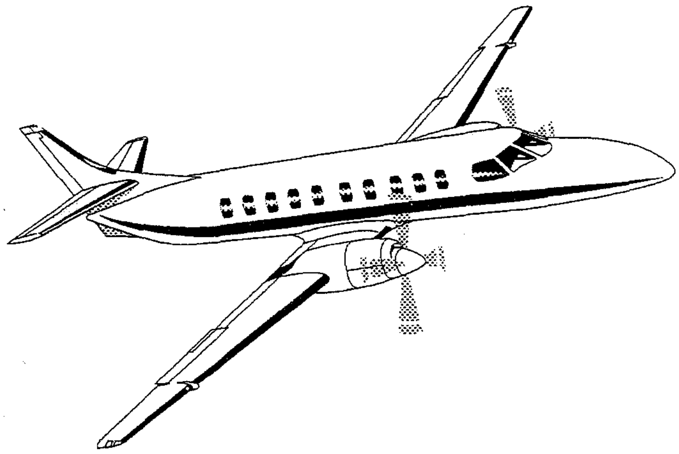
FAA APPROVED
AIRPLANE FLIGHT MANUAL



FAIRCHILD AIRCRAFT
MODEL SA227-AC
- METRO III -

FAA Approved in normal category based on FAR 23, SFAR 23, Special Conditions, and SFAR 41. This manual and its applicable supplements must be carried in the aircraft during flight. It includes the material required to be in the AFM by the Federal Aviation Regulations.

Serial No. ____________________

Registration No. ______________

FAA Approved by: *(signature)*
for Don P. Watson, Manager
Aircraft Certification Division
Federal Aviation Administration
Southwest Region
Ft. Worth, Texas 76193-0150

Date: 4-2-86

Title Page
Revised: MAR 28/96

REISSUE B

FAIRCHILD
AIRCRAFT

P.O. Box 790490 • San Antonio, Texas 78279-0490 • (210) 824-9421

TABLE OF CONTENTS

The following sections are covered in this manual.

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FAA APPROVED AIRPLANE FLIGHT MANUAL

LIST OF EFFECTIVE PAGES

PAGE	DATE
Title	MAR 28/96
0-i	APR 02/86
0-ii	APR 02/86
0-iii	MAY 28/08
0-iv	MAY 28/08
0-v	DEC 07/07
0-vi	OCT 17/94
0-vii	OCT 17/94
0-viii	APR 02/86
0-ix	APR 02/86
0-x	DEC 29/86
0-xi	OCT 17/94
0-xii	NOV 18/97
0-xiii	MAY 28/08
0-xiv	MAY 19/99

SECTION 1

PAGE	DATE
1-i	DEC 07/07
1-ii	JUN 02/00
1-1	APR 02/86
1-2	MAY 13/97
1-3	OCT 17/94
1-4	DEC 07/07
1-5	APR 02/86
1-6	DEC 29/86
1-7	MAY 19/99
1-8	MAY 19/99
1-9	AUG 07/90
1-10	MAY 19/99
1-11	MAY 19/99
1-12	MAY 19/99
1-13	MAY 19/99
1-14	OCT 17/94
1-15	MAY 19/99
1-16	MAY 19/99
1-17	MAY 19/99
1-18	OCT 17/94
1-19	OCT 17/94
1-20	OCT 17/94
1-21	NOV 18/97
1-22	NOV 18/97
1-23	JUN 02/00
1-24	JUN 02/00
1-25	JUN 02/00
1-26	JUN 02/00
1-27	JUN 02/00
1-28	OCT 17/94

SECTION 2

PAGE	DATE
2-i	MAY 19/99
2-ii	MAY 19/99
2-1	APR 02/86
2-2	APR 02/86
2-3	APR 02/86
2-4	APR 02/86
2-5	OCT 17/94
2-6	OCT 17/94
2-7	APR 28/00
2-8	MAY 19/99
2-9	MAY 19/99
2-10	MAY 19/99
2-10A	MAY 19/99
2-10B	MAY 19/99
2-11	MAY 19/99
2-12	MAY 19/99
2-13	MAY 19/99
2-14	MAY 19/99
2-15	OCT 17/94
2-16	NOV 18/97

LIST OF EFFECTIVE PAGES (continued)

SECTION 2 (continued)

PAGE	DATE	PAGE	DATE
2-17	OCT 17/94	2-37	NOV 18/97
2-18	NOV 18/97	2-38	NOV 18/97
2-19	OCT 17/94	2-39	MAY 13/97
2-20	OCT 17/94	2-40	MAY 13/97
2-21	OCT 17/94	2-41	MAY 13/97
2-22	OCT 17/94	2-42	OCT 17/94
2-23	OCT 17/94	2-43	OCT 17/94
2-24	NOV 18/97	2-44	OCT 17/94
2-25	OCT 17/94	2-45	OCT 17/94
2-26	OCT 17/94	2-46	APR 02/86
2-27	OCT 17/94	2-47	APR 02/86
2-28	NOV 18/97	2-48	MAY 19/99
2-29	NOV 18/97	2-49	MAY 19/99
2-30	DEC 30/86	2-50	APR 02/86
2-31	DEC 30/86	2-51	NOV 18/97
2-32	OCT 17/94	2-52	OCT 17/94
2-33	APR 02/86	2-53	OCT 17/94
2-34	APR 02/86	2-54	MAY 13/97
2-35	OCT 17/94	2-55	JUN 02/00
2-36	APR 02/86	2-56	NOV 18/97

SECTION 3

PAGE	DATE	PAGE	DATE
3-i	MAY 28/08	3-15	APR 02/86
3-ii	MAY 19/99	3-16	SEP 05/86
3-1	MAY 19/99	3-17	MAY 19/99
3-2	MAY 19/99	3-18	MAY 19/99
3-3	MAY 19/99	3-19	DEC 06/91
3-4	APR 28/00	3-20	APR 02/86
3-5	MAY 19/99	3-21	MAY 07/87
3-6	MAY 19/99	3-22	MAY 19/99
3-7	MAY 19/99	3-23	MAY 19/99
3-8	MAY 19/99	3-24	APR 02/86
3-9	MAY 28/08	3-25	APR 02/86
3-10	MAY 19/99	3-26	OCT 17/94
3-11	MAY 19/99	3-27	OCT 17/94
3-12	MAY 19/99	3-28	OCT 17/94
3-13	MAY 19/99	3-29	OCT 17/94
3-14	MAY 19/99	3-30	APR 02/86

FAA APPROVED AIRPLANE FLIGHT MANUAL

LIST OF EFFECTIVE PAGES (continued)

SECTION 3A

SECTION 4

SECTION 4A

SECTION 4B

FAA APPROVED AIRPLANE FLIGHT MANUAL

LIST OF EFFECTIVE PAGES (continued)

SECTION 4C

SECTION 4D

SECTION 4E

SECTION 4F

FAA APPROVED AIRPLANE FLIGHT MANUAL

LIST OF EFFECTIVE PAGES (continued)

SECTION 4G

SECTION 4H

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LIST OF REVISIONS

AFM Reissue B incorporates all revisions to AFM Reissue A through Revision A-9. It also includes the contents of AFM Supplements A-2, A-3, and A-6. Old Supplement A-1 has been renumbered B-1 and A-5 has been renumbered B-2. Supplement A-4, "Increased Gross Weight", is not yet required and is held pending incorporation of its contents in a separate AFM for 16,000 pound airplanes. This reissue and its supplements contain editorial corrections and amplifications to operating and descriptive information.

Revisions to the Airplane Flight Manual provide current information applicable to operation of the SA227-AC aircraft. Revised pages should be inserted into the manual to replace existing pages or to add additional pages, as applicable. The manual is valid only when current revisions are incorporated.

Revision Number	Revised Pages	Description of Revision	FAA Approved Signature	FAA Approved Date
B-1	Title, 0-iii, 0-iv, 0-v, 0-vi, 0-ix, 0-x, 1-i, 1-3 1-14, 1-16, 1-18 thru 1-28, 2-6, 2-15 thru 2-20, 2-41, 2-54, 3-16, 3-17, 3A-3, 3A-12, 3A-13, 3A-20, thru 3A-23, 4A-i, 4A-2, thru 4A-8, 4B-19, 4B-20, 4C-i, 4C-1, 4D-i, 4D-1, 4E-i, 4E-1, 4F-i, 4F-1	Revised to accommodate use of Goodyear tires; to delete reference to MMEL; to revise use of bleed air before take-off and during climb; to change balked landing procedural step; to amplify door warning, transfer pump, and yaw damper discussions; and to correct editorial errors.	C L Stone	9-5-86
B-2	0-iii, 0-v, 0-ix, 1-6, 1-7, 1-10, 1-11, 1-13, 1-14, 3A-8, 3A-14	Revised AWI mix, corrected generator loads effectivity, corrected editorial error, and modified notes for alternate static source in Section 3A to agree with notes and cautions in Section 4.	C L Stone	12-29-86

A black bar in the margin of a revised page shows the current change.

LIST OF REVISIONS (continued)

Revision Number	Revised Pages	Description of Revision	FAA Approved Signature	Date
B-3	0-iii, 0-iv, 0-x, 2-7, 2-23, 2-30 2-31, 2-32, 3-26, 3-27.	Revised to address change to SAS clutch nomenclature when magnetic powder clutch servo is replaced by torque motor servo.	C S Stern	12-30-86
B-4	0-iii, 0-iv, 0-v, 0-x, 1-21, 1-22, 2-28, 2-29, 2-51, 2-52, 2-53, 2-55, 3A-7.	Revised to make procedures for avoidance of flameout due to ice ingestion more explicit, to provide an equivalent method of compliance with AD 86-25-04, dated Dec. 15, 1986, and to authorize removal of supplement which was originally inserted in limitations section in order to comply with that AD.	Henry A Armstrong	3-13-87
B-5	0-iii, 0-iv, 0-v, 0-x, 1-16, 1-21, 2-29, 3-8, 3-21, 3-22, 3-23, 3A-i, 3A-32, 4A-1, 4A-3.	Corrected editorial errors, rounded off F.S. references for bending moment calculations, clarified effects of propeller feathering on glide distance, emphasized wind effects on runway performance.	L.B. Andriesen	5-7-87
B-6	0-iii, thru 0-v, 0-x, 2-7, 2-15, 2-18, 2-20, 3-4, 3-6, 3-7, 3A-24, 3A-26.	Accommodated S.B. 227-61-006 (prop synch switch removal).	H A Armstrong	3-3-89
B-7	0-iii, 0-x, 1-9	Increased the overspeed governor and propeller unfeathering pump check interval to 200 hours.	C. S. Lowell for Manager, Airplane Certification Office	8-7-90

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LIST OF REVISIONS (continued)

Revision Number	Revised Pages	Description of Revision	FAA Approved Signature	Date
B-8	0-iii thru 0-vi, 0-xi, 0-xii, 1-15, thru 1-17, 2-22, 2-23, 2-35, 3-9, 3-19, 4B-i, 4B-1, 4C-1, 4D-1 and 4E-1	Added new P/N and new name of brake manufacturer, changed Note on maximum loads for forward and aft baggage compartment, added Notes on cooling engines, changed interval for overspeed governor check in Normal Procedures, revised Emergency Procedures, added Fuel Venting and Exhaust Emissions statement. Changed Takeoff Power Check Charts to include engine anti-ice effects.	Michele M Owsley	12·6·91
B-9	0-iii, 0-iv, 0-xi, 1-8, 2-14, 2-15, 3-6, and 3-11	Changed: Battery Overheat Warning System, Current Limiters step in Before Taxi, added: NOTE to Interior/Exterior Lights, WARNING to Landing Gear (after liftoff) takeoff continued at or above V_1.	Michele M Owsley	3·29·94
B-10	0-iii thru 0-vii, 0-xi, 1-i, 1-2 thru 1-4, 1-7, 1-13 thru 1-20, 1-27, 1-28, 2-i, 2-ii, 2-5 thru 2-27, 2-29, 2-32, 2-35, 2-37, 2-38, 2-40 thru 2-45, 2-51 thru 2-56, 3-i, 3-ii, 3-1 thru 3-3, 3-5, 3-6, 3-12 thru 3-14, 3-18, 3-26 thru 3-29, 3A-i, 3A-1 thru 3A-6, 3A-9 thru 3A-15, 3A-17, 3A-18, 3A-32, 4-i, 4A-i, 4A-1, thru 4A-5, 4A-7, 4A-8, 4C-1, 4C-8, 4D-1, 4E-1, 4F-i, 4G-i, 4G-1, 4G-2, 4G-6 thru 4G-9, 4H-1 thru 4H-9	Changed Limitations, Normal Procedures, Emergency Procedures, and Abnormal Procedures sections. Corrected editorial errors. Changed order of Landing Distance and Landing Brake Energy Limits charts. Modified Reduced Power Takeoff section.	Michele M Owsley	10·17·94

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LIST OF REVISIONS (continued)

Revision Number	Revised Pages	Description of Revision	FAA Approved Signature	Date
B-11	Cover, 0-iii, 0-iv, 0-xii, 2-ii, 2-38 thru 2-41	Changed airplane art, company name, area code, and Ft. Worth zip code on the cover; changed Variable Authority NWS system for aircraft modified by S.B. 227 32-040.	Werner Koch	3/28/96
B-12	0-iii, 0-iv, 0-xii, 1-2, 2-ii, 2-39 thru 2-41 2-51, 2-54 thru 2-56.	Added to **WARNING** for Propeller Reversing, corrected NWS Power Lever Button(s) procedures and corrected Continuous Ignition System data in the text and **WARNING** on page 2-56 to bring AFM back in compliance with AD 86-25-04 which was accomplished in Revision B-4.	Ronald L. Fuller	5/13/97
B-13	0-iii thru 0-v, 0-xii, 1-i, 1-21 thru 1-23, 2-7, 2-16, 2-18, 2-24, 2-28, 2-29, 2-37, 2-38, 2-51, 2-56, 3A-i, 3A-7 thru 3A-7B	"Revision B-13 to this Airplane Flight Manual (AFM) is approved by the Manager of the Small Airplane Directorate as an alternative means of compliance with AD 96-09-16, paragraph (1)(a), approved in FAA letter dated January 1997." Changed Power Levers info on page 2-7 and made changes to Section 2 to match other AFM's. There were two pages added: 3A-7A and 3A-7B. After inserting this Revision, Remove TFM2 REVISION dated OCT 20/95.	Michele M. Owsley	11-18-97

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LIST OF REVISIONS (continued)

Revision Number	Revised Pages	Description of Revision	FAA Approved Signature	Date
B-14	0-iii thru 0-v, 0-xiii, 0-xiv, 1-7, 1-8, 1-10 thru 1-13, 1-15 thru 1-17, 1-27, 2-i, 2-ii, 2-7 thru 2-14, 2-48, 2-49, 3-i, 3-ii, 3-1 thru 3-14, 3-17, 3-18, 3-22, 3-23, 3A-i, 3A-3, 3A-4, 3A-6, 3A-9, thru 3A-15, 3A-20 thru 3A-24 and 3A-30	*Section 1* – changed Figure 1-2 and 1-3 Tables to vertical page format and corrected Nose Wheel Steering – Restricted Use. Revised *Battery Start* and *Ground Power Unit (GPU) Start* (*Section 2*) and *Manual Ground Start Procedures* (*Section 3A*) to accommodate SB 227 24-015 and SB 227 80-001. *Section 3* – added *Double Generator Failure*, *Double Engine Failure (Restarts/Relights Unsuccessful)*; revised *Annunciator Panel*, *Smoke in Aircraft*, *Wheelwell and Wing Overheat Warning Light On*. Corrected editorial errors in all sections. Added six pages: 0-xiii, 0-xiv, 2-10A, 2-10B, 3A-14A and 3A-14B.	[signature]	5/19/99
B-15	0-iii, 0-iv, 0-xiii, 2-7, 3-i and 3-4	Added *Out-of-Trim Warning* info to *Sections 2* and *3*.	MMOwsley	4.28.00
B-16	0-iii thru 0-v, 0-xiii, 1-i, 1-ii, 1-23 thru 1-27, 2-55, and 3A-7B	Added *Pneumatic Deicing Boots System* information to comply with AD 2000-06-04.	MMOwsley	6.2.00
B-17	0-iii, 0-v, 0-xiii, 1-i, 1-4, 3A-i, 3A-3A, 3A-3B	Page 1-4 added Fuel Balancing Operation. Added two pages 3A-3A and 3A-3B. Page 3A-3A added Fuel Balancing Procedure.	MMOwsley	12.7.07
B-18	0-iii, 0-iv, 0-xiii, 3-i, and 3-9	Page 3-9, Added No Response to Power Lever Movement procedure.	MMOwsley	5.28.08

LIST OF REVISIONS (continued)

Revision Number	Revised Pages	Description of Revision	FAA Approved Signature	Date

TABLE OF CONTENTS
LIMITATIONS

ITEM PAGE

TABLE OF CONTENTS (continued)
LIMITATIONS

INTRODUCTION

Section 1 of this manual provides the operating limitations, the significance of such limitations, instrument markings, color coding, and basic placards necessary for safe operation of the airplane, its engines and systems. The limitations in this section have been approved by the Federal Aviation Administration (FAA).

WARNINGS, **CAUTIONS**, and NOTES are used throughout this manual to emphasize important operating information.

WARNING

OPERATING PROCEDURES, PRACTICES, ETC., WHICH MAY RESULT IN PERSONAL INJURY OR LOSS OF LIFE IF NOT CAREFULLY FOLLOWED.

CAUTION

OPERATING PROCEDURES, PRACTICES, ETC., WHICH IF NOT STRICTLY OBSERVED MAY RESULT IN DAMAGE TO EQUIPMENT.

NOTE

An operating procedure, condition, etc., which is essential to emphasize.

REDUCED POWER TAKEOFF OPERATIONS

When operating in accordance with Section 4, Part H (Reduced Power Takeoff Operations) the following limitations apply:

1. The engine torque used for a takeoff may not be less than 90% of the torque shown by the appropriate power setting chart for the actual ambient conditions.

2. The use of reduced power for takeoff is not permitted when the runway is contaminated with water, ice, slush, or snow.

3. As a condition to the use of reduced power procedures, operators must establish a periodic check system or engine condition monitoring system to ensure that the engines are capable of producing normal takeoff thrust for the actual ambient temperature.

4. Minimum crew during reduced power takeoff operations is two pilots.

5. Air Carrier or Air Taxi commercial operators must have prior approval of the cognizant FAA inspector prior to conducting reduced power takeoff operations.

POWER PLANT

Two Garrett TPE331-11U-601G or -611G engines, rated at 1,000 shaft horsepower (dry) or 1,100 shaft horsepower (wet), are equipped with 106 inch diameter Dowty Rotol Limited (C) R.321/4-82-F/8 full feathering, reversible, constant speed, four bladed propellers.

PROPELLERS

Propeller blade angles, measured at propeller blade station J-J are:

(Station J-J is station 36.278 inches)

Feathered .... 84^{o} 46' plus or minus 20'
Flight Idle .... 7^{o} plus or minus 30'
Start Locks .... –30' plus or minus 1^{o}
Full Reverse .... -13^{o} 30' plus or minus 1^{o}

PROPELLER REVERSING

Full reverse operations (landing rollout, taxi, and ramp operations) are limited to speeds below 90 knots.

<u>WARNING</u>

- **PROPELLER REVERSING IN FLIGHT IS PROHIBITED.**

- **DO NOT RETARD POWER LEVERS AFT OF THE FLIGHT IDLE GATE IN FLIGHT. SUCH POSITIONING MAY LEAD TO LOSS OF AIRPLANE CONTROL OR MAY RESULT IN AN ENGINE OVERSPEED CONDITION AND CONSEQUENT LOSS OF ENGINE POWER.**

FUELS

Use aviation fuels conforming to AiResearch Installation Manual IM5117 (Jet A, Jet A-1, Jet B, JP-1, JP-4, JP-5, and JP-8). Grade 100LL aviation gasoline may be used at a rate not to exceed 250 gallons per 100 hours of operation, with the total used limited to 7,000 gallons per engine overhaul period. Jet fuel and aviation gasoline may be mixed in any proportion. If 25% or more aviation gasoline is used, add one quart of MIL-L-6082 specification grade 1065 or 1100 piston engine oil per 100 gallons of aviation gasoline to provide fuel pump lubrication.

NOTE

The amount of aviation gasoline used must be recorded in the Engine Log Book.

Icing inhibitor MIL-I-27686E fuel additive, or equivalent, is approved not to exceed 0.15% by volume.

The usable fuel quantity is 648 U.S. gallons.

Maximum demonstrated fuel imbalance for takeoff and landing is 500 pounds.

Boost pumps must be on for all flight operations outside the no boost pumps required envelope of Figure 1-1.

Takeoff with fuel transfer pump caution light(s) illuminated is prohibited.

FUEL BOOST PUMP AVAILABILITY REQUIREMENTS

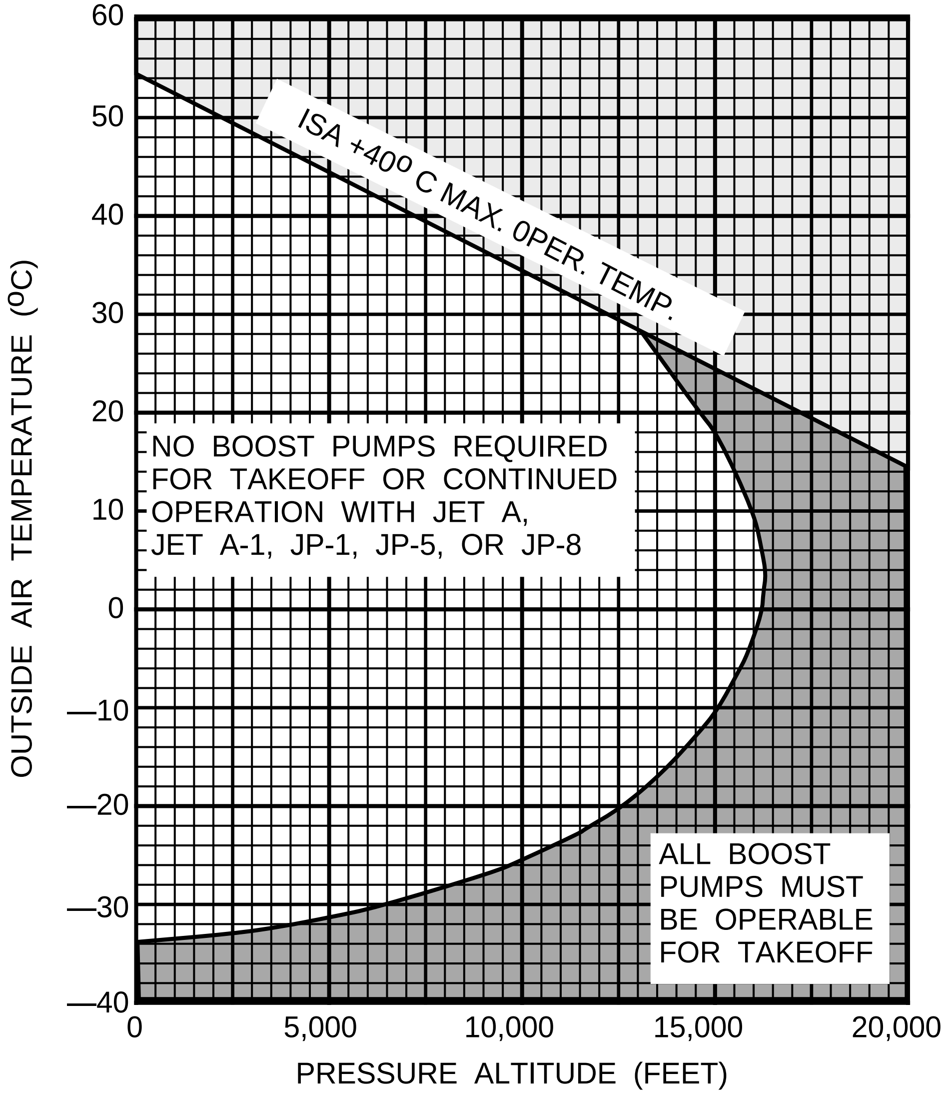


FIGURE 1-1

FUEL BALANCING OPERATION

WARNING

AUTOPILOT/YAW DAMPER USE DURING FUEL BALANCING IS PROHIBITED.

OIL

Mixing oil types or brands is prohibited. Refer to Maintenance Manual for Oil Change Procedures. Engine/propeller system total oil quantity is 7.1 U.S. quarts. Oil specification is MIL-L-23699B (Type II). Refer to Garrett AiResearch Specification EMS53110 Type II for a current list of approved oils.

ENGINE OPERATION WITH CONTINUOUS ALCOHOL-WATER INJECTION (CAWI)

Time Limit.......................................5 Minutes
Maximum Torque.......................................110%
Maximum EGT..650°C
Minimum Outside Air Temperature for CAWI Operation........-6°C

CAUTION

CAWI USE IS LIMITED TO TAKEOFF OPERATIONS ONLY. INFLIGHT USE OF CAWI MAY RESULT IN EXCEEDING THE ENGINE OPERATING LIMITS.

ALCOHOL-WATER MIXTURE COMPOSITION AND RELATED DATA

Maximum Usable AWI Fluid Quantity...................16 Gallons
Minimum AWI Fluid Quantity for Wet Takeoff...........8 Gallons

NOTE

- Eight gallons is the minimum AWI fluid quantity for wet takeoff and acceleration to V_{YSE}.
- Refer to Figure 1-2 for minimum AWI fluid quantity for continued wet takeoff after recognizing engine failure at V_1, a continued wet power single engine climb at V_2 to 1000 foot height, and acceleration to V_{YSE}.

MINIMUM AWI FLUID QUANTITY FOR WET TAKEOFF, CONTINUED WET V_2 CLIMB TO 1,000 FOOT HEIGHT, AND ACCELERATION TO $V_{Y_{SE}}$.

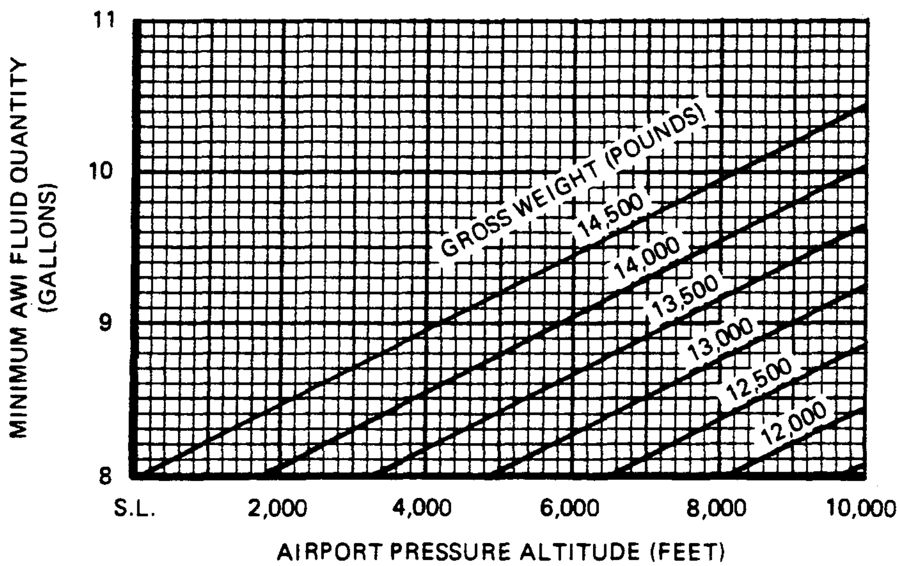


FIGURE 1-2

ALCOHOL-WATER MIXTURE COMPOSITION AND RELATED DATA (continued)

The CAWI system may not be operated if the AWI fluid has been exposed to ambient temperatures below -24°C within the preceding one hour.

Mixture Composition By Percent of Volume	Specific Gravity At Temperatures 4°C To 15°C (39°F To 59°F)	Approximate Freeze Point
Methanol 40% (plus 6%, minus 2%) Water 60% (plus 2%, minus 6%)	0.9510 to 0.9390	-31°C (-24°F)

Methyl Alcohol (Methanol) having a minimum purity of 99.8 weight percentage and nonvolatile content of less than 0.001 weight percentage shall be used.

Water shall conform to the following requirements: It shall be treated by a demineralization process or shall be distilled if necessary to ensure conformation (Material Specification - EMS 53123).

	Minimum	Maximum
Total Solids, PPM	-------	10
pH	6.0	8.0
Chlorides, PPM	-------	1
Sulfates, PPM	-------	1
Sodium, PPM	-------	1

TEMPERATURE LIMITS - ALL ALTITUDES

Minimum Ambient Temperature
For Engine Ground Starting..............................-40°C
For Engine Operation....................................-54°C

NOTE

Successful engine starts may not be possible if the fuel has cold soaked at temperatures below -40°C.

Maximum Ambient Temperature.............................ISA +40°C
(See International Standard Atmosphere Chart, Section 4)

SINGLE RED LINE COMPUTER (SRL)

Operation of the airplane with the SRL inoperative is prohibited except as stipulated in Section 3A, ABNORMAL PROCEDURES, and Supplement B-3, TAKEOFF WITH SRL OFF/INOPERATIVE.

MAXIMUM RECOMMENDED STARTING CURRENT

Due to the possibility of excessively high current surge during engine start, it is recommended that the maximum starting current from an external power source be limited to 1,000 amperes.

ENGINE STARTER DUTY CYCLES

Start Attempt	*Allowable Starter ON Time	Starter OFF Time
1	30 seconds	60 seconds
2	30 seconds	60 seconds
3	30 seconds	15 minutes

*The specified starter ON times assume no ignition of fuel but do include engine clearing time. Starter ON time may be extended if ignition of fuel occurs, but procedures listed under Battery Start in Sections 2 and 3A should be observed.

GENERATORS

Maximum continuous load for each generator

- Ground operations and takeoff operations to 1,000 feet AGL .... 200 amps
- Inflight (AC-398 through AC-577, except AC-546, AC-547, and AC-559) .... 200 amps
- Inflight (AC-546, AC-547, AC-559, AC-578 and later) .... 300 amps

NOTE

- When the generator is turned on following battery engine starts, the indicated load on the generator initially will exceed 200 amps while the batteries are being recharged. The duration at more than 200 amps shall not exceed two minutes.
- When the operating generator is used to assist in starting the second engine, its ammeter will peg high at the beginning of the start sequence and will continue to indicate in excess of 200 amps while the starter for the second engine is engaged.

BATTERY OVERHEAT WARNING SYSTEM

1. Battery temperature warning sensor setting is 150^{o}F, plus or minus 3^{o}F.

2. Takeoff after a battery overheat warning (red light) illuminates is prohibited until the cause of the overheat warning is corrected.

TEMPERATURE LIMITER (Fuel Bypass Valve Open)

Maximum altitude for prolonged operation is 15,000 feet.

RPM with the bypass valve open must be maintained between 99 and 101% or between 96 and 98%.

TEMPERATURE LIMITER INOPERATIVE

Do not take off with either fuel bypass valve failed in the open position.

FIRE EXTINGUISHER SYSTEM

The fire extinguisher system is required equipment. If the system does not test satisfactorily (see Section 2), takeoff is prohibited.

AIRSTART ENVELOPE

Maximum Pressure Altitude for Airstarts
With Boost Pumps Operating .... 20,000 FEET
Without Boost Pumps Operating .... 12,000 FEET
Airspeed Limits for Airstart .... 100 TO 180 KIAS

REQUIRED ENGINE CHECKS (continued)

A. The NTS System must be checked:

1. Operationally before the first flight of the day.

2. At intervals not to exceed 250 flight hours in accordance with instructions in Garrett/AiResearch Maintenance Manual, 72-00-00.

B. The SRL Computer and Temperature Limiter System should be checked operationally:

1. At intervals not to exceed 50 flight hours.

2. Prior to any flight when manual engine start has been necessary.

3. When there is any indication of SRL computer malfunction.

4. After any engine fuel control or SRL computer maintenance or adjustment.

C. The overspeed governors and the propeller unfeathering pumps should be checked:

1. At intervals not to exceed 200 flight hours.

2. Prior to any flight for which intentional air starts are planned.

3. When there is any indication of malfunction.

4. After engine control system maintenance or adjustment.

POWER SETTINGS AND OPERATING LIMITS FOR TPE331-11U-601G OR -611G TURBOPROP ENGINES WITH REVERSING PROPELLERS

POWER SETTING	TIME	MAX TORQUE (%)	MAX EGT (°C)	RPM(1) (%)	OIL PRESS. (PSI)	FUEL PRESS. (PSI)	OIL TEMP (°C)
TAKEOFF (DRY)		100(2)	650(3)	100(4)	70 – 120	20 – 80	55 – 110
TAKEOFF (WET)	5 MIN.	110(5)	650(3)	100(4)	70 – 120	20 – 80	55 – 110
MAXIMUM CONT.		100	650(3)	100	70 – 120(6)	20 – 80	55 – 110
FLIGHT IDLE				96 – 100	70 – 120(6)	20 – 80	55 – 110
GROUND IDLE				70 or 97(7)	40 – 120	15 – 80	–40 TO 127
STARTING			770				–40 MIN.
REVERSE HIGH				95.5 – 97	70 – 120	20 – 80	55 – 110
REVERSE LOW				75 MIN.	70 – 120	15 – 80	–40 TO 127
SHUTDOWN	3 MIN.(8)						

(1) Avoid operation between 18% and 28% RPM except for transients occurring during engine start and shutdown. 96% is the minimum RPM during flight. At 100% RPM, propeller speed is 1591 RPM.

(2) Static takeoff power should be limited to 97% dry torque to preclude overtorque condition occurring due to ram effects during takeoff. (100% equals 3,301 ft.-lbs.).

(3) 650°C to 675°C, reduce power. 675°C to 685°C for less than 20 seconds, reduce power. 675°C to 685°C for more than 20 seconds, conduct power check. 685°C to 687°C for up to 5 seconds, conduct power check 685°C to 687°C for more than 5 seconds or in excess of 687°C, remove engine.

(4) 101% to 101.5% for 5 minutes, 101.5% to 105.5% for 30 seconds. If RPM time limits are exceeded, conduct power checks to determine satisfactory engine performance. Record time in excess of time limits in engine log book. 105.5% to 106% for 5 seconds. If 5 second time limit or 106% is exceeded, remove engine.

(5) Static takeoff power should be limited to 107% wet torque to preclude overtorque condition occurring due to ram effects during takeoff.

(6) Above 23,000 feet, minimum oil pressure is 50 psi.

(7) Typical engine speeds for low and high RPM speed lever position.

(8) Three minute cooldown period prior to stopping engines. Descent, approach, landing roll, and taxi times are included if power during those phases does not exceed 20% torque. If reverse power is used and exceeds 20% power (stabilized) the 3 minute cooling period commences at engine power reduction.

FIGURE 1-3

INSTRUMENT MARKINGS

INSTRUMENT	RED RADIAL (MIN.)	YELLOW ARC	WHITE ARC	GREEN ARC	YELLOW ARC	RED RADIAL (MAX.)	RED ARC	RED DOT OR DIAMOND	BLUE SECTOR
Airspeed Indicator (KIAS)	87(1)		86.5 to 159	97 TO 246		246(3) or (3)			129 to 134(4)
EGT (^{o}C)				0 to 650		650		770(5)	
Torquemeter (% Torque)				0 to 100	100 to 110	110			
Tachometer (%RPM)				96 to 100		101			
Fuel Pressure (psi)	15(6)	15 to 20		20 to 80		80			
Oil Pressure (psi)	40(6)	40 to 70(6)		50 to 70(7) 70 to 120		120			
Oil Temperature (^{o}C)	–40	–40 to 55		55 to 110	110 to 127(8)	127			
Oxygen Pressure (psi)			0 to 300	1600 to 1850			1850 to 2000		
Deice Pressure (psi)	10	10 to 12		12 to 19	19 to 21	21			
Suction (in. Hg.)	4.4			4.4 to 4.8		5.5			
Hydraulic Pressure (psi)		1400 to 1700		1700 to 2100	2100 to 2300	2300			
Cabin Differential Pressure (psi)				0 to 7.0	7.0 to 7.25	7.25			
Prop Deice Ammeter (amps)				17 to 21 18 to 24 (9) 25 to 32 (10) 35 to 47 (11)					
Pitot Heat Ammeter (amps)				2.4 to 10 3.5 to 15(12)					
CAWI Quantity (gal.)	8(15)								
Generator Ammeter (amps)						200(13) 300(14)			

(1) V_{MCA}
(2) Radial is extended and inner red radial is provided to show V_{MO} variation with altitude.
(3) Maximum allowable Airspeed Indicator: Cross hatched needle moves to indicate V_{MO}/M_{MO} for aircraft operating altitude.
(4) V_{YSE}
(5) Used during start as limit EGT (1 second).
(6) At 71% RPM.
(7) Above 23,000 feet, minimum oil pressure is 50 psi.
(8) Ground operation only.
(9) AC-498 through AC-545.
(10) Aircraft AC-550 and later or those aircraft modified in accordance with S.B. 30-001.
(11) Dowty-Rotol propellers with P/N 660716235 prop deice boots.
(12) Aircraft with heated pitot masts. (S.B. 227-34-001).
(13) Generator load limit will be exceeded during cross-generator starting cycle, but not to exceed 2 minutes.
(14) In flight operations for AC-546, AC-547, AC-559, AC-578 and later.
(15) Minimum AWI fluid quantity for Wet Takeoff and acceleration to V_{YSE} at 50 feet. See Figure 1-2 for additional fluid quantity requirements.

FIGURE 1-4

AIRSPEED LIMITS

SPEED	KCAS	KIAS (1)	REMARKS
V_A Maneuvering Speed	176	176	Maximum speed at which individual application of full available aerodynamic control will not overstress the aircraft at 14,500 pounds gross weight. This speed decreases approximately 7 KIAS per 1,000 pounds reduction in weight.
V_{FE} Flaps Extended Speed			Maximum speed for extending the flaps or operating with the flaps extended.
	215	214	1/4 Flaps (9^o)
	180	179	1/2 Flaps (18^o)
	159	159	Full Flaps (36^o)
V_{LO} Landing Gear Operating Speed	176	176	Maximum speed for operating the landing gear with the normal or emergency systems.
V_{LE} Landing Gear Extended Speed	176	173	Maximum speed with gear extended.
V_{MCA} Minimum Control Airspeed	87	87	Minimum control speed in flight in the following configuration: Gear up and flaps at 1/4, takeoff power on the operating engine, windmilling propeller on the inoperative engine with NTS operative, no more than 5^o bank into good engine.

(1) KIAS is based on normal static system and assumes zero instrument error.

AIRSPEED LIMITS (continued)

SPEED	KCAS	KIAS [1]	REMARKS
V_{MO} Maximum Operating Speed	248	246	This speed applies from sea level through 17,800 feet. At pressure altitudes above 17,800 feet use the following table or maximum allowable airspeed indicator to remain below the M_{MO} limit.
M_{MO} Maximum Operating Mach Number	0.52		See altitude/airspeed table below.

ALTITUDE (FT)	AIRSPEED (KIAS)
18,000	245
20,000	235
23,000	221
26,000	208
29,000	194
31,000	186

V_{MO}/M_{MO} must not be exceeded deliberately.

(1) KIAS is based on normal static system and assumes zero instrument error.

ALTITUDE LIMIT

Maximum Operating Pressure Altitude .... 31,000 FEET

FLIGHT ABOVE 15,000 FEET

The certification basis of this aircraft requires that supplemental breathing oxygen be provided for at least one pilot and for any one passenger.

FLIGHT ABOVE 25,000 FEET

The certification basis of this aircraft requires that supplemental breathing oxygen be provided for each occupant.

NOTE

It is the pilot's responsibility to ensure that oxygen system servicing and oxygen mask provisioning meet the requirements of the rules under which the aircraft is to be operated.

CABIN PRESSURIZATION

Maximum Normal Cabin Differential Pressure .... 7.0 psi
Safety valve is set at 7.25 psi
Cabin must be depressurized during takeoff and landing.

TIRE GROUND SPEED LIMITS

Main Wheel Tires
- B.F. Goodrich P/N 021-335 .... 139 Knots
- B.F. Goodrich P/N 021-335-1 .... 148 Knots
- B.F. Goodrich P/N 028-335-1 .... 165 Knots
- Goodyear Aerospace P/N 196K08-6 or 196K08-9 .... 165 Knots
- Aviator P/N 028-335-3 .... 165 Knots

Nose Wheel Tires
- B.F. Goodrich P/N 021-611 (No Chines) .... 139 Knots
- B.F. Goodrich P/N 031-613 or P/N 031-613-4 (Chined) .... 183 Knots
- Goodyear Aerospace P/N 184F03-2 (Chined) .... 183 Knots

NOTE

The above stated tires are the only approved tires.

APPROVED BRAKES

Dual Rotor Brakes: Goodyear Aerospace or Aircraft Braking Systems (ABS) P/N 5007396, or ABS P/N 5011640 or P/N 5011640-1.

NOTE

- Aircraft Braking Systems (ABS) is the current name for the company previously known as Goodyear Aerospace.
- Performance charts marked "Goodyear Aerospace Dual Rotor Brakes" also apply to Aircraft Braking Systems (ABS) brakes.

OR

B.F. Goodrich Single Rotor Brakes, P/N 2-1203-3

ANTI-SKID BRAKE SYSTEM (If Installed)

NOTE

- Use of the anti-skid brake system is prohibited when there has been a hydraulic system failure.
- Use of the anti-skid brake system is prohibited when the yellow anti-skid caution light fails to extinguish.
- Use of power brakes without anti-skid is prohibited.

NOSE WHEEL STEERING

1. Use of nose wheel steering is prohibited when there has been a hydraulic system failure.
2. Use of nose wheel steering is prohibited when the arming valve has failed to test properly.

NOSE WHEEL STEERING – RESTRICTED USE (Aircraft not modified in accordance with Service Bulletin 32-006)

Restrict operation of the nose wheel steering to taxi operations only at speeds below 10 knots, in accordance with Service Bulletin 227 A32-001, dated June 3, 1981.

MANEUVERING LOAD FACTORS

Flaps Up .... Plus 3.08g to Minus 1.23g
Flaps Down .... Plus 2.00g to Zero g

MAXIMUM FUSELAGE BENDING MOMENTS

Cargo and passengers must be distributed to ensure that the maximum bending moments in the following table are not exceeded.

MAX. ZERO FUEL WT.	PAYLOAD LOCATION	REFERENCE F.S.(INCHES)	MAX. WT, (POUNDS)	MAXIMUM MOMENT (IN-LB/1,000)
13,130 LBS. (STANDARD)	FWD. OF FRONT SPAR	274	2,465	351.4
	AFT OF REAR SPAR	310	2,470	232.2
13,900 LBS. (OPTIONAL)	FWD. OF FRONT SPAR	274	2,825	232.2
	AFT OF REAR SPAR	310	3,138	352.6

NOTE

See Section 5 for bending moment calculation instructions.

CONVERTIBLE INTERIOR

The SA227-AC interior is designed to permit conversion from a 19 or 20 passenger arrangement to full or partial cargo configurations. Seats may be removed, and the structural bulkhead(s) may be removed, or relocated to any of several locations shown in Section 5.

NOTE

Seating configuration changes are classified as aircraft alterations that require the aircraft to be returned to service in accordance with the applicable regulations.

CENTER OF GRAVITY LIMITS

Forward Limit (landing gear down):
257.0 inches aft of datum at 11,000 pounds and less
260.7 inches aft of datum at 14,500 pounds
(Straight line variation between 11,000 and 14,500 pounds)

Aft Limit (landing gear down):
277.0 inches aft of datum at all weights

NOTE

- Landing gear retraction will not shift the center of gravity beyond limits.
- Follow loading instructions in Section 5.

WEIGHT AND BALANCE

The preflight loading must be arranged to provide a center of gravity sufficiently forward of the aft limit to prevent exceeding the aft c.g. limit during CAWI takeoff operations.

MAXIMUM WEIGHTS

* Maximum Ramp Weight	14,600 pounds
* Maximum Takeoff Weight	14,500 pounds
Maximum Landing Weight	14,000 pounds
Maximum Zero Fuel Weight	13,130 pounds
Maximum Zero Fuel Weight (See Note)	13,900 pounds
Maximum Forward Baggage Compartment Load (baggage and equipment)	800 pounds
Maximum Fuel Imbalance (for takeoff and landing)	500 pounds
Maximum Aft Baggage Compartment Load	850 pounds
Maximum Floor Loading (all cargo and passenger areas)	150 pounds/ft^2

*Applies to S/N AC-514 and subsequent or previous aircraft with Service Bulletin 11-001 incorporated. If Service Bulletin 11-001 has not been incorporated the maximum ramp weight is 14,100 pounds and the maximum certificated takeoff weight of 14,000 pounds must be observed.

NOTE

- 13,900 pounds Zero Fuel Weight is approved for aircraft with part numbers 27-13900-65, -66, -67, and -69 installed per drawing 27-13900 by ECP 441 or by kit drawing 27K20004.

- The maximum load that can be carried in the forward baggage compartment is 800 pounds, including equipment, baggage, and cargo. The compartment is placarded to show the amount of baggage and cargo allowed after subtracting the weight of the CAWI system components (65 pounds), the weight of a full CAWI tank (128 pounds), and the weight of installed equipment (varies with customer options).

- The maximum load that can be carried in the aft baggage compartment is 850 pounds plus up to 100 pounds installed equipment on the equipment shelf at F.S. 530 – 548 aft of the baggage compartment. The weight of equipment installed in the baggage compartment, such as the optional lavatory and its fluid, or air conditioner components, is subtracted from the 850 pound maximum allowable. The compartment is placarded to show the amount of baggage and cargo allowed after subtracting the weight of this installed equipment.

OPERATING WEIGHTS

1. When operating rules require, and/or when operating at weights above 12,500 pounds, the limitations listed below apply.

   a. The maximum takeoff weight may not exceed the lower of the following:

      (1) The weight at which the single engine takeoff climb requirements are met (Figure 4-19, 4-29 or 4-39).

      (2) The weight at which the accelerate-stop distance (Figure 4-22, 4-23, 4-32, 4-33, 4-42 or 4-43) or the two-engine takeoff distance (Figure 4-26, 4-36 or 4-46), whichever is longest, equals the available runway length.

      (3) The weight at which the maximum ground speed during takeoff operations is equal to the tire ground speed limit:

      Nose Wheel Tires
      B.F. Goodrich P/N 021-611, See Figure 4-16

      Main Wheel Tires
      B.F. Goodrich P/N 021-335, See Figure 4-17

      NOTE

      For all other approved tires, the corresponding tire ground speed limits will not be exceeded if the aircraft is operated in accordance with the maximum takeoff weight limitation charts (Figure 4-19, 4-29, or 4-39).

   b. The maximum landing weight may not exceed the lower of the following:

      (1) The weight at which the balked landing climb requirement is met (Figure 4-53 or 4-54).

      (2) The weight at which the required field length (Figure 4-56 or 4-57) equals the landing runway length.

      (3) The weight at which the landing brake energy limit is reached (Figure 4-58 or 4-59).

OPERATING WEIGHTS (continued)

2. When operating at takeoff weights at or below 12,500 pounds the limitations listed below apply.

   a. When configured to carry 10 or more passengers (excluding any crew seat):

      (1) The maximum takeoff weight may not exceed the lower of the following:

         (a) The weight at which the single engine takeoff climb requirements are met (Figure 4-19 or 4-29). Limit is 12,500 pounds with wet takeoff power for all temperatures, sea level to 10,000 feet.

         (b) The weight at which the accelerate-slow distance (Figure 4-20, 4-21, 4-30, 4-31, 4-40 or 4-41) or the two-engine takeoff distance (Figure 4-26, 4-36 or 4-46), whichever is longest, equals the available runway length.

         (c) The weight at which the maximum ground speed during takeoff operations is equal to the tire ground speed limit:

Nose Wheel Tires
B.F. Goodrich P/N 021-611, See Figure 4-16

Main Wheel Tires
B.F. Goodrich P/N 021-335, see Figure 4-17

NOTE

For all other approved tires, the corresponding tire ground speed limits will not be exceeded if the aircraft is operated at or below 12,500 pounds and in accordance with the applicable performance data in Section 4.

      (2) The maximum landing weight may not exceed the lower of the following:

         (a) The weight at which the balked landing climb requirement is met (Figure 4-53 or 4-54).

         (b) The weight at which the required field length (Figure 4-56 or 4-57) equals the available landing runway length.

         (c) The weight at which the landing brake energy limit is reached (Figure 4-58 or 4-59).

OPERATING WEIGHTS (continued)

b. When configured to carry 9 or fewer passengers (excluding any crew seat):

(1) The maximum takeoff weight may not exceed the lower of the following:

(a) The weight at which the two engine takeoff distance (Figure 4-26, 4-36, or 4-46) equals the available runway length.

(b) The weight at which the maximum ground speed during takeoff operations is equal to the tire ground speed limit.

Nose wheel tires
B.F. Goodrich P/N 021-611, See Figure 4-16

Main wheel tires
B.F. Goodrich P/N 021-335, See Figure 4-17

NOTE

For all other approved tires, the corresponding tire ground speed limits will not be exceeded if the aircraft is operated in accordance with the maximum takeoff weight limitation charts (Figure 4-19, 4-29, or 4-39).

(2) The maximum landing weight may not exceed the weight at which the landing brake energy limit is reached (Figures 4-58 or 4-59).

MINIMUM CREW

The minimum crew required is one pilot except when two pilots are required by the operating rules or when conducting reduced power takeoff operations.

TYPES OF OPERATION/REQUIRED EQUIPMENT LIST

This is a normal category aircraft approved for operation in Day/Night, VFR/IFR and icing conditions.

Ingestion of slush, excessive quantities of water, or ice shedding from spinners, propellers, or engine intakes may interrupt air flowing to the combustion chambers and cause engine flameout. Specific operating instructions for use of the continuous ignition system are in the form of procedures, notes, and warnings in Sections 2, 3, and 3A and must be followed.

The following equipment must be installed and operating for the approved types of operations to be valid.

VFR – Day:

1. Airspeed Indicator
2. Altimeter
3. Magnetic Direction Indicator
4. Tachometers (2)
5. Torquemeters (2)
6. Exhaust Gas Temperature Indicators (2)
7. Oil Pressure Indicators (2)
8. Oil Temperature Indicators (2)
9. Fuel Quantity Indicators (2)
10. Fuel Pressure Indicators (2)
11. Stall Avoidance System (SAS)
12. Landing Gear Position Indicator
13. Approved Seat Belt for Each Seat. Shoulder Harness for Pilot and Copilot.
14. Oxygen System and Mask for One Crew Member
15. OAT Indicator
16. SRL Computers (2)
17. NTS Systems (2)
18. Airplane Flight Manual

VFR – Night:

1. All equipment required for VFR – Day
2. Anti-Collision Light System
3. Position Lights
4. Instrument Light System
5. At least one landing light
6. Adequate electrical energy to operate all electrical and radio equipment

IFR:

1. All equipment required for VFR – Day (if for IFR – Day) and all equipment required for VFR – Night (if for IFR – Night)
2. Two-way radio and navigation equipment appropriate for ground facilities to be used
3. Turn and Slip Indicator
4. Sensitive Altimeter (Adjustable for Barometric Pressure)
5. Clock with sweep second hand or equivalent digital presentation
6. Generators (2)
7. Gyro Bank and Pitch Indicator (Artificial Horizon)
8. Gyro Direction Indicator

TYPES OF OPERATION/REQUIRED EQUIPMENT LIST (continued)

ICING CONDITIONS (In Visible Moisture and OAT Below +5^{o}C)

WARNING

SEVERE ICING MAY RESULT FROM ENVIRONMENTAL CONDITIONS OUTSIDE OF THOSE FOR WHICH THE AIRPLANE IS CERTIFIED. FLIGHT IN FREEZING RAIN, FREEZING DRIZZLE, OR MIXED ICING CONDITIONS (SUPERCOOLED LIQUID WATER AND ICE CRYSTALS) MAY RESULT IN ICE BUILD-UP ON PROTECTED SURFACES EXCEEDING THE CAPABILITY OF THE ICE PROTECTION SYSTEM, OR MAY RESULT IN ICE FORMING AFT OF THE PROTECTED SURFACES. THIS ICE MAY NOT BE SHED USING THE ICE PROTECTION SYSTEMS, AND MAY SERIOUSLY DEGRADE THE PERFORMANCE AND CONTROLLABILITY OF THE AIRPLANE.

- **DURING FLIGHT, SEVERE ICING CONDITIONS THAT EXCEED THOSE FOR WHICH THE AIRPLANE IS CERTIFIED SHALL BE DETERMINED BY THE FOLLOWING VISUAL CUES.**

– **UNUSUALLY EXTENSIVE ICE ACCRETED ON THE AIRFRAME IN AREAS NOT NORMALLY OBSERVED TO COLLECT ICE.**

– **ACCUMULATION OF ICE ON THE UPPER SURFACE OF THE WING AFT OF THE PROTECTED AREA.**

– **ACCUMULATION OF ICE ON THE PROPELLER SPINNER FARTHER AFT THAN NORMALLY OBSERVED.**

- **USE OF THE AUTOPILOT IS PROHIBITED .**

- **ALL ICING DETECTION LIGHTS MUST BE OPERATIVE PRIOR TO FLIGHT INTO ICING CONDITIONS AT NIGHT.**

NOTE

IOAT may be as much as 10^{o}C higher than actual OAT during high speed, high altitude flight due to compressibility and temperature probe system errors. See Section 4 to determine OAT during flight.

TYPES OF OPERATION/REQUIRED EQUIPMENT LIST (continued)

ICING CONDITIONS (In Visible Moisture and OAT Below +5^{o}C) (continued)

The following equipment must be ON and OPERATIVE:

1. Engine/Propeller Anti-Ice Systems
2. Pitot Heat/SAS Heat
3. Windshield Heat (High)
4. Wing/Empennage Deice Boots
5. Continuous Ignition System
6. Propeller leading edge erosion tape is required for those aircraft prior to aircraft S/N AC-550, which have not been modified in accordance with SB30-001. (Installation of erosion tape is optional on AC-550 and later and on aircraft modified by Service Bulletin 30-001).

NOTE

- If propeller erosion tape is installed, it must be maintained in accordance with the following guidelines:

  1. For flight into known icing conditions, an inspection of the tape with log book entry, must be made by maintenance personnel within the previous 24 hours.

  2. The preflight walk-around must include inspection of the leading edge tape. This may be accomplished by the flight crew.

  3. If the erosion tape is not in an acceptable condition, as outlined below, flight into icing conditions is prohibited.

- The effectiveness of erosion tape in maintaining the ice shedding capability of the props is reduced if the tape becomes gouged, torn, or badly eroded. The tape must be replaced whenever such conditions exist or the underlying metal is exposed. Normal erosive wear occurs first at the tip end of the blade and this area should be used as a guide for tape replacement. When the tape on one propeller blade requires replacement, then the tape on all blades of that propeller must be replaced in accordance with Service Bulletin A61-002.

- Tape effectiveness may be enhanced by application of a silicone base emulsion protective coating such as Armorall.

TYPES OF OPERATION/REQUIRED EQUIPMENT LIST (continued)

PNEUMATIC DEICING BOOTS SYSTEM (AD 2000-06-04)

Except for certain phases of flight where the AFM specifies that deicing boots should not be used (e.g. take-off, final approach, and landing), compliance with the following is required.

- Wing and Tail Leading Edge Pneumatic Deicing Boot System, if installed, must be activated:
  - At the first sign of ice formation anywhere on the aircraft, or upon annunciation from an ice detector system, whichever occurs first; and
  - The system must either be continued to be operated in the automatic cycling mode, if available; or the system must be manually cycled as needed to minimize the ice accretions on the airframe.
- The wing and tail leading edge pneumatic deicing boot system may be deactivated only after:
  - Leaving known or observed/detected icing that the flight crew has visually observed on the aircraft or was identified by the on-board sensors; and
  - After the airplane is determined to be clear of ice.

NOTE

The FAA recommends periodic treatment of deicing boots with approved ice release agents, such as ICEX\TM\, in accordance with the manufacturer's application instructions.

PLACARDS

ABOVE LEFT SIDE CONSOLE

OPERATING LIMITATIONS

THIS AIRPLANE MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS, AND MANUALS. NO ACROBATIC MANEUVERS INCLUDING SPINS, APPROVED.

MAXIMUM OPERATING SPEED (SEA LEVEL TO 17,800 FT.) .... 246 KIAS

MANEUVERING SPEED .... 176 KIAS
MINIMUM CONTROL SPEED .... 87 KIAS
MAXIMUM FLAP EXTENSION SPEEDS .... FULL FLAP .... 159 KIAS
1/2 FLAP .... 179 KIAS
1/4 FLAP .... 214 KIAS
MAXIMUM LANDING GEAR SPEEDS .... IN TRANSIT .... 176 KIAS
EXTENDED .... 173 KIAS

APPROVED TYPES OF OPERATION

DAY/NIGHT, VFR/IFR AND ICING CONDITIONS.
SEE AFM FOR REQUIRED EQUIPMENT LIST.

RECOMMENDED SPEEDS

SINGLE ENGINE BEST RATE-OF-CLIMB, S.L. .... 134 KIAS
TWO ENGINE BEST RATE-OF-CLIMB, S.L .... 147 KIAS
TWO ENGINE BEST ANGLE-OF-CLIMB .... 98 KIAS
APPROACH SPEED, FULL FLAP .... 113 KIAS
DEMONSTRATED CROSSWIND VELOCITY .... 20 KNOTS
(SPEEDS FOR OTHER CONDITIONS SHOWN IN AFM)

NOTE

THE DEMONSTRATED CROSSWIND IS NOT A LIMITATION.

PLACARDS (Continued)

NEAR AIRSPEED INDICATORS:

DO NOT STALL AIRCRAFT WITH SAS INOPERATIVE

ON COMPASS FAIRING:

CAUTION............READ STANDBY COMPASS
WITH WINDSHIELD HEAT........................OFF

BESIDE STATIC SELECTOR:

CAUTION
SEE AFM FOR
ALTERNATE
STATIC SOURCE
ERROR

NEAR NAV – NAV/STROBE LIGHTS SWITCH:

TURN OFF STROBE LIGHTS WHEN TAXIING IN VICINITY OF OTHER AIRCRAFT, OR DURING FLIGHT THROUGH CLOUD, FOG OR HAZE.

NEAR PILOTS' OXYGEN OUTLETS:

NO SMOKING WHEN OXYGEN IS IN USE. HOSE PLUG MUST BE REMOVED TO STOP OXYGEN FLOW.

NEAR CABIN PRESSURE CONTROLLER:

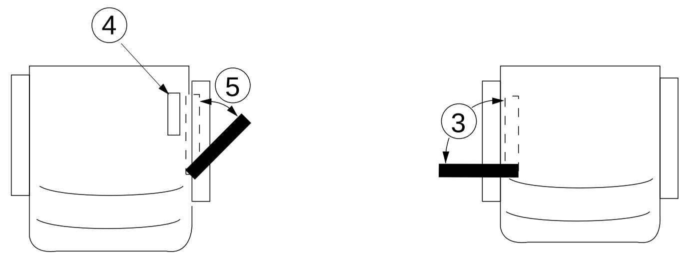
DEPRESSURIZE CABIN PRIOR TO T.O. & LANDING

PLACARDS (Continued)

NEAR LANDING GEAR EMERGENCY RELEASE LEVER:

LANDING GEAR EMERGENCY EXTENSION

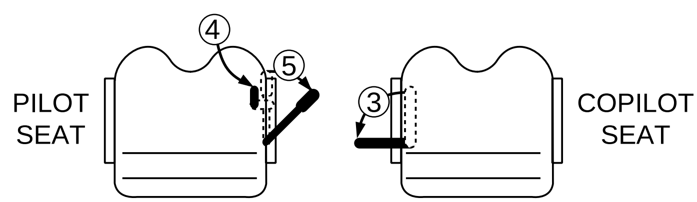
1. AIRSPEED .... 176 KTS MAX.
2. LANDING GEAR HANDLE .... DOWN
3. EMERGENCY RELEASE LEVER .... ROTATE AFT
4. HAND PUMP ENGAGE VALVE .... PULL PIP PIN/ ROTATE VALVE HANDLE 90° FORWARD
5. EMERGENCY HAND PUMP .... PUMP AS REQUIRED
   a. GEAR INDICATOR .... ALL DOWN AND LOCKED
   b. HYDRAULIC PRESSURE GAUGE .... 500 TO 800 PSI



PILOT'S SEAT COPILOT'S SEAT

LANDING GEAR EMERGENCY EXTENSION

1. AIRSPEED .... 176 KIAS MAX.
2. LANDING GEAR HANDLE .... DOWN
3. EMERGENCY RELEASE LEVER .... ROTATE AFT
4. HAND PUMP ENGAGE VALVE .... PULL PIP PIN ROTATE VALVE HANDLE 90° FORWARD
5. EMERGENCY HAND PUMP .... PUMP AS REQUIRED
   a. GEAR INDICATOR .... ALL DOWN AND LOCKED
   b. HYDRAULIC PRESSURE GAUGE ..... 500 TO 800 PSI



NOTE

This –17 placard corrects minor clerical errors and is equivalent to and suitable substitute for placard shown above.

AIRWORTHINESS

The AIRFRAME AIRWORTHINESS LIMITATIONS MANUAL, ST-UN-M001, contains overhaul times, replacement times, and special inspections required for continued airworthiness.

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TABLE OF CONTENTS
NORMAL PROCEDURES

TABLE OF CONTENTS (continued)
NORMAL PROCEDURES

INTRODUCTION

This section presents the recommended procedures for normal operations. Switches, controls, and instrumentation have been arranged to enhance single pilot operation of the airplane. The expanded procedures in this section have been prepared accordingly. Nevertheless, the same procedures, in the same sequence, apply during operation by two pilots. Careful coordination by two pilots is required, particularly during operation of engine controls. Procedures identified by an asterisk are those recommended to be accomplished by a copilot. These procedures have been FAA approved.

PREFLIGHT WALK-AROUND INSPECTION

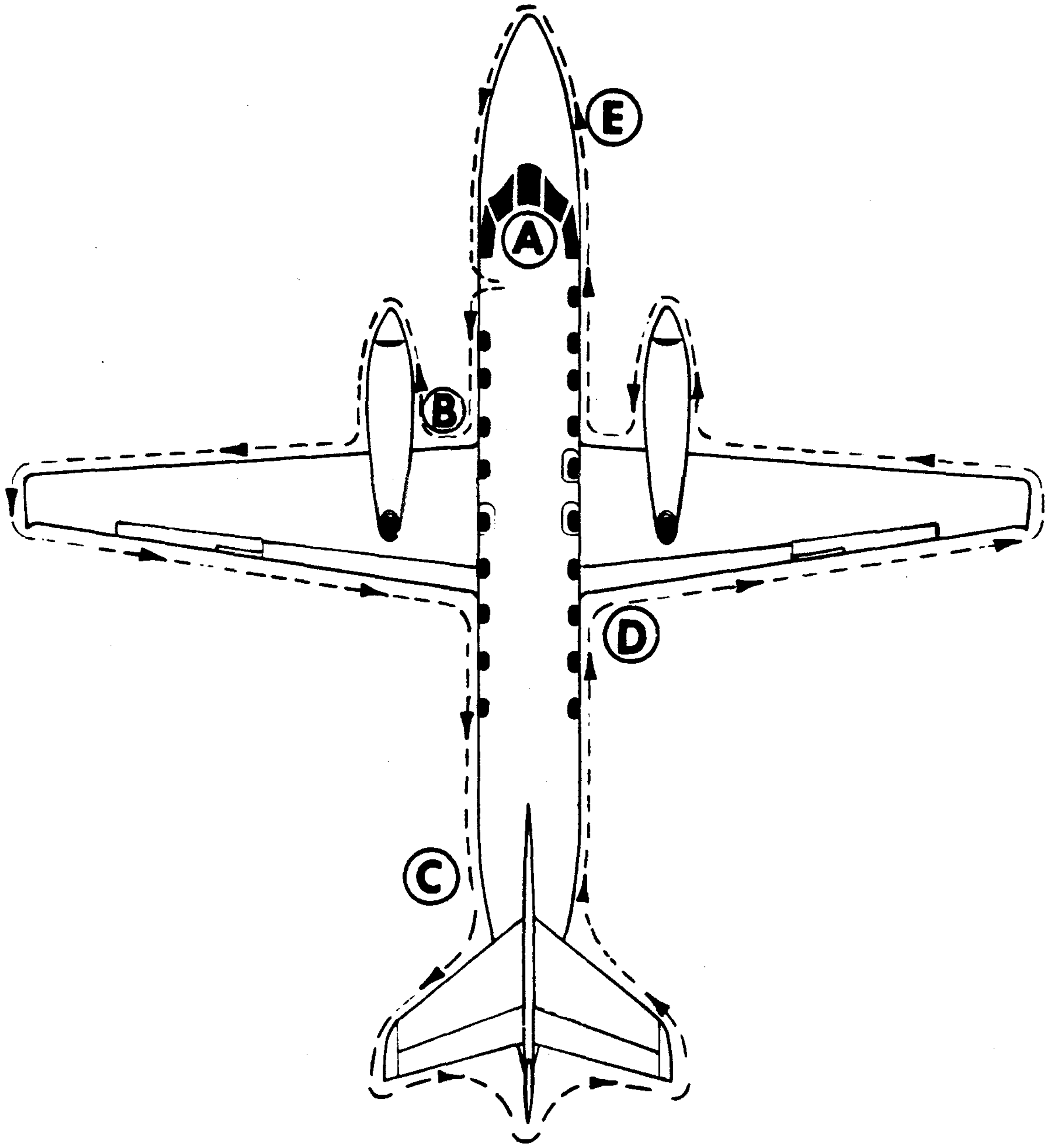


FIGURE 2-1

PREFLIGHT

A. COCKPIT

1. Landing Gear Handle..DOWN
2. Landing Gear Hand Pump Valve Handle.....AFT/PIP PIN INSTALLED
3. GPU/Battery Disconnect System..............CHECK/BATTERIES ON (SEE PAGE 2-32)
4. Landing Gear Position Indicator......PRESS-TO-TEST/DIMMER SET
5. Control Lock..................................AS REQUIRED
6. Control Surface Trim..................................NEUTRAL
7. Parking Brake.................................AS REQUIRED
8. GPU/Battery Switches..........................AS REQUIRED

B. LEFT WING

1. Fuel Sumps..DRAIN
2. Lower Antennas......................................CONDITION
3. Leading Edge Ram Air Scoop.............................CLEAR
4. Gear Doors (first flight of day)........................OPEN
5. Landing Gear, Brakes, Tires, Hub Caps, and Wheelwell...................................CONDITION
6. Generator Voltmeter Circuit Breaker (and Control Circuit Breakers, Later Aircraft)....................................IN
7. Gear Doors..CLOSED
8. Tie Downs and Chocks..................................REMOVE
9. Cowling and Doors.....................................SECURE
10. Fire Extinguisher Bottle Pressure......................CHECK
11. Oil Cooler Inlet..............................CLEAR/CONDITION
12. Engine Inlet and Sensors......................CLEAR/CONDITION
13. Propeller and Propeller Deice Boots..........................FREE ROTATION/CONDITION
14. Engine Oil Quantity and Filler Cap..............CHECK/SECURE
15. Hydraulic Reservoir Sight Glasses......................CHECK
16. Wing Ice Detector Light................................CHECK
17. Fuel Sump..DRAIN
18. Wing Deice Boots...................................CONDITION
19. Fuel Vent..CLEAR
20. Landing and Recognition Lights and Shield..............CHECK
21. Navigation Lights......................................CHECK
22. Aileron and Tab....................................CONDITION
23. Wing Fuel Cap...SECURE
24. Flaps..CONDITION
25. Exhaust..CLEAR

PREFLIGHT (continued)

C. TAIL SECTION

1. Cargo Door....................SECURE
2. Static Sources....................CLEAR
3. Deice Boots....................CONDITION
4. Stabilizer Setting....................CHECK IN AGREEMENT WITH COCKPIT INDICATOR
5. Control Surfaces and Rudder Tab....................CONDITION
6. Navigation Lights....................CHECK
7. Upper Antennas....................CONDITION
8. Tie Down....................REMOVE
9. Oxygen Bottle Thermal Relief Disc....................CONDITION

D. RIGHT WING

1. Flaps....................CONDITION
2. Exhaust....................CLEAR
3. Wing Fuel Cap....................SECURE
4. Aileron and Tab....................CONDITION
5. Navigation Lights....................CHECK
6. Landing and Recognition Lights and Shield....................CHECK
7. Fuel Vent....................CLEAR
8. Wing Deice Boots....................CONDITION
9. Wing Ice Detector Light....................CHECK
10. Fuel Sump....................DRAIN
11. Tie Downs and Chocks....................REMOVE
12. Fire Extinguisher Bottle Pressure....................CHECK
13. Oil Cooler Inlet....................CLEAR/CONDITION
14. Engine Inlet and Sensors....................CLEAR/CONDITION
15. Propeller and Propeller Deice Boots....................FREE ROTATION/CONDITION
16. Engine Oil Quantity and Filler Cap....................CHECK/SECURE
17. Cowling and Doors....................SECURE
18. Gear Doors (first flight of day)....................OPEN
19. Landing Gear, Brakes, Tires, Hub Caps, and Wheelwell....................CONDITION
20. Generator Voltmeter Circuit Breaker (and Control Circuit Breakers, Later Aircraft)....................IN
21. Gear Doors....................CLOSED
22. Leading Edge Ram Air Scoop....................CLEAR
23. Fuel Sumps....................DRAIN

PREFLIGHT (continued)

E. NOSE SECTION

1. Outside Air Temperature Sensor .... CLEAR
2. Static Sources .... CLEAR
3. CAWI Tank Sight Gauge .... CHECK QUANTITY

NOTE

If the CAWI tank is filled to capacity, the CAWI fluid level may not be visible at the top of the sight gauge. It may be necessary to open the CAWI filler cap to vent the tank in order to visually determine the fluid level in the sight gauge.

4. CAWI Tank Filler Cap .... SECURE
5. Baggage Doors .... SECURE
6. SAS Vane .... CHECK
7. Pitot Covers .... REMOVE
8. Windshield Wipers .... CONDITION
9. Nose Gear, Tires, Wheelwell, and Gear Doors .... CONDITION

BEFORE STARTING ENGINES

1. Exterior Preflight Inspection .... COMPLETED
2. Weight and Center of Gravity .... COMPUTED WITHIN LIMITS
3. Performance Data .... DETERMINED

CABIN

1. Entrance Lights .... AS DESIRED
2. Cabin Door .... LOCKED (VISUALLY CHECK LATCH INDICATORS)
3. Cargo and Baggage .... SECURE
4. Emergency Exits .... SECURE

COCKPIT

1. Battery Switch/GPU .... AS REQUIRED
2. Interior Lights .... AS DESIRED
3. Landing Gear Handle .... DOWN

*4. No Smoking – Fasten Belts Switch .... ON

BEFORE STARTING ENGINES (continued)

PILOT'S CONSOLE

1. Left Essential Bus Tie Switch .... ON
2. Bus Transfer Switches .... LEFT BUS
3. All Circuit Breakers .... IN
4. Cabin Pressure Selector Lever .... AUTO
5. Cabin Pressure Manual Control Knob .... CLOCKWISE
6. Ignition Mode Switches .... NORMAL

   OR

   Auto/Cont Ignition Switches .... AUTO
7. Starter Test Switch .... CENTERED
8. Speed Switch Select Switches .... AUTO
9. Start Mode Switch .... AS REQUIRED
10. Anti-Skid Switch (if installed) .... AS DESIRED
11. Nose Wheel Steering Switch .... AS DESIRED
12. Battery Voltages .... CHECK
13. SRL – Δ P/P Power Switches .... NORMAL
14. Temp Limiter Test Switch .... CENTERED
15. Light Control Knobs .... AS REQUIRED
16. Unfeather Test Switch .... CENTERED

INSTRUMENT PANEL

1. Static Selector .... NORMAL
*2. Cockpit Conditioned Air Controls (pilot and copilot) .... AS REQUIRED
3. Cabin Altitude and Rate Indicators and Controls .... SET
4. All Rocker Switches (except battery switches) .... OFF
5. Pitch Trim .... COMPARE WITH POSITION NOTED DURING PREFLIGHT
6. Fuel Counter .... ZEROED
7. Fuel Quantity .... CHECK (500 POUNDS MAXIMUM IMBALANCE)
8. Crossflow Switch .... CLOSED
*9. Temperature Controls .... AS REQUIRED
*10. Cabin Pressure Dump Switch .... DUMP
*11. Bleed Air Switches .... OFF
*12. Fresh Air Fan Switch .... OFF
*13. Windshield Defog Switch (if installed) .... OFF
*14. Oxygen Pressure .... CHECK
*15. Passenger Oxygen Toggle Control .... OFF

*COPILOT'S CONSOLE

1. Cargo Door Auxiliary Warning Light .... TEST/CHECK OUT
2. Light Control Knobs .... AS REQUIRED
3. All Circuit Breakers .... IN
4. Nonessential Bus Tie Switch .... ON
5. Right Essential Bus Tie Switch .... ON

BEFORE STARTING ENGINES (continued)

PEDESTAL

1. Light Control Knobs .... AS REQUIRED
2. Aileron Trim .... NEUTRAL
3. Rudder Trim .... NEUTRAL
4. Parking Brake .... SET
5. Yaw Damper Switch (if yaw damper installed) .... OFF
6. Auxiliary Trim Switch .... OFF
7. SAS Clutch or SAS Servo Switch .... OFF
8. Fuel and Hydraulic Shutoff Switches .... OPEN
9. Fuel Boost Switches .... OFF
10. Engine Stop and Feather Controls .... IN
11. Trim Select Switch .... PILOT
12. Out-of-Trim Warning (first flight of day) .... CHECK
    a. Stabilizer trim .... NOT IN GREEN TAKEOFF BAND
    b. Power levers .... ADVANCE TO 50% TRAVEL
    c. Out-of-trim warning horn .... STEADY
    d. Stabilizer trim .... SET IN GREEN TAKEOFF BAND
    e. Out-of-trim warning horn .... SILENCED
13. Flaps Control .... UP
14. Water Injection Switch .... OFF
15. Control Lock .... OFF/CONTROLS CHECKED FREE

CAUTION

TO PRECLUDE POSSIBLE DAMAGE TO FLIGHT INSTRUMENTS, HOLD CONTROL WHEEL FIRMLY WHEN UNLOCKING CONTROLS.

16. Speed Levers .... LOW RPM/FRICTION SET
17. Power Levers. .... CHECK (SEE PAGE 2-26) SET AT FLIGHT IDLE GATE
18. Propeller Synchrophaser Switch (if installed) .... TAKEOFF & LANDING

BATTERY START

1. Battery Switches .... ON

*2. Battery Temperature Indicator .... TEST/NOTE TEMPERATURES (SEE PAGE 2-33)

3. Annunciator Panel and System Warning Lights .... PRESS-TO-TEST (SEE PAGE 2-27)

NOTE

Annunciator press-to-test button must remain pressed until the WING OVHT warning lights start flashing.

4. Fire Extinguisher System .... TEST (SEE PAGE 2-43)

*5. Inverter (Check No. 2, then No. 1) .... ON

BATTERY START (continued)

RIGHT ENGINE (RECOMMENDED FIRST)

6. All Instruments and Clocks .... CHECK/SET
7. SRL OFF Light .... CHECK ON
8. Boost Pumps .... CHECK/AS DESIRED
9. Propellers .... UNFEATHERED/CLEAR (SEE PAGE 2-26)
10. Start Mode Switch .... AS DESIRED

NOTE

The series mode is recommended for use during the first battery start of the day and for all other battery starts when engines have cooled to near ambient temperatures since last being operated.

11. Engine Start Button .... PRESS AND HOLD

NOTE

- Both torque indicators will display erroneous indications during battery starts when the starter is engaged and bus voltage is low.
- The inoperative engine RPM indicator is sensitive to bus voltage variations prior to normal engine operation and may reflect spurious fluctuations before engine starts when operating various aircraft systems.

12. RPM .... 10% TO 12%
13. Observe illumination of IGN light and ignition of fuel as indicated by rising EGT. Release the start button when EGT rises.

CAUTION

IF EGT RISE IS NOT OBTAINED WITHIN 10 SECONDS AFTER REACHING 10% RPM, OR BEFORE ATTAINING 20% RPM, PULL ENGINE STOP AND FEATHER CONTROL AND PRESS THE STOP BUTTON. CLEAR ENGINE FOR 10 SECONDS WITH STARTER TEST SWITCH. DO NOT ALLOW ENGINE TO OPERATE IN THE 18% TO 28% RPM RANGE DURING START OR CLEARING OPERATIONS EXCEPT DURING COMBUSTION ASSISTED ACCELERATION THROUGH THAT RANGE.

BATTERY START (continued)

RIGHT ENGINE (RECOMMENDED FIRST) (continued)

NOTE

- If no fuel flow or ignition is observed and combustion is not obtained, it is permissible to attempt engine start using MANUAL GROUND START procedures. See page 3A-9.

- The engine is equipped with a start fuel enrichment system that is automatically actuated during a normal start when:

  1. The speed switch select switch is in “AUTO” position,

  2. The EGT is less than 695^{o}C and not increasing at a rate higher than 1^{o}C per sec,

  3. The RPM is between 10% and 60%,

  AND

  4. The SRL – Δ P/P power switch is in “NORMAL.”

- Pressing the start button will override the automatic function and increase starting fuel flow provided the engine RPM is between 10% and 60%.

- Whenever an engine ground start is required soon after engine shutdown while residual EGT is above 200^{o}C, the following procedure is recommended:

  Prior to pressing the start button, hold the starter test switch until RPM is 15%. Then press the start button only long enough to provide fuel and ignition and to ensure light-off. Release the starter test switch after light-off is obtained and continue with the normal start procedure.

14. EGT .... MONITOR (770^{o}C MAXIMUM FOR ONE SECOND)

CAUTION

IF RPM STOPS INCREASING AND EGT IS APPROACHING THE START LIMIT AND RISING RAPIDLY, IMMEDIATELY PULL ENGINE STOP AND FEATHER CONTROL AND PRESS THE STOP BUTTON. EXCEEDING THE START EGT LIMIT MAY SERIOUSLY DAMAGE THE ENGINE.

BATTERY START (continued)

RIGHT ENGINE (RECOMMENDED FIRST) (continued)

15. RPM .... STABILIZED AT 70% TO 72%
16. EGT .... STABILIZED
17. Fuel and Oil Pressure .... YELLOW OR GREEN ARCS
18. Generator .... RESET/ON
19. SRL OFF Light .... ON BELOW 80% RPM

*20. Bleed Air Switch (right engine) .... ON

NOTE

Check for absence of air flow through the open cooling air "eyeballs" prior to turning on either bleed air system.

21. Start Mode Switch .... PARALLEL

LEFT ENGINE
(For airplanes NOT modified in accordance with Service Bulletin 227 24-015)

22. Right Generator Load .... 150 AMPS MAXIMUM
23. Repeat Steps 7 Through 19 for Left Engine.

*24. Bleed Air Switch (left engine) .... ON

NOTE

Verify operation of each bleed air system by selectively operating right and left systems.

25. Generators .... RESET/VOLTAGES CHECKED/ON
26. Battery Disconnects and Current Limiters .... CHECK (SEE PAGES 2-32 AND 2-25)

BATTERY START (continued)

LEFT ENGINE
(For airplanes modified in accordance with Service Bulletin 227 24-015)

22. Right Generator Load .... 150 AMPS MAXIMUM
23. Repeat Steps 7 Through 19 for Left Engine.
*24. Bleed Air Switch (left engine) .... ON

NOTE

Verify operation of each bleed air system by selectively operating right and left systems.

25. Generators .... ON/CHECK VOLTS AND AMPS AND EVEN LOAD SHARING

CAUTION

IF THE **GENERATOR** SWITCH IS RESET AND **ON**, GENERATOR **VOLTAGE** IS **OBSERVED**, **GEN FAIL** ANNUNCIATOR LIGHT IS **NOT ILLUMINATED**, AND THE **AMMETER READS ZERO**, THE RESPECTIVE **325** AMPERE **CURRENT LIMITER** IS **OPEN**. THE FAULTY CURRENT LIMITER SHOULD BE REPLACED PRIOR TO FLIGHT.

26. Battery Disconnects .... CHECK (SEE PAGE 2-32)

GROUND POWER UNIT (GPU) START

CAUTION

- USE ONLY NEGATIVELY GROUNDED GROUND POWER SOURCES.
- DUE TO THE POSSIBILITY OF EXCESSIVELY HIGH CURRENT SURGE DURING ENGINE START, IT IS RECOMMENDED THAT THE MAXIMUM STARTING CURRENT FROM A GROUND POWER SOURCE BE LIMITED TO 1,000 AMPERES.

1. Battery Switches .... OFF
2. GPU .... CONNECTED/ON
3. GPU Voltage .... CHECK
4. Battery Switches .... ON

*5. Battery Temperature Indicator .... TEST/NOTE TEMPERATURES (SEE PAGE 2-33)

6. Annunciator Panel and System Warning Lights .... PRESS-TO-TEST (SEE PAGE 2-27)

NOTE

Annunciator press-to-test button must remain pressed until the WING OVHT warning lights start flashing.

7. Fire Extinguisher System .... TEST (SEE PAGE 2-43)

*8. Inverter (Check No. 2, then No. 1) .... ON

9. All Instruments and Clocks .... CHECKED/SET

RIGHT ENGINE (RECOMMENDED FIRST)

10. SRL OFF Light .... CHECK ON
11. Boost Pumps .... CHECK/AS DESIRED
12. Propellers .... UNFEATHERED/CLEAR (SEE PAGE 2-26)
13. Start Mode Switch .... PARALLEL
14. Engine Start Button .... PRESS AND HOLD
15. RPM .... 10% TO 12%

GROUND POWER UNIT (GPU) START (continued)

RIGHT ENGINE (RECOMMENDED FIRST) (continued)

16. Observe illumination of IGN light and ignition of fuel as indicated by rising EGT. Release the start button when EGT rises.

CAUTION

IF EGT RISE IS NOT OBTAINED WITHIN 10 SECONDS AFTER REACHING 10% RPM, OR BEFORE ATTAINING 20% RPM, PULL ENGINE STOP AND FEATHER CONTROL AND PRESS THE STOP BUTTON. CLEAR ENGINE FOR 10 SECONDS WITH STARTER TEST SWITCH. DO NOT ALLOW ENGINE TO OPERATE IN THE 18% TO 28% RPM RANGE DURING START OR CLEARING OPERATIONS EXCEPT DURING COMBUSTION ASSISTED ACCELERATION THROUGH THAT RANGE.

NOTE

- If no fuel flow or ignition is observed and combustion is not obtained, it is permissible to attempt engine start using MANUAL GROUND START procedures. See page 3A-12.

- The engine is equipped with a start fuel enrichment system that is automatically actuated during a normal start when:

  1. The speed switch select switch is in “AUTO” position,

  2. The EGT is less than 695°C and not increasing at a rate higher than 1°C per sec,

  3. The RPM is between 10% and 60%,

  AND

  4. The SRL – Δ P/P power switch is in “NORMAL.”

- Pressing the start button will override the automatic function and increase starting fuel flow provided the engine RPM is between 10% and 60%.

- Whenever an engine ground start is required soon after engine shutdown while residual EGT is above 200°C, the following procedure is recommended:

  Prior to pressing the start button, hold the starter test switch until RPM is 15%. Then press the start button only long enough to provide fuel and ignition and to ensure light-off. Release the starter test switch after light-off is obtained and continue with the normal start procedure.

GROUND POWER UNIT (GPU) START (continued)

RIGHT ENGINE (RECOMMENDED FIRST) (continued)

17. EGT .... MONITOR (770^{o}C MAXIMUM FOR ONE SECOND)

CAUTION

IF RPM STOPS INCREASING AND EGT IS APPROACHING THE START LIMIT AND RISING RAPIDLY, IMMEDIATELY PULL ENGINE STOP AND FEATHER CONTROL AND PRESS THE STOP BUTTON. EXCEEDING THE START EGT LIMIT MAY SERIOUSLY DAMAGE THE ENGINE.

18. RPM .... STABILIZED AT 70% TO 72%
19. EGT .... STABILIZED
20. Fuel and Oil Pressure .... YELLOW OR GREEN ARCS
21. SRL OFF Light .... ON BELOW 80% RPM

*22. Bleed Air Switch (right engine) .... ON

NOTE

Check for absence of air flow through the open cooling air “eyeballs” prior to turning on either bleed air system.

LEFT ENGINE
(For airplanes NOT modified in accordance with Service Bulletin 227 24-015)

23. Repeat Steps 10 Through 21 For Left Engine.

*24. Bleed Air Switch (left engine) .... ON

NOTE

Verify operation of each bleed air system by selectively operating right and left systems.

25. GPU .... OFF/DISCONNECTED/ANNUNCIATOR CHECKED OUT
26. Generators .... RESET/VOLTAGES CHECKED/ON
27. Battery Disconnects and Current Limiters .... CHECK (SEE PAGES 2-32 AND 2-25)

GROUND POWER UNIT (GPU) START (continued)

LEFT ENGINE
(For airplanes modified in accordance with Service Bulletin 227 24-015)

23. Repeat Steps 10 Through 21 For Left Engine.
*24. Bleed Air Switch (left engine) .... ON

NOTE

Verify operation of each bleed air system by selectively operating right and left systems.

25. GPU .... OFF/DISCONNECTED/ANNUNCIATOR CHECKED OUT
26. Generators .... ON/CHECK VOLTS AND AMPS AND EVEN LOAD SHARING

CAUTION

IF THE **GENERATOR** SWITCH IS RESET AND **ON**, GENERATOR **VOLTAGE** IS **OBSERVED**, **GEN FAIL** ANNUNCIATOR LIGHT IS **NOT ILLUMINATED**, AND THE **AMMETER READS ZERO**, THE RESPECTIVE **325** AMPERE **CURRENT LIMITER** IS **OPEN**. THE FAULTY CURRENT LIMITER SHOULD BE REPLACED PRIOR TO FLIGHT.

27. Battery Disconnects .... CHECK (SEE PAGE 2-32)

BEFORE TAXI

*1. Cabin Pressure Dump Switch .... NORMAL
*2. Temperature Controls .... AS REQUIRED
*3. Avionics .... ON/AS REQUIRED
4. SAS .... CHECK ALL TEST FUNCTIONS (SEE PAGE 2-29)
5. Boost Pumps .... ON
6. Interior and Exterior Lights .... AS REQUIRED
7. Windshield Heat .... AS REQUIRED
8. Nose Wheel Steering Switch .... ARMED
9. Generator Volts and Amps .... CHECK (APPROXIMATELY 28.5 VOLTS AND EVEN LOAD SHARING)
10. Current Limiters (Airplanes NOT modified in accordance with Service Bulletin 227 24-015) .... CHECK (SEE PAGE 2-25)
11. Battery Temperature Indicator .... CHECK/NOTE TEMPERATURES
12. Stabilizer Trim System .... CHECK ALL FUNCTIONS (SEE PAGE 2-34)
13. Overspeed Governors (periodically) .... CHECK (SEE PAGE 2-35)
14. Single Red Line Computer/Temp Limiter (periodically) .... CHECK (SEE PAGE 2-36)
15. Propeller Start Locks .... RELEASE (SEE PAGE 2-26)

TAXI

1. Parking Brake .... RELEASE

NOTE

Apply pressure to the brake pedals while pushing the parking brake control full forward to ensure complete release of the wheel brakes.

TAXI (continued)

2. Power Levers .... AS REQUIRED
3. Brakes .... CHECK
4. Nose Wheel Steering System .... TEST
(SEE PAGE 2-39)
5. Yaw Damper (if installed) .... TEST/ON
(SEE PAGE 2-41)

BEFORE TAKEOFF

1. Controls .... FREE
2. Stabilizer, Rudder, and Aileron Trim .... SET FOR TAKEOFF
3. Flaps .... SET AT 1/4
4. Propeller Synchrophaser Switch (if installed) .... TAKEOFF & LANDING
5. Flight Instruments .... SET AND CHECK
6. Engine Instruments .... CHECK IN GREEN
7. Annunciator Panel .... CHECK

*8. Suction, Deice, and Hydraulic Pressure .... CHECK

*9. Takeoff Power Setting, V_{MCA}, V_1, V_2, and V_{50} Speeds, and Takeoff Weight .... CONFIRM

NOTE

For Reduced Power Takeoff Operations, determine COMPUTED TORQUE from Section 4H.

10. NTS (First Flight of Day) .... CHECK
(SEE PAGE 2-38)
11. CAWI System .... CHECK
(SEE PAGE 2-42)
12. Ice Protection Systems .... CHECK/AS REQUIRED
(SEE PAGE 2-51)
13. Ignition Mode Switches .... AS REQUIRED

OR

Auto/Cont Ignition Switches .... AUTO OR CONT
(SEE PAGES 2-28, 2-51, 2-54 AND 2-56)

NOTE

Use continuous ignition for takeoff on a wet or snow/slush covered runway to ensure immediate relight in the event that engine combustion is interrupted by ingested water, slush, or snow during the ground roll.

14. Fuel Quantity .... CHECK (500 POUNDS MAXIMUM IMBALANCE)
15. Fuel Crossflow Valve .... CHECK CLOSED

*16. Navigation Equipment .... AS REQUIRED

BEFORE TAKEOFF (continued)

17. Interior/Exterior Lights .... AS REQUIRED

NOTE

For flights at night or in Instrument Meteorological Conditions, consideration should be given to setting glareshield and overhead lights (which are powered from the Nonessential DC Bus) bright enough to provide emergency instrument lighting in the event of an Essential Bus failure during flight.

TAKEOFF – (DRY)

*1. Bleed Air Switches .... AS DESIRED
*2. Speed Levers .... HIGH RPM/SRL OFF ANNUNCIATOR LIGHTS OUT / FRICTION SET

WARNING

IF FLIGHT IS ATTEMPTED WITH THE POWER LEVERS SET AT LOW RPM, DIVERGENT POWER OSCILLATIONS ARE LIKELY TO OCCUR IF THE TEMPERATURE LIMITING RANGE IS REACHED.

3. Engine Speed .... CHECK 96% TO 97.5% RPM
4. Power Levers .... SET COMPUTED TAKEOFF POWER. DO NOT EXCEED 650^{o}C EGT OR 97% TORQUE

CAUTION

DO NOT ALLOW TORQUE TO EXCEED 100% DURING DRY TAKEOFFS.

NOTE

- During takeoff the blue fuel bypass lights may illuminate with no action required. However, in climb and cruise the power levers must be retarded to extinguish the lights.

- Advance power levers smoothly to takeoff power at a moderate rate. Advancing the power levers too rapidly will cause excessive RPM overshoot.

- If more power is required during a reduced power takeoff (engine failure, windshear encounter, etc.), torque can be increased to maximum takeoff power torque.

- When the runway distance available exceeds the runway distance required, power can be applied during the initial roll provided computed torque has been set by the time the runway distance remaining is equal to the computed runway length required for takeoff.

TAKEOFF – (DRY) (continued)

5. Engine Speed .... CHECK 100% TO 101% RPM

CAUTION

IF RPM IS ALLOWED TO DECREASE TO BELOW 99% WITH THE TEMPERATURE LIMITING SYSTEM OPERATING, ENGINE POWER SURGES MAY OCCUR WHEN THE SRL COMPUTER TRANSITIONS BACK AND FORTH BETWEEN ITS SPEED/TEMPERATURE SCHEDULES.

6. Brakes .... RELEASE
7. NWS Power Lever Button .... AS DESIRED

NOTE

- Normal authority steering is available until deactivated by the landing gear squat switches at liftoff unless modified.
- On those aircraft which have been modified in accordance with Service Bulletin 32-006, normal authority steering is available until deactivated by landing gear retraction.

8. V_1 Speed .... ROTATE
9. Landing Gear (after liftoff) .... UP
10. Flaps (above 115 KIAS) .... UP

TAKEOFF (WITH CAWI)

*1. Bleed Air Switches .... OFF
*2. Speed Levers .... HIGH RPM/SRL OFF ANNUNCIATOR LIGHTS OUT/FRICTION SET

WARNING

IF FLIGHT IS ATTEMPTED WITH THE SPEED LEVERS SET AT LOW RPM, DIVERGENT POWER OSCILLATIONS ARE LIKELY TO OCCUR IF THE TEMPERATURE LIMITING RANGE IS REACHED.

3. Engine Speed .... CHECK 96% TO 97.5% RPM

TAKEOFF (WITH CAWI) (continued)

4. Power Levers .... APPROXIMATELY 60% TORQUE
5. Water Injection Switch .... CONTINUOUS
6. CAWI Pump Lights .... CHECK ON
7. Torquemeters .... CHECK SYMMETRICAL INCREASE
8. Power Levers .... SET COMPUTED TAKEOFF POWER. DO NOT EXCEED 650^{o}C EGT OR 107% TORQUE

CAUTION

DO NOT ALLOW TORQUE TO EXCEED 110% DURING CAWI TAKEOFFS.

NOTE

- During takeoff the blue fuel bypass lights may illuminate with no action required. However, in climb and cruise the power levers must be retarded to extinguish the lights.
- Advance power levers smoothly to takeoff power at a moderate rate. Advancing the power levers too rapidly will cause excessive RPM overshoot.
- If more power is required during a reduced power takeoff (engine failure, windshear encounter, etc.), torque can be increased to maximum takeoff power torque.
- When the runway distance available exceeds the runway distance required, power can be applied during the initial roll provided computed torque has been set by the time the runway distance remaining is equal to the computed runway length required for takeoff.

9. Engine Speed .... CHECK 100% RPM

CAUTION

IF RPM IS ALLOWED TO DECREASE TO BELOW 99% WITH THE TEMPERATURE LIMITING SYSTEM OPERATING, ENGINE POWER SURGES MAY OCCUR WHEN THE SRL COMPUTER TRANSITIONS BACK AND FORTH BETWEEN ITS SPEED/TEMPERATURE SCHEDULES.

10. Brakes .... RELEASE
11. NWS Power Lever Button .... AS DESIRED

NOTE

- Normal authority steering is available until deactivated by the landing gear squat switches at liftoff unless modified.
- On those aircraft which have been modified in accordance with Service Bulletin 32-006, normal authority steering is available until deactivated by landing gear retraction.

TAKEOFF (WITH CAWI) (continued)

12. V_1 Speed .... ROTATE
13. Landing Gear (after liftoff) .... UP
14. Flaps (above 115 KIAS) .... UP

CLIMB

1. Climb Speed .... ATTAIN
(SEE SECTION 4, PERFORMANCE)
2. Water Injection Switch .... OFF

NOTE

When the water injection switch is turned off, engine torque may decrease by as much as 35%.

*3. Bleed Air Switches .... AS DESIRED
4. Climb Power .... NOT TO EXCEED 650°C EGT OR 100% TORQUE
*5. Propeller Synchrophaser Switch (if installed) .... CLIMB & CRUISE
6. Ice Protection Systems .... AS REQUIRED
7. Cabin Pressure Scheduling .... CHECK
*8. No Smoking – Fasten Seat Belt Signs .... AS REQUIRED
9. Nose Wheel Steering Switch .... OFF
10. Ignition Mode Switches .... NORMAL OR AS REQUIRED

OR

Auto/Cont Ignition Switches .... AUTO OR CONT
(SEE PAGES 2-28, 2-51, 2-54 AND 2-56)

10,000 FEET .... CHECK AS FOLLOWS
1. Ammeters .... CHECK
2. Annunciator Panel .... CHECK

CRUISE

1. Cruise Power .... SET (97% RPM, 650°C EGT MAX)

NOTE

Reduce EGT to 600°C or less before retarding speed levers. Advance power levers to desired cruise power (not to exceed 650°C or 100% torque).

2. Cabin Pressurization .... AS DESIRED

DESCENT

1. Power .... AS REQUIRED
2. Altimeters .... SET
3. Cabin Pressure Controller .... SET TO ENSURE ZERO CABIN DIFFERENTIAL AT TOUCHDOWN
4. Cabin Rate Control .... AS DESIRED
*5. No Smoking – Fasten Seat Belt Signs .... AS REQUIRED
6. Fuel Quantity .... CHECK (500 POUNDS MAXIMUM IMBALANCE)
7. Fuel Crossflow Valve .... CHECK CLOSED
8. Ice Protection Equipment .... AS REQUIRED
9. Ignition Mode Switches .... NORMAL OR AS REQUIRED

   OR

   Auto/Cont Ignition Switches .... AUTO OR CONT
   (SEE PAGES 2-28, 2-51, 2-54 AND 2-56)

BEFORE LANDING

*1. No Smoking – Fasten Seat Belt Signs .... ON
2. Interior/Exterior Lights .... AS REQUIRED
*3. Propeller Synchrophaser Switch (if installed) .... TAKEOFF & LANDING
4. Speed Levers .... HIGH RPM
5. Friction Controls .... SPEED LEVERS – AS DESIRED/POWER LEVERS – OFF
6. Landing Gear, Hydraulic Pressure, and Indicators .... DOWN/CHECK
7. Flaps .... AS REQUIRED
8. Yaw Damper (if installed) .... AS DESIRED
9. Cabin Differential Pressure .... CHECK ZERO
10. Nose Wheel Steering Switch .... ARMED
11. Anti-Skid Switch (if installed) .... AS DESIRED

BEFORE LANDING (continued)

12. Ignition Mode Switches .... AS REQUIRED
OR
Auto/Cont Ignition Switches .... AUTO OR CONT
(SEE PAGES 2-28, 2-51, 2-54 AND 2-56)

NOTE

Use continuous ignition for landing on a wet or snow/slush covered runway to ensure immediate relight in the event that engine combustion is interrupted by ingested water, slush, or snow during the ground roll.

13. Fuel Crossflow Valve .... CHECK CLOSED
*14. Final Approach Speed .... CONFIRM
(SEE FIGURE 4-56 OR 4-57)

BALKED LANDING

NOTE

When required for obstacle clearance, this procedure is used to obtain the climb performance depicted in Section 4G.

1. Power Levers .... 650°C EGT OR 100% TORQUE (WHICHEVER OCCURS FIRST)
2. Climb Speed .... ATTAIN (SEE FIGURE 4-55)
3. Rate of Climb .... ESTABLISH POSITIVE RATE OF CLIMB
4. Landing Gear .... UP
5. Flaps .... RETRACT TO 1/2
6. Airspeed .... ACCELERATE TO 120 KIAS
7. Flaps .... UP
8. Engine and Propeller Heat Switches .... AS REQUIRED
9. Ignition Mode Switches .... NORMAL OR AS REQUIRED
OR
Auto/Cont Ignition Switches .... AUTO OR CONT
(SEE PAGES 2-28, 2-51, 2-54 AND 2-56)

LANDING

1. Power Levers .... FLIGHT IDLE

WARNING

THE POWER LEVERS MUST NOT BE RETARDED BELOW FLIGHT IDLE IN THE AIR.

2. Power Levers (after touchdown) .... GROUND IDLE

NOTE

Check both BETA lights illuminated before moving power levers into reverse range during landing roll.

3. Brakes .... AS REQUIRED

NOTE

If anti-skid installed:

For maximum braking performance with anti-skid on, apply firm continuous pressure. Do not modulate brake pedals.

4. Nose Wheel Steering .... AS REQUIRED
5. Power Levers .... REVERSE (AS REQUIRED)

CAUTION

- DO NOT USE FULL REVERSE ABOVE 90 KNOTS. REDUCE AIRSPEED 1 KNOT FOR EACH 1°F ABOVE 90°F PRIOR TO USING MAXIMUM REVERSE POWER.
- ATTEMPTED REVERSE WITH THE SPEED LEVERS AFT OF THE HIGH RPM POSITION MAY RESULT IN AN ENGINE OVER TEMPERATURE CONDITION.

AFTER LANDING

1. Power Levers .... GROUND IDLE
2. Flaps .... UP
3. Speed Levers .... LOW RPM

CAUTION

- DO NOT RETARD SPEED LEVERS WHILE POWER LEVERS ARE AFT OF GROUND IDLE.
- DO NOT RETARD THE SPEED LEVERS TO THE FULL AFT (LOW RPM) POSITION UNTIL A NORMAL TAXI SPEED IS REACHED. BECAUSE NOSE WHEEL STEERING IS ACTUATED IMMEDIATELY WHEN THE RIGHT ENGINE SPEED LEVER IS PLACED IN THE FULL AFT POSITION, THE POSSIBILITY OF AN UNWANTED STEERING COMMAND EXISTS. IF REDUCTION OF ENGINE NOISE IS DESIRED PRIOR TO REACHING NORMAL TAXI SPEED, THE SPEED LEVERS CAN BE RETARDED TO A POSITION APPROXIMATELY 1/2 INCH FORWARD OF THE AFT LOW RPM STOP. THIS WILL RESULT IN DESIRED REDUCTION OF ENGINE RPM AND YET PRECLUDE ACTUATION OF THE NWS SWITCH. STEERING THROUGH THE LEFT POWER LEVER THUMB BUTTON REMAINS ACTIVE.

4. Ignition Mode Switches .... NORMAL

   OR

   Auto/Cont Ignition Switches .... AUTO
5. Ice Protection Systems .... OFF
6. Stabilizer, Aileron, and Rudder Trim .... NEUTRAL
7. Interior/Exterior Lighting .... AS DESIRED

NOTE

- Allow the engines to cool below 20% torque for at least three minutes. (This may include descent, approach, landing and taxi time if power does not exceed 20% torque.)
- If taxiing was above ground idle RPM, a one minute cooling period at ground idle prior to engine shutdown is recommended.

STOPPING ENGINES

1. Nose Wheel Steering Switch .... OFF
2. SAS Clutch or SAS Servo Switch .... OFF
3. Yaw Damper (if installed) .... OFF
4. Avionics .... OFF

*5. Cabin Pressure Dump Switch .... DUMP
*6. Bleed Air Switches .... OFF

7. Generator Switches .... OFF
8. Engine Stop Buttons .... PRESS AND HOLD

NOTE

Press the Engine Stop Button a minimum of five seconds. RPM will increase approximately 5% with actuation of the stop circuit as the fuel is purged into the combustor, and then decay as the manifold fuel is depleted. If this increase in RPM does not occur, the purge system has failed or the engine RPM has not reached 96% since the engine was started.

9. Power Levers .... REVERSE AT APPROXIMATELY 50% RPM (HOLD TO BELOW 10% RPM TO PLACE PROPELLER BLADES ON START LOCKS)
10. Fuel Boost Switches .... OFF

*11. Inverter Switch .... OFF

12. Interior/Exterior Lights .... OFF
13. Battery Switches .... OFF
14. Parking Brake, Control Lock, Chocks, Tie Down, and Pitot Covers .... AS REQUIRED

NOTE

- Wheel chocks, rather than the parking brake, should be used whenever practical to allow even cooling of the brakes.
- Hand rotation of the propeller through 12 to 16 blades in the normal direction of rotation, within 5 minutes after shutdown, will enhance the service life of the fuel nozzles and dissipate residual heat from the rotating components of the engine thereby preserving compressor seal integrity and facilitating starts following quick turn-arounds.

SYSTEM CHECKS AND OPERATION

NIGHT OR INSTRUMENT FLIGHT

1. Exterior Lights .... CHECK
2. Interior Lights .... CHECK
3. Flight Instruments .... CHECK
4. Generator Volts and Amps .... CHECK

NOTE

During night flight in clouds, turn rotating beacon and strobe lights off.

CURRENT LIMITER CHECK

Either of the following checks (3a. or 3b.) will verify the status of the current limiters. Use of the pitch trim systems provides visual and aural proof of continuity while use of the annunciator panel is a quicker and quieter method.

1. Battery Switches .... OFF
2. Generator Switch (either engine) .... OFF

3a. Pitch Trim .... ACTUATE BOTH PILOT SWITCHES, NOTE STABILIZER MOVEMENT. ACTUATE BOTH COPILOT SWITCHES, NOTE STABILIZER MOVEMENT.

OR

3b. Annunciator Panel .... PRESS-TO-TEST. NOTE THAT ALL ANNUNCIATOR LIGHTS (EXCEPT BATTERY FAULT) ILLUMINATE.

4. Battery and Generator Switches .... ON

CAUTION

IF EITHER THE PILOT OR COPILOT TRIM SYSTEMS WILL NOT OPERATE THE STABILIZER, OR IF ANNUNCIATOR PANEL LIGHTS DO NOT ILLUMINATE DURING THIS TEST, A CURRENT LIMITER HAS FAILED.

SYSTEM CHECKS AND OPERATION (continued)

FLIGHT IDLE GATE CHECK

1. Advance both power levers beyond flight idle.
2. Retard both power levers and ensure that neither power lever will travel beyond the flight idle gate without lifting the release knob on each power lever.

BEFORE START PROPELLER UNFEATHERING

1. Power Lever .... REVERSE
2. Unfeather Test Switch .... SELECT L OR R
3. Unfeather Test Switch .... MOVE TO OFF WHEN BLADES REACH REVERSE PITCH
4. Power Lever .... GROUND IDLE

PROPELLER START LOCK RELEASE

Place power levers into reverse with engines running to release propeller blades from start locks.

NOTE

- Typically, if the power levers are retarded rapidly, a sharp drop in oil pressure will be indicated and the beta lights will be extinguished while the propeller blades are being driven toward reverse. Holding the power levers in full reverse until oil pressures return to normal, torque indications rise, and beta lights reilluminate will ensure start locks release.

- Start locks can be released by use of partial reverse power. However, power levers must be moved aft of ground idle far enough to cause a definite increase in torque and then moved forward of ground idle far enough to check that torque is high enough to indicate that start locks have released.

- Slow movement of power levers into reverse range may not cause the beta lights to blink.

SYSTEM CHECKS AND OPERATION (continued)

ANNUNCIATOR PANEL AND SYSTEM WARNING LIGHTS

An integrated warning (red), caution (amber), and advisory (green) light panel centrally located on the instrument panel provides the necessary annunciations to the crew for necessary systems operations and significant systems malfunctions.

The functions of the annunciator panel green lights are shown in the following table. See the Emergency and Abnormal Procedures sections for functions of the red and amber lights. Spare positions are indicated by a line across the lights.

LIGHT ILLUMINATED	INDICATES THAT
LEFT or RIGHT INTAKE HEAT ON (L or R INTAKE HT, later aircraft)	a. Corresponding engine intake heat bleed air valve is not closed when engine and prop heat switch is on. b. Corresponding engine intake heat bleed air valve is closed when engine and prop heat switch is off and valve test switch is pressed.
L or R W/S HEAT CYCLE (L or R W/S HT, later aircraft)	a. If windshield heat switch is low, heat is being applied to both windshields when both lights are on and to neither windshield when only one light is on. b. If windshield heat switch is high, heat is being applied to windshield corresponding to illuminated light.
SAS ARM	SAS servo is armed. Light should be illuminated at speeds below 135 KIAS and out at speeds above 145 KIAS.
SAS DEICE	Either pitot heat switch is in pitot and SAS heat position. Does not indicate that the vane is actually heated.
NOSE STEERING	a. Steady light: Power is available to the nose wheel steering relay. System is okay. b. Flashing light: Fault in system or nose wheel is positioned 3^{o} or more from position being commanded by pedals.
AWI # 1 or # 2 PUMP ON (AWI NO 1 or NO 2 PUMP ON, later aircraft)	Corresponding pump is operating.

SYSTEM CHECKS AND OPERATION (continued)

CONTINUOUS IGNITION SYSTEMS

The continuous ignition systems are provided for use during periods when excessive water, slush, or ice ingestion might interrupt the flow of air to the engine combustion chambers and cause engine flameout. The systems include operating modes which energize the engine igniters either manually or automatically to allow the engine to relight as soon as air flow is restored following a flameout. A lever-lock switch independently controls the ignition mode selection for each engine. Either of the following two systems are installed in the aircraft. Each system is identified by the switch label; IGNITION MODE or AUTO/CONT IGNITION. The ignition modes provided by each switch position of the two different systems are as follows:

IGNITION MODE switches

NORMAL: Ignition is supplied to the engine only during the automatic or manual start cycle, between 10% and 60% RPM. This mode is provided for use during normal operations.

CONT: Ignition is supplied to the engine continuously as long as the main landing gear squat switches are in the ground position. This mode is provided for use during takeoff or landing on wet or slush covered runways when ingestion is possible.

OVERRIDE: Ignition is supplied to the engine continuously. This mode should be used whenever meteorological conditions exist or are encountered that pose a significant risk of engine flameout. This mode is provided for use during flight in known icing conditions, heavy rain, turbulence encounters, and before selecting engine and prop heat following inadvertent icing encounters. Note: Do not initiate engine starts with OVERRIDE selected.

AUTO/CONT IGNITION switches

AUTO: Ignition is automatically supplied to the engine whenever the engine power output is disrupted, such as following flameout, when the negative torque sensing (NTS) system is activated. This mode should be selected for all normal operations including flight in known icing conditions, rain and turbulence. Ignition during automatic or manual engine start is not affected by the selection of this mode.

SYSTEM CHECKS AND OPERATION (continued)

AUTO/CONT IGNITION switch (continued)

NOTE

When in the AUTO mode, it is normal for the ignition system to be activated by an inflight engine shutdown using the preplanned shutdown procedure (Abnormal Procedures, Section 3A), as indicated by illumination of the respective engine's ignition light. The ignition system senses NTS system oil pressure and may remain energized for as long as approximately 30 seconds after the propeller is feathered. The reverse will occur during airstarts. The ignition system might not be energized during an inflight engine shutdown using the emergency shutdown procedure (Emergency Procedures, Section 3), because immediate stop and feather action of the engine and propeller could preclude activation of the NTS system. If negative torque is sensed when stopping engines on the ground (for example, when a tailwind exists), the igniters might be activated.

CONT: Ignition is supplied to the engine continuously. This mode should be used whenever meteorological conditions exist or are encountered that pose a significant risk of engine flameout. (i.e.) during takeoff and landing whenever standing water or slush is present, during flight in heavy rain, and before selecting engine and prop heat following inadvertent icing encounters. Note: Do not initiate engine starts with CONT selected.

OFF: Ignition is supplied to the engine only during the automatic or manual start cycle. This mode is provided to deactivate the ignition system following engine failure or fire, or if the NTS pressure switch should stick in its ignition-on position.

An amber light, adjacent to each EGT indicator, is provided for each engine to indicate that power is being supplied to the igniters. Power for the system is provided via a five ampere circuit breaker marked (L or R) CONT IGN.

STALL AVOIDANCE SYSTEM (SAS)

The stall avoidance system provides an aural stall warning and a sixty pound forward stick force augmentation prior to reaching the aerodynamic stall. An angle-of-attack sensing vane and transmitter located on the right side of the nose provide the signal inputs to a SAS computer that actuates the stall warning horn, provides power for the stick force augmentation servo, and provides the signal for the SAS indicator.

SYSTEM CHECKS AND OPERATION (continued)

STALL AVOIDANCE SYSTEM (SAS) (continued)

The following are provided in the cockpit: a test switch and indicator (for preflight checking of the SAS); a fault light (for automatic annunciation of system malfunctions); and a SAS deice light (see anti-ice and deice systems).

A switch is provided on the center pedestal to disengage the stick pusher servo in the event of a SAS malfunction (see Section 3, Emergency Procedures). The switch is identified as the SAS CLUTCH switch when a servo with a magnetic powder clutch is installed (early, unmodified aircraft). It is identified as the SAS SERVO switch when a torque motor servo is installed (late or modified aircraft).

The following system checks are applicable to the stall avoidance system:

NOTE

If the vane is moved up (by hand, by wind gust or any other method) so that the needle on the SAS indicator is at less than 1.0 V_S, the SAS fault light will come on steady.

During the Before Taxi check, the SAS will be checked as follows:

CAUTION

ENSURE THAT THE CONTROL LOCK IS OFF PRIOR TO SAS CHECKS.

1. Flaps .... UP
2. SAS ARM Light .... ON
3. SAS Clutch or SAS Servo Switch .... OFF
4. SAS FAULT Light .... CHECK FOR FLASHING LIGHT
5. SAS Clutch or SAS Servo Switch .... ON
6. SAS FAULT Light .... CHECK LIGHT OFF
7. SAS Test Switch .... HOLD IN STALL POSITION

NOTE

To prevent damage to some flight instruments, hold elevator control firmly during this check.

SYSTEM CHECKS AND OPERATION (continued)

STALL AVOIDANCE SYSTEM (SAS) (continued)

While holding the SAS test switch in the STALL position, verify the following:

a. SAS FAULT light .... OFF
b. Stall warning horn .... ON
c. SAS indicator .... POINTER ALIGNED WITH RIGHT SIDE OF STALL BAND
d. Elevator control .... CHECK AUGMENTED FORWARD STICK FORCE
e. SAS clutch or SAS servo switch .... OFF
f. SAS FAULT light .... CHECK FOR FLASHING LIGHT
g. Elevator control .... CHECK NORMAL ELEVATOR STICK FORCE (NO FORCE AUGMENTATION)
h. SAS clutch or SAS servo switch .... ON/CHECK FORCE RETURN

8. SAS Test Switch .... HOLD IN CRUISE POSITION

While holding the SAS test switch in CRUISE position, verify the following:

a. Flaps .... UP
b. Elevator control .... CHECK NORMAL ELEVATOR STICK FORCE (NO FORCE AUGMENTATION)
c. SAS FAULT light .... OFF
d. SAS indicator .... POINTER ALIGNED AT 1.3 (PLUS OR MINUS .05) V_S
e. Flap compensator .... LOWER FLAPS WHILE HOLDING SAS TEST SWITCH IN CRUISE POSITION. NOTE POINTER ON INDICATOR MOVES FROM 1.3 V_S TO APPROXIMATELY 1.2 V_S

SYSTEM CHECKS AND OPERATION (continued)

STALL AVOIDANCE SYSTEM (SAS) (continued)

NOTE

In cruise test, the following will occur:

- Flaps up, pointer needle will be positioned on 1.3 V_S.
- Flaps between up and one-quarter, pointer needle will move up slightly.
- Flaps between one-quarter and one-half, pointer needle will move up more.
- Flaps between one-half and full down, pointer needle will move to approximately 1.2 V_S position.

9. Flaps .... AS REQUIRED

Inflight SAS Operational Check (Reference is Copilot's Airspeed Indicator)

1. Below 135 KIAS, SAS ARM Light .... ON
2. Above 145 KIAS, SAS ARM Light .... OFF

WARNING

IF THE SAS ARM LIGHT HAS NOT EXTINGUISHED BY THE TIME THE AIRSPEED HAS INCREASED TO 145 KIAS, THE SAS CLUTCH SWITCH OR SAS SERVO SWITCH (WHICHEVER IS INSTALLED) SHOULD BE TURNED OFF. THE SWITCH SHOULD BE TURNED BACK ON FOR ALL OPERATIONS BELOW 140 KIAS.

BATTERY DISCONNECT SYSTEM

With both battery switches off, the battery disconnect system is checked by the following procedure:

1. Left Battery Switch .... ON
2. R BAT DISC Light .... ON
3. Right Battery Switch .... ON
4. R BAT DISC Light .... OFF
5. Left Battery Switch .... OFF
6. L BAT DISC Light .... ON
7. Left Battery Switch .... ON

SYSTEM CHECKS AND OPERATION (continued)

BATTERY TEMPERATURE INDICATOR

Battery Temperature Indicating System

A battery temperature indicator is located on the instrument panel. The indicator face has an expanded scale to show the pilot when battery temperatures are abnormally high (in the 100° to 190°F range). An amber caution light is incorporated in the instrument to alert the crew when either battery temperature is above 120°F (plus or minus 3°F) and a red light in the instrument warns the pilot that the battery temperature is above 150°F (plus or minus 3°F). The indicator needles will remain off scale low until battery temperatures are above 100°F.

Battery Temp Test Button

Pressing the test button adjacent to the indicator provides an integrity check of the battery temperature probe and indicator functions. Satisfactory functioning is indicated when the pointers are driven to the top of the scale in approximately five seconds, the amber light illuminates as the pointers pass approximately 120°F, and the red light illuminates as the needles pass approximately 150°F. The rate of travel may vary, depending upon ambient battery temperatures. Should one pointer lag the other, or should it fail to travel full scale during test, a fault in the system is indicated and maintenance action will be required.

Range Extend Button

When pressed, this button adds 50°F to the existing temperature indications of the batteries. Thus, an indicated temperature of 130°F would tell the pilot that the actual temperature in the battery is 80°F. This feature of the battery temperature indicating system is useful for making battery maintenance and pilot operating decisions. It is recommended that battery temperature rise logs be kept for battery starts. A mental note of battery temperatures approximately five minutes after engine start will establish the rise due to post start recharging. As batteries approach the need for deep cycle, the temperature rise per engine start will become greater. Knowing the temperature rise expected during a battery start will help the pilot decide whether the batteries can tolerate another battery start, if he should obtain an auxiliary power unit, or if he should delay the start until the batteries have cooled to a lower temperature.

SYSTEM CHECKS AND OPERATION (continued)

STABILIZER TRIM SYSTEM

The pilot and copilot double element trim control switches independently control individual jackscrew actuators when selected by the trim selector switch. A pilot auxiliary trim switch is included in the copilot trim system and will override the copilot trim control switches.

All takeoffs should be made with the stabilizer trimmed within the takeoff band marked on the trim indicator. When the airplane is loaded to a forward center of gravity configuration, the stabilizer should be trimmed to the nose up end of the takeoff band; for aft center of gravity configurations, the stabilizer should be trimmed to the nose down end of the takeoff band. If the stabilizer is trimmed out of the takeoff band while the airplane is on the ground, and the power levers are advanced to takeoff power, an aural out-of-trim warning will sound.

The trim system also incorporates an aural trim-in-motion system. This system provides an aural tone at any time electrical power is applied to either trim actuator.

During the Before Taxi Check, the stabilizer trim system is checked by the following procedure. The procedure verifies normal operation of all switches and indications in the stabilizer trim circuitry. It is necessary to operate each trim system only long enough to ensure that the stabilizer travels in the proper direction and that the sonalert sounds. Operating the trim systems from stop to stop prior to each flight requires excessive time and exposes the trim system motors to unnecessary use.

1. Pitch Trim Indicator..........COMPARE WITH STABILIZER SETTING NOTED DURING PREFLIGHT
2. Trim Select Switch.......................................PILOT
3. Individual Pilot Trim Switches.........................ACTUATE BOTH DIRECTIONS/CHECK FOR NO STABILIZER MOVEMENT AND AURAL TRIM SIGNAL ON ONE SWITCH ONLY

WARNING

OPERATION OF THE TRIM SYSTEM SHOULD OCCUR ONLY BY MOVEMENT OF PAIRS OF SWITCHES. ANY MOVEMENT OF THE STABILIZER WHILE ACTUATING ONLY ONE SWITCH ON THE CONTROL WHEELS INDICATES A MALFUNCTION. FLIGHT SHOULD NOT BE INITIATED WITH ANY MALFUNCTION OF EITHER THE PILOT'S SYSTEM OR THE COPILOT'S SYSTEM.

SYSTEM CHECKS AND OPERATION (continued)

STABILIZER TRIM SYSTEM (continued)

4. Both Pilot Trim Switches .... ACTUATE BOTH DIRECTIONS/NOTE STABILIZER MOVEMENT AND AURAL TRIM SIGNAL
5. Trim Select Switch .... OFF
6. Pilot Trim Switches, Auxiliary Trim Switch, and Copilot Trim Switches .... ACTUATE BOTH DIRECTIONS/CHECK FOR NO STABILIZER MOVEMENT AND NO AURAL TRIM SIGNAL
7. Trim Select Switch .... COPILOT
8. Individual Copilot Trim Switches .... ACTUATE BOTH DIRECTIONS/CHECK FOR NO STABILIZER MOVEMENT AND AURAL TRIM SIGNAL ON ONE SWITCH ONLY
9. Both Copilot Trim Switches .... ACTUATE BOTH DIRECTIONS/NOTE STABILIZER MOVEMENT AND AURAL TRIM SIGNAL
10. Auxiliary Trim Switch .... ACTUATE BOTH DIRECTIONS/NOTE STABILIZER MOVEMENT AND AURAL TRIM SIGNAL
11. Trim Select Switch .... PILOT
12. Stabilizer Trim .... SET FOR TAKEOFF

OVERSPEED GOVERNOR

This check should be made (1) at intervals not to exceed 200 flight hours; (2) prior to any flight during which intentional airstarts are planned; (3) when there is any indication of overspeed governor malfunction; and (4) after any engine control system maintenance or adjustment.

During the Before Taxi check and before releasing the start locks, the overspeed governors may be checked as follows:

1. Brakes .... SET
2. Speed Levers .... HIGH RPM
3. Power Levers .... ADVANCE UNTIL FURTHER MOTION CAUSES NO INCREASE IN FUEL FLOW OR RPM (RPM SHOULD BE 103% TO 105%)
4. Speed Levers .... LOW RPM

CAUTION

- DO NOT ALLOW RPM TO EXCEED 106%.
- FAILURE OF THE START LOCKS DURING AN OVERSPEED GOVERNOR CHECK CAN RESULT IN A SUDDEN FORWARD “JUMP” OF THE AIRCRAFT. BEFORE PERFORMING OVERSPEED GOVERNOR CHECKS, THE PILOT SHOULD VERIFY THAT THE AREAS BEHIND AND AHEAD OF THE AIRCRAFT ARE CLEAR.

SYSTEM CHECKS AND OPERATION (continued)

SINGLE RED LINE COMPUTER/TEMP LIMITER

The single red line computer is checked during each application of high RPM and power. During takeoff checks observe the following:

1. As engine speed passes 80% RPM, check that the SRL OFF annunciator lights go out and that EGT's jump sharply.

2. Whenever power levers reach temp limiting position, check that temp limiting is indicated by illumination of both fuel bypass lights, and even EGT's, torques, and fuel flows.

NOTE

- Failure of an SRL OFF light to go out or other indications of SRL computer or temp limiting failure require discontinuance of the takeoff and subsequent troubleshooting.

- See page 3A-14 for inflight operating procedures with SRL/Temp Limiter Inoperative.

SYSTEM CHECKS AND OPERATION (continued)

SINGLE RED LINE COMPUTER/TEMP LIMITER (continued)

The following SRL/Temp Limiter checks are required (1) at intervals not to exceed 50 flight hours; (2) prior to any flight when manual engine start has been necessary; (3) when there is any indication of SRL/Temp Limiter malfunction; and (4) after any engine fuel control or SRL computer maintenance or adjustment.

WARNING

DO NOT TEST TEMP LIMITER IN FLIGHT. AT HIGH ALTITUDES FLAME OUT MAY RESULT.

Proper operation of the temp limiter and SRL circuits is assured by the following test: During the SRL test, the difference between SRL ON and OFF EGT of one engine is compared with the difference between SRL ON and OFF EGT of the opposite engine. The difference must not exceed 10°C.

1. Speed Levers .... HIGH RPM
2. Left Power Lever .... ADVANCE TO 100% RPM WITH PROPELLER ON START LOCK
3. EGT .... STABILIZE AND NOTE VALUE
4. Left SRL – Δ P/P Power Switch .... Δ P/P OFF/NOTE A SLIGHT EGT INCREASE

If no increase is noted, system must be checked and corrected before further flight.

5. Left SRL – Δ P/P Power Switch .... NORMAL
6. Left SRL – Δ P/P Power Switch .... SRL OFF/NOTE CHANGE IN EGT VALUE/ L SRL OFF LIGHT ILLUMINATED

NOTE

- The change in EGT between engines SRL OFF and ON must not exceed 10°C.

Example:

Left Engine EGT		Right Engine EGT
400°C	SRL ON	395°C
330°C	SRL OFF	320°C
70°C	5°C Difference	75°C

- If 10° difference is exceeded, the SRL System must be checked and corrected before further flight.

SYSTEM CHECKS AND OPERATION (continued)

SINGLE RED LINE COMPUTER/TEMP LIMITER (continued)

7. Left SRL – Δ P/P Power Switch .... NORMAL (L SRL OFF LIGHT EXTINGUISHED)
8. Temp Limiter Test Switch .... L (NOTE DECREASE IN ENGINE EGT, RPM, FUEL FLOW, AND ILLUMINATION OF FUEL BYPASS OPEN LIGHT)
9. Temp Limiter Test Switch .... RELEASE (NOTE INCREASE IN EGT, RPM, FUEL FLOW, AND FUEL BYPASS OPEN LIGHT OUT)
10. Left Power Lever .... GROUND IDLE
11. Repeat Steps 2 through 10 for right engine.

NOTE

If the temp limiter fails, pull the temp limiter circuit breaker. Operate the engine in accordance with the procedures outlined in "TEMPERATURE LIMITER MALFUNCTIONS." (Section 3A, Abnormal Procedures.)

12. Speed Levers .... LOW RPM

NTS SYSTEM

1. First Flight of Day – Check propeller governor reset function by setting speed lever low and advancing power lever slowly. Note maximum stabilized RPM does not exceed 94.5%. RPM in excess of 94.5% indicates either improper propeller governor low setting or NTS system malfunction.

2. Every 250 Flight Hours – See Garrett Maintenance Manual 72-00-00, page 518A, NTS Trip System Check.

ANTI-SKID BRAKE SYSTEM (If Installed)

During taxi, the manual and anti-skid brake systems may be checked by noting brake pedal travel and feel and by observing the anti-skid annunciator light.

1. Anti-Skid Switch .... OFF/ANTI-SKID LIGHT ON
2. Brake Pedals .... CHECK TRAVEL, FEEL, AND PERFORMANCE
3. Anti-Skid Switch .... ON/ANTI-SKID LIGHT OFF
4. Brake Pedals .... CHECK TRAVEL, FEEL, AND PERFORMANCE

NOTE

Brake pedals should feel hard with very little travel when anti-skid is ON. The pedals feel softer and permit more travel before braking response when anti-skid is OFF or when anti-skid is not installed.

SYSTEM CHECKS AND OPERATION (continued)

VARIABLE AUTHORITY NOSE WHEEL STEERING SYSTEM (Unmodified)

During Taxi

1. Nose Wheel Steering Arm Switch .... ARMED
2. NOSE STEERING Light .... STEADY
3. Right Speed Lever .... FORWARD OF LOW RPM
4. Nose Wheel Steering .... NOTE INOPERATIVE
5. NWS Power Lever Button(s) .... PRESS INDIVIDUALLY, NOTE STEERING, THEN RELEASE
6. Right Speed Lever .... LOW RPM
7. Test Switch L
8. Nose Wheel Steering .... NOTE LEFT TURN FOLLOWED BY AUTO DISENGAGEMENT

NOTE

Application of a slight amount of opposite rudder during operation of the test switch will provide a positive check of the fault detection system with minimum deflection of the airplane nose.

9. NOSE STEERING Light .... BLINKING
10. Test Switch .... OFF
11. Rudder Pedals .... CENTER
12. NOSE STEERING Light .... STEADY
13. Repeat Steps 7 Through 12 for Right Test.
14. Nose Wheel Steering Arm Switch .... VALVE TEST
15. Nose Wheel Steering .... NOTE INOPERATIVE
16. Nose Wheel Steering Arm Switch .... ARMED

SYSTEM CHECKS AND OPERATION (continued)

VARIABLE AUTHORITY NOSE WHEEL STEERING SYSTEM (Modified in accordance with Service Bulletin 227 32-006)

During Taxi

1. Nose Wheel Steering Arm Switch .... ARMED
2. NOSE STEERING Light .... STEADY
3. Right Speed Lever .... FORWARD OF LOW RPM

NOTE

The amber NOSE STEER FAIL annunciator light MUST blink each time nose wheel steering is deactivated by the right speed lever switch.

4. NOSE STEER FAIL Light .... OUT
5. Nose Wheel Steering .... NOTE INOPERATIVE
6. NWS Power Lever Button(s) .... PRESS INDIVIDUALLY, NOTE STEERING, THEN RELEASE

NOTE

The amber NOSE STEER FAIL annunciator light MUST blink each time nose wheel steering is deactivated by the NWS power lever button(s).

7. Right Speed Lever .... LOW RPM
8. Rudder Pedals .... CENTER OR OPPOSITE TO TEST SWITCH
9. Test Switch L

NOTE

The amber NOSE STEER FAIL annunciator light MUST blink each time nose wheel steering is deactivated by the test switch.

10. Nose Wheel Steering .... NOTE LEFT TURN FOLLOWED BY AUTO DISENGAGEMENT

NOTE

Application of a slight amount of opposite rudder during operation of the test switch will provide a positive check of the fault detection system with minimum deflection of the airplane nose.

11. NOSE STEERING Light .... BLINKING
12. Test Switch .... OFF
13. Rudder Pedals .... CENTER

SYSTEM CHECKS AND OPERATION (continued)

VARIABLE AUTHORITY NOSE WHEEL STEERING SYSTEM (Modified in accordance with Service Bulletin 227 32-006) (continued)

During Taxi (continued)

14. NOSE STEERING Light .... STEADY
15. Repeat Steps 9 Through 14 for Right Test.
16. Nose Wheel Steering Arm Switch .... VALVE TEST

NOTE

The amber NOSE STEER FAIL annunciator light MUST blink each time nose wheel steering is deactivated by the arm switch.

17. Nose Wheel Steering .... NOTE INOPERATIVE
18. Nose Wheel Steering Arm Switch .... ARMED

NOTE

- Some combinations of rudder pedal displacement and test switch operation may cause the NOSE STEER FAIL light to flash in unison with the green NOSE STEERING light or at random during the functional checks above.

- Expect the NOSE STEER FAIL annunciator light to blink briefly when nose wheel steering is released during takeoff roll.

YAW DAMPER SYSTEM (If Installed)

A yaw damper amplifier, energized by AC voltage from a rate gyro in the pilot's turn and slip indicator and by a slip-skid sensor, activates a servo which is mechanically linked to the rudder control system. A mechanical clutch in the drive linkage assures the pilot of override capability in the event of damper malfunction.

NOTE

- Yaw damper system operation is not required for flight.

- The following discussion addresses factory-installed yaw damper systems when no automatic pilot is installed. If autopilot is installed, refer to appropriate AFM Supplement for yaw damper checks and operation.

SYSTEM CHECKS AND OPERATION (continued)

YAW DAMPER SYSTEM (If Installed) (continued)

Yaw Damper Preflight Check

While parked or during taxi at low speeds, displace the rudder pedals from neutral and place the three position yaw damper switch in the spring loaded TEST position. The TEST position bypasses the landing gear squat switch and energizes the yaw damper system. The yaw damper will drive the rudder pedals back toward neutral when parked and will move the pedals to counteract turns during taxi checks. Press on the instrument panel adjacent to the Bendix turn and slip indicator to displace the turn needle. A distinct rudder pedal movement should result. On completion of these checks, place the yaw damper switch in the ON position. The system will now be energized immediately after the aircraft becomes airborne.

Yaw Damper Operation In Flight

The yaw damper is provided to dampen aircraft yawing oscillations during low speed flight in turbulence. If the yaw damper is turned on in flight when the aircraft is not trimmed accurately, the pilot may feel rudder pedal movement. This is normal and indicates that the yaw damper slip-skid sensor has detected the mistrim and that the system is attempting to correct the directional trim problem. If the yaw damper is turned on when a large yaw exists, the corrective action by the yaw damper system may be abrupt and annoy passengers. Therefore, the aircraft should be well trimmed prior to engaging the yaw damper during flight.

CONTINUOUS ALCOHOL-WATER INJECTION (CAWI) SYSTEM

The CAWI system is installed to provide increased power during takeoff operations at high weights and/or in hot weather at high altitudes. When the CAWI system is to be used during takeoff, perform the following Before Takeoff check;

1. AWI Quantity Gauge .... CHECK (8 GALLONS MINIMUM)

NOTE

Minimum CAWI fluid quantity is 8 gallons for Wet Takeoff and acceleration to V_{YSE} at 50 feet. See Figure 1-2 for additional CAWI fluid quantity requirements.

2. AWI Pump Test Switch .... HOLD IN NO. 1 POSITION
3. AWI No 1 Pump Light .... CHECK ON

SYSTEM CHECKS AND OPERATION (continued)

CONTINUOUS ALCOHOL-WATER INJECTION (CAWI) SYSTEM (continued)

4. AWI No 2 Pump Light .... CHECK OFF

NOTE

- Illumination of the light corresponding to the pump test switch position indicates satisfactory pump pressure.
- Illumination of the opposite pump on light indicates a faulty check valve.
- The average flow rate of CAWI fluid to each engine is 2.5 U.S. gallons per minute.

5. Repeat Steps 2 through 4 for No 2 Pump.

ENGINE FIRE DETECTION AND EXTINGUISHING SYSTEM

The engine fire detection, extinguisher control, and the primary system test features are mounted centrally on the pilot's instrument panel. They consist of a red fire warning light for each engine; an amber empty light to indicate the condition of each extinguishing agent bottle; a green O.K. light to determine the status of each bottle cartridge; an extinguishing agent discharge switch incorporated into each annunciation cluster; and a system test button which permits preflight check of the annunciator bulbs and of electrical continuity to the bottle cartridges. The annunciator/switch bulbs can be replaced by pulling the switch frames outward and exposing the bulbs.

NOTE

Pull both fire extinguisher circuit breakers prior to replacing bulbs in the fire extinguisher switches. Otherwise accidental discharge of the agent may occur when the switch is reinstalled in its housing.

SYSTEM CHECKS AND OPERATION (continued)

ENGINE FIRE DETECTION AND EXTINGUISHING SYSTEM (continued)

Four fire detectors are located forward of the firewall in each engine nacelle. The detectors are heat sensitive, normally open switches which close when reaching their trigger points. Three of the detectors operate at approximately 450°F and the other operates at approximately 600°F. When any switch closes, the red FIRE light illuminates. If the fire extinguisher switch guard is lifted and the switch is depressed, the agent is discharged from the respective bottle. The amber E light will illuminate and stay on, indicating that the bottle is empty. When engine area temperatures decrease to below the triggering temperature of the detectors, the switches will return to their open positions and the red FIRE lights should go out. Failure of either FIRE light to illuminate during annunciator panel tests indicates electrical discontinuity in the detector circuit of the appropriate engine nacelle and must be corrected prior to flight.

NOTE

Some aircraft incorporate duplicate fire warning lights in the annunciator panel.

A fire extinguisher bottle is mounted aft of the firewall on the right side of each engine. The extinguishing agent is approximately 2.5 pounds of Halon 1301 in each bottle. The agent is propelled to critical areas of the engine by nitrogen at a pressure of approximately 600 psi. Each bottle is equipped with a pressure gauge which is visible through a port in the engine nacelle. When the appropriate fire extinguisher switch on the instrument panel is pressed, an explosive cartridge at the base of the bottle fires and releases the agent. Each bottle serves its respective engine and there is no crossflow capability. Proper nitrogen pressure is shown in the following table.

FIRE EXTINGUISHER BOTTLE PRESSURE

Bottle Temperature (°F)	–40	–20	0	+20	+40	+60	+80	+100	+120
Bottle Pressure Range (PSI)	292 to 370	320 to 400	355 to 437	396 to 486	449 to 540	518 to 618	593 to 702	670 to 784	755 to 855

SYSTEM CHECKS AND OPERATION (continued)

CARGO DOOR SECONDARY WARNING AND TEST SYSTEM

A red DOOR UNSAFE light and a green SWITCHES NORMAL light are located at the forward end of the copilot's side panel. The adjacent spring-loaded test switch will cause the bulbs in both lights to illuminate when it is held in the LAMP TEST position. If the switch is held aft in the SWITCH TEST position, the SWITCHES NORMAL light will illuminate if all the following exist:

1. The cargo door latches have been withdrawn to the door open position.

2. All cargo door switches have extended to their relaxed (door open) positions.

3. The cargo door handle is not in the fully closed position.

The DOOR UNSAFE light will be illuminated whenever DC power is available to the system and either of the following conditions exists:

1. The cargo door handle is not in its fully closed position.

2. Any cargo door latch switch has not been compressed to its door closed position by its respective latch.

DC power to this system can be supplied from either the left essential bus (landing gear position circuit breaker) or from the auxiliary lights arming circuit. A test jack adjacent to the TEST switch is provided for troubleshooting the cargo door latching system.

During preflight the Cargo Door Secondary Warning and Test System should be checked as follows:

CARGO DOOR CLOSED AND LOCKED

1. DOOR UNSAFE and CARGO DOOR Annunciators .... CHECK OFF
2. Test Switch .... LAMP TEST/
   VERIFY DOOR UNSAFE & SWITCHES NORMAL LIGHTS ON
3. Test Switch .... SWITCH TEST/
   VERIFY DOOR UNSAFE & SWITCHES NORMAL LIGHTS OUT

CARGO DOOR OPEN

1. DOOR UNSAFE and CARGO DOOR Annunciators .... CHECK ON
2. Test Switch .... SWITCH TEST/
   VERIFY SWITCHES NORMAL LIGHT ILLUMINATES

OXYGEN SYSTEM

Crew oxygen is supplied to a mask hose receptacle provided at each seat. Oxygen from the regulator at the bottle is supplied directly to the pilot and copilot oxygen mask hose receptacles which are located below the cockpit side windows. The pilot and copilot masks are diluter demand type with a normal or 100% flow selector. Passenger oxygen is either supplied to plug-in receptacles at each seat, or to overhead drop-out masks.

Either one or two supply bottles are located aft of the aft baggage compartment bulkhead. The standard bottle has a capacity of 49 cubic feet. Two optional installations are available. One provides a capacity of 115 cubic feet in a single bottle. The other provides a total capacity of 179 cubic feet by using a 115 cubic foot bottle plus a 64 cubic foot bottle. Each oxygen supply bottle has a regulator which includes a manually operated shut-off valve.

Oxygen from the bottle(s) is plumbed directly to the pilot’s and copilot’s mask hose receptacles and to a passenger oxygen toggle control which is located below the copilot’s side window. The toggle control must be in the ON position in order for oxygen to flow through the continuous flow mask provided for each passenger. When the crew diluter demand masks are plugged in, oxygen is available to the crew, regardless of the position of the passenger oxygen toggle control.

NOTE

- Oxygen will not flow to any of the mask hose receptacles if the manually operated valve at the supply bottle(s) is in the OFF position.

- Figure 2-2 shows the oxygen duration available for the plug-in system, while Figure 2-3 shows the duration for the drop-out mask system. Both figures are for a system pressure of 1850 psi and bottle temperature of 70^{o}F (fully serviced).

- Oxygen system indicated pressure will vary with supply bottle temperature. See Figure 2-4.

- Figure 2-5 provides correction factors to be used when the various systems are partially serviced.

OXYGEN SYSTEM (continued)

PLUG-IN PASSENGER OXYGEN MASKS

If a passenger mask is plugged into a cabin receptacle and the toggle control is ON, oxygen will flow through the mask and receptacle until the mask hose is unplugged or the toggle control is turned OFF.

To use oxygen:

1. No Smoking Sign .... ON
2. Oxygen Mask Hoses .... CONNECTED
3. Passenger Oxygen Toggle Control .... ON
4. Oxygen Masks .... DON

See Figure 2-2 for oxygen duration.

DROP-OUT PASSENGER OXYGEN MASKS

Passenger oxygen mask deployment and oxygen flow from the supply bottle to the passengers' oxygen mask flow valves is controlled by a passenger oxygen toggle control located below the copilot's side window. When this control is turned ON, oxygen pressure causes the overhead oxygen mask compartment doors in the cabin to open. The masks will drop out and be suspended by lanyards. Each lanyard is attached to a flow valve in the mask compartment. When any mask is pulled further to be placed over the passenger's face, the lanyard opens its flow valve and oxygen flows to the mask. The passengers' masks are constant flow type. Oxygen will continue to flow through these masks until each flow valve is turned off manually or the passenger oxygen toggle control is turned off.

NOTE

Turning the passenger oxygen toggle control ON will cause passenger oxygen masks to deploy.

To use passenger oxygen:

1. No Smoking Sign .... ON
2. Passenger Oxygen Toggle Control .... ON
3. Oxygen Masks .... PULL DOWN AND DON

See Figure 2-3 for oxygen duration.

OXYGEN SYSTEM (continued)

OXYGEN DURATION TABLES – PLUG-IN PASSENGER MASKS

NOTE

- Tables assume fully serviced bottle(s), constant flow passenger masks, and diluter demand crew masks. See Figures 2-4 and 2-5 for correction factor to use when system is partially serviced.
- Duration shown is in addition to a two hour supply for two pilots using 100% oxygen when above 20,000 feet, and normal flow oxygen when at or below 20,000 feet cabin pressure altitude. Passengers use continuous flow.

PLUG-IN – 49 CUBIC FOOT SYSTEM

NUMBER OF PASSENGERS	HOURS DURATION AT CABIN PRESSURE ALTITUDE (FEET)							
	15,000		20,000		25,000		31,000	
	MIN.	HOURS	MIN.	HOURS	MIN.	HOURS	MIN.	HOURS
4	38	0.63	54	0.91	39	0.66	55	0.92
6	25	0.42	36	0.61	26	0.44	37	0.61
8	19	0.31	27	0.45	20	0.33	28	0.46
10	15	0.25	22	0.36	16	0.26	22	0.37
12	12	0.21	18	0.30	13	0.22	18	0.31
14	11	0.18	16	0.26	11	0.19	16	0.26
16	9	0.16	14	0.23	10	0.16	14	0.23
18	8	0.14	12	0.20	9	0.15	12	0.20
19	8	0.13	12	0.19	8	0.14	12	0.19

PLUG-IN – 115 CUBIC FOOT SYSTEM

NUMBER OF PASSENGERS	HOURS DURATION AT CABIN PRESSURE ALTITUDE (FEET)							
	15,000		20,000		25,000		31,000	
	MIN.	HOURS	MIN.	HOURS	MIN.	HOURS	MIN.	HOURS
4	158	2.64	179	2.98	158	2.64	186	3.09
6	109	1.81	119	1.99	109	1.81	124	2.06
8	83	1.38	90	1.50	83	1.38	93	1.55
10	65	1.09	72	1.20	65	1.09	74	1.24
12	54	0.90	59	0.99	54	0.90	62	1.03
14	46	0.76	51	0.85	46	0.76	53	0.88
16	40	0.66	46	0.76	40	0.66	46	0.77
18	35	0.59	40	0.66	35	0.59	41	0.69
19	34	0.56	38	0.63	34	0.56	39	0.65

PLUG-IN – 179 CUBIC FOOT SYSTEM

NUMBER OF PASSENGERS	HOURS DURATION AT CABIN PRESSURE ALTITUDE (FEET)							
	15,000		20,000		25,000		31,000	
	MIN.	HOURS	MIN.	HOURS	MIN.	HOURS	MIN.	HOURS
4	274	4.57	298	4.97	287	4.78	310	5.17
6	183	3.05	199	3.32	191	3.19	207	3.45
8	137	2.29	149	2.49	143	2.39	155	2.59
10	110	1.83	119	1.99	115	1.91	124	2.07
12	92	1.52	99	1.66	96	1.59	103	1.72
14	79	1.31	85	1.42	82	1.37	89	1.48
16	69	1.14	75	1.24	72	1.20	78	1.29
18	61	1.02	67	1.11	64	1.06	69	1.15
19	58	0.96	63	1.05	61	1.01	65	1.03

FIGURE 2–2

OXYGEN SYSTEM (continued)

OXYGEN DURATION TABLES – DROP-OUT PASSENGER MASKS

NOTE

- Tables assume fully serviced bottle(s), constant flow passenger masks, and diluter demand crew masks. See Figures 2-4 and 2-5 for correction factor to use when system is partially serviced.
- Duration shown is in addition to a two hour supply for two pilots using 100% oxygen when above 20,000 feet, and normal flow oxygen when at or below 20,000 feet cabin pressure altitude. Passengers use continuous flow.

DROP-OUT – 49 CUBIC FOOT SYSTEM

NUMBER OF PASSENGERS	HOURS DURATION AT CABIN PRESSURE ALTITUDE (FEET)							
	15,000		20,000		25,000		31,000	
	MIN.	HOURS	MIN.	HOURS	MIN.	HOURS	MIN.	HOURS
4	38	0.63	54	0.90	39	0.64	54	0.89
6	25	0.42	36	0.60	26	0.43	36	0.59
8	19	0.32	27	0.45	19	0.32	27	0.45
10	15	0.25	22	0.36	15	0.26	21	0.36
12	13	0.21	18	0.30	13	0.21	18	0.30
14	11	0.18	15	0.26	11	0.18	15	0.25
16	10	0.16	14	0.22	10	0.16	13	0.22
18	8	0.14	12	0.20	9	0.14	12	0.20
19	8	0.13	11	0.19	8	0.14	11	0.19

DROP-OUT – 115 CUBIC FOOT SYSTEM

NUMBER OF PASSENGERS	HOURS DURATION AT CABIN PRESSURE ALTITUDE (FEET)							
	15,000		20,000		25,000		31,000	
	MIN.	HOURS	MIN.	HOURS	MIN.	HOURS	MIN.	HOURS
4	155	2.59	173	2.88	160	2.66	177	2.94
6	104	1.73	115	1.92	106	1.77	118	1.96
8	78	1.29	86	1.44	80	1.33	88	1.47
10	62	1.04	69	1.15	64	1.06	71	1.18
12	52	0.86	58	0.96	53	0.89	59	0.98
14	44	0.74	49	0.82	45	0.76	50	0.84
16	39	0.65	43	0.72	40	0.66	44	0.74
18	35	0.58	38	0.64	35	0.59	39	0.65
19	33	0.55	36	0.61	34	0.56	37	0.62

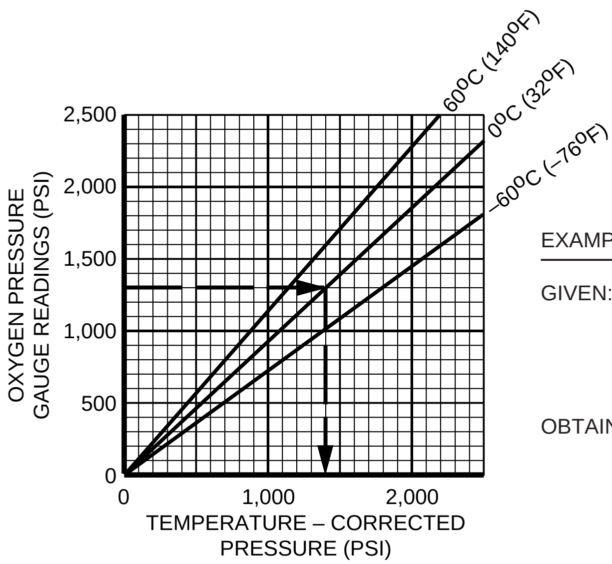
DROP-OUT – 179 CUBIC FOOT SYSTEM

NUMBER OF PASSENGERS	HOURS DURATION AT CABIN PRESSURE ALTITUDE (FEET)							
	15,000		20,000		25,000		31,000	
	MIN.	HOURS	MIN.	HOURS	MIN.	HOURS	MIN.	HOURS
4	268	4.47	287	4.79	275	4.59	295	4.91
6	179	2.98	192	3.19	192	3.19	196	3.27
8	134	2.23	144	2.39	144	2.39	147	2.45
10	107	1.79	115	1.92	115	1.92	118	1.96
12	89	1.49	96	1.60	96	1.60	98	1.64
14	77	1.28	82	1.37	82	1.37	84	1.40
16	67	1.12	72	1.20	72	1.20	74	1.23
18	60	0.99	64	1.06	64	1.06	65	1.09
19	56	0.94	60	1.01	60	1.01	62	1.03

FIGURE 2–3

OXYGEN SYSTEM (continued)

OXYGEN PRESSURE CORRECTION FOR BOTTLE TEMPERATURE



EXAMPLE:

GIVEN: 49 CU. FT. SYSTEM WITH PLUG-IN MASKS
4 PASSENGERS
15,000 FEET CABIN ALTITUDE
1300 PSI GAUGE READING
0°C OXYGEN BOTTLE TEMPERATURE

OBTAIN: TEMPERATURE CORRECTED PRESSURE = 1400 PSI (FIG. 2–4)
PARTIAL CHARGE CORRECTION FACTOR = 0.35 (FIG. 2–5)
FULL CHARGE DURATION = 0.63 HOURS (FIG. 2–2)
CORRECTED DURATION = 0.35 x 0.63 = 0.22 HOURS

FIGURE 2-4

OXYGEN DURATION CORRECTION FOR PARTIALLY CHARGED OXYGEN BOTTLE(S)

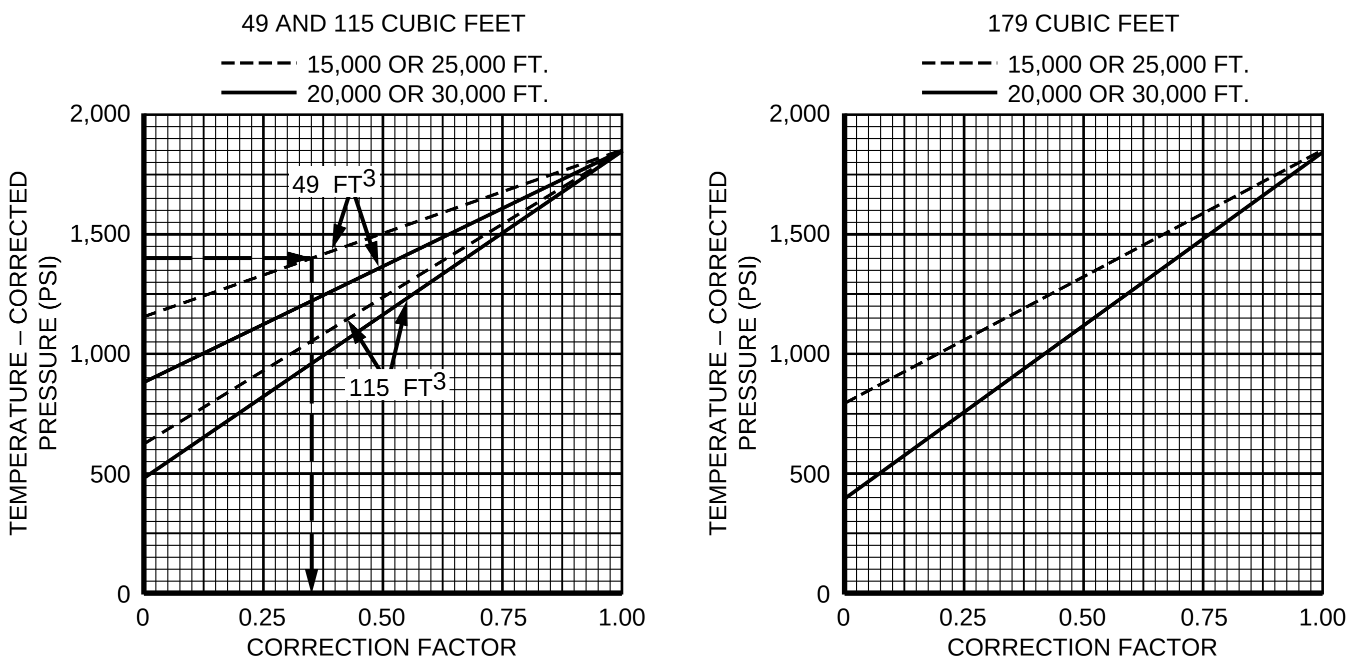


FIGURE 2-5

OPERATIONS IN ICING CONDITIONS

The METRO III SA227-AC is certified for operations in icing conditions. With the exception of the wing deice boots, all ice protection systems on the aircraft are anti-ice systems that require activation prior to entering icing conditions (visible moisture and OAT below 5°C.)

NOTE

IOAT may be as much as 10°C higher than actual OAT during high speed, high altitude flight due to compressibility and temperature probe system errors. See Section 4 to determine OAT during flight.

PREFLIGHT CHECKS

When icing conditions are anticipated during flight, accomplish the following Ice Protection Systems checks before takeoff.

CONTINUOUS IGNITION SYSTEM

1. Ignition Mode Switches .... OVERRIDE
   OR
   Auto/Cont Ignition Switches .... CONT
2. Ignition Lights .... CHECK ON
3. Ignition Switches .... AS REQUIRED

NOTE

Use continuous ignition for takeoff or landing on a wet or snow/slush covered runway to ensure immediate relight in the event that engine combustion is interrupted by ingested water, slush, or snow during the ground roll.

DEICE BOOTS

1. Deice Boots Switch .... .AUTO
2. Deice Pressure .... CHECK 12 TO 19 PSI

NOTE

Visually check wing boot operation and observe deice pressure fluctuation as tail boots actuate. Allow one full cycle of the timer (approximately three minutes).

3. Deice Boots Switch .... OFF

PREFLIGHT CHECKS (continued)

PITOT & SAS HEAT

1. Pitot Heat Switches .... PITOT & SAS HEAT

CAUTION

EXTENDED GROUND OPERATION WILL DAMAGE THE PITOT & SAS HEATING ELEMENTS. THE SAS DEICE ANNUNCIATOR WILL ILLUMINATE WHEN A SAS HEAT SWITCH IS TURNED ON. FAILURE OF THE ANNUNCIATOR TO ILLUMINATE INDICATES AN ELECTRICAL FAULT.

2. Pitot Heat Loadmeter (L & R) .... CHECK IN GREEN BAND
3. SAS DEICE Annunciator .... CHECK ON

NOTE

Either pitot heat switch, when moved to the PITOT & SAS HEAT position, will control the SAS vane heater elements. The PITOT HEAT position of either switch will only apply power to the individual pitot head heater.

4. Pitot Heat Switches .... AS REQUIRED

ENGINE AND PROPELLER HEAT

1. Speed Levers .... LOW RPM
2. Power Levers .... GROUND IDLE
3. Heat Switches .... ENGINE & PROP HEAT

CAUTION

- DO NOT OPERATE EITHER THE PROPELLER DEICE BOOTS OR THE OIL COOLER DUCT HEAT WHEN THE PROPELLERS ARE STATIC.

- RESTRICT GROUND OPERATION OF ENGINE INTAKE HEAT TO A MAXIMUM OF TEN SECONDS WHEN OAT IS ABOVE +5^{o}C.

NOTE

EGT will increase and torque will decrease slightly when engine intake heat is activated.

PREFLIGHT CHECKS (continued)

ENGINE AND PROPELLER HEAT (continued)

4. L/R INTAKE HT Annunciators .... CHECK ON
5. Heat Switches .... PROP & DUCT
6. Eng Intake Heat Test Buttons .... PRESS MOMENTARILY/ CHECK INTAKE HT LIGHTS ILLUMINATE

NOTE

Whenever engine intake heat is turned off, the bleed air valve position should be verified by pressing the test buttons. Illumination of the respective INTAKE HT annunciator indicates the valve is closed.

7. L/R INTAKE HT Annunciators .... CHECK OFF
8. Propeller Deice Loadmeter .... CHECK IN GREEN BAND

NOTE

Monitor the loadmeter in both L & R position for at least one minute. A small momentary deflection approximately every 30 seconds indicates proper system operation.

9. Duct Heat Lights & Generator Loads .... CHECK INTERMITTENT ILLUMINATION AND INCREASED LOADS
10. Heat Switches .... AS REQUIRED

WINDSHIELD HEAT

1. Windshield Heat Switch .... CHECK HIGH/SET LOW
2. L/R W/S HT Annunciators .... CHECK ON (OR CYCLING)

FLIGHT IN ICING CONDITIONS (In visible moisture and OAT below +5°C)

Ice will accumulate in low pressure areas (such as the engine inlets) before it is visible to the pilot on the windshield wipers and wing leading edges. The following anti-ice systems should be used continuously anytime visible moisture (rain, fog, clouds, snow, ice pellets, etc.) is encountered and the OAT is below 5°C.

NOTE

If actual ice is encountered before the anti-ice systems are activated, refer to Inadvertent Icing Encounter in Section 3A.

PITOT & SAS VANE HEAT

1. Pitot Heat Switches .... PITOT & SAS HEAT
2. Pitot Heat Loadmeter .... CHECK L & R
3. SAS DEICE Annunciator .... CHECK ON

WINDSHIELD HEAT

1. Windshield Heat Switch .... LOW OR HIGH (AS REQUIRED)
2. W/S HEAT Annunciators .... CHECK ON (OR CYCLING)

IGNITION MODE switch (if installed)

1. Ignition Mode Switches .... OVERRIDE
2. IGN LIGHTS .... CHECK ON

AUTO/CONT IGNITION SWITCH (if installed)

1. Auto/Cont Ignition Switches .... AUTO (CONT IF DESIRED)
2. IGN Lights (if CONT is selected) .... CHECK ON

ENGINE & PROPELLER HEAT

1. Heat Switches .... ENGINE & PROP HEAT

NOTE

- It is recommended that continuous ignition be activated before activating Engine Heat.
- EGT will increase slightly and torque will decrease slightly when Engine Heat is activated.

FLIGHT IN ICING CONDITIONS (In visible moisture and OAT below +5^{o}C) (continued)

ENGINE & PROPELLER HEAT (continued)

2. L/R INTAKE HT Annunciators .... CHECK ON
3. Propeller Deice Loadmeter .... CHECK L & R
4. DUCT HT CYCL Lights .... MONITOR

NOTE

The Generator Loadmeters will increase up to 30 amps each time an oil cooler duct anti-ice boot cycles on.

5. Deice Boots Switch .... AUTO (AT THE FIRST SIGN OF ICE FORMATION ANYWHERE ON THE AIRCRAFT)

DEPARTING ICING CONDITIONS

1. Deice Boots Switch .... OFF (AFTER THE AIRPLANE IS DETERMINED TO BE CLEAR OF ICE)
2. ENGINE & PROP HEAT Switches .... OFF

NOTE

Whenever engine intake heat is turned off, the anti-ice valve position should be verified by pressing the test buttons. Illumination of the INTAKE HT annunciator indicates the valve is closed.

DEPARTING ICING CONDITIONS (continued)

IGNITION MODE switch (if installed)

3. Ignition Mode Switches .... OVERRIDE
4. IGN LIGHTS .... CHECK ON

AUTO/CONT IGNITION SWITCH (if installed)

3. Auto/Cont Ignition Switches .... AUTO (CONT IF DESIRED)
4. IGN Lights (if CONT is selected) .... CHECK ON

WARNING

ENGINE HEAT AND CONTINUOUS IGNITION, IN THE OVERRIDE MODE (IGNITION MODE SWITCH) OR AUTO POSITION (AUTO/CONT IGNITION SWITCH), MUST BE USED AFTER LEAVING ICING CONDITIONS UNTIL THE PILOT IS CONFIDENT THAT ANY RESIDUAL ICE ON PROPELLERS, SPINNERS, INTAKE LIPS, OR INTAKE THROATS WILL NOT BE SHED INTO THE ENGINES.

5. Ignition Mode Switches .... NORMAL OR CONT (WHEN PILOT IS CONFIDENT RISK OF RESIDUAL ICE SHEDDING IS REDUCED)

   OR

   Auto/Cont Ignition Switches .... AUTO (WHEN PILOT IS CONFIDENT RISK OF RESIDUAL ICE SHEDDING IS REDUCED)
6. Pitot Heat Switches .... AS REQUIRED

WARNING

WHENEVER THERE ARE ICE ACCUMULATIONS ON THE AERODYNAMIC SURFACES OF THE AIRPLANE, THE FOLLOWING PRECAUTIONS SHOULD BE TAKEN DURING APPROACH AND LANDING:

1. **INCREASE V_{MCA} BY 5 KIAS.**
2. **INCREASE LANDING APPROACH SPEEDS LISTED IN FIGURES 4-56 AND 4-57 BY 19 KIAS.**
3. **LIMIT LANDING APPROACH ANGLE TO A MAXIMUM OF 3 DEGREES IN ORDER NOT TO REQUIRE HIGH ROTATION RATES DURING LANDING FLARE.**

TABLE OF CONTENTS
EMERGENCY PROCEDURES

ITEM PAGE

TABLE OF CONTENTS (continued)
EMERGENCY PROCEDURES

INTRODUCTION

Section 3 of this manual covers emergencies that might occur during ground or flight operation and the recommended procedures for correcting the situations. The emergency situations covered are placed in the order of most serious first, i.e., Fires, Engine Failure, etc. The **IMMEDIATE ACTION** items, which must be performed first, are in **BOLD CAPITAL** letters (and underlined in old IBM format) with the remaining steps (clean up procedures) following. Expanded procedures are covered in this section. They have been prepared assuming single pilot operation of the airplane. The same procedures apply during operation by two pilots provided the pilots coordinate their activities to ensure proper sequence of operation. Procedures identified by an asterisk are those recommended to be accomplished by a copilot. The emergency procedures in this section have been FAA approved.

NOTE

- Overcoming emergencies successfully depends upon the pilot's sound judgement and thorough knowledge of the aircraft systems and equipment.

- In case of emergency:

  1. Maintain aircraft control.
  2. Analyze the situation. Then take proper action to correct it.
  3. If the difficulty has occurred during flight, land as soon as conditions permit.

ANNUNCIATOR PANEL

The functions of the annunciator panel red lights and the amber lights addressed in the Emergency Procedures Section are shown in the following table.

LIGHT ILLUMINATED	INDICATES THAT
L or R ENG FIRE (RED) (SOME AIRCRAFT)	Corresponding engine fire detector has sensed excessive temperature within the nacelle. Corresponding warning light in extinguishing agent discharge switch should also illuminate. See page 3-3.
L or R WING OVHT (RED)	a. Steady light: There is a brake fire, wheelwell or air conditioning duct overheat in the corresponding side. See page 3-13. b. Flashing light: There is a wing leading edge bleed air line failure or an overheated generator wire in the corresponding side. See page 3-14.
L or R OIL PRESS(URE) (RED)	Corresponding engine oil pressure is less than 40 psi. Monitor engine instruments.
L or R HYDR PRESS (RED)	Output from corresponding hydraulic pump is less than approximately 1,250 psi. Monitor hydraulic pressure gauge. See page 3-18.
CABIN or CARGO DOOR (RED)	Corresponding door is not closed securely. See page 3-17.
BATT(ERY) FAULT (RED)	A fault has been detected in the battery feeder circuit. Both batteries will disconnect. See page 3A-5.
SAS FAULT (RED)	a. Steady light: SAS computer power has failed or that power has failed in combination with servo failure. See page 3-26. On the ground, the SAS vane has blown full up. Check SAS indicator needle. b. Flashing light: SAS servo or servo clutch has failed. See page 3-26.
GEAR DOOR (POSITION) (RED)	At least one of the main landing gear doors is not closed securely when on the ground. Do not take off.
CABIN ALT(ITUDE) (AMBER)	Cabin altitude is above 10,000 feet. See page 3-15.
NOSE STEER FAIL (AMBER) (SOME AIRCRAFT)	Hydraulic pressure is being applied to the nose steering actuator without pilot steering command. See page 3-29.

ENGINE FIRE ON GROUND

1. ENGINE STOP AND FEATHER CONTROL (affected engine) .... PULL
2. ENGINE STOP BUTTON (affected engine) .... PRESS
3. FUEL SHUTOFF SWITCH (affected engine) .... CLOSED
4. HYDRAULIC SHUTOFF SWITCH (affected engine) .... CLOSED
5. FIRE EXTINGUISHER SWITCH (affected engine) .... PRESS
6. Generator Switch (affected engine) .... OFF

NOTE

Use of start test with respective generator switch ON may cause a battery fault and subsequent loss of ability to motor the engine.

7. Starter Test Switch (affected engine) .... ENGAGE
8. Fuel Boost Pump Switch (affected engine) .... OFF
9. Auto/Cont Ignition Switch (if installed) (affected engine) .... OFF
10. Affected Engine .... MOTOR UNTIL ENGINE IS CLEARED

ENGINE FIRE IN FLIGHT

1. ENGINE STOP AND FEATHER CONTROL (affected engine) .... PULL
2. FUEL SHUTOFF SWITCH (affected engine) .... CLOSED
3. HYDRAULIC SHUTOFF SWITCH (affected engine) .... CLOSED
4. FIRE EXTINGUISHER SWITCH (affected engine) .... PRESS
5. Fuel Boost Pump Switch (affected engine) .... OFF
6. Generator Switch (affected engine) .... OFF
*7. Bleed Air Switch (affected engine) .... OFF
8. Auto/Cont Ignition Switch (if installed) (affected engine) .... OFF
9. Power Lever (operating engine) .... AS REQUIRED
*10. Bleed Air (operating engine) .... AS REQUIRED

NOTE

If the 100% torque limit is not being developed and bleed air is on, increased power may be obtained by selecting bleed air off.

11. Trim .... AS REQUIRED
12. Generator (operating engine) .... 200 AMPS MAXIMUM
(SOME AIRPLANES – SEE LIMITATIONS)
*13. Propeller Synchrophaser Switch (if installed) .... TAKEOFF & LANDING

OUT-OF-TRIM WARNING

AURAL OUT-OF-TRIM WARNING .... ABORT TAKEOFF

ENGINE FAILURE DURING TAKEOFF – TAKEOFF ABORTED

1. **POWER LEVERS .... GROUND IDLE**

NOTE

Retard power levers to ground idle as directional control permits. Retarding the power lever of the operating engine from flight idle to ground idle will cause the airplane to yaw toward the operating engine.

2. **BRAKES .... AS REQUIRED**
3. Nose Wheel Steering .... AS REQUIRED
4. Reverse Thrust (operating engine) .... AS REQUIRED

CAUTION

REVERSE THRUST ON THE OPERATING ENGINE WILL CAUSE A YAWING MOMENT TOWARD THE OPERATING ENGINE WHICH IS PROPORTIONAL TO THE AMOUNT OF REVERSE THRUST APPLIED. ON WET OR ICY RUNWAYS, IT IS POSSIBLE TO APPLY MORE ASYMMETRIC REVERSE THRUST THAN CAN BE COUNTERACTED BY OPPOSITE BRAKE, RUDDER, AND NOSE WHEEL STEERING.

5. Engine Stop and Feather Control (failed engine) .... PULL
6. Engine Clean Up Procedure (failed engine)
   a. Fuel shutoff switch .... CLOSED
   b. Hydraulic shutoff switch .... CLOSED
   c. Fuel boost pump switch .... OFF
   d. Generator switch .... OFF
   *e. Bleed air switch .... OFF
   f. Auto/cont ignition switch (if installed) .... OFF
7. Water Injection Switch .... OFF

ENGINE FAILURE DURING TAKEOFF – TAKEOFF CONTINUED AT OR ABOVE V_1

1. POWER LEVER (operating engine) .... SET MAXIMUM POWER, DRY OR WET

NOTE

- Commanding high propeller blade angle by keeping the power lever of the inoperative engine well forward will reduce windmilling propeller drag in the event that NTS failure accompanies engine failure.
- Set 650°C EGT or 100% torque, whichever occurs first, during dry takeoff. If the 100% torque limit is not being developed and bleed air is ON, increased power may be obtained by selecting bleed air OFF.
- Set 650°C EGT or 110% torque, whichever occurs first, during takeoff with CAWI.

***2. LANDING GEAR (after liftoff) .... UP**

WARNING

IF THE ENGINE FAILURE IS ACCOMPANIED BY A LEFT ESSENTIAL BUS FAILURE (AS INDICATED BY LOSS OF POWER TO THE GEAR POSITION INDICATOR) THE LANDING GEAR WILL NOT RETRACT UNTIL THE LANDING GEAR CONTROL ESSENTIAL BUS POWER TRANSFER IS MOVED TO THE RIGHT BUS POSITION.

***3. ENGINE STOP AND FEATHER CONTROL (failed engine) .... PULL**
4. FLAPS (at acceleration altitude and above 115 KIAS) .... UP
5. AIRSPEED .... SINGLE ENGINE BEST RATE OF CLIMB SPEED
(SEE FIG 4-49 OR 4-50)

6. Engine Clean Up Procedure (failed engine)
   a. Fuel shutoff switch .... CLOSED
   b. Hydraulic shutoff switch .... CLOSED
   c. Fuel boost pump switch .... OFF
   d. Generator switch .... OFF
   *e. Bleed air switch .... OFF
   f. Auto/cont ignition switch (if installed) .... OFF
7. Power Lever (operating engine) .... AS REQUIRED
8. Trim .... AS REQUIRED
9. Generator (operating engine) .... 200 AMPS MAXIMUM (SOME AIRPLANES – SEE LIMITATIONS)

*10. Propeller Synchrophaser Switch (if installed) .... TAKEOFF & LANDING
11. Water Injection Switch .... AS REQUIRED

ENGINE FAILURE DURING FLIGHT

1. **ENGINE STOP AND FEATHER CONTROL (failed engine) .... PULL**
2. Engine Clean Up Procedure (failed engine)
   a. Fuel shutoff switch .... CLOSED
   b. Hydraulic shutoff switch .... CLOSED
   c. Fuel boost pump switch .... OFF
   d. Generator switch .... OFF
   *e. Bleed air switch .... OFF
   f. Auto/cont ignition switch (if installed) .... OFF
3. Power Lever (operating engine) .... AS REQUIRED
*4. Bleed Air (operating engine) .... AS REQUIRED

NOTE

If the 100% torque limit is not being developed and bleed air is on, increased power may be obtained by selecting bleed air off.

5. Trim .... AS REQUIRED
6. Generator (operating engine) .... 200 AMPS MAXIMUM (SOME AIRPLANES – SEE LIMITATIONS)
*7. Propeller Synchrophaser Switch (if installed) .... TAKEOFF & LANDING

AIRSTART

CAUTION

IF AN ENGINE HAS BEEN SHUT DOWN BECAUSE OF AN OBVIOUS FAILURE, AS INDICATED BY THE ENGINE INSTRUMENTS OR EXCESSIVE VIBRATION, AN AIRSTART SHOULD NOT BE ATTEMPTED. AIRSTART FOLLOWING INTENTIONAL ENGINE SHUTDOWN IS COVERED IN SECTION 3A, ABNORMAL PROCEDURES.

INFLIGHT RELIGHT

CAUTION

- THIS PROCEDURE IS INTENDED FOR USE DURING FLIGHT ONLY.
- ATTEMPTED USE OF THIS PROCEDURE WHILE ON THE GROUND WITH LIMITED AIRFLOW THROUGH THE ENGINE COULD RESULT IN ENGINE OVER-TEMPERATURES.
- THIS PROCEDURE IS INTENDED FOR USE ONLY WHEN THE REASON FOR THE INADVERTENT FLAMEOUT IS KNOWN WITH CERTAINTY AND WHEN THE PILOT IS CERTAIN THAT A RELIGHT WILL NOT AGGRAVATE THE CONDITION.

INFLIGHT RELIGHT (continued)

1. Power Lever .... APPROXIMATELY 1/4 INCH FORWARD OF FLIGHT IDLE (UNTIL LANDING GEAR WARNING HORN IS SILENCED)
2. Speed Lever .... APPROXIMATELY 97% RPM
3. Airspeed .... BETWEEN 180 AND 100 KIAS
4. RPM .... BETWEEN 60% AND 10%
5. Engine Start Button .... PRESS MOMENTARILY

NOTE

- Press the start button in only long enough to obtain ignition and fuel flow and subsequent light-off.
- If RPM has decayed below 10%, the start button will have to be held in while the unfeathering pump drives the propeller blades to finer pitch and RPM increases to above 10%. Ignition, fuel flow, and light-off should then occur.
- Engine relight will not occur if the SRL computer speed switch function has failed or if the SRL – Δ P/P switch is in the OFF position.

6. EGT .... MONITOR (770°C MAXIMUM FOR ONE SECOND)
7. RPM .... STABILIZED
8. SRL OFF Light .... CHECK OFF
9. Power .... RESET AS REQUIRED

NOTE

Engine relight should be expected to occur automatically if Auto/Cont Ignition Switch is installed, the Auto/Cont Ignition Switch is in AUTO, and fuel is available at the igniters.

SINGLE ENGINE LANDING

*1. No Smoking – Fasten Seat Belt Sign .... ON
2. Fuel Balance .... CHECK

NOTE

If excess fuel imbalance is indicated by fuel quantity gauge and/or aileron trim position, balance fuel by utilizing the fuel crossflow.

3. Fuel Crossflow Switch .... OPEN IF REQUIRED TO BALANCE, THEN CLOSED
4. Cabin Differential Pressure .... ZERO
5. Electrical Load .... TURN OFF NONESSENTIAL ITEMS
6. Speed Lever (operating engine) .... HIGH RPM
7. Flaps .... DO NOT EXTEND BEYOND 1/2 UNTIL LANDING IS ASSURED
8. Landing Gear .... EXTEND WHEN LANDING IS ASSURED
9. Nose Wheel Steering .... ARMED
10. Ignition Mode Switches .... AS REQUIRED

OR

Auto/Cont Ignition Switch (operating engine) .... AUTO OR CONT

AFTER TOUCHDOWN

1. Brakes .... AS REQUIRED
2. Nose Wheel Steering .... AS REQUIRED
3. Power Levers .... GROUND IDLE

NOTE

Retard power levers to ground idle as directional control permits. Retarding the power lever of the operating engine from flight idle to ground idle will cause the airplane to yaw toward the operating engine.

4. Reverse Thrust .... AS REQUIRED

CAUTION

REVERSE THRUST ON THE OPERATING ENGINE WILL CAUSE A YAWING MOMENT TOWARD THE OPERATING ENGINE WHICH IS PROPORTIONAL TO THE AMOUNT OF REVERSE THRUST APPLIED. ON WET OR ICY RUNWAYS, IT IS POSSIBLE TO APPLY MORE ASYMMETRIC REVERSE THRUST THAN CAN BE COUNTERACTED BY OPPOSITE BRAKE, RUDDER, AND NOSE WHEEL STEERING.

SINGLE ENGINE GO-AROUND

CAUTION

- THE FOLLOWING PROCEDURE ASSUMES THAT THE SINGLE ENGINE GO-AROUND BEGINS WITH GEAR DOWN, FLAPS NO MORE THAN 1/2 DOWN, AND AIRSPEED AT OR HIGHER THAN APPROACH SPEED.
- PERFORMANCE AND CONTROL LIMITATIONS WITH FULL FLAPS AND GEAR DOWN MAY PRECLUDE SUCCESSFUL SINGLE ENGINE GO-AROUND.

1. Power .... AS REQUIRED
2. Landing Gear .... UP
3. Flaps .... RETRACT IN INCREMENTS
4. Airspeed .... V_{YSE} (SEE FIGURE 4-49 OR 4-50)

*5. Bleed Air Switch .... OFF

6. Engine Anti-Ice .... OFF UNLESS REQUIRED

ENGINE CONTROL MALFUNCTION

In the event there is an indication of improper operation of a fuel control or propeller control, it is recommended that the affected engine be shut down and a single engine landing accomplished.

NO RESPONSE TO POWER LEVER MOVEMENT

If either engine (or both) exhibits a lack of response to the power lever after extended operation at high altitude with OAT below freezing, the cause may be ice blockage of the P_{T2} inlet sensor probe. In certain flight conditions, when engine anti-ice would not normally be ON, probe icing can occur even though visible moisture is not present. If lack of power lever response is observed, the following procedure should be accomplished:

1. Ignition Switches .... CONT
2. Engine Heat Switch(es) .... ENGINE & PROP HEAT

This will introduce anti-icing air to the sensors (as well as the engine inlet) and normal power lever response should return within approximately 3 minutes.

After the condition has cleared and normal operation is observed, anti-ice and ignition can again be turned OFF.

1. Engine Heat Switch(es) .... AS REQUIRED
2. Ignition Switches .... AUTO

BATTERY TEMPERATURE CAUTION/WARNING LIGHTS ON

NOTE

- The amber caution light illuminates if either battery temperature reaches 120°, plus or minus 3°F.
- The red warning light illuminates if either battery temperature reaches 150°, plus or minus 3°F.

AMBER LIGHT ILLUMINATES

1. Before Engine Start .... DO NOT MAKE BATTERY START

NOTE

- Either obtain GPU or wait until the batteries have cooled.
- Leaving the battery switch off for several minutes following a caution light may allow the battery to cool enough to extinguish the light.

2. After Engine Start .... MONITOR BATTERY TEMPERATURE INDICATOR AND GENERATOR LOADS
3. Temperature Increasing to 140°F .... DO NOT TAKE OFF
4. Temperature Increasing Above 140°F .... AFFECTED BATTERY SWITCH OFF
5. In Flight .... MONITOR BATTERY TEMPERATURE INDICATOR AND GENERATOR LOADS/AFFECTED BATTERY SWITCH OFF IF REQUIRED

RED WARNING LIGHT ILLUMINATES (Any Phase of Operations)

1. Affected Battery Switch .... OFF
2. BAT DISC Light (affected battery) .... CHECK ON
3. Battery Temperature Indicator .... MONITOR CLOSELY

WARNING

- **WHEN ON GROUND, SHUT DOWN ENGINES AND INSPECT AFFECTED BATTERY AS SOON AS POSSIBLE.**
- **WHEN IN FLIGHT AND BATTERY TEMPERATURE(S) CONTINUE TO RISE AFTER DISCONNECT, LAND AS SOON AS PRACTICABLE AND INSPECT BATTERY.**
- **TAKEOFF AFTER A BATTERY TEMPERATURE WARNING (RED LIGHT) ILLUMINATES IS PROHIBITED UNTIL THE CAUSE OF THE OVERHEAT WARNING IS CORRECTED.**

NOTE

A battery temperature red warning light caused by a thermal runaway may sometimes be verified by observing sustained and excessively high generator loads when the affected battery switch is on.

DOUBLE GENERATOR FAILURE

1. Both Generator Switches .... OFF
2. Electrical Load .... REDUCE
3. Generator and Start Control Circuit Breakers .... CHECK
4. Left Generator Switch .... RESET/VOLTAGE CHECKED
5. Left Generator Switch .... ON
   If left generator will not go on line, turn it OFF and try the right generator.

NOTE

If one of the two generators can be put on line, consideration should be given to continuing the flight with a single generator rather than risking a second double generator failure.

6. Right Generator Switch .... RESET/VOLTAGE CHECKED
7. Right Generator Switch .... ON

NOTE

- If neither generator voltage is within limits, it is acceptable to put a single generator on line.
- If neither generator can be put on line, all electrical systems (except auxiliary air conditioning systems) will be functional on battery power. However, electrical loads should be quickly reduced to the minimum for existing flight conditions to prolong battery life.

WARNING

WHEN IN FLIGHT ON BATTERY POWER ALONE, LAND AS SOON AS PRACTICABLE TO PRECLUDE COMPLETE ELECTRICAL FAILURE.

DOUBLE ENGINE FAILURE (RESTARTS/RELIGHTS UNSUCCESSFUL)

1. **AIRSPEED .... MAINTAIN BEST GLIDE AIRSPEED**

GLIDE AIRSPEED			
WEIGHT (POUNDS)	14,000	12,000	10,000
AIRSPEED (KIAS)	150	140	130

NOTE

- Best glide airspeed is approximately 1.5 V/V_S on the SAS indicator.
- Glide ratio at best glide airspeed is approximately 10:1 (2NM/1,000 FT AGL).

2. **GEAR .... UP**
3. **FLAPS .... UP**
4. Complete Engine Failure During Flight Checklist
   Plan for emergency gear extension and a zero flap landing. If altitude above ground level (AGL) permits, unfeathering one engine may provide sufficient hydraulic pressure to operate the flaps.

TOTAL ELECTRICAL FAILURE

1. Entrance Light Switch .... ON (IF ILLUMINATION IS REQUIRED)

NOTE

The pilot's overhead and entrance door flood lights are powered by the left battery when the entrance light switch is in its ON position.

2. Both Battery and Both Generator Switches .... OFF
3. Battery Switches (individually) .... RESET/ON
4. Generator Switches (individually) .... RESET/ON

If total electrical failure occurred as a result of lightning strike or static discharge, the aircraft should be thoroughly inspected for evidence of lightning damage. See the SA227 Maintenance Manual, Chapter 05 and the TPE 331 Maintenance Manual, Chapter 72.

SMOKE IN AIRCRAFT

1. CREW OXYGEN MASKS .... DON

*2. If Smoke or Fire from Electrical Source:
- *a. Smoke or fire from essential bus:
  - (1) Bus tie switch .... OFF
  - (2) Bus transfer switches .... OPPOSITE ESSENTIAL BUS
- *b. Smoke or fire from nonessential bus
  - • Bus tie switch .... OFF

3. If Smoke from Bleed Air Source:
- * Bleed air switches .... TURN OFF ONE SOURCE. IF SMOKE CONTINUES, TURN BACK ON AND TURN OTHER SOURCE OFF. IF UNSUCCESSFUL, TURN OFF BOTH SOURCES.

NOTE

It is unlikely that both bleed air systems would malfunction simultaneously. However, if they should, closing both bleed air valves would prevent more smoke from entering the cockpit and cabin. But the outflow valve would then close in order to retain cabin differential pressure and the existing smoke would be trapped until depressurizing procedures are begun.

4. If Smoke in Rear of Aircraft .... USE MANUAL PRESSURIZATION AND SELECT FULL DECREASE. WHEN PRESSURE DIFFERENTIAL IS ZERO, ACTIVATE CABIN DUMP SWITCH

*5. If Smoke is in Cockpit .... ACTIVATE CABIN DUMP SWITCH

6. Emergency Descent .... AS REQUIRED
7. Airspeed .... 173 KIAS MAXIMUM
8. Landing Gear .... DOWN

SMOKE IN AIRCRAFT (continued)

*9. Fresh Air Fan .... OVERRIDE

NOTE

- If failure occurs in the pneumatic or electrical system of the bleed air control valve, the engine may have to be shut down to stop the flow of bleed air.

- If an engine must be shut down to prevent bleed air from entering the cockpit and cabin, the landing gear should be retracted to ensure adequate single engine performance.

- Whether or not smoke has dissipated, if it cannot be visibly verified that the fire has been extinguished following fire suppression and/or smoke evacuation procedures, land immediately at the nearest suitable airport.

WHEELWELL AND WING OVERHEAT WARNING LIGHT ON

STEADY LIGHT (indicates brake fire, wheelwell or air conditioning duct overheat)

***1. BLEED AIR SWITCH (affected side) .... OFF**
2. LANDING GEAR .... DOWN
Leave gear extended at least three (3) minutes to allow cooling of overheated brakes in order to preclude a brake/tire fire and tire explosion.
3. GENERATOR SWITCH (affected side) .... OFF

NOTE

If the warning light extinguishes, retract the landing gear after three (3) minutes cooling and continue flight with the bleed air OFF; the generator may be RESET/ON. If the light reilluminates **STEADY**, extend the gear. Expect performance degradation due to the drag of the gear. A diversion and precautionary landing may be necessary. If the light changes to a **FLASHING** mode complete the wheelwell wing overheat flashing items.

CAUTION

IF THE WARNING LIGHT DOES NOT EXTINGUISH WITHIN THREE MINUTES, THE AFFECTED ENGINE SHOULD BE SHUT DOWN. THE LANDING GEAR MAY HAVE TO BE RETRACTED TO SUSTAIN FLIGHT UNTIL ARRIVING AT A SUITABLE LANDING FIELD.

WHEELWELL AND WING OVERHEAT WARNING LIGHT ON (continued)

FLASHING LIGHT (indicates a wing leading edge bleed air line failure or an overheated generator wire)

***1. BLEED AIR SWITCH (affected side) .... OFF**
2. GENERATOR SWITCH (affected side) .... OFF

CAUTION

IF THE WARNING LIGHT DOES NOT EXTINGUISH WITHIN THREE MINUTES, THE AFFECTED ENGINE SHOULD BE SHUT DOWN.

CABIN PRESSURIZATION MALFUNCTIONS

LOW PRESSURE MALFUNCTION

The cabin altitude warning light illuminates when the cabin pressure is equivalent to a pressure altitude between 10,000 feet and 12,000 feet. Check cabin altitude, differential pressure, controller setting, cabin dump switch and CAWI/Water Injection switch. If the cabin pressurization controller is not providing proper cabin pressure, change to manual operation. If the desired cabin altitude or differential pressure still cannot be attained, an excessive leak exists and it may be necessary to descend or use oxygen.

HIGH PRESSURE MALFUNCTION

If the cabin differential pressure exceeds the normal limit of 7.0 psi, the cabin pressurization controller may have failed and allowed the outflow valve to close. Open the manual control valve approximately 1/2 turn; select MANUAL position on the cabin pressure selector, and regulate pressure manually. If manual control is ineffective, the safety valve should relieve excess cabin pressure at 7.25 psi. Prior to landing, the cabin pressure differential must be eliminated by use of the manual control or the following alternate procedure:

1. Altitude .... BELOW 12,000 FEET
*2. Bleed Air Switches .... OFF
3. Allow cabin to depressurize to less than 1 psi differential.
*4. Cabin Dump Switch .... DUMP

NOTE

If cabin pressure is dumped when a significant cabin pressure differential exists, the resulting sensation may be alarming and uncomfortable to passengers. Consequently, use of the dump valve should normally be restricted to situations where cabin pressure differential is less than 1 psi or when other methods of pressure differential control are ineffective.

*5. Bleed Air Switches .... ON
6. Proceed unpressurized to airport. Air conditioning will be available.

CABIN PRESSURIZATION MALFUNCTIONS (continued)

EXCESSIVE RATE OF PRESSURIZATION

If an excessive rate of pressurization is experienced and it cannot be controlled by the rate knob on the cabin pressurization controller or by the manual control knob, the following steps should be accomplished:

*1. Bleed Air Switches..OFF

If Step 1 eliminates the excessive rate of pressurization, determine the source of the malfunction by turning the bleed air controls on individually. If the malfunction was caused by one of the bleed air control valves, leave the malfunctioning side off and continue pressurized flight using bleed air from one engine.

If the pressure surge does not decrease:

*2. Cabin Dump Switch..DUMP

NOTE

If cabin pressure is dumped when a significant cabin pressure differential exists, the resulting sensation may be alarming and uncomfortable to passengers. Consequently, use of the dump valve should normally be restricted to situations where cabin pressure differential is less than 1 psi or when other methods of pressure differential control are ineffective.

EMERGENCY DESCENT PROCEDURE

If cabin pressure is lost while at high altitude, execute the following procedure:

1. CREW OXYGEN MASKS....................................DON
*2. PASSENGER OXYGEN CONTROL.............................ON
3. PASSENGER OXYGEN MASKS...............................DON
4. Speed Levers....................................HIGH RPM
5. Power Levers.................................FLIGHT IDLE
6. Airspeed...............................173 KIAS MAXIMUM
7. Landing Gear...DOWN
8. Flaps...ONE-HALF
9. Altitude.....................................AS REQUIRED

NOTE

- A pitch attitude of approximately 11 degrees nose down will allow the airplane to stabilize very close to the gear limit speed of 173 KIAS in the 1/2 flaps configuration.
- This procedure results in a descent from 31,000 feet to 15,000 feet within three and one-half minutes when initiated from cruise power and airspeed.

CARGO OR CABIN DOOR WARNING LIGHT ON

An illuminated CABIN DOOR or CARGO DOOR red warning light indicates that the affected door is not closed securely and may not be safe for flight. All door latches must extend fully and engage the door latch switches in order to extinguish the door warning lights. In addition, the cargo door handle must be in its fully closed position for that warning light to go out. Maladjusted door latch switches may cause nuisance illumination of either of the door warning lights. This problem typically occurs when the cabin differential pressure reaches approximately 5 psi during climbs. Reducing cabin differential pressure to less than approximately 4 psi will allow the pressure vessel to deflate, the door latch to seat the switch, and the warning light to go out.

EITHER DOOR WARNING LIGHT ON

(DURING GROUND OPERATIONS)

1. Do not take off.
2. Determine cause of door warning prior to flight.

(DURING INITIAL PART OF TAKEOFF ROLL)

1. Takeoff .... ABORT
2. Determine cause of door warning prior to flight.

(DURING FINAL PART OF TAKEOFF ROLL)

1. Takeoff .... CONTINUE
2. Bleed Air Switches .... OFF
3. Seat Belt Signs .... ON
4. Crew and Passengers .... KEEP CLEAR OF AFFECTED DOOR
5. Land as soon as practicable.
6. Determine cause of door warning prior to further flight.

(DURING FLIGHT)

1. Seat Belt Signs .... ON
2. Crew and Passengers .... KEEP CLEAR OF AFFECTED DOOR
3. Cabin Differential Pressure .... REDUCE UNTIL WARNING LIGHT GOES OUT
4. Descent .... AS REQUIRED
5. Land as soon as practicable.
6. Determine cause of door warning prior to further flight.

HYDRAULIC SYSTEM FAILURE

In case of hydraulic system failure:

1. Prepare for emergency extension of the landing gear.
2. Prepare for landing with existing wing flaps configuration.
3. Ensure that the nose wheel steering switch is turned off and remains off.
4. Ensure that the anti-skid switch is turned off and remains off if anti-skid is installed.

WARNING

IN THE EVENT OF A HYDRAULIC SYSTEM MALFUNCTION, THE NOSE WHEEL STEERING SYSTEM MUST NOT BE ARMED. STEER WITH BRAKES, POWER, AND RUDDER.

CAUTION

IF ANTI-SKID IS INSTALLED:

- IF THERE IS ANY INDICATION THAT BRAKE POWER IS ON AND THERE IS NO ANTI-SKID PROTECTION, TURN THE ANTI-SKID SWITCH OFF.

- WHEEL ANTI-SKID PROTECTION WILL NOT BE AVAILABLE FOLLOWING HYDRAULIC SYSTEM FAILURE. THE ANTI-SKID SWITCH MUST BE TURNED OFF AND MANUAL BRAKING USED DURING GROUND OPERATIONS.

MANUAL GEAR RELEASE SYSTEM

An emergency hand pump and a cable operated manual release system are provided to extend the landing gear in the event of a hydraulic system failure. A stand pipe system in the hydraulic reservoir provides a supply of fluid for hand pump operation. The manual release system also permits free fall gear extension in the event that all hydraulic fluid is lost.

PARTIAL FLAP LANDINGS

There are no provisions to extend or retract the flaps following a hydraulic system failure. Landing approach should be made at approximately 1.3 V_{S1} for the existing configuration.

APPROACH SPEEDS (KCAS)

	WEIGHT (1,000 POUNDS)								
	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0
1/2 FLAPS	103	105	107	108	110	111	113	114	116
1/4 FLAPS	108	110	112	113	115	116	118	120	121
NO FLAPS	110	112	114	116	118	120	122	124	126

An acceptable, alternate procedure to determine approach speed with flaps up is to add 10 KIAS to the full flaps approach speed provided in Figure 4-56 or 4-57. Compute flaps up landing distances by adding 74% to the landing distance shown in Figure 4-56 or 4-57.

LANDING GEAR EMERGENCY EXTENSION

1. Airspeed .... 173 KIAS MAXIMUM
2. Landing Gear Handle .... DOWN
*3. Emergency Release Lever .... ROTATE AFT
*4. Hand Pump Valve Handle .... PULL PIP PIN/ROTATE VALVE HANDLE 90^{o} FORWARD
*5. Emergency Hand Pump .... PUMP AS REQUIRED
    Gear indicator .... ALL DOWN AND LOCKED

NOTE

- Strong resistance to pump handle motion gives sufficient pressure (500 to 800 psi) to insure gear security in addition to the mechanical downlocks.

- If manual extension is used because of a failure in the landing gear electrical control system, the hydraulic pressure gauge will continue to indicate approximately 2,000 psi system pressure. In this case, the pressure to the gear down actuators can be detected only by the effort required to move the emergency hand pump.

- If a failure at the bottom of the hydraulic pack allows depletion of all hydraulic fluid, the emergency hand pump will not provide pressure. Nevertheless, Step 3 above will allow the landing gear to free fall to a safe, down and locked position.

- Hydraulic pressure to the nose wheel steering system will not be available following landing gear emergency extension required by either hydraulic failures or gear position selector valve electrical failures. Do not arm nose wheel steering.

- On those aircraft which have been modified in accordance with Fairchild Aircraft Service Bulletin 32-013 and on AC-600 and up: Hydraulic pressure to the anti-skid brake system will not be available following landing gear emergency extension required by either hydraulic failures or gear position selector valve electrical failures. The anti-skid caution light will be illuminated. Turn anti-skid switch off in these situations.

LANDING GEAR EMERGENCY EXTENSION (continued)

If the gear does not extend, the following additional procedure may allow the gear to extend.

NOTE

Extending the landing gear in this manner requires that the airplane be slowed to a minimum safe airspeed. Therefore, this procedure must be performed at high enough altitude to ensure safe flight operation.

1. Retract the gear.

NOTE

If the landing gear will not retract, check that the hand pump valve handle and the emergency release lever have been returned to their normal positions.

2. Use full flaps and slow the aircraft to just above flight idle stall speed.

3. Place the landing gear handle in the down position.

4. If the gear fails to extend, repeat the above procedure. If the gear still will not extend, repeat the above procedure using the emergency gear release lever instead of the landing gear handle. (Steps 3, 4, and 5 in Landing Gear Emergency Extension.)

GEAR UP LANDINGS

NOTE

- If either main gear will not extend, land with all three gear up if possible. If the nose gear will not extend, land on the mains.
- Ensure that passengers are thoroughly briefed regarding bracing position and evacuation procedure.
- Depressurize airplane and consider removal and secure stowage of escape hatches prior to landing. Expect the entrance door to operate normally with the exception that it will not open fully after landings with the nose or left main gear retracted.
- Historically, airplanes of this class have received more airframe damage from gear up landings on sod than from landings on smooth, paved surfaces.
- Propeller blades contacting the surface while turning under power tend to disintegrate and throw shrapnel which may puncture the fuselage. Blades contacting the surface when feathered, or nearly feathered, will bend slightly and wear away but most likely will not shatter and will aid in holding the wings and nacelles off the runway.
- The pilot may choose to feather one propeller early and save the other engine for last minute glide path corrections. During approaches with one main gear up and one down, it is recommended that the propeller on the gear up side be feathered first. When a propeller is feathered with flight idle power set, drag will be reduced and gliding distance increased slightly.

GEAR UP LANDINGS (continued)

LANDING WITH ALL THREE GEAR UP:

1. Use full flaps.
2. Approach the runway at normal approach speed plus 5 to 10 KIAS.
3. Do not feather propellers until landing on the runway is assured.
4. Shut off electrical power just prior to touchdown (this is to allow use of the pitch trim system until touchdown). Leave batteries on during night landings to permit use of landing lights.
5. Allow aircraft to touch down in a relatively flat attitude and on centerline. Use rudder for directional control.

LANDING WITH NOSE GEAR UP:

1. Use normal approach technique and flap configuration.
2. Feather propellers and shut off electrical power after the mains have touched the runway. Leave batteries on during night landings to permit use of landing lights.
3. Hold the nose of the aircraft off the runway as long as practical, but not so long that pitch control is lost. Put nose on runway gently rather than letting it drop to the runway.

LANDING WITH NOSE GEAR AND ONE MAIN GEAR EXTENDED:

1. Attempt to retract all three gear. Check the position of the emergency gear release lever, the hand pump valve handle and the landing gear control circuit breaker. Transfer the landing gear control to the other essential bus using the transfer switch.
2. If possible, select the runway with the fewest obstructions and flattest terrain on the side of the unextended gear.
3. Feather propellers after landing on the runway is assured.
4. Shut off electrical power just prior to touchdown (this is to allow use of the pitch trim system until touchdown). Leave batteries on during night landings to permit use of landing and taxi lights.
5. Hold the wing with the unextended landing gear off the runway as long as possible. Use brakes and rudder for aircraft directional control. Expect the aircraft to turn into the low wing.

STABILIZER TRIM MALFUNCTIONS

STABILIZER TRIM SYSTEM RUNAWAY

The application of electrical power to the stabilizer trim actuators is indicated by an aural signal. If the signal occurs in flight when the trim system is not being operated, the following procedure should be initiated immediately:

1. **ELEVATOR CONTROL .... OVERPOWER TO MAINTAIN AIRPLANE CONTROL**
2. **TRIM SELECTOR .... OFF (CENTER POSITION)**
3. Trim Selector .... OPPOSITE POSITION FROM WHERE MALFUNCTION OCCURRED
4. Retrim as required.

PILOT'S TRIM SYSTEM INOPERATIVE

1. Trim Selector .... COPILOT
2. Pilot's Auxiliary Trim Switch or Copilot's Trim Switches .... TRIM AS REQUIRED

COPILOT'S TRIM SYSTEM INOPERATIVE

1. Trim Selector .... PILOT
2. Pilot's Trim Switches .... TRIM AS REQUIRED

STABILIZER TRIM MALFUNCTIONS (continued)

BOTH PILOT'S AND COPILOT'S TRIM SYSTEMS INOPERATIVE

1. Trim Selector .... OFF (CENTERED)
2. Airspeed .... AS REQUIRED TO MAINTAIN LOW ELEVATOR FORCES
3. SAS Clutch or SAS Servo Switch .... OFF

NOTE

- If the trim system fails in an extreme nose down trim position, do not extend flaps unless required for landing because of the subsequent high pull force required to maintain level flight.
- If the trim system fails in an extreme nose up trim position, flap extension (below V_{FE}) will reduce the push force required to maintain level flight.

4. Flaps (on landing approach) .... AS REQUIRED

NOTE

Flap extension decreases push force requirements.

5. Landing Gear .... DOWN WHEN DESIRED

NOTE

Gear extension increases push force requirements slightly.

STABILIZER TRIM MALFUNCTIONS (continued)

GO-AROUND WITH STABILIZER TRIM INOPERATIVE

WARNING

VERY HIGH PUSH FORCES WILL BE REQUIRED IF THE FLAPS ARE RETRACTED WITH THE STABILIZER TRIM IN THE EXTREME NOSE UP POSITION. IF A GO-AROUND OR BALKED LANDING IS REQUIRED WHEN THE STABILIZER TRIM IS STUCK IN AN EXTREME NOSE UP POSITION, DO NOT RETRACT THE FLAPS IMMEDIATELY.

1. Power .... AS REQUIRED

NOTE

Application of power increases push force requirements.

2. Flaps .... RETRACT IN INCREMENTS

NOTE

Flap retraction increases push force requirements.

3. Airspeed .... AS REQUIRED TO MAINTAIN LOW STICK FORCES
4. Landing Gear .... RETRACT WHEN FEASIBLE

STALL AVOIDANCE SYSTEM (SAS) MALFUNCTIONS

SAS FAULT LIGHT ON IN FLIGHT

***1. SAS CLUTCH OR SAS SERVO SWITCH .... OFF**
2. SAS Circuit Breakers (four) .... PULL

CAUTION

WITH THE SAS DISENGAGED (OR INOPERATIVE) THE AIRPLANE WILL HAVE UNDESIRABLE STALL CHARACTERISTICS AT AFT CENTER OF GRAVITY LOADINGS. ADEQUATE MARGINS ABOVE THE STALL SPEED SHOULD BE MAINTAINED IN ALL OPERATIONS. ENSURE THAT TOUCHDOWN SPEED IS EQUAL TO OR GREATER THAN 1.1 V_{S1}.

NOTE

- SAS FAULT light on flashing indicates a stopped servo or servo disengagement.
- SAS FAULT light on steady in flight indicates computer power failure, or computer power failure with simultaneous servo failure.
- With the fault light on, angle of attack and stall warning indications may be unreliable.

SAS MALFUNCTION – NOSE DOWN (INADVERTENT PUSHER)

In the event of a nose down malfunction (with or without a stall warning horn) the following procedure should be initiated:

1. ELEVATOR CONTROL ....OVERPOWER TO MAINTAIN AIRPLANE CONTROL
***2. SAS CLUTCH OR SAS SERVO SWITCH .... OFF**
3. SAS Circuit Breakers (four) .... PULL

WARNING

PULL FORCES REQUIRED TO OVERPOWER THE STICK PUSHER MAY EXCEED 60 POUNDS.

CAUTION

WITH THE SAS DISENGAGED (OR INOPERATIVE) THE AIRPLANE WILL HAVE UNDESIRABLE STALL CHARACTERISTICS AT AFT CENTER OF GRAVITY LOADINGS. ADEQUATE MARGINS ABOVE THE STALL SPEED SHOULD BE MAINTAINED IN ALL OPERATIONS. ENSURE THAT TOUCHDOWN SPEED IS EQUAL TO OR GREATER THAN 1.1 V_{S1}.

STALL AVOIDANCE SYSTEM (SAS) MALFUNCTIONS (continued)

AURAL STALL WARNING AT SPEEDS WELL IN EXCESS OF NORMAL STALL WARNING SPEEDS (INADVERTENT STALL WARNING)

When an aural stall warning occurs in unaccelerated flight at speeds well in excess of normal stall warning speed, possible damage to the SAS vane or a system malfunction is indicated and an inadvertent nose down push may occur.

***1. SAS CLUTCH OR SAS SERVO SWITCH .... OFF**

To silence the stall warning horn:

2. Stall Warning Circuit Breakers (four) .... PULL

CAUTION

WITH THE SAS DISENGAGED (OR INOPERATIVE) THE AIRPLANE WILL HAVE UNDESIRABLE STALL CHARACTERISTICS AT AFT CENTER OF GRAVITY LOADINGS. ADEQUATE MARGINS ABOVE THE STALL SPEED SHOULD BE MAINTAINED IN ALL OPERATIONS. ENSURE THAT TOUCHDOWN SPEED IS EQUAL TO OR GREATER THAN 1.1 V_{S1}.

EMERGENCY EXITS

There are two emergency exits on the right side of the center cabin and one emergency exit on the left side. To open the emergency exits:

1. Cabin .... DEPRESSURIZE
2. Handle Cover (if installed) .... PULL/OUT DISCARD
2. Release Handle .... PULL

NOTE

Pull hatch inward, rotate, extend through opening, and discard outside the airplane when on the ground. Ensure that the hatch is clear of the exit route from the airplane.

NOSE WHEEL STEERING ELECTRICAL MALFUNCTION

Fault protection is provided by circuitry which automatically deactivates the nose wheel steering system if an electrical malfunction occurs. The nose wheel is then free to caster and rudder, differential braking, and/or differential power can be used for steering.

If the system fails to test correctly, the arm switch should be placed in the OFF position and steering accomplished with rudder, differential braking, and/or differential power.

In the event of a flashing green NOSE STEERING light, an unwanted steering deflection, and/or park light illuminated when the PARK button is not depressed:

NOTE

> It is normal for the park light to remain illuminated, but vary in intensity, during the transition from park mode to normal mode.

1. NWS Power Lever Button .... RELEASE
2. Right Speed Lever .... APPROXIMATELY 1/2 INCH FORWARD OF LOW
3. Directional Control .... MAINTAIN WITH RUDDER, BRAKES, AND/OR POWER
4. Nose Wheel Steering Arm Switch .... OFF

*5. Nose Wheel Steering Circuit Breaker .... PULL

NOSE WHEEL STEERING HYDRAULIC MALFUNCTION

(Aircraft modified in accordance with Service Bulletin 32-006)

An illuminated NOSE STEER FAIL amber annunciator light indicates that hydraulic pressure is being supplied to the nose wheel steering actuator but the pilot is not commanding a steering signal. Illumination of the amber NOSE STEER FAIL light should alert the pilot to potentially undesirable steering actuation and that corrective action may be required. Corrective action depends upon the operational phase.

NOTE

The following procedures assume that the NOSE STEER FAIL (NWS FAIL, some aircraft) light illuminates while the nose wheel steering switch is in its ARMED position. Neither the NWS power lever button nor the speed lever switch will be effective if the nose wheel steering switch is OFF. Therefore, if the switch is OFF, corrective action must be preceded by arming the nose wheel steering system.

NOSE STEER FAIL Light On

(DURING GROUND OPERATIONS):

1. NWS Power Lever Button .... PRESS AND HOLD

   OR

   Right Speed Lever .... LOW
2. NOSE STEER FAIL Light .... CHECK OUT
3. Directional Control .... MAINTAIN WITH NWS
4. Do Not Take Off.

(DURING INITIAL PART OF TAKEOFF ROLL):

1. NWS Power Lever Button .... PRESS AND HOLD
2. NOSE STEER FAIL Light .... CHECK OUT
3. Directional Control .... MAINTAIN
4. Takeoff .... ABORT

(DURING FINAL PART OF TAKEOFF ROLL):

1. NWS Power Lever Button .... PRESS AND HOLD
2. NOSE STEER FAIL Light .... CHECK OUT
3. Directional Control .... MAINTAIN
4. Continue With Normal Takeoff Procedures.

(IN FLIGHT WITH GEAR DOWN):

1. NWS Power Lever Button .... PRESS AND HOLD
2. NOSE STEER FAIL Light .... CHECK OUT

NOTE

Conduct normal landing and rollout while keeping the power lever button depressed to avoid uncommanded steering actuation.

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TABLE OF CONTENTS
ABNORMAL PROCEDURES

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INTRODUCTION

The Abnormal Procedures section is an extension of the Emergency Procedures section and covers situations of a less serious nature. Procedures identified by an asterisk are those recommended to be accomplished by a copilot. These procedures have been FAA approved.

ANNUNCIATOR PANEL

The functions of the annunciator panel amber lights are shown in the following table.

LIGHT ILLUMINATED	INDICATES THAT
L or R BETA	Corresponding prop pitch control oil pressure is sufficient to command reverse operation.
L or R CHIP DET	Magnetic plug in corresponding engine has detected foreign object in oil. See page 3A-7.
L or R XFER PUMP	Corresponding hopper tank fuel level is low. See page 3A-3.
L or R BAT DISC	Corresponding battery switch is not on or that there has been a feeder circuit fault. See page 3A-5.
L or R AC BUS	a. Both lights on: The selected inverter has failed. See page 3A-6. b. One light on: The 115V bus tie has failed. Reset circuit breaker.
L or R GEN(ERATOR) FAIL	Corresponding generator switch is not on or that the generator has failed. See page 3A-6.

ANNUNCIATOR PANEL (continued)

LIGHT ILLUMINATED	INDICATES THAT
LOW SUCTION	There is insufficient output from the suction regulator. Check suction indicator.
CABIN ALT(ITUDE)	Cabin altitude is above 10,000 feet. See page 3-14.
GPU PLUG IN	The ground power unit is plugged into the aircraft. Do not attempt to put generators on line and do not taxi.
LH or RH SRL OFF (L or R SRL OFF, later aircraft)	Corresponding engine RPM is less than 80% when SRL power switch is normal or that the SRL computer has failed. See page 3A-17.
ANTI-SKID (IF INSTALLED)	Anti-skid switch is not on or that there is a system fault. Do not use system, see page 1-15.
NOSE STEER FAIL (SOME AIRCRAFT)	Hydraulic pressure is being applied to the nose steering actuator without pilot steering command. See page 3-29.

BOOST PUMP FAILURE

In the event of a boost pump failure, as indicated by low fuel pressure, both auxiliary boost pumps should be selected. See Figure 1-1 for no boost pumps required flight envelope.

FUEL TRANSFER PUMP CAUTION LIGHT ON

The fuel pump caution lights illuminate when fuel quantity in the respective hopper tank is less than approximately 70 pounds. The light switches are actuated by a float located in each hopper tank. Nuisance caution lights may occur following refueling if a float switch sticks in its low quantity position. The false indication often will correct itself during taxi. Takeoff with fuel transfer pump caution light(s) illuminated is prohibited.

With the boost pumps and transfer pumps operating, the XFER PUMP annunciator light will illuminate when the wing tank is empty and the hopper tank fuel is below approximately 70 pounds.

With the boost pumps and/or transfer pumps not operating, fuel will gravity feed from the wing tank into the hopper tank and the XFER PUMP annunciator will illuminate when the wing tank fuel level reaches the hopper tank float switch level (approximately 600 – 700 pounds of fuel remaining in that wing). Without a boost pump operating, approximately 75 pounds of the indicated fuel is unusable.

In the event that a XFER PUMP annunciator illuminates with a boost pump ON, the other boost pump in that tank should be turned on.

CAUTION

WITH TRANSFER PUMPS OPERATIVE AND LESS THAN 70 POUNDS OF FUEL IN THE AFFECTED TANK, THE TRANSFER PUMP CAUTION LIGHT SERVES AS A LOW FUEL WARNING. A LANDING SHOULD BE MADE AS SOON AS PRACTICABLE.

NOTE

Whenever selecting or switching boost pumps, the same pump (Main or Auxiliary) should be used on both sides to insure that subsequent failure of an essential bus will only cause loss of boost pump pressure to one engine.

OPERATION WITH FUEL IMBALANCE

Takeoff with a fuel imbalance up to 500 pounds is permitted using the normal performance data contained in Section 4. Aileron trim and/or control wheel force requirements with fuel imbalance are dependent upon the total fuel loading and the airspeed. During takeoff and initial climb with a relatively heavy fuel load, full aileron trim plus control wheel force in the direction of the light wing will be required for fuel imbalance over 300 pounds. The wheel force requirement increases with increased imbalance. For fuel imbalance between zero and 300 pounds, a proportionate amount of aileron trim should be preset prior to takeoff.

FUEL BALANCING PROCEDURE

Prior to initiating a fuel transfer, test the fuel quantity indicating system by depressing the "Push to Test" button. During preflight, magna sticks, if installed, can be used to verify fuel quantity, but only between 30-155 gallons per side.

Ground Operations

1. On a level surface, open the cross flow valve and observe the proper annunciation. Fuel will flow in the desired direction (heavy to light) due to gravity. The fuel transfer process can be expedited by utilizing local ramp/taxiway inclines.

2. When proper balance has been achieved, close the cross flow valve and note proper valve annunciation.

In Flight Operations

WARNING

AUTOPILOT/YAW DAMPER USE DURING FUEL BALANCING IS PROHIBITED.

1. Check aircraft is in coordinated flight.

2. Open Cross Flow Valve and observe proper annunciation. In level unaccelerated flight, fuel will flow in the desired direction (heavy to light) due to gravity.

3. To expedite process, use aileron control and place the wing with less fuel to a lower position (no more than 5 degrees is needed) than the wing with more fuel. Use rudder to maintain assigned heading. Maintain a safe margin of airspeed during this “slip” condition.

4. When fuel balance approaches desired indications, close the cross flow valve, check for proper annunciation, and return aircraft to trimmed condition.

5. If fuel balance cannot be achieved, or the imbalance worsens, stop the cross feed process immediately by closing the cross flow valve. Land as soon as conditions permit, and determine cause.

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ELECTRICAL SYSTEM FAILURES (See Section 3 for Total Electrical Failure)

EXCESSIVE AMMETER INDICATION

If an excessive electrical load occurs, as indicated by an excessive ammeter indication, the malfunctioning circuit should be identified and turned off.

1. Battery Switches .... OFF
   a. If overload condition still exists, turn battery switches ON and continue to Step 2.
   b. If overload condition ceases, a battery circuit malfunction exists and the malfunctioning circuit must remain disconnected from the DC electrical bus.
      - Isolate the malfunctioning circuit by turning the battery switches ON individually. Leave the switch for the malfunctioning circuit OFF.

If Step 1 did not correct the excessive ammeter indication:

2. Nonessential Bus Tie Switch .... OFF
   a. If overload condition still exists, turn the nonessential bus tie switch ON and continue to Step 3.
   b. If overload condition ceases, pull all circuit breakers on the nonessential bus and turn the bus tie switch ON. Reset circuit breakers until the malfunctioning circuit is identified. Pull circuit breaker for malfunctioning circuit and do not reset. See Note following Step 3.

If Step 2 did not correct the excessive ammeter indication:

3. Left and Right Essential Bus Tie Switches .... REPEAT THE SAME PROCEDURE FOR EACH ESSENTIAL BUS UNTIL SOURCE OF THE PROBLEM IS FOUND AND MALFUNCTIONING CIRCUIT IS ISOLATED

NOTE

It may be preferable to leave the malfunctioning bus off in flight and to troubleshoot the difficulty after landing.

ELECTRICAL SYSTEM FAILURES (continued)

BATTERY FAULT LIGHT ON

NOTE

A fault in either battery feeder circuit will cause both battery relays to disconnect automatically from the aircraft electrical system. Both battery relays will remain open until either battery switch is moved to RESET, then ON.

1. Both Battery Switches .... OFF
2. Left Battery Switch .... RESET/ON

If no fault exists in the left feeder circuit, the battery fault light will remain off. In this case, leave the left battery switch ON and proceed to Step 3.

If a fault exists in the left circuit, the battery will automatically disconnect and the light will come back on. In this case, move the left battery switch to RESET (to reset the detector circuit), then OFF and proceed to Step 3.

3. Right Battery Switch .... ON

If no fault exists in the right feeder circuit, the battery fault light will remain off. In this case, leave the right battery switch ON.

If a fault exists in the right circuit, both batteries will automatically disconnect and the light will come back on. In this case, move the right battery switch to RESET (to reset the detector circuit), then OFF and turn the left battery back on.

NOTE

- Either generator switch, when positioned to RESET, then ON, will also reset the battery fault detection circuit.

- All electrically operated components can be operated normally on power from the generators when the battery switches are off.

ELECTRICAL SYSTEM FAILURES (continued)

GENERATOR INOPERATIVE – FAIL LIGHT ILLUMINATED

1. Generator Switch .... OFF/RESET/ON

If the generator will not reset:

2. Generator Switch .... OFF

CAUTION

DO NOT EXCEED LIMIT LOAD ON OPERATING GENERATOR.

CIRCUIT BREAKER TRIPPED

Circuit Breaker .... PUSH TO RESET

CAUTION

IF CIRCUIT BREAKER TRIPS AGAIN, DO NOT RESET.

INVERTER INOPERATIVE

* Select other inverter.

ELECTRICAL BUS FAILURE (indicated by loss of systems on the particular bus)

1. Left Essential Bus Failure:
   a. Left essential bus tie switch .... OFF
   b. Bus transfer switches .... RIGHT BUS
2. Right Essential Bus Failure:
   *a. Right essential bus tie switch .... OFF
   b. Bus transfer switches .... LEFT BUS
3. Nonessential Bus Failure:
   * Nonessential bus tie switch .... OFF

CHIP LIGHT ON PRIOR TO TAKEOFF

If the chip light illuminates prior to takeoff, the flight should be aborted and the cause of the warning determined.

CHIP LIGHT ON DURING FLIGHT

If the chip light illuminates and engine operation appears to be normal, continue to the first intended landing and determine cause. The affected engine and instruments should be monitored closely during flight.

If the chip light illuminates and engine operation does not appear to be normal, the affected engine should be shut down (ENGINE FAILURE DURING FLIGHT) and a single engine landing accomplished.

WEATHER CONDITIONS CONDUCIVE TO SEVERE IN-FLIGHT ICING:

- Visible rain at temperatures below 0 degrees Celsius ambient air temperature.
- Droplets that splash or splatter on impact at temperatures below 0 degrees Celsius ambient air temperature.

PROCEDURES FOR EXITING THE SEVERE ICING ENVIRONMENT:

Monitor the ambient air temperature. While severe icing may form at temperatures as cold as –18 degrees Celsius, increased vigilance is warranted at temperatures around freezing with visible moisture present. If the visual cues for identifying severe icing conditions are observed, accomplish the following:

- Immediately request priority handling from Air Traffic Control to facilitate a route or an altitude change to exit the severe icing conditions. Avoid extended exposure to icing conditions more severe than those for which the airplane has been certified.
- Avoid abrupt and excessive maneuvering that may exacerbate control difficulties.
- Do not engage the autopilot.
- If the autopilot is engaged, hold the control wheel firmly and disengage the autopilot.
- If an unusual roll response or uncommanded roll control movement is observed, reduce the angle-of-attack.
- Do not extend flaps during extended operation in icing conditions. Operation with flaps extended can result in a reduced wing angle-of-attack, with the possibility of ice forming on the upper surfaces further aft on the wing than normal, possibly aft of the protected area.
- If the flaps are extended, do not retract them until the airframe is clear of ice.
- Report these weather conditions to Air Traffic Control.

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INADVERTENT ICING ENCOUNTER

If icing is encountered with the ice protection systems off, the following procedure should be followed.

IGNITION MODE switch (if installed)

1. Ignition Mode Switches .... OVERRIDE
2. IGN LIGHTS .... CHECK ON
3. Left Engine Heat Switch .... ENGINE & PROP HEAT

AUTO/CONT IGNITION SWITCH (if installed)

1. Auto/Cont Ignition Switches .... AUTO (CONT IF DESIRED)
2. IGN Lights (if CONT is selected) .... CHECK ON
3. Left Engine Heat Switch .... ENGINE & PROP HEAT

NOTE

- Determine that the first engine operates satisfactorily before selecting engine and prop heat for the second engine.
- EGT will increase slightly and torque will decrease when engine and propeller heat is selected. Power lever adjustment may be required.

4. Pitot/SAS Heat .... ON
5. Windshield Heat Switch .... HIGH
6. Deice Boots Switch .... AUTO (AT THE FIRST SIGN OF ICE FORMATION ANYWHERE ON THE AIRCRAFT)
7. Right Engine Heat Switch .... ENGINE & PROP HEAT

<u>**WARNING**</u>

ENGINE HEAT AND CONTINUOUS IGNITION, IN THE OVERRIDE MODE (IGNITION MODE SWITCH) OR AUTO POSITION (AUTO/CONT IGNITION SWITCH), MUST BE USED AFTER LEAVING ICING CONDITIONS UNTIL THE PILOT IS CONFIDENT THAT ANY RESIDUAL ICE ON PROPELLERS, SPINNERS, INTAKE LIPS, OR INTAKE THROATS WILL NOT BE SHED INTO THE ENGINES.

INSTRUMENT STATIC PRESSURE MALFUNCTION

If the pilot's static pressure instruments malfunction, select ALTERNATE position on the static source selector valve. The pilot's instruments will be vented to the forward baggage compartment. See Section 4 of this manual for corrected airspeed and altimeter readings when operating on the alternate source.

CAUTION

- DO NOT DUMP PRESSURIZATION WHEN USING THE ALTERNATE STATIC PRESSURE SOURCE.
- THE ALTERNATE STATIC SOURCE ALTITUDE AND AIRSPEED CORRECTIONS SHOWN IN SECTION 4 OF THIS MANUAL ARE NOT VALID IF THE DUMP VALVE IS OPEN.

NOTE

The copilot's static pressure instruments are not connected to the alternate static pressure source.

YAW DAMPER MALFUNCTIONS (IF YAW DAMPER INSTALLED)

The yaw damper is provided to prevent yawing oscillations during flight at low indicated airspeeds and in turbulence. Should the yaw damper fail to test properly during the taxi check, or should it malfunction during flight, turn the yaw damper switch OFF.

LANDING GEAR SQUAT SWITCH MALFUNCTION

A squat switch on the left main landing gear controls power to the landing gear control solenoid-operated down lock plunger. Should the squat switch malfunction after takeoff, the down lock plunger would remain in its extended position and lock the control lever in its down position. If it is necessary to retract the gear when the plunger is extended, move the override release lever down and counterclockwise and then move the landing gear control lever to its up position.

MANUAL GROUND START PROCEDURES

Certain malfunctions in the engine starting system can prevent a normal, automatic engine ground start. An example is failure of the 10% and 60% speed functions in the SRL computer. In this case, other SRL functions could remain operative; however, an automatic start would not be obtained because fuel and ignition sequencing controlled by the 10% and 60% speed functions would be inoperative. A manual start can be accomplished using the appropriate speed switch select switch located on the pilot's side console. These switches enable the pilot to bypass the normally automatic engine speed functions. The manual ground start procedure using these switches is the same as for a normal ground start except for the denoted changes as indicated by the small letter "a" and double asterisks.

During a manual start it is not necessary to place the SRL – Δ P/P switch in the OFF position. Confirm that the SRL OFF light is illuminated (a normal indication whenever engine RPM is less than 80%) and leave the SRL – Δ P/P switch in the NORM position. On aircraft that have incorporated Service Bulletin 227-80-001 when the speed select switch is placed in the manual position auto fuel enrichment is disabled. Fuel enrichment must be accomplished by the pilot.

NOTE

> During a manual start, start fuel enrichment can be obtained by pressing the start button. When using the start button to manually provide start fuel enrichment, modulate the start button and attempt to emulate a normal automatic start. Maintain normal engine acceleration and an EGT of approximately 685°C – 695°C.

On aircraft that have not incorporated Service Bulletin 227-80-001 when the speed select switch is placed in the manual position the Temp Limiter is enabled and will prevent start temperatures from exceeding 650°C. This may inhibit engine acceleration during the start (most noticeable between 35 – 40% RPM) and may result in a hung start and possible damage to the engine unless the start is aborted properly. On such aircraft (Pre Service Bulletin 227-80-001) the Temp Limiter circuit breaker must be pulled to disable the Temp Limiter during the start and then reset after the engine has stabilized at idle prior to accomplishment of the required SRL checks.

NOTE

> After accomplishing a manual ground start, all SRL system checks must be accomplished satisfactorily prior to flight, see page 2-37.

MANUAL GROUND START PROCEDURES (continued)

BATTERY MANUAL START

1. Battery Switches .... ON
2. Battery Temperature Indicator .... TEST/NOTE TEMPERATURES
3. Annunciator Panel and System Warning Lights .... PRESS-TO-TEST

NOTE

Annunciator press-to-test button must remain pressed until the WING OVHT warning lights start flashing.

4. Fire Extinguisher System .... TEST

*5. Inverter (Check No. 2, then No. 1) .... ON

6. All Instruments and Clocks .... CHECKED/SET

Right Engine (RECOMMENDED FIRST)

7. SRL OFF Light .... CHECK ON
8. Boost Pumps .... CHECK/AS DESIRED
9. Propellers .... UNFEATHERED/CLEAR
10. Start Mode Switch .... AS DESIRED

NOTE

The series mode is recommended for use during the first battery start of the day and for all other battery starts when engines have cooled to near ambient temperatures since last being operated.

11. Engine Start Button .... PRESS AND HOLD
12. RPM .... 10% TO 12%
    **a. Speed switch select switch .... MANUAL
13. Observe illumination of IGN light and ignition of fuel as indicated by rising EGT. Use the start button as required to provide fuel enrichment between 10% and 60% RPM.

CAUTION

IF EGT RISE IS NOT OBTAINED WITHIN 10 SECONDS AFTER SELECTING MANUAL SPEED SWITCH CONTROL, OR BEFORE ATTAINING 20% RPM, PULL ENGINE STOP AND FEATHER CONTROL AND PRESS THE STOP BUTTON. CLEAR ENGINE FOR 10 SECONDS WITH STARTER TEST SWITCH. DO NOT ALLOW ENGINE TO OPERATE IN THE 18% TO 28% RPM RANGE DURING START OR CLEARING OPERATIONS EXCEPT DURING COMBUSTION ASSISTED ACCELERATION THROUGH THAT RANGE.

MANUAL GROUND START PROCEDURES (continued)

BATTERY MANUAL START (continued)

Right Engine (RECOMMENDED FIRST) (continued)

14. EGT .... MONITOR (770^{o}C MAXIMUM FOR ONE SECOND)

CAUTION

IF RPM STOPS INCREASING AND EGT IS APPROACHING THE START LIMIT AND RISING RAPIDLY, IMMEDIATELY PULL ENGINE STOP AND FEATHER CONTROL AND PRESS THE STOP BUTTON. EXCEEDING THE START EGT LIMIT MAY SERIOUSLY DAMAGE THE ENGINE.

15. RPM .... STABILIZED AT 70% TO 72%
16. EGT .... STABILIZED
    **a. Speed switch select switch .... AUTO
17. Fuel and Oil Pressure .... YELLOW OR GREEN ARCS
18. Generator .... RESET/ON
19. SRL OFF Light .... ON BELOW 80% RPM
*20. Bleed Air Switch (right engine) .... ON

NOTE

Check for absence of air flow through the open cooling air "eyeballs" prior to turning on either bleed air system.

21. Start Mode Switch .... PARALLEL

Left Engine – Manual Start If Required
(For airplanes NOT modified in accordance with Service Bulletin 227 24-015)

22. Right Generator Load .... 150 AMPS MAXIMUM
23. Repeat Steps 7 Through 19 for Left Engine.
*24. Bleed Air Switch (left engine) .... ON

NOTE

Verify operation of each bleed air system by selectively operating right and left systems.

25. Generators .... RESET/VOLTAGES CHECKED/ON
26. Battery Disconnects and Current Limiters .... CHECK (SEE PAGES 2-32 AND 2-25)

MANUAL GROUND START PROCEDURES (continued)

BATTERY MANUAL START (continued)

Left Engine – Manual Start If Required
(For airplanes modified in accordance with Service Bulletin 227 24-015)

22. Right Generator Load .... 150 AMPS MAXIMUM
23. Repeat Steps 7 Through 19 for Left Engine.

*24. Bleed Air Switch (left engine) .... ON

NOTE

Verify operation of each bleed air system by selectively operating right and left systems.

25. Generators .... ON/CHECK VOLTS AND AMPS AND EVEN LOAD SHARING

CAUTION

IF THE **GENERATOR** SWITCH IS RESET AND **ON**, GENERATOR **VOLTAGE** IS **OBSERVED**, **GEN FAIL** ANNUNCIATOR LIGHT IS **NOT ILLUMINATED**, AND THE **AMMETER READS ZERO**, THE RESPECTIVE **325** AMPERE **CURRENT LIMITER** IS **OPEN**. THE FAULTY CURRENT LIMITER SHOULD BE REPLACED PRIOR TO FLIGHT.

26. Battery Disconnects .... CHECK (SEE PAGE 2-31)

GROUND POWER UNIT (GPU) MANUAL START

CAUTION

- USE ONLY NEGATIVELY GROUNDED GROUND POWER SOURCES.
- DUE TO THE POSSIBILITY OF EXCESSIVELY HIGH CURRENT SURGE DURING ENGINE START, IT IS RECOMMENDED THAT THE MAXIMUM STARTING CURRENT FROM A GROUND POWER SOURCE BE LIMITED TO 1,000 AMPERES.

1. Battery Switches .... OFF
2. GPU .... CONNECTED/ON/ANNUNCIATOR CHECKED
3. GPU Voltage .... CHECK
4. Battery Switches .... ON

MANUAL GROUND START PROCEDURES (continued)

GROUND POWER UNIT (GPU) MANUAL START (continued)

*5. Battery Temperature Indicator .... TEST/NOTE TEMPERATURES
6. Annunciator Panel and System Warning Lights .... PRESS-TO-TEST

NOTE

Annunciator press-to-test button must remain depressed until the WING OVHT warning lights start flashing.

7. Fire Extinguisher System .... TEST
*8. Inverter (Check No. 2, then No. 1) .... ON
9. All Instruments and Clocks .... CHECKED/SET

Right Engine (RECOMMENDED FIRST)

10. SRL OFF Light .... CHECK ON
11. Boost Pumps .... CHECK/AS DESIRED
12. Propellers .... UNFEATHERED/CLEAR
13. Start Mode Switch .... PARALLEL
14. Engine Start Button .... PRESS AND HOLD
15. RPM .... 10% TO 12%
    **a. Speed switch select switch .... MANUAL
16. Observe illumination of IGN light and ignition of fuel as indicated by rising EGT. Use the start button as required to provide fuel enrichment between 10% and 60% RPM.

CAUTION

IF EGT RISE IS NOT OBTAINED WITHIN 10 SECONDS AFTER SELECTING MANUAL SPEED SWITCH CONTROL, OR BEFORE ATTAINING 20% RPM, PULL ENGINE STOP AND FEATHER CONTROL AND PRESS THE STOP BUTTON. CLEAR ENGINE FOR 10 SECONDS WITH STARTER TEST SWITCH. DO NOT ALLOW ENGINE TO OPERATE IN THE 18% TO 28% RPM RANGE DURING START OR CLEARING OPERATIONS EXCEPT DURING COMBUSTION ASSISTED ACCELERATION THROUGH THAT RANGE.

17. EGT .... MONITOR (770^{o}C MAXIMUM FOR ONE SECOND)

CAUTION

IF RPM STOPS INCREASING AND EGT IS APPROACHING THE START LIMIT AND RISING RAPIDLY, IMMEDIATELY PULL ENGINE STOP AND FEATHER CONTROL AND PRESS THE STOP BUTTON. EXCEEDING THE START EGT LIMIT MAY SERIOUSLY DAMAGE THE ENGINE.

MANUAL GROUND START PROCEDURES (continued)

GROUND POWER UNIT (GPU) MANUAL START (continued)

Right Engine (RECOMMENDED FIRST) (continued)

18. RPM .... STABILIZED AT 70% TO 72%
19. EGT .... STABILIZED
    **a. Speed switch select switch .... AUTO
20. Fuel and Oil Pressure .... YELLOW OR GREEN ARCS
21. SRL OFF Light .... ON BELOW 80% RPM

*22. Bleed Air Switch (right engine) .... ON

NOTE

- Check for absence of air flow through the open cooling air "eyeballs" prior to turning on either bleed air system.
- After accomplishing a manual ground start, all SRL system checks must be accomplished satisfactorily prior to flight, see page 2-36.

Left Engine – Manual Start If Required
(For airplanes NOT modified in accordance with Service Bulletin 227 24-015)

23. Repeat Steps 10 Through 21 For Left Engine.

*24. Bleed Air Switch (left engine) .... ON

NOTE

Verify operation of each bleed air system by selectively operating right and left systems.

25. GPU .... OFF/DISCONNECTED/ANNUNCIATOR CHECKED OUT
26. Generators .... RESET/VOLTAGES CHECKED/ON
27. Battery Disconnects and Current Limiters .... CHECK
    (SEE PAGES 2-32 AND 2-25)

MANUAL GROUND START PROCEDURES (continued)

GROUND POWER UNIT (GPU) MANUAL START (continued)

Left Engine – Manual Start If Required
(For airplanes modified in accordance with Service Bulletin 227 24-015)

23. Repeat Steps 10 Through 21 For Left Engine.
*24. Bleed Air Switch (left engine) .... ON

NOTE

Verify operation of each bleed air system by selectively operating right and left systems.

25. GPU .... OFF/DISCONNECTED/ANNUNCIATOR CHECKED OUT
26. Generators .... ON/CHECK VOLTS AND AMPS AND EVEN LOAD SHARING

CAUTION

IF THE **GENERATOR** SWITCH IS RESET AND **ON**, GENERATOR **VOLTAGE** IS **OBSERVED**, **GEN FAIL** ANNUNCIATOR LIGHT IS **NOT ILLUMINATED**, AND THE **AMMETER READS ZERO**, THE RESPECTIVE **325** AMPERE **CURRENT LIMITER** IS **OPEN**. THE FAULTY CURRENT LIMITER SHOULD BE REPLACED PRIOR TO FLIGHT.

27. Battery Disconnects .... CHECK (SEE PAGE 2-32)

TEMPERATURE LIMITER MALFUNCTIONS

OPERATIONS WITH THE TEMPERATURE LIMITER CIRCUIT INOPERATIVE

An inoperative temperature limiter circuit results in loss of automatic temperature control. When the temperature limiter becomes inoperative the pilot must use caution in power management. The EGT indication lags actual engine performance. The following procedures should be followed when the temperature limiter is inoperative.

1. Do not advance power lever rapidly beyond 50% travel.

2. Set power lever carefully above 50% power to allow for EGT indication lag. Adjust power by making small power lever position changes and allowing adequate time for EGT lag.

3. Changes in airspeed, temperature and/or altitude will produce changes in EGT. Monitor EGT when operating the engine near the EGT limit.

TEMPERATURE LIMITER MALFUNCTIONS (continued)

OPERATIONS WITH TEMPERATURE LIMITER INOPERATIVE (FUEL BYPASS VALVE FAILED OPEN)

Failure of the fuel bypass valve in the open, or near open position, will allow fuel to be bypassed at all times with possible low power being developed at intermediate power lever positions. A valve stuck in a partially open position would be detected during the application of power for takeoff or during flight at less than 650°C EGT due to the requirement for excessively split power levers at even EGT's.

CAUTION

TAKEOFF WITH A FUEL BYPASS VALVE FAILED IN THE OPEN POSITION IS NOT APPROVED.

Failure in the open position while in flight might cause so much reduced fuel flow at the nozzles that, at power lever settings near flight idle, the NTS system would activate. This potential difficulty could be confirmed by retarding the power lever for the suspect engine to flight idle while flying at speeds near final approach speed. If negative torquing occurs, the pilot has the options of landing with asymmetric power levers in order to maintain even power, or of shutting down the engine with the failed fuel bypass valve and making a single engine landing.

Temperature Limiter Circuit Breaker .... PULL

OPERATIONS WITH TEMPERATURE LIMITER INOPERATIVE (FUEL BYPASS VALVE FAILED CLOSED)

Takeoff and initial climb operations are conducted with power set to appropriate torque and reference EGT values determined from the Takeoff Power Check Charts in Section 4. Therefore, a fuel bypass failure may not be detected during normal operations until cruise power is set with EGT at 650°C. If fuel bypass malfunctions are suspected after conducting the temp limiter check on page 2-37, the following ground check will verify the status of the temperature limiting systems.

1. Speed Levers .... HIGH RPM

NOTE

(TPE331-11U-601G Engines Only)
Allow approximately 35 seconds for the secondary fuel nozzles to fill and operate after RPM passes 80%. Otherwise, remainder of check may be invalid.

TEMPERATURE LIMITER MALFUNCTIONS (continued)

OPERATIONS WITH TEMPERATURE LIMITER INOPERATIVE (FUEL BYPASS VALVE FAILED CLOSED) (continued)

2. Power Levers .... SET TO OBTAIN 350 PPH FUEL FLOW
3. Temp Limiter Test Switch .... HOLD L THEN R. NOTE THAT RESPECTIVE FUEL BYPASS LIGHTS ILLUMINATE AND THAT FUEL FLOW FOR EACH ENGINE DROPS TO APPROXIMATELY 280 PPH

NOTE

- It is permissible to conduct this check one engine at a time.
- Failure of either engine to bypass approximately 70 PPH or failure of either fuel bypass light to illuminate during this check indicates a malfunction of the fuel bypass/temp limiter system.
- If dry power takeoff operations are required with a fuel bypass valve failed at its closed position, use normal takeoff, climb, and cruise procedures taking care to not exceed 650^{o}C EGT.

CAUTION

ENGINE OVER-TEMPERATURE AND CONSEQUENT ENGINE DAMAGE MAY OCCUR WITH IMPROPER POWER LEVER MANAGEMENT WHEN THE FUEL BYPASS VALVE HAS FAILED IN THE CLOSED POSITION.

SRL COMPUTER FAILURE

A failure of the SRL system may be indicated by one or more of the following:

1. Illumination of an SRL OFF light which indicates loss of power to the system, loss of signal to the computer, loss of computer output signal or that the difference between compensated EGT and SRL value is less than 15^{o}C.

2. A sudden change in EGT of 20^{o}C or more with no corresponding change in other engine parameters.

3. An erratic or fluctuating EGT indication.

4. SRL OFF light not illuminated with engine speed below 80% RPM.

5. SRL – Δ P/P power switch in the SRL OFF position.

NOTE

The SRL inoperative EGT charts in Figures 3A-1 and 3A-2 are provided only for maximum continuous power at 100% RPM and for cruise power at 97% RPM. Cruise with SRL inoperative is limited to between 96% and 98% or at 100% RPM.

When operating with the SRL computer inoperative, the following apply:

1. The temperature limiter circuit will be inoperative; therefore, all the cautions listed under the heading TEMPERATURE LIMITER MALFUNCTIONS apply and must be followed. Pull the temperature limiter circuit breaker.

2. The maximum allowable EGT will vary with altitude, airspeed, and temperature. The pilot must operate the engine within the maximum EGT limits by obtaining the limiting EGT from Figures 3A-1 and 3A-2 in this section and adjusting engine power accordingly. An alternative method of ensuring proper power on the engine which has suffered SRL failure is to match its torque with that of the engine with operable SRL system.

3. After landing at the next scheduled destination, the SRL system must be repaired before further flight or operations must be conducted in accordance with Supplement B-3.

SRL COMPUTER FAILURE (continued)

SIMULATED SRL COMPUTER FAILURE

Failure of the SRL computer may be simulated in flight as follows:

1. Adjust the power lever to extinguish the fuel BYPASS OPEN light.
2. Place the SRL – Δ P/P power switch in the SRL OFF position.
3. Manually control engine temperature to the appropriate limits from Figures 3A-1 and 3A-2.

CAUTION

ENGINE OVER-TEMPERATURE CAN RESULT FROM TURNING THE SRL OFF WITH THE FUEL BYPASS OPEN LIGHT ON.

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SRL COMPUTER FAILURE (continued)

EGT LIMIT WITH SRL INOPERATIVE
100% RPM – MAXIMUM CONTINUOUS POWER

NOTE

- Indicated outside air temperature (IOAT) as shown in table includes compressibility and position errors.
- Airspeeds shown are provided to permit interpolation of EGT's. Do not exceed V_{MO}.

EXAMPLE:
Given: Altitude = 15,000 Feet
Airspeed = 199 KIAS (200 KCAS)
IOAT = –6°C
Obtain: Maximum EGT = 562°C

ALTITUDE (FEET)	Δ ISA (°C)	OAT (°C)	INDICATED/CALIBRATED AIRSPEED (KNOTS)							
			98/100		149/150		199/200		248/250	
			IOAT	EGT	IOAT	EGT	IOAT	EGT	IOAT	EGT
SEA LEVEL	–30	–15	–14.1	564	–12.9	563	–11.3	561	–9.2	558
	–20	–5	–4.0	572	–2.8	570	–1.2	569	1.0	566
	–10	5	6.0	579	7.2	578	9.0	576	11.2	574
	0	15	16.0	587	17.3	586	19.1	584	21.4	582
	10	25	26.1	596	27.4	595	29.3	593	31.6	590
	20	35	36.1	607	37.5	606	39.4	603	41.9	600
	30	45	46.1	617	47.6	616	49.5	614	52.1	611
	40	55	56.2	628	57.6	627	59.7	625	62.3	622
5,000	–30	–25	–23.8	560	–22.5	558	–20.7	556	–18.3	553
	–20	–15	–13.8	564	–12.4	563	–10.5	561	–8.0	558
	–10	–5	–3.8	572	–2.3	570	–0.3	568	2.2	565
	0	5	6.3	580	7.8	578	9.8	576	12.5	573
	10	15	16.3	587	17.9	586	20.0	584	22.8	581
	20	25	26.4	596	28.0	595	30.2	592	33.0	589
	30	35	36.4	607	38.1	605	40.4	603	43.3	600
	40	45	46.5	618	48.2	616	50.5	614	53.6	610
10,000	–30	–35	–33.6	555	–32.0	553	–29.9	551	–27.2	547
	–20	–25	–23.5	560	–21.9	558	–19.7	555	–16.9	552
	–10	–15	–13.5	564	–11.8	562	–9.5	560	–6.6	556
	0	–5	–3.4	572	–1.7	570	0.7	568	3.8	564
	10	5	6.6	580	8.4	578	10.9	575	14.1	572
	20	15	16.7	587	18.5	586	21.1	583	24.4	580
	30	25	26.7	597	28.6	595	31.3	591	34.7	588
	40	35	36.8	607	38.8	605	41.5	602	45.0	598

FIGURE 3A-1

SRL COMPUTER FAILURE (continued)

EGT LIMIT WITH SRL INOPERATIVE
100% RPM – MAXIMUM CONTINUOUS POWER (continued)

ALTITUDE (FEET)	Δ ISA (°C)	OAT (°C)	INDICATED/CALIBRATED AIRSPEED (KNOTS)							
			98/100		149/150		199/200		248/250	
			IOAT	EGT	IOAT	EGT	IOAT	EGT	IOAT	EGT
15,000	–30	–45	–43.3	551	–41.5	549	–39.0	546	–35.9	542
	–20	–35	–33.2	555	–31.4	553	–28.8	550	–25.5	546
	–10	–25	–23.2	560	–21.2	558	–18.5	555	–15.2	551
	0	–15	–13.1	565	–11.1	563	–8.3	560	–4.8	556
	10	–5	–3.0	572	–0.9	570	2.0	568	5.6	564
	20	5	7.0	580	9.2	578	12.2	575	16.0	572
	30	15	17.1	588	19.3	586	22.4	583	26.4	580
	40	25	27.2	597	29.5	595	32.7	592	36.8	588
20,000	–30	–55	–52.9	547	–50.9	544	–48.0	541	–44.4	535
	–20	–45	–42.9	551	–40.7	549	–37.7	545	–34.0	540
	–10	–35	–32.8	556	–30.5	553	–27.4	550	23.5	545
	0	–25	–22.7	560	–20.3	558	–17.1	554	–13.0	549
	10	–15	–12.6	565	–10.2	562	–6.8	559	–2.6	555
	20	–5	–2.6	572	0.0	570	3.5	567	7.9	563
	30	5	7.5	580	10.2	578	13.8	575	18.4	–
	40	15	17.6	588	20.3	586	24.1	583	28.8	–
25,000	–30	–64	–62.5	542	–60.1	539	–56.8	535	–52.7	528
	–20	–54	–52.4	547	–49.9	544	–46.9	539	–42.1	533
	–10	–44	–42.4	551	–39.7	548	–36.1	544	–31.5	–
	0	–34	–32.3	556	–29.5	553	–25.7	549	–21.0	–
	10	–24	–22.2	560	–19.3	557	–15.3	553	–10.4	–
	20	–14	–12.1	565	–9.1	562	–4.9	558	0.2	–
	30	–4	–2.0	573	1.2	570	5.4	566	10.7	–
	40	5	8.1	580	11.4	578	15.8	575	21.3	–
30,000	–30	–74	–72.1	537	–69.2	534	–65.4	528	–60.6	–
	–20	–64	–62.0	542	–59.0	538	–54.9	533	–49.9	–
	–10	–54	–51.8	546	–48.7	543	–44.4	537	–39.2	–
	0	–44	–41.7	551	–38.4	547	–34.0	542	–28.5	–
	10	–34	–31.6	555	–28.2	552	–23.5	547	–17.8	–
	20	–24	–21.5	560	–17.9	556	–13.1	551	–7.1	–
	30	–14	–11.4	565	–7.6	562	–2.6	557	3.6	–
	40	–4	–1.3	573	2.6	570	7.8	565	14.3	–

FIGURE 3A-1 (continued)

SRL COMPUTER FAILURE (continued)

EGT LIMIT WITH SRL INOPERATIVE
97% RPM – CRUISE POWER

NOTE

- Indicated outside air temperature (IOAT) as shown in table includes compressibility and position errors.
- Airspeeds shown are provided to permit interpolation of EGT's. Do not exceed V_{MO}.

EXAMPLE:
Given: Altitude = 15,000 Feet
Airspeed = 199 KIAS (200 KCAS)
IOAT = –6°C
Obtain: Maximum EGT = 535°C

ALTITUDE (FEET)	Δ ISA (°C)	OAT (°C)	INDICATED/CALIBRATED AIRSPEED (KNOTS)							
			98/100		149/150		199/200		248/250	
			IOAT	EGT	IOAT	EGT	IOAT	EGT	IOAT	EGT
SEA LEVEL	–30	–15	–14.1	538	–12.9	536	–11.3	534	–9.2	531
	–20	–5	–4.0	546	–2.8	544	–1.2	542	1.0	539
	–10	5	6.0	557	7.2	555	9.0	552	11.2	548
	0	15	16.0	567	17.3	565	19.1	563	21.4	559
	10	25	26.1	576	27.4	576	29.3	573	31.6	570
	20	35	36.1	587	37.5	587	39.4	584	41.9	581
	30	45	46.1	597	47.6	597	49.5	595	52.1	592
	40	55	56.2	608	57.6	608	59.7	606	62.3	602
5,000	–30	–25	–23.8	530	–22.5	529	–20.7	526	–18.3	523
	–20	–15	–13.8	538	–12.4	536	–10.5	534	–8.0	531
	–10	–5	–3.8	546	–2.3	548	–0.3	542	2.2	539
	0	5	6.3	557	7.8	559	9.8	552	12.5	548
	10	15	16.3	567	17.9	569	20.0	562	22.8	559
	20	25	26.4	578	28.0	580	30.2	573	33.0	569
	30	35	36.4	589	38.1	591	40.4	584	43.3	580
	40	45	46.5	599	48.2	602	50.5	595	53.6	591
10,000	–30	–35	–33.6	524	–32.0	522	–29.9	519	–27.2	515
	–20	–25	–23.5	530	–21.9	528	–19.7	525	–16.9	522
	–10	–15	–13.5	538	–11.8	536	–9.5	533	–6.6	530
	0	–5	–3.4	546	–1.7	544	0.7	541	3.8	538
	10	5	6.6	557	8.4	555	10.9	551	14.1	547
	20	15	16.7	568	18.5	565	21.1	562	24.4	558
	30	25	26.7	578	28.6	576	31.3	573	34.7	569
	40	35	36.8	589	38.8	587	41.5	584	45.0	580

FIGURE 3A-2

SRL COMPUTER FAILURE (continued)

EGT LIMIT WITH SRL INOPERATIVE
97% RPM – CRUISE POWER (continued)

ALTITUDE (FEET)	Δ ISA (°C)	OAT (°C)	INDICATED/CALIBRATED AIRSPEED (KNOTS) 98/100 IOAT	98/100 EGT	149/150 IOAT	149/150 EGT	199/200 IOAT	199/200 EGT	248/250 IOAT	248/250 EGT
15,000	–30	–45	–43.3	519	–41.5	517	–39.0	514	–35.9	510
	–20	–35	–33.2	524	–31.4	521	–28.8	518	–25.5	514
	–10	–25	–23.2	531	–21.2	528	–18.5	525	–15.2	521
	0	–15	–13.1	538	–11.1	536	–8.3	533	–4.8	529
	10	–5	–3.0	547	–0.9	544	2.0	541	5.6	537
	20	5	7.0	557	9.2	555	12.2	551	16.0	546
	30	15	17.1	568	19.3	566	22.4	561	26.4	557
	40	25	27.2	579	29.5	576	32.7	573	36.8	568
20,000	–30	–55	–52.9	515	–50.9	513	–48.0	509	–44.4	504
	–20	–45	–42.9	519	–40.7	517	–37.7	513	–34.0	508
	–10	–35	–32.8	524	–30.5	522	–27.4	518	23.5	513
	0	–25	–22.7	531	–20.3	529	–17.1	525	–13.0	520
	10	–15	–12.6	539	–10.2	537	–6.8	533	–2.6	529
	20	–5	–2.6	547	0.0	545	3.5	541	7.9	537
	30	5	7.5	558	10.2	555	13.8	551	18.4	–
	40	15	17.6	569	20.3	566	24.1	562	28.8	–
25,000	–30	–64	–62.5	511	–60.1	508	–56.8	504	–52.7	498
	–20	–54	–52.4	516	–49.9	513	–46.9	509	–42.1	503
	–10	–44	–42.4	520	–39.7	517	–36.1	513	–31.5	–
	0	–34	–32.3	525	–29.5	522	–25.7	518	–21.0	–
	10	–24	–22.2	532	–19.3	530	–15.3	526	–10.4	–
	20	–14	–12.1	540	–9.1	537	–4.9	534	0.2	–
	30	–4	–2.0	551	1.2	546	5.4	542	10.7	–
	40	5	8.1	561	11.4	557	15.8	552	21.3	–
30,000	–30	–74	–72.1	507	–69.2	504	–65.4	499	–60.6	–
	–20	–64	–62.0	512	–59.0	509	–54.9	504	–49.9	–
	–10	–54	–51.8	516	–48.7	513	–44.4	508	–39.2	–
	0	–44	–41.7	520	–38.4	518	–34.0	513	–28.5	–
	10	–34	–31.6	525	–28.2	522	–23.5	518	–17.8	–
	20	–24	–21.5	533	–17.9	530	–13.1	526	–7.1	–
	30	–14	–11.4	540	–7.6	538	–2.6	534	3.6	–
	40	–4	–1.3	550	2.6	547	7.8	543	14.3	–

FIGURE 3A-2 (continued)

PREPLANNED ENGINE SHUTDOWN IN FLIGHT

Intentional engine shutdowns and airstarts may be required during crew training and following maintenance or adjustment of the engine or propeller controls. Stresses due to temperature gradients within the engine can be reduced and engine life prolonged if the ENGINE FAILURE DURING FLIGHT procedure is expanded as follows:

WARNING

IN THE EVENT OF AN ACTUAL ENGINE FAILURE OR ENGINE FIRE, IMPLEMENT THE APPROPRIATE EMERGENCY PROCEDURE AS STATED IN SECTION 3 OF THIS MANUAL.

PREPARATION FOR ENGINE SHUTDOWN

*1. Bleed Air Switch (selected engine) .... OFF
*2. Propeller Synchrophaser Switch (if installed) .... TAKEOFF & LANDING
3. Power Lever (selected engine) .... APPROXIMATELY 1/4 INCH FORWARD OF FLIGHT IDLE (UNTIL LANDING GEAR WARNING HORN IS SILENCED)
4. Speed Levers .... 97% RPM

Allow the selected engine to cool and stabilize at low power while accomplishing steps 5, 6 and 7 as applicable. Observe torque and EGT limits on the operating engine.

5. Generators (airplanes modified IAW SB 227 24-015) .... CHECK AMPS

CAUTION

IF THE **GENERATOR** SWITCH IS RESET AND **ON**, GENERATOR **VOLTAGE** IS **OBSERVED**, **GEN FAIL** ANNUNCIATOR LIGHT IS **NOT ILLUMINATED**, AND THE **AMMETER READS ZERO**, THE RESPECTIVE **325** AMPERE **CURRENT LIMITER** IS **OPEN**. THE FAULTY CURRENT LIMITER SHOULD BE REPLACED PRIOR TO FLIGHT.

NOTE

An open current limiter will not prevent an engine restart, but an intentional engine shutdown with an open current limiter is not recommended unless an engine malfunction has been detected.

6. Generator Switch (selected engine) .... OFF
7. Current Limiters (airplanes not modified with SB 227 24-015) .... CHECK (SEE PAGE 2-25)

CAUTION

IF A CURRENT LIMITER HAS FAILED, AN AIRSTART MAY NOT BE POSSIBLE. DO NOT CONTINUE WITH A PREPLANNED ENGINE SHUTDOWN.

PREPLANNED ENGINE SHUTDOWN IN FLIGHT (continued)

ENGINE SHUTDOWN

NOTE

In order to maintain consistency in training and in reaction patterns, this procedure follows the sequence of actions specified in the ENGINE FAILURE DURING FLIGHT procedure contained in Section 3 of this manual. However, certain actions are expanded to permit symmetrical cooling of rotating parts of the engine and to allow extended observation of the functions of engine and propeller components such as the manual fuel shutoff valve, negative torque sensing system, and feathering valve.

1. Engine Stop and Feather Control (selected engine)..........PULL

Pull the control out only to the point where the fuel shutoff valve shuts off the fuel, as indicated by fuel flow dropping to zero. Leave the control in that position for one minute or until RPM decays to approximately 30%. Frequently, RPM will remain above 30% at the end of one minute. Then pull the control full aft to open the feather valve and allow the propeller to feather.

CAUTION

- o DO NOT ALLOW ENGINE TO WINDMILL DURING RPM DECAY LONGER THAN ONE MINUTE
- o DO NOT PERMIT THE INOPERATIVE ENGINE TO WINDMILL IN THE 18% TO 28% RPM RANGE.

2. Engine Clean Up Procedure (selected engine)
   a. Fuel shutoff switch..................................CLOSED
   b. Hydraulic shutoff switch.............................CLOSED
   c. Fuel boost pump switch..................................OFF
   d. Generator switch..OFF
   *e. Bleed air switch.......................................OFF

PREPLANNED ENGINE SHUTDOWN IN FLIGHT (continued)

3. Power Lever (operating engine)....................AS REQUIRED
4. Trim...AS REQUIRED
5. Generator (operating engine)................200 AMPS MAXIMUM
*6. Propeller Synchrophaser Switch
(if installed)..............................TAKEOFF & LANDING
*7. Engine Stop and Feather Control.......................FORWARD
8. Unfeather Test Switch (selected engine)...........AS REQUIRED

Depending upon airspeed and ambient temperature during RPM decay, residual EGT may be above 200°C when the propeller feathers and stops rotation. If the EGT is above 200°C, use the unfeather test switch intermittently to keep the propeller windmilling slowly (up to approximately 10% RPM) until the EGT stabilizes at or below 200°C.

PREPLANNED ENGINE SHUTDOWN IN FLIGHT (continued)

NOTE

- Above approximately 7% windmilling RPM, sufficient oil pressure may be generated to sustain the unfeathering cycle thus increasing RPM toward the 18% to 28% RPM range. Prevent such increases in RPM by pulling the engine stop and feather control full aft and resetting it forward when the propeller feathers.

- Repeated momentary use of the unfeather test switch to cause very slow rotation of the feathered propeller will eventually cause all the oil to be pumped from the oil tank, through the propeller dome, and into the nose case. At very slow rotation speeds, the scavenge pumps will not be able to return the oil from the nose case to the oil tank. Avoid exhausting the oil tank by ensuring that the propeller windmills at no less than 5% RPM. Prior to final feathering when EGT is less than 200°C, allow windmilling RPM to reach approximately 15% to ensure sufficient oil scavenging to provide a source of oil for unfeathering.

- If the supply of oil from the oil tank to the unfeathering pump is exhausted inadvertently, it can be replenished by using the starter test switch to cause rotation and scavenge pump operation. However, since the electrical load on the starter while turning a feathered propeller in flight is unknown and variable, this procedure should not be attempted without realizing that damage to the starter may occur. Observe the starter duty cycle limitations.

- A feathered propeller should not rotate backward at speeds above 115 KIAS. If backward rotation occurs, either increase airspeed or use momentary activation of unfeather pump (engine stop and feather control - forward) to stop backward rotation.

PREPARATION FOR IMMEDIATE AIRSTART

NOTE

Prepositioning controls and switches as follows will shorten the time required to restart the engine should an immediate airstart be required.

*1. Speed Lever....................97% RPM

NOTE

The 97% RPM speed lever position can be attained either by setting this value prior to shutdown or by setting the operating engine speed at 97% RPM and aligning both speed levers.

2. Power Lever..........APPROXIMATELY 1/4 INCH FORWARD OF FLIGHT IDLE (UNTIL LANDING GEAR WARNING HORN IS SILENCED)
*3. Engine Stop and Feather Control..........FORWARD
4. Fuel Shutoff Switch..........OPEN
5. Hydraulic Shutoff Switch..........OPEN
6. Fuel Boost Pump Switch..........ON
7. Generator Switch..........OFF
*8. Bleed Air Switch..........OFF
9. Ignition Mode Switch..........NORMAL
OR
Auto/Cont Ignition Switch..........AUTO

AIRSTART

CAUTION

IF AN ENGINE HAS BEEN SHUT DOWN BECAUSE OF AN OBVIOUS FAILURE, AS INDICATED BY THE ENGINE INSTRUMENTS OR EXCESSIVE VIBRATION, AN AIRSTART SHOULD NOT BE ATTEMPTED.

NOTE

- Satisfactory airstarts have been demonstrated up to 20,000 feet pressure altitude with the fuel boost pumps operating and up to 12,000 feet pressure altitude without the boost pumps operating.
- When airstarting an engine at low airspeeds (100 to 110 KIAS) significant yaw and roll into the starting engine will occur as the engine approaches its on-speed condition. The yaw and roll are barely noticeable during airstarts at speeds above 150 KIAS.

AIRSTART (continued)

*1. Speed Lever .... 97% RPM
2. Power Lever .... APPROXIMATELY 1/4 INCH FORWARD OF FLIGHT IDLE (UNTIL LANDING GEAR WARNING HORN IS SILENCED)
3. EGT .... BELOW 200°C (IF FEASIBLE)
4. RPM .... 10% OR LESS
5. Altitude .... 20,000 FEET MAXIMUM
6. Airspeed .... 100 KIAS TO 180 KIAS
*7. Engine Stop and Feather Control .... FORWARD
8. Fuel Shutoff Switch .... OPEN
9. Hydraulic Shutoff Switch .... OPEN
10. Fuel Boost Pump Switch .... ON
11. Generator Switch .... OFF
*12. Bleed Air Switch .... OFF
13. Ignition Mode Switch .... NORMAL

OR

Auto/Cont Ignition Switch .... AUTO
14. Engine Start Button .... PRESS UNTIL LIGHT-OFF
*15. Propeller .... OBSERVE UNFEATHERING
16. Fuel Flow .... SHOULD START BY 10% RPM
17. EGT .... SHOULD INCREASE AT 10% TO 20% RPM. IF NOT INCREASING BY 25% RPM, ABORT AIRSTART BY PULLING ENGINE STOP AND FEATHER CONTROL
18. Engine Start Button .... RELEASE WHEN EGT STARTS TO RISE

NOTE

During airstarts following prolonged feathered flight at cold outside air temperatures (oil temperature cooled to below +25°C), increased starting fuel may be required. Depress the start button as required to maintain normal EGT and engine acceleration during airstarts of cold-soaked engines.

19. Fuel and Oil Pressure .... GREEN ARC
20. Generator Switch .... RESET/ON
*21. Bleed Air Switch .... ON

NOTE

If the engine fails to accelerate within the 18% to 28% RPM range, feather the propeller by pulling the engine stop and feather control full aft. Use the unfeather test switch as in ENGINE SHUTDOWN step 8 to keep the propeller rotating for a minimum of 5 minutes. Attempt a second airstart. If this airstart is unsuccessful, a single engine landing should be planned since further airstart attempts could damage the engine.

AIRSTART PROCEDURE WITH SRL COMPUTER INOPERATIVE

Two three-position speed switch select switches, located on the left cockpit console, are provided to permit airstarts with the SRL computer inoperative. These switches bypass the normally automatic engine speed functions controlled by the SRL computer that are required during start. The switch positions are AUTO, OFF, and MANUAL. The airstart procedure with SRL computer inoperative is the same as the normal airstart procedure except for the denoted changes below as indicated by the small letter “a” and double asterisks.

*1. Speed Lever .... 97% RPM
2. Power Lever .... APPROXIMATELY 1/4 INCH FORWARD OF FLIGHT IDLE (UNTIL LANDING GEAR WARNING HORN IS SILENCED)
3. EGT .... BELOW 200^{o}C (IF FEASIBLE)
4. RPM .... 10% OR LESS
5. Altitude .... 20,000 FEET MAXIMUM
6. Airspeed .... 100 KIAS TO 180 KIAS
*7. Engine Stop and Feather Control .... FORWARD
8. Fuel Shutoff Switch .... OPEN
9. Hydraulic Shutoff Switch .... OPEN
10. Fuel Boost Pump Switch .... ON
11. Generator Switch .... OFF
*12. Bleed Air Switch .... OFF
   **a. Speed switch select switch .... MANUAL
13. Ignition Mode Switch .... NORMAL

    OR

    Auto/Cont Ignition Switch .... AUTO
14. Engine Start Button .... PRESS MOMENTARILY
*15. Propeller .... OBSERVE UNFEATHERING
16. Fuel Flow .... SHOULD START BY 10% RPM
17. EGT .... SHOULD INCREASE AT 10% TO 20% RPM. IF NOT INCREASING BY 25% RPM, ABORT AIRSTART BY PULLING ENGINE STOP AND FEATHER CONTROL
18. Engine Start Button .... OBSERVE EGT AND RPM ACCELERATION. USE START BUTTON AS REQUIRED TO PROVIDE FUEL ENRICHMENT BETWEEN 10% AND 60% RPM

NOTE

During airstarts following prolonged feathered flight at cold outside air temperatures (oil temperature cooled to below +25^{o}C), increased starting fuel may be required. Depress the start button as required to maintain normal EGT and engine acceleration during airstarts of cold-soaked engines.

AIRSTART PROCEDURE WITH SRL COMPUTER INOPERATIVE (continued)

19. Fuel and Oil Pressure .... GREEN ARC
    **a. Speed switch select switch .... AUTO/CHECK IGNITION LIGHT GOES OUT
20. Generator Switch .... RESET/ON
*21. Bleed Air Switch .... ON

ABORTED AIRSTART (DUE TO NO COMBUSTION)

1. Engine Stop and Feather Control .... PULL
2. Altitude .... REDUCE BEFORE ATTEMPTING ANOTHER START

PRESSURIZATION/AIR CONDITIONING SYSTEM MALFUNCTIONS

COLD AIR

Warm or hot air flowing from cold air outlets could be caused by an air cooling turbine failure or by a malfunctioning water separator anti-icing modulator valve. If warm air exits from cold air outlets, isolate the source of the malfunction by turning off bleed air from the engine on the side of the aircraft which is producing the warm air.

CONDITIONED AIR

If the automatic temperature controller fails to respond to commanded temperature changes, switch to manual control of the hot air mixing valves. Modulate travel of the valves by selecting colder or warmer temperatures with two to three-second pulses. Although the mixing valves will travel from full hot to full cold in approximately eight seconds, several minutes may be required before the conditioned air temperature stabilizes following manual changes to the position of the mixing valve.

UNPRESSURIZED FLIGHT

1. Cabin Dump Switch .... DUMP
*2. Bleed Air Switches .... AS DESIRED

WARNING

WHEN THE AIRPLANE IS UNPRESSURIZED, THE PASSENGER ENTRANCE DOOR SAFETY LOCK WILL NOT BE ENGAGED, AND IT WILL BE POSSIBLE TO OPEN THE DOOR IN FLIGHT.

HIGH OIL TEMPERATURE

Elevated oil temperatures (in the caution range) on the ground are common with high ambient temperatures. If the maximum oil temperature limit is exceeded, do not takeoff.

In flight, high oil temperature can be an indication of low oil quantity or impending engine failure. If the oil temperature exceeds the maximum limit in flight, reduce power on the affected engine. If the oil temperature remains out of limits and there are any other indications of pending engine failure, the engine should be shutdown.

TABLE OF CONTENTS
PERFORMANCE

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PART A – INTRODUCTION

CONTENTS

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INTRODUCTION

This section has been sub-divided into tabbed parts in order to assist the operator in solving his performance problems, particularly those associated with takeoff and landing distances and permissible operating weights. Note that some runway performance is affected by the type of brakes installed. In those cases, appropriate charts are presented for both B.F. Goodrich Single Rotor Brakes and Goodyear Aerospace Dual Rotor Brakes. Be sure to use the chart(s) applicable to the brakes installed on your aircraft. The performance information in this section has been FAA approved.

Part B provides standard reference data which affect all weights.

Parts C, D, and E show takeoff performance data separated into three parts by power setting to be used.

Part F provides data regarding en route climb performance.

Part G provides FAA approved data for landing performance determination.

Part H provides FAA approved procedures for reduced power takeoffs. Air Carrier or Air Taxi commercial operators must have prior approval of the cognizant FAA inspector to use these procedures.

Typically, sufficient information is provided on each chart to acquaint the user with the conditions and procedures upon which the data are based. Examples and chase-around arrows are provided when appropriate.

All performance information in this section that is dependent upon engine power includes the effects of temperature, altitude, engine accessory loads, and installation losses. OAT's noted in performance charts are true temperatures (indicated OAT's corrected for the ram rise and position error given in Figure 4-2). IOAT's obtained when parked or taxiing may not be accurate, particularly when operating from surfaces which have strong radiation characteristics. Wind effect lines on takeoff and landing distance charts account for 150% of reported tailwinds and 50% of reported headwinds. Therefore, those charts may be entered using reported headwind or tailwind velocity.

The generator loads shown in Associated Conditions tables are total loads being used by aircraft systems. Performance degradations due to generator loads have been included in appropriate figures and are assumed to be shared equally when both engines are operating and by the operating engine when one has failed. The effects of reduced power due to bleed air extraction for operation of pressurization and anti-ice systems have been included where applicable. The operating status of the bleed air systems is noted on the appropriate charts. The takeoff power check charts may be used to verify minimum engine power output equivalent to that used in preparation of the performance charts. The torque setting on the Takeoff Power Check Charts must be available without exceeding the 650^{o}C EGT limit.

NOTE

> The data provided in this section do not include those required when the aircraft is to be operated in accordance with ICAO Annex 8 rules. Refer to AFM Supplement B-1 when operating under ICAO Annex 8 rules.

OPERATING WEIGHT LIMITATIONS

The Operating Weight Limitations from Section 1 are repeated below:

1. When operating rules require, and/or when operating at weights above 12,500 pounds, the limitations listed below apply.

   a. The maximum takeoff weight may not exceed the lower of the following:

      (1) The weight at which the single engine takeoff climb requirements are met (Figure 4-19, 4-29 or 4-39).

      (2) The weight at which the accelerate-stop distance (Figure 4-22, 4-23, 4-32, 4-33, 4-42 or 4-43) or the two-engine takeoff distance (Figure 4-26, 4-36 or 4-46), whichever is longest, equals the available runway length.

      (3) The weight at which the maximum ground speed during takeoff operations is equal to the tire ground speed limit:

      Nose Wheel Tires
      B.F. Goodrich P/N 021-611, See Figure 4-16

      Main Wheel Tires
      B.F. Goodrich P/N 021-335, See Figure 4-17

NOTE

For all other approved tires, the corresponding tire ground speed limits will not be exceeded if the aircraft is operated in accordance with the maximum takeoff weight limitation charts (Figure 4-19, 4-29, or 4-39).

   b. The maximum landing weight may not exceed the lower of the following:

      (1) The weight at which the balked landing climb requirement is met (Figure 4-53 or 4-54).

      (2) The weight at which the required field length (Figure 4-56 or 4-57) equals the landing runway length.

      (3) The weight at which the landing brake energy limit is reached (Figure 4-58 or 4-59).

OPERATING WEIGHT LIMITATIONS (continued)

2. When operating at takeoff weights at or below 12,500 pounds the limitations listed below apply.

   a. When configured to carry 10 or more passengers (excluding any crew seat):

      (1) The maximum takeoff weight may not exceed the lower of the following:

         (a) The weight at which the single engine takeoff climb requirements are met (Figure 4-19 or 4-29). Limit is 12,500 pounds with wet takeoff power for all temperatures, sea level to 10,000 feet.

         (b) The weight at which the accelerate-slow distance (Figure 4-20, 4-21, 4-30, 4-31, 4-40 or 4-41) or the two-engine takeoff distance (Figure 4-26, 4-36 or 4-46), whichever is longest, equals the available runway length.

         (c) The weight at which the maximum ground speed during takeoff operations is equal to the tire ground speed limit:

         Nose Wheel Tires
         B.F. Goodrich P/N 021-611, See Figure 4-16

         Main Wheel Tires
         B.F. Goodrich P/N 021-335, see Figure 4-17

NOTE

For all other approved tires, the corresponding tire ground speed limits will not be exceeded if the aircraft is operated at or below 12,500 pounds and in accordance with the applicable performance data in Section 4.

      (2) The maximum landing weight may not exceed the lower of the following:

         (a) The weight at which the balked landing climb requirement is met (Figure 4-53 or 4-54).

         (b) The weight at which the required field length (Figure 4-56 or 4-57) equals the available landing runway length.

         (c) The weight at which the landing brake energy limit is reached (Figure 4-58 or 4-59).

OPERATING WEIGHT LIMITATIONS (continued)

b. When configured to carry 9 or fewer passengers (excluding any crew seat):

(1) The maximum takeoff weight may not exceed the lower of the following:

(a) The weight at which the two engine takeoff distance (Figure 4-26, 4-36, or 4-46) equals the available runway length.

(b) The weight at which the maximum ground speed during takeoff operations is equal to the tire ground speed limit.

Nose wheel tires
B.F. Goodrich P/N 021-611, See Figure 4-16

Main wheel tires
B.F. Goodrich P/N 021-335, See Figure 4-17

NOTE

For all other approved tires, the corresponding tire ground speed limits will not be exceeded if the aircraft is operated in accordance with the maximum takeoff weight limitation charts (Figure 4-19, 4-29, or 4-39).

(2) The maximum landing weight may not exceed the weight at which the landing brake energy limit is reached (Figures 4-58 or 4-59).

NOTE

- The operating rules may require the use of factored landing distances in determining the minimum runway lengths required. The distances shown in Figures 4-56 and 4-57 are not factored.

- Do not exceed performance weight limitations shown in this section nor structural weight limitations shown in Section 1 and repeated below:

Max Ramp Weight............... 14,600 pounds
Max Takeoff Weight .... 14,500 pounds
Max Landing Weight .... 14,000 pounds

DEFINITIONS

PRESSURE ALTITUDE	Altitude determined with the altimeter set at 29.92 inches Hg. Assume no instrument error.
ISA	International Standard Atmosphere (15^{o}C at sea level with approximately 2^{o}C per 1,000 feet lapse rate).
IOAT	Indicated outside air temperature. Assumes no instrument error.
KIAS	Indicated airspeed in knots. Assumes no instrument error.
KCAS	Calibrated airspeed in knots. Indicated airspeed corrected for position error.
KTAS	True airspeed in knots.
EGT	Exhaust Gas Temperature. The single red line (SRL) computer is assumed to be operating except as noted on the charts.
REFERENCE EGT	Reference EGT is the EGT obtained when the required engine torque is set in accordance with the appropriate takeoff power check chart and must not exceed 650^{o}C.
DRY POWER	Normal engine power without alcohol water injection.
WET POWER	Engine power with alcohol water injection.

DEFINITIONS (continued)

TAKEOFF POWER	Defined as the power available at reference EGT or 100% torque (3,301 foot-pounds) dry, or 110% torque (3,631 foot-pounds) wet, whichever occurs first, at 100% RPM, including ram air effects.
MAXIMUM CONTINUOUS POWER	Defined as the power available at reference EGT or 100% torque (3,301 foot-pounds), whichever occurs first, at 100% RPM and without CAWI.
TAKEOFF WEIGHT	Aircraft gross weight at brake release when beginning takeoff roll.
V_{MCA}	Minimum control speed in flight. Assumes one engine in negative torque sensing (NTS) mode and the other engine at takeoff power.
V_{S1}	Stall speed in a specified configuration.
V_1	Takeoff Decision Speed in knots (Figure 4-15). V_1 is the airspeed on the ground at which, as a result of engine failure or other reasons, the pilot is assumed to have made a decision to continue or discontinue the takeoff.
V_R	Rotate speed. Rotation is initiated at V_1 for all FAA takeoff performance.
V_2	Takeoff safety speed at 50 foot height with one engine inoperative.
V_{50}	Takeoff speed at 50 foot height with both engines operating.
SINGLE ENGINE TAKEOFF FLIGHT PATH DISTANCE TO 50 FEET	The distance required to accelerate on the runway, experience failure of one engine at or just before V_1, recognize the failure at V_1, rotate at V_1, continue the takeoff with the remaining engine, and achieve 50 feet above the runway surface at V_2.
NET CLIMB GRADIENT	Demonstrated climb gradient minus 0.8%.

TECHNIQUE

The takeoff and landing performance presented in this section is based on flight tests which were conducted as follows. The user should obtain equal performance by following the same procedures.

ENGINE POWER SETTINGS

Before brakes were released for takeoff performance tests, engine power was set to the torque values determined from the appropriate Takeoff Power Check Chart (Dry – Bleed Air On or Off, or Wet). Those check charts are provided in Parts C, D or E, respectively. Note that when torque limited, static torque was set at 97% (Dry) or 107% (Wet) to avoid exceeding torque limits during the takeoff roll. Power settings were not changed after brake release until after either achieving V_{YSE} for continued takeoff, or V_1 for aborted takeoffs. Torque increases due to ram rise, up to the torque limit, were accepted.

TWO ENGINE TAKEOFF DISTANCE TO 50 FOOT HEIGHT

Prior to brake release, takeoff power was set according to the appropriate Takeoff Power Check Chart. When power was stabilized, the brakes were released and the aircraft was allowed to accelerate. Nose wheel steering was not used during the takeoff roll but may be used as desired. At V_1 the aircraft was rotated to takeoff attitude (approximately 10^o to 15^o nose up) and the airspeed was increased from V_1 to V_{50} during the climb to 50 foot height. The landing gear was retracted after takeoff. V_{50} was achieved at the 50 foot height.

DISTANCE TO ACCELERATE TO V_1 AND STOP – B.F. GOODRICH SINGLE ROTOR BRAKES

Prior to brake release, takeoff power was set according to the appropriate Takeoff Power Check Chart. When power was stabilized, the brakes were released and the aircraft was allowed to accelerate. The engine failure, which occurred just prior to V_1, was recognized at the takeoff decision speed, V_1, and the power levers were retarded to ground idle. Maximum braking was then applied. Nose wheel steering was not used to assist in directional control but may be used as desired. Reverse power was not used; however, shorter distances should be obtained by use of reverse power as directional control permits.

DISTANCE TO ACCELERATE TO V_1 AND STOP – GOODYEAR AEROSPACE DUAL ROTOR BRAKES

Prior to brake release, takeoff power was set according to the appropriate Takeoff Power Check Chart. When power was stabilized, the brakes were released and the aircraft was allowed to accelerate. The engine failure, which occurred just prior to V_1, was recognized at the takeoff decision speed, V_1, and the power levers were retarded to flight idle. Maximum braking was then applied and the power levers were retarded to ground idle. Nose wheel steering was not used to assist in directional control but may be used as desired. Reverse power was not used; however, shorter distances should be obtained by use of reverse power as directional control permits.

TECHNIQUE (continued)

SINGLE ENGINE TAKEOFF FLIGHT PATH DISTANCE TO 50 FOOT HEIGHT

Prior to brake release, takeoff power was set according to the appropriate Takeoff Power Check Chart. When power was stabilized, the brakes were released and the aircraft was allowed to accelerate. The engine failure was recognized at V_1, the aircraft was rotated to takeoff attitude (approximately 10^o nose up), and an accelerating climb was continued to 50 foot height. The landing gear was retracted after the aircraft was clear of the ground. Nose wheel steering was not used during the takeoff roll but may be used as desired. Trim and engine power settings were not changed during this phase.

LANDING DISTANCE OVER 50 FOOT HEIGHT – B.F. GOODRICH SINGLE ROTOR BRAKES

A single engine flight idle approach was made at 1.3 V_{SO} with gear and flaps down. The landing was made with minimum flare. After touchdown, the power lever of the operating engine was retarded to ground idle and maximum braking was used until the aircraft came to a complete stop. The propeller on the inoperative engine was feathered during the entire approach and landing. Reverse power was not used. Nose wheel steering was not used during the tests but may be used as desired.

LANDING DISTANCE OVER 50 FOOT HEIGHT – GOODYEAR AEROSPACE DUAL ROTOR BRAKES

Power on both engines was set to maintain a stabilized 3^o approach at the approach speed with gear and flaps down. At 50 feet above the runway, the power was reduced to flight idle and the aircraft was landed with minimum flare. After touchdown, both power levers were retarded to ground idle and maximum braking was used until the aircraft came to a complete stop. Reverse power was not used. Shorter landing distance may be obtained by using reverse power. Nose wheel steering was not used during the tests but may be used as desired.

PART B – STANDARD REFERENCE DATA

CONTENTS

ITEM PAGE

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FLYOVER NOISE LEVELS

Flyover noise level measured in accordance with Appendix F to FAR 36 is 74.8 dB(A).

NOTE

No determination has been made by the Federal Aviation Administration that the noise levels of this aircraft are or should be acceptable for operation at, into, or out of any airport.

FUEL VENTING AND EXHAUST EMISSIONS

This airplane complies with SFAR 27, "Fuel Venting and Exhaust Emissions Requirements for Turbine Engine Powered Airplanes", which is equivalent to FAR PART 34, effective September 10, 1990.

WIND COMPONENT CHART

EXAMPLE:

GIVEN: WIND VELOCITY = 25 KNOTS
AT 40° OFF RUNWAY HEADING
OBTAIN: HEADWIND COMPONENT = 19 KNOTS
CROSSWIND COMPONENT = 16 KNOTS

NOTE
DEMONSTRATED CROSSWIND COMPONENT IS 20 KNOTS.

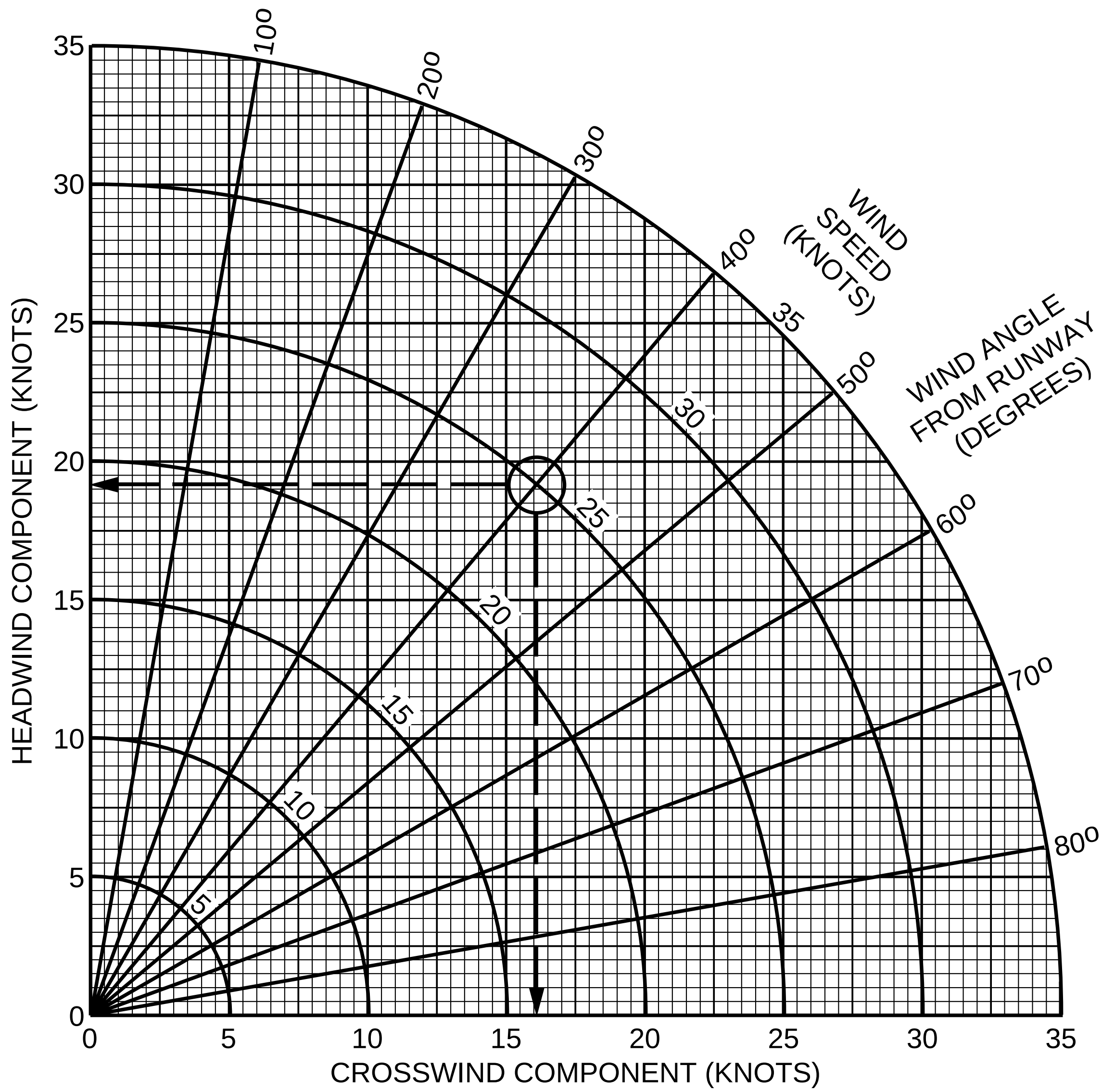


FIGURE 4-1

COMPRESSIBILITY AND POSITION ERROR CORRECTION TO INDICATED OUTSIDE AIR TEMPERATURE (IOAT)

EXAMPLE:

GIVEN: AIRSPEED = 200 KIAS
PRESSURE ALTITUDE = 15,000 FEET
IOAT = −10°C

OBTAIN: ΔT = −6.5°C
OAT = IOAT +ΔT
= −10 + (−6.5)
= −16.5°C

NOTE

- TEMPERATURE RISE IS SHOWN FOR STANDARD DAY AMBIENT TEMPERATURES. FOR AMBIENT TEMPERATURES WITHIN ±40°C OF STANDARD, THE TEMPERATURE RISE MAY VARY BY AS MUCH AS ±2.5°C FROM THAT SHOWN.
- IOAT NOTED WHEN PARKED OR TAXIING MAY NOT BE ACCURATE.

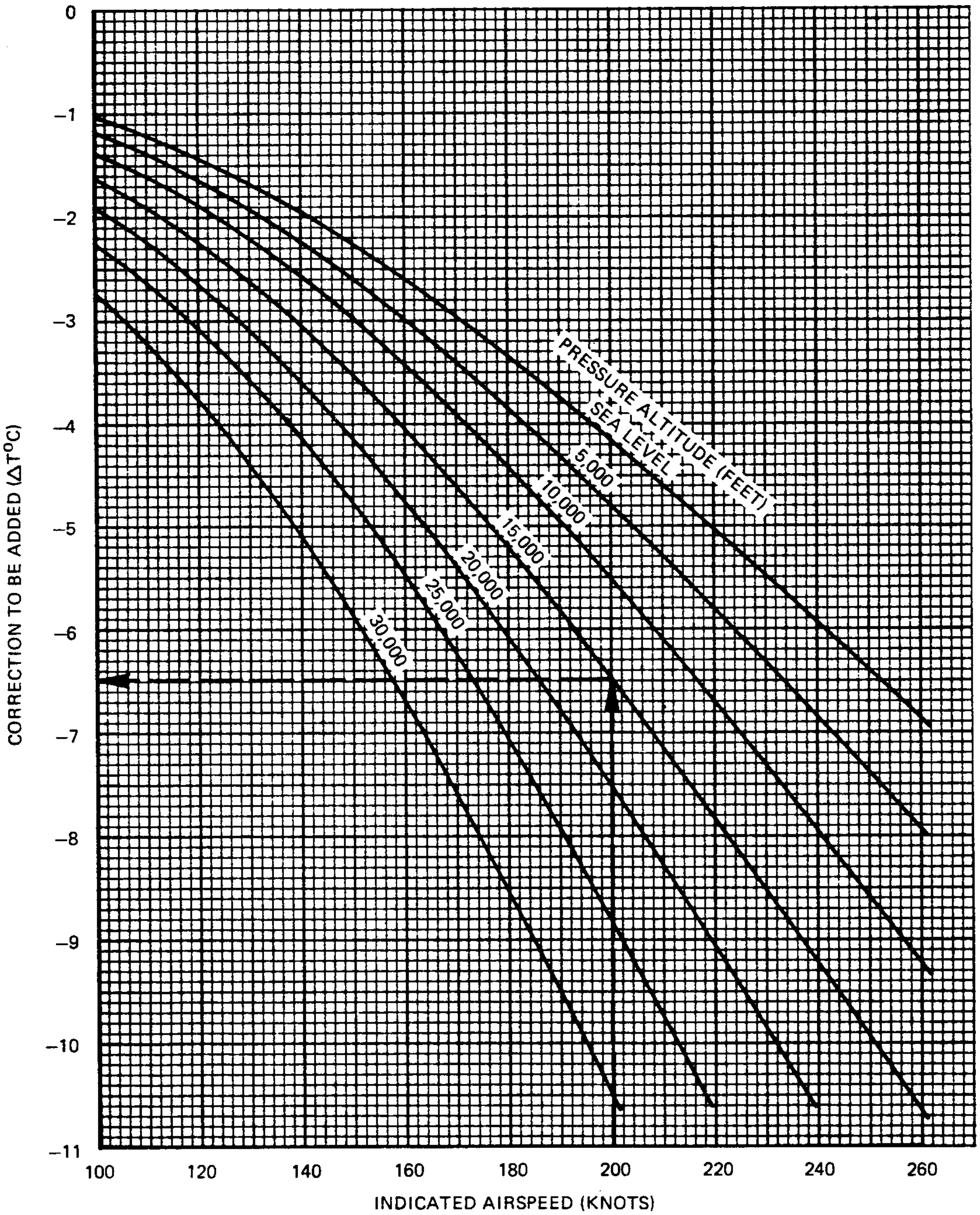


FIGURE 4-2

RELATIONSHIP OF OUTSIDE AIR TEMPERATURE TO ISA TEMPERATURE

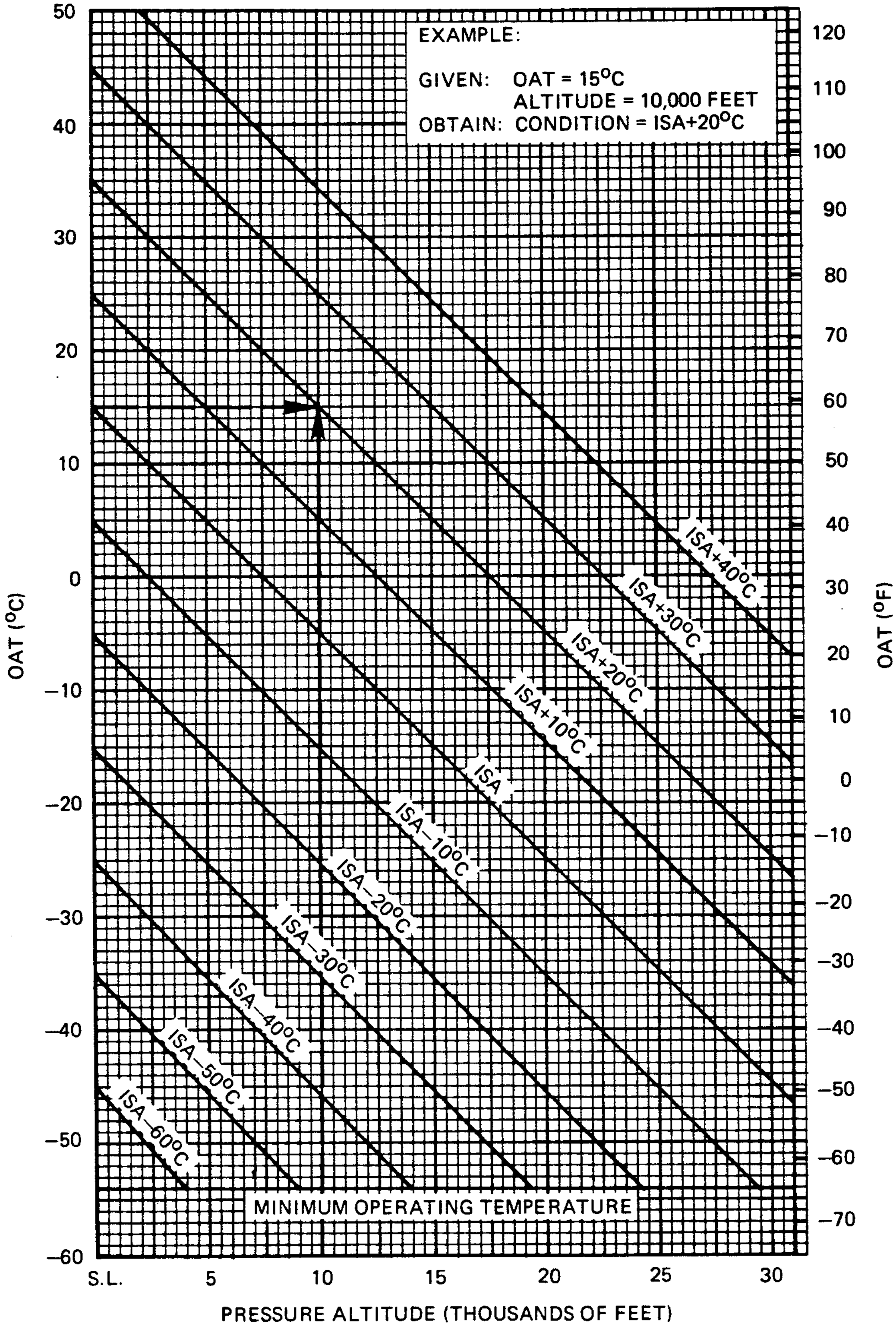


FIGURE 4-3

AIRSPEED CALIBRATION - NORMAL SYSTEM
GEAR UP, FLAPS UP OR 1/4

EXAMPLE:

GIVEN: INDICATED AIRSPEED = 180 KIAS
OBTAIN: CALIBRATED AIRSPEED = 181 KCAS

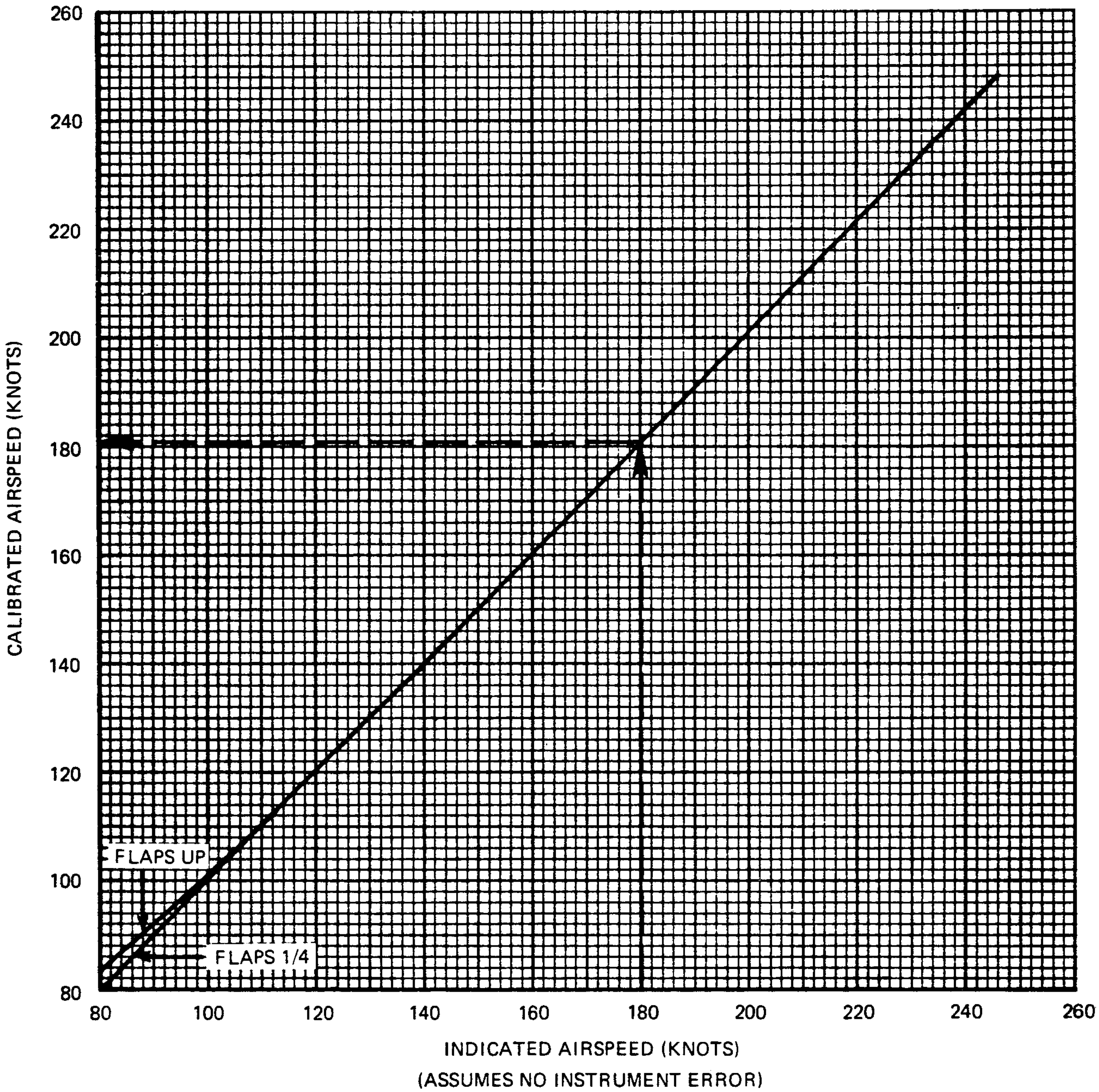


FIGURE 4-4

AIRSPEED CALIBRATION - NORMAL SYSTEM
GEAR DOWN, FLAPS UP

EXAMPLE:

GIVEN: INDICATED AIRSPEED = 140 KIAS
OBTAIN: CALIBRATED AIRSPEED = 143 KCAS

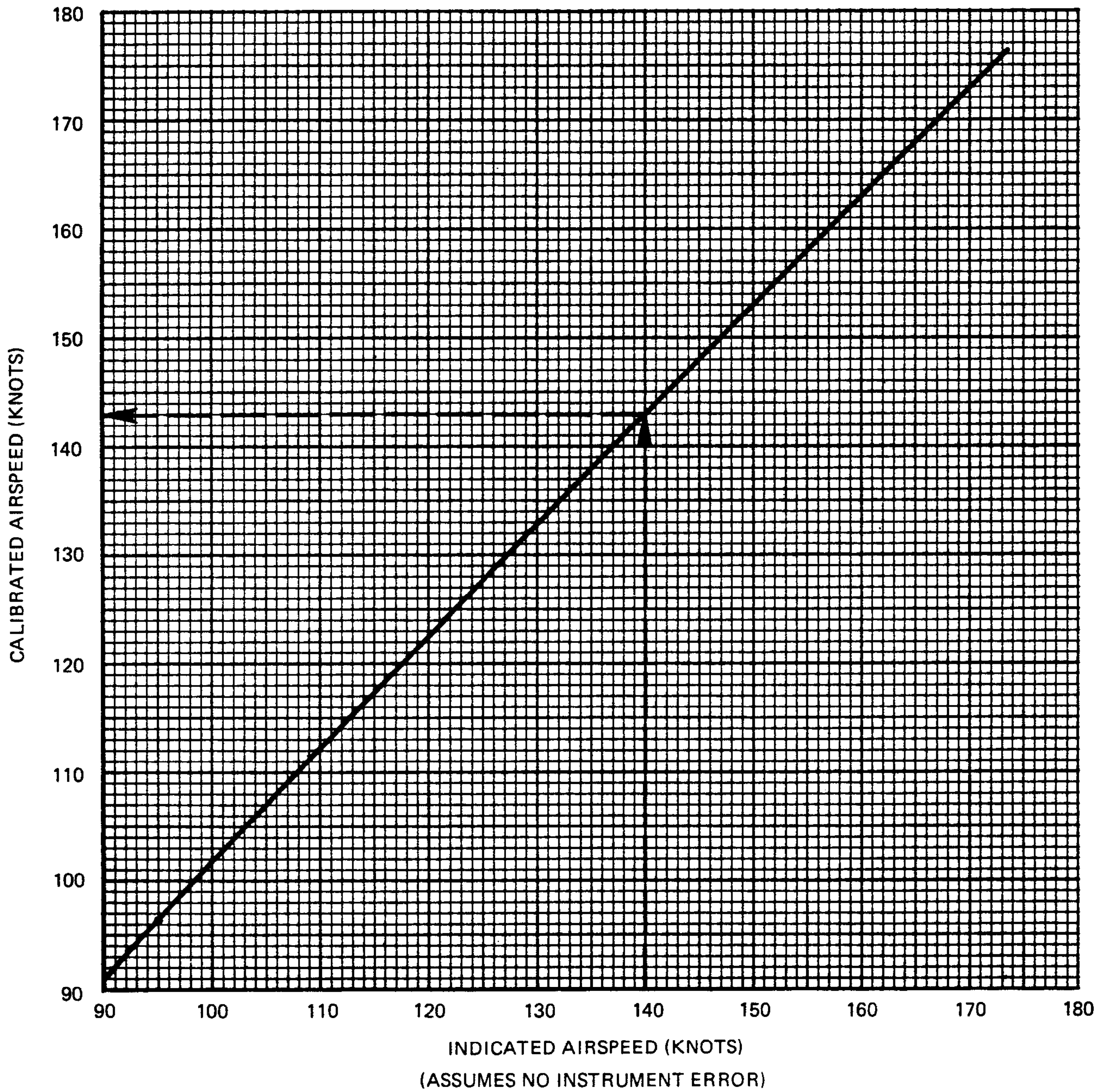


FIGURE 4-5

AIRSPEED CALIBRATION - NORMAL SYSTEM
GEAR DOWN, FLAPS 1/4 OR 1/2

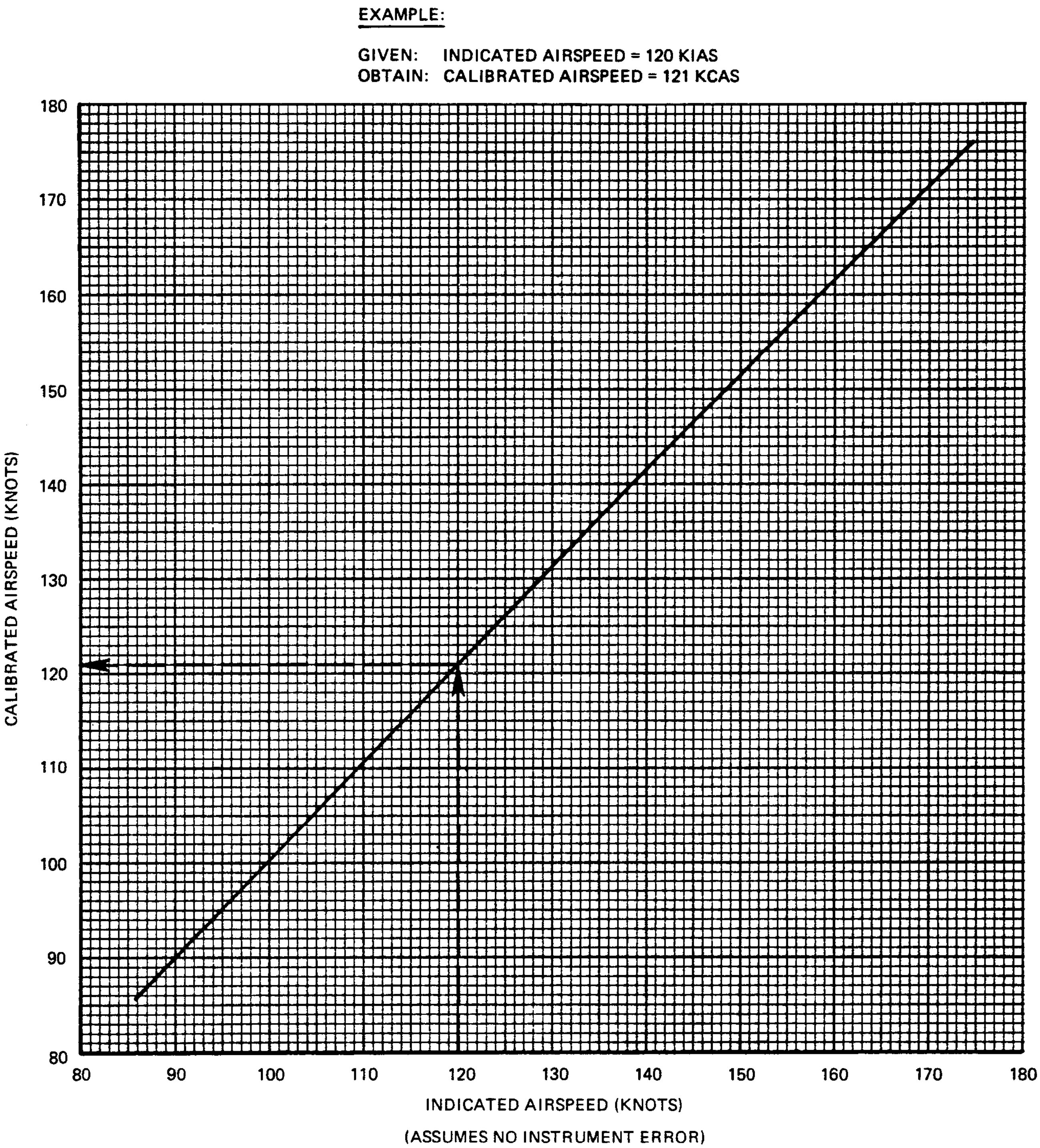


FIGURE 4-6

AIRSPEED CALIBRATION - NORMAL SYSTEM
GEAR DOWN, FLAPS DOWN

EXAMPLE:

GIVEN: INDICATED AIRSPEED = 120 KIAS
OBTAIN: CALIBRATED AIRSPEED = 120 KCAS

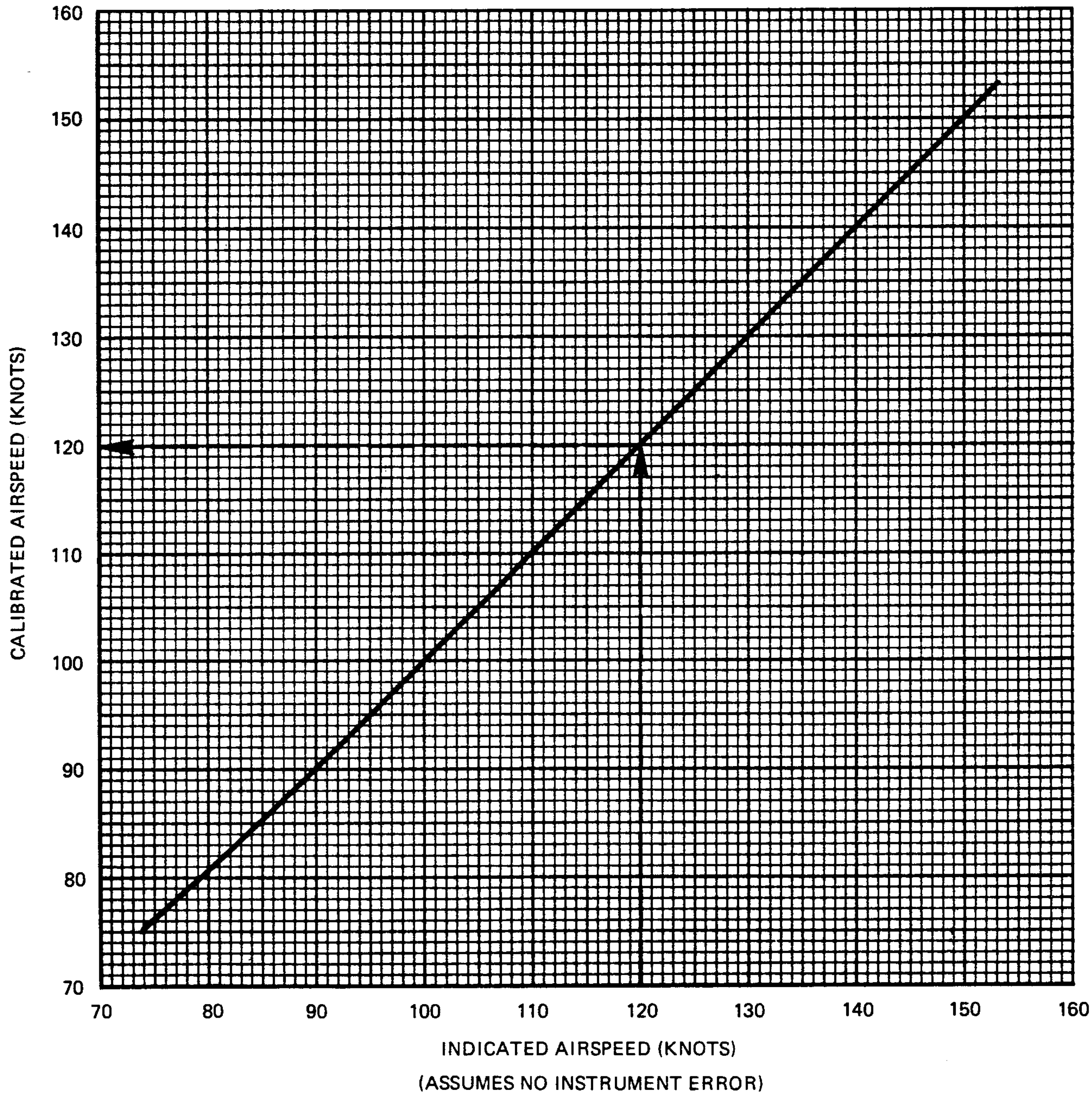


FIGURE 4-7

AIRSPEED CALIBRATION - FOR GROUND OPERATION - NORMAL SYSTEM
GEAR DOWN, FLAPS 1/4

EXAMPLE:

GIVEN: INDICATED AIRSPEED = 88 KIAS
OBTAIN: CALIBRATED AIRSPEED = 85 KCAS

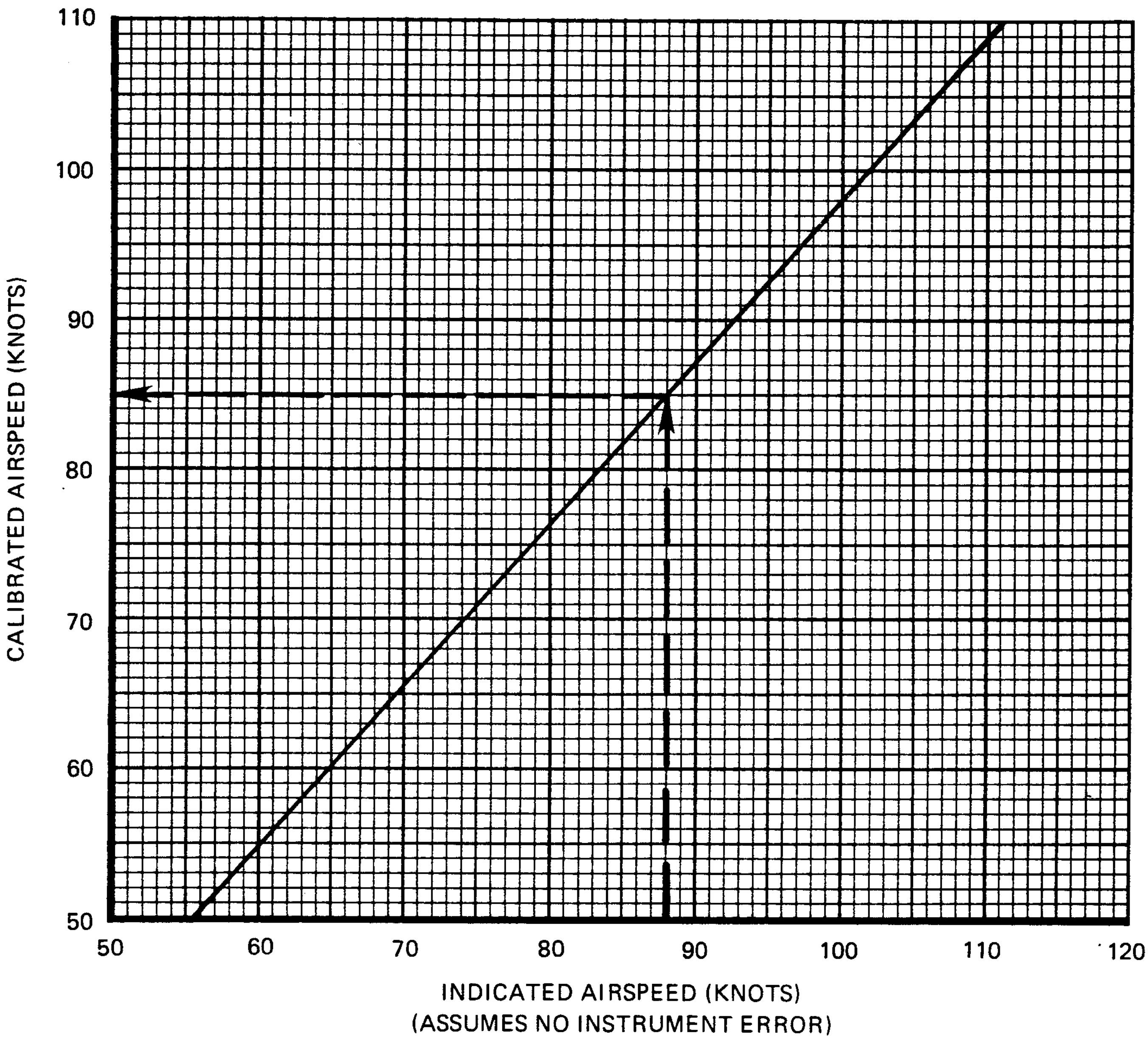


FIGURE 4-8

ALTIMETER CORRECTION - NORMAL SYSTEM

PILOT AND COPILOT SYSTEMS

NOTE

The altimeter correction is less than plus or minus 20 feet in all configurations, throughout the normal operating range of airspeeds.

AIRSPEED CALIBRATION - ALTERNATE SYSTEM
GEAR UP, FLAPS UP

EXAMPLE:

GIVEN: INDICATED AIRSPEED = 170 KIAS
OBTAIN: CALIBRATED AIRSPEED = 168 KCAS

CAUTION

- DO NOT DUMP PRESSURIZATION WHEN USING THE ALTERNATE STATIC SOURCE.
- THE AIRSPEED CORRECTION GIVEN IS NOT VALID IF THE DUMP VALVE IS OPEN.

NOTE

THE COPILOT'S STATIC PRESSURE INSTRUMENTS ARE NOT CONNECTED TO THE ALTERNATE STATIC SOURCE.

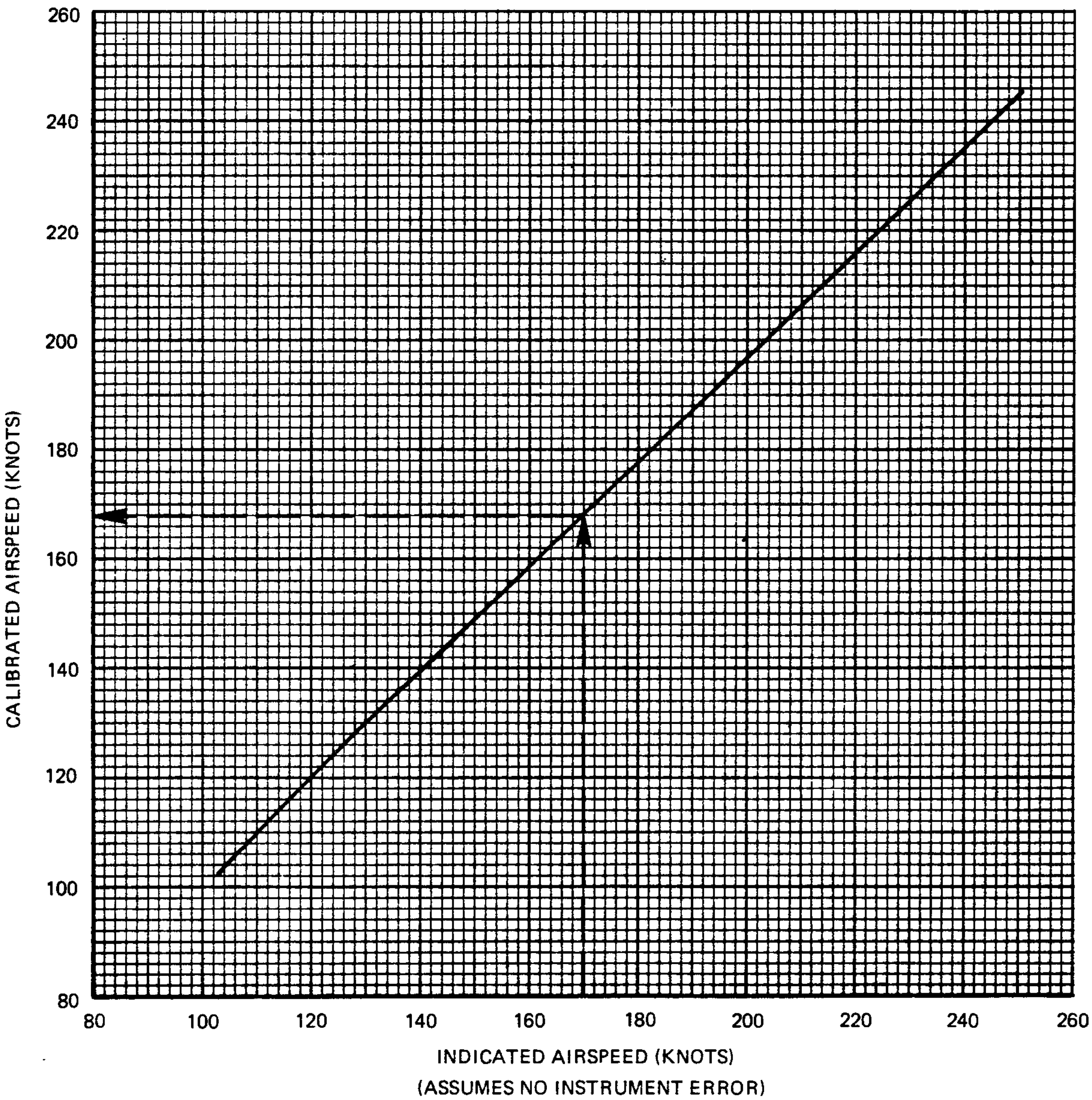


FIGURE 4-9

AIRSPEED CALIBRATION - ALTERNATE SYSTEM
GEAR DOWN, FLAPS UP

EXAMPLE:

GIVEN: INDICATED AIRSPEED = 140 KIAS
OBTAIN: CALIBRATED AIRSPEED = 145 KCAS

CAUTION

- DO NOT DUMP PRESSURIZATION WHEN USING THE ALTERNATE STATIC SOURCE.
- THE AIRSPEED CORRECTION GIVEN IS NOT VALID IF THE DUMP VALVE IS OPEN.

NOTE

THE COPILOT'S STATIC PRESSURE INSTRUMENTS ARE NOT CONNECTED TO THE ALTERNATE STATIC SOURCE.

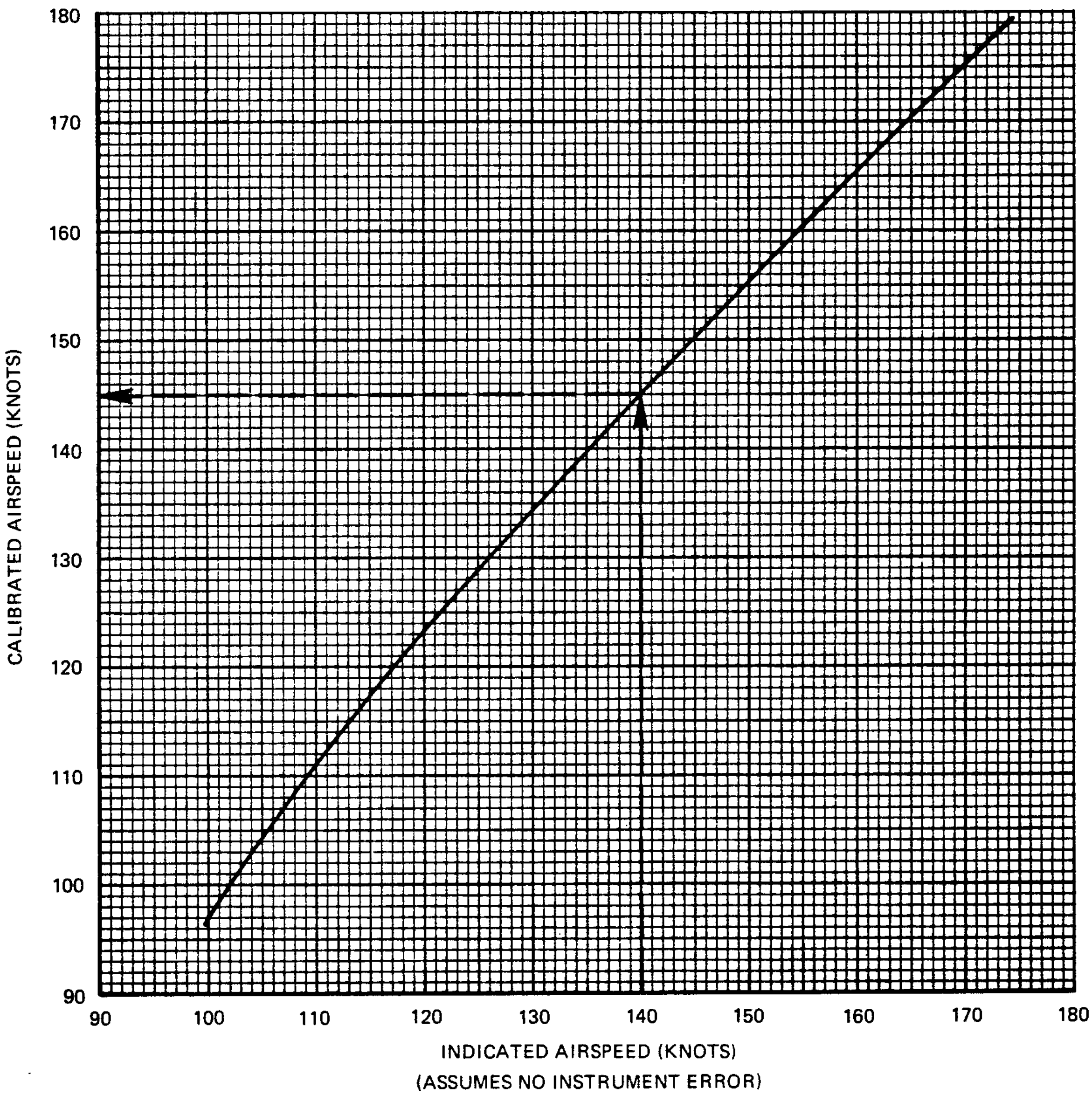


FIGURE 4-10

AIRSPEED CALIBRATION - ALTERNATE SYSTEM
GEAR DOWN, FLAPS 1/4, 1/2, OR DOWN

EXAMPLE:

GIVEN: INDICATED AIRSPEED = 130 KIAS
OBTAIN: CALIBRATED AIRSPEED = 133 KCAS

CAUTION

- DO NOT DUMP PRESSURIZATION WHEN USING THE ALTERNATE STATIC SOURCE.
- THE AIRSPEED CORRECTION GIVEN IS NOT VALID IF THE DUMP VALVE IS OPEN.

NOTE

THE COPILOT'S STATIC PRESSURE INSTRUMENTS ARE NOT CONNECTED TO THE ALTERNATE STATIC SOURCE.

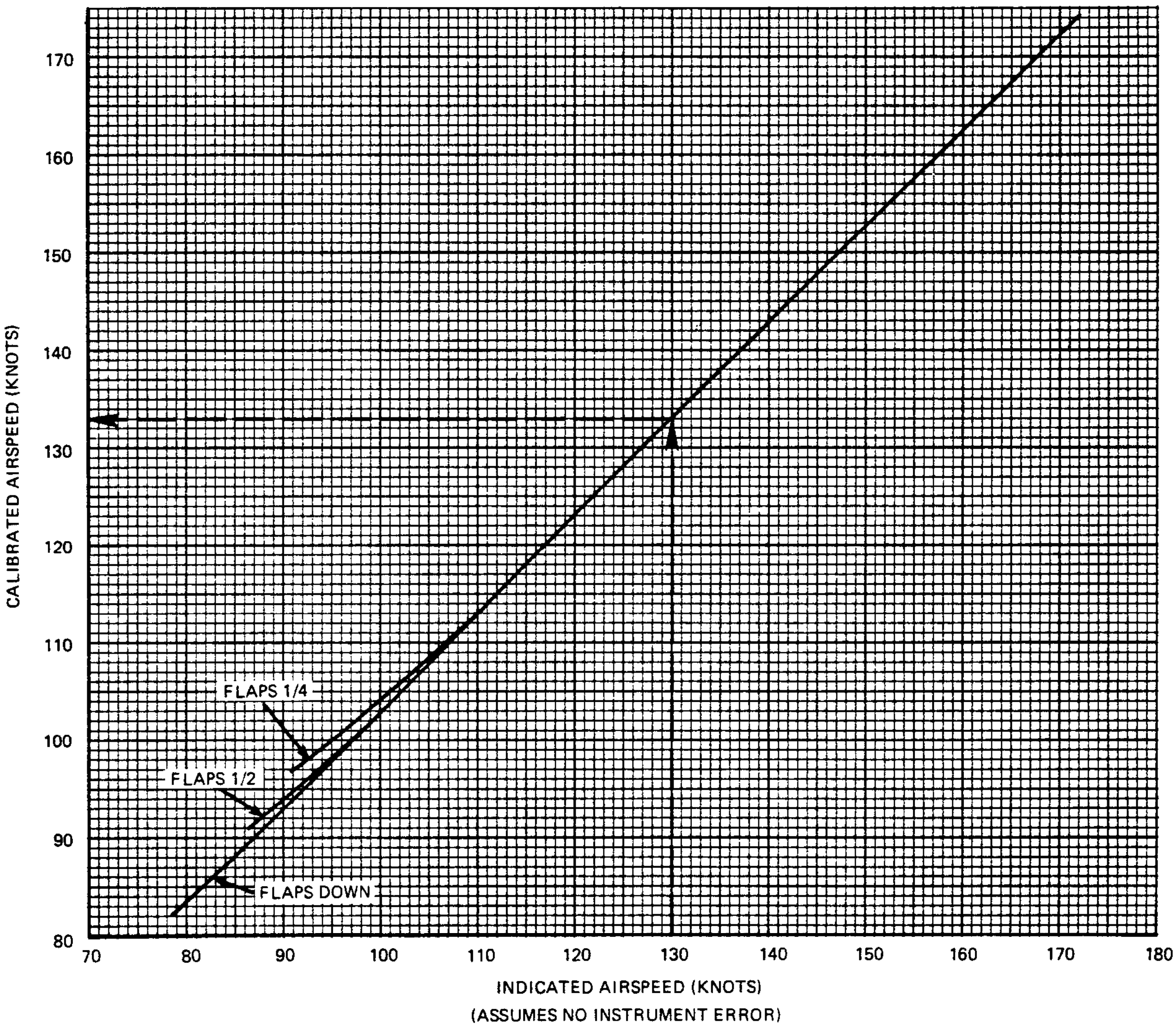


FIGURE 4-11

ALTIMETER CORRECTION - ALTERNATE SYSTEM
GEAR UP OR DOWN, FLAPS UP

EXAMPLE:

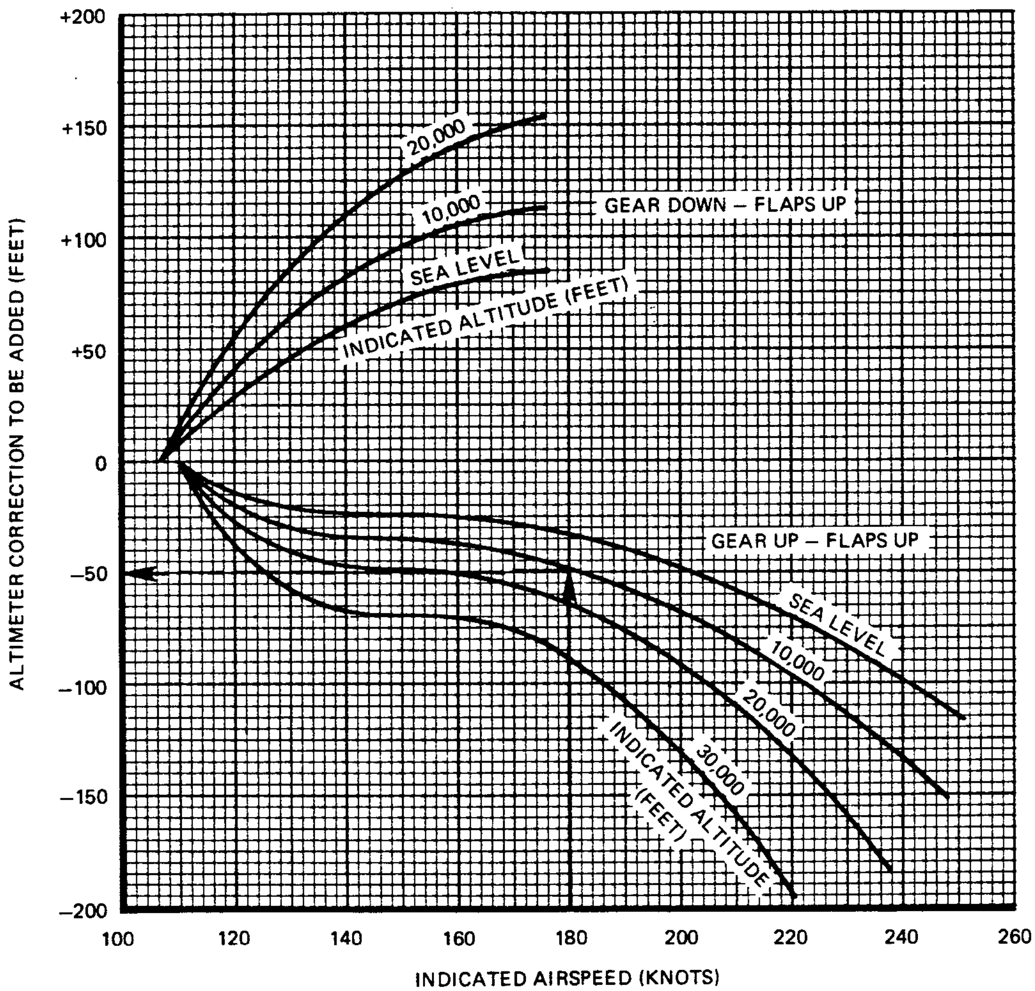
GIVEN: GEAR UP, FLAPS UP
INDICATED AIRSPEED = 180 KNOTS
INDICATED ALTITUDE = 10,000 FEET
OBTAIN: CORRECTED ALTITUDE = (10,000 −50) = 9,950 FEET

CAUTION

- DO NOT DUMP PRESSURIZATION WHEN USING THE ALTERNATE STATIC SOURCE.
- THE ALTIMETER CORRECTION GIVEN IS NOT VALID IF THE DUMP VALVE IS OPEN.

NOTE

THE COPILOT'S STATIC PRESSURE INSTRUMENTS ARE NOT CONNECTED TO THE ALTERNATE STATIC SOURCE.



(INDICATED ALTITUDE AND AIRSPEED ASSUMES NO INSTRUMENT ERROR)

FIGURE 4-12

ALTIMETER CORRECTION - ALTERNATE SYSTEM

CAUTION

- DO NOT DUMP PRESSURIZATION WHEN USING THE ALTERNATE STATIC SOURCE.
- THE ALTIMETER CORRECTION GIVEN IS NOT VALID IF THE DUMP VALVE IS OPEN.

NOTE

The copilot's static pressure instruments are not connected to the alternate static source.

GEAR DOWN FLAPS 1/4, 1/2	THE ALTIMETER CORRECTION IS APPROXIMATELY PLUS 50 FEET FROM SEA LEVEL TO 10,000 FEET THROUGHOUT THE NORMAL OPERATING RANGE OF AIRSPEEDS.
GEAR DOWN FLAPS DOWN	THE ALTIMETER CORRECTION IS APPROXIMATELY PLUS 25 FEET FROM SEA LEVEL TO 10,000 FEET THROUGHOUT THE NORMAL OPERATING RANGE OF AIRSPEEDS.

ZERO THRUST STALL SPEEDS

EXAMPLE:

GIVEN: GROSS WEIGHT = 11,000 POUNDS
FLAPS = UP
BANK ANGLE = 20°
OBTAIN: STALL SPEED = 88.5 KIAS

NOTE

- SPEEDS ARE BASED ON TESTS WITH BOTH PROPELLERS FEATHERED AND DEICE BOOTS DEFLATED.
- THE CENTER OF GRAVITY IS THE MOST FORWARD ALLOWABLE AT EACH WEIGHT.
- THE GEAR IS UP OR DOWN FOR FLAPS UP.
- THE GEAR IS DOWN FOR FLAPS 1/4, 1/2, AND DOWN.
- MAXIMUM ALTITUDE LOSS DURING RECOVERY FROM FLIGHT IDLE POWER STALL IS APPROXIMATELY 800 FEET.
- MAXIMUM NOSE DOWN PITCH ATTITUDE, AND ALTITUDE LOSS DURING RECOVERY FROM SINGLE ENGINE, POWER ON STALLS ARE APPROXIMATELY 10° AND 390 FEET, RESPECTIVELY.

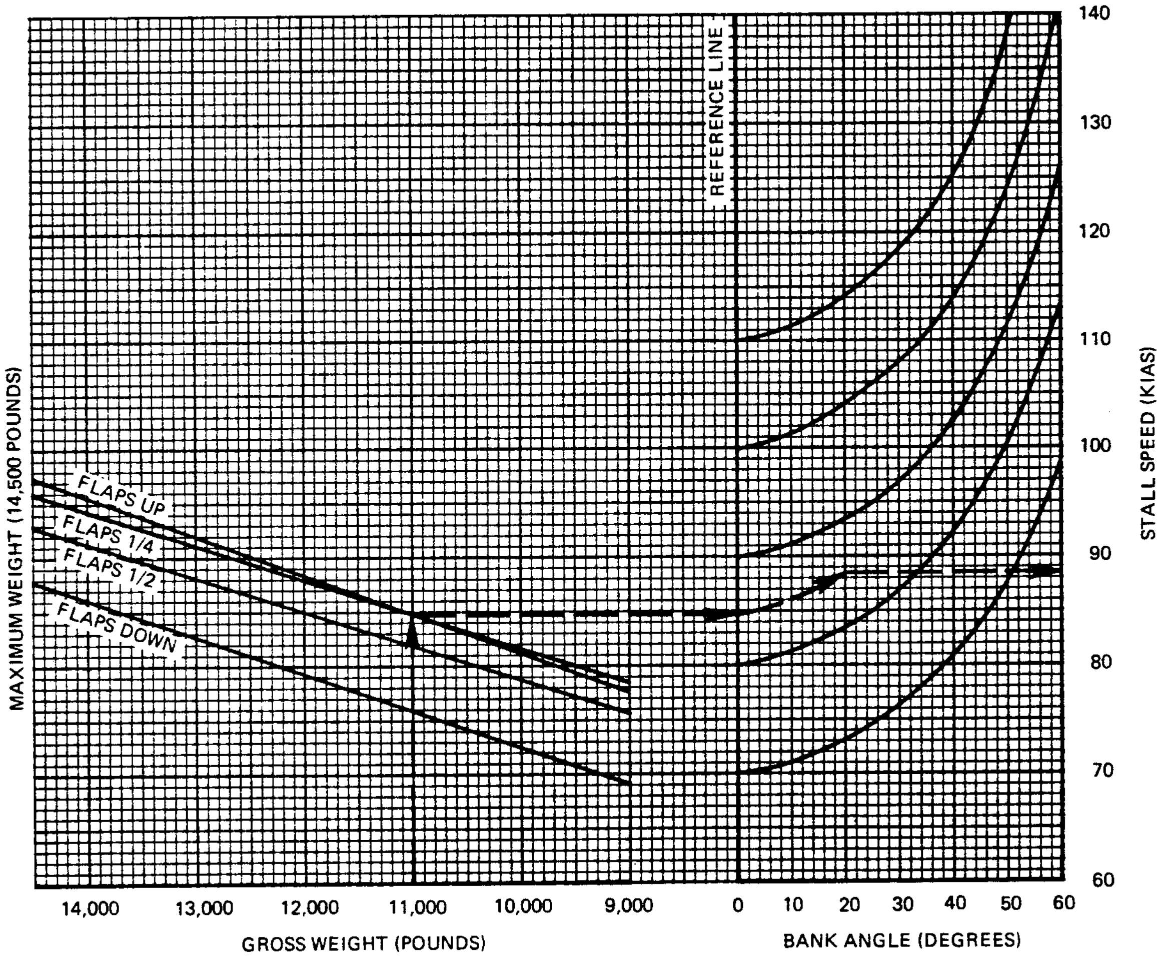


FIGURE 4-13

BEST ANGLE OF CLIMB SPEEDS

SINGLE ENGINE BEST ANGLE OF CLIMB SPEED ($V_{X_{SE}}$) SCHEDULE (KIAS)

ASSOCIATED CONDITIONS:

POWER........... MAX CONTINUOUS
PROPELLER .... FEATHERED ON INOPERATIVE ENGINE
GEN LOAD............ AS REQUIRED
BLEED AIR .... AS REQUIRED
ENG ANTI-ICE......... AS REQUIRED
GEAR.......................... UP
FLAPS .... UP

PRESSURE ALTITUDE (FEET)	GROSS WEIGHT (POUNDS)	OAT (°C) ISA −30	ISA −20 TO ISA +20	ISA +40
S.L.	14,500	120	121	121
	14,000	119	119	118
	13,000	116	115	113
	12,000	113	112	109
	11,000	110	109	104
	10,000	107	106	100
	9,000	104	103	94
5,000	14,500	120	121	121
	14,000	118	118	119
	13,000	115	114	114
	12,000	112	111	109
	11,000	109	107	104
	10,000	107	103	99
	9,000	104	100	93
10,000	14,500	123	121	124
	14,000	120	119	121
	13,000	116	114	115
	12,000	112	110	110
	11,000	111	105	104
	10,000	106	101	99
	9,000	103	97	92
15,000	14,500	123	124	127
	14,000	120	121	124
	13,000	116	115	118
	12,000	111	110	112
	11,000	107	106	106
	10,000	103	101	100
	9,000	100	96	93
20,000	14,500	125	125	129
	14,000	123	124	126
	13,000	117	119	120
	12,000	111	112	114
	11,000	107	106	103
	10,000	102	101	102
	9,000	96	95	94

TWO ENGINE BEST ANGLE OF CLIMB SPEED (V_X) SCHEDULE (KIAS)

ASSOCIATED CONDITIONS:

POWER........... MAX CONTINUOUS
GEN LOAD............ AS REQUIRED
BLEED AIR .... AS REQUIRED
ENG ANTI-ICE......... AS REQUIRED
GEAR.......................... UP
FLAPS .... UP

PRESSURE ALTITUDE (FEET)	GROSS WEIGHT (POUNDS)	OAT (°C) ISA −30	ISA −20 TO ISA +20	ISA +40
S.L.	14,500	98	98	103
	14,000	95	95	100
	13,000	92	92	93
	12,000	88	88	88
	11,000	87	87	87
	10,000	87	87	87
	9,000	87	87	87
5,000	14,500	102	101	105
	14,000	100	98	102
	13,000	95	93	96
	12,000	90	87	87
	11,000	87	87	87
	10,000	87	87	87
	9,000	87	87	87
10,000	14,500	102	102	108
	14,000	100	100	105
	13,000	96	95	100
	12,000	92	90	93
	11,000	87	87	87
	10,000	87	87	87
	9,000	87	87	87
15,000	14,500	103	106	113
	14,000	101	103	110
	13,000	96	97	104
	12,000	92	92	97
	11,000	87	87	92
	10,000	87	87	87
	9,000	87	87	87
20,000	14,500	107	112	118
	14,000	104	108	115
	13,000	98	102	109
	12,000	92	95	102
	11,000	87	89	94
	10,000	87	87	87
	9,000	87	87	87
25,000	14,500	114	118	123
	14,000	110	114	120
	13,000	103	109	114
	12,000	96	102	108
	11,000	90	93	101
	10,000	87	87	92
	9,000	87	87	87

FIGURE 4-14

TAKEOFF SPEEDS V_1, V_2, AND V_{50}

V_1 – TAKEOFF DECISION SPEED AND ROTATION SPEED CONDITIONS: GEAR DOWN, FLAPS 1/4 — $V_1 = 1.1\ V_{S1}$ OR $1.1\ V_{MCA}$, WHICHEVER IS GREATER.
V_2 – TAKEOFF SPEED AT 50 FOOT HEIGHT (SINGLE ENGINE) V_{50} – TAKEOFF SPEED AT 50 FOOT HEIGHT (TWO ENGINE) CONDITIONS: GEAR UP, FLAPS 1/4 — $V_2 = 1.2\ V_{S1}$ BUT NOT LESS THAN V_1. $V_{50} = 1.3\ V_{S1}$.

EXAMPLE:

GIVEN: TAKEOFF WEIGHT = 12,100 POUNDS
OBTAIN: V_1 SPEED = 99 KIAS
V_2 SPEED = 107.5 KIAS
V_{50} SPEED = 116.5 KIAS

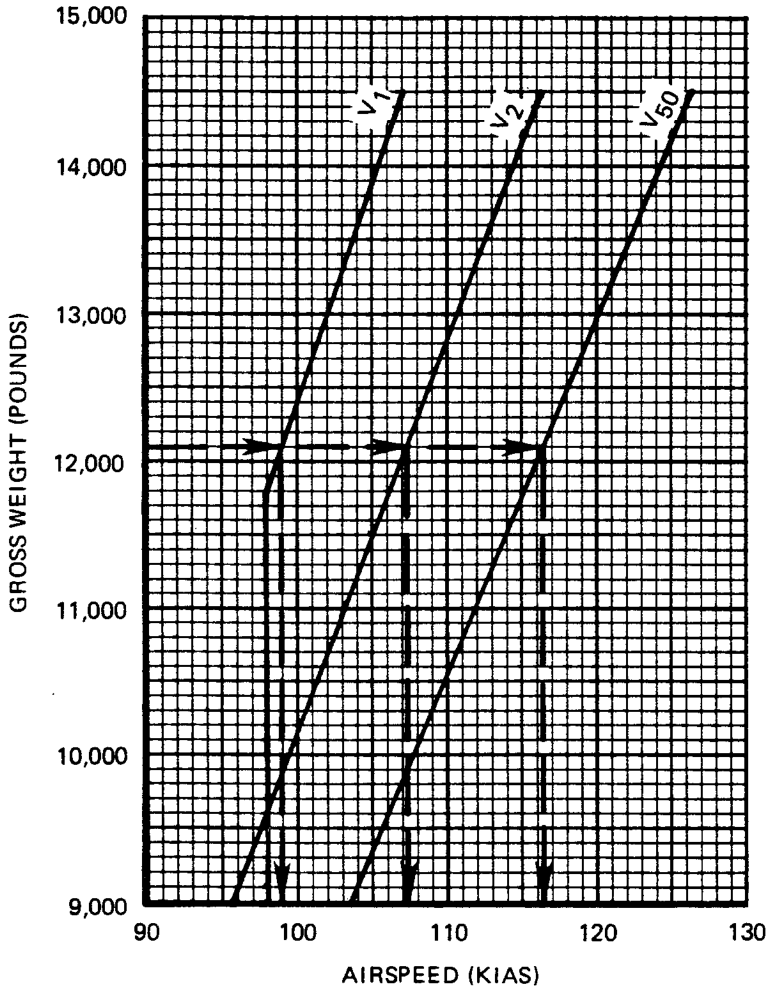


FIGURE 4-15

TIRE LIMITATION CHART - NOSE GEAR TIRE
B.F. GOODRICH P/N 021-611 (WITHOUT CHINES)

ASSOCIATED CONDITIONS:

POWER......TAKEOFF (WET OR DRY)
GEN LOAD................200 AMPS
BLEED AIR..............ON OR OFF
ENG ANTI-ICE...........ON OR OFF
SPEED............V_1 (FIGURE 4-15)
GEAR.......................DOWN
FLAPS........................1/4

EXAMPLE:

GIVEN: TAKEOFF WEIGHT = 13,000 POUNDS
OAT = 40°C
PRESSURE ALTITUDE = 4,000 FEET
TAILWIND = 5 KNOTS

OBTAIN: MAXIMUM ALLOWABLE TAILWIND = 10 KNOTS
(TIRE SPEED WILL NOT BE EXCEEDED)

CAUTION

OPERATIONS WITH INSUFFICIENT HEADWINDS OR EXCESSIVE TAILWINDS AS DETERMINED FROM FIGURE 4-16 WILL RESULT IN EXCEEDING THE TIRE SPEED LIMIT OF 139 KNOTS.

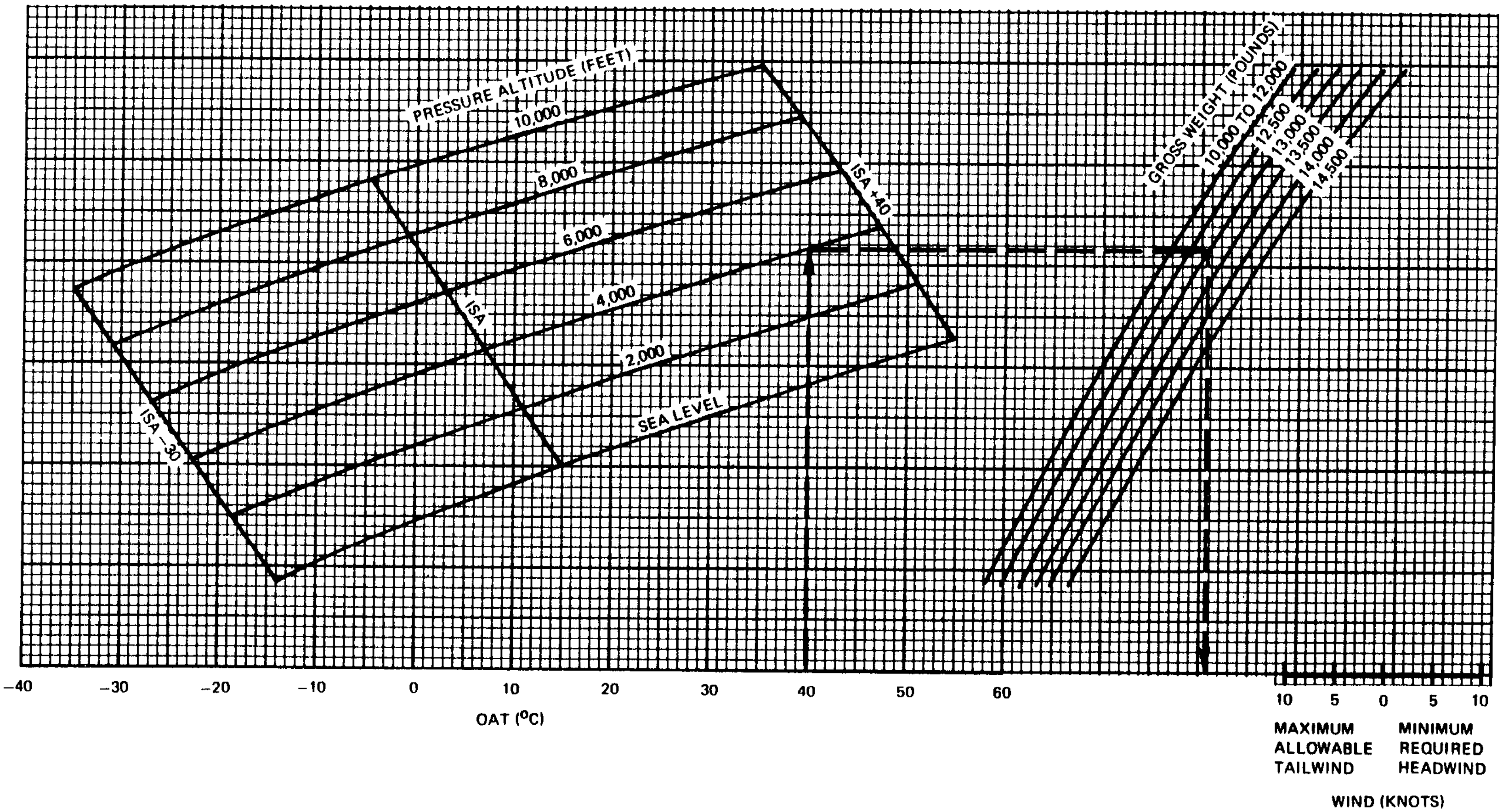


FIGURE 4-16

TIRE LIMITATION CHART - MAIN GEAR TIRE
B.F. GOODRICH P/N 021-335

ASSOCIATED CONDITIONS:

POWER......TAKEOFF (WET OR DRY)
GEN LOAD................200 AMPS
BLEED AIR..............ON OR OFF
ENG ANTI-ICE............ON OR OFF
SPEED............V_1 (FIGURE 4-15)
GEAR.......................DOWN
FLAPS.........................1/4

EXAMPLE:

GIVEN: TAKEOFF WEIGHT = 13,000 POUNDS
OAT = 40°C
PRESSURE ALTITUDE = 4,000 FEET
TAILWIND = 5 KNOTS

OBTAIN: MAXIMUM ALLOWABLE TAILWIND = 10 KNOTS
(TIRE SPEED WILL NOT BE EXCEEDED)

CAUTION

OPERATIONS WITH INSUFFICIENT HEADWINDS OR EXCESSIVE TAILWINDS AS DETERMINED FROM FIGURE 4-17 WILL RESULT IN EXCEEDING THE TIRE SPEED LIMIT OF 139 KNOTS.

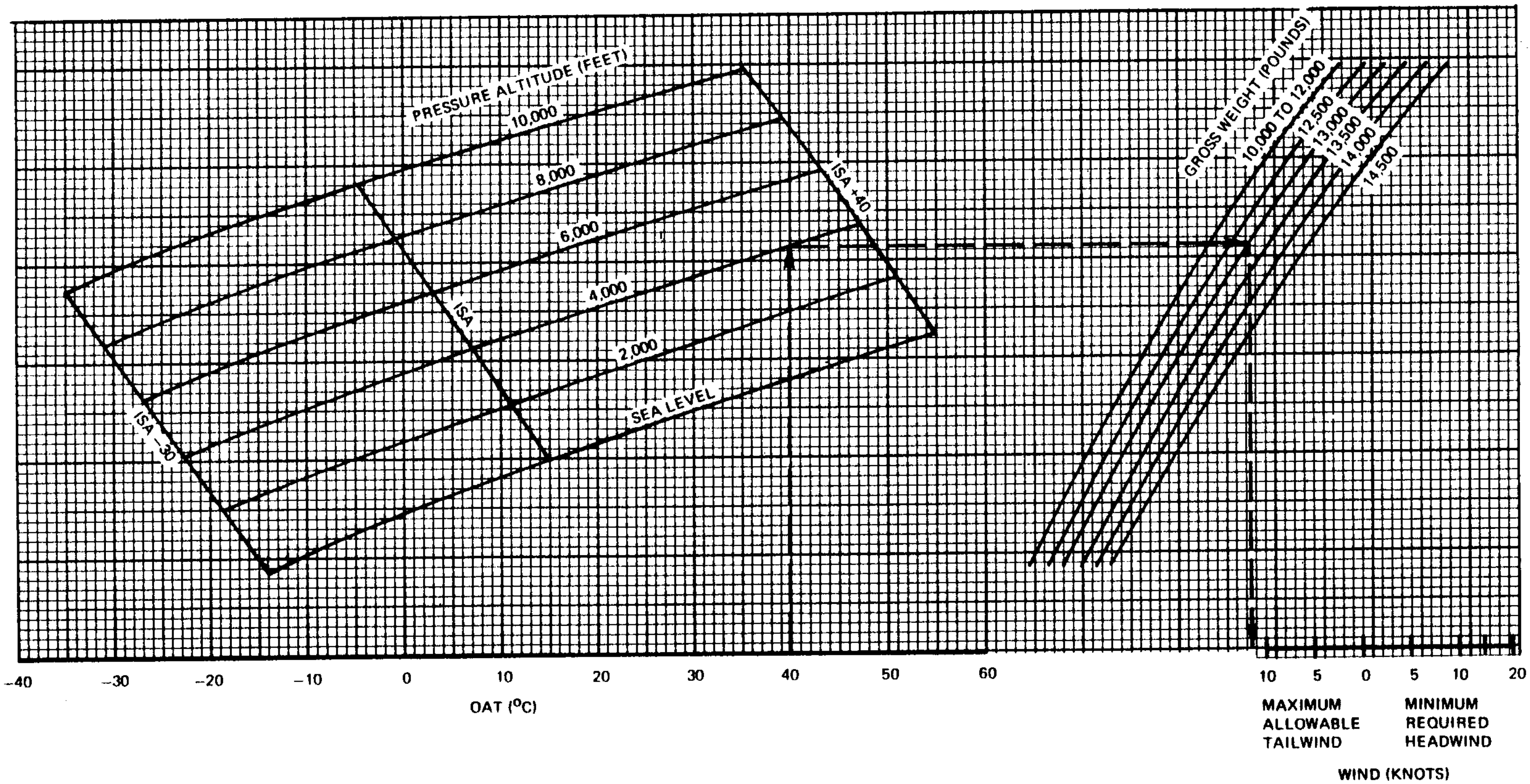


FIGURE 4-17

PART C TAKEOFF PERFORMANCE
DRY, BLEED AIR ON

CONTENTS

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TAKEOFF POWER CHECK CHART – DRY, BLEED AIR ON

ASSOCIATED CONDITIONS:

POWER .... TAKEOFF (DRY)
RPM 100%
MAX ALLOWABLE EGT.... 650°C
GEN LOAD ...... 0 TO 200 AMPS
BLEED AIR .... ON
ENG ANTI-ICE .... SEE GRAPH
SPEED .... 0 TO 50 KIAS

EXAMPLE:

GIVEN: OAT = 0°C
PRESSURE ALTITUDE = 2,000 FEET
ENGINE ANTI-ICE SYSTEM – OFF
OBTAIN: ENGINE TORQUE = 91.3 PERCENT

NOTE

- MAXIMUM OAT WITH ENGINE ANTI-ICE ON IS 5°C.
- REFERENCE EGT IS THE EGT OBTAINED WHEN REQUIRED ENGINE TORQUE IS SET IN ACCORDANCE WITH THIS CHART AND MUST NOT EXCEED 650°C.

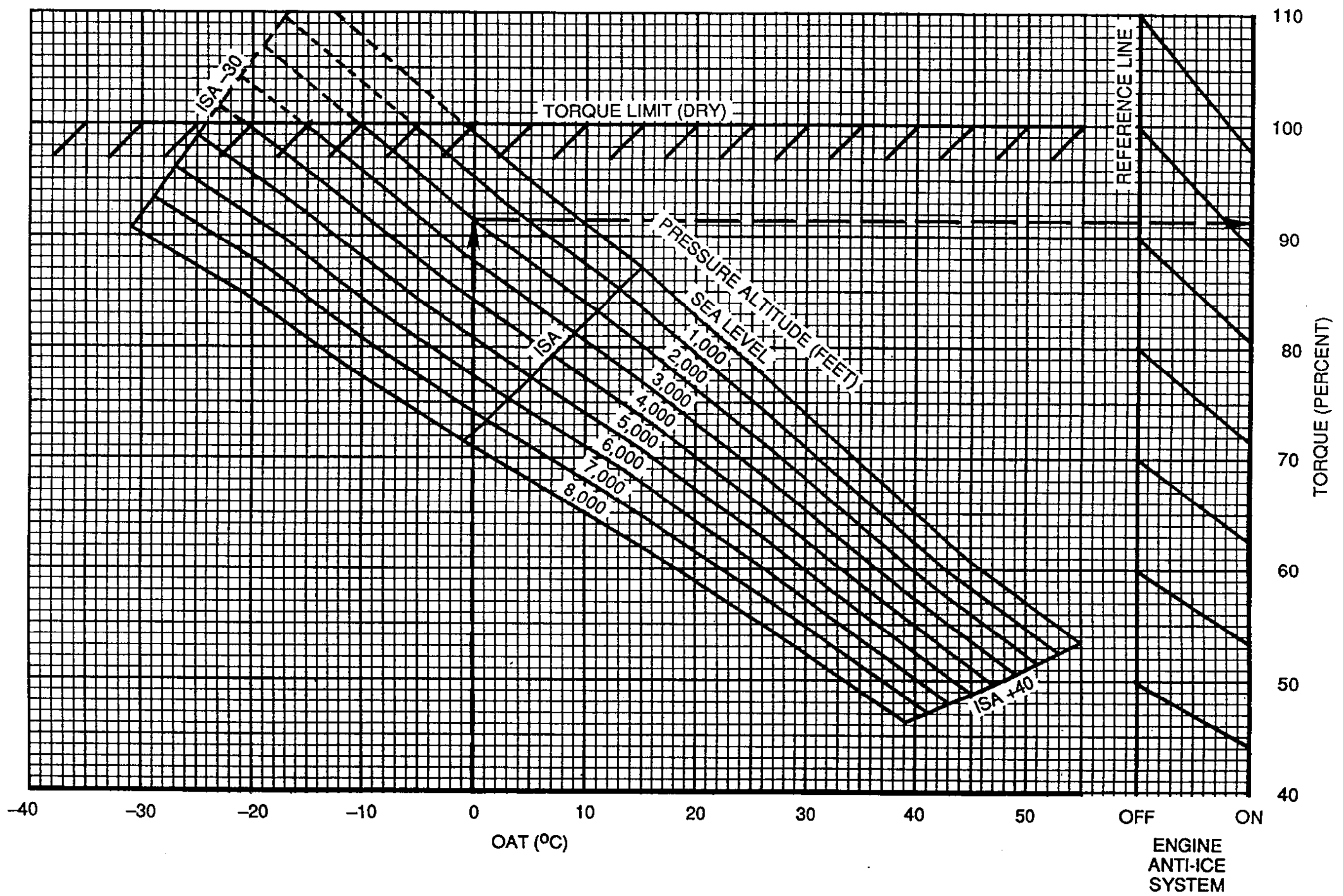

FIGURE 4-18

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MAXIMUM TAKEOFF WEIGHT LIMITATION CHART - DRY, BLEED AIR ON

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (DRY)
GEN LOAD................ 200 AMPS
BLEED AIR .... ON
ENG. ANTI-ICE ...... OFF (SEE NOTE)
GEAR............ DOWN (TAKEOFF)
UP (ENROUTE)
FLAPS .... 1/4 (TAKEOFF)
UP (ENROUTE)

NOTE

- REDUCE TAKEOFF WEIGHT BY 1,085 POUNDS WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.
- THIS WEIGHT IS DEFINED BY FAR 135 APP. A AND RESULTS IN THE WEIGHT AT WHICH TAKEOFF CAN BE CONTINUED AFTER AN ENGINE FAILURE IS RECOGNIZED AT OR ABOVE V_1.

EXAMPLE:

GIVEN: OAT = 30°C
PRESSURE ALTITUDE = 7,000 FEET
OBTAIN: TAKEOFF WEIGHT = 10,750 POUNDS

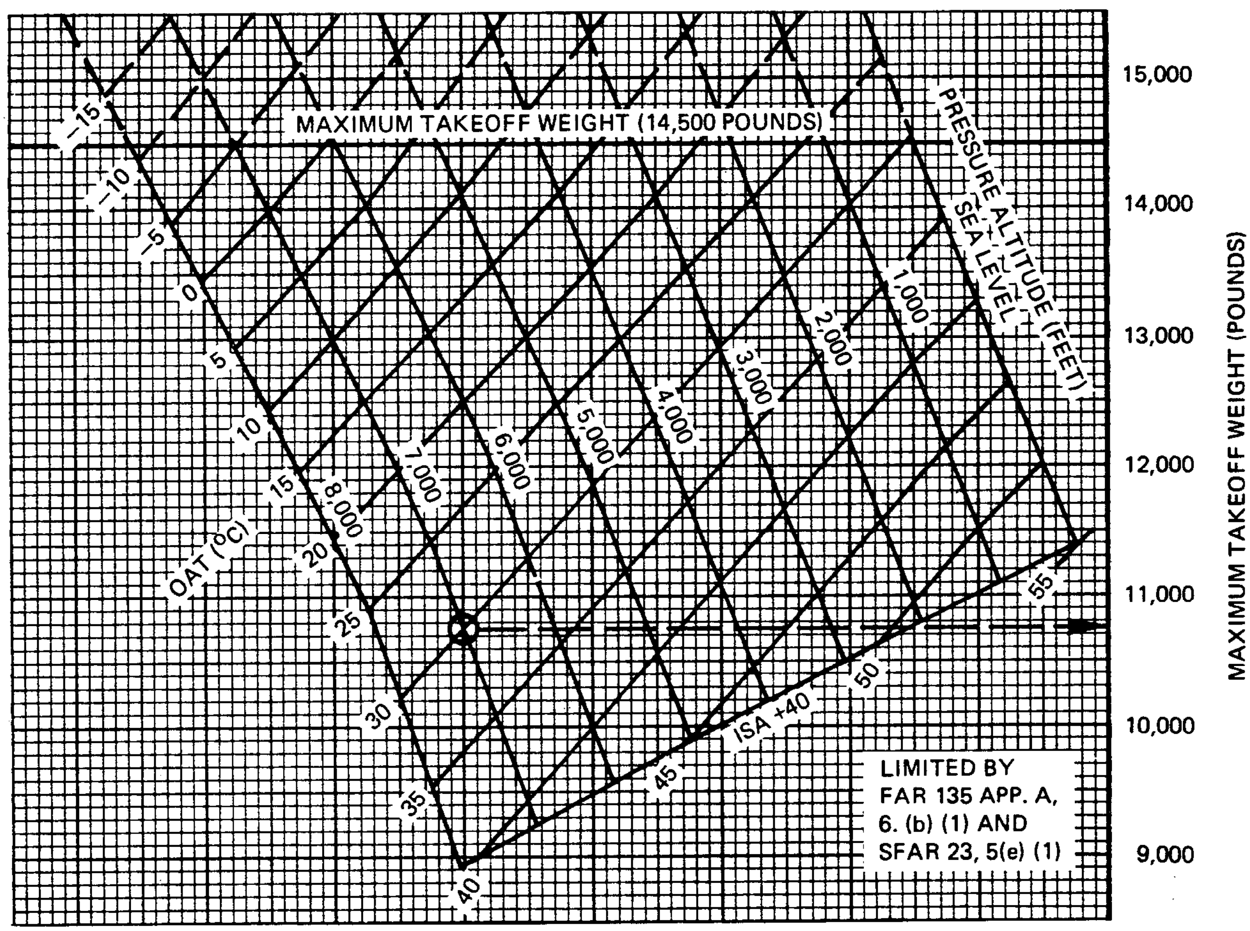

FIGURE 4-19

DISTANCE TO ACCELERATE TO V_1 AND SLOW TO 35 KNOTS - DRY, BLEED AIR ON

B.F. GOODRICH SINGLE ROTOR BRAKES
(MAXIMUM 12,500 POUNDS)

EXAMPLE:

GIVEN: PRESSURE ALTITUDE = 2,000 FEET
GROSS WEIGHT = 11,000 POUNDS
OBTAIN: PERCENT INCREASE IN ACCEL-SLOW DISTANCE
(ENGINE ANTI-ICE ON) = 4.1 PERCENT

NOTE

MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

ENGINE ANTI-ICE EFFECT

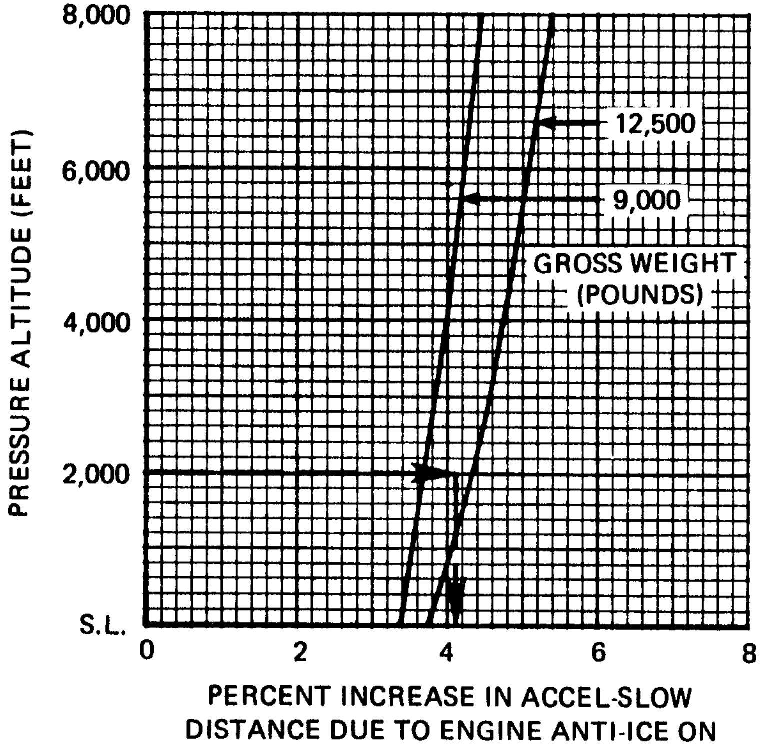

FIGURE 4-20

DISTANCE TO ACCELERATE TO V_1 AND SLOW TO 35 KNOTS - DRY, BLEED AIR ON
B.F. GOODRICH SINGLE ROTOR BRAKES
(MAXIMUM 12,500 POUNDS)

ASSOCIATED CONDITIONS:

POWER............TAKEOFF (DRY)
GEN LOAD................200 AMPS
BLEED AIR......................ON
ENG ANTI-ICE......OFF (SEE GRAPH)
RUNWAY...... DRY, HARD SURFACE
FLAPS.........................1/4
DECISION SPEED...V_1 (FIGURE 4–15)
ANTI-SKID..............ON OR OFF
NOSE WHEEL STEERING...ON OR OFF

EXAMPLE:

GIVEN: OAT = –5°C
PRESSURE ALTITUDE = 2,000 FEET
GROSS WEIGHT = 11,000 POUNDS
HEADWIND = 10 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)

OBTAIN: ACCELERATE AND SLOW DISTANCE = 2,480 FEET
INCREASE (ANTI-ICE ON) = 100 FEET
NET ACCELERATE AND SLOW DISTANCE = 2,580 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4–19. DO NOT EXCEED 12,500 POUNDS.

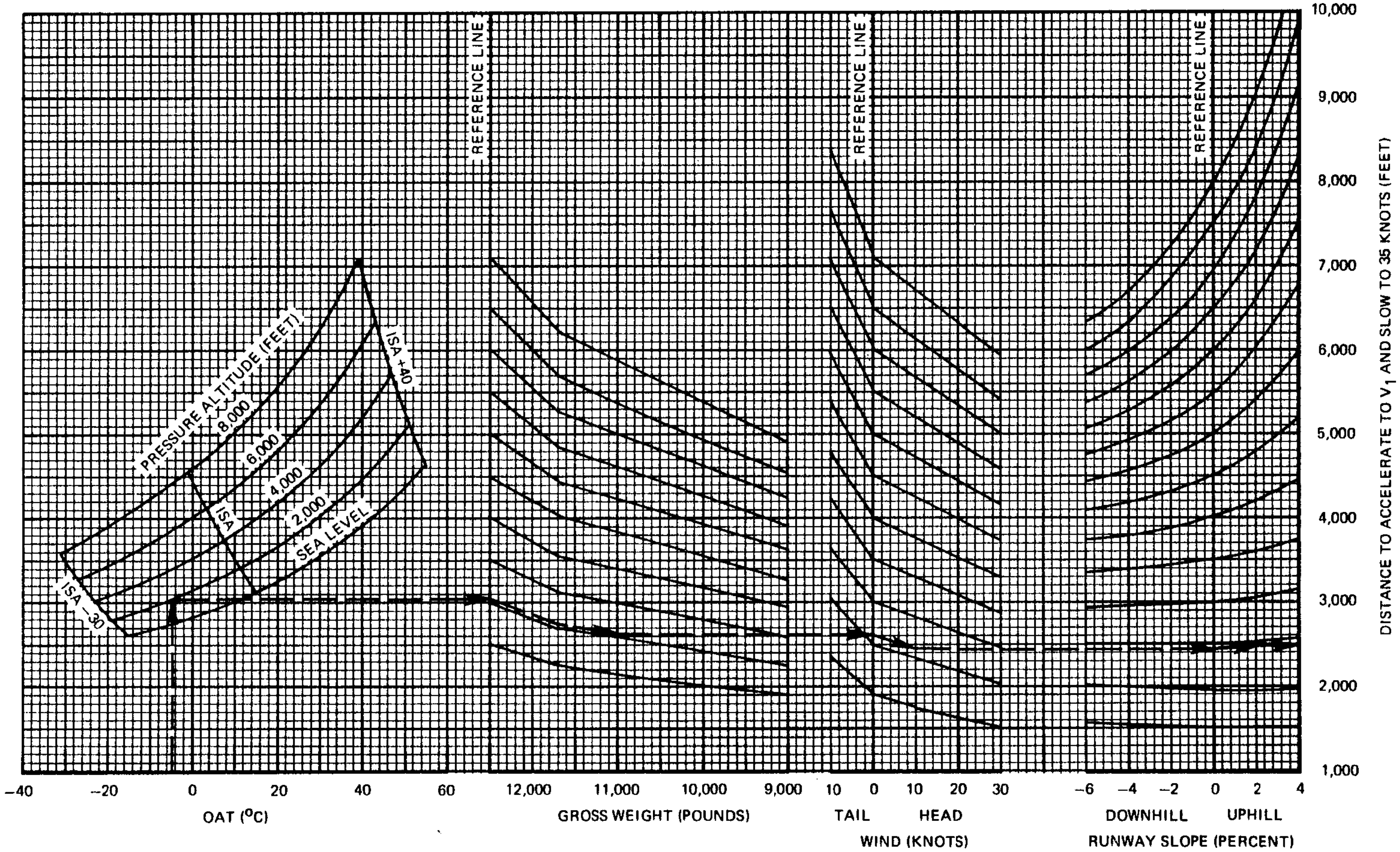

FIGURE 4-20 (continued)

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DISTANCE TO ACCELERATE TO V_1 AND SLOW TO 35 KNOTS – DRY, BLEED AIR ON

GOODYEAR AEROSPACE DUAL ROTOR BRAKES
(MAXIMUM 12,500 POUNDS)

ASSOCIATED CONDITIONS:

POWER .... TAKEOFF (DRY)
GEN LOAD .... 200 AMPS
BLEED AIR .... ON
ENG ANTI-ICE .... OFF (SEE NOTE)
RUNWAY .... DRY, HARD SURFACE
FLAPS 1/4
DECISION SPEED .... V_1 (FIGURE 4-15)
NOSE WHEEL STEERING ... ON OR OFF

EXAMPLE:

GIVEN: OAT = 5°C
PRESSURE ALTITUDE = 2,000 FEET
GROSS WEIGHT = 11,000 POUNDS
HEADWIND = 10 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)

OBTAIN: ACCELERATE AND SLOW DISTANCE = 2,810 FEET
INCREASE (ANTI-ICE ON) = 170 FEET
NET ACCELERATE AND SLOW DISTANCE = 2,980 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4-19. DO NOT EXCEED 12,500 POUNDS.

NOTE

- INCREASE ACCELERATE AND SLOW DISTANCE BY 6 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT WITH ENGINE ANTI-ICE ON IS 5°C.

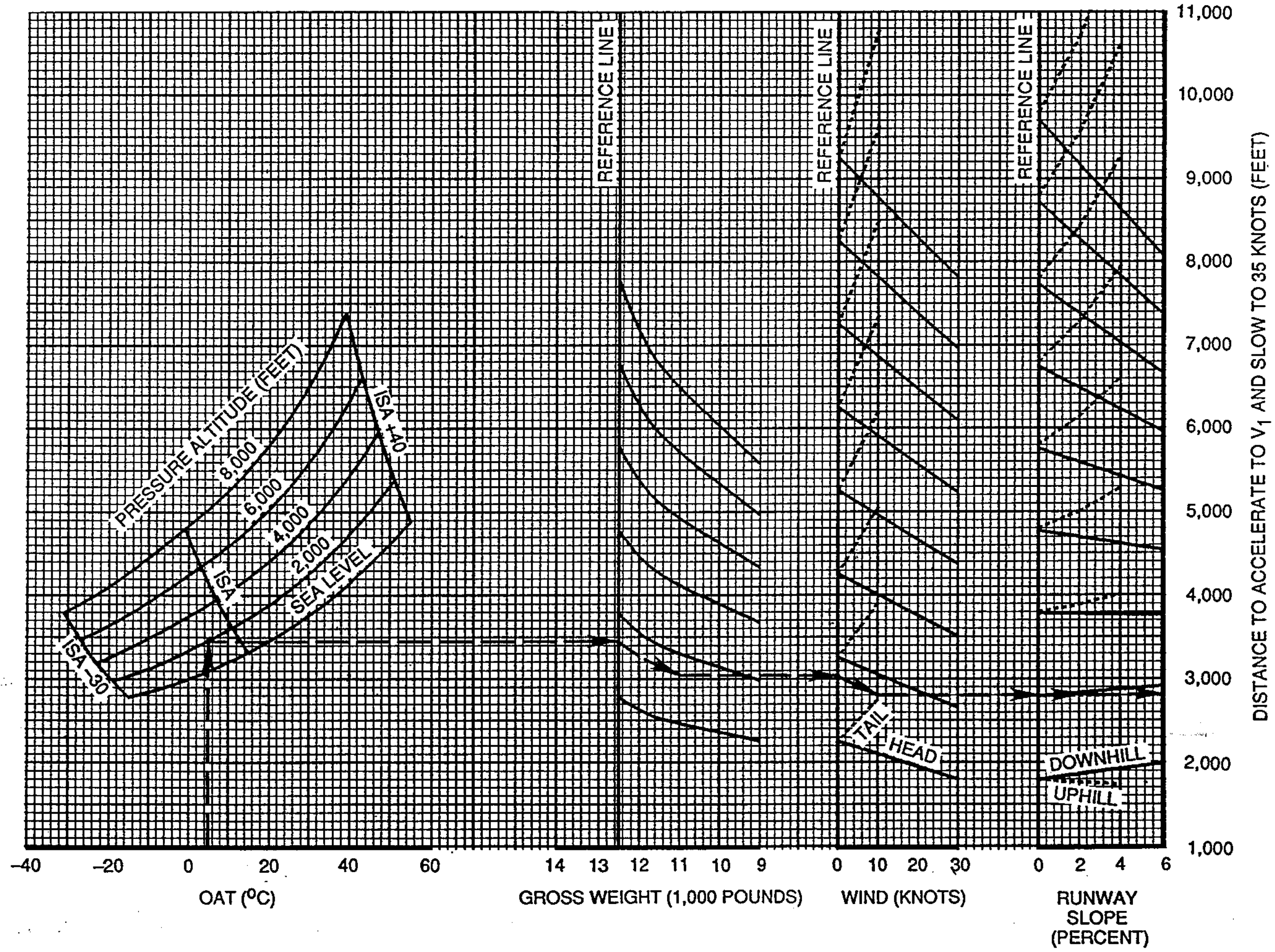


FIGURE 4-21

DISTANCE TO ACCELERATE TO V_1 AND STOP – DRY, BLEED AIR ON

B.F. GOODRICH SINGLE ROTOR BRAKES

ASSOCIATED CONDITIONS:

POWER .... TAKEOFF (DRY)
GEN LOAD .... 200 AMPS
BLEED AIR .... ON
ENG ANTI-ICE .... OFF (SEE NOTE)
RUNWAY .... DRY, HARD SURFACE
FLAPS 1/4
DECISION SPEED .... V_1 (FIGURE 4-15)
ANTI-SKID .... ON OR OFF
NOSE WHEEL STEERING ... ON OR OFF

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4-19.

EXAMPLE:

GIVEN: OAT = –11°C
PRESSURE ALTITUDE = 2,000 FEET
GROSS WEIGHT = 12,000 POUNDS
HEADWIND = 6 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)

OBTAIN: ACCELERATE STOP DISTANCE = 2,890 FEET
INCREASE (ANTI-ICE ON) = 200 FEET
NET ACCELERATE STOP DISTANCE = 3,090 FEET

NOTE

- INCREASE ACCELERATE STOP DISTANCE BY 7 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT WITH ENGINE ANTI-ICE ON IS 5°C.

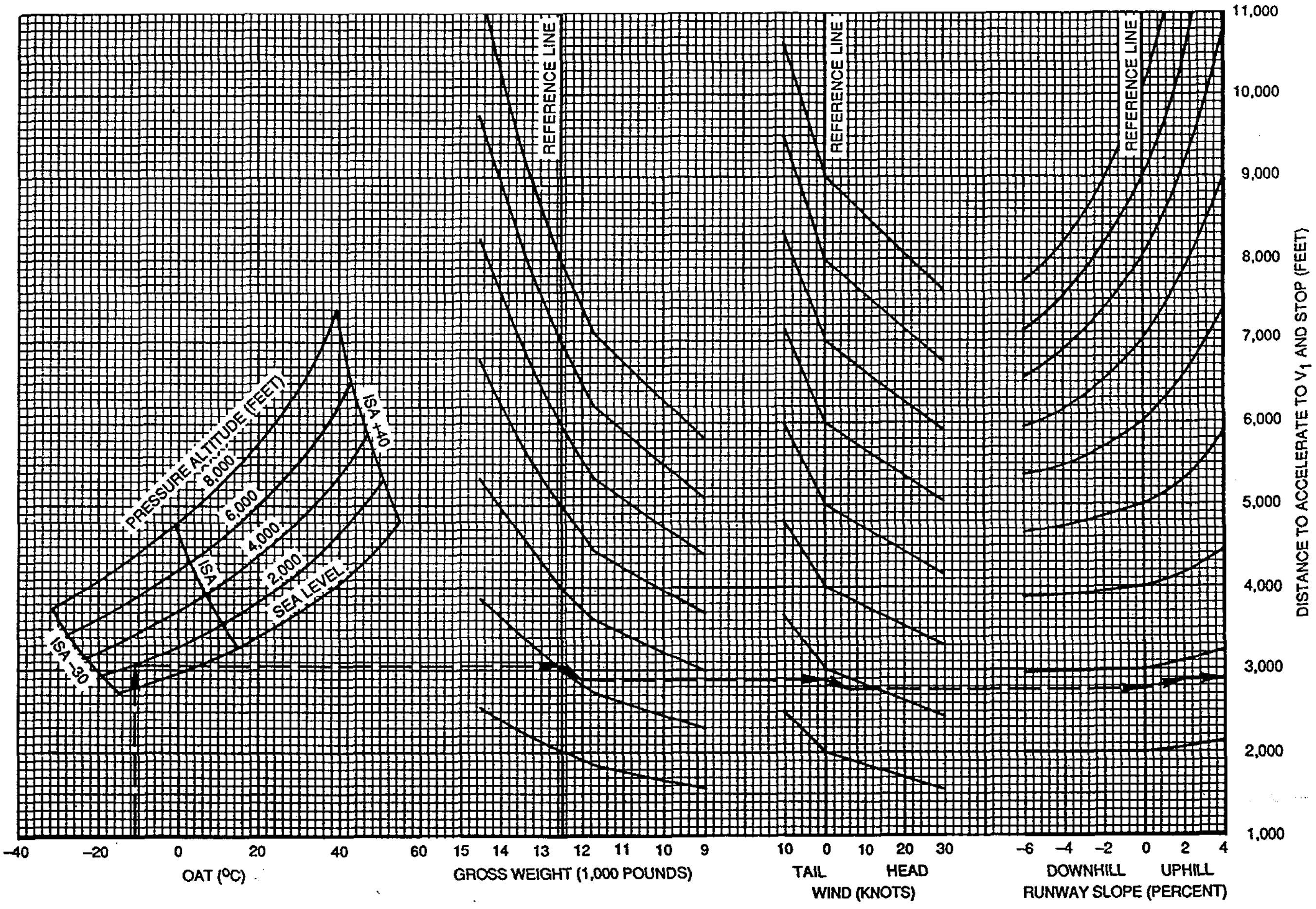


FIGURE 4-22

DISTANCE TO ACCELERATE TO V_1 AND STOP - DRY, BLEED AIR ON
GOODYEAR AEROSPACE DUAL ROTOR BRAKES

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (DRY)
GEN LOAD................ 200 AMPS
BLEED AIR .... ON
ENG ANTI-ICE....... OFF (SEE NOTE)
RUNWAY...... DRY, HARD SURFACE
FLAPS 1/4
DECISION SPEED ... V_1 (FIGURE 4-15)
NOSE WHEEL STEERING... ON OR OFF

EXAMPLE:

GIVEN: OAT = 0°C
PRESSURE ALTITUDE = 2,000 FEET
GROSS WEIGHT = 11,500 POUNDS
HEADWIND = 10 KNOTS
RUNWAY SLOPE = 2 PERCENT (DOWNHILL)

OBTAIN: ACCELERATE STOP DISTANCE = 3,100 FEET
INCREASE (ANTI-ICE ON) = 165 FEET
NET ACCELERATE STOP DISTANCE = 3,265 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4-19.

NOTE

- INCREASE ACCELERATE STOP DISTANCE BY 5.3 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

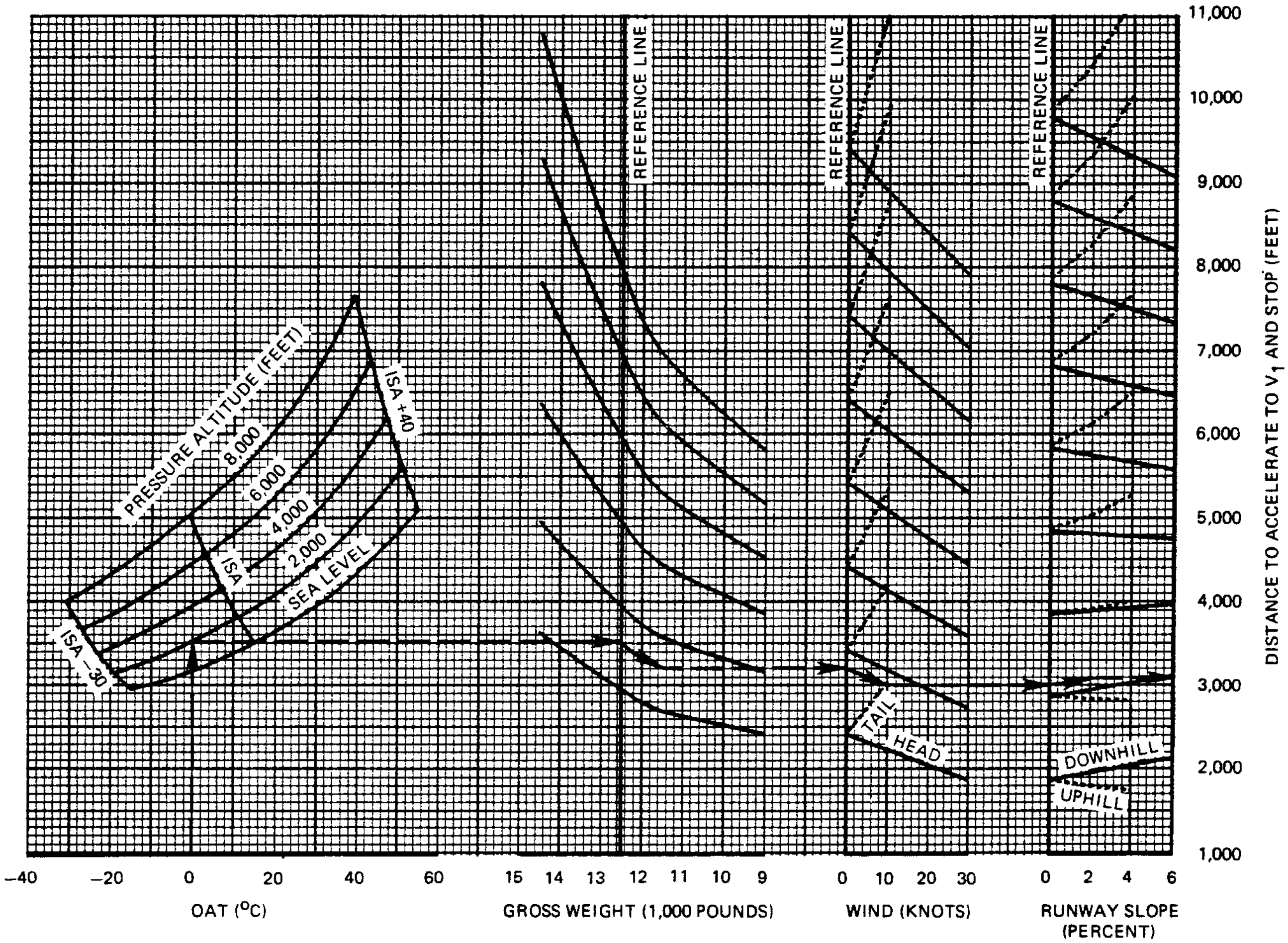


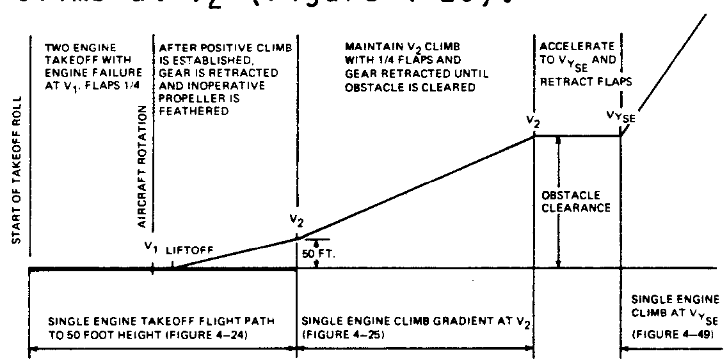
FIGURE 4-23

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT - DRY, BLEED AIR ON

An estimate of the horizontal distance required to clear an obstacle up to 1,000 feet above the runway may be obtained by using Figures 4-24 and 4-25. The takeoff path is considered in two phases, as follows:

(1) The distance from the start of the takeoff roll to 50 feet above runway (Figure 4-24). Both engines are assumed to operate normally to speed V_1, where one engine fails and the takeoff is continued on one engine. This phase is concluded when the airplane reaches 50 foot height at V_2.

(2) Single Engine Climb at V_2 (Figure 4-25).



EXAMPLE

Given: OAT=20°C (ISA +8°C)
AIRFIELD PRESSURE ALTITUDE = 1,400 FEET
GROSS WEIGHT = 12,900 POUNDS
BLEED AIR ON
ENGINE ANTI-ICE OFF
DRY POWER

Desired: FLIGHT PATH DISTANCE TO 1,000 FOOT HEIGHT AFTER ENGINE FAILURE AT V_1

Obtain: (1) DISTANCE FROM START OF THE TAKEOFF ROLL TO 50 FOOT HEIGHT = 6,100 FEET (FIGURE 4-24)

(2) CLIMB DISTANCE:

a. $\text{AVG HEIGHT} = \text{FIELD ELEVATION} + \frac{\text{HEIGHT INCREASE}}{2} = 1{,}900 \text{ FT}$

b. ESTIMATED TEMPERATURE = 19°C (AT 2°C/1,000 FEET)

c. CLIMB GRADIENT = 4.3 PERCENT (FIGURE 4-25)

d. $\text{DISTANCE} = \frac{(100) \times (1{,}000 - 50)}{4.3} = 22{,}093 \text{ FEET}$

(3) TOTAL FLIGHT PATH DISTANCE = (1) + (2) = 28,193 FEET

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT (continued)

The charts on the following pages (Figures 4-24 and 4-25) depend upon the following variable conditions. The appropriate charts must be used to ensure accuracy.

VARIABLE CONDITIONS:

- o Power - Dry with Bleed Air On.
- o Engine Anti-Ice - Off or On (Adjust distances as indicated by anti-ice effects charts for anti-ice On).
- o V_1 and V_2 Speeds - From Figure 4-15.
- o Wind effect on takeoff distance to 50 feet.

The charts are also based on the following common conditions:

COMMON CONDITIONS:

- o Generator Load - 200 AMPS total.
- o Runway - Dry, Level, Hard Surface.
- o No wind effect on V_2 climb gradient.
- o Flaps - 1/4 until clearing obstacles at V_2; then up.
- o Propeller on inoperative engine - Windmilling in the NTS mode until it is feathered after attaining V_2 speed.

NOTE

The maximum takeoff weight (Figure 4-19) and the flight paths constructed from Figures 4-24 and 4-25, can be realized using the following procedures:

1. At V_1, rotate to takeoff attitude (approximately 10° nose up).
2. Once airborne, establish 5° of bank into operating engine.
3. After a positive rate of climb is indicated on the vertical speed indicator and the altimeter, retract the landing gear. This will occur at approximately 15 to 20 feet above the ground.
4. Climb and accelerate to the scheduled V_2 speed.
5. Feather the propeller on the inoperative engine.
6. Maintain V_2 speed until obstacle clearance is assured.
7. Retract flaps and accelerate to best rate of climb speed.

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT (continued)
SINGLE ENGINE TAKEOFF FLIGHT PATH DISTANCE TO 50 FOOT HEIGHT - DRY, BLEED AIR ON

EXAMPLE:

GIVEN: PRESSURE ALTITUDE = 4,000 FEET
GROSS WEIGHT = 10,000 POUNDS
OBTAIN: INCREASE IN TAKEOFF DISTANCE = 5.8 PERCENT

NOTE

MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

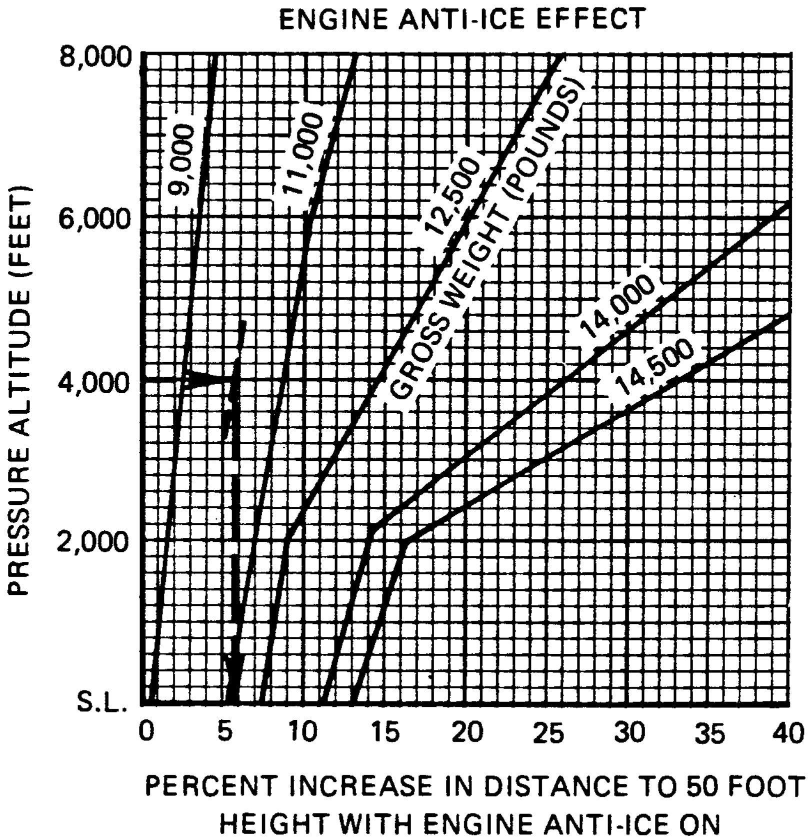


FIGURE 4-24

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT (continued)
SINGLE ENGINE TAKEOFF FLIGHT PATH DISTANCE TO 50 FOOT HEIGHT - DRY, BLEED AIR ON

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (DRY)
GEN LOAD................ 200 AMPS
BLEED AIR .... ON
ENG ANTI-ICE...... OFF (SEE GRAPH)
RUNWAY.............. DRY, LEVEL, HARD SURFACE, NO WIND
V_1 SPEED.............. FIGURE 4-15
V_2 SPEED.............. FIGURE 4-15
FLAPS 1/4
NOSE WHEEL STEERING... ON OR OFF

EXAMPLE:

GIVEN: OAT = -8°C
PRESSURE ALTITUDE = 4,000 FEET
GROSS WEIGHT = 10,000 POUNDS

OBTAIN: V_1 SPEED = 98 KIAS
V_2 SPEED = 99 KIAS

DISTANCE TO 50 FOOT HEIGHT =	3,100 FEET
INCREASE (ANTI-ICE ON) =	180 FEET
TOTAL DISTANCE TO 50 FOOT HEIGHT =	3,280 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4-19.

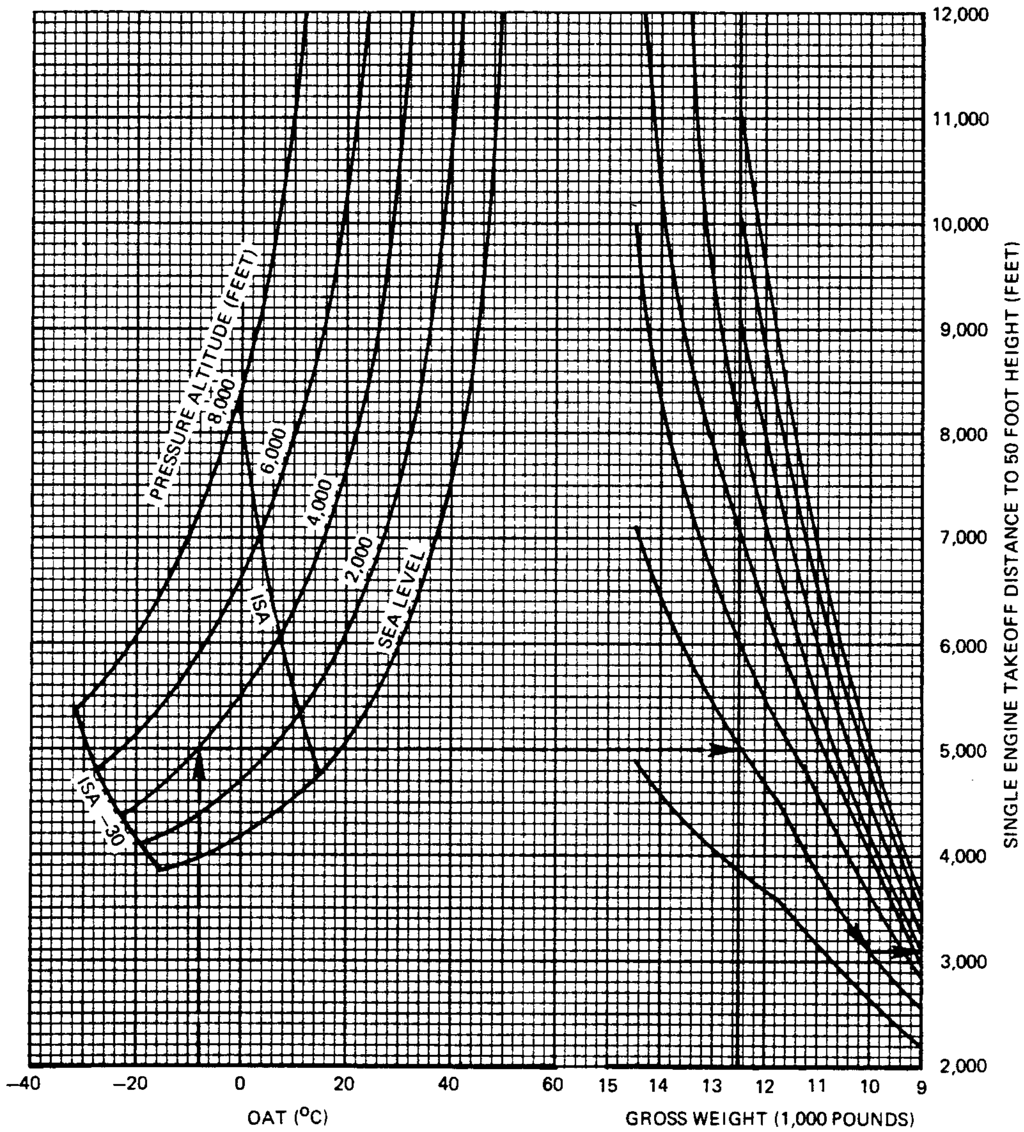
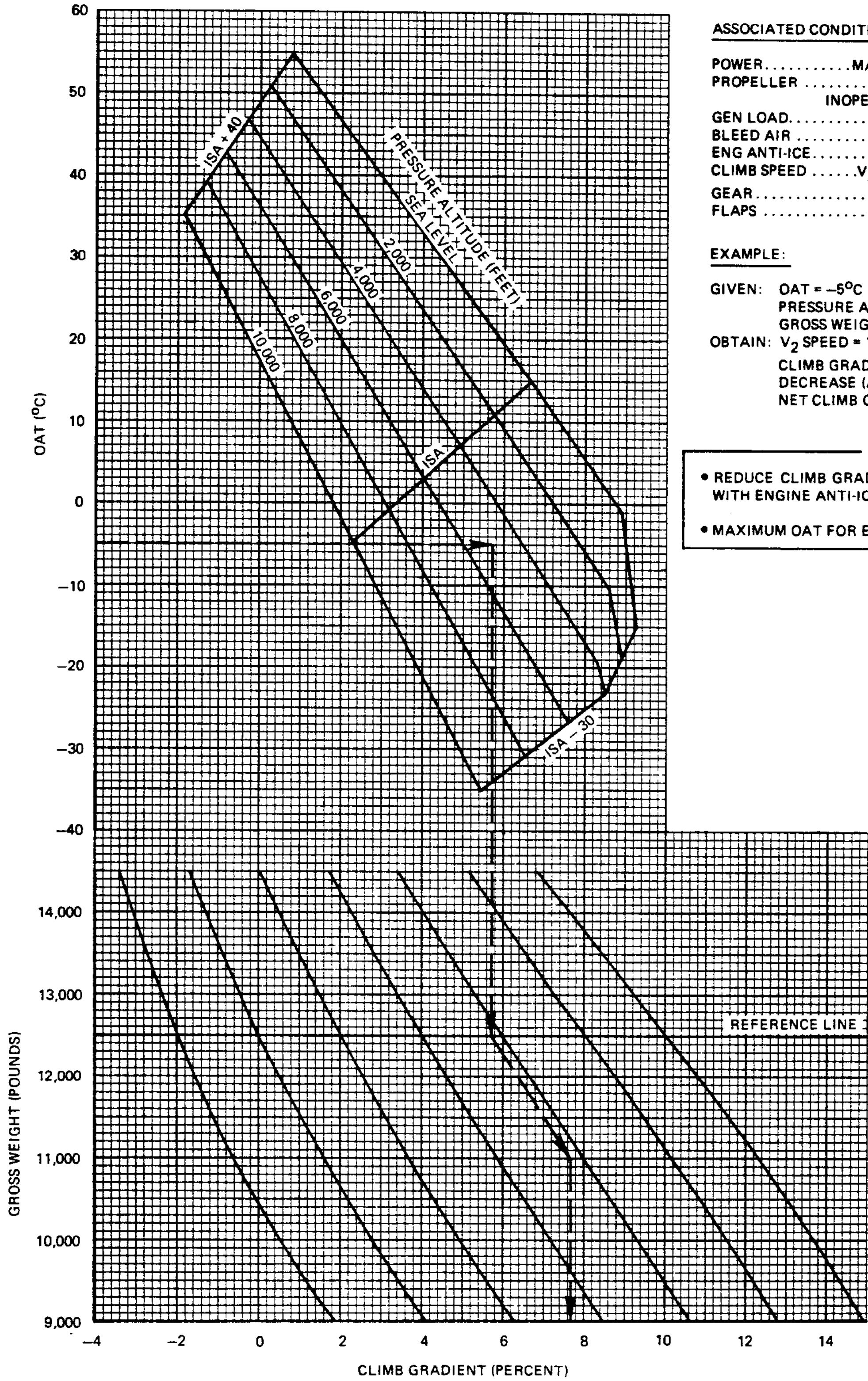


FIGURE 4-24 (continued)

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT (continued)
SINGLE ENGINE CLIMB GRADIENT AT V_2 - DRY, BLEED AIR ON



ASSOCIATED CONDITIONS:

POWER........... MAX CONTINUOUS
PROPELLER .... FEATHERED ON INOPERATIVE ENGINE
GEN LOAD................ 200 AMPS
BLEED AIR .... ON
ENG ANTI-ICE....... OFF (SEE NOTE)
CLIMB SPEED ...... V_2 (FIGURE 4–15)
GEAR .... UP
FLAPS 1/4

EXAMPLE:

GIVEN: OAT = −5°C
PRESSURE ALTITUDE = 5,000 FEET
GROSS WEIGHT = 11,000 POUNDS
OBTAIN: V_2 SPEED = 103 KIAS
CLIMB GRADIENT = 7.7 PERCENT
DECREASE (ANTI-ICE ON) = −1.5 PERCENT
NET CLIMB GRADIENT = 6.2 PERCENT

NOTE

- REDUCE CLIMB GRADIENT BY 1.5 PERCENT GRADIENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

FIGURE 4-25

TWO ENGINE TAKEOFF DISTANCE TO 50 FEET HEIGHT - DRY, BLEED AIR ON

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (DRY)
GEN LOAD................ 200 AMPS
BLEED AIR .... ON
ENG ANTI-ICE....... OFF (SEE NOTE)
RUNWAY...... DRY, HARD SURFACE
V_1 SPEED.............. FIGURE 4–15
V_{50} SPEED............. FIGURE 4–15
FLAPS 1/4
NOSE WHEEL STEERING...ON OR OFF

EXAMPLE:

GIVEN: OAT = –5°C
PRESSURE ALTITUDE = 4,000 FEET
GROSS WEIGHT = 11,000 POUNDS
TAILWIND = 10 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)

OBTAIN: V_1 SPEED = 98 KIAS
V_{50} SPEED = 112 KIAS
DISTANCE TO 50 FOOT HEIGHT = 3,200 FEET
INCREASE (ANTI-ICE ON) = 640 FEET
TOTAL TAKEOFF DISTANCE = 3,840 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4–19.

NOTE

- INCREASE TAKEOFF DISTANCE BY 20 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

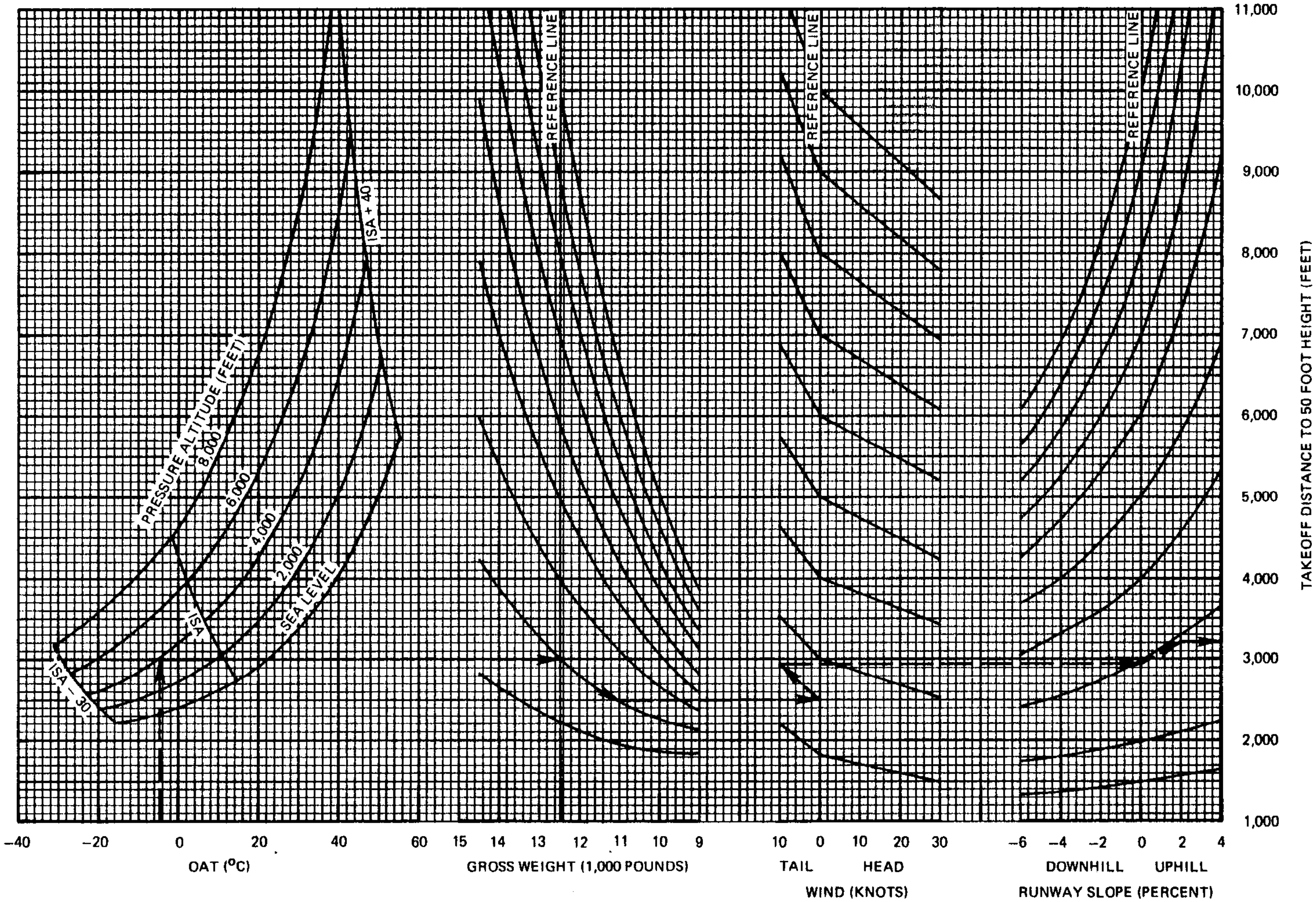
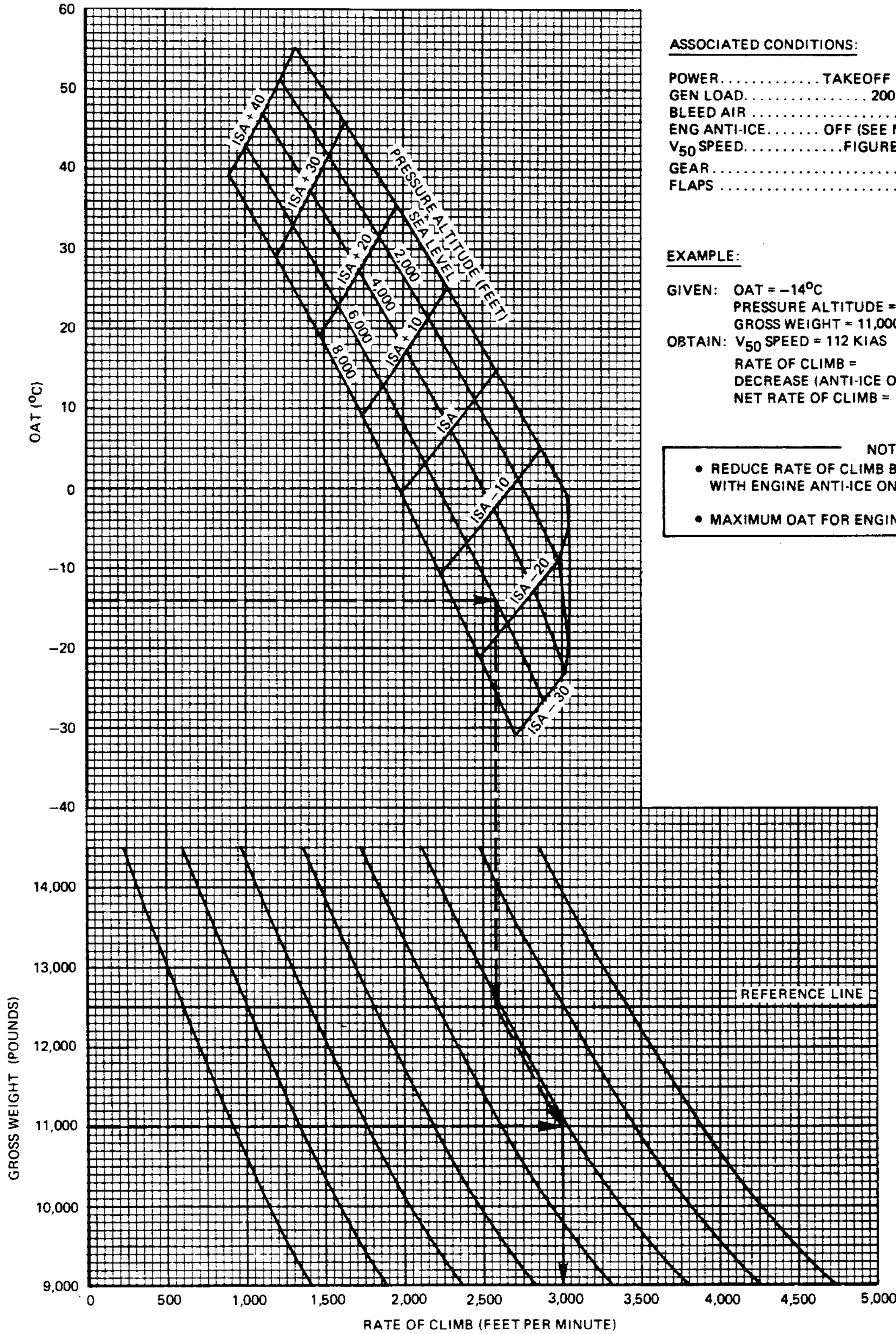


FIGURE 4-26

TWO ENGINE RATE OF CLIMB AT V_{50} - DRY, BLEED AIR ON



ASSOCIATED CONDITIONS:

POWER............TAKEOFF (DRY)
GEN LOAD................200 AMPS
BLEED AIR.....................ON
ENG ANTI-ICE....... OFF (SEE NOTE)
V_{50} SPEED............FIGURE 4—15
GEAR..........................UP
FLAPS..........................1/4

EXAMPLE:

GIVEN: OAT = −14°C
PRESSURE ALTITUDE = 6,000 FEET
GROSS WEIGHT = 11,000 POUNDS

OBTAIN: V_{50} SPEED = 112 KIAS

RATE OF CLIMB =	3,000 FEET PER MINUTE
DECREASE (ANTI-ICE ON) =	−410 FEET PER MINUTE
NET RATE OF CLIMB =	2,590 FEET PER MINUTE

NOTE

- REDUCE RATE OF CLIMB BY 410 FEET PER MINUTE WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

FIGURE 4-27

PART D TAKEOFF PERFORMANCE
DRY, BLEED AIR OFF

CONTENTS

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FAA APPROVED: APR 02/86
REVISED: OCT 17/94

TAKEOFF POWER CHECK CHART – DRY, BLEED AIR OFF

ASSOCIATED CONDITIONS:

POWER .... TAKEOFF (DRY)
RPM 100%
MAX ALLOWABLE EGT .... 650°C
GEN LOAD ...... 0 TO 200 AMPS
BLEED AIR .... OFF
ENG ANTI-ICE .... SEE GRAPH
SPEED .... 0 TO 50 KIAS

EXAMPLE:

GIVEN: OAT = –5°C
PRESSURE ALTITUDE = 3,000 FEET
ENGINE ANTI-ICE SYSTEM – ON
OBTAIN: ENGINE TORQUE = 92.2 PERCENT

NOTE

- MAXIMUM OAT WITH ENGINE ANTI-ICE ON IS 5°C.
- REFERENCE EGT IS THE EGT OBTAINED WHEN REQUIRED ENGINE TORQUE IS SET IN ACCORDANCE WITH THIS CHART AND MUST NOT EXCEED 650°C.

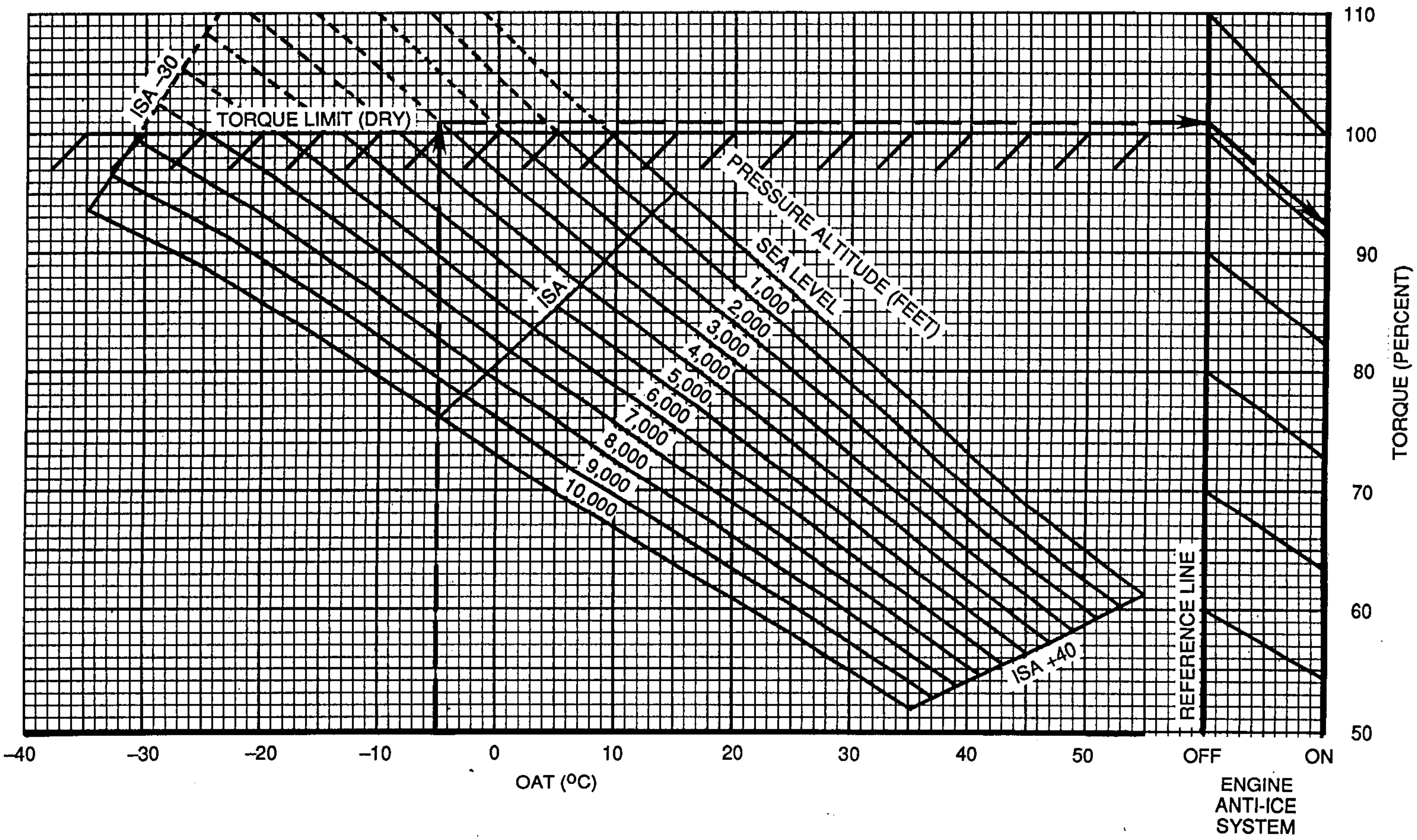

FIGURE 4-28

PERFORMANCE

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MAXIMUM TAKEOFF WEIGHT LIMITATION CHART - DRY, BLEED AIR OFF

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (DRY)
GEN LOAD................. 200 AMPS
BLEED AIR .... OFF
ENG ANTI-ICE....... OFF (SEE NOTE)
GEAR.............DOWN (TAKEOFF)
UP (ENROUTE)
FLAPS .... 1/4 (TAKEOFF)
UP (ENROUTE)

NOTE

- REDUCE TAKEOFF WEIGHT BY 1,025 POUNDS WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.
- THIS WEIGHT IS DEFINED BY FAR 135 APP. A AND RESULTS IN THE WEIGHT AT WHICH TAKEOFF CAN BE CONTINUED AFTER AN ENGINE FAILURE IS RECOGNIZED AT OR ABOVE V_1.

EXAMPLE:

GIVEN: OAT = 40°C
PRESSURE ALTITUDE = 6,000 FEET
OBTAIN: TAKEOFF WEIGHT = 11,210 POUNDS

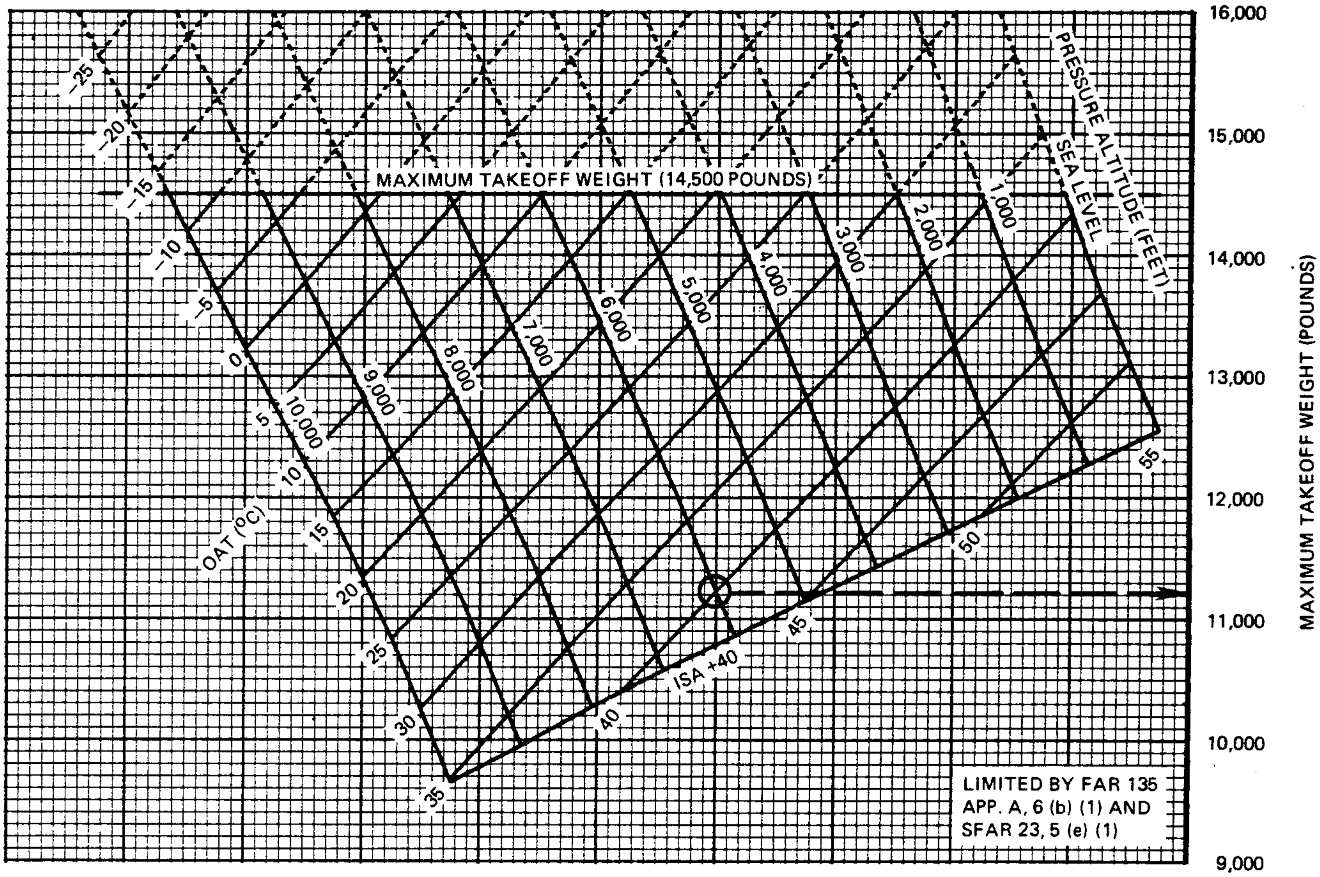

FIGURE 4-29

DISTANCE TO ACCELERATE TO V_1 AND SLOW TO 35 KNOTS - DRY, BLEED AIR OFF

B.F. GOODRICH SINGLE ROTOR BRAKES
(MAXIMUM 12,500 POUNDS)

EXAMPLE:

GIVEN: PRESSURE ALTITUDE = 6,000 FEET
GROSS WEIGHT = 11,000 POUNDS
OBTAIN: PERCENT INCREASE IN ACCEL-SLOW DISTANCE (ENGINE ANTI-ICE ON) = 3.6 PERCENT

NOTE

MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

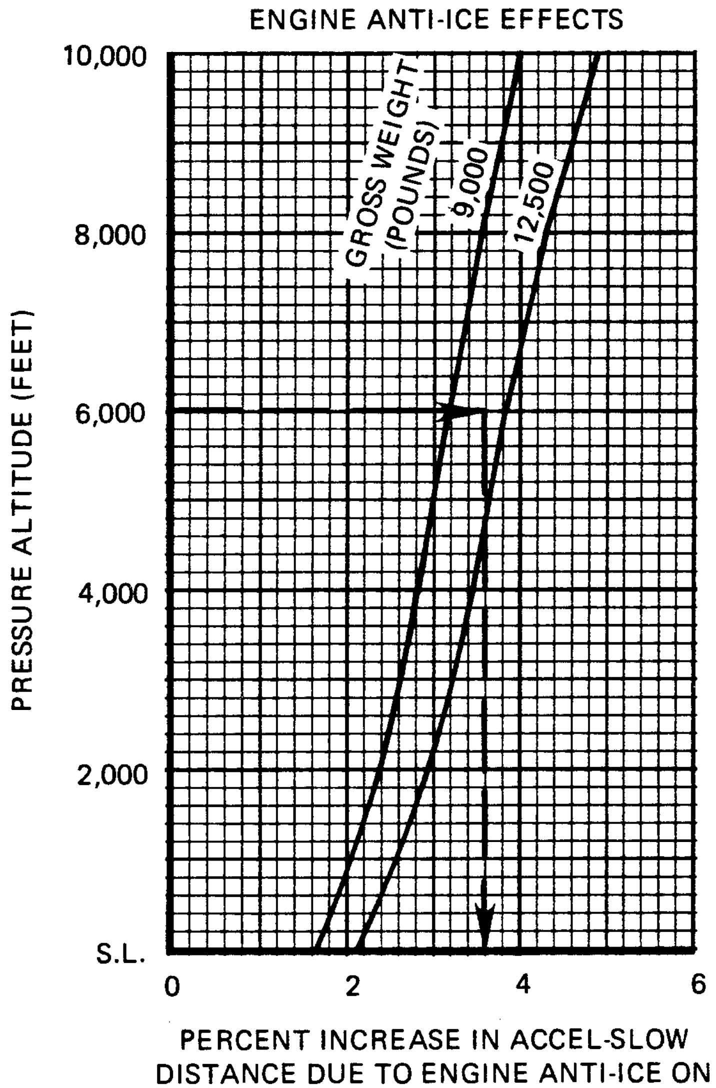

FIGURE 4-30

DISTANCE TO ACCELERATE TO V_1 AND SLOW TO 35 KNOTS - DRY, BLEED AIR OFF
B.F. GOODRICH SINGLE ROTOR BRAKES
(MAXIMUM 12,500 POUNDS)

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (DRY)
GEN LOAD................ 200 AMPS
BLEED AIR.................... OFF
ENG ANTI-ICE...... OFF (SEE GRAPH)
RUNWAY...... DRY, HARD SURFACE
FLAPS.......................... 1/4
DECISION SPEED ... V_1 (FIGURE 4-15)
ANTI-SKID.............. ON OR OFF
NOSE WHEEL STEERING... ON OR OFF

EXAMPLE:

GIVEN: OAT = 0°C
PRESSURE ALTITUDE = 6,000 FEET
GROSS WEIGHT = 11,000 POUNDS
HEADWIND = 10 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)

OBTAIN: ACCELERATE AND SLOW DISTANCE = 3,200 FEET
INCREASE (ANTI-ICE ON) = 115 FEET
NET ACCELERATE AND SLOW DISTANCE = 3,315 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4-29. DO NOT EXCEED 12,500 POUNDS.

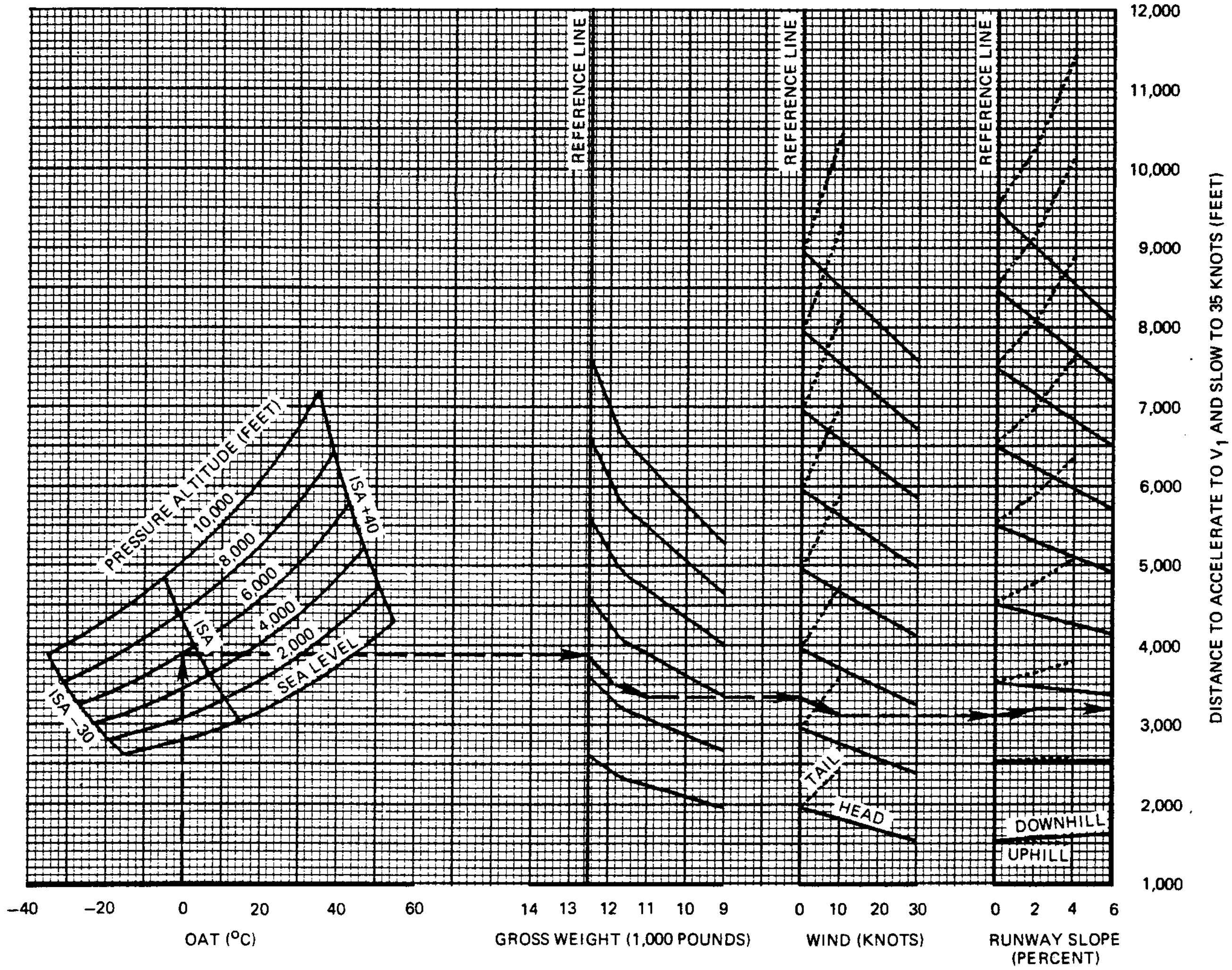

FIGURE 4-30 (continued)

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DISTANCE TO ACCELERATE TO V_1 AND SLOW TO 35 KNOTS - DRY, BLEED AIR OFF

GOODYEAR AEROSPACE DUAL ROTOR BRAKES
(MAXIMUM 12,500 POUNDS)

ASSOCIATED CONDITIONS:

POWER.............TAKEOFF (DRY)
GEN LOAD................200 AMPS
BLEED AIR......................OFF
ENG ANTI-ICE.......OFF (SEE NOTE)
RUNWAY......DRY, HARD SURFACE
FLAPS..........................1/4
DECISION SPEED...V_1 (FIGURE 4-15)
NOSE WHEEL STEERING...ON OR OFF

EXAMPLE:

GIVEN: OAT = 0°C
PRESSURE ALTITUDE = 4,000 FEET
GROSS WEIGHT = 11,000 POUNDS
HEADWIND = 10 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)

OBTAIN: ACCELERATE AND SLOW DISTANCE = 3,000 FEET
INCREASE (ANTI-ICE ON) = 130 FEET
NET ACCELERATE AND SLOW DISTANCE = 3,130 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4-29. DO NOT EXCEED 12,500 POUNDS.

NOTE

- INCREASE ACCELERATE AND SLOW DISTANCE BY 4.4 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

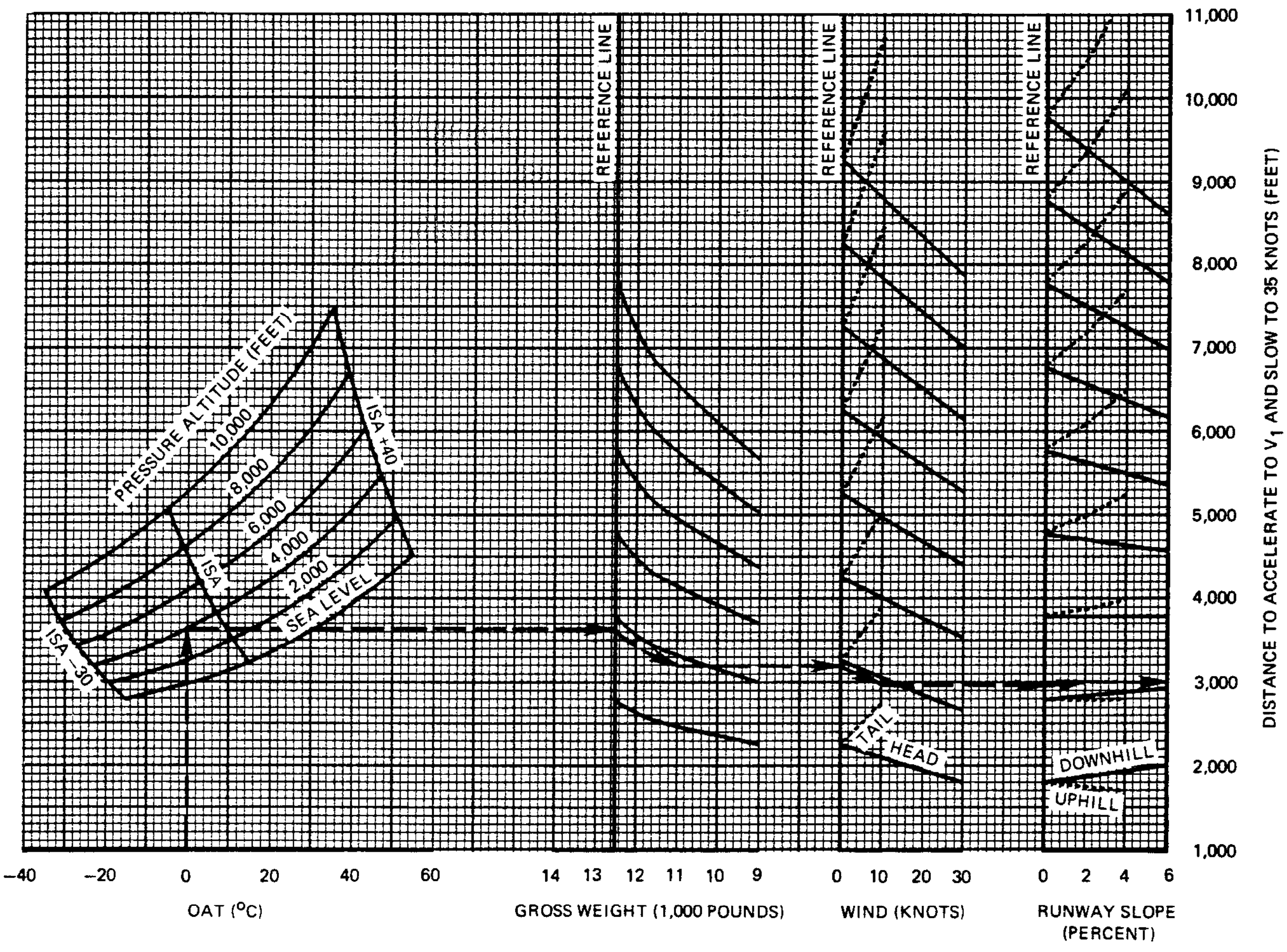


FIGURE 4-31

DISTANCE TO ACCELERATE TO V_1 AND STOP - DRY, BLEED AIR OFF
B.F. GOODRICH SINGLE ROTOR BRAKES

ASSOCIATED CONDITIONS:

POWER............TAKEOFF (DRY)
GEN LOAD...............200 AMPS
BLEED AIR....................OFF
ENG ANTI-ICE.......OFF (SEE NOTE)
RUNWAY......DRY, HARD SURFACE
FLAPS..........................1/4
DECISION SPEED...V_1 (FIGURE 4–15)
ANTI-SKID..............ON OR OFF
NOSE WHEEL STEERING...ON OR OFF

EXAMPLE:

GIVEN: OAT = 0°C
PRESSURE ALTITUDE = 6,000 FEET
GROSS WEIGHT = 13,500 POUNDS
HEADWIND = 10 KNOTS
RUNWAY SLOPE = 1 PERCENT (UPHILL)

OBTAIN: ACCELERATE STOP DISTANCE = 4,600 FEET
INCREASE (ANTI-ICE ON) = 230 FEET
NET ACCELERATE STOP DISTANCE = 4,830 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4–29.

NOTE

- INCREASE ACCELERATE STOP DISTANCE BY 5 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

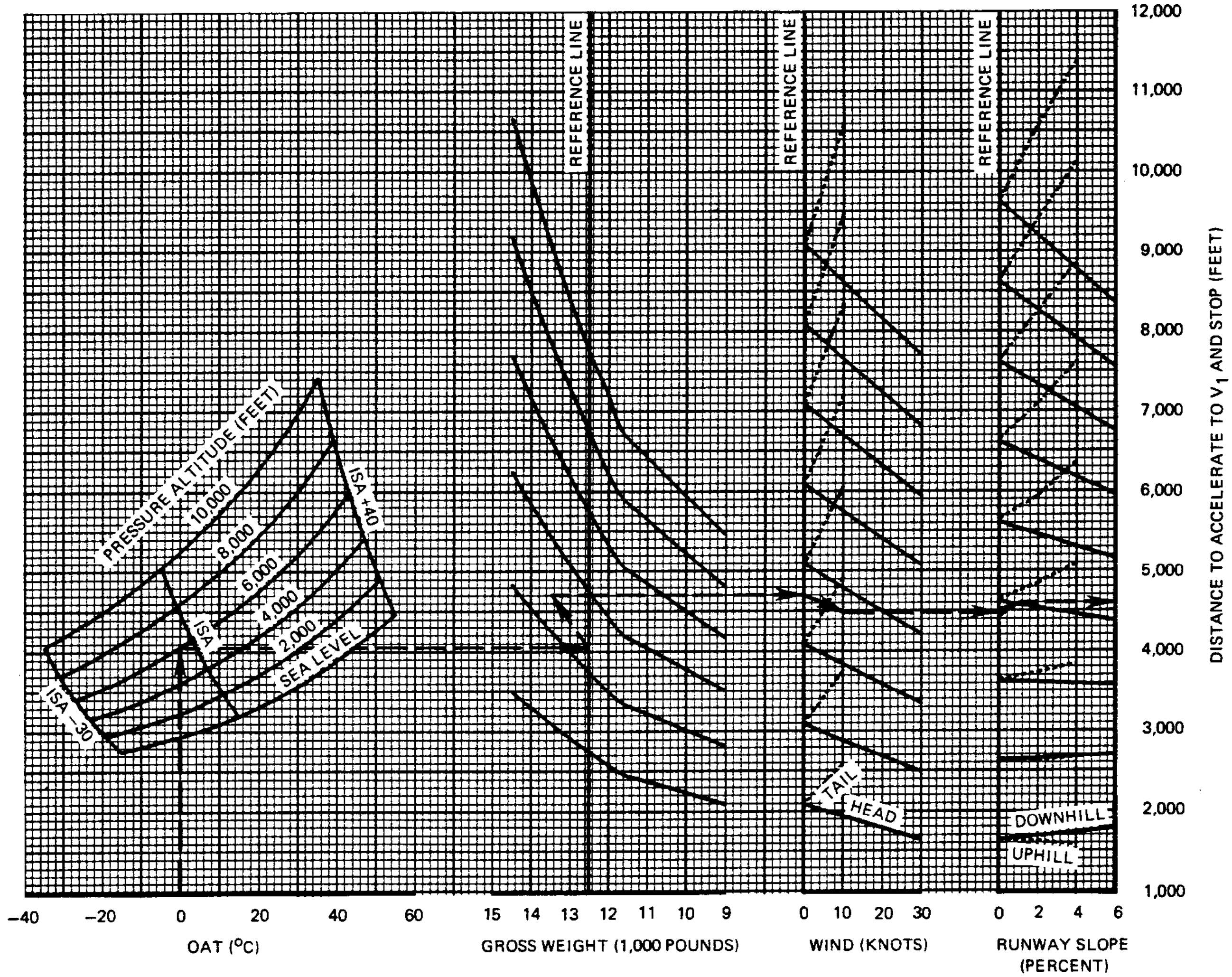


FIGURE 4-32

DISTANCE TO ACCELERATE TO V_1 AND STOP - DRY, BLEED AIR OFF GOODYEAR AEROSPACE DUAL ROTOR BRAKES

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (DRY)
GEN LOAD................ 200 AMPS
BLEED AIR.................... OFF
ENG ANTI-ICE....... OFF (SEE NOTE)
RUNWAY...... DRY, HARD SURFACE
FLAPS........................ 1/4
DECISION SPEED ... V_1 (FIGURE 4-15)
NOSE WHEEL STEERING...ON OR OFF

EXAMPLE:

GIVEN: OAT = 0°C
PRESSURE ALTITUDE = 6,000 FEET
GROSS WEIGHT = 13,500 POUNDS
HEADWIND = 10 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)

OBTAIN: ACCELERATE STOP DISTANCE = 4,630 FEET
INCREASE (ANTI-ICE ON) = 210 FEET
NET ACCELERATE STOP DISTANCE = 4,840 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4-29.

NOTE

- INCREASE ACCELERATE STOP DISTANCE BY 4.5 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

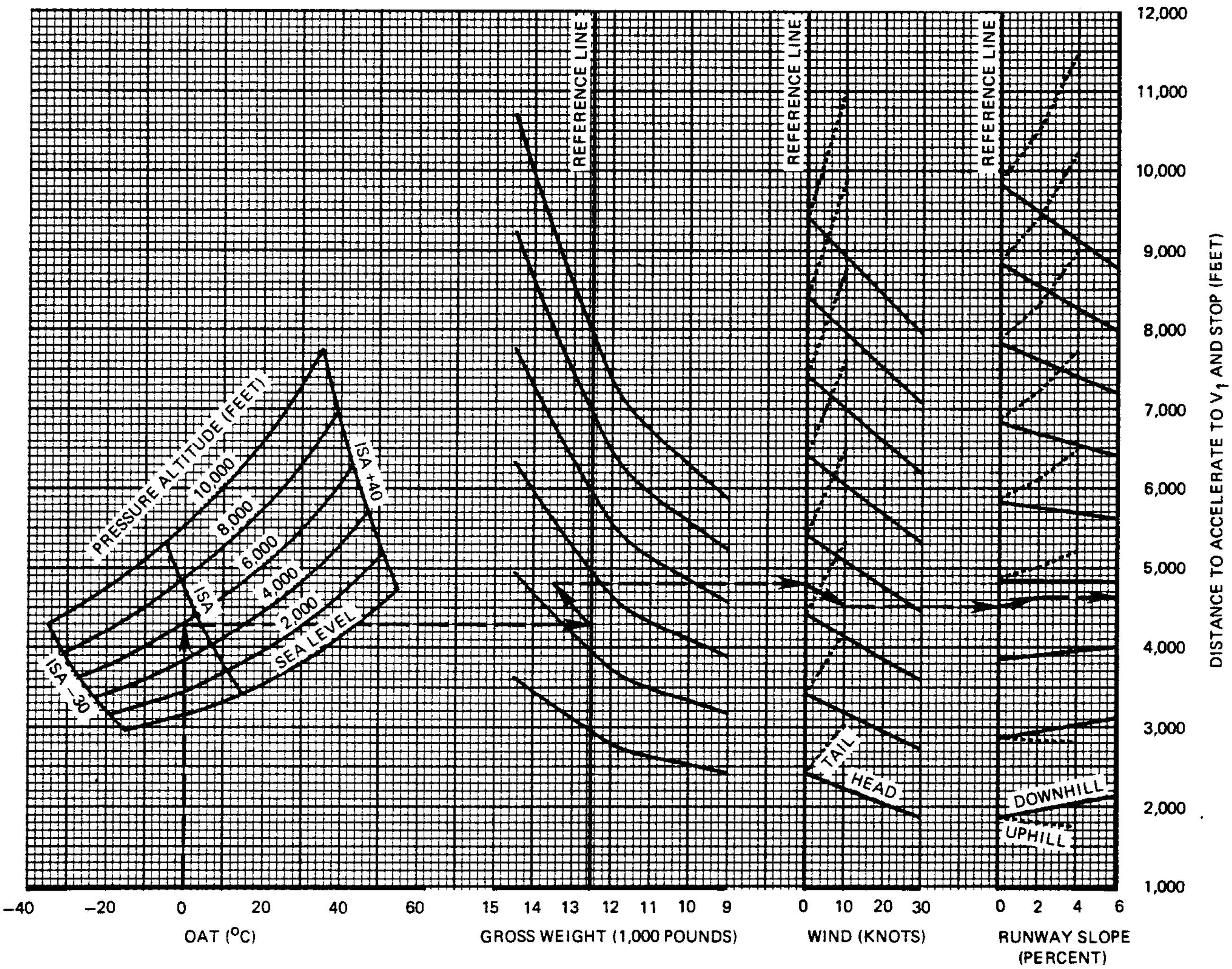


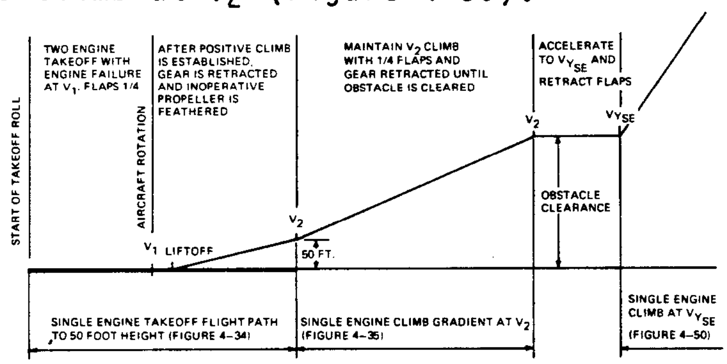
FIGURE 4-33

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT - DRY, BLEED AIR OFF

An estimate of the horizontal distance required to clear an obstacle up to 1,000 feet above the runway may be obtained by using Figures 4-34 and 4-35. The takeoff path is considered in two phases, as follows:

(1) The distance from the start of the takeoff roll to 50 feet above runway (Figure 4-34). Both engines are assumed to operate normally to speed V_1, where one engine fails and the takeoff is continued on one engine. This phase is concluded when the airplane reaches 50 foot height at V_2.

(2) Single Engine Climb at V_2 (Figure 4-35).



EXAMPLE

Given: OAT=20°C (ISA +8°C)
AIRFIELD PRESSURE ALTITUDE = 1,400 FEET
GROSS WEIGHT = 12,900 POUNDS
BLEED AIR OFF
ENGINE ANTI-ICE OFF
DRY POWER

Desired: FLIGHT PATH DISTANCE TO 1,000 FOOT HEIGHT AFTER ENGINE FAILURE AT V_1

Obtain: (1) DISTANCE FROM START OF THE TAKEOFF ROLL TO 50 FOOT HEIGHT = 5,600 FEET (FIGURE 4-34)

(2) CLIMB DISTANCE:

a. $\text{AVG HEIGHT} = \text{FIELD ELEVATION} + \frac{\text{HEIGHT INCREASE}}{2} = 1{,}900\ \text{FT}$

b. ESTIMATED TEMPERATURE = 19°C (AT 2°C/1,000 FEET)

c. CLIMB GRADIENT = 5.5 PERCENT (FIGURE 4-35)

d. $\text{DISTANCE} = \frac{(100) \times (1{,}000 - 50)}{5.5} = 17{,}273\ \text{FEET}$

(3) TOTAL FLIGHT PATH DISTANCE = (1) + (2) = 22,873 FEET

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT (continued)

The charts on the following pages (Figures 4-34 and 4-35) depend upon the following variable conditions. The appropriate charts must be used to ensure accuracy.

VARIABLE CONDITIONS:

- o Power - Dry with Bleed Air Off.
- o Engine Anti-Ice - Off or On (Adjust distances as indicated by anti-ice effects charts for anti-ice On).
- o V_1 and V_2 Speeds - From Figure 4-15.
- o Wind effect on takeoff distance to 50 feet.

The charts are also based on the following common conditions:

COMMON CONDITIONS:

- o Generator Load - 200 AMPS total.
- o Runway - Dry, Level, Hard Surface.
- o No wind effect on V_2 climb gradient.
- o Flaps - 1/4 until clearing obstacles at V_2; then up.
- o Propeller on inoperative engine - Windmilling in the NTS mode until it is feathered after attaining V_2 speed.

NOTE

The maximum takeoff weight (Figure 4-29) and the flight paths constructed from Figures 4-34 and 4-35, can be realized using the following procedures:

1. At V_1, rotate to takeoff attitude (approximately 10° nose up).
2. Once airborne, establish 5° of bank into operating engine.
3. After a positive rate of climb is indicated on the vertical speed indicator and the altimeter, retract the landing gear. This will occur at approximately 15 to 20 feet above the ground.
4. Climb and accelerate to the scheduled V_2 speed.
5. Feather the propeller on the inoperative engine.
6. Maintain V_2 speed until obstacle clearance is assured.
7. Retract flaps and accelerate to best rate of climb speed.

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT (continued)
SINGLE ENGINE TAKEOFF FLIGHT PATH DISTANCE TO 50 FOOT HEIGHT - DRY, BLEED AIR OFF

EXAMPLE:

GIVEN: PRESSURE ALTITUDE = 4,000 FEET
GROSS WEIGHT = 11,000 POUNDS
OBTAIN: INCREASE IN TAKEOFF DISTANCE = 5.5 PERCENT

NOTE

MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

ENGINE ANTI-ICE EFFECT

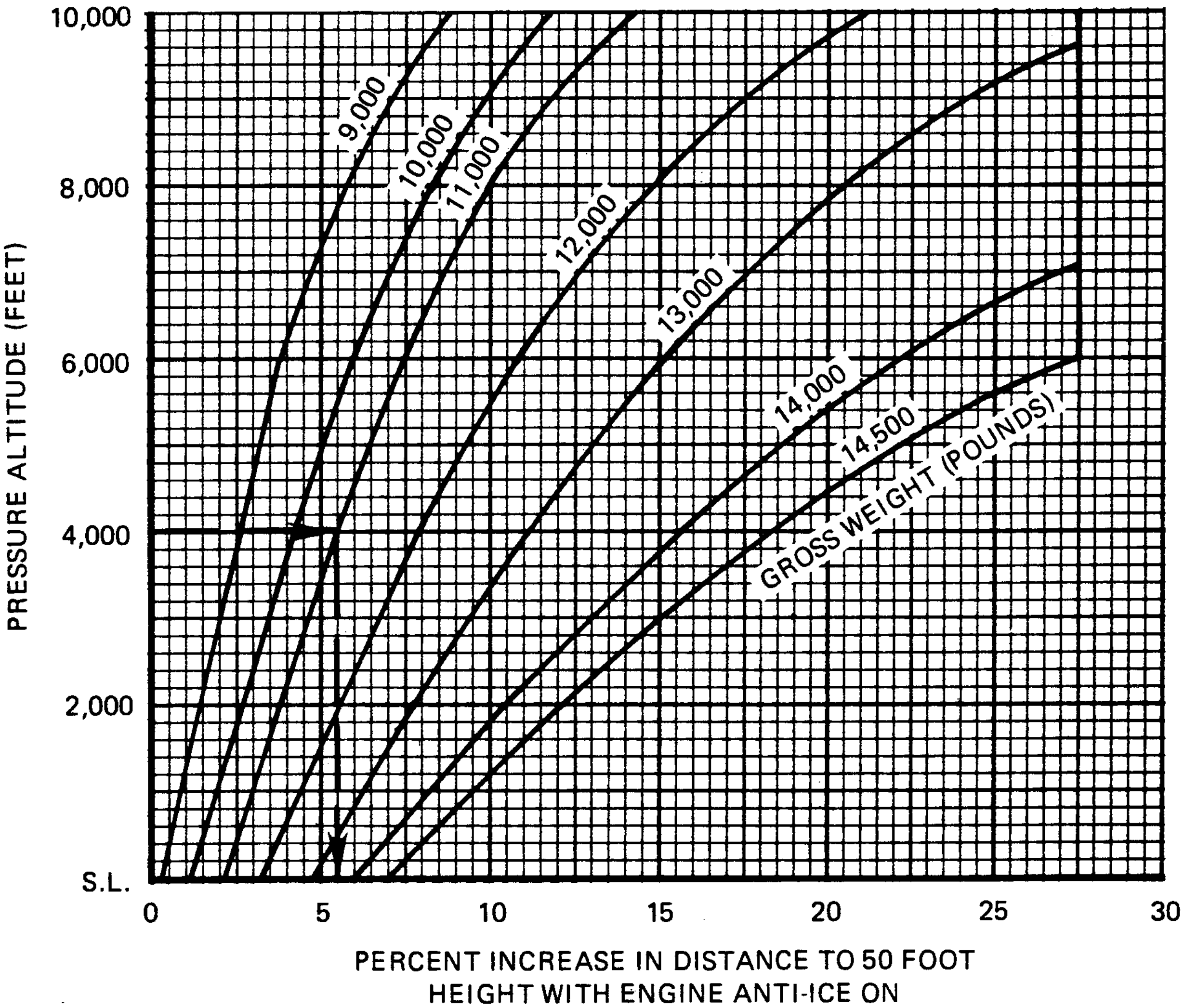


FIGURE 4-34

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT (continued)
SINGLE ENGINE TAKEOFF FLIGHT PATH DISTANCE TO 50 FOOT HEIGHT - DRY, BLEED AIR OFF

ASSOCIATED CONDITIONS:

POWER.............TAKEOFF (DRY)
GEN LOAD................200 AMPS
BLEED AIR....................OFF
ENG ANTI-ICE......OFF (SEE GRAPH)
RUNWAY..............DRY, LEVEL, HARD SURFACE, NO WIND
V_1 SPEED.............FIGURE 4–15
V_2 SPEED.............FIGURE 4–15
FLAPS.........................1/4
NOSE WHEEL STEERING...ON OR OFF

EXAMPLE:

GIVEN: OAT = –2°C
PRESSURE ALTITUDE = 4,000 FEET
GROSS WEIGHT = 11,000 POUNDS
OBTAIN: V_1 SPEED = 98 KIAS
V_2 SPEED = 103 KIAS

DISTANCE TO 50 FOOT HEIGHT =	3,925 FEET
INCREASE (ANTI-ICE ON) =	220 FEET
TOTAL DISTANCE TO 50 FOOT HEIGHT =	4,145 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4–29.

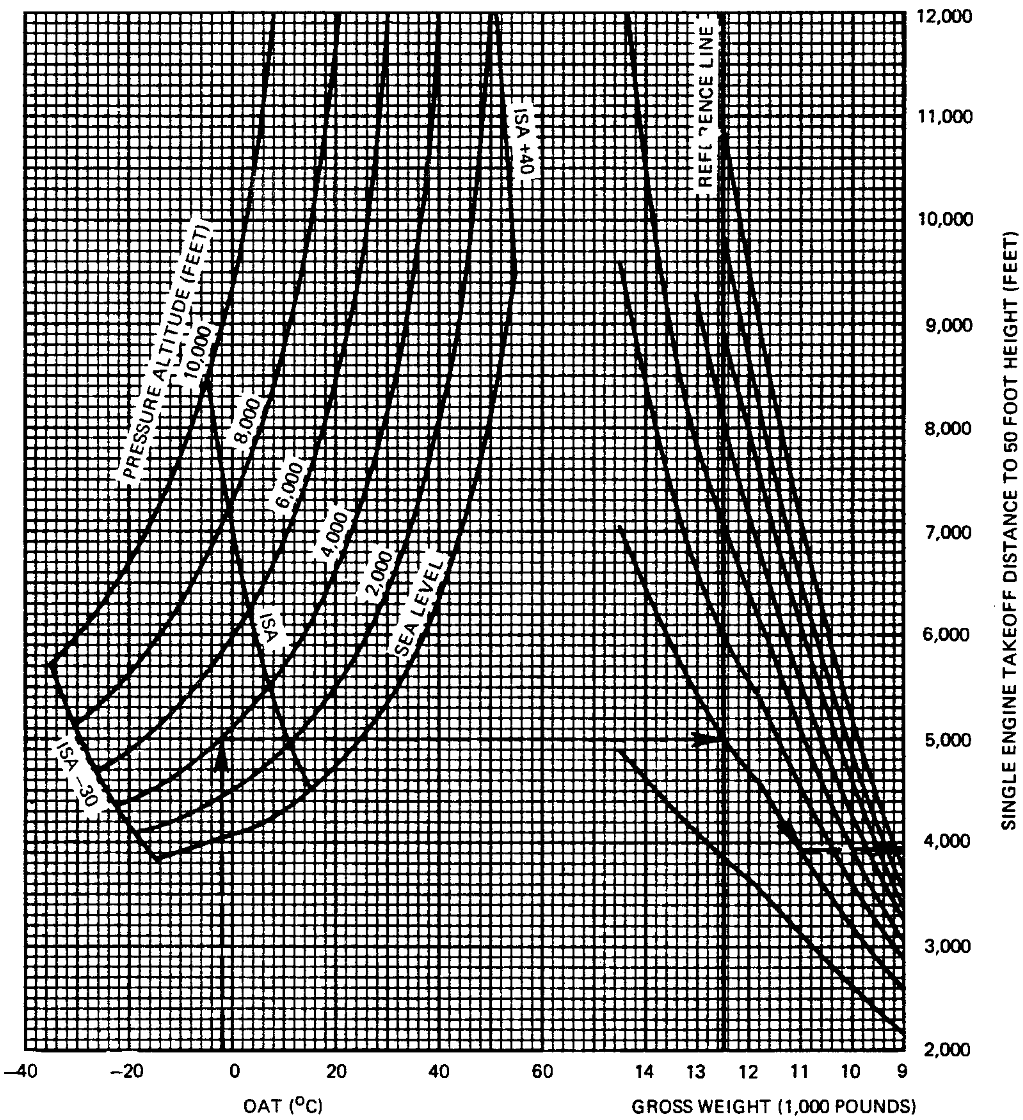
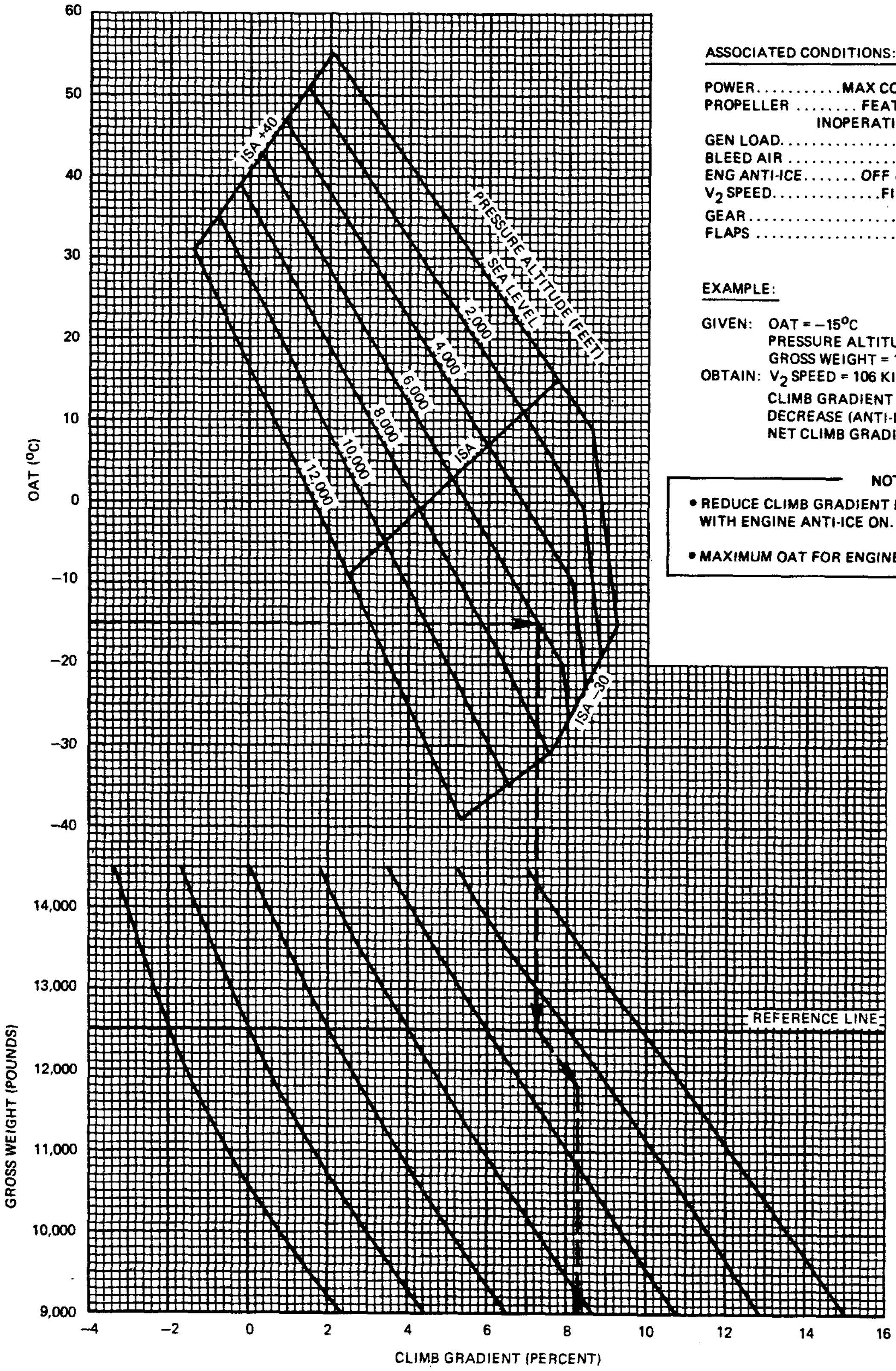


FIGURE 4-34 (continued)

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT (continued)
SINGLE ENGINE CLIMB GRADIENT AT V_2 - DRY, BLEED AIR OFF



ASSOCIATED CONDITIONS:

POWER .... MAX CONTINUOUS
PROPELLER .... FEATHERED ON INOPERATIVE ENGINE
GEN LOAD .... 200 AMPS
BLEED AIR .... OFF
ENG ANTI-ICE .... OFF (SEE NOTE)
V_2 SPEED .... FIGURE 4-15
GEAR .... UP
FLAPS 1/4

EXAMPLE:

GIVEN: OAT = -15°C
PRESSURE ALTITUDE = 6,000 FEET
GROSS WEIGHT = 11,800 POUNDS
OBTAIN: V_2 SPEED = 106 KIAS
CLIMB GRADIENT = 8.30 PERCENT
DECREASE (ANTI-ICE ON) = -1.40 PERCENT
NET CLIMB GRADIENT = 6.90 PERCENT

NOTE

- REDUCE CLIMB GRADIENT BY 1.4 PERCENT GRADIENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

FIGURE 4-35

TWO ENGINE TAKEOFF DISTANCE TO 50 FOOT HEIGHT - DRY, BLEED AIR OFF

ASSOCIATED CONDITIONS:

POWER............TAKEOFF (DRY)
GEN LOAD...............200 AMPS
BLEED AIR..................OFF
ENG ANTI-ICE.......OFF (SEE NOTE)
RUNWAY......DRY, HARD SURFACE
V_1 SPEED.............FIGURE 4–15
V_{50} SPEED............FIGURE 4–15
FLAPS........................1/4
NOSE WHEEL STEERING...ON OR OFF

EXAMPLE:

GIVEN: OAT = −10°C
PRESSURE ALTITUDE = 6,000 FEET
GROSS WEIGHT = 11,000 POUNDS
TAILWIND = 8 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)

OBTAIN: V_1 SPEED = 98 KIAS
V_{50} SPEED = 112 KIAS
DISTANCE OVER 50 FOOT HEIGHT = 3,250 FEET
INCREASE (ANTI-ICE ON) = 465 FEET
TOTAL TAKEOFF DISTANCE = 3,715 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4–29.

NOTE

- INCREASE TAKEOFF DISTANCE BY 14.2 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

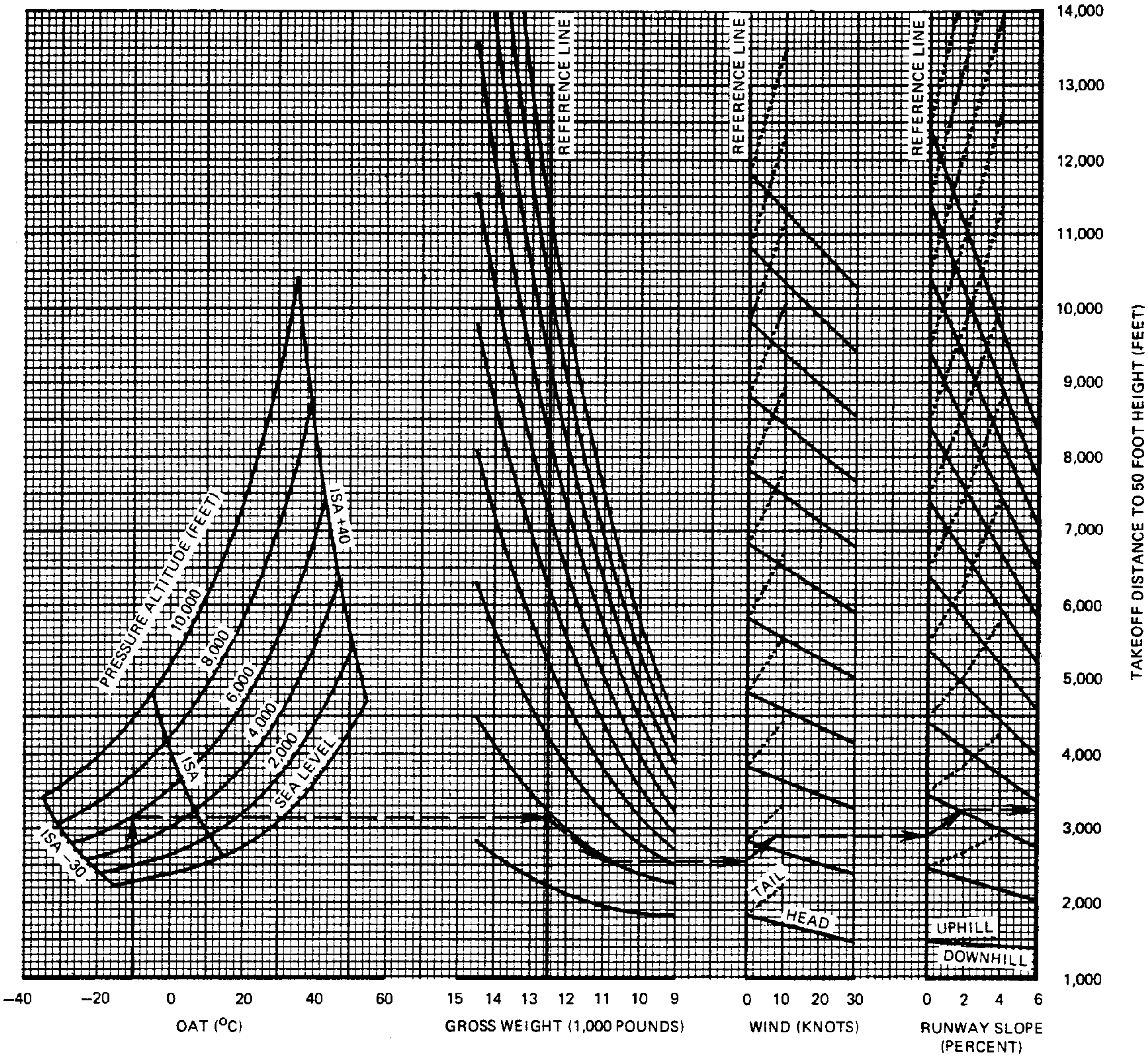
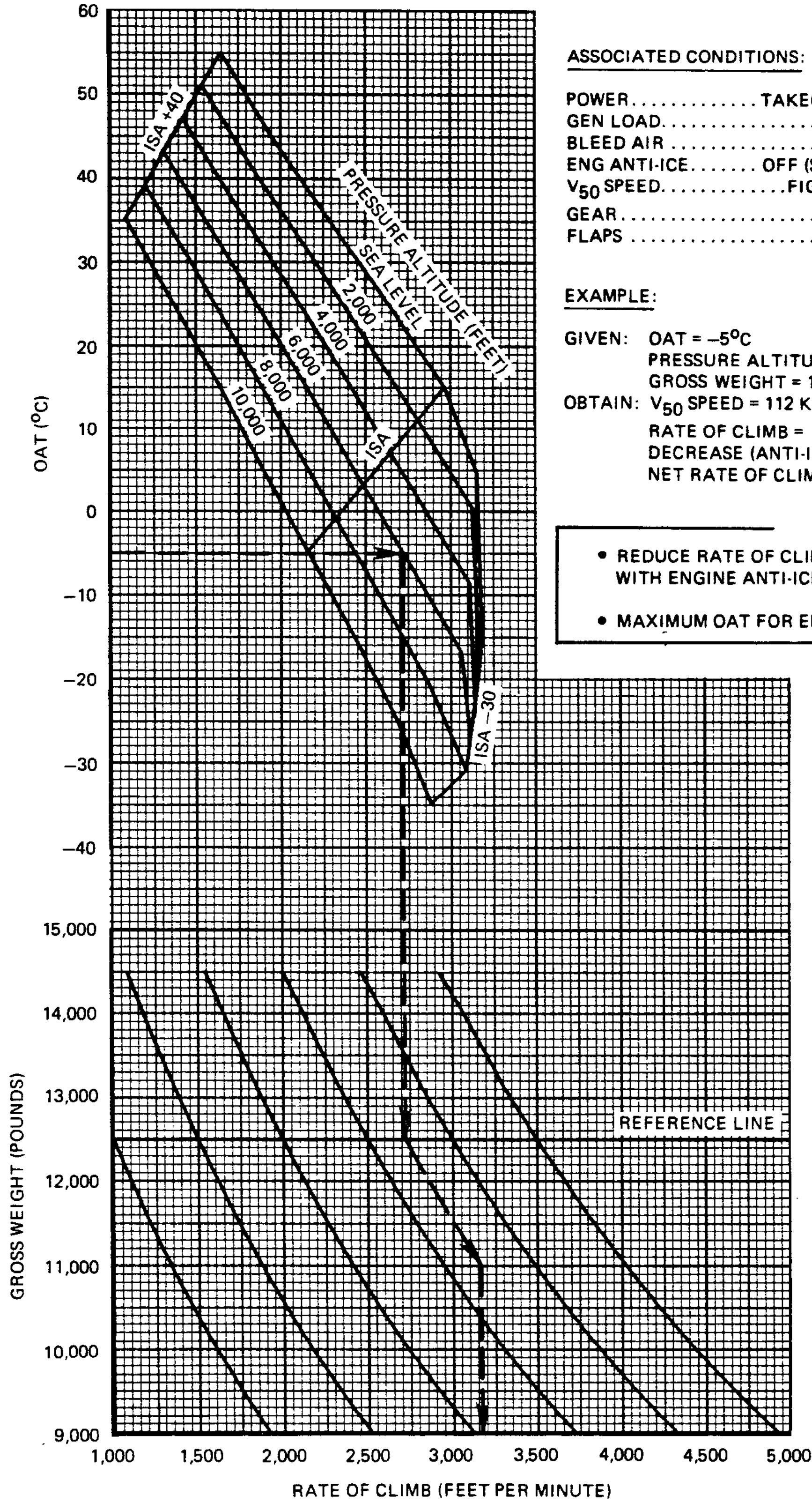


FIGURE 4-36

TWO ENGINE RATE OF CLIMB AT V_{50} - DRY, BLEED AIR OFF



ASSOCIATED CONDITIONS:

POWER............TAKEOFF (DRY)
GEN LOAD...............200 AMPS
BLEED AIR....................OFF
ENG ANTI-ICE.......OFF (SEE NOTE)
V_{50} SPEED............FIGURE 4–15
GEAR.........................UP
FLAPS.......................1/4

EXAMPLE:

GIVEN: OAT = −5°C
PRESSURE ALTITUDE = 6,000 FEET
GROSS WEIGHT = 11,000 POUNDS

OBTAIN: V_{50} SPEED = 112 KIAS

RATE OF CLIMB =	3,175 FEET PER MINUTE
DECREASE (ANTI-ICE ON) =	−400 FEET PER MINUTE
NET RATE OF CLIMB =	2,775 FEET PER MINUTE

NOTE

- REDUCE RATE OF CLIMB BY 400 FEET PER MINUTE WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

FIGURE 4-37

PART E TAKEOFF PERFORMANCE WET

CONTENTS

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TAKEOFF POWER CHECK CHART – WET

ASSOCIATED CONDITIONS:

POWER .... TAKEOFF (WET)
RPM 100%
MAX ALLOWABLE EGT........ 650°C
GEN LOAD .... 0 TO 200 AMPS
BLEED AIR .... OFF
ENG ANTI-ICE............ SEE GRAPH
SPEED....................... 0 TO 50 KIAS

EXAMPLE:

GIVEN: OAT = 27°C
PRESSURE ALTITUDE = 3,000 FEET
ENGINE ANTI-ICE SYSTEM – OFF
OBTAIN: ENGINE TORQUE = 99 PERCENT

NOTE

- MAXIMUM OAT WITH ENGINE ANTI-ICE ON IS 5°C.
- MINIMUM OAT FOR WET POWER OPERATION IS –6°C.
- REFERENCE EGT IS THE EGT OBTAINED WHEN REQUIRED ENGINE TORQUE IS SET IN ACCORDANCE WITH THIS CHART AND MUST NOT EXCEED 650°C.

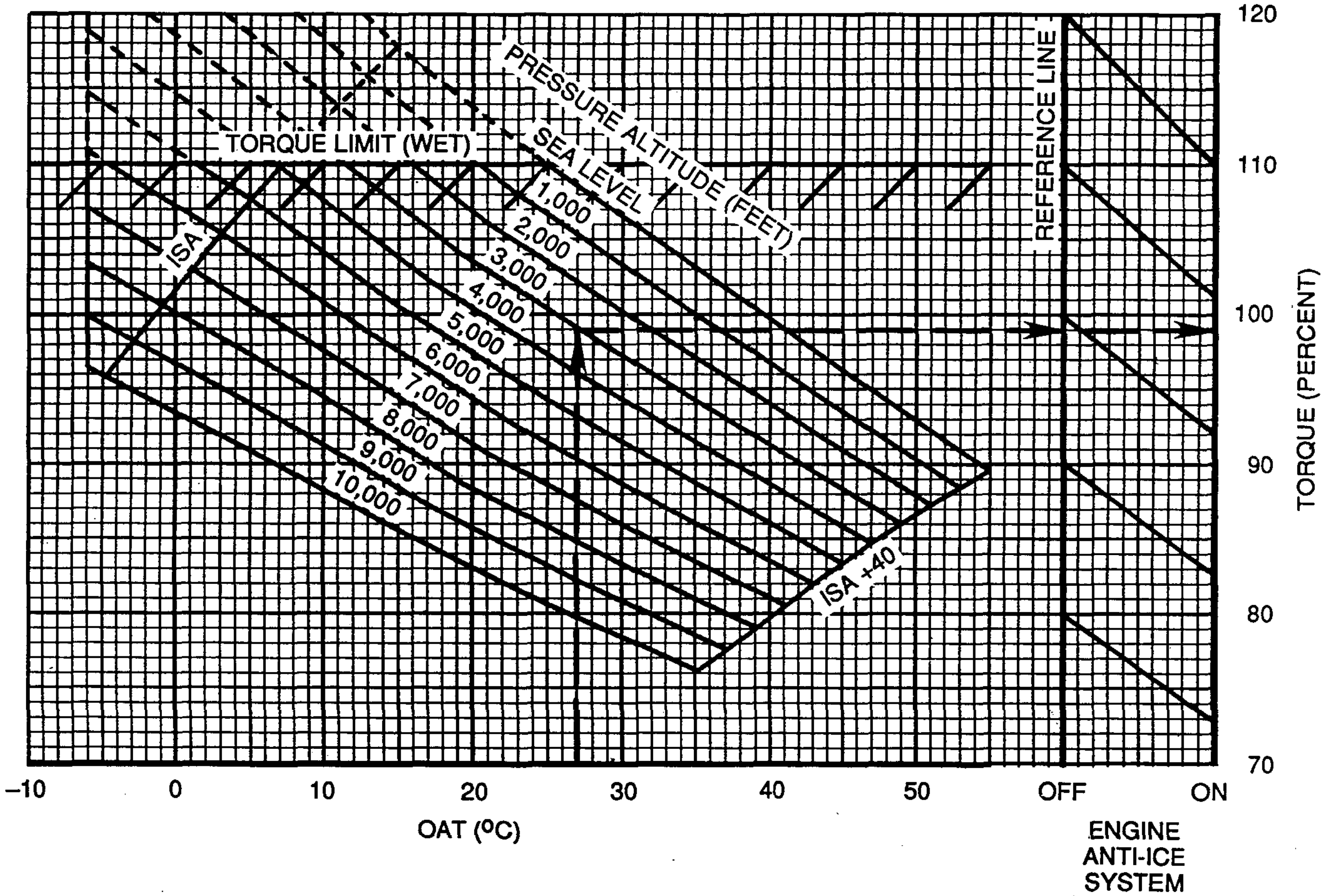

FIGURE 4-38

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MAXIMUM TAKEOFF WEIGHT LIMITATION CHART - WET

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (WET)
GEN LOAD................ 200 AMPS
BLEED AIR..................... OFF
ENG ANTI-ICE....... OFF (SEE NOTE)
GEAR............ DOWN (TAKEOFF)
UP (ENROUTE)
FLAPS .... 1/4 (TAKEOFF)
UP (ENROUTE)

EXAMPLE:

GIVEN: OAT = 37°C
PRESSURE ALTITUDE = 6,500 FEET
OBTAIN: TAKEOFF WEIGHT = 12,300 POUNDS

NOTE

- MINIMUM OAT FOR WET POWER OPERATION IS –6°C.
- REDUCE TAKEOFF WEIGHT BY 985 POUNDS WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.
- THIS WEIGHT IS DEFINED BY FAR 135 APP. A AND RESULTS IN THE WEIGHT AT WHICH TAKEOFF CAN BE CONTINUED AFTER AN ENGINE FAILURE IS RECOGNIZED AT OR ABOVE V_1.

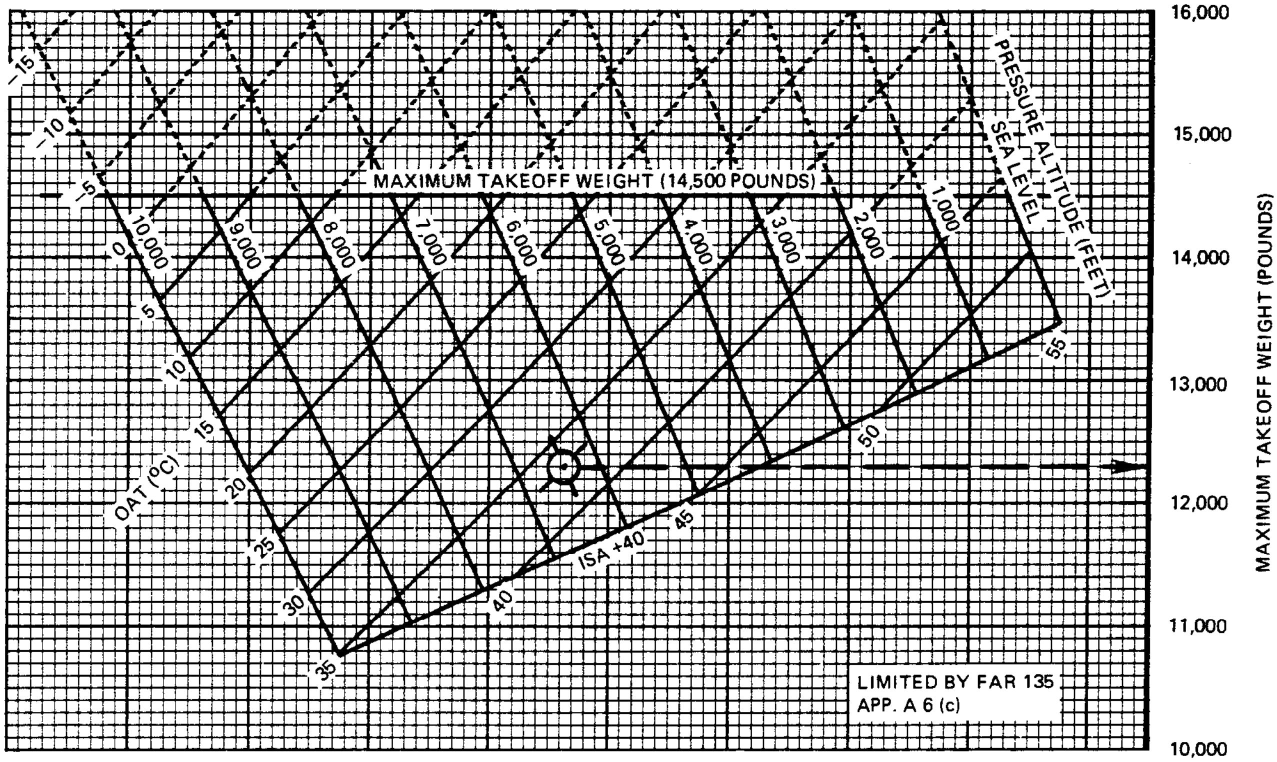


FIGURE 4-39

DISTANCE TO ACCELERATE TO V_1 AND SLOW TO 35 KNOTS - WET

B.F. GOODRICH SINGLE ROTOR BRAKES
(MAXIMUM 12,500 POUNDS)

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (WET)
GEN LOAD................ 200 AMPS
BLEED AIR.................... OFF
ENG ANTI-ICE....... OFF (SEE NOTE)
RUNWAY...... DRY, HARD SURFACE
FLAPS.......................... 1/4
DECISION SPEED ...V_1 (FIGURE 4–15)
ANTI-SKID.............. ON OR OFF
NOSE WHEEL STEERING...ON OR OFF

EXAMPLE:

GIVEN: OAT = 10°C
PRESSURE ALTITUDE = 2,000 FEET
GROSS WEIGHT = 11,000 POUNDS
HEADWIND = 10 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)
OBTAIN: ACCELERATE AND SLOW DISTANCE = 2,550 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4–39. DO NOT EXCEED 12,500 POUNDS.

NOTE

- INCREASE ACCELERATE AND SLOW DISTANCE BY 1.7 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.
- MINIMUM OAT FOR WET POWER OPERATION IS –6°C.

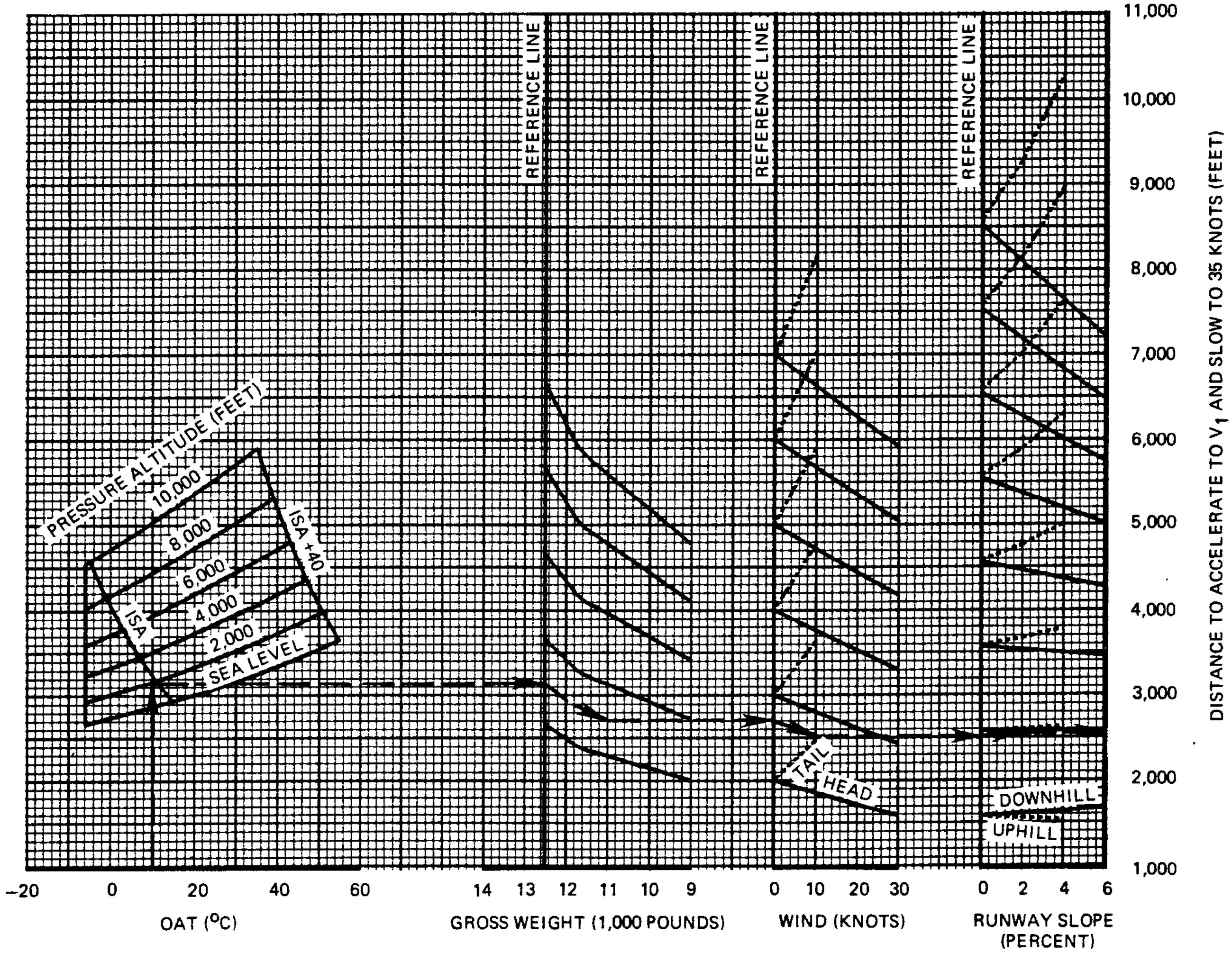


FIGURE 4-40

DISTANCE TO ACCELERATE TO V_1 AND SLOW TO 35 KNOTS - WET
GOODYEAR AEROSPACE DUAL ROTOR BRAKES
(MAXIMUM 12,500 POUNDS)

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (WET)
GEN LOAD................ 200 AMPS
BLEED AIR.................... OFF
ENG ANTI-ICE....... OFF (SEE NOTE)
RUNWAY...... DRY, HARD SURFACE
FLAPS.......................... 1/4
DECISION SPEED ...V_1 (FIGURE 4–15)
NOSE WHEEL STEERING...ON OR OFF

EXAMPLE:

GIVEN: OAT = 10°C
PRESSURE ALTITUDE = 2,000 FEET
GROSS WEIGHT = 11,000 POUNDS
HEADWIND = 10 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)
OBTAIN: ACCELERATE AND SLOW DISTANCE = 2,700 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4–39. DO NOT EXCEED 12,500 POUNDS.

NOTE

- INCREASE ACCELERATE AND SLOW DISTANCE BY 1.5 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.
- MINIMUM OAT FOR WET POWER OPERATION IS –6°C.

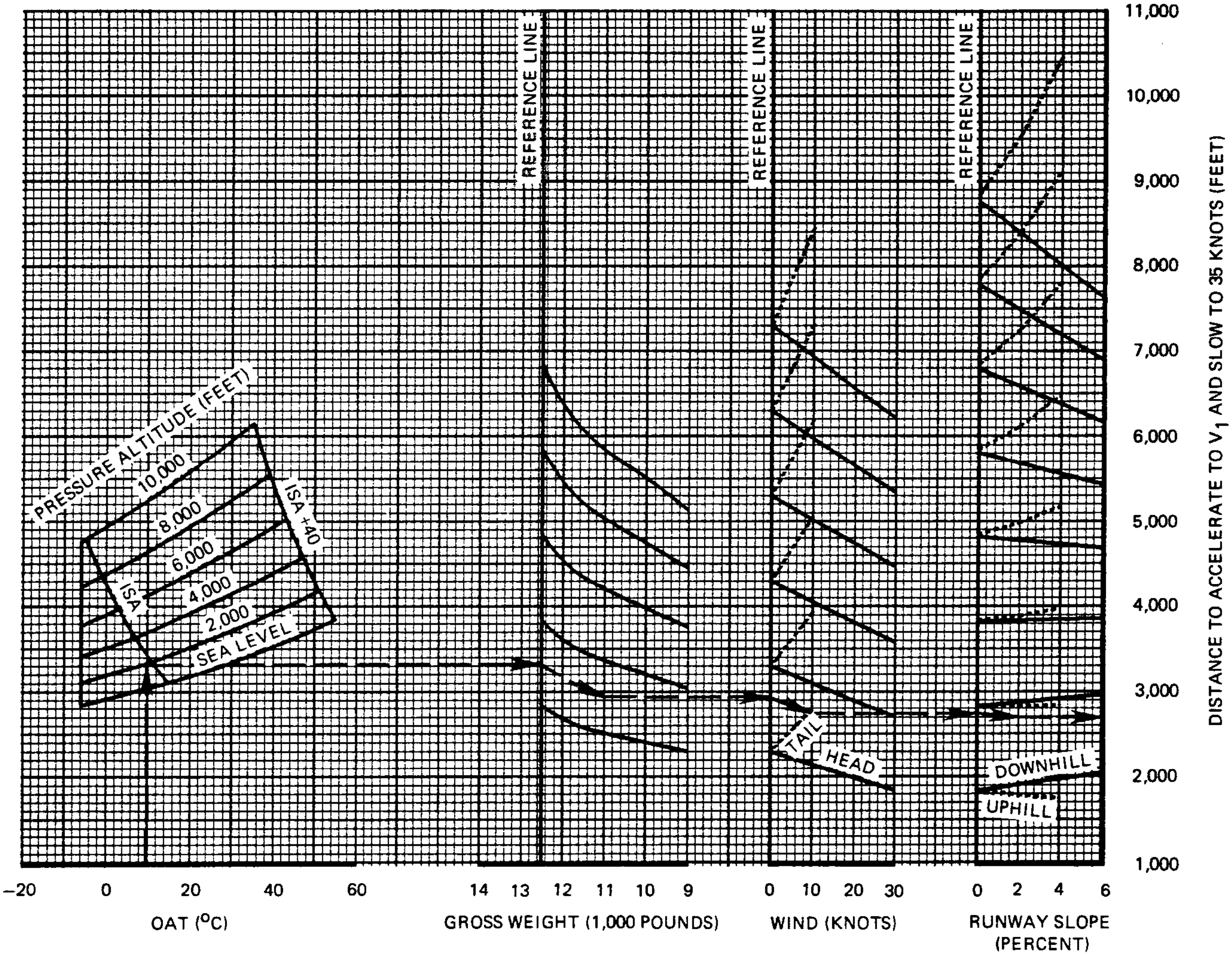


FIGURE 4-41

DISTANCE TO ACCELERATE TO V_1 AND STOP - WET
B.F. GOODRICH SINGLE ROTOR BRAKES

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (WET)
GEN LOAD................ 200 AMPS
BLEED AIR..................... OFF
ENG ANTI-ICE....... OFF (SEE NOTE)
RUNWAY...... DRY, HARD SURFACE
FLAPS.......................... 1/4
DECISION SPEED ... V_1 (FIGURE 4–15)
ANTI-SKID.............. ON OR OFF
NOSE WHEEL STEERING... ON OR OFF

EXAMPLE:

GIVEN: OAT = 10°C
PRESSURE ALTITUDE = 4,000 FEET
GROSS WEIGHT = 11,000 POUNDS
HEADWIND = 10 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)
OBTAIN: ACCELERATE STOP DISTANCE = 3,000 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4–39.

NOTE

- INCREASE ACCELERATE STOP DISTANCE BY 1.8 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.
- MINIMUM OAT FOR WET POWER OPERATION IS –6°C.

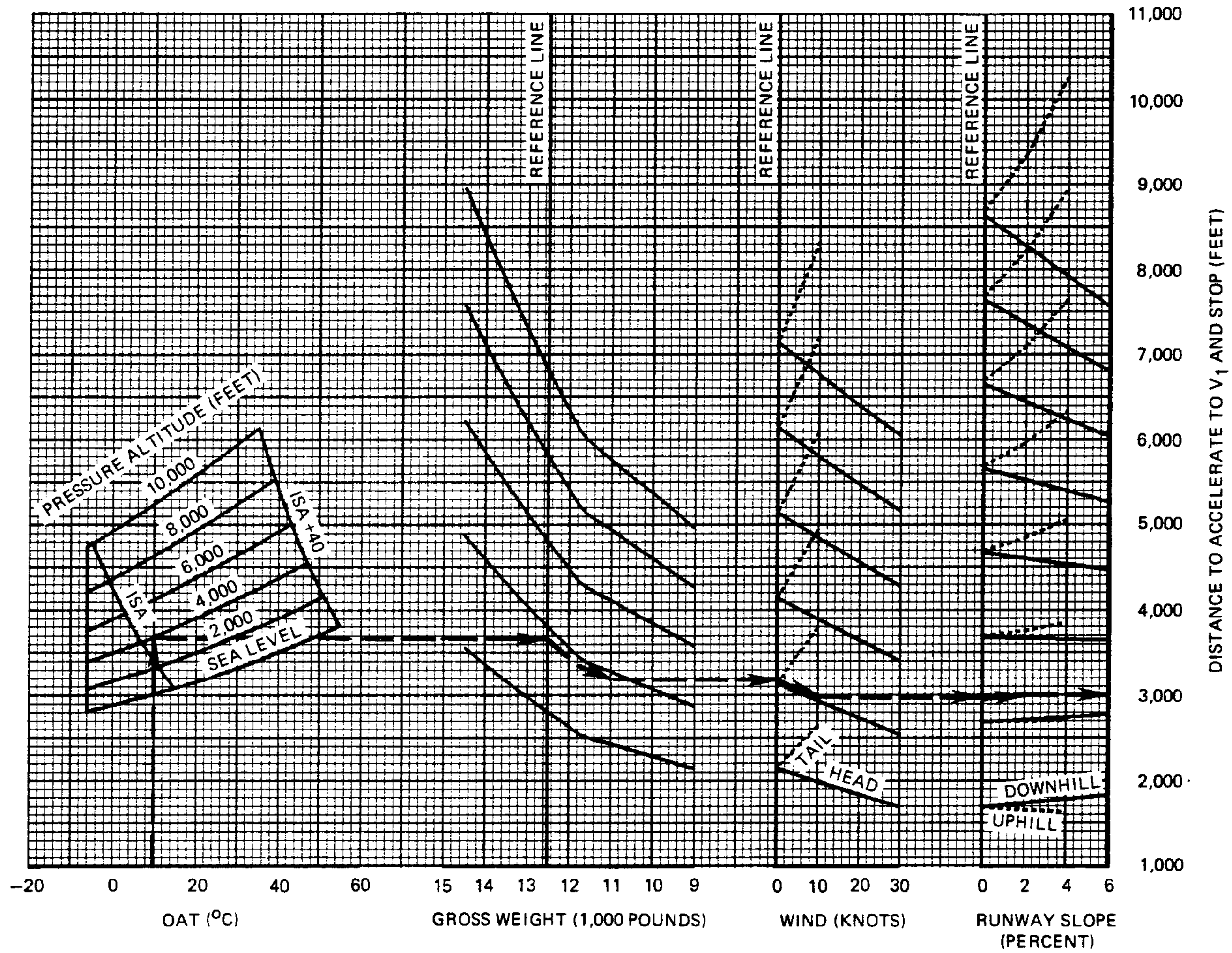


FIGURE 4-42

DISTANCE TO ACCELERATE TO V_1 AND STOP - WET
GOODYEAR AEROSPACE DUAL ROTOR BRAKES

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (WET)
GEN LOAD................ 200 AMPS
BLEED AIR..................... OFF
ENG ANTI-ICE....... OFF (SEE NOTE)
RUNWAY...... DRY, HARD SURFACE
FLAPS 1/4
DECISION SPEED ... V_1 (FIGURE 4–15)
NOSE WHEEL STEERING... ON OR OFF

EXAMPLE:

GIVEN: OAT = 10°C
PRESSURE ALTITUDE = 4,000 FEET
GROSS WEIGHT = 11,000 POUNDS
HEADWIND = 10 KNOTS
RUNWAY SLOPE = 2 PERCENT (DOWNHILL)
OBTAIN: ACCELERATE STOP DISTANCE = 3,300 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4–39.

NOTE

- INCREASE ACCELERATE STOP DISTANCE BY 1.8 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.
- MINIMUM OAT FOR WET POWER OPERATION IS –6°C.

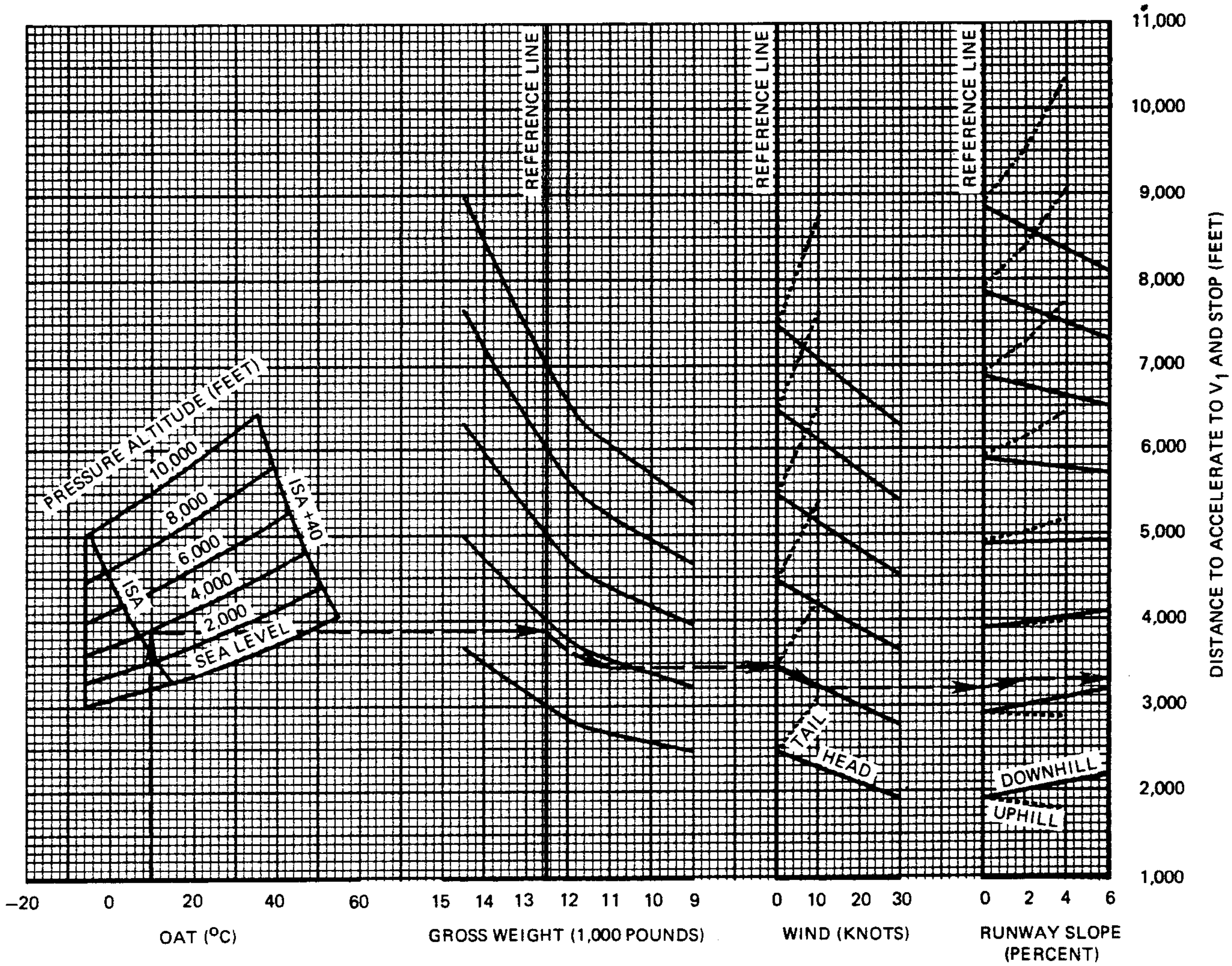


FIGURE 4-43

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT - WET

An estimate of the horizontal distance required to clear an obstacle up to 1,000 feet above the runway may be obtained by using Figures 4-44 and 4-45. The takeoff path is considered in two phases, as follows:

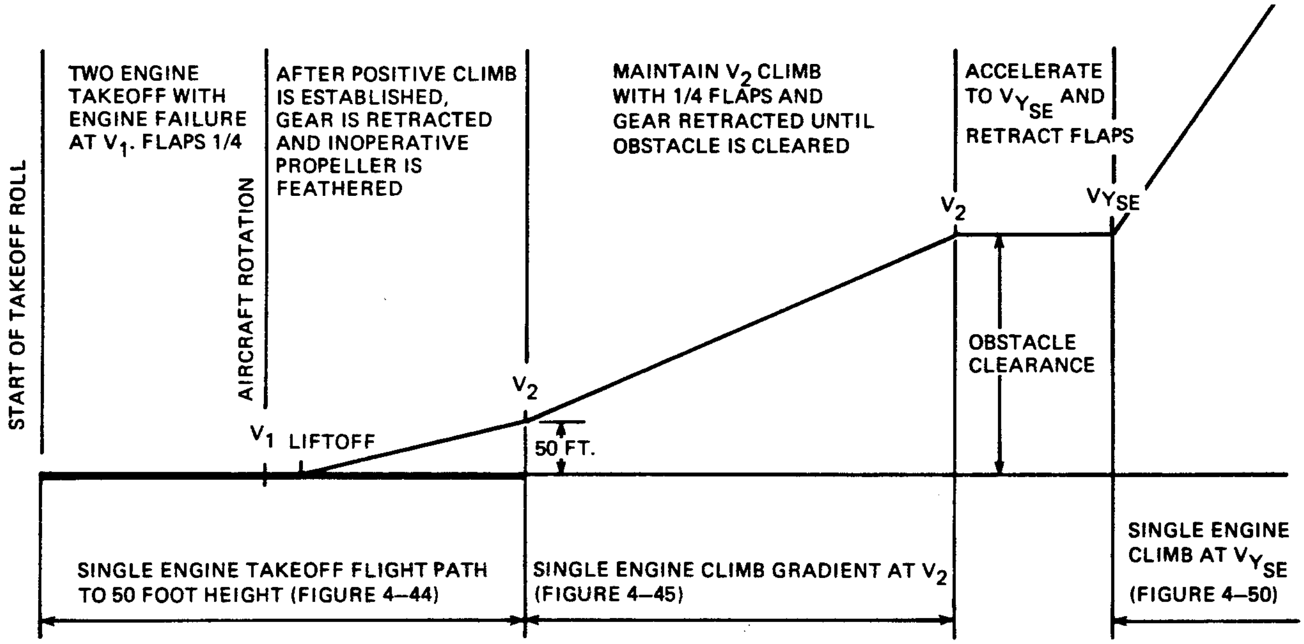
(1) The distance from the start of the takeoff roll to 50 feet above runway (Figure 4-44). Both engines are assumed to operate normally to speed V_1, where one engine fails and the takeoff is continued on one engine. This phase is concluded when the airplane reaches 50 foot height at V_2.

(2) Single Engine Climb at V_2 (Figures 4-35 and 4-45).

Figure 4-35 provides single engine V_2 climb performance when using Dry, Bleed Air Off power during the climb from 50 feet. Figure 4-45 provides climb performance when wet takeoff power is maintained during the climb. Note that if the V_2 climb is to be conducted with Dry, Bleed Air Off Power, the minimum required AWI fluid quantity is eight gallons when operating from airfield elevations up to 10,000 feet pressure altitude.

Improved single engine climb performance and obstacle clearance can be achieved by using Wet Takeoff Power (five minute limit) during the V_2 climb. However, additional AWI fluid must be aboard in order to maintain Wet Takeoff Power during the climb. Figure 4-45 presents the Single Engine Climb Gradient when using Wet Takeoff Power at V_2 speed. Figure 4-45 also shows the amount of AWI fluid which must be available before takeoff at various weight and pressure altitude conditions in order to ensure ability to maintain Wet Takeoff Power to 1,000 feet above the airport and through the level acceleration to V_{YSE}.

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT (continued)



EXAMPLE

Given: OAT=20°C (ISA +8°C)
AIRFIELD PRESSURE ALTITUDE = 1,400 FEET
GROSS WEIGHT = 12,900 POUNDS
BLEED AIR OFF
ENGINE ANTI-ICE OFF
WET POWER TAKEOFF AND V_2 CLIMB

Desired: FLIGHT PATH DISTANCE TO 1,000 FOOT HEIGHT AFTER ENGINE FAILURE AT V_1

Obtain: (1) DISTANCE FROM START OF THE TAKEOFF ROLL TO 50 FOOT HEIGHT = 4,600 FEET (FIGURE 4-44)

(2) CLIMB DISTANCE:

a. AVG HEIGHT = FIELD ELEVATION + $\frac{\text{HEIGHT INCREASE}}{2}$ = 1,900 FT

b. ESTIMATED TEMPERATURE = 19°C (AT 2°C/1,000 FEET)

c. CLIMB GRADIENT = 8.2 PERCENT (FIGURE 4-45)

d. DISTANCE = $\frac{(100) \times (1,000 - 50)}{8.2}$ =11,585 FEET

(3) TOTAL FLIGHT PATH DISTANCE = (1) + (2) = 16,185 FEET

(4) MINIMUM AWI FLUID REQUIRED = 8.0 GALLONS (FIGURE 4-45)

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT (continued)

The charts on the following pages (Figures 4-44 and 4-45) depend upon the following variable conditions. The appropriate charts must be used to ensure accuracy.

VARIABLE CONDITIONS:

- o Power - Wet.
- o Engine Anti-Ice - Off or On (Adjust distances as indicated by anti-ice effects charts for anti-ice On).
- o V_1 and V_2 Speeds - From Figure 4-15.
- o Wind effect on takeoff distance to 50 feet.

The charts are also based on the following common conditions:

COMMON CONDITIONS:

- o Generator Load - 200 AMPS total.
- o Runway - Dry, Level, Hard Surface.
- o No wind effect on V_2 climb gradient.
- o Flaps - 1/4 until clearing obstacles at V_2; then up.
- o Propeller on inoperative engine - Windmilling in the NTS mode until it is feathered after attaining V_2 speed.

NOTE

The maximum takeoff weight (Figure 4-39) and the flight paths constructed from Figures 4-44 and 4-45, can be realized using the following procedures:

1. At V_1, rotate to takeoff attitude (approximately 10° nose up).
2. Once airborne, establish 5° of bank into operating engine.
3. After a positive rate of climb is indicated on the vertical speed indicator and the altimeter, retract the landing gear. This will occur at approximately 15 to 20 feet above the ground.
4. Climb and accelerate to the scheduled V_2 speed.
5. Feather the propeller on the inoperative engine.
6. Maintain V_2 speed until obstacle clearance is assured.
7. Retract flaps and accelerate to best rate of climb speed.

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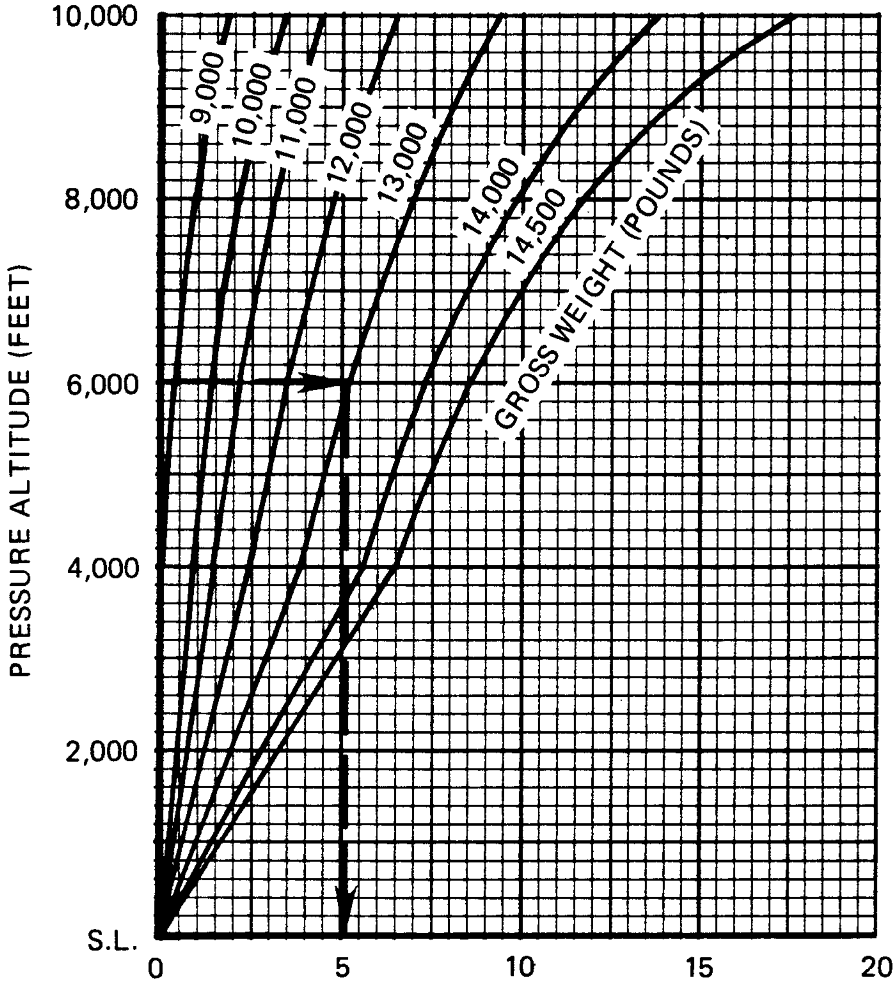
TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT (continued)
SINGLE ENGINE TAKEOFF FLIGHT PATH DISTANCE TO 50 FOOT HEIGHT - WET

EXAMPLE:

GIVEN: PRESSURE ALTITUDE = 6,000 FEET
GROSS WEIGHT = 13,000 POUNDS
OBTAIN: INCREASE IN TAKEOFF DISTANCE = 5.1 PERCENT

NOTE
MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

ENGINE ANTI-ICE EFFECT



PERCENT INCREASE IN DISTANCE TO 50 FOOT HEIGHT WITH ENGINE ANTI-ICE ON

FIGURE 4-44

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT (continued)
SINGLE ENGINE TAKEOFF FLIGHT PATH DISTANCE TO 50 FOOT HEIGHT - WET

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (WET)
GEN LOAD................ 200 AMPS
BLEED AIR..................... OFF
ENG ANTI-ICE...... OFF (SEE GRAPH)
RUNWAY.............. DRY, LEVEL, HARD SURFACE, NO WIND
V_1 SPEED............. FIGURE 4–15
V_2 SPEED............. FIGURE 4–15
FLAPS.......................... 1/4
NOSE WHEEL STEERING... ON OR OFF

EXAMPLE:

GIVEN: OAT = 20°C
PRESSURE ALTITUDE = 6,000 FEET
GROSS WEIGHT = 13,500 POUNDS
OBTAIN: V_1 SPEED = 104 KIAS
V_2 SPEED = 113 KIAS
TAKEOFF DISTANCE TO 50 FOOT HEIGHT = 7,200 FEET

NOTE

MINIMUM OAT FOR WET POWER OPERATION IS −6°C.

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4–39.

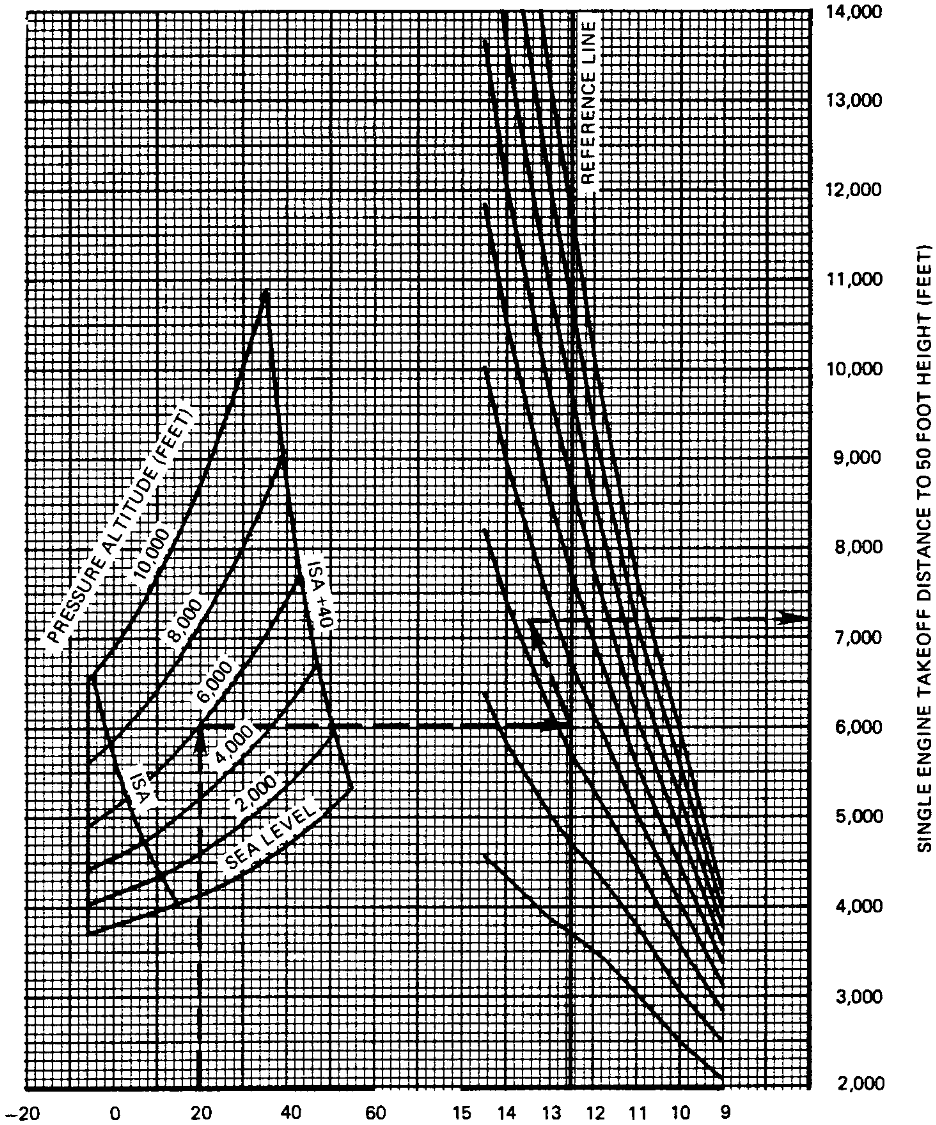


FIGURE 4-44 (continued)

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT (continued)
SINGLE ENGINE CLIMB GRADIENT AT V_2 - WET

MINIMUM AWI FLUID QUANTITY FOR WET TAKEOFF, CONTINUED WET V_2 CLIMB TO 1,000 FOOT HEIGHT, AND ACCELERATION TO $V_{Y_{SE}}$.

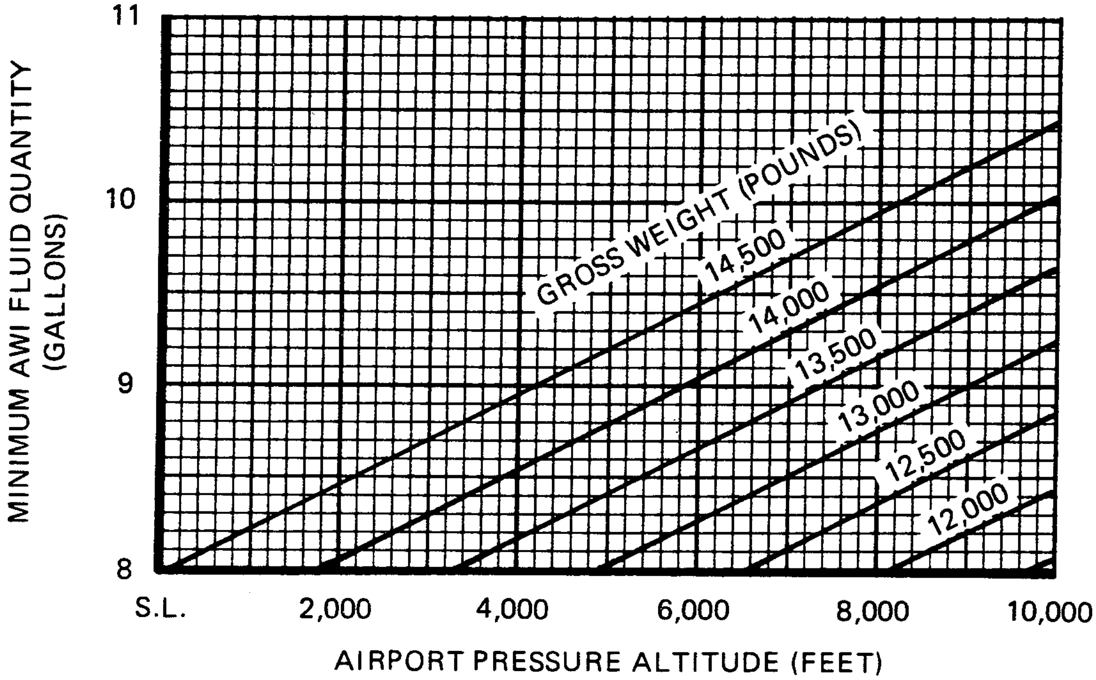
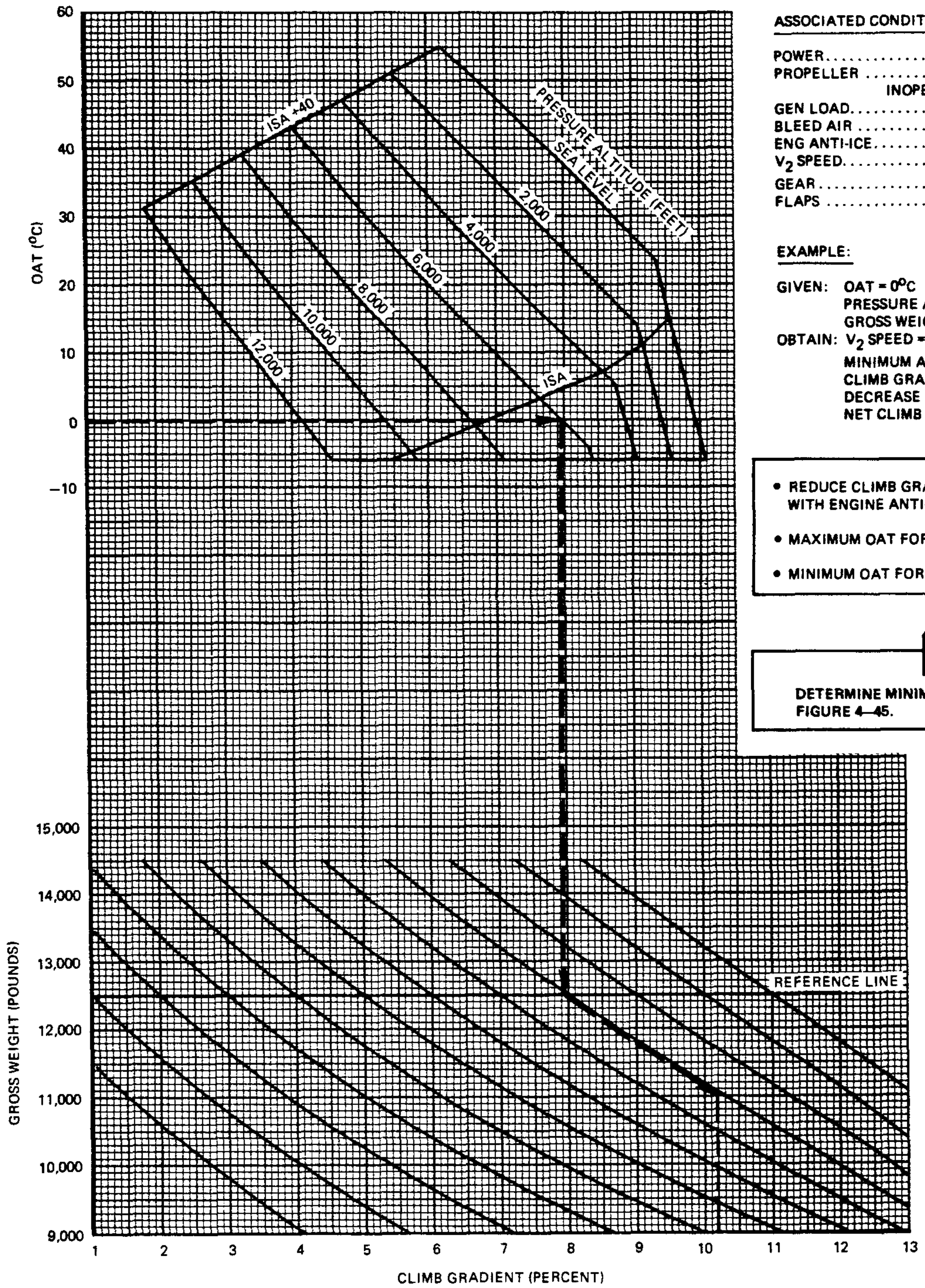


FIGURE 4-45

TAKEOFF FLIGHT PATH DISTANCE TO 1000 FOOT HEIGHT (continued)
SINGLE ENGINE CLIMB GRADIENT AT V_2 - WET



ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (WET)
PROPELLER........ FEATHERED ON INOPERATIVE ENGINE
GEN LOAD................ 200 AMPS
BLEED AIR.................... OFF
ENG ANTI-ICE....... OFF (SEE NOTE)
V_2 SPEED............. FIGURE 4–15
GEAR.......................... UP
FLAPS......................... 1/4

EXAMPLE:

GIVEN: OAT = 0°C
PRESSURE ALTITUDE = 6,000 FEET
GROSS WEIGHT = 11,000 POUNDS
OBTAIN: V_2 SPEED = 103 KIAS
MINIMUM AWI FLUID = 8 GALLONS
CLIMB GRADIENT = 10.2 PERCENT
DECREASE (ANTI-ICE ON) = –0.9 PERCENT
NET CLIMB GRADIENT = 9.3 PERCENT

NOTE

- REDUCE CLIMB GRADIENT BY 0.9 PERCENT GRADIENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.
- MINIMUM OAT FOR WET POWER OPERATION IS –6°C.

WARNING

DETERMINE MINIMUM AWI FLUID QUANTITY FROM FIGURE 4–45.

FIGURE 4-45 (continued)

TWO ENGINE TAKEOFF DISTANCE TO 50 FOOT HEIGHT - WET

ASSOCIATED CONDITIONS:

POWER.............TAKEOFF (WET)
GEN LOAD................200 AMPS
BLEED AIR....................OFF
ENG ANTI-ICE.......OFF (SEE NOTE)
RUNWAY......DRY, HARD SURFACE
V_1 SPEED.............FIGURE 4–15
V_{50} SPEED............FIGURE 4–15
FLAPS..........................1/4
NOSE WHEEL STEERING...ON OR OFF

EXAMPLE:

GIVEN: OAT = 0°C
PRESSURE ALTITUDE = 6,000 FEET
GROSS WEIGHT = 11,000 POUNDS
TAILWIND = 10 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)

OBTAIN: V_1 SPEED = 98 KIAS
V_{50} SPEED = 112 KIAS
DISTANCE OVER 50 FOOT HEIGHT = 3,500 FEET
INCREASE (ANTI-ICE ON) = 150 FEET
TOTAL TAKEOFF DISTANCE = 3,650 FEET

WARNING

DETERMINE MAXIMUM TAKEOFF WEIGHT FROM FIGURE 4–39.

NOTE

- INCREASE TAKEOFF DISTANCE BY 4.3 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.
- MINIMUM OAT FOR WET POWER OPERATION IS –6°C.

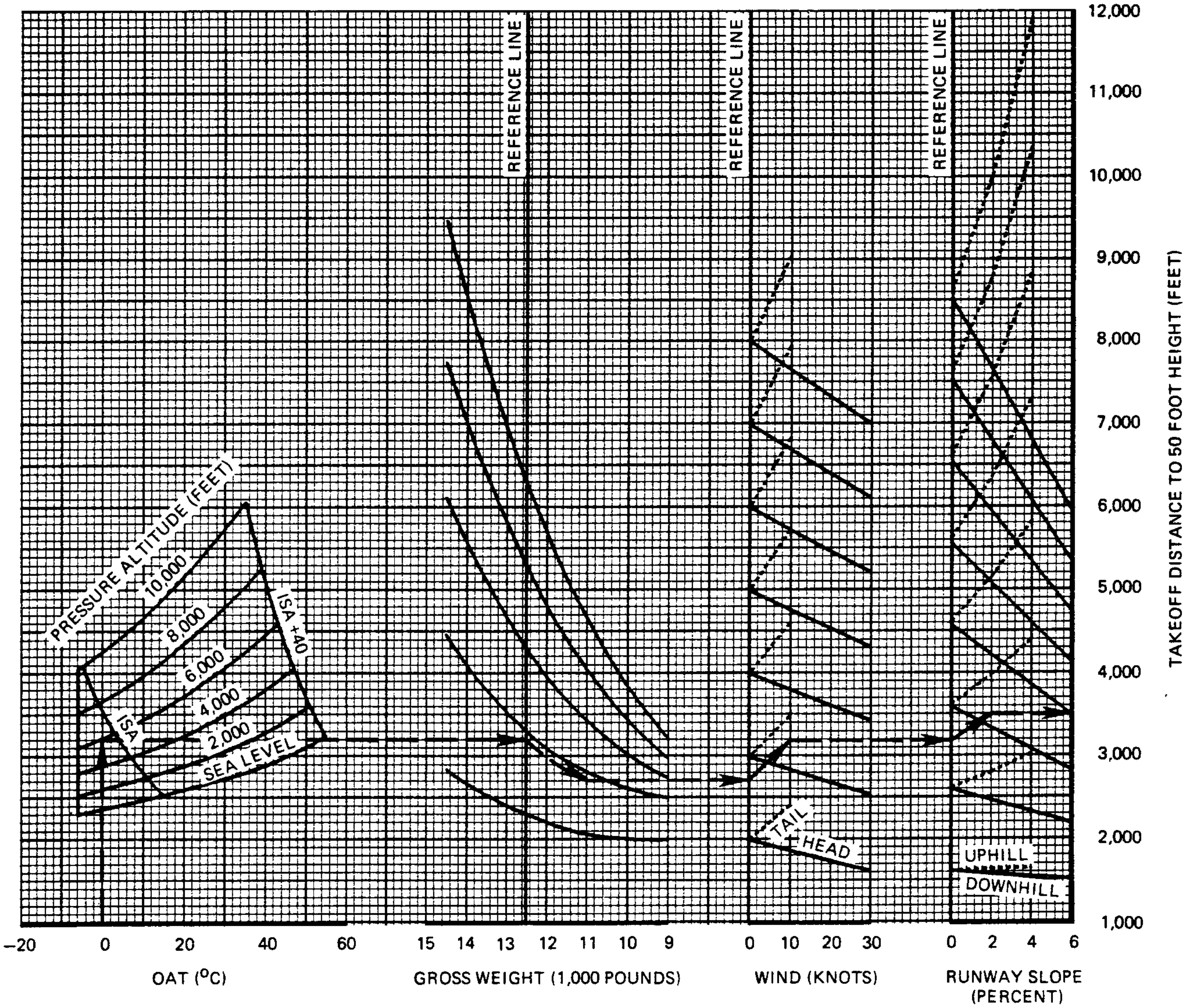
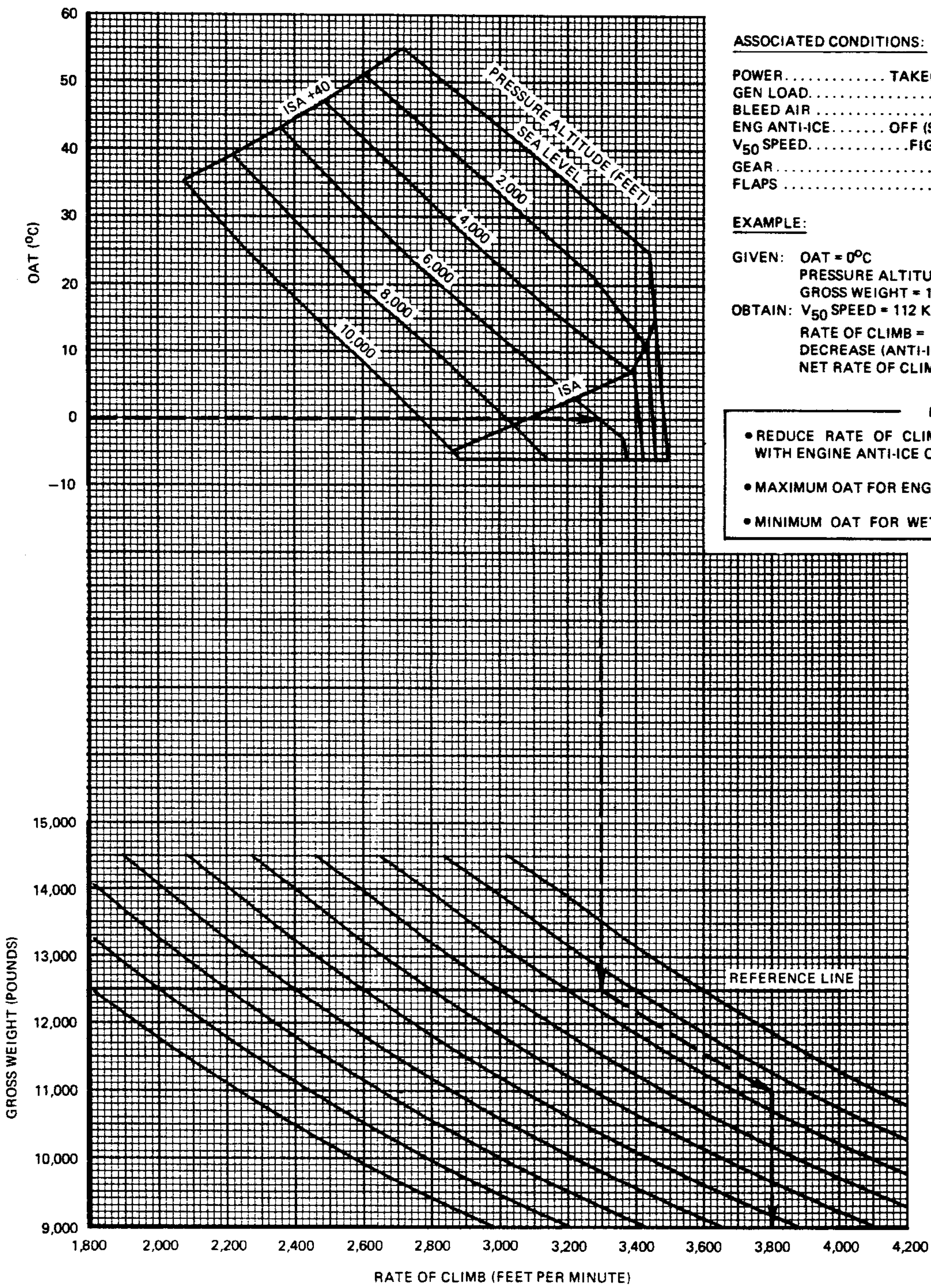


FIGURE 4-46

TWO ENGINE RATE OF CLIMB AT V_{50} - WET



ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (WET)
GEN LOAD................ 200 AMPS
BLEED AIR.................... OFF
ENG ANTI-ICE....... OFF (SEE NOTE)
V_{50} SPEED............. FIGURE 4-15
GEAR.......................... UP
FLAPS......................... 1/4

EXAMPLE:

GIVEN: OAT = 0°C
PRESSURE ALTITUDE = 6,000 FEET
GROSS WEIGHT = 11,000 POUNDS
OBTAIN: V_{50} SPEED = 112 KIAS
RATE OF CLIMB = 3,800 FEET PER MINUTE
DECREASE (ANTI-ICE ON) = −310 FEET PER MINUTE
NET RATE OF CLIMB = 3,490 FEET PER MINUTE

NOTE

- REDUCE RATE OF CLIMB BY 310 FEET PER MINUTE WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.
- MINIMUM OAT FOR WET POWER OPERATION IS −6°C.

FIGURE 4-47

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PART F – EN ROUTE CLIMB PERFORMANCE

CONTENTS

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ENGINE POWER CHECK CHART - MAXIMUM CONTINUOUS POWER - DRY, 200 KCAS

ASSOCIATED CONDITIONS:

RPM 100%
MAX ALLOWABLE EGT .... 650°C
GEN LOAD............0 TO 200 AMPS
BLEED AIR .... ON
ENG ANTI-ICE.................. OFF
SPEED .... 198 KIAS
GEAR .... UP
FLAPS .... UP

EXAMPLE:

GIVEN: IOAT = 7°C
PRESSURE ALTITUDE = 3,500 FEET
OBTAIN: ENGINE TORQUE = 90 PERCENT

NOTE

- REFERENCE EGT IS THE EGT OBTAINED WHEN REQUIRED ENGINE TORQUE IS SET IN ACCORDANCE WITH THIS CHART AND MUST NOT EXCEED 650°C.
- INDICATED OAT IS USED TO ENTER THIS CHART.

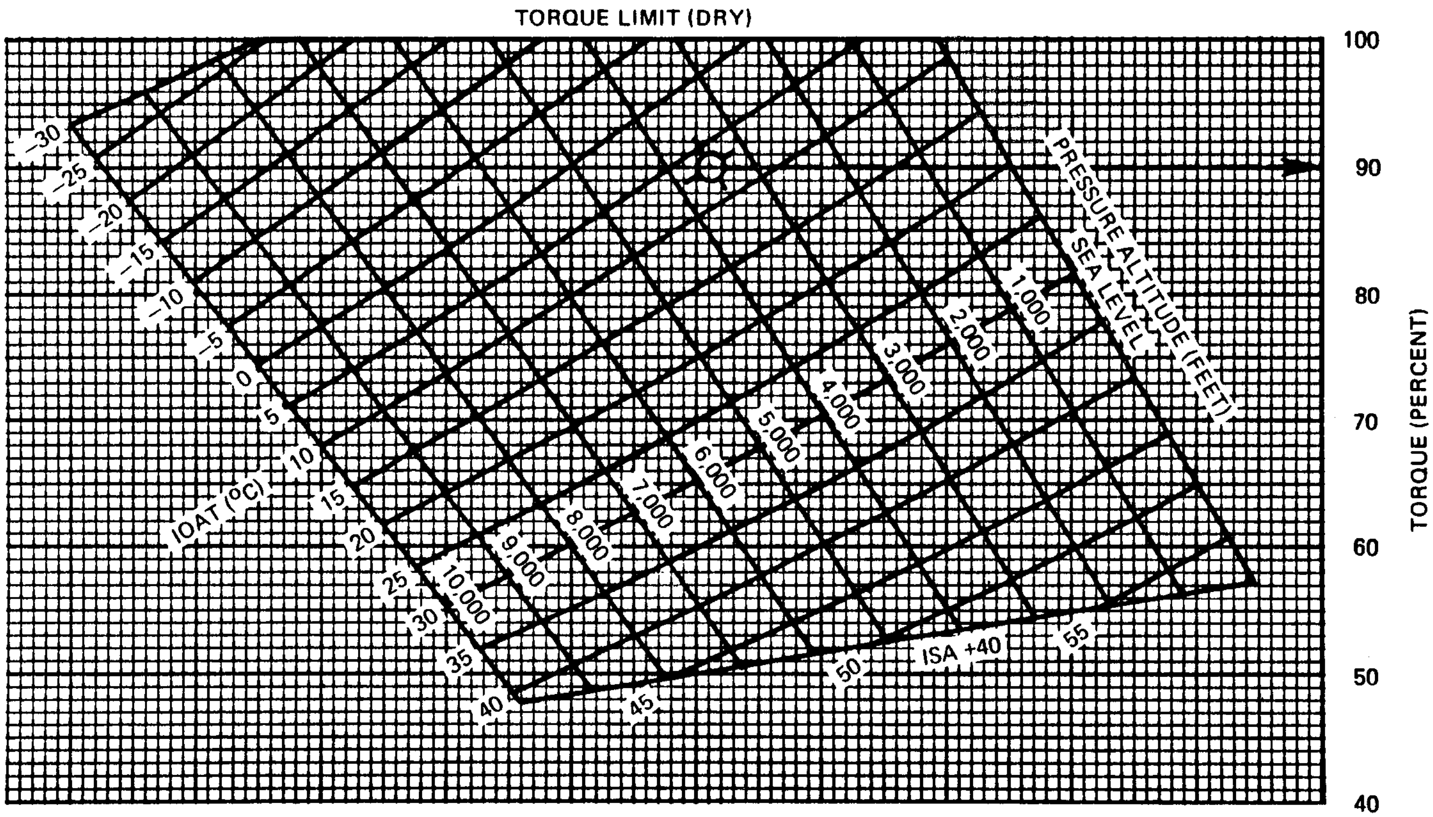


FIGURE 4-48

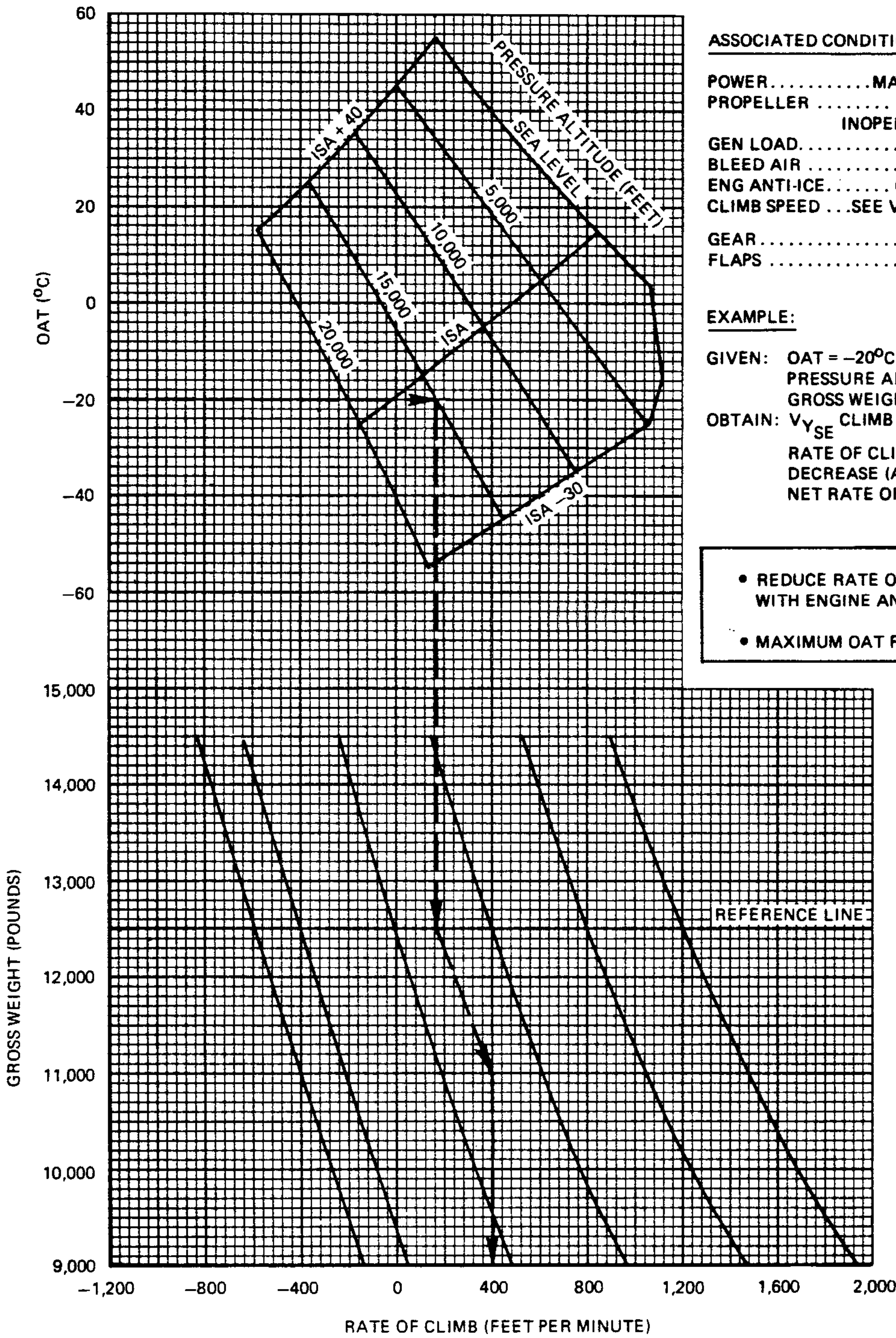
SINGLE ENGINE BEST RATE OF CLIMB - DRY, BLEED AIR ON

$V_{Y_{SE}}$ CLIMB SPEED SCHEDULE (KIAS)

PRESSURE ALTITUDE (FEET)	GROSS WEIGHT (POUNDS)	OAT (°C)		
		ISA −30	ISA −20 TO ISA +20	ISA +40
S.L.	14,500	138	134	130
	13,000	135	131	119
	11,000	132	128	111
	9,000	130	125	107
5,000	14,500	137	130	130
	13,000	134	127	119
	11,000	132	123	108
	9,000	129	119	103
10,000	14,500	133	130	130
	13,000	130	122	119
	11,000	127	117	105
	9,000	123	113	100
15,000	14,500	130	130	130
	13,000	124	119	119
	11,000	119	112	105
	9,000	115	107	96
20,000	14,500	130	130	130
	13,000	119	119	119
	11,000	113	107	105
	9,000	108	102	93

FIGURE 4-49

SINGLE ENGINE BEST RATE OF CLIMB - DRY, BLEED AIR ON



ASSOCIATED CONDITIONS:

POWER........... MAX CONTINUOUS
PROPELLER .... FEATHERED ON INOPERATIVE ENGINE
GEN LOAD............ AS REQUIRED
BLEED AIR .... ON
ENG ANTI-ICE....... OFF (SEE NOTE)
CLIMB SPEED ...SEE $V_{Y_{SE}}$ SCHEDULE
GEAR .... UP
FLAPS .... UP

EXAMPLE:

GIVEN: OAT = −20°C
PRESSURE ALTITUDE = 15,000 FEET
GROSS WEIGHT = 11,000 POUNDS
OBTAIN: $V_{Y_{SE}}$ CLIMB SPEED = 112 KIAS
RATE OF CLIMB = 400 FEET PER MINUTE
DECREASE (ANTI-ICE ON) = −250 FEET PER MINUTE
NET RATE OF CLIMB = 150 FEET PER MINUTE

NOTE

- REDUCE RATE OF CLIMB BY 250 FEET PER MINUTE WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

FIGURE 4-49 (continued)

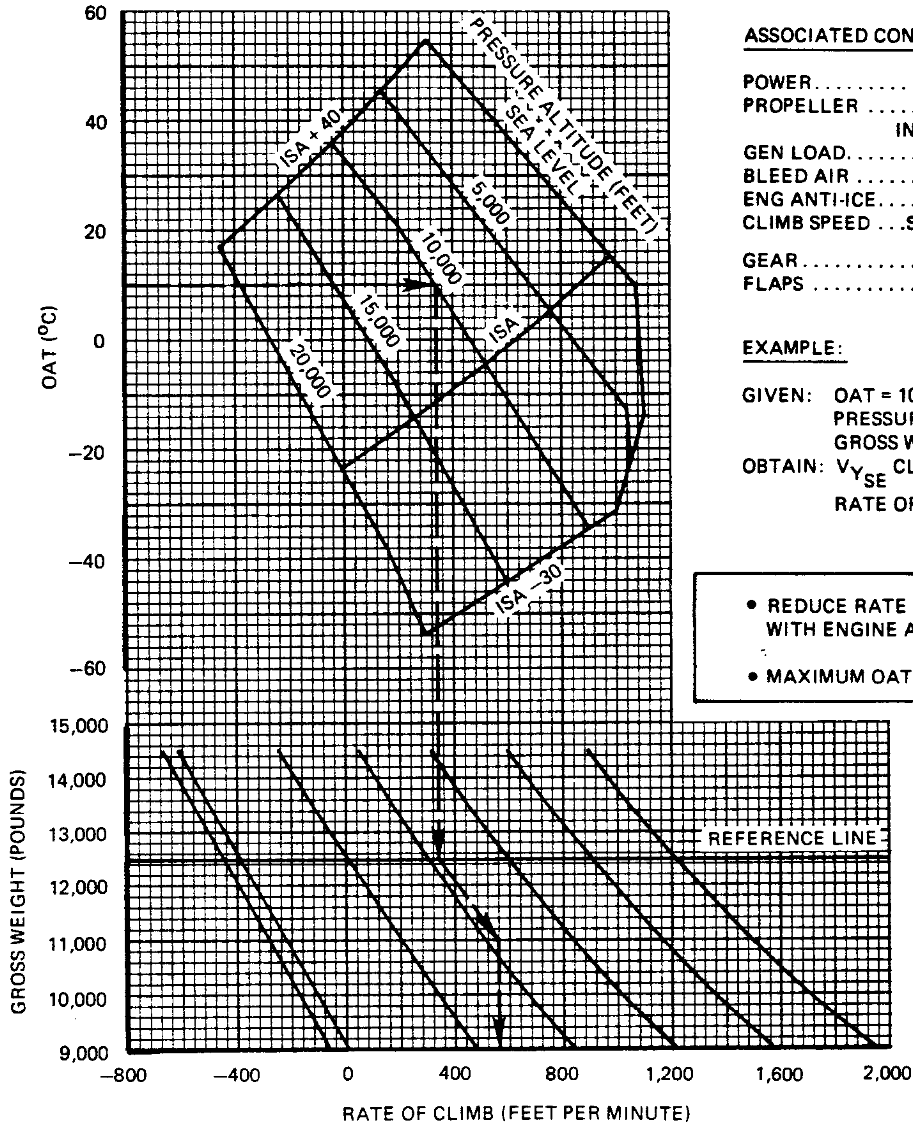
SINGLE ENGINE BEST RATE OF CLIMB - DRY, BLEED AIR OFF

$V_{Y_{SE}}$ CLIMB SPEED SCHEDULE (KIAS)

		OAT (°C)		
PRESSURE ALTITUDE (FEET)	GROSS WEIGHT (POUNDS)	ISA −30	ISA −20 TO ISA +20	ISA +40
S.L.	14,500	138	136	130
	13,000	135	134	119
	11,000	132	130	114
	9,000	130	128	110
5,000	14,500	136	132	130
	13,000	134	129	119
	11,000	131	125	111
	9,000	128	121	106
10,000	14,500	136	130	130
	13,000	133	124	119
	11,000	130	119	108
	9,000	127	115	103
15,000	14,500	131	130	130
	13,000	127	120	119
	11,000	123	114	108
	9,000	118	110	99
20,000	14,500	130	130	130
	13,000	121	119	119
	11,000	116	111	108
	9,000	111	105	95

FIGURE 4-50

SINGLE ENGINE BEST RATE OF CLIMB - DRY, BLEED AIR OFF



ASSOCIATED CONDITIONS:

POWER........... MAX CONTINUOUS
PROPELLER .... FEATHERED ON INOPERATIVE ENGINE
GEN LOAD............ AS REQUIRED
BLEED AIR .... OFF
ENG ANTI-ICE....... OFF (SEE NOTE)
CLIMB SPEED ... SEE $V_{Y_{SE}}$ SCHEDULE
GEAR .... UP
FLAPS .... UP

EXAMPLE:

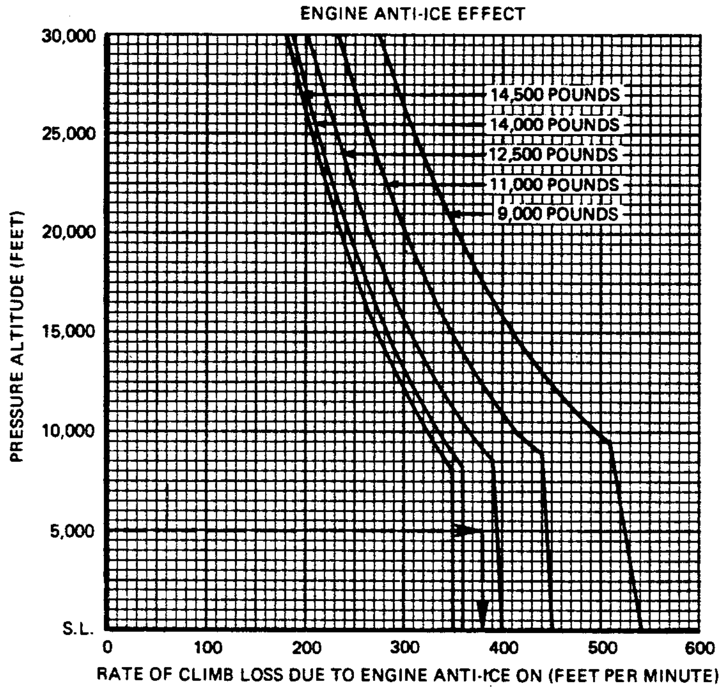
GIVEN: OAT = 10°C
PRESSURE ALTITUDE = 10,000 FEET
GROSS WEIGHT = 11,000 POUNDS
OBTAIN: $V_{Y_{SE}}$ CLIMB SPEED = 119 KIAS
RATE OF CLIMB = 560 FEET PER MINUTE

NOTE

- REDUCE RATE OF CLIMB BY 250 FEET PER MINUTE WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

FIGURE 4-50 (continued)

TWO ENGINE BEST RATE OF CLIMB - DRY, BLEED AIR ON

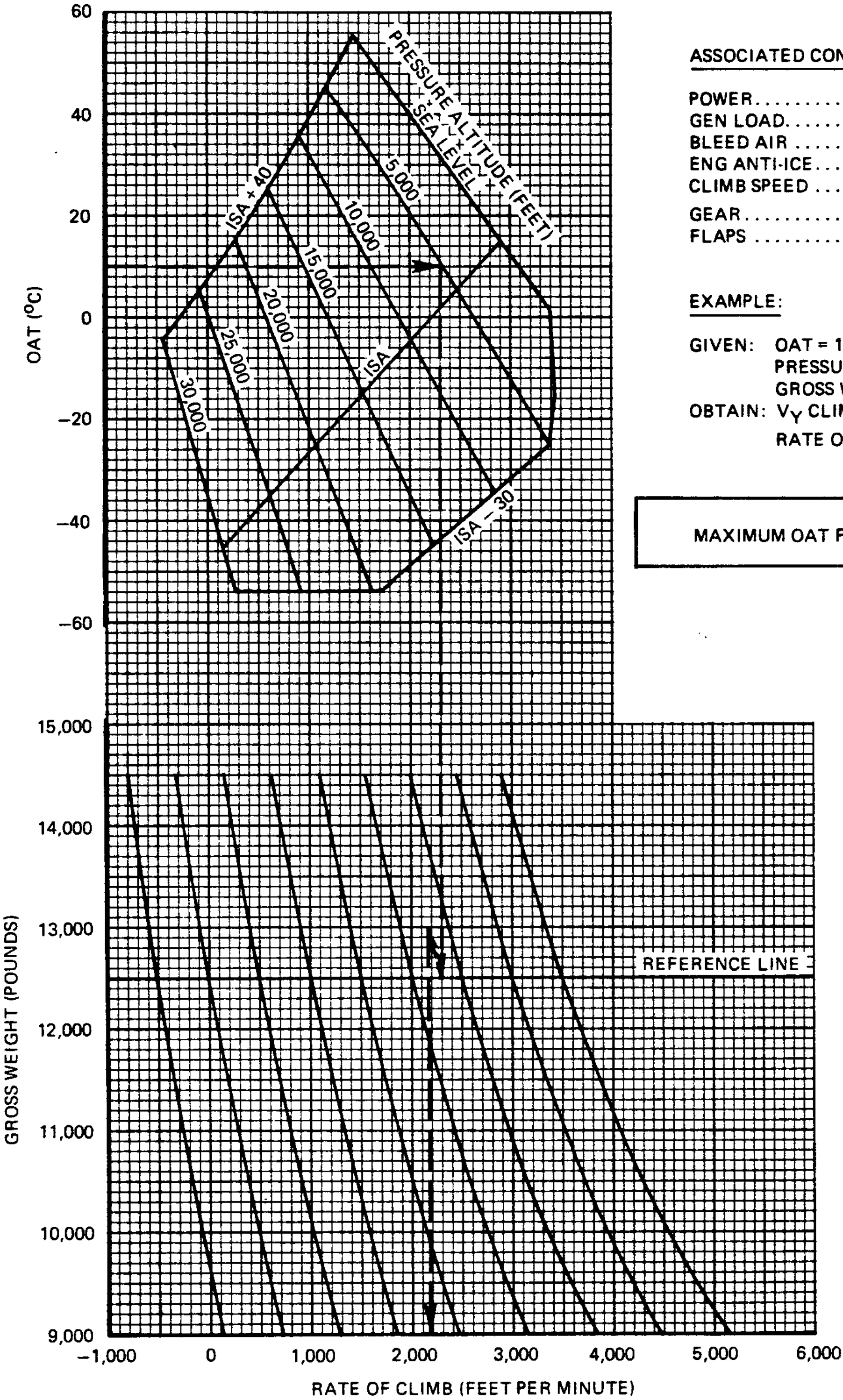


V_Y CLIMB SPEED SCHEDULE

PRESSURE ALTITUDE (FEET)	GROSS WEIGHT (POUNDS)	OAT (°C) ISA −30	ISA −20 TO ISA +20	ISA +40
S.L.	14,500 13,000 11,000 9,000	149 146 143 141	147 144 141 137	130 126 120 116
5,000	14,500 13,000 11,000 9,000	147 145 142 140	142 138 135 131	130 120 116 112
10,000	14,500 13,000 11,000 9,000	150 146 142 137	137 134 129 124	130 119 112 107
15,000	14,500 13,000 11,000 9,000	142 139 136 130	132 129 124 118	130 119 110 104
20,000	14,500 13,000 11,000 9,000	136 132 128 124	130 124 118 113	130 119 107 99
25,000	14,500 13,000 11,000 9,000	130 126 120 110	130 119 113 108	130 119 105 96
30,000	14,500 13,000 11,000 9,000	130 120 114 109	130 119 109 103	130 119 105 93

FIGURE 4-51

TWO ENGINE BEST RATE OF CLIMB - DRY, BLEED AIR ON



ASSOCIATED CONDITIONS:

POWER . . . . MAX CONTINUOUS
GEN LOAD. . . . . AS REQUIRED
BLEED AIR . . . . ON
ENG ANTI-ICE . . . . . . OFF (SEE GRAPH)
CLIMB SPEED . . . . . SEE V_Y SCHEDULE
GEAR . . . . UP
FLAPS . . . . UP

EXAMPLE:

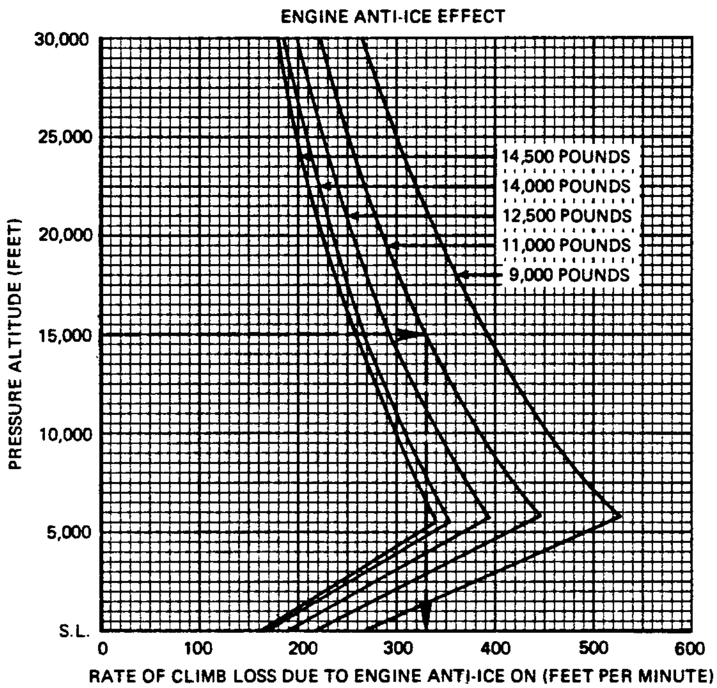
GIVEN: OAT = 10°C
PRESSURE ALTITUDE = 5,000 FEET
GROSS WEIGHT = 13,000 POUNDS
OBTAIN: V_Y CLIMB SPEED = 138 KIAS
RATE OF CLIMB = 2,180 FEET PER MINUTE

NOTE

MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

FIGURE 4-51 (continued)

TWO ENGINE BEST RATE OF CLIMB - DRY, BLEED AIR OFF

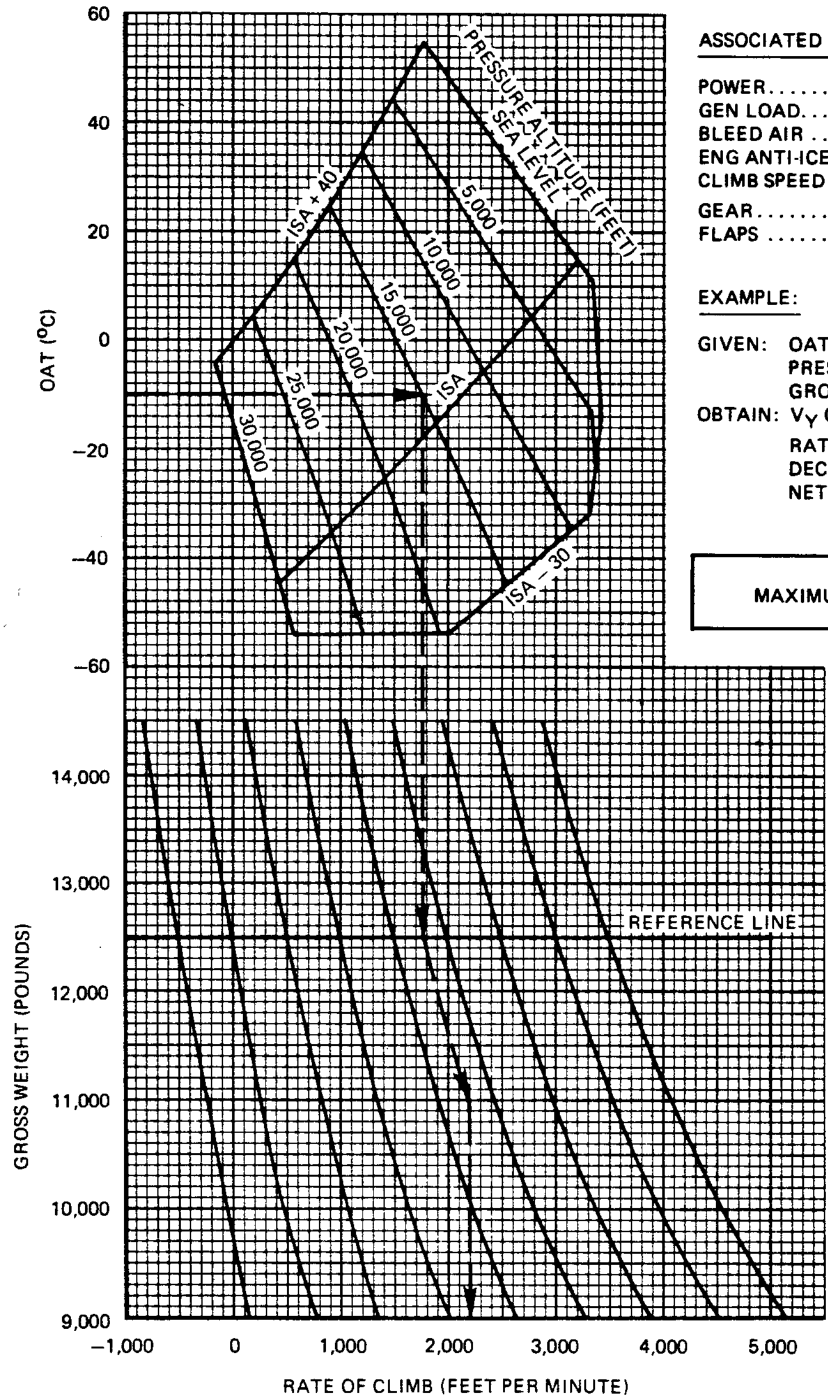


V_Y CLIMB SPEED SCHEDULE (KIAS)

PRESSURE ALTITUDE (FEET)	GROSS WEIGHT (POUNDS)	OAT (°C) ISA −30	ISA −20 TO ISA +20	ISA +40
S.L.	14,500	148	149	132
	12,500	143	143	128
	11,000	143	143	125
	9,000	141	142	120
5,000	14,500	146	145	130
	12,500	143	141	123
	11,000	142	138	119
	9,000	140	133	115
10,000	14,500	152	139	130
	12,500	149	136	119
	11,000	146	134	115
	9,000	143	128	111
15,000	14,500	144	135	130
	12,500	141	131	117
	11,000	139	128	113
	9,000	134	124	107
20,000	14,500	138	131	130
	12,500	134	126	116
	11,000	132	123	110
	9,000	127	118	104
25,000	14,500	132	130	130
	12,500	128	120	116
	11,000	124	116	106
	9,000	119	114	100
30,000	14,500	130	130	130
	12,500	121	116	116
	11,000	118	111	105
	9,000	113	106	96

FIGURE 4-52

TWO ENGINE BEST RATE OF CLIMB - DRY, BLEED AIR OFF



ASSOCIATED CONDITIONS:

POWER........... MAX CONTINUOUS
GEN LOAD............ AS REQUIRED
BLEED AIR..................... OFF
ENG ANTI-ICE...... OFF (SEE GRAPH)
CLIMB SPEED ..... SEE V_Y SCHEDULE
GEAR.......................... UP
FLAPS .... UP

EXAMPLE:

GIVEN: OAT = −10°C
PRESSURE ALTITUDE = 15,000 FEET
GROSS WEIGHT = 11,000 POUNDS

OBTAIN: V_Y CLIMB SPEED = 128 KIAS

RATE OF CLIMB =	2,200 FEET PER MINUTE
DECREASE (ANTI-ICE ON) =	−330 FEET PER MINUTE
NET RATE OF CLIMB =	1,870 FEET PER MINUTE

NOTE

MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

FIGURE 4-52 (continued)

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PART G – APPROACH AND LANDING PERFORMANCE

CONTENTS

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MAXIMUM LANDING WEIGHT LIMITATION CHART – DRY, BLEED AIR ON

ASSOCIATED CONDITIONS:

POWER .... MAX CONTINUOUS
GEN LOAD .... 200 AMPS (SEE NOTE)
BLEED AIR .... OFF
ENG ANTI-ICE .... ON OR OFF
CLIMB SPEED .... SEE SCHEDULE
GEAR .... DOWN
FLAPS .... DOWN

EXAMPLE :

GIVEN: OAT = 37°C
PRESSURE ALTITUDE = 7,500 FEET
OBTAIN: MAX LANDING WEIGHT = 13,000 POUNDS

NOTE

- THIS WEIGHT RESULTS IN THE MAXIMUM LANDING WEIGHT PERMITTED BY THE 3.3% GRADIENT ALL ENGINE BALKED LANDING CLIMB REQUIREMENT.
- DECREASE MAXIMUM LANDING WEIGHT BY 5 POUNDS FOR EACH 10 AMPS ABOVE 200 AMPS GENERATOR LOAD.

BALKED LANDING CLIMB SPEED SCHEDULE (KIAS)

GROSS WEIGHT (POUNDS)	CLIMB SPEED (KIAS)
14,000	96
13,000	92
9,000	92

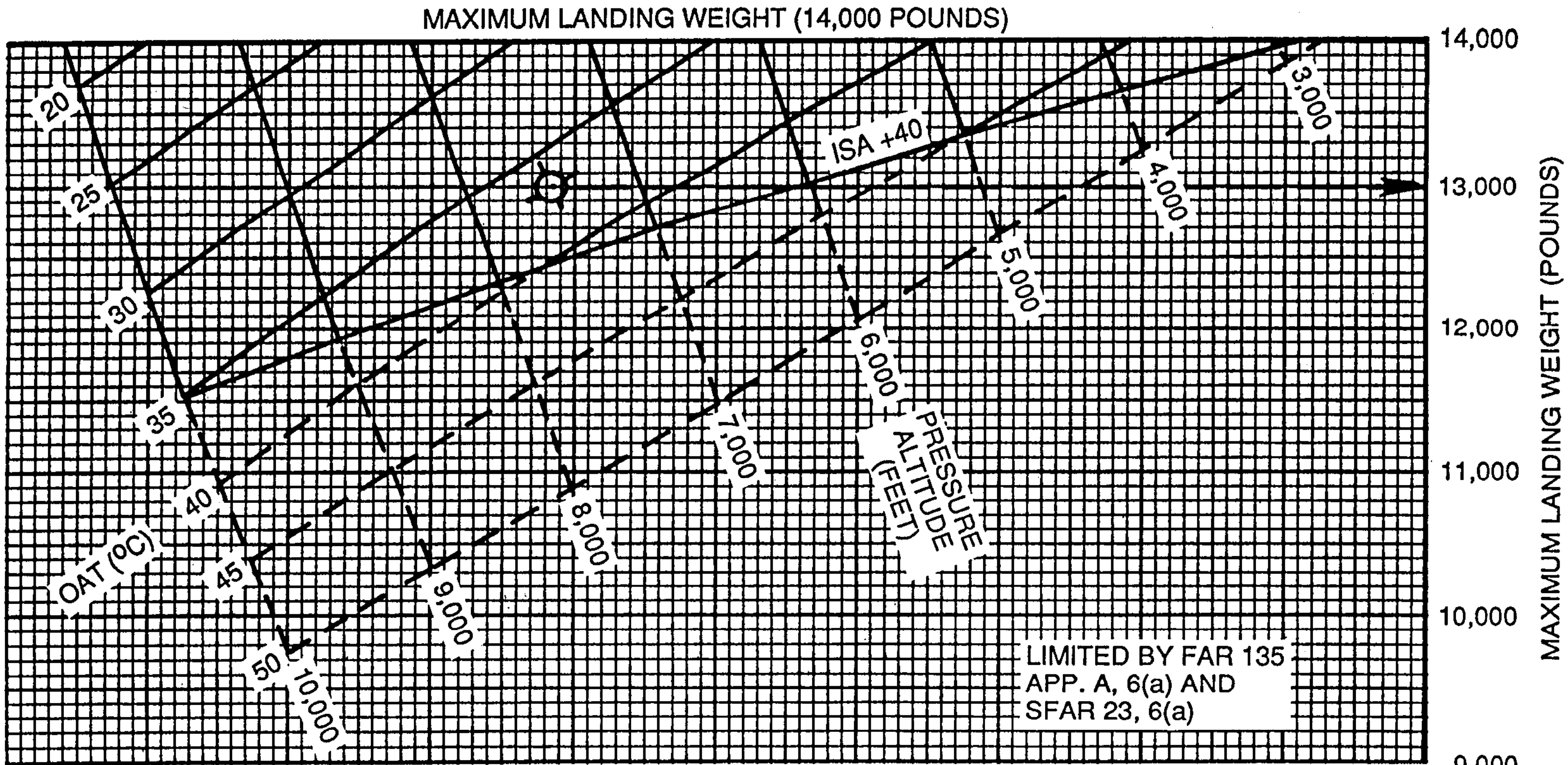

FIGURE 4-53

MAXIMUM LANDING WEIGHT LIMITATION CHART - DRY, BLEED AIR OFF

ASSOCIATED CONDITIONS:

POWER .... MAX CONTINUOUS
GEN LOAD ...... 200 AMPS (SEE NOTE)
BLEED AIR .... OFF
ENG ANTI-ICE .... ON OR OFF
CLIMB SPEED .... SEE SCHEDULE
GEAR .... DOWN
FLAPS .... DOWN

EXAMPLE:

GIVEN: OAT = 38°C
PRESSURE ALTITUDE = 7,500 FEET
OBTAIN: MAX LANDING WEIGHT = 13,925 POUNDS

NOTE

- THIS WEIGHT RESULTS IN THE MAXIMUM LANDING WEIGHT PERMITTED BY THE 3.3% GRADIENT ALL ENGINE BALKED LANDING CLIMB REQUIREMENT.
- DECREASE MAXIMUM LANDING WEIGHT BY 5 POUNDS FOR EACH 10 AMPS ABOVE 200 AMPS GENERATOR LOAD.

BALKED LANDING CLIMB SPEED SCHEDULE (KIAS)

GROSS WEIGHT (POUNDS)	CLIMB SPEED (KIAS)
14,000	96
13,000	92
9,000	92

MAXIMUM LANDING WEIGHT (14,000 POUNDS)

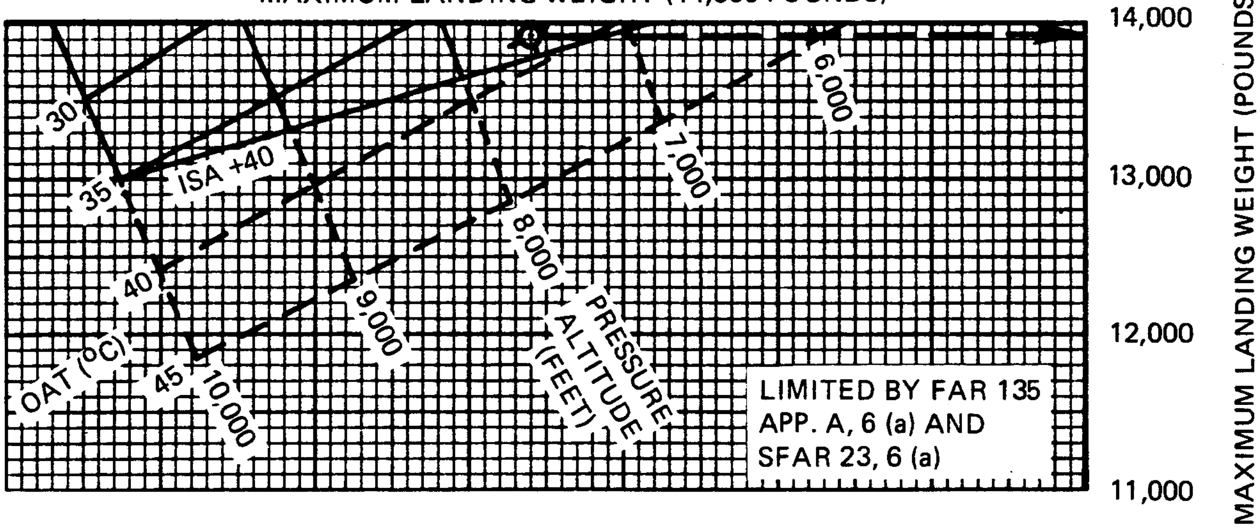

FIGURE 4-54

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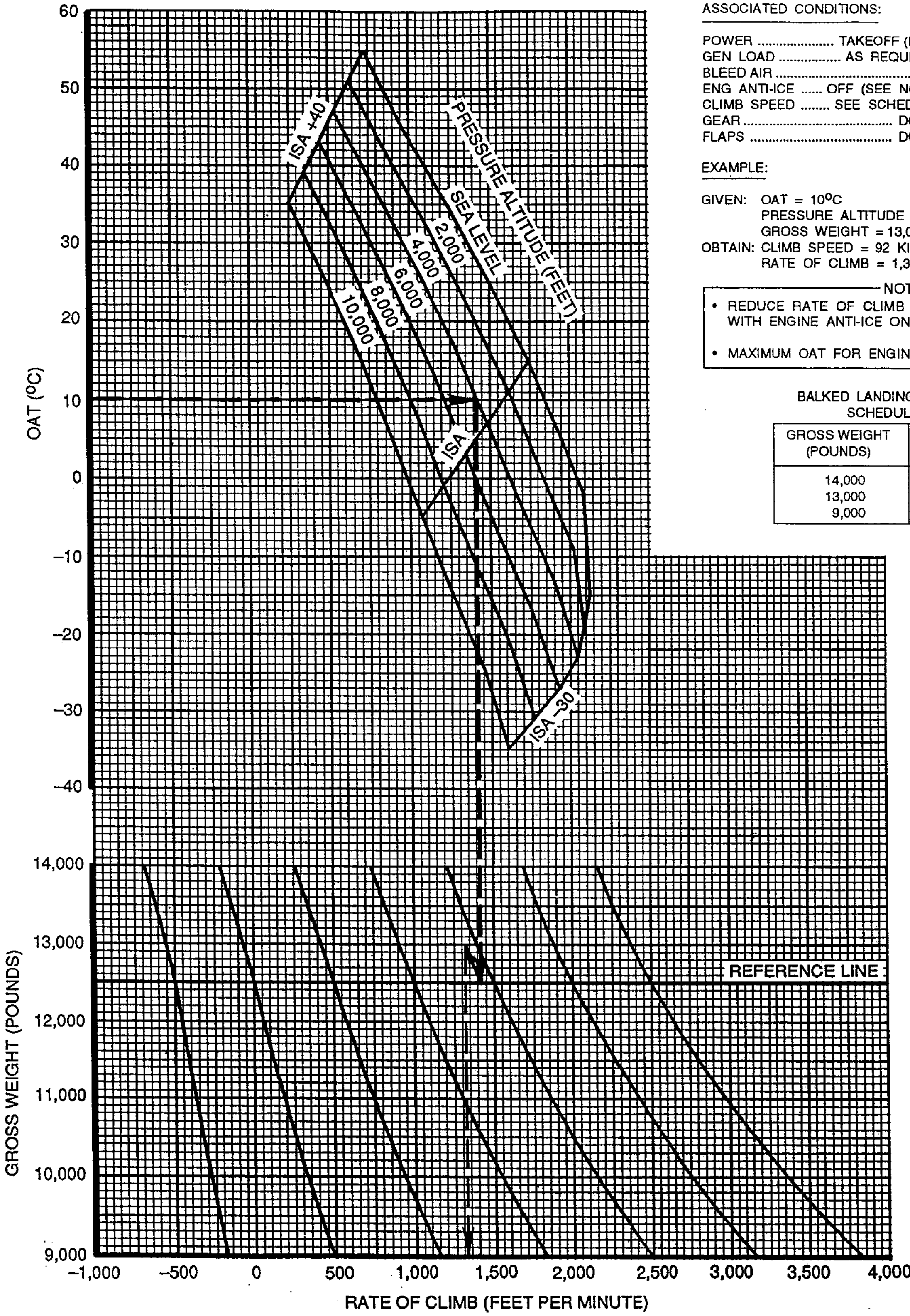
BALKED LANDING RATE OF CLIMB – BLEED AIR ON



ASSOCIATED CONDITIONS:

POWER .... TAKEOFF (DRY)
GEN LOAD .... AS REQUIRED
BLEED AIR .... ON
ENG ANTI-ICE ...... OFF (SEE NOTE)
CLIMB SPEED .... SEE SCHEDULE
GEAR .... DOWN
FLAPS .... DOWN

EXAMPLE:

GIVEN: OAT = 10°C
PRESSURE ALTITUDE = 4,000 FEET
GROSS WEIGHT = 13,000 POUNDS
OBTAIN: CLIMB SPEED = 92 KIAS
RATE OF CLIMB = 1,325 FEET PER MINUTE

NOTE

- REDUCE RATE OF CLIMB BY 340 FEET PER MINUTE WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

BALKED LANDING CLIMB SPEED SCHEDULE (KIAS)

GROSS WEIGHT (POUNDS)	CLIMB SPEED (KIAS)
14,000	96
13,000	92
9,000	92

FIGURE 4-55

LANDING DISTANCE OVER 50 FOOT HEIGHT
B. F. GOODRICH SINGLE ROTOR BRAKES

ASSOCIATED CONDITIONS:

- APPROACH SPEED .... SEE CHART
- POWER .... FLIGHT IDLE
- GEN LOAD .... AS REQUIRED
- BLEED AIR .... ON OR OFF
- ENG ANTI-ICE .... ON OR OFF
- RUNWAY .... DRY, LEVEL, HARD SURFACE
- GEAR .... DOWN
- FLAPS .... DOWN
- BRAKING .... HEAVY DURING ROLLOUT
- ANTI-SKID .... ON OR OFF
- NOSE WHEEL STEERING ... ON OR OFF

EXAMPLE:

GIVEN: OAT = 18°C
PRESSURE ALTITUDE = 7,000 FEET
GROSS WEIGHT = 11,900 POUNDS
HEADWIND = 15 KNOTS

OBTAIN: APPROACH SPEED = 106 KIAS
LANDING DISTANCE = 2,775 FEET

CAUTION

DETERMINE THAT THE BRAKE ENERGY LIMIT WILL NOT BE EXCEEDED FROM FIGURE 4-58.

NOTE

- LANDING GROUND ROLL IS 72% OF LANDING DISTANCE.
- SINGLE ENGINE LANDING DISTANCES ARE SHOWN AND, IN ALL CASES, ARE LONGER THAN TWO ENGINE LANDING DISTANCES.
- IF APPLICABLE, SEE OPERATING RULES FOR FACTORS TO OBTAIN REQUIRED FIELD LENGTH.

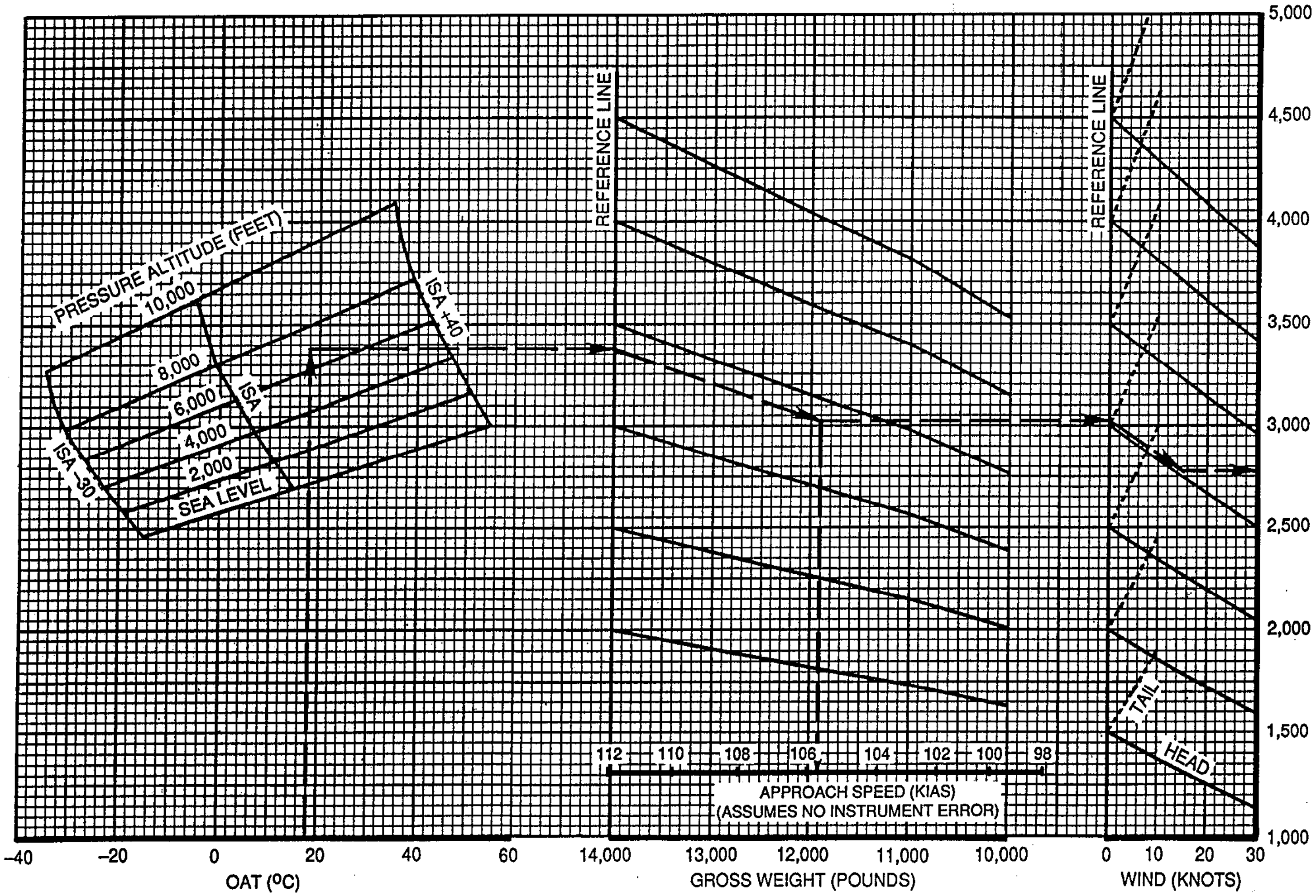


FIGURE 4-56

FAA APPROVED: APR 02/86
REVISED: OCT 17/94

LANDING DISTANCE OVER 50 FOOT HEIGHT
GOODYEAR AEROSPACE DUAL ROTOR BRAKES

ASSOCIATED CONDITIONS:

APPROACH SPEED .... SEE CHART
POWER .... 3° GLIDE PATH POWER AS REQUIRED
GEN LOAD .... AS REQUIRED
BLEED AIR .... ON OR OFF
ENG ANTI-ICE .... ON OR OFF
RUNWAY .... DRY, LEVEL, HARD SURFACE
GEAR .... DOWN
FLAPS .... DOWN
BRAKING .... HEAVY DURING ROLLOUT
NOSE WHEEL STEERING ... ON OR OFF

EXAMPLE:

GIVEN: OAT = 18°C
PRESSURE ALTITUDE = 7,000 FEET
GROSS WEIGHT = 13,000 POUNDS
HEADWIND = 15 KNOTS
OBTAIN: APPROACH SPEED = 109 KIAS
LANDING DISTANCE = 2,760 FEET

CAUTION

DETERMINE THAT THE BRAKE ENERGY LIMIT WILL NOT BE EXCEEDED FROM FIGURE 4-59.

NOTE

- LANDING GROUND ROLL IS 64% OF LANDING DISTANCE.
- TWO ENGINE LANDING DISTANCES ARE SHOWN, INCREASE LANDING DISTANCE BY 72% FOR SINGLE ENGINE OPERATION.
- IF APPLICABLE, SEE OPERATING RULES FOR FACTORS TO OBTAIN REQUIRED FIELD LENGTH.

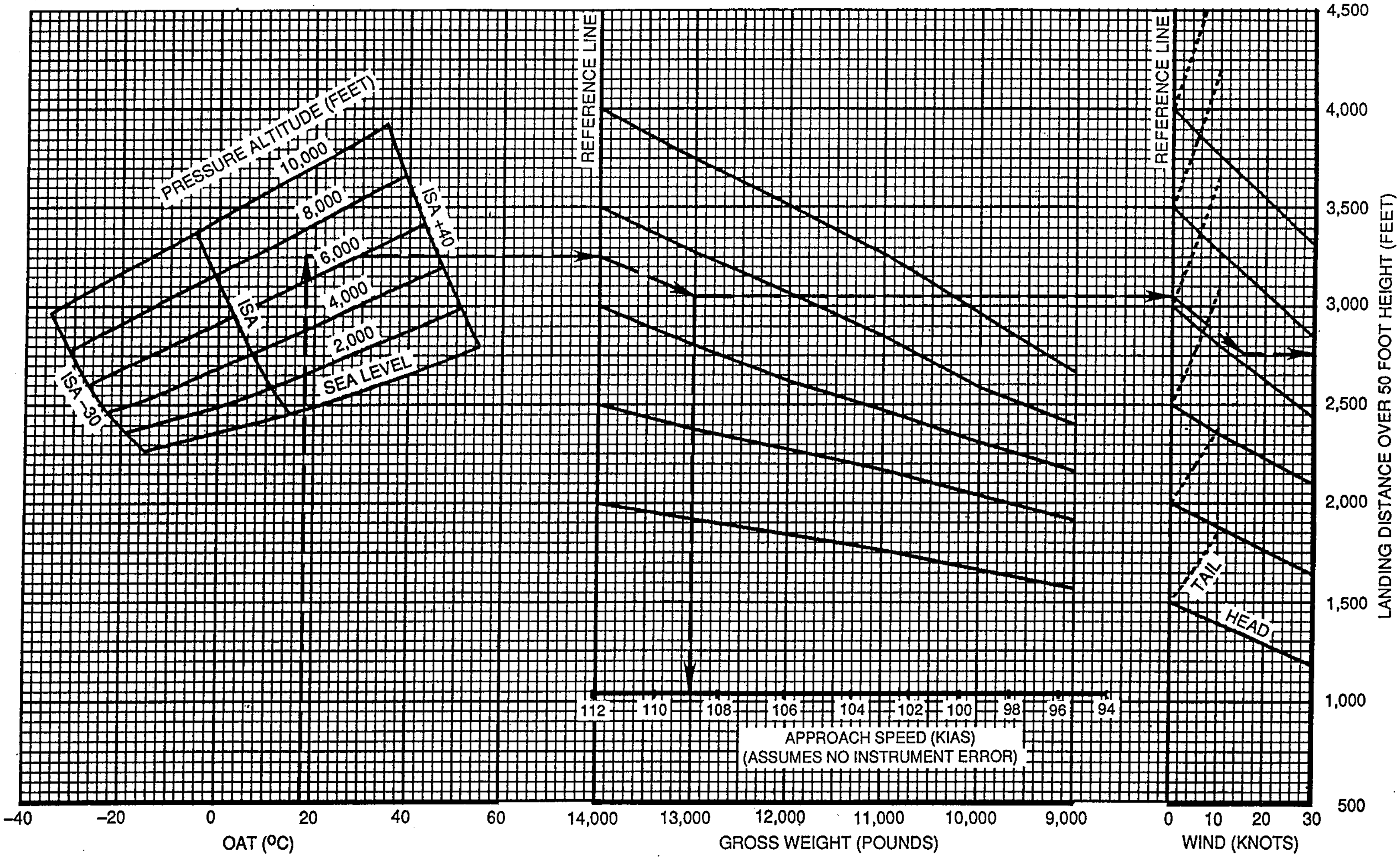


FIGURE 4-57

LANDING BRAKE ENERGY LIMITS
B. F. GOODRICH SINGLE ROTOR BRAKES

EXAMPLE:

GIVEN: OAT = 30°C
PRESSURE ALTITUDE = 10,000 FEET
GROSS WEIGHT = 13,000 POUNDS
HEADWIND = 5 KNOTS
OBTAIN: MAXIMUM ALLOWABLE TAILWIND = 0.5 KNOTS
(BRAKE ENERGY LIMIT WILL NOT BE EXCEEDED)

CAUTION

OPERATIONS WITH INSUFFICIENT HEADWINDS OR EXCESSIVE TAILWINDS WILL RESULT IN EXCEEDING THE BRAKE ENERGY LIMIT OF 2,520,000 FOOT POUNDS PER BRAKE.

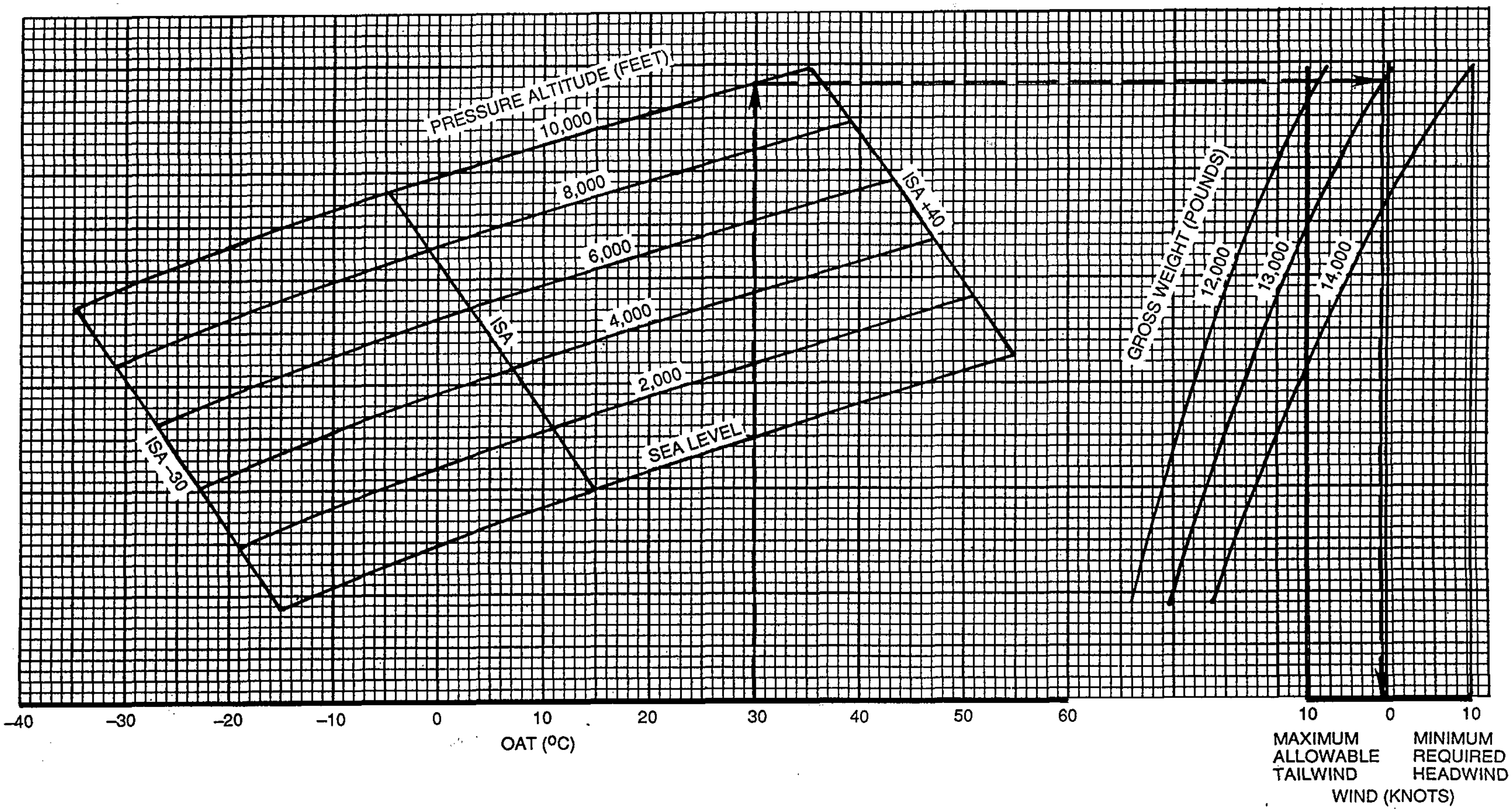


FIGURE 4-58

LANDING BRAKE ENERGY LIMITS

GOODYEAR AEROSPACE DUAL ROTOR BRAKES

EXAMPLE:

GIVEN: OAT = 30°C
PRESSURE ALTITUDE = 8,000 FEET
GROSS WEIGHT = 13,000 POUNDS
HEADWIND = 5 KNOTS

OBTAIN: MAXIMUM ALLOWABLE TAILWIND = 8.5 KNOTS
(BRAKE ENERGY LIMIT WILL NOT BE EXCEEDED)

CAUTION

OPERATIONS WITH INSUFFICIENT HEADWINDS OR EXCESSIVE TAILWINDS WILL RESULT IN EXCEEDING THE BRAKE ENERGY LIMIT OF 2,820,000 FOOT POUNDS PER BRAKE.

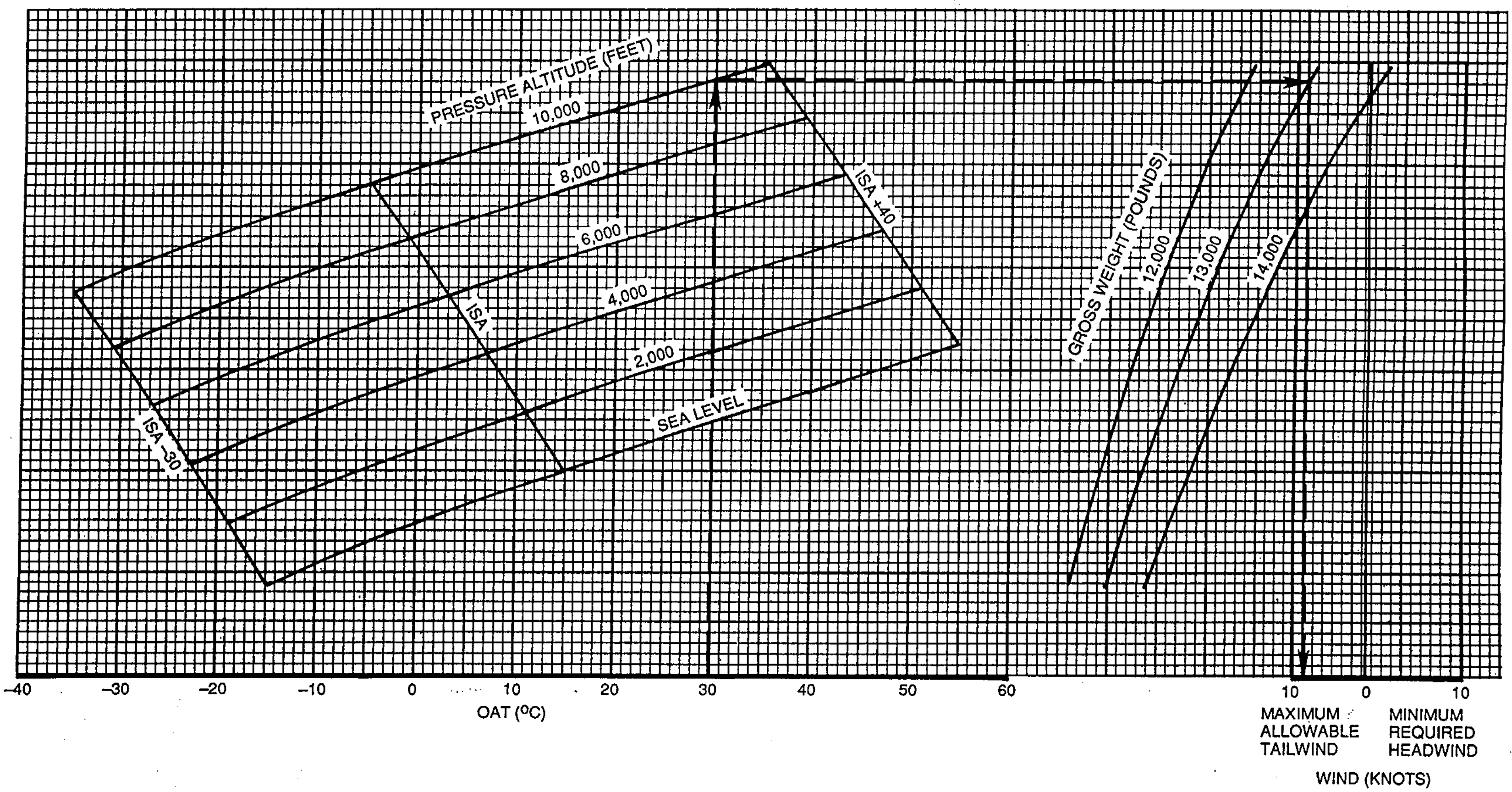


FIGURE 4-59

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PART H REDUCED POWER TAKEOFF OPERATIONS

CONTENTS

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INTRODUCTION

Part H provides for the use of reduced engine power for takeoff by employing the Assumed Temperature Method (ATM). This technique allows takeoff with less than the maximum available engine power in those cases where excess climb performance and runway length are available. The amount of power to be set for the reduced power takeoff is determined by assuming an air temperature, higher than the actual temperature, at which adequate performance is available.

Air Carrier or Air Taxi commercial operators must have prior approval of the cognizant FAA inspector to use this part.

The limitations applicable to reduced power operations are repeated below from Section 1.

1. The engine torque used for a takeoff may not be less than 90% of the torque shown by the appropriate power setting check chart for the actual ambient conditions.

2. The use of reduced power for takeoff is not permitted when the runway is contaminated with water, ice, slush, or snow.

3. As a condition to the use of reduced power procedures, operators must establish a periodic check system or engine condition monitoring system to ensure that the engines are capable of producing normal takeoff thrust for the actual ambient temperature.

4. Minimum crew during reduced power takeoff operations is two pilots.

The correct engine torque to be set for reduced power takeoff is determined from the performance section using the technique illustrated by the filled-in work sheets on Figures 4-61, 4-62, and 4-63.

For any given set of conditions, the procedure involves:

1. Determination of the highest OAT at which the performance requirements will allow takeoff; this becomes the assumed temperature.

2. Finding the torque to be used. This is the higher of the torque for a 10% power reduction at the actual OAT or the torque for the assumed temperature.

NOTE

> Determine both computed reduced power and maximum takeoff power torques. Set computed reduced power torque for takeoff. If more power is required during takeoff (engine failure, windshear encounter, etc.), torque can be increased to maximum takeoff power torque.

3. Selection of the takeoff speeds for the actual OAT and takeoff weight conditions.

Use the procedure outlined by the form presented on Figure 4-60 of this part, together with the performance data listed below, to establish the minimum safe power setting for takeoff and the associated scheduled speeds. The procedure is illustrated by three examples on pages 4H-4, 4H-6, and 4H-8.

INTRODUCTION (continued)

Applicable Performance Data

NOTE

Compliance with the charts listed above is required at all weights.

WORKSHEET
REDUCED POWER TAKEOFF
ASSUMED TEMPERATURE METHOD (ATM)

(1) ACTUAL PRESSURE ALTITUDE			FT.
(2) ACTUAL OAT			°C
(3) RUNWAY LENGTH, SLOPE, AND WIND	FT.	%	KTS.
(4) GROSS WEIGHT			LBS.

(5) MAX. OAT FOR GROSS WEIGHT (4), ____________________ POWER

(a) MAXIMUM TAKEOFF WEIGHT LIMITATION CHART	FIG.	°C
(b) DISTANCE TO ACCEL TO V_1 AND SLOW CHART	FIG.	°C
(c) DISTANCE TO ACCEL TO V_1 AND STOP CHART	FIG.	°C

NOTE

WHEN (5a) (5b), AND (5c) RESULT IN MAX. OAT's WARMER THAN THE ISA +40 BOUNDARY IN THE FIGURES, THE ASSUMED TEMPERATURE IS THE MAXIMUM TEMPERATURE APPROVED FOR THE ALTITUDE (ISA +40°C).

IF EITHER (5a) (5b) OR (5c) IS LOWER THAN ACTUAL OAT (2), THE GROSS WEIGHT MUST BE REDUCED OR A DIFFERENT POWER CONDITION USED.

(6) ASSUMED TEMPERATURE [LOWER OF (5a) OR (5b)] , OR MAXIMUM ALLOWABLE	°C

(7) TORQUE, FROM TAKEOFF POWER CHECK CHART, FIGURE: _________

(a) FOR OAT (2)	%
(b) TORQUE FOR (a) – [(a) DIVIDED BY 10]	%
(c) FOR ASSUMED TEMPERATURE (6)	%
(d) COMPUTED TORQUE, USE HIGHER OF (b) OR (c)	%

(8) TAKEOFF SPEEDS, FIGURE: _________

(a) V_1 FOR ALTITUDE (1), OAT (2), WEIGHT (4)	KIAS
(b) V_R FOR ALTITUDE (1), OAT (2), WEIGHT (4)	KIAS
(c) V_2 FOR ALTITUDE (1), OAT (2), WEIGHT (4)	KIAS
(d) V_{50} FOR ALTITUDE (1), OAT (2), WEIGHT (4)	KIAS

FIGURE 4-60

REDUCED POWER TAKEOFF (continued)

EXAMPLE 1

Given Conditions:

Engine Power Setting for Takeoff – Dry, Bleed Air Off
Airport Altitude: 1,000 Feet Press. Alt.
Airport OAT: 20^{o}C
Runway Length: 5,000 Feet
Runway Slope: Zero
Airport Wind: Zero
Desired Takeoff Weight: 14,000 Lbs.
B.F. Goodrich Single Rotor Brakes Installed
Dowty Rotol Propellers Installed

- Dry takeoff power with bleed air off is desired, so Figure 4-29, Maximum Takeoff Weight Limitation Chart, is used to determine (5a).
- Since B.F. Goodrich brakes are installed; and the gross weight is above 12,500 pounds so Figure 4-32, Distance to Accelerate to V_1 and Stop, is used with given runway length to determine (5c).
- Figure 4-28, Takeoff Power Check Chart – Dry, Bleed Air Off, is used to determine (7a) and (7c).
- The torque for the actual OAT, when reduced by 10%, (7b), is higher than that for the assumed temperature, (7c), so the higher torque is used for the Computed Torque, (7d).
- Takeoff speeds are determined from Figure 4-15.

EXAMPLE 1 (continued)

WORKSHEET
REDUCED POWER TAKEOFF
ASSUMED TEMPERATURE METHOD (ATM)

(1)	ACTUAL PRESSURE ALTITUDE	***1,000*** FT.
(2)	ACTUAL OAT	***20*** °C
(3)	RUNWAY LENGTH, SLOPE, AND WIND	***5,000*** FT. / ***0*** % / ***0*** KTS.
(4)	GROSS WEIGHT	***14,000*** LBS.

(5) MAX. OAT FOR GROSS WEIGHT (4), ***DRY, BLEED AIR OFF*** POWER

(a)	MAXIMUM TAKEOFF WEIGHT LIMITATION CHART	FIG. ***4-29***	***38.5*** °C
(b)	DISTANCE TO ACCEL TO V_1 AND SLOW CHART	FIG.	°C
(c)	DISTANCE TO ACCEL TO V_1 AND STOP CHART	FIG. ***4-32***	***36.0*** °C

NOTE

WHEN (5a) (5b), AND (5c) RESULT IN MAX. OAT's WARMER THAN THE ISA +40 BOUNDARY IN THE FIGURES, THE ASSUMED TEMPERATURE IS THE MAXIMUM TEMPERATURE APPROVED FOR THE ALTITUDE (ISA +40°C).

IF EITHER (5a) (5b) OR (5c) IS LOWER THAN ACTUAL OAT (2), THE GROSS WEIGHT MUST BE REDUCED OR A DIFFERENT POWER CONDITION USED.

(6) ASSUMED TEMPERATURE [LOWER OF (5a) OR (5b)] , OR MAXIMUM ALLOWABLE .... ***36.0*** °C

(7) TORQUE, FROM TAKEOFF POWER CHECK CHART, FIGURE: ***4-28***

(a)	FOR OAT (2)	***87.8*** %
(b)	TORQUE FOR (a) – [(a) DIVIDED BY 10]	***79.0*** %
(c)	FOR ASSUMED TEMPERATURE (6)	***74.3*** %
(d)	COMPUTED TORQUE, USE HIGHER OF (b) OR (c)	***79.0*** %

(8) TAKEOFF SPEEDS, FIGURE: ***4-15***

(a)	V_1 FOR ALTITUDE (1), OAT (2), WEIGHT (4)	***105.5*** KIAS
(b)	V_R FOR ALTITUDE (1), OAT (2), WEIGHT (4)	***105.5*** KIAS
(c)	V_2 FOR ALTITUDE (1), OAT (2), WEIGHT (4)	***114.5*** KIAS
(d)	V_{50} FOR ALTITUDE (1), OAT (2), WEIGHT (4)	***124.0*** KIAS

FIGURE 4-61

REDUCED POWER TAKEOFF (continued)

EXAMPLE 2

Given Conditions:

Engine Power Setting for Takeoff – Dry, Bleed Air Off
Airport Altitude: 2,000 Feet Press. Alt.
Airport OAT: 10°C
Runway Length: 6,000 Feet
Runway Slope: Zero
Airport Wind: 10 Knots Headwind
Desired Takeoff Weight: 11,800 Lbs.
B.F. Goodrich Single Rotor Brakes Installed
Dowty Rotol Propellers Installed

- Since B.F. Goodrich brakes are installed; and the gross weight is below 12,500 pounds so Figure 4-30, Distance to Accelerate to V_1 and Slow is used with given runway length to determine (5b).
- Both (5a) and (5b) result in Max. OAT's of ISA +40°C or greater, so the maximum allowable temperature of ISA +40°C at 2,000 feet pressure altitude is entered in (6).
- Again, the Computed Torque, (7d) is limited by the 10% maximum reduction.

EXAMPLE 2 (continued)

WORKSHEET
REDUCED POWER TAKEOFF
ASSUMED TEMPERATURE METHOD (ATM)

(1) ACTUAL PRESSURE ALTITUDE			***2,000*** FT.
(2) ACTUAL OAT			***10*** °C
(3) RUNWAY LENGTH, SLOPE, AND WIND	***6,000*** FT.	***0*** %	***10*** KTS.
(4) GROSS WEIGHT			***11,800*** LBS.

(5) MAX. OAT FOR GROSS WEIGHT (4), ***DRY, BLEED AIR OFF*** POWER

(a) MAXIMUM TAKEOFF WEIGHT LIMITATION CHART	FIG. ***4-29***	***ISA +40*** °C
(b) DISTANCE TO ACCEL TO V_1 AND SLOW CHART	FIG. ***4-30***	***ISA +40*** °C
(c) DISTANCE TO ACCEL TO V_1 AND STOP CHART	FIG.	°C

NOTE

WHEN (5a) (5b), AND (5c) RESULT IN MAX. OAT's WARMER THAN THE ISA +40 BOUNDARY IN THE FIGURES, THE ASSUMED TEMPERATURE IS THE MAXIMUM TEMPERATURE APPROVED FOR THE ALTITUDE (ISA +40°C).

IF EITHER (5a) (5b) OR (5c) IS LOWER THAN ACTUAL OAT (2), THE GROSS WEIGHT MUST BE REDUCED OR A DIFFERENT POWER CONDITION USED.

(6) ASSUMED TEMPERATURE [LOWER OF (5a) OR (5b)] , OR MAXIMUM ALLOWABLE	***51*** °C

(7) TORQUE, FROM TAKEOFF POWER CHECK CHART, FIGURE: ***4-28***

(a) FOR OAT (2)	***92.9*** %
(b) TORQUE FOR (a) – [(a) DIVIDED BY 10]	***83.6*** %
(c) FOR ASSUMED TEMPERATURE (6)	***59.3*** %
(d) COMPUTED TORQUE, USE HIGHER OF (b) OR (c)	***83.6*** %

(8) TAKEOFF SPEEDS, FIGURE: ***4-15***

(a) V_1 FOR ALTITUDE (1), OAT (2), WEIGHT (4)	***98*** KIAS
(b) V_R FOR ALTITUDE (1), OAT (2), WEIGHT (4)	***98*** KIAS
(c) V_2 FOR ALTITUDE (1), OAT (2), WEIGHT (4)	***106*** KIAS
(d) V_{50} FOR ALTITUDE (1), OAT (2), WEIGHT (4)	***115*** KIAS

FIGURE 4-62

REDUCED POWER TAKEOFF (continued)

EXAMPLE 3

Given Conditions:

Engine Power Setting for Takeoff – Dry, Bleed Air On
Airport Altitude: 2,000 Feet Press. Alt.
Airport OAT: 25^{o}C
Runway Length: 10,000 Feet
Runway Slope: 1 Percent (Downhill)
Airport Wind: 5 Knots Headwind
Desired Takeoff Weight: 14,500 Lbs.
B.F. Goodrich Single Rotor Brakes Installed
Dowty Rotol Propellers Installed

- In this example (5a) results in a Max. OAT less than the actual airport OAT.
- Either gross weight must be reduced or a higher power setting selected for takeoff power (e.g. Dry with Bleed Air Off, or Wet).

EXAMPLE 3 (continued)

WORKSHEET
REDUCED POWER TAKEOFF
ASSUMED TEMPERATURE METHOD (ATM)

(1) ACTUAL PRESSURE ALTITUDE .... ***2,000*** FT.

(2) ACTUAL OAT .... ***25*** °C

(3) RUNWAY LENGTH, SLOPE, AND WIND .... ***10,000*** FT. | ***–1*** % | ***5*** KTS.

(4) GROSS WEIGHT .... ***14,500*** LBS.

(5) MAX. OAT FOR GROSS WEIGHT (4), ***DRY, BLEED AIR ON*** POWER

(a) MAXIMUM TAKEOFF WEIGHT LIMITATION CHART	FIG. ***4-19***	***22*** °C
(b) DISTANCE TO ACCEL TO V_1 AND SLOW CHART	FIG.	°C
(c) DISTANCE TO ACCEL TO V_1 AND STOP CHART	FIG. ***4-22***	***ISA +40*** °C

NOTE

WHEN (5a) (5b), AND (5c) RESULT IN MAX. OAT's WARMER THAN THE ISA +40 BOUNDARY IN THE FIGURES, THE ASSUMED TEMPERATURE IS THE MAXIMUM TEMPERATURE APPROVED FOR THE ALTITUDE (ISA +40°C).

➡ IF EITHER (5a) (5b) OR (5c) IS LOWER THAN ACTUAL OAT (2), THE GROSS WEIGHT MUST BE REDUCED OR A DIFFERENT POWER CONDITION USED.

(6) ASSUMED TEMPERATURE [LOWER OF (5a) OR (5b)] , OR MAXIMUM ALLOWABLE .... °C

(7) TORQUE, FROM TAKEOFF POWER CHECK CHART, FIGURE: ______

(a) FOR OAT (2)	%
(b) TORQUE FOR (a) – [(a) DIVIDED BY 10]	%
(c) FOR ASSUMED TEMPERATURE (6)	%
(d) COMPUTED TORQUE, USE HIGHER OF (b) OR (c)	%

(8) TAKEOFF SPEEDS, FIGURE: ______

(a) V_1 FOR ALTITUDE (1), OAT (2), WEIGHT (4)	KIAS
(b) V_R FOR ALTITUDE (1), OAT (2), WEIGHT (4)	KIAS
(c) V_2 FOR ALTITUDE (1), OAT (2), WEIGHT (4)	KIAS
(d) V_{50} FOR ALTITUDE (1), OAT (2), WEIGHT (4)	KIAS

FIGURE 4-63

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TABLE OF CONTENTS
WEIGHT & BALANCE

TABLE OF CONTENTS (continued)
WEIGHT & BALANCE

ITEM PAGE

LIST OF EFFECTIVE PAGES

SECTION 5

PAGE	DATE	PAGE	DATE
5-i	MAY 19/99	5-27	MAY 19/99
5-ii	MAY 19/99	5-28	MAY 07/87
5-iii	MAY 19/99	5-29	SEP 02/86
5-iv	APR 02/86	5-30	MAY 19/99
5-v	MAY 19/99	5-31	FEB 01/88
5-vi	APR 02/86	5-32	MAY 19/99
5-1	MAY 07/87	5-33	APR 02/86
5-2	OCT 17/94	5-34	OCT 17/94
5-3	OCT 17/94	5-35	FEB 01/88
5-4	DEC 06/91	5-36	OCT 17/94
5-5	APR 02/86	5-37	FEB 01/88
5-6	DEC 06/91	5-38	OCT 17/94
5-7	MAY 07/87	5-39	FEB 01/88
5-8	OCT 17/94	5-40	OCT 17/94
5-9	APR 02/86	5-41	FEB 01/88
5-10	APR 02/86	5-42	OCT 17/94
5-11	OCT 17/94	5-43	FEB 01/88
5-12	OCT 17/94	5-44	OCT 17/94
5-13	MAY 19/99	5-45	APR 02/86
5-14	MAY 19/99	5-46	FEB 01/88
5-15	DEC 06/91	5-47	APR 02/86
5-16	MAY 19/99	5-48	DEC 06/91
5-17	MAY 19/99	5-49	DEC 06/91
5-18	MAY 19/99	5-50	DEC 06/91
5-19	MAY 19/99	5-51	OCT 17/94
5-20	MAY 19/99	5-52	OCT 17/94
5-21	MAY 19/99	5-53	DEC 06/91
5-22	APR 02/86	5-54	OCT 17/94
5-23	MAY 19/99	5-55	DEC 06/91
5-24	MAY 19/99	5-56	OCT 17/94
5-25	OCT 17/94	5-57	DEC 30/86
5-26	DEC 06/91	5-58	APR 02/86

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LIST OF REVISIONS

Revisions to the Airplane Flight Manual provide current information applicable to operation of the SA227-AC aircraft. Revised pages should be inserted into the manual to replace existing pages or to add additional pages, as applicable. The manual is valid only when current revisions are incorporated.

Revision Number	Revised Pages	Description of Revision	Date of Revision
B-1	5-iii, 5-v, 5-29, 5-31, 5-35, 5-37, 5-39, 5-41, and 5-43.	Asterick removed from calculation block (e) and revised figure reference.	SEP 05/86
B-2	5-iii, 5-v, 5-56, 5-57.	Added SAS torque motor servo to equipment list.	DEC 30/86
B-3	5-iii, 5-v, 5-1, 5-7, 5-8, 5-13 thru 5-16, 5-26, 5-27, 5-31, 5-32.	Corrected editorial errors, added configuration information.	MAY 07/87
B-4	5-i, 5-iii, 5-v, 5-30, 5-31, 5-34 thru 5-43, 5-46.	Revised configuration titles.	FEB 01/88
B-5	5-iii, 5-v, 5-2 thru 5-4, 5-6, 5-14, 5-15, 5-25, 5-26, 5-48 thru 5-56	Added information for allowable weight placards in forward and aft baggage compartments, added cargo net P/N and info on ANCRA single stud fittings. Modified weight and balance data in Figures 5-1 and 5-2. Corrected editorial errors, changed Weight and Moment Envelope and cleaned up Equipment List.	DEC 06/91
B-6	5-iii, 5-v, 5-2, 5-3, 5-8, 5-11, 5-12, 5-14, 5-25, 5-30, 5-34, 5-36, 5-38, 5-40, 5-42, 5-44, 5-51, 5-52, 5-54 and 5-56	Corrected weight and balance data in Figures 5-1 and 5-2, changed floor plans, cargo door and fuselge station diagram illustrations, added main gear tire and corrected editorial errors.	OCT 17/94
B-7	5-i thru 5-iii, 5-v, 5-13, 5-14, 5-16 thru 5-21, 5-23, 5-24, 5-27, 5-30 and 5-32	Corrected Table of Contents, changed company name on page 5-13, replaced Figures 5-13 and 5-16, corrected editorial errors.	MAY 19/99

A black bar in the margin of a revised page shows the current change.

LIST OF REVISIONS

Revision Number	Revised Pages	Description of Revision	Date of Revision

A black bar in the margin of a revised page shows the current change.

INTRODUCTION

This section has been prepared to assist the user in the methods and limitations that must be considered when loading the METRO III aircraft.

DEFINITIONS

BASIC EMPTY WEIGHT

The weight of the aircraft fully equipped, including unusable fuel, full oil, full hydraulic fluid, full brake fluid, and full oxygen. Excludes the weight of CAWI fluid, operating fuel, crew and passenger supplies, and personnel or cargo. See Figure 5-1.

*RAMP WEIGHT

The weight of the aircraft loaded and ready to start engines. The maximum is 14,600 pounds.

*TAKEOFF WEIGHT

The weight of the aircraft at brake release for takeoff. The maximum is 14,500 pounds.

FUSELAGE STATION (F.S.)

The distance, in inches from the fuselage reference datum (F.S. 0.00) which is located 28.94 inches aft of the tip of the radome. See Figure 5-30.

*Applies to S/N AC-514 and subsequent or previous aircraft with Service Bulletin 11-001 incorporated. If Service Bulletin 11-001 has not been incorporated the maximum ramp weight is 14,100 pounds and the maximum certificated takeoff weight of 14,000 pounds must be observed.

MANUFACTURER'S WEIGHT AND BALANCE DATA

Fairchild Aircraft Model SA227-AC, S/N ______________, R/N ______________, was weighed at the factory this date. The weight includes full hydraulic fluid, full brake fluid, full engine oil, full oxygen, empty CAWI tank, and undrainable fuel. Fuselage station 0.00 is 28.94 inches aft of the tip of the radome.

	WEIGHT	X	ARM	=	MOMENT
Nose Jack Pad	_________		68.35		________________
Left Jack Pad	_________		306.50		________________
Right Jack Pad	_________		306.50		________________
*Weight & Moment	_________				________________
Center of Gravity Arm			_________		

* Enter this weight and moment on Figure 5-2 for "AS WEIGHED AT FACTORY".

NOTE

To determine Basic Empty Weight of this aircraft, add 27 pounds of drainable (but unusable) fuel at F.S. 282.

____
Inspection Department

____
Date

FIGURE 5-1

WEIGHT AND BALANCE RECORD

(CONTINUOUS HISTORY OF CHANGES IN STRUCTURE OR EQUIPMENT AFFECTING WEIGHT AND BALANCE)

AIRPLANE MODEL				SERIAL NUMBER						PAGE NUMBER	
	ITEM NO.			WEIGHT CHANGE						RUNNING BASIC EMPTY WEIGHT	
				ADDED (+)			REMOVED (–)				
DATE	IN	OUT	DESCRIPTION OF ARTICLE OR MODIFICATION	WT. (LBS)	ARM (IN.)	MOMENT /1,000	WT. (LBS)	ARM (IN.)	MOMENT /1,000	WT. (LBS)	MOMENT /1,000
			AS WEIGHED AT FACTORY								
	X		Fuel per NOTE Page 5-2 / Delivery Weight	27	282	7.6					

FIGURE 5-2

WEIGHT AND BALANCE RECORD

(CONTINUOUS HISTORY OF CHANGES IN STRUCTURE OR EQUIPMENT AFFECTING WEIGHT AND BALANCE)

AIRPLANE MODEL				SERIAL NUMBER						PAGE NUMBER		
	ITEM NO.			WEIGHT CHANGE						RUNNING BASIC EMPTY WEIGHT	
				ADDED (+)			REMOVED (–)				
DATE	IN	OUT	DESCRIPTION OF ARTICLE OR MODIFICATION	WT. (LBS)	ARM (IN.)	MOMENT /1,000	WT. (LBS)	ARM (IN.)	MOMENT /1,000	WT. (LBS)	MOMENT /1,000

FIGURE 5-2 (continued)

WEIGHING INSTRUCTIONS

JACKSTAND METHOD

This method requires the use of electronic load cells and support jacks.

Attach the jacking adapter to the wing at the rear spar just inboard of the nacelles. The nose jack point is located on the lower forward nose on the left hand side. With the load cells in place on the jacks and zeroed, raise the airplane until the gear is clear of the floor. The gear should be down and locked during weighing. Level the airplane laterally by placing a level across the leveling points on the aft door frames of the nose baggage compartment. Accomplish longitudinal leveling by placing a level on the marked area of the wheelwell cover in the nose baggage compartment.

Record the load cell values on the weighing form. Complete the weighing form, Figure 5-3, to calculate the aircraft weight and balance.

PLATFORM METHOD

In this case, the airplane is supported on platform scales placed under the wheels. The only precaution is to ensure that the airplane is longitudinally level when the scale readings are taken. The airplane may be leveled by increasing or decreasing the oleo strut pressure of the nose gear.

Record the scale readings on the weighing form, Figure 5-3, and calculate the airplane weight and balance.

WEIGHING FORM

JACKSTAND METHOD

Jack	Scale Reading (Pounds	–	Tare (Pounds)	=	Net Weight (Pounds)	X	Arm (Inches)	=	Moment (In-Lbs)
Nose	______		______		______		68.35		______
Left	______		______		______		306.50		______
Right	______		______		______		306.50		______
TOTALS					______				______

PLATFORM METHOD

Gear	Scale Reading (Pounds	–	Tare (Pounds)	=	Net Weight (Pounds)	X	Arm (Inches)	=	Moment (In-Lbs)
Nose	______		______		______		64.10		______
Left	______		______		______		293.69		______
Right	______		______		______		293.69		______
TOTALS					______				______

AIRCRAFT LOADING FORMULAE:

$$\text{CENTER OF GRAVITY ARM} = \frac{\text{TOTAL MOMENT}}{\text{TOTAL WEIGHT}}$$

$$\text{C.G. IN \% MAC} = \frac{\text{C.G. ARM} - 250.93}{72.33} \times 100$$

FIGURE 5-3

AIRCRAFT LOADING FEATURES

The METRO III is a convertible passenger aircraft that can be adapted to carry passengers and/or cargo. Movable bulkheads permit use of the passenger compartment area for cargo loading through a 53 inch by 51.25 inch cargo door. The fuselage interior can be configured to accommodate nineteen passengers and a nominal cargo load; fewer than nineteen passengers and a proportionately larger cargo load; or a full load of cargo and no passengers. See Figure 5-5.

The maximum approved seating capacity of the aircraft is 22, including crew seats.

To convert the cabin to carry additional cargo, passenger seats can be removed from the floor tracks and the movable bulkhead repositioned allowing for additional cargo space. Alternate locations are provided for the movable bulkhead which provides visual isolation of the passenger and cargo compartments. Fittings are provided for its installation at 30 inch increments as far forward as the aft emergency escape hatch. This enables conversion between passenger and cargo loading with passenger loading through the forward door and cargo through the aft door. The cabin flooring is designed for uniformly distributed loading of 150 pounds per square foot. The clamshell cargo door permits loading and unloading of the aircraft from truck bed level.

THREE VIEW

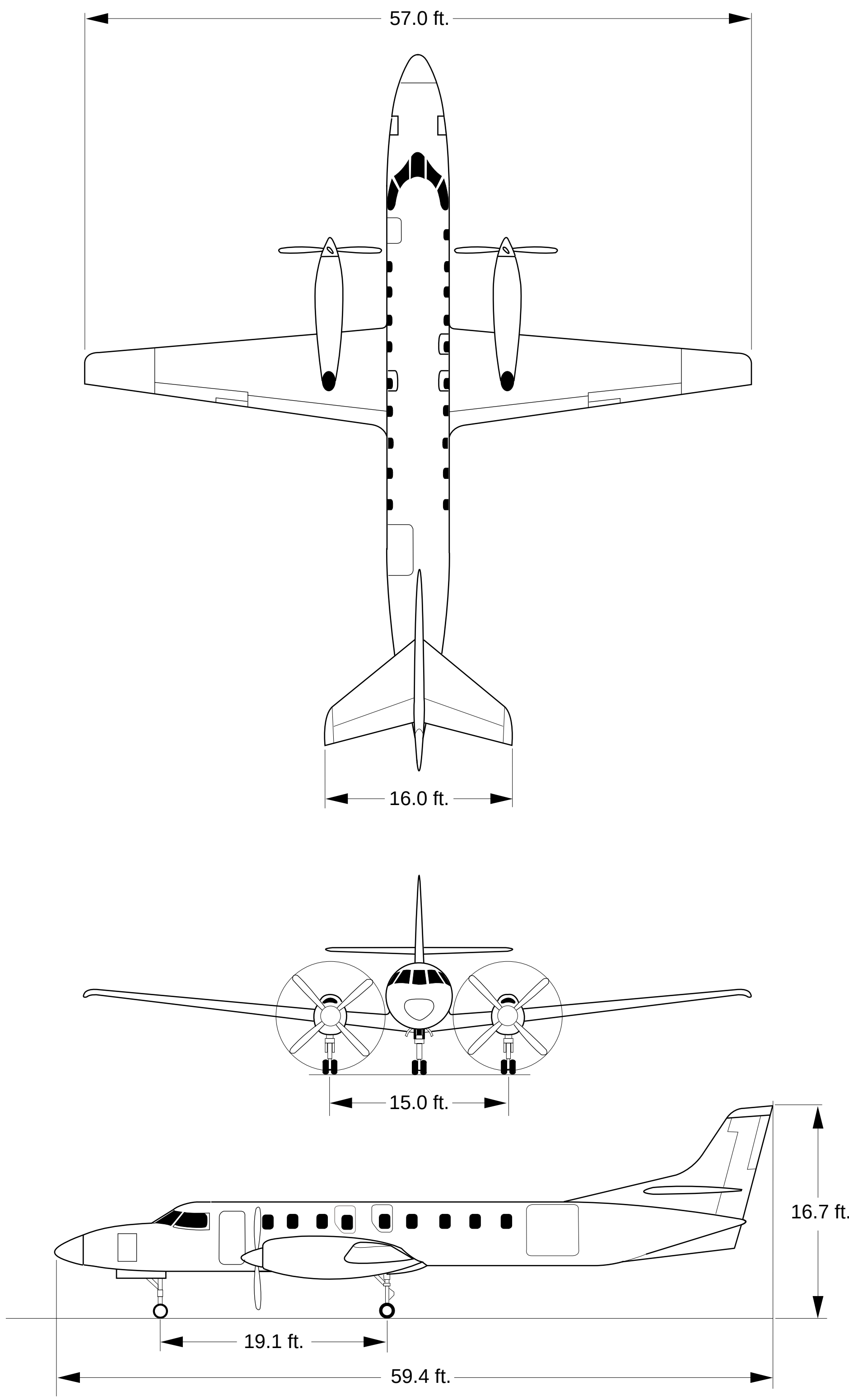


FIGURE 5-4

GENERAL ARRANGEMENTS

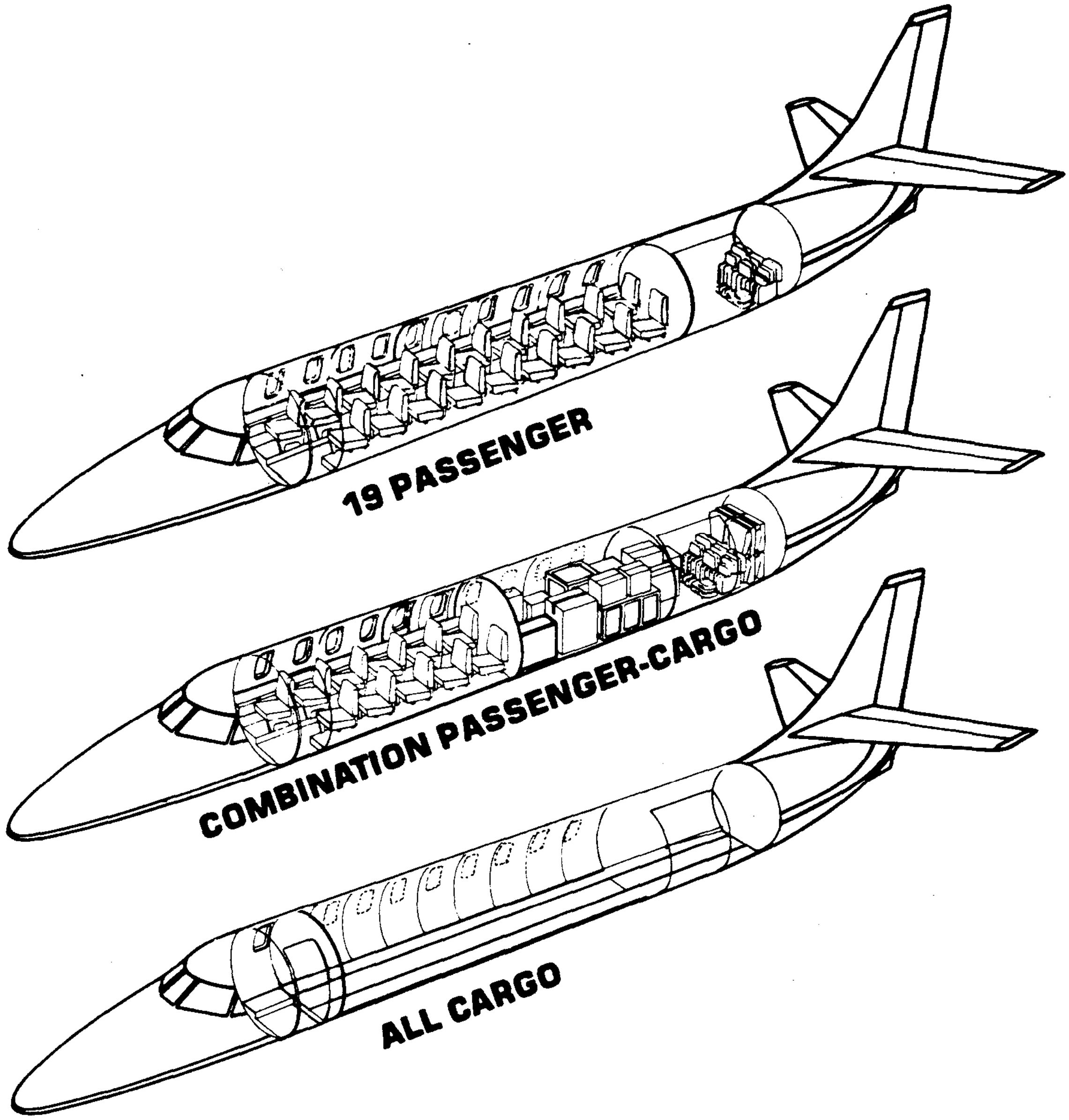


FIGURE 5-5

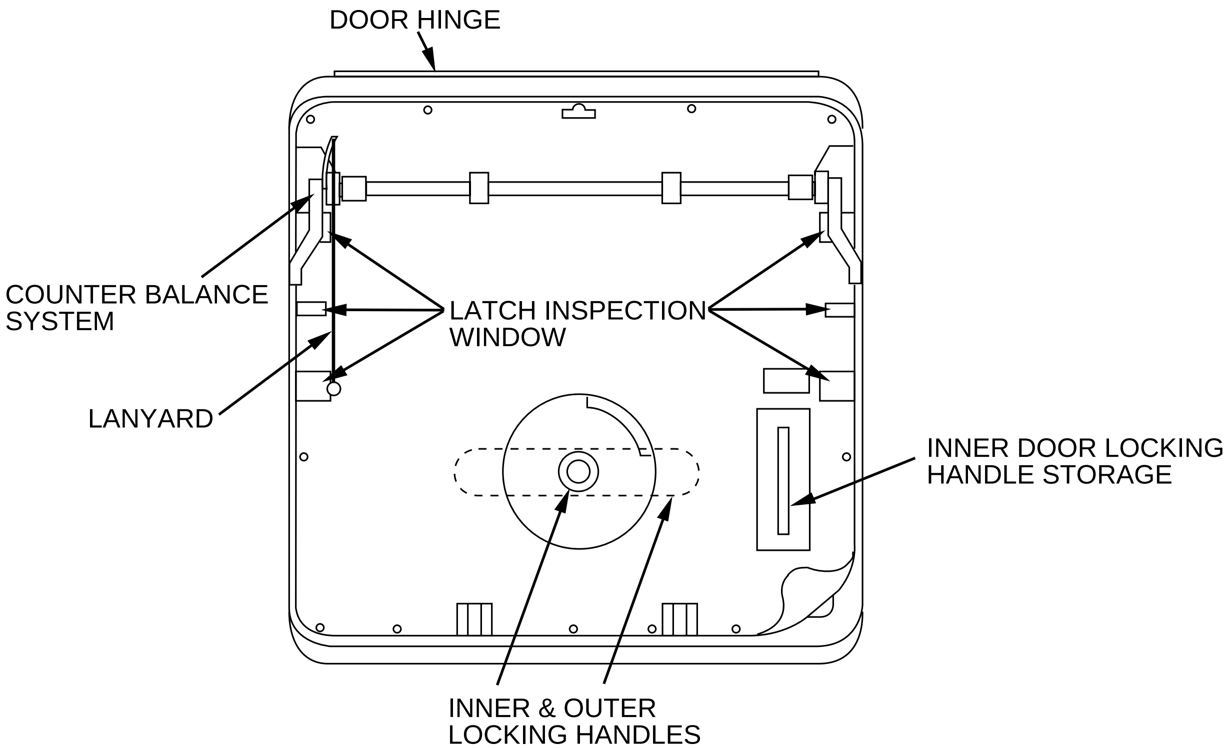
CARGO DOOR

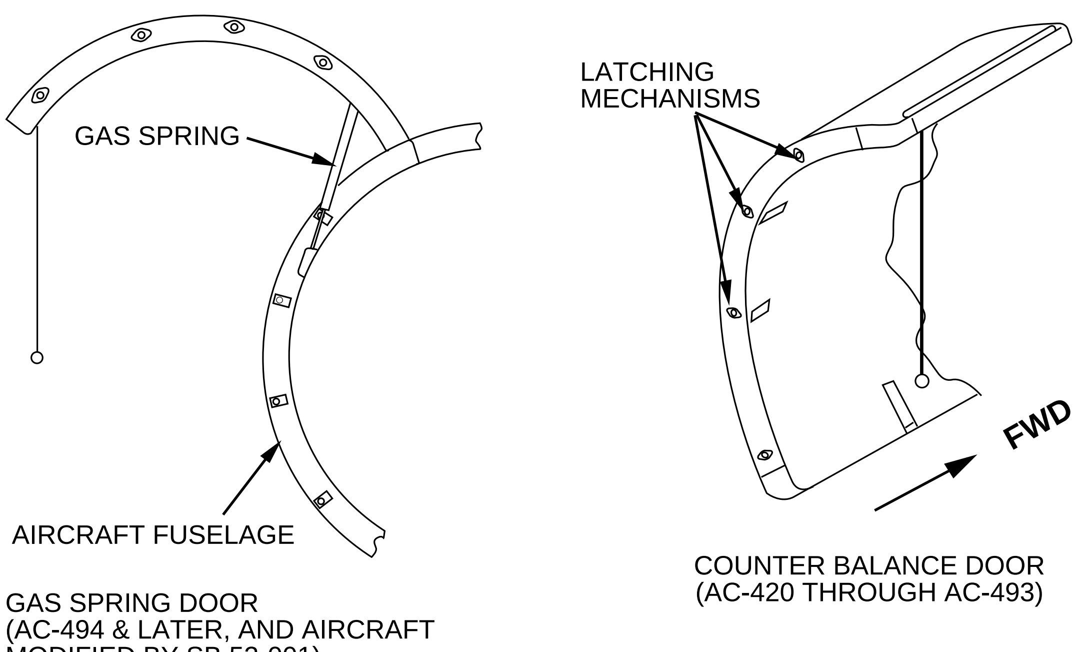
DESCRIPTION AND OPERATION

A clamshell cargo door is located on the left aft section of the fuselage between stations 438.06 and 491.06. The door is 53 inches by 51.25 inches in size, weighs 74.9 pounds, and is hinged at the top. The door is opened manually outward and upward to 83 degrees. Earlier aircraft have a counterbalance spring to overcome the door weight. The door must be opened over halfway before the spring can drive it toward full open. A restraining lanyard is provided to prevent the door from opening too far by its upward momentum. The lanyard should be held, maintaining light tension, when pushing the cargo door up and over center toward its fully open position. An overcentering arm links to hold the door at its fully-open position. The lanyard is used to move the arm from over center to allow the door to be closed. As the door closes, tension increases on the spring in the counterbalance system to prevent the door from free falling. But after the door is pulled down about halfway, the weight of the door will close it all the way. The cargo door may be opened from the inside or the outside by interconnected handles. The outside handle, in the closed position, is recessed into the door frame and may be locked to provide security.

Some aircraft are equipped with a pair of gas springs attached to the cargo door at the front and rear edges. The gas springs replace the counterbalance spring and overcentering arm. As the door is unlocked, the gas springs apply an upward (opening) force to lift the door to the fully-open position. The gas springs also provide damping to prevent the cargo door from opening too fast or too far. The lanyard should be held during opening to provide a means of closing the door.

CARGO DOOR FUNCTIONAL ITEMS



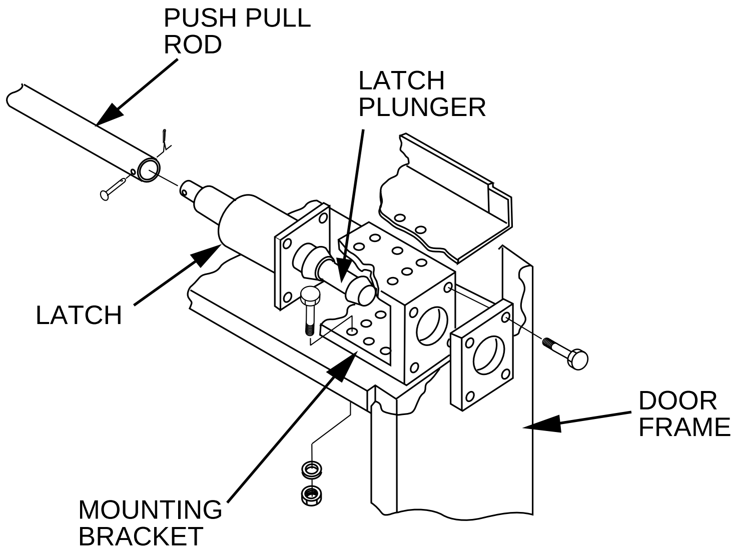


GAS SPRING DOOR
(AC-494 & LATER, AND AIRCRAFT
MODIFIED BY SB 52-001)

COUNTER BALANCE DOOR
(AC-420 THROUGH AC-493)

FIGURE 5-6

CARGO DOOR LATCHING MECHANISM



DOOR LATCH

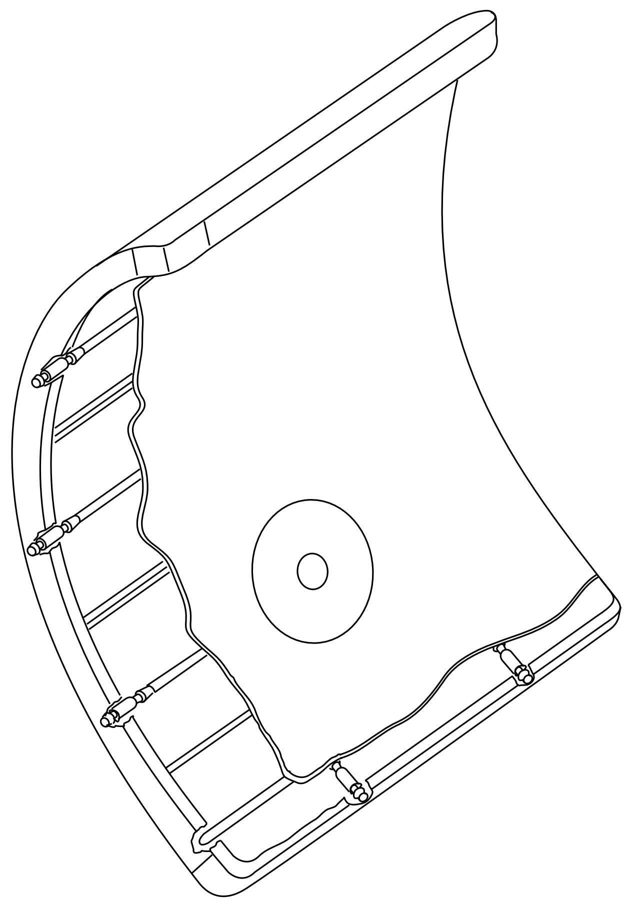


FIGURE 5-7

LOADING INSTRUCTIONS

WEIGHT AND BALANCE

Proper loading of the METRO III requires a combination of payload and fuel load which will not exceed ramp weight, takeoff weight, and center of gravity limitations. Major limiting weights follow.

	FAR 23	SFAR 41
Ramp Weight	12,600 pounds	*14,600 pounds
Maximum Takeoff Weight	12,500 pounds	*14,500 pounds
Maximum Landing Weight	12,500 pounds	14,000 pounds
Maximum Zero Fuel Weight	12,500 pounds	**13,130 pounds

To determine the moment due to payload, refer to the appropriate moment table for the existing cabin configuration, or calculate the moment by multiplying the payload weight (pounds) by the fuselage station of the payload center of gravity (inches) and divide the result by 1,000. To simplify data presentation and calculations, moments are divided by 1,000 in all moment tables.

All cabin and cargo compartment configurations provided by Fairchild Aircraft have been approved by the FAA.

Cabin diagrams, weight and balance calculation forms, and payload moment tables are included in this section for various interior configurations of the METRO III. Fuselage stations, in inches, are included on the weight and balance calculation forms so that moments may be computed directly if desired. The METRO III interior configurations are not restricted to only those shown in this manual. As indicated in Figure 5-5, there is no minimum number of passenger seats required. For configurations not specifically provided for in this section, determine the payload moment arm by reference to Figure 5-30 and compute the weight and center of gravity using the general procedure detailed in subsequent pages.

*Applies to S/N AC-514 and subsequent or previous aircraft with Service Bulletin 11-001 incorporated. If Service Bulletin 11-001 has not been incorporated the maximum ramp weight is 14,100 pounds and the maximum certificated takeoff weight of 14,000 pounds must be observed.

**13,900 pounds for AC-624 and subsequent and previous aircraft which have P/N's 27-13900-65, -66, -67, and -69 installed per drawing 27-13900 (part of ECP 441) or per drawing 27K20004.

Figure 5-31 is a passenger weight table that is provided as a convenience in determining the total weight of passengers with average weights ranging from 150 to 200 pounds.

To determine the moment due to fuel load, see Figure 5-34. The weight of the fuel is assumed to be 6.7 pounds per U.S. gallon. When the CAWI tank contains fluid, the weight and moment must be corrected as indicated in Figure 5-35.

LOADING INSTRUCTIONS (Continued)

CONFIGURATION OPTIONS AND LOAD LIMITS

Standard Baggage Compartments

The maximum load that can be carried in the forward baggage compartment is 800 pounds, including equipment, baggage, and cargo. The compartment is placarded to show the amount of baggage and cargo allowed after subtracting the weight of the CAWI system components (65 pounds), the weight of a full CAWI tank (128 pounds), and the weight of installed equipment (varies with customer options).

The maximum load that can be carried in the aft baggage compartment is 850 pounds plus up to 100 pounds installed equipment on the equipment shelf at F.S. 530 – 548 aft of the baggage compartment. The weight of equipment installed in the baggage compartment, such as the optional lavatory and its fluid, or air conditioner components, is subtracted from the 850 pound maximum allowable. The compartment is placarded to show the amount of baggage and cargo allowed after subtracting the weight of this installed equipment.

The maximum floor loading for all cargo and passenger areas is 150 pounds per square foot.

Aft Baggage Compartment With Second Structural Bulkhead

If the aircraft has two structural bulkheads installed (one at F.S. 437 and one at F.S. 467) the maximum load for the aft baggage compartment (F.S. 437 to F.S. 530) is 850 pounds. With this configuration the aft baggage compartment is divided into two zones. (Zone A is from F.S. 437 to F.S. 467, Zone B is from F.S. 467 to F.S. 530). The maximum load to be placed in either Zone A or Zone B is 500 pounds with no more than 350 pounds placed in the opposite compartment. Each structural bulkhead is approved to retain up to 500 pounds of baggage in the event of an emergency landing. If the structural bulkhead at F.S. 467 is removed, or not installed, then all baggage or cargo weight above 500 pounds must be secured by an acceptable means. The 500 pounds of loose baggage must be stowed directly behind the structural bulkhead at F.S. 437 and the balance of the load, up to 350 pounds, must be secured utilizing the cargo floor tie down rings.

LOADING INSTRUCTIONS (Continued)

CONFIGURATION OPTIONS AND LOAD LIMITS (continued)

Movable Structural Bulkhead

A movable structural bulkhead weighing 37 pounds may be located in seven different positions within the aircraft, or removed entirely. The standard location at F.S. 437 permits carrying 19 passengers. Alternate locations and the corresponding moment changes are shown in Figure 5-8. When installed, the movable structural bulkhead is approved to retain up to 500 pounds of baggage in the event of an emergency landing. When cargo other than passenger baggage, such as high density industrial equipment, is carried in the cargo compartment, it should be secured by the cargo net furnished with each aircraft, or by other acceptable means. The P/N 27-90150 cargo net is structurally satisfactory to secure a total of 540 pounds of high density cargo utilizing the floor tie down fittings. If these items are not secured, they may shift during flight in turbulent conditions and cause damage to the cargo compartment liner and/or an undesirable shift of C.G. Without the movable structural bulkhead all cargo and baggage, regardless of size or weight, must be secured.

When the bulkhead is moved forward to convert passenger space to cargo space, the capacity of the aft baggage compartment may be increased by 530 pounds for each set of seats removed in rows 10, 9, or 8. If rows 7 through 1 are to be converted to cargo space, only 360 additional pounds of cargo may be added for each additional row of seats. Caution should be exercised to maintain the cargo center of gravity toward the center of the aircraft (F.S. 274 to 309), to avoid exceeding the bending moment load limit.

MOMENT CHANGE TABLE

37 POUND MOVABLE STRUCTURAL BULKHEAD

F.S.	MOMENT CHANGE (IN.-LB./1,000)
167	–10.0
317	–4.4
347	–3.3
377	–2.2
407	–1.1
437*	0.0
467**	1.1

* STANDARD LOCATION
** SPECIAL OPTION

FIGURE 5-8

LOADING INSTRUCTIONS (Continued)

CONFIGURATION OPTIONS AND LOAD LIMITS (continued)

Aft Baggage Compartment with Two Cargo Nets

An optional installation of two high-strength cargo nets (P/N 27-13884-3), as illustrated by Figure 5-28, provides a total aft baggage/cargo capacity of 1,350 pounds. In this configuration, the structural bulkhead is installed at F.S. 407, and one net is installed at F.S. 411. The resulting Zone A1 is approved to restrain 750 pounds of baggage/cargo. A floor plug is provided to raise the aisle floor aft of the structural bulkhead. A second cargo net is installed at F.S. 492 to define Zone B1 and is approved to restrain 600 pounds .

Passenger High-Back, Bucket Seat Removal

Passenger seats can be removed from the floor tracks to make room for additional cargo. Some aircraft are configured with 3 seats in row 10, while others have only 2 seats in the last row. The tables in Figure 5-9 provide the weight and moment changes that result from removing rows of seats. The first table pertains to aircraft with 2 seats in row 10, while the second table is for aircraft with 3 seats in row 10. The third table is provided to facilitate weight and moment calculations if the center seat is reinstalled in the seat row immediately ahead of the movable structural bulkhead after moving the bulkhead forward.

PASSENGER HIGH-BACK, BUCKET SEAT REMOVAL MOMENT CHANGE TABLES

INFLUENCE OF REMOVING HIGH-BACK, BUCKET SEATS,
AND THE ACCUMULATED EFFECT,
WORKING FORWARD FROM THE LAST ROW

SEAT ROW	NUMBER OF SEATS IN ROW	SEAT* C.G. (F.S.)	WEIGHT** CHANGE (POUNDS)	MOMENT CHANGE (IN.-LB./1,000)	CUMULATIVE Δ WT. (POUNDS)	CUMULATIVE Δ MOMENT (IN.-LB./1,000)
10	2	425	26.2	–11.14	–26	–11.1
9	2	395	26.2	–10.35	–52	–21.5
8	2	365	26.2	–9.56	–79	–31.1
7	2	334	26.2	–8.75	–105	–39.8
6	2	303	26.2	–7.94	–131	–47.7
5	2	272	26.2	–7.13	–157	–54.9
4	2	242	26.2	–6.34	–183	–61.2
3	2	213	26.2	–5.58	–210	–66.8
2	2	184	26.2	–4.82	–236	–71.6
1	1	154	13.1	–2.02	–249	–73.6

SEAT ROW	NUMBER OF SEATS IN ROW	SEAT* C.G. (F.S.)	WEIGHT** CHANGE (POUNDS)	MOMENT CHANGE (IN.-LB./1,000)	CUMULATIVE Δ WT. (POUNDS)	CUMULATIVE Δ MOMENT (IN.-LB./1,000)
10	3	425	39.3	–16.70	–39	–16.7
9	2	395	26.2	–10.35	–66	–27.1
8	2	365	26.2	–9.56	–92	–36.6
7	2	334	26.2	–8.75	–118	–45.5
6	2	303	26.2	–7.94	–144	–53.3
5	2	272	26.2	–7.13	–170	–60.4
4	2	242	26.2	–6.34	–197	–66.8
3	2	213	26.2	–5.58	–223	–72.4
2	2	184	26.2	–4.82	–249	–77.2
1	1	154	13.1	–2.02	–262	–79.2

* THE C.G. OF AN EMPTY HIGH-BACK, BUCKET SEAT IS 6 INCHES AFT OF THE C.G. OF AN OCCUPIED SEAT. FOR EXAMPLE: THE EMPTY SEATS IN ROW 10 BALANCE AT F.S. 425 AS SHOWN IN THE TABLE; BUT THE MOMENT ARM FOR OCCUPIED ROW 10 SEATS IS 6 INCHES FURTHER FORWARD AT F.S. 419 (REF. FIGURE 5–22).

** A SINGLE SEAT WEIGHS 13.1 POUNDS.

FIGURE 5-9

PASSENGER HIGH-BACK, BUCKET SEAT REMOVAL MOMENT CHANGE TABLES (continued)

INFLUENCE OF ADDING HIGH-BACK CENTER SEAT

SEAT ROW	SEAT C.G. (F.S.)	WEIGHT CHANGE (POUNDS)	MOMENT CHANGE (IN.-LB./1,000)
10	425	13.1	+5.6
9	395	13.1	+5.2
8	365	13.1	+4.8
7	334	13.1	+4.4
6	303	13.1	+4.0

EXAMPLE: Compute the adjustments to weight and moment of removing three seats from row 10 and reinstalling the center seat in row 9.

1. From the second table in Figure 5-9, find the weight and moment change due to removing 3 row 10 seats to be –39.3 pounds and –16.7 in.-lb./1,000.

2. From the above table, find the weight and moment change due to adding a center seat to row 9 to be +13.1 lbs. and +5.2 in.-lb./1,000.

3. Compute the net adjustments by combining the changes in steps 1 and 2.

   Net weight change = –39.3 + 13.1 = –26.2 lbs.
   Net moment change = –16.7 + 5.2 = –11.5 in.-lb./1,000

4. Enter the adjustments in block (d) of the appropriate Weight and Balance Calculation Form. See Figure 5-18 for example.

FIGURE 5-9 (continued)

LOADING INSTRUCTIONS (continued)

CONFIGURATION OPTIONS AND LOAD LIMITS (continued)

Passenger Low-Back, Folding Seat Removal

The low-back, folding seats can be removed from the floor and side wall fittings. The tables in Figure 5-10 provide weight and moment changes that result from removing rows of these seats. The tables in Figure 5-10 are used in the same manner as those in Figure 5-9.

PASSENGER LOW-BACK, FOLDING SEAT REMOVAL CHANGE TABLES

INFLUENCE OF REMOVING LOW-BACK, FOLDING SEATS,
AND THE ACCUMULATED EFFECT,
WORKING FORWARD FROM THE LAST ROW

SEAT ROW	NUMBER OF SEATS IN ROW	SEAT* C.G. (F.S.)	WEIGHT** CHANGE (POUNDS)	MOMENT CHANGE (IN.-LB./1,000)	CUMULATIVE Δ WT. (POUNDS)	CUMULATIVE Δ MOMENT (IN.-LB./1,000)
10	2	428	20.2	–8.64	–20	–8.6
9	2	398	20.2	–8.04	–40	–16.7
8	2	368	20.2	–7.43	–61	–24.1
7	2	338	20.2	–6.83	–81	–30.9
6	2	308	20.2	–6.22	–101	–37.2
5	2	278	20.2	–5.62	–121	–42.8
4	2	248	20.2	–5.01	–141	–47.8
3	2	218	20.2	–4.40	–162	–52.2
2	2	188	20.2	–3.80	–182	–56.0
1	1	158	10.1	–1.60	–192	–57.6

SEAT ROW	NUMBER OF SEATS IN ROW	SEAT* C.G. (F.S.)	WEIGHT** CHANGE (POUNDS)	MOMENT CHANGE (IN.-LB./1,000)	CUMULATIVE Δ WT. (POUNDS)	CUMULATIVE Δ MOMENT (IN.-LB./1,000)
10	3	428	30.3	–12.97	–30	–13.0
9	2	398	20.2	–8.04	–51	–21.0
8	2	368	20.2	–7.43	–71	–28.4
7	2	338	20.2	–6.83	–91	–35.3
6	2	308	20.2	–6.22	–111	–41.5
5	2	278	20.2	–5.62	–131	–47.1
4	2	248	20.2	–5.01	–152	–52.1
3	2	218	20.2	–4.40	–172	–56.5
2	2	188	20.2	–3.80	–192	–60.3
1	1	158	10.1	–1.60	–202	–61.9

* THE C.G. OF AN EMPTY LOW-BACK, FOLDING SEAT IS 4 INCHES AFT OF THE C.G. OF AN OCCUPIED SEAT. FOR EXAMPLE: THE EMPTY SEATS IN ROW 10 BALANCE AT F.S. 428 AS SHOWN IN THE TABLE; BUT THE MOMENT ARM FOR OCCUPIED ROW 10 SEATS IS 4 INCHES FURTHER FORWARD AT F.S. 424 (REF. FIGURE 5–20).

** A SINGLE SEAT WEIGHS 10.1 POUNDS.

FIGURE 5-10

PASSENGER LOW-BACK, FOLDING SEAT REMOVAL MOMENT CHANGE TABLES (continued)

INFLUENCE OF ADDING LOW-BACK CENTER SEAT

SEAT ROW	SEAT C.G. (F.S.)	WEIGHT CHANGE (POUNDS)	MOMENT CHANGE (IN.-LB./1,000)
10	428	10.1	+4.3
9	398	10.1	+4.0
8	368	10.1	+3.7
7	338	10.1	+3.4
6	303	10.1	+3.1

FIGURE 5-10 (continued)

LOADING INSTRUCTIONS (continued)

CONFIGURATION OPTIONS AND LOAD LIMITS (continued)

Optional Modular Toilet

An optional modular toilet, that is part of the structural bulkhead, may be located at five different locations. If the modular toilet is located at any position other than between F.S. 437 and 467, an adjustment to the moment must be made as shown in Figure 5-11.

MOMENT CHANGE TABLE

	MOMENT CHANGE (IN.-LB./1,000)	
BETWEEN F.S. – F.S.	CHEMICAL TOILET	ELECTRIC FLUSH
317 – 347	–12.0	–12.8
347 – 377	–9.0	–9.6
377 – 407	–6.0	–6.4
407 – 437	–3.0	–3.2
437 – 467	0.0	0.0

FIGURE 5-11

Optional Fixed Position Toilet

An optional fixed position toilet can be installed with a non-structural bulkhead which contains a door to provide access to the toilet compartment. This toilet is located at F.S. 459. If it is removed, an adjustment to the moment must be made as shown in Figure 5-12. With this installation the structural bulkhead is installed at F.S. 467.

MOMENT CHANGE TABLE

	MOMENT CHANGE (IN.-LB./1,000)	
BETWEEN F.S. – F.S.	CHEMICAL TOILET	ELECTRIC FLUSH
437 – 467	–16	–17

FIGURE 5-12

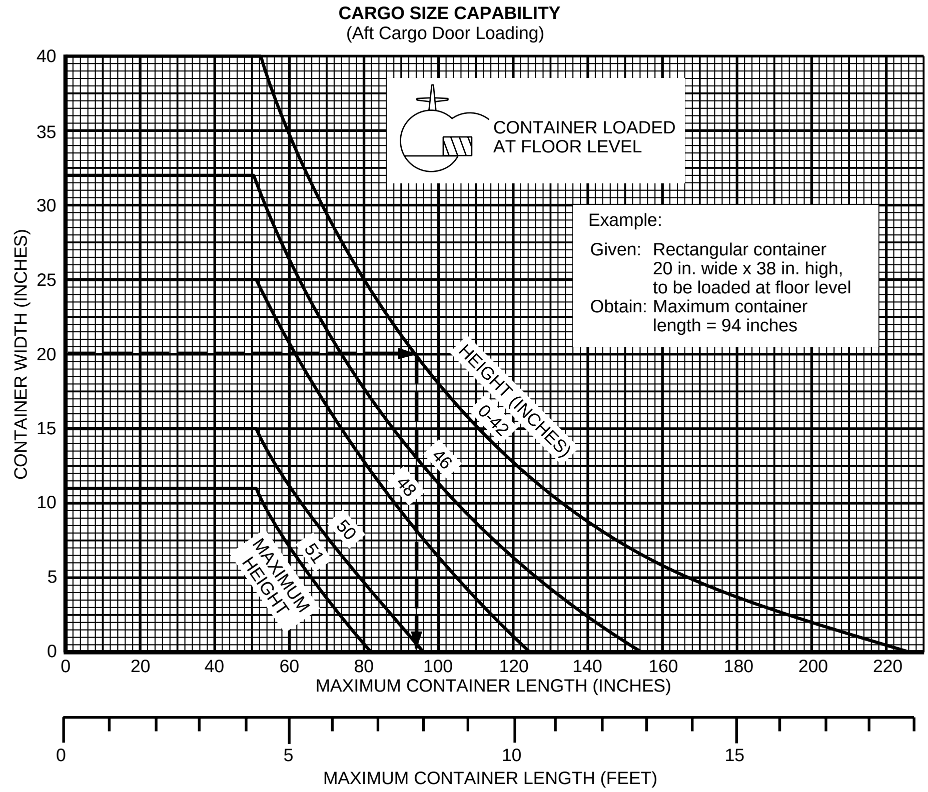
LOADING INSTRUCTIONS (continued)

CARGO SIZE LIMITATIONS

Because of physical obstructions, the size of the cargo to be loaded must be considered. Two cargo size limitation illustrations have been prepared to determine if a specific load can be easily moved into the fuselage (See Figure 5-13). Both illustrations are computed for maximum loading with the cargo door in the full open position (83 degrees). To use either chart it is necessary to measure the width, length, and height of the item to be loaded.

Loading at the various stations of the aircraft is restricted by the fuselage and flooring structure. Use of shoring materials may be required, depending upon the density and rigidity of the load.

MAXIMUM CONTAINER DIMENSIONS



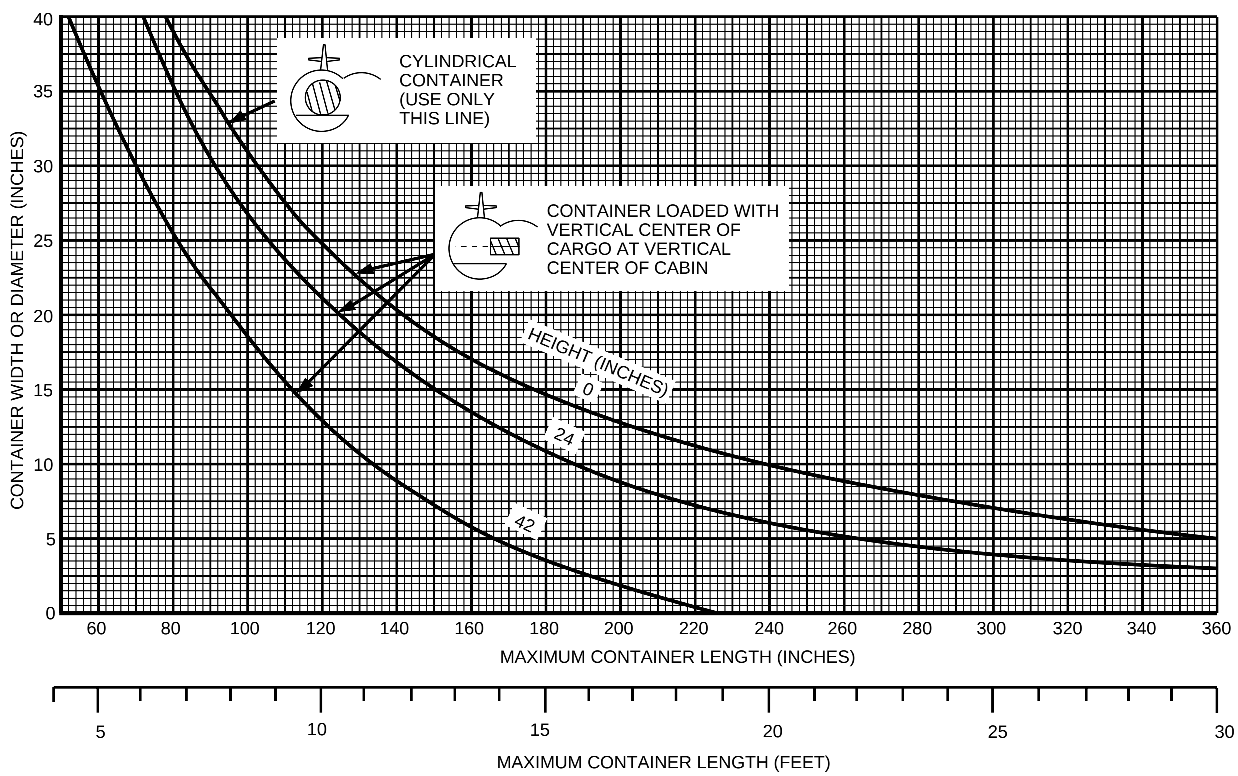


FIGURE 5-13

LOADING INSTRUCTIONS (continued)

FLOOR FITTINGS

After the cargo is properly positioned within the allowable parameters and the aircraft balance is obtained, use the floor fittings and tiedown devices to properly restrain each piece of cargo to prevent undesired movement during flight.

The METRO III is equipped with Davis cargo tiedown rings each of which has an allowable load limit of 3,000 pounds vertical or 2,500 pounds around any element of a 45 degree cone with the apex at the ring attachment fitting. Each tiedown ring forward of F.S. 520 will restrain a maximum weight of 171 pounds subjected to a 9g horizontal acceleration. The tiedown rings at and aft of F.S. 520 are limited by floor strength to restraining a weight of 104 pounds each.

The Davis FDC-1885M26 fitting has non-countersunk attach screw holes, a seat post fitting, a round-shaped tiedown ring, and is installed with structural pan head screws.

The Davis FDC-1885M27 fitting has non-countersunk attach screw holes, no seat post fitting, a round-shaped tiedown ring, and is used for cargo tiedown only.

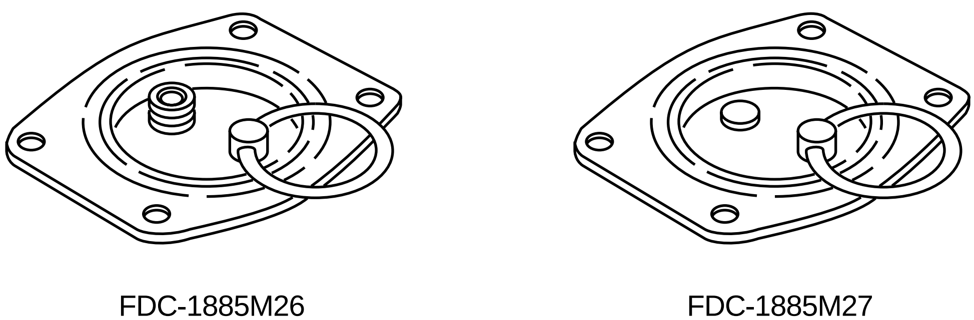


FIGURE 5-14

On airplanes with seat tracks in the passenger compartment, cargo is secured by tiedown rings inserted in the seat tracks. ANCRA P/N 40340-10 single stud fittings are supplied, as loose equipment, for this purpose. These fittings should be spaced at least 30 inches apart. When placed at the minimum spacing of 30 inches, the one-g allowable loads for these fittings are 1,200 pounds up, 1,200 pounds forward, and 400 pounds inboard.

LOADING INSTRUCTIONS (continued)

FUSELAGE BENDING MOMENTS

Fuselage bending limits are not exceeded during normal passenger operations. However, fuselage bending moments should be checked for unusual cargo loadings to protect against exceeding the following guide lines. Crew, passengers, baggage, cargo, and CAWI fluid must be considered. Airplanes with in-creased zero fuel weight also have increased bending moment allowable. Fuselage bending moments may be checked utilizing Figures 5-16 and 5-17 as shown in the example in Figure 5-19.

NOTE

Any optional installations, such as avionics, toilets, bars, closets, movable bulkhead, etc., must be accounted for in the calculation of fuselage bending moments.

MAXIMUM BENDING MOMENTS

MAX. ZERO FUEL WT.	PAYLOAD LOCATION	REFERENCE F.S. (INCHES)	MAX. WT (POUNDS)	MAX. MOMENT (IN.-LB./1,000)
13,130 LB. (STANDARD)	FWD. OF FRONT SPAR	274	2,465	351.4
	AFT OF REAR SPAR	310	2,470	232.2
13,900 LB. (OPTIONAL)	FWD. OF FRONT SPAR	274	2,825	359.8
	AFT OF REAR SPAR	310	3,138	352.6

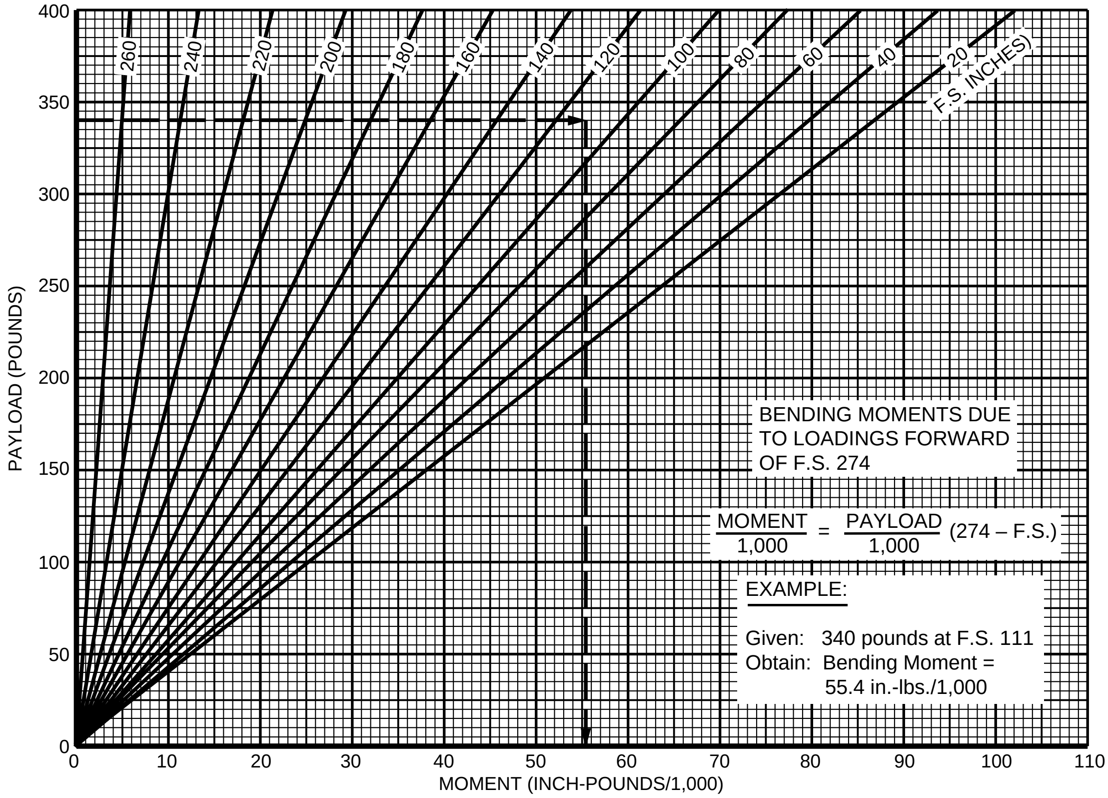
The equations for computing the bending moments are:

$$\text{FWD MOMENT} = \frac{\text{LOAD X (274 – F.S.)}}{1000}$$

$$\text{AFT MOMENT} = \frac{\text{LOAD X (F.S. – 310.)}}{1000}$$

FIGURE 5-15

FUSELAGE BENDING MOMENT CHARTS



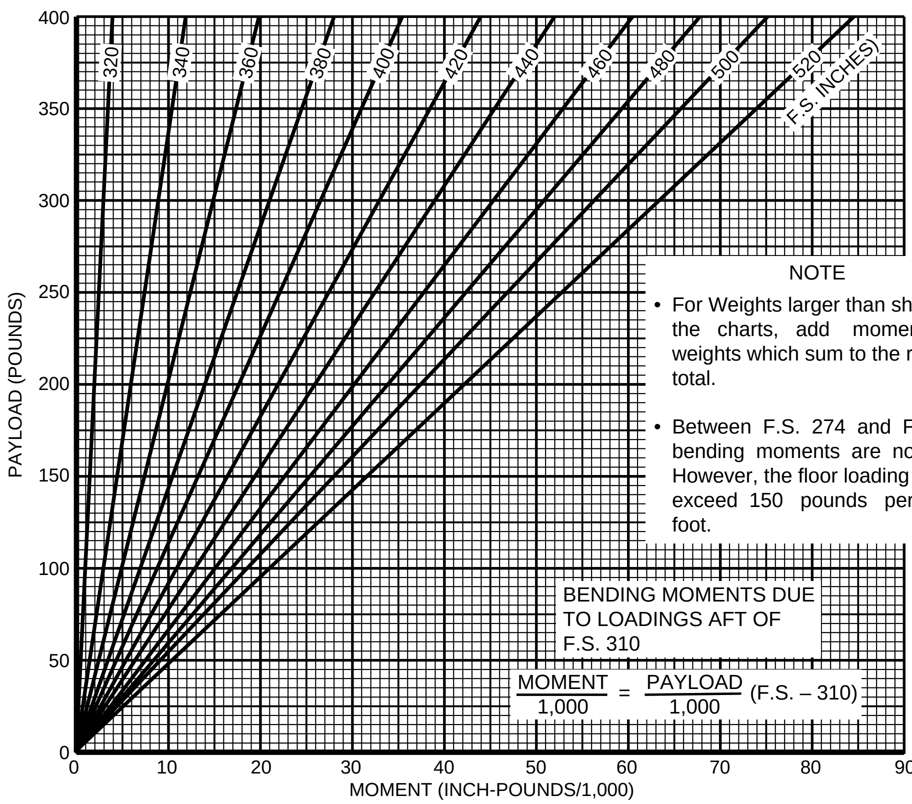


FIGURE 5-16

FUSELAGE BENDING MOMENTS WORK SHEET

BENDING MOMENTS FOR LOADINGS FORWARD OF F.S. 274

F.S.	ITEM	WEIGHT (POUNDS)	BENDING MOMENT * (IN.-LB./1,000)
	TOTAL		
	MAXIMUN ALLOWABLE (FROM FIGURE 5-15)		

BENDING MOMENTS FOR LOADINGS FORWARD OF F.S. 274

F.S.	ITEM	WEIGHT (POUNDS)	BENDING MOMENT * (IN.-LB./1,000)
	TOTAL		
	MAXIMUN ALLOWABLE (FROM FIGURE 5-15)		

• FROM FIGURE 5-16

FIGURE 5-17

WEIGHT AND BALANCE CALCULATION

1. Select proper weight and balance form and payload moment table. Distribute payload in appropriate compartments and compute the weight and moment for each station utilized.

NOTE

Ensure that the appropriate payload moment table and weight and balance calculation form are selected for the existing cabin configuration; otherwise, refer to Figure 5-30 for the correct moment arm.

2. Add basic empty weight and moment to the total payload weight and moment to obtain zero fuel weight and moment. The result must fall within the weight and moment envelope, Figure 5-36.

3. Compute the maximum allowable takeoff fuel load by subtracting the zero fuel weight from the maximum takeoff weight of 14,500 pounds.

4. Determine moment of the actual fuel load from the fuel moment table, Figure 5-34.

5. Compute the takeoff weight and moment by adding the actual fuel weight and moment to the zero fuel weight and moment. The results must not exceed 14,500 pounds and must fall within the weight and moment envelope, Figure 5-36.

NOTE

- Up to 100 pounds additional fuel may be added, as appropriate, for fuel consumption prior to takeoff.

- Landing gear retraction will not shift the center of gravity beyond limits.

6. Ensure that consumption of all CAWI fluid will not cause the center of gravity to travel beyond the aft limit.

7. Check to ensure that fuselage bending moment limits are not exceeded.

EXAMPLE OF LOADING CALCULATION

Given:

Standard 19 place cabin with high-back, bucket seats
Basic Empty Weight .... 8,880 pounds*
Empty Aircraft Moment 2,295.0 inch-pounds/1,000*
Crew Members .... 2 @ 170 pounds each
Passengers .... 12 @ 170 pounds each
Baggage .... 325 pounds
Cargo .... 750 pounds
Fuel .... Maximum Allowable
CAWI Tank .... Full
* Includes structural bulkhead installed at F.S. 437 with 3 seats in row 10.

Complete the calculation of airplane weight and moment as shown on Figure 5-18 as follows:

1. Enter the known items on the form – crew weight, basic empty weight, and moments.

2. Additional cargo space is required; therefore, three seats are removed from row 10 and the structural bulkhead is moved from F.S. 437 to F.S. 407. The center seat removed from row 10 will be reinstalled in row 9. Refer to Figures 5-8 and 5-9 and adjust the airplane empty weight and moment for these changes. Enter these adjustments on lines (c), (d), and (e) on Figure 5-18. Enter adjustments for CAWI fluid on line (f).

3. Six suitcases at 24 pounds each (144 pounds) will be loaded in the forward baggage compartment. The remaining load of 931 pounds will be loaded aft. The capacity of the expanded aft baggage compartment is 1,380 pounds (850 plus 530).

4. The center of gravity of the aft baggage and cargo load falls at F.S. 460. This situation is not covered by the moment table, Figure 5-31, therefore, it is calculated.

$$\text{Cargo Moment} = \frac{460 \times 931}{1,000} = 428.3 \text{ inch-pounds/1,000}$$

5. The cargo/baggage items are entered on the weight and balance calculation form.

6. The form is completed using the payload moment table, Figure 5-33, and the fuel moment data, Figure 5-34.

7. Check the zero fuel and takeoff conditions using the weight and moment envelope, Figure 5-36. The C.G. is acceptable, as determined by checking weight and moment with all CAWI fluid consumed. However, when tankering CAWI fluid, this step may be omitted.

8. Using Figures 5-16 and 5-17, evaluate the fuselage bending moments, as illustrated in Figure 5-19.

WEIGHT AND BALANCE CALCULATION EXAMPLE
STANDARD 19 OR 20 PLACE CABIN WITH HIGH-BACK, BUCKET SEATS

		PAYLOAD (POUNDS)	MOMENT (IN.-LB./1,000)	
	F.S. 42: Forward Baggage	***144***	***6.0***	
	F.S. 111: Crew Seats	***340***	***37.7***	
High-Back, Bucket Seats	F.S. 148: Row 1 Seat or F.S. 144: Coat Closet			
High-Back, Bucket Seats	F.S. 178: Row 2 Seats	***340***	***60.5***	
High-Back, Bucket Seats	F.S. 207: Row 3 Seats	***340***	***70.4***	
High-Back, Bucket Seats	F.S. 236: Row 4 Seats	***170***	***40.1***	
High-Back, Bucket Seats	F.S. 266: Row 5 Seats	***340***	***90.4***	
High-Back, Bucket Seats	F.S. 297: Row 6 Seats	***170***	***50.5***	
High-Back, Bucket Seats	F.S. 328: Row 7 Seats	***170***	***55.8***	
High-Back, Bucket Seats	F.S. 359: Row 8 Seats	***170***	***61.0***	
High-Back, Bucket Seats	F.S. 389: Row 9 Seats	***340***	***132.3***	
High-Back, Bucket Seats	F.S. 419: Row 10 Seats			
	F.S. 460: CARGO AND BAGGAGE	***931***	***428.3***	
	F.S. 475: Baggage			
	TOTAL PAYLOAD AND MOMENT	***3,455***	***1,033.0***	(a)

BASIC EMPTY WEIGHT & MOMENT	***8,880***	***2,295.0***	(b) (FROM WT. & BAL. RECORD)
ADJUSTMENT FOR BULKHEAD	***0***	***–1.1***	(c) ***(MOVED FROM F.S. 437 TO F.S. 407)***
OTHER ADJUSTMENTS	***–26***	***–11.5***	(d) ***(3 SEATS REMOVED FROM ROW 10, CENTER SEAT MOVED TO ROW 9)***
ADJUSTED EMPTY WT & MOMENT	***8,854***	***2,282.4***	(e)

EMPTY WT & MOM, EXISTING CONFIGURATION	***8,854***	***2,282.4***	(e)
CAWI FLUID WT & MOMENT	***128***	***2.7***	(f)
ZERO FUEL WT & MOMENT (a) + (e) + (f)	***12,437***	***3,318.1***	(g)*

MAX. ALLOWABLE FUEL	***2,063***

ACTUAL FUEL WEIGHT & MOMENT	***2,063***	***590.2***	(h)
TAKEOFF WEIGHT & MOMENT (g) + (h)	***14,500***	***3,908.3***	(i)*
LESS CAWI FLUID CONSUMED	***–128***	***–2.7***	(f)
FLIGHT WT & MOM, W/CAWI FLUID CONSUMED (i) – (f)	***14,372***	***3,905.6***	*

* THIS WEIGHT AND MOMENT MUST BE WITHIN THE WEIGHT-MOMENT ENVELOPE (FIGURE 5–36).

FIGURE 5-18

FUSELAGE BENDING MOMENTS EXAMPLE (HIGH-BACK, BUCKET SEATS)

BENDING MOMENTS FOR LOADINGS FORWARD OF F.S. 274

F.S.	ITEM	WEIGHT (POUNDS)	BENDING MOMENT * (IN.-LB./1,000)
21	***CAWI FLUID***	***128***	***32.4***
42	***BAGGAGE***	***144***	***33.4***
58	***AVIONICS***	***150***	***32.4***
111	***CREW***	***340***	***55.5***
178	***ROW 2 SEATS***	***340***	***32.7***
207	***ROW 3 SEATS***	***340***	***22.8***
236	***ROW 4 SEAT***	***170***	***6.5***
266	***ROW 5 SEATS***	***340***	***2.8***
	TOTAL	***1,952***	***218.5***
	MAXIMUN ALLOWABLE (FROM FIGURE 5-15)	***2,465***	***351.4***

BENDING MOMENTS FOR LOADINGS FORWARD OF F.S. 274

F.S.	ITEM	WEIGHT (POUNDS)	BENDING MOMENT * (IN.-LB./1,000)
328	***ROW 7 SEAT***	***170***	***3.1***
359	***ROW 8 SEAT***	***170***	***8.4***
389	***ROW 9 SEATS***	***340***	***27.0***
395	***1 SEAT ADDED TO ROW 9***	***13***	***1.1***
407	***MOVABLE BULKHEAD***	***37***	***3.6***
425	***3 SEATS REMOVED FROM ROW 10***	***–39***	***–4.5***
437	***MOVABLE BULKHEAD REMOVED***		
	FROM STATION 437	***–37***	***–4.7***
460	***CARGO***	***931***	***140.0***
	TOTAL	***1,585***	***174.0***
	MAXIMUN ALLOWABLE (FROM FIGURE 5-15)	***2,470***	***232.2***

• FROM FIGURE 5-16

FIGURE 5-19

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STANDARD 19 OR 20 PLACE CABIN
WITH LOW-BACK, FOLDING SEATS

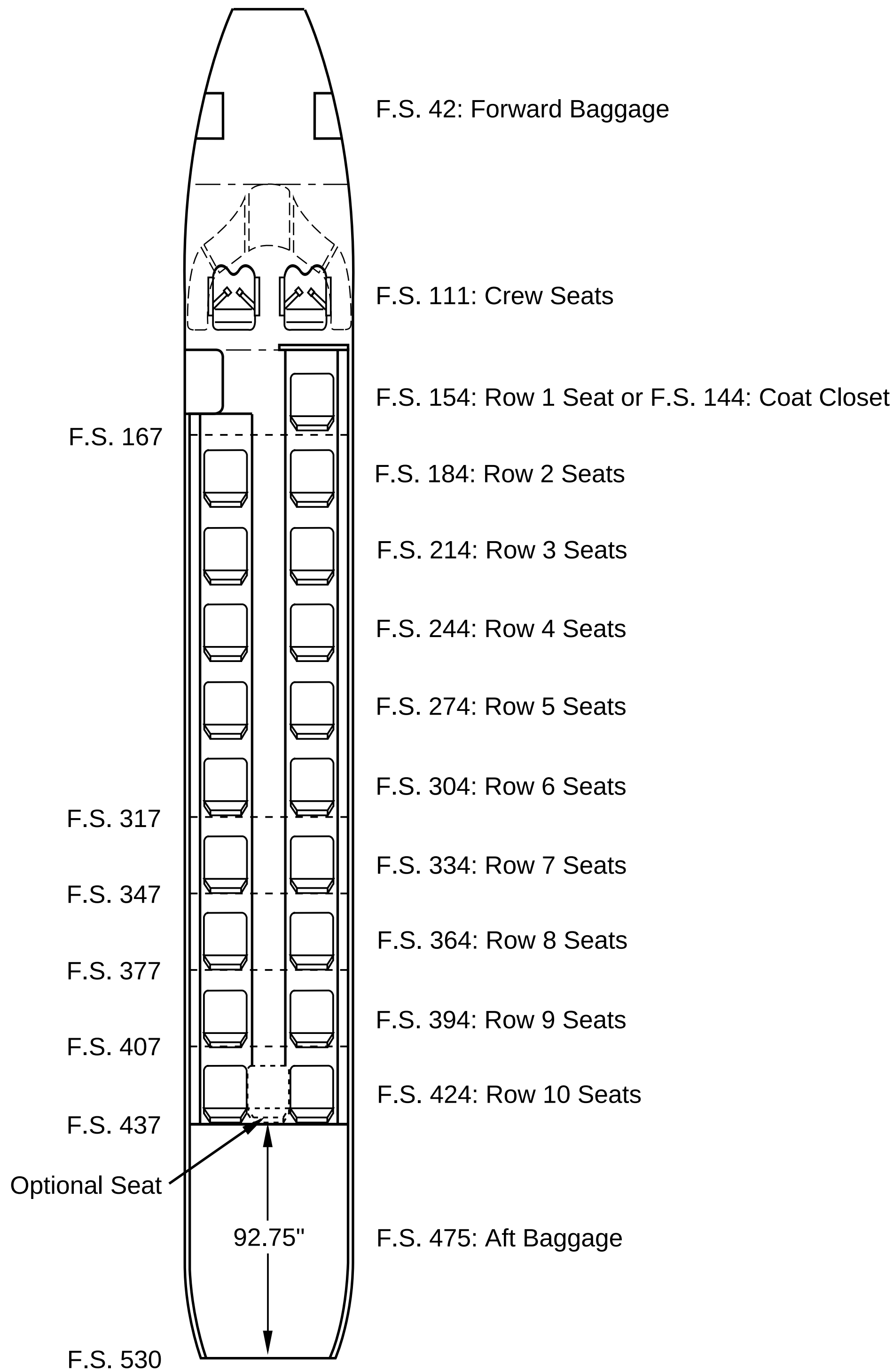


FIGURE 5-20

WEIGHT AND BALANCE CALCULATION FORM

STANDARD 19 OR 20 PLACE CABIN WITH LOW-BACK, FOLDING SEATS

		PAYLOAD (POUNDS)	MOMENT (IN.-LB./1,000)
F.S. 42: Forward Baggage			
F.S. 111: Crew Seats			
Low-Back, Folding Seats	F.S. 154: Row 1 Seat or F.S. 144: Coat Closet		
	F.S. 184: Row 2 Seats		
	F.S. 214: Row 3 Seats		
	F.S. 244: Row 4 Seats		
	F.S. 274: Row 5 Seats		
	F.S. 304: Row 6 Seats		
	F.S. 334: Row 7 Seats		
	F.S. 364: Row 8 Seats		
	F.S. 394: Row 9 Seats		
	F.S. 424: Row 10 Seats		
F.S. 475: Baggage			
	TOTAL PAYLOAD AND MOMENT			(a)

BASIC EMPTY WEIGHT & MOMENT			(b) (FROM WT. & BAL. RECORD)
ADJUSTMENT FOR BULKHEAD			(c)
OTHER ADJUSTMENTS			(d)
ADJUSTED EMPTY WT & MOMENT			(e)

EMPTY WT & MOM, EXISTING CONFIGURATION			(e)
CAWI FLUID WT & MOMENT			(f)
ZERO FUEL WT & MOMENT (a) + (e) + (f)			(g)*

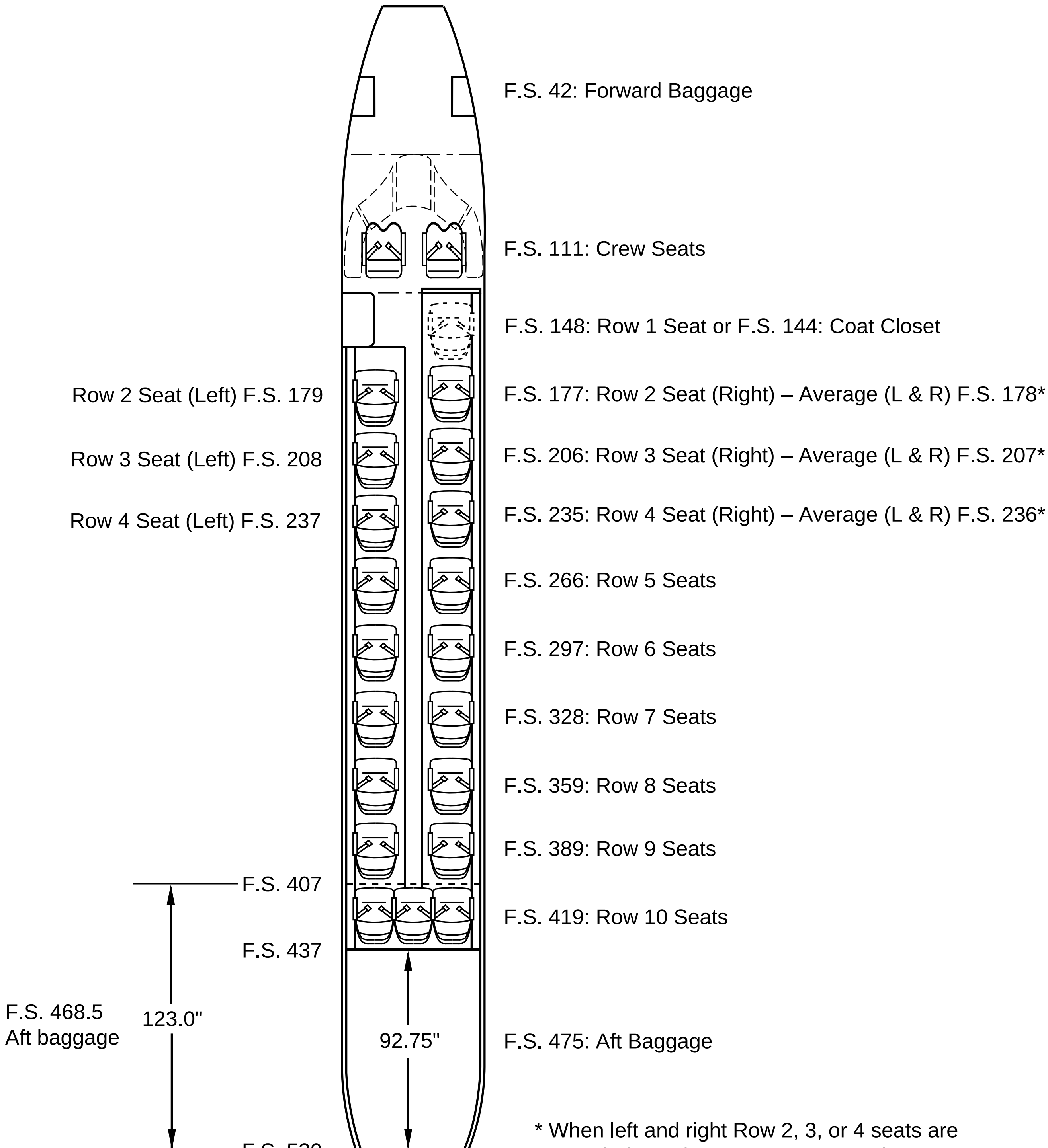
MAX. ALLOWABLE FUEL	

ACTUAL FUEL WEIGHT & MOMENT			(h)
TAKEOFF WEIGHT & MOMENT (g) + (h)			(i)*
LESS CAWI FLUID CONSUMED			(f)
FLIGHT WT & MOM, W/CAWI FLUID CONSUMED (i) – (f)			*

* THIS WEIGHT AND MOMENT MUST BE WITHIN THE WEIGHT-MOMENT ENVELOPE (FIGURE 5–36).

FIGURE 5-21

STANDARD 19 OR 20 PLACE CABIN
WITH HIGH-BACK, BUCKET SEATS



* When left and right Row 2, 3, or 4 seats are occupied use the average F.S. numbers above to compute weight and balance.

FIGURE 5-22

WEIGHT AND BALANCE CALCULATION FORM

STANDARD 19 OR 20 PLACE CABIN WITH HIGH-BACK, BUCKET SEATS

		PAYLOAD (POUNDS)	MOMENT (IN.-LB./1,000)	
F.S. 42: Forward Baggage				
F.S. 111: Crew Seats				
High-Back, Bucket Seats	F.S. 148: Row 1 Seat or F.S. 144: Coat Closet			
	F.S. 178: Row 2 Seats			
	F.S. 207: Row 3 Seats			
	F.S. 236: Row 4 Seats			
	F.S. 266: Row 5 Seats			
	F.S. 297: Row 6 Seats			
	F.S. 328: Row 7 Seats			
	F.S. 359: Row 8 Seats			
	F.S. 389: Row 9 Seats			
	F.S. 419: Row 10 Seats			
F.S. 475: Baggage				
	TOTAL PAYLOAD AND MOMENT			(a)

BASIC EMPTY WEIGHT & MOMENT			(b) (FROM WT. & BAL. RECORD)
ADJUSTMENT FOR BULKHEAD			(c)
OTHER ADJUSTMENTS			(d)
ADJUSTED EMPTY WT & MOMENT			

(e)

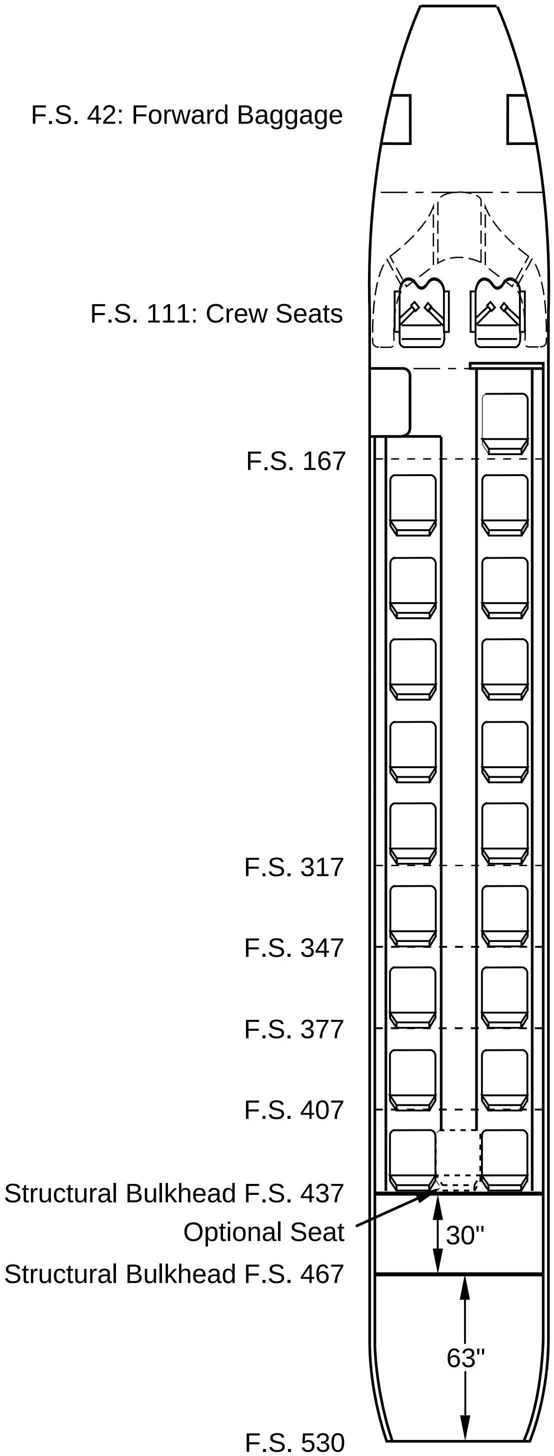
EMPTY WT & MOM, EXISTING CONFIGURATION			(e)
CAWI FLUID WT & MOMENT			(f)
ZERO FUEL WT & MOMENT (a) + (e) + (f)			(g)*

MAX. ALLOWABLE FUEL

ACTUAL FUEL WEIGHT & MOMENT (h)

FIGURE 5-23

OPTIONAL 19 OR 20 PLACE CABIN
WITH SECOND STRUCTURAL BULKHEAD IN THE AFT BAGGAGE COMPARTMENT
LOW-BACK, FOLDING OR HIGH-BACK, BUCKET SEATS



	Passenger Seats Folding**	Passenger Seats Bucket
Row 1 Seat	F.S. 154	F.S. 148
or Coat Closet	F.S. 144	F.S. 144
Row 2 Seats	F.S. 184	F.S. 178*
Row 3 Seats	F.S. 214	F.S. 207*
Row 4 Seats	F.S. 244	F.S. 236*
Row 5 Seats	F.S. 274	F.S. 266
Row 6 Seats	F.S. 304	F.S. 297
Row 7 Seats	F.S. 334	F.S. 328
Row 8 Seats	F.S. 364	F.S. 359
Row 9 Seats	F.S. 394	F.S. 389
Row 10 Seats	F.S. 424	F.S. 419

F.S. 452: Baggage – Zone A

F.S. 498: Baggage – Zone B

* Average of Left and Right Stations
** Folding Seats are shown.

FIGURE 5-24

WEIGHT AND BALANCE CALCULATION FORM
OPTIONAL 19 OR 20 PLACE CABIN
WITH SECOND STRUCTURAL BULKHEAD IN AFT BAGGAGE COMPARTMENT
LOW-BACK, FOLDING OR HIGH-BACK BUCKET SEATS

		PAYLOAD (POUNDS)	MOMENT (IN.-LB./1,000)	
	F.S. 42: Forward Baggage			
	F.S. 111: Crew Seats			
Seats	F.S. : Row 1 Seat or F.S. 144: Coat Closet			
Seats	F.S. : Row 2 Seats			
Seats	F.S. : Row 3 Seats			
Seats	F.S. : Row 4 Seats			
Seats	F.S. : Row 5 Seats			
Seats	F.S. : Row 6 Seats			
Seats	F.S. : Row 7 Seats			
Seats	F.S. : Row 8 Seats			
Seats	F.S. : Row 9 Seats			
Seats	F.S. : Row 10 Seats			
	F.S. 452: Baggage – Zone A			
	F.S. 498: Baggage – Zone B			
	TOTAL PAYLOAD AND MOMENT			(a)

BASIC EMPTY WEIGHT & MOMENT			(b) (FROM WT. & BAL. RECORD)
ADJUSTMENT FOR BULKHEAD			(c)
OTHER ADJUSTMENTS			(d)
ADJUSTED EMPTY WT & MOMENT			(e)

EMPTY WT & MOM, EXISTING CONFIGURATION			(e)
CAWI FLUID WT & MOMENT			(f)
ZERO FUEL WT & MOMENT (a) + (e) + (f)			(g)*

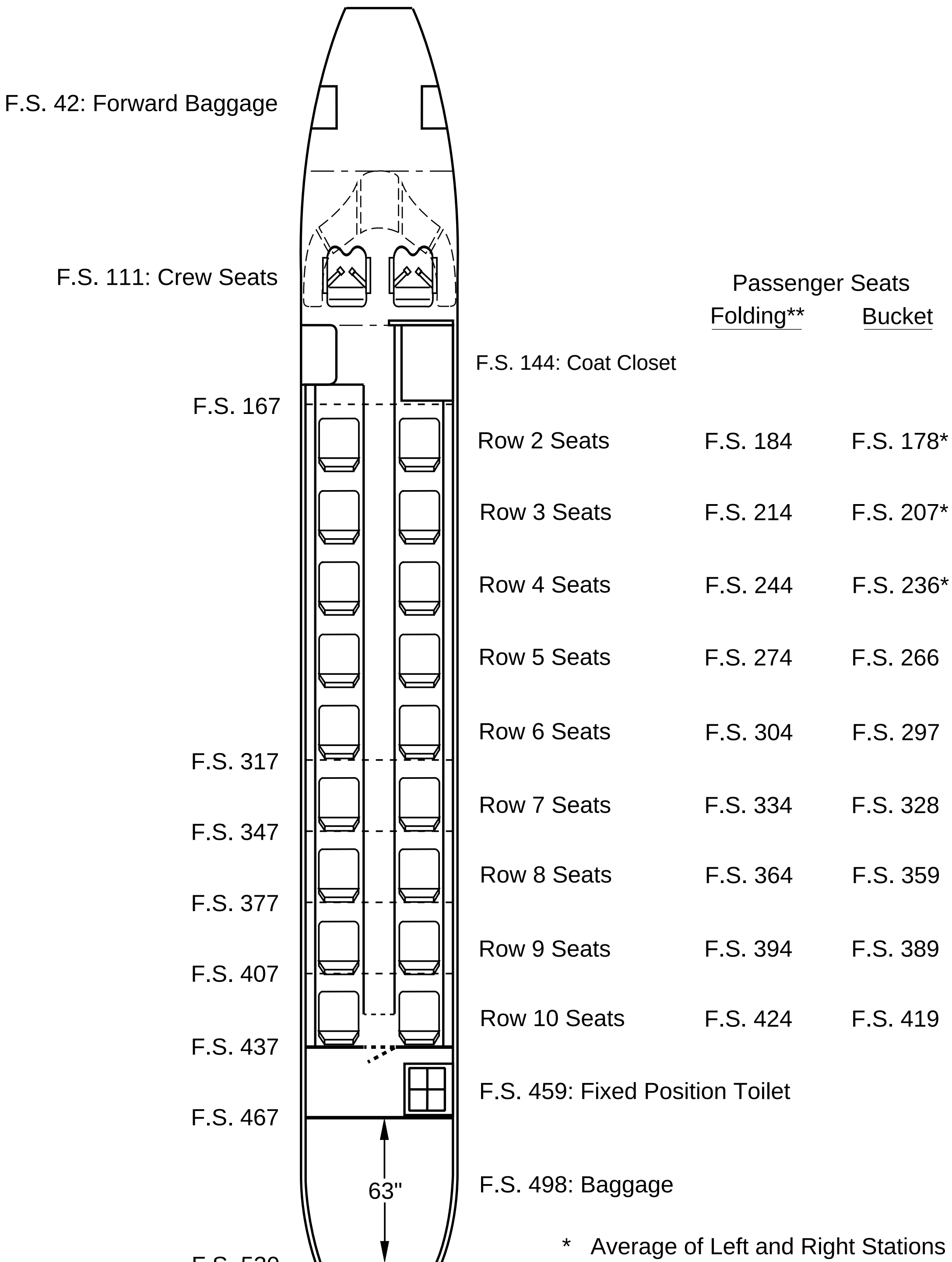
MAX. ALLOWABLE FUEL	

ACTUAL FUEL WEIGHT & MOMENT			(h)
TAKEOFF WEIGHT & MOMENT (g) + (h)			(i)*
LESS CAWI FLUID CONSUMED			(f)
FLIGHT WT & MOM, W/CAWI FLUID CONSUMED (i) – (f)			*

* THIS WEIGHT AND MOMENT MUST BE WITHIN THE WEIGHT-MOMENT ENVELOPE (FIGURE 5–36).

FIGURE 5-25

OPTIONAL 18 OR 19 PLACE CABIN
WITH LOW-BACK, FOLDING OR HIGH-BACK, BUCKET SEATS



* Average of Left and Right Stations
** Folding Seats are shown.

FIGURE 5-26

WEIGHT AND BALANCE CALCULATION FORM
OPTIONAL 18 OR 19 PLACE CABIN
WITH LOW-BACK, FOLDING OR HIGH-BACK, BUCKET SEATS

		PAYLOAD (POUNDS)	MOMENT (IN.-LB./1,000)	
F.S. 42: Forward Baggage				
F.S. 111: Crew Seats				
Seats	F.S. : Row 1 Seat or F.S. 144: Coat Closet			
	F.S. : Row 2 Seats			
	F.S. : Row 3 Seats			
	F.S. : Row 4 Seats			
	F.S. : Row 5 Seats			
	F.S. : Row 6 Seats			
	F.S. : Row 7 Seats			
	F.S. : Row 8 Seats			
	F.S. : Row 9 Seats			
	F.S. : Row 10 Seats			
F.S. 498: Baggage				
	TOTAL PAYLOAD AND MOMENT			(a)

BASIC EMPTY WEIGHT & MOMENT			(b) (FROM WT. & BAL. RECORD)
ADJUSTMENT FOR BULKHEAD			(c)
OTHER ADJUSTMENTS			(d)
ADJUSTED EMPTY WT & MOMENT			(e)

EMPTY WT & MOM, EXISTING CONFIGURATION			(e)
CAWI FLUID WT & MOMENT			(f)
ZERO FUEL WT & MOMENT (a) + (e) + (f)			(g)*

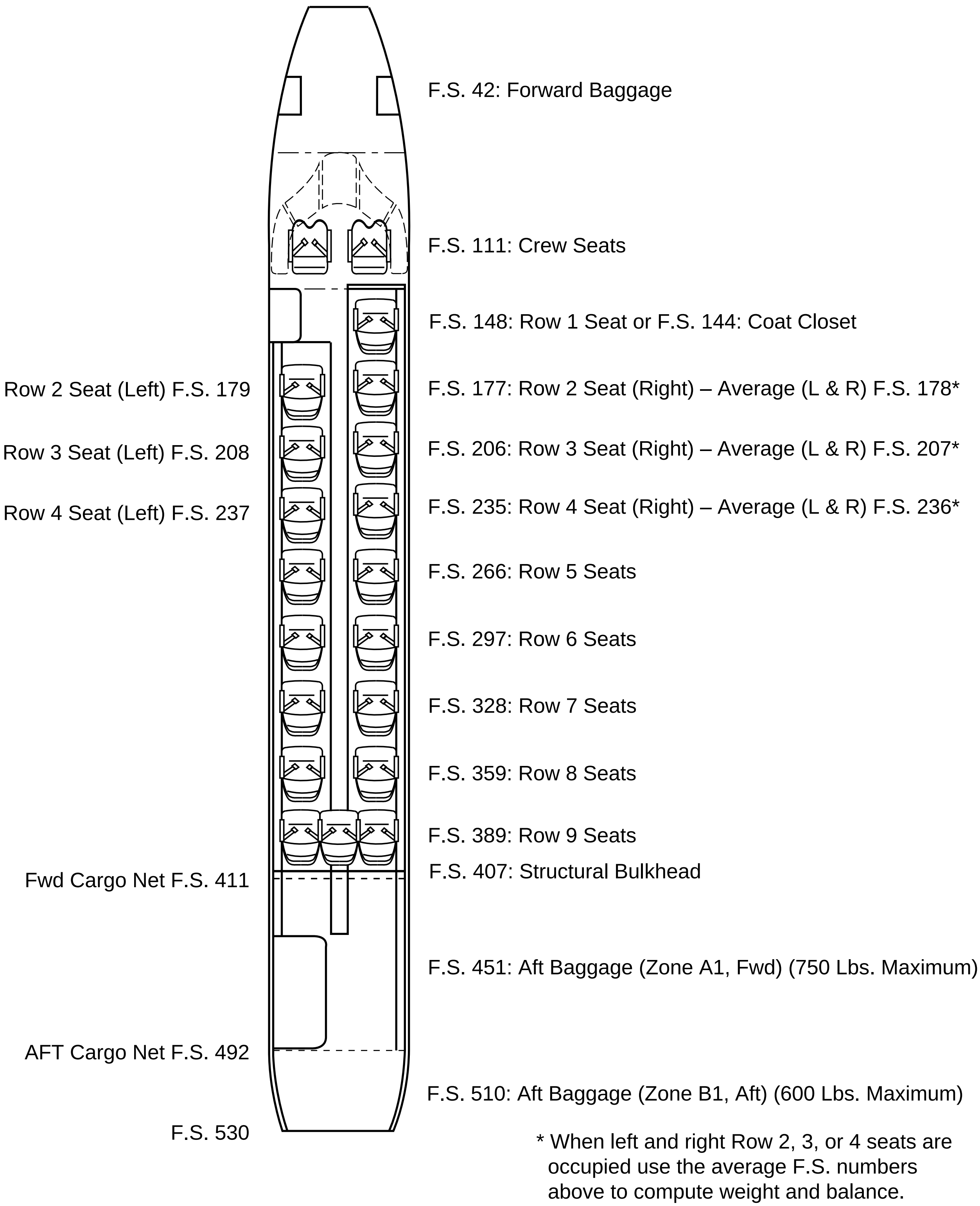
MAX. ALLOWABLE FUEL [ ]

ACTUAL FUEL WEIGHT & MOMENT			(h)
TAKEOFF WEIGHT & MOMENT (g) + (h)			(i)*
LESS CAWI FLUID CONSUMED			(f)
FLIGHT WT & MOM, W/CAWI FLUID CONSUMED (i) – (f)			*

* THIS WEIGHT AND MOMENT MUST BE WITHIN THE WEIGHT-MOMENT ENVELOPE (FIGURE 5–36).

FIGURE 5-27

OPTIONAL 17 OR 18 PLACE CABIN
WITH HIGH-BACK BUCKET SEATS AND 1,350 POUND CAPACITY AFT BAGGAGE COMPARTMENT



* When left and right Row 2, 3, or 4 seats are occupied use the average F.S. numbers above to compute weight and balance.

FIGURE 5-28

WEIGHT AND BALANCE CALCULATION FORM
OPTIONAL 17 OR 18 PLACE CABIN
WITH HIGH BACK, BUCKET SEATS AND 1,350 POUND
CAPACITY AFT BAGGAGE COMPARTMENT

		PAYLOAD (POUNDS)	MOMENT (IN.-LB./1,000)
	F.S. 42: Forward Baggage		
	F.S. 111: Crew Seats		
High-Back, Bucket Seats	F.S. 148: Row 1 Seat or F.S. 144: Coat Closet		
	F.S. 178: Row 2 Seats		
	F.S. 207: Row 3 Seats		
	F.S. 236: Row 4 Seats		
	F.S. 266: Row 5 Seats		
	F.S. 297: Row 6 Seats		
	F.S. 328: Row 7 Seats		
	F.S. 359: Row 8 Seats		
	F.S. 389: Row 9 Seats		
	F.S. 451: Baggage – Zone A1		
	F.S. 510: Baggage – Zone B1		
	TOTAL PAYLOAD AND MOMENT		(a)

BASIC EMPTY WEIGHT & MOMENT			(b) (FROM WT. & BAL. RECORD)
ADJUSTMENT FOR BULKHEAD			(c)
OTHER ADJUSTMENTS			(d)
ADJUSTED EMPTY WT & MOMENT			(e)

EMPTY WT & MOM, EXISTING CONFIGURATION			(e)
CAWI FLUID WT & MOMENT			(f)
ZERO FUEL WT & MOMENT (a) + (e) + (f)			(g)*

MAX. ALLOWABLE FUEL	

ACTUAL FUEL WEIGHT & MOMENT			(h)
TAKEOFF WEIGHT & MOMENT (g) + (h)			(i)*
LESS CAWI FLUID CONSUMED			(f)
FLIGHT WT & MOM, W/CAWI FLUID CONSUMED (i) – (f)			*

* THIS WEIGHT AND MOMENT MUST BE WITHIN THE WEIGHT-MOMENT ENVELOPE (FIGURE 5–36).

FIGURE 5-29

FUSELAGE STATION DIAGRAM
(Inches from Datum)

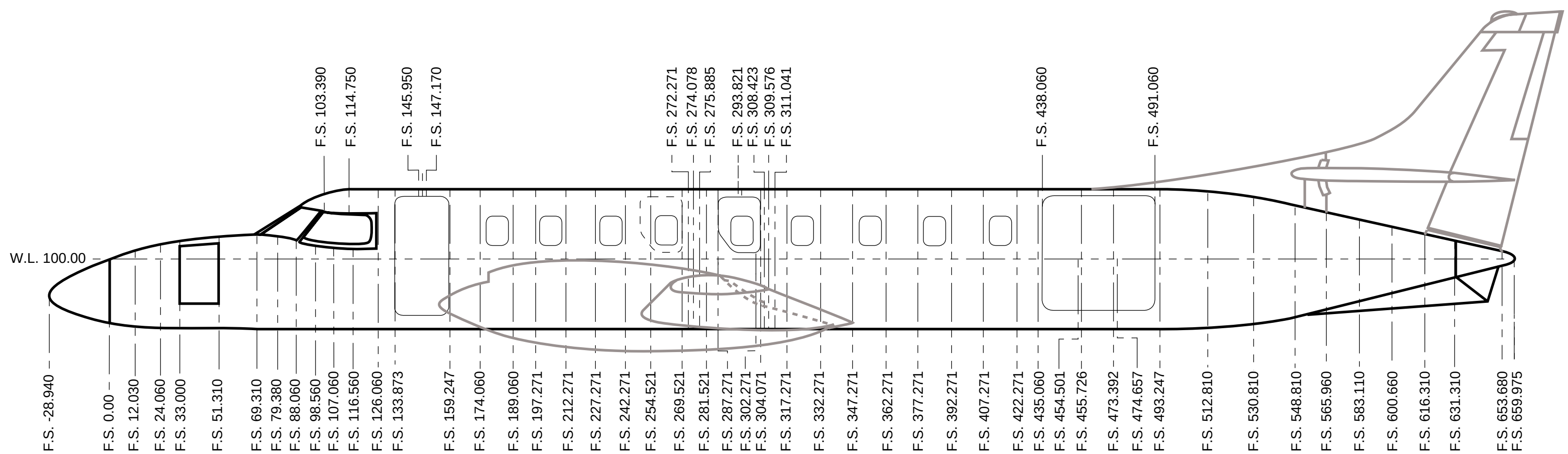


FIGURE 5-30
WEIGHT AND BALANCE

NOTE:
Nose Gear Station = 64.10"
Main Gear Station = 293.69"

PASSENGER WEIGHT TABLE

NO. OF PASSENGERS	PASSENGER WEIGHT (POUNDS)										
	150	155	160	165	170	175	180	185	190	195	200
1	150	155	160	165	170	175	180	185	190	195	200
2	300	310	320	330	340	350	360	370	380	390	400
3	450	465	480	495	510	525	540	555	570	585	600
4	600	620	640	660	680	700	720	740	760	780	800
5	750	775	800	825	850	875	900	925	950	975	1,000
6	900	930	960	990	1,020	1,060	1,080	1,110	1,140	1,170	1,200
7	1,050	1,085	1,120	1,155	1,190	1,225	1,260	1,295	1,330	1,365	1,400
8	1,200	1,240	1,280	1,320	1,360	1,400	1,440	1,480	1,520	1,560	1,600
9	1,350	1,395	1,440	1,485	1,530	1,575	1,620	1,665	1,710	1,755	1,800
10	1,500	1,550	1,600	1,650	1,700	1,750	1,800	1,850	1,900	1,950	2,000
11	1,650	1,705	1,760	1,815	1,870	1,925	1,980	2,035	2,090	2,145	2,200
12	1,800	1,860	1,920	1,980	2,040	2,100	2,160	2,220	2,280	2,340	2,400
13	1,950	2,015	2,080	2,145	2,210	2,275	2,340	2,405	2,470	2,535	2,600
14	2,100	2,170	2,240	2,310	2,380	2,350	2,520	2,590	2,660	2,730	2,800
15	2,250	2,325	2,400	2,475	2,550	2,625	2,700	2,775	2,850	2,925	3,000
16	2,400	2,480	2,560	2,640	2,720	2,800	2,880	2,960	3,040	3,120	3,200
17	2,550	2,635	2,720	2,805	2,890	2,975	3,060	3,145	3,230	3,315	3,400
18	2,700	2,790	2,880	2,970	3,060	3,150	3,240	3,330	3,420	3,510	3,600
19	2,850	2,945	3,040	3,135	3,230	3,375	3,420	3,515	3,610	3,705	3,800
20	3,000	3,100	3,200	3,300	3,400	3,500	3,600	3,700	3,800	3,900	4,000

FIGURE 5-31

PAYLOAD MOMENT TABLE
AFT BAGGAGE COMPARTMENT

Moments listed are inch-pounds/1,000 for weights located as shown.

Payload Weight (pounds)	20	40	60	80	100	150	200	300	400	500	600	700	800	850
F.S. 475 (Standard)	9.5	19.0	28.5	38.0	47.5	71.2	95.0	142.5	190.0	237.5	285.0	332.5	380.0	403.8
F.S. 452 (Zone A)	9.04	18.1	27.1	36.2	45.2	67.8	90.4	135.6	180.8	226.0	271.2	316.4	361.6	384.2
F.S. 498 (Zone B)	10.0	19.9	29.9	39.8	49.8	74.7	99.6	149.4	199.2	249.0	298.8	348.6	398.4	423.3
F.S. 451 (Zone A1)	9.0	18.0	27.1	36.1	45.1	67.6	90.2	135.3	180.4	225.5	270.6	315.7		
F.S. 510 (Zone B1)	10.2	20.4	30.6	40.8	51.0	76.5	102.0	153.0	204.0	255.0	306.0			

FIGURE 5-32

PAYLOAD MOMENT TABLES

Moments listed are inch-pounds/1,000 for weights located as shown.

STANDARD 19 OR 20 PLACE CABIN
WITH LOW-BACK, FOLDING SEATS

	PAYLOAD WEIGHT (POUNDS)	40	60	80	100	135	170*	200	270	300	340	400
	F.S. 42: Forward Baggage	1.7	2.5	3.4	4.2	5.7	7.1	8.4	11.8	12.6	14.3	16.8
	F.S. 111: Crew Seats	4.4	6.7	8.9	11.1	15.0	18.9	22.2	30.0	33.3	37.7	44.4
Low-Back, Folding Seats	F.S. 154: Row 1 Seats	6.2	9.2	12.3	15.4	20.8	26.2	30.8	41.6	46.2	52.4	61.6
	F.S. 184: Row 2 Seats	7.4	11.0	14.7	18.4	24.8	31.3	36.8	49.7	55.2	62.6	73.6
	F.S. 214: Row 3 Seats	8.6	12.8	17.1	21.4	28.9	36.4	42.8	57.8	64.2	72.8	85.6
	F.S. 244: Row 4 Seats	9.8	14.6	19.5	24.4	32.9	41.5	48.8	65.9	73.2	83.0	97.6
	F.S. 274: Row 5 Seats	11.0	16.4	21.9	27.4	37.0	46.6	54.8	74.0	82.2	93.2	109.6
	F.S. 304: Row 6 Seats	12.2	18.2	24.3	30.4	41.0	51.7	60.8	82.1	91.2	103.4	121.6
	F.S. 334: Row 7 Seats	13.4	20.0	26.7	33.4	45.1	56.8	66.8	90.2	100.2	113.6	133.6
	F.S. 364: Row 8 Seats	14.6	21.8	29.1	36.4	49.1	61.9	72.8	98.3	109.2	123.8	145.6
	F.S. 394: Row 9 Seats	15.8	23.6	31.5	39.4	53.2	67.0	78.8	106.4	118.2	134.0	157.6
	F.S. 424: Row 10 Seats	17.0	25.4	33.9	42.4	57.2	72.1	84.4	114.5	127.2	144.2	169.6
	Aft Baggage	(SEE TABLE, FIGURE 5-32)										

STANDARD 19 OR 20 PLACE CABIN
WITH HIGH-BACK, BUCKET SEATS

	PAYLOAD WEIGHT (POUNDS)	40	60	80	100	135	170*	200	270	300	340	400
	F.S. 42: Forward Baggage	1.7	2.5	3.4	4.2	5.7	7.1	8.4	11.8	12.6	14.3	16.8
	F.S. 111: Crew Seats	4.4	6.7	8.9	11.1	15.0	18.9	22.2	30.0	33.3	37.7	44.4
	F.S. 144: Coat Closet	5.8										
High-Back, Bucket Seats	F.S. 148: Row 1 Seats	5.9	8.9	11.8	14.8	20.0	25.2	29.6	40.0	44.4	50.3	59.2
	F.S. 178: Row 2 Seats	7.1	10.7	14.2	17.8	24.0	30.3	35.6	48.1	53.4	60.5	71.2
	F.S. 207: Row 3 Seats	8.3	12.4	16.6	20.7	28.0	35.2	41.4	55.9	62.1	70.4	82.8
	F.S. 236: Row 4 Seats	9.4	14.2	18.9	23.6	31.9	40.1	47.2	63.7	70.8	80.2	94.4
	F.S. 266: Row 5 Seats	10.6	16.0	21.3	26.6	35.9	45.2	53.2	71.8	79.8	90.4	106.4
	F.S. 297: Row 6 Seats	11.9	17.8	23.8	29.7	40.1	50.5	59.4	80.2	89.1	101.0	118.8
	F.S. 328: Row 7 Seats	13.1	19.7	26.2	32.8	44.3	55.8	65.6	88.6	98.4	111.5	131.2
	F.S. 359: Row 8 Seats	14.4	21.5	28.7	35.9	48.5	61.0	71.8	96.9	107.7	122.1	143.6
	F.S. 389: Row 9 Seats	15.6	23.3	31.1	38.9	52.5	66.1	77.8	105.0	116.7	132.3	155.6
	F.S. 419: Row 10 Seats	16.8	25.1	33.5	41.9	56.6	71.2	83.8	113.1	125.7	142.5	167.6
	Aft Baggage	(SEE TABLE, FIGURE 5-32)										

* Nominal passenger weight.
For weights other than those listed, either interpolate or add moments for weights which sum to the required total.

FIGURE 5-33

FUEL MOMENT TABLE

USABLE FUEL		HORIZONTAL ARM* (INCHES)	FUEL MOMENT (IN.-LBS./1,000)
POUNDS	U.S. GALLONS @ 6.7 LBS./GAL.		
200	29.8	293.6	58.7
400	59.7	293.0	117.2
600	89.6	292.3	175.4
800	119.4	291.4	233.1
1,000	149.2	290.5	290.5
1,200	179.1	289.6	347.5
1,400	209.0	288.7	404.2
1,600	238.8	287.8	460.5
1,800	268.6	287.0	516.6
2,000	298.5	286.3	572.6
2,200	328.4	285.6	628.3
2,400	358.2	285.0	684.0
2,600	388.0	284.4	739.4
2,800	417.9	283.9	794.9
3,000	447.8	283.5	850.5
3,200	477.6	283.0	905.6
3,400	507.5	282.6	960.8
3,600	537.3	282.3	1,016.3
3,800	567.2	282.0	1,071.6
4,000	597.0	281.7	1,126.8
4,200	626.9	281.4	1,181.9
4,342**	648.0	281.3	1,221.4
4,400	648.0 @ 6.8	281.3	1,237.7
4,600	648.0 @ 7.1	281.3	1,294.0

* HORIZONTAL ARM IS A FUNCTION OF THE FUEL VOLUME.
** FULL FUEL @ 6.7 POUNDS PER U.S. GALLON.

FIGURE 5–34

CAWI FLUID MOMENT TABLE
(Weight = 8 Lb./U.S. Gal., Arm = 21.1 Inches)

CAWI FLUID (U.S. GALLONS)	WEIGHT (POUNDS)	MOMENT (IN.-LBS./1,000)
4	32	0.7
8	64	1.4
9	72	1.5
16	128	2.7

FIGURE 5–35

WEIGHT AND MOMENT ENVELOPE
(GEAR DOWN)

EXAMPLE:

GIVEN: WEIGHT = 9,800 POUNDS
MOMENT = 2,600 IN.-LBS./1,000
OBTAIN: C.G. = 265.3 INCHES AFT OF DATUM

NOTE
LANDING GEAR RETRACTION WILL NOT SHIFT C.G. BEYOND LIMITS

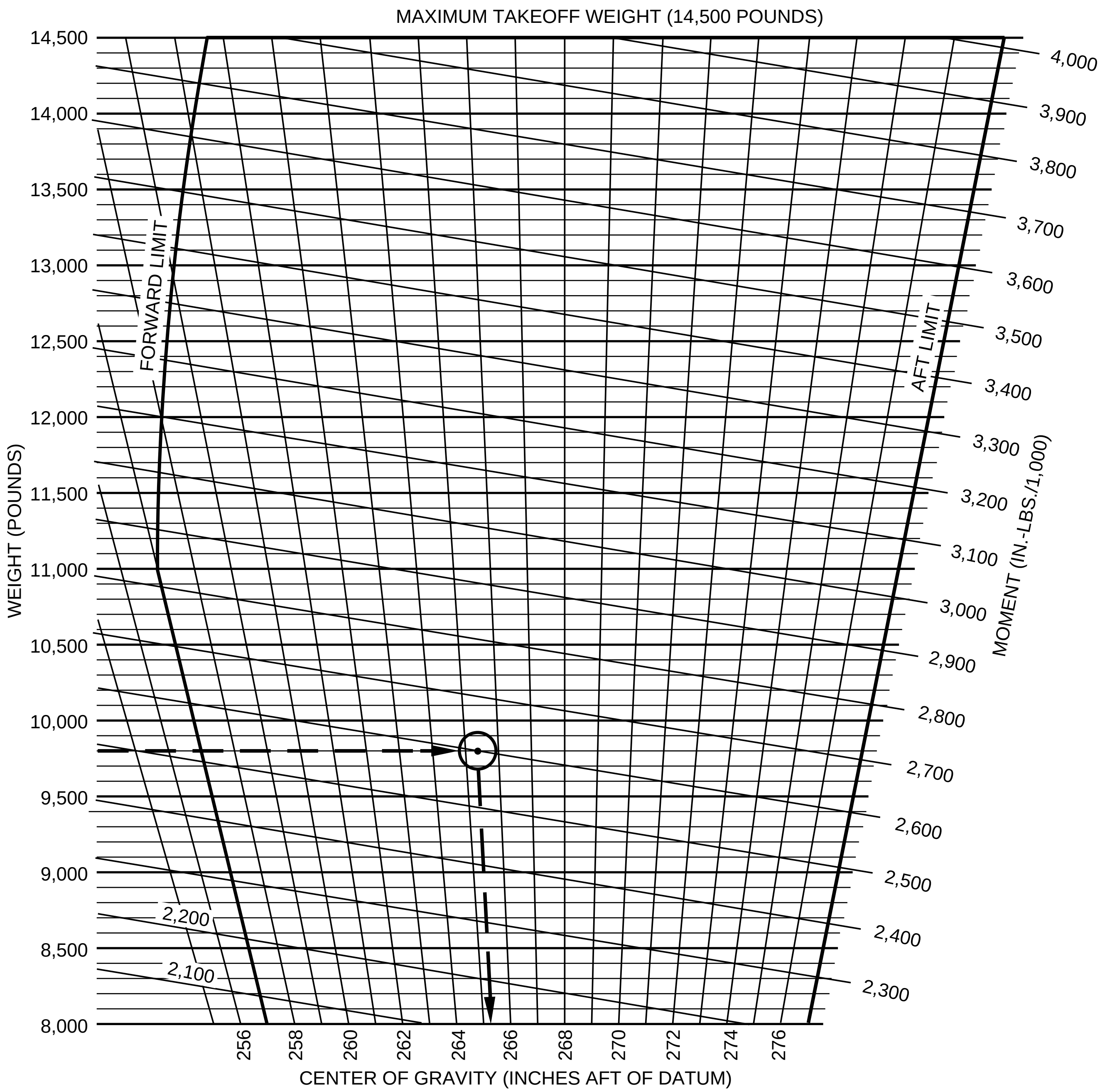


FIGURE 5-36

EQUIPMENT LIST
AIRPLANE S/N ________________

The weights shown in this list are to the nearest pound and the arms to the nearest inch.

Items with a total weight of less than one pound have been omitted from the list.

QTY. REQ.	ITEM	MARK IF INSTALLED (X)	TOTAL WEIGHT (POUNDS)	MOMENT ARM (INCHES)
	ENGINES AND ENGINE ACCESSORIES			
2	Engine, Garrett TPE331-11U-601G or -611G		844	197
4	Engine Mount (Side)		22	190
2	Engine Mount (Lower)		5	192
4	Engine Mount (Rear)		2	214
2	Oil Cooler		16	219
2	Fire Extinguisher Bottle (Charged)		16	228
2	Starter-Generator		62	197
2	Mounting Pad (Starter Gen)		2	190
2	Engine Driven Hydraulic Pump		13	193
2	CAWI Pumps		7	37
1	CAWI Tank Assembly		24	20
2	Torque Signal Conditioner, AiResearch		2	539
2	SRL Auto-Start Computer, AiResearch		6	538
2	Δ P/P Transducer		4	248
2	Torque and Temp Limiter, AiResearch		3	539

EQUIPMENT LIST
AIRPLANE S/N ________________

The weights shown in this list are to the nearest pound and the arms to the nearest inch.

Items with a total weight of less than one pound have been omitted from the list.

QTY. REQ.	ITEM	MARK IF INSTALLED (X)	TOTAL WEIGHT (POUNDS)	MOMENT ARM (INCHES)
	PROPELLERS & PROPELLER ACCESSORIES			
2	Propeller Installation, Dowty-Rotol		352	170
2	Spinner & Bulkhead Assembly, Dowty-Rotol		19	167
2	Propeller Unfeathering Pump		5	202
1	Propeller Synchrophaser		2	201
2	Prop Tach Generator		2	191

EQUIPMENT LIST
AIRPLANE S/N ________________

The weights shown in this list are to the nearest pound and the arms to the nearest inch.

Items with a total weight of less than one pound have been omitted from the list.

QTY. REQ.	ITEM	MARK IF INSTALLED (X)	TOTAL WEIGHT (POUNDS)	MOMENT ARM (INCHES)
	LANDING GEAR AND FLAP			
4	Main Wheel (18 x 5.5 Type VII Tubeless), B.F. Goodrich		38	294
4	Brake Assembly, B.F. Goodrich		66	294
4	Main Wheel (18 x 5.5 Type VII Tubeless), Goodyear Aerospace		38	294
4	Brake Assembly, Goodyear Aerospace or Aircraft Braking Systems (ABS) P/N 5007396 or P/N 5011640 or P/N 5011640-1		94	294
4	Tire–Main (19.5 x 6.75-8, Tubeless 10 P.R.), B.F. Goodrich		59	294
4	Tire–Main (19.5 x 6.75-8, Tubeless 10 P.R.), Goodyear Aerospace		66	294
4	Tire–Main (19.5 x 6.75-8, Tubeless 10 P.R.), Aviator		59	294
2	Nose Wheel (18 x 4.4 Tubeless), B.F. Goodrich		22	64
2	Tire–Nose (18 x 4.4 6 P.R. Tubeless), B.F. Goodrich		17	64
2	Tire–Nose (18 x 4.4 10 P.R. Chine Tubeless), B.F. Goodrich		28	64
2	Tire–Nose (18 x 4.4 10 P.R. Chine Tubeless), Goodyear Aerospace		24	64

EQUIPMENT LIST
AIRPLANE S/N ________________

The weights shown in this list are to the nearest pound and the arms to the nearest inch.

Items with a total weight of less than one pound have been omitted from the list.

QTY. REQ.	ITEM	MARK IF INSTALLED (X)	TOTAL WEIGHT (POUNDS)	MOMENT ARM (INCHES)
	LANDING GEAR AND FLAP (continued)			
4	Actuator, Main Landing Gear		16	281
2	Actuator, Nose Landing Gear		8	52
1	Hydraulic Steering Unit, Airight		9	62
1	Hand Pump, Hydraulic		2	105
1	Reservoir, Airight		17	228
2	Actuator, Wing Flap		5	310
4	Master Brake Cylinder		3	72
2	Flap Lock Valve Assembly		2	269
1	Sight Glass, Airight		1	230
2	Engine Driven Pump Shutoff Valve		2	228
1	Hydraulic Accumulator, Airight		3	228
2	Parking Brake Valve		1	72
1	Flap Controller, Calco		2	69

EQUIPMENT LIST
AIRPLANE S/N ________________

The weights shown in this list are to the nearest pound and the arms to the nearest inch.

Items with a total weight of less than one pound have been omitted from the list.

QTY. REQ.	ITEM	MARK IF INSTALLED (X)	TOTAL WEIGHT (POUNDS)	MOMENT ARM (INCHES)
	SURFACE DEICING AND MISCELLANEOUS SYSTEMS			
2	Wing Deice Boot (Left and Right), B.F. Goodrich		18	257
2	Wing Deice Boot (Tip), B.F. Goodrich		7	266
2	Wing Deice Boot (Inboard) (Left and Right), B.F. Goodrich		7	257
2	Horizontal Stabilizer Deice Boot, B.F. Goodrich		9	583
1	Surface Deice Timer, B.F. Goodrich		1	69
1	Distributor Valve, Bendix		2	255
1	Pressure Regulator Valve, Bendix		2	262
1	Vacuum Regulator Valve		1	257
1	Vacuum Warning Unit		1	262
2	Pitot Tube		2	4
1	Oxygen Cylinder Assembly, Steel, Fully Charged			
	49 cu. ft.		21	540
	115 cu. ft.		45	540

EQUIPMENT LIST
AIRPLANE S/N __________________

The weights shown in this list are to the nearest pound and the arms to the nearest inch.

Items with a total weight of less than one pound have been omitted from the list.

QTY. REQ.	ITEM	MARK IF INSTALLED (X)	TOTAL WEIGHT (POUNDS)	MOMENT ARM (INCHES)
	SURFACE DEICING AND MISCELLANEOUS SYSTEMS (continued)			
1	Oxygen Cylinder Assembly, Composite Fully Charged			
	50 cu. ft.		13	540
	115 cu. ft.		28	540
	115 & 64 cu. ft.		48	540
2	Refrigeration Unit, AiResearch		27	260
2	Water Separator, AiResearch,		4	262
2	Control Valve, Hot Air, Barber Coleman		1	260
1	Blower Recirculating Air, Janitrol		5	55
1	Outflow Valve		3	629
1	Safety Valve		2	73
1	Pressurization Controller		3	86
2	Solenoid Valve, AiResearch		2	248

EQUIPMENT LIST
AIRPLANE S/N ________________

The weights shown in this list are to the nearest pound and the arms to the nearest inch.

Items with a total weight of less than one pound have been omitted from the list.

QTY. REQ.	ITEM	MARK IF INSTALLED (X)	TOTAL WEIGHT (POUNDS)	MOMENT ARM (INCHES)
	INSTRUMENTS AND INDICATORS			
2	Ammeter		1	95
1	Magnetic Compass		1	93
1	SAS Indicator		1	80
2	Air Speed Indicator		1	87
2	Altimeter		3	87
2	Vertical Velocity		3	87
1	Turn & Slip, Pilot		2	87
1	Turn & Slip, Copilot		2	87
1	Gyro Horizon, Pilot		3	86
1	Gyro Horizon, Copilot		3	86
1	Directional Gyro, Pilot		4	86
1	Directional Gyro, Copilot		4	86
2	EGT		3	87
2	Percent Torque		2	87
2	Percent RPM		2	87
2	Fuel Flow		2	87
1	Fuel Quantity		2	87
1	Annunciator Panel Assembly		2	87

EQUIPMENT LIST
AIRPLANE S/N __________________

The weights shown in this list are to the nearest pound and the arms to the nearest inch.

Items with a total weight of less than one pound have been omitted from the list.

QTY. REQ.	ITEM	MARK IF INSTALLED (X)	TOTAL WEIGHT (POUNDS)	MOMENT ARM (INCHES)
	ELECTRICAL			
2	Battery		111	267
1	Fault Panel, Lear-Siegler		1	117
2	Voltage Regulator		6	117
2	Inverter		15	540
1	Inverter Control		3	540
1	Horizontal Stabilizer Actuator		13	565
2	Electrical Windshield		48	88
2	Windshield Wiper Motor Assembly		4	79
1	Windshield Defog Blower		2	79
4	Fuel Boost Pump		18	292
1	Magnetic Clutch Servo, Stick Pusher		6	247
1	Torque Motor Servo, Stick Pusher		3	250
1	SAS Computer Unit, Conrac		3	98
1	Airspeed Switch		1	63
1	SAS Transducer, Conrac		2	5
1	Flap Position Transmitter		1	320
1	Yaw Damper Amplifier, Bendix		2	551

EQUIPMENT LIST
AIRPLANE S/N ________________

The weights shown in this list are to the nearest pound and the arms to the nearest inch.

Items with a total weight of less than one pound have been omitted from the list.

QTY. REQ.	ITEM	MARK IF INSTALLED (X)	TOTAL WEIGHT (POUNDS)	MOMENT ARM (INCHES)
	ELECTRICAL (continued)			
1	Yaw Damper Servo		5	583
1	Rotating Beacon		3	656
2	Ice Light		5	247
2	Landing Lights		10	264
1	Nose Taxi Light		1	52

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TABLE OF CONTENTS
MANUFACTURER'S DATA

TABLE OF CONTENTS (continued)
MANUFACTURER'S DATA

TABLE OF CONTENTS (continued)
MANUFACTURER'S DATA

TABLE OF CONTENTS (continued)
MANUFACTURER'S DATA

TABLE OF CONTENTS (continued)
MANUFACTURER'S DATA

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LIST OF EFFECTIVE PAGES

REISSUE B

NOTE

Manufacturer's performance data apply to S/N AC-514 and subsequent or aircraft with Service Bulletin 11-001 incorporated.

SECTION 6

LIST OF EFFECTIVE PAGES (continued)

REISSUE B

NOTE

Manufacturer's performance data apply to S/N AC-514 and subsequent or aircraft with Service Bulletin 11-001 incorporated.

SECTION 6

DATE	PAGE
6-49	MAY 07/87
6-50	MAR 13/87
6-51	APR 02/86
6-52	APR 02/86
6-53	MAR 13/87
6-54	MAR 13/87
6-55	MAY 19/99
6-55A	MAY 19/99
6-55B	MAY 19/99
6-56	APR 02/86
6-57	SEP 05/86
6-58	MAR 13/87
6-59	APR 02/86
6-60	MAY 19/99
6-61	MAY 19/99
6-62	MAR 13/87
6-63	MAR 13/87
6-64	OCT 17/94
6-65	MAY 19/99
6-66	MAY 19/99
6-67	APR 02/86
6-68	APR 02/86
6-69	APR 02/86
6-70	NOV 06/03
6-71	APR 02/86
6-72	OCT 17/94
6-73	APR 02/86
6-74	OCT 17/94
6-75	MAY 19/99
6-76	MAY 19/99
6-77	MAR 13/87
6-78	FEB 01/88
6-79	FEB 01/88
6-80	OCT 17/94
6-81	MAY 19/99
6-82	MAR 13/87
6-83	MAR 13/87
6-84	APR 02/86
6-85	MAY 19/99
6-86	MAY 19/99
6-87	OCT 17/94
6-88	OCT 17/94
6-89	APR 02/86
6-90	APR 02/86
6-91	MAY 19/99
6-92	OCT 17/94
6-93	OCT 17/94
6-94	OCT 17/94
6-95	MAR 28/96
6-96	OCT 17/94
6-97	MAR 13/87
6-98	APR 02/86
6-99	MAR 13/87
6-100	MAY 19/99
6-101	MAY 07/87
6-102	OCT 17/94
6-103	MAR 13/87
6-104	MAR 03/89
6-105	MAY 19/99
6-106	MAR 13/87

LIST OF EFFECTIVE PAGES (continued)

REISSUE B

NOTE

Manufacturer's performance data apply to S/N AC-514 and subsequent or aircraft with Service Bulletin 11-001 incorporated.

SECTION 6

DATE	PAGE	DATE	PAGE
6-107	MAR 13/87	6-117	MAY 19/99
6-108	OCT 17/94	6-118	MAY 19/99
6-109	APR 02/86	6-119	MAY 19/99
6-110	MAY 19/99	6-120	MAY 19/99
6-111	MAY 19/99	6-121	MAY 19/99
6-112	OCT 17/94	6-122	MAY 19/99
6-113	FEB 01/88	6-123	MAY 19/99
6-114	MAY 19/99	6-124	OCT 17/94
6-115	MAY 19/99	6-125	OCT 17/94
6-116	OCT 17/94	6-126	FEB 01/88

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LIST OF REVISIONS

Revisions to the Airplane Flight Manual provide current information applicable to operation of the SA227-AC aircraft. Revised pages should be inserted into the manual to replace existing pages or to add additional pages, as applicable. The manual is valid only when current revisions are incorporated.

Revision Number	Revised Pages	Description of Revision	Date of Revision
B-1	6-v, 6-vii, 6-viii, 6-ix, 6-xi, 6-57, 6-60, 6-63, 6-78, 6-88, 6-95, 6-101, 6-102, 6-111, 6-121, 6-123, and 6-124	Corrected typographical errors.	SEP 5/86
B-2	6-iii, 6-iv, 6-v, 6-vii, 6-viii, 6-ix, 6-xi, 6-50, 6-53, 6-54, 6-55, 6-58, 6-60, 6-62, 6-63, 6-65, 6-75, 6-77, 6-78, 6-79, 6-82, 6-83, 6-87, 6-88, 6-91, 6-93, 6-97, 6-99, 6-103, 6-104, 6-106, 6-107, 6-113, 6-118, 6-119, 6-120	Corrected editorial errors, added or amplified system description, provided operating tip regarding engine flameouts.	MAR 13/87
B-3	6-vii, 6-viii, 6-xi, 6-49, 6-75, 6-101, 6-102	Revised Cooling System.	MAY 07/87
B-4	6-i, 6-v, 6-vii, 6-viii, 6-ix, 6-xi, 6-78, 6-79, 6-86, 6-94, 6-102, 6-112, 6-113, 6-126.	Editorial corrections. Corrected nose gear figure and propeller description. Added tip regarding low oil pressure annunciations.	FEB 01/88

A black bar in the margin of a revised page shows the current change.

LIST OF REVISIONS (continued)

Revision Number	Revised Pages	Description of Revision	Date of Revision
B-5	6-vii, 6-viii, 6-xii, 6-104	Acommodate S.B. 227-61-006 (prop synch switch removal).	MAR 03/89
B-6	6-i thru 6-v, 6-vii thru 6-ix, 6-xii, 6-13, 6-20 thru 6-22, 6-37, 6-48, 6-55, 6-64, 6-70, 6-72, 6-74, 6-75, 6-80, 6-81, 6-85 thru 6-88, 6-92, thru 6-94, 6-96, 6-102, 6-108, 6-110, 6-112, 6-114 thru 6-116, 6-119, 6-120, 6-122, 6-124 and 6-125	Corrected editorial errors, changed Cruise Speeds Charts, Fuel System drawings, Jet Transfer Pump System information, order of items in Ice and Rain Protection. Added drawing for main landing gear to reflect effectivity of gear up switches striker plate, added total oil system capacity, added Takeoff RPM to Pilot's Operating Tips, deleted overspeed governor check, corrected list of approved oils.	OCT 17/94
B-7	6-ii thru 6-v, 6-vii thru 6-ix, 6-xii, 6-39 thru 6-41D, 6-95 and 6-121	Changed Figure numbers for Range Profile charts, added Single Engine Fuel Flow and Cruise Speed Tables, changed Variable Authority NWS system for aircraft modified by S.B. 227 32-040, changed company name on page 6-121 and added four (4) pages 6-41A thru 6-41D.	MAR 28/96
B-8	6-iii, 6-v, 6-vii thru 6-ix, 6-xii, 6-55 thru 6-55B, 6-60, 6-61, 6-65, 6-66, 6-75, 6-76, 6-81, 6-85, 6-86, 6-91, 6-100, 6-105, 6-110, 6-111, 6-114, 6-115, 6-117 thru 6-123	Changed *DC Power Distribution* section, information on *Fuel System*, expanded *Wing Overheat Warning System* to include the *Wheelwell*, upgraded drawing for Figure 6-50, revised *Engine Flameouts During Adverse Weather*, corrected editorial errors and added two pages: 6-55A and 6-55B.	MAY 19/99
B-9	6-iii, 6-vii, 6-viii, 6xii and 6-70	Added alternate rudder gust lock.	NOV 06/03

A black bar in the margin of a revised page shows the current change.

INTRODUCTION

This section contains additional data that are supplied by the manufacturer for the user's convenience. These data include short field performance, mission planning material, and specialized performance data, such as drift-down charts and flaps up landing distances.

NOTE

> Depending on the jurisdiction, the use of the short field performance data may place the operator in violation of applicable regulations.

In addition, systems descriptions and pilot operating tips are included in the latter part of this section.

Conversion tables for commonly used measuring units are located at the end of the section.

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SHORT FIELD TAKEOFF PERFORMANCE

The METRO III Short Field Performance data (Figures 6-2 through 6-7) are based on the V_R and V_{50} speeds shown below. These speeds provide smaller safety margins than the FAA Approved schedule of Figure 4-15, and are not recommended for routine use. Be sure to use the speed schedule specified on each of the following performance charts. Use Figure 6-1 only where V_R is specified.

TAKEOFF SPEEDS V_R AND V_{50}

V_R – ROTATION SPEED (V_{MC} OR V_{S1}, WHICHEVER IS GREATER)
CONDITIONS:
GEAR DOWN
FLAPS 1/4

V_{50} – TAKEOFF SPEED AT 50 FOOT HEIGHT (1.2 V_{S1})
CONDITIONS:
GEAR UP
FLAPS 1/4

EXAMPLE:

GIVEN: TAKEOFF WEIGHT = 12,100 POUNDS
OBTAIN: V_R = 87.5 KIAS
V_{50} = 107.5 KIAS

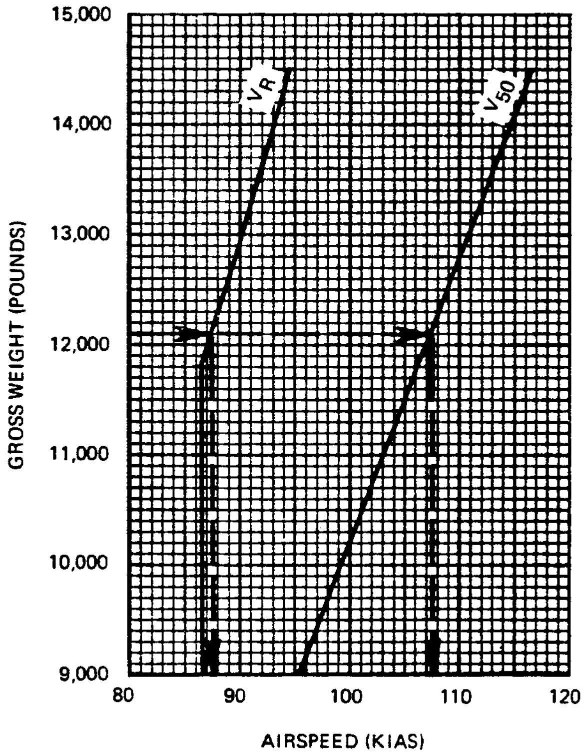

FIGURE 6-1

DISTANCE TO ACCELERATE TO V_R AND STOP - DRY BLEED AIR ON
B.F. GOODRICH SINGLE ROTOR BRAKES

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (DRY)
GEN LOAD................ 200 AMPS
BLEED AIR .... ON
ENG ANTI-ICE....... OFF (SEE NOTE)
RUNWAY ...... DRY, HARD SURFACE
FLAPS 1/4
DECISION SPEED ... V_R (FIGURE 6-1)
ANTI-SKID............... ON OR OFF
NOSE WHEEL STEERING... ON OR OFF

EXAMPLE:

GIVEN: OAT = -4°C
PRESSURE ALTITUDE = 4,000 FEET
GROSS WEIGHT = 13,600 POUNDS
HEADWIND = 10 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)

OBTAIN: ACCELERATE STOP DISTANCE = 3,320 FEET
INCREASE (ANTI-ICE ON) = 200 FEET
NET ACCELERATE STOP DISTANCE = 3,520 FEET

NOTE

- INCREASE ACCELERATE STOP DISTANCE BY 6 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

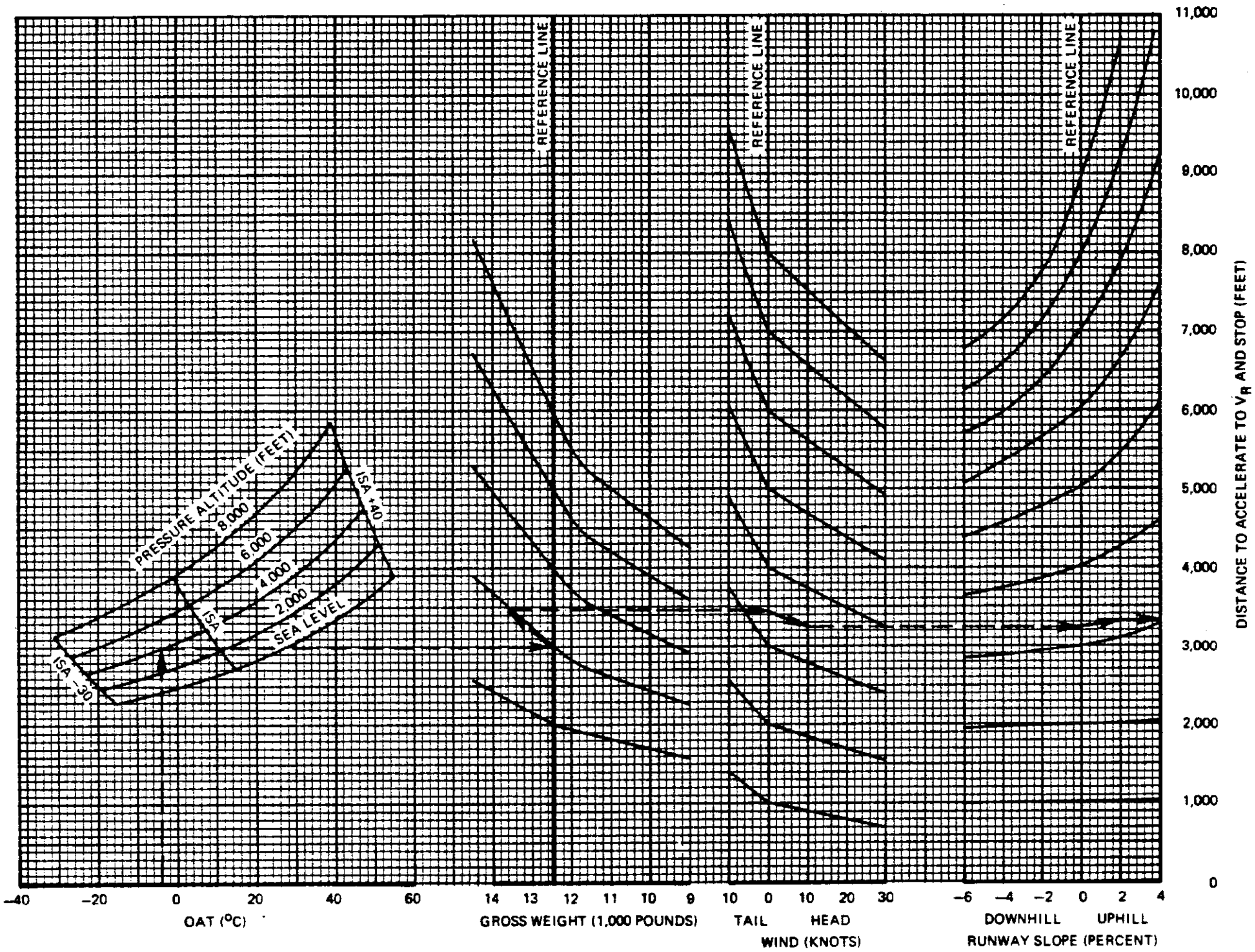

FIGURE 6-2

DISTANCE TO ACCELERATE TO V_R AND STOP - DRY BLEED AIR OFF
B.F. GOODRICH SINGLE ROTOR BRAKES

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (DRY)
GEN LOAD................ 200 AMPS
BLEED AIR..................... OFF
ENG ANTI-ICE....... OFF (SEE NOTE)
RUNWAY...... DRY, HARD SURFACE
FLAPS........................ 1/4
DECISION SPEED ... V_R (FIGURE 6-1)
ANTI-SKID.............. ON OR OFF
NOSE WHEEL STEERING... ON OR OFF

EXAMPLE:

GIVEN: OAT = -5°C
PRESSURE ALTITUDE = 2,000 FEET
GROSS WEIGHT = 14,000 POUNDS
TAILWIND = 3 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)

OBTAIN: ACCELERATE STOP DISTANCE = 3,710 FEET
INCREASE (ANTI-ICE ON) = 155 FEET
NET ACCELERATE STOP DISTANCE = 3,865 FEET

NOTE

- INCREASE ACCELERATE STOP DISTANCE BY 4.2 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

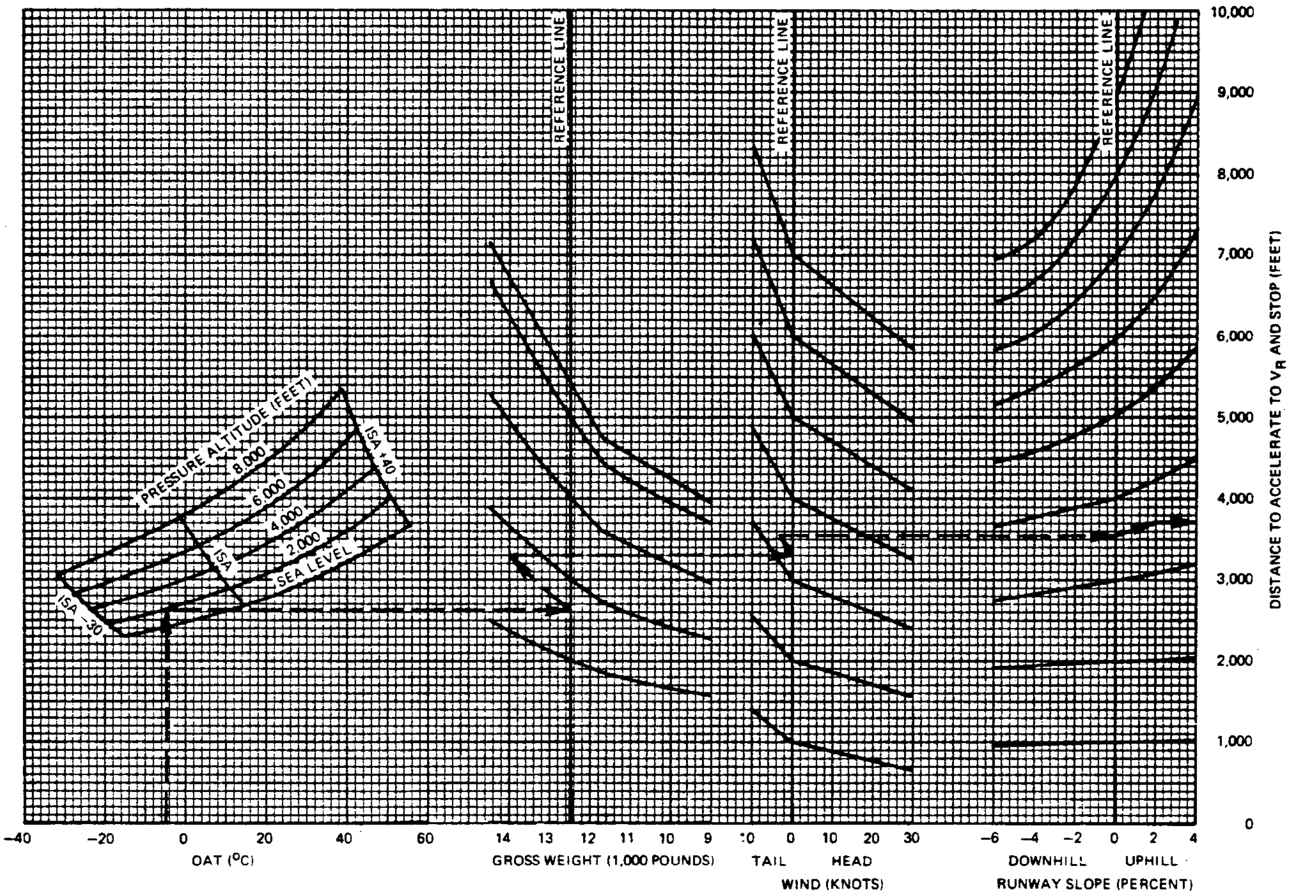

FIGURE 6-3

DISTANCE TO ACCELERATE TO V_R AND STOP - WET
B.F. GOODRICH SINGLE ROTOR BRAKES

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (WET)
GEN LOAD................. 200 AMPS
BLEED AIR .... OFF
ENG ANTI-ICE.................. OFF
RUNWAY...... DRY, HARD SURFACE
FLAPS 1/4
DECISION SPEED ... V_R (FIGURE 6–1)
ANTI-SKID............... ON OR OFF
NOSE WHEEL STEERING... ON OR OFF

EXAMPLE:

GIVEN: OAT = 15°C
PRESSURE ALTITUDE = 4,000 FEET
GROSS WEIGHT = 11,000 POUNDS
HEADWIND = 13 KNOTS
RUNWAY SLOPE = 0 PERCENT (LEVEL)
OBTAIN: ACCELERATE STOP DISTANCE = 2,500 FEET

NOTE

MINIMUM OAT FOR WET POWER OPERATION IS 5°C.

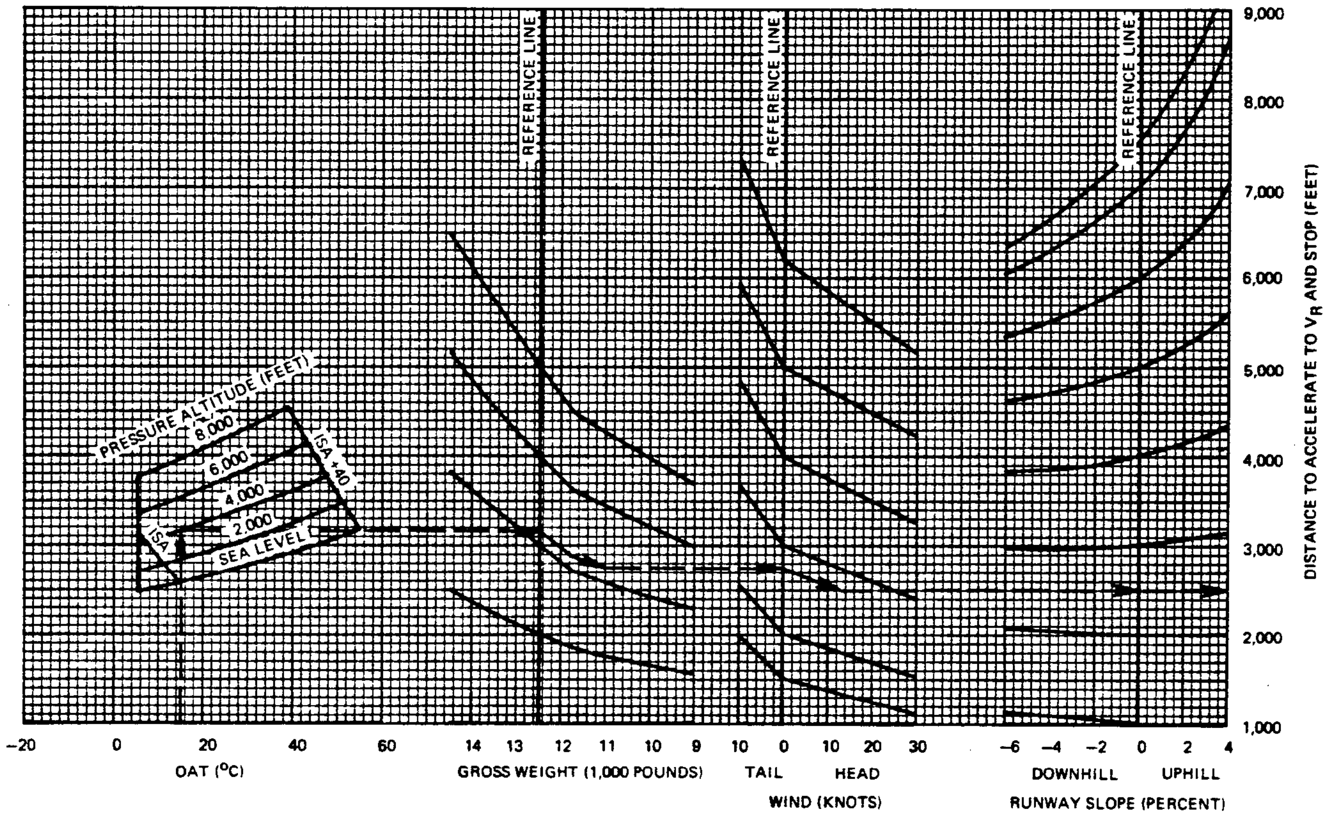

FIGURE 6-4

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TWO ENGINE TAKEOFF DISTANCE TO 50 FOOT HEIGHT (V_R ROTATION SPEED) - DRY, BLEED AIR ON

ASSOCIATED CONDITIONS:

POWER.............TAKEOFF (DRY)
GEN LOAD................200 AMPS
BLEED AIR......................ON
ENG ANTI-ICE.......OFF (SEE NOTE)
RUNWAY......DRY, HARD SURFACE
V_R SPEED..............FIGURE 6-1
V_{50} SPEED.............FIGURE 6-1
FLAPS..........................1/4
NOSE WHEEL STEERING...ON OR OFF

EXAMPLE:

GIVEN: OAT = −10°C
PRESSURE ALTITUDE = 6,000 FEET
GROSS WEIGHT = 11,000 POUNDS
TAILWIND = 5 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)

OBTAIN: TAKEOFF DISTANCE TO 50 FOOT HEIGHT = 2,750 FEET
INCREASE (ANTI-ICE ON) = 455 FEET
TOTAL TAKEOFF DISTANCE = 3,205 FEET

NOTE

- INCREASE TAKEOFF DISTANCE BY 16.5 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

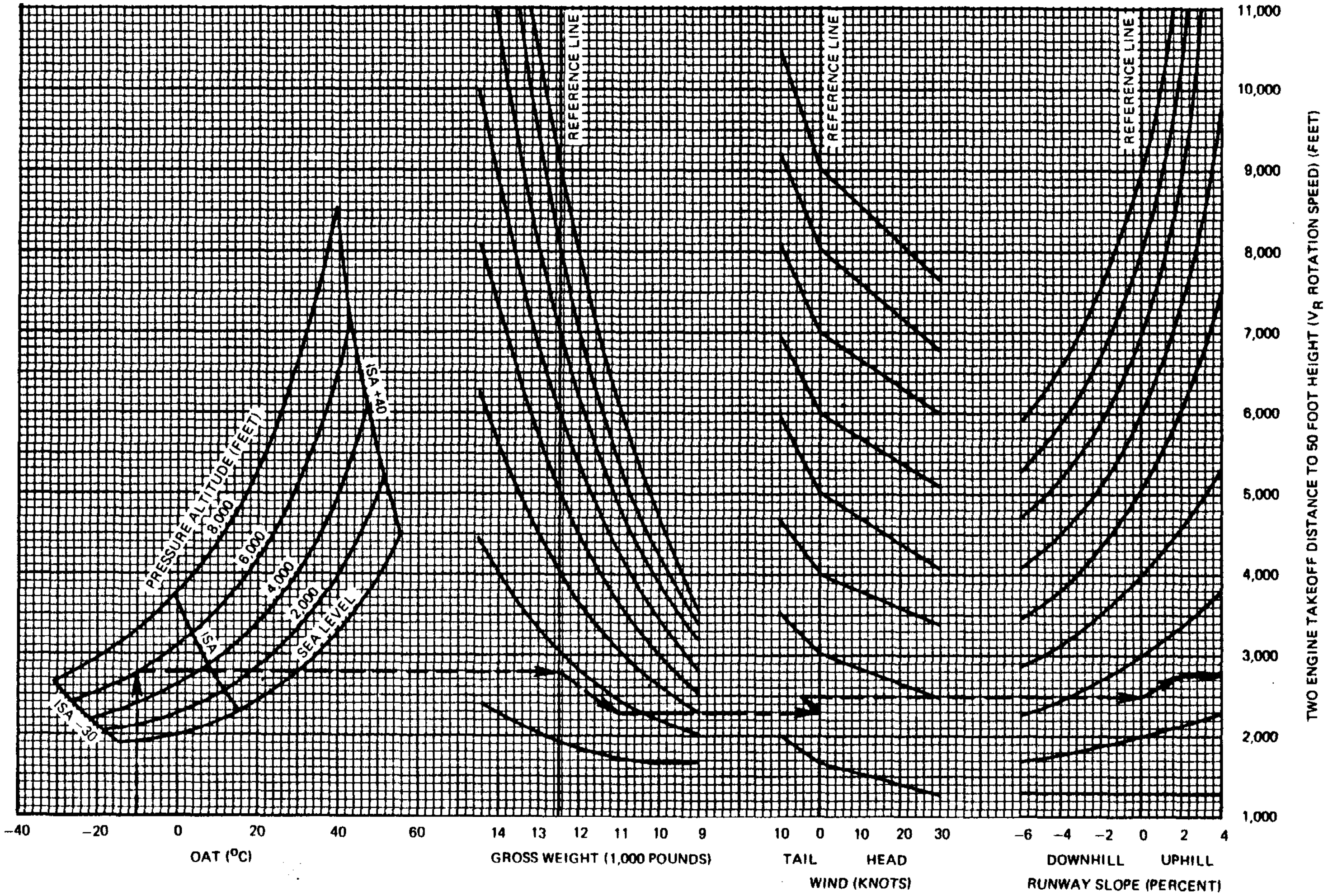


FIGURE 6-5

TWO ENGINE TAKEOFF DISTANCE TO 50 FOOT HEIGHT (V_R ROTATION SPEED) - DRY, BLEED AIR OFF

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (DRY)
GEN LOAD................ 200 AMPS
BLEED AIR.................... OFF
ENG ANTI-ICE....... OFF (SEE NOTE)
RUNWAY...... DRY, HARD SURFACE
V_R SPEED.............. FIGURE 6-1
V_{50} SPEED............. FIGURE 6-1
FLAPS......................... 1/4
NOSE WHEEL STEERING... ON OR OFF

EXAMPLE:

GIVEN: OAT = -8°C
PRESSURE ALTITUDE = 6,000 FEET
GROSS WEIGHT = 11,000 POUNDS
TAILWIND = 5 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)

OBTAIN: TAKEOFF DISTANCE TO 50 FOOT HEIGHT = 2,700 FEET
INCREASE (ANTI-ICE ON) = 340 FEET
TOTAL TAKEOFF DISTANCE = 3,040 FEET

NOTE

- INCREASE TAKEOFF DISTANCE BY 12.6 PERCENT WITH ENGINE ANTI-ICE ON.
- MAXIMUM OAT FOR ENGINE ANTI-ICE ON IS 5°C.

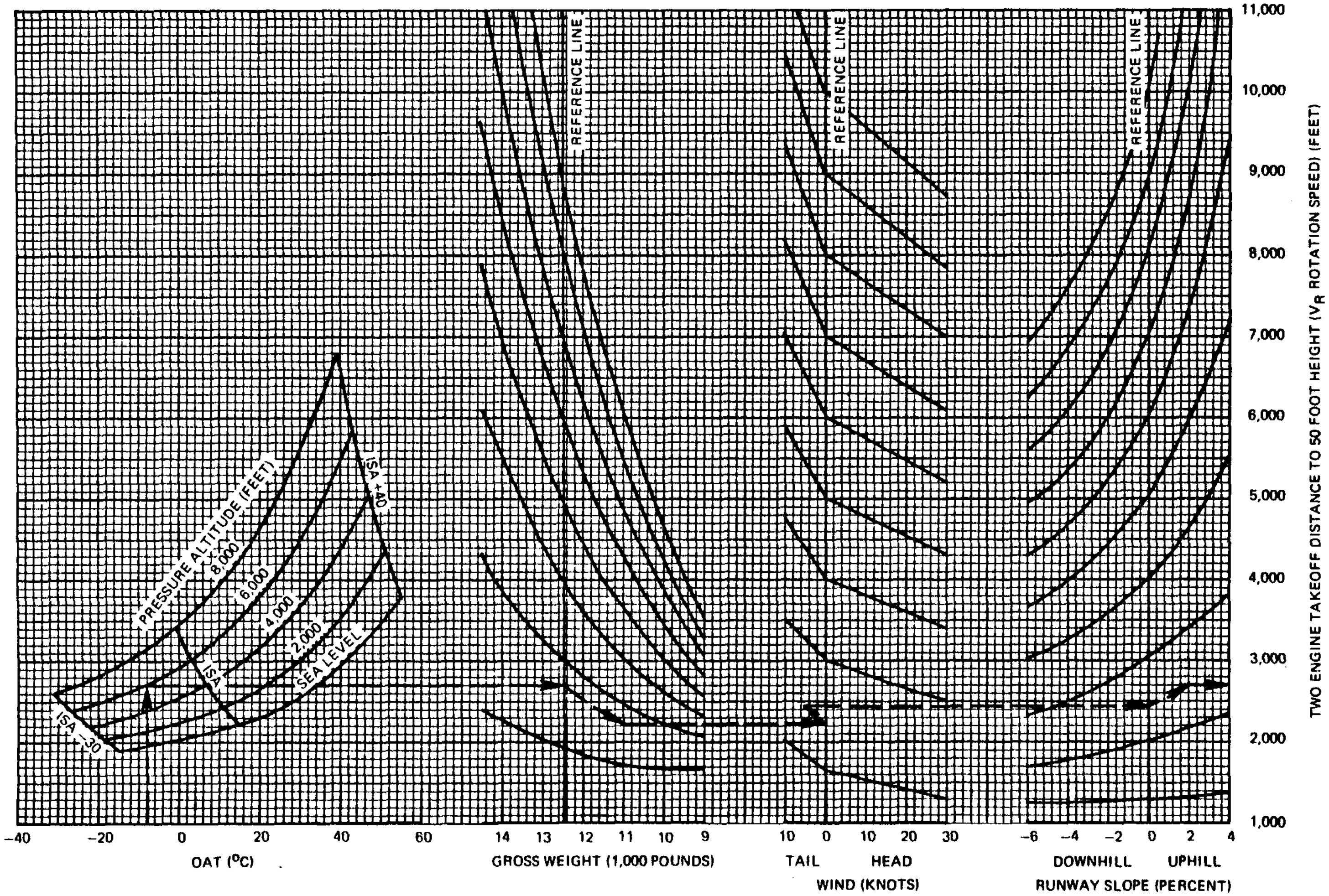


FIGURE 6-6

TWO ENGINE TAKEOFF DISTANCE TO 50 FOOT HEIGHT (V_R ROTATION SPEED) - WET

ASSOCIATED CONDITIONS:

POWER............. TAKEOFF (WET)
GEN LOAD................ 200 AMPS
BLEED AIR..................... OFF
ENG ANTI-ICE.................. OFF
RUNWAY...... DRY, HARD SURFACE
V_R SPEED.............. FIGURE 6–1
V_{50} SPEED.............. FIGURE 6–1
FLAPS.......................... 1/4
NOSE WHEEL STEERING... ON OR OFF

EXAMPLE:

GIVEN: OAT = 21°C
PRESSURE ALTITUDE = 2,000 FEET
GROSS WEIGHT = 11,300 POUNDS
HEADWIND = 10 KNOTS
RUNWAY SLOPE = 2 PERCENT (UPHILL)
OBTAIN: TAKEOFF DISTANCE TO 50 FOOT HEIGHT = 2,300 FEET

NOTE

MINIMUM OAT FOR WET POWER OPERATION IS 5°C.

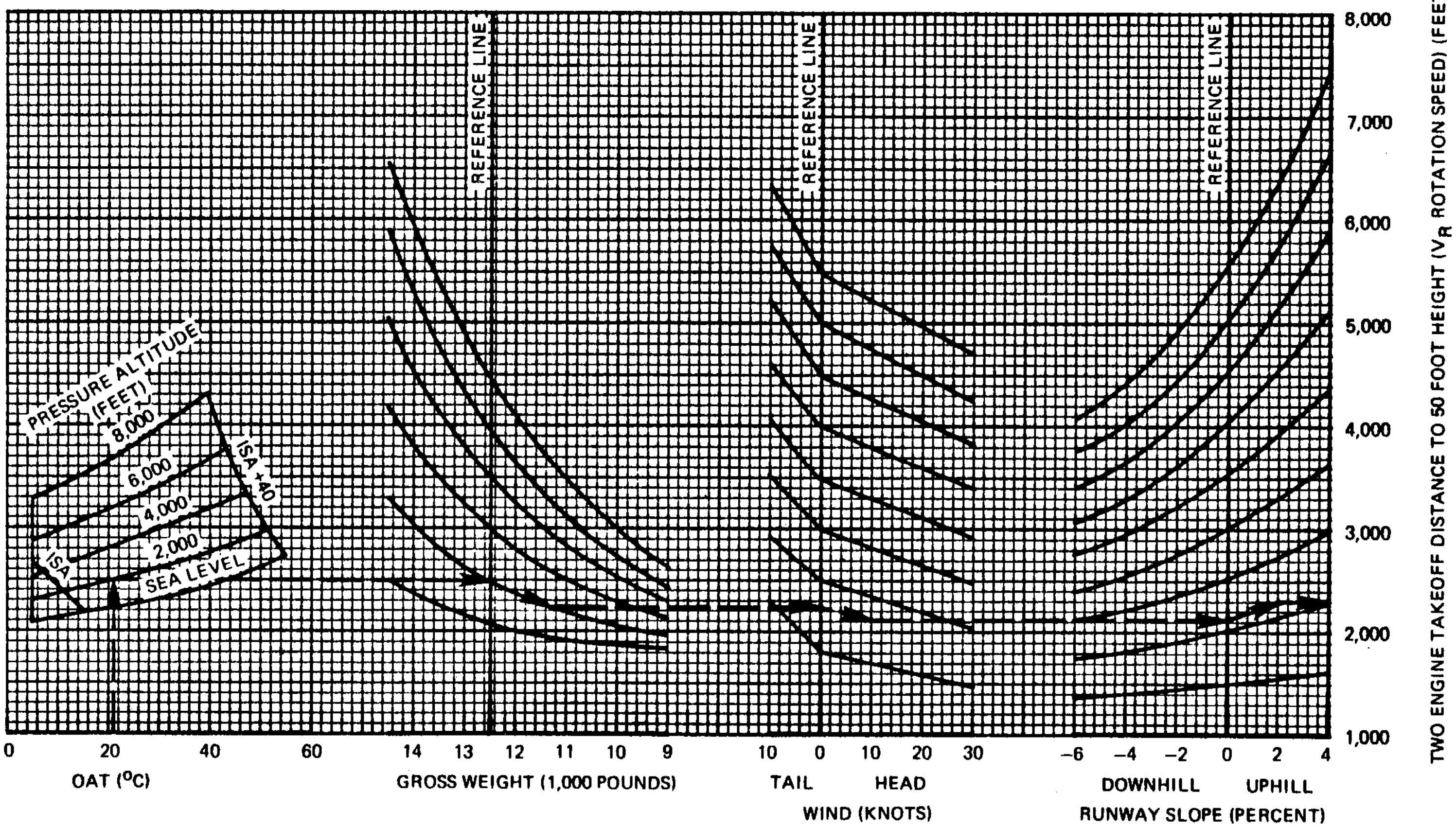


FIGURE 6-7

TWO ENGINE SERVICE CEILING, 100 FPM - DRY, BLEED AIR ON

ASSOCIATED CONDITIONS:

POWER........... MAX CONTINUOUS
GEN LOAD................ 200 AMPS
BLEED AIR .... ON
ENG ANTI-ICE.................. OFF
CLIMB SPEED .....(SEE FIGURE 4-51)
GEAR.......................... UP
FLAPS .... UP

EXAMPLE:

GIVEN: OAT AT 27,000 FEET = −13°C
PRESSURE ALTITUDE = 27,000 FEET
GROSS WEIGHT = 11,200 POUNDS

OBTAIN: TWO ENGINE SERVICE CEILING ASSUMING STANDARD TEMPERATURE LAPSE RATE ABOVE PRESENT ALTITUDE = 28,800 FEET

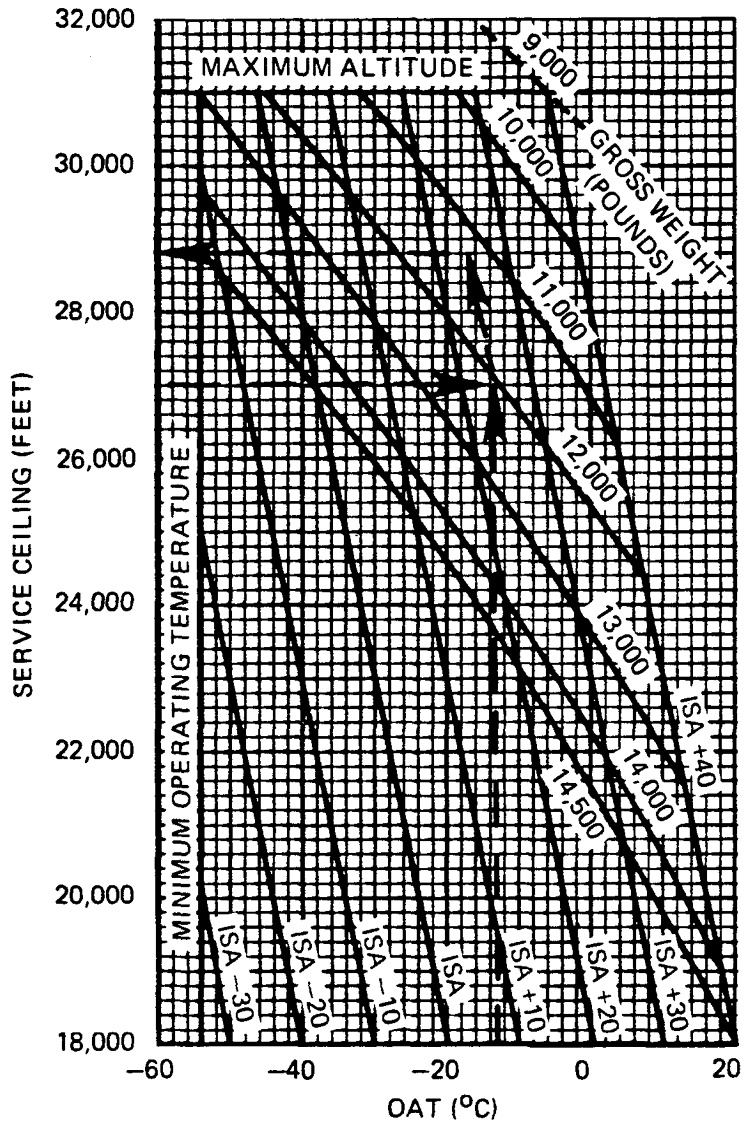


FIGURE 6-8

SINGLE ENGINE SERVICE CEILING, 50 FPM - DRY, BLEED AIR OFF

ASSOCIATED CONDITIONS:

POWER............MAX CONTINUOUS
PROPELLER .... FEATHERED ON INOPERATIVE ENGINE
GEN LOAD................ 200 AMPS
BLEED AIR ....OFF
ENG ANTI-ICE..................OFF
CLIMB SPEED .....(SEE FIGURE 4–50)
GEAR.......................... UP
FLAPS .... UP

EXAMPLE:

GIVEN: OAT AT 23,000 FEET = –26°C
PRESSURE ALTITUDE = 23,000 FEET
GROSS WEIGHT = 11,500 POUNDS

OBTAIN: SINGLE ENGINE SERVICE CEILING ASSUMING STANDARD TEMPERATURE LAPSE RATE BELOW PRESENT ALTITUDE = 20,250 FEET

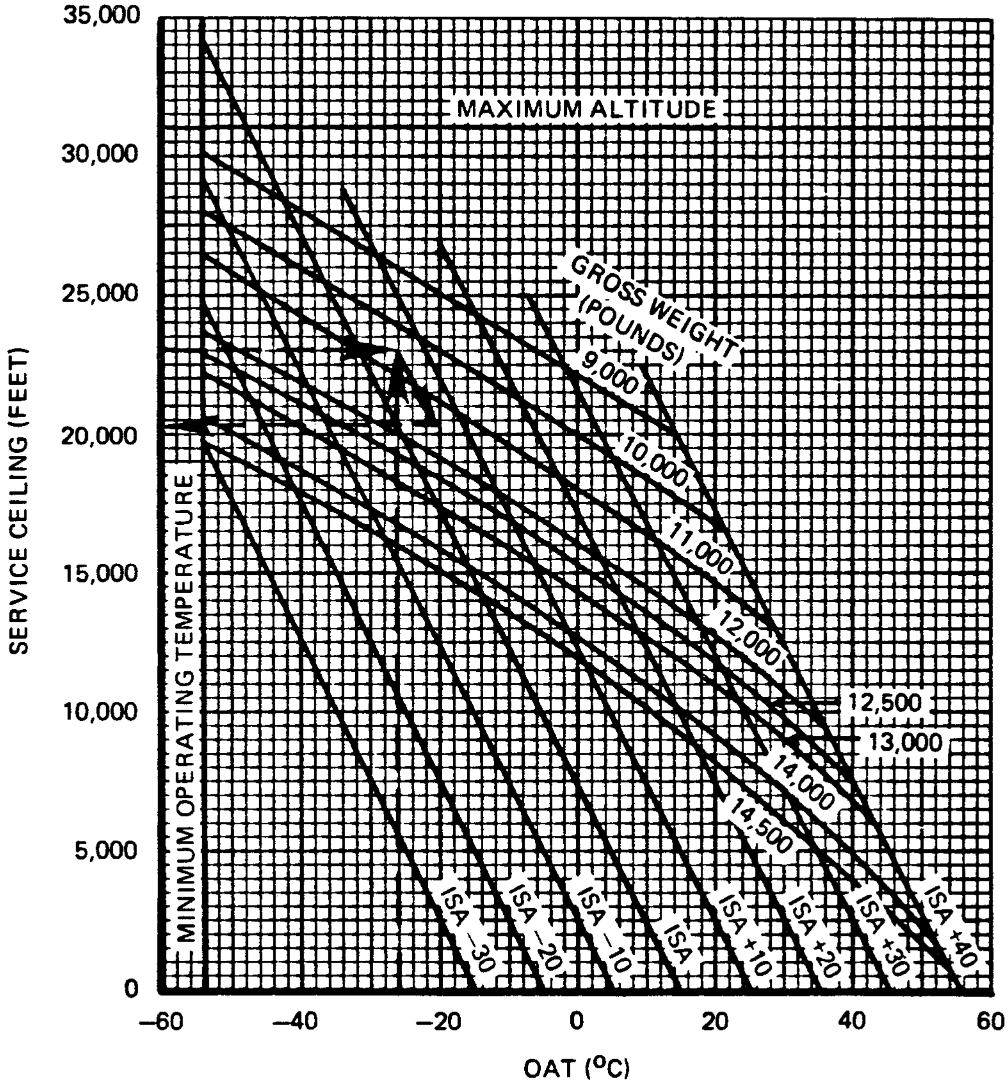
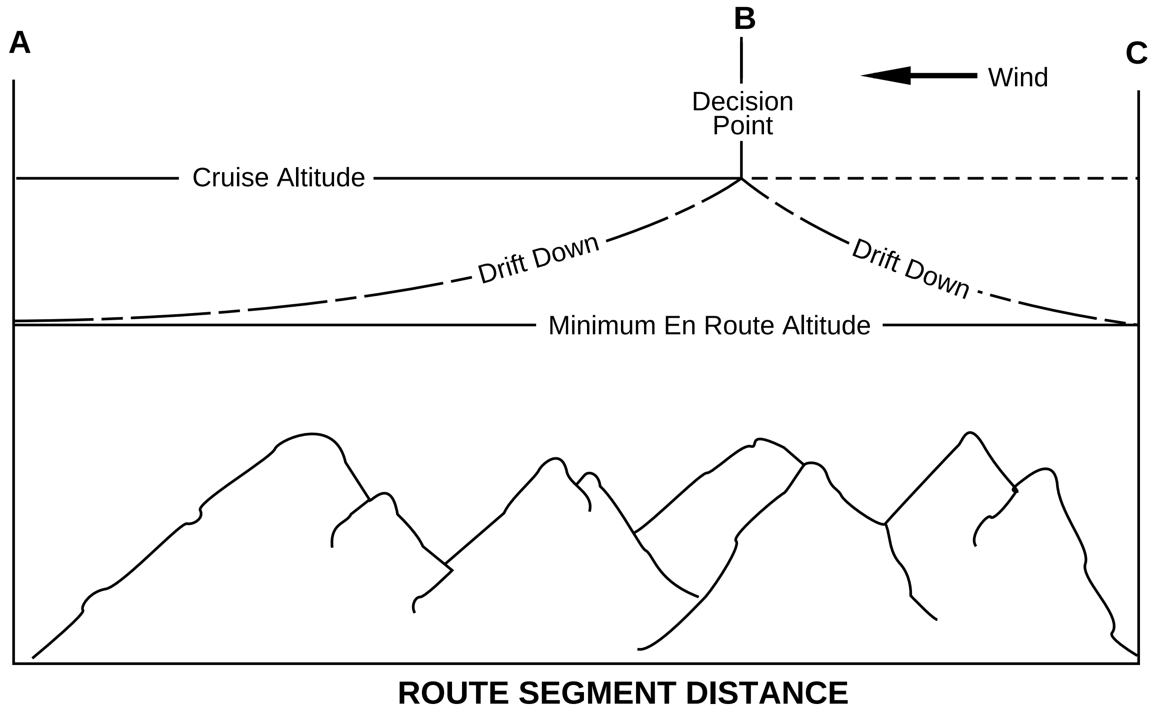


FIGURE 6-9

SINGLE ENGINE DRIFT DOWN PERFORMANCE

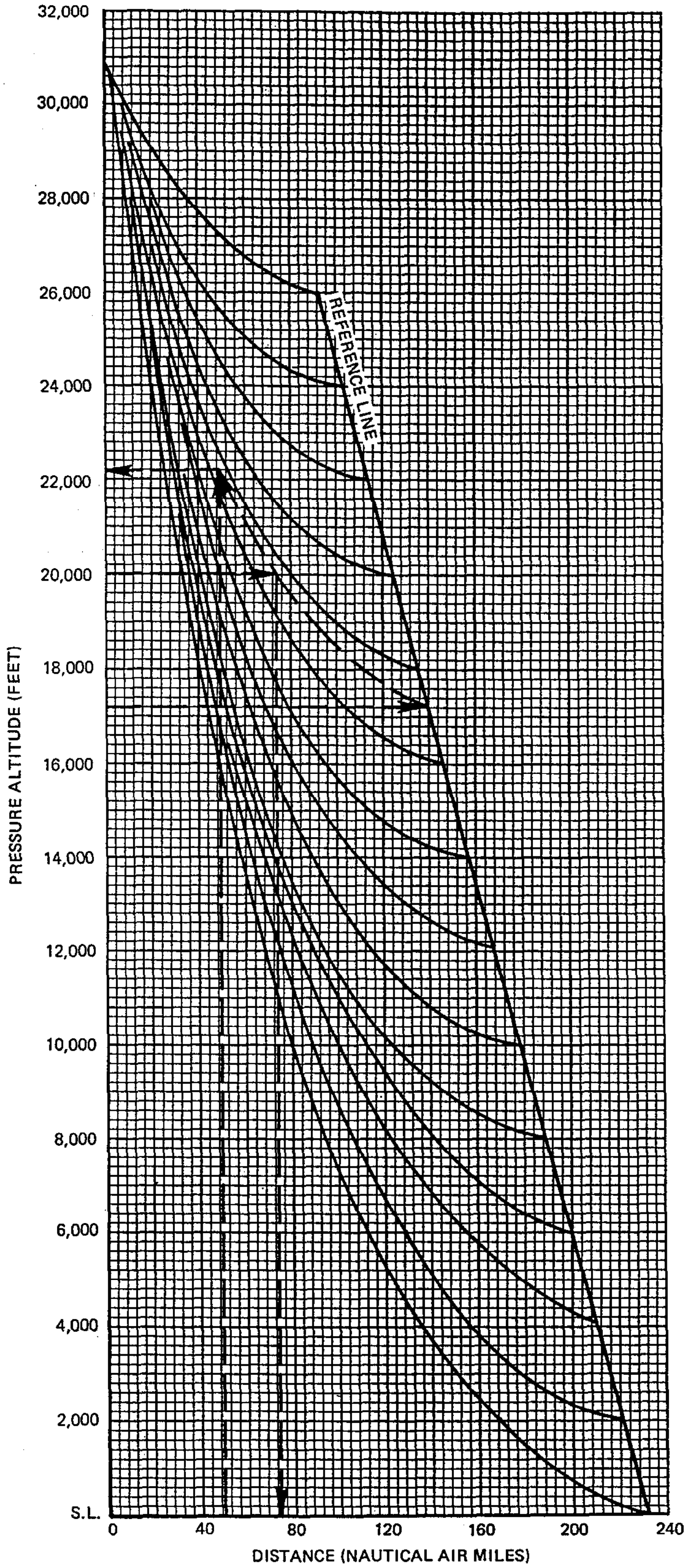
Operations over some mountainous areas require minimum en route altitudes which are higher than the airplane's single engine service ceiling. In those cases an added margin of safety may be obtained by cruising at an altitude higher than the minimum en route altitude so as to allow drift down to the single engine service ceiling in the event single engine operation becomes necessary. Drift down cruise during single engine operation then could result in reaching the end of the route segment at an altitude equal to or higher than the minimum en route altitude.

The problem is illustrated below:



Refer to Figure 6-10 to determine the minimum cruise altitude which will allow safe drift down in the event of engine failure while flying from point A to point C. Whether one should continue to point C or return to point A depends upon whether the decision point B has been reached. The effect of a headwind is to move the decision point closer to the destination end of the route segment. A tailwind will move the decision point closer to the origin of the route segment. This effect can be determined from Figure 6-11.

SINGLE ENGINE DRIFT DOWN PERFORMANCE (continued)



EXAMPLE:

GIVEN: OAT = −16°C AT 22,000 FEET ALTITUDE
MEA = 20,000 FEET
GROSS WEIGHT = 12,000 POUNDS
MEA SEGMENT DISTANCE = 48 NM
WIND = 0 KNOTS

OBTAIN: ALTITUDE FOR 50 FPM CEILING FROM FIGURE 6-9 IS Hp = 17,200 FEET
ENTER CHART WITH 50 FPM CEILING AND REFERENCE LINE INTERSECTION.
FOLLOW GUIDE LINE TO MEA, CONTINUE ALONG GUIDE LINE A DISTANCE EQUAL TO 1/2 THE MEA SEGMENT DISTANCE.
REQUIRED ALTITUDE FOR DRIFT DOWN IS 22,200 FEET.
SEE FIGURE 6-11 FOR WIND EFFECT

FIGURE 6-10

MANUFACTURER'S DATA

SINGLE ENGINE DRIFT DOWN PERFORMANCE DECISION POINT

EXAMPLE: (CONTINUED FROM FIGURE 6–10) WITH 70 KNOT HEADWIND

MEA SEGMENT = 48 NM
AVERAGE ALTITUDE = (22,200 + 20,000)/2 = 21,100 FEET
SINGLE ENGINE CLIMB SPEED (FIGURE 4–50) = 115 KIAS
EST. OAT AT AVERAGE ALTITUDE = −14°C
TRUE AIRSPEED = 164 KNOTS
FROM CHART F_D = 0.715
DISTANCE TO THE DECISION POINT = 0.715 x 48 = 34.3 NM

NOTE

DISTANCE TO THE DECISION POINT (NO-RETURN POINT) IS EQUAL TO THE SEGMENT LENGTH MULTIPLIED BY THE DECISION FACTOR (F_D).

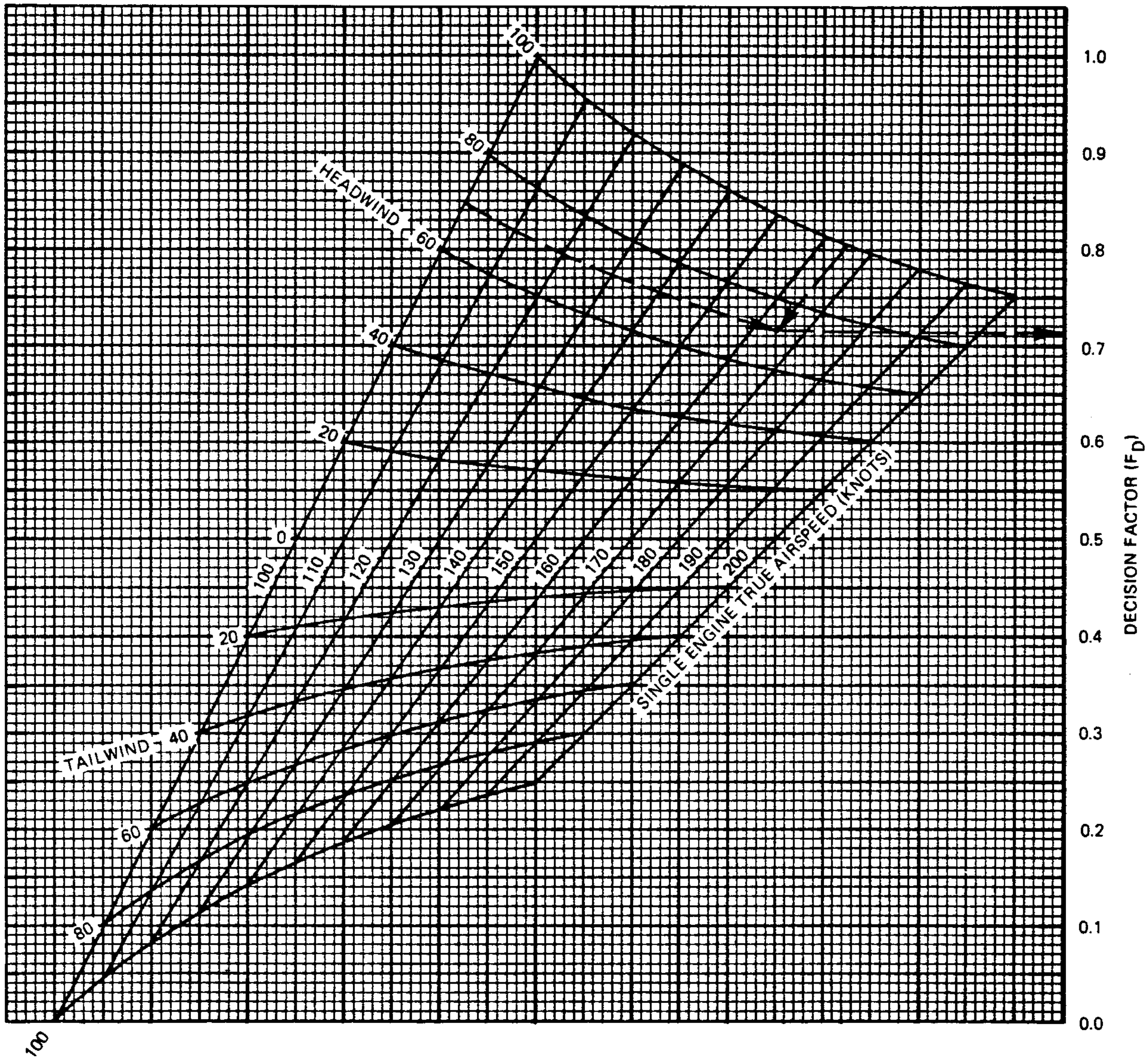


FIGURE 6-11

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CRUISE RATE OF CLIMB AT CRUISE POWER - 97% RPM

ASSOCIATED CONDITIONS:

POWER................ MAX CRUISE (97% RPM 650°C EGT)
GEN LOAD................ 200 AMPS
BLEED AIR .... ON
ENG ANTI-ICE.................. OFF
CLIMB SPEED ..... V_Y (FIGURE 4-51)
GEAR.......................... UP
FLAPS .... UP

EXAMPLE:

GIVEN: OAT = −20°C
PRESSURE ALTITUDE = 20,000 FEET
GROSS WEIGHT = 14,000 POUNDS
OBTAIN: RATE OF CLIMB = 650 FEET PER MINUTE

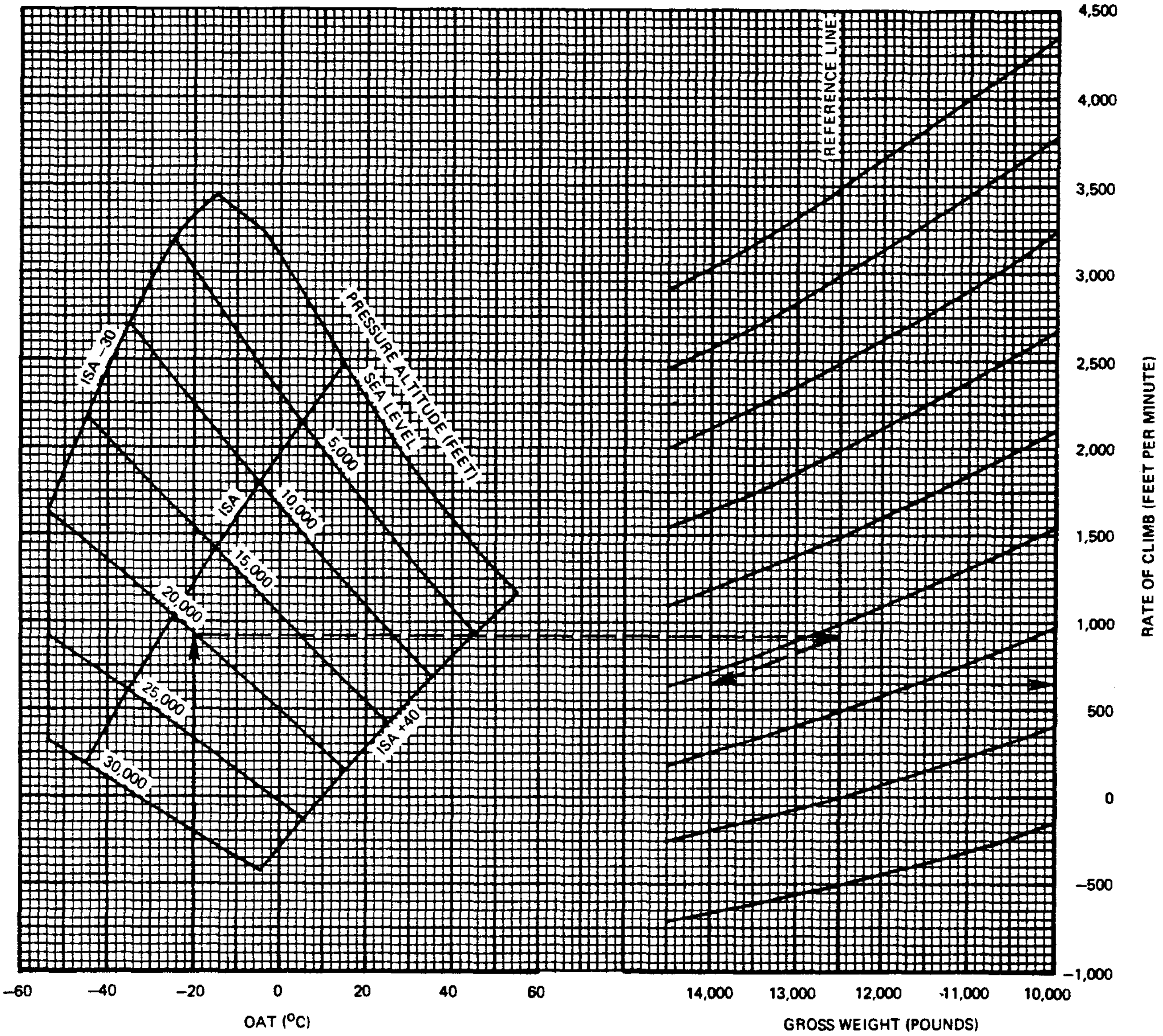

FIGURE 6-12

TIME, FUEL, AND DISTANCE TO CLIMB - 97% RPM

ASSOCIATED CONDITIONS:

POWER . . . . . MAX CRUISE (650°C EGT)
GEN LOAD . . . . 200 AMPS
BLEED AIR . . . . ON
ENG ANTI-ICE . . . . OFF
CLIMB SPEED . . . . . V_Y (FIGURE 4-51)
GEAR . . . . UP
FLAPS . . . . UP

EXAMPLE:

GIVEN: T.O. PRESSURE ALTITUDE = 5,000 FEET
T.O. WEIGHT = 13,000 POUNDS
CRUISE PRESSURE ALTITUDE = 24,000 FEET
TEMPERATURE = ISA +10°C

OBTAIN: TIME = (22.2 – 3.0) = 19.2 MINUTES
FUEL = (245 – 40) = 205 POUNDS
DISTANCE = (55 – 8) = 47 MILES

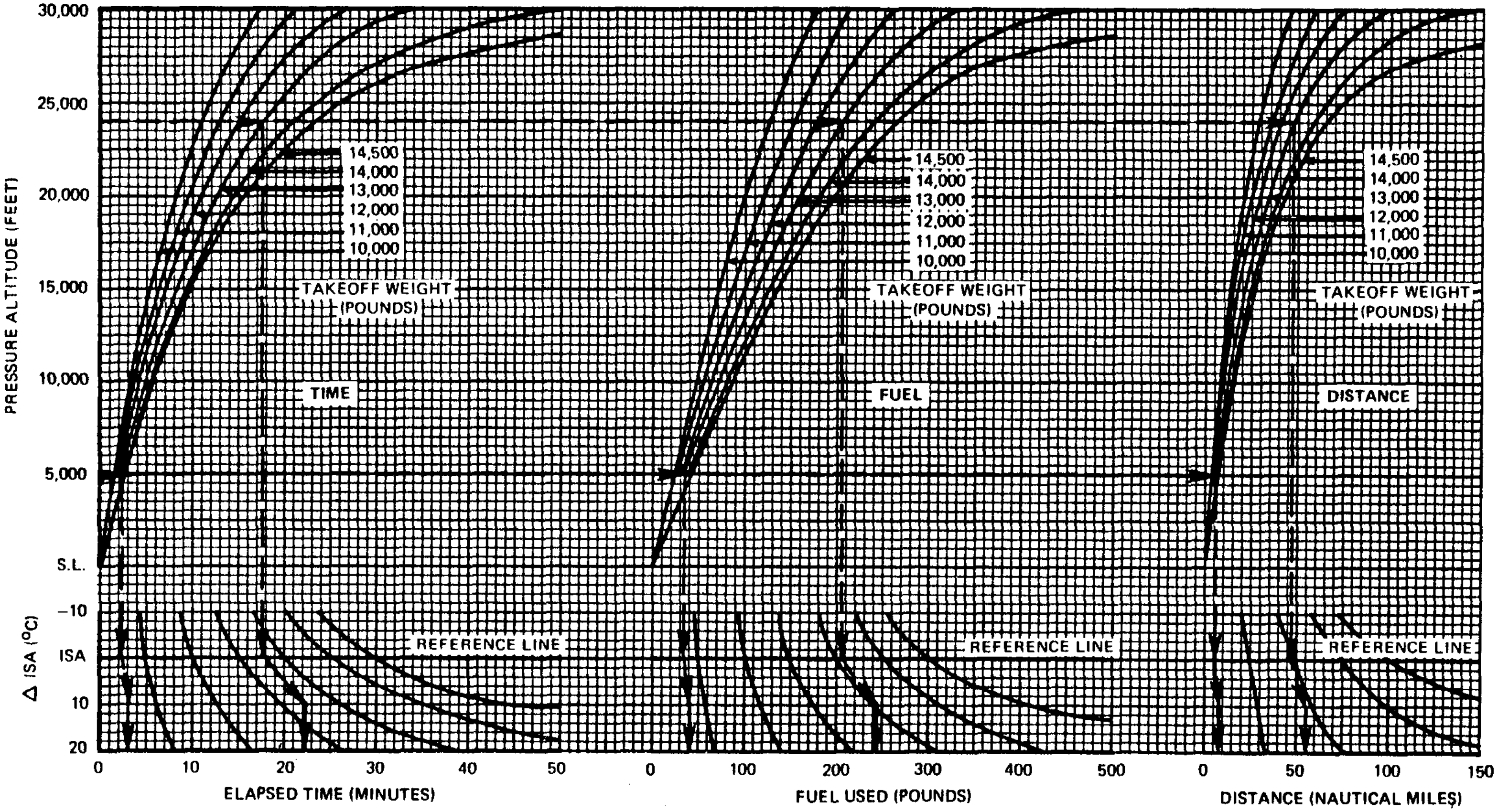

FIGURE 6-13

MANUFACTURER'S DATA

TIME, FUEL, AND DISTANCE TO CLIMB – 100% RPM

ASSOCIATED CONDITIONS:

POWER .... MAX CONTINUOUS
GEN LOAD .... 200 AMPS
BLEED AIR .... ON
ENG ANTI-ICE .... OFF
CLIMB SPEED ...... V_Y (FIGURE 4-51)
GEAR .... UP
FLAPS .... UP

EXAMPLE:

SEE EXAMPLE ON TIME, FUEL, AND DISTANCE TO CLIMB – 97%RPM (FIGURE 6-13)

NOTE

USE REFERENCE EGT AS DETERMINED IN ACCORDANCE WITH FIGURE 4-18.

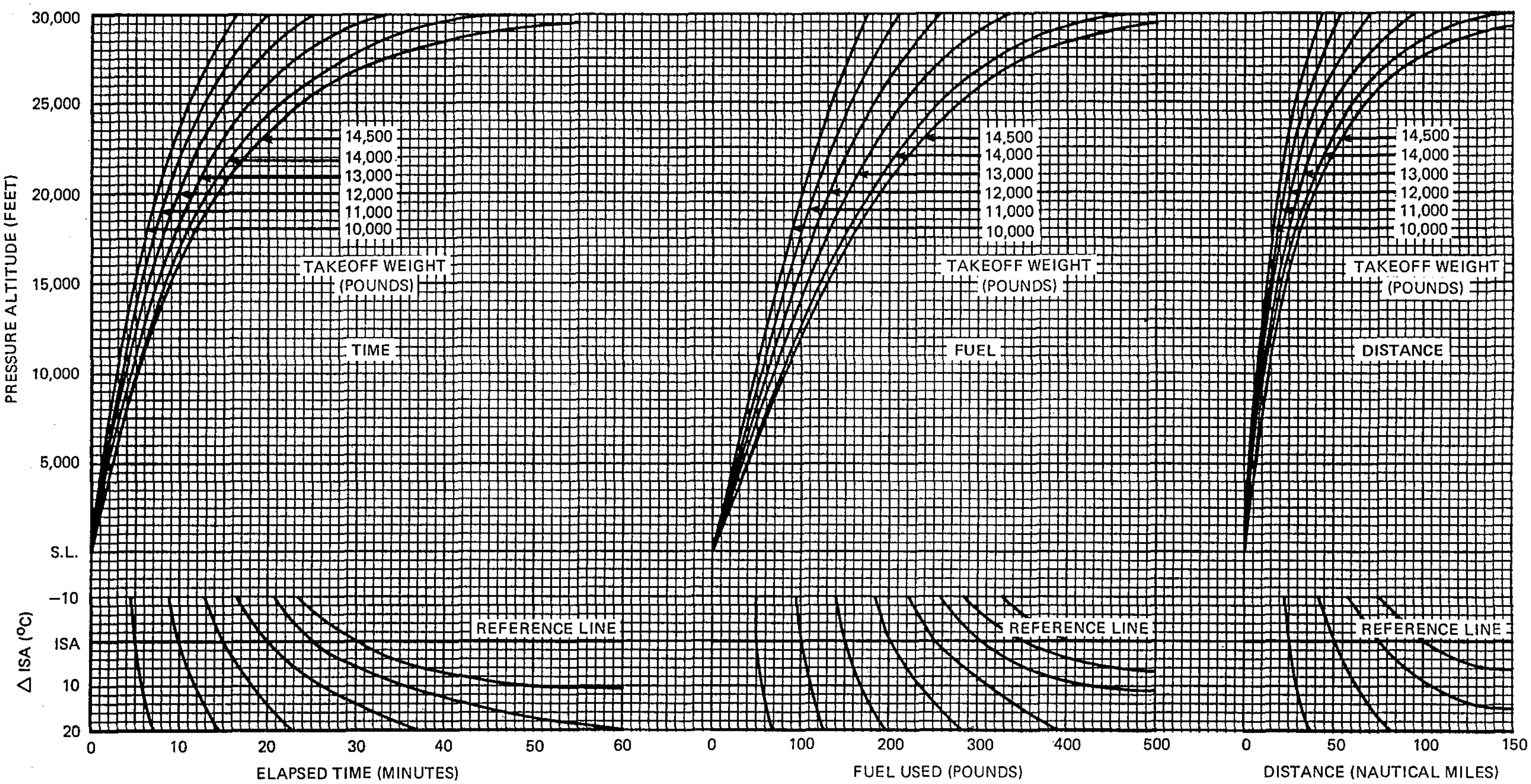

FIGURE 6-14
MANUFACTURER'S DATA

CRUISE SPEEDS AT MAXIMUM CRUISE POWER – KNOTS

10,000 AND 11,000 POUNDS

97% RPM, EGT = 650 °C, BLEED AIR ON

10,000 POUNDS

OAT °C	–50		–40		–30		–20		–10		0		10		20		30		40		50	
PR. ALT.	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS
Sea Level									246	237	246	241	246	246	246	250	246	254	238	250	225	240
2,000									246	245	246	250	246	255	246	259	240	257	227	247	214	237
4,000							246	249	246	254	246	259	246	264	243	264	229	254	216	244		
6,000							246	259	246	264	246	269	246	273	232	262	218	251	205	240		
8,000					246	263	246	268	246	273	246	279	234	270	220	258	207	247				
10,000					246	273	246	278	246	284	237	278	223	267	209	255	196	243				
12,000					246	283	246	289	238	285	225	275	211	263	197	250	184	237				
14,000			246	288	246	294	239	291	226	282	214	271	200	259	186	245						
16,000			246	299	239	297	227	287	215	278	202	266	188	253	174	239						
18,000	245	303	240	303	226	292	214	283	203	273	190	261	176	247								
20,000	236	303	227	298	214	288	202	278	190	267	177	254	163	239								
22,000	225	301	214	293	201	282	189	271	177	260	164	246	151	229								
24,000	212	296	201	287	188	276	176	264	164	251	152	236										
26,000	198	290	187	280	175	267	163	254	151	241	138	225										
28,000	184	282	173	271	160	256	149	244	138	229												
30,000	170	271	158	258	147	245	136	231	121	210												

11,000 POUNDS

OAT °C	–50		–40		–30		–20		–10		0		10		20		30		40		50	
PR. ALT.	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS
Sea Level									246	237	246	241	246	246	246	250	246	254	236	248	223	238
2,000									246	245	246	250	246	255	246	259	239	255	225	245	212	235
4,000							246	249	246	254	246	259	246	264	241	263	227	252	214	242		
6,000							246	259	246	264	246	269	244	271	230	260	216	249	203	238		
8,000					246	263	246	268	246	273	246	279	233	268	218	256	205	244				
10,000					246	273	246	278	246	284	235	276	221	265	207	252	193	240				
12,000					246	283	246	289	237	283	223	272	209	260	195	247	181	233				
14,000			246	288	246	294	237	289	225	279	211	268	197	256	183	241						
16,000			246	299	238	295	225	285	212	275	199	263	185	249	170	234						
18,000	245	303	238	301	225	290	212	280	200	270	187	257	172	242								
20,000	236	303	225	296	212	285	199	274	187	263	173	249	159	233								
22,000	223	299	211	290	199	279	186	267	173	254	160	239	146	222								
24,000	209	293	198	283	185	271	172	258	160	244	147	229										
26,000	195	285	183	274	170	261	158	247	146	233	131	214										
28,000	180	276	168	263	155	249	144	235	130	217												
30,000	164	263	153	250	141	236	127	217														

CRUISE SPEEDS AT MAXIMUM CRUISE POWER – KNOTS

12,000 AND 13,000 POUNDS

97% RPM, EGT = 650 °C, BLEED AIR ON

12,000 POUNDS

OAT °C	–50		–40		–30		–20		–10		0		10		20		30		40		50	
PR. ALT.	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS
Sea Level									246	237	246	241	246	246	246	250	246	254	235	246	222	236
2,000									246	245	246	250	246	255	246	259	237	254	223	243	210	232
4,000							246	249	246	254	246	259	246	264	240	261	226	250	212	239		
6,000							246	259	246	264	246	269	243	270	228	258	214	246	200	235		
8,000					246	263	246	268	246	273	245	278	231	266	216	254	202	242				
10,000					246	273	246	278	246	284	234	274	219	262	205	250	190	236				
12,000					246	283	246	289	235	281	221	270	207	258	192	243	177	229				
14,000			246	288	246	294	235	287	223	277	209	265	195	252	179	236						
16,000			246	299	236	293	223	282	210	272	196	259	182	245	166	228						
18,000	245	303	236	298	223	287	210	277	197	266	183	252	168	236								
20,000	235	301	223	293	209	282	196	270	183	258	169	243	155	226								
22,000	221	296	209	287	195	274	182	261	169	248	156	233	140	213								
24,000	206	289	194	278	181	265	167	251	155	238	141	220										
26,000	191	280	179	268	166	254	153	240	139	223	119	194										
28,000	176	269	163	256	150	241	137	224	115	192												
30,000	159	255	147	241	132	221																

13,000 POUNDS

OAT °C	–50		–40		–30		–20		–10		0		10		20		30		40		50	
PR. ALT.	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS
Sea Level									246	237	246	241	246	246	246	250	246	254	233	245	220	234
2,000									246	245	246	250	246	255	246	259	235	252	221	241	208	230
4,000							246	249	246	254	246	259	246	264	238	260	224	248	210	237		
6,000							246	259	246	264	246	269	241	268	226	256	212	244	197	231		
8,000					246	263	246	268	246	273	244	276	229	264	214	251	199	238				
10,000					246	273	246	278	246	283	232	272	217	260	202	246	187	232				
12,000					246	283	246	289	233	279	219	267	204	254	189	239	173	224				
14,000			246	288	246	294	233	285	220	274	206	262	191	248	175	231						
16,000			246	299	234	290	220	280	207	268	193	255	178	239	162	222						
18,000	245	303	234	296	220	284	207	273	194	261	179	246	164	230								
20,000	232	299	220	290	206	278	193	266	179	252	165	237	149	219								
22,000	218	292	206	283	192	269	178	255	165	242	150	225	131	199								
24,000	203	284	190	273	176	259	163	245	150	229	131	205										
26,000	187	274	174	261	161	247	147	231	129	206												
28,000	171	261	158	248	143	230	124	203														
30,000	153	246	138	227																		

CRUISE SPEEDS AT MAXIMUM CRUISE POWER – KNOTS
14,000 AND 14,500 POUNDS
97% RPM, EGT = 650°C, BLEED AIR ON

OAT °C	–50		–40		–30		–20		–10		0		10		20		30		40		50	
PR. ALT.	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS	IAS	TAS
14,000 POUNDS																						
Sea Level									246	237	246	241	246	246	246	250	245	253	231	243	217	232
2,000									246	245	246	250	246	255	246	259	233	250	219	238	205	227
4,000							246	249	246	254	246	259	246	264	236	258	221	246	207	233		
6,000							246	259	246	264	246	269	239	266	224	253	209	241	194	227		
8,000					246	263	246	268	246	273	242	274	227	262	211	248	196	234				
10,000					246	273	246	278	244	281	230	270	214	257	199	242	183	227				
12,000					246	283	244	287	231	276	217	264	201	250	185	234	169	218				
14,000			246	288	245	293	231	282	218	271	203	258	188	243	171	226						
16,000			246	298	232	288	218	276	204	264	189	250	174	234	157	216						
18,000	244	301	232	293	217	281	203	269	190	256	175	241	159	224								
20,000	230	296	217	286	203	274	189	260	175	246	160	231	142	208								
22,000	215	288	202	278	187	264	173	249	160	235	143	214										
24,000	199	279	186	267	172	252	158	237	141	217												
26,000	183	267	170	255	155	238	138	216														
28,000	166	254	152	238	131	211																
30,000	145	233	117	192																		
14,500 POUNDS																						
Sea Level									246	237	246	241	246	246	246	250	245	252	230	242	216	230
2,000									246	245	246	250	246	255	246	259	232	249	218	237	203	225
4,000							246	249	246	254	246	259	246	264	235	256	220	244	205	232		
6,000							246	259	246	264	246	269	238	265	223	252	208	239	192	225		
8,000					246	263	246	268	246	273	241	273	226	260	210	246	194	232				
10,000					246	273	246	278	243	280	228	268	213	255	197	240	181	225				
12,000					246	283	244	285	230	275	215	263	200	248	183	232	167	216				
14,000			246	288	244	292	230	281	216	269	202	256	186	240	169	224						
16,000			245	297	231	286	216	275	202	262	187	248	172	232	154	212						
18,000	243	300	231	292	216	279	202	267	188	253	173	238	156	220								
20,000	229	294	216	284	201	271	187	257	173	243	158	227	137	200								
22,000	213	286	200	275	185	261	171	246	157	231	138	206										
24,000	197	276	184	264	169	249	154	232	135	208												
26,000	180	264	167	251	151	233	130	204														
28,000	163	250	147	232																		
30,000	139	223																				

SPECIFIC RANGE

ASSOCIATED CONDITIONS:

POWER .... 97% RPM
GEN LOAD .... 200 AMPS
BLEED AIR .... ON
ENG ANTI-ICE .... OFF
GEAR .... UP
FLAPS .... UP
TEMPERATURE .... ISA OR ISA +15°C (AS NOTED)
GROSS WEIGHT .... AS NOTED ON CHARTS

EXAMPLE:

GIVEN: ISA
PRESSURE ALTITUDE = 15,000 FEET
AVERAGE GROSS WEIGHT = 14,000 POUNDS
MAX CRUISE POWER

OBTAIN: SPECIFIC RANGE = 0.388 NAUTICAL MILES/POUND (FIGURE 6–21)
FUEL FLOW = 700 POUNDS/HOUR
TRUE AIRSPEED = 273 KTAS

USEFUL EQUATIONS:

$$\text{FUEL FLOW} = \frac{\text{TAS}}{\text{SPECIFIC RANGE}}$$

WITH NO WIND:

$$\text{FUEL} = \frac{\text{DISTANCE}}{\text{SPECIFIC RANGE}}$$

$$\text{TIME} = \frac{\text{DISTANCE}}{\text{TAS}}$$

RANGE = FUEL X SPECIFIC RANGE

WITH WIND (TAILWIND +, HEADWIND –):

$$\text{TIME} = \frac{\text{DISTANCE}}{\text{TAS + WIND}}$$

FUEL = TIME X FUEL FLOW

$$\text{RANGE} = \frac{\text{FUEL}}{\text{FUEL FLOW}} \text{ X TAS + WIND}$$

MEASUREMENT UNITS:

FUEL .... POUNDS
TIME .... HOURS
FUEL FLOW .... POUNDS/HOUR
DISTANCE AND RANGE .... NAUTICAL MILES
SPECIFIC RANGE .... NAUTICAL MILES/POUND
TAS AND WIND .... NAUTICAL MILES/HOUR

FUEL FLOW, SPECIFIC RANGE, AND CRUISE SPEEDS
10,000 POUNDS - ISA - 97% RPM

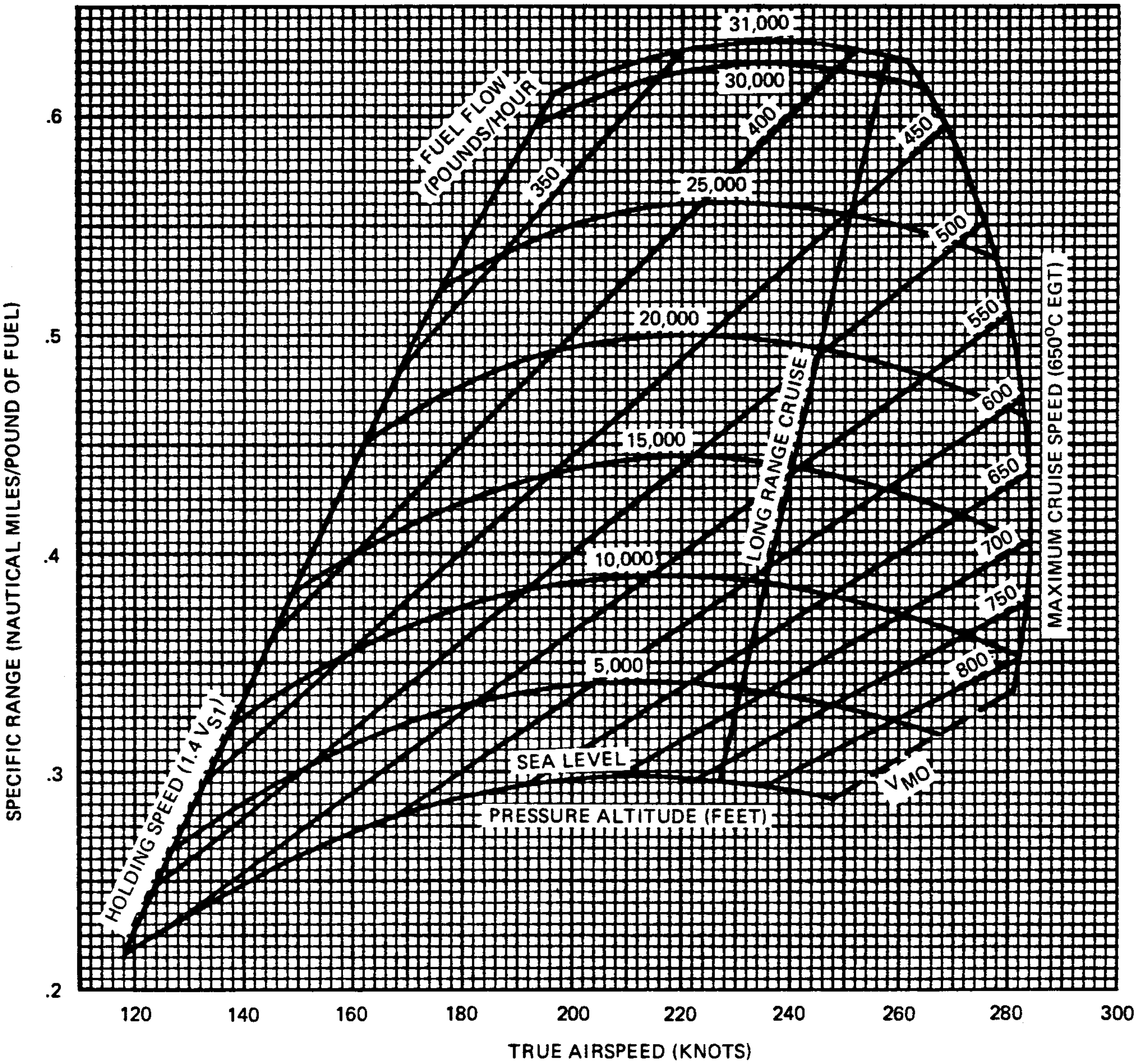

FIGURE 6-15

FUEL FLOW, SPECIFIC RANGE, AND CRUISE SPEEDS
10,000 POUNDS - ISA +15°C - 97% RPM

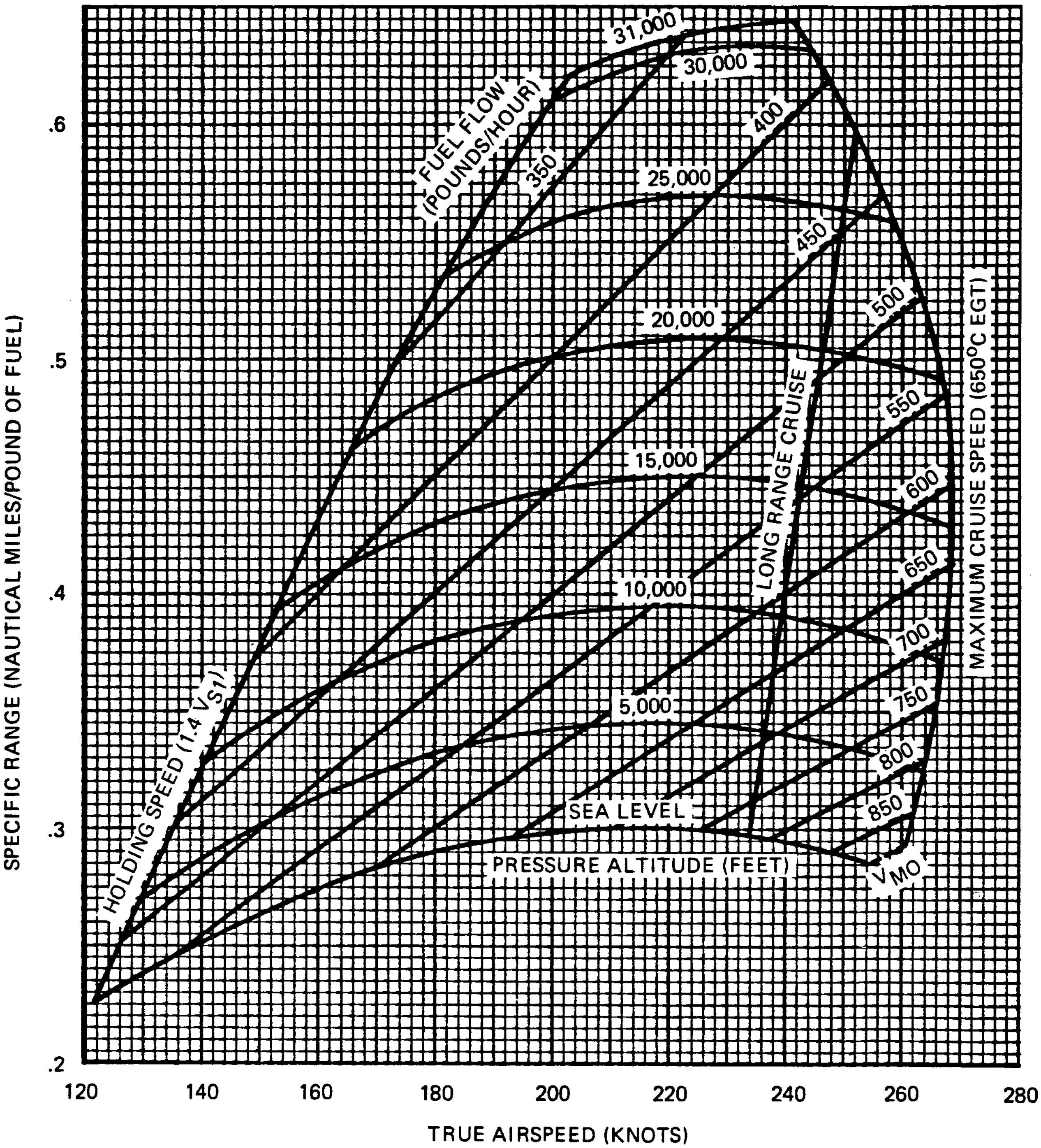

FIGURE 6-16

FUEL FLOW, SPECIFIC RANGE, AND CRUISE SPEEDS
12,000 POUNDS - ISA - 97% RPM

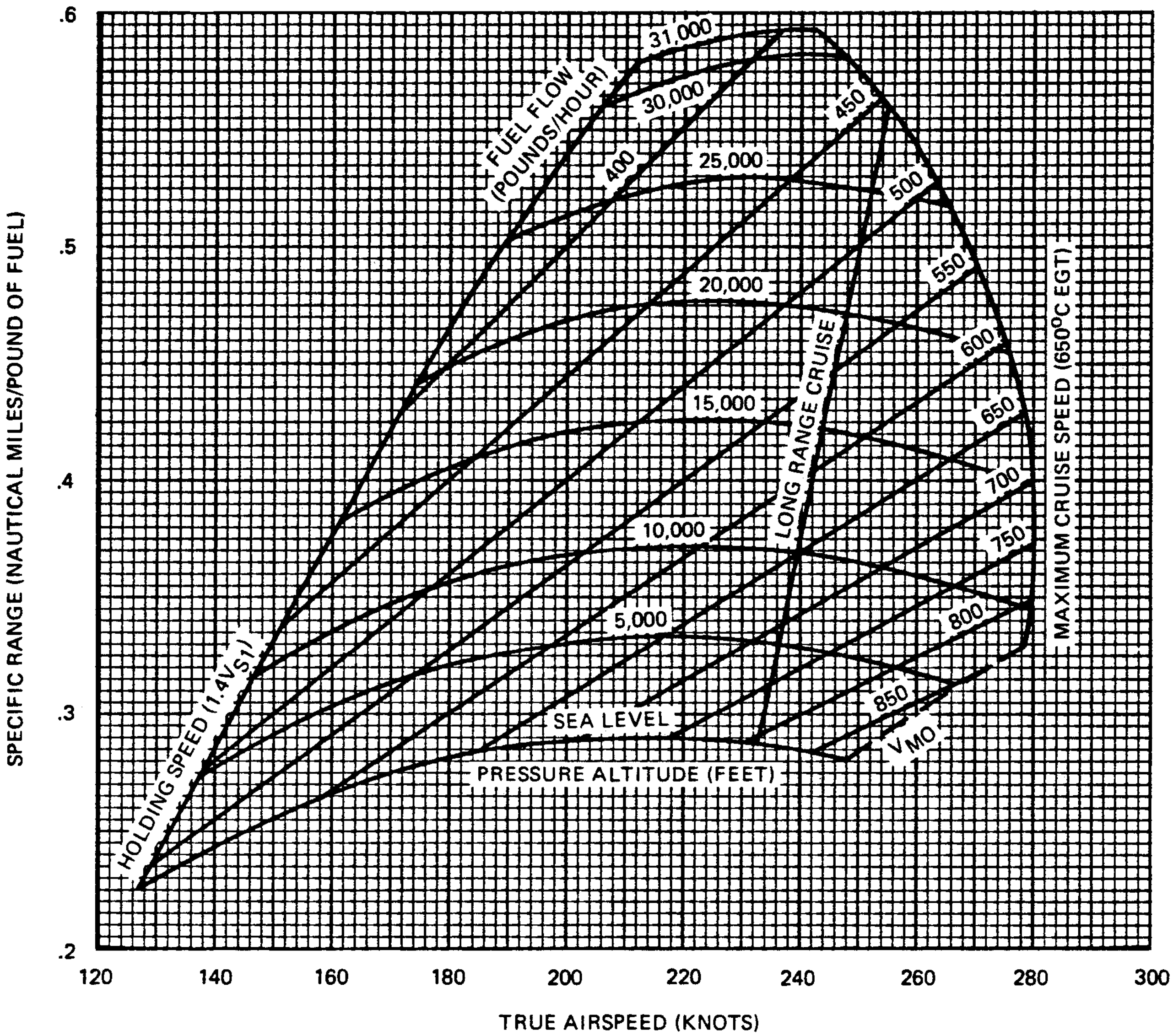

FIGURE 6-17

FUEL FLOW, SPECIFIC RANGE, AND CRUISE SPEEDS
12,000 POUNDS - ISA +15°C - 97% RPM

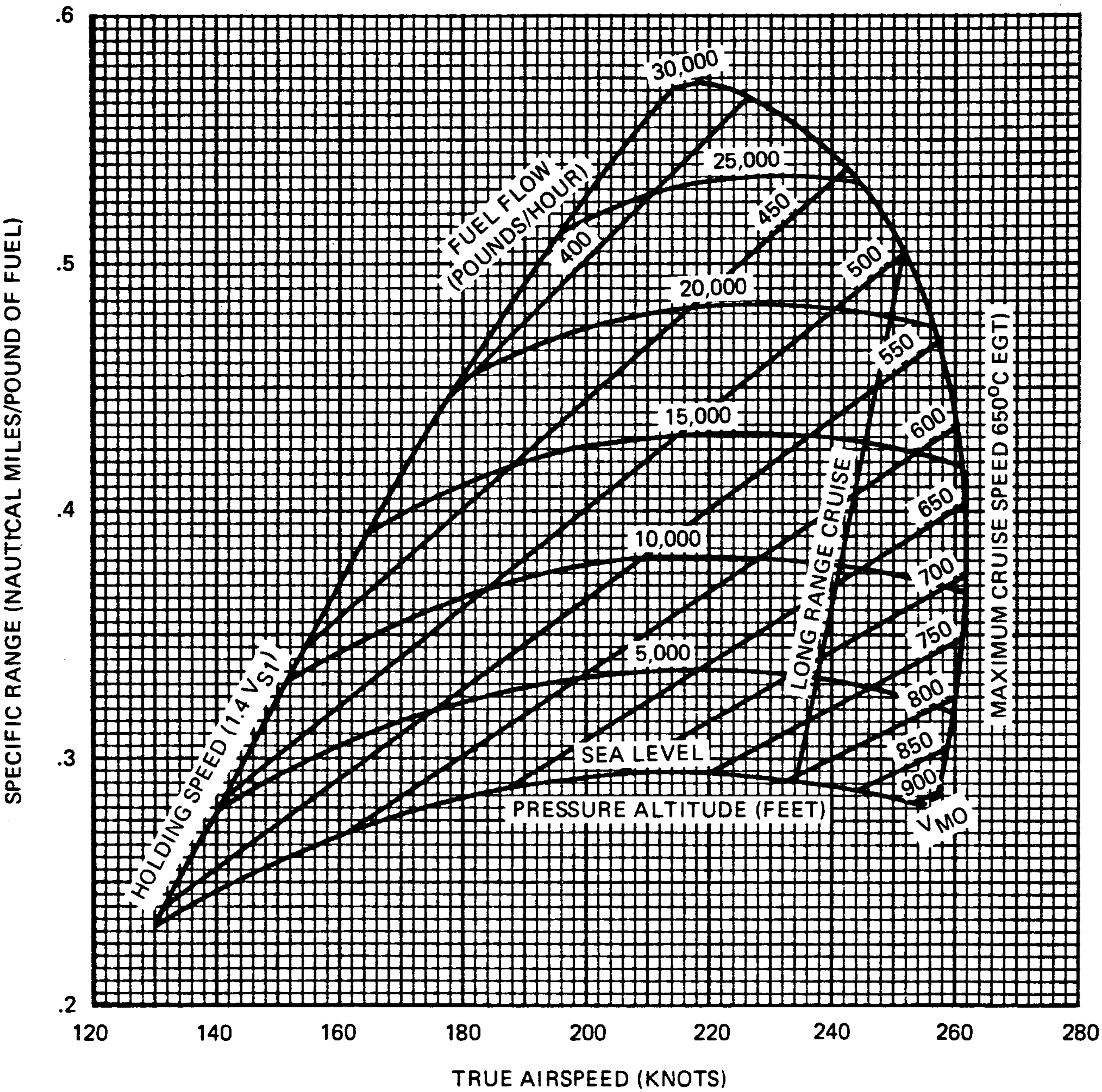

FIGURE 6-18

FUEL FLOW, SPECIFIC RANGE, AND CRUISE SPEEDS
13,000 POUNDS - ISA - 97% RPM

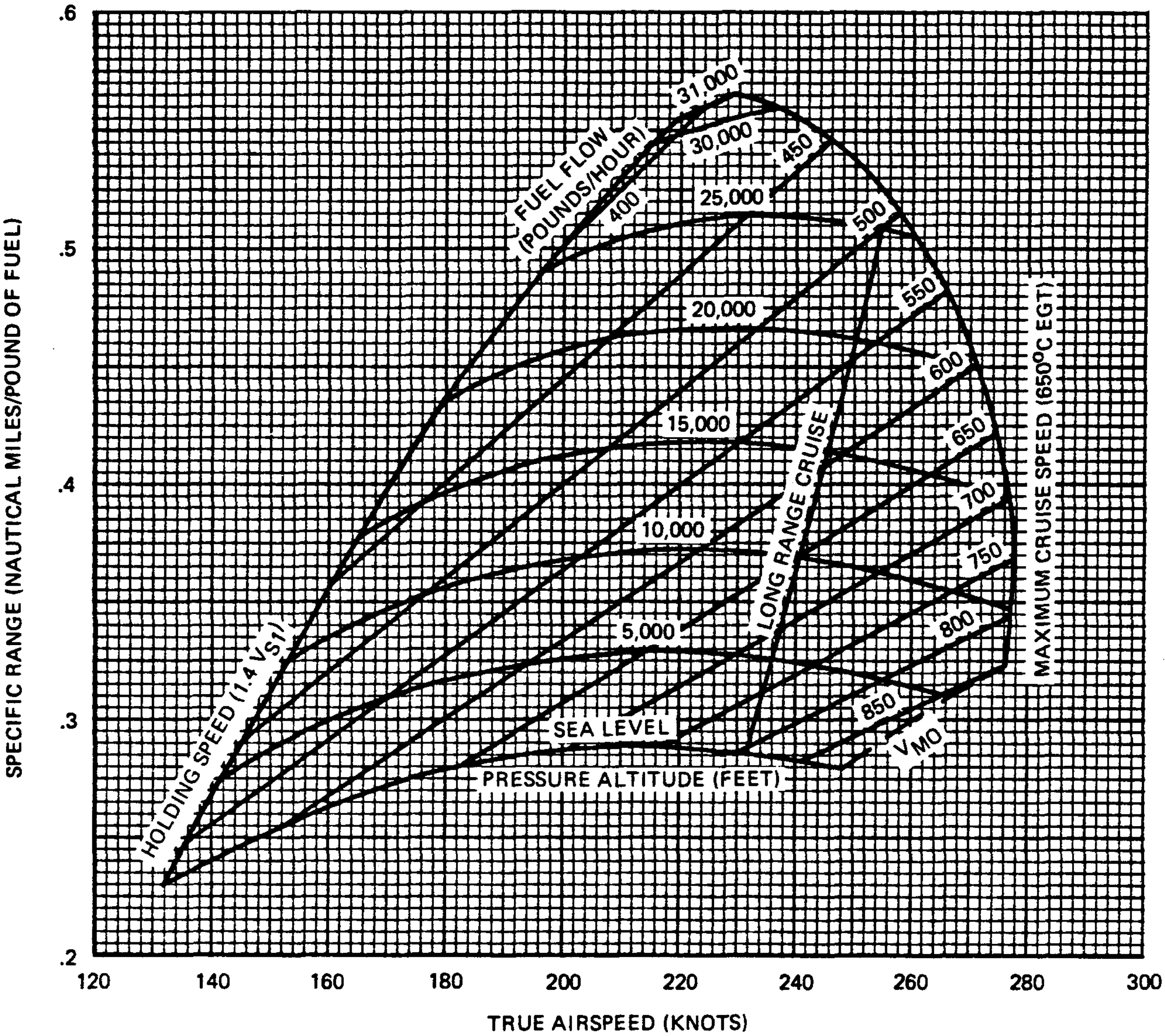

FIGURE 6-19

FUEL FLOW, SPECIFIC RANGE, AND CRUISE SPEEDS
13,000 POUNDS - ISA +15°C - 97% RPM

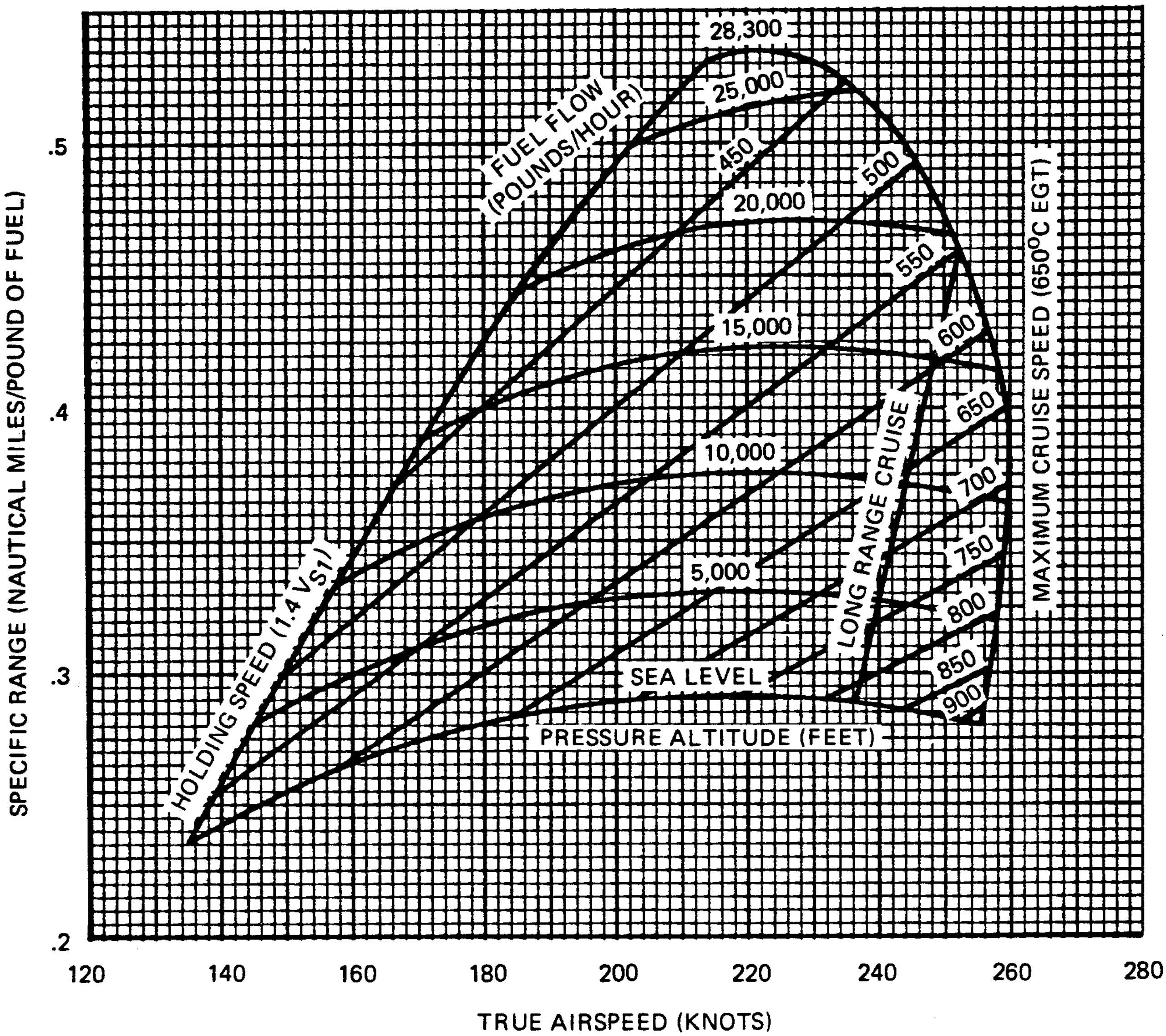

FIGURE 6-20

FUEL FLOW, SPECIFIC RANGE, AND CRUISE SPEEDS
14,000 POUNDS - ISA - 97% RPM

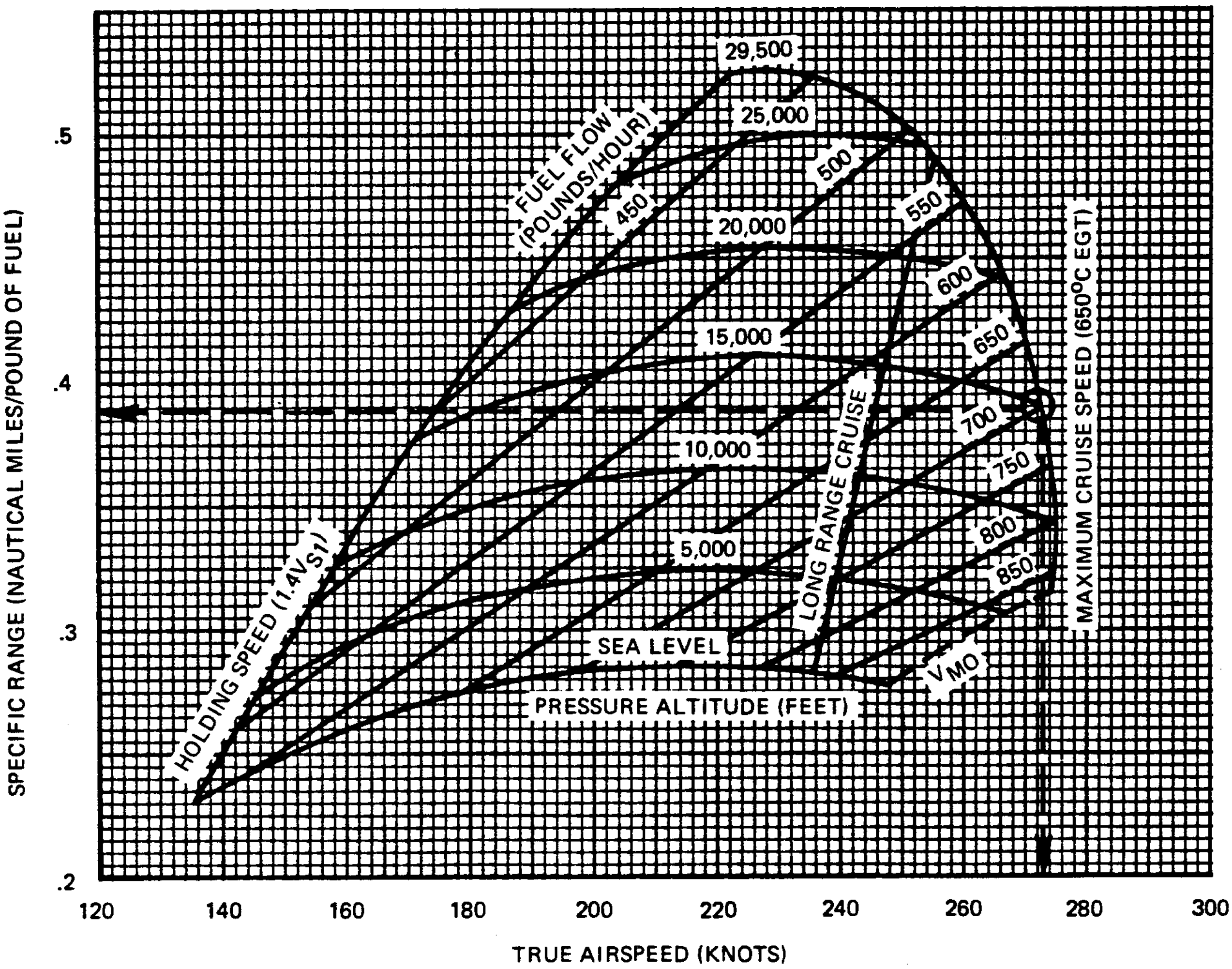

FIGURE 6-21

FUEL FLOW, SPECIFIC RANGE, AND CRUISE SPEEDS
14,000 POUNDS - ISA +15°C - 97% RPM

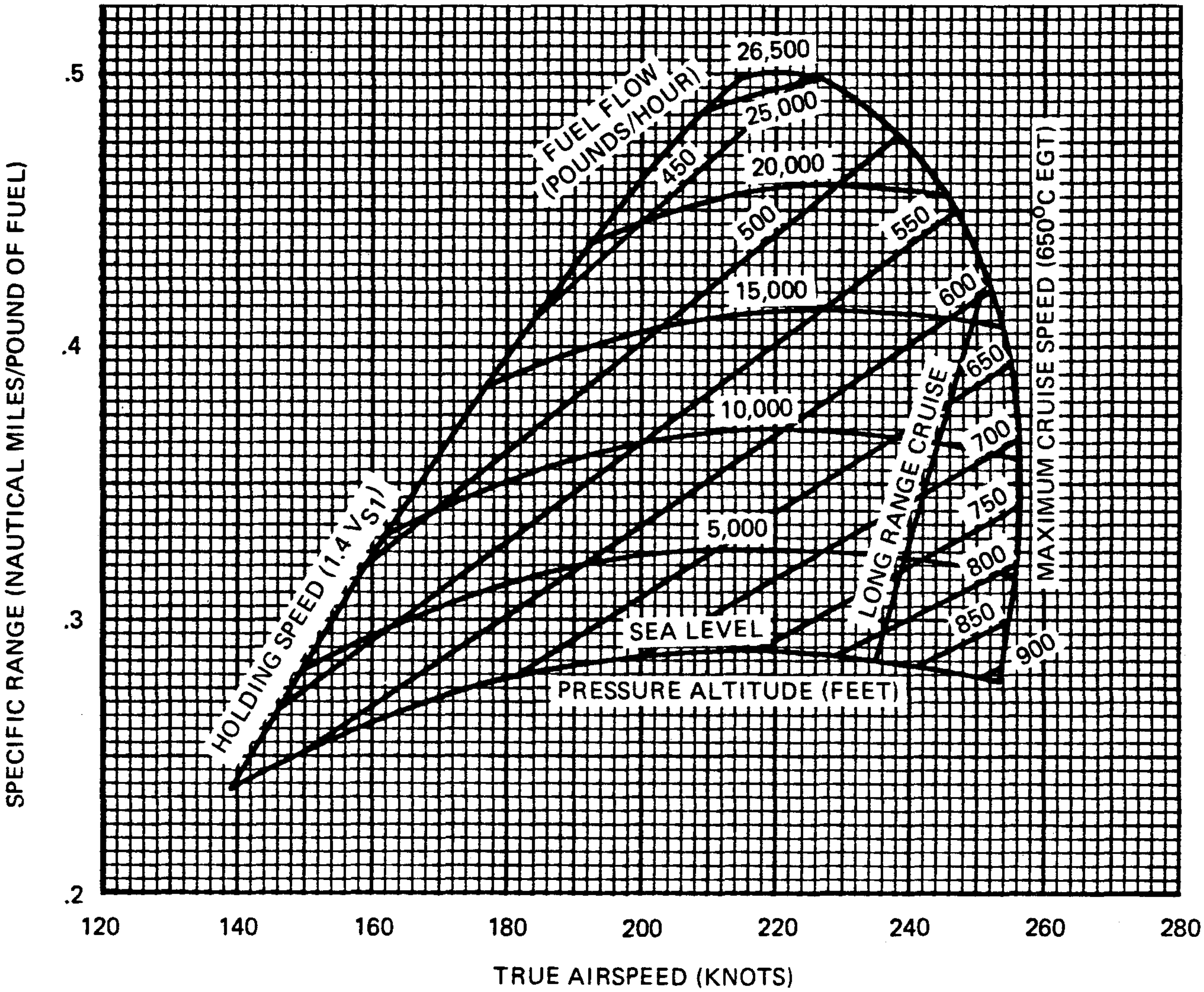

FIGURE 6-22

FUEL FLOW, SPECIFIC RANGE, AND CRUISE SPEEDS
14,500 POUNDS - ISA - 97% RPM

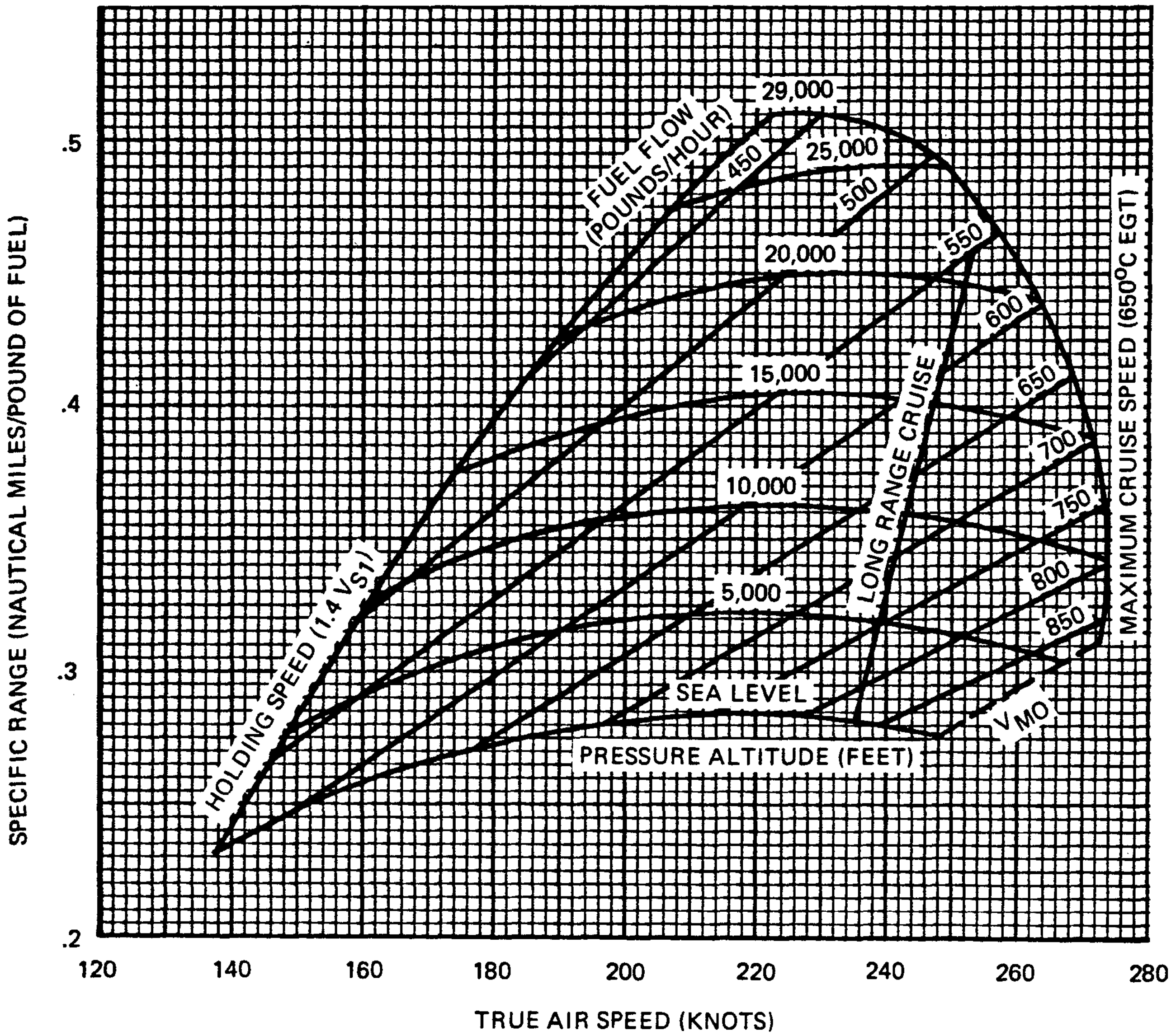

FIGURE 6-23

FUEL FLOW, SPECIFIC RANGE, AND CRUISE SPEEDS
14,500 POUNDS - ISA +15°C - 97% RPM

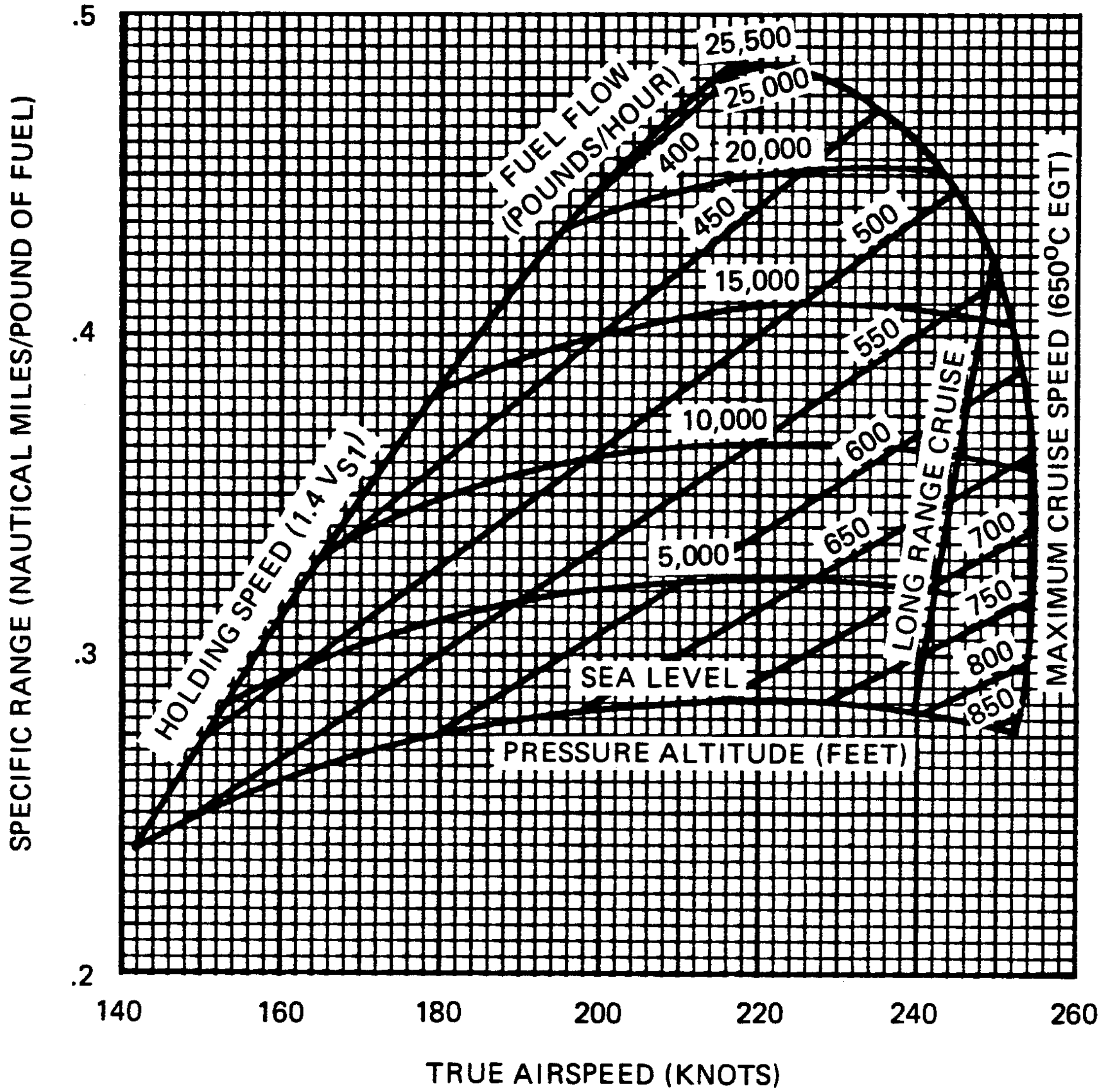

FIGURE 6-24

1,000 FOOT PER MINUTE DESCENT: DISTANCE, TIME, AND FUEL

ASSOCIATED CONDITIONS:

POWER .... AS REQUIRED
RPM 97%
GEN LOAD .... 200 AMPS
BLEED AIR .... ON OR OFF
ENG. ANTI-ICE .... ON OR OFF
SPEED .... SEE SPEED SCHEDULE
GEAR .... UP
FLAPS .... UP

EXAMPLE:

GIVEN: AMBIENT TEMPERATURE = ISA +10°C
GROSS WEIGHT = 10,000 POUNDS
BEGIN DESCENT AT 28,000 FEET
END DESCENT AT 5,000 FEET

OBTAIN: DISTANCE = (119 – 19) = 100 NAUTICAL MILES
TIME = (28 – 5) = 23 MINUTES
FUEL = (228 – 48) = 180 POUNDS

DESCENT SPEED SCHEDULE	
ALTITUDE (FT)	KIAS
30,000	150
28,000	170
26,000	190
25,000	200
↓	↓
S.L.	200

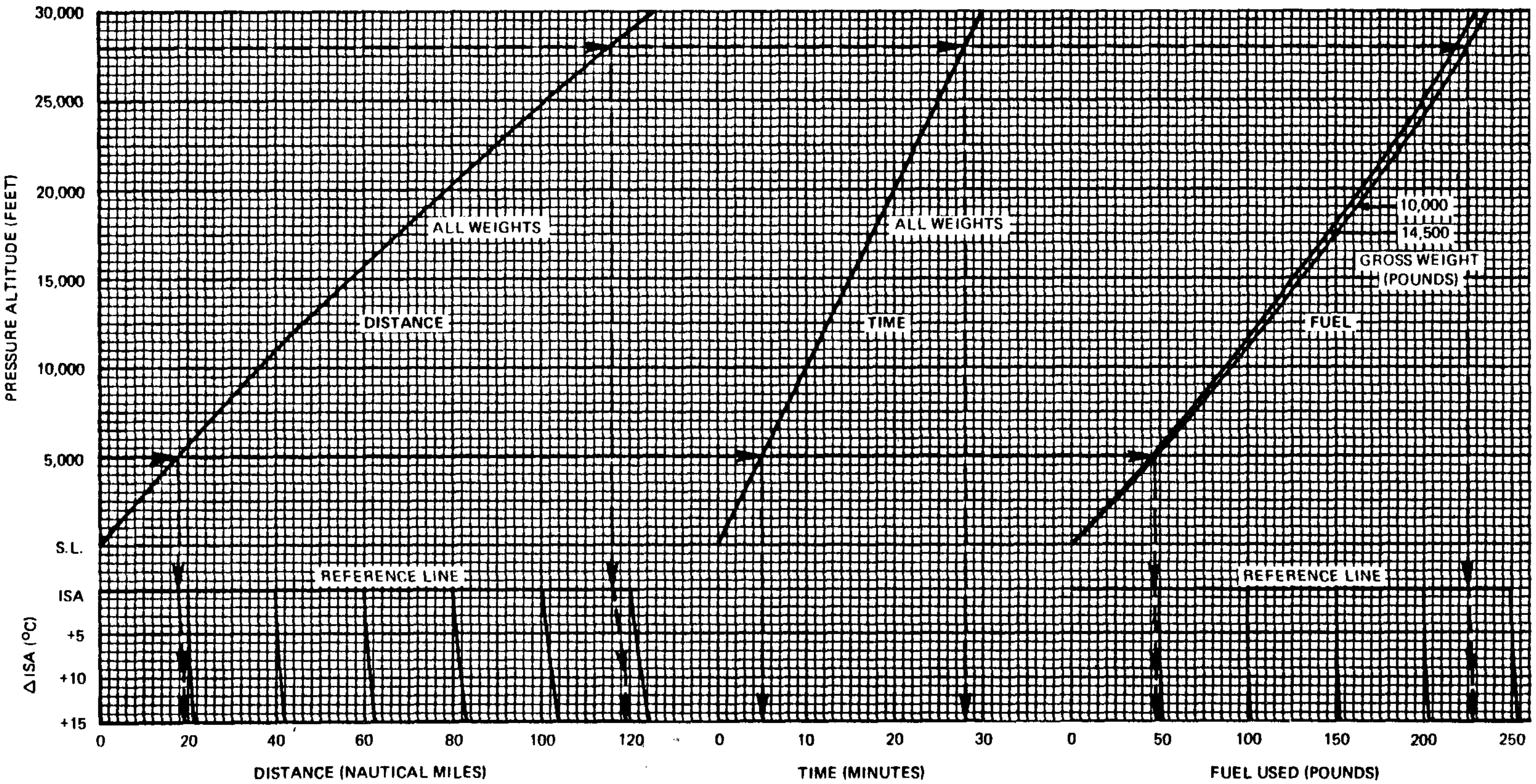

FIGURE 6-25

MANUFACTURER'S DATA

METRO III

2,500 FOOT PER MINUTE DESCENT: DISTANCE, TIME, AND FUEL

ASSOCIATED CONDITIONS:

POWER .... AS REQUIRED
RPM 97%
GEN LOAD .... 200 AMPS
BLEED AIR .... ON OR OFF
ENG ANTI-ICE .... ON OR OFF
SPEED .... V_{MO} SCHEDULE
GEAR .... UP
FLAPS .... UP

EXAMPLE:

SEE EXAMPLE ON 1,000 FOOT PER MINUTE DESCENT CHART (FIGURE 6-25)

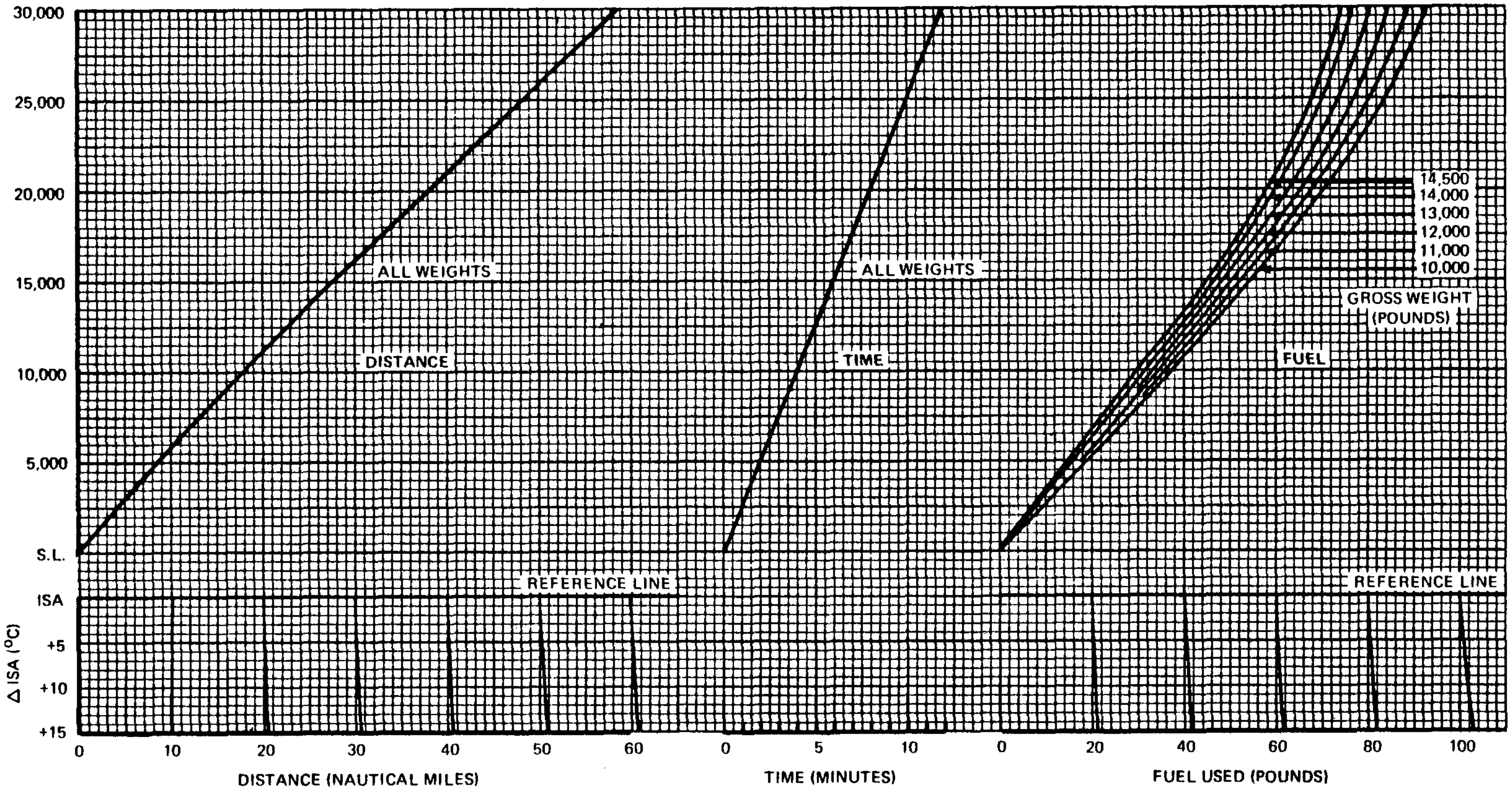

FIGURE 6-26

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RANGE PROFILE

Associated Conditions:
Engine Power and Atmospheric Conditions .... As Noted on Chart
Maximum Cruise .... 97% RPM and 650^{o}C EGT
Long Range Cruise .... 97% RPM
Fuel Flow .... Figure 6-15 Through Figure 6-24
Generator Load .... 200 AMPS
Bleed Air .... ON
Engine Anti-Ice .... OFF
Flaps .... UP
Gear .... UP
Takeoff Gross Weight At Brake Release .... 14,500 Pounds
Wind .... Calm

NOTE

Range Includes:

- 50 pounds fuel allowance for takeoff and acceleration to climb speed.
- V_Y Climb, 100% RPM Time, Distance, Fuel to Climb chart – (Figure 6-14).
- 2,500 Foot Per Minute Descent (Figure 6-26).
- Reserve fuel for 45 minutes holding at 1.4 V_{S1} at Cruise Altitude.

Example:
Given: Pressure Altitude = 17,500 feet
Ambient Temperature = ISA
Usable Fuel = 3,000 pounds
Desired Power Setting: Maximum Cruise
Obtain: Range = 1,070 nautical miles (Figure 6-27)

RANGE PROFILE
MAXIMUM CRUISE POWER – ISA

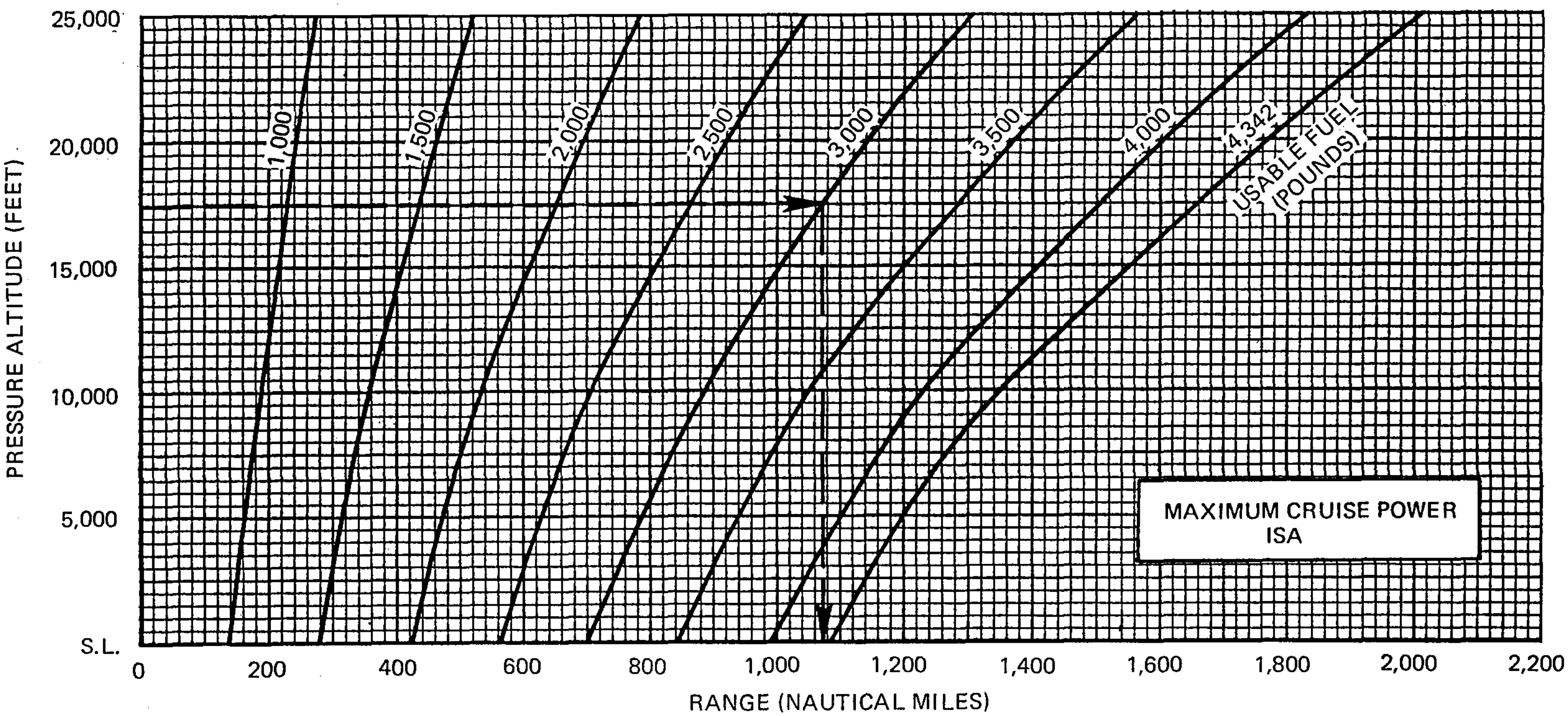

FIGURE 6-27
MANUFACTURER'S DATA

RANGE PROFILE

MAXIMUM CRUISE POWER – ISA +15°C

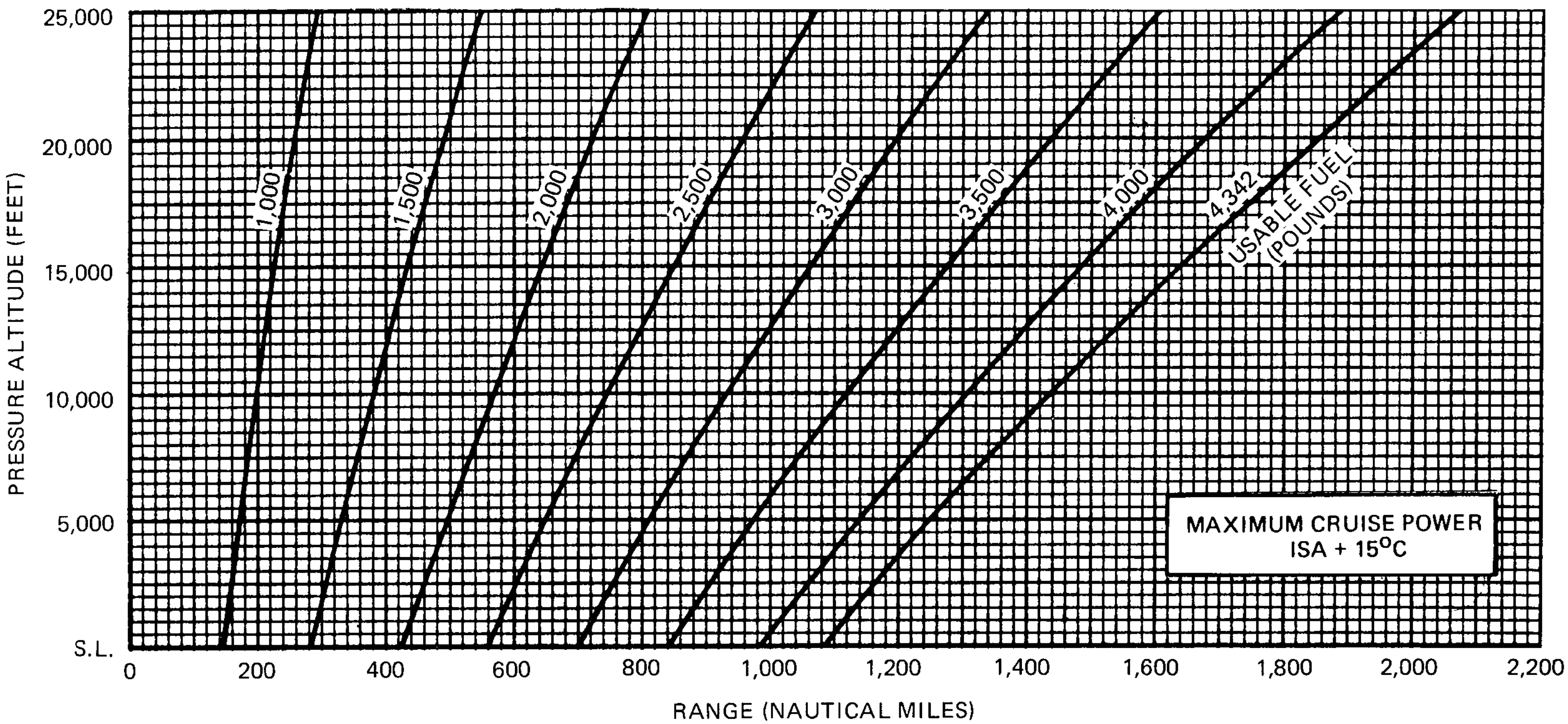

FIGURE 6-27A

MANUFACTURER'S DATA

RANGE PROFILE
LONG RANGE CRUISE POWER – ISA

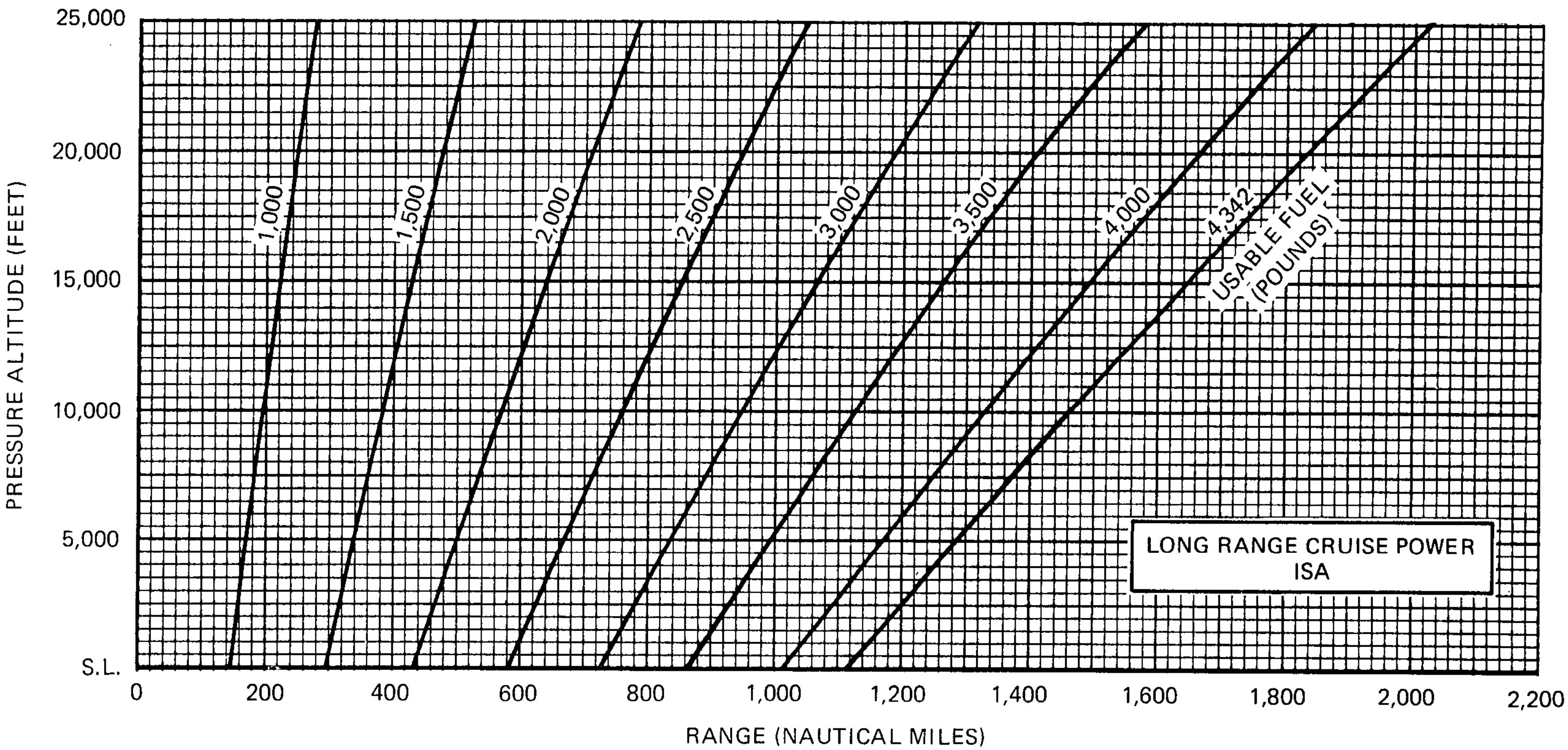

FIGURE 6-28
MANUFACTURER'S DATA

RANGE PROFILE

LONG RANGE CRUISE POWER – ISA +15°C

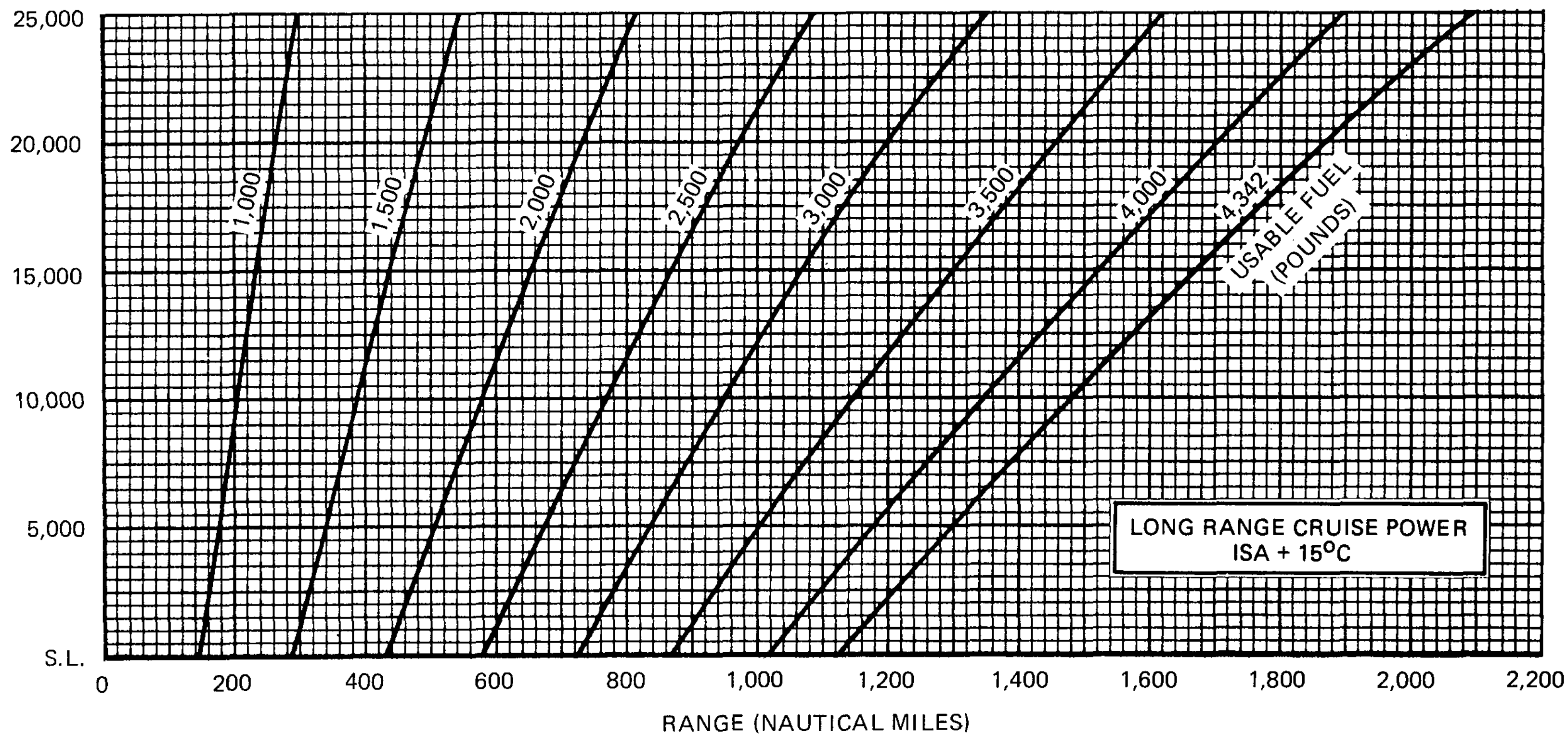

FIGURE 6-28A

MANUFACTURER'S DATA

SINGLE ENGINE FUEL FLOW AND CRUISE SPEEDS AT MAXIMUM CRUISE POWER

10,000 AND 12,000 POUNDS

97% RPM, EGT = 650°C, GEN LOAD = 200 AMPS, BLEED AIR ON

10,000 POUNDS

OAT °C	–50		–40		–30		–20		–10		0		10		20		30		40		50	
PR. ALT.	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS
SEA LEVEL									566	209	555	207	516	200	480	191	447	183	419	174	395	165
2,000							395	165	553	211	515	205	479	197	444	189	415	180	389	170		
4,000							549	215	512	209	477	203	444	195	412	186	384	176	360	166		
6,000							508	214	474	207	442	200	411	192	381	182	356	171	333	159		
8,000					504	217	470	211	437	204	408	197	380	188	352	177	328	164				
10,000					465	215	433	208	403	201	377	193	351	183	325	170	303	155				
12,000					428	212	398	204	372	196	347	188	323	176	299	161						
14,000			420	214	394	208	366	200	342	191	319	181	297	167	275	141						
16,000			385	210	360	203	336	194	314	184	293	171	272	150								
18,000	372	210	353	205	330	196	308	186	287	173												

12,000 POUNDS

OAT °C	–50		–40		–30		–20		–10		0		10		20		30		40		50	
PR. ALT.	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS
SEA LEVEL									567	206	555	204	516	196	479	187	447	177	419	167	394	155
2,000							394	155	552	208	514	201	479	193	444	183	414	172	388	160		
4,000							549	212	511	206	476	198	444	189	412	178	384	166	359	150		
6,000							508	210	473	202	441	194	410	184	381	172	355	157				
8,000					503	213	469	206	436	198	407	189	379	178	352	163						
10,000					464	210	432	202	403	193	376	183	350	170	324	146						
12,000					427	206	397	196	371	186	346	174	321	154								
14,000			418	207	392	200	365	189	340	177												
16,000			383	201	359	192	334	179														
18,000	369	200	350	192	328	180																

FIGURE 6-29

MANUFACTURER'S DATA

SINGLE ENGINE CRUISE AT MAXIMUM CRUISE POWER – FUEL FLOW AND SPEED

13,000 AND 14,000 POUNDS

97% RPM, EGT = 650 °C, GEN LOAD = 200 AMPS, BLEED AIR ON

13,000 POUNDS

OAT °C	–50		–40		–30		–20		–10		0		10		20		30		40		50	
PR. ALT.	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS
SEA LEVEL									568	205	554	202	516	194	479	184	446	173	418	162	393	146
2,000							393	146	552	206	514	199	478	190	444	179	413	167	387	152		
4,000							548	210	511	203	476	195	443	186	411	174	383	158				
6,000							507	207	472	200	441	191	410	180	380	165	354	140				
8,000					502	211	468	203	436	194	407	185	379	172	351	149						
10,000					463	207	431	198	402	188	375	176	349	158								
12,000					426	201	396	191	370	179	345	162										
14,000			417	203	391	194	364	181														
16,000			382	195	358	183																
18,000	368	193	349	183																		

14,000 POUNDS

OAT °C	–50		–40		–30		–20		–10		0		10		20		30		40		50	
PR. ALT.	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS
SEA LEVEL									568	203	554	200	515	191	478	181	446	169	417	154		
2,000									551	204	513	196	478	187	443	175	413	160	386	136		
4,000							548	208	510	201	476	192	443	181	411	167	382	145				
6,000							506	205	472	196	440	186	409	174	379	154						
8,000					502	208	467	200	435	190	406	179	378	162								
10,000					462	203	431	194	401	182	374	166										
12,000					425	197	396	184	369	168												
14,000			416	198	390	187																
16,000			381	187																		
18,000																						

MANUFACTURER'S DATA

FIGURE 6-29A

SINGLE ENGINE CRUISE AT MAXIMUM CONTINUOUS POWER – FUEL FLOW AND SPEED

10,000 AND 12,000 POUNDS

100% RPM, EGT = 650°C, GEN LOAD = 200 AMPS, BLEED AIR ON

10,000 POUNDS

OAT °C	–50		–40		–30		–20		–10		0		10		20		30		40		50	
PR. ALT.	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS
SEA LEVEL									563	209	578	212	576	211	537	204	500	196	467	188	437	179
2,000							437	179	565	214	567	215	534	209	498	202	464	194	432	184		
4,000							554	217	559	218	525	213	494	207	461	199	430	191	401	181		
6,000							550	221	516	216	486	210	457	204	426	196	398	187	370	176		
8,000					538	224	509	219	476	213	448	207	422	201	394	192	367	182				
10,000					496	221	468	216	439	210	413	204	389	196	363	187	339	175				
12,000					457	218	430	212	403	206	380	199	358	191	334	180	311	166				
14,000			441	219	419	214	395	208	371	201	349	193	329	184	307	171						
16,000			404	215	384	209	362	202	340	194	320	185	301	174								
18,000	389	214	369	209	351	203	331	195	311	185	293	173										

12,000 POUNDS

OAT °C	–50		–40		–30		–20		–10		0		10		20		30		40		50	
PR. ALT.	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS
SEA LEVEL									564	207	578	209	575	208	537	201	500	192	466	182	436	171
2,000							436	171	566	212	566	211	533	206	497	198	463	188	431	177		
4,000							554	214	558	215	524	209	493	202	461	194	429	183	400	171		
6,000							550	218	515	212	484	205	456	198	426	189	397	177	369	162		
8,000					537	220	508	215	475	208	447	201	421	194	393	183	366	169				
10,000					495	217	467	211	437	203	412	196	388	187	362	174	337	154				
12,000					456	213	429	205	402	197	379	188	357	177	332	158						
14,000			439	212	417	207	393	199	369	189	347	178										
16,000			402	206	381	199	360	190	338	177												
18,000	386	204	367	198	348	189																

MANUFACTURER'S DATA

FIGURE 6-30

SINGLE ENGINE CRUISE AT MAXIMUM CONTINUOUS POWER – FUEL FLOW AND SPEED

13,000 AND 14,000 POUNDS

100% RPM, EGT = 650°C, GEN LOAD = 200 AMPS, BLEED AIR ON

13,000 POUNDS

OAT °C	–50		–40		–30		–20		–10		0		10		20		30		40		50	
PR. ALT.	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS
SEA LEVEL									565	205	579	207	574	206	536	198	500	189	466	178	436	166
2,000							436	166	566	210	566	209	533	203	497	195	463	185	431	172		
4,000							555	212	557	213	523	206	492	199	460	190	429	179	399	164		
6,000							549	216	515	209	484	202	455	195	425	184	396	171	368	148		
8,000					537	218	507	212	474	204	446	197	420	189	392	176	365	157				
10,000					494	214	466	207	437	199	411	190	387	180	361	163						
12,000					455	209	428	201	401	191	378	180										
14,000			438	208	416	202	392	192	368	180												
16,000			401	201	380	192	358	180														
18,000	385	198	365	189																		

14,000 POUNDS

OAT °C	–50		–40		–30		–20		–10		0		10		20		30		40		50	
PR. ALT.	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS	F F PPH	TAS KTS
SEA LEVEL									565	204	579	206	574	204	536	196	499	186	465	174	435	160
2,000							435	160	567	208	565	207	532	201	496	191	463	180	430	166		
4,000							555	210	557	210	523	203	492	196	460	186	428	173	398	153		
6,000							549	213	514	206	483	199	455	190	425	178	395	161				
8,000					536	215	506	209	473	201	446	192	420	182	391	167						
10,000					493	211	465	203	436	194	410	184	386	170								
12,000					453	205	427	195	400	184												
14,000			436	203	415	196	391	184														
16,000			399	193																		
18,000	383	189																				

MANUFACTURER'S DATA

FIGURE 6-30A

SINGLE ENGINE LANDING DISTANCE OVER 50 FOOT HEIGHT – WITH ICE ACCUMULATION

B. F. GOODRICH SINGLE ROTOR BRAKES

ASSOCIATED CONDITIONS:

APPROACH SPEED .... SEE CHART (1.3 V_{S1} +19 KTS)
POWER .... AS REQUIRED FOR 3° APPROACH UNTIL 50 FT THEN FLIGHT IDLE
GEN LOAD .... AS REQUIRED
BLEED AIR .... ON OR OFF
ENG ANTI-ICE .... ON
RUNWAY .... DRY, LEVEL, ... HARD SURFACE
GEAR .... DOWN
FLAPS .... DOWN
BRAKING .... HEAVY DURING ROLLOUT
ANTI-SKID .... OFF (SEE NOTE)
NOSE WHEEL STEERING ..... ON OR OFF

EXAMPLE:

GIVEN: OAT = 0°C
PRESSURE ALTITUDE = 2,000 FEET
GROSS WEIGHT = 12,500 POUNDS
HEADWIND = 10 KNOTS
OBTAIN: APPROACH SPEED = 125.7 KIAS
LANDING DISTANCE = 3,450 FEET

PROCEDURE:

POWER REQUIRED FOR 3° GLIDE PATH ANGLE UNTIL 50 FEET ABOVE THE GROUND, THEN REDUCE POWER TO FLIGHT IDLE. LAND WITH MAXIMUM FLARE AND REDUCE POWER TO GROUND IDLE DURING ROLL OUT FOLLOWED BY HEAVY BRAKING.

NOTE

- SINGLE ENGINE LANDING DISTANCES ARE SHOWN AND, IN ALL CASES, ARE LONGER THAN TWO ENGINE LANDING DISTANCES.
- DECREASE LANDING DISTANCE BY 360 FEET WITH ANTI-SKID ON.

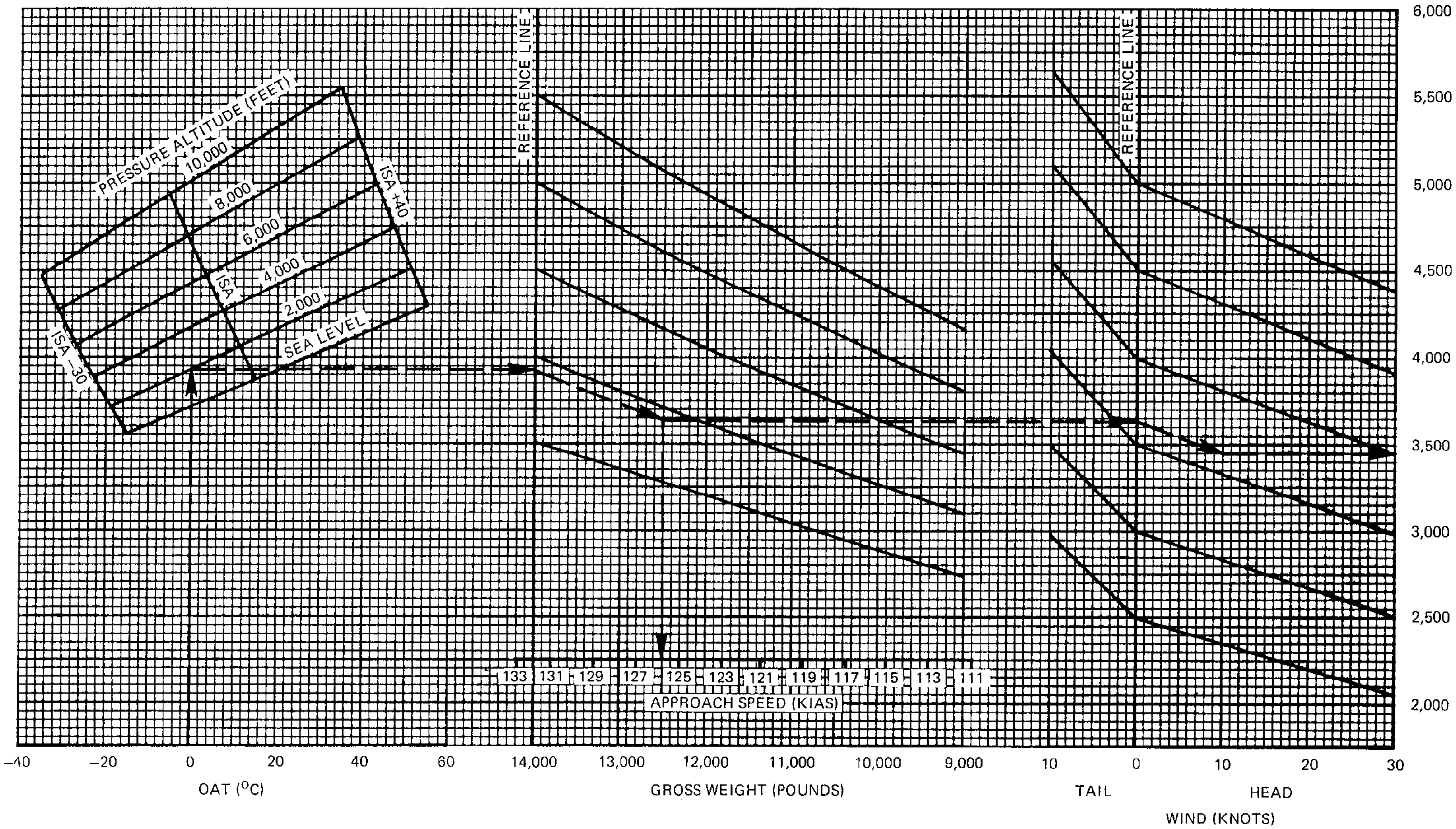

FIGURE 6-31

MANUFACTURER'S DATA

METRO III

TWO ENGINE LANDING DISTANCE OVER 50 FOOT HEIGHT - NO REVERSE
B.F. GOODRICH SINGLE ROTOR BRAKES

ASSOCIATED CONDITIONS:

APPROACH SPEED .... SEE CHART ($1.3 V_{S1}$)
POWER .... FLIGHT IDLE
GEN LOAD .... AS REQUIRED
BLEED AIR .... ON OR OFF
ENG ANTI-ICE .... ON OR OFF
RUNWAY .... DRY, LEVEL, HARD SURFACE
GEAR .... DOWN
FLAPS .... DOWN
BRAKING. . HEAVY DURING ROLLOUT
ANTI-SKID .... ON OR OFF
NOSE WHEEL STEERING. . . ON OR OFF

EXAMPLE:

GIVEN: OAT = -8°C
PRESSURE ALTITUDE = 5,000 FEET
GROSS WEIGHT = 13,500 POUNDS
HEADWIND = 5 KNOTS
OBTAIN: APPROACH SPEED = 111 KIAS
LANDING DISTANCE = 2,370 FEET

NOTE

LANDING GROUND ROLL IS 63% OF LANDING DISTANCE.

PROCEDURE:

USE FINAL APPROACH SPEED IN CHART WITH POWER AT FLIGHT IDLE. LAND WITH MINIMUM FLARE, MOVE POWER LEVERS TO GROUND IDLE AFTER LANDING, AND APPLY MAXIMUM BRAKING.

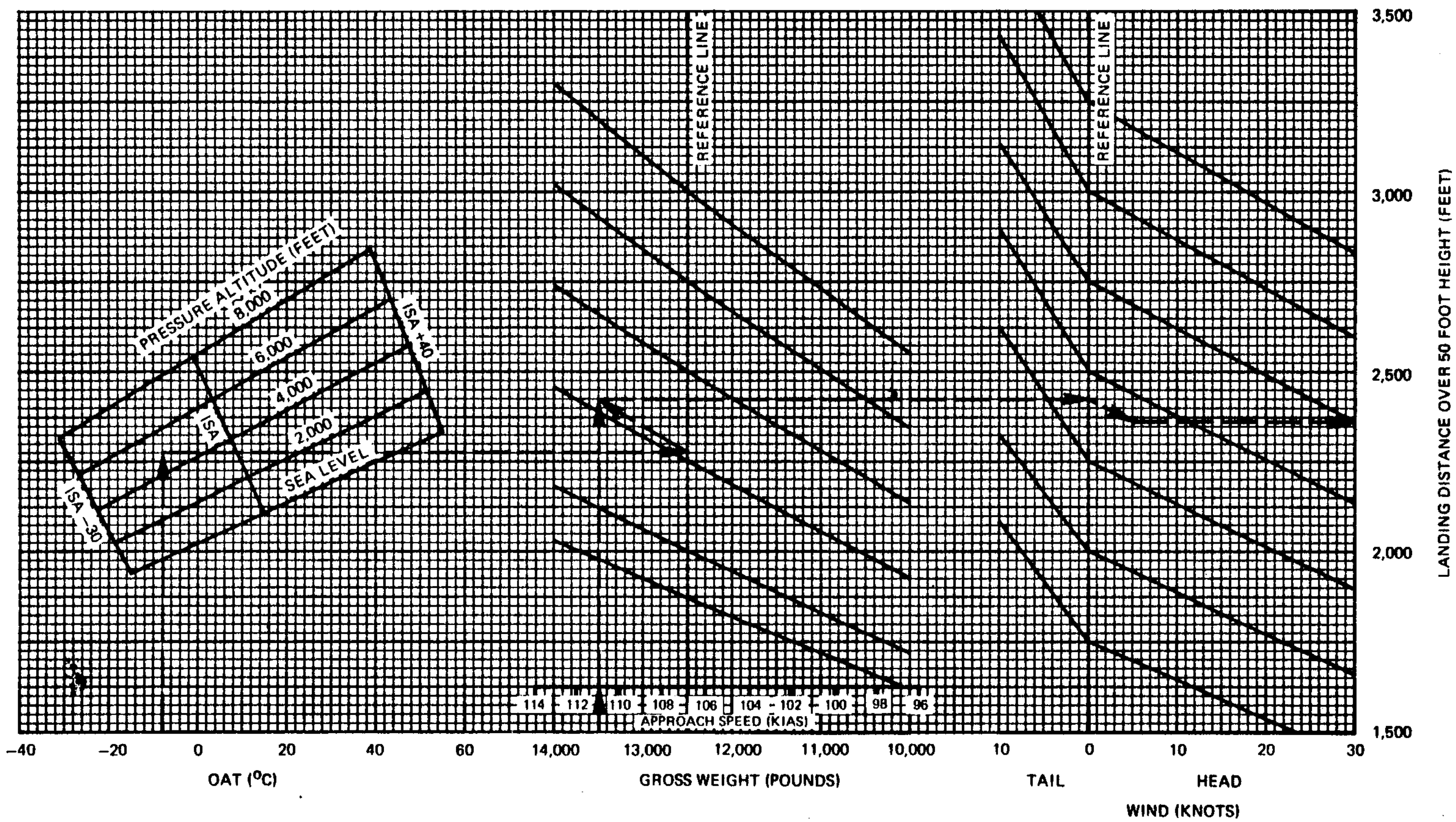

FIGURE 6-32

TWO ENGINE LANDING DISTANCE OVER 50 FOOT HEIGHT - FULL REVERSE
B.F. GOODRICH SINGLE ROTOR BRAKES

ASSOCIATED CONDITIONS:

APPROACH SPEED .... SEE CHART ($1.3\ V_{S1}$)
POWER .... FLIGHT IDLE
GEN LOAD .... AS REQUIRED
BLEED AIR .... ON OR OFF
ENG ANTI-ICE .... ON OR OFF
RUNWAY .... DRY, LEVEL, HARD SURFACE
GEAR .... DOWN
FLAPS .... DOWN
BRAKING. . HEAVY DURING ROLLOUT
ANTI-SKID .... ON OR OFF
NOSE WHEEL STEERING. . . ON OR OFF

EXAMPLE:

GIVEN: OAT = 18°C
PRESSURE ALTITUDE = 7,000 FEET
GROSS WEIGHT = 11,900 POUNDS
HEADWIND = 25 KNOTS
OBTAIN: APPROACH SPEED = 104.4 KIAS
LANDING DISTANCE = 1,925 FEET

NOTE

LANDING GROUND ROLL IS 58% OF LANDING DISTANCE.

PROCEDURE:

USE FINAL APPROACH SPEED IN CHART WITH POWER AT FLIGHT IDLE. LAND WITH MINIMUM FLARE, MOVE POWER LEVERS TO GROUND IDLE AFTER LANDING AND APPLY MAXIMUM BRAKING. CHECK BETA LIGHTS ILLUMINATED. APPLY FULL REVERSE BELOW 90 KIAS.

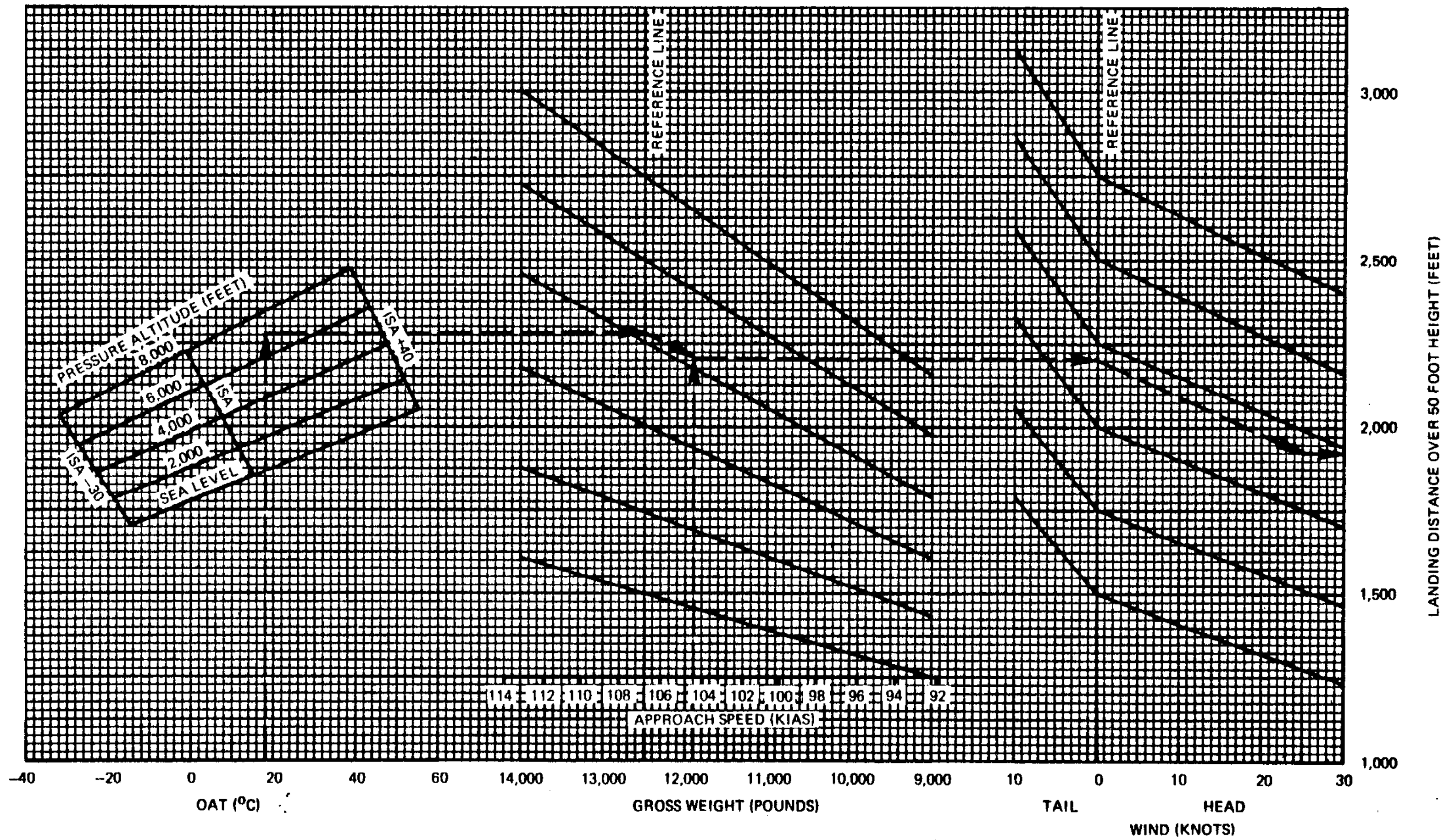

FIGURE 6-33

MANUFACTURER'S DATA

TWO ENGINE LANDING DISTANCE OVER 50 FOOT HEIGHT - FLAPS UP
B.F. GOODRICH SINGLE ROTOR BRAKES

ASSOCIATED CONDITIONS:

APPROACH SPEED .... SEE CHART ($1.3 V_{S1}$)
POWER .... FLIGHT IDLE
GEN LOAD .... AS REQUIRED
BLEED AIR .... ON OR OFF
ENG ANTI-ICE .... ON OR OFF
RUNWAY .... DRY, LEVEL, HARD SURFACE
GEAR .... DOWN
FLAPS .... UP
BRAKING. . HEAVY DURING ROLLOUT
ANTI-SKID .... ON OR OFF
NOSE WHEEL STEERING. . . ON OR OFF

EXAMPLE:

GIVEN: OAT = −8°C
PRESSURE ALTITUDE = 4,900 FEET
GROSS WEIGHT = 13,200 POUNDS
HEADWIND = 16 KNOTS
OBTAIN: APPROACH SPEED = 120 KIAS
LANDING DISTANCE = 2,725 FEET

NOTE

LANDING GROUND ROLL IS 57% OF LANDING DISTANCE.

PROCEDURE:

USE FINAL APPROACH SPEED IN CHART WITH POWER AT FLIGHT IDLE. LAND WITH MINIMUM FLARE, MOVE POWER LEVERS TO GROUND IDLE AFTER LANDING AND APPLY MAXIMUM BRAKING.

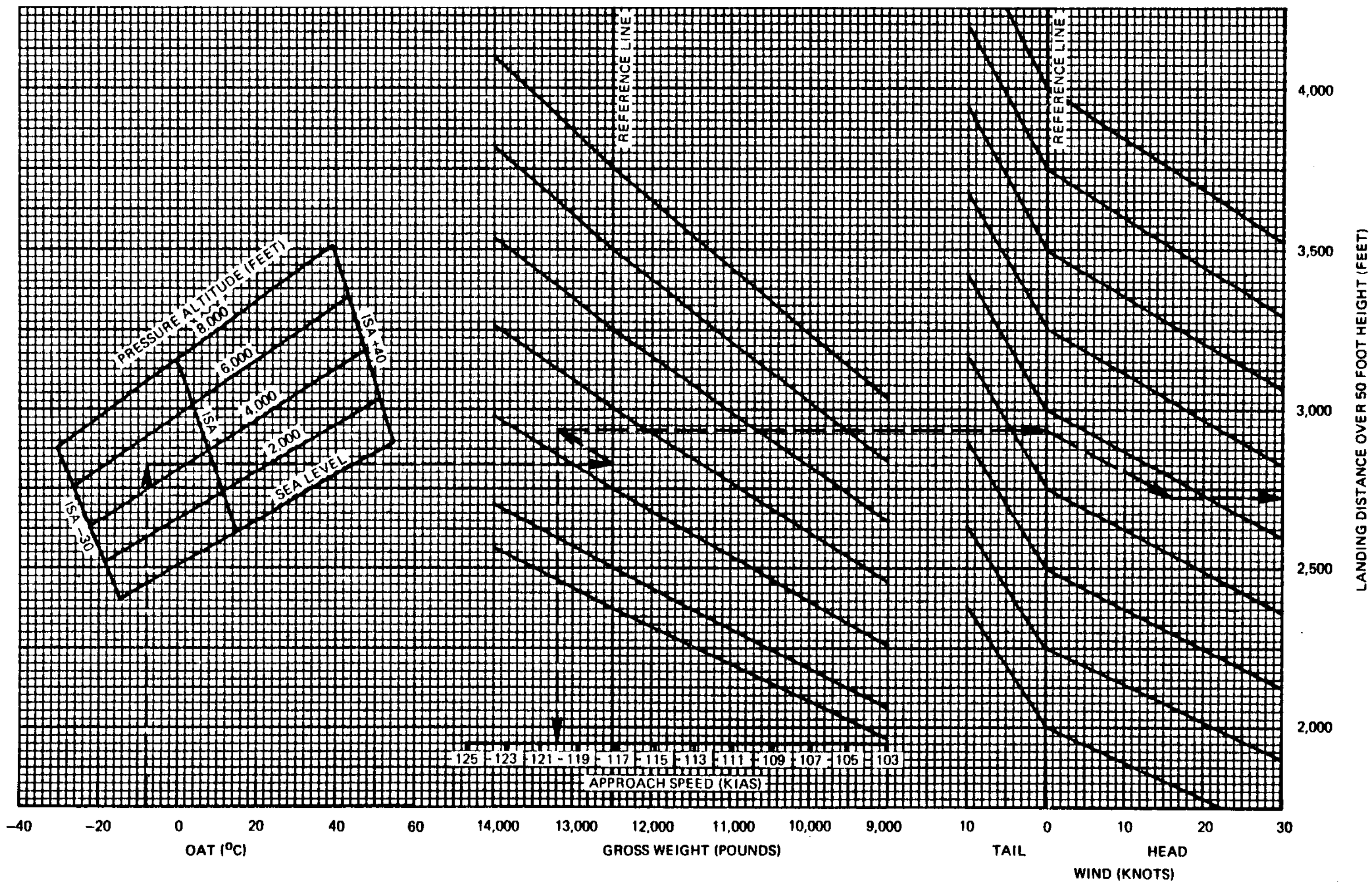

FIGURE 6-34

ENVIRONMENTAL CONTROL SYSTEM

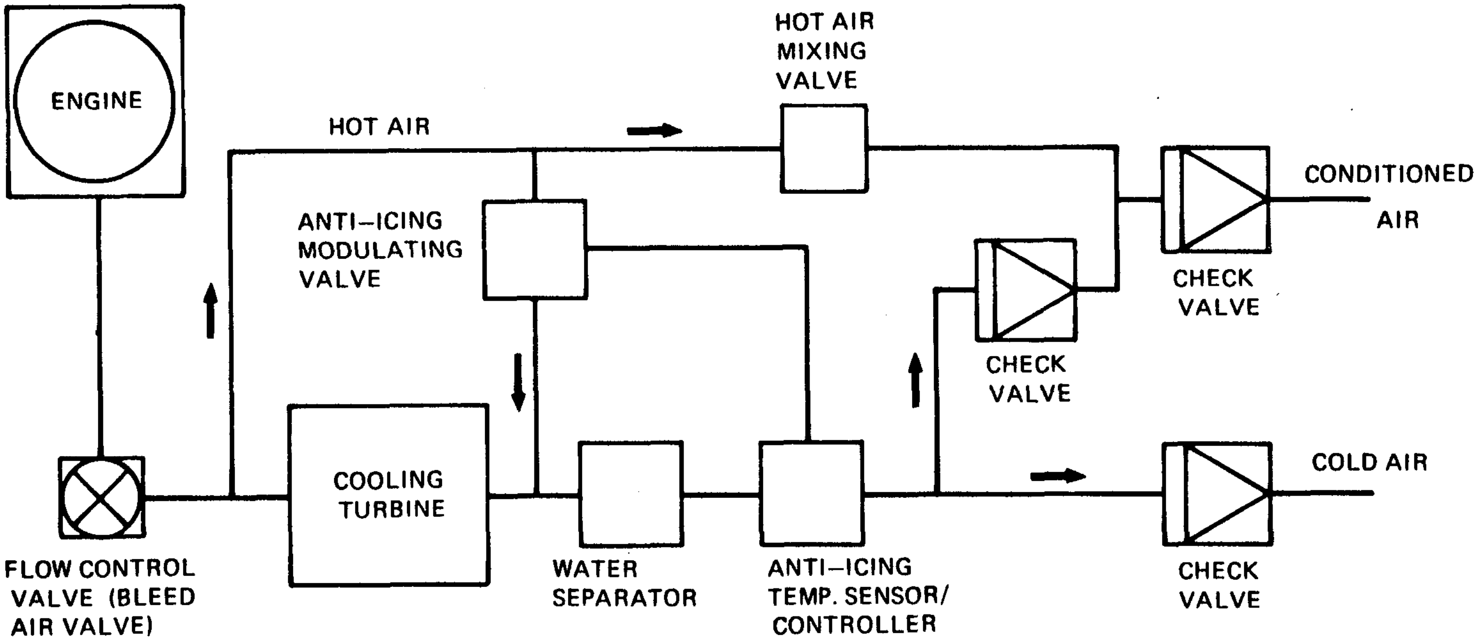

FIGURE 6-35

ENVIRONMENTAL CONTROL SYSTEM

The air conditioning system supplies cold air and conditioned air to the cabin and cockpit. Two independent systems are provided. Bleed air is supplied by each engine to drive cooling turbines which provide cool air for the aircraft. Hot bleed air is routed to the center section of the aircraft and mixed with cold bleed air to provide conditioned air. Either bleed air system may be operated on the ground when the respective engine is operating. Ducts within the fuselage distribute the air to the passengers and crew. An automatic temperature control system senses and regulates the temperature within the aircraft. Fresh air is supplied by a blower and motor assembly located in the nose baggage compartment.

The aircraft cabin is pressurized. The pressurization system automatically compensates for increasing aircraft altitude by maintaining cabin altitude as near to selected elevation as possible. The cabin altitude will remain at sea level, when selected, until aircraft altitude reaches approximately 16,800 feet pressure altitude. The pressurization system provides automatic over pressurization and negative pressure relief. Cabin pressure can be dumped manually in emergency situations.

The air conditioning system, the pressurization control system and the fresh air system comprise the environmental control system (ECS).

TEMPERATURE CONTROL UNIT

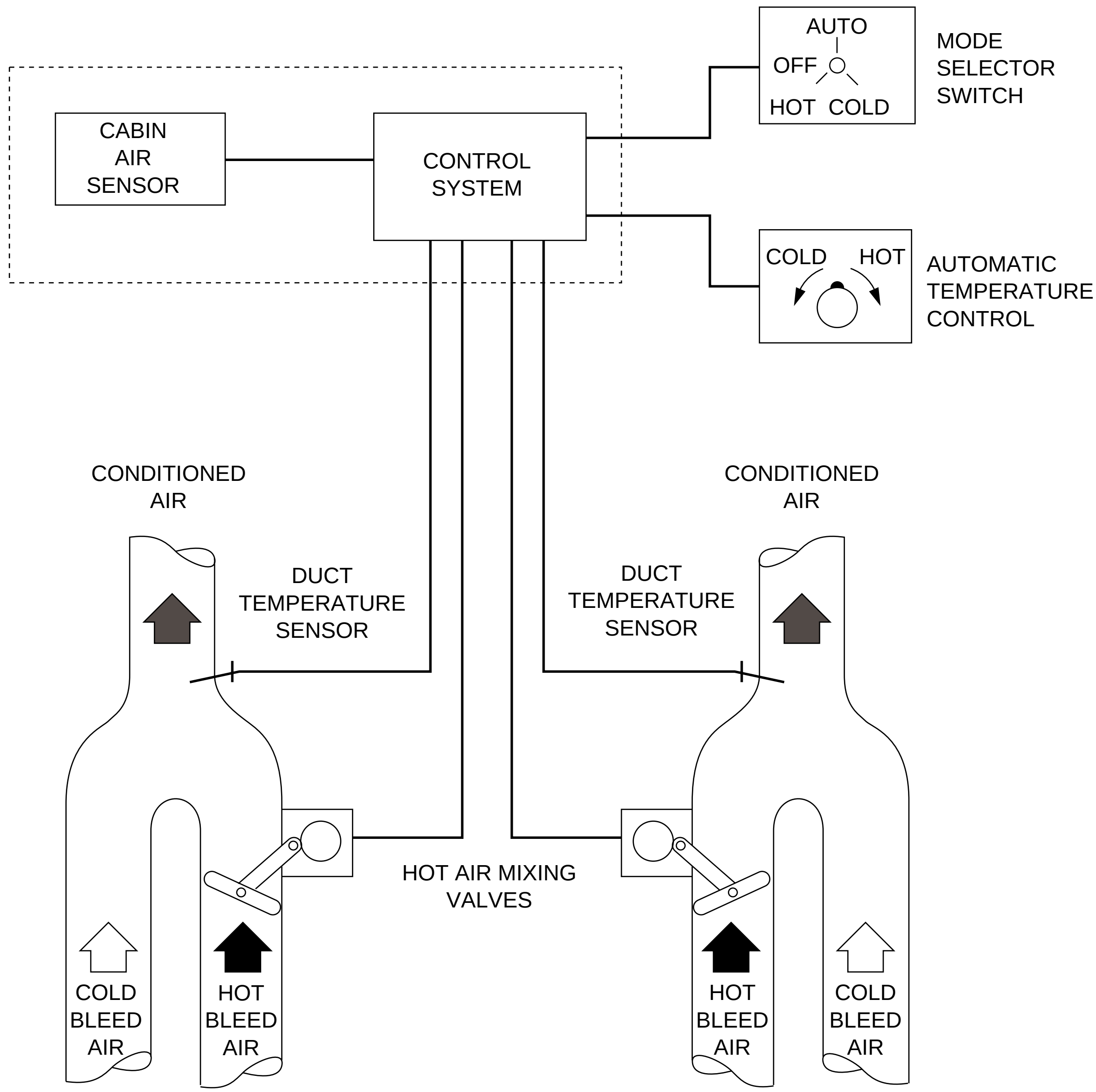

FIGURE 6-36

ENVIRONMENTAL CONTROL SYSTEM (continued)

TEMPERATURE CONTROL

The electrically powered temperature control system is used to maintain the cabin temperature at pilot-selected levels. The system may be operated in either of two modes, automatic or manual. In the automatic mode, the pilot selects a temperature level he wishes to maintain within the aircraft. The temperature control system will monitor the cabin temperature and the outside air temperature, and adjust the temperature of the conditioned air introduced into the cabin. In the manual mode, the pilot controls the temperature of conditioned air supplied to the cabin. The principal system components are as shown in Figure 6-36.

HEATING SYSTEM

Bleed air supplied by the engines, mixed with cold air from the cooling turbines, is used for heating the cockpit and cabin. The amount of engine bleed air introduced into the conditioned air ducts is controlled by two hot air mixing valves. These mixing valves are positioned electrically. Signals controlling the valve positioning come from the temperature control system.

COOLING SYSTEM

An air cooling turbine is installed near the nacelle in each wing leading edge. Cold, non-conditioned air from each cooling turbine enters the cabin and is ducted fore and aft to cold air outlets at crew and passenger stations. Formerly a customer option, a cold air dump valve is located in the cold air ducting under the floor on each side of the aircraft, aft of the wing. The dump valves allow the cold air to be ducted to the cabin and cockpit cold air outlets (dump valve closed) or to flow rearward through ducts which terminate in the tail cone and dump a major portion of the cold air near the outflow valve (dump valve open). The cold air dump valves are mechanically controlled flapper valves which can be modulated between full open and full closed by push-pull cables. The cable controls are located on the floor at the entrance to the cockpit.

ENVIRONMENTAL CONTROL SYSTEM (continued)

MOISTURE AND CONTAMINANT CONTROL SYSTEM

Moisture and other contaminants are removed from engine supplied bleed air before the air enters the cabin.

The cooling turbine output air, depending upon ambient conditions, will usually be below freezing in temperature and contain some percentage of water. A water separator is installed downstream of the cooling turbine to remove water from the air. Since the air exiting the turbine is below freezing, some of the water in the air will begin to freeze, usually inside the water separator. If continued freezing is allowed, the water separator will eventually become blocked. A deicing system is installed to prevent blocking of the water separator.

The deicing system consists of a slave valve that controls the introduction of hot bleed air into the cold air duct and a master valve that controls the operation of the slave valve. The master valve senses the outlet air temperature at the water separator. The master valve will control the slave valve as necessary to prevent freezing of the water separator.

BLEED AIR AND CONTROL

Air is extracted from a pad on the left hand side of each engine case for use in the environmental control system, surface deice system, and vacuum system. Part of the surface deice system provides pressure for the inflatable door seals. Before passing through the firewall, the bleed air is routed to a heat exchanger. The heat exchanger lowers the temperature of the bleed air approximately 100°F, thereby increasing the service life of the ECS components. Bleed air for use in the engine anti-icing system is routed and controlled through separate lines and valves.

A flow control valve is used to regulate the bleed air flow. Since the extraction of bleed air will cause a loss in engine power, the amount of air extracted must be carefully regulated. The flow control valve is calibrated to extract a preset amount of bleed air from the engine under all operating and ambient conditions. When the cockpit bleed air switch is moved to the OFF position, the flow control valve will close to stop bleed airflow to the ECS. The bleed air supplied to the engine anti-icing and vacuum systems is not controlled or affected by the flow control valve.

ENVIRONMENTAL CONTROL SYSTEM (continued)

FRESH AIR SYSTEM

A blower motor and associated distribution plumbing supply fresh air to the cockpit. The blower is located under the nose baggage compartment left hand floorboard. A check valve prevents the escape of cabin pressurization in flight.

A switch actuated by the nose gear during retraction serves as a safety interlock to prevent operation of the fresh air fan in flight. An override position of the fresh air fan switch allows this interlock to be defeated in case the fan is needed in flight. The fan should not be operated with the cabin pressurized.

FRESH AIR BLOWER AND CHECK VALVE

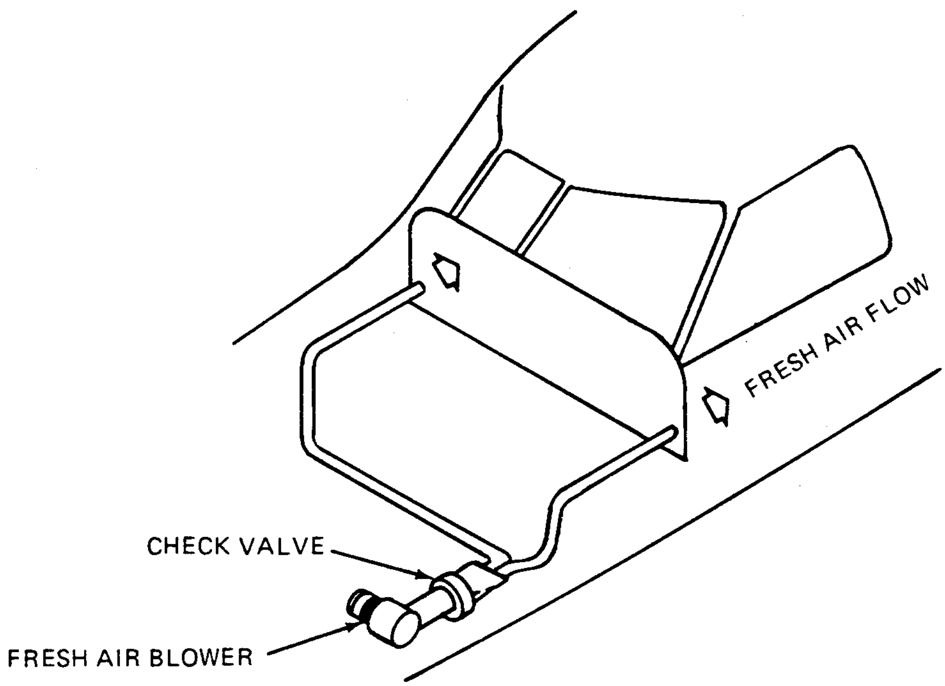

FIGURE 6-37

ENVIRONMENTAL CONTROL SYSTEM (continued)

PRESSURIZATION SYSTEM

The pressurization system, within the limits available, maintains the cabin of the aircraft at any selected pressure altitude equal to or lower than the aircraft altitude. In normal operation, the system controls the increase or decrease in cabin pressure and the rate at which these changes in pressure take place. Safety features prevent the cabin from exceeding the maximum pressurization limit and from maintaining a negative pressure (cabin pressure less than ambient pressure). A safety dump valve is used to manually dump cabin pressure. The entire fuselage, with the exception of the nose baggage compartment, is pressurized. The outflow valve, which controls air leaving the fuselage, is located on the aft pressure bulkhead. The emergency dump valve is located on the forward pressure bulkhead. Normal airflow through the aircraft is rearward and out the outflow valve. With the emergency dump valve open, the airflow is forward.

PRESSURIZED VESSEL

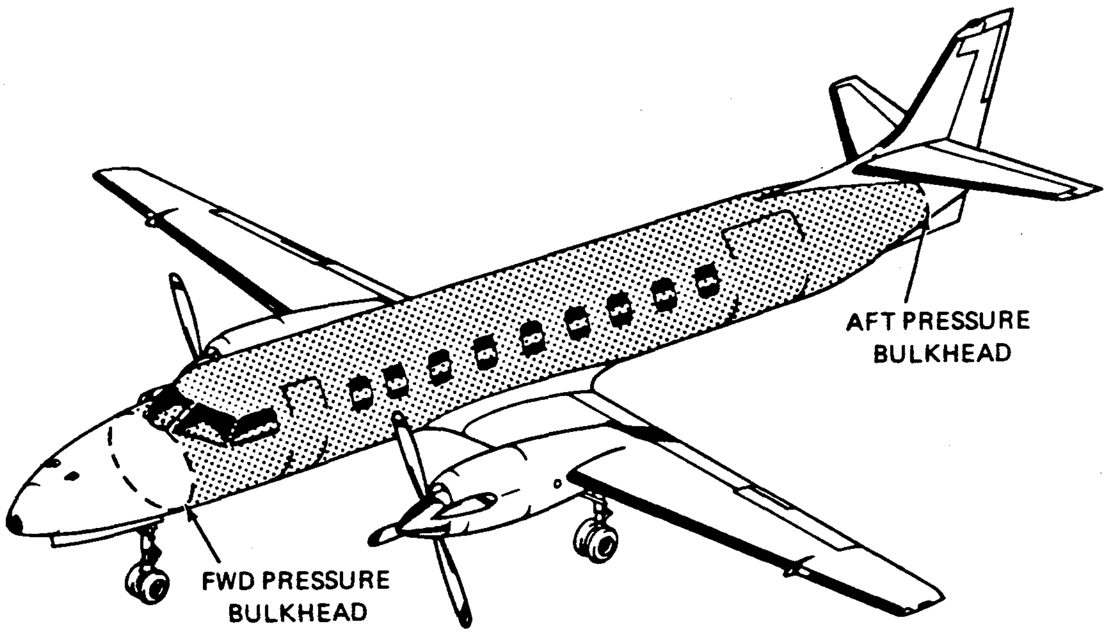

FIGURE 6-38

ENVIRONMENTAL CONTROL SYSTEM (continued)

PRESSURIZATION SYSTEM COMPONENTS

Cabin Altitude Warning

The cabin altitude warning system is used to inform the pilot that cabin altitude has exceeded approximately 11,000 feet. Above this altitude supplemental oxygen will be required. Illumination of the cabin altitude warning light usually indicates a problem with the pressurization system.

Dump Valve

The pressurization dump valve can be used to quickly depressurize the cabin should a malfunction of the pressurization system occur. The dump valve, located on the left hand side of the forward pressure bulkhead, is connected to a static source, the vacuum system , and the dump valve electrical circuitry. Power is supplied to open the valve when the aircraft is on the ground. After takeoff, with the dump switch in NORMAL, the valve will close. Vacuum is supplied to the valve causing the valve to close slowly, thus preventing a pressure bump immediately after takeoff. Electrical power for the valve may be obtained from either essential bus by using the transfer switch. The dump valve also contains internal overpressurization relief that will cause the valve to open should the pressure differential between the cabin and ambient exceed 7.30, plus or minus .10 psi.

Outflow Valve

The outflow valve, installed on the aft pressure bulkhead, is used to control the flow of air out of the aircraft pressure vessel. The valve responds to pressure commands supplied by the pressurization control system through the pneumatic relay. If the maximum differential pressure between the aircraft cabin and ambient pressure exceeds 7.15 psi, the valve will open regardless of the command being supplied by the pressure control system. Also incorporated into the outflow valve is automatic vacuum relief capability. If the pressure within the aircraft cabin is lower than the ambient pressure, the outflow valve will open to equalize the pressure.

Pneumatic Relay

The pneumatic relay is used to speed up the reaction time of the outflow valve to commands given by the pressurization control system. Small changes in pressure to the control connection of the relay produce large but corresponding changes in pressure to the outflow valve connection. The relay is located in the aft fuselage area.

ENVIRONMENTAL CONTROL SYSTEM (continued)

PRESSURIZATION SYSTEM COMPONENTS (continued)

Mode Selector and Manual Control

Manual pressurization controls consist of the pressurization mode selector and manual rate control. The mode selector is a two position valve that controls the connection of the aircraft vacuum system to the pressurization system. In the AUTO position, vacuum is supplied directly to the ATMOS 3 port of the pressurization controller. In the MANUAL position, vacuum is supplied to the manual rate control.

The manual pressurization rate control is a needle valve that controls the amount of vacuum supplied to the outflow valve (through the pneumatic relay). Opening the valve (turning counterclockwise) supplies more vacuum to cause the outflow valve to open and decrease cabin pressure. Closing the valve (turning clockwise) supplies less vacuum to cause the outflow valve to close and increase cabin pressure. In comparison to the pressurization controller, the manual rate control provides very coarse adjustment. When using the manual system, small adjustments must be made with the manual rate control knob and adequate time must be allowed for them to take effect. Opening the manual rate control with the aircraft pressurized can produce a very rapid depressurization that may be uncomfortable for passengers.

ELECTRICAL SYSTEMS

The aircraft is equipped with a DC and an AC power system. The DC power distribution system is a segmented, three bus system consisting of two essential buses and one nonessential bus. Each bus may be selectively disabled and is over voltage and overload protected. Redundant circuitry is provided to ensure the operation of all essential and emergency electrical and electronic systems.

The 115 VAC and 26 VAC buses provide power for AC equipment. Either of two AC inverters powers those buses.

DC POWER DISTRIBUTION

As shown in Figure 6-39A or 6-39B, the battery bus forms the central distribution point for power. Each battery is connected, through a battery relay, to the battery bus relay and then to the battery bus itself. A 150 amp circuit breaker supplies power to the nonessential bus. Power to each bus is controlled by a bus tie switch. Each generator supplies power to the battery bus through a 325 amp circuit limiter. Power supplied to each bus is distributed to the various circuit breakers by smaller bus bars.

SIMPLIFIED DC DISTRIBUTION SCHEMATIC
(Airplanes NOT modified by Service Bulletin 227 24-015)

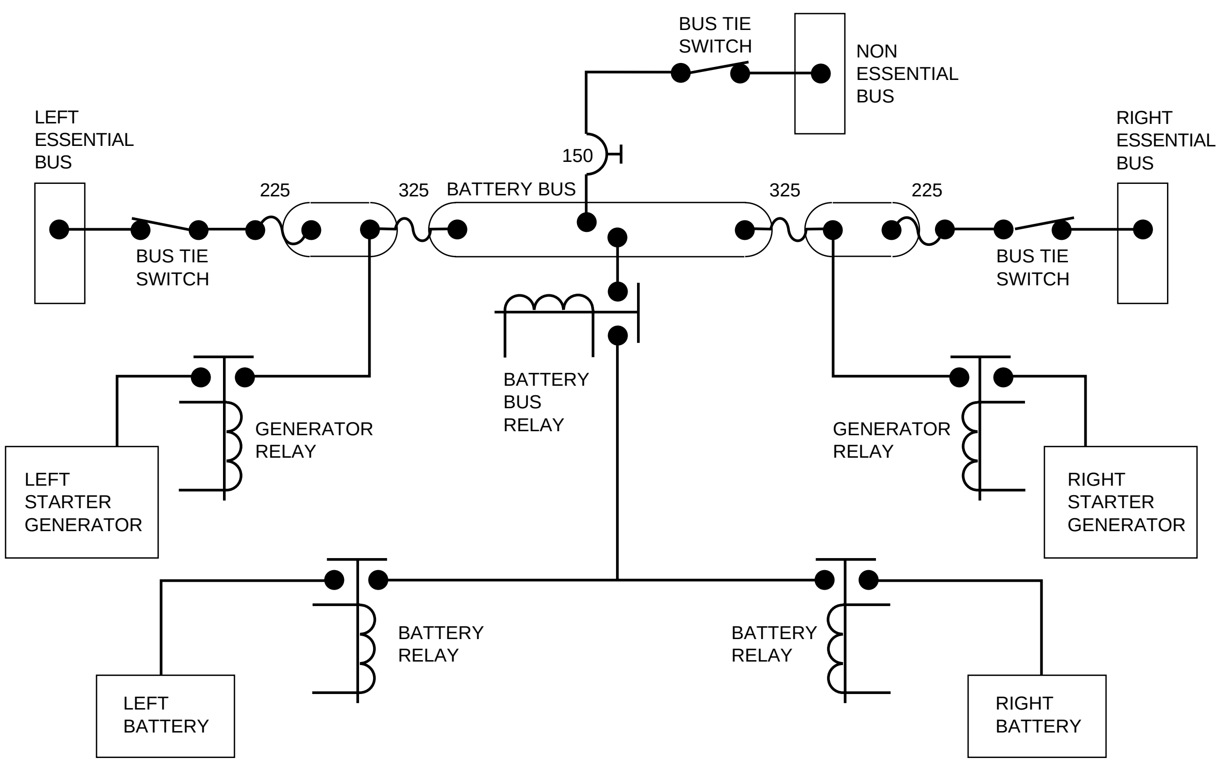

FIGURE 6-39A

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ELECTRICAL SYSTEMS (continued)

SIMPLIFIED DC DISTRIBUTION SCHEMATIC (continued)

(Airplanes modified in accordance with Service Bulletin 227 24-015)

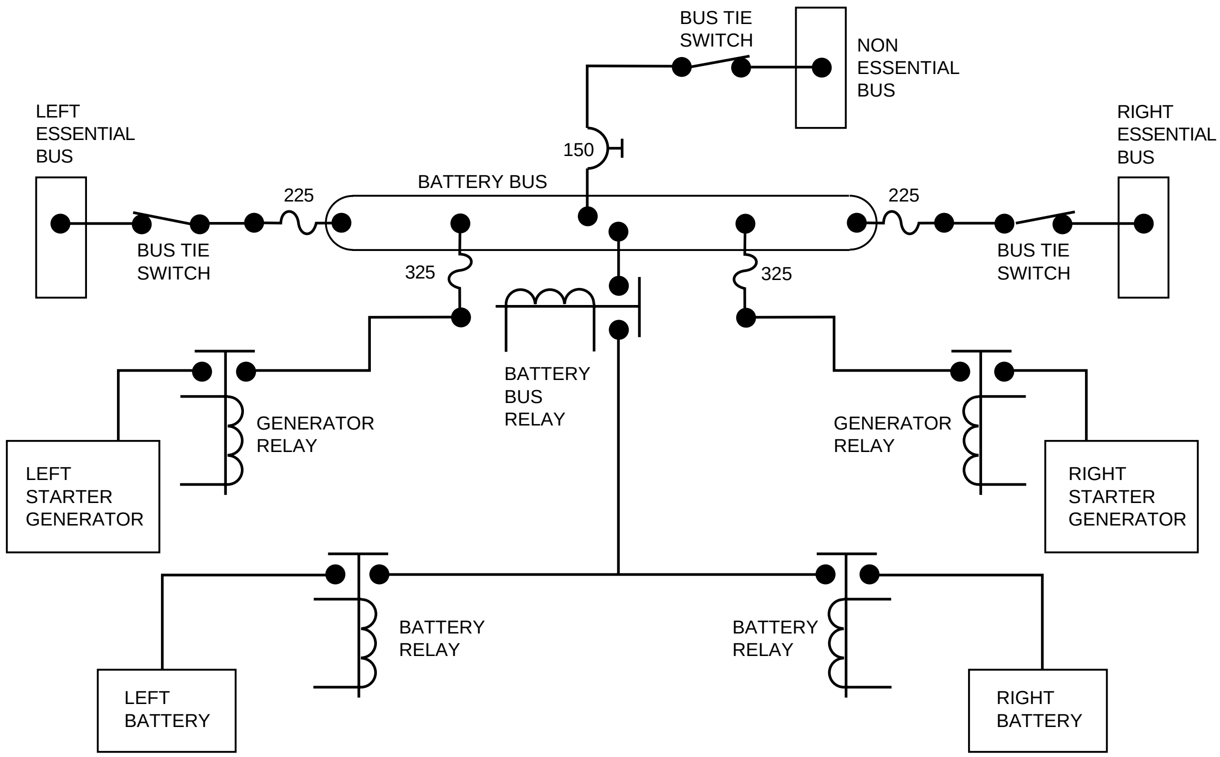


FIGURE 6-39B

ELECTRICAL SYSTEMS (continued)

BUS TRANSFER

Nine essential items (normally switched to the left essential bus) may be transferred from one essential bus to the other. The transferrable items are:

1. Turn and slip indicator (pilot's)
2. Fuel crossflow.
3. Windshield heat (pilot's)
4. Landing gear control
5. Landing gear position
6. Surface deice boots
7. Cabin pressure dump
8. L intake heat
9. R intake heat

In some avionics installations, a tenth transfer switch may be installed to allow transfer of power to selected pilot's avionic equipment.

DC POWER SOURCES

Batteries

Two 24 volt, nickel-cadmium batteries are installed in the aircraft. They are located, one in each wing, inboard of the nacelles. Each battery is rated at 24 ampere hours at the 5-hour rate, at 80^{o}F.

Generators

The primary power for the aircraft DC system is supplied by two engine-driven starter-generators. The generators are rated at 200 amperes (300 amps, later aircraft) continuous operation. The generators will deliver power to the DC system at all engine speeds at and above ground idle.

External Power Supply

A ground power unit receptacle normally is located on the outboard side of the right hand engine nacelle. The receptacle location may differ, depending upon customer option. This receptacle may be used to supply auxiliary DC power during routine servicing and engine starts. Power from the ground power unit is connected directly to the aircraft bus system. Auxiliary power is not connected to the aircraft bus system until either battery switch is turned on.

ELECTRICAL SYSTEMS (continued)

DC POWER SOURCES (continued)

External Power Switch

Some aircraft are equipped with an external power unit switch, normally located at the right end of the copilot's switch panel near the fresh air fan control switch. The purpose of the switch is to allow the pilot to monitor the output of the auxiliary power unit prior to introducing external power to the aircraft. When the switch if OFF, the pilot can check the voltage of a connected GPU on the aircraft DC voltmeter. However, the output of the GPU will not be connected to remaining aircraft systems until a battery switch and the external power switch are moved to their ON positions.

ELECTRICAL SYSTEMS (continued)

AC POWER DISTRIBUTION

Either of two DC powered 350 volt-amp static inverters provides AC power for the aircraft. Inverter operation is pilot selectable. In case of inverter failure, the pilot must select the other inverter.

Operation

The two inverters are controlled by a switch installed on the copilot's switch panel. Power for No. 1 inverter comes from the left essential bus and power for No. 2 inverter comes from the right essential bus. When an inverter is selected, power from the one amp inverter control circuit breaker is used to close the inverter power relay. The inverter relay powers the respective inverter and the AC switching relay. The inverter output is both 115 volts and 26 volts and is fed to the AC buses.

The AC distribution system is shown in Figure 6-40. Bus tie circuit breakers between both the 26 volt and the 115 volt buses allow AC power to flow to all buses.

NOTE

> The inverter switch is designed to permit operation of only one inverter at a time.

SIMPLIFIED AC DISTRIBUTION SCHEMATIC

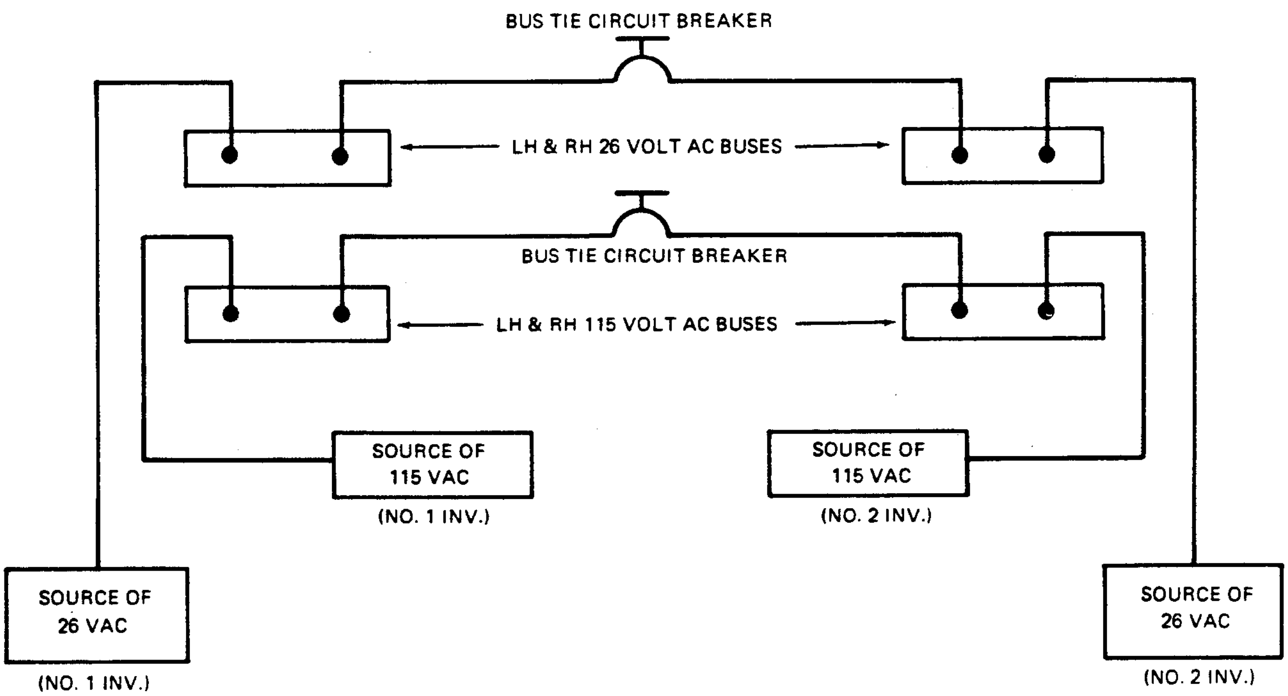


FIGURE 6-40

WARNING AND MONITORING SYSTEMS

The pilot is informed of the condition and operational status of the various sources of electrical power. Each system will be discussed separately.

BATTERY TEMPERATURE INDICATOR

Refer to NORMAL PROCEDURES section for description and operation of this system.

BATTERY DISCONNECT LIGHT

An amber battery disconnect light, when illuminated, indicates the respective battery relay has opened and disconnected the battery from the bus system. The circuit consists of contacts inside the battery relay which are shorted to ground when the relay is open. The disconnect light function is turned off during the engine start cycle.

BATTERY FAULT LIGHT

The red battery fault light illuminates when the fault protection panel senses a battery fault and disconnects the batteries. The circuit consists of a relay inside the fault control panel which provides power to illuminate the fault light.

GENERATOR FAIL LIGHT

An amber generator fail light, when illuminated, indicates the respective generator relay has opened, disconnecting the generator from the bus system. Contacts inside the generator relay are shorted to ground when the relay is open. Circuitry inside the annunciator panel to power the light also serves as a press-to-test function.

WARNING AND MONITORING SYSTEMS (continued)

AC VOLTMETER AND BUS FAIL LIGHTS

A bus selectable voltmeter and two amber bus failure caution lights comprise the AC warning and monitoring systems. The AC voltmeter is powered from the 115 volt bus system. A selector switch allows either bus to be monitored. Each 115 volt bus also powers a bus failure relay. When voltage is present at the bus, the relay is energized and breaks the path for power to the AC bus caution light. If power is lost to the bus, the relay relaxes and the light illuminates, indicating a loss of bus power. Illumination of one AC caution light is normally an indication of an AC bus tie circuit breaker failure. Illumination of both caution lights is normally an indication of an AC power source failure.

GENERATOR AMMETER

Two ammeters are installed in the left side console to indicate the respective generator's output. Each meter is powered by a shunt installed in the negative side of the respective generator.

VOLTMETER AND SELECTOR SWITCH

A voltmeter and selector switch are used to monitor any one of six sources listed below. Each source providing a signal to the voltmeter contains a circuit breaker for protection. The functions of each switch position are as follows:

1. L or R battery position: Monitors the battery voltage of the battery side of the battery relay. In order to obtain an accurate reading, the battery switch should be moved to OFF to isolate the battery from the bus. If a reading is taken with the battery switch ON, the indicated battery voltage will be approximately equal to bus voltage.

2. L or R GEN position: Monitors the generator voltage of the generator side of the generator relay. In order to obtain an accurate reading, the generator switch should be moved to the OFF position, isolating the generator from the bus. If a reading is taken with the generator switch ON, the indicated generator voltage will be approximately equal to bus voltage.

3. BUS position: Monitors the voltage at the battery bus in the electrical panel behind the pilot's seat. This voltage will be the average of the voltages applied to the bus. For example, with one battery switch on and no generators operating, the bus and battery voltage will be approximately equal.

4. GPU position: Monitors the voltage output of a GPU connected to the aircraft. Voltage upstream of the battery bus relay is monitored. After the battery switch is moved to ON, this voltage will be approximately equal to bus voltage.

NOTE

To avoid battery drain after shutdown, the voltmeter selector should be placed in the DC bus position.

VOLTMETER AND SELECTOR SWITCH CIRCUIT

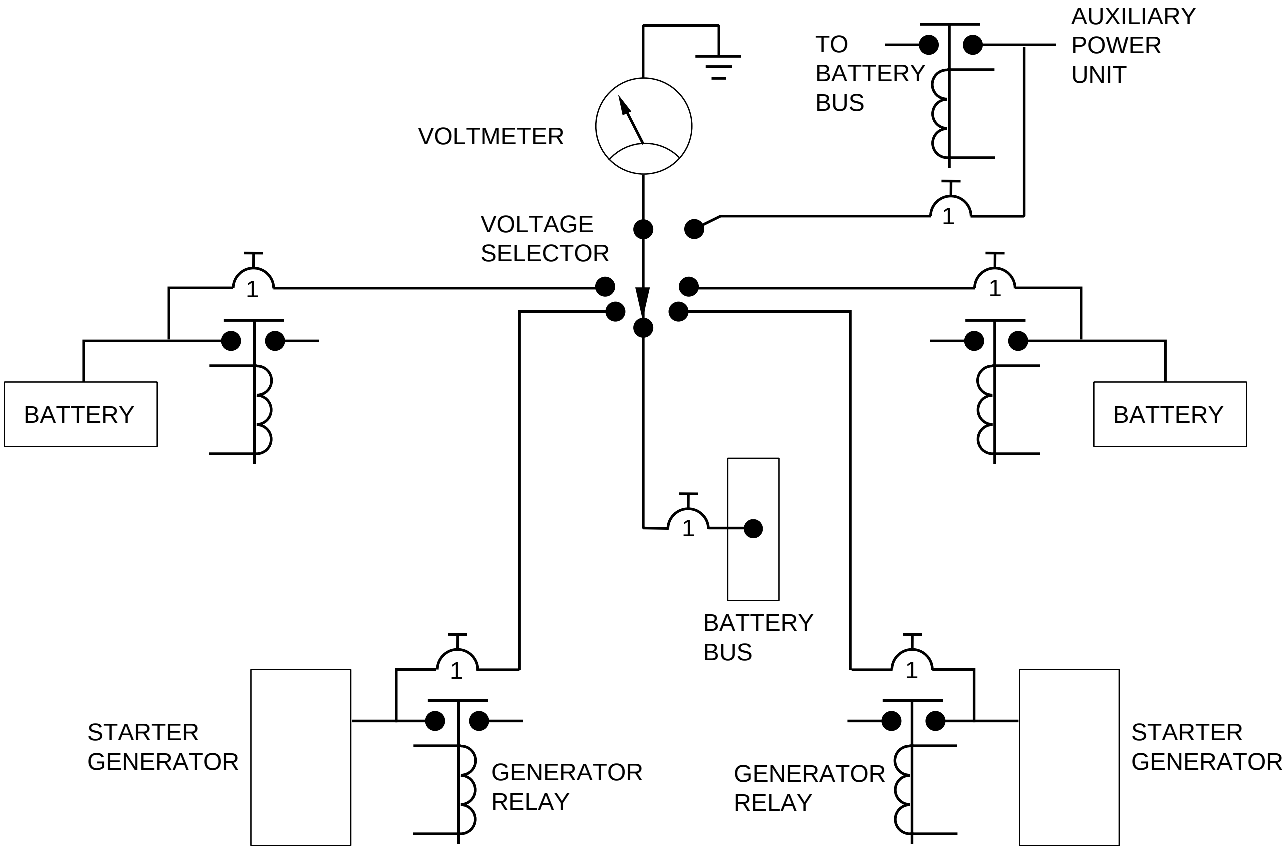


FIGURE 6-41

PASSENGER ENTRANCE DOOR

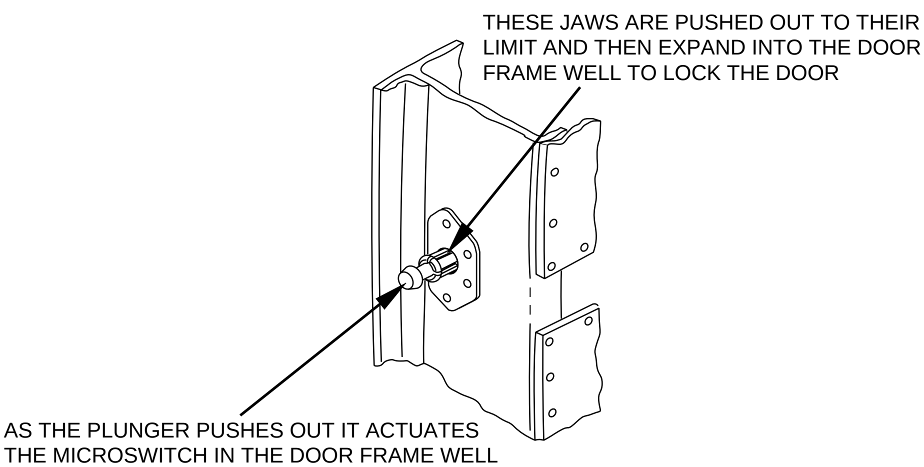
The passenger entrance door is located on the left side forward of the prop plane and is of the air stair type. The latch mechanism is capable of being operated from inside or outside of the aircraft and is equipped with a key operated locking device. A warning light located on the instrument panel indicates the status of the door latches. A patented latch mechanism (click-clack) provides carry-through structure when the door is closed on earlier aircraft. Later aircraft are equipped with additional structure around the doorway and bayonet latches in the door. The door is equipped with a spring to assist in closing and a hydraulic snubber to allow the door to open smoothly. The door on later airplanes is equipped with door closers which are operated by gas springs.

The latch mechanism should be kept clean. Lubricants that leave an oily or greasy coating should not be used because they tend to cause an accumulation of dirt and other contaminants. Refer to the Maintenance Manual for procedures for inspection, cleaning, installation, adjustment, and servicing.

CAUTION

ENSURE THAT THE CLICK-CLACK OR BAYONET LATCHES ARE COMPLETELY RETRACTED INTO THE DOOR BEFORE ATTEMPTING TO CLOSE THE DOOR. ATTEMPTING TO CLOSE THE DOOR WITH A LATCH EXTENDED CAN CAUSE SERIOUS DAMAGE TO THE LATCH. THIS DAMAGE, IN TURN, MAY MAKE IT IMPOSSIBLE TO EXTEND THE LATCHES PROPERLY INTO THE DOOR FRAME OR IT MAY CAUSE THE DOOR TO BE IMPOSSIBLE TO OPEN BY NORMAL PROCEDURE AFTER IT HAS BEEN CLOSED.

CLICK-CLACK



CLICK-CLACK EXTENDED
(DOOR HANDLE IN CLOSED POSITION)

FIGURE 6-42

EMERGENCY EXITS

Three emergency exits incorporating normal cabin windows are provided. Each exit provides a 20 by 28 inch opening. Two are located on the right side of the fuselage over the wing and one is located on the left side of the aircraft over the wing. The placards and handles are illuminated by fluorescent materials for operation in total darkness.

EQUIPMENT/FURNISHINGS

FLIGHT COMPARTMENT

The flight compartment is equipped with dual flight controls, instruments, and electrical control panels conveniently located for crew accessibility. Upholstered seats are provided for the pilot and copilot. Each seat is mounted on parallel tracks bolted to the compartment floor. The seats are adjustable vertically and horizontally and are removable (See Figure 6-43). Depressing a button under the inboard armrest releases a locking mechanism and allows the armrest to be lowered. The outboard armrests rotate upward and are stowed vertically.They must be lifted vertically to unlock them prior to rotating them to the horizontal position. The flight compartment is sound dampened and insulated with flame-resistant material.

PILOT'S SEAT

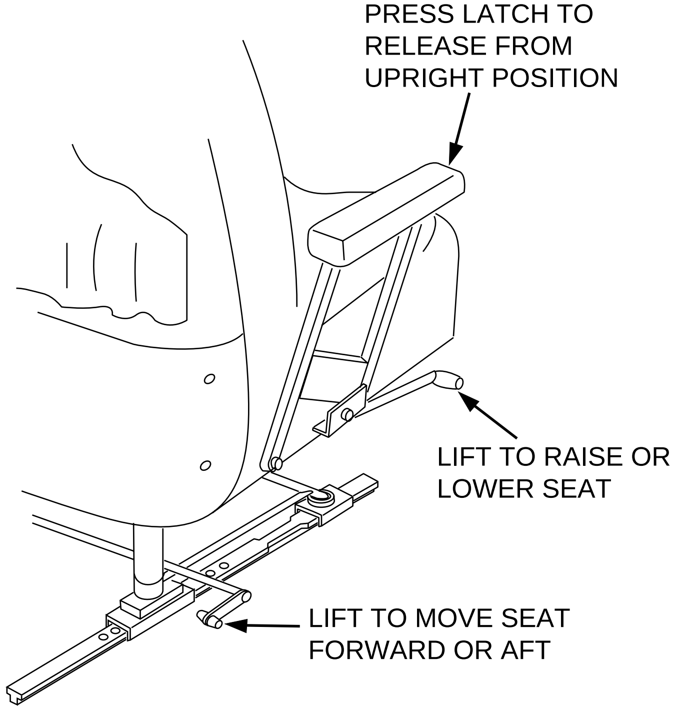


FIGURE 6-43

EQUIPMENT / FURNISHINGS (continued)

PASSENGER COMPARTMENT

The passenger compartment typically is equipped with 19 passenger chairs. The chairs are installed in two rows with a center aisle. To provide space for cargo, the seats may be removed. A movable bulkhead provides visual isolation of the passenger and cargo compartments. Fittings are provided for its installation at each chair station as far forward as the aft emergency escape hatch. This enables conversion between passenger and cargo loading at 30-inch increments, with passenger loading through the forward door and cargo through the aft door. The cabin flooring is designed f or uniformly distributed loading of 150 pounds per square foot. A cargo tiedown net is provided as loose equipment. A shelf is installed just aft of the rear cargo compartment. This shelf is designed to carry additional remote-mounted avionics equipment as well as a number of the standard equipment items.

INTERIOR ARRANGEMENT

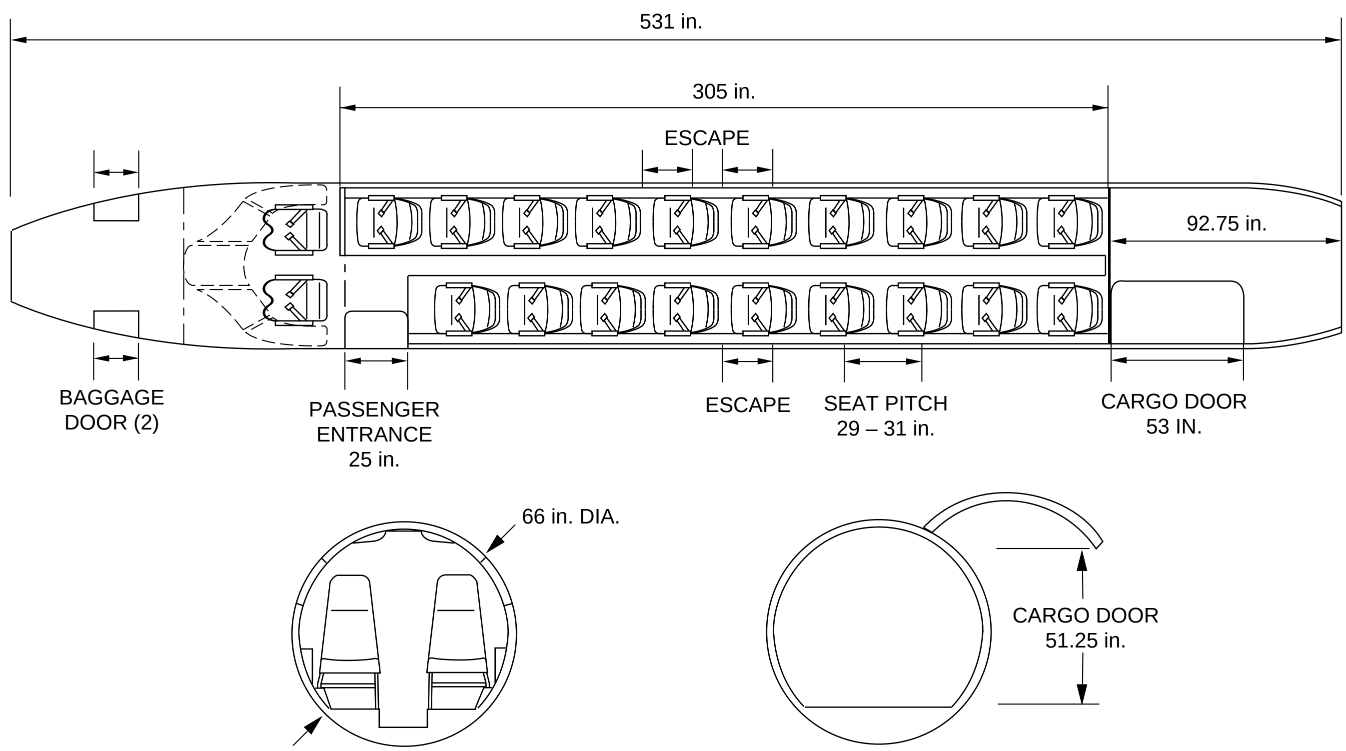


FIGURE 6-44

EQUIPMENT / FURNISHINGS (continued)

PASSENGER COMPARTMENT (continued)

Passenger Advisory Lights

The passenger advisory lights consist of FASTEN SEAT BELT – NO SMOKING signs located on the bulkheads at the forward end of the cabin. The lighting for the signs is controlled by a switch on the copilot's switch panel. A passenger alerting chime, which sounds when the switch is repositioned, is available as a option along with the avionics equipment.

INTERIOR

The interior is provided with a wide choice of fabrics, trim materials, and colors. The following is standard equipment.

COCKPIT

1. Two four-way adjustable seats with folding armrests and shoulder harnesses.
2. Ash tray at each crew station.
3. Partial bulkhead behind pilot and arm height curtain on right.
4. Cold air outlet at each crew station.
5. Foot warmer at each crew station.
6. Oxygen outlet at each crew station.
7. Map light at each crew station.
8. Cockpit storage pockets.
9. Clip on sun visors.

CABIN

1. Side mounted seats with fold-over back and pocket.
2. Reading light and air outlet at each seat location.
3. Ash tray at each seat location.
4. Oxygen outlet at each seat location.
5. Underseat baggage restraint for each seat.
6. Floor lights.
7. Hot air outlets at floor.
8. Movable bulkhead separating cabin and rear baggage compartment.

FIRE DETECTION AND PROTECTION

ENGINE FIRE DETECTION AND EXTINGUISHING SYSTEM

Refer to NORMAL PROCEDURES section for description and operation of this system.

WHEELWELL AND WING OVERHEAT WARNING SYSTEM

A wheelwell and wing overheat warning system is provided. Red L WING OVHT and R WING OVHT warning lights are located on the annunciator panel. Two warning modes are incorporated, **STEADY** and **FLASHING**. A steady warning takes precedence over a flashing warning. It is the more critical of the two warnings. A steady illumination indicates an overheat condition in the wheelwell and/or the conditioned air duct. A wheelwell overheat can be caused by a bleed air leak, overheated brakes or a brake/tire fire. A flashing illumination indicates an overheated condition in the leading edge cavity caused by a bleed air leak or an electrical problem. Refer to EMERGENCY PROCEDURES section for procedures to be followed in the event the lights illuminate. The steady illumination Emergency Procedure addresses both modes.

TEST SWITCH

The test switch for the wheelwell and wing overheat warning system is the same test switch used to test all annunciator panel lights.

HAND HELD FIRE EXTINGUISHER

Two hand held fire extinguishers are provided in each aircraft. One is located directly behind the copilot's seat and the other is located on the side wall, immediately aft of the passenger entrance door. The extinguishers are usable at temperatures of -40^{o}F through $+120^{o}$F for use on liquid, grease, and electrical fires.

FLIGHT CONTROLS

The flight controls are manually and electrically controlled from the pilot's or copilot's position by conventional means. The flight controls consist of ailerons with a trimmable balance tab on each aileron, the rudder with trim tab, a horizontal stabilizer which is electrically operated, elevators, and electrically controlled/hydraulically operated wing flaps.

AILERONS

The aileron control system is interconnected to dual control wheels for operation by either pilot. Cables are attached to a chain and sprocket segment at each control wheel. The cables are routed through the control column, then beneath the cabin center aisle floor, and connect to the aileron bow tie and bellcrank shaft which passes through the pressure vessel at a bearing seal. The shaft turns the main bellcrank which actuates push-pull rods which are routed to the ailerons. The push-pull rods are attached to a series of bellcranks mounted along the rear spar. Each aileron is attached to the wing at three brackets. An adjustable push-pull rod, connected to a swing link at each outboard bellcrank, actuates the aileron.

Aileron Trim Tabs

The aileron trim tabs are controlled by a trim tab wheel on the control pedestal through a cable system which actuates the trim actuators mounted on the rear wing spars. The actuators move push-pull rods through the ailerons to the tabs. The actuators also provide servo action during aileron movement.

RUDDER

The rudder is controlled by the pilot's or copilot's rudder pedals which are interconnected by push-pull rods. Bellcranks actuate the rudder cables from the cockpit to the rudder bow tie which is located forward of the aft pressure bulkhead. The rudder torque tube is attached to the bow tie and extends vertically through the pressure vessel. The torque tube is sealed internally by an aluminum plug. The fuselage cut out is sealed by an O-ring assembly.

Rudder Trim Tab

The rudder trim tab is actuated by a cable and chain operated actuator mounted in the vertical stabilizer. By turning the rudder trim control wheel located on the control pedestal, cable movement rotates a sprocket which actuates a push-pull rod through the rudder to the tab deflecting it in the desired direction.

FLIGHT CONTROLS (Continued)

ELEVATOR

The elevators are actuated by an arm mounted on the interconnecting torque tube between the two control columns. A push-pull rod is connected between the arm and walking beam located centrally under the cockpit floor. Cables are routed around the walking beam and through a pulley arrangement to the aft fuselage section, then to a bellcrank installed in the vertical stabilizer. Two bellcrank push-pull rods actuate the elevators. The elevators are aerodynamically balanced with set back hinges and statically balanced with lead weights.

HORIZONTAL STABILIZER

The horizontal stabilizer is electrically positioned to provide pitch trim. Electric motors actuate interconnected jackscrews to provide a dual, fail-safe trim system. Mechanical stops for the jackscrews are built into the actuator. Electrical limit switches for the motors are mounted inside the vertical stabilizer. A dual switch on each pilot wheel controls separate circuits to each motor. A trim selector/kill switch is mounted on the center pedestal. A pitch trim indicator gives the pilot visual reference of trim position. Trim-in-motion sonalerts are provided to indicate pitch trim actuation and alert the crew in the event of a pitch trim runaway.

FLIGHT CONTROLS (continued)

TRIM CONTROLS

A master pitch trim switch is located on the pedestal. The center position of the switch is the OFF position. In the pilot (left) position, the pilot has trim control, in the copilot (right) position the copilot has control. This switch prevents the pilot and copilot from trimming the aircraft simultaneously.

Pilot and Copilot Pitch Trim Control Switches

The pilot and copilot pitch trim control switches, located on the control wheels, have double toggle actuators. Both halves of the switch must be operated simultaneously to provide trim operation.

Pilot’s Auxiliary Pitch Trim

A pilot’s auxiliary pitch trim switch is located on the pedestal. It is incorporated to facilitate single pilot operation should a malfunction occur in the pilot’s trim control circuitry. This allows the pilot to trim the horizontal stabilizer without having to reach across to the copilot’s trim switches on the copilot’s control wheel.

Position Indicating System

A pitch trim indicator is located on the instrument panel. An out-of-trim sonalert system is also provided. The sonalert is inoperative until the throttles are advanced for takeoff. If during takeoff roll an out-of-trim condition exists, the out-of-trim sonalert will sound a warning. When the aircraft is airborne the sonalert is disabled.

FLIGHT CONTROLS (continued)

WING FLAPS

The wing flaps, controlled by a flap selector located on the right side of the control pedestal, are electrically actuated and hydraulically operated. A flap position indicator is located on the instrument panel. The flaps may be lowered or raised in increments from 0 to 36 degrees. The flaps are interconnected for positive, symmetrical operation should hydraulic actuation be lost on one side. There are no emergency provisions to extend or retract the flaps in the event of complete electrical or hydraulic system failure.

GUST LOCK SYSTEM

An internal, cable operated gust lock system is provided to lock the flight controls in the neutral position. The gust lock control lever is located forward of the power levers on the control pedestal. When the gust lock is engaged, the power levers are locked in the retarded position. This prevents application of power for takeoff.

The gust lock control lever actuates a cable which is routed to lock pins at the aileron bow tie, the rudder bow tie, and the elevator bellcrank and bracket. Cable movement actuates these spring-loaded pins into lock pin holes when the flight controls are in neutral and holds the controls in the neutral or streamlined position until the gust lock is released. The lock pins are mounted in spring-loaded housings to prevent engagement of the pins in the event of gust lock cable failure.

When Service Bulletin 227-27-016 has been complied with, the elevator portion of the cable-operated gust lock system is disabled. In that case, a gust lock belt is used to secure the control column in its nose up position. An alternate rudder gust lock, may be manufactured locally and installed, as described in Service Bulletin 227-27-048.

STALL AVOIDANCE SYSTEM

A stall avoidance system (SAS) is incorporated in the aircraft to warn the pilot of an impending stall aurally by use of a horn, and visually, by instrument indication. The system also provides for actual stall avoidance by means of a stick pusher which applies a forward force of approximately 65 pounds to the elevator control. The SAS system is armed at liftoff and disarmed at approximately 145 knots. The aural warning horn sounds at about seven knots above stall speed and the stick pusher is automatically engaged approximately one knot before the actual stall. The system can be manually overridden by the pilot.

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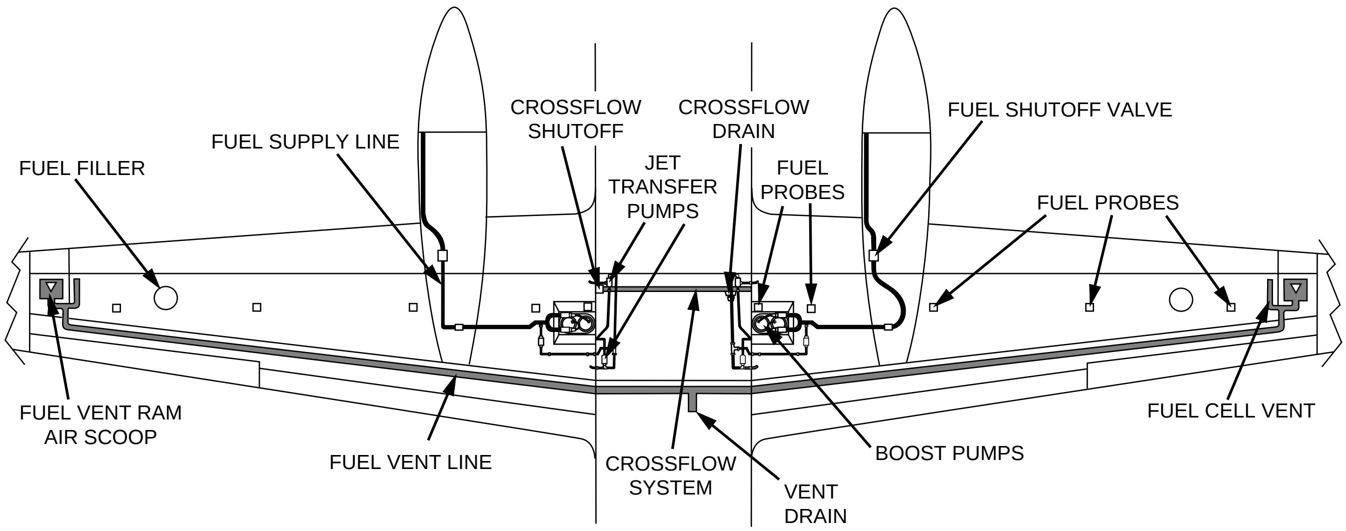
FUEL SYSTEM



FUEL QUANTITIES

ITEM	U.S. GALLONS	POUNDS
TOTAL USABLE	648	4,342
USABLE PER SIDE	324	2,171
UNUSABLE PER SIDE BOOST PUMP ON BOOST PUMP OFF	 2 13	 13 88
XFER PUMP LIGHT ON BOOST PUMP ON BOOST PUMP OFF	 9 to 12 89 to 105	 65 to 75 600 to 700

FIGURE 6-45

FUEL SYSTEM

The fuel system includes left and right integral wing fuel tanks with a total usable capacity of 648 U.S. gallons. Each wing tank contains an integral hopper tank that serves as a fuel sump for the boost pumps. Two boost pump actuated jet transfer pumps are provided in each wing tank to maintain the hopper tanks at full capacity. With the jet transfer pumps operative, the usable full capacity per tank is 324 gallons (2,171 pounds at 6.7 pounds per gallon). The zero point on the fuel quantity gauge is adjusted to allow for 13.4 pounds of unusable fuel. With the transfer pump operative, the fuel quantity gauge readings repre-sent the total usable fuel available in pounds. A crossflow valve provides for fuel balancing between tanks when required. An amber annunciator light illuminates when the fuel crossflow switch is placed in the OPEN position. The annunciator senses crossflow valve position and illuminates whenever the valve is not fully closed.

FUEL STORAGE

Fuel for each engine is stored in two integral fuel tanks, one located in each wing. Each tank serves as an independent fuel system for its respective engine. The tanks are interconnected by a crossflow line to balance the fuel quantity or to provide either engine with all of the fuel on board. Two gravity filled collector tanks in each wing tank, coupled with jet transfer pump action, supply a hopper tank with fuel, ensuring boost pump submergence in all flight attitudes.

Two sump drain valves are located just outboard of wing stations 27, forward of the boost pump access panels. Another drain is located on the outboard side of each nacelle. The valves are used to drain accumulated water from the tank or may be used to drain residual fuel when defueling the tank.

A flush-mounted vent is located on the lower surface of the wing inboard of each wing tip. A vent balance line tees into the vent system and is routed along the entire length of the wing behind the rear spar.

JET TRANSFER PUMP SYSTEM

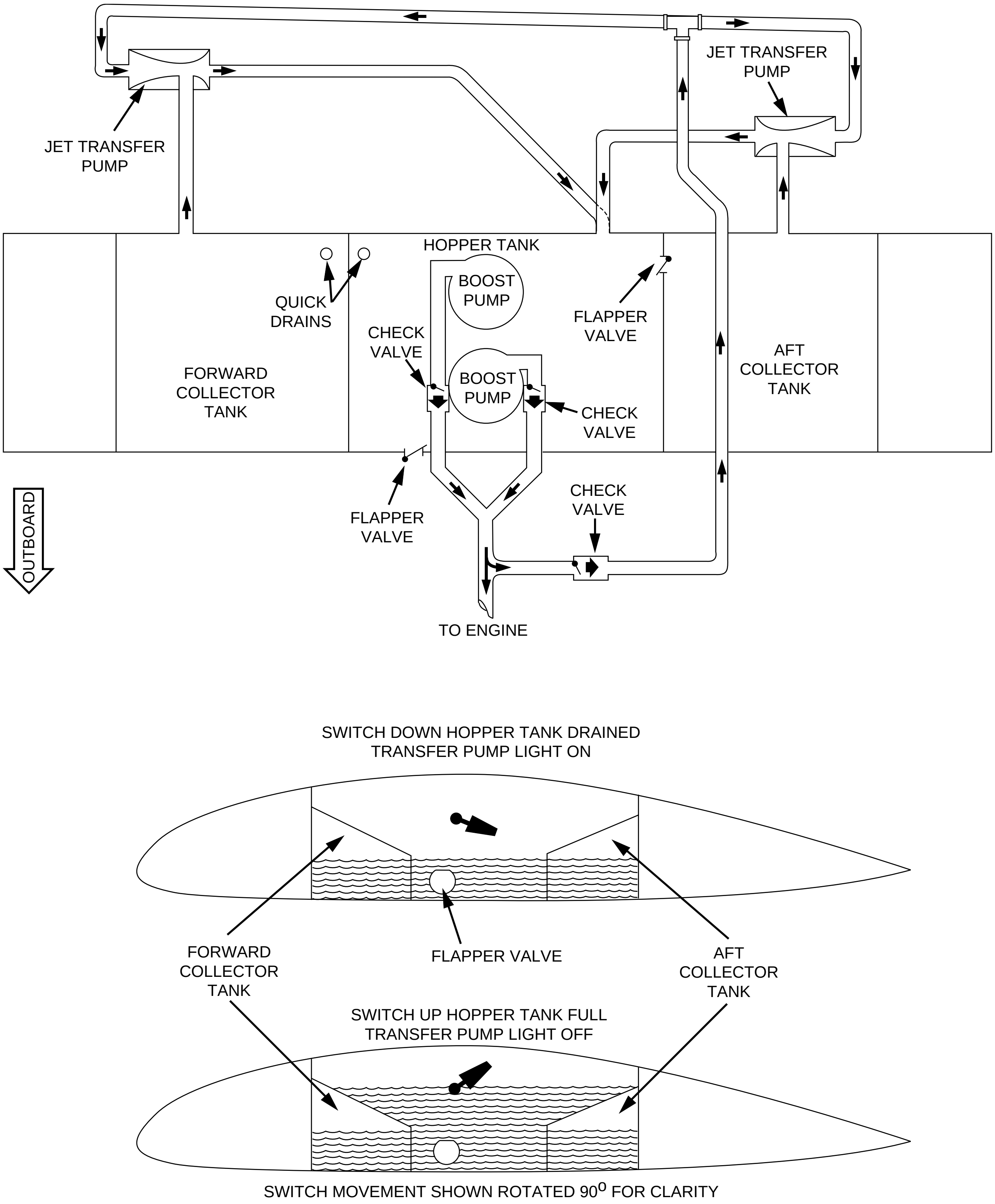


FIGURE 6-46

FUEL SYSTEM (Continued)

JET TRANSFER PUMP SYSTEM

A schematic of the jet transfer pump system is shown in Figure 6-39. The system is provided to transfer fuel from the collector tanks to the hopper tank in each wing. The hopper tank and two collector tanks (Forward & Aft) are at the most inboard section of each wing fuel tank. The hopper tank contains the boost pumps and feeds the engine driven fuel pump. The collector tanks gravity feed from the wing tank. Flapper valves prevent span wise flow of the fuel during maneuvering flight. Two jet transfer pumps are located in the dry center section inboard of the collector tanks and use boost pump flow to transfer fuel from the collector tanks to the hopper tank. The jet transfer pump system can fill the hopper tank 1.5 times as fast as the engine driven pump can drain it.

A flapper valve in the hopper tank allows fuel to gravity feed in from the wing tank. A float switch located in the hopper tank activates the respective amber XFER PUMP annunciator light whenever the fuel level in the hopper tank is below the equivalent of approximately 70 pounds. With the boost pumps off and fuel gravity feeding to the hopper tank, illumination occurs with about 600 to 700 pounds of fuel remaining in the wing tank. With the boost & transfer pumps operating and scavenging the collector tanks, the light will illuminate with approximately 70 pounds of usable fuel remaining (all of which would be in the hopper tank).

With the jet transfer system operating, the unusable fuel quantity is 2 gallons (13 pounds) per side. The fuel quantity indicating system is calibrated to exclude normally unusable fuel from the fuel gauge readings. However, without an operational jet transfer system, an additional 11 gallons (75 pounds) of unusable fuel would be trapped in the collector tanks and this unusable fuel would be shown on the fuel gauges.

During normal operation with the respective boost pump on, illumination of a L or R XFER PUMP annunciator light indicates that the jet transfer pumps are not maintaining the hopper tank at full capacity. Since the jet transfer pumps operate due to boost pump flow, the first action when a XFER PUMP caution light illuminates is to select the other boost pump for that tank. If that does not extinguish the light, the transfer pump system can be assumed to be inoperative and the unusable fuel in that tank would be increased 75 pounds.

The XFER PUMP annunciator light will be illuminated with less than 600 to 700 pounds of fuel per wing tank with boost pumps off, and with less than 65 to 75 pounds of fuel per hopper tank with boost pumps on. When the caution light illuminates with less than 70 pounds of fuel available, a landing should be made as soon as practicable or, if fuel is available in the opposite tank, the crossflow valve should be opened.

FUEL SYSTEM (Continued)

BOOST PUMPS

Two submerged boost pumps are installed in the hopper tank of each wing. The pumps are connected through check valves to a common supply line. See Figure 6-39. Excess boost pump flow is tapped off the supply line for use in the jet transfer pump system. A fuel shutoff valve installed in each nacelle can be used to stop fuel flow to the engine. A fuel pressure transmitter senses interstage pressure of the engine driven fuel pump. When the engine is not operating, the fuel pressure gauge will indicate boost pump pressure. After the engine is operating the fuel pressure displayed will be a combination of engine driven pump pressure and boost pump pressure.

Each essential bus provides power for one pump, in each wing (i.e. L ess bus powers L MAIN & R AUX boost pumps). This is a safety feature should either bus be inoperative. The two pumps within each wing are designated main and auxiliary. These designations are for purposes of identification only as the pumps are identical. Two three-position switches (MAIN-OFF-AUX) are installed in the center pedestal, one for each pair of pumps.

FUEL SYSTEM (continued)

FUEL SHUTOFF VALVE

A lever lock toggle switch on the center pedestal in the cockpit controls a fuel shutoff valve for each engine. The shutoff valve is located in the upper left hand corner of the wheelwell along the left hand keelson and the main wing spar.

The shutoff valve is motor operated and controlled by the two position (OPEN-CLOSED) toggle switch. Limit switches are incorporated in the valve to de-energize the motor when the gate reaches the full open or closed position. The position of the valve is annunciated on a sub-annunciator panel when the valve has not reached its intended position.

FUEL CROSSFLOW

The fuel crossflow system provides the capability of maintaining proper fuel balance between integral wing tanks. The system consists of a two inch line that interconnects the wing tanks, a crossflow valve for regulating fuel flow between the tanks, and a fuel drain for quick defueling of the aircraft. The crossflow line is located in the center section aft of the main wing spar and is accessible through panels in the wing center section. The motor actuated crossflow valve is controlled by a combination light and switch located on the instrument panel. The light illuminates when the switch is actuated to open the valve and remains on until the switch is reactuated to the closed position. In addition, crossflow valve position is annunciated by a light on the sub-annunciator panel. This light illuminates whenever the valve is not in its closed position.

FUEL QUANTITY SYSTEM (continued)

FUEL QUANTITY SYSTEM

The fuel quantity system is comprised of two capacitance fuel gauge systems, one for each integral wing tank. Each system includes five tank sensors, and a low level caution light (XFER PUMP) on the annunciator panel. The fuel quantity system uses the difference in capacitance between fuel and air to measure the amount of fuel in the tanks. As the tank is filled, more of the probes are covered by fuel with a resulant change in capacitance. The dual indicator, which houses a bridge circuit, an amplifier, and servo motor, converts the tank sensor capacitance into a dial presentation of measured fuel quantity in hundreds of pounds. The low level caution light is activated by a float switch in each hopper tank.

Since the density (and therefore weight) of the fuel changes with temperature, the fuel quantity system, without compensation, would only be accurate in a narrow temperature range. To prevent this occurrence, the most inboard fuel probe has a temperature sensitive compensator section. The output of the compensator is used by the indicator to provide an accurate display of fuel weight regardless of temperature.

A push-to-test button near the quantity indicator is used to test each system. When the button is depressed, the indicator should move to the 12 o'clock position. When the button is released, the needle should return to the correct fuel quantity indication. This procedure tests all the electrical and mechanical functions within the indicator.

MAGNA-STICKS

Magna-sticks are optional, direct-reading, mechanical fuel level indicators. One is mounted on the fuel cell access plate on the bottom of the wing, just inboard of each nacelle. They provide visual indications of the usable fuel quantity in the respective tank if the tank contains between approximately 30 and 155 U.S. gallons. A doughnut shaped float is free to slide up and down a fixed tube and draw with it a calibrated indicator stick to show the level of fuel in the tank. The indicator stick is normally held fixed inside the tube by locking tabs at the base of the stick. A quarter turn of the base unlocks the stick and allows it to drop down to its indicating position. Magnets draw the indicator stick to the level of the float when the stick is unlocked.

FUEL SYSTEM (continued)

MAGNA-STICKS (continued)

The indicator stick is graduated to show fuel quantity in U.S. gallons. The internal geometry of the fuel tank and the dihedral of the wing affect the spacing of the quantity marks on the stick and limit the useful range of this indicating system. With less than approximately 25 gallons in the tank, the float may rest on structure inside the tank. With more than approximately 160 gallons aboard, the float will be at the top of the tube and no longer floating on top of the fuel. Therefore, Magna-sticks are useful when fuel tanks are less than half full but have at least 30 gallons in them.

Accurate readings are obtainable only when the airplane is on a reasonably level ramp because the Magna-stick indications depend upon the level of the fuel in the tank. Avoid inaccurate readings caused by binding of the indicator stick in its bushing by tapping the bottom surface of the wing around the Magna-stick housing before taking readings. Accurate determination of usable fuel in a tank (within plus or minus two gallons) is obtained by using the plane of the bottom surface of the wing and access plate to read the graduations on the indicator stick.

HYDRAULIC SYSTEM SCHEMATIC

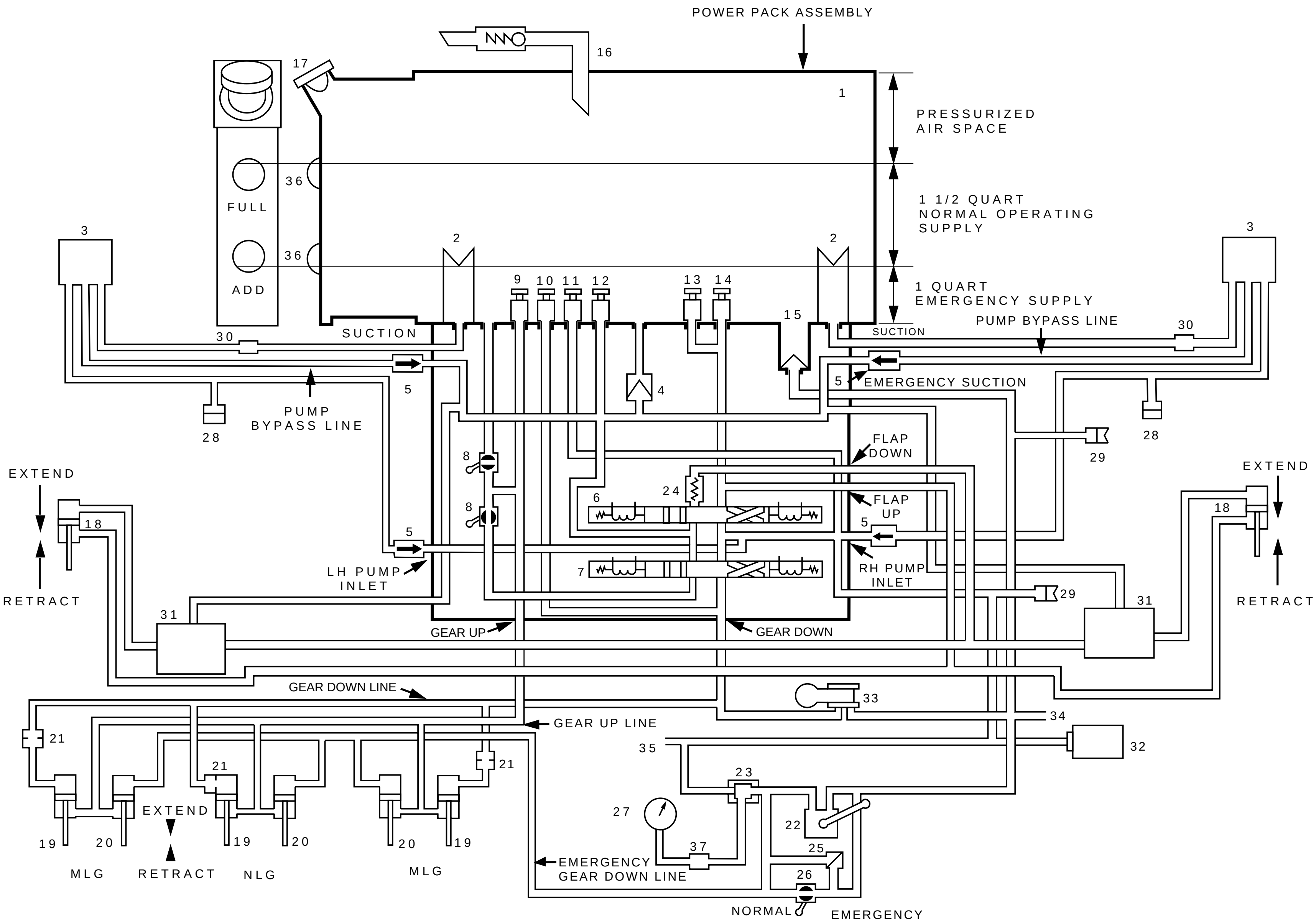


FIGURE 6-47

MANUFACTURER'S DATA

METRO III

HYDRAULIC SYSTEM SCHEMATIC LEGEND

1. HYDRAULIC FLUID RESERVOIR
2. ENGINE PUMP SUCTION STANDPIPE
3. ENGINE DRIVEN HYDRAULIC PUMP
4. SYSTEM RETURN FILTER
5. ENGINE DRIVEN PUMP CHECK VALVE
6. FLAP POSITION SELECTOR VALVE
7. GEAR POSITION SELECTOR VALVE
8. GEAR BY PASS VALVE
9. GEAR UP TERMAL RELIEF VALVE
10. GEAR DOWN THERMAL RELIEF VALVE
11. SYSTEM RELIEF VALVE
12. FILTER RELIEF VALVE
13. FLAP UP THERMAL RELIEF VALVE
14. FLAP UP SUCTION CHECK VALVE
15. HAND PUMP SUCTION SUMP
16. RESERVOIR PRESSURIZATION RELIEF VALVE
17. FLUID FILLER & SCREEN
18. FLAP ACTUATING CYLINDERS
19. GEAR UP & NORMAL GEAR DOWN CYLINDER
20. GEAR UP & EMERGENCY GEAR DOWN CYLINDER
21. GEAR DOWN RESTRICTOR VALVE
22. EMERGENCY HAND PUMP (A)
23. SHUTTLE VALVE (I)
24. FLAP DOWN RESTRICTOR VALVE (A)
25. AUXILIARY GEAR SYSTEM SELECTOR VALVE (I)
26. AUXILIARY GEAR SYSTEM
27. PRESSURE GAUGE (I)
28. PRESSURE WARNING SWITCH (I)
29. EXTERNAL CONNECTION ASSEMBLY
30. SHUTOFF VALVE
31. FLAP LOCK VALVE
32. ACCUMULATOR
33. NOSE GEAR STEERING ACTUATOR
34. POWER BRAKE RETURN (OPTIONAL)
35. POWER BRAKE PRESSURE SUPPLY (OPTIONAL)
36. SIGHT GAUGES (I)
37. TRANSDUCER

NOTE

COMPONENTS DESIGNATED (A) COMPRISE THE AUXILIARY SYSTEM. COMPONENTS DESIGNATED (I) COMPRISE THE INDICATING SYSTEM. ALL OTHER COMPONENTS COMPRISE THE NORMAL SYSTEM.

FIGURE 6-47 (continued)

MANUFACTURER'S DATA

HYDRAULIC SYSTEM

The aircraft hydraulic system is a closed center system that provides pressure for normal operation of the landing gear, wing flaps, nose wheel steering, and when installed, power and anti-skid brakes. Major system components are a power pack, two engine driven pumps, two shutoff valves, an accumulator, associated lines, pressure transmitters, lights, and an emergency landing gear down hand pump. A pressure gauge in the instrument panel indicates main or emergency system pressure. System quantity is indicated by a sight gauge system located on the outboard side of the left nacelle. The system is serviced with MIL-H-83282 (Brayco) fluid through pressure quick disconnects located forward of the left main gear doors. Gravity servicing can be accomplished through the power pack reservoir filler cap accessible from the outboard side of the left nacelle.

Hydraulic pressure is tapped off the nose landing gear down line to power the nose wheel steering actuator and the optional anti-skid brake system.

HYDRAULIC POWER PACK

The hydraulic power pack, located in the left hand nacelle, stores fluid and controls pressure provided by the engine driven pumps. Two selector valves in the bottom of the pack control operation of the gear and flaps. The upper cylindrical portion of the pack is used to store fluid for normal system use. The engine driven pumps are supplied from standpipes which reserve the last quart of fluid for emergency hand pump operation. A shutoff valve is installed in the supply line to each engine driven pump.

MAIN HYDRAULIC SYSTEM OPERATION

Either engine driven hydraulic pump is capable of delivering 5 gpm at 2,000 psi. When gear or flap selection is made with cockpit controls, a solenoid actuated pilot valve on the power pack directs hydraulic fluid to the gear or flap actuators. Fluid from the return side of the actuators is routed through the opposite side of the selector valve and through a filter to the reservoir. Limit switches actuated by the landing gear retraction mechanism open the circuit to the selector valve, permitting the spring loaded valve to return to the neutral position. The uplock mechanism mechanically locks the landing gear in the up position. With landing gear extended, the selector valve stays in the gear down position and pressure is continuously exerted on the actuators until the engines are shut down and the battery switches are turned off. Normal gear extension or retraction time is five to seven seconds. With one pump inoperative the gear travel times remain about the same (within one second).

HYDRAULIC SYSTEM (continued)

ACCUMULATOR

An accumulator is installed near the left side of the hydraulic pack to dampen pressure fluctuations within the system.

AUXILIARY SYSTEM

The auxiliary system consists of a hand pump, a system selector valve, and a manual hydraulic pressure dump system. The system selector valve, located adjacent to the hand pump, is a two position manually controlled valve. With the selector valve in the EMER GEAR position, the valve is closed and hand pump pressure is directed to the right hand nose gear actuator and the main gear inboard actuators. With the selector valve in the NORM GEAR position, the valve is open. The manual hydraulic pressure dump system consists of two valves in the power pack that shut off flow from the landing gear selector valve and dump fluid from the retract end of the gear actuators to the reservoir. The system is controlled by a lever located adjacent to the copilot's inboard seat track.

HYDRAULIC SYSTEM (continued)

WARNING LIGHTS

Two red warning lights on the annunciator panel and a pressure gauge on the instrument panel are used to monitor the hydraulic system. Each warning light is controlled by a pressure switch on the output side of each engine driven pump. The pressure gauge is connected to a shuttle valve. The shuttle valve allows the gauge to display main system pressure or auxiliary system pressure, whichever is greater.

EXCESSIVE HYDRAULIC PRESSURE INDICATIONS

Indicated hydraulic pressure above the normal operating range of 1700 to 2100 psi might be caused by:

- o An indicating system malfunction
- o A malfunctioning hydraulic pump
- o A blocked return line

In either of the first two cases, the pilot cannot clear the difficulty. Hydraulic system pressure relief valves should prevent a malfunctioning pump from over-pressurizing system plumbing during the remainder of the flight. The difficulty and its duration should be reported to a maintenance organization.

A common occurence of high indicated hydraulic pressure follows attempts to retract the landing gear with the hydraulic hand pump engage valve rotated to its forward position. In this case, retract pressure exists in all landing gear actuators and lines and emergency extension fluid is trapped between the emergency extension actuators and the hand pump selector valve and pressure indicator. Neither full retraction of the landing gear nor elimination of the excessive hydraulic pressure will occur until the hand pump valve has been returned to its normal position.

HYDRAULIC FLUID SHUTOFF VALVES

Two lever lock toggle switches on the center pedestal control the motor operated hydraulic fluid shutoff valves located in each nacelle aft of the firewall. The hydraulic fluid shutoff valve lights are on the lower left and right of the sub annunciator panel. These lights will illuminate any time the valves are moving from the open to closed or closed to open positions. The lights are "in transit lights" only and do not reflect the precise position of the hydraulic shutoff valves.

ICE AND RAIN PROTECTION

The following equipment is provided to permit flight operations in adverse weather.

Pneumatic deice boots on wing and horizontal tail leading edges.
Electrically heated windshields for the pilot and copilot.
Electrically operated windshield wipers for the pilot and copilot.
Electrically anti-iced pitot heads and SAS vane.
Engine inlets anti-iced by bleed air and engine oil heat.
Electrically anti-iced oil cooler duct lips.
Electrically deiced propeller blades.
Oil-to-fuel heat exchangers.
Flush-mounted fuel tank vents.
Ice free static sources.

SURFACE DEICE SYSTEM (WING AND TAIL BOOTS)

Deice boots are installed along each wing and on the horizontal stabilizers. A .010 inch ply of conductive neoprene is provided on the surface to dissipate static electric charges. The boots are lightweight construction and are provided with only one inflation port so that all tubes in any individual section are inflated simultaneously.

DEICE BOOT OPERATION

The deice boot system is served by one distributor valve located in the forward center wing section, right side. The distributor valve functions to apply pressure or vacuum to the deice boots in a sequence selected by the electronic timer.

When boots are cycled through by the electric timer they are sequenced as follows:

1. All wing boots are inflated from tip to tip. This phase lasts six seconds.

2. All empennage boots are inflated for a period of four seconds, the wing boots deflating at this time.

3. System rests for 170 seconds, making the overall single cycle time three minutes.

The control switch, located on the pilot's switch panel is a three-way, center-off switch. By placing the switch forward in the AUTO position, the boots will be cycled automatically by the electronic timer on the preceding schedule.

When the control switch is placed in the spring-loaded aft, or MANUAL position, electrical power is directed to both solenoids on the distributor valve, bypassing the electronic timer, and causing all boots to inflate simultaneously. Boots will remain inflated as long as the switch is held in this position. When the switch is released, boots will deflate and again be held flat by vacuum.

Electrical power for the system is supplied from the left or right essential buses, as selected. The transfer switch is normally switched to the left essential bus.

ICE AND RAIN PROTECTION (continued)

WINDSHIELD HEAT

The windshield panels installed in front of the pilot and copilot are electrically heated. With the control switch in the LOW position, power is supplied by the right essential bus to actuate a relay that places the heating elements of the windshields in series. Power for the heating elements is also furnished by the left essential bus. The sensing elements in the windshield are referenced only to their respective temperature controls. Each temperature control operates a separate control relay. Power applied by the temperature control to operate these relays is also applied to the windshield cycle lights located on the annunciator panel. Since it is possible for one panel to reach temperature cutoff before the other, it is also possible for cycle indication to be limited to one light, the other remaining on.

With the control switch in the HIGH position, power is supplied to the left windshield from the left essential bus and to the right windshield from the right essential bus. Each windshield is cycled independently through the individual temperature controls.

A bus transfer switch is provided to transfer the pilot's windshield heat from the left essential bus to the right essential bus in the event a left essential bus failure occurs. Windshield temperature will be maintained from 90^{o}F to 100^{o}F in either HIGH or LOW position; however, current draw will be approximately one half in LOW.

ICE AND RAIN PROTECTION (continued)

WINDSHIELD WIPER SYSTEM

The windshield wiper system is an electro-mechanical system. Electrical power is supplied by the left essential bus for the pilot's wiper and by the right essential bus for the copilot's wiper, each through its own circuit breaker. A single rocker type double poledouble throw switch with FAST-PARK-SLOW positions provides single switch operation for both pilot and copilot wipers.

With electrical power on and the circuit breakers in, the system is activated by moving the rocker type control switch to the FAST or SLOW position. The wiper will run at a maximum speed of approximately 200 strokes per minute when operated on wet glass. By placing the control switch in the SLOW position, the wiper system operates at approximately one-half of the FAST speed. When the control switch is placed in the PARK position, the wiper blades will move automatically to their parked position.

CAUTION

OPERATING THE WINDSHIELD WIPERS ON DRY WIND-SHIELDS MAY SCRATCH THE WINDSHIELD SURFACES.

NOTE

The life and serviceability of the windshield wiper system will be improved by restricting use of the wipers to airspeeds below approximately 125 KIAS. Use of the wipers at higher speeds overloads the windshield wiper motors. Furthermore, at high speeds, the wipers tend to stand away from the glass and are relatively ineffective at keeping the windshields clear of precipitation.

ICE AND RAIN PROTECTION (continued)

PITOT AND SAS ANTI-ICE

Each of the pitot tubes is electrically heated for anti-icing. Each pitot heater receives 28.5 VDC electrical power from its respective left or right essential bus. Two individual switches labeled PITOT and SAS and PITOT HEAT, are located on the pilot's switch panel.

NOTE

Either pitot heat switch, when moved to the PITOT & SAS HEAT position, will control the SAS vane heater element. The PITOT HEAT position of either switch will apply power to only the individual pitot heater.

A loadmeter is located on the left console with a left-right selector switch for checking either the left or right pitot heat circuits, as selected. A green SAS DEICE light on the annunciator panel will illuminate when power is applied to the SAS vane heat relay.

ENGINE INLET ANTI-ICE

The engine inlets are anti-iced using compressor bleed air which is extracted from a pad on the right side of the engine and routed to an anti-ice valve. From the valve, the air is routed to the engine intake throat and the nose cowl inlet lip.

The anti-ice valve incorporates limit switches to determine valve position. Two three position switches, installed in the cockpit, are used to control power to the valves. When the respective switch is placed in the ENGINE & PROP HEAT position, the anti-icing valve opens and causes the INTAKE HEAT light to illuminate. When the switch is placed in the OFF position, the valve closes and the light will extinguish. When the engine intake heat test button is pressed, the annunciator light will illuminate if the valve is closed. If the annunciator light does not illuminate with the button pressed, the valve is stuck open or partially open.

The leading edge of the oil cooler inlet scoop is heated electrically when the switch is in either the ENGINE & PROP HEAT or PROP & DUCT HEAT position. The heating element on each duct cycles independently when inlet lip temperatures reach preset temperatures. Duct heat cycling is indicated by the indicator lights forward of the tri-meter on the pilot's side console and by fluctuating generator loads.

ICE AND RAIN PROTECTION (continued)

PROPELLER DEICE SYSTEM

The propeller deice system consists of electrically heated boots bonded to each propeller blade, a slip ring and brush-block assembly (to transfer electrical power to the heating elements), a separate timer for each propeller, an ammeter, a control switch, and the necessary circuit breakers and wiring to complete the system. The propeller deice boots may be approximately 12 inches long (through AC-545) or approximately 21 inches long (as changed by Service Bulletin 30-001).

To reduce the electrical power requirement, current is cycled to the heating elements at timed intervals rather than continuously. When equipped with the shorter deice boots, each propeller blade has two separate heating elements -- one outer and one inner -- mounted on the inboard area of each propeller blade. By heating all outer or all inner heating elements simultaneously on either propeller, rotational balance is maintained during the deicing, and current draw is held to a low value. The timer successively delivers current via the slip ring and brush-block to the outer heating elements and then the inner heating elements on the respective propeller. The timer does not have a "home" position. Heating may begin on either pair of blades, depending on the timer position when the switch was turned off after previous use.

The longer (21-inch) deice boots contain dual heating elements connected in parallel in each boot. The electrical power requirement is reduced by cycling current to opposing pairs of blades on each propeller. As with the shorter deice boots, the timing interval is approximately 34 seconds.

The use of heat at the ice adhesion surface reduces the grip of the ice which is then removed by the centrifugal effect of propeller rotation and the blast of the airstream. The thickness or weight of the ice build-up and the outside air temperature will vary the time required for complete deicing. The system may be used continuously while in flight if needed. When selected, engine and nacelle inlet anti-ice as well as oil cooler duct heat are also activated as these systems are controlled by the same switches on the pilot's switch panel. Electrical power is supplied to the left and right propeller deice systems from the respective 28.5 VDC left and right essential buses.

ICE AND RAIN PROTECTION (continued)

FUEL ANTI-ICING

Fuel anti-icing is accomplished automatically by a temperature controlled anti-icing valve within the high pressure fuel pump portion of the fuel control. Fuel is metered automatically, when the engine RPM is above 60%, to an oil-fuel heat exchanger mounted on the upper left side of each engine. The fuel is heated by hot scavenged oil flowing through the oil-fuel heat exchanger to maintain the fuel temperature above freezing conditions. The flow of fuel to the temperature controlled anti-icing valve is locked out during the start sequence from 0% to 60% engine RPM. The lockout is accomplished by actuating an anti-ice lockout solenoid valve mounted on the fuel control. The anti-ice lockout solenoid valve is actuated to the closed position when the start button is depressed and is actuated to the open position when the 60% engine RPM speed switch opens.

LANDING GEAR SYSTEM

Landing gear extension and retraction is electrically controlled and hydraulically actuated. The landing gear handle, located on the cockpit pedestal, is used to direct 28.5 VDC electrical power from the left essential bus to the landing gear selector valve located in the left nacelle over the wing. The selector valve, when actuated, directs hydraulic pressure to the landing gear actuators for either retraction or extension of the gear, as selected. Two actuators are installed on each gear. Both actuators are used for gear retraction. Main hydraulic system pressure is directed to the left actuator on the nose gear and to the outboard actuators on the main gear during normal gear extension. During emergency extension of the gear, auxiliary hydraulic pressure is supplied to the right actuator on the nose gear and to the inboard actuators on the main gear.

As each gear is fully retracted, it engages a mechanical uplock hook. When the last of the three gear fully retracts, the electrical power is shut off to the selector valve. The selector valve moves to the closed (OFF) position, and the actuator lines are ported to return.

As each gear moves to the fully extended (DOWN) position, its dual drag strut unfolds and the drag strut joints (or elbows) move to an overcenter position. This overcenter position of the extended drag strut is locked by the mechanical interference between a bellcrank and roller strut. Normal hydraulic pressure is applied to the down side of the primary system actuator on each gear until the selector valve closes due to shutdown of both engines (causing loss of normal hydraulic pressure) or the electrical power is shut off. When the emergency hand pump is used, hydraulic pressure is applied to the down side of the auxiliary system actuator on each gear. Emergency hand pump pressure is not routed through the normal selector valve.

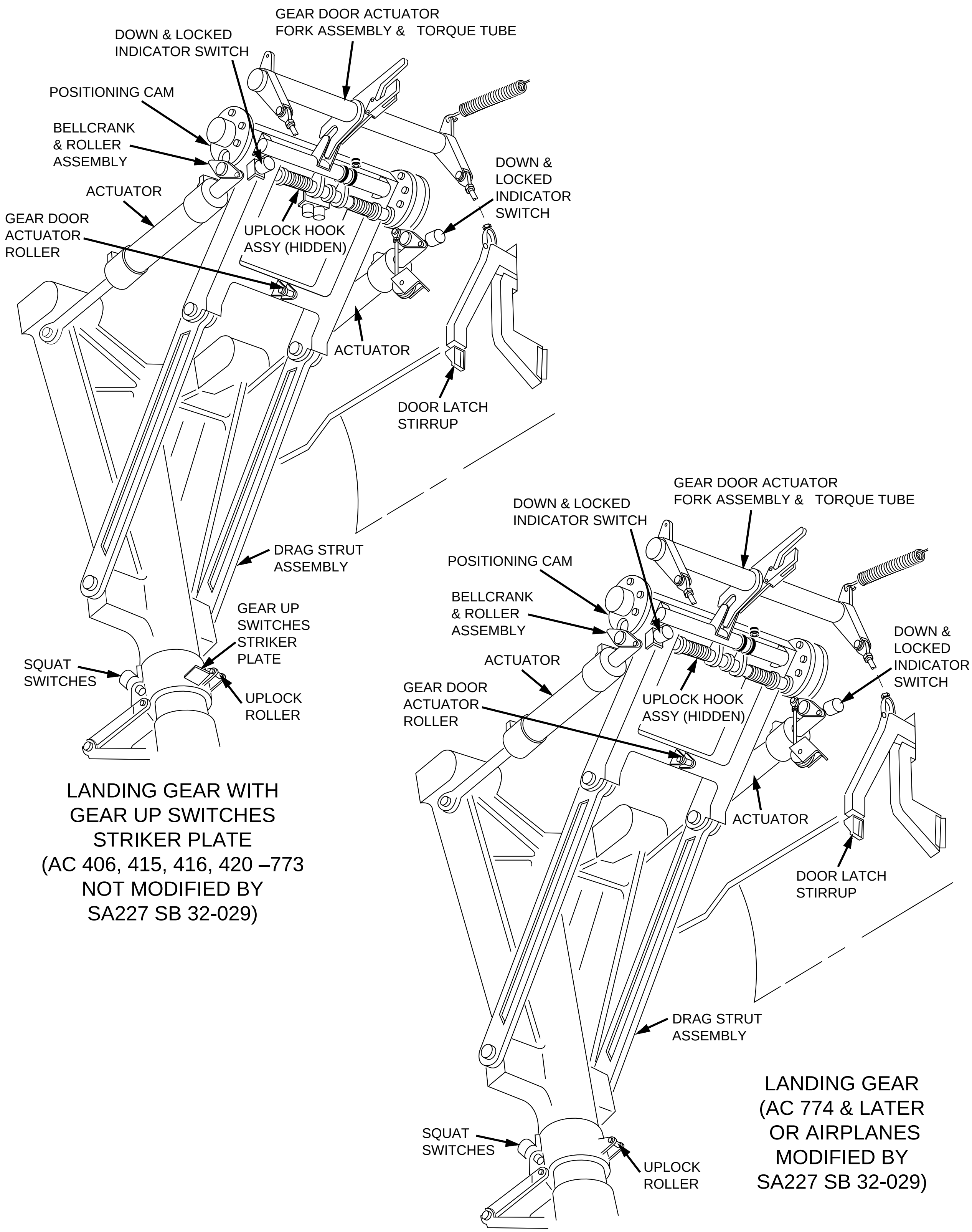
The aircraft has the capability of free fall extension of the landing gear. The free fall can be supplemented by hand pumped hydraulic pressure in the event the gear does not lock down.

LANDING GEAR WARNING SYSTEM

The landing gear warning sonalert will sound if:

1. Any landing gear down and locked switch is not made,
2. And either power lever is at the flight idle gate,
3. Or if the flaps are more than half way down, regardless of power lever position.

MAIN LANDING GEAR



LANDING GEAR WITH
GEAR UP SWITCHES
STRIKER PLATE
(AC 406, 415, 416, 420 –773
NOT MODIFIED BY
SA227 SB 32-029)

LANDING GEAR
(AC 774 & LATER
OR AIRPLANES
MODIFIED BY
SA227 SB 32-029)

FIGURE 6-48

LANDING GEAR SYSTEM (continued)

LANDING GEAR WARNING SYSTEM (continued)

The micro switches at the flight idle gate are adjusted to sound the sonalert at the gate and through power lever travel approximately 1/8 inch forward of the gate. That range corresponds to the range of flight idle power. Therefore, descents at flight idle power may be conducted in the clean configuration without the gear warning sounding by merely advancing the power levers slightly.

Some airplanes may be equipped with a gear warning mute button located on the pedestal aft of the power levers. Pushing the mute button will silence the landing gear warning. Advancing either power lever beyond the micro switch will reset the gear warning system.

If the landing gear warning is generated because the wing flaps are more than half way down and any gear is not down and locked, the warning horn can not be silenced by either power lever manipulation or the mute button (if installed).

MAIN LANDING GEAR STRUTS

Each main landing gear strut essentially is two telescoping cylinders with enclosed ends. The two cylinders, when assembled together, form an upper and lower chamber. The chambers are separated from each other by a floating piston. The lower cylinder is serviced with nitrogen and the upper cylinder is serviced with hydraulic fluid. The upper chamber contains an orifice that divides it into two smaller chambers. The hydraulic fluid must pass through this orifice during compression of the nitrogen in the lower chamber. This provides the absorption and dissipation of the energy transmitted to the strut and controls the rate of vertical motion. Each strut contains the necessary seals to prevent the loss of nitrogen and hydraulic fluid. A packing gland is installed at the open end of the outer cylinder to seal the sliding joint between the telescoping cylinders. A scraper also is installed in a groove in the upper jacket to keep the sliding surface of the lower cylinder free of dirt, mud, ice, snow, and other contaminants.

NOSE LANDING GEAR

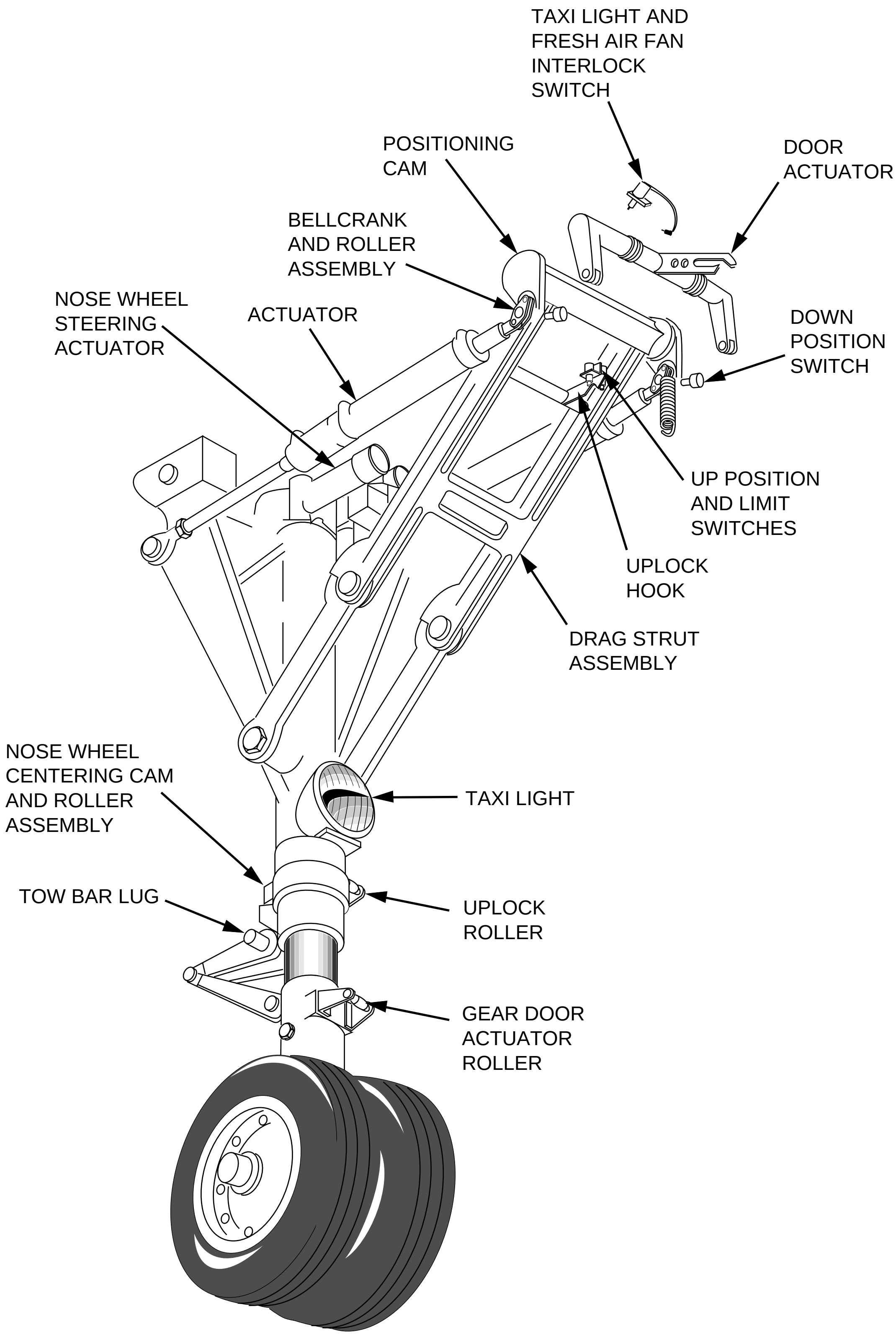


FIGURE 6-49

LANDING GEAR SYSTEM (continued)

NOSE LANDING GEAR STRUT

The nose landing gear strut is identical in operation to the main landing gear strut, except for the addition of a metering pin at the orifice which, in effect, creates a variable orifice. The effective size of the orifice, and hence the restriction to fluid flow, varies with the amount of compression and extension of the strut. A taxi light, a nose wheel steering actuator, and a nose wheel centering device are installed on the nose gear strut. The taxi light and the nose wheel steering system are discussed in later sections of this manual.

NOSE WHEEL CENTERING DEVICE

The nose wheel centering device consists of a fixed cam attached to the stationary upper section of the strut and a follower arm and roller device attached to the scissors between the two sections of the strut. As the weight of the airplane is removed from the nose gear, the weight of the gear plus the force of the nitrogen pressure causes the strut to extend. These extension forces also are transmitted through the scissors to the follower arm and roller assembly which tracks to the center of the cam and thereby moves the steerable portion of the nose gear to the centered position.

VARIABLE AUTHORITY NOSE WHEEL STEERING

A hydraulically powered, electrically controlled actuator is used for nose wheel steering. Controls for the system include a test switch, an arm switch, and a park button all installed on the left hand console. A nose wheel steering button is installed on the left hand power lever. For aircraft modified by S.B. 227-32-040, a NWS power lever button is installed on each power lever to provide independent control actuation for the pilot or copilot. Either the power lever button or the right speed lever micro switch will provide electrical power to the actuator.

For normal steering operations with the nose wheel steering switch armed and either the speed lever switch made or the power lever button depressed, the rudder pedals are moved to steer the airplane. Steady illumination of the NOSE STEERING light indicates the system is armed and the direction of the aircraft should respond to rudder pedal deflection. If more steering authority is required, the park button may be depressed. This increases the maximum nose wheel deflection from 10 degrees to 63 degrees left or right. An electrical delay prevents abrupt transition to or from the parking mode.

LANDING GEAR SYSTEM (continued)

EMERGENCY EXTENSION OF LANDING GEAR

Both DC electrical power and hydraulic pressure (approximately 250 psi minimum) are required for normal extension of the landing gear. Electrical circuitry for landing gear control and position indication can be switched to either essential bus via one of the nine bus transfer switches located on the pilot’s console. Normally, the left essential bus is selected. If a failure of left essential bus power occurs, the circuitry should be switched to the right essential bus. Loss of electrical power from both essential buses or loss of hydraulic pressure will require emergency extension of the gear.

The landing gear emergency extension system includes provisions for manual release of the mechanical uplocks, manual repositioning of valves to bypass the gear selector valve, and a hydraulic hand pump. Stand pipes in the hydraulic reservoir reserve approximately one quart of hydraulic fluid for hand pump operation if a loss of normal system hydraulic fluid occurs. The EMERGENCY PROCEDURES section contains the procedures for emergency extension of the landing gear.

When the emergency release lever, located on the cockpit floor to the left of the copilot’s seat, is moved counterclockwise to its stop (approximately 90^{o}), cables release the mechanical uplock on each gear and reposition two gear bypass valves located underneath the forward side of the hydraulic reservoir. The repositioning of these two valves allows the fluid trapped in the “up” lines of the actuators used for normal retraction to bypass the gear selector valve and return to the reservoir. The gear then free falls. The gear weight plus the force of the airstream move the gear to the down and locked position. After the gear has been allowed to free fall, hydraulic fluid via the hand pump is used to apply additional force. The hand pump, located on the cockpit floor adjacent to the pilot’s seat, is blocked by an emergency gear valve lever. When this valve lever is rotated approximately 90^{o} counterclockwise, the hand pump bypass line is closed and the hand pump handle is free. The hand pump can then be actuated to provide hydraulic pressure to the down side of the auxiliary actuator at each landing gear.

A shuttle valve is installed between an engine driven pump pressure line and an emergency hand pump pressure line. The valve is moved by hydraulic pressure to direct the higher of the two pressures via electrical signal from a pressure transducer to the hydraulic pressure gauge located on the copilot’s instrument panel. If normal hydraulic pressure has been lost, the hydraulic pressure gauge will indicate hand pump pressure.

PARKING BRAKE

To set the parking brake, push the button in the center of the knob and pull the parking brake control to its fully extended (aft) position. Release the button and hold the knob fully out while applying pressure to either set of brake pedals. Release the force on the brake pedals and then release the parking brake knob (which will stay in its fully extended position).

To release the parking brake, apply pressure to the brake pedals while pushing the parking brake control full forward. Brake pressure will release when the brake pedals are released.

AIRPLANE LIGHTING SYSTEMS

The lighting system is divided generally into three groups; exterior lighting, interior cabin lighting, and cockpit lighting. The cockpit lighting is divided further into those lights powered from the essential buses and those powered from the nonessential bus.

All exterior lighting is powered from the nonessential DC bus. The exterior lighting consists of a standard set of navigation lights, a rotating beacon, two ice detection lights, two landing lights, two recognition lights, and a taxi light. Strobe lights are optional and, when installed, are powered from the left essential bus.

All interior cabin lighting is powered from the nonessential DC bus with the exception of the entrance lights, which are powered from the battery side of the left battery relay.

The edge lighted panel lights in the cockpit are powered by 5 VDC which is obtained from four 5 VDC power supplies connected to the essential buses. The pilot's flight instrument lights and panels are powered from the left essential bus. The copilot's flight instrument lights and panels are powered from the right essential bus.

The remaining cockpit lights are powered from the nonessential bus.

CARGO COMPARTMENT LIGHTING

Compartment lighting is available in the forward baggage compartment and the rear cargo compartment by activation of light switches in the respective compartments. If the airplane primary electrical system is on, lighting is available in these two compartments by selecting the compartment lights switches on. A time delay relay is incorporated in the light circuits to provide electrical power from the right battery for five minutes after primary electrical system is turned off. If more than five minutes time is needed, the auxiliary light system can be recycled for additional use of lights. Momentarily turning on either battery switch, or activating the system by use of the button in the left side of the nose baggage compartment, will reset the auxiliary light system.

AIRPLANE LIGHTING SYSTEMS (continued)

LIGHTING SYSTEM - EXTERIOR

Navigation Lights

The navigation light circuitry consists of two right wingtip lights (green), two left wingtip lights (red), and one tailcone light (white). These lights are powered from the nonessential bus through a switch located on the pilot's switch panel.

Any time the navigation lights are turned on, all green lights on the annunciator panel and the duct heat cycle lights are dimmed automatically.

Taxi Light

The taxi light circuitry consists of a 250 watt lamp assembly mounted on the nose landing gear, a relay located in the nose baggage compartment, and a microswitch in the nose wheelwell.

The taxi light operates on 28.5 VDC supplied by the nonessential bus through a 15 amp circuit breaker. Any time the taxi light switch located on the pilot's switch panel is selected to the ON position, ground will be provided to the relay. Energizing the relay causes current to flow from the nonessential bus, across the relay contacts to the taxi light. The nose landing gear must not be in the up position for the relay to close and the light to illuminate.

NOTE

- It is good practice to ensure the taxi light switch is in the OFF position except when in actual use. Should a malfunction occur and the light be ON when the nose landing gear is retracted, the light is powerful enough to cause heat damage within the nose landing gear wheelwell. However, the microswitch in the nose wheelwell will turn the light out when the landing gear is fully retracted.
- If the taxi light is used during takeoff in hazy or foggy weather, it may produce a disconcerting beam of light as the nose gear retracts after takeoff.

AIRPLANE LIGHTING SYSTEMS (continued)

LIGHTING SYSTEM – EXTERIOR (continued)

Landing and Recognition Lights

A landing/recognition light assembly is mounted in the leading edge of each wing outboard of the fuel cells. Each of these light assemblies contains one landing light and one recognition light. These four lights are controlled by a three position switch located on the pilot's switch panel. The three switch positions are identified as LDG & RECOG, OFF, or RECOG. If the LDG & RECOG position of the switch is selected, both landing lights and both recognition lights are illuminated. The selection of RECOG switch position illuminates only the two recognition lights.

The landing/recognition light assemblies receive 28.5 VDC power through the nonessential bus and are protected by four 15 amp circuit breakers.

Wing Ice Lights

The wing ice detection light circuitry consists of a 50 watt sealed beam light assembly located in the outboard side of each engine nacelle at the wing leading edge and the light control switch located on the pilot's switch panel.

The wing ice lights receive power from the nonessential DC bus through a five amp circuit breaker.

Rotating Beacon

The rotating beacon is a lightweight, oscillating anti-collision light mounted on top of the vertical stabilizer. It has an aerodynamic shape to reduce drag and is shielded to prevent radio interference. The light is a dual lamp unit with the lamps oscillating 180 degrees out of phase. The beacon flashes at a rate of 60 to 100 flashes per minute. The forward, ROT BCN, position of the switch allows the light to operate and the center, OFF, position turns the beacon off. The aft, ROT BCN and LOGO, position will cause the beacon as well as four optionally installed logo lights to illuminate.

The rotating beacon is energized from the nonessential bus through a five amp circuit breaker. It is controlled by a switch located on the pilot's switch panel.

PITOT STATIC SYSTEMS

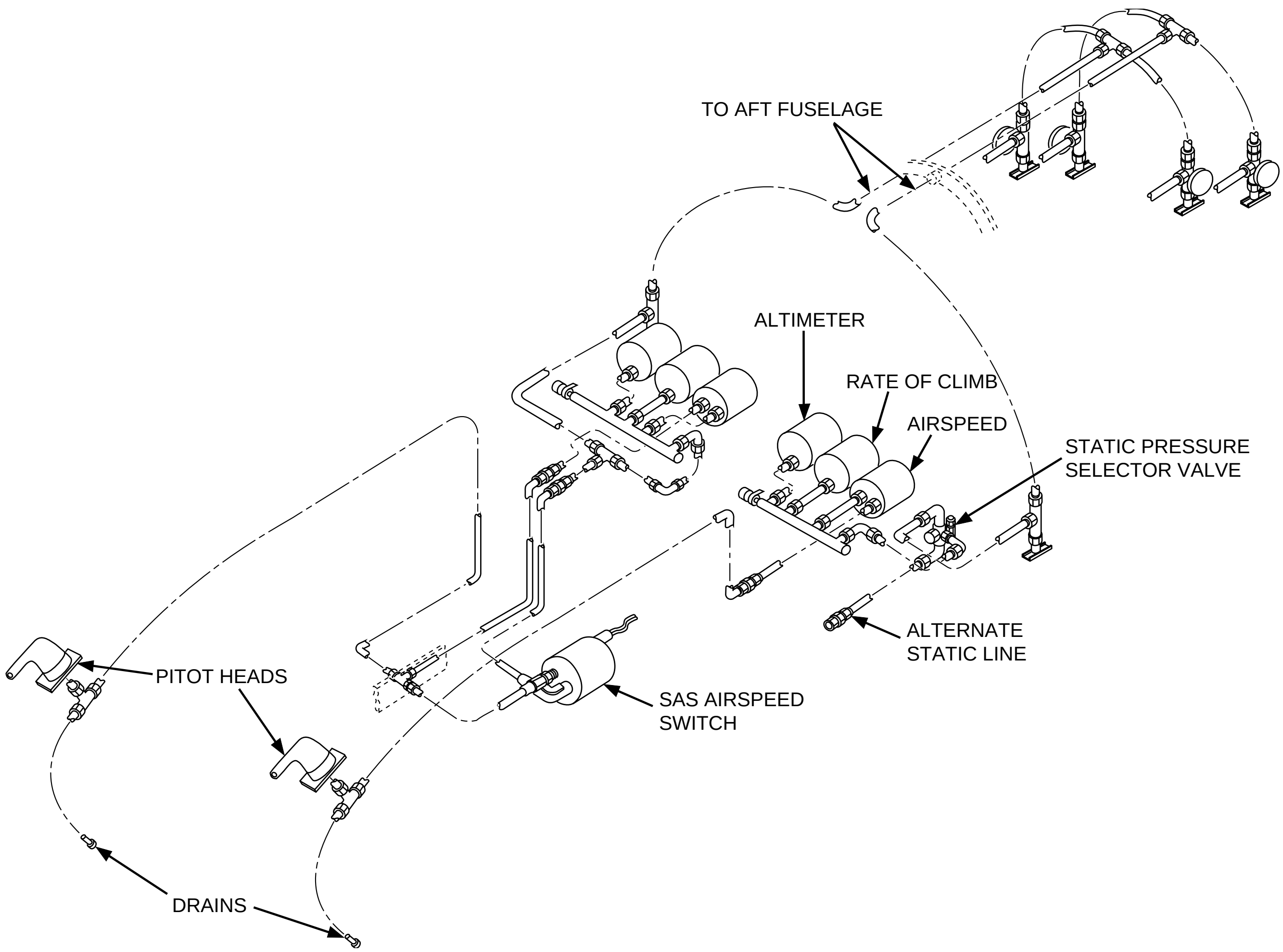


FIGURE 6-50

PITOT STATIC SYSTEMS

Separate pitot masts are installed, left and right, on the top of the fuselage nose section to provide individual pitot reference to the pilot's and copilot's airspeed indicators. Each pitot mast is electrically heated for anti-icing. Individual pitot heat switches are located on the pilot's switch panel. A loadmeter is located on the left console with a left and right selector switch for checking the individual circuits for proper operation. Individual static systems provide reference to the pilot's and copilot's rate-of-climb, altimeter, and airspeed indicators. Two static reference buttons for each of these static systems are located on opposite sides of the fuselage aft of the cargo door area.

Air from the unpressurized nose baggage compartment is referenced for the alternate static source through a static reference button. An alternate static selector valve is located on the lower left side of the pilot's instrument panel. When selection is made to the alternate position, only the pilot's instruments will be utilizing the alternate static source.

NOTE

Refer to Section 4 for position error correction data when operating from the alternate static source.

POWER PLANT

The METRO III is equipped with two Garrett TPE331-11U-601G, -611G, or -612G single-shaft turboprop engines rated at 1,000 shaft horsepower maximum continuous or dry takeoff power, and 1,100 shaft horsepower for a wet takeoff. At 100% engine RPM, the propeller rotates at 1,591 RPM.

The major components of the engine power section consist of a two stage centrifugal compressor, an annular reverse-flow combustion chamber, and a three stage axial flow turbine. During operation, ram air enters the upper air scoop and is directed into the center of the first stage compressor where the air is compressed and directed to the second stage compressor. After second stage compression, the air is directed into the plenum surrounding the combustion chamber and then into the combustion chamber. Fuel is sprayed into the combustion chamber, mixed with the compressed air, and ignited. As the mixture ignites, it expands with a great increase in temperature and pressure. The air exits the combustion chamber and is directed to the first axial flow turbine. As the air flows through the axial flow turbine blades, the turbine wheel is rotated and the air velocity decreases. This process is repeated over the remaining two turbine wheels extracting most of the heat and energy from the air and converting it to rotating mechanical energy. This energy is used to drive the centrifugal compressors, the reduction gears, the propeller, and various engine components. Labyrinth seals situated between the various turbine and compressor wheels prevent back flow of hot gasses from one stage to another.

PROPELLER AND CONTROL

The propellers on the METRO III are oil operated, constant speed, full feathering, and reversible. The propeller governing system consists of engine oil pressure, a feathering spring, and propeller blade counterweights. The engine oil is pressurized by the propeller governor and directed into the propeller dome through a passageway called a beta tube. Oil pressure acts against one side of the piston inside the propeller dome to cause the blades to move from high pitch toward low pitch and, when needed, into reverse. Forces of the feathering spring and counterweights act in the opposite direction to move the blades from low pitch to high pitch. The opposing forces are balanced to keep the engine and propeller turning at the speeds selected by the speed lever. The propeller blades are driven toward feather if the NTS system ports some of the governing oil to the gear case, and they are driven all the way to feather if all of the oil is dumped through the beta tube to the gear case by use of the stop and feather control.

POWER PLANT (continued)

PROPELLER AND CONTROL (continued)

Because the TPE331 engine has a single shaft, it is necessary to have the propeller blades in low pitch position for starting to reduce high drag loads due to air resistance. To allow for this, a pair of centrifugal-mechanical start locks have been installed in each propeller dome. During normal engine shut-down, the propeller blades are placed into reverse pitch as the engine decelerates so that the start locks can engage. During start, the locks are held extended by a shear load placed on them by the propeller blades. Reverse position must again be selected to release the start locks. If the start locks were not engaged during shutdown, refer to NORMAL OPERATING PROCEDURES for the procedure Before Start Propeller Unfeathering.

ENGINE CONTROLS

The engine controls consist of power levers, speed levers, negative torque sensing, single red line computer, and a temperature limiting system.

POWER LEVERS

The power lever controls engine operation in beta and propeller governing ranges. Beta range is used only during ground operations and occurs when the power lever is positioned between flight idle and reverse. When operating in beta range, propeller blade angles are hydraulically selected. Engine speed is controlled by a fuel metering device called the underspeed governor which is part of the fuel control.

Propeller governing range is used during all flight operations and occurs when the power lever is positioned between flight idle and takeoff. When operating in propeller governing range, the power lever assumes the function of a fuel throttle and regulates the amount of fuel metered to the engine for producing desired power.

During landing flare, the power levers are positioned in flight idle to establish predictable thrust and drag and to allow the airplane to settle to the runway at an established rate of descent.

POWER PLANT (continued)

SPEED LEVERS

The speed lever is placarded Low RPM and High RPM. This lever sets the speed governors. When the power lever is in beta range, engine speed is controlled by the underspeed governor which limits speed between 70% and 96% to 97.5% RPM. The speed lever can reset the underspeed governor anywhere within this range. When the power lever is in propeller governing mode, engine speed is controlled by the propeller governor. The speed lever can be used to set the propeller governor anywhere within the normal range of 96% to 100% RPM when in the propeller governing mode of operation.

PROPELLER SYNCHROPHASING (If Installed)

Automatic propeller synchrophasing is provided through a toggle switch located forward of the speed levers. The syncrophaser automatically matches the speed of the two propellers and sets a phase angle relationship between the propellers. The difference between propeller speeds can be no greater than 1.4% RPM in order for the synchrophaser to operate. There is no "master" propeller. When the synchrophaser is initially turned on, an increase in RPM of up to 0.7% may be observed on both propellers.

If the synchrophaser is on and one propeller is subsequently feathered, the RPM of the operating engine will not decrease more than 1.4% before reverting to unsynchronized mode of operation. A similar reversion will occur if the speed of the two propellers differ more than 1.4% RPM. A noticeable audible change in sound level will accompany the reversion to unsynchronized operation. To prevent undesirable RPM excursions, the propeller RPM's should be closely matched by use of the speed levers before engaging the synchrophaser.

NEGATIVE TORQUE SENSING (NTS) SYSTEM

The negative torque sensing system operates automatically and requires no cockpit controls. The operational capability of the system should be checked before the first flight of the day. Negative torque occurs whenever the propeller drives the engine rather than when the engine drives the propeller. When negative torque is sensed, propeller pitch will automatically increase toward feather and reduce the drag of the windmilling propeller.

POWER PLANT (continued)

SINGLE RED LINE (SRL) COMPUTER

The single red line computer receives information from various sources and computes a single red line temperature that constantly corrects itself for changing flight conditions. This red line is used to prevent exceeding maximum engine temperatures. Its inputs are: compressor and inlet temperature, exhaust gas temperature, airspeed, and altitude.

TEMPERATURE LIMITER SYSTEM

The temperature limiter system consists of a temperature limiter control box installed aft of the cargo compartment and a fuel bypass valve installed on the engine. A maximum computed EGT value (approximately 650^{o}C) is set in the control box. If engine temperature begins to exceed this preset value, the control box supplies a signal to open the fuel bypass valve and reduce EGT. A blue fuel BYPASS OPEN light located near each EGT indicator illuminates while the signal is being supplied to the valve. The temperature limiter receives signals from the SRL computer; therefore, loss of the SRL system may cause the temperature limiter to close the fuel bypass and could result in an engine over temperature condition. During takeoff, the blue bypass light may illuminate with no action required, but in climb and cruise, power levers should be retarded until the lights extinguish. This action should prevent an engine over-temperature condition should the SRL system fail.

The temp limiter and the fuel bypass light illumination operate according to the following logic:

1. SRL OFF light illuminated below 80% RPM .... NORMAL OPERATION
2. SRL OFF light extinguishes as engine passes through 80% RPM .... NORMAL OPERATION
3. Bypass light is illuminated at 650^{o}C EGT .... NORMAL OPERATION (FUEL IS BEING BYPASSED TO LIMIT ENGINE TEMPERATURE)
4. Bypass light illuminated in flight at 650^{o}C EGT .... NORMAL OPERATION (RETARD POWER LEVER UNTIL LIGHT IS EXTINGUISHED)

ENGINE INDICATING SYSTEMS

TORQUE INDICATOR

A torque indicator for each engine is located on the instrument panel. The torque indicator receives its voltage inputs from a torque signal conditioner for the respective engine. The torque signal conditioner detects strain gauge torque output at the engine gear box.

The torque signal conditioner requires 22 to 32 VDC to operate accurately. Therefore, whenever aircraft bus voltage drops below 22 VDC, as during battery starts, the output from the torque signal conditioners decreases and causes the torque indicators to indicate erroneously. As bus voltage builds up during engine battery starts, indicated torque will gradually decrease until starter drop-out occurs at approximately 60% RPM. Then bus voltage returns to normal and the torque indicators present factual information.

RPM INDICATOR

One RPM indicator for each engine is located on the instrument panel. The RPM indicator is operated by 28.5 VDC with power normally supplied to the left engine indicator from the left essential bus and from the right essential bus for the right engine indicator.

FUEL FLOW INDICATOR

The temperature compensated fuel flow indicating system consists of a fuel flow transducer and an indicator located on the instrument panel. The transducer converts fuel flow to an electrical signal which is displayed on the fuel flow indicator. The indicator is calibrated in pounds per hour.

FUEL PRESSURE INDICATOR

Each engine is equipped with a fuel pressure indicating system. The system consists of a dual indicator located on the instrument panel and a pressure transducer located aft of the firewall at the top of each engine nacelle.

ENGINE INDICATING SYSTEMS (continued)

OIL PRESSURE INDICATOR

Each engine has an oil pressure transducer and an oil pressure indicator. The pressure transducer is located adjacent to the fuel pressure transducer aft of the firewall at the top of each engine nacelle on earlier aircraft. The pressure transducer is located nearer the oil tank on later aircraft.

OIL PRESSURE WARNING

Each engine is equipped with an oil pressure switch and a low oil pressure warning light located on the annunciator panel. The pressure switch is located close to and is supplied from the line feeding the oil pressure transducer. The pressure switches are set to close when oil pressure is less than 40 psi.

OIL TEMPERATURE INDICATOR

Each engine is equipped with an oil temperature bulb and an oil temperature indicator. The oil temperature bulb is a standard resistance type bulb installed in the oil temperature port on the center rear face of the reduction gear housing.

CHIP DETECTOR

The forward lower housing of the reduction gear case on each engine is fitted with a magnetic plug having an insulated electrical stud. This stud is connected to a chip detector light located on the annunciator panel. Any metal particles attracted by the magnet will cause the light for the respective engine to illuminate.

ENGINE OIL SYSTEM

The engine oil system provides lubrication and cooling of engine parts and accessories, control of the propeller, and operation of the negative torque sensing system. The basic components of the system are the oil storage tank, oil cooler air scoop, oil cooler, oil pressure transmitter, oil pressure gauge, and the necessary plumbing to supply oil as needed. Total oil system capacity (engine and prop) is 7.1 U.S. quarts.

Engine oil is contained in a 3.8 U.S. quart tank located on the left side of each engine on the firewall section. An access door is provided on each nacelle for inspecting the oil quantity sight gauge.

Oil flows from the oil tank to the engine driven oil pump which provides lubrication for engine bearings and gears. After pressurized oil leaves the oil pump, it is routed through an oil filter. If the filter becomes clogged, the oil will bypass the filter. Scavenge pumps return the oil to the tank by way of the oil cooler. During engine starting, an oil vent valve allows gear case air to enter the oil pumps to decrease starting loads. As engine speed increases, the vent valve closes and the oil pump will return to normal operation allowing oil pressure to be generated.

FUEL CONTROL SYSTEM

The major components of the engine fuel system are the high-pressure boost pump assembly, fuel control, fuel solenoid valve, fuel flow divider, primary nozzles, secondary nozzles, and manifold assemblies. Prior to starting, the electrical components in the aircraft system are energized and fuel is directed to the engine mounted fuel pump through a filter to the high pressure pump. The high pressure pump output is directed to the fuel control. The fuel control then meters fuel flow to the fuel solenoid valve. The fuel solenoid valve opens at approximately 10% RPM and permits fuel to enter the flow divider where it is routed to the primary and secondary nozzles and manifold for combustion.

ENGINE START SYSTEM

The start system consists of two starter-generators, two nickel-cadmium batteries, associated relays, switches, circuit breakers, and wiring necessary to furnish power to the start system.

STARTER-GENERATORS

The starter-generators are mounted on the lower right side of each engine. When the start cycle is completed, the unit is switched to the generator mode to provide DC power when selected.

BATTERIES

The two nickel-cadmium batteries that power the start system are rated at 24 ampere hours each at the five hour rate. The batteries are mounted, one in each wing, between the nacelle and fuselage.

SERIES-PARALLEL START MODE SELECTOR SWITCH

The start mode selector switch on the pilot’s console allows engine starts on battery power to be made with the batteries in series or in parallel, as required. If a GPU or an engine generator is on the line, the engine start will be in the parallel mode, regardless of start mode selector switch position. With battery power only and with the switch in series position, automatic switching to series at 10% RPM is obtained. As RPM passes approximately 60%, the batteries automatically switch back to parallel. With the switch in parallel position, or if other power is on line, the series-parallel relay is disabled and the batteries remain in parallel during the start sequence. The series mode is recommended for use during the first battery start of the day and for all other battery starts when engines have cooled to near ambient temperatures since last being operated.

PILOT'S OPERATING TIPS

EXTERNAL POWER SWITCH

Some airplanes are equipped with an external power unit switch, normally located at the right end of the copilot's switch panel near the fresh air fan control switch. The purpose of the switch is to allow the pilot to monitor the output of the ground power unit prior to introducing external power to the airplane. When the switch is OFF, the pilot can check the voltage of a connected GPU on the airplane DC voltmeter. However, the output of the GPU will not be connected to remaining airplane systems until the battery switch and the external power switch are moved to their ON positions.

USE OF BOOST PUMPS DURING ENGINE GROUND STARTS

During engine start, the electrical power available to the boost pumps is below normal voltage. Operation at low voltage may decrease boost pump motor life. Therefore, it is recommended that the boost pumps be operated during engine ground start only when necessary. The boost pump check made during the engine start procedure normally provides sufficient initial fuel pressure for engine start with the boost pump off. However, accumulation of vapor in the fuel line, such as occurs when the aircraft is defueled and then refueled or when the fuel is exceptionally hot, may require use of the boost pump for engine start. With the boost pump off, excessive vapor in the fuel line will be indicated by a decay in engine acceleration between approximately 30% RPM and 60% RPM. Normal acceleration of engine RPM can be restored by turning the boost pump on.

CROSS GENERATOR STARTS

When starting an engine with the assistance of the opposite generator, stresses on the assisting generator due to initial high current demands may be reduced by use of the following procedure:

1. Battery Switches .... ON
2. Assisting Generator and Engine .... ON/OPERATION NORMAL
3. Ammeter Load .... LESS THAN 150 AMPS
4. Assisting Generator .... OFF
5. Start Button .... PRESS AND HOLD
6. RPM .... 10% TO 12%
7. Observe ignition .... RELEASE START BUTTON WHEN EGT RISES
8. Assisting Generator .... RESET/ON
9. Continue normal battery start sequence.

EFFECT OF AMBIENT TEMPERATURE ON STARTING TIME

The time required for an engine to accelerate from 10% to 71% RPM during starting varies with ambient temperature from approximately 50 seconds at 10^{o}C to 80 seconds at either plus 50^{o}C or minus 50^{o}C. These times are based on a normally charged battery or an adequate ground power unit.

PILOT'S OPERATING TIPS (continued)

POWER LEVER MANAGEMENT DURING ENGINE START

Normal procedures call for setting power levers approximately 1/4 inch forward of ground idle prior to starting engines on the ground. When the engine controls are properly rigged, that power lever setting ensures that the propeller blades remain on the start locks, the engines come on speed at about 75% RPM, and the pilot has no power lever manipulation to do during the start. However, after considerable use and/or field adjustments, rigging tolerances might become stacked to permit one or more of the following adverse conditions to occur when engine starts are made with the power levers set at approximately 1/4 inch forward of ground idle. The possibilities are:

1. Propeller blade angles might be at less than that called for when on the start locks.
2. Slow, warm starts might result when relatively small reverse blade angles exist during start.
3. Excessive wear of the locking ring inside the propeller dome might occur when the locking pins drag slowly out of the ring.
4. The propeller blades might come off the start locks and preclude successful preflight checks of overspeed governors, fuel bypass systems, and/or the SRL – Δ P/P systems.

Provided that the power controls are not grossly misrigged, the following procedure will ensure that minimum blade angles exist throughout the engine start cycle. Consequently, minimum blade resistance will allow relatively cool starts with rapid acceleration, and the blades will stay on the start locks and permit subsequent preflight checks. The disadvantage of the procedure is that engine RPM will be about 90% at the on speed condition if the power lever is not retarded prior to the end of the start cycle.

1. Following the flight idle gate check, leave the power levers at the flight idle gate instead of setting them at approximately 1/4 inch forward of ground idle.
2. If on-the-locks checks are required, retard the power lever to regulate RPM at about 75% as the engine approaches 70% RPM.
3. If on-the-locks checks are not required, retard the power lever to ground idle as the engine approaches 70% RPM.

PILOT'S OPERATING TIPS (continued)

PROPELLER START LOCK RELEASE

Propeller start locks are released by the procedure in NORMAL PROCEDURES. Positive assurance that the start locks have released may be gained during taxi. Slowly advance one power lever from ground idle to a positive thrust position. Note aircraft acceleration and turning tendency. Retard power lever smoothly and repeat for opposite engine. If a positive thrust effect is not noted, repeat the procedure for releasing start locks. Always monitor torque when setting power during rolling takeoffs. Failure of torque to rise above approximately 20% indicates the possibility that the associated propeller is still on the start locks.

LOW OIL PRESSURE ANNUNCIATIONS

The low oil pressure warning light on the annunciator panel is operated by an oil pressure sensing switch which operates at approximately 45 psi. The switch is located at the top of the nacelle, aft of the firewall on earlier aircraft. It is located centrally, aft of the gear case on later aircraft and on early aircraft which incorporate Service Bulletin 227-71-004.

It is common for the low pressure warning light to blink when taxiing in and out of reverse, particularly if engine oil temperature is above 110^{o}C and the Service Bulletin has not been accomplished. The Service Bulletin shortens the pressure line to the switch significantly. Illumination of the low pressure warning light during taxi operations is much less common in aircraft equipped with the short pressure line.

PILOT'S OPERATING TIPS (continued)

BETA LIGHT OPERATION

Taxi: It is permissible to have the beta lights out at engine speeds between 70% RPM and 85% RPM during taxi and ground operation. However, when operating in the beta mode, the beta lights should be on if engine RPM is above 85%.

Failure of a beta light to illuminate when on the ground and operating in the beta range (power lever at ground idle and speed lever at, or above, 85% RPM) indicates a possible internal oil leak in the beta control system. In that case, reverse thrust should not be used during landing roll or takeoff abort because the associated propeller might not reverse properly.

In Flight: The beta lights should not be illuminated during normal flight operations. If a beta light illuminates during flight at normal operating airspeeds and power settings, an electrical wiring malfunction is indicated. No flight safety nor handling characteristics issue is associated with this case. If a beta light illuminates during takeoff or during flight at very low true airspeeds with maximum power set, an out-of-tolerance beta pressure switch malfunction is indicated. Again, no flight safety nor handling characteristics issue is associated with this case. Illumination of a beta light when at flight idle power and very low true airspeed, as during approach to a stall, might indicate either improper flight idle blade angle settings and/or that flight idle power is set too low. Provided that engine power remains symmetrical throughout the maneuver and that there is no difficulty in controlling the aircraft laterally and directionally, there is no safety of flight problem. However, if asymmetric power is evident, approach and landing should be planned with power above flight idle. If power asymmetry is severe, the pilot should consider shutting down (Preplanned Engine Shutdown Procedure) the engine which has low flight idle power and conducting a single engine landing.

PILOT'S OPERATING TIPS (continued)

VARIABLE AUTHORITY NOSE WHEEL STEERING TESTS

When the variable authority nose wheel steering test switch is held to either the left or right position, a strong steering signal is sent to the actuator to turn in that direction. The fault detection circuit immediately senses this signal as a fault and cancels the signal, stops the steering servo, and causes the nose steering light on the annunciator panel to blink. The nose wheel steering will remain disabled and the annunciator light will blink until the test switch is released to its neutral position.

If nose wheel steering is tested while holding the park mode button down and the park mode button is released before the test switch is released, the nose wheel steering is likely to remain disabled until the park mode button is depressed again and the rudder pedals are returned to the position they were when the test was begun. Another way to clear such a continuing fault is to turn the nose wheel steering switch off, align the rudder pedals with the nose wheel, and turn the nose wheel steering switch on again.

If the nose wheel steering system is tested while taxiing at relatively high speed, the fault introduced will cause the airplane to begin a turn at a rate which might be objectionable to passengers. Therefore, for passenger comfort, it is recommended that the nose wheel steering test be accomplished while taxiing slowly.

SETTING TAKEOFF AND CLIMB POWER

The takeoff distance and takeoff climb performance charts show the performance of this aircraft provided the torque required by the Takeoff Power Check Charts is set prior to brake release. There are two exceptions: when atmospheric conditions permit obtaining 100% torque dry or 110% torque wet, static torque must be limited to 97% or 107%, respectively, to avoid over-torquing the engines during the latter part of the takeoff roll when ram rises cause set power to increase.

When the engines are new, torque required by the charts can be obtained at less than the maximum allowed 650^{o}C EGT. Typically, a new engine reference EGT may be expected to increase gradually as engine time increases. Eventually, chart torque may no longer be attainable at limiting EGT (650^{o}C). At that time, the aircraft will not be able to meet the takeoff distance and takeoff climb performance presented in the PERFORMANCE SECTION. Any sudden requirement for higher EGT indicates possible problems with the engine or indicating system and the need for maintenance action.

PILOT'S OPERATING TIPS (continued)

SETTING TAKEOFF AND CLIMB POWER (continued)

Except possibly during single engine emergencies, use of more than reference EGT during engine operations at 100% RPM amounts to unnecessary abuse of the engine with shortened engine life the likely result. Reference EGT should be set during en route climbs if published climb performance is expected. Therefore, it is important for the pilot to keep in mind the reference EGT for his engines. Periodic static checks at takeoff torque or MCP in flight checks are recommended to determine reference EGT trends.

NOTE

Single engine performance is based on the operating engine being capable of producing the static power shown in the Takeoff Power Check Charts. V_{MCA} is based on the operating engine producing 110% torque. The pilot should not hesitate to use any reserve power available (up to 650^{o}C EGT or 100% torque – dry/110% torque – wet) if extra power is required during single engine emergencies at low airspeeds.

It is important that the pilot set speed lever friction prior to takeoff roll. If friction is loose enough, the speed lever(s) might vibrate to a lower RPM setting which would cause the SRL computer(s) to operate on the inappropriate temperature correction schedule.

TAKEOFF RPM

The takeoff and climb performance of the aircraft and the maximum weight at which that performance can be obtained depend upon the power produced by the engine(s). That power is directly related to torque and RPM. The torque to set for takeoff is determined from the engine power setting charts in Section 4. Those torque values are the values required when the RPM is 100%. Less than 100% RPM, or less than chart torque at brake release, means less than "charted" power is set and that less than "charted" performance will be obtained.

When the power levers are set for takeoff, the stabilized RPM indicated in the cockpit can be influenced by several factors. Some of them are:

1. Adjustment of prop governor-high (PGH).
2. The position of the speed levers. PGH can't do its job if the speed levers aren't full forward or if the linkage between the speed levers and the prop governors is maladjusted.
3. Engine oil temperature. High oil temperature will cause the RPM at PGH to be lower than when oil temperature is in the 70 to 75 degree range normally seen during flight. As a rule for every 3^{o}C of temperture higher than 70^{o}C, you should decrease the nominal value of the stabilized RPM 0.1%.
4. Wind direction and velocity. Static PGH checks on the ground with a strong tailwind will produce low RPM.
5. Accuracy of the tach generator and tachometer. When the RPM's are aurally synched in flight but there is a split in indicated RPM, the split is probably caused by indication error.

PILOT'S OPERATING TIPS (continued)

TAKEOFF RPM (continued)

Engine oil temperature during prolonged ground operations, particularly during the summer season, can easily exceed 100°C. It is not uncommon to not be able to achieve 100% RPM at speed levers high at such high oil temperatures. However, most commonly during takeoff roll, the oil cools down rapidly and RPM increases to at least 100% (due both to the cooler oil and to the increased volocity of the relative wind).

In summary, there is an operational requirement to have PGH set to achieve 100% to 101% RPM for takeoff. The factors mentioned above affect PGH readings. Therefore PGH must be fine tuned in consideration of these factors to ensure that at least 100% RPM is available for takeoff.

SRL COMPUTER SCHEDULES AND SETTING CRUISE POWER

Indicated EGT in the cockpit is the sum of compensated EGT plus a variable correction. The variable correction is dependent upon engine speed and is applied only when the SRL computer is powered and engine speed is above 80% RPM (SRL annunciator lights out). Furthermore, two distinct correction schedules are used: one schedule when engine speed is between 99% and 101.5% RPM, and the other when engine speed is between 95.5% and approximately 98% RPM. When engine speed is changed from takeoff and climb setting (100% RPM) to cruise setting (97% RPM), a noticeable, rapid increase in indicated EGT occurs at the time the SRL computer transitions from the high RPM schedule to the low RPM schedule. Illumination of the fuel bypass lights and torque fluctuation may accompany the transition between the two schedules.

To reduce the apparent abruptness and magnitude of the transition, retard the power levers to less than approximately 580°C EGT before decreasing RPM in flight. Then reset the power levers to desired cruise EGT. Cruise performance charts are based on 650°C and 97% RPM. Precise setting of RPM and EGT is required to obtain that performance. But if 650°C EGT is set, and turbulence or flight control manipulations load the propellers enough to cause RPM to decrease, the EGT will increase and cause the fuel bypass lights to illuminate. Similarly, if RPM is set slightly above 97% and the propellers are unloaded, RPM might increase sufficiently above 98% to cause the SRL computer to transition to the high RPM temperature schedule with associated EGT excursion. Avoid operating with RPM set in the range that allows transitioning between the two temperature schedules. Your passengers will not enjoy the power excursion that may result from improperly set RPM.

PILOT'S OPERATING TIPS (continued)

REVERSE TAXI OPERATIONS

At maximum gross ramp weight the speed levers may have to be placed in high RPM and power levers in full reverse to begin initial movement of the airplane. Reverse taxi speed should be controlled primarily with the power levers. Wheel brakes should not be used to stop the aircraft unless absolutely necessary, particularly when stopping from a relatively fast reverse taxi speed and/or with the center of gravity near the aft limit. If wheel brakes are used under these conditions, the weight on the nose wheels will be substantially reduced. Nose tire scrubbing and undesired turns caused by a castering nose gear or uneven braking may result.

The nose wheel steering park button should be used only when negotiating backing turns over 20 degrees. Use of the park button for straight backing or turns of less than 20^{o} will result in overly sensitive response of the nose wheel steering system to rudder pedal inputs.

All reverse taxi operations should be conducted at the minimum speed required to accomplish the desired ground maneuver. As with all ground operations, care should be taken to prevent excessive propeller air blast on personnel or equipment directly in front of the airplane during reverse taxi operation. Use of reverse at slow speeds when on taxiways or ramps that are not clean will result in prop blade erosion and nicks from loose gravel or other debris.

CABIN PRESSURE CONTROLLER OPERATION

The cabin pressure controller operates to keep the cabin pressure at the pressure altitude selected on the controller. It is important to realize that the controller recognizes only standard day altitudes. Thus, if the controller is set to pressurize 100 feet above field elevation on a day when the altimeter setting is well above 29.92 in. Hg., the airplane will be several hundred feet in the air after takeoff with bleed air ON before pressurization begins. Similarly, with the same controller setting during landing approach to the same airport, the airplane will be depressurized well above touchdown and the crew and passengers will experience pressure build-up at a rate equal to the rate of descent during the landing approach. Selecting a cabin altitude slightly below field elevation on high pressure days will eliminate the high rate of pressure increase during final approach.

Conversely, if it is a day with an altimeter setting well below 29.92 in. Hg., the selected cabin altitude should be higher than field elevation to avoid an objectionable pressurization bump immediately after liftoff with bleed air ON and to avoid touchdown with the airplane still pressurized.

During takeoff the bleed air may be turned off. Therefore, the pilot should set the cabin altitude after considering the altimeter setting and the altitude where he predicts he will be when he turns the bleed air switches ON, or AWI switch OFF, after takeoff. Turning the bleed air switches ON one at a time before reaching the altitude where pressurization will begin should prevent the "bump" associated with sudden pressurization.

With sea level selected on the cabin pressure controller, the cabin will maintain that altitude until the aircraft exceeds 16,800 feet pressure altitude.

PILOT'S OPERATING TIPS (continued)

COCKPIT LIGHTING

The cockpit is equipped with DC lighting. The integrally lighted instruments and the edge-lighted panels are also DC powered.

Spare bulbs are stored behind the pilot's seat. The 327 bulbs are used in press-to-test lights, the 334 bulbs are used in glareshield lights, the 328 bulbs are used in post lights and the standby magnetic compass, and the 6839 bulbs are used in the landing gear position indicator, crossflow valve switch position light, oil cooler duct heat lights, and the fuel, hydraulic, and crossflow valve position lights.

NOTE

> Bulbs must be verified for the correct type prior to replacement of burned out bulbs.

ENGINE FLAMEOUTS DURING ADVERSE WEATHER

If air or fuel flowing to the combustion chambers is interrupted, any turbine engine is apt to flame out. Although every potential cause of such interruptions cannot be predicted, it is known with certainty that ingestion of large quantities of slush or ice have caused TPE331 engines to flame out. Flameouts due to slush ingestion have occurred during both takeoff and landing rolls. Flameouts in flight have occurred when large amounts of ice shed from prop spinners, when sheets of ice inside the intake throats slid back after engine and prop heat was selected, and after the airplane was flown into air warm enough to loosen the accumulation of ice in the throats. Some of these flameouts occurred after leaving icing conditions when visible precipitation or moisture no longer existed in the vicinity of the airplane. In every reported case of flameout due to ice or slush ingestion, the continuous ignition system was not operating. Fairchild Aircraft has received no reports of sustained flameouts on SA227 aircraft when the continuous ignition systems were operating in accordance with AFM procedures.

For normal flight operations in known icing conditions, rain and turbulence the OVERRIDE mode (Ignition Mode Switches) or AUTO position (AUTO/CONT Ignition Switches) should be selected. If flight operations include takeoff and landing whenever standing water or slush is present, flight in heavy rain, and as required before selecting engine and prop heat following inadvertent icing encounters, the OVERRIDE or CONT position should be selected. Whenever operating with OVERRIDE or CONT ignition, flight crews should return to weather conditions suitable for the NORMAL or AUTO position as soon as practical.

With AUTO/CONT Ignition switch installed, if an interruption to the engine airflow occurs (caused by ingestion of slush or ice) and the AUTO/CONT ignition switch is in the AUTO position, the ignition system provides an engine re-light protection feature by energizing the ignition when the negative torque sensing (NTS) system is activated. A re-light cycle initiated by a NTS signal may last for 3 to 7 seconds, and may be identified by engine Torque and RPM roll back and a mild yaw excursion on the aircraft as the ignition system detects a power interruption and restores normal engine performance.

PILOT'S OPERATING TIPS (continued)

ENGINE FLAMEOUTS DURING ADVERSE WEATHER (continued)

The OVERRIDE or CONT ignition position will provide an immediate re-light if either air or fuel flowing to the combustion chambers is interrupted briefly. Such interruptions are usually not recognized by the flight crew. When planning long term operations in weather conditions requiring extensive use of OVERRIDE or CONT ignition, flight crews should consider changing altitudes (temperature and moisture content) to preclude excessive ice accumulation.

OPERATIONS WITH STANDING WATER, SLUSH, OR WET SNOW ON THE RUNWAY

Standing water, slush, and wet snow all appear to affect aircraft takeoff and landing performance in the same way. During takeoff, acceleration is reduced by the impingement of spray on the aircraft. At some speed, during the acceleration, the wheels will start to hydroplane. When the nose wheel hydroplanes, it becomes relatively ineffective for steering. This effect will be especially noticeable during crosswind conditions; however, rudder effectiveness should be sufficient to control the airplane. When the nose wheel hydroplanes, the amount of extra drag appears to be reduced since the spray pattern narrows with a resulting reduction of impingement on the aircraft, and therefore, hydroplaning is not a completely adverse condition for takeoff. During landing, the problems encountered are obviously those of reduced brake and steering effectiveness. Once started, hydroplaning is likely to continue well below the speed at which it would start during takeoff. However, ground idle drag should promptly decelerate the aircraft through the hydroplaning speed range. Heavy use of reverse thrust should be reserved for emergency stopping situations. The cloud of spray produced may obstruct forward visibility and result in engine ingestion sufficient to cause flameout.

Exact data on the changes in aircraft performance caused by runway coverings are not available. The amount of performance deterioration is a function of both runway conditions and aircraft configuration. It is recommended that current FAA Advisory Circular guidelines concerning performance with water, slush, or snow on the runway be followed.

For takeoff, the required runway length should be increased by at least 30% for depths of up to 1/2 inch of standing water, slush, and/or wet snow. When the depth of the covering extends over an appreciable part of the runway and exceeds 1/2 inch, takeoff should not be attempted. For landing, a minimum of 30% additional runway should be allowed for wet or slippery runway.

Chined nose wheel tires, recognized by a protruding strip around the outer side of the tire, are available and approved for use on the METRO III. The use of chined nose wheel tires is strongly recommended on these aircraft when operating from runways with standing water, slush, and/or wet snow.

NOTE

> Use continuous ignition for takeoff or landing on a wet or snow/slush covered runway to ensure immediate relight in the event that engine combustion is interrupted by ingested water, slush, or snow during the ground roll.

PILOT'S OPERATING TIPS (continued)

NOISE CONTROL

Many people object to the sounds of aviation. Therefore, out of consideration for the public and to avoid possible legal restrictions, every effort should be made to minimize the noise impact of each flight. Appropriate use of Minimum Normal Operating Power (MNOP) and the following procedures will lessen the noise perceived by both those on the ground and the passengers aboard your aircraft.

NOTE

MNOP is defined as:

97% RPM and 100% torque or 650°C EGT, whichever is encountered first. It is equivalent to maximum cruise power.

Takeoff and Climb

1. Maintain takeoff power and V_{50} until obstacles are cleared, then retract flaps and accelerate to V_Y.

2. Reduce power to MNOP and continue climb at V_Y until reaching 2,000 feet AGL.

3. Continue climb with MNOP set or increase power to MCP if required or desired to obtain better climb performance.

En Route

1. Avoid unnecessary flight at low altitudes over noise sensitive areas.

2. Maintain at least 2,000 feet AGL when flying at high power.

Approach

1. Delay resetting RPM from cruise to 100% until after gear and one-half flaps are down.

2. Conditions permitting, delay RPM increase until after flaps are full down.

PILOT'S OPERATING TIPS (continued)

INTENTIONAL ONE ENGINE INOPERATIVE SPEED (V_{SSE})

The intentional one engine inoperative speed (V_{SSE}) is the speed above which an engine may be intentionally and suddenly flamed out for pilot training purposes and must not be confused with the demonstrated minimum control speed (V_{MCA}). V_{SSE} is to be used as the starting speed when training pilots to recognize the low speed, single engine, handling qualities and perfomance of the METRO III. After ensuring proficiency in controlling the airplane at V_{SSE}, it is permissible to slow down with one engine inoperative toward V_{MCA} to further increase the trainee's awareness, proficiency, and confidence.

Several factors must be considered prior to intentionally rendering an engine inoperative in flight by either depressing the stop button, pulling the engine stop and feather control part way out, or stopping fuel flow by shutting off at the firewall with the fuel shutoff switch. Pertinent factors are terrain proximity, gross weight, airspeed, gear and flap configuration, pilot proficiency, and the necessity for flaming out the engine.

NOTE

Retarding a power lever to the flight idle stop to simulate a failed engine at low airspeed will provide approximately the same control and performance problems as will rendering an engine inoperative intentionally. Power lever chops do not adversely affect the engine. With the failed engine at flight idle power, it is readily available to be used to recover from excessive loss of airspeed, altitude, control, or possible difficulties with the operating engine.

WARNING

FAIRCHILD AIRCRAFT RECOMMENDS THAT THE INHERENT SAFETY MARGINS OF SIMULATING ENGINE FAILURE, RATHER THAN ACTUALLY RENDERING IT INOPERATIVE, BE USED DURING PILOT TRAINING.

PILOT'S OPERATING TIPS (continued)

INTENTIONAL ONE ENGINE INOPERATIVE SPEED (V_{SSE}) (continued)

If it is deemed necessary to intentionally render an engine inoperative for pilot training, the following conditions define the circumstances under which the chosen V_{SSE} is valid.

Prior to Intentional Engine Failure

1. Airport Pressure Altitude .... 5,000 FEET MAXIMUM
2. Minimum Altitude .... 100 FEET ABOVE GROUND
3. Both Engines .... TAKEOFF POWER
4. Landing Gear .... RETRACTING OR RETRACTED
5. Wing Flaps .... NO MORE THAN 1/4
6. Gross Weight .... 14,000 POUNDS MAXIMUM
7. Bleed Air .... ON
8. Airspeed (V_{SSE}) .... 115 KIAS MINIMUM

NOTE

- The right engine is the critical engine and will create the more challenging directional control problem if it is rendered inoperative.
- If the yaw damper is on, the yaw damper will assist the pilot in directional control. (If yaw damper installed.)
- Commanding high propeller blade angle by keeping the power lever of the failed engine well forward will reduce windmilling propeller drag in the event that NTS failure accompanies intentional engine failure.

PILOT'S OPERATING TIPS (continued)

INTENTIONAL ONE ENGINE INOPERATIVE SPEED (V_{SSE}) (continued)

After Intentional Engine Failure

1. Operating Engine .... TAKEOFF POWER
2. Landing Gear .... RETRACTED
3. Wing Flaps .... RETRACTED
4. Engine Stop and Feather Control (Failed Engine) .... PULLED
5. Bleed Air .... OFF
6. Airspeed .... V_{YSE}

WARNING

AT HIGH GROSS WEIGHT AND AT HIGH DENSITY ALTITUDES, ALTITUDE MUST BE SACRIFICED TO ACCELERATE FROM V_{MCA} to V_{YSE}.

CAUTION

- REPEATED INTENTIONAL FLAMEOUTS WHEN OPERATING AT HIGH ENGINE POWER WILL EXPOSE THE ENGINE TO UNNECESSARY AND EXCESSIVE THERMAL SHOCKS AND WILL LIKELY REDUCE ENGINE LIFE.
- DO NOT ALLOW THE ENGINE TO WINDMILL IN THE 18% TO 28% RPM RESTRICTED RANGE.

INTENTIONAL ONE ENGINE INOPERATIVE SPEED IS

115 KIAS

APPROVED ENGINE OILS

Approved engine oils as listed in Garrett Installation Manual IM-5117 are:

Mobil Jet Oil II
Exxon (Enco/Esso) Turbo Oil 2380
Castrol 5000
Aeroshell/Royco Turbine Oil 500
Aeroshell/Royco Turbine Oil 560
Mobil 254

AiResearch Specification EMS53110 Type II is equivalent to Military Specification MIL-L-23699B.

NOTE

Do not mix types or brands of oil.

CONVERSION TABLES

DISTANCE

Meters	Feet	Meters	Feet	Meters	Feet	Meters	Feet
1	3	10	33	100	328	1,000	3,281
2	7	20	66	200	656	2,000	6,562
3	10	30	98	300	984	3,000	9,843
4	13	40	131	400	1,312	4,000	13,123
5	16	50	164	500	1,640	5,000	16,405
6	20	60	197	600	1,969	6,000	19,686
7	23	70	230	700	2,297	7,000	22,967
8	26	80	263	800	2,625	8,000	26,248
9	30	90	295	900	2,953		

TEMPERATURE

°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
–40	–40.0	–24	–11.2	–8	17.6	8	46.4	24	75.2	40	104.0
–39	–38.2	–23	–9.4	–7	19.4	9	48.2	25	77.0	41	105.8
–38	–36.4	–22	–7.6	–6	21.2	10	50.0	26	78.8	42	107.6
–37	–34.6	–21	–5.8	–5	23.0	11	51.8	27	80.6	43	109.4
–36	–32.8	–20	–4.0	–4	24.8	12	53.6	28	82.4	44	111.2
–35	–31.0	–19	–2.2	–3	26.6	13	55.4	29	84.2	45	113.0
–34	–29.2	–18	–0.4	–2	28.4	14	57.2	30	86.0	46	114.8
–33	–27.4	–17	1.4	–1	30.2	15	59.0	31	87.8	47	116.6
–32	–25.6	–16	3.2	0	32.0	16	60.8	32	89.6	48	118.4
–31	–23.8	–15	5.0	1	33.8	17	62.6	33	91.4	49	120.2
–30	–22.0	–14	6.8	2	35.6	18	64.4	34	93.2	50	122.0
–29	–20.2	–13	8.6	3	37.4	19	66.2	35	95.0	51	123.8
–28	–18.4	–12	10.4	4	39.2	20	68.0	36	96.8	52	125.6
–27	–16.6	–11	12.2	5	41.0	21	69.8	37	98.6	53	127.4
–26	–14.8	–10	14.0	6	42.8	22	71.6	38	100.4	54	129.2
–25	–13.0	–9	15.8	7	44.6	23	73.4	39	102.2	55	131.0

WEIGHT

Kgs.	Lbs.	Kgs.	Lbs.	Kgs.	Lbs.	Kgs.	Lbs.
1	2	10	22	100	221	1,000	2,205
2	4	20	44	200	441	2,000	4,409
3	7	30	66	300	661	3,000	6,614
4	9	40	88	400	882	4,000	8,818
5	11	50	110	500	1,102	5,000	11,023
6	13	60	132	600	1,323	5,670	12,500
7	15	70	154	700	1,543	6,000	13,228
8	18	80	176	800	1,764	6,350	14,000
9	20	90	198	900	1,984	6,580	14,500

CONVERSION TABLES

PRESSURE

Millibars	0	1	2	3	4	5	6	7	8	9
	INCHES HG									
910	26.87	26.90	26.93	26.96	26.99	27.02	27.05	27.08	27.11	27.14
920	27.17	27.20	27.23	27.26	27.29	27.32	27.34	27.37	27.40	27.43
930	27.46	27.49	27.52	27.55	27.58	27.61	27.64	27.67	27.70	27.73
940	27.76	27.79	27.82	27.85	27.88	27.91	27.94	27.96	27.99	28.02
950	28.05	28.08	28.11	28.14	28.17	28.20	28.23	28.26	28.29	28.32
960	28.35	28.38	28.41	28.44	28.47	28.50	28.53	28.56	28.58	28.61
970	28.64	28.67	28.70	28.73	28.76	28.79	28.82	28.85	28.88	28.91
980	28.94	28.97	29.00	29.03	29.06	29.09	29.12	29.15	29.18	29.21
990	29.23	29.26	29.29	29.32	29.35	29.38	29.41	29.44	29.47	29.50
1000	29.53	29.56	29.59	29.62	29.65	29.68	29.71	29.74	29.77	29.80
1010	29.83	29.85	29.88	29.91	29.94	29.97	30.00	30.03	30.06	30.09
1020	30.12	30.15	30.18	30.21	30.24	30.27	30.30	30.33	30.36	30.39
1030	30.42	30.45	30.47	30.50	30.53	30.56	30.59	30.62	30.65	30.68
1040	30.71	30.74	30.77	30.80	30.83	30.86	30.89	30.92	30.95	30.98
1050	31.01	31.04	31.07	31.10	31.12	31.15	31.18	31.21	31.24	31.27

TURBINE FUEL

Lbs.	Gal.	Liters	Lbs.	Gal.	Liters	Lbs.	Gal.	Liters
10	1.5	5.7	100	15	57	1,000	150	567
20	3.0	11.3	200	30	113	2,000	300	1,134
30	4.5	17.0	300	45	170	3,000	449	1,701
40	6.0	22.7	400	60	227	4,000	599	2,268
50	7.5	28.4	500	75	284	5,000	749	2,835
60	9.0	34.0	600	90	340			
70	10.5	39.7	700	105	397			
80	12.0	45.4	800	120	454			
90	13.5	51.0	900	135	510			

NOTE

Fuel conversions are approximate and will vary with fuel temperature. The quantities are based on 6.6763 pounds per U.S. gallon, and 3.785 liters per U.S. gallon.