FAA APPROVED

ROTORCRAFT

FLIGHT MANUAL

REVISION NO. 26

SIKORSKY

MODEL

S-76B

PART 1

SIKORSKY
A LOCKHEED MARTIN COMPANY

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Approved by:

Manager, Boston Aircraft
Certification Office, ANE-150

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ERRATA SHEET

FAA APPROVED ROTORCRAFT FLIGHT MANUAL

Date of Approval 16 March 2007

This ERRATA replaces the title page to include new Lockheed Martin company logo and export statement footers

Sikorsky Aircraft Corporation has already inserted the new page. No further action required on customer's behalf

Removed Pages	Inserted Pages
Title Page with Old Logo	Title Page with New Logo

This page does not contain export controlled technical data.

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When collating this revision or subsequent revisions into the basic Rotorcraft Flight Manual, be sure not to discard any Supplement 11 or 12 and/or S-55 pages which may have been integrated into the basic Rotorcraft Flight Manual. Refer to the basic and supplement list of effective pages.

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1	1-8A, 1-9, 1-17, 1-20, 1-25, 4-7 4-12, 4-13, 4-14	Revised ambient temperature limits, EAPS operation, V_{ne} placards, fuel limits, power assurance, and performance charts	1/13/86	Manager, Boston Aircraft Certification Office, ANE-150
2	ii, iii, 1-6, 1-6A, 1-9, 1-10, 1-11, 2-11, 4-1/4-2, 4-7, 4-8, 4-9, 4-10, 4-10A, 4-10B, 4-11, 4-12, 4-13, 4-14, 4-15, 4-16, 4-17	Revised category "B" operations, altitude limits, flight limits, height velocity diagram, before starting checks, engine power assurance, climb performance and hover out of ground effect.	2/19/86	Manager, Boston Aircraft Certification Office, ANE-150

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3	1-11	Revised fuel cross-feed limits	3/8/86	Manager, Boston Aircraft Certification Office, ANE-150
4	1-6, 1-6A, 1-8, 1-9, 1-16, 1-20, 1-25, 2-3, 2-9, 2-10 2-11, 2-14, 2-14A, 2-16, 2-30, 2-31, 3-15, 3-20, 3-24, 3-31/3-32, 3-39, 3-42, 3-44, 3-45, 3-46, 3-47, 3-57, 4-10B, 4-11, 4-15, 4-16, 4-17	Revised minimum operating temperature, V_{ne} placards, rotor limits, exterior check, before starting check, starting procedures, fuel priming, manual reversion operations, EAPS failure, main gear box oil system, fire procedures, landing gear malfunction, electrical system malfunctions, ditching, and performance	6/17/86	Manager, Boston Aircraft Certification Office, ANE-150

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9	2-4, 2-4A, 2-6, 2-6A	Revised Normal Procedures	9/22/88	Manager, Boston Aircraft Certification Office, ANE-150
10	1-18, 1-18A, 2-3, 2-14, 2-14A, 3-31/3-32, 3-42, 3-45, 3-46A, 3-46B, 3-46C, 3-47, 4-9, 4-10 Supplement 1, 2	Revised fuel flow limits, normal procedures checklist, overspeed checks, flight control damper jam, electrical system failures, power assurance figures.	10/19/89	for Manager, Boston Aircraft Certification Office, ANE-150

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11	1-17	Add JP- 8 as alternate fuel	9/24/90	Manager, Boston Aircraft Certification Office, ANE-150
12	1-7	Revised CG limits.	3/13/92	Manager, Boston Aircraft Certification Office, ANE-150

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15	1-5, 1-6B, 1-6C, 1-8, 1-9, 1-10A/1-10B, 1-12, 1-13 1-15, 1-16, 2-8, 2-11, 2-12, 2-12A/ 2-12B, 2-17, 2-19, 2-21, 2-28, 2-28A/ 2-28B, 2-30, 3-10, 3-10A, 4-1, 4-2, 4-7, 4-8, 4-9, 4-10, 4-19, 4-20, 4-24, 4-25 4-26 Supplements Index 1, 2, 3, 4	Increased takeoff and landing operation to 15,000 feet.	10/27/94	for Manager, Boston Aircraft Certification Office, ANE-150

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16	1-1, 1-2, 1-14, 1-15, 3-2, 3-23, 3-24, 3-24A/3-24B Supplements Index 3, 4	Revised Utility Hoist Minimum Crew Limits, and Main Gear Box Low Oil Press, and Chip Detector Emergency Procedures.	1/19/95	for Manager, Boston Aircraft Certification Office, ANE-150
17	1-12, 1-12A/1-12B, 1-13 Index 1 thru 6	Revised external cargo hook limitations. Updated Supplement Index	3/19/96	for Manager, Boston Aircraft Certification Office, ANE-150

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18	1-9, 1-17, 1-24	Adds JP-4 as an acceptable fuel. Clarified placard location.	9/19/96	
	Index 6	Updated Supplement Index		
			Manager, Boston Aircraft Certification Office, ANE-150	
19	1-7, 2-3, 2-12, 2-16, 2-16A/2-16B, 2-20B, 2-27, 2-28, 2-28A/2-28B	Revised CG Limits at Various Gross Weights chart, revised Exterior check procedure instruction, added air conditioner Note, added AFCS Check Note, added Approach and Landing Note, and revised Utility Hoist Pickup procedure.	6/17/97	
	Index 1, 2, 3, 4, 5, 6	Updated Supplement Index		
			for Manager, Boston Aircraft Certification Office, ANE-150	

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REVISION NO.	PAGES REVISED	REMARKS	DATE	FAA APPROVED
20	1-7, 2-8, 2-8A/2-8B, 2-9, 2-14A/ 2-14B, 2-16, 2-16A/2-16B, 2-17, 2-27, 2-28A/2-28B	Revised Electronic Engine Control (EEC) Limits. Revised Before Starting Engines, Starting Engines (Battery or External Power), Taxiing, Utility Hoist Pickup, and Hoist Duty Cycle procedures.	5/22/98	
	Index 1, 2, 3, 4, 5, 6, 7, 8, 9/10	Updated Supplement Index.		
			for Manager, Boston Aircraft Certification Office, ANE-150	
21	2-11, 2-14	Revised Rotor Brake Procedures contained in the Normal Procedures, Section II.	7/15/99	
			FER Manager, Boston Aircraft Certification Office, ANE-150	

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REVISION NO.	PAGES REVISED	REMARKS	DATE	FAA APPROVED
22	2-4, 2-6A	Revised Exterior Check – Main Rotor Blades	9/23/99 Manager, Boston Aircraft Certification Office, ANE-150	
23	1-8	Change IFR equipment requirements	11/6/03 Manager, Boston Aircraft Certification Office, ANE-150	
24	2-5, 2-6	Added Tiedown rings, Incorporated T-Rev No. 1	5/25/04 Manager, Boston Aircraft Certification Office, ANE-150	
25	2-5, 2-6	Clarified Tiedown Ring Inspection, revised supplement Index.	12/22/04 Manager, Boston Aircraft Certification Office, ANE-150	

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REVISION NO.	PAGES REVISED	REMARKS	DATE	FAA APPROVED
26	1-20, 2-11, 2-12, 2-12A/2-12B, 2-17, 3-2, 3-21/3-22	Revised N_r transient limitations, added caution on parking brake handle operation, added fuel flowmeter readings split emergency procedure.	3/16/07	Manager, Boston Aircraft Certification Office, ANE-150

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ACTIVE TEMPORARY REVISIONS

TEMPORARY REVISION NO.	PAGES REVISED	REMARKS	DATE	FAA APPROVED
2	4-12B, 4-17, 4-24	Revised Performance Information – Category "A" and "B" Operations.	4/9/02	Manager, Boston Aircraft Certification Office, ANE-150
3	1-9, 1-20A	Added limitations to Minimum Flight Crew requirements and revised cockpit placard for helicopters with LCR-100 Mod status 18 (76070-60019-101) AHRS installed. (Supersedes T-Rev. No. 3 dated 5/17/10).	6/25/10	Manager, Boston Aircraft Certification Office, ANE-150
*4	1-14, 1-15, 2-27	Added additional limitations and Warning regarding the Goodrich hoist system.	8/06/15	Manager, Boston Aircraft Certification Office, ANE-150
5	2-4, 2-6A	Added main rotor swashplate guide and shield area checks to exterior check.	3/12/15	Tracy Murphy OMT Lead, Boston Aircraft Certification Office, ANE-150

ACTIVE TEMPORARY REVISIONS

FAA APPROVED AUGUST 6, 2015

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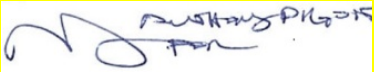
PART 1

ACTIVE TEMPORARY REVISIONS (CONT)

TEMPORARY REVISION NO.	PAGES REVISED	REMARKS	DATE	FAA APPROVED
6	3-31/3-32	Added Pedal Damper/Yaw Trim Actuator emergency procedure.	2/19/15	 Tracy Murphy OMT Lead, Boston Aircraft Certification Office, ANE-150

INSTRUCTIONS:

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2. ONLY ACTIVE TEMPORARY REVISIONS APPEAR IN THIS LIST. ALL OTHER TEMPORARY REVISIONS SHOULD BE REMOVED FROM THE MANUAL.
3. THIS LIST WILL BE REVISED EACH TIME THAT TEMPORARY REVISIONS ARE ISSUED, REVISED, OR INCORPORATED BY A NORMAL REVISION. AN ASTERISK (*) WILL IDENTIFY TEMPORARY REVISION PAGES PROVIDED WITH THIS LIST; DESTROY SUPERSEDED, INCORPORATED, OR CANCELLED TEMPORARY REVISION PAGES.

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GENERAL INFORMATION

Revision No. 5 to the S-76B Rotorcraft Flight Manual is for helicopters equipped with PT6B-36A engines. Existing customer PT6B-36 engines may be changed to the PT6B-36A standard by installing the new engine electronic control part no. 785340-4-013 (CPW 3036206) and changing the Pratt and Whitney B36 nameplate. If your helicopter has not been retrofitted you must use Supplement No. 2 along with the basic Flight Manual to obtain the proper limitations, operating procedures and performance information.

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SECTION I

OPERATING LIMITATIONS

NOTE

Compliance with the limitations in this section is required by law.

WEIGHT LIMITS

Maximum takeoff and landing weight is 11,700 pounds (5,307 Kg). This helicopter is to be operated using the approved loading schedule. Refer to LOADING INFORMATION in Part 2.

For minimum operating weight, refer to Figure 1 -2.

CATEGORY “A” OPERATIONS

See Figure 1-0 for variation of allowable takeoff gross weight with altitude and temperature.

CATEGORY “B” OPERATIONS

See Figure 1-1 for variation of allowable takeoff gross weight with altitude and temperature.

CG (CENTER OF GRAVITY) LIMITS

See Figure 1-2 for forward and aft center of gravity limits at various gross weights.

Lateral CG limits: Left or right 4-1/2 inches (114.3 mm) with hoist load attached at gross weights up to 10,800 pounds (4,899 Kg), hover only.

Left or right 3-1/2 inches (89 mm) except as restricted to left or right 2-1/2 inches (63.5 mm) at gross weights above 11,400 pounds (5,171 Kg) for taxi, takeoff, and landing.

LOADING LIMITS

Maximum allowable cabin floor and baggage floor loading is 75 pounds per square foot (366 Kg per square meter).

The maximum allowable floor loading for the baggage compartment is 75 pounds per square foot (366 Kg per square meter) for weights up to the maximum capacity of 600 pounds (272 Kg).

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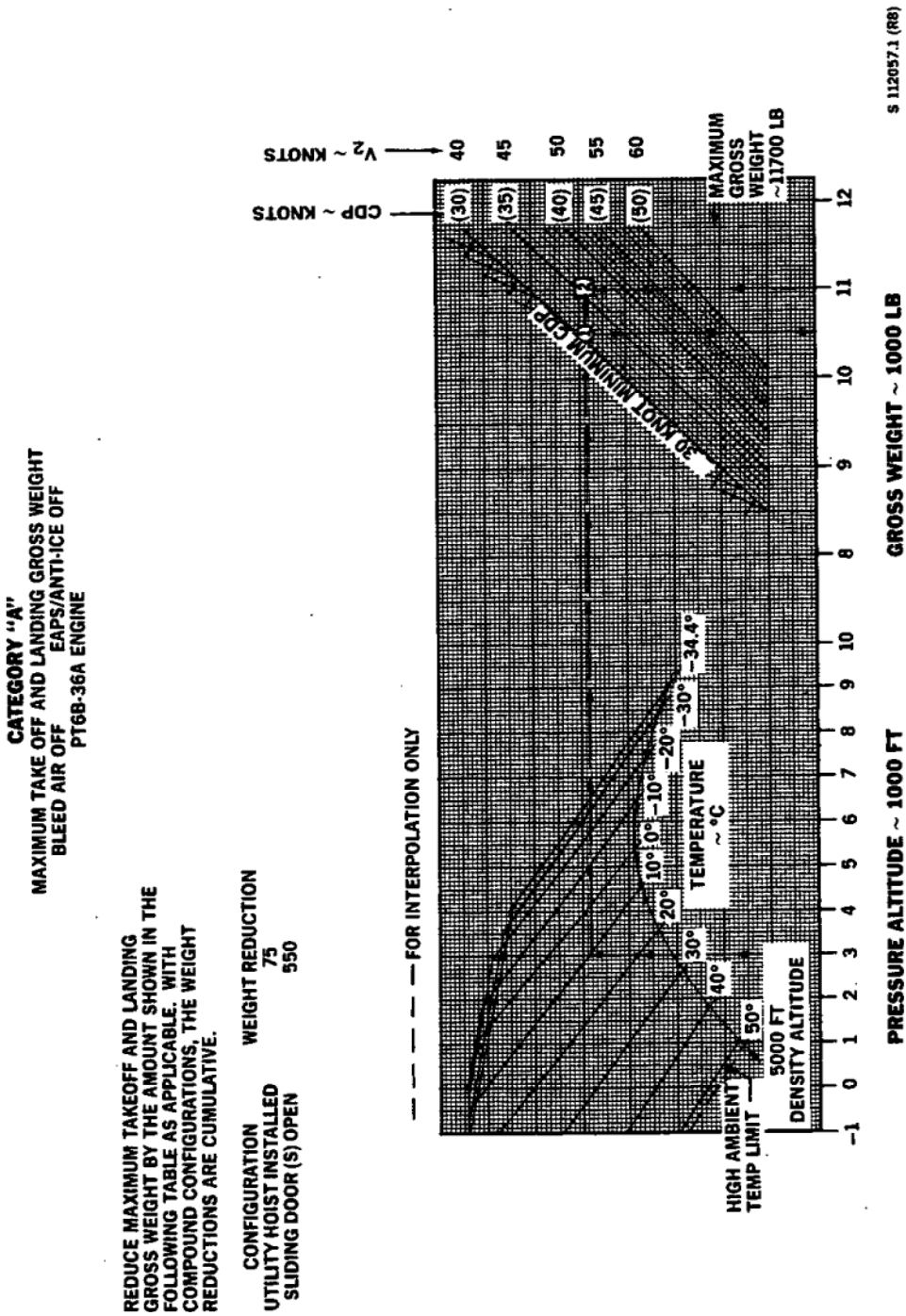

Figure 1-0. Category "A" Maximum Takeoff and Landing Gross Weight, PT6B-36A Engines (Sheet 1 of 2)

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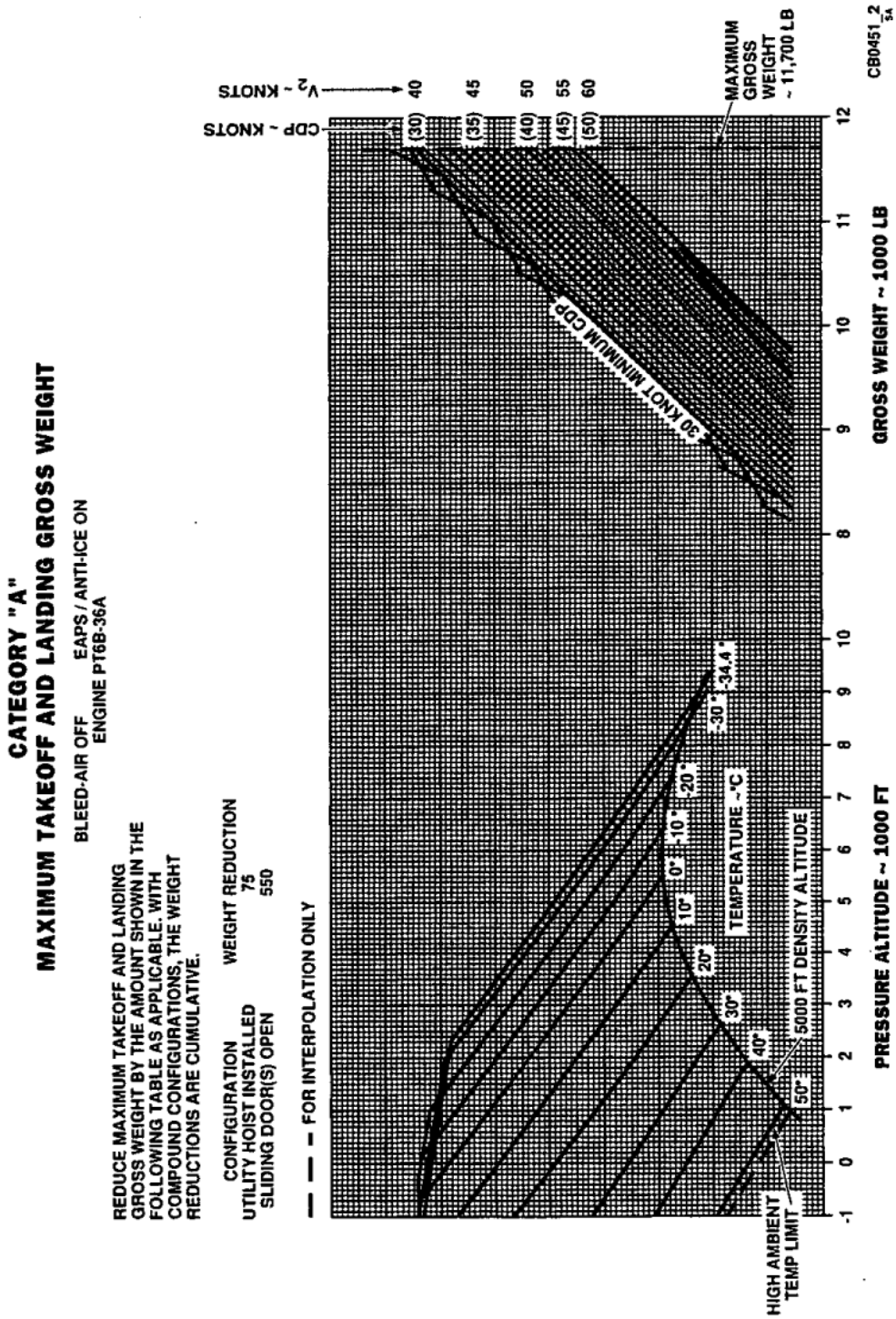

Figure 1-0. Category “A” Maximum Takeoff and Landing Gross Weight, PT6B-36A Engines (Sheet 2 of 2)

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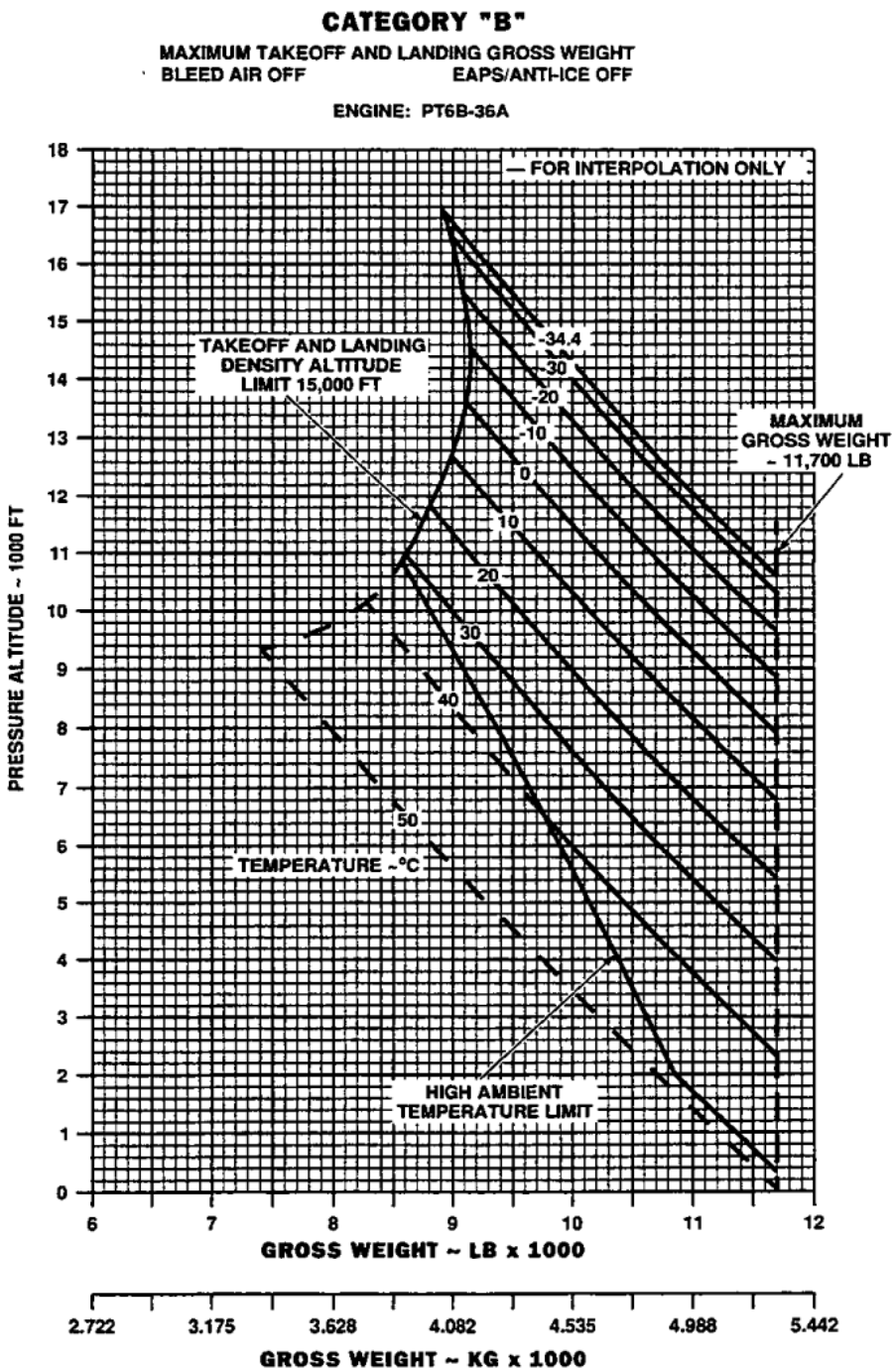

Figure 1-1. Category "B" Maximum Takeoff and Landing Gross Weight, PT6B-36A Engines (Sheet 1 of 2)

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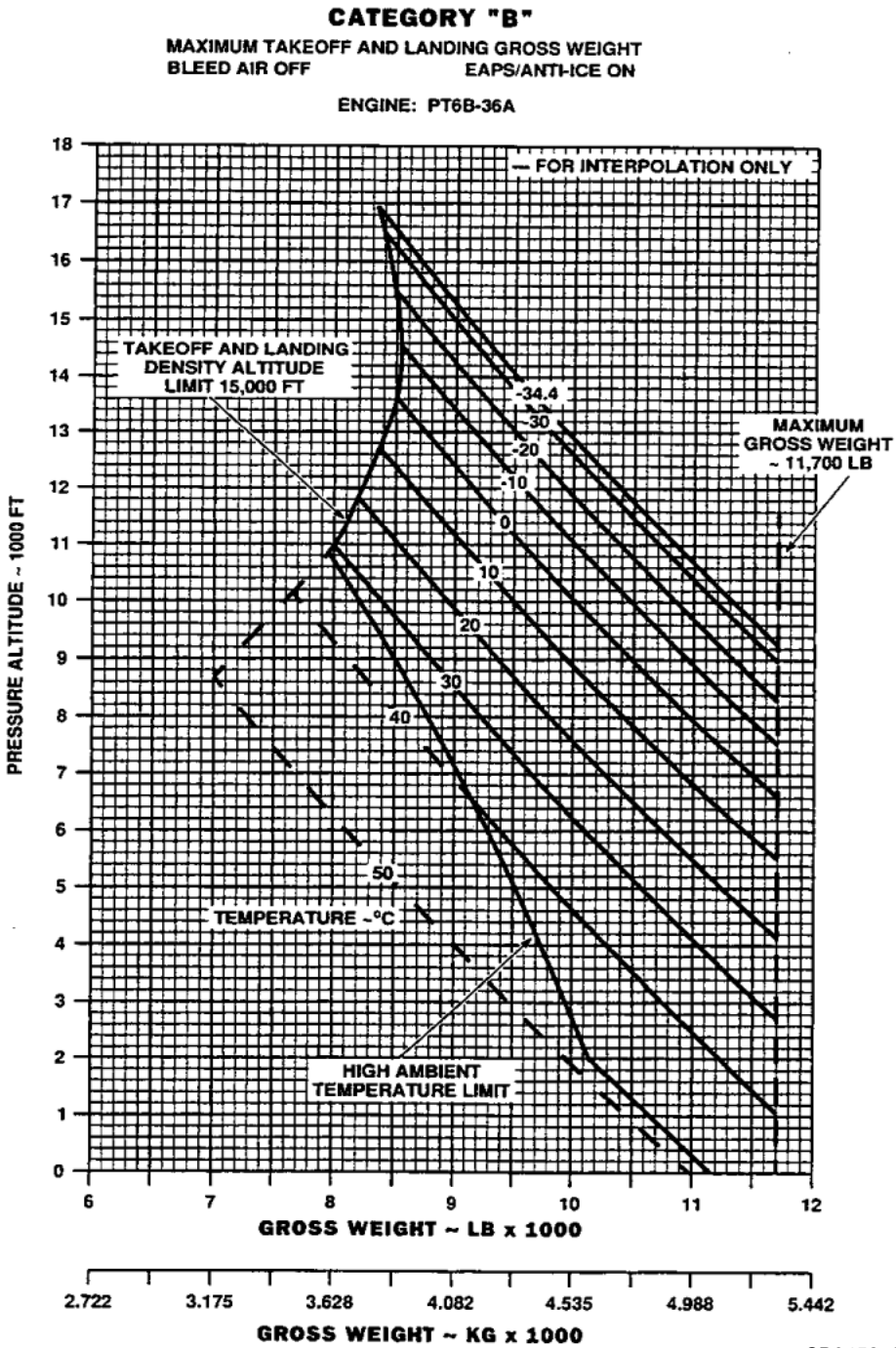

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Figure 1-1. Category "B" Maximum Takeoff and Landing Gross Weight, PT6B-36A Engines (Sheet 2 of 2)

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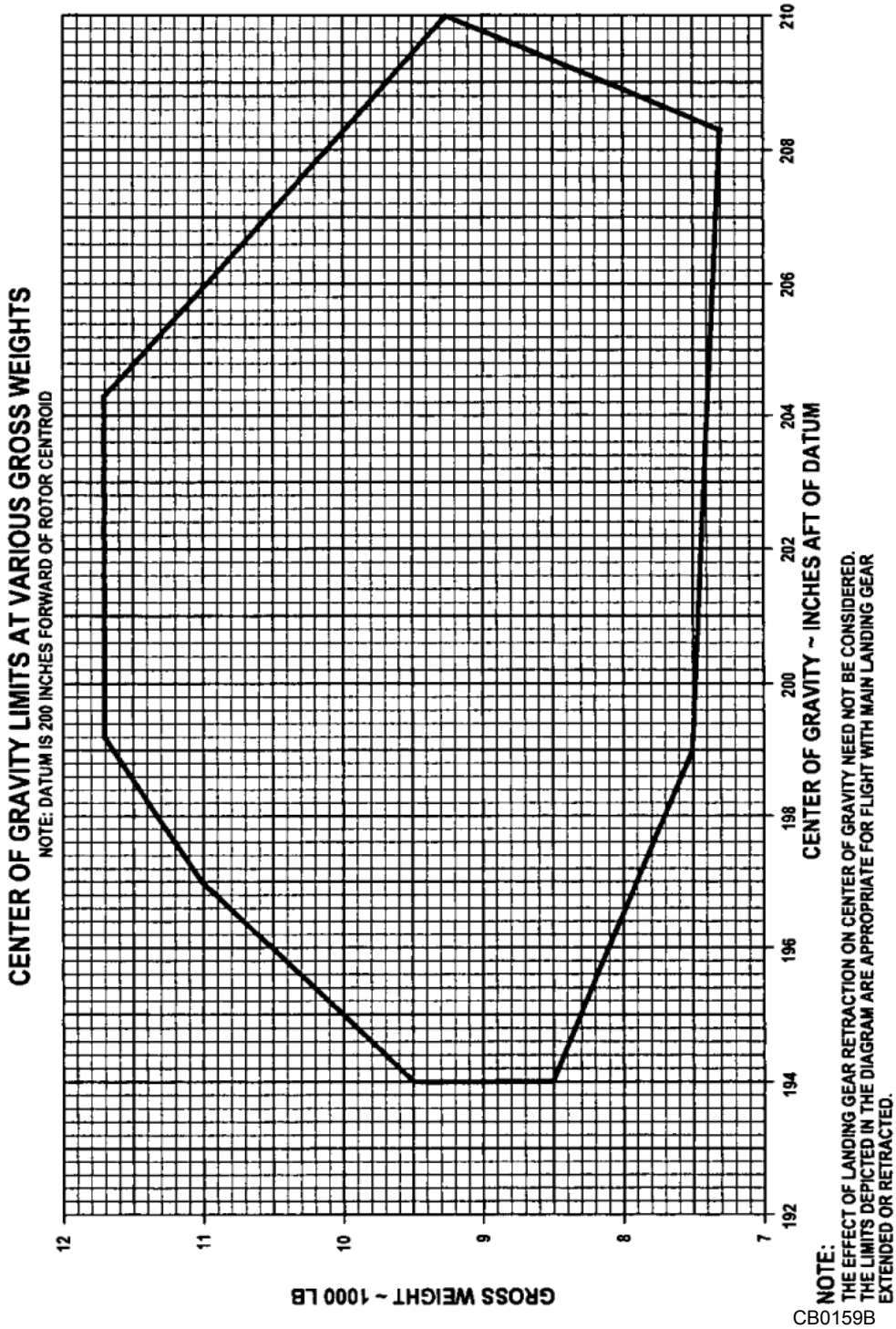

Figure 1-2. CG Limits At Various Gross Weights.

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TYPES OF OPERATION

CATEGORY "A" AND B"

Transport

Day, Night, VFR

Day, Night, IFR The following equipment must be installed and operating for operation under Instrument Flight Rules (IFR).

1. AFCS (one pitch, roll, and yaw channel).
2. Copilot flight controls and flight instruments
3. Dual 5-inch attitude indicators or equivalent.
4. C-14A Compass System.
5. Pitch Bias Actuator (PBA).
6. Cyclic stick trim.
7. An operative navigation and communication system that has demonstrated compliance with the pertinent airworthiness regulations and also meets the requirements of the applicable operating regulations.
8. AC Power – AC generator and inverter.
9. Two DC generators.

Not approved for ditching unless the emergency flotation gear, P/N 76076-02002, and suitable lifesaving equipment (life jackets, rafts, etc.) as required by the operating rules are installed and compliance with FAR 29.1411, 29.1415, and 29.1561 is shown.

CATEGORY "B" ROTORCRAFT - EXTERNAL LOAD COMBINATIONS

Class "B" external loads.

NOTE

A class "B" external load is an external load that can be jettisoned and is lifted free of land or water during rotorcraft operation.

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TEMPORARY REVISION NO. 3

FILING INSTRUCTIONS: Insert this Temporary Revision facing page 1-9, dated September 19, 1996. This Temporary Revision replaces Temporary Revision No. 3 dated May 17, 2010 in its entirety.

SUBJECT: LCR-100 Mod Status 18 (76070-60019-101) AHRS operating limitations.

This Temporary Revision adds limitations to Minimum Flight Crew for aircraft with LCR-100 Mod status 18 (76070-60019-101) AHRS installed.

MANUAL CHANGES:
Insert the following limitations under Minimum Flight Crew:

NIGHT:

For helicopters with LCR-100 Mod Status 18 (P/N 76070-60019-101) AHRS units installed:

> Two Pilots required for flight, single pilot flight is prohibited.
> Pilot at the controls must have hands and feet on or near flight controls when flying coupled and on flight controls when flying uncoupled.

Add following Note under Instrument Flight Rules:

NOTE

> For helicopters with LCR-100 Mod Status 18 (P/N 76070-60019-101) AHRS units installed: Pilot at the controls must have hands and feet on or near flight controls when flying coupled and on flight controls when flying uncoupled.

TEMPORARY REVISION NO. 3

FAA APPROVED JUNE 25, 2010

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MINIMUM FLIGHT CREW

Visual Flight Rules - 1 pilot unless otherwise required by operating rules (single-pilot operations not permitted from left seat).

Instrument Flight Rules - 2 pilots.

AIRSPEED LIMITS

NOTE

The S-76B uses an Aerosonic P/N 20020-11293 airspeed indicator. For Category A operation, the airspeed indicator must be equipped with a Qualitair P/N 702C-000-41 airspeed bug or Sporty's Pilot Shop P/N 2416A airspeed bug.

V_{ne} power on (Maximum Airspeed) is 155 KIAS.

See V_{ne} placard, Figure 1-7, for variation of V_{ne} with temperature, pressure altitude, and gross weight.

V_{ne} above 10,000 feet density altitude at actual gross weights greater than 11,000 pounds is BROC (best rate of climb) airspeed (see appropriate V_{ne} placard, Figure 1-7).

V_{ne} power off is 136 KIAS. See V_{ne} placard, Figure 1-7, for variation of V_{ne} with temperature and pressure altitude.

Minimum IFR airspeed is 60 KIAS.

Maximum airspeed for main landing gear down or in transit is 130 KIAS.

Maximum airspeed for windshield wiper operation is 141 KIAS.

Maximum groundspeed for landing, takeoff, or taxi is 54 knots.

Maximum groundspeed for brake application is 34 knots.

ALTITUDE LIMITS

Takeoff and landing, Category A: 5,000 feet density altitude.

Takeoff and landing, Category B: 15,000 feet density altitude.

Takeoff and landing, Category B: 10,000 feet pressure altitude with JP-4 fuel.

Enroute: 15,000 feet density altitude.

Enroute: 10,000 feet pressure altitude with JP-4 fuel.

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LIMITING HEIGHTS AND CORRESPONDING SPEEDS FOR SAFE LANDING AFTER AN ENGINE SUDDENLY BECOMES INOPERATIVE

THESE CURVES ARE APPLICABLE TO ALTITUDES AND TEMPERATURES AT THE CORRESPONDING MAXIMUM ALLOWABLE TAKEOFF GROSS WEIGHT AS DETERMINED FOR CATEGORY A OR B. THE HIGH HOVER POINT IS BASED ON MAXIMUM OGE HOVER WEIGHT.

INFORMATION ON TEST CONDITIONS:

1. HARD SURFACE RUNWAY
2. WINDS 5 KTS OR LESS
3. STRAIGHT TAKEOFF AND CLIMBOUT PATH
4. GEAR DOWN AT ENTRY

NOTE: AVOID FLIGHT WITHIN SHADED AREA EXCEPT AFTER INITIATING FLARE FOR A NORMAL LANDING.

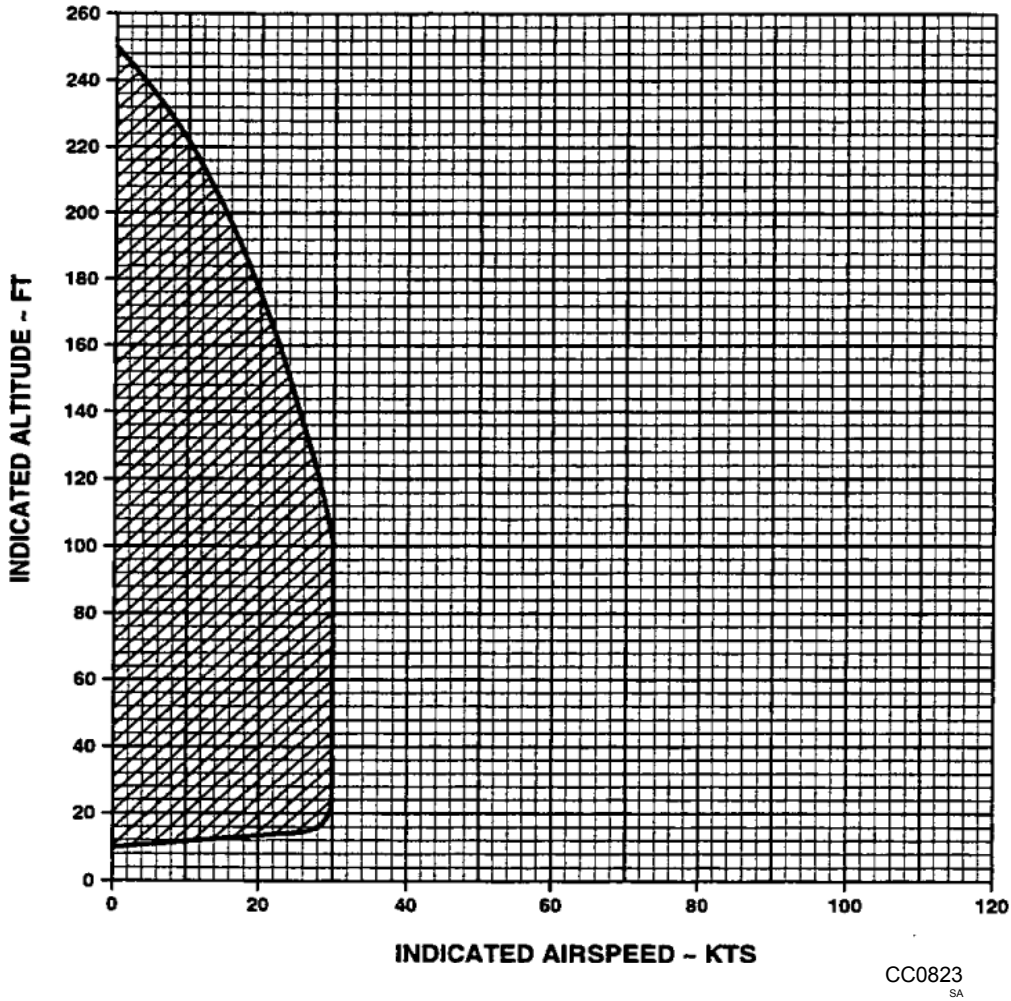

Figure 1-3. Height/Velocity Diagram

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AMBIENT TEMPERATURE LIMITS

-34.4°C (-30°F) to ISA + 38°C not to exceed 49°C (120°F) with bleed air ECU off or not installed.

-34.4°C (-30°F) to ISA + 35°C not to exceed 43°C (109°F) with bleed air ECU on.

FLIGHT LIMITS

See Figure 1-3 for altitude and airspeeds to be avoided at low altitude in case of engine failure.

No aerobatic maneuvers allowed.

360° hovering turns in less than 12 seconds prohibited.

Flight in known icing conditions prohibited.

Maximum airspeed for sideward flight or crosswind hover is 35 knots.

Maximum airspeed for rearward flight or tailwind hover is 35 knots.

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With usable fuel per tank indicating 80 lbs or less, avoid sustained nose down pitch attitudes in excess of 5° nose low.

Do not re-engage a particular AFCS channel after a known malfunction exists in that particular channel.

Cockpit ventilation must be provided by any of the following:

1. Overhead vents or door vents
2. Pilot's window
3. Heater blower
4. Heater bleed-air
5. ECU

Fuel crossfeed operations limited to:

1. With vent line check valves (P/N 76070-30029-013) installed:
   a. Category A - emergency operation only
   b. Category B - cruising flight only
2. Without vent line check valves (P/N 76070-30029-013) installed, crossfeed operations are prohibited except as follows:
   a. Engine Restart in Flight, page 3-8B
   b. Fuel Crossfeed of the Remaining Engine After Engine Failure, page 3-9.

EAPS ON at 2°C and below, with visible moisture.

External door locks must be unlocked before flight.

SLIDING CABIN DOOR LIMITS

Sliding cabin door(s) may be opened for flight operations with these restrictions:

Maximum airspeed for opening and closing sliding cabin door in flight is 50 KIAS and is limited to level flight or descent.

Maximum airspeed with sliding cabin door in full open and locked position is 74 KIAS.

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IFR flight prohibited with sliding cabin door open.

An operable flashlight must be available in the cabin if the sliding door is to be opened in flight at night.

FLOTATION SYSTEM LIMITS

Maximum airspeed for inflation of the emergency flotation gear is 75 KIAS.

Maximum airspeed with emergency flotation gear inflated is 75 KIAS.

Maximum water contact speed with emergency flotation system inflated is 33 knots.

Landing gear must be down prior to float inflation.

Maximum demonstrated airspeed for sideward flight or crosswind hover is 20 knots.

Maximum pressure altitude with emergency flotation gear inflated is 5000 feet.

EXTERNAL CARGO HOOK LIMITS

External hook operations must be conducted by a qualified flight crew under the provisions of the operating rules for rotorcraft external load operations for loads that are jettisonable and are lifted free of the surface (Class B loads). Normal operations are permitted with the external cargo hook installed, but not used.

The height-velocity diagram in Figure 1-3 does not constitute a limitation when conducting rotorcraft-external load operations.

WEIGHT LIMITS

Maximum weight of the external cargo is 3,300 pounds (1,500 kg).

Maximum weight of the helicopter - external load combination is 11,700 pounds (5,307 kg).

AIRSPEED LIMITS

Maximum airspeed with an external cargo weight of 1,900 pounds (864 kg) or less is 136 KIAS.

Maximum airspeed must be reduced with increases in external cargo weight and density altitude as shown in Figure 1-4. Maximum airspeed may be further limited if operating in the white area of the V_{ne} placard. Refer to Figure 1-7.

ALTITUDE LIMITS

15,000 feet density altitude.

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NOTE

- It should be noted that operational use of the cargo sling is a highly specialized industrial procedure. Extreme caution must be taken to be sure that the loads carried and the speed range throughout which operation is intended do not adversely effect the controllability characteristics of the helicopter. It is the responsibility of the operator to establish safe and sound limitations for each operation.
- The external cargo hook is located forward of the main rotor shaft. Releasing a load will cause the helicopter to pitch nose up.

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MAXIMUM AIRSPEED VS DENSITY ALTITUDE AND EXTERNAL CARGO HOOK WEIGHT

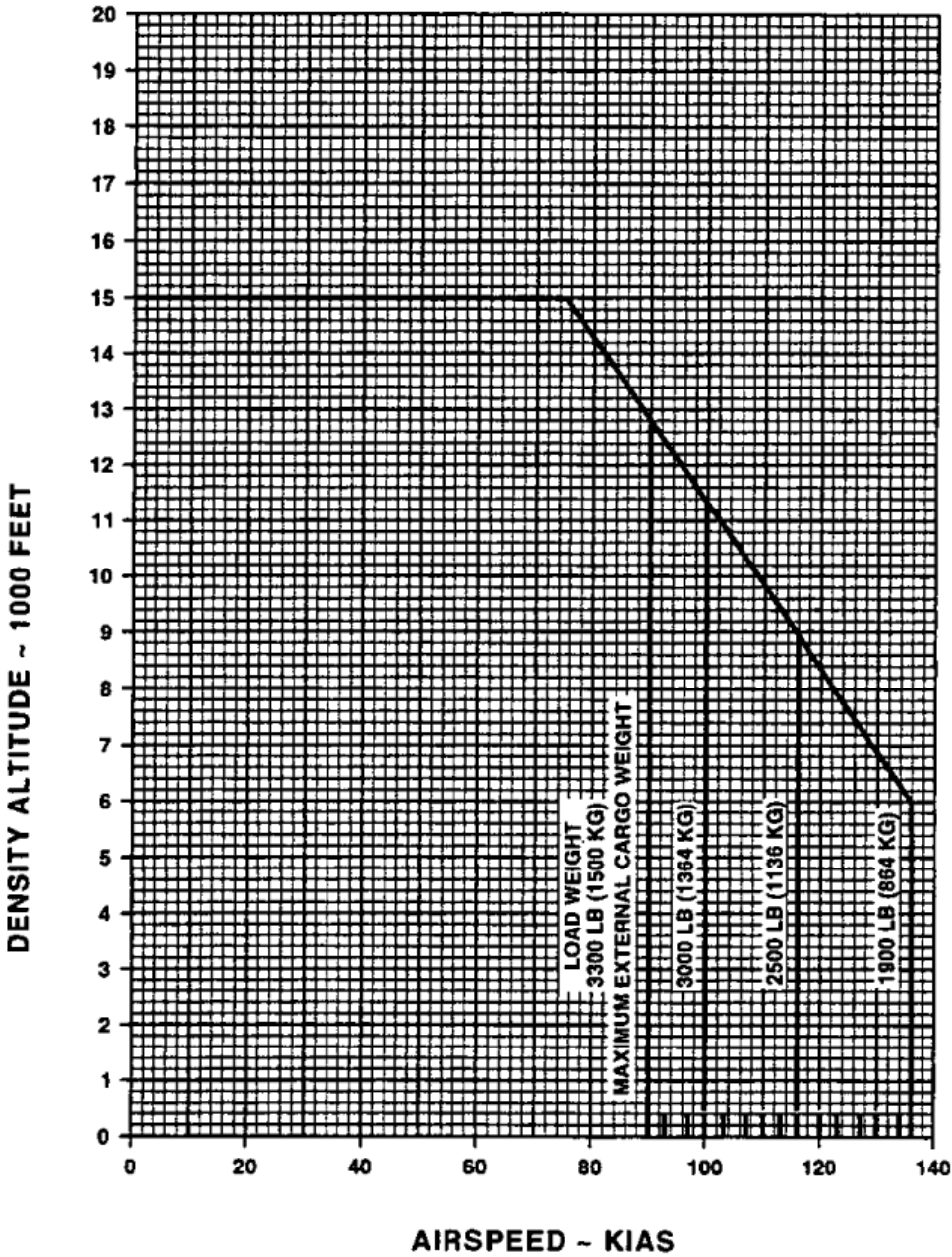

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Figure 1-4. Maximum Airspeed vs Density Altitude and External Cargo Hook Weight

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UTILITY HOIST LIMITS

Utility hoist operations must be conducted by a qualified flight crew under the provisions of the operating rules for rotorcraft external load operations for loads that are jettisonable and are lifted free of the surface (Class B loads). Normal operations are permitted with the utility hoist installed, but not used.

NOTE

It should be noted that operational use of the utility hoist is a highly specialized procedure. Extreme caution must be taken to be sure that the loads carried and the speed range throughout which operation is intended do not adversely effect the controllability characteristics of the helicopter. It is the responsibility of the operator to establish safe limitations for each operation.

The height-velocity diagram, Figure 1-3, does not constitute a limitation when conducting rotorcraft-utility hoist operations.

A cabin intercom system with operational “hot mike” capability is required for hoist operations in which loads are brought into or out of the cabin.

The last 20 feet of hoist cable (colored red) is unusable.

WEIGHT LIMITS

The maximum utility hoist load is 600 pounds (272 kg).

The maximum weight of the rotorcraft - external load combinations is 11,700 pounds (5,307 kg).

The hoist load may be restricted by lateral loading limits. See hoist loading information, Part 2, Section III.

MINIMUM FLIGHT CREW

Minimum flight crew for utility hoist operations is:

1. Two pilots, and a hoist operator in communication with the pilots.

or

2. One pilot and a hoist operator in communication with the pilot if the hoist configuration includes a collective mounted hoist up/down switch in addition to the cabin mounted provisions.

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TEMPORARY REVISION NO. 4

FILING INSTRUCTIONS: Insert this Temporary Revision facing page 1-14, dated January 19, 1995.

SUBJECT: HOIST OPERATIONS. This temporary revision adds additional limitations regarding the Goodrich hoist system.

MANUAL CHANGES: Execute the following change to the UTILITY HOIST LIMITS, WEIGHT LIMITS section.

Change:

The maximum utility hoist load is 600 pounds (272 kg).

To read:

The maximum utility hoist load is as follows:

OAT	Pounds (lb)	Kilograms (kg)
At or above 0°C (32°F)	600	272
Between -20°C - 0°C (-4°F - 32°F)	550	249
At or below -20°C (-4°F)	500	227

TEMPORARY REVISION NO. 4

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TEMPORARY REVISION NO. 4

FILING INSTRUCTIONS: Insert this Temporary Revision facing page 1-15, dated January 19, 1995.

SUBJECT: HOIST OPERATIONS. This temporary revision adds additional limitations regarding the Goodrich hoist system.

MANUAL CHANGES: Execute the following change to the UTILITY HOIST LIMITS, AIRSPEED LIMITS section.

Change:

With a load on the utility hoist, the maximum airspeed for sideward flight or crosswind hover is 35 knots, while the maximum airspeed in forward flight may be restricted by stability of the load and is not to exceed 74 KIAS.

At 4½ inches lateral CG with hoist load attached, maximum demonstrated airspeed for forward, sideward, and rearward flight or hover in wind from any azimuth is 35 knots.

To read:

Hoist operations are prohibited outside the envelope shown in Figure 1-4A. The hoist operating envelope indicates airspeed and angle of bank restrictions that are applicable to sustained banked turns.

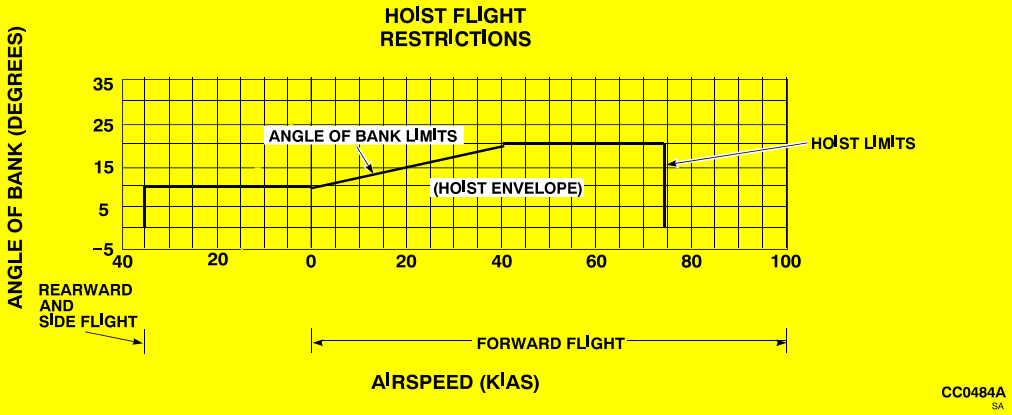

Figure 1-4A. Hoist Operational Envelope

TEMPORARY REVISION NO. 4

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AIRSPEED LIMITS

With a load on the utility hoist, the maximum airspeed for sideward flight or crosswind hover is 35 knots, while the maximum airspeed in forward flight may be restricted by stability of the load and is not to exceed 74 KIAS.

At 4-1/2 inches lateral CG with hoist load attached, maximum demonstrated airspeed for forward, sideward, and rearward flight or hover in wind from any azimuth is 35 knots.

ENGINE LIMITS
(See Figure 1-5)

NOTE

- If any of the following limits are exceeded, refer to engine manufacturer's maintenance manual for action to be taken.
- Intentional operation above 100% torque, 816° T_5, or 100.0% N_1 is reserved for actual emergency use only. Use of power above these levels for training is not allowable.

ENGINE TORQUE LIMITS

NOTE

Refer to TRANSMISSION LIMITS in this section for additional torque limits.

Maximum continuous limit: 120% Torque

30-minute limit, single-engine: 141% Torque

10-second transient, single-engine: 152% Torque

N_1 (GAS GENERATOR) SPEED LIMITS

Maximum for continuous operation: 100.0% N_1

30-minute, single-engine: 101.6% N_1

N_S (POWER TURBINE) SPEED LIMITS

Maximum at 0% torque: 115.5% N_2

Maximum at 26% torque: 110% N_2; above 26% torque maximum N_2 is 108%

10-second transient within torque limits: 115.5% N_2

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ENGINE OR DRIVE SYSTEM OPERATING LIMITS

This table is a summary of limitations. Observe the first limit encountered for any given operating condition.

OPERATING CONDITION	TIME	TRANSMISSION TORQUE LIMIT (%)	ENGINE TORQUE LIMIT(%)	T_5 °C	% N_1	% N_2
Takeoff	5 Min.	100 (4)	133	816	100.0	(1)
Maximum Continuous	—	100 (4)	120	776	100.0	(1)
2-1/2 Minute OEI	2-1/2 Min.	136% (2) (5)	—	—	—	—
30 Minute OEI	30 Min.	128	141 (2)	844	101.6	(1)
Starting	2 Sec.	—	—	1090	—	—
Starting	5 Sec.	—	—	940	—	—
Transient OEI	5 Sec.	150 (2)	—	—	—	—
Transient	10 Sec.	115 (3) (4)	152 (2)	870	101.8	(6)

NOTES:

(1) Maximum N_2 up to 26% torque is 110%.
(2) The EEC will limit available single-engine torque to 136%.
(3) Dual-engine transient limit - 230% total torque (No. 1 torque plus No. 2 torque).
(4) The EEC will normally limit available dual-engine torque to a total of 202%.
(5) Transmission 2-1/2-minute OEI torque limit.
(6) 108 - 115.5% N_2 within torque limits.

Figure 1-5 Engine or Drive System Operating Limits, PT6B-36A Engines

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T5 (POWER TURBINE INLET TEMPERATURE) LIMITS

Steady State Limits

30 minute power, one engine inoperative: 844°C

5 minute takeoff dual-engine: 816°C

Maximum continuous: 776°C

Starting

For 5 seconds: 940°C

For 2 seconds: 1090°C

ELECTRONIC ENGINE CONTROL (EEC) LIMITS

Before takeoff, the following EEC conditions pertain.

1. One EEC channel per engine must be free of hard and soft failures and maintenance codes.
2. All four EEC overspeed protection systems must be operational.
3. Operations are prohibited with two channel active lights illuminated on an engine.

EAPS ON OPERATION

Operation below 15% torque with EAPS on is prohibited with a tailwind; that is, a wind from 091° through 269° relative whether caused by natural conditions or other source such as a taxiing aircraft.

After an inadvertant icing encounter where airframe accumulation may be expected, subsequent flight operations below 35 KIAS in conditions conducive to engine icing (OAT below 2°C with visible moisture) are limited to a cumulative 10 minutes.

FUEL

ASTM D-1655 Jet A, or A1
MIL-T-5624 Grade JP-4 (do not use above 10,000 feet pressure altitude)
MIL-T-5624 Grade JP-5 (do not use below - 26°C (-15°F))
MIL-T-83133 Grade JP-8

Cold Weather Fuel (Below 4°C (40°F))

Anti-icing protection additives meeting MIL-D-27686 or equivalent must be present in concentrations of 0.035% to 0.15% by volume.

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OIL

PWA 521, Type I or II. Approved oil brands are listed in Pratt and Whitney Canada Service Bulletin No. 11001 or latest revision.

Low Temperature Limits For Starting

Type I oil usable to -54°C (-65°F). Type II oil usable to -40°C (-40°F).

OIL TEMPERATURE LIMITS

Minimum: 0°C in flight

Maximum continuous: 115°C

Maximum for 5 minutes: 127°C

NOTE

Engine may be operated at ground idle (rotor stopped or turning) with oil temperature 115° to 127°C for 30 minutes.

OIL PRESSURE LIMITS

Minimum: 40 PSI, below 78.1% N_1

Continuous operation: 70 PSI to 105 PSI, above 78.1% N_1

Maximum: 105 PSI

FUEL FLOW LIMITS

Minimum: 75 pounds per hour

Maximum: 650 pounds per hour

NOTE

Fuel flow may go beyond these limits during transient operations including start.

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TRANSMISSION LIMITS

TORQUE LIMITS
(See Figure 1-5)

NOTE

Intentional operation above 100% torque, 816° T_5, or 100.0% N_1 is reserved for actual emergency use only. Use of power above these levels for training is not allowable.

Dual-Engine Operation

Takeoff and maximum continuous: 100% Torque per engine

10 second transient: 115% Torque

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Single-Engine Operation

Maximum continuous: 100% Torque

30 minute limit: 128% Torque

2 1/2 minute limit: 136% Torque 5 second transient: 150% Torque

OIL

MIL-L-21260 Type I, Grade 30 - Low temperature limit: -9°C (15°F)

Dexron II ATF - Low temperature limit: -34°C (-30°F)

MIL-L-23699 - Low temperature limit: -34°C (-30°F)

OIL TEMPERATURE LIMITS

Minimum: -20°C

Maximum: 135°C

OIL PRESSURE LIMITS

Minimum: 20 PSI

Maximum: 120 PSI

ROTOR LIMITS

POWER OFF

Minimum: 91 % N_r

Transient (minimum): 74% N_r

Transient (minimum): 68% N_r at touchdown while executing an autorotative landing

Maximum: 115% N_r

Transient (maximum): 121% N_r

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POWER ON

Transient: 91 % N_r

Transient: 68% N_r at touchdown while executing a single engine landing

Minimum (One engine inoperative): 100% N_r

One engine operation up to best rate of climb speed: 100% to 108% N_r

One engine operation above best rate of climb speed: 106% to 108% N_r

Minimum (Dual-engine operation): 106% N_r

Maximum: 108% N_r; except 109% transient operation for 20 seconds.

ROTOR BRAKE LIMITS

ROTOR STOPPED

Engine operation (one or two) limited to IDLE with rotor brake on.

ROTOR TURNING

Rotor brake application limited to one engine only operating at IDLE or both engines shut down.

Maximum rotor speed for normal rotor brake application is 65% N_r.

Maximum rotor speed for emergency rotor brake application with both engines shut down is 107% N_r.

A rotor shutdown using the rotor brake shall not be performed more than one time in any 10 minute period.

ENGINE INLET PLENUMS OPEN

Only single engine operations permitted. Rotor must be stopped.

INSTRUMENT MARKINGS

See Figure 1-6.

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TEMPORARY REVISION NO. 3

FILING INSTRUCTIONS: Insert this Temporary Revision facing page 1-20A, dated September 3, 1992. This Temporary Revision replaces Temporary Revision No. 3 dated May 17, 2010 in its entirety.

SUBJECT: LCR-100 Mod Status 18 (76070-60019-101) AHRS operating limitations.

This Temporary Revision revises the cockpit placard for aircraft with LCR-100 Mod status 18 (76070-60019-101) AHRS installed.

MANUAL CHANGES:

Insert the following under Placards:

"LCR-100 MOD STATUS 18 AHRS INSTALLED
SINGLE PILOT IFR FLT PROHIBITED,
SINGLE PILOT NIGHT FLT PROHIBITED
REDUCE A/S TO 120 KIAS IF BOTH AP'S
UNCOUPLE WHILE IMC OR NIGHT FLT."

TEMPORARY REVISION NO. 3

FAA APPROVED JUNE 25, 2010

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PLACARDS

"THIS HELICOPTER MUST BE OPERATED IN ACCORDANCE WITH THE OPERATING LIMITS SPECIFIED IN THE FAA APPROVED ROTORCRAFT FLT MAN. THE AIRWORTHINESS LIMITATIONS SECT OF THE ROTORCRAFT MAINTENANCE MANUAL MUST BE COMPLIED WITH." (On instrument panel.)

"CAUTION - TURN OFF STROBE LIGHT WHEN TAXIING NEAR OTHER AIRCRAFT OR WHEN FLYING IN FOG OR CLOUDS. STANDARD POSITION LIGHTS MUST BE USED FOR ALL NIGHT OPERATIONS." (On instrument panel.)

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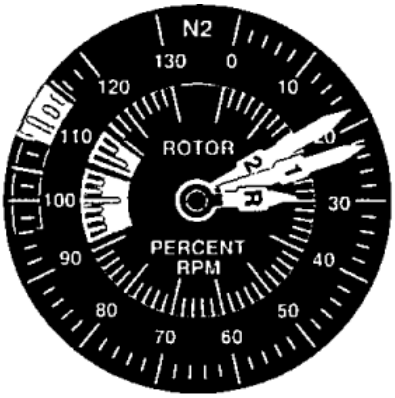

TRIPLE TACHOMETER

Nr TACHOMETER (ROTOR)

- 115% MAXIMUM POWER OFF
- 108% TO 115% PRECAUTIONARY RANGE
- 106% TO 108% NORMAL RANGE
- 91% TO 106% PRECAUTIONARY RANGE
- 91% MINIMUM

N2 TACHOMETER (ENGINE ONLY)

- 115.5% MAXIMUM
- 108% TO 115.5% PRECAUTIONARY RANGE
- 96% TO 108% NORMAL RANGE

TORQUEMETER

- 136% 2 1/2 MINUTE LIMIT SINGLE ENGINE (TRANSMISSION LIMIT)
- 128% 30 MINUTE LIMIT SINGLE ENGINE
- 100% TO 136% PRECAUTIONARY RANGE
- 100% TAKEOFF AND MAXIMUM CONTINUOUS LIMIT DUALENGINE
- 0% TO 100% NORMAL RANGE

N1 TACHOMETER

- 101.6% 30 MINUTE LIMIT SINGLEENGINE
- 100% MAXIMUM CONTINUOUS LIMIT
- 49% TO 100% NORMAL RANGE
- 49% MINIMUM

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Figure 1-6. Instrument Markings, PT6B-36A Engines (Sheet 1 of 3)

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ENGINE OIL TEMPERATURE/PRESSURE

- 127 °C - MAXIMUM
- 115 °C TO 127 °C - PRECAUTIONARY RANGE
- 0 °C TO 115 °C - NORMAL RANGE
- 0 °C - MINIMUM
- 105 PSI - MAXIMUM
- 70 PSI TO 105 PSI - NORMAL RANGE
- 40 PSI TO 70 PSI - PRECAUTIONARY RANGE
- 40 PSI - MINIMUM, BELOW 78.1% N_1

TRANSMISSION OIL TEMPERATURE/PRESSURE

- 135 °C - MAXIMUM
- 120 °C TO 135 °C - PRECAUTIONARY RANGE
- 15 °C TO 120 °C - NORMAL RANGE
- 20 °C TO 15 °C - PRECAUTIONARY RANGE
- 20 °C - MINIMUM
- 120 PSI - MAXIMUM
- 90 PSI TO 120 PSI - PRECAUTIONARY RANGE
- 50 PSI TO 90 PSI - NORMAL RANGE
- 20 PSI TO 50 PSI - PRECAUTIONARY RANGE
- 20 PSI - MINIMUM

HYDRAULIC PRESSURE

- 3300 PSI - MAXIMUM
- 2800 PSI TO 3200 PSI - NORMAL RANGE
- 2700 PSI - MINIMUM

AIRSPEED INDICATOR

- 0 TO 30 KIAS - PRECAUTIONARY RANGE INDICATIONS INCONSISTENT
- 30 TO 155 KIAS - NORMAL RANGE
- 155 KIAS - MAXIMUM

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SA

Figure 1-6. Instrument Markings, PT6B-36A Engines (Sheet 2 of 3)

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T5 INDICATOR
PT6B-36A ENGINE

- 1090 °C - 2 SECOND STARTING LIMIT
- 844 °C - 30 MINUTE LIMIT - SINGLE-ENGINE
- 776 °C TO 844 °C - PRECAUTIONARY RANGE, SINGLE-ENGINE
- 816 °C - 5 MINUTE LIMIT - DUAL-ENGINE
- 776 °C TO 816 °C - PRECAUTIONARY RANGE, DUAL-ENGINE
- 350 °C TO 776 °C - NORMAL RANGE

FUEL FLOWMETER

- 650 LB/HR - MAXIMUM
- 75 TO 650 LB/HR - NORMAL RANGE
- 75 LB/HR - MINIMUM

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SA

Figure 1-6. Instrument Markings, PT6B-36A Engines (Sheet 3 of 3)

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V_{ne} PLACARDS: See Figure 1-7. (On instrument panel.)

CAUTION

"WITH USABLE FUEL PER TANK INDICATING 80 LBS OR LESS, AVOID SUSTAINED NOSE DOWN PITCH ATTITUDES IN EXCESS OF 5°." (On instrument panel.)

"THE MAXIMUM ALLOWABLE FLOOR LOADING FOR THE BAGGAGE COMPT. IS 75 LB. PER SQ FT. FOR WEIGHTS UP TO THE MAXIMUM COMPARTMENT CAPACITY OF 600 LB." (On baggage compartment doors.)

"CAUTION — NORMAL ROTOR BRAKE STOPS ARE AUTHORIZED ONLY AT 65% N_r OR LESS WITH BOTH ENGINES SHUT OFF, OR ONE ENGINE AT IDLE." (On rotor brake handle.)

"CARGO HOOK/HOIST LIMITS

ROTORCRAFT-LOAD COMB CLASS B

NO PERSON MAYBE CARRIED UNLESS:

- HE IS A FLIGHT CREWMEMBER.
- HE IS A FLIGHT CREWMEMBER TRAINEE.
- HE PERFORMS AN ESSENTIAL FUNCTION IN CONNECTION WITH THE EXTERNAL LOAD OPER.
- HE IS NECESSARY TO THE ACCOMPLISHMENT OF THE WORK ACTIVITY DIRECTLY ASSOCIATED WITH THAT OPER." (On instrument panel, center console, or other cockpit location clearly visible to the pilot.)

"CARGO HOOK - MAX. CAP. 3300 LB FOR AIRCRAFT EQUIPPED WITH STD. HOOK OPTION ONLY." (On bottom of aircraft, forward of hook.)

"PILOTS' PERMISSION REQUIRED TO OPEN SLIDING DOOR. INSURE THAT ALL PASSENGER SEAT BELTS/HARNESSES ARE FASTENED." (On sliding doors.)

"CHECK SLIDING DOOR LOCKED OPEN BY ATTEMPTING TO PULL IT CLOSED WITHOUT PULLING ON HANDLE. INSURE SUPPORT PINS ARE ENGAGED." (On sliding doors.)

"MAXIMUM LOAD 600 LBS" (On hoist.)

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WHITE AREA ABOVE 10,000 FT HD
VNE (IAS) PWR ON 106-108% NR

PRESS ALT X 1000	-35	-30	-20	-10	0	10	20	30	40	50
-1					OAT ~ °C					
0	11,700 LB									150
1					155 KTS				149	143
2								148	142	137
3						154	148	141	136	130
4					154	147	141	135	129	123
5				154	147	141	134	128	122	117
6	152	153	154	147	140	134	127	121	115	109
8	134	135	136	133	126	120	114	107	101	95
10	118	118	118	119	112	105	99	92	86	80
12	99	99	99	104	97	90	84	77		
14	80	92	92	89	82	76		11,000 LB		
16	73	73	73	73						
18	56	56						FLIGHT NOT ALLOWED		

Vne POWER ON

NOTE

Vne ABOVE 10,000 FEET DENSITY ALTITUDE AT GROSS WEIGHTS GREATER THAN 11,000 POUNDS IS BEST RATE OF CLIMB AIRSPEED AS SHOWN BELOW

VNE (IAS) PWR ON 106-108% NR

PRESS ALT X 1000	-35	-30	-20	-10	0	10	20	30	40	50
-1										
0										
1										
2										
3										
4										
5										
6										68
8								66		
10						64				
12				62						
14		60								
16	58									
18	56									

WHITE AREA FOR USE ABOVE 10,000 DENSITY ALTITUDE FOR A/C WEIGHTS 11,001 TO 11,700 LBS

FLIGHT NOT ALLOWED

Vne POWER ON

S 95668.1 (R8)

Figure 1-7. V_{ne} Placards (Sheet 1 of 2)

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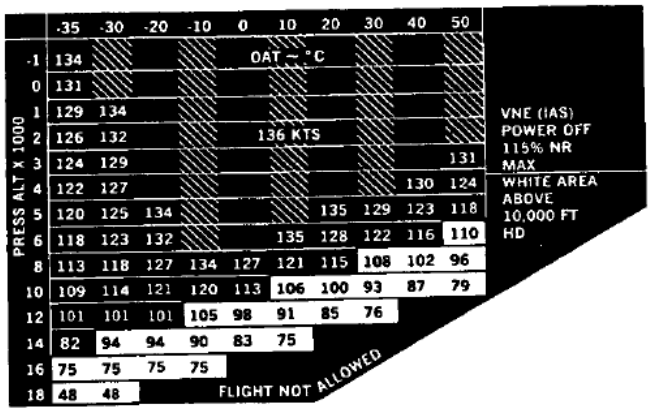

PRESS ALT X 1000	-35	-30	-20	-10	0	10	20	30	40	50
-1	134									
0	131									
1	129	134								
2	126	132								
3	124	129								131
4	122	127							130	124
5	120	125	134				135	129	123	118
6	118	123	132			135	128	122	116	110
8	113	118	127	134	127	121	115	108	102	96
10	109	114	121	120	113	106	100	93	87	79
12	101	101	101	105	98	91	85	76		
14	82	94	94	90	83	75				
16	75	75	75	75						
18	48	48								

Vne POWER OFF
ALL WEIGHTS

S95668.2(R8)

Figure 1-7. V_{ne} Placards (Sheet 2 of 2)

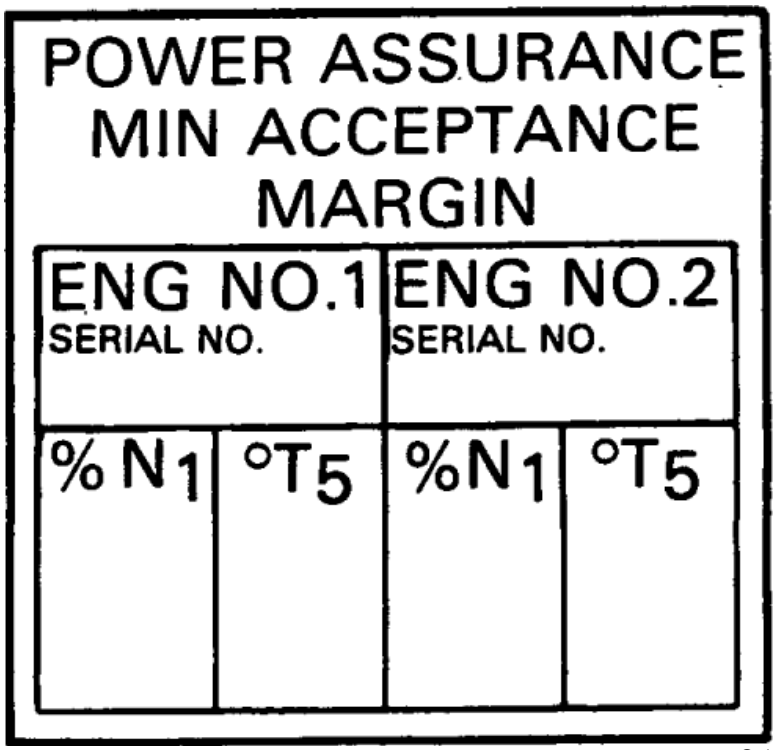

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Figure 1-8. Power Assurance Placard

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SECTION II

NORMAL PROCEDURES

NORMAL OPERATION

FLIGHT PLANNING

Publications - Checked

Weight and Balance - Completed

Performance Requirements - Completed

Weather Briefing - Completed

EXTERIOR CHECK

The pilot will determine that the following exterior preflight check has been done before the first flight of the day or before the next flight after extended maintenance. Those items marked with an asterisk (*) should be checked just prior to each flight. Following removal and proper stowage of protective plugs, tie downs, and other associated supplementary equipment, the following check is performed beginning at the pilot's door and proceeding clockwise around the helicopter.

CHECK	FOR
*Pilot's and Right Cabin Doors	Proper operation, fit, condition, security, window clean and unscratched, condition of hinges and latches, security of jettison handles. Ensure keylocks unlocked (if installed) by physically opening each door from the outside
Rotor Brake	Off
Nose Flotation Gear Bottle	Proper pressure
*Right Cabin Sliding Door, if equipped	Proper operation, security, condition of window and sliding rails, security of window jettison handle
Main Gear Box (right side)	Proper oil level
Oil Filter Bypass	Unpopped
Hydraulic Module - Second Stage	Proper fluid level, filter button, no leakage

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CHECK	FOR
Main Rotor Servo (If aircraft has been non-operational for more than 2 hours in freezing temperatures).	Attempt to manually move input link to Forward Main Rotor Servo. Input link should move freely with no restrictions approximately 1/4 inch.
Main Rotor Head	General condition
Main Rotor Blades	General condition: tip cap for condition and security; blade upper and lower surfaces for raised skin indicative of disbond. Rotate the rotor system as required to view all blade surfaces and tip caps.
Engine Oil Reservoir	Proper fluid level; when securing oil filler cap, make sure latching mechanism is properly engaged before closing access panel.
Oil and Fuel Filter Bypasses	Unpopped
Engine Fire Bottle	Proper pressure, condition
Engine Area	Fuel or oil leaks, damage
Engine Air Intake	Obstructions and foreign objects
EAPS Doors	Condition and position
EEC, Engine Envelope, and DC and AC Generator Cooling Ducts	Obstructions
*Fuel Filler Cap	Fuel level, cap secure
Electrical Compartment	For hoist mission, check HOIST POWER and HOIST CONTROL circuit breakers in
*Electrical Compartment Access	Panel secure
*Baggage Compartment	Contents, fuel leakage, door secure
Main Landing Gear Compartment	Tire inflation, strut extension, door and gear actuator rods properly attached and undamaged, fluid leakage, elastomeric bearing condition, general condition

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TEMPORARY REVISION NO. 5

FILING INSTRUCTIONS: Insert this Temporary Revision facing page 2-4, dated September 23, 1999.

SUBJECT: Main Rotor Swashplate Guide and Shield Area Preflight Check. This temporary revision adds the main rotor swashplate guide and shield area check to the exterior check.

MANUAL CHANGES:

Add the following check after “Main Rotor Head” check:

Main Rotor Swashplate Guide and Shield Area	Leakage

TEMPORARY REVISION NO. 5

FAA APPROVED MARCH 12, 2015

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*Tiedown ring	Tiedown ring stowed in a position from flat against shock strut to end of ring no more than 0.25 inches from strut.

CAUTION

Tiedown rings that are not stowed flat may lead to failure of the landing gear to retract or extend.

*Downlock pin	Downlock pin removed
Flotation Gear	Bags for proper storage, covers for condition and security, bottles for proper pressure.
Hydraulic Lines	Leakage
Fluid Drains and Vents	Leakage
Antennas	Damage, corrosion, security
Tail Cone Static Ports	Clear of soot and obstructions
Pylon Skin and Fairings	General condition
Horizontal Stabilizer	General condition. Check that the attachment is tight and that there is no movement (play) in any direction
Side Position Light	Cracked or broken lens
Intermediate Gear Box Fairing	Lower surface for scrapes and condition, air intake for obstructions
*Intermediate Gear Box	Proper oil level, lightly shake pylon while checking
Tail Rotor Head	General condition
Tail Rotor Blades	General condition
*Tail Rotor Gear Box	Proper oil level, lightly shake pylon while checking
Anti-collision and Position Light	Cracked or broken lenses
Pylon Skin and Fairings (Left Side)	General condition
Horizontal Stabilizer	General condition
Side Position Light	Cracked or broken lens
Antennas	Damage, corrosion, security
Tail Cone Static Ports	Clear of soot and obstructions

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CHECK	FOR
Tail Cone Access Panel	Security, condition
Main Landing Gear Compartment	Tire inflation, strut extension door and gear actuator rods properly attached and undamaged, fluid leakage, elastomeric bearing con--dition, general condition
*Tiedown ring	Tiedown ring stowed in a position from flat against shock strut to end of ring no more than 0.25 inches from strut

CAUTION

Tiedown rings that are not stowed flat may lead to failure of the landing gear to retract or extend.

*Downlock pin	Downlock pin removed
Flotation Gear	Bag for condition, bottles for proper pressure
Hydraulic Lines	Leakage
Fuel Sump Drain	Drain — Check for water and visible contaminants. Adequate water drainage is provided only with the helicopter approximately level (less than 3° nose up or down)
*Baggage Compartment	Contents, fuel leakage, door secure
*Fuel Filler Cap	Fuel level, cap secure
Thermal Relief Indicator Button	Unpopped
EEC, Engine Envelope and DC Generator Ducts	Obstructions
Engine Area	Fuel or oil leaks, damage, and security
Engine Oil Reservoir	Proper fluid level; when securing oil filler cap, make sure latching mechanism is properly engaged before closing access panel
Engine Fire Bottle	Proper pressure
Oil and Fuel Filter Bypasses	Not popped
Engine Air Intake	Obstructions and foreign objects
EAPS Doors	Condition and position

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TEMPORARY REVISION NO. 5

FILING INSTRUCTIONS: Insert this Temporary Revision facing page 2-6A, dated September 23, 1999.

SUBJECT: Main Rotor Swashplate Guide and Shield Area Preflight Check. This temporary revision adds the main rotor swashplate guide and shield area check to the exterior check.

MANUAL CHANGES:

Add the following check after “Main Rotor Head” check:

Main Rotor Swashplate Guide and Shield Area	Leakage

TEMPORARY REVISION NO. 5

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CHECK	FOR
Rotor Brake Accumulator	Proper fluid level, leakage
Main Rotor Head	General condition
Hydraulic Module - First Stage	Proper fluid level, filter button, no leakage
Main Rotor Servos (If aircraft has been non-operational for more than 2 hours in freezing temperatures).	Attempt to manually move input links to Lateral and Aft Main Rotor Servos. Input links should move freely with no restrictions approximately 1/4 inch.
*All Engine and Transmission Doors and Cowls	Condition, security, including hinges and latches
*Left Cabin Sliding Door, if equipped	Proper operation, security, condition of window and sliding rails, security of window jettison handle
*Copilot and Left Cabin Door	Proper operation, fit, condition, security, window clean and unscratched, condition of hinges and latches, security of jettison handles. Ensure keylocks unlocked (if installed) by physically opening each door from the outside

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CHECK	FOR
*Nose Gear Lockpin (copilot's side of console)	Removed
*Copilot's Seat Belt	Security, if to be unoccupied
Nose Flotation Gear Bottle	Proper pressure
Emergency Blowdown Bottle	Proper pressure
*Electronics Compartment	Panels closed, security
Windshield Washer	Fluid level
Windscreen	Glass clean and unscratched
Windshield Wipers	Clean, wear, condition, security
Nose Gear Compartment	Tire inflation, strut extension, door and gear actuator rods properly attached, general condition, fluid leakage
Battery Vents (dual battery aircraft only)	Obstructions
Nose Flotation Gear Panels	Condition
Battery Access (dual battery aircraft only)	Panels secured
*Pitot Heads	Covers removed, clean
Controllable Searchlight, or Landing Light	Lens damage, proper stowage
*Electronics Compartment	Panel closed
OAT Source	Clean, free of obstructions
Main Rotor	Free to turn

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INTERIOR CHECK

The takeoff and anticipated landing gross weight and balance should be determined before takeoff and checked against the LOADING INFORMATION contained in Part 2 and OPERATING LIMITATIONS.

NOTE

Those items marked with an asterisk (*) should be checked before each flight.

*1 Cabin exits – Secure and accessible.

*2. Cargo – Secure.

3. Fire extinguishers - Charged and secure.

4. First aid kit - Sealed and secure.

5. Emergency locator transmitter - Secure, antennas connected, switch to ARM.

*6. Training switch - OFF, door secured.

*7. Required aircraft documents checked.

NIGHT FLIGHTS

*1. All interior lights - Check.

*2. All exterior lights - Check.

BEFORE STARTING ENGINES

*1. Doors - Secure. Check lockpins.

*2. Seat(s) - Adjust to achieve pilot eye reference point.

*2A. Tail rotor pedals - Adjust reach.

*3. Wheel brakes - Set.

*4. Safety belt and shoulder harness - Check and fasten.

*5. Landing gear handle - DN.

*6. Landing gear emergency T-handle - In.

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*7. Avionics - OFF.

*8. Flight control servo switches - Centered.

*9. Channel monitor selector - PBA. Check both indicator needles centered.

*10. Remaining center console switches - As desired.

*11. Arming switches - OFF.

*12. Stick trim switches - ON.

*13. Generator switches - ON.

*13A. Inverter - OFF.

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14. Battery Feeder Fault - TEST (dual battery installation).
    a. BATT FEED FAULT TEST switch - HOLD FWD.
    b. AUX battery - ON.
    c. Check BATT FEED FAULT light - On.
    d. AUX Battery - OFF.
    e. Repeat steps a. through d. using AFT and MAIN battery.

14A. Battery Feeder Fault - TEST (single battery installation).
    a. BATT FEEDER FAULT TEST switch - Hold FWD.
    b. Battery - ON.
    c. Check BATT FEED FAULT light - On.
    d. Battery - OFF.
    e. Repeat steps a. through d. using AFI switch position.

*15. Battery switch(es) - ON.

*16. External power switch (if desired and external power available) - ON.

*17. AFCS switches - OFF, NO GO lights off.

*18. Fuel quantity - Check.

19. Fuel indicating system - Note fuel quantity; then press test button. Indicator pointer should decrease slowly to zero. Release test button and pointer should return to original indication.

*20. N_1 and T_5 digit lighting - Set.

*21. Landing gear down and locked lights (3 green) - On.

*22. Caution/advisory panel - Press to test. Check these lights:

    Caution panel
    ECC channel active lights
    Master warning panels

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Manual reversion lights, press to dim
Landing gear
AFCS GO/NO GO
Fire extinguisher test
Float test panel

*23. #1 and #2 MANUAL REVERSION lights - Off.

24. Engine failure warning system – Check

a. 1 and #2 ENGINE OUT warning lights - On.

b. Engine out ground test switch (side of console) - Hold in TEST. Alternating tone will be heard. Press ENGINE OUT warning light capsules to reset tone. Warning lights will remain on.

c. Engine out ground test switch – OFF

*25. Circuit breaker panels - Check.

*26. Fire extinguisher test and prime switches - NORM or OFF.

27. Fire detector system – Check

a. Fire detector test switch - FWD. FIRE warning lights and T-handle lights should light and continuous tone should be heard.

b. Press FIRE warning light capsules to reset tone.

c. Fire detector test switch - NORM. All fire warning lights off.

d. Fire detector test switch - AFT/BAG. Fire warning lights and T-handle light should light and continuous tone should be heard.

NOTE

If external power is in use, the SMOKE DET BAGGAGE warning light will go on.

e. Press FIRE warning light capsules to reset tone.

f. Fire detector test switch - NORM. All fire warning lights off.

*28. Heater BLEED AIR switch or ECU CONT SEL switch - OFF.

*29. Rotor brake - Off, handle in detent, check ROTOR BRAKE caution light off.

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*30. Rotor brake handle - On (two strokes required). Check ROTOR BRAKE caution light on and pressure gage for at least 200 psi.

*31. Rotor brake off starts - If desired. Release brake, handle in detent, and check caution light off within 3 seconds.

*32. Engine levers – OFF.

*33. Fuel levers – XFEED.

*34. Engine T-handles – Forward.

*35. Engine power assurance target values – Determine torque, T_5 and N_1 values for prevailing pressure altitude and OAT using appropriate Figure 4-6 or 4-7 on pages 4-9 and 4-10. The minimum acceptable margins for T_5 and N_1 are displayed on the cockpit flip down placard located under glareshield.

STARTING ENGINES (BATTERY OR EXTERNAL POWER)

NOTE

- Maximum wind speed for which rotor engagements have been demonstrated on an aircraft with rotor brake fitted is 40 knots with gusts to 50 knots. No difficulties were encountered at these conditions and operators may agree to higher values with their local authorities. Sikorsky Aircraft should be kept advised of these higher values.
- When starting on battery power, the oil pressure and fuel flow indicators are inoperative until the dc generator comes on line; however, the engine oil pressure and fuel pressure warning lights on the caution/advisory panel can be monitored for pressure locations.

*1. Rotor area - Clear.

WARNING

Passengers and crewmembers should not be allowed to approach or depart the helicopter directly from the front because of rotor clearance, especially at low rpm and with gusty wind conditions.

*2. Passengers and crew - Alerted.

*3. EAPS switch – OFF.

*4. Master Start switch – ON.

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CAUTION

If rotor should begin to turn during start with the rotor brake applied, shut down the engine(s) or release rotor brake. See Section III, EMERGENCY PROCEDURES for details.

NOTE

- Engine operation with the rotor stopped is limited to one or both engines operating at IDLE. Rotor engagements may be made by releasing the rotor brake with one or both engines at IDLE or by starting an engine without use of the rotor brake.
- Either engine may be started first.
- During external power starts with the battery switch(es) inadvertently OFF, some external power supplies might cause a sharp fluctuation of cockpit indicators. Turn battery on to eliminate.
- Select air conditioner (if equipped) OFF prior to engine starter engagement.
- Absence of indicated fuel flow and the failure to attain light off (with functioning ignition) during a start attempt are indications of possible loss of fuel pressure. This condition is more likely to occur following fuel system maintenance or storage of the helicopter. See FUEL PRIMING PROCEDURES in the OPTIONAL PROCEDURES at the end of Section II for details
- Engine starting with EAPS on is permitted only if the EAPS system is non-operational and positioned in the on mode. Engine starts with EAPS on is restricted to nose into the wind.
- When starting the second engine with the first engine providing generated power at ground idle, the first engine's engine out light may illuminate momentarily but will extinguish when the second engine starter is disengaged.

*5. No. 1 engine start.

CAUTION

- Abort the start if the engine fails to light off within 10 seconds from an indication of fuel flow or fuel pressure (warning light extinguishes).
- If an engine fails to accelerate for a period greater than 5 seconds after light-off, a hung start is indicated and an abort should be initiated.

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NOTE

- The start is aborted by depressing the trigger, retarding the engine lever to OFF, and releasing the trigger. Consider motoring the engine if T_5 fails to decrease normally.
- Starter use limits very depending on whether or not fuel ignition (light-off) occurs in the engine. With fuel ignition, the starter limits are: a 60-second start attempt, a 60-second interval, and then a 60-second start attempt followed by a 15-minute interval. Without fuel ignition the limits are a 30-second engagement, a 30-second interval, a 30-second engagement, followed by a 15-minute interval. Repeat cycle.

CAUTION

Following an aborted start, allow at least 30 seconds for unburned fuel to drain from the engine. As an added precaution, motor the engine for 15 seconds with the engine lever in the OFF position before attempting another start. To attempt a successive start within starter use limits, the engine lever may be advanced to IDLE at the end of the 15-second motoring interval and a semiautomatic start may be attempted in the remaining 15 seconds, or if light-off occurs, completed in the remaining 45 seconds.

a. Automatic start.

(1) Engine lever - IDLE/START position.

(2) Starter button - Press and release.

(3) Check that channel A active light reverts to B during the sequence and reverts to A at the end of the start.

NOTE

Failure to follow this sequence indicates a possible EEC malfunction. Accomplish normal EEC check procedures prior to take off.

(4) Check that EEC controls T_5 within starting limits, while being prepared to initiate an abort in the event of a hot start.

(5) Oil pressure - Above 40 PSI.

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(6) A normal start should be completed in 10 to 30 seconds. Idle speed is 50.8% (±0.2%) N_1. Steady state idle speeds outside this range require maintenance investigation.

(7) At idle, check #1 DC GEN caution light off (dual battery aircraft check AUX BATT OFF light on).

b. Semiautomatic start (optional).

(1) Engine lever - OFF.

(2) Starter button - Press and hold.

(3) Check that channel A active light switches to B during the sequence and then back to A at the end of the start.

NOTE

Failure to follow this sequence indicates a possible EEC malfunction. Accomplish normal EEC check procedures prior to take off.

(4) Engine lever - IDLE/START position at 12% N_1.

(5) Check that T_5 remains within starting limits, while being prepared to initiate an abort in the event of a hot start.

(6) Oil pressure - Above 40 PSI.

(7) Starter button - Release at 48% N_1.

(8) A normal start should be completed in 10 to 30 seconds. Idle speed is 50.8% (±0.2%) N_1. Steady state idle speeds outside this range require maintenance investigation.

(9) At idle, check #1 DC GEN caution light off (dual battery aircraft check AUX BATT OFF light on).

*6. Inverter switch - ON.

*7. For rotor brake off starts, check transmission oil pressure, servo pressure, and tip-path response to cyclic inputs.

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*8. Rotor brake - Release brake, handle in detent, and check caution light off within 3 seconds.

*9. Transmission oil and servo hydraulic system pressures - Check indicators for normal range and MAIN XMSN OIL PRESS warning light and, #1 SERVO SYSTEM and #2 SERVO SYSTEM caution lights off.

*9A. Engine and transmission oil temperatures - Check indicators for normal range. At cold ambients, control N_r below 65% until main transmission temperature reaches the normal range (15°C).

*10. No. 1 engine lever - Move forward towards FLY while positioning cyclic to minimize droop stop interference.

*11. Flight controls and servo systems - Check at 65% to 70% N_r with droop stops out.

CAUTION

If flight controls do not respond correctly or a restriction in control motion is evident during operation on either isolated hydraulic system, move servo switch to center (both ON) and proceed with shutdown.

CAUTION

Do not move flight control servo switch from ON during flight, except in case of emergency where it is necessary to turn off a malfunctioning servo stage.

a. Move all flight controls through a displacement of at least 1 inch from trimmed position, checking for binding or roughness. Observe tip-path plane for proper response.

b. Pilot's flight control servo switch - NO. 1 OFF. Note that #1 SERVO SYSTEM caution light goes on immediately. There should be no jump in controls. Check flight controls as above.

c. Pilot's flight control servo switch - Move rapidly to NO. 2 OFF. #1 SERVO SYSTEM caution light goes off and #2 SERVO SYSTEM caution light goes on immediately. There should be no jump in controls. Check flight controls as above.

d. Pilot's flight control servo switch - ON. Both servo pressures normal and both caution lights off.

* 12 No. 1 engine lever - Advance to the FLY position stop (trigger released).

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*13. No. 2 engine - Start. Follow same procedures as for No. 1 engine.

*14. MASTER START switch - OFF.

NOTE

The MASTER START switch must be OFF except for starting since actuation of the starter button with the engine running will result in momentary loss of that dc generator.

*15. No. 2 engine lever - Advance to the FLY position stop (trigger released).

*16. AC generator - Check on-line with #1 engine running and #2 engine N_2 above 92%.

17. Engine overspeed checks.

a. Both engines in the FLY position and N_2/N_r is 107%.

b. Collective full down. (Overspeed check will not function above 8% collective.)

c. Select #1 engine channel A overspeed test. N_2 should decrease to approximately 102% and cycle for no more than 3 seconds.

d. Check #1 engine channel B and #2 engine channels A and B.

e. When checked, all four channels must test satisfactorily; if not, shutdown and investigate.

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18. EAPS switch - ON, check that both EAPS ON advisory lights go on within 5 seconds.

NOTE

Use of EAPS mode for taxiing in sandy or dusty conditions is recommended.

*19. EAPS switch - As desired except ON below 2°C with visible moisture.

*20. EEC status switches - Check hard and soft failures, all channels. One channel per engine must be free of hard and soft failures.

*21. Load sharing - Torque or T_5 as desired.

*22. Check EEC maintenance codes - Confirm results of hard/soft failure status of step 20. One EEC channel per engine must be free of hard/soft failures and codes.

*23. EEC channel active lights - Illuminated active light must be the channel free of failures. One active light per engine must be illuminated. Operations are prohibited with two active lights illuminated.

*24. Heater or ECU - As desired.

*25. Avionics - As desired.

*26. Fuel totalizer indicator - Set total fuel indicated on fuel quantity indicator.

NOTE

The fuel totalizer indicator shall be used for information purposes only. The fuel quantity indication system must be used for all operations.

*27. Fire detector test switch - AFT/BAG. The SMOKE DET BAGGAGE warning light on the caution/advisory panel should light. Also, fire warning lights and T-handle light should light and continuous tone should be heard. Return fire detector test switch to NORM. All fire lights will go off.

*28. Fuel levers - DIRECT.

*29. External power - OFF and disconnected.

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30. AC generator - Check at 107% N_r.

    a. AC generator overvolt-undervolt test switch - Hold at UNDERVOLT for about 5 seconds.

    b. AC generator should drop off the line as indicated by the lighting of the AC GEN caution light. Check that INV ON advisory light goes on when generator drops off the line.

    c. Place ac generator switch OFF, then ON, to restore generator output.

    d. AC generator overvoltage-undervoltage test switch - Hold at OVERVOLT. Generator dropout should be immediate. Repeat steps b. and c.

    e. AC generator feeder fault test switch - FEEDER FAULT. Repeat steps b. and c.

31. DC generators - Check with BUS TIE OPEN caution light remaining off throughout sequence.

    a. Deleted

    b. No. 1 generator test switch - Hold at GND FAULT for about 5 seconds.

    c. No. 1 generator should drop off the line as indicated by lighting of the #1 DC GEN caution light.

    d. Observe that the DC ESS BUS, No. 1 DC PRI BUS, and the No. 2 DC PRI BUS remain powered by noting continued fuel quantity and engine torque indications.

    e. Place No. 1 generator switch OFF, wait for 5 seconds, move to RESET and then ON to restore generator output.

    f. #1 DC GEN caution light - Off when generator output is restored. Repeat test with No. 1 generator test switch at OVERVOLT. Generator dropout should be immediate.

    g. Repeat steps b. through f. for No. 2 generator.

    h. Deleted

31A. Essential bus recovery system - CHECK.

    a. Essential bus recovery switch - Hold in TEST.

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b. ESS BUS VOLTS LOW caution light, the MASTER CAUTION, and the amber identification light above the test switch should illuminate.

c. Essential bus recovery switch - Release, lights go off.

d. Battery switch - OFF, BATT OFF caution light - On.

e. Essential bus recovery switch – ON.

f. BUS TIE OPEN, #1 DC GEN, and AUX BATT OFF caution lights should illuminate, while the ESS BUS VOLTS LOW and amber identification lights remain off.

g. Check that all dc buses remain powered (confirmed by observing fuel quantity and #1 and #2 N_2 needles).

h. Battery switch - ON, BATT OFF caution light - Off.

i. Essential bus recovery switch - OFF.

j. BUS TIE OPEN, #1 DC GEN, and AUX BATT OFF caution lights out.

*32. AFCS - Check.

NOTE

When operating aboard ship it is recommended that the automatic flight control system not be tested and that the system remain disengaged until just prior to takeoff.

a. Check all NO GO lights (AFCS control panel) – Off.

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b. Channel monitor switch (AFCS indicator panel) - PITCH.

c. No. 1 pitch channel engage-disengage switch - ENG. CH 1 indicator pointer should be approximately centered.

d. No. 2 pitch channel engage-disengage switch - ENG. CH 2 indicator pointer should be approximately centered. Slight movement of collective pitch should cause both needles to respond.

e. Channel monitor switch - ROLL. Engage roll axis following same procedure as for pitch axis (steps c. and d. above). Use lateral cyclic movement to check roll AFCS response.

f. Channel monitor switch - YAW. Engage yaw axis following same procedure as for pitch axis (steps c. and d. above). Use pedal movement to check yaw AFCS response.

g. Channel monitor switch - PBA. Check both indicator needles are full left (LFT/FWD).

TAXIING

NOTE

- Use tip path plain to control taxi speed. Use wheel brakes only as needed to slow down, turn stop, or maintain a Ground position.
- When conducting extended ground operations in heavy snow, avoid high tail winds when practical. Headwinds improve EAPS performance.

*1. Pilot door(s) - Secured. Check lockpins. DOOR OPEN caution light off.

*2. Chocks - Removed.

CAUTION

To prevent damage to the optional parking brake light system, guide handle down to off position when releasing parking brake.

*3. Parking brake - Guide handle to OFF position.

*4. Wheel brakes - Checked.

PRE-TAKEOFF

*1. Engine and transmission instruments - Normal range.

2. Engine power assurance - Check as required using procedures in section IV.

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*3. Caution/advisory and master warning panels - Check.

*4. Engine levers – FLY; Fuel levers - DIRECT.

*5. Heater BLEED AIR switch or ECU CONT SEL switch - OFF.

*6. Heater blower on, or pilot's window, overhead vents or door vents open for ventilation.

*7. AFCS – As desired (engage for IFR flight)

*8. Stick trims – As desired (Cyclic trim – ON for IFR flight).

*9. EAPS – As required.

NOTE

EAPS must be ON at or below 2° C with visible moisture, an its use is recommended when operating from unpaved surfaces.

*10. Flight instruments – Check and set.

*11. Navigation and communication equipment – Check and set.

*12. Windshield heat - As required.

*13. Pitot heat - As required.

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TAKEOFF

CAUTION

The nose wheel will not self-center after lift-off if it has swiveled about 180° just before lift-off. If retracted in this position, the nosewheel will jam in the up position and normal extension will not be possible. If nosewheel is swiveled more than 90°, slight forward taxi is recommended before lift-off

NOTE

- After a period of prolonged wheel brake use, leave landing gear extended for a minimum of 5 minutes before gear retraction.
- For night takeoff with controllable searchlight, adjust light in hover so that spot appears in front, just above glare shield. Leave light in this position throughout the takeoff.
- When taking off over water, the floats switch should be placed at ARMED until airspeed approaches 75 KIAS.

CATEGORY A TAKEOFF

1. Refer to Figures 4-9 and 4-9A, Section 4, for CDP and V_2 determination.
2. Set the white (orange) airspeed bug at the CDP speed and the yellow (green) bug at the V_2 speed.
3. Hover at 5-foot wheel height, and note the stabilized hover torque required.
4. Increase collective to achieve 10% torque greater than hover, and lower the nose as necessary to result in a 5- to 10-foot wheel height, level acceleration to the CDP (CDP airspeed at 5- to 10-foot wheel height).
5. Upon passing the CDP, adjust pitch attitude to initiate a climb at V_2.
6. With V_2 established in a positive climb and clear of obstacles, gradually accelerate to best rate of climb speed (V_{BROC}) and retract the landing gear.

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CATEGORY “B” TAKEOFF

1. Hover at 5-foot wheel height, note hover torque required.
2. Accelerate forward while maintaining 5- to 10-foot wheel height.
3. Increase collective to achieve up to 10% torque over hover, if available, and continue level acceleration. Do not exceed takeoff limits.
4. As 50 KIAS is achieved, raise nose to maintain 55 KIAS and climb until all obstructions are cleared. During takeoff and climb, observe height-velocity limits (Figure 1-3).

CLIMB

1. Landing gear lever - UP before reaching 130 KIAS.
2. Heater or ECU - As desired.

PRE-LANDING

1. Crew and passengers - Alerted.
2. Landing gear lever - Down below 130 KIAS, three green lights - On.
3. Heater BLEED AIR switch or ECU CONT SEL switch - OFF.
4. Heater blower on, or pilot's window open, or overhead vents open for ventilation.
5. EAPS switch - As required.

WARNING

Do not turn the anti-ice/EAPS switches off if accumulation of ice or snow is suspected. Opening the EAPS doors under these conditions could result in engine damage or flameout.

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NOTE

EAPS must be ON at or below +2°C with visible moisture, and its use is recommended when operating to unpaved surfaces.

APPROACH AND LANDING

Instrument approach speeds of 70 KIAS to 125 KIAS are recommended.

CAUTIONS

- Do not transmit on the HF radio during an approach where ADF or VOR is being used for navigation unless it has been determined that the frequency combination selected is not subject to interference.
- During landing and operations near the ground, avoid attitudes greater than 10° nose-up, to reduce possibility of tail to ground contact, especially during operations at aft CG.
- During high speed running landings, allow 2 minutes of intervening forward flight time above 50 KIAS or 10 minutes of intervening ground time between maximum performance wheel brake applications to permit brake disc cool-down.

NOTES

- When making an approach over water, the floats switch should be placed to ARMED when airspeed is less than 75 KIAS.
- Two Category "A" approach profiles are provided. The Category "A" Approach and Landing procedure is intended for visual approaches to minimum available field lengths. The Alternate Category "A" Approach and Landing procedure provides a more shallow profile for transition from instrument approaches or where available landing space is not critically short.
- Collective to yaw control coupling can be felt in the controls at certain extreme control positions not encountered within the normal flight envelope. See Part 2 Section I, TAIL ROTOR FLIGHT CONTROLS, for detail information.

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- During rotor turning operations aboard ship it is recommended that the automatic flight control system be disengaged.

CATEGORY "A" APPROACH AND LANDING

1. Establish an approach to arrive at the LDP, a point 250 feet above the touchdown elevation, with 40 KIAS, and rate of descent of no more than 600 FPM.
2. Initiate a deceleration passing 50 feet at 40 KIAS.
3. Continue approach and deceleration to a running touchdown or hover

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ALTERNATE CATEGORY "A" APPROACH AND LANDING

1. Establish an approach to arrive at the LDP, a point 75 feet above the touchdown elevation, with 60 KIAS, and a rate of descent of no more than 300 FPM.
2. Upon passing the LDP, initiate a smooth deceleration while reducing collective to continue the descent through 50 feet, with up to 20 to 25° flare attitude.
3. Apply collective to reduce descent rate and decrease flare attitude to pass 20 feet at approximately 30 KIAS.
4. Continue approach and deceleration to a running touchdown or hover.

CATEGORY "B"APPROACH AND LANDING

1. Establish an approach to arrive at a point 250 feet above the touchdown elevation, with 45 KIAS, and a rate of descent of no more than 600 FPM.
2. Initiate a deceleration passing 50 feet at 45 KIAS.
3. Continue approach and deceleration to a running touchdown or hover.

GO-AROUND

1. Increase collective pitch up to takeoff power.
2. Accelerate to best rate of climb speed.
3. Raise landing gear when positive rate of climb is established.

PRE-SHUTDOWN

1. AFCS switches - OFF.
2. Parking brakes - Set.
3. Flight controls - Centered, collective down.
4. Avionics - OFF.
5. EAPS - OFF, unless icing conditions had been encountered during flight.
6. Master start switch - ON.

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SHUTDOWN

NOTE

- When a tail wind shutdown is necessary and EAPS on is required, engine shutdown (stopcock) from flat pitch power is required. A one-minute cool down at flat pitch power replaces the normal cool down at IDLE.
- If an internal engine fire occurs as indicated by a rapid increase in T_5, immediately engage starter with engine lever and fuel lever OFF to minimize high T_5, and put out fire.
- Droop stops should be in at about 45% N_r. Tip-path plane clearance is reduced if droop stops are not in.
- Conditions for rotor brake application include one engine shut down and the other engine at IDLE or both engines shut down. Normal N_r will be 40% to 60% N_r. Maximum N_r is 65%. For emergencies, with both engines shut off, rotor brake may be applied up to 107% N_r.

1. Engine levers - IDLE (for 1 minute).
2. Engine lever(s) - Release trigger(s) and retard to OFF.

NOTE

During shutdown the channel active lights will switch to channel B and then back to channel A.

3. Rotor brake - On, if desired. Two strokes are required to achieve proper brake application, but modulation is available to accomplish the desired deceleration rate and smooth rotor stops.

CAUTION

Maximum manual rotor brake application is not recommended when commenced below 30% N_r. Brake applications begun at less than 30% N_r should be light enough to produce a smooth, gentle stop.

4. Remaining engine lever – OFF

POST SHUTDOWN

1. Fuel levers - OFF.
2. EAPS switch - OFF.

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3. Center console switches - OFF or as desired
4. Master start switch - OFF.
5. EEC Status switches - Check and note any hard or soft failures.
6. EEC Maintenance switches - Read codes of any EEC failure.
7. Battery switches - OFF.

EXTERNAL CARGO HOOK OPERATION

NOTE

The preceding normal procedures should be followed unless superceded by the following:

PREFLIGHT

The following checks should be performed daily, prior to cargo hook operations:

1. Ground personnel exerts pressure on cargo hook from beneath the helicopter.
2. Mechanical release handle - Pull. Ground personnel should confirm hook open. Mechanical release handle - Push down. Ground personnel should confirm hook locked.
3. Cargo hook arming switch - ARMED. Check HOOK ARMED green light on.
4. Pilot's cyclic release button - Press. HOOK OPEN advisory light will cycle on/off. Ground personnel should confirm hook open and allow hook to relock when cyclic button is released.
5. Copilot's cyclic release button - Press. Repeat checks.
6. Cargo hook arming switch - OFF, HOOK ARMED light off.

TAKEOFF

When an external load is being carried, the following performance factors should be considered.

1. The helicopter was tested for this operation under day, VFR conditions only. This does not necessarily preclude the operator from demonstrating the ability to operate under night, VFR conditions.

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2. Performance published in the flight manual may or may not be realized depending on the size and shape of the load to be carried on the sling. Compensation should be allowed for the drag effects of external loads having large surface areas.

3. Figure 4-18 shows maximum gross weight for hovering out of ground effect. Vertical drag of the external load is not accounted for.

CARGO PICKUP

1. Cargo hook - ARMED.

2. Ground personnel - Secure load to cargo hook.

CAUTION

Under some atmospheric conditions, a static electrical charge will exist on the rotorcraft in flight. This charge should be dissipated by a suitable means prior to ground personnel touching the cargo hook of a hovering rotorcraft.

3. Slowly apply collective and ascend vertically to apply tension slowly to the cargo cable and to insure that cyclic control is adequate and that power limits are not exceeded.

NOTE

The CG shift with external load is approximately equal to 2.5 inches per 1000 pounds of load weight, i.e., a 3300-pound load will result in a forward CG shift of approximately 8 inches.

CRUISE

Accelerate slowly into forward flight to verify that no condition is encountered in which the rotorcraft can be uncontrollable.

APPROACH AND LANDING

The descent and approach to the external load drop area should be made at a combination of horizontal and vertical speed so that the rotorcraft will come to a stabilized hover over the drop point. Descend slowly with minimum forward speed and no side drift until the cargo rests on the ground and the cargo attachment cable becomes slack.

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CAUTION

Excessive approach speeds or rates of descent may require the use of excessive torque at termination of the approach.

SLIDING CABIN DOOR IN FLIGHT OPERATION

WARNING

The FASTEN SEAT BELT sign must be on and all cabin occupants shall have safety belts fastened or wear an approved safety harness, properly adjusted, with the sliding door open in flight.

NOTE

Avoid prolonged downwind hover with the sliding doors open to prevent accumulation of exhaust fumes in the cabin.

1. Cabin occupants - Seat belts and/or safety harness fastened.

CAUTION

Safety harness should be attached to an unused cargo tiedown ring. Tiedown ring should not be loaded laterally when a ring is in the vertical position. The ring should be free to swivel so the tension is applied to the top of the ring rather than the side.

2. Airspeed - 50 KIAS or less.
3. Sliding cabin door - Open fully. The MASTER CAUTION, DOOR OPEN caution, and RHDR or LHDR lights go on.
4. Press RHDR/LHDR light - MASTER CAUTION and DOOR OPEN capsule goes off. The RHDR/LHDR light stays on.

NOTE

The helicopter can be accelerated rapidly, especially in the low-speed range. With the sliding doors open, changes in airspeed cues (noise, buffeting, etc.) are minimal. Exercise care to prevent exceeding the 74 KIAS sliding door airspeed limit.

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5. Aft door support pin engagement - Check upper and lower pins visually. Confirm door is locked open by attempting to slide it forward.

UTILITY HOIST OPERATION

EXTERIOR INSPECTION

Check utility hoist hook for operation, swivel for freedom of movement and fairing for security.

INTERIOR CHECK

Determine that lateral and longitudinal CG limits will not be exceeded during planned hoist operations. See Part 2 Section III.

1. Manual cable cutters - Attached and secure.
2. Safety harness - Secure and adjusted.
3. Hoist pendant control - Secure and cable connected.

PREFLIGHT

This check requires both dc generators operating. Hoist high speed will not function with only one dc generator or external power. Only the hoist shear will function with battery power.

1. Hoist power switch - ON. Green indicator light - On.
2. Cable shear test switch - Lift guard and place switch to TEST. Observe that hoist power indicator goes out.
3. Pilot's cable shear switch - Lift guard and place to SHEAR. HOIST TEST LT near cable shear test switch and HI TEMP WARN light on pendant should light.
4. Pilot's cable shear switch - Close guard. Both lights should go off.
5. Repeat steps 3 and 4 using cable shear switch in pendant control storage compartment.
6. Cable shear test switch - Close guard. Switch will move to ARM. Check hoist power indicator green light - On.
7. Hoist master switch - CREW. Check operation of hoist with pendant control.

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TEMPORARY REVISION NO. 4

FILING INSTRUCTIONS: Insert this Temporary Revision facing page 2-27, dated May 22, 1998.

SUBJECT: HOIST OPERATIONS. This temporary revision adds additional information regarding the Goodrich hoist system.

MANUAL CHANGES: Add the Warning below to follow the Warning after step 5A. of the UTILITY HOIST PICKUP section:

WARNING

A failure of the overload clutch can be d etected by a r atchet noise from the hoist or by a gloved hand on the hoist cable. Failure to maintain vigilance by keeping a gloved hand on the cable and awareness of the load during operation can result in a partial peel out event without notice by the operator. Partial peel out is defined as an obvious detectable slip of the hoist overload clutch that results in an uncommanded pay out of 20 inches (0.5 meters) or more of the hoist cable. Do not attempt to raise the load to the aircraft after a partial peel out. Smoothly lower the load to the ground while in a hover

TEMPORARY REVISION NO. 4

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8. Hoist master switch - PILOT. Check operation of hoist control switch on control console.
9. Hoist power switch - OFF.

UTILITY HOIST PICKUP

1. Hoist operator's safety harness - Secured and adjusted.

NOTE

Hoist operator should put on the safety harness and attach it to the floor before opening the sliding door. Harness should be attached to an unused tiedown ring.

2. R.H. sliding cabin door - As desired
3. ECU, heater blower, cockpit dome light, pilot and copilot pilot heat, and weather radar or wipers - off.

NOTE

The above manual load shed provides for the failure of one DC generator during hoisting.

4. Hoist power switch - ON. Green indicator light - On.
5. Hoist master switch - PILOT or CREW as desired.

5A. It is the hoist operator's responsibility to assure that hoist cable does not contact any portion of the aircraft. In situations where contact with airframe or other obstacle is observed, hoisting should be interrupted while the contact area on the cable is inspected. If any broken wires, unraveling, or kinks are observed, hoisting operations should be discontinued and the cable replaced.

WARNING

Reeling a kinked/damaged cable into the hoist may cause a hoist jam condition when reel-out is attempted, rendering hoist inoperative.

5B. Hoist crewman/operator is responsible to maintain stability of the hoisted load by use of hoist controls, ICS calls to pilot, and physical control of cable (hand or foot). For minor oscillation (linear or circular swing), stop reel-in, apply hand motion to cable in direction opposite to oscillation. For significant oscillation, stop reel-in, start reel-out or call for pilot to lower aircraft.

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WARNING

If not quickly stopped, the instability may become unmanageable. Reeling in an unstable load will only aggravate the motion.

5C. All crew should observe for shock loads, jerks, or snaps that impart high loads on cable. If observed, hoisting should be interrupted and cable inspection undertaken to verify integrity (no broken wires, unraveling, or kinks) before resuming operations. Replace cable before next mission.

CAUTION

Static electricity should be dissipated by suitable means before ground personnel touch the hook or cable.

6. Hoist cable - Lower.

WARNING

The last 20 feet of cable is painted red and is unusable.

7. Ground personnel - Secure load to utility hoist hook.

8. Hoist cable - Apply tension by either raising cable or increasing hover height. Adjust cable length as desired.

NOTE

Swinging loads may cause erratic radar altimeter and ADF indications.

CAUTION

- The hoist operator should wear gloves to prevent injury from broken wires.
- When rewinding cable, keep tension on cable. Stop rewinding if cable does not rewind on drum evenly and smoothly. If hoist speed does not automatically slow with about 15 feet of cable remaining, release trigger before bumper contacts spring on bottom of hoist. In all cases, intermittently operate the hoist in the UP direction for the last 6 inches of travel allowing the up-limit switch to stop the hoist.
- Cable contact with the rails or sliding door in forward flight may be avoided by carrying load with at least 100 feet of cable extended when practical.

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9. Hoist master power switch - OFF.

9A. Restore items shed in step 3 as desired.

10. RH sliding cabin door - As desired.

NOTE

With a constant load on the hoist, symmetrical reduction in gross weight (fuel burn off, for example) will result in the lateral cg moving outboard. See Part 2 Section III.

HOIST DUTY CYCLE

Hoist motor is protected with a thermal shutdown circuit. To preclude inadvertent shutdown, the following duty cycle guidelines based on raising and lowering the hoist load through full cable travel without intermittent operation are provided.

1. Between each cycle (reel-in/reel-out) pause 30 seconds.

2. For continuous cycles, rest for 30 minutes between each series of, 5 cycles for a 600-pound load, or 8 cycles for a 300-pound load.

NOTE

Consider restoring items shed in step 3 above during cooldown intervals.

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OPTIONAL PROCEDURES

ENGINE FIRE EXTINGUISHER SYSTEM TEST

The fire extinguisher test panel provides a method of performing a full functional check of the fire extinguisher system from the cockpit. This test may be performed whenever desired by the pilot or as required by maintenance.

Make this check before starting engines:

1. Fire extinguisher test switch - OPEN. Check red WARN light on.
2. Pull both T-handles back 1 inch.
3. Fire extinguisher - MAIN, then RESERVE. Check that green TEST light goes on in each position. Release switch.
4. Fire extinguisher test switch - SHORT. Check red WARN light and green test light - On.
5. Fire extinguisher switch - MAIN, then RESERVE. Check that green TEST light stays on in each position.
6. Both T-handles - Full forward.
7. Fire extinguisher test switch - NORM.
8. Check red WARN light and green TEST light – Off.

FLOTATION SYSTEM TEST

Make this check for electrical continuity daily before all anticipated overwater flights. DC external power must be available or the helicopters dc generators must be operating to make this test.

1. Flotation test switch - TEST. Check red WARN indicator light - On.
2. Floats arming switch - ARMED. Check FLOTATION ARMED advisory light - On.
3. Floats inflation switch (pilot's cyclic) - Press. Check TEST 1 and TEST 2 green indicator lights - On. Release switch, lights out.

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4. Floats inflation switch (copilot's cyclic) - Press. Check TEST 1 and TEST 2 green indicator lights - On. Release switch, lights out.

5. Floats arming switch - OFF. Check FLOTATION ARMED advisory light – Off.

6. Flotation test switch - NORM. Check red WARN indicator light - Off.

FUEL PRIMING PROCEDURES - DURING NORMAL START

Loss of fuel prime can be indicated by continued illumination of the low fuel pressure light, absence of indicated fuel flow, and the failure to attain light off (with functioning ignition) during the start attempt. This condition is more likely to occur following engine or fuel system maintenance or prolonged storage of the helicopter. The following prime procedure should be used to attain light off. If loss of prime is noted after relatively short intervals, suspect a malfunctioning fuel line check valve.

1. Starter motoring: If no indication of fuel flow or fuel pressure (warning light extinguishes) is observed during a start attempt, especially after engine maintenance, the following procedure is recommended. With the fuel lever in DIRECT, motor the engine in the OFF position for 15 seconds and then advance the engine lever to IDLE with starter button depressed to attempt a semiautomatic start in the remaining 15 seconds, or, if light-off occurs, complete a start in the remaining 45 seconds.

2. Engine cross prime: With one engine running, the other engine can be primed as follows:

   a. Fuel lever of engine to be primed - PRIME.

   b. Engine prime switch of engine to be primed - PRIME.

   c. Fuel pressure light - Note light goes out.

   d. Engine - Start.

   e. Engine prime switch - OFF.

   f. Fuel lever – Crossfeed.

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NOTE

Extended running of an engine in DIRECT with the opposite engine's prime switch at ON and fuel lever at PRIME or XFEED can result in vent overflow if tanks are full.

NAV TEST SWITCH FUNCTION

(When used in conjunction with King Radio Navigation System)

When NAV TEST switch is at PILOT or COPILOT, all the corresponding pilot's or copilot's Marker Lamps should go on. If the appropriate Marker audio selector switch on the ICS control is selected, a tone should be heard.

(When used in conjunction with the Collins Radio Navigation System)

1. Turn on VOR receiver(s) and select a VOR frequency on the appropriate navigation control panel.

   Set pilot's HSI display switch to PLT NAV; copilot's HSI display switch to CPLT NAV; HSI OBS switch to NORM; PLT/CPLT bearing switches to VOR.

2. Set and hold NAV TEST switch at PLT (to test pilot's system), or CPLT (to test copilot's system).

3. Select the corresponding HSI Course Select Knob to center CDI.

4. The following should occur on the appropriate indicator:

   a. The NAV and both GS warning flags should remain out of view.

   b. The deviation bar should center at a course of 000° ±5° and GS deviation bar should deflect approximately 1-1 /2 dots down.

   c. The To/From indicator will indicate TO.

   d. The bearing pointer will indicate 000° ± 5°.

   e. All of the pilot's (or copilot's if CPLT position is selected) MKR BCN lights should illuminate.

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5. Release the NAV TEST switch.
6. Select a Localizer frequency on the appropriate navigation control panel, and rotate Course Set Knob to select the helicopter indicated heading.
7. Set and hold the NAV TEST switch in PLT position (to test pilot's system) or CPLT position (to test copilot's system).
8. The following should occur on the appropriate indicator:
   a. The LOC and both GS warning flags should remain out of view.
   b. The Localizer deviation bar should deflect approximately l-1/2 dots to the right.
   c. The GS deviation bar should deflect approximately 1-1/2 dots down.
   d. All of the pilot's (or copilot's if CPLT position is selected) Marker Lamps should illuminate.
9. Select MKR audio on the appropriate ICS control. A tone should be heard.
10. Release the NAV TEST switch.

FUNCTIONAL CHECK - PITCH BIAS ACTUATOR

During nominal 100 KIAS cruise, note that both PBA indicator needles are approximately centered. The needles should track together (upper needle motion somewhat delayed), and should move to the right with increasing airspeed and to the left with increasing collective pitch setting.

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SECTION III

EMERGENCY PROCEDURES

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SECTION III

EMERGENCY PROCEDURES

INTRODUCTION

The procedures outlined in this section deal with the common types of emergencies; however, the actions taken in each actual emergency must relate to the complete situation. Extraordinary circumstances such as compound emergencies may require departures from the normal corrective procedures used for any specific emergency.

Throughout this section, the terms "land immediately", "land as soon as possible", and "land as soon as practicable" are used to reflect the degree of urgency with which a landing must be made.

Land immediately - Self-explanatory.

Land as soon as possible - Land at the nearest site at which a safe landing can be made.

Land as soon as practicable - Extended flight is not recommended. The landing site and duration of the flight are at the discretion of the pilot.

Many of the malfunctions described in this section will be indicated by the lighting of warning or caution lights, the master caution light, and in some cases, a tone in the headsets. Whenever a caution light goes on, the master caution light capsule should be pressed in to put the master caution light off, and reset it for another condition. An audio tone can be eliminated and reset for another condition by pressing the appropriate warning light capsule.

NOTES

- Several of the following procedures require pulling and resetting circuit breakers. The circuit breakers referenced in these procedures are marked in white for ease of identification.
- When locating circuit breakers at night, it is recommended that the glare shield lights be set to BRIGHT.

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ENGINE SYSTEM MALFUNCTIONS

Engine system malfunctions generally are of three types: (1) partial or total failure of the engine to provide power as demanded, (2) failure of an engine control system, (3) failure of engine auxiliary systems, (lubrication system, EAPS system, etc.).

In case of any malfunction, the first duty of the crew is to make sure of continued safe flight until the malfunction can be diagnosed. Particular care must be taken to confirm which engine has the malfunction.

An engine failure will result in the loss of the AC generator.

SINGLE-ENGINE POWER FAILURE

Symptoms:

Large torque split

Confirming:

N_r remains the same or droops
N_1 decreases below 48%
T_5 decreasing
NO. 1 or NO. 2 ENG OUT warning light and alternating tone

SINGLE-ENGINE POWER FAILURE WITH EAPS OPERATING

There is no interlock to turn off the EAPS of the on-line engine if the other engine fails. The pilot may elect to turn off EAPS after an engine failure prior to executing a single-engine landing unless icing conditions have been encountered.

SINGLE-ENGINE.FAILURE - HOVER (5 TO 10 FEET)

1. Maintain collective pitch setting or lower collective slightly if required to establish descent.
2. Increase collective to cushion landing as touchdown becomes imminent.
3. After touchdown, neutralize cyclic and simultaneously reduce collective to minimum.

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SINGLE-ENGINE FAILURE ON TAKEOFF - CATEGORY "A"

Engine failure during Category "A" takeoff can be detected by the occurrence of an unusual torque split and possible rotor droop, as well as illumination of the engine out light and sounding of the engine out tone. The procedure to be followed depends upon the point in the takeoff sequence where the failure occurs. If an engine fails before or at the CDP, the takeoff is rejected, while the takeoff is continued if the failure occurs after the CDP.

Prior to Reaching 30 KIAS:

1. Initiate a reject by rotating nose-up to 5° - 10° pitch attitude.
2. Apply collective to cushion ground contact.
3. After touchdown, neutralize cyclic and reduce collective to minimum.
4. Apply wheel brakes as necessary to stop within the available reject distance.

After Passing 30 KIAS Up To and Including the CDP (V_1 at 5 - 10 Foot Wheel Height):

1. Initiate a reject by rotating nose-up to 10° pitch attitude, and when sufficient ground clearance is gained, continue rotation up to 25° pitch attitude.
2. Positively reduce collective to maintain rotor RPM in the resultant level deceleration.
3. With adequate reduction in apparent ground speed, reduce flare to 5° - 10° nose-up pitch attitude.
4. Apply collective to cushion ground contact.
5. After touchdown, neutralize cyclic and reduce collective to minimum.
6. Apply wheel brakes as necessary to stop within the available reject distance.

After CDP (V_1 at 5 - 10 Foot Wheel Height):

1. Lower collective to maintain rotor RPM at or above 100%.
2. Gently adjust pitch attitude to accelerate to and establish a climb at V2 airspeed.
3. Retract landing gear with positive rate of climb established.

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4. With obstacles cleared, continue climb and gradually accelerate to V_{BROC} (best of rate of climb speed).
5. Reduce collective slowly to return rotor RPM to 107%, and maintain engine and transmission limits as applicable.
6. Land as soon as practicable.

SINGLE-ENGINE FAILURE ON TAKEOFF - CATEGORY "B"

If gross weight and flight path permit, takeoff and climbout may be continued. For a rejected takeoff, do this:

1. Collective pitch - Reduce as necessary to maintain rotor rpm if altitude permits.
2. Make a partial flare to reduce ground speed. Limit flare to 10° when close to the ground.
3. Collective - Apply to cushion ground contact.
4. After touchdown, neutralize cyclic and simultaneously reduce collective to minimum.
5. Apply wheel brakes to minimize ground roll.

SINGLE-ENGINE FAILURE DURING CRUISE

1. Adjust collective as necessary to maintain desired rotor rpm and torque.
2. Establish an appropriate single-engine airspeed.
3. Readjust collective as required to minimize altitude loss by applying up to maximum OEI power consistent with engine and rotor limits.
4. Consider air restart. Follow procedures in paragraph titled Engine Restart in Flight. Restart should be attempted only if the cause of the initial failure has been determined and corrected.
5. If restart fails or no attempt to restart is made because of conditions causing engine failure, follow procedure in paragraph titled Engine Shutdown in Flight.

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Engine Restart in Flight

An engine restart may be attempted after a flameout subject to the pilot's evaluation of the cause of the flameout. The following procedure assumes that the affected engine was operating with its fuel lever in Direct and cause of flameout was fuel source related. If a flameout occurs with the fuel lever in XFEED, attempt restart with the fuel lever in DIRECT (no prime will be available).

NOTE

Increased generator load during an air restart could cause a significant T_5 increase on the operating engine. The power setting on the operating engine should be adjusted to allow this temperature increase without exceeding 844°C T_5 and causing rotor RPM to droop.

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1. T-handle - Forward.
2. Engine lever - IDLE, after allowing coastdown to below 5.0% N_1 at OFF.
3. Fuel lever (on affected engine) - XFEED.
4. Engine prime switch (on affected engine) - ON.
5. Master start switch - ON.
6. Engine - Start (as in normal procedure).
7. Engine running at idle - Engine lever forward to FLY.
8. Engine prime switch - OFF.
9. Master start switch - OFF.

Fuel Crossfeed of the Remaining Engine After Engine Failure

CAUTIONS

- Fuel crossfeed after an engine failure should only be considered if necessary to permit flight to a suitable landing area. There is some possibility that a fuel system malfunction was the cause of the first engine failure, and that crossfeeding might expose the remaining engine to a similar problem.
- The following procedure will minimize the chance of interrupting fuel flow to the remaining engine. If unsteady operation of the operating engine is noted at any time during the procedure, rapidly discontinue attempts to crossfeed.

1. Failed engine - Shut down for at least 5 minutes to minimize possible ignition source for fuel leaks.
2. Failed engine fuel lever - PRIME.
3. Failed engine prime switch - PRIME for at least 1 minute, (monitor operating engine fuel pressure, fuel flow, N_1, and T_5. If signs of unsteady operation are noted, quickly move the prime switch to OFF and discontinue attempts to crossfeed.).

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4. Failed engine fuel lever - OFF.

5. Failed engine prime switch - OFF.

6. Operating engine fuel lever - XFEED. Monitor operating engine fuel pressure, fuel flow, N_1 and T_5. If signs of unsteady operation are noted, quickly switch fuel lever back to DIRECT and discontinue attempts to crossfeed.

Engine Shutdown in Flight

1. Engine lever - OFF.

2. Fuel lever - OFF.

SINGLE-ENGINE FAILURE DURING APPROACH -CATEGORY "A"

The Category "A" Landing Decision Point (LDP) is 250 feet above the touchdown elevation at 40 KIAS and a descent rate of not more than 600 FPM. If an engine failure occurs before or at the LDP, the pilot may elect to perform a balked landing or continue the approach to complete a single engine landing. The approach must be continued to touchdown if the failure occurs beyond the LDP.

Prior to or at LDP - Balked Landing (Go Around)

1. Apply collective to utilize available single-engine power and maintain rotor RPM at or above 100% N_r.

2. Adjust pitch attitude to achieve a gradual acceleration to 60 KIAS.

3. Retract landing gear with a positive rate-of-climb is established.

4. When clear of obstacles, continue climb and gradually accelerate to Vbroc airspeed.

5. Reduce collective slowly to return rotor RPM to 107% N_r and observe engine and transmission limits.

After LDP - See SINGLE-ENGNE LANDING - CATEGORY "A" OR "B" below.

SINGLE-ENGINE LANDING - CATEGORY "A" or "B"

1. Establish normal approach so as to arrive at a point 250 feet above the touchdown elevation at 40 KIAS (Category "A") or 45 KIAS (Category "B") and a descent rate of no more than 600 fpm.

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2. Initiate a deceleration passing 50 feet at 40 KIAS (Category "A") or 45 KIAS (Category "B").

3. Continue deceleration to running touchdown at or above translational lift. Use collective pitch to cushion touchdown.

4. After touchdown, neutralize cyclic and simultaneously reduce collective to minimum.

5. Apply brakes as necessary to stop within heliport confines.

SINGLE-ENGINE FAILURE DURING APPROACH - ALTERNATE CATEGORY "A" PROFILE

The Alternate Category "A" Landing Decision Point (LDP) is 75 feet above the touchdown elevation at 60 KIAS and a descent rate of not more than 300 FPM. If an engine failure occurs before or at the LDP, the pilot may elect to perform a balked landing or continue the approach to complete a single engine landing. The approach must be continued to touchdown if the failure occurs beyond the LDP.

Prior to or at LDP - Balked Landing (Go Around)

1. Apply collective to utilize available single-engine power and maintain rotor RPM at or above 100% N_r.

2. Maintain 60 KIAS.

3. Retract landing gear when a positive rate-of-climb is established.

4. When clear of obstacles, continue climb and gradually accelerate to Vbroc airspeed.

5. Reduce collective slowly to return rotor RPM to 107% N_r and observe engine and transmission limits.

After LDP - See SINGLE-ENGINE LANDING - ALTERNATE CATEGORY "A" PROFILE below.

SINGLE-ENGINE LANDING - ALTERNATE CATEGORY "A" PROFILE

1. Establish an approach to arrive at the LDP, a point 75 feet above the touchdown elevation, at 60 KIAS and a descent rate of no more than 300 FPM.

2. Upon passing the LDP, initiate a smooth deceleration while reducing collective to continue the descent through 50 feet with up to 20 to 25° flare attitude.

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3. Apply collective to reduce descent rate and decrease flare attitude to pass 20 feet at approximately 30 KIAS.
4. Continue deceleration to running touchdown at or above translational lift. Use collective pitch to cushion touchdown.
5. After touchdown, neutralize cyclic while simultaneously reducing collective to minimum.
6. Apply brakes as necessary to stop within heliport confines.

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DUAL-ENGINE FAILURE

WARNING

Rotor RPM will reduce to an unrecoverable state with resultant loss of control unless autorotation is entered immediately.

GENERAL

Dual-engine failure requires immediate action for a power-off landing. The varied conditions under which engine failure may occur prevent dictating a standard procedure. However, a thorough knowledge of the helicopter's characteristics and emergency procedures will enable a pilot to respond correctly to the emergency. The altitude and airspeed at which engine failure occurs will dictate the action to be taken to effect a safe landing. Should dual-engine failure occur, a safe autorotative landing can usually be made. Upon dual-engine failure, the helicopter will swing to the left, due to the reduction in torque as engine power decreases. An immediate collective pitch reduction will be required to maintain N_r within safe limits. Minimum collective (full down) should be selected until N_r builds to within normal operation range. Apply tail rotor pedal as necessary to maintain heading.

DUAL-ENGINE FAILURE WHILE HOVERING OR ON TAKEOFF AT 10 FEET OR BELOW

Settling will be very rapid; however, the landing can be cushioned by increasing collective pitch as the helicopter settles to the ground. Decreasing collective could cause an excessive sink rate. The helicopter should be held in a level attitude until contact is made with the ground, then the cyclic control stick should be moved slightly forward of neutral. After ground contact is made, reduce collective pitch to minimum and apply wheel brakes.

WARNING

Excessive displacement of the cyclic control stick aft of neutral will decrease the main rotor blade-tail cone clearance and increase the possibility of striking the tail cone with a main rotor blade.

DUAL-ENGINE FAILURE DURING TAKEOFF AND INITIAL CLIMB

After climb has been started, do this:

1. Immediately decrease collective pitch to minimum and establish a glide at 75 KIAS, when altitude permits. Regulate collective pitch to maintain rotor speed within limits. 100% to 105% N_r should be the optimum for glide to touchdown.

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2. Cabin occupants - Alerted.
3. Landing gear - DOWN. UP over water if flotation system is not installed.
4. Make an autorotative landing following procedure in paragraph titled AUTO-ROTATIVE LANDINGS in this section.

DUAL-ENGINE FAILURE DURING CRUISE

A safe autorotative landing can be made if the helicopter is being flown at a safe altitude-airspeed combination and there is enough terrain clearance to reach a suitable landing area. When altitude and conditions permit, an air restart should be attempted. If neither engine will start, a normal power-off landing should be made as described in the paragraph titled AUTOROTATIVE LANDINGS in this section.

1. Reduce collective pitch immediately and establish an autorotative glide at 75 KIAS. Regulate collective pitch to keep rotor speed within limits. A comfortable rate of descent will be reached if N_r is adjusted to 100% to 105%.
2. Landing gear - DOWN. UP over water if flotation system is not installed.
3. Fuel and engine levers - OFF.
4. Cabin occupants - Alerted.
5. If time and attitude permit, try to restart one or both engines.

NOTE

It will be left to the pilot's judgement, whether to attempt a start or to make an autorotative landing. If an attempt to start is to be made, refer to the paragraph titled Engine Restart in Flight.

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AUTOROTATIVE LANDINGS

NOTE

Autorotative landings for training purposes are not recommended.

Power-off autorotative landing may be safely made except when operating at low altitude and at a low airspeed. These procedures apply after autorotative entry has
been completed:

1. Establish a glide at a minimum 75 KIAS.
2. Landing gear - DOWN. UP over water if flotation system is not installed.
3. At about 50 to 75 feet, execute a flare to about 20° nose up by moving cyclic stick back with no change in collective pitch. When performed properly, the flare will check the rate of descent and reduce airspeed while causing an increase in rotor RPM.
4. As the flare loses effectiveness and the helicopter begins to settle, smoothly reduce the flare attitude to about 10° nose up.
5. Just prior to ground contact, increase collective to cushion the landing.
6. Maximum desired ground contact speed is 40 knots. Desired nose attitude is + 10° or less.
7. Immediately after ground contact, decrease collective pitch smoothly and slowly and neutralize cyclic.
8. Apply wheel brakes.

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ENGINE CONTROL MALFUNCTIONS

MANUAL REVERSION ON ONE ENGINE

Symptom:

Illumination of the MANUAL REVERSION light for the affected engine.

Confirming:

Torque. Ng and T_5 remain constant, and are not changed by collective movement. Channel active lights off for both channels.

Action:

NOTE

- A secondary latch is provided within the engine lever trigger assembly to lock out the FLY stop for operation in manual reversion. When it is latched, unobstructed motion from IDLE to fully forward is available for power adjustment: To preclude inadvertent shutdown, the latch will disengage if a lever position below IDLE is attempted.
- The manual reversion lights include press to dim for night time operation.

During takeoff phase following initial power application - Continue takeoff and climb. As power is reduced to alter climb or establish the cruise altitude, confirm that engine in manual does not respond to collective inputs. Adjust the engine lever as required to maintain 107% N_r and ensure both engines remain within limits. Engage the trigger's secondary latch. Land as soon as practicable.

Coordinate use of the engine lever with anticipated collective input to provide normal rotor operations at about 107% N_r. Pilot workload is reduced while rotor governing is maintained by the normal engine within its authority range from very low to maximum power. Operations with large torque splits are acceptable.

During cruise - Adjust the engine lever as required to maintain 107% N_r and ensure both engines remain within limits. Engage the secondary latch. Land as soon as practicable.

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During approach with descent profile established - Engage the secondary latch. Anticipate the power required to terminate the approach, and prior to the final collective input, increase the reverted engine lever to assume a greater share of total torque. Acceptable governing within engine limits will continue to be maintained as the collective is increased, although subsequent engine lever adjustment may be necessary if the approach is terminated to a hover at heavy gross weights. After landing reduce engine lever prior to lowering collective.

Tips and recommendations - Coordinate use of the reverted engine lever with anticipated large changes in power level requirements. For example, when transiting from cruise to descent, a reduction of the reverted engine lever in proportion and prior to the subsequent collective reduction should result in a trimmed descent with satisfactory governing at 107% N_r and acceptable load sharing. Engine lever adjustments with small power changes are unnecessary, and operation with torque splits is acceptable. As a guideline, if the power contributed by the engine not in manual is maintained between a minimum of 10% torque and maximum power, its EEC will provide total rotor governing at 107% N_r. When these extremes are reached, a compensating engine lever adjustment will be necessary before, making a further collective input. Avoid rapid collective inputs.

NOTE

Some rare EEC malfunctions may leave both EECs on one engine inoperative without illuminating that engine's MANUAL REVERSION light. The pilot can recognize that the engine is in manual by observing that the torque and other engine parameters remain nearly constant, and do not follow the movement of the collective.

NOTE

Although the normal engine will continue to govern the rotor within its minimum to maximum power range, excessive mismanagement of the reverted engine may lead to rotor overspeed or excessive droop.

MANUAL REVERSION ON BOTH ENGINES

Symptom:

Illumination of both MANUAL REVERSION lights.

Confirming:

Torque, Ng, and T_5 remain constant on both engines and are not changed by collective movement. All channel active lights are off.

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Action:

Coordinate movement of collective with adjustment of both engine levers to maintain N_r between 100% and 108%. Engage the triggers' secondary latches so that unobstructed movement of the engine levers is possible from IDLE to full forward. Land as soon as practicable. A run-on landing will lessen pilot workload.

WARNING

When both engines are in manual reversion all collective movements must be accompanied by an adjustment of both engine levers. Failure to coordinate collective and engine lever movement may result in rotor overspeed due to excessive power, or rotor droop due to insufficient power.

ENGINE POWER OSCILLATIONS AND EXCURSIONS

Symptoms:

Both engines' parameters fluctuate sharply causing torque splits and N_r excursions from the 107% reference.

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Action:

1. Adjust the collective to prevent rotor overspeeds or excessive droops.
2. If in a hover, land and shut down both engines.
3. In forward flight, transition to a flight regime permitting single-engine operation.
4. Identify the malfunctioning engine by its uncommanded power changes. Make slow collective inputs while observing the dual torque indicator. Torque of the normal engine will follow the collective input.
5. Retard the malfunctioning engine's engine lever to IDLE.
6. Verify that the remaining engine is functioning normally.
7. If fluctuations have not been corrected, return engine lever to FLY and retard other engine lever to IDLE.
8. Shutdown the malfunctioning engine when correctly identified.
9. Land as soon as practicable using SINGLE-ENGINE LANDING procedures.

An engine control malfunction that causes excursions of all engine parameters of one engine will require the pilot, as a first action, to adjust the collective to prevent N_r from overspeeding or drooping excessively. Although only one engine is malfunctioning, both engines may respond. The pilot can identify the malfunctioning engine by observing the response of both engines' torque to collective motion. While the good engine's torque is load sharing in response to the malfunctioning engine's torque changes, the good engine will exhibit a direct response to collective motion. Conversely, the malfunctioning engine's torque increases and decreases randomly, independent of collective motion.

Excursions to the high side may result in N_2 overspeed trips at 115.5% if insufficient collective input is used. Additionally, an N1 overspeed trip may occur as result of high side excursions whether or not a collective application is used.

Some isolated engine control malfunctions may not be detectable by the EEC, and hence no change in hard/soft status or active lights will occur although power oscillations and excursions as described above may result.

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ENGINE HIGH SPEED SHAFT FAILURE

Symptom:

Large torque split, possibly accompanied by a loud bang, and may be accompanied initially by an intermittent display of the ENG OUT warning light and alternating tone.

Confirming:

Engine with the failed shaft indicates zero torque.

N_2 of the engine with suspected failed shaft indicates slightly higher than N_r and N_2 of the other engine and may be unsteady.

N_1, T_5, and fuel flow indications appropriate for low power condition.

Transitory manual reversion light and simultaneous absence of the channel active lights accompanying initial overspeed trips.

Action:

If in hover, land and shut down the affected engine.

If in flight, transition to single-engine flight.

Sharply retard affected engine lever to IDLE.

Shutdown the affected engine and land as soon as possible.

DEGRADATION IN LOAD SHARING OR N2 GOVERNING

Symptom:

Transient or steady torque splits, degraded steady state rotor governing, or excessive N_2 droops and overshoots in response to a disturbance.

Confirming:

The manual reversion light illuminates when the soft fail status switch is positioned to the channel coinciding with an engine's channel active light.

Action:

Continue flight. If excessive droops or overshoots in N_2 governing are experienced, avoid large, rapid collective applications.

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Operation with one or multiple soft failures is confirmed when an engine's manual reversion light illuminates when the displayed active channel is interrogated by the soft fail status switch. Depending upon the specific soft failure experienced, engine response may continue to be normal or a degradation in load sharing or rotor governing may occur. After landing, check and record any maintenance codes.

NOTE

The following serves as a review of the EEC channel switching priority:

If the active channel develops one or multiple soft failures, a transfer to the inactive channel will automatically occur only if that channel is free of failures. No change in engine operating characteristics will result.

If the active channel develops a hard failure, a transfer to the inactive channel will automatically occur if that channel is free of hard failures. Hard failures in both channels will result in manual reversion.

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ENGINE AUXILIARY SYSTEMS FAILURE

ENGINE OIL PRESSURE MALFUNCTION

Symptoms:

#1 or #2 engine oil pressure indicates less than 70 psi at N_1 speed greater than 78%

Action:

If in hover, land and investigate.

If in flight, transition to single engine flight, retard the affected engine to IDLE, and retain in reserve if pressure remains above 40 psi.

If pressure indicates less than 40 psi, shut down the affected engine and land as soon as practicable.

NOTE

The ENG OIL PRESS warning light will be illuminated at pressures below 48 psi.

ENGINE OIL TEMPERATURE HIGH

Symptom:

Engine oil temperature rises above 127°C.

Action:

If in hover, land and shut down the affected engine. If in forward flight retard engine lever to IDLE and observe temperature. If temperature stabilizes at 127°C or decreases, return lever to FLY for landing or as needed. If temperature continues to rise above 127°C, transition to single-engine flight and shut down the affected engine.

FUEL PRESSURE WARNING LIGHT ON

Symptom:

#1 ENG or #2 ENG FUEL PRESS warning light on.

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Action:

If engine parameters indicate a possible engine problem, adjust flight conditions to minimize impact of possible engine failure. Consider use of crossfeed if appropriate. Land as soon as practicable. Note discrepancy. Correct prior to next flight.

Low fuel pressure fluctuation might be caused by air in the engine fuel line, which could be caused by a leak in a fuel line or impending fuel starvation. Such causes will usually result in unsteady engine operation, including fluctuation in output torque, N_1, T_5, and possibly unsteady rumbling noises.

ENGINE CHIP DETECTOR CAUTION LIGHT ON

Symptom:

1 ENG CHIP or #2 ENG CHIP caution light on.

Action:

1. Pull and reset CHIP DET circuit breaker of affected engine.
2. If light remains off, continue flight.
3. If light comes back on, land as soon as practicable. In cruise flight, reduce airspeed to enable single-engine cruise and retard engine lever to IDLE. Readvance engine lever to FLY prior to landing if desired.

NOTE

After landing and prior to further flight, check and comply with the appropriate procedures in the maintenance manual.

4. If light is accompanied by abnormal noises, oil pressure, or temperature and single-engine flight can be maintained, shut down the affected engine and land as soon as practicable. If single-engine flight is not possible, retard the engine lever for minimum power in cruise and advance to FLY upon landing. Land as soon as possible.

The engine is equipped with Fuzz Burn type chip detectors.

EAPS FAIL CAUTION LIGHT ON

The EAPS FAIL caution light goes on in the following case:

1. EAPS switch ON, but EAPS doors do not reach the on position within 15 seconds.

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CAUTION

If EAPS are selected ON to provide engine anti-ice protect-tion and the EAPS FAIL caution light illuminates, the pilot should depart the flight conditions conducive to engine icing immediately.

NOTE

Once EAPS switch is on and the green EAPS ON advisory light comes on (doors full open), it remains on until the EAPS actuator moves to the OFF position (doors full closed). Partial movement of EAPS doors or actuator to the OFF position has no effect on the EAPS FAIL caution light.

FUEL FLOWMETER BEYOND LIMITS

If a fuel flowmeter indicates erratically or goes beyond limits, crosscheck the other engine indicators (N_1, T_5, torque, fuel pressure caution light). If all other indications are normal, continue the fight and monitor the other engine instruments closely.

FUEL FLOWMETER READINGS SPLIT

A fuel leak in the combustor area may cause a difference in the fuel flow to power output ratio between engines.

Symptom: N_1, T_5, torque markedly different from other engine.

Confirming: Fuel flow does not correspond to N_1, T_5 and torque (too high). Fuel flow in the same region as the other engine.

Action:

If in hover and landing is possible:

1. LAND AND SHUT DOWN AFFECTED ENGINE IMMEDIATELY.

In forward flight:

1. Set OEI power.
2. Affected engine lever – IDLE.

If fuel flow of affected engine is still higher than normal (Normal fuel flow at flight idle is 200-230lbs/ hour) or N_1, T_5 and or torque was decreased before affected engine was set to idle:

3. Continue with ENGINE SHUT DOWN IN FLIGHT (5a).

If fuel leak is suspected:

4. LAND AS SOON AS POSSIBLE.

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MAIN GEAR BOX SYSTEM FAILURES

The most common main gear box system malfunctions are of three general types: (1) lubrication system failure, (2) transmission component failure, and (3) transmission accessory failure. The pilot has a cockpit gage indicating oil temperature and pressure and three caution lights monitoring low oil pressure, high oil temperature and chip detected, which inform him of the operating condition of the system. A thorough knowledge of the main transmission and accessory systems will enable the pilot to evaluate the indications available to him, diagnose problems, and act accordingly. In general, a single failure indication dictates that the helicopter be landed as soon as practicable. If multiple failure indications, including abnormal noise and/or vibration, are noted, land immediately.

MAIN GEAR BOX OIL SYSTEM FAILURES

Main Gear Box Oil Pump Failure

Symptom:

Oil pressure falls to 40 to 45 psi and remains steady.

Action:

Land as soon as practicable. Monitor main transmission gages and caution light for further failure indications.

NOTE

The remaining pump will normally provide adequate lubrication for the main gear box.

Low Oil Pressure

Symptom:

MAIN XMSN OIL PRESS warning light on.

Confirming:

Main transmission oil pressure less than 20 psi.

Action:

Over Land

Land as soon as possible.

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Descend to a minimum safe altitude and reduce airspeed to 80 knots if required to reach a landing site.

If loud or unusual noises or high vibration levels occur, land immediately.

Over Water

Descend to a minimum safe altitude, proceed to the nearest landing site, and reduce airspeed to 80 knots. Land as soon as possible.

If loud or unusual noises or high vibration levels occur, land immediately.

Most likely cause of low oil pressure is an excessive loss of transmission oil. Other indications such as high temperature or chips detected may or may not occur. Do not attempt further flight until cause of low pressure indications has been corrected.

High Oil Temperature

Symptom:

MAIN XMSN OIL HOT warning light on.

Confirming:

Main transmission oil temperature high.

Action:

Reduce power, and land as soon as practicable. If oil temperature rises above 135°C or if oil pressure drops, land as soon as possible.

NOTE

If the indicated oil temperature remains above 120°C, a transmission oil cooler malfunction is indicated. Transmission oil temperature should be controlled by avoiding high power settings and/or prolonged hovering.

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Main Gear Box Chip Detector

The main transmission is equipped with fuzz burn type chip detectors.

Symptom:

MAIN XMSN CHIP caution light on.

Action:

Pull and reset MGB CHIP DET circuit breaker.

If light remains off, continue flight.

If light comes back on, land as soon as practicable.

In case of secondary failure indications such as an oil pressure loss or temperature rise, land as soon as possible. Operate at best rate-or-climb speed (minimum power required) and at a safe minimum altitude.

If loud noises or high vibration levels occur, land immediately.

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INTERMEDIATE OR TAIL GEAR BOX CHIP/HIGH OIL TEMPERATURE DETECTED

Symptom:

INT GB CHIP/HOT or TAIL GB CHIP/HOT caution light on.

Action:

Pull and reset the DET I/TGB circuit breaker.

If light remains off, continue flight.

If light comes back on, land as soon as possible.

If loud noises, smoke or high vibration levels occur, land immediately. Anticipate tail rotor loss of thrust. (See TAIL ROTOR MALFUNCTIONS.)

Intermediate and tail gear boxes have combination high-temperature and fuzz burn chip detectors.

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ROTOR BRAKE CAUTION LIQHT ON - ROTOR TURNING

Symptom:

ROTOR BRAKE caution light on.

Action:

During start or shutdown on ground:

Shut down and investigate.

During Flight:

Rotor brake handle - Check in detent.

If ROTOR BRAKE caution light remains on, investigate for rotor brake fire (smoke, unusual noises or vibrations, etc.). If rotor brake fire is suspected, land immediately.

The ROTOR BRAKE caution light indicates that pressure has been applied to the rotor brake system. If this pressure results in a rotor brake puck dragging against brake disk, an overheated brake disk and possible rotor brake fire might occur.

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FLIGHT CONTROL HYDRAULIC SERVO SYSTEM FAILURE

Complete control of the helicopter can be maintained through either stage of the flight control system; however, prolonged operation with only one servo system operating is not recommended. This is an emergency condition, since control is not possible with both servo systems inoperative. Flight conditions and route should be chosen which will allow a safe immediate landing.

PUMP FAILURE OR LOSS OF PRESSURE IN BASIC HYDRAULIC SYSTEM

Symptom:

#1 or #2 SERVO SYSTEM caution light on (below 1600 psi).

Confirming:

Decrease in corresponding gage pressure.

Action:

1. Servo switch - Failed system OFF if no usable pressure remains or if erratic pressure is observed.
2. Reduce airspeed to 125 KIAS or lower.
3. Land as soon as possible.
4. If controls bind or are restricted, land immediately.

NOTE

If the second stage has malfunctioned and flight range considerations permit, immediately lower the landing gear. If gage pressure has decreased to below about 2000 psi, it may be necessary to use the emergency landing gear system to lower the landing gear.

SERVO UNIT JAM OR MALFUNCTIONING SERVO SHUTOFF VALVE

For helicopters equipped with a tail rotor servo shutoff valve PN 76076-65003-011, refer to Supplement No. 4 for proper procedures.

Symptom:

#1 or #2 SERVO SYSTEM caution light on and corresponding hydraulic gage pressure normal.

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Confirming:

Both system gage pressures - Normal.

Both flight control servo switches - ON.

Action:

1. Reduce airspeed to 125 KIAS or lower.
2. If binding or restrictions in the controls are felt, shut off failed system and land as soon as possible.
3. If binding or restriction in the controls does not disappear after failed system is shut off, land immediately.
4. If no binding or restriction in controls is felt, recycle appropriate SVO JAM circuit breaker on DC ESNTL bus panel. If appropriate SERVO SYSTEM light goes off, a momentary jam is indicated. Continue for a landing as soon as practicable.
5. If SERVO SYSTEM light remains on after step 4., either a jam or malfunctioning servo shutoff valve is indicated. Pull appropriate SVO SHUTOFF circuit breaker. This removes power to SERVO SHUTOFF VALVE and, if valve or shutoff control switch has malfunctioned, hydraulic system will be restored.
6. Cycle SVO JAM circuit breaker to reset holding circuit on warning light.
7. If SERVO SYSTEM light remains on after step 6. is completed, a continuing servo jam condition is indicated; reset SVO SHUTOFF circuit breaker, and land as soon as possible.
8. If light goes off after step 6., a malfunctioning servo shutoff valve has been isolated. Land as soon as practicable.

NOTE

When a SERVO SYSTEM caution light goes on in flight, a holding relay will keep the light on even if the cause was momentary. Since the holding relay operates through the landing gear interlock that functions only when the helicopter is airborne, the caution light will go off upon landing if caused by a momentary jam condition. The caution light may be cleared in flight by recycling the appropriate SVO JAM circuit breaker on the DC ESNTL bus panel.

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TEMPORARY REVISION NO. 6

FILING INSTRUCTIONS: Insert this Temporary Revision facing page 3 -31/3-32, dated September 3, 1992.

SUBJECT: Flight Control. This temporary revision adds the PEDAL DAMPER/YAW TRIM ACTUATOR FAILURE emergency procedure.

MANUAL CHANGES: Add the following emergency procedure prior to the FLIGHT CONTROL DAMPER JAM emergency procedure:

PEDAL DAMPER/YAW TRIM ACTUATOR FAILURE

Symptom: Uncommanded pedal movement with resultant aircraft yaw.

Action:

In flight:

1. Turn yaw trim switch off.

If uncommanded pedal movement is still present:

2. Apply increased force to the yaw pedals to actuate a bypass relief valve device internal to the Pedal Damper/Yaw Trim Actuator.

NOTE

- The Pedal Damper/Yaw Trim Actuator is designed with an internal bypass relief feature that enables a pilot to override uncommanded pedal movement in the event of an internal fault. The bypass relief valves are designed to activate when approximately 55 to 60 pounds of force are applied to the yaw pedals. Pedal damping remains functional when the bypass relief valves are actuated.

- Uncommanded movement may reoccur requiring the pedal force to be reapplied for the remainder of the flight until the aircraft is shut down.

3. Land as soon as practicable.

On ground:

1. Turn yaw trim switch off.

2. Shut down the aircraft and correct prior to flight.

TEMPORARY REVISION NO. 6

FAA APPROVED FEBRUARY 19, 2015

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FLIGHT CONTROL DAMPER JAM

Symptom:

Cyclic or collective control of pitch, roll, or collective will not move with normal hand-control pressure.

Confirming:

Typically, only one axis is involved, and remaining axes are normal.

Action:

If on the ground, shutdown and investigate.

In flight, check whether jam can be alleviated by securing the affected trim system and that cockpit controls travel is not impeded by a foreign object.

A shear device within the jammed flight control damper will be relieved by applying increased hand-control pressure. This action should be taken against trim to possibly reduce overshoot. Typical amount of force required is:

Collective	55 - 62 pounds
Pitch 1	17 - 20 pounds
Roll	35 - 40 pounds

PITCH BIAS ACTUATOR RUNAWAY

Actuator runaway is characterized by a slow repositioning of the actuator to its stops accompanied by a corresponding change in pitch attitude. Confirmation is indicated by observing the indicator pointers on the AFCS channel monitor panel with the channel monitor switch in PBA. At above 45 knots, the upper pointer will be at the full left or right extremes, indicating that the actuator has moved to its extended or retracted stop. Below 45 knots the system is not operational and the pointers should be full left. Recovery is made by repositioning the cyclic stick. Electrical power should be removed by pulling the BIAS ACTR circuit breaker.

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AFCS (PHASE II) FAILURE

In IMC, if any AFCS malfunction results in less than one pitch and one roll channel remaining functional, maintain airspeed below 120 KIAS. Attempt to transition to VMC. If less than one channel of yaw AFCS remains functional, reduce airspeed as necessary.

Failures that may occur include: single-channel hardover, single-channel actuator failure, or oscillatory malfunction.

SINGLE-ACTUATOR HARDOVER

A single-actuator hardover in the pitch and roll axis will result in an abrupt change in attitude. The attitude change in yaw is less abrupt and may not be detected as easily by the pilot. Recovery is made by repositioning the controls to the trim attitude. Turn the failed axis off on the appropriate AFCS control panel. The failed axis may be determined by turning the channel monitor switch on the AFCS indicator panel to the failed axis position (PITCH, ROLL, or YAW) and monitoring each actuator indicator for an off-center indication.

SINGLE-ACTUATOR FAILURE

Failure of an actuator to repositon, in any axis, is indicated by failure of the indicator needle of the corresponding channel to move. A single-actuator failure may be determined by turning the channel monitor switch to the PITCH, ROLL, or YAW positions and monitoring each actuator indicator for an off-center indication and lack of movement. The failed axis should be turned off on the appropriate AFCS control panel.

OSCILLATORY MALFUNCTIONS

Cyclic stick jitter or lower frequency lateral or longitudinal stick oscillation, whether or not accompanied by corresponding aircraft response, may indicate a malfunction of a vertical gyro, series actuator, or an electrical power problem. Disengage individual SAS channels until an improvement is realized, commencing with the axis displaying the most stick or aircraft motion. Subsequently, reengage those channels not contributing to the problem.

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TAIL ROTOR MALFUNCTIONS

Tail rotor malfunctions can be classified generally as drive system or control system failures. The helicopter's reactions and consequences of tail rotor failures will vary widely, depending upon the type of failure and the flight condition of the helicopter at the time of the failure. In general, however, control system failure is less critical than drive system failure.

TAIL ROTOR DRIVE SYSTEM FAILURE IN FORWARD FLIGHT

Since tail rotor drive system failures may produce a large response from the helicopter it is very important to recognize impending failure. The failure will usually be preceded by excessive noise or vibration in the tail section. When this occurs at high speed, immediately slow to 100 to 110 KIAS. Tail rotor drive system failure is always accompanied by a sharp yaw to the right. Reduce collective as necessary to control the yaw. Autorotate if necessary to control yawing rate. When a landing is to be made:

1. Autorotate.
2. Maintain an airspeed of 75 KIAS
3. Landing gear - DOWN. UP over water if flotation system is not installed.
4. Engines - Shutdown before touchdown.
5. Execute autorotative landing

NOTE

Ground contact speed must be held to a minimum to reduce the tendency to roll over due to yaw.

TAIL ROTOR DRIVE SYSTEM FAILURE IN A HOVER

1. Maintain helicopter attitude and attempt to achieve zero groundspeed and drift.
2. Engine levers - OFF at about 10 feet if possible.
3. Increase collective to cushion landing.

TAIL ROTOR CONTROL SYSTEM FAILURE

The most probable tail rotor control failures are jammed or binding controls, before or after the mixing unit. An interruption of the control system such as a severed control cable is also possible. The helicopter's reaction and the cues available to the pilot will vary widely with flight regime.

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Depending upon the origin of the interference, the pedals may not be movable (control bind or interference between the pedals and the collective to yaw control mixer), or movable through a restricted range (blocked pedal damper orifice). Full collective control is available under these conditions and normal collective to yaw inputs to tail rotor pitch will be available. Minimal yaw control loss will result from this condition.

Fixed Pitch Setting – General

A control bind or interference aft of the mixer output will result in a fixed tail rotor pitch situation. Full collective control is available when this occurs only if the pilot allows the pedals to move simultaneously with collective. No tail rotor pitch control is available, and adverse yaw proportional to the amount of collective change should be expected. Therefore, in this fixed tail rotor pitch condition, disregard pedal motion as an indicator of potential tail rotor control.

The technique for landing the helicopter will vary greatly, depending upon the resulting tail rotor thrust. A practice approach at altitude may be useful in predicting yaw response as a function of airspeed, but care should be taken to avoid slowing beyond safe limits. Yaw SAS will continue to provide short term damping reducing gust-related disturbances and both channels should be selected on, if available. In general, touchdown will be made with some yaw. Attempt to land with a minimum rate-of-descent. Touchdown should occur first on the most forward main landing gear. Counter roll tendency with cyclic while allowing nose of helicopter to pivot toward direction of landing. After touchdown, slowly lower collective to minimum and use differential braking to control helicopter on ground.

Fixed Pitch Setting - Reduced Power

The helicopter will swing right as power is applied, with the amount and rate of yaw proportional to the amount and rate of power applied. Decrease power as necessary to control the heading of the helicopter. Make a roll-on landing at the speed, up to 40 knots, which results in minimum yaw on touchdown.

Fixed Pitch at High Power Settings

The helicopter will swing left as collective pitch is reduced, at a rate and amount proportional to the rate and amount of collective reduction. Make an approach and landing, accepting some left yaw on approach. Touch down at a speed slow enough to permit an increase of collective at touchdown to minimize yaw. Consideration might be given to selecting a runway with a right crosswind which will reduce some of the adverse yaw on touchdown.

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Fixed Pitch Setting at Cruise Power

The helicopter will swing left or right as power is reduced or added, although in general the reaction should be milder than in the previous cases described. Plan approach and landing to touch down at the airspeed below 50 knots that corresponds to the cruise power setting.

Tail Rotor Cable Failure - Centering Spring Active

Normally passive, the centering spring(s) will become active upon the failure of the respective control cable(s). Upon recognizing a tail rotor cable failure, proceed to a landing area offering at least 2,000 feet of surface. Crosswind landings with winds greater than 10 knots are not recommended. Yaw SAS continues to provide short term damping that reduces gust related disturbances and both channels should be selected on.

If insufficient yaw control remains to enable trimmed flight, accept the sideslip and fly the helicopter along a desired track using lateral cyclic. A single cable failure will affect tail rotor control from the centering spring position (-2°) in failed direction only, leaving full control in the opposite direction by means of the remaining cable. Although the helicopter may continue to fly normally enroute and during descents, it is recommended that the following dual cable failure landing procedure be followed to complete a roll-on landing as soon as the helicopter heading is satisfactorily aligned with the runway.

Landing Procedure - Tail Rotor Control Cable Failure, Centering Spring Active

Initiate a long shallow approach, commencing descent at about 80 KIAS. Plan approach to be established low, on short final, with 60 KIAS. Expect heading to remain left of track but responsive to collective change, yawing further left with collective reduction and right with collective increase.

When over the landing surface, arrest remaining rate of descent with a gradual cyclic flare that results in a level flight deceleration to 40 KIAS. Use small collective inputs as necessary and continue a level flight deceleration at 10-feet wheel height or lower. Left yaw will decrease, as airspeed decreases and power required increases. Plan touchdown point to occur as helicopter heading becomes aligned with runway. Do not attempt to slow beyond where an acceptable yaw attitude is realized. After touchdown, gradually reduce collective while maintaining runway heading with differential braking.

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A balked landing is executed during the approach by adding sufficient collective to initiate a gradual acceleration while establishing a shallow climb. As airspeed increases, additional collective may be used if a steeper climb is desired. A balked landing should not be attempted once the nose swings right of center. Collective application beyond this point can result in a continuing flat rotation to the right.

CAUTION

Large control inputs at moderate to rapid rates are to be avoided. Collective applications, especially, should be slow and deliberate, not exceeding that required gradually transition from one flight regime to the next (approach to balked landing, descent to level off, and touchdown to rollout are examples).

TAIL ROTOR DAMAGE

Damage to the tail rotor can be noted by a sharp increase in tail rotor vibration. Slow to about 90 KIAS and land as soon as possible.

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FIRE

ENGINE COMPARTMENT FIRE

Symptom:

#1 or #2 FIRE warning light and respective T-handle light on with continuous tone heard.

Confirming:

Smoke, burning odor, or abnormal engine indications.

Action:

Reset tone by pressing a FIRE warning light.

With fire confirmed, establish safe single-engine flight while fully retarding illuminated T-handle of affected engine.

Place fire extinguisher switch to MAIN. An extinguishing of the appropriate FIRE warning light and T-handle light is supportive information that the fire has been arrested. If fire persists, place fire extinguisher switch to RESERVE.

If any sign of fire still persists, land immediately, otherwise land as soon as possible.

Shut down and leave helicopter immediately.

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INTERNAL ENGINE FIRE AFTER SHUTDOWN

Symptom:

Smoke, flames and/or a rapid increase in T_5.

Confirming:

No FIRE warning light or tone.

Action:

With engine lever OFF and trigger released, press and hold starter button to motor engine.

If smoke or flames persist, fully retard T-handle and continue to motor engine while fire guard discharges an extinguisher into engine air intake.

If fire still persists, shut off all switches and leave helicopter.

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NOTE

If fire warning lights should go on at any time during this procedure, follow procedure in the paragraph titled ENGINE COMPARTMENT FIRE.

CABIN OR COCKPIT FIRE

1. Begin a descent, if able.
2. Close all cabin ventilation.

CAUTION

If smoke accumulation becomes a problem, execute SMOKE AND FUME ELIMINATION procedure below and continue to fight fire.

3. Heater BLEED AIR switch or ECU CONT SEL switch - OFF.
4. Determine location and extent of fire. Use portable fire extinguisher.
5. Land as soon as possible and shut down.
6. If fire is not out, land immediately and leave helicopter.

BAGGAGE COMPARTMENT SMOKE DETECTED

Symptom:

SMOKE DET BAGGAGE warning light illuminated.

Confirming:

Unusual smell or smoke.

Action:

Land as soon as possible. Inspect baggage compartment and fight fire with fire extinguisher if required.

NOTE

The baggage compartment is sealed so that harmful quantities of smoke will not enter the cockpit and cabin. Large quantities of smoke in the baggage compartment will probably be smelled in the cockpit/cabin area.

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SMOKE AND FUME ELIMINATION

The following procedures will eliminate smoke and fumes from the cockpit and cabin.

1. Pilot and copilot overhead vents - OPEN.
2. Pilot's clear view window - OPEN.
3. Heater BLOWER switch or ECU CONT SEL switch - ON. Turn OFF if smoke or fumes are noted coming from cabin or cockpit air outlets.
4. Door vents and cabin exhaust ducts, if equipped - OPEN.

ELECTRICAL FIRE

Electrical fires are generally indicated by a smell of burning insulation and/or acrid smoke. As in any fire, the most important consideration is to maintain safe flight while dealing with the fire. When detecting an electrical fire, the pilot must shut down any unnecessary electrical equipment.

If in VMC, perform the following:

Action:

Turn off both dc generators, the ac generator, and the inverter(s), and pull dc bus-tie circuit breakers (2) on the dc primary circuit breaker panel. Choose the appropriate action.

- If fire persists, turn on all generators and inverter(s), and turn off battery(ies). The fire should go out. Land as soon as possible. The emergency blowdown system will be required for landing gear extension.

  or

- If fire goes out, restore the following equipment in sequence. Allow a brief interval between actions to assess response. Disengage the component if signs of fire return. Land as soon as possible.
- AC generator
- NO. 1 dc generator, and if fire remains out, reset the bus-tie circuit breakers (2).

If in IMC, transition immediately to VMC flight if possible. If it is not possible to achieve VMC flight and the source of the fire is not evident, see Figure 3-1.

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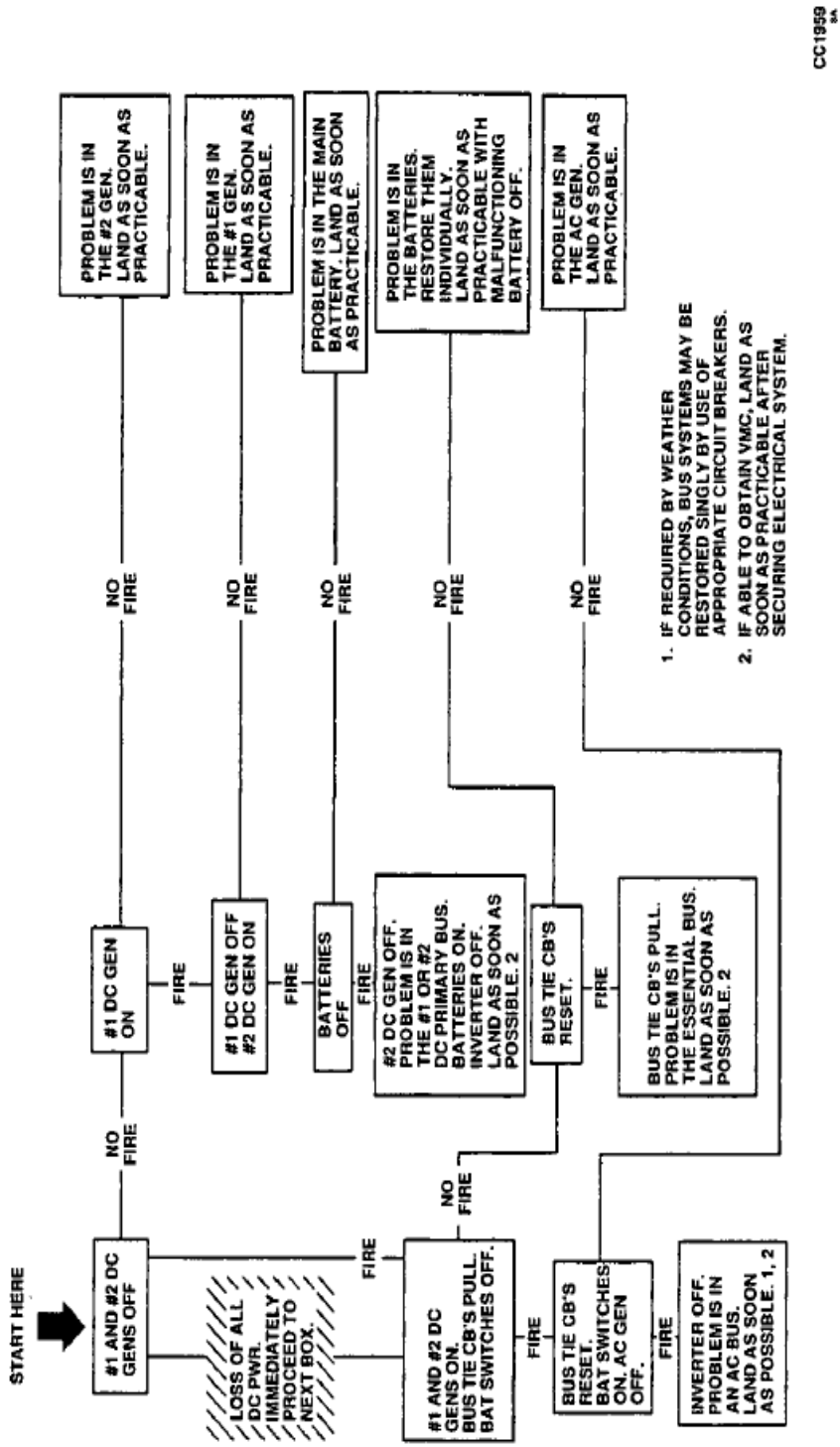

Figure 3-1. Electrical Fire Procedures (Sheet 1 of 2) (Dual Battery)

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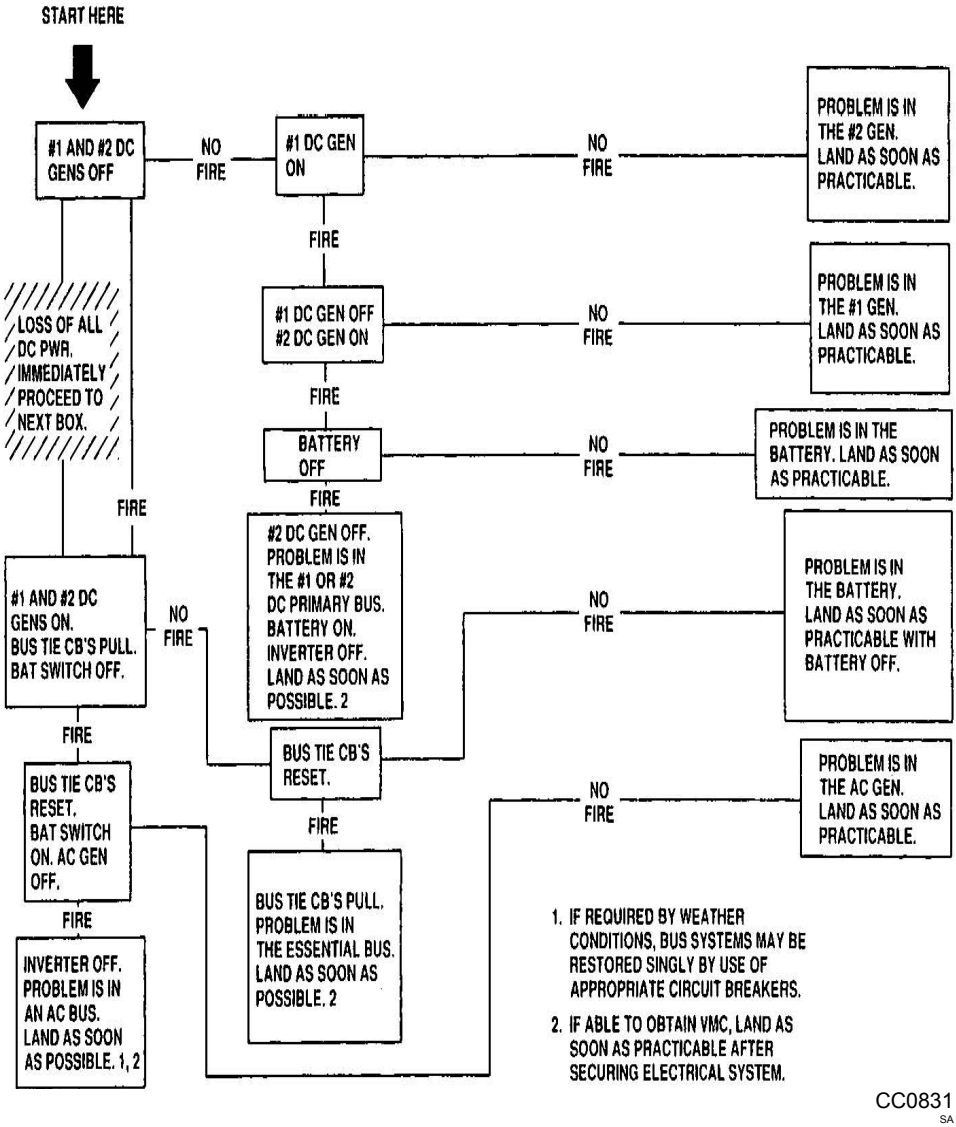

Figure 3-1. Electrical Fire Procedures (Sheet 1 of 2) (Single Battery)

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LANDING GEAR MALFUNCTIONS

Normal gear extension is indicated by the lighting of all three green gear down indicator lights and the red UNLKD gear warning light going off. Complete retraction will result in all four lights going off. Any other indications must be assumed unsafe and require the following emergency action.

NOTE

- Once a safe down indication is obtained, the landing gear should not be cycled. Land gently, have the gear pinned, and shut down. Taxi operations with unpinned gear should be avoided. Also avoid the use of the rotor brake with unpinned gear.
- If gear cannot be made to extend completely or cannot be pinned, a landing on a cradle or similar fixture should be made (mattresses, sandbags. etc.). Asymmetrical gear extension could increase roll tendency. Landing with all wheels up would probably not lead to roll over. Consider evacuation of passengers and unrequired crew while at a hover: avoid rapid deceleration of rotor.

LANDING GEAR WILL NOT EXTEND

NOTE

Absence of normal No. 2 hydraulic pressure or dc essential bus power requires the use of the emergency landing gear blowdown system.

Symptom:

On lowering the gear handle, none of the three green indicator lights illuminate within the normal extension period.

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Action:

Press to test the caution/advisory and check landing gear lights.

Slow to about 80 KIAS.

Check that LDG GR CONT and LDG GR POS LTS circuit breakers are set.

Attempt to cycle the gear handle several times and leave down.

On final approach before reaching a hover, check that the normal gear handle is selected DN, and then turn and pull the emergency landing gear T-handle to discharge the blowdown bottle.

A three green safe indication is to be expected following use of blowdown.

NOTE

Once blowdown bottle has ben discharged, do not attempt to raise landing gear. Maintenance is required prior to next flight.

Complete the landing by touching down lightly. Have a crewman pin the gear prior to taxi or shutdown.

UNSAFE INDICATION - GEAR EXTENSION

Symptom:

On lowering gear handle, one or more of the three green indicator lights do not light, and/or red UNLKD light remains on.

Action:

If a green light is off, press test button on caution/advisory panel. If light does not test, switch light bulb with one of other lights and check for a safe indication.

Slow to about 80 KIAS.

Check that LDG GR CONT circuit breaker is set.

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Cycle landing gear several times.

CAUTION

If any indications of a jammed gear are present, leave gear handle DN.

If landing gear still does not extend, hover and have someone outside examine landing gear. Consider having ground crew make a careful attempt to pull gear into place. Use of the emergency blowdown system is not recommended for cases with mixed safe and unsafe indications.

If at this point the gear appears to be extended and/or a safe gear indication is obtained, touch down lightly and have crew pin gear. Do not put weight on or taxi on unpinned gear.

UNSAFE INDICATION - GEAR RETRACTION

Flight above 130 KIAS is not authorized with the landing gear extended or partially extended.

Symptom:

With gear handle UP, one or more green indicator lights or the red UNLKD light remain on.

Action:

Slow helicopter to 80 KIAS.

Lower gear handle. If a safe down indication is obtained and destination can be reached with gear down, continue flight at airspeeds up to 130 KIAS. Do not consider raising gear again unless no safe landing area is within reach with gear extended.

If gear will not extend, continue as in the section titled UNSAFE INDICATION - GEAR EXTENSION.

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ELECTRICAL SYSTEM FAILURES

MASTER WARNING AND CAUTION-ADVISORY PANEL FAILURE

With a latent failure of a diode in any of the caution or advisory lights that are on the test circuit, a subsequent failure in a corresponding system will illuminate all the lights on the warning or advisory panels. By eliminating the electrical power to the failed system warning or advisory light, the lights can be returned to their normal condition. With the failed system identified, an appropriate reaction can then be made.

Since a large percentage of the warning lights have been checked before flight by following the normal procedures section of the RFM, the following procedure is recommended for determining the most probable cause of the failure. If the condition occured after actuating a particular system isolation of the failed circuit may be accomplished by deactivation of that system.

1. Check engine, hydraulic, transmission and fuel level instruments. If any abnormal indications are noted, pull the associated warning light circuit breaker, and perform the appropriate emergency procedure.
2. Cycle OFF; if ON, these switches:

   Bleed Air
   Pilot Pitot Heat
   Co-Pilot Pitot Heat
   EAPS
   AUX BATT
   MAIN BATT

3. Pull out and then reset the following circuit breakers:

   - DC ESSENTIAL BUS
     NO. 1 ENG CHIP
     NO. 2 ENG CHIP
     MGB CHIP
     I/TGB CHIP
     DOOR WARN
   - NO. 1 DC PRIMARY BUS
     BATT WARN
     WSHLD HTR CONT
   - NO. 2 DC PRIMARY BUS
     WSHLD HTR CONT
     NO. 1 FUEL LOW (if indicated level is low)
     NO. 2 FUEL LOW (if indicated level is low)

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4. Pull out both circuit breakers and then reset them:

- DC ESSENTIAL BUS
  AC GEN WARN
- NO. 2 DC PRIMARY BUS
  AC GEN WARN

BATTERY OVERTEMPERATURE (dual battery installation)

Symptom:

BATT HOT warning light on.

Action:

Check BATT OFF or AUX BATT OFF caution light on

If neither BATT OFF nor AUX BATT OFF caution light is on, place AUX battery switch OFF and check that BATT HOT warning light goes off. If BATT HOT warning light remains on, place AUX battery switch ON and MAIN battery switch OFF. If BATT HOT warning light remains on, place AUX battery switch OFF.

Land as soon as practicable.

If any smoke or odor is noted, land as soon as possible.

BATTERY OVERTEMPERATURE (single battery installation)

Symptom:

BATT HOT warning light on.

Action:

Check BATT OFF caution light on. If caution light is not on, place battery switch OFF.

Land as soon as practicable.

If any smoke or odor is noted, land as soon as possible.

FEEDER FAULT

Symptom:

BATT FEED FAULT light on, and BATT OFF light on.

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Action (dual battery installation):

Turn the AUX battery switch OFF. Cycle the MAIN battery OFF, then ON. If light extinguishes, turn the AUX battery switch ON and continue. If light remains on, turn both battery switches OFF. Land as soon as practicable.

NOTE

With battery power only, the BATT FEED FAULT light will not be accompanied by either BATT OFF light. With external power, both batteries are automatically disconnected and BATT FEED FAULT light cannot illuminate.

Action (single battery installation):

Cycle the battery OFF, then ON. If light extinguishes, continue. If light remains on, turn battery switch OFF. Land as soon as practicable.

NOTE

With battery power only, the BATT FEED FAULT light will not be accompanied by a BATT OFF light. With external power, the battery is automatically disconnected and BATT FEED FAULT light cannot illuminate.

SINGLE DC GENERATOR FAILURE

Symptom:

#1 or #2 DC GEN caution light on.

Action:

Move affected generator switch to OFF, wait 5 seconds and move to RESET, then ON. Repeat as necessary.

If unable to restore generator output, place failed generator switch OFF. If in IMC, transition to VMC as soon as practicable and continue flight.

If single generator fails, only the aux battery charged circuit is dropped. The remaining generator will normally provide required power for all other installed equipment. Consider shutting off unnecessary equipment, however, as a conservative measure. The radio master switches, if installed, may be used to turn off non-essential avionics equipment.

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NOTE

The utility hoist will still function after a single generator failure, but the high speed capability will not be available.

DUAL DC GENERATOR FAILURE

Symptoms:

#1 and #2 DC GEN caution lights on.

BUS TIE OPEN caution light on - indicating that both dc primary buses are inoperative

NOTE

At this time the only source of dc power is the battery(ies) which powers the dc essential bus. Engine, transmission, hydraulic and fuel system instruments will be lost except for N_r, N_1, T_5, and fuel quantity. The pilot's flight instruments, navigation radios, radar altimeter, and one VHF communication set will be retained.

Action:

Attempt to reset both dc generators. In turn, select dc generator switches to OFF, wait 5 seconds, then select RESET, and then ON.

With loss of both dc generators: If in IMC, transition to VMC as soon as possible.

If operating at night, turn on glareshield lights.

NOTE

The utility hoist will be inoperative, but the hoist shear will still function with battery power.

Reduce electrical load by shutting off unnecessary equipment.

Turn inverter off if ac generator is on line.

Land as soon as practicable.

If equipped with the emergency load shed switch, approximately one hour of night flight in IMC is possible using the following procedures (assuming a fully charged battery):

1. EMER LOAD SHED switch – SHED
2. Inverter - ON, if ac generator is off.

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NOTE

With the load shed switch in the SHED position, the inverter continues to operate at reduced loads to maintain ac power for the pilot's navigation system (pilot's HSI, VOR and C-14 compass). Loads that are shed include:

- anti-collision lights
- non-flight instrument lights
- ATC transponder
- weather radar (if installed)
- AFCS SAS II (channel 1)
- co-pilot clock
- DATA NAVIGATION (if installed)
- DDAFCS (if installed) (channel 1)

3. Pilot's PITOT HEAT switch - OFF.

4. LANDING LIGHT switch - OFF (landing light should be used for a maximum of 1 minute during landing only).

NOTE

Items 1, 3, and 4 above are to be initiated within 5 minutes after annunciation of the second dc generator failure to attain the approximately one hour flight duration.

5. If in IMC flight, transition to VMC as soon as possible. Land as soon as practicable.

NOTE

The pilot's pitot heat may be selected on for an additional period of up to 5 minutes without reducing the specified battery endurance.

INVERTER FAILURE

Symptom:

INVERTER caution light on.

Action:

If in IMC, transition to VMC as soon as practicable, and continue flight.

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NOTE

Subsequent failure of an engine or the ac generator will cause loss of all ac electrical power.

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AC GENERATOR FAILURE

Symptom:

AC GEN caution light on. INV ON advisory light on.

Action:

Turn ac generator switch OFF, then ON.

If generator is not regained, turn switch OFF.

If in IMC, transition to VMC as soon as practicable, and continue flight

NOTES

- Failure of either engine will result in irretrievable loss of the ac generator.
- The inverter is capable of providing ac power for all installed equipment except the optional heated wind-shield which is on the monitored bus and will be dropped automatically.

AC Generator Bearing Failure

Symptom:

AC GEN BEARING caution light on.

Action:

Continue flight. Limit flight to 5 hours.

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WINDSHIELD HOT CAUTION LIGHT

The WINDSHIELD HOT caution light goes on when either the pilot's or copilot's windshield exceeds 58°C (135°F). The system should be turned off to prevent overheat damage to the windshield. If required, the individual overheated windshield can be identified and left off to allow operation of the remaining windshield half. If the caution light remains on after the windshield heater switches are turned off, the electrical contactors may have welded. The windshield power circuit breakers should be pulled in this case

Symptom:

WINDSHIELD HOT caution light on.

Action:

Pilot and copilot windshield heater switches - OFF.

Check:

WINDSHIELD HOT caution light - Off.

If the caution light does not go off. pull the PLT and CPLT WSHLD HTR PWR circuit breakers on the AC MON BUS panel.

If the heated windshield is required and the power circuit breakers were not pulled, the functional windshield can be restored as follows:

Action:

Feel center of pilot's and copilot's windshield with hand. If one windshield feels distinctly cooler than the other, turn on the windshield heater switch for the cooler windshield. If the WINDSHIELD HOT caution light returns, turn the switch off and do not attempt to use either windshield heater.

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EMERGENCY ENTRANCES AND EXITS

Emergency entrances and exits are through the four personnel doors.

HINGED DOORS

The hinged doors are opened from the outside by lifting the door latch or from inside by lifting up the lockpin button on the lower aft window frame of each door and pulling the door latches aft. The doors may also be jettisoned from inside using the door lockpin and jettison handles, forward of the door latches. The jettison levers are under a plastic protective panel. A finger grip in the plastic cover is used to pop the cover loose from the door frame. The red jettison handle is pulled up to release the hinges, and a sharp blow with the fist on the door below the jettison handle will jettison the door. Decals as shown in Figure 3-2 provide instructions for normal opening or jettisoning of doors.

If door does not open normally, attempt to jettison it.

Door Jettison Procedure

1. Lift door lockpin.
2. Remove jettison handle plastic cover.
3. Pull jettison handle up.
4. Strike door below the jettison handle sharply with the fist.

SLIDING DOOR(S) (OPTIONAL)

The sliding door is opened from the outside by unlocking the door lock (rotating the door lock to the UNLOCK position) and then rotating the door handle downward to the OPEN position. Pull the door out and slide aft. From the inside, move the door lock to the UNLOCK position and then rotate the door handle downward to the OPEN position. Push the door out and slide aft. If the door does not open normally attempt to jettison window.

Window Jettison Procedure

NOTE

Do not jettison window in flight.

1. Remove plastic cover over the window jettison handle.
2. Pull window jettison handle.

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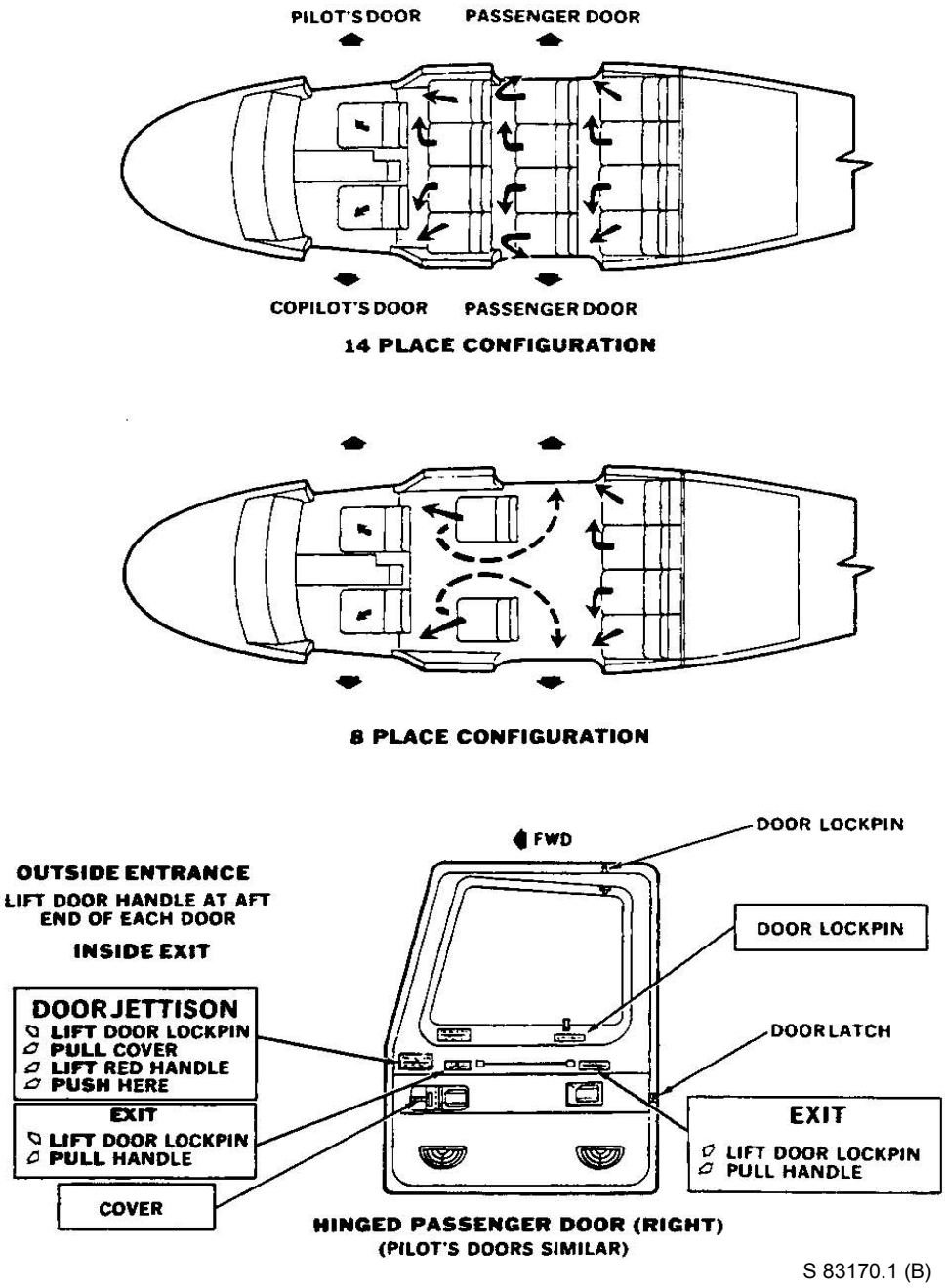

Figure 3-2. Emergency Entrances and Exit (Sheet 1 of 2)

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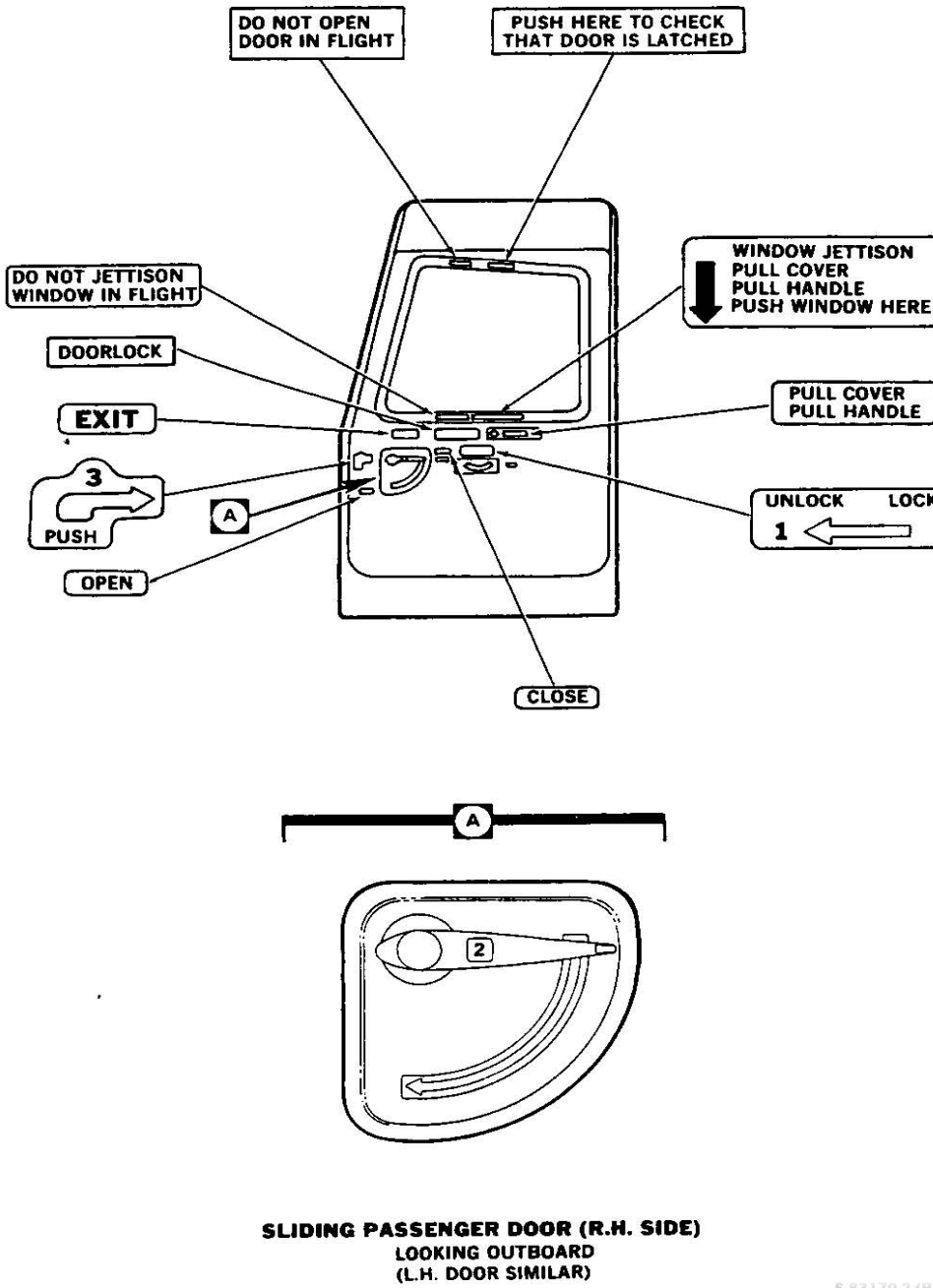

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Figure 3-2. Emergency Entrances and Exit (Sheet 2 of 2)

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3. Push window out.

Sliding Door Open In Flight

If sliding door becomes unlocked or opens in flight, decrease airspeed to 50 KIAS or less before closing. If not possible to close door, open fully and lock. Do not exceed 74 KIAS for remainder of flight.

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DITCHING (FLOTATION SYSTEM)

The optional emergency flotation system is designed only for emergency landing on water. The system may be expected to keep the helicopter upright long enough to permit passengers and crew to exit to life rafts or rescue boats. A subsequent takeoff or long term towing should not be attempted.

When it appears that ditching is likely, consideration must be given to such factors as wind direction and velocity, sea state conditions, and helicopter power available for ditching. The maximum permissible water entry conditions are 33 knots water speed at 300 feet per minute rate of descent in a calm sea. Optimum ditching conditions would occur in a calm sea state with the forward speed of the helicopter reduced to as near zero as possible, and with little or no lateral drift component. Minimum touchdown forces will be achieved when touchdown is made on the crest or back of a wave with a minimum rate of descent. Greatly increased touchdown forces will be experienced if the landing is made on the front or rising face of a wave. Every effort should be made to land the helicopter with as little sideward drift as possible as the roll rate after touchdown increases sharply with any increase in lateral motion. Ditching with power available (such as when fuel starvation is imminent, or a loss of transmission oil pressure dictates such action) will greatly increase controllability, reduce touchdown forces, and assist in preventing the helicopter from rolling after impact. Power off ditching (autorotation) should be avoided if possible. With sufficient power available to fully control the helicopter descent rate, sideward drift and forward speed to near zero values, successful ditchings may be accomplished in sea states up to and including Sea State 4 (wave height 6.5 feet, wave length to height ratio - 10 to 1) depending on wind conditions.

All possible control available from the rotor system should be used to prevent rolling after impact. Consideration should be given to extended power on water taxi, if wave conditions make rotor to water contact improbable. Power-on water taxi will greatly increase the roll stability of the helicopter and will allow yaw and heading control. The floats may be inflated at any time during the ditching procedure (below 75 KIAS). Allow sufficient time for full inflation before water contact. Float inflation time is within 10 seconds.

The following general ditching techniques are recommended as the best for a successful controlled emergency water landing:

- Activate the inflation system in a hover if sufficient power is available to permit a hover.
- Reduce forward speed to as near zero as possible.
- Reduce lateral drift component to a minimum.
- Avoid rising faces of large waves.
- Reduce rate of descent to minimum at touchdown.

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- Fuselage angle at impact should be between 0° and 10° nose up.
- Use all control available from the rotor system to prevent the helicopter from pitching or rolling after touchdown.
- The pilot should endeavor to touch down, heading into wind, as near the crest of a wave as possible to minimize the impact vertical velocity.
- If the helicopter is towed, it should be towed at a slow rate of speed.

DITCHING PROCEDURES

1. Flotation system test switch - Check NORM.
2. Landing gear - DN.

NOTE

If the landing gear cannot be extended for any reason, the floats can be deployed with the gear retracted.

CAUTION

Operation of the landing gear during or after float inflation may result in damage to the floats and partial loss of flotation capability.

3. Float arming switch - ARMED.
4. Press the cyclic stick float inflation switch. Allow sufficient time for full inflation prior to water contact.

NOTE

Float inflation time is 10 seconds.

5. Notify all occupants to prepare for emergency water landing.

NOTES

- Cabin occupants should fasten their safety belts and remain in their seats with their arms braced against their knees until water contact is made.
- If time and conditions permit, consider opening and locking sliding door(s).

6. Transmit distress message.
7. Check life vests for security and lock shoulder harness.

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8. Hold the helicopter level as possible, contact the water with minimum forward speed and rate of descent.
9. Water and aircraft conditions permitting - consider extended water taxi using collective pitch for increased stability.
10. If the helicopter is unstable or taking on water, shut down engines, notify cabin occupants to evacuate through the cabin doors after the rotor blades have stopped turning. The rotor brake may be used with a gentle application to result in slow deceleration.

WARNING

Do not evacuate the helicopter until the rotor blades have stopped turning. Do not inflate life vests until clear of the helicopter.

SINGLE-ENG1NE LANDING IN THE WATER
(FLOTATION GEAR INFLATED)

NOTE

The following procedures are recommended if single engine flight to a safe landing area is not possible.

1. Establish normal approach so as to arrive at approximately 100 feet above touchdown point at 40 KIAS at a rate of descent of no more than 600 FPM.
2. Initiate a deceleration passing 50 feet at 40 KIAS and increase power to reduce rate of descent to a maximum of 300 FPM.
3. Continue deceleration to running touchdown at or above translational lift.
4. Water and aircraft conditions permitting - consider extended water taxi using collective pitch for increased stability.
5. If the helicopter is unstable or taking on water, shut down engines, notify cabin occupants to evacuate through the cabin doors after the rotor blades have stopped turning. The rotor brake may be used with a gentle application to result in slow deceleration.

WARNING

Do not evacuate the helicopter until the rotor blades have stopped turning. Do not inflate life vests until clear of the helicopter.

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AUTOROTATIVE LANDING TO THE WATER

1. Establish autorotative glide.
2. Inflate floats using DITCHING PROCEDURES above.
3. At about 50 to 75 feet, execute a partial flare to about 20° nose up by moving cyclic stick back with no change in collective pitch. This will reduce airspeed and rate of descent and will cause an increase in rotor rpm.
4. Gradually increase collective pitch and apply forward cyclic as the helicopter settles and until water contact is made.
5. Maximum desired water contact speed is 30 knots. Desired nose attitude is +10° or less.
6. Immediately after water contact, decrease collective pitch smoothly and slowly.
7. Water and helicopter conditions permitting, consider remaining in helicopter until rescued.
8. If the helicopter is unstable or taking on water, shut down engines, notify cabin occupants to evacuate through the cabin doors after the rotor blades have stopped turning. The rotor brake may be used with a gentle application to result in slow deceleration.

WARNING

Do not evacuate the helicopter until the rotor blades have stopped turning. Do not inflate life vests until clear of the helicopter.

DITCHING (WITHOUT FLOTATION SYSTEM)

The general procedures outlined under DITCHING (FLOTATION SYSTEM) should be followed. Passengers and crew should be briefed to plan to exit the helicopter as soon as the rotor blades have stopped turning.

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EXTERNAL CARGO HOOK PROCEDURES

If an emergency requires release of the external cargo, perform either of the following:

1. CARGO HOOK arming switch - ARMED.
2. CARGO hook release button (pilot's or copilot's cyclic stick) - Press.

or

1. EMERGENCY CARGO HOOK RELEASE "T" handle (on center console) - Pull.

NOTES

- Because of the rapid CG shift following a sudden release, a moderate climb and pitch up should be anticipated.
- If an approach terminates with insufficient power to stop the rate of descent, consideration should be given to allowing the cargo to touch down rather than executing a premature release.

UTILITY HOIST PROCEDURES

If an emergency requires release of a utility hoist load, perform the following:

1. Cable shear switch (pilot's or cabin) - SHEAR. If load does not separate, cut the cable with the manual cable cutters as close to the hoist as possible.

For hoist operation with electrical malfunctions, refer to ELECTRICAL SYSTEM FAILURES in this section.

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TEMPORARY REVISION NO. 2

FILING INSTRUCTIONS: Insert this Temporary Revision facing page 4-1, dated October 27, 1994.

SUBJECT: CATEGORY "A" AND "B" OPERATIONS

This temporary revision adds a rejected takeoff and landing distance adjustment for aircraft that have 5014067 rotating brake disk(s) installed as determined per Aircraft Braking Systems' Alert Service Bulletin No. S76-32-A24 or S76-32-A25.

MANUAL CHANGES:

If the 5014067 brake disks are installed or the brake disk configuration has not been confirmed, calculate the Category "A" Rejected Takeoff Distance and Category "A" Landing Distance or Category "B" Landing Distance normally, as applicable. Multiply the distance(s) by 1.67 to obtain the corrected distance(s).

Applicable figures:

FIGURE NUMBER	TITLE
4-9	Category 'A" Rejected Takeoff Distance, Rejected and Continued Takeoff
4-12	Category "A" Landing Distance
4-17	Category "B" Landing Distance, PT6B-36A Engines

TEMPORARY REVISION NO. 2

FAA APPROVED APRIL 9, 2002

This document contains technical data subject to EAR. See WARNING and classifications on first page

SECTION IV

PERFORMANCE INFORMATION

LIST OF PERFORMANCE CHARTS

FIGURE NUMBER	TITLE	PAGE
4-1	Density Altitude Chart	4-3
4-2	Temperature Conversion Chart	4-4
4-3	Airspeed Calibration - Pilot's System	4-5
4-4	Airspeed Calibration - Copilot's System	4-6
4-5	Power Assurance Example	4-8
4-6	Power Assurance - EAPS OFF, PT6B-36A Engines	4-9
4-7	Power Assurance - EAPS ON, PT6B-36A Engines	4-10
4-8	Category "A" Takeoff Profile	4-12
4-8A	Wind Components	4-12A
4-9	Category "A" Takeoff Distance, Rejected and Continued Takeoff	4-12B
4-9A	Category "A" Maximum Takeoff and Landing Gross Weight, PT6B-36A Engines	4-12C
4-10	Forward Climb Performance, Single-Engine, 30-Minute Power, Takeoff Safety Speed, PT6B-36A Engines	4-14
4-11	Category "A" Landing Profile	4-16
4-11A	Category "A" Alternate Landing Profile	4-16A
4-12	Category "A" Landing Distance	4-17
4-13	Category "B" Takeoff Distance, PT6B-36A Engines	4-19

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LIST OF PERFORMANCE CHARTS (Cont)

FIGURE NUMBER	TITLE	PAGE
4-14	Forward Climb Performance - Two Engines, Maximum Continuous Power, PT6B-36A Engines	4-21
4-15	Forward Climb Performance - Single-Engine, 30-Minute Power, PT6B-36A Engines	4-22
4-16	Forward Climb Performance - Single-Engine, Maximum Continuous Power, PT6B-36A Engines	4-23
4-17	Category "B" Landing Distance, PT6B-36A Engines	4-24
4-18	Hover Out of Ground Effect - EAPS OFF, PT6B-36A Engines	4-25
4-19	Hover Out of Ground Effect - EAPS ON, PT6B-36A Engines	4-26

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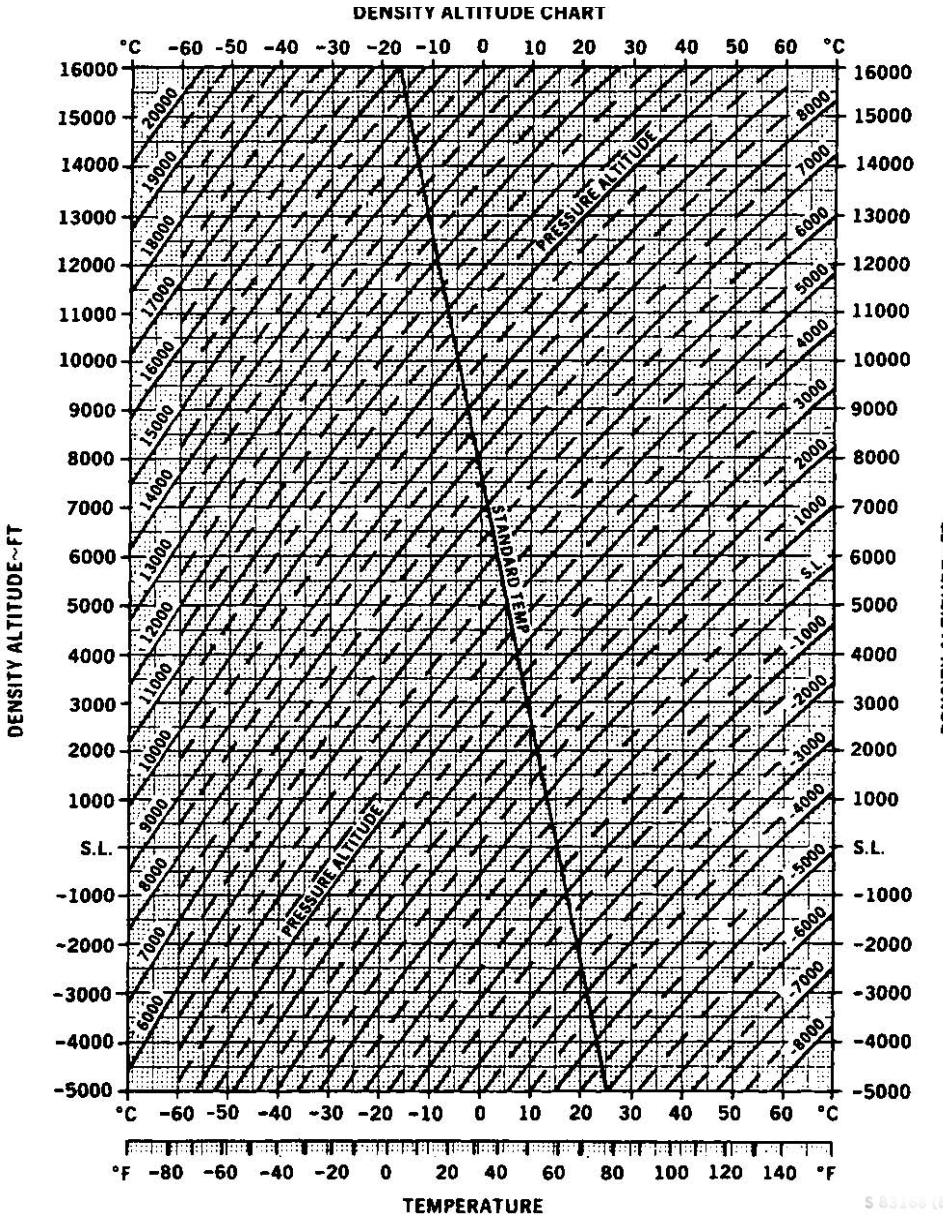

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Figure 4-1. Density Altitude Chart

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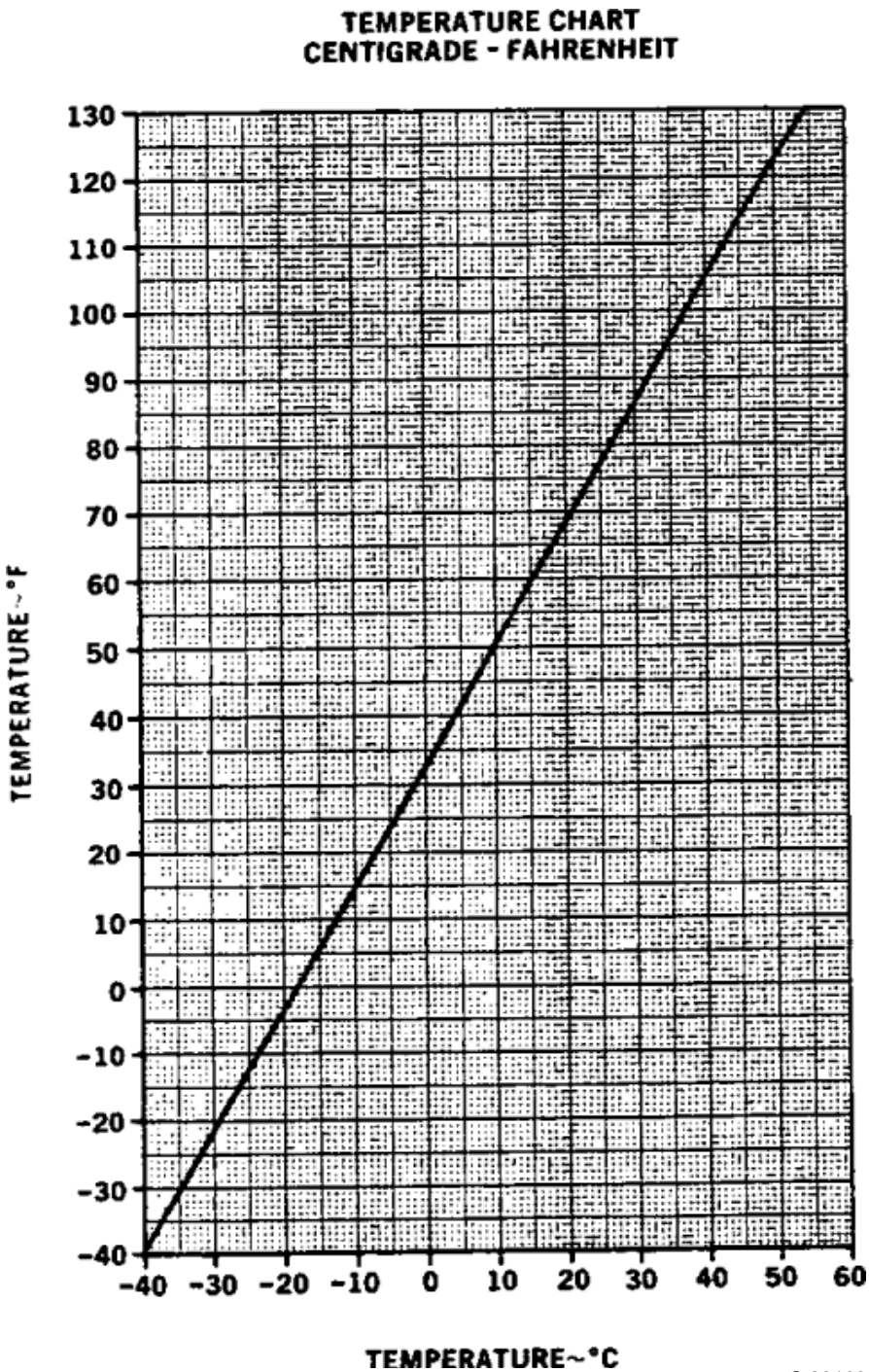

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Figure 4-2. Temperature Conversion Chart

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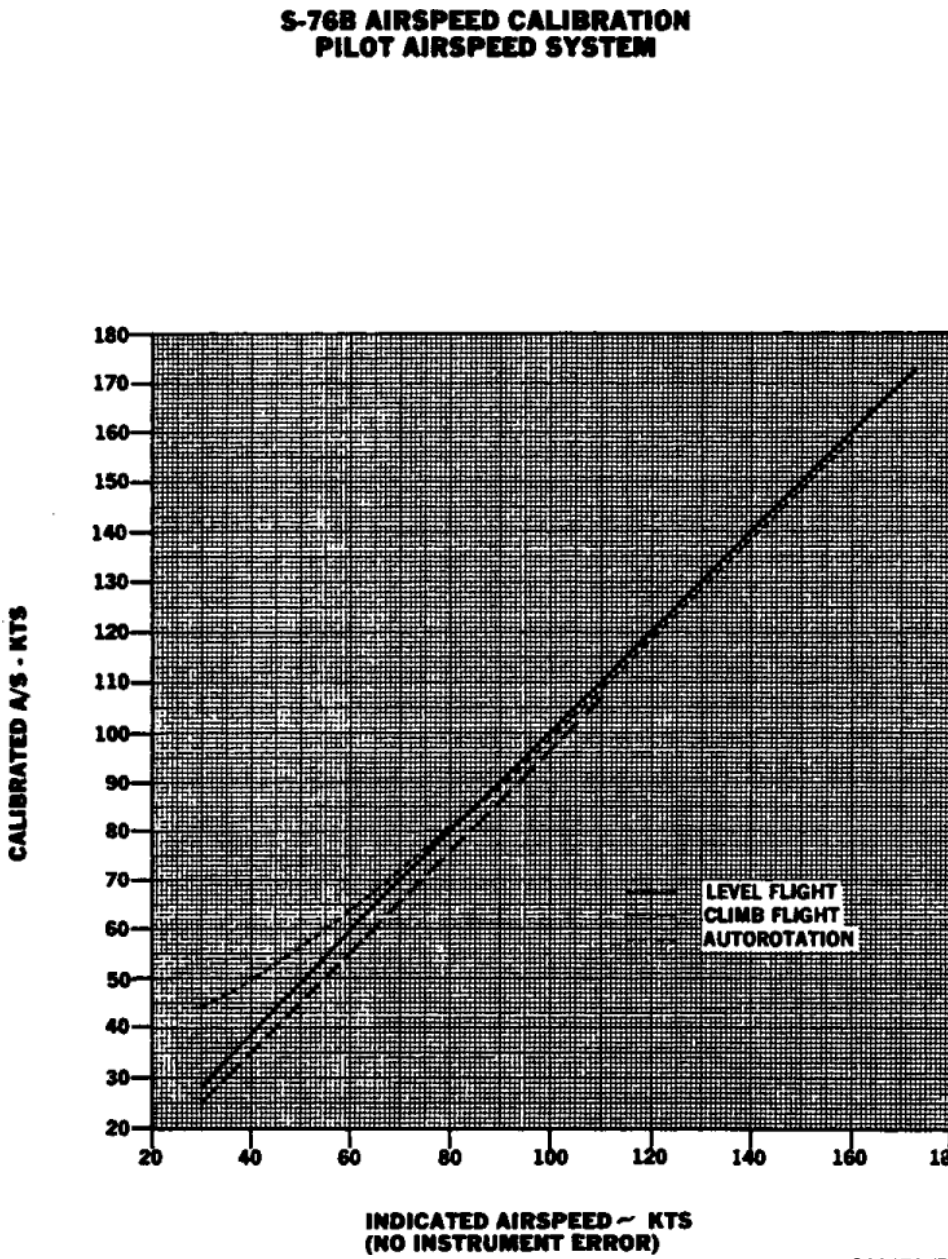

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Figure 4-3. Airspeed Calibration - Pilot's System

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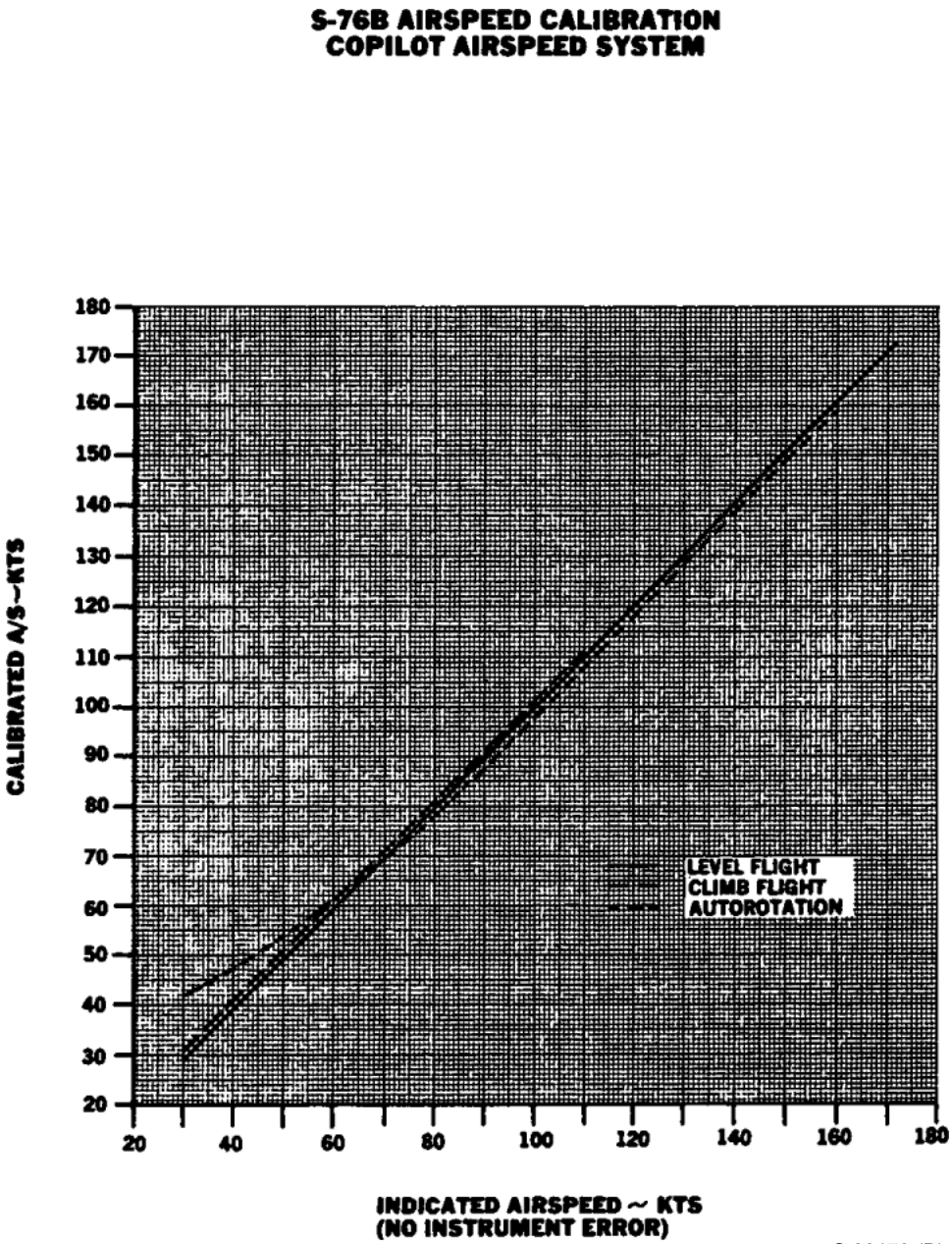

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Figure 4-4. Airspeed Calibration - Copilot's System

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ENGINE POWER ASSURANCE

The Power Assurance check charts indicate the maximum T_5 and N_1 values for specific target torques. In order to meet minimum manufacturers specification and performance data contained in the RFM, the engine must develop the target torque with adjusted T_5 and N_1 values that are less than or equal to the chart limits.

CAUTION

Limitations listed in Section I are not to be exceeded.

Each engine is to be checked prior to takeoff using the appropriate Power Assurance check chart.

NOTE

- Power Assurance should be done only when engine and transmission oil temperatures are in the normal operating range.
- Power assurance with EAPS ON must be conducted prior to flight with EAPS ON.

1. Refer to the cockpit engine placard and note the minimum acceptable values for T_5 and N_1 margins (Figure 1-8).
2. Refer to Figure 4-6 or 4-7 depending on the mode of operation and determine target torque and T_5 and N_1 limits at the prevailing ambient conditions.
3. Engine not being checked - IDLE.
4. With the nose of the helicopter into wind, check bleed air off, shut off the ac generator and the dc generator of the engine being tested, and then set torque obtained in step 2.
5. Stabilize the engine for 15 seconds and record the observed T_5 and N_1.
6. Using other engine, repeat steps 3. through 5.
7. Add the placard values to the observed T_5 and N_1 to obtained adjusted T_5 and N_1.
8. Determine T_5 and N1 margins (subtract adjusted T_5 and N1 from limit T_5 and N_1 recorded in step 2).
   a. If T_5 and N_1 margins are zero or greater, published performance is assured.

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b. If either the T_5 or N_1 margin is negative (adjusted T_5 or N_1 exceed the limit value from step 2), there is no margin and engine maintenance must be accomplished in accordance with the maintenance manual before flight.

9. If a negative T_5 or N_1 margin is determined in step 8b, re-establish the target torque and repeat steps 3, 4, 5, 7, and 8 up to three times for confirmation.

10. Ac and dc generator switches - ON.

11. Match torques at 107% N_r.

12. At the conclusion of the flight, submit the recorded power assurance information for inclusion in the maintenance record.

POWER ASSURANCE EXAMPLE

NOTE

SHADED AREAS ENTERED BEFORE FLIGHT.

OAT 15°C PRESSURE ALTITUDE	5,000 FT	EAPS- ON / OFF
NO. 1	ENGINE	NO. 2
62%	TARGET Q	62%
687°/92.9%	OBSERVED Ts/N1	680°/92.6%
6°/0.1%	Ts/N1 PLACARD VALUES	8°/0.2%
693°/93.0%	ADJUSTED Ts/N1	688°/92.8%
714°/94.0%	Ts/N1 LIMITS	714°/94.0%
21°/+1.0%	Ts/N1 MARGINS	26°/1.2%

Figure 4-5. Power Assurance Example

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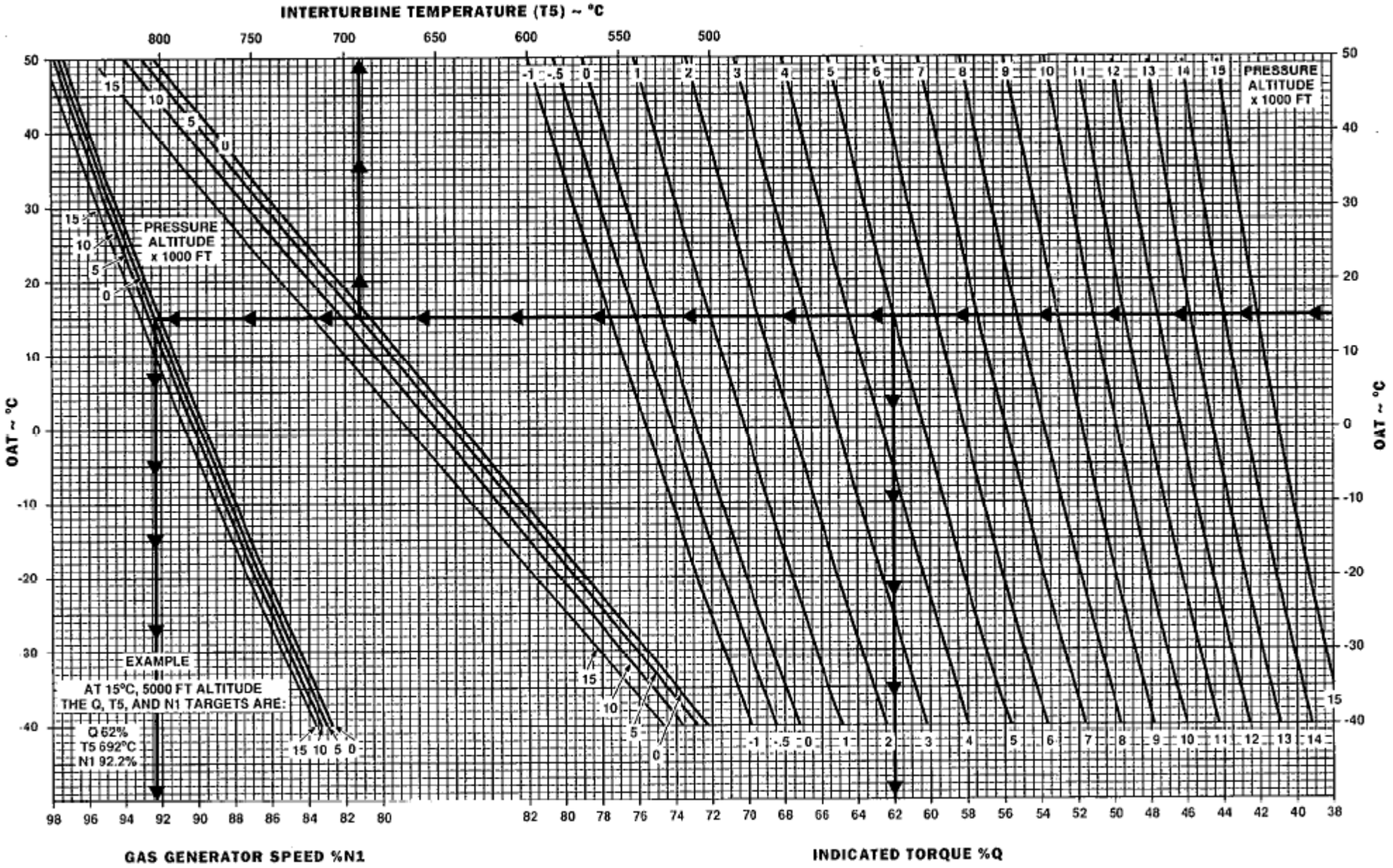
POWER ASSURANCE

ENGINE: PT6B-36A EAPS OFF



REF NORMALIZED POWER=600 SHP

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Figure 4-6. Power Assurance - EAPS OFF, PT6B-36A Engines

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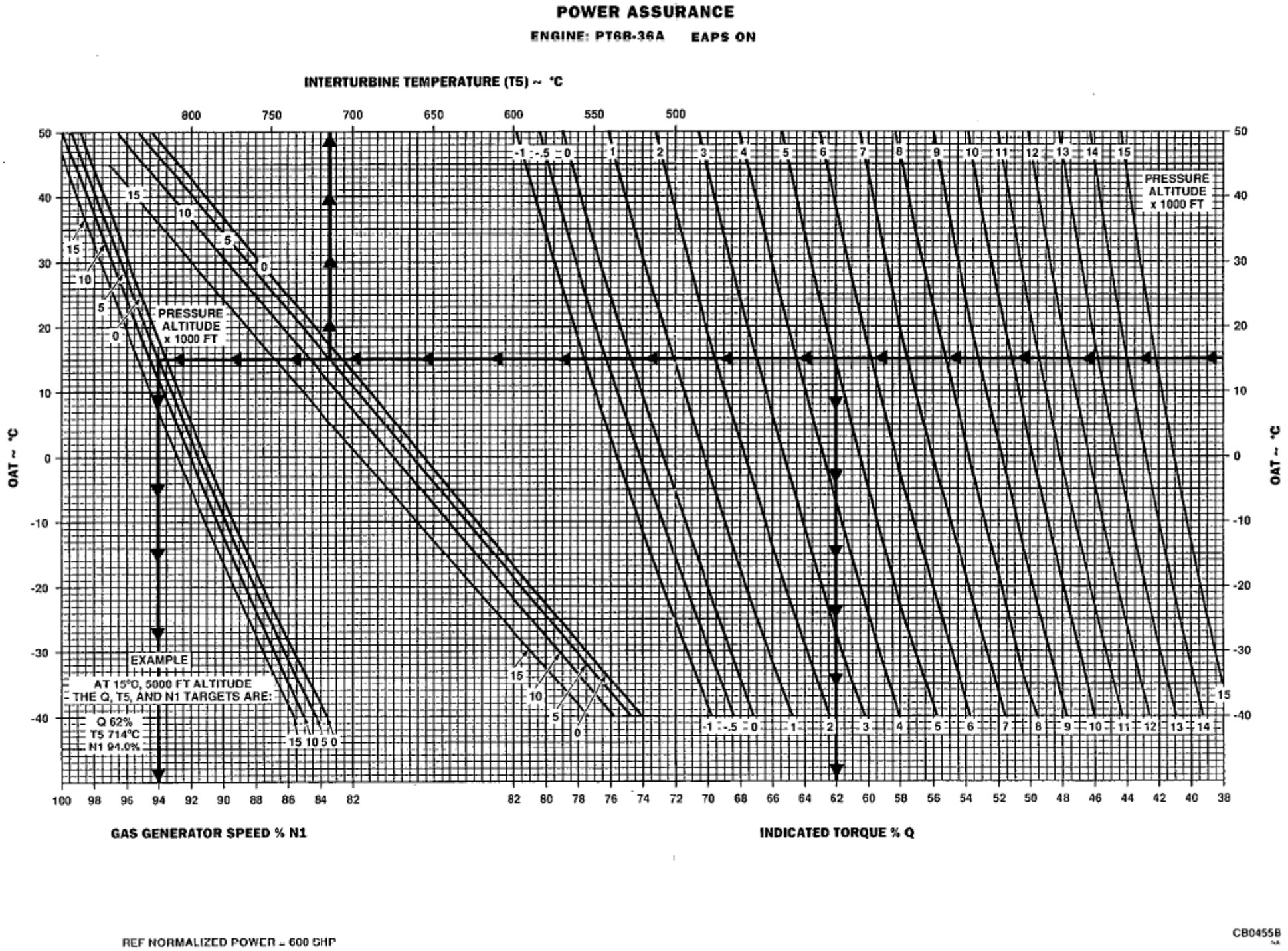

REF NORMALIZED POWER = 600 SHP

Figure 4-7. Power Assurance - EAPS ON, PT6B-36A Engines

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CATEGORY "A" TAKEOFF

Description

The S-76B Category "A" takeoff procedure shown diagrammatically in Figure 4-8 features variable critical decision point (CDP) and takeoff safety speed (V_2). The CDP, expressed only in terms of airspeed, is selectable in 1 knot increments between 30 and 50 knots while V_2, defined as CDP + 10 knots, varies in 1 knot increments between 40 and 60 knots. This permits payload to be traded off against available field length in such a manner that Category "A" one engine inoperative (OEI) climb performance minima can be maintained over a wide range of environmental conditions.

Figure 4-9 shows the rejected takeoff (RTO) and continued takeoff (CTO) distances as a function of pressure altitude, temperature, headwind component, CDP speed, and V_2 speed. RTO and CTO distances are directly proportional to CDP and V_2 speeds respectively, therefore lower CDP and V_2 speeds equate to shorter field lengths. Figure 4-9A shows the maximum takeoff and landing gross weight as a function of pressure altitude, temperature, and CDP/V_2 speeds. Maximum takeoff and landing gross weight is also directly proportional to CDP/V_2 speeds, therefore higher CDP/V_2 speeds can equate to higher maximum takeoff gross weights.

The Category "A" takeoff procedure provides the flexibility to address specific payload and/or field length requirements appropriate to either of the following operational scenarios:

1. Determine the maximum takeoff gross weight, given the available field length.
2. Determine the required field length, given the desired mission takeoff gross weight.

Specific numerical examples follow which illustrate the use of the charts for each of the above stated scenarios.

Example 1

Determine the maximum takeoff gross weight, given the available RTO field length, pressure altitude, temperature, and headwind component.

1. Enter Figure 4-9 with the RTO space available, and using the headwind component, pressure altitude, and temperature, read the resultant CDP speed. Note: If resultant CDP is greater than 50 knots, use 50 knots as CDP.

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2. Enter Figure 4-9A for the appropriate EAPS configuration with pressure altitude, temperature, and CDP speed from Step 1, and determine the maxi-- mum takeoff gross weight. Notes: (1) If the horizontal line defined by pressure altitude and temperature intersects 11,700 lb. at a CDP speed lower than the CDP from Step 1, use the lower CDP speed, or (2) if the desired takeoff gross weight is less than the maximum permitted takeoff gross weight, use the lower CDP speed corresponding to the desired takeoff gross weight.

3. Using Figure 4-9, verify that the CTO distance for V2 (CDP + 10 knots) is suitable for the takeoff area.

Given:

Available RTO Field Length:	650 ft.
Pressure Altitude:	3,000 ft.
Temperature:	$+10^0$C
Headwind Component:	20 kt.
EAPS	OFF

Determine:

CDP Speed:	31 kt.
Maximum Takeoff Gross Weight:	10,500 lb.
V2 Speed:	41 kt.
CTO Distance:	770 ft.

Example 2

Determine the required field length, given the desired mission takeoff gross weight, pressure altitude, temperature, and headwind component.

1. Enter Figure 4-9A for the appropriate EAPS configuration with the desired takeoff gross weight, and using the pressure altitude and temperature, read the resultant CDP and V_2 (CDP + 10 knots) speeds.

2. Enter Figure 4-9 with pressure altitude, temperature, headwind component, and CDP and V_2 from Step 1, and determine the RTO and CTO field length requirements.

Given:

Desired Takeoff weight:	11,000 lb.
Pressure Altitude:	3,000 ft
Temperature:	$+10^0$C
Headwind Component:	20 kt.
EAPS:	Off

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Determine:

CDP Speed:	36 ft.
V_2 Speed:	46 ft.
RTO Distance:	800 ft.
CTO distance:	890 ft.

Technique

After determining and setting bugs for CDP and V2 on airspeed indicator, hover at 5-foot wheel height. Increase collective pitch to achieve 10% torque above hover torque and accelerate forward maintaining 5- to 10-foot wheel height until reaching CDP. After passing CDP rotate nose-up to initiate climb at V2. When clear of obstacles gradually accelerate to best rate of climb speed (Vbroc) and retract landing gear.

Associated Conditions:

Bleed Air: Off
EAPS/ Anti-Ice: Off or On

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CATEGORY "A"

TAKEOFF PROFILES

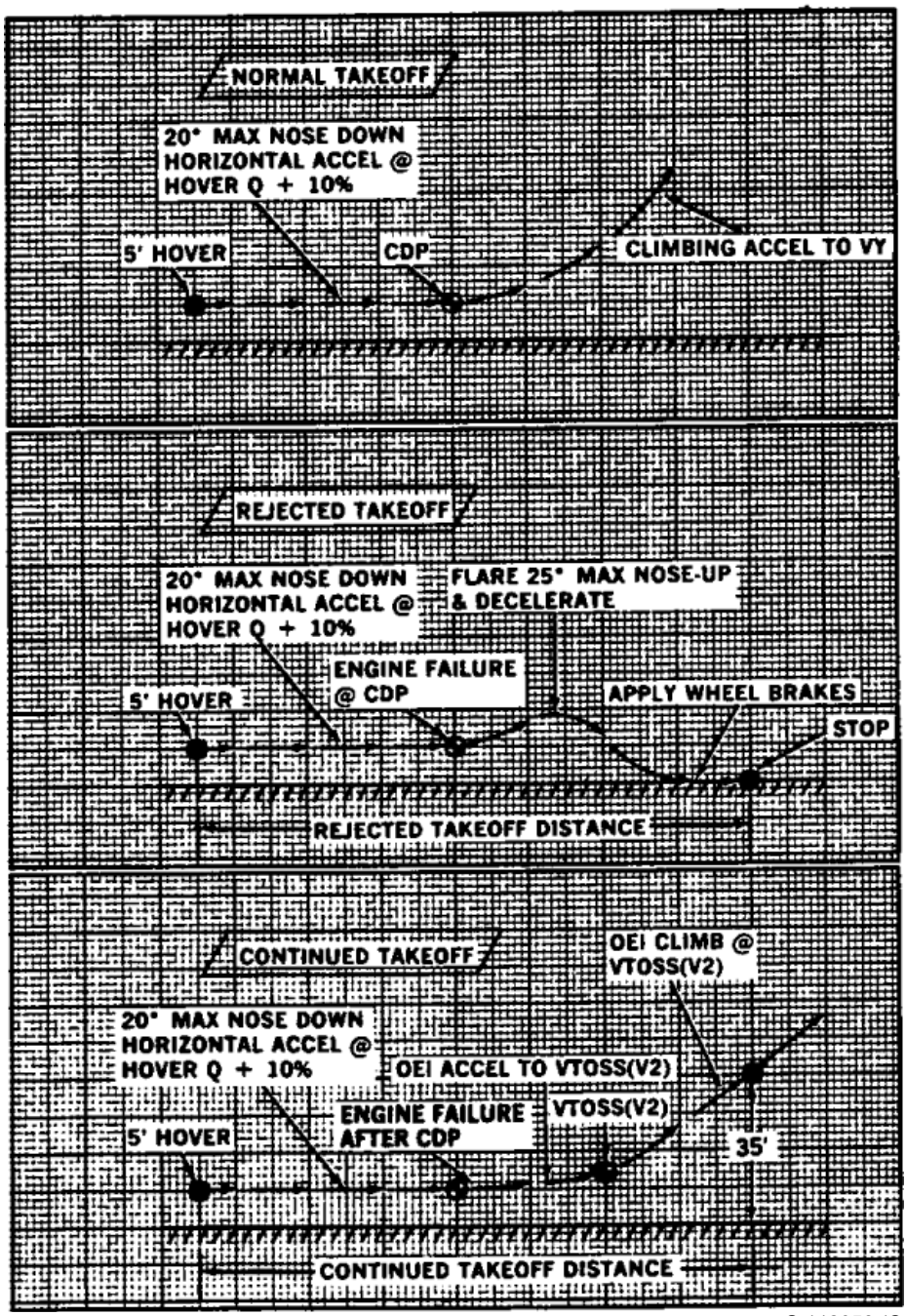

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Figure 4-8. Category "A" Takeoff Profile

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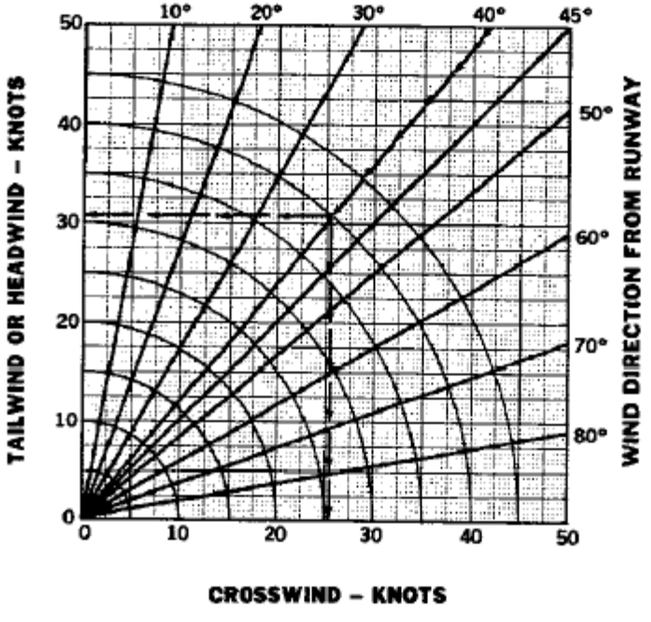
WIND COMPONENTS

ANGLE BETWEEN WIND DIRECTION AND FLIGHT PATH



CONDITION:

WIND VELOCITY - 40 KTS
WIND DIRECTION - 130°
FLIGHT PATH - 090°

EXAMPLE:

ENTER CHART AT WIND DIRECTION FROM FLIGHT PATH = 40°
MOVE DOWN TO WIND VELOCITY ART = 40 KTS
MOVE LEFT TO HEADWIND COMPONENT = 30.6 KTS
MOVE DOWN TO CROSSWIND COMPONENT = 25.7 KTS

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S 131225 (R7) 76B (FAA)

Figure 4–8A. Wind Components

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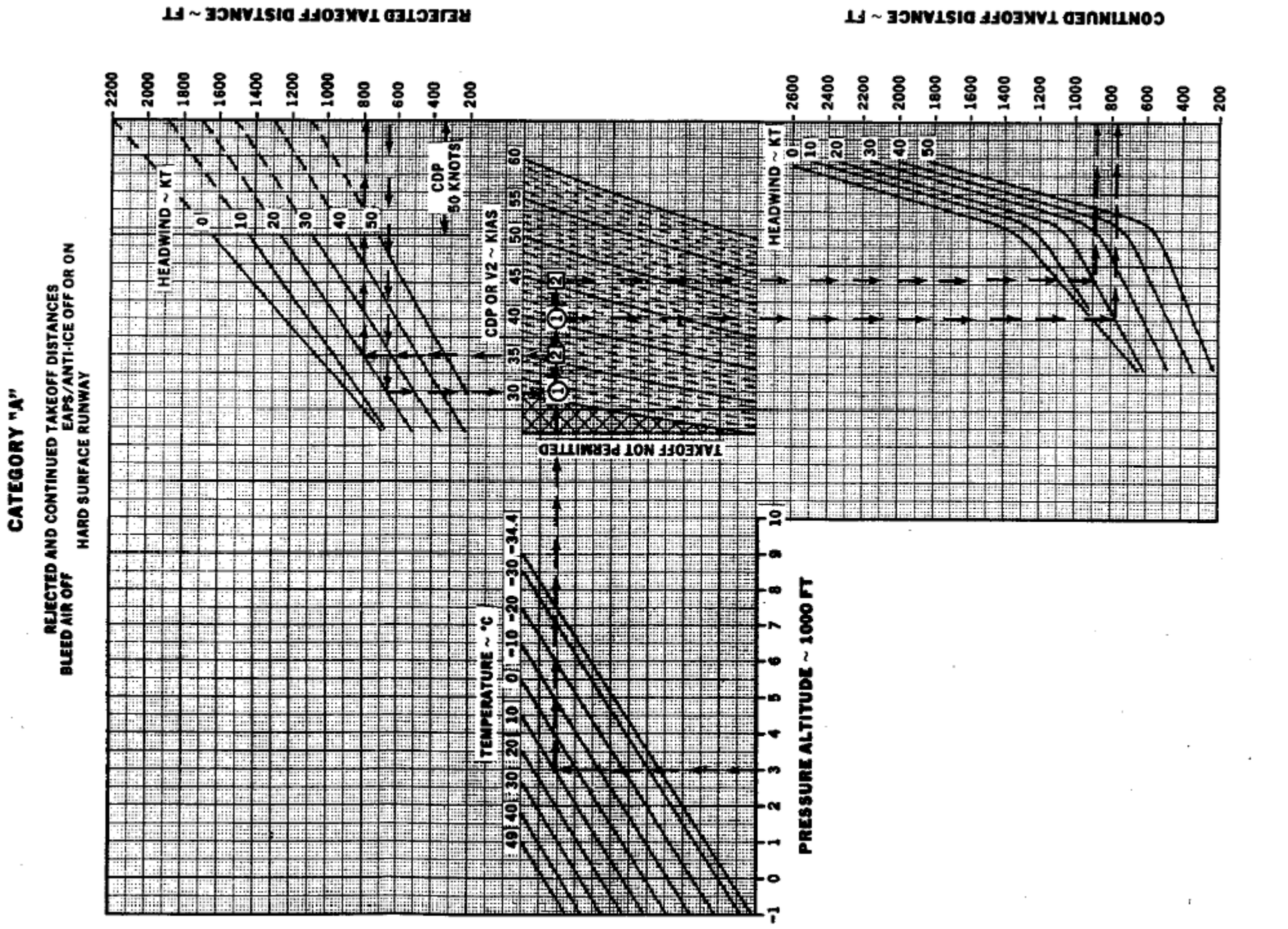

Figure 4-9. Category "A" Takeoff Distance, Rejected and Continued Takeoff

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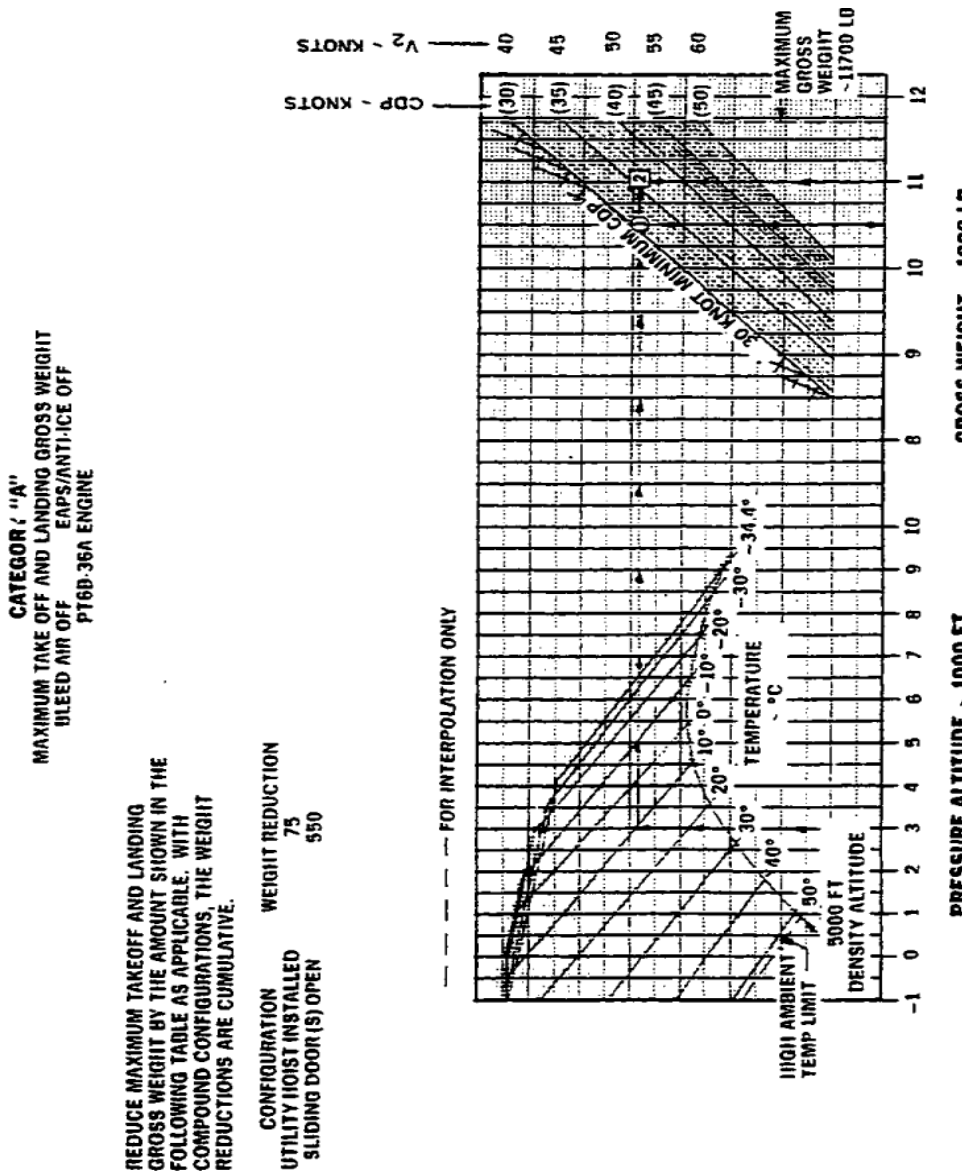

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Figure 4-9A. Category "A" Maximum Takeoff and Landing Gross Weight, PT6B-36A Engines (Sheet 1 of 2)
(This Figure same as Figure 1-0)

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FLIGHT MANUAL

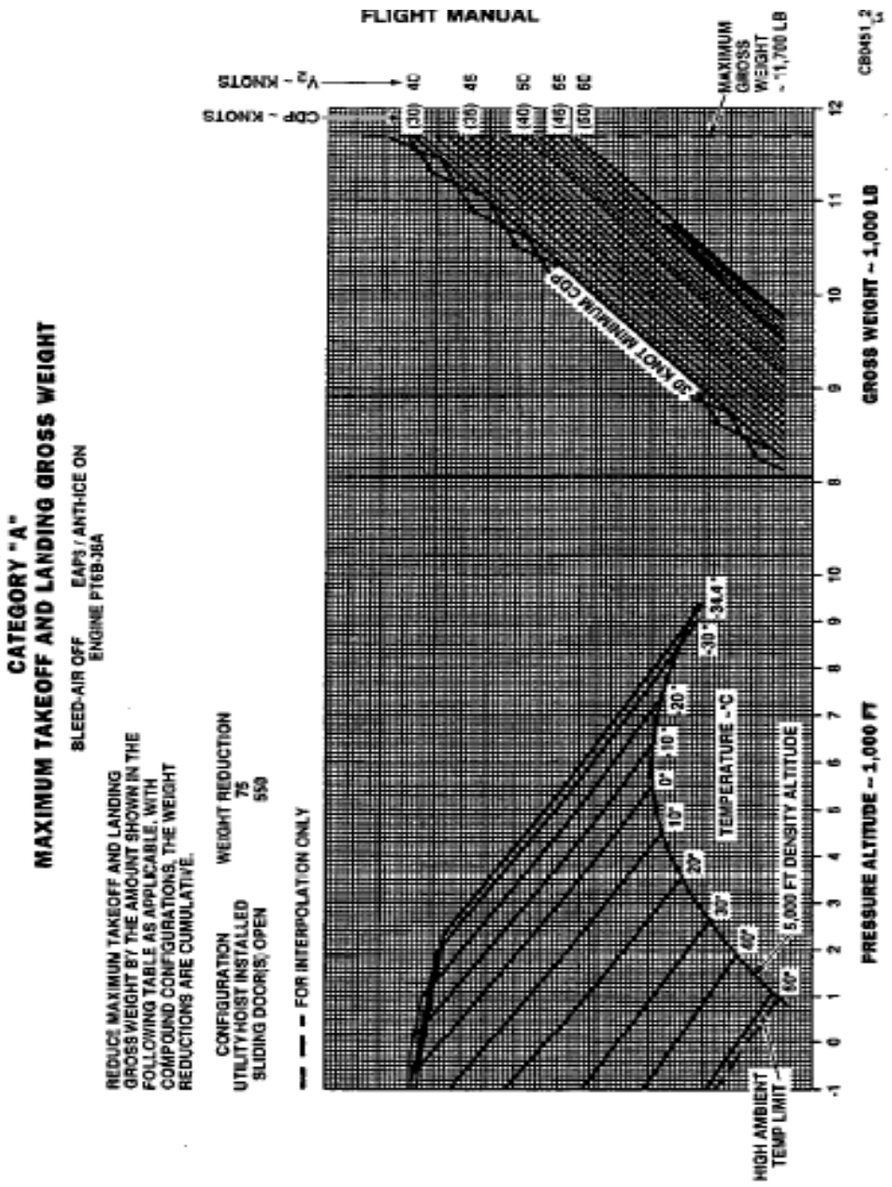

Figure 4-9A. Category "A" Maximum Takeoff and Landing Gross Weight, PT6B-36 Engines (Sheet 2 of 2)
(This Figure same as Figure 1-0)

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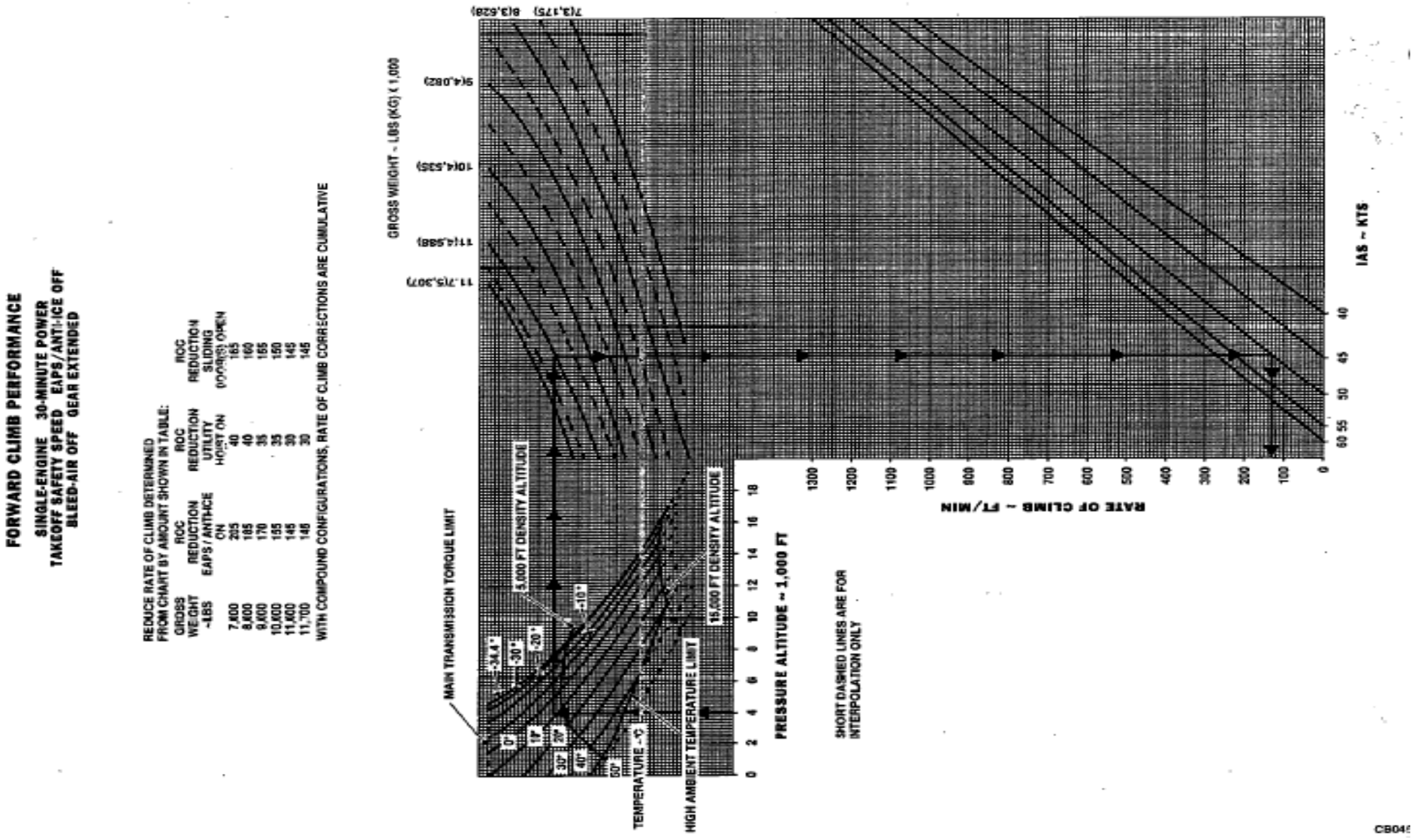

Figure 4-10. Forward Climb Performance, Single-Engine, 30-Minute Power, Takeoff Safety Speed (V2), PT6B-36A Engines

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CATEGORY "A" LANDING

Technique

Establish an approach to arrive at the LDP, a point 250 feet above the touchdown elevation, with 40 KIAS, and a rate of descent of no more than 600 FPM. Initiate a deceleration passing 50 feet at 40 KIAS. Continue approach and deceleration to a running touchdown or hover. Refer to emergency procedures for single-engine landing.

Associated Conditions

Bleed air: OFF

EAPS/Anti-ice: OFF or ON

Landing Distance

The landing distances shown in Figure 4-12 reflect one-engine inoperative landings to a hard-surfaced runway.

ALTERNATE CATEGORY "A" LANDING TECHNIQUE

Establish an approach to arrive at the LDP, a point 75 feet above the touchdown elevation, with 60 KIAS and a rate of descent of no more than 300 FPM. Upon passing the LDP, initiate a smooth deceleration while reducing collective to continue descent through 50 feet with up to 20-25° flare attitude. Apply collective to reduce descent rate and decrease flare attitude to pass 20 feet at approxiamtely 30 KIAS. Continue approach and deceleration to a running touchdown or hover. Refer to emergency procedures for single-engine landing.

Associated Conditions

Bleed air: OFF

EAPS/Anti-ice: OFF or ON

Landing Distance

The landing distance reflects one-engine inoperative landings to a hard-surfaced runway. The landing distance is 1,000 feet for all weight, altitude, and temperature combinations.

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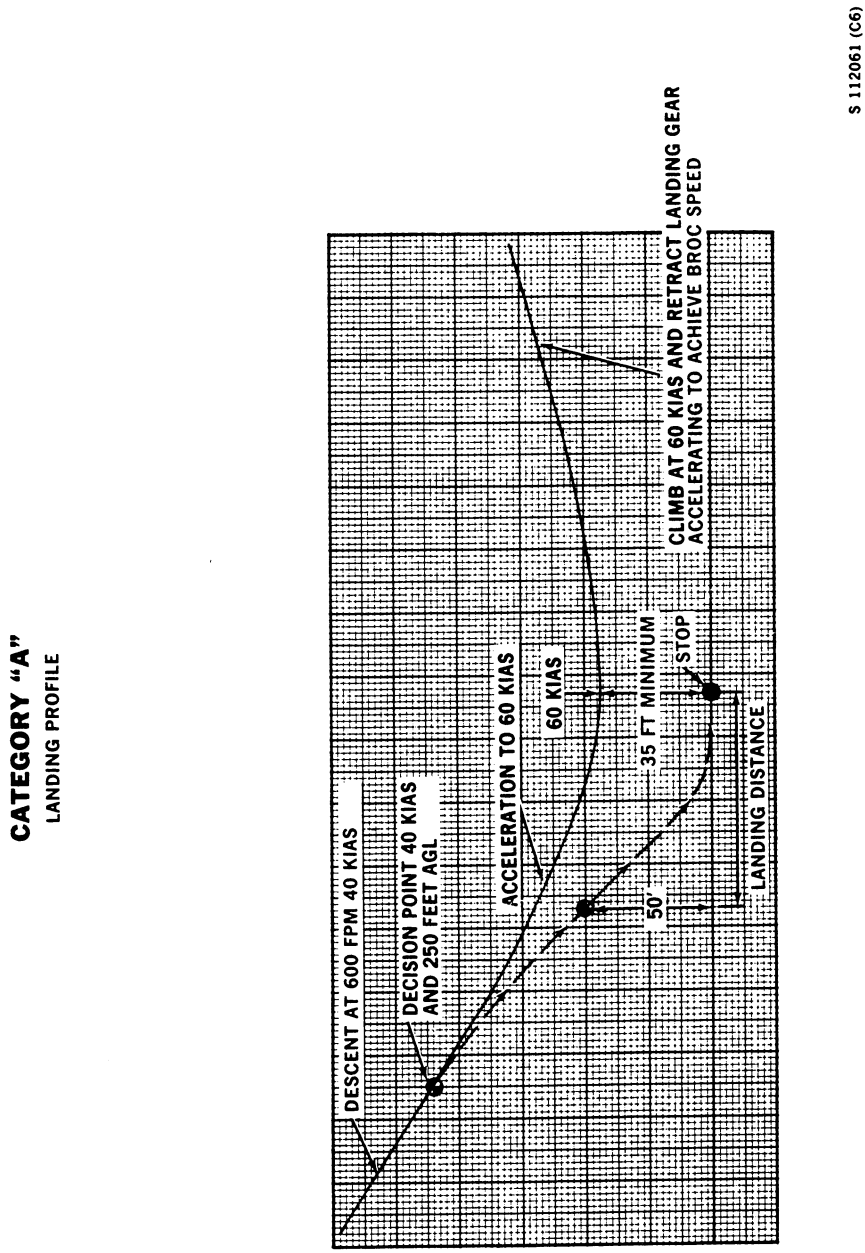

Figure 4-11. Category "A" Landing Profile

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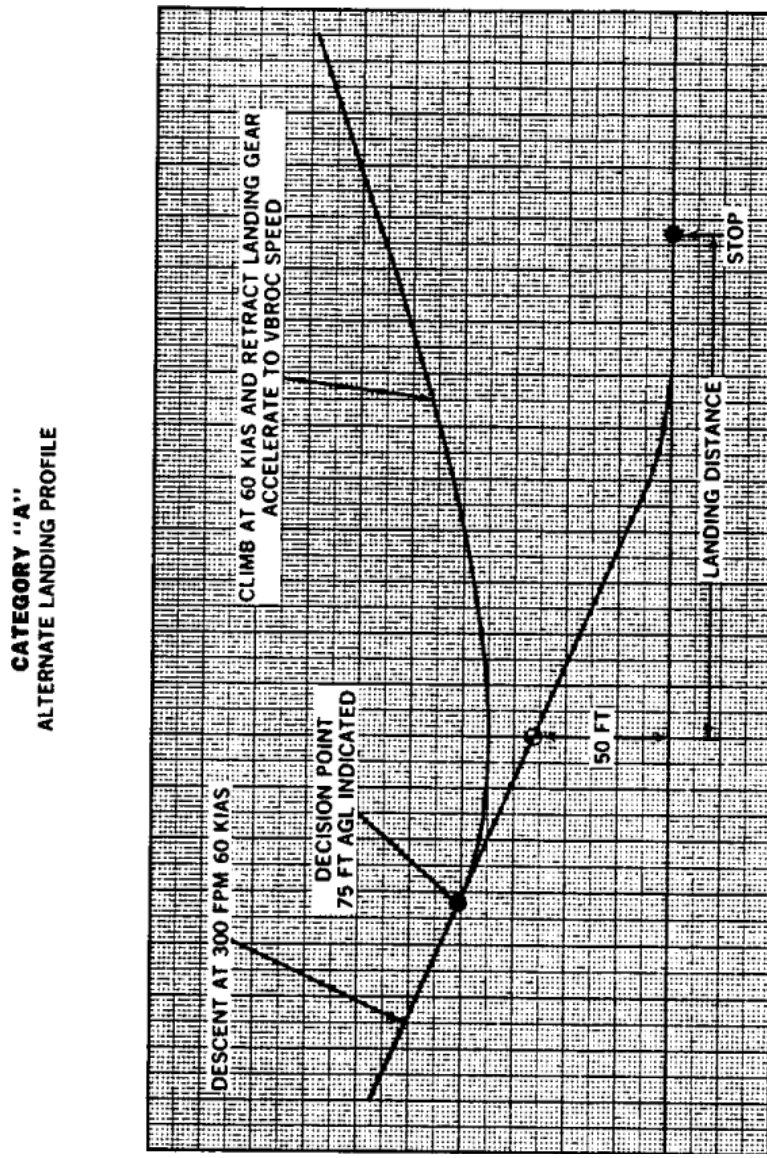

Figure 4-11A. Category "A" Alternate Landing Profile

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This document contains technical data subject to EAR. See WARNING and classifications on first page.

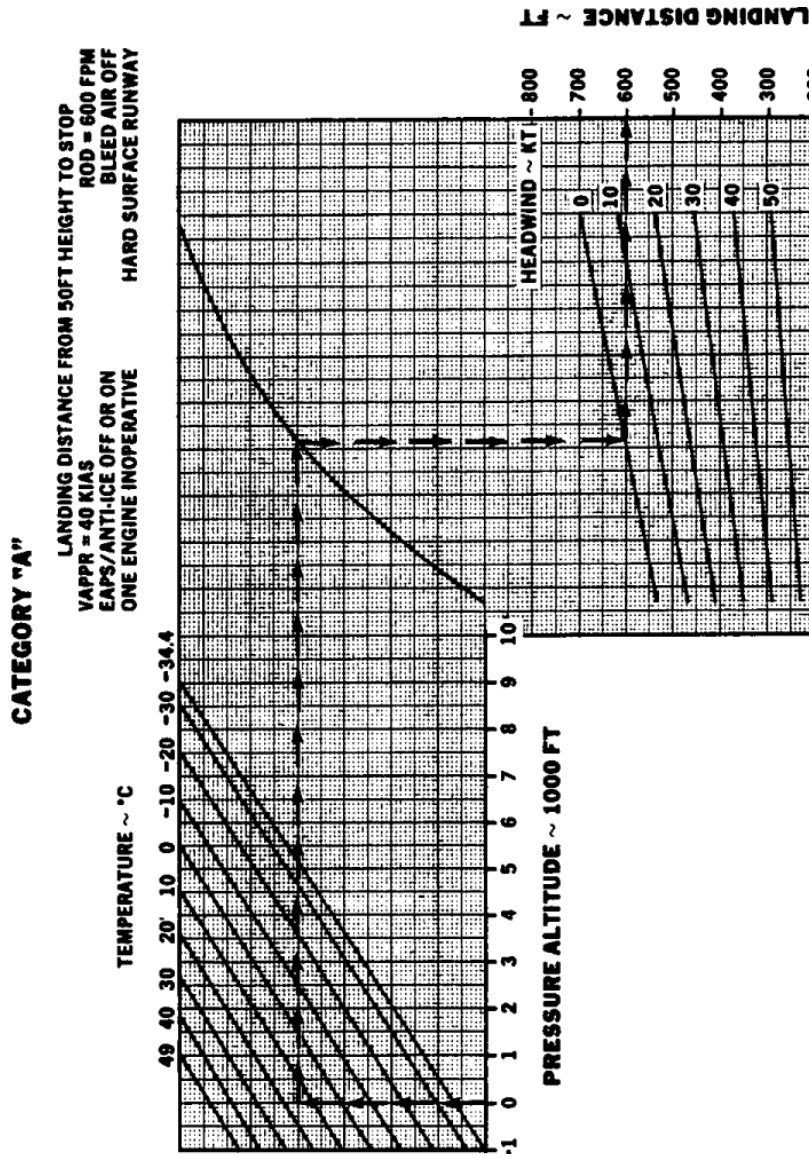

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Figure 4-12. Category "A" Landing Distance

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CATEGORY "B" TAKEOFF

Technique

Rise vertically to 5 foot wheel height. Increase collective pitch to achieve 10% torque above hover torque (not to exceed takeoff power limits) and accelerate forward maintaining 5 to 10 foot wheel height. Rotate nose-up at 50 KIAS, and climb at 55 KIAS until obstructions are cleared.

Associated Conditions

Bleed Air: OFF

EAPS/Anti-ice: OFF or ON

Takeoff Distance

The takeoff distances from 5 foot hover to 50 foot height are shown in Figure 4-13 (Sheet 1 of 2) for EAPS/Anti-ice OFF and Figure 4-13 (Sheet 2 of 2) for EAPS/ Anti-ice ON.

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CATEGORY "B" TAKEOFF DISTANCE

BLEED AIR OFF WIND CALM EAPS/ANTI-ICE OFF
ENGINE: PT6B-36A

OAT ~ °C	PRESSURE ALTITUDE 1000 FT.	GROSS WEIGHT LB. 7,000	8,000	9,000	10,000	11,000	11,700
-34.4	0	630	680	720	760	810	840
	1	670	710	760	800	840	880
	2	700	750	790	840	880	910
	3	740	780	830	870	910	940
	4	780	820	860	900	950	970
	5	820	860	900	940	980	1,010
	6	850	890	930	970	1,010	1,040
	7	890	930	960	1,000	1,040	1,080
	8	930	960	1,000	1,030	1,080	1,120
	9	960	1,000	1,030	1,060	1,120	1,160
	10	1,000	1,030	1,060	1,100	1,160	1,370
	11	1,040	1,060	1,080	1,130	1,270	1,730+
	12	1,070	1,090	1,110	1,170	1,580	2,150+
	13	1,100	1,110	1,140	1,260	1,990+	2,630+
	14	1,130	1,140	1,180	1,560	2,470+	
	15	1,150	1,160	1,230	1,960+	3,000+	
	16	1,170	1,200	1,480	2,440+		
	17	1,190+	1,240+	1,850+	2,980+		
-30	0	650	700	740	780	830	860
	1	690	730	770	820	860	890
	2	720	770	810	850	900	920
	3	760	800	840	890	930	960
	4	800	840	880	920	960	990
	5	830	870	910	950	990	1,020
	6	870	910	950	990	1,020	1,060
	7	910	940	980	1,020	1,060	1,100
	8	940	980	1,010	1,050	1,100	1,140
	9	980	1,010	1,040	1,080	1,140	1,200
	10	1,020	1,040	1,070	1,110	1,170	1,470
	11	1,050	1,070	1,090	1,150	1,350	1,850+
	12	1,090	1,100	1,120	1,190	1,700+	2,290+
	13	1,110	1,120	1,160	1,340	2,130+	
	14	1,140	1,150	1,200	1,680	2,620+	
	15	1,160	1,170	1,300	2,100+	3,190+	
	16	1,180	1,210	1,590	2,600+		
	17	1,200+	1,260+	1,990+	3,160+		
-20	0	690	730	780	820	870	900
	1	730	770	810	860	900	930
	2	760	800	850	890	930	960
	3	800	840	880	920	970	990
	4	840	880	920	960	1,000	1,030
	5	870	910	950	990	1,030	1,070
	6	900	950	980	1,020	1,060	1,110
	7	950	980	1,010	1,050	1,100	1,150
	8	980	1,010	1,040	1,080	1,140	1,180
	9	1,020	1,050	1,070	1,110	1,180	1,390
	10	1,050	1,080	1,100	1,150	1,290	1,740+
	11	1,090	1,100	1,120	1,190	1,600	2,160+
	12	1,110	1,130	1,160	1,290	2,010+	2,640+
	13	1,140	1,150	1,200	1,590	2,470+	
	14	1,160	1,170	1,270	2,000+	3,020+	
	15	1,180	1,220	1,520	2,460+		
	16	1,200+	1,260+	1,900+	3,010+		
	17	1,230+	1,410+	2,340+			

FLIGHT NOT ALLOWED.

OAT ~ °C	PRESSURE ALTITUDE 1000 FT.	GROSS WEIGHT LB. 7,000	8,000	9,000	10,000	11,000	11,700
0	0	770	810	850	890	930	960
	1	800	840	890	930	970	1,000
	2	840	880	920	960	1,000	1,030
	3	880	910	950	990	1,030	1,070
	4	910	950	980	1,020	1,060	1,110
	5	950	980	1,010	1,050	1,100	1,150
	6	980	1,010	1,040	1,080	1,140	1,180
	7	1,020	1,050	1,070	1,110	1,180	1,340
	8	1,050	1,070	1,090	1,150	1,260	1,660
	9	1,090	1,100	1,120	1,190	1,530	2,040+
	10	1,110	1,120	1,160	1,260	1,910+	2,480+
	11	1,140	1,140	1,200	1,520	2,330+	
	12	1,160	1,170	1,250	1,900+	2,830+	
	13	1,180	1,210	1,480	2,330+		
	14	1,200+	1,250+	1,840+	2,840+		
	15	1,220+	1,400+	2,250+			
	16	1,260+	1,670+	2,730+			
20	0	840	880	920	960	1,000	1,030
	1	870	910	950	990	1,030	1,070
	2	910	940	980	1,020	1,060	1,100
	3	940	980	1,010	1,050	1,100	1,140
	4	980	1,010	1,040	1,070	1,140	1,220
	5	1,020	1,040	1,070	1,110	1,170	1,450
	6	1,050	1,070	1,090	1,140	1,360	1,780+
	7	1,080	1,100	1,120	1,180	1,660+	2,140+
	8	1,110	1,120	1,160	1,360	2,020+	2,550+
	9	1,130	1,140	1,190	1,660	2,420+	3,030+
	10	1,150	1,160	1,340	2,010+	2,880+	
	11	1,170	1,200	1,600	2,420+		
	12	1,200+	1,300+	1,970+	2,900+		
	13	1,220+	1,530+	2,370+			
	14	1,260+	1,860+	2,850+			
40	0	900	940	980	1,010	1,050	1,100
	1	940	970	1,010	1,040	1,090	1,210
	2	970	1,000	1,030	1,070	1,150	1,420
	3	1,010	1,030	1,060	1,100	1,330	1,700+
	4	1,040	1,060	1,090	1,150	1,590+	2,000+
	5	1,070	1,090	1,110	1,330	1,890+	2,350+
	6	1,100	1,110	1,150	1,590	2,230+	2,740+
	7	1,130+	1,140+	1,300+	1,890+	2,610+	
	8	1,150+	1,160+	1,540+	2,230+		
	9	1,170+	1,260+	1,830+	2,620+		
	10	1,190+	1,460+	2,180+	3,070+		
	11	1,230+	1,750+	2,570+			
	12	1,380+	2,080+	3,020+			
49	0	930	960	1,000	1,030	1,110	1,370
	1	960	1,000	1,030	1,060	1,300	1,630+
	2	1,000	1,030	1,060	1,130	1,560+	1,920+
	3	1,030+	1,060+	1,080+	1,320+	1,830+	2,230+
	4	1,070+	1,080+	1,140+	1,570+	2,140+	
	5	1,100+	1,110+	1,310+	1,850+		
	6	1,120+	1,160+	1,560+	2,170+		
	7	1,140+	1,300+	1,850+	2,530+		

+ PRESENTED FOR INTERPOLATION ONLY. DATA ABOVE 15,000 FT DENSITY ALTITUDE LIMIT, OR HIGH AMBIENT TEMPERATURE LIMIT, OR EXCEEDS CAT "B" WAT LIMITS.

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Figure 4-13. Category "B" Takeoff Distance, PT6B-36A Engines (Sheet 1 of 2)

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CATEGORY "B" TAKEOFF DISTANCE

BLEED AIR OFF WIND CALM EAPS/ANTI-ICE ON
ENGINE: PT6B-36A

OAT ~ °C	PRESSURE ALTITUDE 1000 FT.	GROSS WEIGHT LB. 7,000	8,000	9,000	10,000	11,000	11,700
-34.4	0	630	680	720	760	810	840
	1	670	710	760	800	840	880
	2	700	750	790	840	880	910
	3	740	780	830	870	910	940
	4	780	820	860	900	950	980
	5	820	860	900	940	980	1,010
	6	850	890	930	970	1,010	1,040
	7	890	930	960	1,000	1,040	1,080
	8	930	960	1,000	1,030	1,080	1,160
	9	960	1,000	1,030	1,060	1,120	1,410
	10	1,000	1,030	1,060	1,090	1,310	1,750+
	11	1,040	1,060	1,080	1,130	1,630+	2,130+
	12	1,070	1,090	1,110	1,310	2,000+	2,560+
	13	1,100	1,110	1,140	1,610	2,420+	
	14	1,130	1,140	1,280	1,990+	2,910+	
	15	1,150	1,160	1,550	2,410+		
	16	1,170	1,230	1,920+	2,910+		
	17	1,190+	1,450+	2,340+			
-30	0	650	690	740	780	830	860
	1	690	730	770	820	860	890
	2	720	770	810	850	900	920
	3	760	800	840	890	930	960
	4	800	840	880	920	960	990
	5	830	870	910	950	990	1,020
	6	870	910	950	990	1,020	1,060
	7	910	940	980	1,020	1,060	1,100
	8	940	980	1,010	1,050	1,110	1,230
	9	980	1,010	1,040	1,070	1,160	1,510
	10	1,020	1,040	1,070	1,110	1,400	1,860+
	11	1,050	1,070	1,100	1,170	1,740+	2,260+
	12	1,090	1,100	1,120	1,400	2,120+	
	13	1,110	1,120	1,160	1,730+	2,560+	
	14	1,140	1,150	1,360	2,120+		
	15	1,160	1,170	1,660	2,560+		
	16	1,190	1,300	2,050+	3,080+		
	17	1,200+	1,550+	2,480+			
-20	0	690	730	780	820	870	900
	1	730	770	810	860	900	930
	2	760	800	850	890	930	960
	3	800	840	880	920	970	990
	4	840	880	920	960	1,000	1,030
	5	870	910	950	990	1,030	1,070
	6	900	950	980	1,020	1,060	1,110
	7	950	980	1,010	1,050	1,100	1,180
	8	980	1,010	1,040	1,080	1,140	1,430
	9	1,020	1,050	1,070	1,110	1,340	1,770+
	10	1,050	1,080	1,100	1,150	1,650+	2,150+
	11	1,090	1,100	1,120	1,340	2,010+	
	12	1,110	1,130	1,160	1,650	2,440+	
	13	1,140	1,150	1,310	2,020+	2,920+	
	14	1,160	1,170	1,600	2,450+		
	15	1,180	1,270	1,960+	2,930+		
	16	1,200+	1,500+	2,380+			
	17	1,230+	1,820+				

FLIGHT NOT ALLOWED.

OAT ~ °C	PRESSURE ALTITUDE 1000 FT.	GROSS WEIGHT LB. 7,000	8,000	9,000	10,000	11,000	11,700
0	0	770	810	850	890	930	960
	1	800	840	890	930	970	1,000
	2	840	880	920	960	1,000	1,030
	3	880	910	950	990	1,030	1,070
	4	910	950	980	1,020	1,060	1,110
	5	950	980	1,010	1,050	1,100	1,150
	6	980	1,010	1,040	1,080	1,140	1,360
	7	1,020	1,050	1,070	1,110	1,290	1,670+
	8	1,050	1,070	1,090	1,150	1,580	2,030+
	9	1,090	1,100	1,120	1,300	1,910+	2,430+
	10	1,110	1,120	1,160	1,580	2,310+	
	11	1,140	1,150	1,290	1,930+	2,750+	
	12	1,160	1,170	1,550	2,330+		
	13	1,180	1,260	1,900+	2,790+		
	14	1,200+	1,490+	2,300+			
	15	1,220+	1,800+	2,740+			
	16	1,390+	2,160+				
20	0	840	880	920	960	1,000	1,030
	1	870	910	950	990	1,030	1,070
	2	910	940	980	1,020	1,060	1,100
	3	940	980	1,010	1,050	1,100	1,230
	4	980	1,010	1,040	1,070	1,180	1,480
	5	1,020	1,040	1,070	1,110	1,390	1,770+
	6	1,050	1,070	1,090	1,190	1,680+	2,110+
	7	1,080	1,100	1,120	1,400	2,000+	2,480+
	8	1,110	1,120	1,190	1,700+	2,380+	
	9	1,130	1,140	1,380	2,030+	2,800+	
	10	1,150	1,180	1,670+	2,400+		
	11	1,170	1,350	2,000+	2,830+		
	12	1,200+	1,610+	2,380+			
	13	1,300+	1,920+	2,810+			
	14	1,500+	2,290+				
40	0	900	940	980	1,010	1,050	1,200
	1	940	970	1,010	1,040	1,150	1,430
	2	970	1,000	1,030	1,070	1,350	1,690+
	3	1,010	1,030	1,060	1,160	1,600+	1,970+
	4	1,040	1,060	1,090	1,350	1,880+	2,290+
	5	1,070	1,090	1,150	1,600+	2,190+	2,650+
	6	1,100	1,110	1,330	1,890+	2,540+	
	7	1,130+	1,160+	1,580+	2,200+		
	8	1,150+	1,300+	1,860+	2,560+		
	9	1,170+	1,510+	2,170+			
	10	1,280+	1,790+	2,530+			
	11	1,460+	2,130+				
	12	1,730+	2,510+				
49	0	930	960	1,000	1,030	1,340	1,650+
	1	960	1,000	1,030	1,160	1,580+	1,920+
	2	1,000	1,030	1,060	1,370	1,850+	2,220+
	3	1,030+	1,060+	1,190+	1,620+	2,140+	
	4	1,070+	1,090+	1,380+	1,890+		
	5	1,100+	1,210+	1,610+	2,170+		
	6	1,120+	1,380+	1,880+			
	7	1,230+	1,600+	2,180+			

+ PRESENTED FOR INTERPOLATION ONLY. DATA ABOVE 15,000 FT DENSITY ALTITUDE LIMIT, OR HIGH AMBIENT TEMPERATURE LIMIT, OR EXCEEDS CAT "B" WAT LIMITS.

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Figure 4-13. Category "B" Takeoff Distance, PT6B-36A Engines (Sheet 2 of 2)

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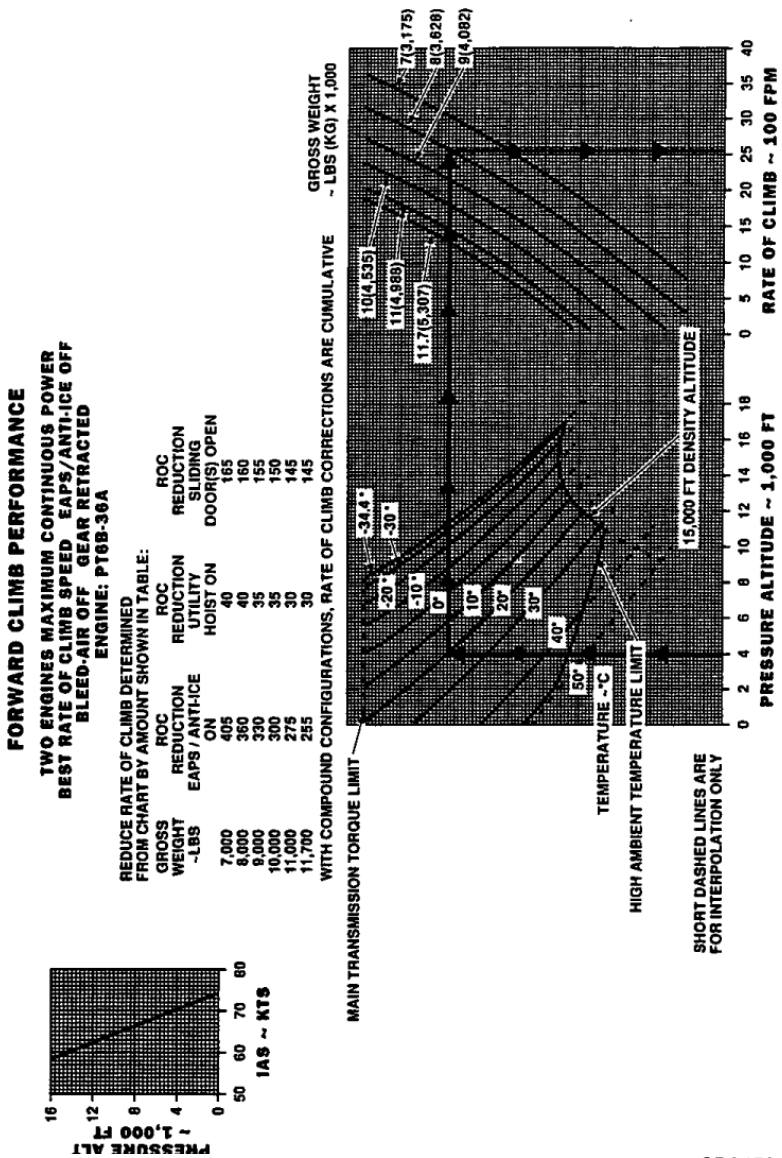

Figure 4-14. Forward Climb Performance –Two Engines, Maximum Continuous Power, PT6B-36A Engines,

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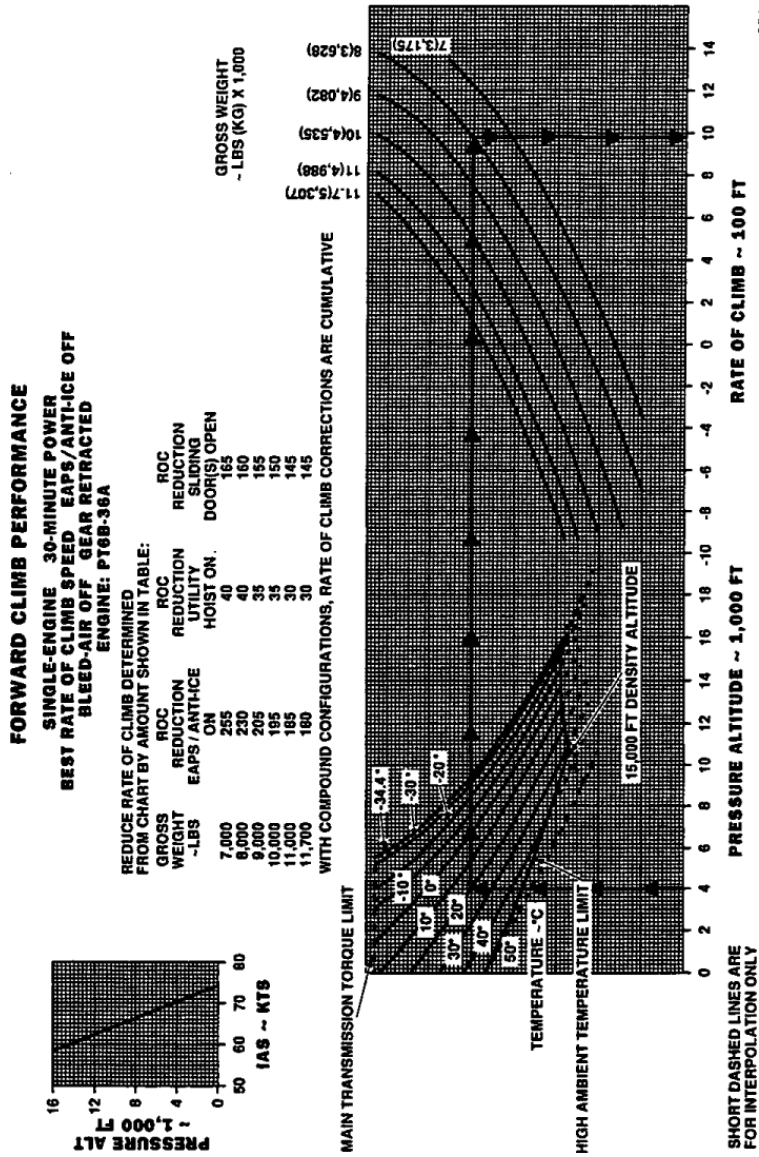

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Figure 4-15. Forward Climb Performance - Single-Engine, 30-Minute Power, PT6B-36A Engines

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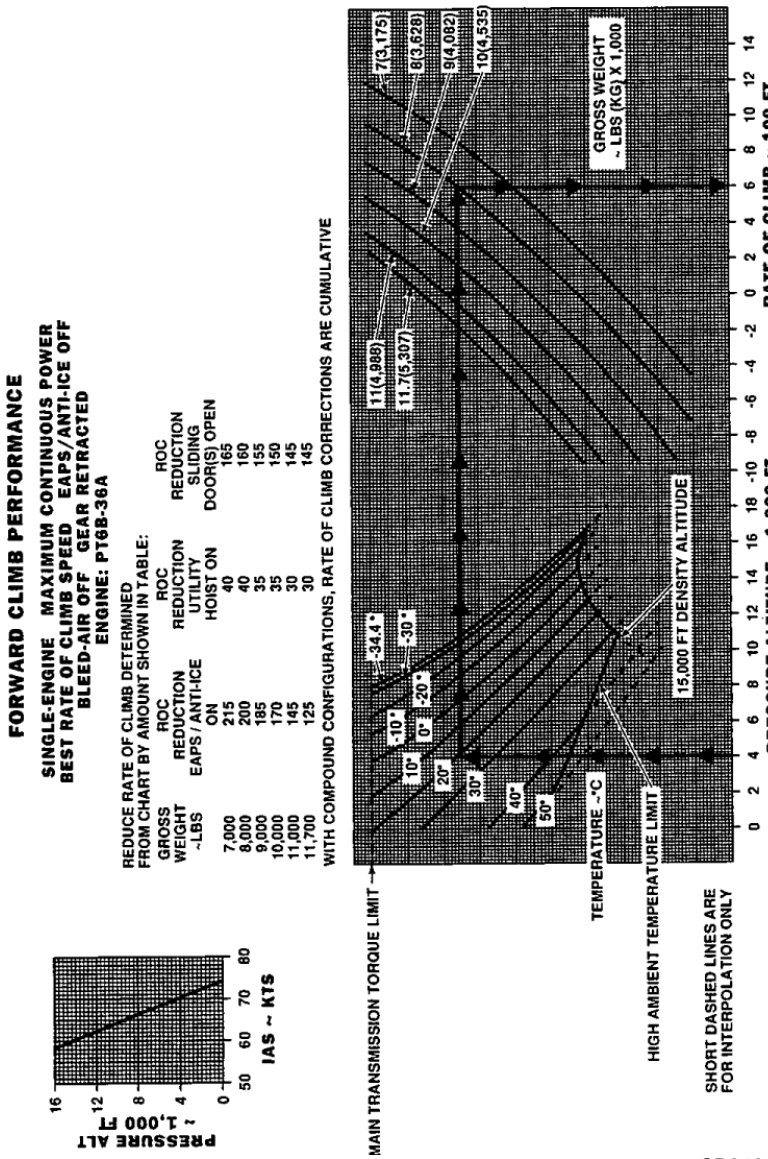

Figure 4-16. Forward Climb Performance - Single-Engine, Maximum Continuous Power, PT6B-36A Engines

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CATEGORY "B" LANDING

Technique

Establish approach to pass through a point 250 feet above the touchdown elevation at 45 KIAS and 600 FPM rate of descent. Initiate a deceleration passing through 50 feet at 45 KIAS. Continue approach and deceleration to a running touchdown or hover. Refer to emergency procedures for single-engine landing.

Associated Conditions

Bleed air: OFF

EAPS/Anti-ice: OFF or ON

Landing Distance

The landing distances shown in Figure 4-17 reflect one engine inoperative landings to a hard-surfaced runway.

CATEGORY "B" LANDING DISTANCE FROM 50 FOOT HEIGHT TO STOP

EAPS / ANTI-ICE OFF OR ON
BLEED AIR OFF WIND CALM
Vappr=45 KIAS ROD=600 FT/MIN
ENGINE: PT6B-36A

PRESSURE ALTITUDE ~1,000 FT	FREE AIR TEMPERATURE~°C									
	-34.4	-30	-20	-10	0	10	20	30	40	49
0	620	630	650	670	690	710	730	760	790	820
1	640	650	670	690	710	740	760	800	830	870
2	660	670	690	710	740	760	800	840	880	920
3	680	690	710	740	760	800	840	890	940	990+
4	700	710	730	760	800	840	890	940	1,000	1,050+
5	720	730	760	800	850	900	950	1,010	1,070	1,130+
6	740	760	800	850	900	960	1,020	1,080	1,150	1,220+
7	780	800	850	900	960	1,020	1,090	1,160	1,250+	1,340+
8	820	840	900	960	1,030	1,090	1,170	1,260	1,390+	
9	870	900	960	1,030	1,100	1,180	1,280	1,410	1,570+	
10	930	960	1,030	1,100	1,190	1,290	1,430	1,610	1,800+	
11	990	1,030	1,100	1,190	1,300	1,450	1,630	1,840+	2,040+	
12	1,060	1,100	1,190	1,310	1,470	1,660	1,870+	2,080+		
13	1,150	1,190	1,310	1,480	1,680	1,900+	2,110+			
14	1,250	1,310	1,490	1,700	1,920+	2,140+				
15	1,400	1,490	1,710	1,940+	2,170+					
16	1,600	1,710	1,950+	2,190+						
17	1,840+	1,960+	2,200+							

LANDING NOT ALLOWED

+ PRESENTED FOR INTERPOLATION ONLY. DATA ABOVE 15,000 FT DENSITY ALTITUDE LIMITS OR HIGH AMBIENT TEMPERATURE LIMIT.

CB0744
SA

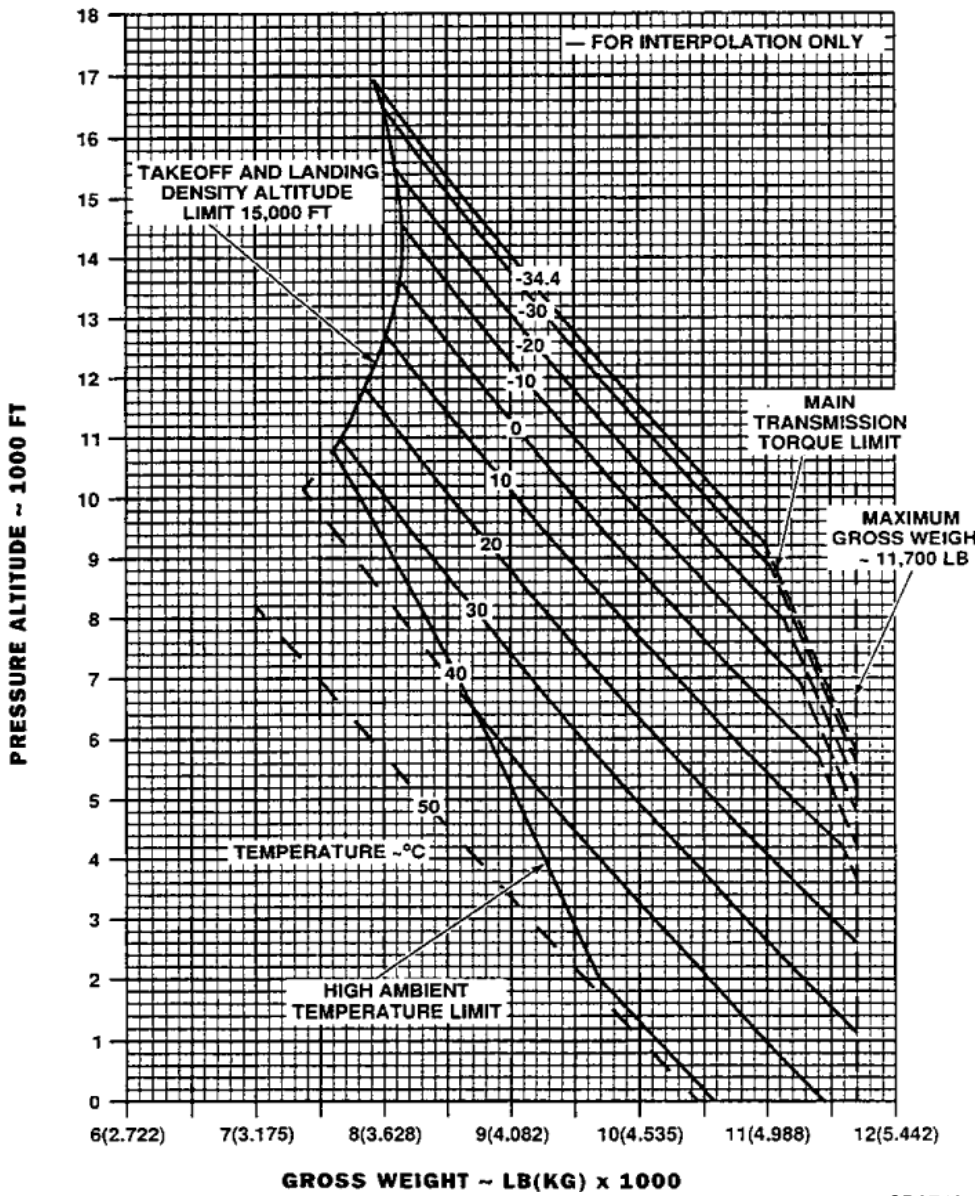
Figure 4-17. Category "B" Landing Distance, PT6B-36A Engines

This document contains technical data subject to EAR. See WARNING and classifications on first page

HOVER OUT OF GROUND EFFECT

TAKEOFF POWER
BLEED AIR OFF EAPS/ANTI-ICE OFF

ENGINE: PT6B-36A



CB0743
SA

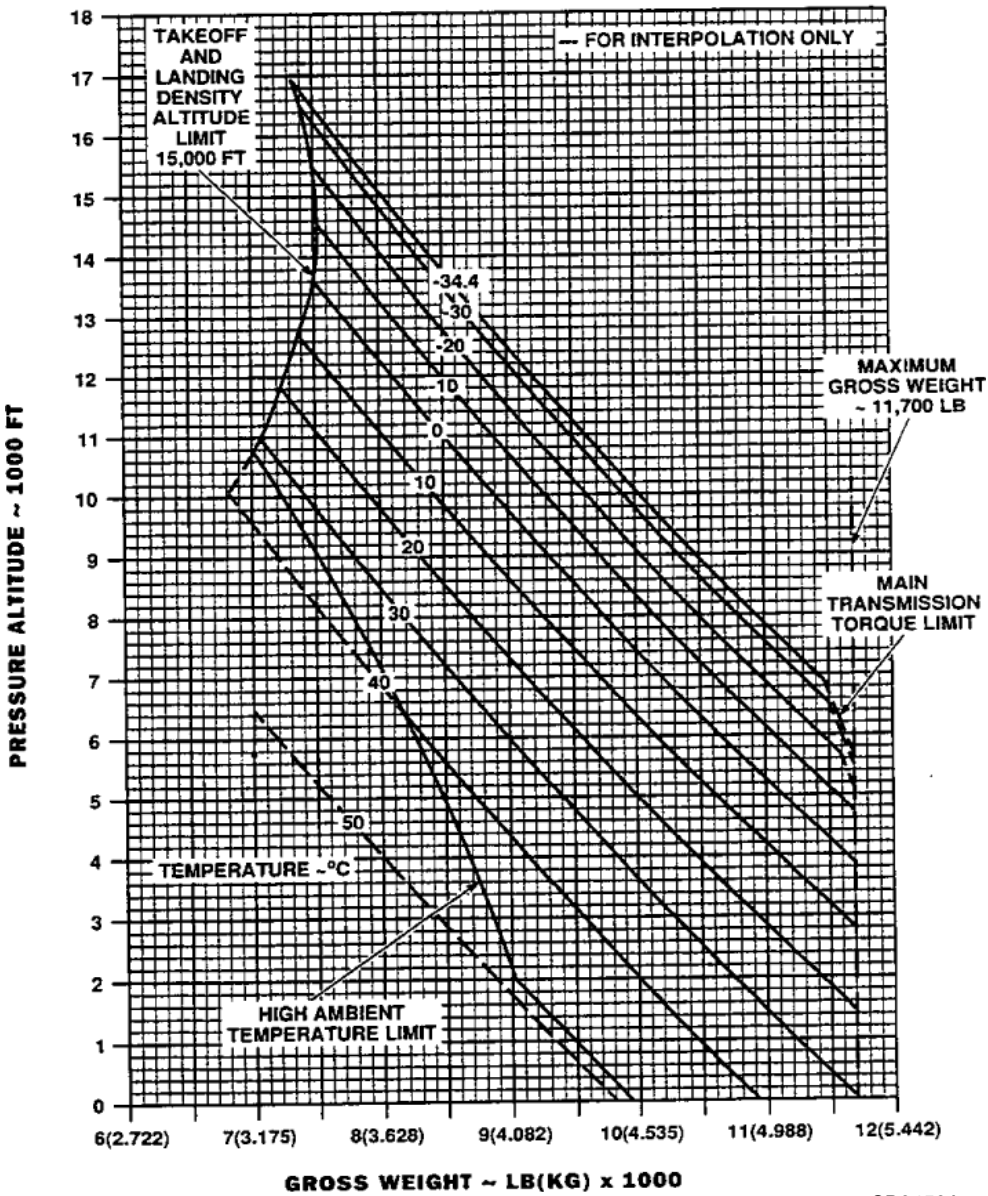
Figure 4-18. Hover Out of Ground Effect - EAPS OFF, PT6B-36A Engines

This document contains technical data subject to EAR. See WARNING and classifications on first page

HOVER OUT OF GROUND EFFECT

TAKEOFF POWER
BLEED AIR ON EAPS/ANTI-ICE ON

ENGINE: PT6B-36A



CB0453A
SA

Figure 4-19. Hover Out of Ground Effect - EAPS ON, PT6B-36A Engines

This document contains technical data subject to EAR. See WARNING and classifications on first page

S-76B FAA SUPPLEMENT INDEX

INTRODUCTION

The supplements listed below are not applicable to every serial number helicopter. The operator is only required to have those supplements that pertain to the equipment installed on their helicopter. If the operator installs the equipment described in a supplement at a later date, the applicable supplement may be ordered from Sikorsky Aircraft.

NOTE

Only Part 1 of the supplements is FAA approved; Part 2 listings are for reference purposes only.

Annotate with an **"X"** in the **APPLICABLE** column those supplements that apply to your helicopter. Please update any revised Supplement Index, as required, when received with future changes.

SUPP. NO.	APPLICABLE	SUBJECT	PART 1 REV. NO.	PART 1 REV. DATE	PART 2 REV. NO.	PART 2 REV. DATE
	_____	**RDL SUPPLEMENTS**				
1	_____	RACAL-DECCA RNAV Type A04	Basic	1/18/88	N/A	N/A
		VENDOR SUPPLEMENTS				
1	_____	SPZ-7000 Digital Flight Control System for Sikorsky S-76B Helicopter, Publication No. 27-5120-10-01	Basic	4/10/92	N/A	N/A
		FAA SUPPLEMENTS – NORTHERN REGION				
1	_____	Lowspeed Approach Procedures for Helicopters with Landing System	1	2/5/87	N/A	N/A
2	_____	Performance and Operating Data for Helicopters PT6B-36 Engines	3	6/7/88	Basic	10/24/86
3	_____	Canceled				
4	_____	PN 76076-65003-011 Tail Rotor Servo Shutoff Valve	Basic	7/10/87	Basic	7/10/87
5	_____	DC Essential Bus Recovery System	Basic	8/25/88	Basic	3/6/89
6	_____	Alternate Static Source	Basic	11/15/89	Basic	11/15/89

This document contains technical data subject to EAR. See WARNING and classifications on first page

SUPP. NO.	APPLICABLE	SUBJECT	PART 1 REV. NO.	PART 1 REV. DATE	PART 2 REV. NO.	PART 2 REV. DATE
7	_____	Litter Installation	Basic	11/29/90	Basic	11/29/90
8	_____	Metair Life Raft Deployment System	Basic	11/2/90	Basic	11/2/90
9	_____	Category A Vertical Operations from Ground Level Heliports	Basic	11/2/94	Basic	11/2/94
10	_____	PT6B-36A Engine MV 29 Software Modification	1	3/4/96	1	3/4/96
11	_____	PT6B-36B Engine Installation	4	7/11/00	3	10/8/96
12	_____	Superseded by Supplement No. 11, Revision No. 3 or later approved revision.				
13	_____	AEM Loud Hailer	Basic	11/21/94	Basic	11/21/94
14	_____	Snow Landing System	Basic	12/9/94	Basic	12/9/94
15	_____	Bendix RDR-1400C Weather Radar	1	12/5/96	Basic	12/19/94
16	_____	Not printed				
17	_____	Parker-Gull Integrated Instrument Display System (IIDS)	1	6/6/00	1	6/6/00
18	_____	Collins RTU 4200	Basic	12/19/96	N/A	N/A
19	_____	Not printed				
20	_____	Dual Static Inverter AC Power System	1	11/6/03	N/A	N/A
76	_____	Data Nav V Display System	2	10/20/00	N/A	N/A
77	_____	Argus 7000 or Argus 7000/CE Moving Map Display System	5	10/20/00	N/A	N/A
78	_____	Global Wulfsburg Automatic Flight Information System (AFIS)	Basic	9/15/97	N/A	N/A
79	_____	Model 655 Davtron 5 Function Indicator System	Basic	9/12/97	Basic	9/12/97
80	_____	Magnastar C-2000 Digital Airbome Telephone	1	10/20/00	N/A	N/A
81	_____	Heads Up CMS-400 Checklist Management System	Basic	10/15/97	1	10/7/98
82	_____	RDR 2100 Color Weather Radar System	1	5/22/98	Basic	7/24/97

This document contains technical data subject to EAR. See WARNING and classifications on first page

Supp. No.	Applicable	Subject	Part 1 Rev. No.	Part 1 Rev. Date	Part 2 Rev. No.	Part 2 Rev. Date
83	_____	BF Goodrich Stormscope ® WX-950 Weather Mapping System	2	10/20/00	1	10/20/00
84	_____	Heads Up PBS-250 Passenger Briefer System	Basic	9/12/97	Basic	9/12/97
85	_____	GC 360A Radar Graphics Computer System	1	9/2/98	1	9/2/98
86	_____	Allied Signal ED-56A Solid State Cockpit Voice Recorder System	Basic	7/25/97	Basic	7/25/97
87	_____	Retractable Boarding Steps	1	3/19/98	1	3/19/98
88	_____	Not applicable				
89	_____	Windshield Defogger System	Basic	11/6/97	N/A	N/A
90	_____	Emergency Locator Transmitter	2	4/15/02	1	4/15/02
91	_____	Honeywell Primus P-700/701 Radar System	1	6/20/01	N/A	N/A
92	_____	Baker Cockpit/Cabin Audio System	1	9/2/98	1	9/2/98
93	_____	Shadin ADC Accessory Box	Basic	10/31/97	Basic	10/31/97
94	_____	Trimble 2101 I/O Approach Navigator System	Basic	10/31/97	N/A	N/A
95	_____	LITEF LCR-92S AHRS	4	2/17/99	N/A	N/A
96	_____	Honeywell EDZ-756 5x6 Electronic Flight Instrument System (EFIS)	Basic	10/22/97	N/A	N/A
97	_____	Fixed Landing Light(s)	Basic	10/22/97	1	10/30/98
98	_____	Global Wulfsburg Systems Flexcomm II Transceiver with C-5000 Control	2	6/20/01	1	6/20/01
99	_____	Metair Long Range Fuel System	2	11/7/00	1	11/7/00
100	_____	Dual Honeywell SRZ-850 Integrated Radio System	2	12/3/98	N/A	N/A
101	_____	Precise Flight Pulselight System	Basic	10/22/97	Basic	10/22/97

This document contains technical data subject to EAR. See WARNING and classifications on first page

Supp. No.	Applicable	Subject	Part 1 Rev. No.	Part 1 Rev. Date	Part 2 Rev. No.	Part 2 Rev. Date
102	_____	Flitefone VI	1	5/22/98	N/A	N/A
103	_____	Grimes Recognition Lights	Basic	10/22/97	Basic	10/22/97
104	_____	J.E.T. Standby Attitude Indicator, ADI-335D	2	2/4/03	N/A	N/A
105	_____	Honeywell Single AA-300 Radio Altimeter System	2	11/27/98	2	11/27/98
106	_____	UNS-1D FMS Flight Management System (FMS)	2	10/20/00	N/A	N/A
107	_____	Cabin ECS System	1	10/20/00	1	10/20/00
108	_____	Cabin Lighting Control System	1	9/23/98	2	10/7/98
109	_____	Logo Light System	1	3/2/00	Basic	12/5/97
110	_____	Collins Dual or Single ALT-55B Radio Altimeter System	2	4/28/98	2	4/28/98
111	_____	Not applicable				
112	_____	Not Printed				
113	_____	Honeywell LSZ-860 Lightning Sensor System	1	6/20/01		
114	_____	Not applicable				
115	_____	Northern Airborne Technology NTX-138 Mission Radio System	Basic	12/22/97	Basic	12/22/97
116	_____	Bendix/King CAS-66A TCAS I Traffic Collision Avoidance System	Basic	3/30/98	N/A	N/A
117	_____	Category “B” Operations With 9 or Less Passenger Seats	1	4/15/02	N/A	N/A
118	_____	Collins MDF-124F and MDF-124F(V2) Direction Finder System	1	6/20/01	N/A	N/A
119	_____	Hunting Aviation/Metair Long Range Fuel System	3	7/3/01	1	7/3/01
120	_____	Primus 880 Radar	1	10/20/00	N/A	N/A
121	_____	BF Goodrich Skywatch Traffic Advisory System SKY497	1	6/20/01	1	6/20/01
122	_____	Automatic Cabin Temperature System	1	10/20/00	1	10/20/00

This document contains technical data subject to EAR. See WARNING and classifications on first page

Supp. No.	Applicable	Subject	Part 1 Rev. No.	Part 1 Rev. Date	Part 2 Rev. No.	Part 2 Rev. Date
123	_____	Collins RTU 4200 Radio Control Unit	1	10/20/00	N/A	N/A
124	_____	Not Printed				
125	_____	Dual Honeywell EDZ-705 EFIS	Basic	4/29/98	N/A	N/A
126	_____	Spectrolab Nightsun Searchlight	2	4/15/02	1	6/20/01
127	_____	Sikorsky Radar Altimeter Warning System	1	10/24/03	1	10/24/03
128	_____	FLIR Systems 2000HP FLIR or Ultra Media Camera System	1	6/20/01	1	6/20/01
129	_____	UNS-1B+ Multi-Mission Management System (MMMS	Basic	4/30/98	N/A	N/A
130	_____	Aux Bus Supplemental Battery Power Pack	1	4/15/02	1	4/15/02
131	_____	Lucas Variable Speed Utility Hoist	Basic	4/28/98	Basic	4/28/98
132	_____	#1 HYD LOW Annunciator	Basic	5/20/98	Basic	5/20/98
133	_____	Not Printed				
134	_____	Astronautics Electro-Mechanical Flight Reference Indicators			1	10/5/98
135	_____	Andrea Cockpit/Cabin Audio System	Basic	8/17/98	Basic	8/17/98
136	_____	Trimble 2101 I/O Approach Plus GPS Navigator System	1	10/20/00	N/A	N/A
137	_____	Honeywell Primus 500	Basic	9/2/98	N/A	N/A
138	_____	Radio Master System	Basic	8/17/98	Basic	8/17/98
139	_____	NAT 110/220 Watt Loud Hailer System	1	7/3/01	2	11/21/03
140	_____	Two-Action, Hinged-Door Jettison	1	11/25/03	N/A	N/A
141	_____	Global Wulfsberg GNS-XLS Flight Management System (FMS)	Basic	9/2/98	N/A	N/A
142	_____	Honeywell AV-850A Cockpit/Cabin Audio System	1	10/20/00	1	10/20/00

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Supp. No.	Applicable	Subject	Part 1 Rev. No.	Part 1 Rev. Date	Part 2 Rev. No.	Part 2 Rev. Date
143	_____	Allied Signal IU-2023B Graphics Unit Computer System With CC-2024D Checklist Control Unit	Basic	12/3/98	N/A	N/A
144	_____	Primus 440 Digital Weather Radar System	Basic	7/15/99	N/A	N/A
145	_____	DB Systems Audio System	2	2/4/03	1	12/5/00
146	_____	Motorola Astro Spectra Radio	Basic	7/15/99	Basic	7/15/99
147	_____	ARNAV MFD 5200 Multifunction Display	Basic	7/15/99	Basic	7/15/99
148	_____	B.F. Goodrich WX-500 Stormscope System	Basic	7/15/99	Basic	7/15/99
149	_____	Tactical Communication System	Basic	7/15/99	Basic	7/15/99
150	_____	Not Printed				
151	_____	Spectrolab SX-5 Starburst Searchlight	1	11/13/03	1	11/13/03
152	_____	Grime Scene Lights	N/A	N/A	Basic	6/24/99
153	_____	Devore Rotor Disc Light	N/A	N/A	Basic	6/24/99
154	_____	Cabin Electrical System	N/A	N/A	2	11/2/02
155	_____	Seven-Place VIP Interior	N/A	N/A	Basic	9/16/99
156	_____	EMS Interior	N/A	N/A	Basic	8/12/99
157	_____	Six-Place VIP Interior	N/A	N/A	2	11/1/99
158	_____	Honeywell MK XXII Enhanced Ground Proximity Warning System	Basic	2/9/01	Basic	2/9/01
		FAA Supplements – Southern Region				
S-1	_____	UNS-1 Jr. Navigation System	2	3/30/87	N/A	N/A
S-2	_____	UNS-1 Navigation System	2	3/30/87	N/A	N/A
S-3	_____	KNS-660 Fight Management System	2	2/7/91	N/A	N/A
S-4	_____	RCA Data Nav III System	Basic	12/3/85	N/A	N/A
S-5	_____	MLS-21 Microwave Landing System	2	5/21/92	N/A	N/A

This document contains technical data subject to EAR. See WARNING and classifications on first page

Supp. No.	Applicable	Subject	Part 1 Rev. No.	Part 1 Rev. Date	Part 2 Rev. No.	Part 2 Rev. Date
S-6	_____	Not printed			N/A	N/A
S-7	_____	Metair Long Range Fuel System PN 33776-61049-013 (Forward) or 33776-61049-014 (Aft)	Basic	5/23/86	N/A	N/A
S-8	_____	GNS-500 Navigation System	1	7/11/86	N/A	N/A
S-9	_____	UNS-1 Jr. Navigation	1	7/11/86	N/A	N/A
S-10	_____	Long Range Fuel System PN 14-54	1	1/30/95	1	1/30/95
S-11	_____	Bendix Aerospace RDS-86 Weather Radar System	Basic	10/17/86	N/A	N/A
S-12	_____	Bendix Aerospace RDS-84 Weather Radar System	Basic	4/7/87	N/A	N/A
S-13	_____	UNS-1 Navigation System	1	1/10/89	N/A	N/A
S-14	_____	Fixed Landing Light	1	1/31/95	N/A	N/A
S-15	_____	Dual Honeywell SRZ-850 Integrated Radio System	1	7/23/97	N/A	N/A
S-16	_____	Emergency Medical Systems (EMS) Interior	Basic	4/20/89	N/A	N/A
S-17	_____	Not printed				
S-18	_____	Dual Honeywell EDZ-705 Electronic Flight Instrument System	1	6/13/89	N/A	N/A
S-19	_____	Honeywell Primus P-870 Radar	Basic	1/11/88	N/A	N/A
S-20	_____	Honeywell LSZ-850 Lightning Sensor System	1	7/2/03	N/A	N/A
S-21	_____	Not printed				
S-22	_____	Cabin Lighting Control System	Basic	11/28/88	N/A	N/A
S-23	_____	Cabin Environmental Control System (ECS)	1	6/16/94	N/A	N/A
S-24	_____	Global Wulfsberg Systems Flitefone VI	Basic	11/28/88	N/A	N/A
S-25	_____	Grimes Recognition Lights	Basic	11/28/88	N/A	N/A
S-26	_____	ARNAV ELT-100HM	Basic	12/21/89	N/A	N/A
S-27	_____	Pulselite System	Basic	11/28/88	N/A	N/A

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Supp. No.	Applicable	Subject	Part 1 Rev. No.	Part 1 Rev. Date	Part 2 Rev. No.	Part 2 Rev. Date
S-28	_____	GNS-500 Navigation System	Basic	3/22/89	N/A	N/A
S-29	_____	Searchlight Mod Switch Relocation	1	2/6/89	N/A	N/A
S-30	_____	UNS-1A Flight Management System	1	5/9/91	N/A	N/A
S-31	_____	Foxtronics Dual Battery Temp. Monitor System	Basic	6/13/89	N/A	N/A
S-32	_____	Superseded by Supplement No. 109				
S-33	_____	Spectrolab Nightsun Searchlight	Basic	11/23/94	N/A	N/A
S-34	_____	Not printed				
S-35	_____	Collins DF-301E	Basic	10/11/90	N/A	N/A
S-36	_____	Collins ALT-55B Radio Altimeter System	Basic	4/19/90	N/A	N/A
S-37	_____	Baker Cockpit/Cabin Audio System	Basic	8/29/95	N/A	N/A
S-38	_____	Not printed				
S-39	_____	Honeywell Primus P-700 Rader	1	6/16/92	N/A	N/A
S-40	_____	RACAL RNAV2 Navigation Management System	Basic	10/18/90	N/A	N/A
S-41	_____	Not printed				
S-42	_____	Radio Altitude Warning System (RAWS)	Basic	4/23/90	N/A	N/A
S-43	_____	Honeywell Data Nav III	1	7/2/03	N/A	N/A
S-44	_____	Not printed				
S-45	_____	Bendix EFS-10 Five Tube EFIS System	Basic	7/20/90	N/A	N/A
S-46	_____	Variable Speed Utility Hoist	1	2/7/97	1	2/7/97
S-47	_____	Sliding Cabin Doors	Basic	6/21/91	Basic	4/27/90
S-48	_____	Not printed				
S-49	_____	Cargo Hook Load Indicating System	Basic	4/27/90	Basic	4/27/90
S-50	_____	TNL-7880 Long Range Navigation System	2	9/16/93	N/A	N/A
S-51	_____	UNS-1A Long Range Navigation System	2	12/30/93	N/A	N/A
S-52	_____	Not printed				
S-53	_____	Not printed				

This document contains technical data subject to EAR. See WARNING and classifications on first page

Supp. No.	Applicable	Subject	Part 1 Rev. No.	Part 1 Rev. Date	Part 2 Rev. No.	Part 2 Rev. Date
S-54	_____	UNS-1B Multi-Mission Management System and UNS-1B Flight Management System	2	7/26/95	N/A	N/A
S-55	_____	Rogerson Kratos Integrated Instrument Display System (IIDS)	2	7/2/03	N/A	N/A
S-56	_____	Not printed				
S-57	_____	Trimble Navigation TNL 2100T (IO) GPS Navigator	Basic	6/16/95	N/A	N/A
S-58	_____	Airdata Accessory Unit	Basic	6/16/94	N/A	N/A
S-59	_____	Honeywell EDZ-756 5 X 6 Electronic Flight Instrument System (EFIS)	Basic	3/7/94	N/A	N/A
S-60	_____	Lucas Variable Speed Utility Hoist	2	2/7/97	N/A	N/A
S-61	_____	FLIR Systems 2000HP FLIR	1	12/23/94	N/A	N/A
S-62	_____	Not printed				
S-63	_____	LITEF LCR-92S AHRS	2	4/30/97	N/A	N/A
S-64	_____	Bendix King CAS-66A TCAS I Traffic Collision Avoidance System	Basic	11/11/94	N/A	N/A
S-65	_____	Automatic Cabin Temperature System	2	8/21/97	B	8/21/97
S-66	_____	J.E.T. Standby Attitude Indicator, ADI-335D	1	1/23/96	N/A	N/A
S-67	_____	Global Wulfsberg GNS-XLS Flight Management System	1	7/24/97	N/A	N/A
S-68	_____	Trimble 2101 I/O Approach Navigator System	Basic	2/20/97	N/A	N/A
S-69	_____	Superseded by Supplement No. 106, Revision 1 or later approved revision				
S-70	_____	Allied Signal KLN 90B GPS	Basic	9/11/96	N/A	N/A
S-71	_____	Wulfsburg Dual Flexcomm II with Single RT-7200 Transceiver System	Basic	3/21/96	N/A	N/A
S-72	_____	Allied Signal KTU-709 TACAN System	Basic	3/21/96	N/A	N/A

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SUPP. NO.	APPLICABLE	SUBJECT	PART 1 REV. NO.	PART 1 REV. DATE	PART 2 REV. NO.	PART 2 REV. DATE
S-73	_____	UNS-1M Navigational Management System (NMS)	Basic	4/18/97	N/A	N/A.66
S-74	_____	Bendix AN/APX-100(V) IFF/Transponder System	Basic	4/18/97	N/A	N/A
S-76	_____	Honeywell Single AA-300 Radio Altimeter System	Basic	3/21/96	N/A	N/A

This document contains technical data subject to EAR. See WARNING and classifications on first page

SA 4047-76B-1

ROTORCRAFT

FLIGHT MANUAL

REVISION NO. 13

SIKORSKY

MODEL

S-76B

PART 2

SYSTEMS DESCRIPTION, LOADING INFORMATION, NOISE ABATEMENT, AND CRUISE PERFORMANCE DATA

SIKORSKY
A LOCKHEED MARTIN COMPANY

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DATE OF ISSUE:
OCTOBER 31, 1985

Date of Revision:
August 15, 2011

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WARNING

Operating the aircraft in configurations not authorized by Sikorsky Aircraft, or failure to comply with the limitations and procedures in this Flight Manual, may result in damage to equipment, personal injury or loss of life.

OCTOBER 31, 1985
Revised August 15, 2011

This document contains technical data subject to EAR. See WARNING and classifications on first page.

ERRATA SHEET

ROTORCRAFT FLIGHT MANUAL

Date of Approval 15 August 2011

This ERRATA replaces the title page to include new Lockheed Martin company logo and export statement footers

Sikorsky Aircraft Corporation has already inserted the new page. No further action required on customer's behalf

Removed Pages	Inserted Pages
Title Page with Old Logo	Title Page with New Logo

This page does not contain export controlled technical data.

This page does not contain export controlled technical data.

S-76B
FLIGHT MANUAL

PART 2

LOG OF TEMPORARY REVISIONS

TEMPORARY REVISION NO.	ISSUE DATE	INCORPORATED / SUPERSEDED	
		BY REV. NO.	ISSUE DATE
*1	4/22/16		

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LOG OF TEMPORARY REVISIONS

APRIL 22, 2016

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REVISION NO.	PAGES REVISED	REMARKS	DATE
1	ii, 1-1, 1-2, 1-7, 1-15, 1-16A, 1-16B, 1-16C, 1-16D, 1-16E, 1-18, 1-19, 1-32,1-32A, 1-44, 1-45, 1-47	Added EEC systems. Revised fuel system, batteries, inverter.	6/17/86
2	1-9, 1-11, 1-16A, 1-16C, 1-16D, 1-16E, 1-27	Revised engine and EEC systems.	10/24/86
3	i, ii, iii, iv, 1-81, 1-82, 5-1, 5-2, 5-3, 5-4, 5-5, 5-6	Added T_5 bias box and single engine training procedures.	5/26/87
4	iii, 1-16C, 1-25, 1-27, 1-32, 1-33, 1-41, 1-43, 1-44A, 1-45, 1-46, 1-48, 1-60, 1-63, 1-65, 2-17	Revised EEC fault codes, EAPS switch panel, engine overspeed system, battery switch, load shed switch, caution advisory panel, engine fire extinguisher system and Chart A.	5/31/88
5	2-4, 2-5, 2-6, 3-4, 3-5, 3-6, 3-7, 3-8, 5-5	Revised to provide increased gross weight to 11,700 pounds.	6/7/88
6	1-8, 1-18, 1-19, 1-37, 1-38, 1-39, 1-41, 2-4, 2-12 thru 2-28A, 3-4, 3-7	Revised power assurance values placard, circuit breaker panel figure titles, center of gravity charts, and chart A figures.	10/19/89

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8	2-1, 2-4, 3-37	Added chart A clarification. Revised sliding door table.	7/12/93
9	v, 5-7, 5-8, 5-9, 5-10, 5-11, 5-12, 5-13, 5-14, 5-15, 5-16	Added fuel consumption charts.	3/19/96
10	iii, 1-1, 1-7, 1-8, 1-9, 1-10, 1-10A, 1-10B, 1-10C/1-10D, 4-1, 4-2	Updated List of Illustrations. Updated Table of Contents for Section I. Added Guidelines for Passenger Boarding and Exit, Cargo Loading and Ground Operations with Engines and/or Rotors Turning. Revised Noise Abatement procedures.	11/4/02
11	1-10A, 1-10B	Revised Guidelines for Passenger Boarding and Exit.	3/16/07

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12	1-10, 5-17, 5-18, 5-19, 5-20, 5-21, 5-22, 5-23, 5-24, 5-25, 5-26, 5-27, 5-28	Updated Recommended Personnel Exit and Approach illustration. Added performance information in Supplemental Performance Data section.	2/12/10
13	Reverse Title	Added warning.	8/15/2011

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FLIGHT MANUAL

PART 2

ACTIVE TEMPORARY REVISIONS

TEMPORARY REVISION NO.	PAGES REVISED	REMARKS	DATE
*1	5-29, 5-30 5-31, 5-32	Revised Supplemental Performance Data – Performance Charts.	4/22/16

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ACTIVE TEMPORARY REVISIONS

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SECTION I

DESCRIPTION

GENERAL DESCRIPTION

The Model S-76B, manufactured by Sikorsky Aircraft Corporation, Division of United Technologies Corporation, is a twin engine, single main rotor helicopter designed to carry up to 13 passengers and a pilot. Flight controls and instrumentation for a second pilot are also available as optional equipment. Various cabin configurations are available and range from the standard interior arrangement to a four- to eight-place executive version. Four large doors provide easy entrance and exit from the cabin. The four-bladed main rotor is mounted on the main gear box, which is directly above the cabin. The two Pratt and Whitney PT6B-36A gas turbine engines are mounted side-by-side aft of the main gear box. Both engines have separate drive inputs to the main transmission, which reduce engine rpm and distribute torque upward to drive the main rotor, and aft through intermediate and tail gear boxes to drive the four-bladed tail rotor. Flight control forces from the main and tail rotor blades are reacted by a two-stage hydraulic servo system. The main rotor flight controls have a stick positioning and force gradient system. The tricycle-type landing gear is hydraulically retractable. Dimensions are shown on Figure 1-2.

ENTRANCES AND EXITS

Four doors, two on each side of the fuselage, are provided. Entrance to the pilot's compartment and the first row of passenger seats, when equipped with the standard three rows of passenger seats, is through the left and right forward doors. Entrance to the second and third rows of passenger seats is through the left and right aft doors.

GUIDELINES FOR PASSENGER BOARDING AND EXIT, CARGO LOADING AND GROUND OPERATIONS WITH ENGINES AND/OR ROTORS TURNING

Turning rotors represent considerable hazard to any persons in their vicinity. The best method for prevention of rotor strike incidents are training of flight and ground crew and effective briefing of passengers. Because well-trained and briefed persons can become preoccupied and helicopter operations may involve areas where access control is limited, special attention must be given to the particular capabilities and characteristics of the S-76 whenever the engines and/or rotors are turning.

MAIN ROTOR CLEARANCE

The minimum clearance of the main rotor at 107% N_r and flat pitch is nominally 8 feet at the front of the helicopter. This clearance, while normally sufficient for safe approach and departure, can be reduced significantly by a number of factors. These factors include control position, rotor speed, winds, and terrain variation.

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FLIGHT MANUAL

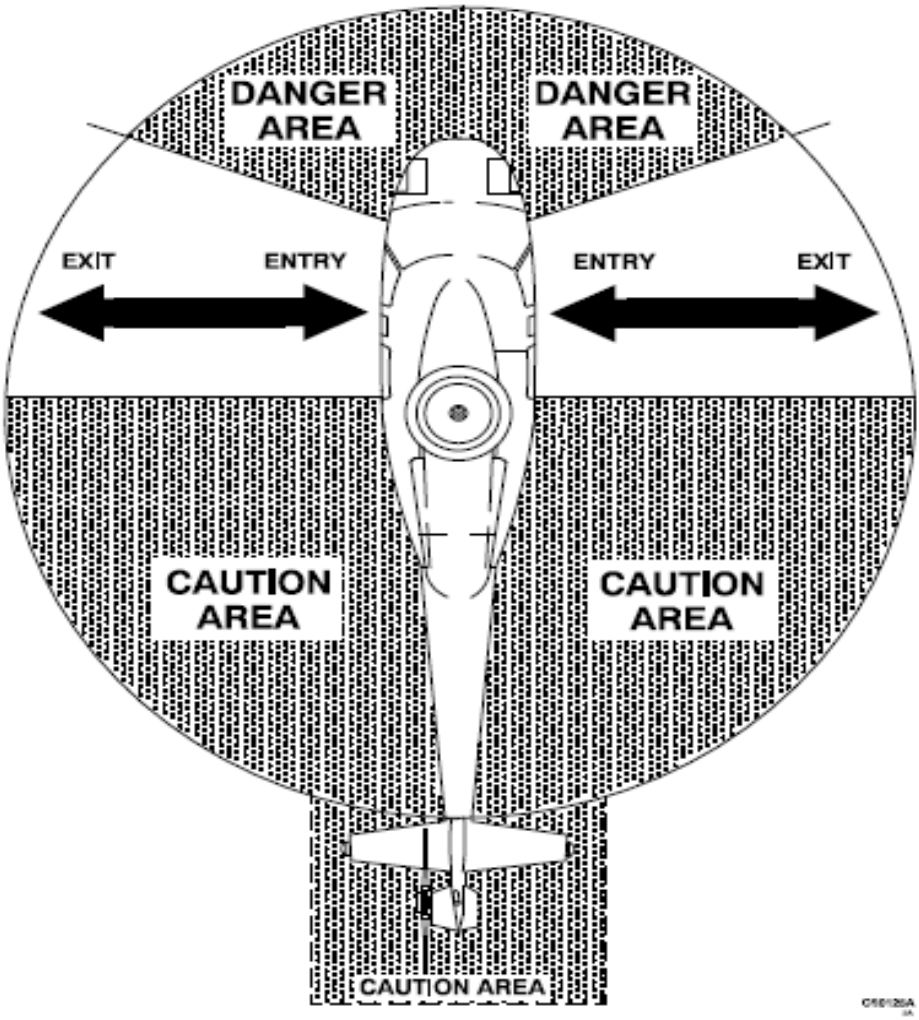

Figure 1-1. Recommended Personnel Exit and Approach

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TAIL ROTOR CLEARANCE

The minimum clearance of the tail rotor is nominally 6 feet by 6 inches. Access to the tail rotor is somewhat limited by the horizontal stabilizer, but ground clearance may be reduced greatly by uneven terrain.

ROTOR BRAKE

The S-76 rotor brake is capable of holding the rotor with both engines running at ground idle. This allows convenient loading and unloading without the necessity of stopping engines. Persons must not be complacent about the possibility of a rotor strike since brake slippage or release will allow the rotor to turn. Treat the rotors as if they are turning whenever the engine(s) is/are running.

GUIDELINES AND CAUTIONS

The following guidelines are useful in planning operations and are recommended. Other appropriate guidelines should be considered when conducting crew/passenger briefings and when writing operations manuals and instructions.

1. Never approach or depart the helicopter unless the pilot sees, acknowledges your intention and approves.
2. Approach only from the sides of the aircraft (see Figure 1-0). Never approach from the front or rear.

WARNING

Some persons may have prior experience with helicopters for which approach from the front is preferred. Approach from the front of an S-76 is not permitted. It is essential that all persons are properly informed regarding the safe approach/departure angles of the S-76.

3. Ensure the cyclic control is centered and the trim is ON. Do not leave the controls unattended. During rotor turning operations aboard a ship or moving platform it is recommended that the automatic flight control system be disengaged.
4. Use ground guides whenever possible to assist passengers. If guides are not available, use available flight crewmembers.
5. Never move under the rotor unless it is stopped or turning at idle or higher speed. Do not approach or depart the helicopter while the rotor is coasting down with the engines off. If the wind is gusty, consider using a rotor speed above idle (approximately 70% N_r).
6. Always treat the rotor as if it is turning.

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7. If practical, position the aircraft so that the natural approach and departure lanes are from the sides of the helicopter.
8. Carefully observe the landing area terrain. Ensure that passengers and crew are not moving over rising or irregular terrain.
9. Standardized procedures will reduce the likelihood of persons being surprised by rotor or engine starts and stops.

HINGED DOORS

Outside door handles, at the aft end of each door are lifted to open the doors. Inside door handles are at the rear of the forward doors and at the front and rear of the aft doors, for convenience from either row of seats. The inside handles are pulled aft to open the doors. Safety lockpins in the top aft corner of the doors prevent accidental opening of the doors from inside the passenger compartment. After the doors are closed and latched, the safety lockpins are engaged by pressing lockpin buttons below the window frame of each door. Engagement can be visually checked by observing that the bottom of the lockpin moves upward into the frame (no red showing). Before opening a door from the inside, the lockpin must be retracted by pulling up the lockpin button. When the door is opened from the outside, the lockpin is retracted when the door latch is lifted.

Electric Door Locks

Electric door locks may be installed as optional equipment in the passenger doors. The door locks are controlled by an ELECTRIC DOORLOCK switch on the center console, with positions marked LOCK and UNLOCK. When the passenger doors are shut properly, activation of the door lock switch will seat the door lockpins. The door lock buttons on the passenger doors will still manually lock and unlock the passenger doors. The electric door lock circuit is connected to the essential bus by a circuit breaker marked DOOR LOCK.

SLIDING DOORS

Sliding doors may be installed in place of the right or left hinged-type passenger doors. After two primary and two secondary latch pins are retracted, the door opens by moving it out from the fuselage and then aft along the fuselage. The door provides entrance and exit for passengers in the center and aft rows of seats. The sliding door cannot be jettisoned, but is removable for maintenance. The door has a large window that can be jettisoned from the inside. Operating controls are inside and outside handles, inside and outside locks, and inside and outside window jettison handles. Both handles are installed in recesses near the front of the door. To open the door from the inside or outside requires that the lock be turned to the UNLOCK position after which the handle is turned down. A window jettison handle is installed in a recess at the center of the door below the window; it is

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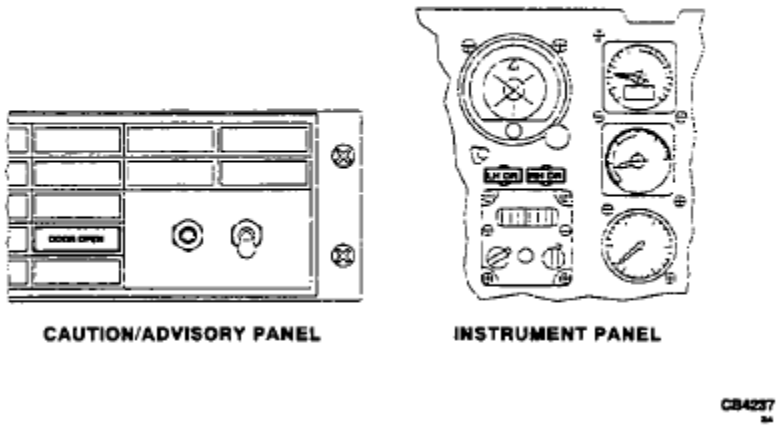

Figure 1-1A. Sliding Passenger Door Open Lights

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covered by a readily removable transparent cover so it will not be moved accidentally. When the cover is removed and the yellow knob pulled out and forward, the window can be pushed out of the door. The secondary latches in the top and bottom of the door are backups for the primary latches in the side of the door and prevent the door from being opened accidentally from the inside. The position of the lock in the locked position and the handle in the closed position provide a visual means for determining proper latching of the door. A microswitch on the lower secondary latch also indicates to the crew via the DOOR OPEN caution light that the door is closed and locked. The door slides on an upper and lower track and swivel assembly. When the door is pushed open, the door and tracks move out from the fuselage about 4 inches. As the door slides aft, the track and swivel assemblies extend; when they reach full extension a stop within each assembly halts further extension and a spring-loaded hold-open stop on the door engages a catch to prevent the door moving forward. To close the door, pull the outside handle slightly forward to disengage the hold-open stop, then slide it to the closed position and follow the depicted number sequence to engage the primary pins followed by the secondary locking devices. Flight operations may be conducted with the sliding doors open (if equipped) within the limitations contained in Part 1, Section I. With sliding doors open, RHDR and LHDR annunciators, on the instrument panel, will light. Depressing the annunciator(s) when lit will reset the DOOR OPEN caution and master warning lights while leaving the annunciator light on.
See Figure 1-1.

ENGINES

Two Pratt and Whitney PT6B-36A gas turbine engines, rated at 1033 shaft horsepower each, are mounted aft of the main gear box. The power turbine of each engine drives the main gear box through separate reduction gearing, drive shafts and freewheeling units. An accessories gear box is attached to the forward end of each engine with mounting provisions for the DC starter/generator, fuel control system and engine oil pressure and scavenge pumps. A dual channel digital electronic engine control (EEC) system maintains engine power by controlling gas generator speed. Gas generator speed (N_r) levels are established by the EEC unit monitoring the following parameters: gas generator speed (N_1), output shaft speed (N_2), engine torque, T_5, inlet pressure (P_1), inlet temperature (T_1), compressor delivery pressure (P_3), rotor speed (N_r), collective stick position and engine throttle position. The EEC system provides automatic starting to idle along as optimized fueling schedule. Although automatic starts typically result in controlled T_5, the EEC cannot reduce fuel below minimum flow and pilot action is required to abort the start. An engine air particle separator (EAPS) to protect against FOD and icing is built into the engine cowling. The engines are started electrically using starter-generators.

ENGINE RATINGS AND RECOMMENDED USAGE

Use of OEI power is for emergency use only. Refer to Part 1 Section 1 Figure 1-5.

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ENGINE FUEL SYSTEM

Fuel from the airframe tanks is drawn into the low-pressure chamber of the jet inducer using bypass return from the centrifugal stage to the jet inducer nozzle causing secondary flow and increasing fuel pressure. The low-pressure fuel from the jet inducer goes to the centrifugal stage where the pressure is raised to between 30 and 100 psi. The fuel then passes through a filter and enters the high pressure gear stage of the fuel pump. After being raised to operating pressure, the fuel enters the hydromechanical unit of the fuel control which meters fuel to the combustor fuel nozzles as required to meet the power demands. The power turbine speed is automatically maintained by the EEC and hydromechanical unit. The electronic overspeed protection system, working through the EEC, prevents N_2 from exceeding safe limits by reducing fuel flow to a minimum if an overspeed should occur.

COMPRESSOR BLEED VALVE

A bleed valve on the bottom of the engine compressor section is programmed to unload the compressor during low and moderate powers to protect against engine acceleration surges or stalls. The valve is scheduled through compressor discharge air pressure and interstage air pressure. The valve is open during startup and closes between 86% and 91% N_1. Because the valve is closed by compressor discharge pressure, the exact N_1 at valve closing will depend on the operating ambient temperature, with higher closing N_1 at higher ambient temperatures.

ENGINE OIL SYSTEM

Each engine has an independent dry sump oil system with separate oil coolers and tanks in front of the engines. Oil capacity is about 2 U.S. gallons (1.66 imperial gallons or 7.57 liters) per tank. Oil flows from the tank to the engine-driven oil pump and is then distributed to the various components of the engine. An oil filter, filter bypass, and a pressure regulating valve are incorporated into the system. Magnetic fuzz burn chip detectors, installed at the bottom of the engine accessory gear box and reduction gear box, light a caution light when metallic chips are detected. A dual gage on the instrument panel indicates oil temperature and pressure, and a caution light indicates low pressure.

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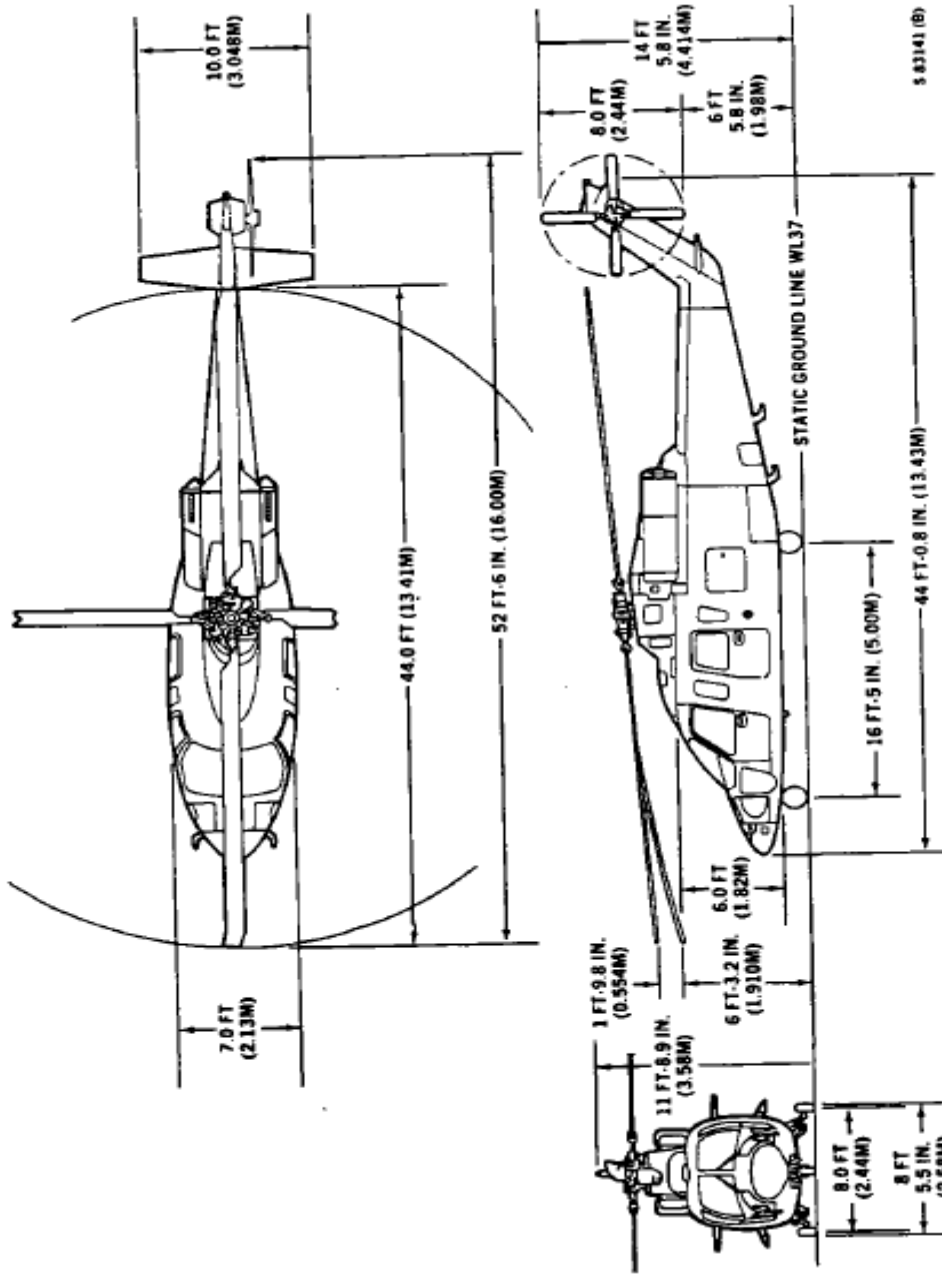

Figure 1-2. Three View Dimensional Diagram

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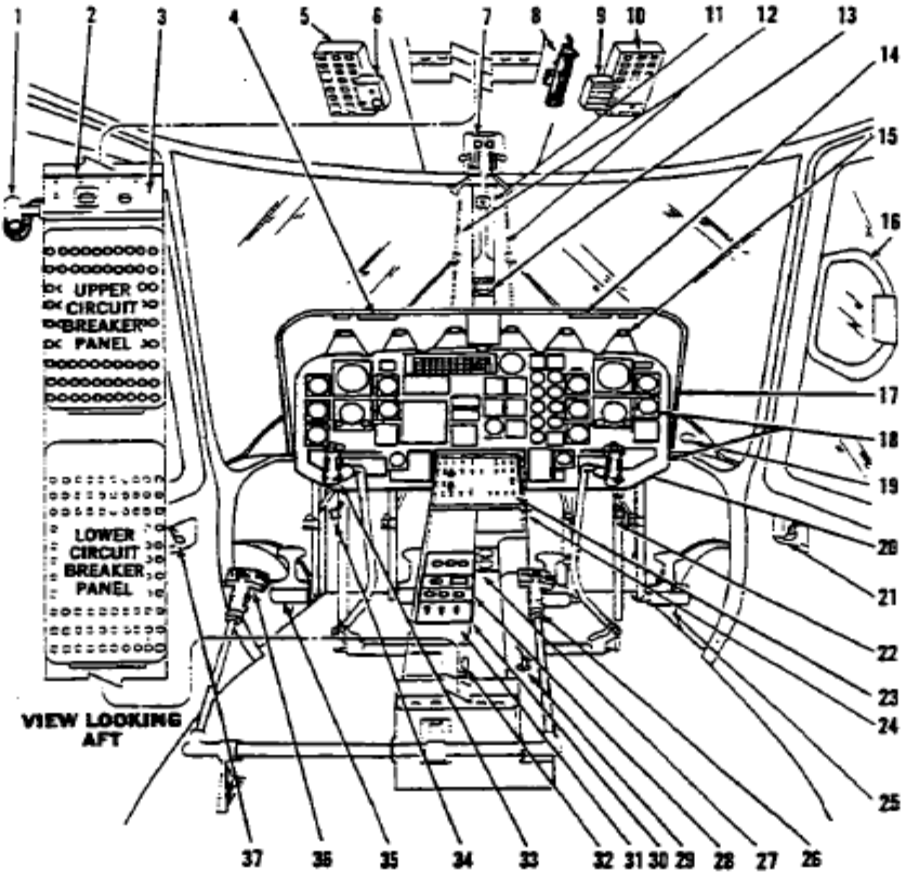

1. COCKPIT UTILITY LIGHT
2. OVERHEAD CONTROL PANEL
3. FLOOD LIGHT PANEL
4. COPILOT'S MASTER WARNING PANEL
5. NO. 1 RELAY PANEL
6. HEATER-VENT/ECS CONTROL PANEL
7. ENGINE CONTROL QUADRANT
8. ROTOR BRAKE
9. OVERHEAD CIRCUIT BREAKER PANEL
10. NO. 2 RELAY PANEL
11. ENGINE FIRE EXTINGUISHER SWITCH
12. WINDSHIELD WIPERS
13. STANDBY COMPASS
14. PILOT'S MASTER WARNING PANEL
15. SECONDARY INSTRUMENT LIGHTS
16. PILOT'S OPENABLE WINDOW
17. GLARE SHIELD
18. UPPER/LOWER INSTRUMENT PANEL
19. OUTSIDE AIR TEMPERATURE GAGE
20. PILOT'S CYCLIC CONTROL STICK
21. PILOT'S DOOR JETTISON HANDLE
22. PILOT'S PEDAL ADJUST KNOB
23. MASTER SWITCH PANEL
24. ENGINE OUT WARNING TEST SWITCH
25. PILOT'S TAIL ROTOR/TOE BRAKE PEDALS
26. PILOT'S COLLECTIVE CONTROL STICK
27. FLIGHT INSTRUMENTS LIGHT SWITCH
28. A.F.C.S. CONTROL PANEL
29. PARKING BRAKE HANDLE
30. EEC PANEL
31. MISCELLANEOUS COMMUNICATIONS/ AVIONICS PANEL
32. CARGO HOOK EMERGENCY RELEASE HANDLE
33. COPILOT'S CYCLIC CONTROL STICK
34. COPILOT'S PEDAL ADJUST KNOB
35. COPILOT'S TAIL ROTOR/TOE BRAKE PEDALS
36. COPILOT'S COLLECTIVE CONTROL STICK
37. COPILOT'S DOOR JETTISON HANDLE

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Figure 1-3. Pilot's Compartment (Typical)

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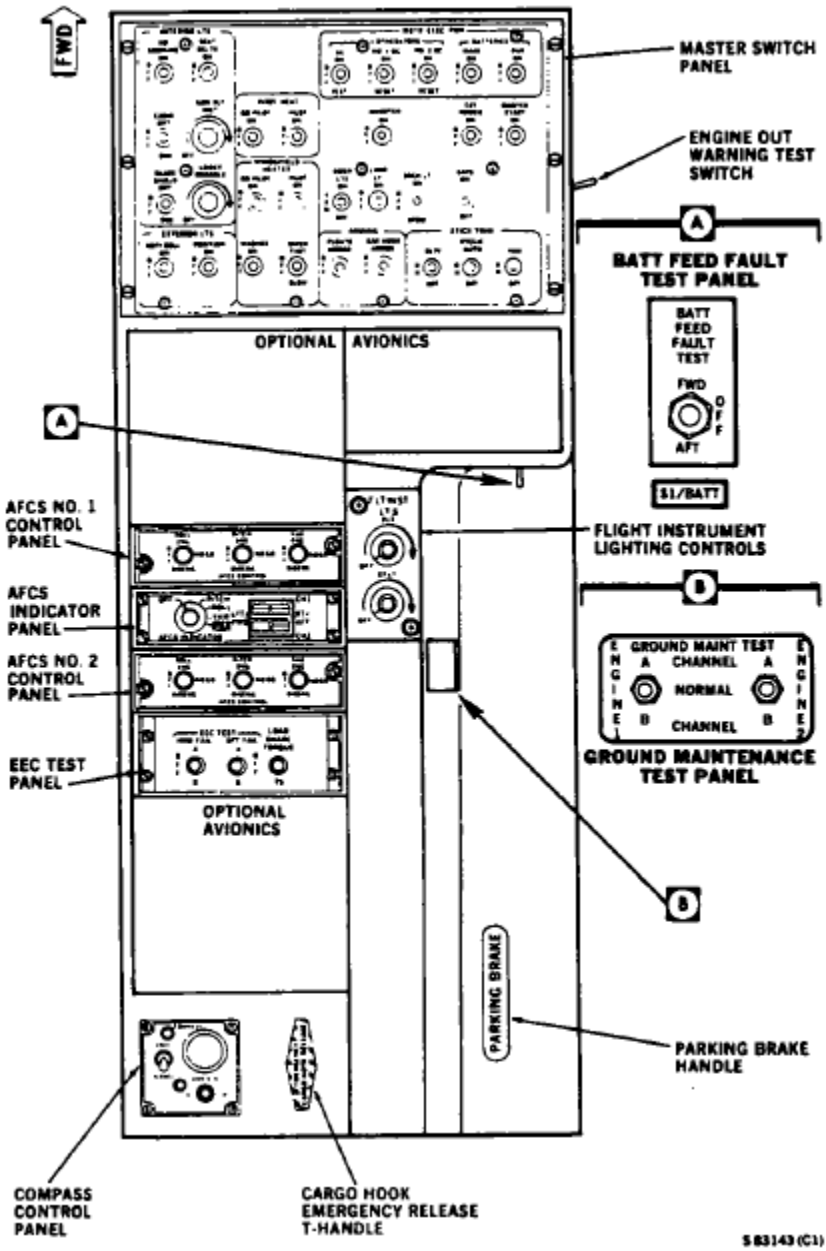

Figure 1-4. Center Console (Typical)

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ENGINE CONTROLS

Engine Levers

No. 1 and No. 2 engine levers on the engine control quadrant (Figure 1-5) are connected to the hydromechanical unit of the fuel control by mechanical linkage. The quadrant has three marked positions, OFF, START/IDLE, and FLY, and a range for emergency usage marked MANUAL. Stops at each of the three positions indicate proper positioning of the lever. To move the engine lever(s) from START/IDLE to OFF or from FLY into MANUAL, the engine lever trigger must be pulled. The trigger should not be used for normal operations when positioning the lever to START/IDLE or FLY. The trigger has a secondary latch that allows free full range movement of the engine lever when it is necessary to operate in MANUAL REVERSION. The latch automatically disengages when the lever is moved from FLY to START/IDLE. A starter button is in the grip of each lever. In a normal automatic start the engine lever is moved to START/IDLE and the start button pressed to initiate engine starling after which all fuel scheduling is controlled by the electronic engine control (EEC). A semi-automatic start can be performed by pressing the start button at OFF and then advancing the engine lever to the START/IDLE position at the appropriate N_1. When moved to the FLY position the engine lever(s) establishes the N_1 speed limit for maximum power. Pulling the fire extinguisher T-handles aft will also move the engine levers to OFF.

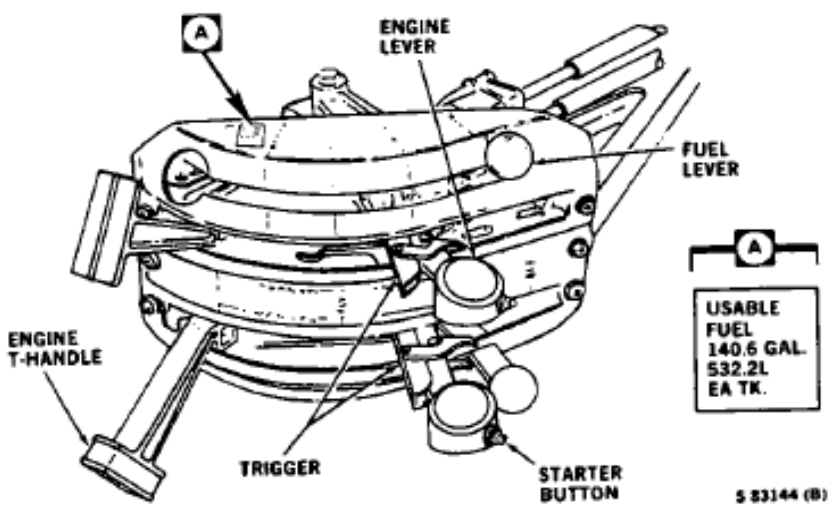

Figure 1-5. Engine Control Quadrant

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ELECTRONIC ENGINE CONTROL (EEC) SYSTEMS

EEC Test Panel

The EEC test panel is located on the center console and includes three switches marked HARD FAIL, SOFT FAIL, and LOAD SHARE. The hard and soft fail switches are spring loaded to the center, OFF, position with two selections marked A and B. The channel A EECs are interrogated for the presence of hard (N_1) failures by holding the switch in position A. A hard failure would be indicated for channel A of engine #1 or #2 if that respective engine's manual reversion light simultaneously illuminated. The EECs are similarly interrogated for hard failures of channel B and soft failures of A and B. EEC status is checked after start and prior to takeoff as recommended in Normal Procedures. EEC status may be checked in flight if degraded operation is suspected.

The load share switch has two positions for matching engines on torque or T_5. The T_5 position is provided to increase the available power in cruise flight if one engine produces more power than the other at equivalent indicated T_5 values. For example, if maximum continuous power T_5 (776°C) was the limiting parameter for high speed cruise and if a recently installed engine produced more torque at that T_5 than the other high time engine, it would be advantageous to select T_5 matching in order to gain the delta torque improvement of the new engine. Whether selected in TORQUE or T_5, the EECs match on torque during dynamic engine demand. Operation in torque matching is recommended at all times except as discussed above and then only when operating at a pilot limited T_5 value, not an EEC limited T_5. The engines will not load share in ground idle.

Ground Maintenance Test Panel

The ground maintenance test switches are located on the pilot's side of the center console adjacent to the collective. There are two spring loaded lever lock switches, one for each engine, labeled as CHANNEL A, OFF, and CHANNEL B. The switches are used to access stored EEC fault notations which will be displayed as digital codes on the respective engine's T_5 indicator digital register. Definitions for the codes are found on page 1-16B and in the PT6B-36/PT6B-36A Maintenance Manual No. 3034442. The switches should be used as recommended in the Normal Procedures start checklist and again after shutdown so that corrective action may be implemented as necessary before the next flight. Both engines may be tested simultaneously.

It is necessary to hold the test switch for ten seconds because each channel can store a maximum of three failure codes and two rigging codes with two seconds of readout alloted for each. With one or two stored failure codes, each may be displayed in any of the three failure locations with the empty ones showing zero (0). The rigging codes are displayed only with the engines shut down.

The use of the switches in flight is inhibited through the weight on wheels switch.

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FAULT CODE	PARAMETER	COMPONENT
0	No Failure	
1	Drift (DRFT)	EEC, Internal
2	Ambient Pressure Excitation (P_1 EXC)	EEC, Internal
3	Ambient Pressure (P_1)	EEC, P_1 Probe
4	Ambient Temperature (T_1)	T_1 Probe or Wiring
5	Torque (TQ)	TQ Probe or Wiring
6	Cold Junction (CJ)	EEC, Internal
7	AC Excitation Drift (ACD)	EEC, Internal
8	Trim Gain (TEX)	EEC, Internal
9	Power Lever Angle (PLA) 1	HMU or EEC
10	Power Lever Angle (PLA) 2	HMU or EEC
11	Collective Pitch Cosine (CLPC)	A/C CLP Resolver or Wiring
12	Collective Pitch Sine (CLPS)	A/C CLP Resolver or Wiring
13	T_5 Temperature (T_5)	T_5 Probe or Wiring
14	Q Bias Trim (QBTM)	TQ Trim Box or Wiring
15	Q Gain Trim (QGTM)	TQ Trim Box or Wiring
16	T_5 Trim (T_5TM)	T_5 Trim Box or Wiring
17	Torque (Q)	TQ Probe or Wiring

Figure 1-5A. EEC Fault Codes (Sheet 1 of 2)

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FAULT CODE	PARAMETER	COMPONENT
18	Torque Test (QT)	EEC
19	Arinc Wraparound (ARWA)	EEC, Internal
20	Rotor Speed (N_r)	N_r Probe or Wiring
21	Free Turbine Speed (N_2)	N_2 Probe or Wiring
22	No Failure	
23	Power Lever Angle (PLA)	HMU or EEC
24	Collective Pitch (CLP)	CLP Resolver Wiring or EEC
25	Arinc Transmitter (ARO)	EEC, Internal
26	Diagnostic Access (UART)	EEC, Internal
27	Erasable Fault Recorder (EEROM)	EEC, Internal
28	Alternator (ALT)	Dedicated Alternator or Wiring
29	Trim Drift (TDRF)	EEC, Internal
30	AC Excitation Gain (ACG)	EEC, Internal
31	Arinc Receiver (ARCAPF)	CH. A EEC (Remote Engine)
32	Arinc Receiver (ARCBPF)	CH. B EEC (Remote Engine)
33	Gas Generator Speed (N_1)	N_1 Probe or Wiring
34	Power Discretes (PWRD)	Harnesses
35	Memory (PMEM)	EEC, Internal
200 Series	Power Lever Angle (PLA)	Engine Power Lever Resolver
500 Series	Collective Stick Angle (CLP)	Collective Resolver

Figure 1-5A. EEC Fault Codes (Sheet 2 of 2)

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The rigging codes are three digit combinations with the 200 series reflecting engine power lever position and the 500 series for collective stick position. These rigging codes are for maintenance diagnostics and are inhibited with the engine running. Negative values or numbers greater than 100 are not displayed.

Manual Reversion Training Switch Panel

The manual reversion training switch is located beneath the power off V_{ne} placard on the copilot's side. The switch is a lever lock type with three positions labeled #1 ENG MAN REV, NORM, and #2 ENG MAN REV. It is intended that the switch be used for training purposes only with an S-76B qualified crewmember in the copilot's seat.

With the training switch selected to either engine position, the appropriate manual reversion light will illuminate, both channel active lights will be out, and the HMU stepper motor is frozen leaving the engine at a fixed power and unresponsive to collective inputs. Dual engine limiting and overspeed protection is retained for the selected engine but limiting for the other engine is switched to the single engine parameters. The early engine failure warning and gain changes provided by the engine failure logic are inhibited on both engines leaving the 48% N_1 parameter to light the engine failure light and provide the gains and limit changes.

Flight in manual reversion is described in the Emergency Procedures Section on page 3-15. However, additional protection is provided in training where the EEC will come on line momentarily to prevent exceedances of dual engine limits if the throttle is mismanaged to the high side. The channel active light will intermittently illuminate if this occurs. If the pilot persists in exceeding the limits, the stepper motor will eventually run out of authority, and the limits can then be exceeded. Such mismanagement is to be avoided.

Failure to provide enough power by the engine in manual may result in the governed engine going to the high side where the dual engine limits are removed in favor of the higher single engine limits. Low power mismanagement with high power demand is to be avoided.

When manual reversion training has been completed, the switch is positioned OFF, the engine lever secondary latch is released and lever positioned to the FLY detent, and the training switch door is closed and secured.

Manual Reversion Caution Lights

Blue manual reversion lights marked #1 ENG MAN REV and #2 ENG MAN REV are positioned at the outboard end of, and are light checked with, the pilot's and copilot's master warning row. A press to dim feature is provided.

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An engine's manual reversion light is on when neither EEC channel is controlling fuel flow (stepper motor is fixed). This can occur under the following conditions:

- Channel A and B have sustained hard failures (loss of N_1 signal)
- Training switch is selected
- During overspeed test
- Hard or soft failure exists on that engine when the status switch is selected to the appropriate channel

Channel Active Lights

There are two channel active lights per engine located adjacent to the respective T_5 gage. They are green when lighted, marked A and B, and may be light checked and dimmed with the respective caution panel functions. A lighted channel active light denotes which EEC channel is controlling an engine's stepper motor. Only one channel active light should be on at one time and neither will be displayed while in manual reversion. Intermittent operation of the lights may be seen during over-speed checks or while operating in manual reversion through the training switch if the engine in training reaches any of the dual engine limits.

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ENGINE INDICATORS

(Figure 1-7)

Torquemeter

A dual torquemeter marked PERCENT TORQUE is a combination dial-pointer and digital readout type indicator. The indicator has pointers marked 1 and 2, and two 3-digit displays reading percent torque. The torquemeter sensing system on the reduction gear box uses a pulse pickup probe to measure the phase shift in pulses generated by two toothed wheels installed on the output and reference shafts. This signal goes to the EEC, is processed and then goes to the cockpit via the 429 ARINC data bus. The electrical circuits for the No. 1 and No. 2 engine torquemeters are connected to the No. 1 and No. 2 dc primary buses respectively, by circuit breakers marked TORQ.

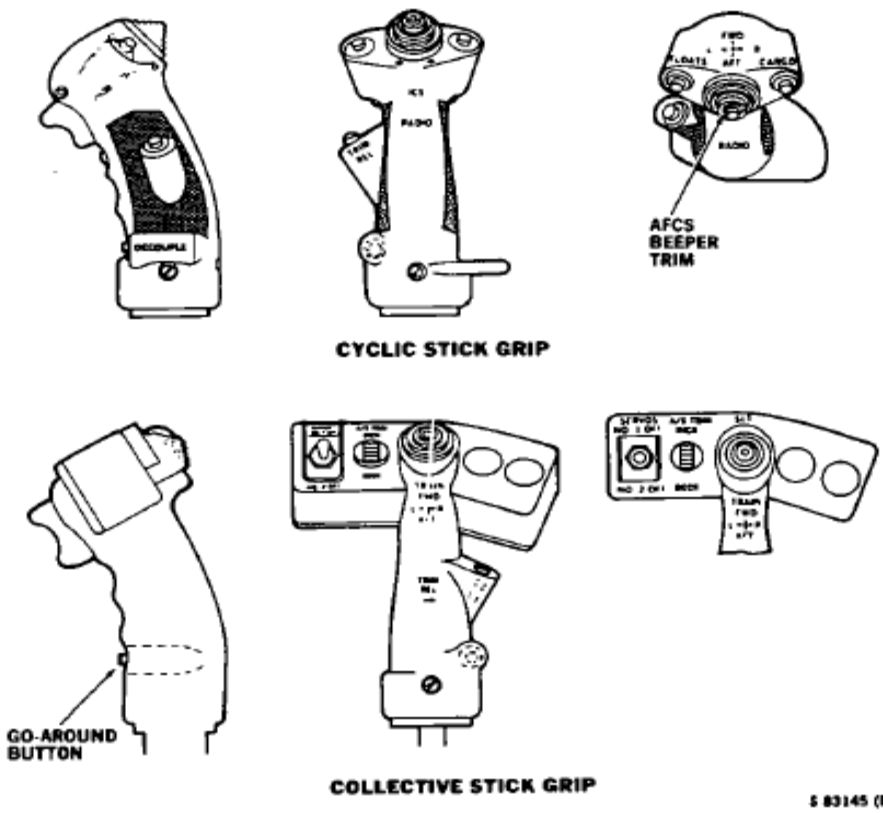

Figure 1-6. Cyclic and Collective Stick Grips

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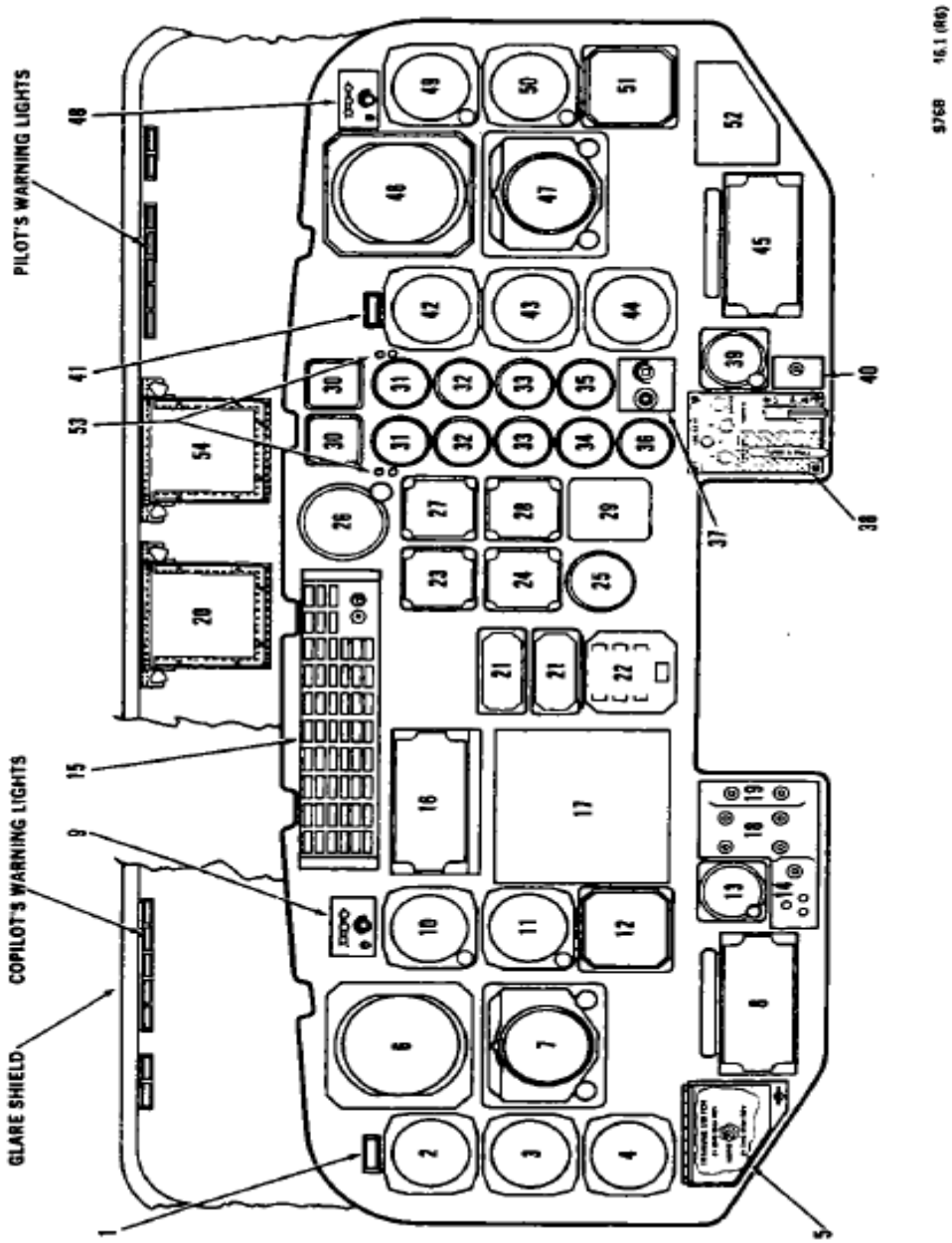

Figure 1-7. Instrument Panel (Typical) (Sheet 1 of 2)

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1. LANDING GEAR UP WARNING LIGHT
2. AIRSPEED INDICATOR
3. DUAL TORQUEMETER
4. TRIPLE TACHOMETER
5. TRAINING SWITCH/Vne POWER-OFF PLACARD
6. ATTITUDE INDICATOR
7. HORIZONTAL SITUATION INDICATOR
8. AUDIO CONTROL PANEL
9. MARKER BEACON PANEL
10. BAROMETRIC ALTIMETER
11. VERTICAL VELOCITY INDICATOR
12. RADAR ALTIMETER
13. CLOCK
14. FLOTATION TEST PANEL
15. CAUTION-ADVISORY PANEL
16. ADF CONTROL PANEL
17. WEATHER RADAR DISPLAY
18. GENERATOR AND ENGINE OVERSPEED TEST PANEL
19. AC GENERATOR TEST PANEL
20. Vne POWER-ON PLACARD
21. DME CONTROL PANELS
22. FLIGHT DIRECTOR MODE SELECT PANELS
23. NO. 1 VHF COMMUNICATION CONTROL PANEL
24. NO. 1 VHF NAVIGATION CONTROL PANEL
25. FUEL TOTALIZER
26. SECONDARY ATTITUDE INDICATOR
27. NO. 2 VHF COMMUNICATION CONTROL PANEL
28. NO. 2 VHF NAVIGATION CONTROL PANEL
29. ATC TRANSPONDER CONTROL
30. N1 INDICATORS
31. T5 INDICATORS
32. FUEL FLOW INDICATORS
33. ENGINE OIL PRESSURE/TEMPERATURE INDICATOR
34. DUAL HYDRAULIC OIL PRESSURE INDICATOR
35. MAIN TRANSMISSION OIL PRESSURE/TEMPERATURE INDICATOR
36. DUAL FUEL QUANTITY INDICATOR
37. FUEL GAGE TEST AND N1/T5 DIGIT LIGHT SWITCH
38. LANDING GEAR CONTROL PANEL
39. CLOCK
40. NAVIGATION TEST PANEL
41. LANDING GEAR UP WARNING LIGHT
42. AIRSPEED INDICATOR
43. DUAL TORQUEMETER
44. TRIPLE TACHOMETER
45. AUDIO CONTROL PANEL
46. ATTITUDE INDICATOR
47. HORIZONTAL SITUATION INDICATOR
48. MARKER BEACON PANEL
49. BAROMETRIC ALTIMETER
50. VERTICAL VELOCITY INDICATOR
51. RADAR ALTIMETER
52. Vne POWER-OFF PLACARD
53. CHANNEL ACTIVE LIGHTS
54. POWER ASSURANCE VALUES PLACARD

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Figure 1-7. Instrument Panel (Typical) (Sheet 2 of 2)

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T5 (Power Turbine Inlet Temperature) Indicators

Two T_5 indicators marked in TEMP °C X 100 are combination dial-pointer and digital readout-type indicators. The digital readout indicates T_5 as a three-digit number (927). If T_5 should go over 1000°C the values will appear as 000 for 1000°C, and 003 for 1003°C, etc. Light intensity of the digital readout may be adjusted by turning the outer knob marked N_1/T_5 DIGITS on the fuel gage test panel (Figure 1-17). Thermocouples in the gas producer turbine of each engine sense operating temperature and electrically transmit it to the EEC which processes the data and sends it to the indicator via the 429 ARINC data bus. Each indicator has a redundant electrical power supply. The No. 1 engine T_5 indicator is connected to the No. 1 dc primary bus and the dc essential bus by two circuit breakers marked T_5. The No. 2 engine T_5 indicator is connected to the No. 2 dc primary bus and the dc essential bus by two circuit breakers marked T_5.

N1 (Gas Generator) Tachometers

Two N_1 gas generator tachometers marked N_1% X 10 are combination dial-pointer and digital readout-type indicators. The digital readout indicates N_1 as a two digit number and a decimal (99.5). If N_1 should go over 100% the values will appear as 00.0 for 100%, and 01.5 for 101.5% etc. Light intensity of the digital readout may be adjusted by turning the inner knob marked N_1/T_5 DIGITS on the instrument panel. Pulse pickup speed sensors indicate changes in N_1 speed and transmit these changes electrically to the indicators. Each engine tachometer has redundant windings so that a single failure does not affect both EEC's. The No. 1 engine N_1 indicator is connected to No. 1 dc primary bus and dc essential bus by two circuit breakers marked N_1. The No. 2 engine N_1 indicator in connected to the No. 2 dc primary bus and the essential bus by the circuit breakers marked N_1.

Triple Tachometer

A triple tachometer marked PERCENT RPM indicates the N_2 (power turbine speed) of each engine and N_r (rotor speed). The outer scale marked N_2 and the 1 and 2 pointers indicate the N_2 of the No. 1 and No. 2 engines. The inner scale marked ROTOR and the R pointer indicate N_r. Pulse pickup speed sensors indicate changes in N_2 or N_r speed and transmit these changes electrically to the indicator. The electrical circuits for No. 1 and No. 2 engine N_2 are connected to the No. 1 and No. 2 dc primary buses by circuit breakers marked N_2. The N_r tachometer has a redundant power source, being connected to the No. 2 dc primary bus and the dc essential bus by circuit breakers marked NR. There are two N_r speed sensors.

Fuel Flow/Totalizer System

Fuel flow indicators and a fuel totalizer are installed on the instrument panel. This system indicates the rate at which fuel is being consumed and the total fuel remaining in the fuel tanks. Flowmeters in the high pressure fuel line to each

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engine fuel manifold contain turbine wheels which rotate at speeds proportional to the pulse signals that are directly proportional to the volume of fuel flow. These pulses are conditioned by a computer unit into a signal which drives the fuel flow indicators (one per engine) on the instrument panel. The dial of each fuel flow indicator is marked FUEL FLOW, LBS/HR. The pulses are also combined by the computer unit to drive a totalizing indicator which reflects the fuel remaining in the fuel system. The dial of the fuel totalizer is marked FUEL REMAINING - POUNDS. The totalizer is inaccurate if one or both flowmeters are inoperative. Four preset switches on the face of the fuel totalizer indicator are used to set the total fuel quantity contained in the fuel tanks as indicated on the dual fuel quantity gage. Each preset switch is pressed in as often as required until the digits on the fuel totalizer indicate total fuel. Each click of the preset switches moves the applicable number one digit. The No. 1 engine fuel flow system is connected to the No. 1 dc primary bus by a circuit breaker marked ENG FUEL FLOW, and the No. 2 engine fuel flow system is connected to the No. 2 dc primary bus by a circuit breaker marked ENG FUEL FLOW.

Fuel Pressure Warning Lights

The #1 ENG FUEL PRESS or #2 ENG FUEL PRESS warning light on the caution-advisory panel (Figure 1-26) goes on when fuel pressure drops below 16.5 psi. Each low fuel pressure circuit is connected to the dc essential bus by separate circuit breakers marked FUEL PRESS WARN.

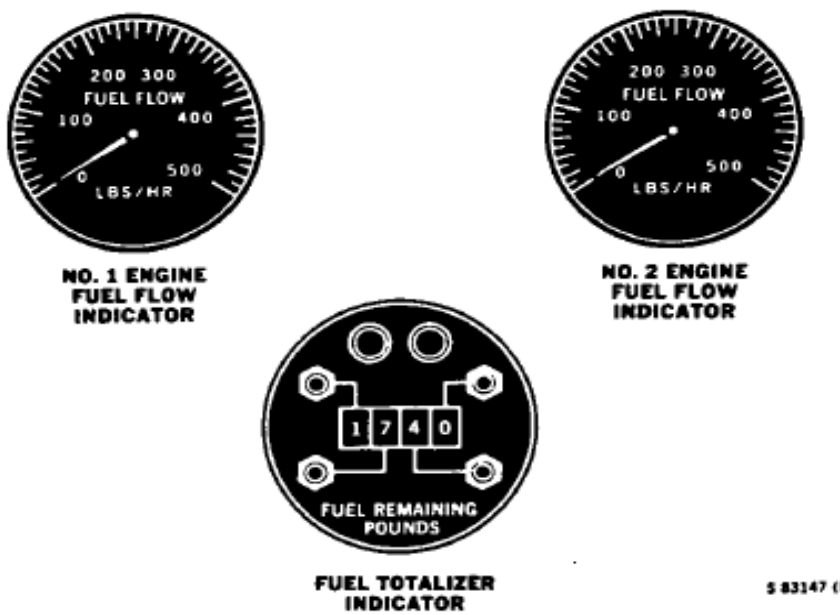

Figure 1-8. Fuel Flow and Fuel Totalizer Indicators

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Engine Oil Pressure/Temperature Indicators

Two dual indicators indicate engine oil pressure, as regulated by the oil pump and pressure regulating valve, and engine oil inlet temperature. The dial of each is marked ENG OIL X 10. The left scale is marked T (temperature) and the right scale is marked P (pressure). The No. 1 engine pressure-temperature indicator is connected to the No. 1 dc primary bus by circuit breakers marked OIL-TEMP PRESS. The No. 2 engine pressure-temperature indicator is connected to the No. 2 dc primary bus by the circuit breakers marked OIL-TEMP PRESS.

Engine Oil Low Pressure Warning Light

The #1 ENG OIL PRESS or #2 ENG OIL PRESS warning lights on the caution-advisory panel (Figure 1-26) go on when engine oil pressure drops below approximately 48 psi. Each low pressure circuit is connected to the dc essential bus by separate circuit breakers marked OIL PRESS WARN.

Engine Chip Detector Caution Lights

The #1 ENG CHIP or #2 ENG CHIP caution lights on the caution-advisory panel (Figure 1-26) go on when metal chips are detected in the lower part of the engine accessory gear box or the reduction gear box. "Fuzz" burn off units in the chip detector minimize false indications of chips by burning off minute metallic particles (fuzz) that may collect on the detector units and cause the caution lights to go on. After a light is switched on by the detector unit, an electrical holding circuit will keep the light on until electrical power is removed by pulling the appropriate circuit breaker, or until the electrical system is shut down. Each engine's chip detector circuit is connected to the dc essential bus by separate circuit breaker marked CHIP DET.

Engine Bleed-Air Advisory Light

The ENG BLEED AIR advisory light on the caution-advisory panel (Figure 1-26) will go on when any of the systems using compressor discharge air are operating. Systems using compressor discharge air are cabin heater and environmental control system.

ENGINE STARTER AND IGNITION SYSTEM

(Figure 1-9)

Starter/generators provide torque for engine starting when supplied with a dc power source. After starting, the starter/generators are driven by the engine and are the primary source of electrical power. The starter/generators, mounted on the engine accessory gear box, are connected to the dc essential bus when they function as starters. Electrical power for engine starting may be provided by the batteries, external power or from the opposite starter/generator and battery, once the

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first engine is started. Controls for starting consist of a master start switch and a starter switch for each engine. Starter control circuits are connected to the dc essential bus by three circuit breakers marked STR CONTROL, on the lower circuit breaker panel.

Master Start Switch

The MASTER START switch on the master switch panel (Figure 1-10) has two positions marked ON and OFF. ON provides dc starter power to the individual starting circuits which are then controlled by the engine starter buttons. OFF removes power from starter circuits. The MASTER START switch must be OFF except for starting because actuation of the starter button with the engine running will result in loss of the dc generator.

Engine Starter Buttons

The starter buttons in the knob of each N_1 lever (Figure 1-5) provide dc power to the starter and ignition systems for each engine. There are two starting procedures, each requiring different application of the starter button but in both cases the master start switch must be ON. In the automatic starting sequence the engine lever is moved to the IDLE position then the starter button is pressed momentarily to initiate the start. In a semi-automatic start, with the engine lever at OFF, the starter button is pressed and held for the duration of the starting sequence. When the desired N_1 is reached, the engine lever is moved to START, activating the ignition system to effect the start. Once idle rpm is obtained the starter button is released, de-energizing the starter and ignition circuits. Ignition is provided only during the starting cycle.

ENGINE AIR PARTICLE SEPARATOR (EAPS)

An engine air particle separator (EAPS) protects each engine by removing foreign objects from air entering the engine inlet. This system removes eroding materials such as sand as well as rain, snow, and ice which eliminates the need for a separate anti-icing system. The EAPS assembly is mounted in the air inlet/bypass cowling and works in conjunction with the exhaust ejector. In the normal mode (EAPS OFF), all the air is directed to the engine inlet. With EAPS ON a series of doors within the cowling alter the air flow to the engine (Figure 1-11). The air required for engine operation makes a 90 degree turn to the engine inlet while a part of the air flow containing all foreign objects continues straight through the cowling and exits through the exhaust duct. Foreign object separation is achieved by a venturi built into the cowling and engine exhaust entering at the rear of the cowling to create a low pressure area downstream of the venturi. The EAPS bypass doors, controlled by the EAPS switch on the master switch panel, are extended and retracted by an electrically operated actuator.

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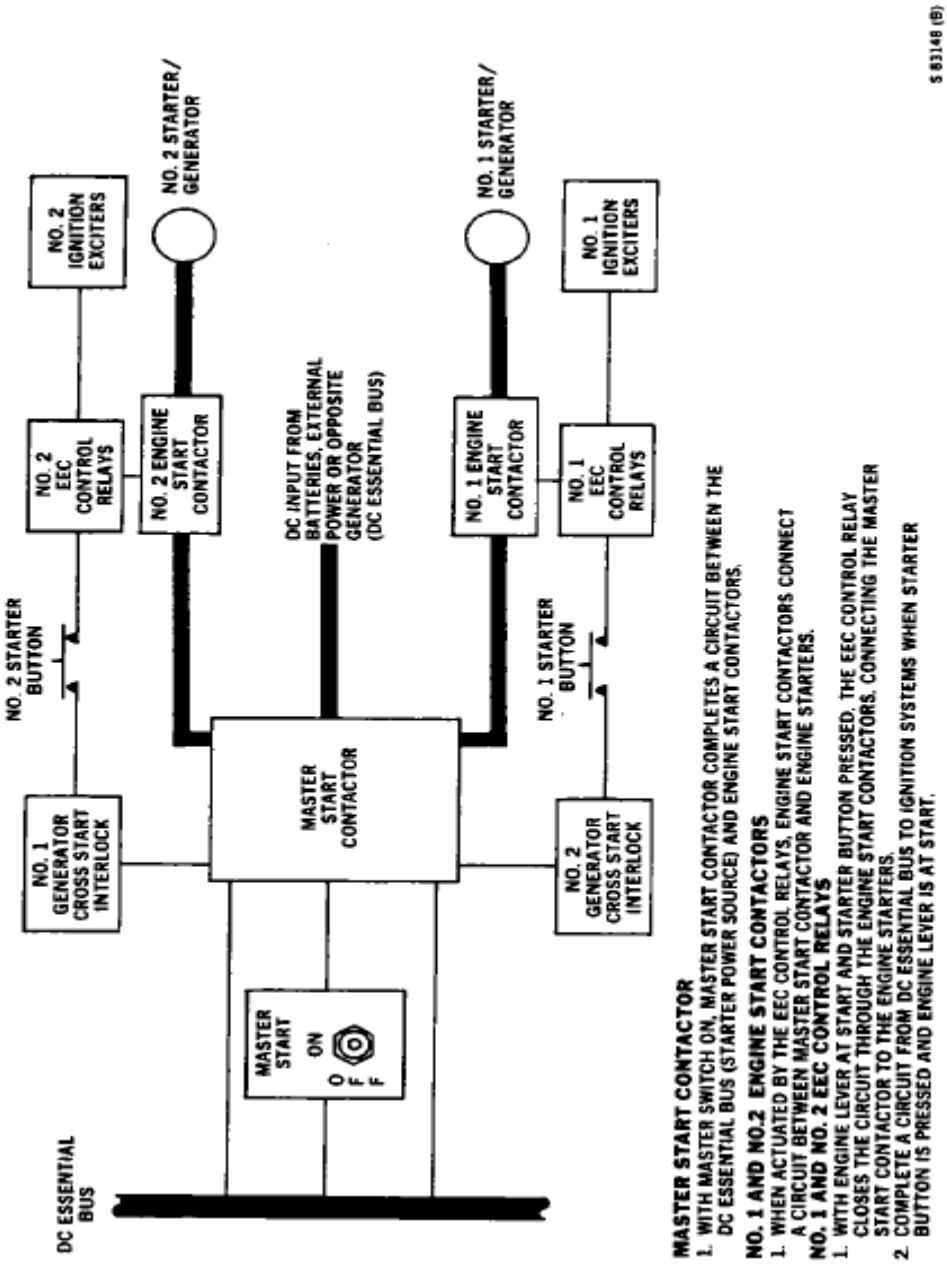

Figure 1-9. Engine Automatic Starting System

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EAPS Switch

One switch on the master switch panel (Figure 1-10) marked EAPS, controls the operation of EAPS for both engines. The switch has marked positions ON and OFF. ON extends the forward EAPS bypass door and retracts the aft door in each inlet air duct and OFF reverses the process. The system for each engine is controlled by dc power from the dc essential bus through circuit breakers marked EAPS.

EAPS FAIL Caution Lights

The #1 and #2 EAPS FAIL caution lights on the caution-advisory panel (Figure 1-26) will go on if the EAPS doors do not reach the extended position within 15 seconds after being selected ON.

EAPS ON Advisory Light

The #1 and #2 EAPS ON advisory lights on the caution-advisory panel will go on when the EAPS doors reach the fully extended position and will remain on until the doors are fully retracted.

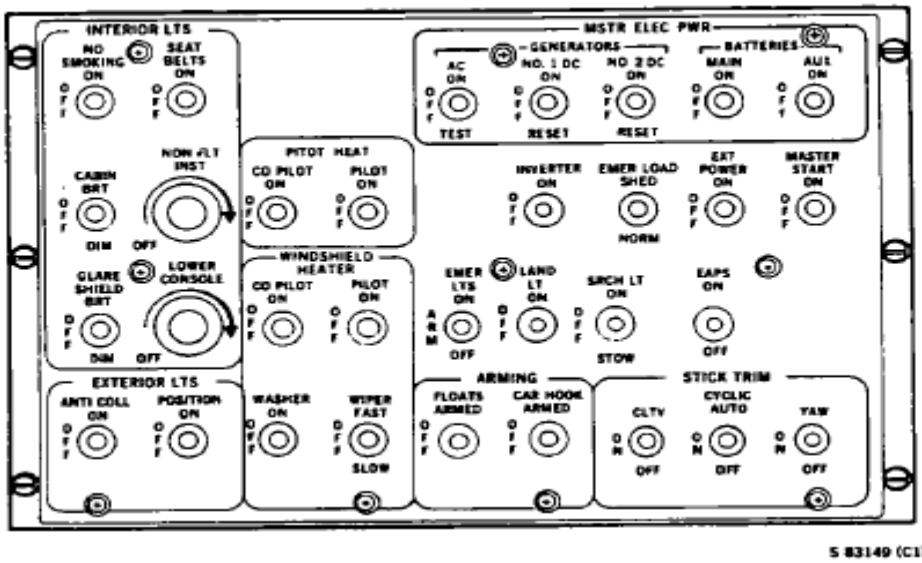

Figure 1-10. Master Switch Panel (Typical)

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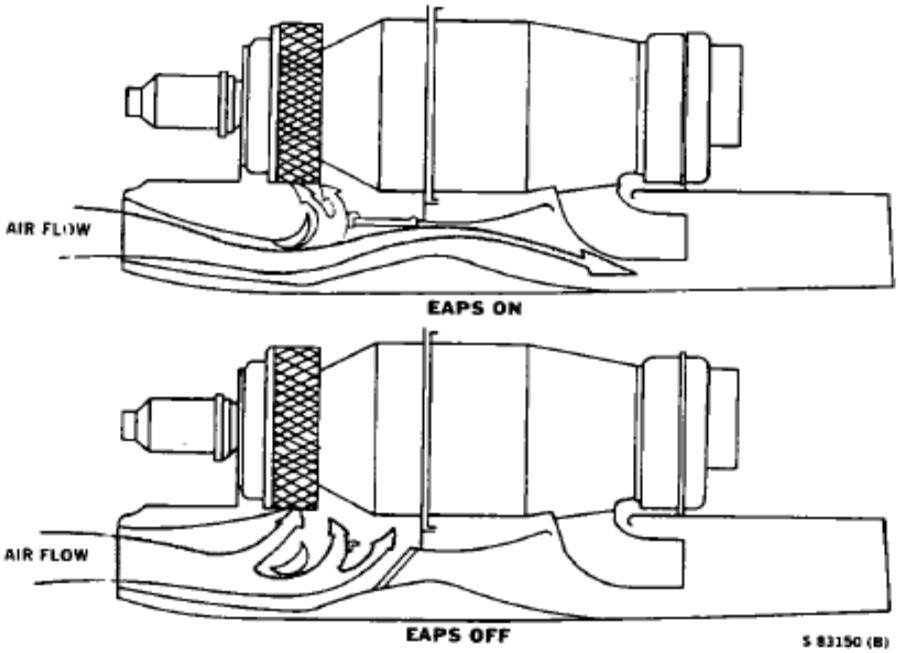

Figure 1-11. Engine Air Particle Separator System

ENGINE OVERSPEED PROTECTION SYSTEM

The engine overspeed protection system is incorporated in the Electronic Engine Controls. The primary means of controlling overspeed is the automatic and continuous programming of the stepper motor by the EEC. In the conduct of its normal constant speed control of N_2, the stepper motor continuously increases and decreases fuel flow, and as soon as N_2 exceeds 107%, the stepper motor is programmed to reduce fuel flow by an amount proportional to the exceedance.

In the unlikely event that the stepper motor programming becomes out of phase with the power demands of the engine, the stepper motor may not decrease fuel flow sufficiently at the instant the N_2 is accelerating to 115%. Should this occur, an N_2 overspeed will be prevented by the action of the overspeed solenoid.

The overspeed solenoid, like the stepper motor, is controlled and powered by the EEC. However, the overspeed solenoid constricts fuel flow downstream of the

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stepper motor, and it reacts faster than the stepper motor. When the overspeed solenoid trips, the stepper motor is frozen in its last commanded position until the solenoid releases as the N_2 decreases below 115.5%. After the overspeed solenoid releases, normal stepper motor controlled fuel flow resumes.

A prerequisite to overspeed solenoid tripping is an agreement between the main processor and the SIM, which are both internal components of one EEC, that 115.5% N_2 has been reached or exceeded. Should the EEC channel in use fail to detect an overspeed condition, the other channel can react to its own detection of the overspeed condition, and trip the overspeed solenoid. In the event of partial internal EEC failures, the SIM of one EEC will pair with the main processor of the other EEC to detect an overspeed and actuate the solenoid.

The fuel cutback of a tripped overspeed solenoid and the maximum fuel cut back of the stepper motor both correspond to the minimum fuel flow required to sustain flight idle engine operation.

There is also overspeed protection for N_1 that is controlled by the EEC. The trip point is 102.4% and the fuel cutback is similar to that described for N_2 overspeed. A double EEC failure on one engine leaves that engine without overspeed protection.

Advancing the engine lever beyond the FLY position with an operative EEC in automatic will result in the stepper motor incrementally reducing its authority until a minimum is reached. The EEC has been trying to hold the commanded 107% N_2 by reducing the stepper motor to the zero step point to counteract the action of the advancing lever. When this point is reached, continued advancement will result in increased N_2 and overspeed protection and all limiting features are lost. Caution should be exercised when advancing the engine lever beyond FLY with an operative EEC controlling fuel flow. The practice is unnecessary and is discouraged. Discussion of engine lever use while in manual reversion or training is discussed in Part 1, Section III, Engine Control Malfunctions, and Part 2, Section I, Manual Reversion Training Switch Panel.

There are two N_2 overspeed system test switches, one for each engine, labeled ENG O/S TEST, #1, and #2 ENG. The switches are spring loaded to the center OFF position with labeled positions A and B corresponding to EEC channels A and B.

Actuation of the test switches on the ground at flat pitch and 107% N_2 changes the overspeed solenoid trip point from 115.5% N_2 to 102.15% N_2. The solenoid, sensing that 107% N_2 is an overspeed, cuts fuel to minimum flow, and cycling takes place around 102 to 103% N_2. If the switch is held longer than 3 seconds, the overspeed trip point returns to 115.5%, cycling ceases, and the N_2 of the tested engine returns to 107%. This feature insures that if an uncommanded overspeed test signal is introduced in flight due to a malfunction, the signal will last only 3 seconds. Similarly, the overspeed test switches are disabled at collective pitch positions above 5%. ■

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TRANSMISSION SYSTEM

The transmission system consists of three gear boxes and associated shafting which transmit engine torque to the gear boxes. Each engine is connected to the main gear box by freewheel units. The main rotor drive shaft, to which the main rotor system is attached, extends upward from the main gear box. A drive shaft extends aft from the main gear box to the intermediate gear box at the base of the tail rotor pylon. Shafting extends up the pylon to the tail rotor gear box which drives the tail rotor. The intermediate and tail gear boxes are splash-lubricated and have no pressure or temperature gages. An accessory drive section at the rear of the main gear box drives the first and second stage hydraulic pumps, two main gear box oil pumps and two oil cooler blowers.

TRANSMISSION OIL SYSTEM

Pressure for lubrication of the main gear box is provided by two oil pumps mounted on and driven by the gear box accessory drive section. Oil is pumped from the sump of the gear box through an oil filter and then to the oil cooler. A thermostatically-controlled bypass valve directs the flow of oil either through the core of the oil cooler if the oil is hot, or through the bypass line if the oil is cold. Two oil cooler blowers are mounted on top of the gear box. The oil filler and oil level sight window are on the right side of the gear box.

Main Gear Box Oil Pressure/Temperature Gage

A dual indicator marked XMSN OIL X 10 indicates oil pressure at the main gear box oil inlet port and oil temperature in the gear box sump. The left scale is marked T (temperature) and the right scale is marked P (pressure). The temperature indicator is connected to the No. 2 dc primary bus by a circuit breaker marked XMSN TEMP. The pressure indicator is connected to the No. 1 dc primary bus by a circuit breaker marked OIL PRESS-XMSN.

Main Gear Box Oil Low Pressure Warning Light

The MAIN XMSN OIL PRESS warning light, on the caution-advisory panel (Figure 1-26), lights when oil pressure in the main gear box drops below about 14 psi. The system is connected to the dc essential bus by a circuit breaker marked XMSN OILWARN-PRESS.

Main Gear Box Oil Hot Warning Light

The MAIN XMSN OIL HOT warning light, on the caution-advisory panel (Figure 1-26), lights when oil inlet temperature goes over about 120°. The system is connected to the dc essential bus by a circuit breaker marked XMSN OIL WARN-TEMP.

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GEAR BOX CHIP DETECTOR/OIL HOT SYSTEM

The MAIN XMSN CHIP, INT GB CHIP/HOT, or TAIL GB CHIP/HOT caution lights on the caution-advisory panel go on when metal chips are detected in the oil sump of the respective gear box. "FUZZ" burn off units in each chip detector minimize false indications of chips by burning off minute metallic particles (fuzz) that may collect on the detector units and cause the caution lights to go on. The intermediate and tail gear box caution lights will also go on whenever oil temperature goes over about 140°C. Once a light is switched on by the detector unit, a holding circuit will keep the light on until electrical power is removed by pulling the appropriate circuit breaker, or until the electrical system is shut down. The chip detector/overtemp systems are connected to the dc essential bus by circuit breakers marked CHIP DETECTOR-MGB and I/TGB.

ROTOR BRAKE SYSTEM

The rotor brake is a manually operated, hydraulically actuated system for stopping the rotors at shutdown or holding the rotors while shut down, during start, or ground idle operation. The rotor brake system consists of a master cylinder, pressure gage, accumulator/reservoir, rotor brake calipers, pressure switch, and caution light.

Master Cylinder

The master cylinder (Figure 1-12) is mounted on the cockpit overhead. It is operated manually to provide hydraulic pressure to actuate the rotor brake calipers on the main gearbox. The rotor brake is applied by pulling down and pushing forward on the master cylinder handle. Two strokes are required to develop the pressure necessary for stopping the rotor effectively. A pressure relief valve set at 300 psi prevents excessive application. The time required to stop the rotor system can be controlled by varying the rate at which the master cylinder handle is applied during the second stroke. For normal operation, the rotor brake should not be applied until rotor speed decreases below 65%. A clear tray is installed under the cylinder as a leakage detector.

Accumulator/Reservoir

The accumulator/reservoir is mounted on top of the main transmission accessory gear box. The unit includes an accumulator, reservoir, sight glass, relief valve, bleed valve and pressure switch. The relief valve relieves system pressure if it goes over 300 psi by venting fluid back to the reservoir. The accumulator stores energy to extend rotor brake park time.

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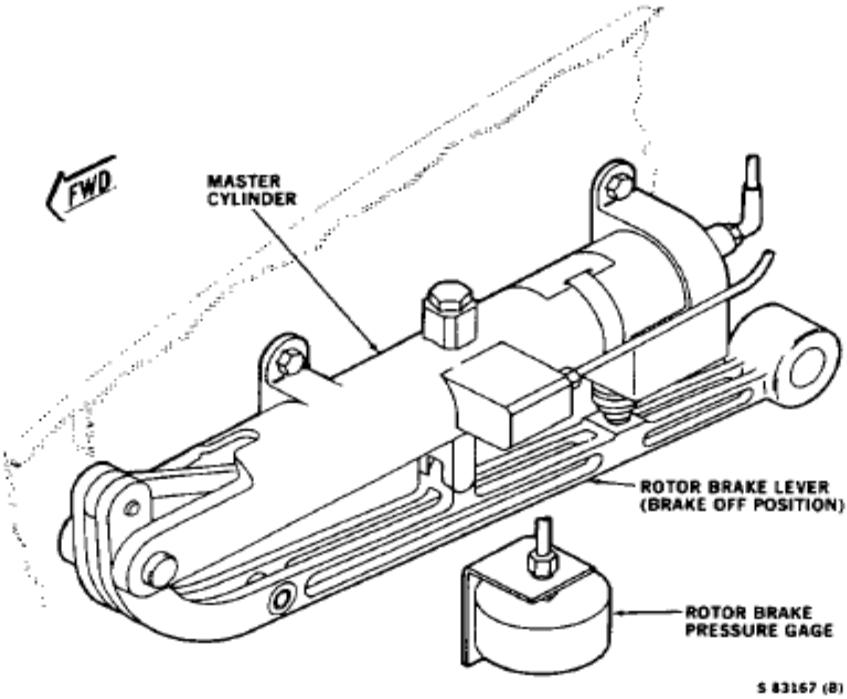

Figure 1-12. Rotor Brake Master Cylinder

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Rotor Brake Caliper

The rotor brake receives hydraulic power from the master cylinder and accumulator. It consists of two opposed cylinder assemblies mounted in a clamping arrangement, with the brake disc rotating between them. The brake disc is bolted to the main gear box tail takeoff flange.

Rotor Brake Caution Light

The ROTOR BRAKE caution light on the caution-advisory panel (Figure 1-26) will be on when the hydraulic braking pressure is 10 psi or above. The caution light will go on as the rotor brake is applied and should be on before the brake pucks begin to move. The light will be off when the master cylinder handle is in the off detent. The caution light circuit is connected to the dc essential bus by a circuit breaker marked RTR BRK WARN.

ROTOR SYSTEM

The rotor configuration is a single main rotor and anti-torque tail rotor. Both systems are driven through the transmission, and blade angles are controlled through the flight control system.

MAIN ROTOR SYSTEM

The main rotor consists of main rotor hub bolted to the main rotor drive shaft, four main rotor blades, blade dampers, a swashplate assembly, and a bifilar vibration absorber. The blades are attached to the main rotor hub by elastomeric bearings which permit the blades to flap vertically, hunt horizontally, and rotate about their spanwise axis. At low rotor speeds, anti-flapping restrainers limit the upward movement of the blade and droop stops limit the downward movement. Droop stops release at about 50% to 60% N_r increasing and are back in at about 45% decreasing. Hydraulic dampers minimize hunting movement of the blades and dampen the in-plane response of the blades when the rotor is started or stopped. Flight control inputs are transmitted to the rotating blades through the swashplate. The bifilar vibration absorber, mounted on top of the main rotor hub, absorbs 3-per rev and 5-per rev vibrations that would be transferred to the aircraft.

Main Rotor Blades

The four main rotor blades consist of a titanium spar and a Nomex honeycomb core covered by a fiber glass skin. The leading edge of the blade is protected by titanium and nickel abrasion strips. A swept-back tip improves performance and reduces noise generated at the tip. Grounding of metal fittings and shielding with aluminum mesh provides lightning protection.

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TAIL ROTOR SYSTEM

A cross-beam tail rotor blade system provides anti-torque action and directional control. The blades are of graphite and fiber glass construction. Blade flap and pitch change motion is provided by deflection of the flexible graphite composite spar eliminating all bearings and lubrication. The spar is a continuous member running from the attachment joint of one blade, through the center hub, to the joint of the opposite blade. Like the main rotor blades, the four tail rotor blades have a fiber glass skin that is internally supported by a Nomex honeycomb. Flight control input is transmitted to the blades through control horns that twist the spar. Grounding of metal fillings and shielding with aluminum mesh provides lightning protection.

FUEL SYSTEM

(Figure 1-13)

Each engine has its own complete fuel system which, under certain conditions, can be connected to the opposite engine by crossfeed valves. Each system is a suction-type supply system, and both systems operate in a similar manner. Two fuel tanks are mounted side by side beneath the baggage compartment floor. The tank on the left supplies fuel to the No. 1 engine and is gravity-fueled through a filler neck on the left side of the fuselage. The tank on the right supplies fuel to the No. 2 engine and is gravity-fueled through a filler neck on the right side of the fuselage. Suction to draw fuel from the fuel tank to the engine fuel control unit is provided by the engine-driven fuel pump. Normal fuel flow is from the tank through the DIR position of the fuel selector valve to the fuel pump. Fuel at pump pressure is supplied to the engine hydromechanical metering unit. The fuel crossfeed system permits both engines to operate from either fuel tank, or either engine to operate from the opposite tank. Fuel crossfeed is used by positioning the fuel system control handles as shown on Figure 1-14. The primer system consists of a primer line extending from the fuel control bypass of one engine to the crossfeed line leading to the opposite engine. A primer valve is contained in this line. One engine must be operating to supply priming fuel to the opposite engine. Engine priming is used by positioning the fuel system control handles as shown in Figure 1-15. Normally, engine priming is not needed, since check valves in the system prevent fuel line drainage back into the fuel tank.

NOTE

Extended running of any engine in DIRECT with the opposite engine's prime switch at ON and fuel lever at PRIME or XFEED can result in vent overflow if tanks are full.

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FUEL LEVERS

The NO. 1 ENG and NO. 2 ENG fuel levers are on the engine control quadrant (Figure 1-5). The levers are connected by mechanical linkage to the fuel selector valve in each main fuel line. The quadrant has four marked positions: OFF, DIR, PRIME, and XFEED. Detents on the valve at all positions except PRIME indicate proper positioning of the lever. OFF closes the fuel line between a fuel tank and its respective engine but does not close the crossfeed line to the opposite fuel system.

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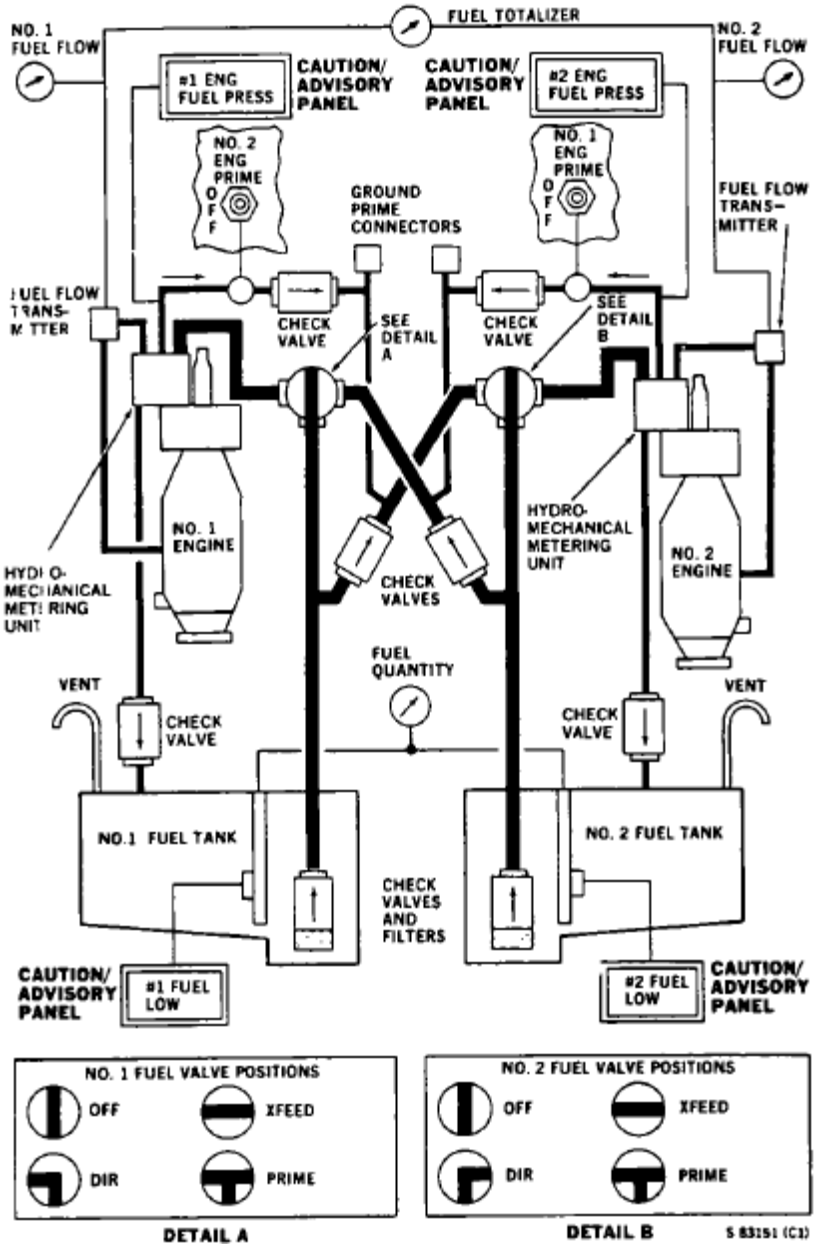

Figure 1-13. Fuel System

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DIR opens the fuel line between a fuel tank and its respective engine. XFEED opens the fuel lines between this engine and the opposite tank. PRIME, although not a true valve position, provides a combined opening of direct and crossfeed and is used if the fuel line leading to one engine has lost its prime. Fuel under pressure from the opposite engine or through the ground primer connection is used to fill the evacuated line. Normally, priming is not necessary, except possibly after fuel line maintenance. In addition to manual positioning, the lever will also be moved to OFF when the respective T-handle is pulled to arm the engine fire extinguisher system.

ENGINE PRIME SWITCHES

The NO. 1 ENG PRIME and NO. 2 ENG PRIME switches, on the overhead control panel (Figure 1-28) are lever-lock switches. Each switch is connected to an electrical primer valve in the primer line of the opposite engine. To prime an engine, the switch is selected to PRIME, with the fuel lever in PRIME. See Figure 1-15 for additional priming requirements. The No. 1 engine primer circuit is connected to the No. 2 dc primary bus by a circuit breaker marked NO. 1 ENG FUEL PRIME. The No. 2 engine primer circuit is connected to the No. 1 dc primary bus by a circuit breaker marked NO. 2 ENG FUEL PRIME.

FUEL QUANTITY INDICATOR

A fuel quantity dial-type indicator, marked MAIN FUEL - LBS X 100, shows the fuel quantity in each fuel tank. Fuel quantity data is measured by probes in the fuel tanks and transmitted electrically to the indicator. The indicating system is connected to the dc essential bus by circuit breakers marked NO. 1 FUEL QTY and NO. 2 FUEL QTY.

	FUEL PRESS REQUIRED	NO. 1 FUEL LEVER	NO. 2 FUEL LEVER
NO. 1 TANK TO NO. 2 ENGINE	NO. 2 ENG	OFF	XFEED
NO. 1 TANK TO BOTH ENGINES	NO. 1 ENG & NO. 2 ENG	DIR	XFEED
NO. 2 TANK TO BOTH ENGINES	NO. 1 ENG & NO. 2 ENG	XFEED	DIR
NO. 2 TANK TO NO. 1 ENGINE	NO. 1 ENG	XFEED	OFF

Figure 1-14. Fuel Crossfeed Operation

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	FUEL PRESS REQUIRED	NO. 1 FUEL LEVER	NO. 2 FUEL LEVER	PRIME SWITCH
TO PRIME NO. 1 ENGINE	NO. 2 ENG	PRIME	DIR	NO. 1 ENG PRIME
TO PRIME NO. 2 ENGINE	NO. 1 ENG	DIR	PRIME	NO. 2 ENG PRIME

Figure 1-15. Engine Prime

TANK	TOTAL CAPACITY			USABLE FUEL		
	U.S. Gallons	Imperial Gallons	Liters	U.S. Gallons	Imperial Gallons	Liters
NO. 1	143.2	119.2	542	140.6	117.1	532
NO. 2	143.2	119.2	542	140.6	117.1	532
TOTAL	286.4	238.4	1084	281.2	234.2	1064

Figure 1-16. Fuel Quantity Data

Fuel Gage Test Button

The FUEL GAGE TEST button on the fuel gage test and digital light switch panel (Figure 1-17) is used to test the fuel quantity gages for proper operation. With dc power available on the essential bus and the test button pressed in, the fuel quantity gage readings should decrease slowly to zero. When the button is released, the gages should return to the original fuel quantities.

FUEL LOW LEVEL CAUTION LIGHTS

The #1 FUEL LOW and #2 FUEL LOW caution lights on the caution-advisory panel (Figure 1-26) light when 85 to 100 pounds of fuel remains in the corresponding tank. The lights are connected to the No. 2 dc primary bus by circuit breakers marked NO. 1 FUEL LOW WARN and NO. 2 FUEL LOW WARN. Less than 20 minutes fuel remains when the lights go on.

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Figure 1-17. Fuel Gage Test and N_1/T_5 Digital Light Switch Panel

ELECTRICAL SYSTEM

The primary source of electrical power is a 28 volt dc system. A 115 volt ac system is powered by one ac generator and one stand-by inverter powered by the essential bus.

CIRCUIT BREAKER PANELS

Circuit breakers in the pilots' compartment are on three panels (Figure 1-18, 1-19 and 1-20), two on the flight control housing between the pilot's and copilot's seats and one in the overhead. The upper panel contains circuit breakers for electrical circuits connected to the No. 1 and No. 2 dc primary buses. The lower panel contains circuit breakers for electrical circuits connected to the dc essential and the No. 1 and No. 2 ac buses. The overhead panel contains circuit breakers for the 26 VAC buses. The following circuit breakers are on the dc junction box in the electrical compartment: GEN CONTR- NO. 1 and NO. 2, BATT CONTR, BLWR PWR, INV PWR, and EMER LT.

DC POWER SUPPLY SYSTEM

(Figure 1-21)

The primary power source for the dc system are two starter-generators. The secondary power sources are the batteries. For ground operation, an external source of dc power may be used to supply power to the electrical system.

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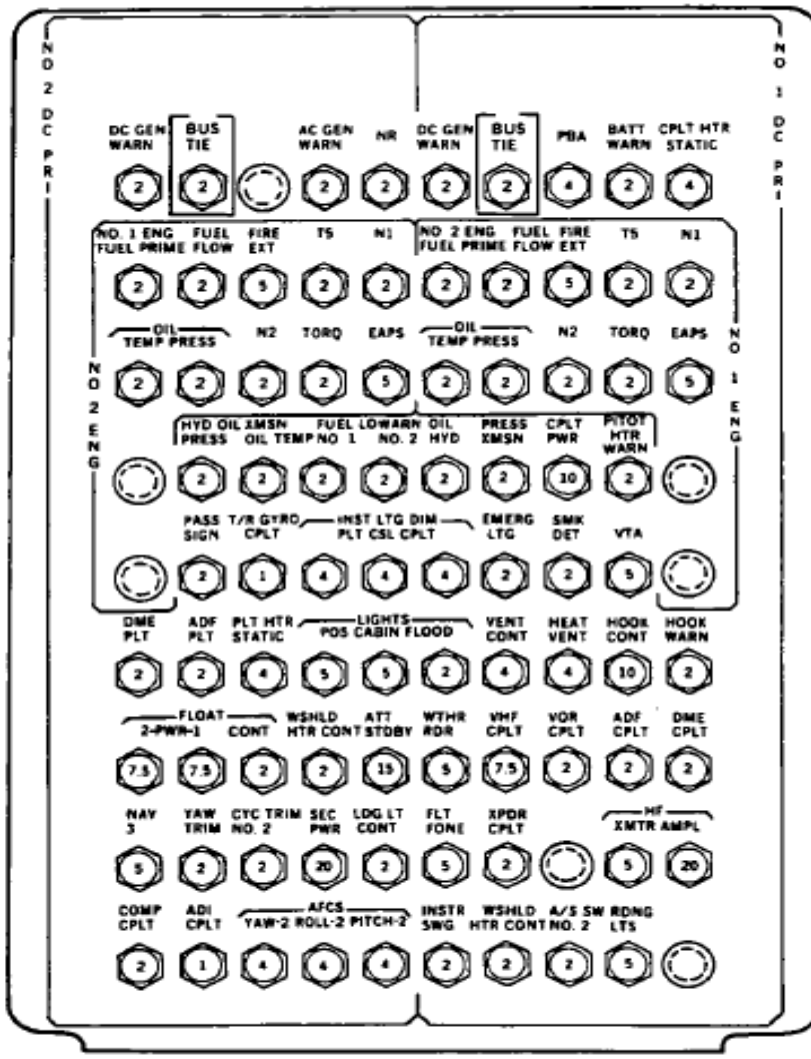

Figure 1-18. Upper Circuit Breaker Panel, DC Primary Bus – Typical

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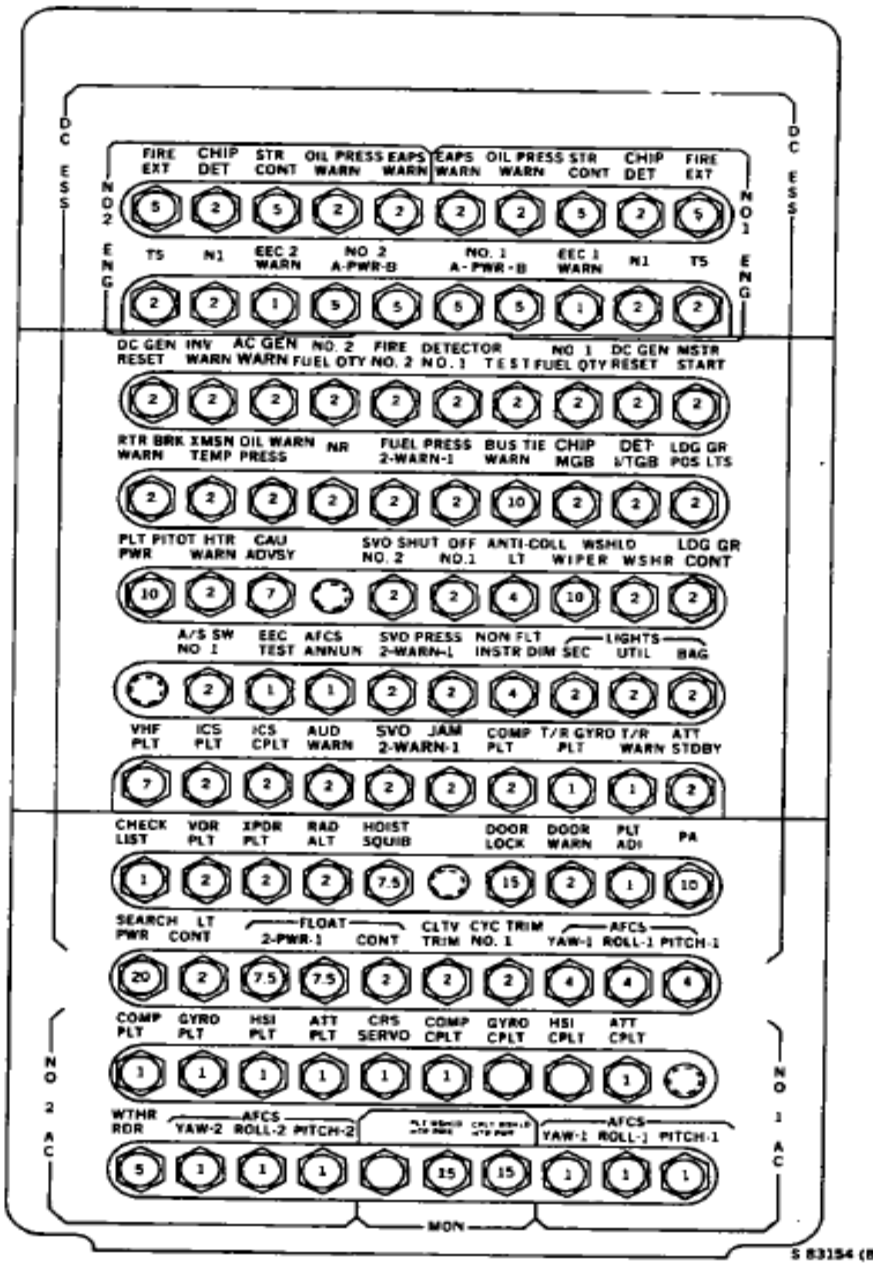

Figure 1-19. Lower Circuit Breaker Panel, DC Essential and AC Bus - Typical

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No. 1 and No. 2 Starter-generators

A 200 amp starter-generator is mounted on the accessory gear box section of each engine. They function as engine starters when provided with dc power from the battery or an external power source. For starter operation, refer to paragraph titled ENGINE STARTER AND IGNITION SYSTEM, in this section. After an engine start when the engine is operating at idle, they function as dc generators. Generator control panels regulate generator output and protect against overvoltage, undervoltage, reverse current, and ground fault conditions.

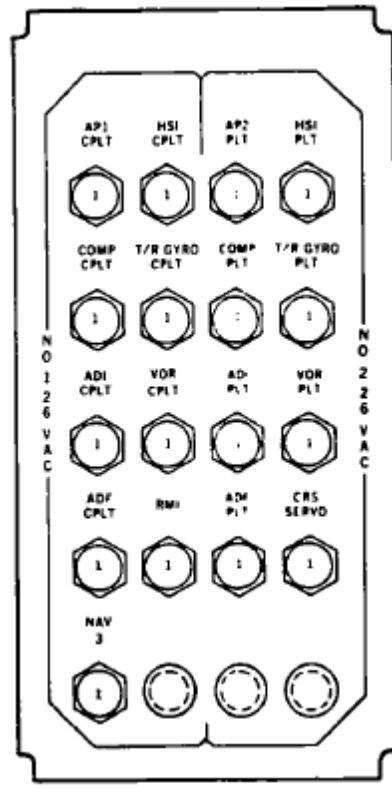

Figure 1-20. Overhead Circuit Breaker Panel, 26 VAC Bus – Typical

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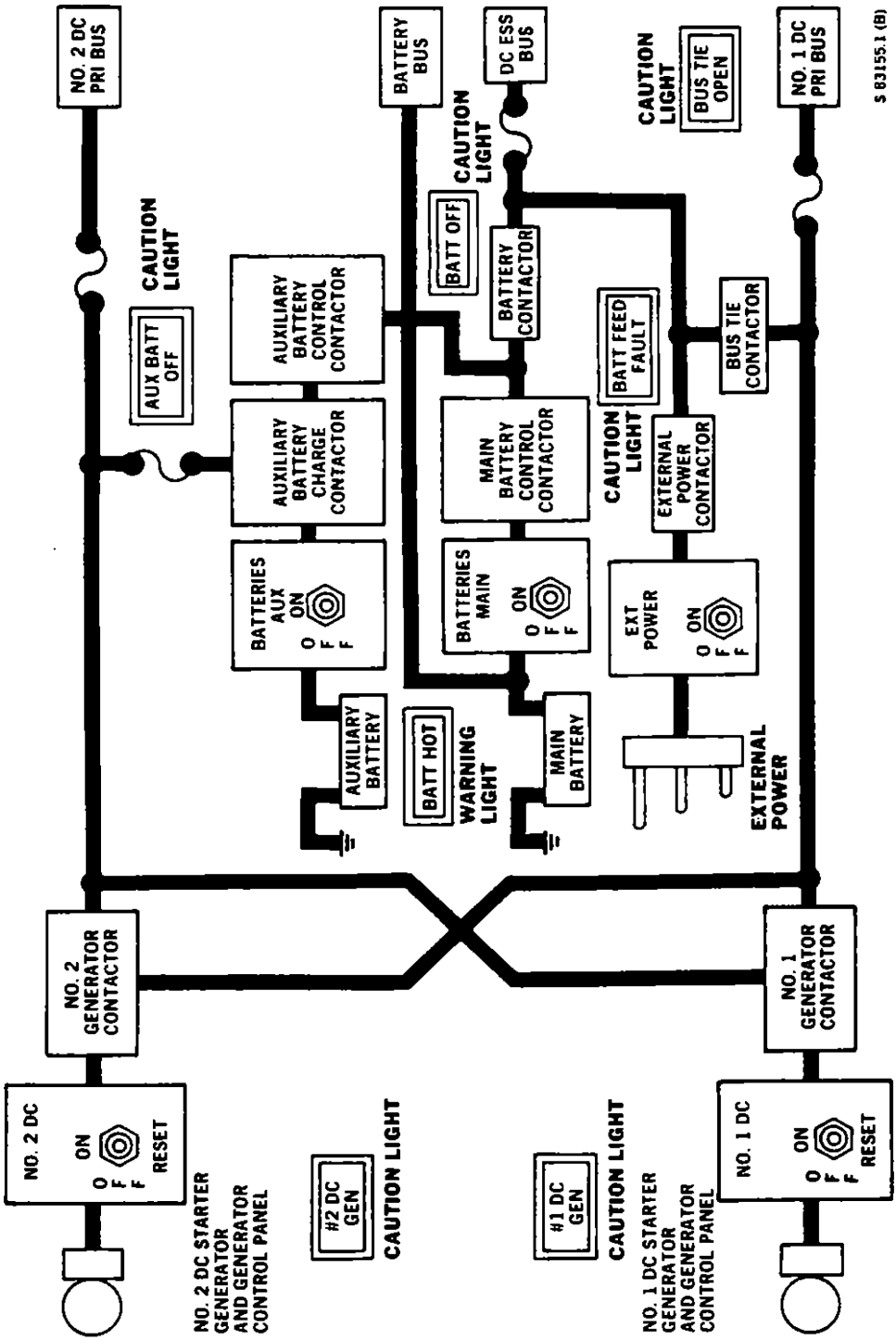

Figure 1-21. DC Electrical System (Sheet 1 of 2)

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GENERATOR CONTACTORS

1. CONNECT EACH GENERATOR TO ITS PRIMARY BUS IF GENERATOR OUTPUT IS ACCEPTABLE TO GENERATOR CONTROL PANEL.
2. CONNECT EITHER GENERATOR TO BOTH PRIMARY BUSES IF OTHER GENERATOR IS OFF OR HAS FAILED.

BATTERY CONTACTOR

1. CONNECTS BATTERIES TO DC ESSENTIAL BUS ONLY. DISCONNECTS BATTERIES FROM DC ESSENTIAL BUS WHEN EXTERNAL POWER IS IN USE, WHEN BATTERY SWITCHES ARE OFF, OR WHEN A BATT FEEDER FAULT IS SENSED.

MAIN BATTERY CONTROL CONTACTOR

1. CONNECTS MAIN BATTERY TO BATTERY CONTACTOR IF EXTERNAL POWER IS NOT APPLIED OR NO FEEDER FAULT EXISTS.

EXTERNAL POWER CONTACTOR

1. CONNECTS EXTERNAL POWER TO DC SYSTEM EXCEPT WHEN ONE OR BOTH GENERATORS ARE OPERATING.

BUS TIE CONTACTOR

1. CONNECTS DC ESSENTIAL BUS TO NO. 1 DC PRIMARY BUS WHEN ONE OR BOTH GENERATORS ARE OPERATING OR WHEN EXTERNAL POWER IS IN USE.
2. ISOLATES BATTERY OUTPUT FROM PRIMARY DC BUSES WHEN OPERATING ON BATTERY ONLY.

AUXILIARY BATTERY CHARGE CONTACTOR

1. CONNECTS #2 DC PRI BUS TO THE AUX BATT THROUGH ITS CHARGING LINE IF BOTH DC GENERATORS ARE ON LINE. DISCONNECTS AUX BATTERY WHEN EXTERNAL POWER IS IN USE.

AUX BATTERY CONTROL CONTACTOR

1. CONNECTS AUX BATTERY TO BATTERY CONTACTOR WHEN BOTH GENERATORS ARE OFF LINE. DISCONNECTS AUX BATTERY WHEN EXTERNAL POWER IS IN USE OR A FEEDER FAULT EXISTS.

GENERATOR CAUTION LIGHTS

1. ON WHEN GENERATOR IS OFF OR INOPERATIVE AND DC SYSTEM IS POWERED BY OTHER GENERATOR, EXTERNAL POWER OR BATTERIES.

BATT HOT WARNING LIGHT

1. ON WHEN EITHER BATTERY IS IN OVERTEMP. WHEN ON EFFECTED BATTERY OFF LIGHT WILL ILLUMINATE. EITHER BATTERY IN OVERTEMP WILL BE RECONNECTED TO THE ESSENTIAL BUS WITH SUBSEQUENT DUAL GENERATOR FAILURE. IF EXTERNAL POWER IS APPLIED AN AUX BATTERY OVERTEMP WILL NOT BE INDICATED. WHEN BATTERY SWITCHES ARE OFF LIGHT GOES OUT.

BATT OFF CAUTION LIGHT

1. ON WHEN #1 DC PRI BUS IS POWERED AND BATTERY SWITCH IS OFF. EXTERNAL POWER IS IN USE DURING PERIOD OF BATTERY OVERTEMPERATURE, OTHER BATTERY MALFUNCTION OR BATTERY FEEDER FAULT

BUS TIE OPEN CAUTION LIGHT

1. ON IF GENERATOR OUTPUT DOES NOT GO THROUGH THE BUS TIE CONTACTOR TO POWER THE DC ESSENTIAL BUS. WHEN ON, DC ESSENTIAL BUS IS POWERED FROM BATTERIES ONLY.

BATT FEED FAULT CAUTION LIGHT

1. ON WHEN A FAULT EXISTS IN FEEDER LINE BETWEEN BATTERY JUNCTION BOX AND DC JUNCTION BOX.

AUX BATT OFF CAUTION LIGHT

1. ON WHEN #1 DC PRI BUS IS POWERED AND AUX BATT SWITCH IS OFF. EXTERNAL POWER IS IN USE. AUX BATT OVERTEMPERATURE OR EITHER DC GENERATOR IS OFF LINE. DURING STARTING, AUX BATT OFF LIGHT COMES ON WHEN 1ST GENERATOR IS TURNED ON AND GOES OUT WHEN 2ND GENERATOR IS TURNED ON UNLESS THERE IS A FAULT IN THE AUX BATT CHARGING LINE.

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Figure 1-21. DC Electrical System (Sheet 2 of 2)

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Generator Switches

Two switches on the master switch panel marked GENERATORS - NO. 1 DC and NO. 2 DC have positions marked ON, OFF, and RESET. ON connects each generator to its power distribution system when the generator control panel senses that generator output is within limits. OFF switches off the generator and disconnects it from the distribution system. If the generator has been dropped off the line due to a momentary overvoltage or other fault (#1 or #2 DC GEN caution light on), placing the switch to RESET and then ON will restore generator operation. The reset circuits are connected to the dc essential bus by circuit breakers marked DC GEN RESET.

Generator Test Switches

The GEN 1 and GEN 2 test switches are on a small panel marked TEST PANEL (Figure 1-22) on the copilot's side of the instrument panel. Each switch has three positions, marked GND FAULT, OFF, and OVERVOLT. GND FAULT and OVERVOLT are used to test that the generator will drop off the line if either of these conditions occur. To test the system, the switch is held at either GND FAULT or OVERVOLT for 5 seconds, with the N_1 of each engine at IDLE or above. The generator should drop off the line as indicated by the lighting of the generator caution light. To restore generator operation, the generator switch is placed to RESET and then ON.

Generator Caution Lights

The #1 DC GEN and #2 DC GEN caution lights, on the caution-advisory panel, go on when the respective generator has malfunctioned or the generator switch is OFF and the dc system is operating from another power source (other generator, battery, or external power). The lights are connected to the No. 1 and No. 2 dc primary buses by circuit breakers marked DC GEN WARN.

Batteries

Two nickel-cadmium 22 amp hour batteries are installed in the battery/radar compartment in the nose of the helicopter. The batteries are used for limited ground operation and as a secondary source of power in flight. The batteries provide power only to the most essential equipment. A battery overtemperature protection system automatically disconnects the battery from the electrical system if battery temperature, due to normal recharging, reaches 63°C (145°F). The battery is automatically reconnected to the electrical system when its temperature drops to 52°C (125°F) or if both generators malfunction. The batteries will also be disconnected from the electrical system when external power is applied.

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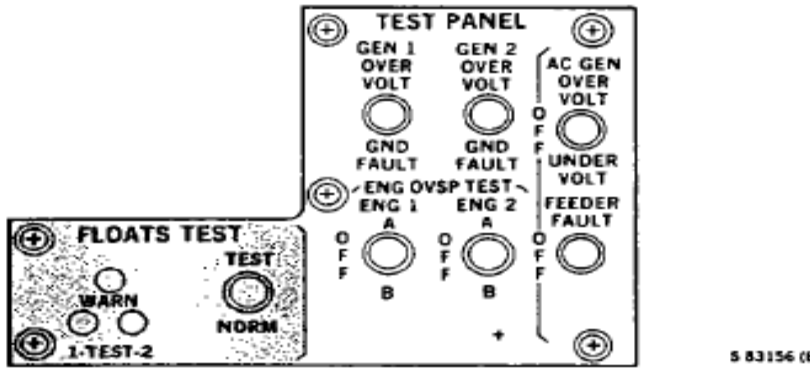

Figure 1-22. AC and DC Generator and Engine Overspeed Test Panels

Battery Switches

The MAIN BATTERY and AUX BATTERY switches on the master switch panel (Figure 1-10) have positions marked ON and OFF. ON connects the batteries to the dc essential bus except when dc external power is in use. The auxiliary battery can not be connected to the essential bus unless both dc generators are not operating. OFF disconnects the batteries from the dc essential bus.

Battery Hot Warning Light

The red BATT HOT warning light on the caution-advisory panel (Figure 1-26) lights whenever either battery is disconnected from the electrical system due to overtemp. When the battery cools it is automatically reconnected to the electrical system and the light will go off. The warning light is inoperative when both battery switches are OFF. The BATT OFF or AUX BATT OFF caution light on the caution-advisory panel will also light when the BATT HOT light goes on.

Battery Off Caution Light

The BATT OFF caution light on the caution-advisory panel (Figure 1-26) lights whenever the dc system is operating and the main battery is disconnected from the dc essential bus. The light is connected to the No. 1 dc primary bus by a circuit breaker marked BATT-WARN.

Auxiliary Battery Off Caution Light

The AUX BATT OFF caution light on the caution-advisory panel (Figure 1-26) lights under the following conditions: loss of one generator, overtemp of auxiliary battery or a fault in the auxiliary battery charging line. The light is connected to the No. 1 dc primary bus by a circuit breaker marked BATT-WARN.

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Battery Feed Fault Caution Light

The BATT FEED FAULT caution light on the caution-advisory panel (Figure 1-26) lights when there is a ground fault in the battery feed line. The light is connected to the ground fault panel by circuit breakers marked MAIN BATT and AUX BATT.

Battery Feeder Fault Test

The battery feeder fault test switch (Figure 1-4) checks the integrity of the ground fault panel and associated current transformers by simulating an unbalance in the current sensing circuit as a result of a ground fault. When the BATT FEED FAULT test switch is held to either the FWD or AFT position and then either battery is turned on, the BATT FEED FAULT caution lamp illuminates and the battery is automatically disconnected from the dc essential bus. Releasing the test switch and setting the battery switch to OFF and then ON resets the ground fault monitoring circuit.

External Power

A 28 vdc external power receptacle is on the right side of the fuselage above the main landing gear door. External power will supply power to the entire dc system. When external power is being used, the batteries are automatically disconnected from the dc system. When either generator is operating, external power is automatically disconnected from the dc system.

External Power Switch

The EXT PWR switch on the master switch panel (Figure 1-10) has two positions marked ON and Off. ON connects dc external power to the dc system except when one or both dc generators are operating. OFF disconnects the external power supply.

DC POWER DISTRIBUTION SYSTEM

DC power is distributed through three buses. The No. 1 dc primary bus is powered by the No. 1 generator and the No. 2 dc primary bus is powered by the No. 2 generator. The dc essential bus is connected to No. 1 generator output through a bus tie contactor. If either generator is inoperative as indicated by the lighting of the appropriate DC GEN caution light, the other generator will provide power to all three buses. If both generators are inoperative and external power is not in use, only the dc essential bus will be powered from the batteries. This condition is indicated by the lighting of both DC GEN and BUS TIE OPEN caution lights. External power will power all three buses unless one or more generators are operating; then external power will be disconnected from the dc system.

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Emergency Load Shed Switch

The EMER LOAD switch on the master switch panel (Figure 1-10), if installed has positions marked NORM and SHED. The switch is kept at NORM during normal operation of the electrical system. If both dc generators should fail, the primary buses are dropped from the system and the battery powers the dc essential bus only. This condition is indicated by the lighting of both DC GEN caution lights and the BUS TIE OPEN caution light. To prolong battery output, the switch may be placed to SHED. In this position, the following equipment is shed from the dc essential bus:

- anticollision lights
- non-flight instrument lights
- ATC transponder
- weather radar (if installed)
- AFCS SAS II (channel 1)
- copilot clock
- data NAVIGATION (if installed)
- DDAFCS (if installed)

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Bus Tie Open Caution Light

The BUS TIE OPEN caution light on the caution-advisory panel (Figure 1-26) lights when the circuit is open between the dc primary busses and the external power receptacle or the dc essential bus. Then, only the battery can provide power to the dc essential bus, and the battery will not be recharged by generator output. The caution light is connected to the dc essential bus by a circuit breaker marked BUS TIE WARN.

NOTE

> The bus tie contactor will sometimes close momentarily when some dc equipment is switched on with battery as the only dc power source. This transient will be indicated by a flash of the BUS TIE OPEN caution light and possible flashing of the DOOR OPEN or other caution lights and a flicker of those instruments powered by the dc primary bus.

AC POWER SUPPLY SYSTEM

(Figure 1-23)

The primary power source for the ac electrical system is a generator, and the secondary power source is an inverter.

AC Generator

A three-phase 10 KVA generator is mounted on and driven by the NO. 2 engine reduction gear box. A generator control unit regulates generator output and protects against overvoltage, undervoltage, under frequency and feeder fault. The generator control circuits are powered by a dc permanent magnet generator (part of ac generator). Three-phase ac is required if the windshield heater is installed.

AC Generator Switch

The GENERATORS - AC switch on the master switch panel (Figure 1-10) has three positions: ON, OFF, and TEST. ON connects the generator to the ac power distribution system when the generator control panel senses that generator output is within limits. OFF switches off the generator and disconnects it from the ac system. If the generator is dropped off the line due to a momentary overvoltage or other fault (AC GEN caution light on), placing the switch to OFF then ON will restore generator operation. The TEST position may be used to lest generator output before connecting it to the ac distribution system (switch on). If generator output is satisfactory, placing the switch to TEST when operating at 107% N_r will cause the AC GEN caution light to go off.

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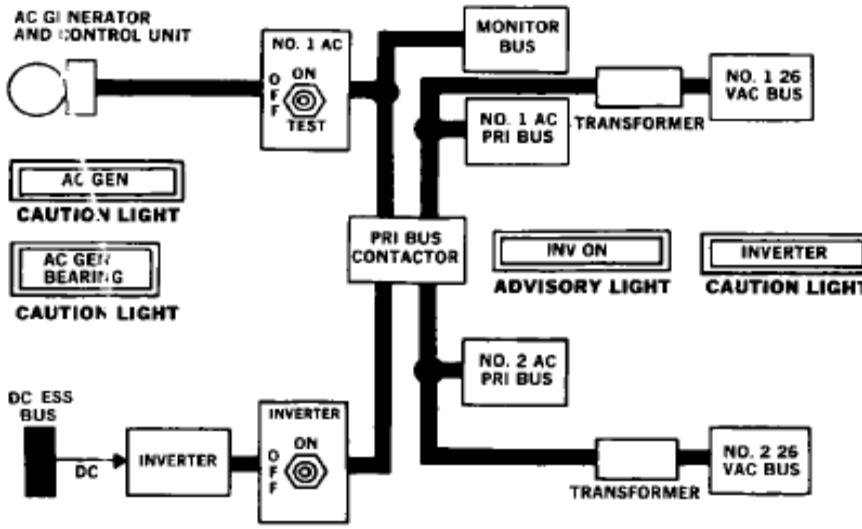

PRIMARY BUS CONTACTOR

1. CONNECTS AC GENERATOR TO ALL BUSSES IF BOTH ENGINES ARE OPERATING, #2 ENGINE N2 IS GREATER THAN 92% AND GENERATOR OUTPUT IS ACCEPTABLE TO GENERATOR CONTROL UNIT.
2. CONNECTS INVERTER TO AC PRIMARY BUSSES IF AC GENERATOR IS INOPERATIVE OR HAS FAILED AND THE INVERTER SWITCH IS IN THE ON POSITION.

AC GEN CAUTION LIGHT

1. WHEN ON, INDICATES THAT AC GENERATOR IS INOPERATIVE OR HAS FAILED.

INVERTER CAUTION LIGHT

1. WHEN ON, INDICATES THERE IS NO INVERTER OUTPUT

INV ON ADVISORY LIGHT

1. WHEN ON, INDICATES THAT INVERTER IS SUPPLYING POWER TO AC PRIMARY BUSES.

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Figure 1-23. AC Electrical System - Typical AC Generator System

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AC Generator Test Switch

A small panel marked TEST AC GEN (Figure 1-22) is on the copilot's side of the instrument panel. The panel has two switches, one marked UNDERVOLT - OFF - and OVERVOLT and the second marked FEEDER FAULT and OFF. The switches are used to test that the generator will drop off the line if any of the above conditions occur. Each condition is tested separately by holding a switch at the desired position for about 5 seconds and then releasing it. The generator should drop off the line as indicated by the lighting of the AC GEN caution light. To restore generator operation, the AC generator switch is placed to OFF, then ON.

AC Generator Caution Light

The AC GEN caution light, on the caution-advisory panel (Figure 1-26) lights when the dc essential bus is energized and the ac generator is inoperative, not connected to the ac distribution system, or has failed. No. 1 engine failure detection will also result in loss of the ac generator. The caution light is connected to the No. 2 dc primary bus and the dc essential bus by circuit breakers marked AC GEN WARN.

AC Generator Bearing Caution Light

The rotor shaft of the ac generator has a set of main bearings and a set of auxiliary bearings. Normally the main bearings carry the rotor shaft load and the auxiliary bearings are clear of the shaft. If the main bearings fail, the auxiliary bearings will take over the rotor shaft load. Then, a bearing failure switch will light the AC GEN BEARING light on the caution-advisory panel (Figure 1-26). Operation on the auxiliary bearings is limited to 5 hours. The caution light is connected to the No. 2 dc primary bus and the dc essential bus by circuit breakers marked AC GEN WARN.

Inverter

The secondary power source for the ac electrical system is a 600 VA inverter. The inverter is powered from the dc essential bus through a circuit breaker marked INV PWR on the dc junction box. For ground operations, the inverter may be used as a source of ac power until the No. 2 engine is running at 92% N_2 or greater.

Inverter Switch

Inverter output is controlled by an INVERTER ON-OFF switch on the master switch panel (Figure 1-10).

Inverter Fail Caution Light

An INVERTER caution light on the caution-advisory panel lights when the inverter fails while either supplying power to the ac system or acting in stand-by as a backup to the generator.

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Inverter On Advisory Light

The INV ON advisory light, on the caution-advisory panel, lights when the inverter is supplying power to the ac system. The light is connected to the dc essential bus by a circuit breaker marked INV WARN.

AC POWER DISTRIBUTION

AC power is distributed through two single-phase ac primary buses and a three-phase monitor bus. Transformers connected to the primary contactor step down voltage to 26 vac for operation of indicators, etc. Normally the entire ac system is powered by the ac generator after the No. 2 engine is operating at 92% N_2 or greater. For ground operation using dc external power, or if the ac generator should become inoperative, the inverter will power the two primary buses and the monitored bus will be dropped. Under this condition the AC GEN caution light and the INV ON advisory light will be on.

FLIGHT CONTROL SYSTEM

Conventional helicopter flight controls consist of a collective pitch lever and a cyclic control stick to control main rotor blade angles, and tail rotor pedals to control tail rotor blade angles. A two-stage servo system reacts the loads imposed on the rotor system and reduces control forces required by the pilot. Collective and cyclic trim and a force gradient system permit trimming of the controls in the cockpit to the desired position. A set of dual controls for a copilot may be installed as optional equipment.

MAIN ROTOR FLIGHT CONTROLS

Control movements from the collective pitch lever for vertical control and from the cyclic for longitudinal and lateral control are transmitted by mechanical linkage to a mixing unit which combines the inputs. The combined input is then transmitted to the stationary ring of the swashplate by mechanical linkage, and through the two-stage hydraulic servo system. Movement is transmitted from the stationary to the rotating ring of the swashplate to vary the pitch of the main rotor blades. A collective to yaw coupling automatically changes tail rotor blade angle and thrust to compensate for changes in main rotor torque when collective pitch is increased or decreased. The collective control and the cyclic longitudinal and lateral controls have viscous dampers attached at the bottom of the controls closet.

Collective Pitch Lever

The collective pitch lever (Figure 1-6) increases or decreases the collective pitch of the main rotor blades. The collective pitch lever may be trimmed to any desired position by use of the trim system. Collective pitch lever movement from the trimmed position is resisted by a gradient spring.

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Collective Pitch Lever Trim and Force Gradient Spring

The collective pitch lever may be trimmed to any desired position and held there with a magnetic brake. The trim system operates from the dc essential bus through a circuit breaker marked CLTV TRIM on the lower circuit breaker panel. The trim is controlled by the STICK TRIM CLTV switch on the master switch panel with positions marked ON and OFF and a switch on the collective pitch grip marked TRIM REL. When the magnetic brake is energized electrically, it holds the lever position. When the magnetic brake is de-energized, the lever is released. With the master switch ON, the collective lever may be trimmed by pressing the pushbutton switch to de-energize the brake, moving the lever to the desired position, and then releasing the pushbutton. The lever will remain trimmed to that position. Any movement from the trimmed position will be resisted by the force gradient spring which creates a stick "feel"

Cyclic Control Stick

The cyclic control stick (Figure 1-6) changes the pitch of the main rotor blades to provide longitudinal and lateral control. The cyclic control stick may be trimmed to any desired position by use of the magnetic brakes. Cyclic control stick movement from the trimmed position will be resisted by a gradient spring.

Cyclic Control Stick Trim and Force Gradient Spring

The cyclic control stick trim system functions similar to the collective trim system, except that two magnetic brakes, one for pitch control, and one for roll control, are used. The trim system operates from the dc essential bus through a circuit breaker marked CYC BRK. The master switch on the master switch panel is marked STICK TRIM-CYCLIC and has positions marked AUTO, ON, and OFF. A push-button switch is on the cyclic stick grip and is marked TRIM REL.

Pitch Bias Actuator

The helicopter is equipped with a pitch bias actuator that improves longitudinal stability by compensating for changes in fuselage attitude caused by changes to airspeed or power. An airspeed transducer senses changes in airspeed and a collective pitch transducer senses changes in collective pitch lever position. These changes are combined and transmitted electrically to a pitch bias actuator. The actuator applies corrective input to the flight control system whenever changes to airspeed (cyclic) or power (collective) are made by the pilot. The pitch bias actuator is limited to about 15% forward and 17% aft of full control input of the flight control system. The corrective inputs result in a constant forward displacement of the cyclic control stick as airspeed is increased and reduces changes in fuselage altitude with collective pitch changes. The system is operational when the airspeed transducer senses about 60 knots airspeed or above. Electrical power is supplied to the system from the No. 1 primary dc bus through a circuit breaker marked BIAS ACTR.

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Channel Monitor Switch

The channel monitor switch, when in the PBA position, and the CH 1 and CH 2 indicators on the AFCS indicator panel are used to monitor the pitch bias actuator. The NO. 2 AFCS indicator indicates input signals to the actuator and the NO. 1 AFCS indicator indicates the position of the actuator. Below about 60 knots airspeed, the indicator pointers should be full left. Above about 60 knots, the NO. 1 pointer should follow movements of the NO. 2 pointer. The AFCS indicator is installed on all helicopters even if AFCS is not installed.

TAIL ROTOR FLIGHT CONTROLS

Tail Rotor Pedals

The tail rotor pedals control the pitch and thrust of the tail rotor blades to compensate for main rotor torque and to provide a means of changing the heading of the helicopter. Control rods and cables connect the pedals to the pitch changing mechanism at the tail rotor. Control forces are relieved by the two-stage tail-rotor servo. A pedal damper provides "feel" in the tail rotor pedals by resisting pedal movements, to prevent overcontrol. Toe-operated wheel brakes are part of the tail rotor pedals.

Tail Rotor Pedal Adjustment Knobs

A tail rotor pedal adjustment knob is below the instrument panel and centered between the pedals. The knob is marked PEDAL ADJUST-TURN. Arrows indicate direction to turn for FWD and AFT adjustments.

COLLECTIVE TO YAW COUPLING

Mechanical collective to yaw coupling incorporated in the flight control system provides automatic tail rotor pitch (thrust) changes proportional to collective pitch (torque changes). The coupling reduces pilot workload by automatically compensating for main rotor torque as collective pitch is increased or decreased. Though mechanical stops prevent tail rotor pitch limits from being exceeded, mechanical feedback can be felt in the controls at certain control extremes. Full down collective and application of full right pedal will result in upward movement of the collective. Further movement of the right pedal, however, produces no further change in tail rotor pitch, since the tail rotor servo is at its mechanical stop. Likewise, at high collective settings, application of left pedal may result in system limits being attained before the pedal stops are reached. Further application of left pedal will result in downward movement of collective and no change in tail rotor pitch. The extreme control positions where the collective to yaw feedback occurs are not normally encountered within the normal flight envelope but may be felt during dynamic maneuvers, e.g., arresting a rapid descent rate in a right crosswind at maximum gross weight.

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SELF-CENTERING TAIL ROTOR CONTROL QUADRANT

The self-centering aft quadrant will return the tail rotor blade pitch to -2° in case of a dual control cable failure or single failure unopposed by the remaining cable. The quadrant uses two pivoting arms with concentrically-mounted torsion springs at the base end and reaction rollers at the outer end. When control cable tension is lost, the respective torsion spring pivots its arm to a fixed reaction plate imparting a rotational force to the quadrant. In the case of the single cable failure, this force may be reacted by the pilot through the remaining cable to retain a desired trim condition dependent upon prefailure pedal position and failed cable combination. In the case of the dual cable failure, the quadrant will rotate unopposed to the -2° setting. The -2° setting is a compromise that results in coordinated level flight at about 40 KIAS in addition to varied combinations of trimmed and untrimmed climbs, descents, autorotative descents, and level flight conditions up through V_{ne}. Flight conditions at airspeeds less than 20 knots may be considered outside a recoverable envelope using -2°.

A single cable failure affecting the right cable will retain normal left yaw control from the -2° setting to full left pedal. In level flight the helicopter will yaw left between 40 and 135 KIAS requiring right lateral cyclic to maintain track. A left cable failure will retain normal right yaw control from the -2° setting to full right pedal. The helicopter will trim normally in level flight at airspeeds 40-135 KIAS but yaw right at airspeed outside that band. Left cyclic input will maintain track during right yaw conditions. During single cable failure conditions normal collective to yaw coupling will be available through the remaining cable and its limited control range. The respective pedal force of the remaining cable varies from near zero at -2° to as much as 20 pounds at the control extremes.

Helicopter response to a cable (or cables) failure will depend upon airspeed and flight condition (level, climb, or descent) at the time of the failure.

FLIGHT CONTROL HYDRAULIC SERVO SYSTEM

Dual servo units in the main and a tandem servo unit in the tail rotor flight control systems react flight loads from the rotor system and reduce the force required to operate the flight controls. The dual servo units consist of a first stage and a second stage each of which operate on 3000 psi hydraulic pressure from separate hydraulic pumps. The pumps are driven by the main gear box. Full pressure is available at about 10% N_r. Three main rotor dual servo units are mounted on the main gear box and attached to the stationary swashplate. The tail rotor tandem servo is mounted on the tail rotor gear box. Hydraulic pressure for extending and retracting the landing gear is supplied by the second stage hydraulic pump. The first and second stage servo systems are controlled electrically by switches on the collective stick grips. Electrical interlocks between the first and second stage systems prevent one system from being shut off unless there is 1600 psi in the opposite system. If one stage is shut off and a pressure loss occurs in the system in operation, the interlocks will switch on the system that was originally shut off.

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FLIGHT CONTROL SERVO SWITCH

The first and second stage servo systems are controlled by a three-position SERVO switch on the collective pitch grip (Figure 1-6). The switch has positions marked NO. 1 OFF and NO. 2 OFF. The switch is normally centered, with both stages operating. To turn off either stage, the switch is placed to the corresponding OFF position. If there is at least 1600 psi hydraulic pressure in the other stage, the selected system will go off. The shutoff system is connected to the dc essential bus by circuit breakers marked SVO SHUTOFF - NO. 1 - NO. 2. When dual flight controls are installed, the copilot's collective grip has a similar switch. Either switch may be used to shut off one stage; however, the same switch must be used to turn that stage back on again. When one stage has been shut off, the other stage cannot be shut off by the opposite switch.

NOTE

If a dc electrical system failure has occurred, a malfunctioning servo system cannot be shut off. If a malfunctioning servo system has been shut off, it will be reactivated if a dc failure occurs.

FLIGHT CONTROL SERVO HYDRAULIC PRESSURE INDICATOR

A dual indicator marked HYD PRESS - PSI X 1000 has scales marked 1 and 2 for first and second stage hydraulic pressure. The indicator is connected to the No. 1 and No. 2 dc primary buses by two circuit breakers marked HYD OIL - PRESS.

FLIGHT CONTROL SERVO LOW PRESSURE CAUTION LIGHTS

The #1 SERVO SYSTEM and #2 SERVO SYSTEM caution lights, on the caution-advisory panel (Figure 1-26) go on when the hydraulic pressure in the corresponding stage drops to 1600 psi. The light will go off when pressure increases to 2200 psi. The same caution lights also sense a jam in one or more of the servo units. When a servo becomes jammed, the corresponding caution light will go on. During flight, the caution light will be kept on through a holding circuit even if the jammed pilot valve returns to normal operation. The holding relay operates through the landing gear interlock and therefore will only function when the helicopter is airborne. To differentiate between a system pressure loss or a jammed servo, note the pressure on the system hydraulic pressure indicator of the affected system. A loss in indicated pressure with the caution light on indicates a loss in system pressure. Normal indicated pressure with the caution light on could indicate a jammed servo. The caution light circuits are connected to the dc essential bus by circuit breakers marked SVO PRESS-2 WARN 1 and SVO JAM-2 WARN 1.

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AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS) PHASE II

A dual channel AFCS provides stability about the pitch, roll and yaw axis. The channels are redundant, each with a separate electrical power source, vertical gyro, yaw rate gyro, linear actuators (pitch, roll, and yaw), and a control panel. Control authority of each channel is limited to 5%, with a combined limited authority of 10%. Due to this limited authority, the pilot may easily override AFCS inputs through normal use of the flight controls if an AFCS system should malfunction. The gyros in each channel transmit signals to an amplifier which senses any deviation from the trimmed attitude and heading of the helicopter as selected by the pilot. Whenever there is any deviation, the amplifier transmits an electrical error signal to the linear actuators, which are an integral part of the flight control system. The linear actuators in turn impart corrective action to the flight control system. Airspeed switches in the copilot's pitot static system increase amplifier gain below speeds of 60 knots. This provides greater stability at lower airspeeds and in a hover.

ATTITUDE RETENTION

Pitch and roll signals are provided to each channel by a vertical gyro. The vertical gyro is referenced to the horizon; however, the attitude of the helicopter may be trimmed to an attitude desired by the pilot (e.g., attitude for desired cruise) which deviates from the horizontal attitude. Once the helicopter is in the trimmed attitude, the vertical gyro signal is nulled in the amplifier and there is no electrical input to the pitch or roll linear actuators. When the altitude of the helicopter deviates from the trimmed attitude, an error signal proportional to the deviation is sensed in the amplifier, which transmits an electrical signal to the linear actuators. The pitch and roll linear actuators in the main rotor cyclic pitch flight control system apply a corrective input to return the helicopter to the trimmed attitude. Short term rate damping is provided using derived rate values from the vertical gyros.

Helicopter attitude may be established or changed by either of these methods:

(1) The cyclic stick position may be retrimmed using the magnetic brake. When the TRIM REL switch is pressed, the error signal to the actuators is nulled and the magnetic brake released. The cyclic stick is then moved to the desired position and the TRIM REL switch released. AFCS will hold the newly established attitude. Rate damping is provided irrespective of cyclic stick trim condition.

(2) The four-way beeper trim switch on the cyclic stick grip is normally used to make small changes to helicopter attitude without changing the cyclic stick position. Pressing the switch to any of the four positions: FWD, AFT, L, or R, drives the actuators to produce the desired helicopter attitude. When the switch is released (centered), AFCS will hold this attitude. If additional correction is necessary, press the switch again to achieve the desired position.

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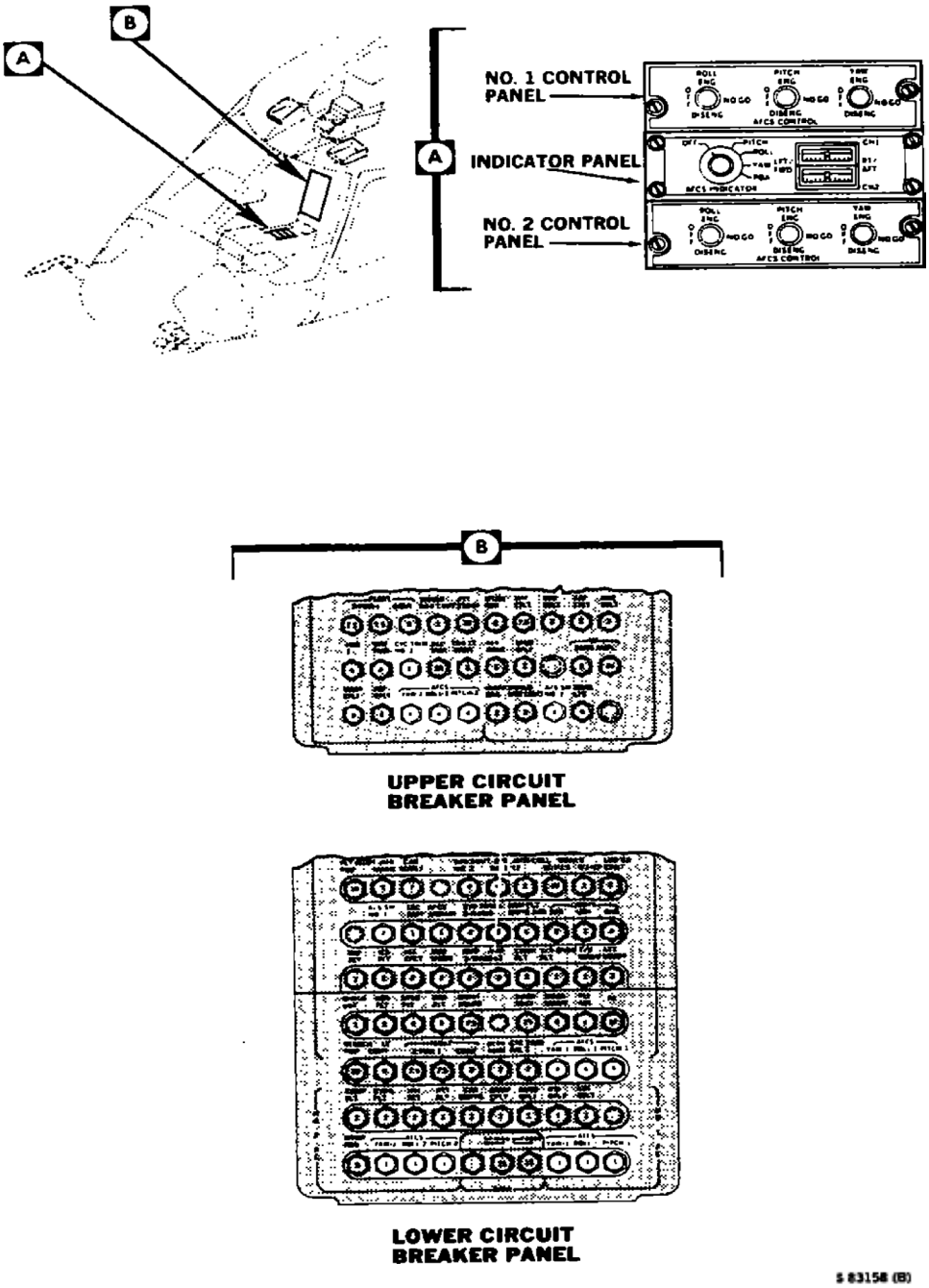

Figure 1-24. AFCS Phase II Control and Circuit Breaker Panels

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YAW CHANNEL

Yaw signals are provided to each channel by a yaw rate gyro. When the helicopter develops a yawing rate, an error signal proportional to the rate is sensed by the rate gyro in the amplifier, which transmits an electrical signal to the yaw linear actuator. The yaw linear actuator in the tail rotor flight control system applies a corrective input to arrest the yaw rate.

AFCS CONTROL PANEL

Two identical AFCS CONTROL panels (Figure 1-24) are on the center console. The forward panel controls the No. 1 channel and the aft panel controls the No. 2 channel. Each panel has three switches marked PITCH, ROLL and YAW. Each switch has three marked positions ENG (engage), OFF, and DISENG (disengage). A light next to each switch lever marked NO GO will go on if there is an electrical malfunction in the system or in the gain control. The NO GO lights will also be tested (go on) when the caution-advisory panel test button is pressed. The ENG position of each switch engages the AFCS for the respective axis. The OFF position of each switch centers the corresponding actuator and then removes power from the system. The lever-lock DISENG position of each switch disengages the system with the actuator remaining in the position at which the system was disengaged.

AFCS INDICATOR PANEL

The AFCS INDICATOR panel (Figure 1-24) is next to the AFCS control panels on the center console. The panel contains a channel monitor switch with marked positions OFF, PITCH, ROLL, YAW, and PBA and two indicators marked CH 1 and CH 2. By selecting PITCH, ROLL, or YAW on the rotary switch, the position of the respective actuators (LFT/FWD or RT/AFT) can be monitored in the windows. Normally the indicator pointer should move about the center position. The PBA position is used to monitor the pitch bias actuator system. (Refer to paragraph titled Pitch Bias Actuator in this section.)

AFCS CIRCUIT BREAKERS

(Figure 1-24)

The No. 1 AFCS channel is connected to the dc essential bus and the No. 1 ac primary bus by circuit breakers marked AFCS. The No. 2 AFCS channel is connected to the No. 2 dc primary bus and the No. 2 ac primary bus by circuit breakers marked AFCS. The vertical gyros for the No. 1 and No. 2 AFCS channels are connected to the No. 1 and No. 2 ac primary buses by circuit breakers marked GYRO CPLT and GYRO PLT, respectively. The turn rate gyro for the No. 1 AFCS channel is connected to the No. 2 dc primary bus by a circuit breaker marked T/R GYRO CPLT. The turn rate gyro for the No. 2 AFCS channel is connected to the dc essential bus by a circuit breaker marked T/R GYRO PILOT.

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LANDING GEAR SYSTEM

The tricycle landing gear consists of a full swiveling, self centering nosewheel assembly and two main landing gear assemblies equipped with hydraulic brakes. Hydraulic pressure from the second stage servo hydraulic pump is used to extend or retract the landing gear. The extension-retraction is controlled electrically on power from the dc essential bus through a circuit breaker marked LDG GR CONT. Indicator lights are connected to the dc essential bus by a circuit breaker marked LDG GR POS LTS. An emergency extension system uses compressed air to extend the gear if the normal system malfunctions. All landing gear controls and position indicator lights are contained on a panel marked LDG GEAR (Figure 1-25) on the right side of the instrument panel.

LANDING GEAR CONTROL HANDLE AND INDICATOR LIGHTS

The landing gear control handle marked NORMAL, UP, and DN, three green indicator lights marked L (left), N (nose), and R (right), and a red indicator light marked UNLKD, are on the landing gear control panel. The control handle must be pulled up to move it to the UP or DOWN position. The red UNLKD indicator light will be on whenever the gear is in the retraction or extension cycle, or whenever one or more landing gear assemblies is not locked in the up or down position. Each green indicator light will be on only when the corresponding gear assembly is down and locked. All four lights should light when the caution/advisory TEST switch is pressed.

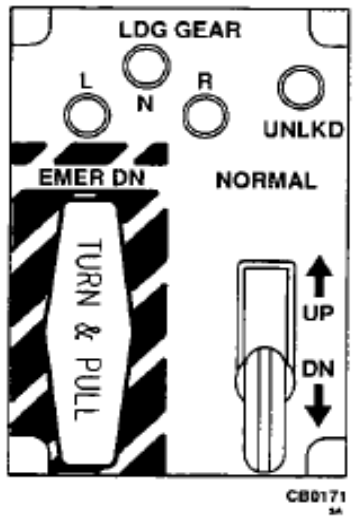

Figure 1-25. Landing Gear Control Panel

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LANDING GEAR UP WARNING LIGHT

A LDG GEAR UP - PRESS TO RESET warning light capsule is installed on the instrument panel. The light will go on and an intermittent 250 Hz tone will be heard in the headset if the landing gear is up and airspeed is less than about 60 KIAS. The tone may be eliminated by pressing in the warning light capsule but the light will remain on until either the landing gear is lowered or airspeed is increased to over 60 KIAS. A second warning light capsule is on the copilot's side of the instrument panel.

EMERGENCY LANDING GEAR SYSTEM

A pneumatic system can be used to lower the landing gear if the hydraulic system malfunctions. The contents of an air container charged to 3000 psi air pressure is discharged into the system to pressurize the down side of the hydraulic pistons. The air charge also repositions a valve which bypasses the main landing gear valve and opens the return flow line. The system is operated by turning and then pulling the red T-handle marked EMER DN - TURN & PULL on the landing gear control panel. After the system is used, the T-handle and the valve which bypasses the main landing gear valve (right wheel well) must be manually reset, and the air container recharged. The air container in the electronics compartment has a charging valve and pressure gage.

INSTRUMENTS

PITOT-STATIC SYSTEM

Separate pitot-static systems for pilot's and copilot's instruments provide pitot and static pressure to the airspeed indicators. Transducers and switches in the pitot-static system are used as sensors for the landing gear warning system, pitch bias system, and AFCS systems. Electrical heaters prevent the formation of ice on the heads.

Pitot Heaters

Pitot heater operation is controlled by two switches on the master switch panel marked PITOT HEAT, PILOT and COPILOT. Both switches have marked positions ON and OFF. When icing conditions are anticipated, the switches are placed ON to prevent the formation of ice on the pitot heads. Caution lights marked PLT PITOT HEAT and CPLT PITOT HEAT will light when the appropriate switch is ON but the pitot heater electrical circuit is inoperative. The pilot's system is connected to the dc essential bus by two circuit breakers marked PLT PITOT HTR PWR-WARN. The copilot's system is connected to the No. 1 dc primary bus by circuit breakers marked CPLT PITOT HTR PWR-WARN.

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TAIL CONE STATIC SYSTEM

Separate static systems for pilot's and copilot's instruments provide static pressure to the altimeters and vertical speed indicators. The static ports can be heated with power being controlled by the PITOT HEAT switches. The pilot's system is connected to the No. 2 dc primary bus by a circuit breaker marked PLT HTR STATIC. The copilot's system is connected to the No. 1 dc primary bus by a circuit breaker marked CPLT HTR STATIC.

STANDBY COMPASS

A standby magnetic compass is mounted on the center frame of the windshield. A CMPS, ON-OFF compass light switch is directly above the compass.

FREE-AIR TEMPERATURE INDICATORS

A free-air temperature indicator on the right side of the pilot's compartment below the windshield indicates temperature in degrees Celsius. An OAT, ON-OFF light switch is directly above the standby compass.

SELF-CONTAINED FLIGHT INSTRUMENTS (OPTIONAL)

Attitude Indicators

Attitude indicators are provided as optional equipment for the pilot and copilot. A second standby indicator is also installed on the pilot's side of the panel. All indicators are identical and contain a pull-to-cage knob, a height adjustment for the miniature airplane, and an OFF flag. The pilot's and the standby indicators are connected to the dc essential bus by circuit breakers marked ATT PLT and ATT STDBY. The copilot's indicator is connected to the No. 1 dc primary bus by a circuit breaker marked ATT CPLT.

Directional Gyros

Directional gyros are provided as optional equipment for the pilot and copilot. Both indicators are identical and contain a push-to-cage and heading set knob and an off flag. The pilot's indicator is connected to the dc essential bus by a circuit breaker marked PLT HDG. The copilot's indicator is connected to the No. 2 dc primary bus by a circuit breaker marked CPLT HDG.

Turn and Slip Indicators

Turn and slip indicators are provided as optional equipment for the pilot and copilot. The pilot's indicator is connected to the dc essential bus by a circuit breaker marked T & S PILOT and the copilot's indicator is connected to the No. 2 dc primary bus by a circuit breaker marked T & S CPLT.

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C-14A COMPASS SYSTEM (OPTIONAL)

The C-14A compass system combines the features of a flux valve and a directional gyro to provide stabilized magnetic heading information. The system may also be used as a free directional gyro at the option of the pilot. Magnetic heading information is presented on the rotating dial of the radio magnetic indicators. Electrical power is supplied to the system from the No. 1 26 vac primary bus through a circuit breaker marked COMP. Controls consisting of a FREE-SLAVED and a MAN SYNC switch, and an annunciator, are on a small panel marked COMPASS on the aft end of the center console. To operate as a gyro stabilized magnetic compass, the FREE-SLAVE switch is placed to SLAVE. A synchronizer automatically aligns the directional gyro to the magnetic heading at a fast slave rate. Proper alignment is indicated when the annunciator meter is centered. The MAN SYNC may also be used to synchronize the gyro to the magnetic heading by moving the switch to the same position (+) or (.) as indicated by the annunciator pointer until the pointer is centered. To operate as a free directional gyro, the FREE-SLAVED switch is placed to FREE. The MAN SYNC switch is placed to the left (+) to increase, or to the right (.) to decrease the compass heading indicated on the radio magnetic indicator. The compass system is connected to the No. 1 ac primary bus and the No. 1 26 vac bus by circuit breakers marked COMP.

ATTITUDE INDICATOR (5") S6147-61053 (OPTIONAL)

The face of the attitude indicator consists of a stationary miniature airplane representing the helicopter, a bank angle scale, bank index, and a moving two-colored sphere with a distinct horizontal line dividing the light color above from the darker color below. A warning flag marked OFF will appear on the face of the instrument when the indicator is inoperative, and for about 68 seconds after ac power has been applied to the system. A pitch trim knob on the right of the case may be used to deflect the horizontal line of the sphere upward or downward to trim for the pitch attitude of the helicopter. A roll trim knob on the left of the case may be used to tilt the horizontal line to trim for the roll attitude of the helicopter. A turn and slip indicator mounted below the attitude indicator indicates rate-of-turn and slip or skid rate. The pilot's indicator operates from the No. 2 ac primary bus and the No. 2 26 vac bus, and the copilot's indicator operates from the No. 1 ac primary bus and the No. 1 26 vac bus through circuit breakers marked ATT PLT and ATT CPLT.

COURSE DEVIATION INDICATOR (OPTIONAL)

The course deviation indicator is used with VOR equipment to indicate deviation from a selected omni range radial or ILS localizer. The OBS knob is used to rotate the compass card to select the desired omni radial. The vertical course deviation pointer indicates the deviation from the selected omni range radial or the course signal from the ILS localizer. The glideslope equipment, if installed, to indicate vertical deviation from an on course glideslope signal. A TO-FROM window indicates the heading of the helicopter (to or from) the selected station. LOC and GS warning flags advise of unreliable signals.

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RADIO MAGNETIC INDICATOR (OPTIONAL)

The radio magnetic indicator presents heading information on a rotating compass card which is coupled to the C-14A compass system. The card containing an azimuth scale, is rotated by the compass system to indicate the magnetic heading of the helicopter beneath a fixed index at the top of the indicator. A single-bar and a double-bar pointer provide magnetic bearing information to VOR or ADF stations provided by whatever VOR or ADF equipment may be installed. The radio magnetic indicator is connected to the dc essential bus and the No. 1 26 vac primary bus by a circuit breaker marked RMI.

WHEEL BRAKE SYSTEM

The wheel brake system is a self-contained hydraulic system that operates on hydraulic pressure from toe-operated brake cylinders on the pilot's tail rotor pedals. A parking brake handle is on the right side of the aft control console. To set the parking brake, press pedals, pull up on brake handle, then release pedals. To release brake, press pedals and the handle will snap down. Brake pedals may also be installed on the copilot's tail rotor pedals.

CAUTION-ADVISORY PANEL

The caution-advisory panel on the instrument panel contains six rows of light capsules. The red warning lights or amber caution lights indicate certain system failures or unsafe conditions, and the green advisory lights call attention to certain noncritical conditions. Each light capsule is controlled by individual circuitry through circuit breakers on the dc essential and/or dc primary bus(es). When a warning or caution light goes on, with the exception of the DFCS light on aircraft so equipped, it will remain on as long as the condition exists which caused it to go on. When the TEST button on the panel is pressed, all lights should light on the caution-advisory panel, master warning panels, landing gear panel, fire extinguisher panel, EEC channel active lights, NO. 1 and NO. 2 engine manual reversion lights, and if installed the NO GO lights on the AFCS control panels, and the red WARN light on the flotation gear panel. Power for the test function is from the dc essential bus through a circuit breaker marked CAU ADVSY. A BRT, DIM switch on the panel is used to control light brilliance.

MASTER WARNING PANEL

Each master warning panel (Figure 1-26) consists of an amber master caution light, two blue caution lights to indicate manual reversion of the engine, two red lights to indicate engine fire, and two red lights to indicate engine failure. To direct the pilot's attention to the caution-advisory panel when a warning or caution light goes on, the MASTER CAUTION-PRESS TO RESET light will also go on. After the condition has been noted, the master caution should be reset to allow it to light again if another caution light should go on. The master caution light does not light when an advisory light on the caution-advisory panel goes on or when the manual reversion lights illuminate. For a description of the NO. 1 and NO. 2 ENG FIRE and the NO. 1 and NO. 2 ENG OUT warning lights, refer to paragraph titled EMERGENCY EQUIPMENT AND SYSTEMS.

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LIGHTING SYSTEM

EXTERIOR LIGHTS

Position Lights

The three position lights are controlled by an EXTERIOR LTS - POSITION switch on the master switch panel (Figure 1-10). The switch has marked positions ON and OFF and is connected to the No. 2 dc primary bus by a circuit breaker marked LIGHTS POS. The red (left) and green (right) position lights are on the stabilizer tips. The white position light is on the aft end of the tail rotor pylon.

Anti-Collision Light

The anti-collision light, mounted on the top of the tail rotor pylon, is controlled by an EXTERIOR LTS - ANTI COLL switch on the master switch panel (Figure 1-10). The switch has positions marked ON and OFF. The light circuit is connected to the dc essential bus by a circuit breaker marked ANTI-COLL LT.

Controllable Searchlight

A full swiveling, tiltable searchlight is installed on the bottom of the fuselage forward of the nosewheel. The searchlight may be tilted downward and turned in any direction by electric motors controlled by switches in the pilot's compartment. The searchlight circuits are connected to the dc essential bus by circuit breakers marked SEARCH LT - PWR and CONT.

Searchlight Master Switch

The SRCH LT master switch on the master switch panel (Figure 1-10) has positions marked ON, OFF, and STOW. ON turns on the light and energizes control switches on the collective stick grips. STOW retracts the light to the stowed position and turns it off. OFF turns off the light but does not retract it.

Searchlight Control Switch

Thumbswitches on the collective control stick grips marked SLT TRAIN have four positions marked FWD, AFT, L, and R, with directional arrows for each. When the searchlight master switch is ON, the control switches are moved to any of the four positions to direct the searchlight beam in the desired direction. The switch is spring loaded to return to center when released.

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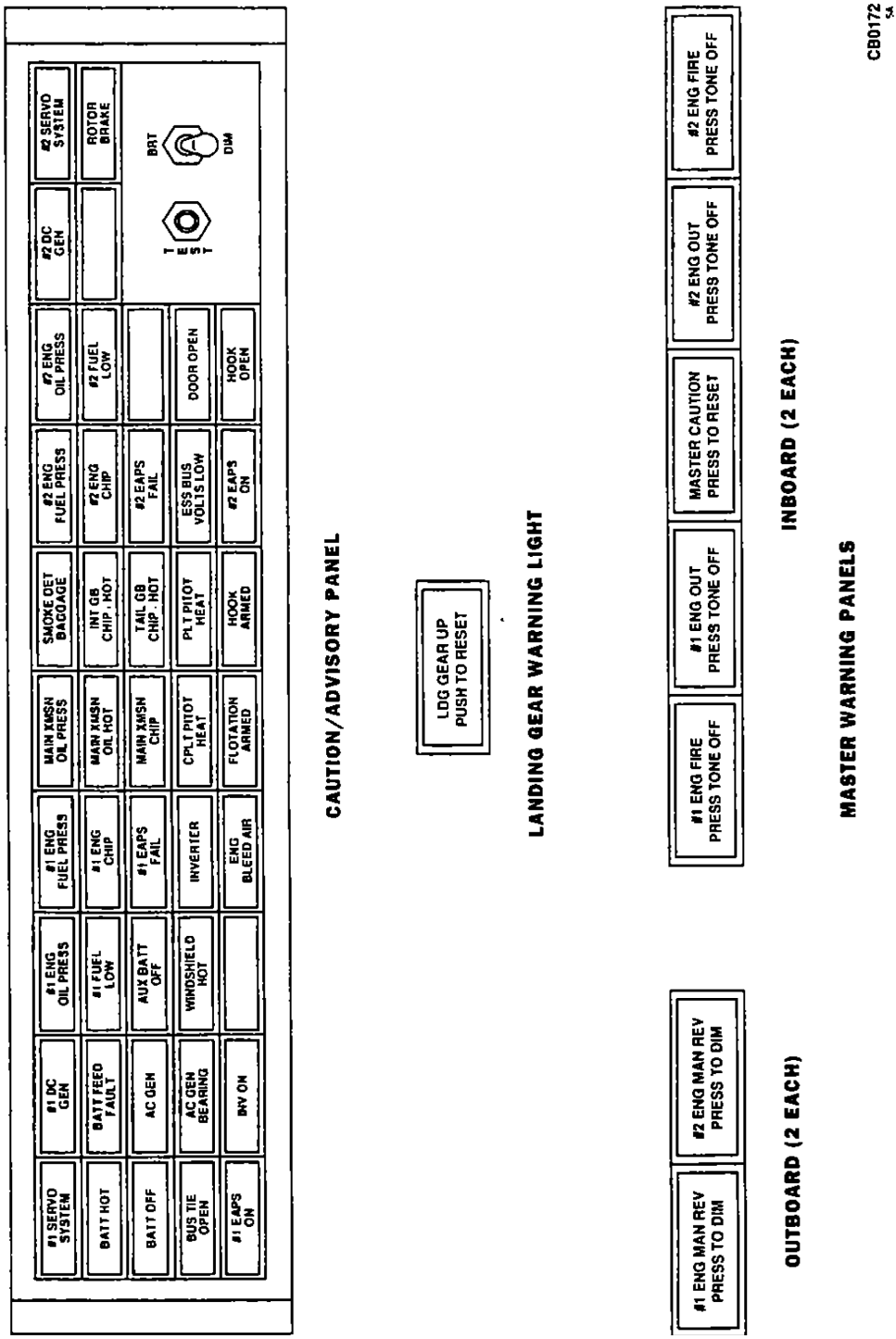

Figure 1-26. Caution/Advisory and Master Warning Panels - Typical

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Landing Light

A fixed landing light may be installed on the right main landing gear. The fixed light is controlled by a switch marked LAND LT on the master switch panel and is connected to the No. 2 dc primary bus by the circuit breakers marked SEC LDG LT PWR-CONT. The lights will automatically extinguish when the gear are raised.

INTERIOR LIGHTS

Flight Instrument Lights

A rotary FLIGHT INST LTS, PLT switch on the center console turns on and controls the intensity of the flight instrument lights. The light circuit is connected to the No. 2 dc primary bus by a circuit breaker marked INST LTG DIM - PLT. When copilot's instruments are installed they are controlled by a similar switch marked CPLT located aft of the pilot's switch. The copilot's instrument light circuit is connected to the No. 1 dc primary bus by a circuit breaker marked INST LTG DIM-CPLT.

Nonflight Instrument Lights

A rotary NON-FLT INST light switch on the master switch panel (Figure 1-10) turns on and controls the intensity of the nonflight instrument lights. The light circuit is connected to the dc essential bus by a circuit breaker marked NON-FLT INSTR DIM.

Lower Console Lights

A rotary LOWER CONSOLE light switch on the master switch panel (Figure 1-10) turns on and controls the intensity of the panel lights on the lower console. The light circuit is connected to the No. 2 dc primary bus by a circuit breaker marked INST LTG DIM-CSL.

Pilot's Compartment Secondary Lights

Six lights recessed in the instrument panel glare shield provide a secondary source of lighting for the instrument and control console. The lights are controlled by a GLARE SHIELD switch on the master switch panel (Figure 1-10) with positions marked BRIGHT, OFF, and DIM. The light circuit is connected to the dc essential bus by a circuit breaker marked LIGHTS-SEC.

Standby Compass and OAT Gage Lights

Lights for the standby compass and OAT gage are controlled by individual light switches mounted on the bracket directly above the standby compass. The switches, marked CMPS and OAT, have positions marked ON and OFF. The light for the compass is connected to the dc essential bus by the LIGHTS-SEC circuit breaker, and the light for the OAT gage is connected to the NO. 2 dc primary bus.

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Cockpit Floodlight

A cockpit floodlight, a flood light control switch, and a rheostat are on a panel (Figure 1-27) above the circuit breaker panels in the aft center section of the cockpit canopy. The light is controlled by the switch marked CONT, OFF, and BRT. Light intensity may be adjusted by turning the rheostat when the switch is at CONT. The floodlight circuit is connected to the No. 2 dc primary bus by a circuit breaker marked LIGHTS-FLOOD.

Cockpit Utility Light

A cockpit utility light and extension cord is mounted on the side of the cockpit floodlight panel. The light is turned on and off by pressing in on the back end of the light casing. Light intensity may be varied by turning the back of the casing. The light circuit is connected to the dc essential bus by a circuit breaker marked LIGHTS-UTIL.

Cabin Dome Light

A cabin light is mounted in the ceiling of the cabin. The light is controlled by a switch on the master switch panel (Figure 1-10) marked CABIN. The switch has positions marked BRT, OFF, and DIM. The light circuit is connected to the No. 2 dc primary bus by a circuit breaker marked LIGHTS-CABIN.

Baggage Compartment Light

A light in the baggage compartment is switched on whenever either baggage compartment door is opened. The light circuit is connected to the dc essential bus by a circuit breaker marked LIGHTS-BAG.

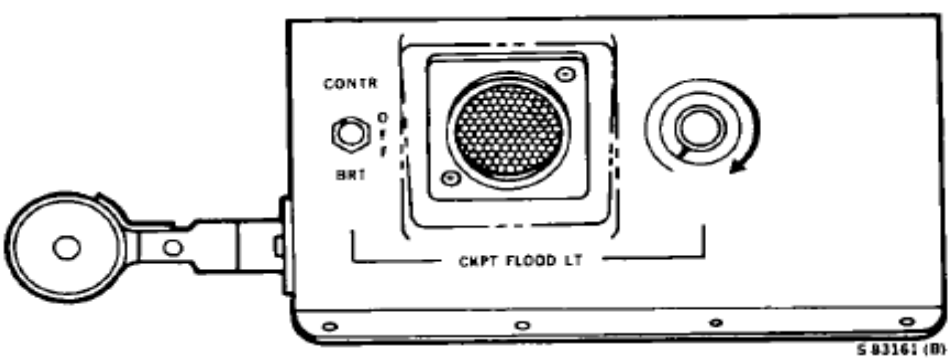

Figure 1 -27. Cockpit Flood Light Panel and Utility Light

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EMERGENCY EQUIPMENT AND SYSTEMS

ENGINE FIRE DETECTOR SYSTEM

Two flame detectors are located in each engine compartment fire zone, one above and behind the exhaust port and one below the combustion chamber. Sensing a flame, the detector transmits a signal to an amplifier unit to light the appropriate ENG FIRE PRESS-TONE OFF warning light on the master warning panels. The amplifier also transmits a continuous tone signal to the pilot's and copilot's headset, and lights the appropriate engine quadrant T-handle warning light marked NO. 1 FIRE or NO. 2 FIRE. The tone signal can be reset for other emergencies by pressing the affected fire warning light capsule. The warning lights will remain on until the fire is out. The No. 1 and No. 2 engine fire detector circuits are connected to the dc essential bus by separate circuit breakers marked FIRE DETECTOR - NO. 1 and NO. 2. A test circuit is provided to test the system for proper operation; however, it does not test the infrared sensors.

Fire Detector Test Switches

A switch marked DET on the overhead control panel (Figure 1-28) has positions marked AFT/BAG, NORM, and FWD. When the switch is moved to AFT/BAG or FWD, both engine fire warning lights on the master fire warning panels and both T-handle lights should light and the continuous tone signal should be heard in each headset. Pressing the fire warning light capsules on the master warning panels will reset the tone signals for other emergencies. Placing the switch to NORM will switch off the lights and arm the system to indicate an actual engine fire. The test circuit is connected to the dc essential bus by a circuit breaker marked FIRE DETECTOR-TEST. The SMOKE DET BAGGAGE warning light on the caution-advisory panel will also go on when the switch is moved to AFT/BAG.

ENGINE FIRE EXTINGUISHER SYSTEM

A CF_3Br fire extinguisher system is installed in the engine compartment. The fire extinguisher agent is stored in a pressurized container under the front end of each engine. Each container has a main and a reserve discharge valve which will release the agent into the compartment of the selected engine. The main discharge valve of each container releases the agent into its respective engine compartment and the reserve valve of each container releases the agent into the opposite engine compartment. The engine compartment to receive the agent is selected by pulling back the appropriate T-handle on the engine control quadrant. Each fire extinguisher unit has a redundant electrical power supply. The No. 1 engine system is connected to the dc essential bus and the No. 1 dc primary bus by circuit breakers marked FIRE EXT and the No. 2 engine system is connected to the dc essential bus and the No. 2 dc primary bus by circuit breakers marked FIRE EXT.

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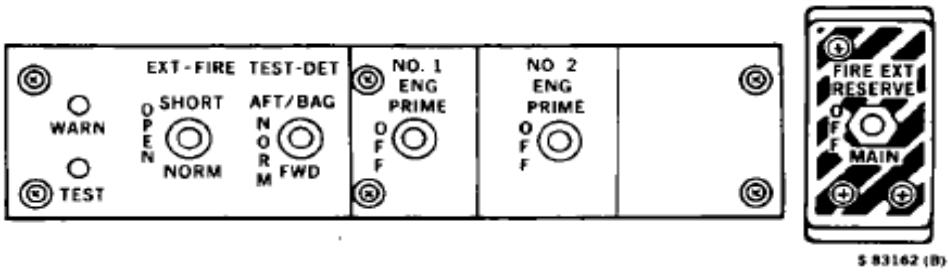

Figure 1-28. Overhead and Fire Extinguisher Control Panels

Engine T-Handles

The engine control quadrant (Figure 1-5) has a T-handle for each engine, which is normally in the full forward position. If an engine compartment fire is indicated by the continuous tone signal in the headsets, and the lighting of the master warning light and the T-handle light of the affected engine, the lever is pulled full aft. When the T-handle is moved full aft, the engine lever and the fuel lever are moved to OFF, the dc generator is switched off, and the fire extinguisher is armed to fire into the affected engine compartment.

Fire Extinguisher Switch

The FIRE EXT switch, on the windshield center column above the standby compass, is used to release the fire extinguisher agent from one or both containers into the compartment of the engine selected by the T-handle. The switch has positions marked MAIN, RESERVE and OFF. After selecting the engine compartment with the T-handle, the MAIN position will release the agent through the main valve of the corresponding container. The RESERVE position releases the agent through the reserve valve of the opposite container.

Fire Extinguisher Test Switch and Indicator Lights

The EXT test switch, a red WARN indicator light, and a green TEST light are on the overhead control panel The lever lock type switch has three positions marked SHORT, OPEN, and NORM. The switch must be pulled out to move it out of the NORM position. To test for an open circuit in the system, place test switch to OPEN; the red WARN light should go on. Pull both T-handles back about 1 inch or more and place the FIRE EXT switch to MAIN then RESERVE. The green TEST light should go on in each position if there is no open circuit. To test for a short circuit in the system, place test switch to SHORT with both T-handles pulled

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back. The red WARN and green TEST lights should go on, the green light should stay on when the FIRE EXT switch is moved to MAIN, then RESERVE. Normal operation is restored by moving the T-handles full forward and returning the test switch to NORM. Both the red and green lights should then go off. The indicator lights should go on when the caution-advisory TEST switch is pressed.

ENGINE FAILURE WARNING SYSTEM

The engine electric control (EEC) unit will automatically detect an engine failure by comparison between engines or when the failing engine N_1 speed decreases to 52% (with engine levers in the FLY detent) and light the ENGINE OUT capsule in the cockpit. A test for the ENGINE OUT capsule is provided.

SMOKE DETECTOR - BAGGAGE COMPARTMENT

A SMOKE DET BAGGAGE warning light on the caution-advisory panel and the master caution light will go on when smoke is sensed by a detector on the forward bulkhead of the baggage compartment. The smoke detector circuit is connected to the No. 1 dc primary bus by a circuit breaker marked SMK DET. A test circuit will light both the warning light and the caution light when the fire detector switch is moved to AFT/BAG.

FIRE EXTINGUISHERS

Two hand-operated fire extinguishers are provided. One is secured to the right side of the flight controls enclosure in the pilot's compartment and the other in the cabin.

FIRST AID KIT

A first aid kit is along the left side of the flight controls enclosure.

EMERGENCY LIGHTING

Emergency lighting is provided by a power pack with a two-bulb light mounted on the cabin ceiling. It is controlled by a switch marked EMER LTS on the master switch panel, with marked positions ON, ARM, and OFF. On some installations there are two one-bulb lights separated and mounted away from the power pack. Electrical power control of the system is provided by the battery bus with system monitoring tied to the No. 1 dc primary bus. At ARM the light (lights) will go on when power supply is interrupted to the No. 1 dc primary bus. The system is protected by circuit breakers marked EMER LTG on the No. 1 dc primary bus, and EMER LT on the dc junction box. Place switch OFF before shutting down last engine or DC GEN.

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EMERGENCY LOCATOR TRANSMITTER (ELT)

An emergency locator transmitter may be installed as optional equipment. It is attached to the right side of the flight controls enclosure in the pilot's compartment. The ELT may be used to transmit a signal on the international distress frequencies of 121.5 and 243 MHz. Power to transmit is from a self-contained battery. The signal can be received at a distance of about 100 miles at a search altitude of 10,000 feet. A switch on the transmitter has three positions marked ON, OFF, and ARM. ON energizes the transmitter. ARM automatically energizes the transmitter when a 5G impact load is encountered. OFF de-energizes the transmitter. If the transmitter is activated by the 5G force (ARM), the switch must be placed ON, then OFF, to de-energize the transmitter. The transmitter is portable and is easily removed from the helicopter. Disconnect the antenna cable and release the strap attaching it to the flight controls enclosure. After removal, connect the portable antenna, stored on the side of the transmitter case, to the top of the transmitter. The transmitter is then energized by placing the switch ON.

SONIC LOCATOR

An underwater sonic locator system may be installed as optional equipment in the forward left cabin overhead. It automatically radiates a pulsed signal to aid in locating the helicopter after a crash landing in fresh or salt water. Power to transmit the signal is from a self-contained battery. The operating depth of the signal is from sea level to 20,000 feet, and the operating life is 30 days. The signal can be detected by portable receivers equipped with directional hydrophones.

FLOTATION SYSTEM

For emergency water landings an emergency flotation system (Figure 1-29) may be installed. It is designed to provide flotation time for the immediate evacuation of personnel and survival equipment after ditching the helicopter. The system is actuated electrically by the pilot just before contacting the water or at speeds up to 75 KIAS. A flotation bag is installed in each main landing gear wheel well and two are installed in compartments next to the nosewheel well. Each bag is divided into two compartments. The contents of two air bottles are used to inflate the nosewheel flotation bags with helium or nitrogen. One bottle discharges into the forward compartment of each nosewheel flotation bag and one into the aft compartment of each to provide balanced flotation. Two additional bottles are used to inflate the main landing gear float-bags in the same manner. Float inflation time is within 5 seconds when helium is used as the inflation medium. Nitrogen is an approved substitute for helium but requires 7 to 10 seconds for inflation. Explosive links are discharged to fully open the main landing gear doors when the system is activated. The floats should be discharged with landing gear extended. Redundant electrical circuits for inflation are connected to the dc essential and No. 2 primary buses by three circuit breakers on each panel marked FLOAT.

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Flotation System Arming Switch and Advisory Light

The FLOATS arming switch on the master switch panel has positions marked ARMED and OFF. ARMED provides power to switches on the cyclic stick grips which are used to inflate the floats. A FLOTATION ARMED advisory light on the caution-advisory panel goes on whenever the arming switch is ARMED; OFF removes electrical power from the flotation system. The arming switch is normally kept in OFF to prevent accidental inflation of the floats.

Floats Inflation Switch

The FLOATS switch on the cyclic stick grip is pressed to fully open the landing gear doors and inflate the floats. The inflation switch is inoperative unless the flotation arming switch is ARMED. If dual controls are installed an identical switch is on the copilot's cyclic stick grip.

Flotation System Test Switch and Indicator Lights

The flotation system TEST switch, a red WARN indicator light, and two green TEST indicator lights marked 1 and 2 are on a FLOATS TEST panel (Figure 1-29) mounted on the instrument panel. The test switch has positions marked TEST and NORM. The flotation circuit is tested by placing the flotation system to ARMED (FLOTATION ARMED advisory light on). With the test switch in TEST, the 1 and 2 TEST lights should go on when the inflation switch is pressed. After completing test, release inflation switch, place arming switch OFF and test switch to NORM.

HEATING AND VENTILATING SYSTEM

The 25,000 BTU heating system mixes hot air from the engine compressor sections with cold air drawn into a mixing valve by venturi action. The air then passes through a sound suppressor and into the pilot's compartment and cabin heater ducts. Some ducted air flows across the windshield for defogging. The heater can be operated only when both engines are operating. The heater will automatically shut off if one engine is shut down, if bleed-air pressure is lost, or if bleed-air pressure or temperature is too high. The ventilating system uses the heater ducts and an electrically operated blower to circulate outside air throughout the interior of the helicopter. Heater and ventilation control circuits are connected to the NO. 1 dc primary bus by circuit breakers marked HEAT CONT and VENT CONT. A panel marked HEATER CONTROL in the copilot overhead contains all controls for the operation of these systems. An additional ventilating system consists of a manually controllable inlet in each door and two exhaust valves, one on each side of the helicopter near the aft cabin bulkhead. This ventilating system should be locked closed for proper heater system operation. To do this, close all door vents and press the lock arm on both exhaust valves, one on each side of the helicopter on the aft cabin bulkhead.

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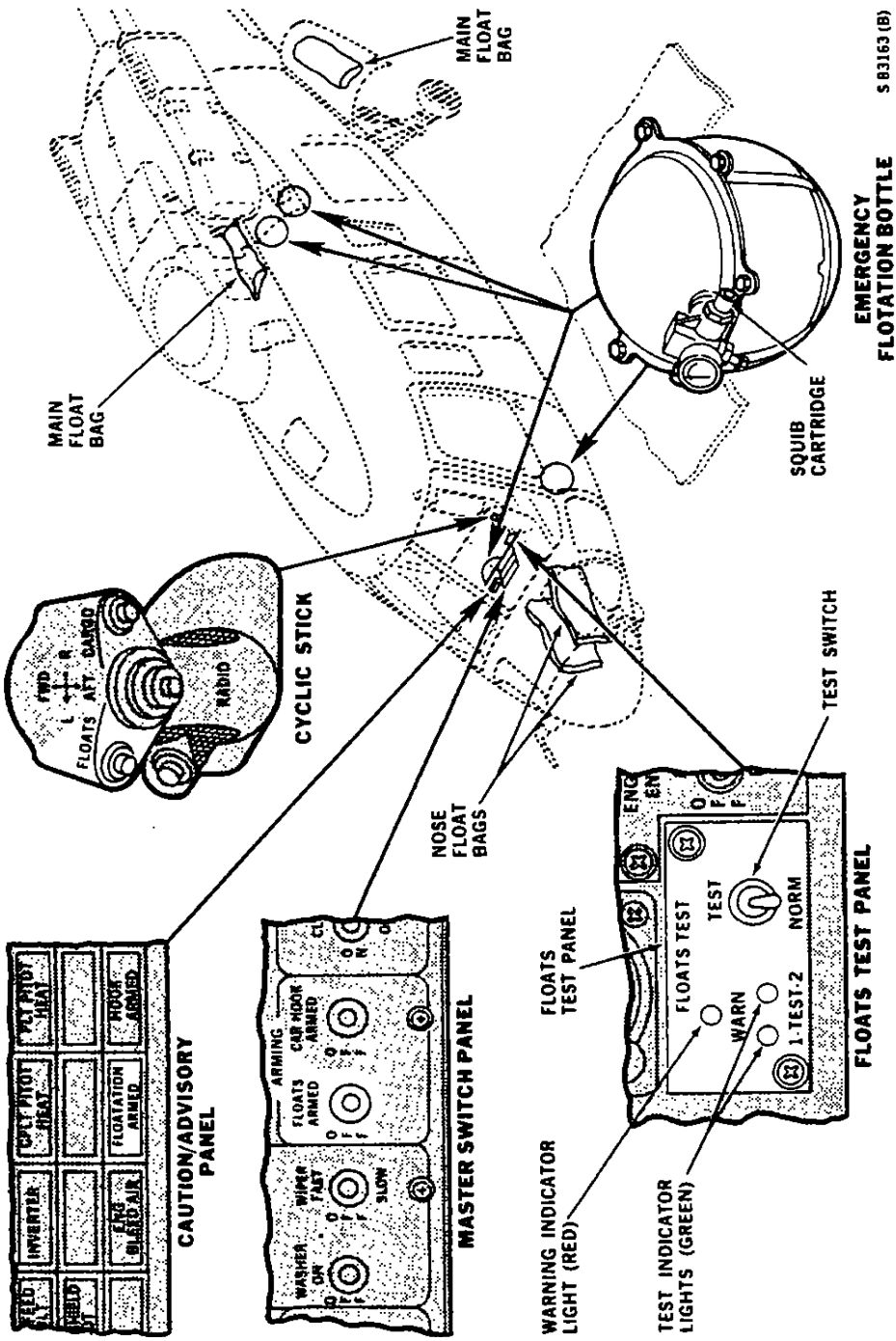

Figure 1-29. Flotation Equipment

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HEATER CONTROL PANEL

The heater control panel (Figure 1-30) contains a bleed-air switch, a heater on-off switch, a temperature control switch and a blower switch. The BLEED AIR switch has two positions marked ON and OFF. ON opens a bleed-air valve which directs engine compressor air into the heater system. The bleed-air valves will open only when both engines are operating. OFF closes the bleed-air valves. The HEATER switch has positions marked ON and OFF. ON permits airflow through the mixing valve and into the interior of the heater. OFF closes the valve. When the heater switch is ON, cabin temperature may be regulated by turning the TEMP CONT switch to the desired setting. The ventilation blower is controlled by the BLOWER switch. When the hoist is operating, the blower, if on, will be shut off by a relay interlock circuit.

ENVIRONMENTAL CONTROL UNIT (ECU)

The ECU provides automatic control for heating or cooling of the interior of the helicopter to maintain a constant selected temperature. The system uses bleed-air from the engine compressors for heating and for the operation of an air conditioning unit. The system can be operated only when both engines are operating. Sensors will automatically shut off the system if one engine is shut down, if bleed-air pressure is lost, if bleed-air pressure or temperature is too high, or cabin inlet duct temperature is too high. Controls for operation of the system are on an ECU CONTROL panel in the overhead. Power and control circuits for operation of the system are connected to the NO. 1 dc primary bus by circuit breakers marked ECU PWR and ECU CONT. When the hoist is operating and the ECU is on, a relay interlock circuit will shut off the blower. The ventilating system should be locked closed for proper ECU operation. To do this, close all door vents and press the lock arm on both exhaust valves, one on each side of the helicopter on the aft cabin bulkhead.

ECU CONTROL PANEL

The ECU control panel (Figure 1-30) contains a CONT SEL switch with positions MAN - AUTO - OFF, and two TEMP CONT switches, one for manual temperature control, and the other for automatic temperature control. The manual position is used only when the automatic mode malfunctions. When the CONT SEL switch is placed to MAN, cabin air temperature is controlled manually by use of the MANUAL switch marked COOL - OFF - HEAT. The switch is spring-loaded to the OFF position and governs the amount of hot or cold air by the length of time it is held at COOL or HEAT. When the CONT SEL switch is placed to AUTO, cabin temperature may be regulated by the rotary switch marked AUTO. A two-position BLOWER switch marked ON - OFF is below the ECU control panel. This switch provides air circulation without use of the ECU.

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ECU OPERATION

When operating in automatic cooling mode, the ECU responds to a large step increase in selected cabin temperature by going into full heating mode (160°F) to produce the newly selected cabin temperature quickly. This feature is typical of current Hamilton Standard control systems. It is recommended that the following operational guidelines be adhered to in order to maintain passenger comfort during the above transient condition:

1. In AUTO mode of operation, do not initially select full cold. A selector rotation of approximately 120° clockwise from full cold will provide a comfortable selected temperature of approximately 73°F.
2. If a significant (5° to 10°) increase in cabin temperature is requested while in cooling mode, turn the selector control gradually in steps of 30° with at least 1 minute between steps.

CAUTION

The manual mode is to be used only when the automatic mode malfunctions. Prolonged use of the full cold manual mode may cause ice to form at the inlet and/or outlet of the turbine section of the ECU, leading to unit damage. A malfunction of the AUTO mode should receive prompt maintenance action.

NOTE

In AUTO mode, ECU output is automatically adjusted to attain and maintain the selected cabin temperature. In manual mode a hot air bypass valve is moved by an open loop command signal.

MISCELLANEOUS EQUIPMENT

WINDSHIELD WIPER

The electrically-operated windshield wipers are controlled by a WINDSHIELD WIPER switch on the master switch panel (Figure 1-10) with positions marked OFF-SLOW-FAST. The windshield wiper circuit is connected to the dc essential bus by a circuit breaker marked WSHLD-WIPER.

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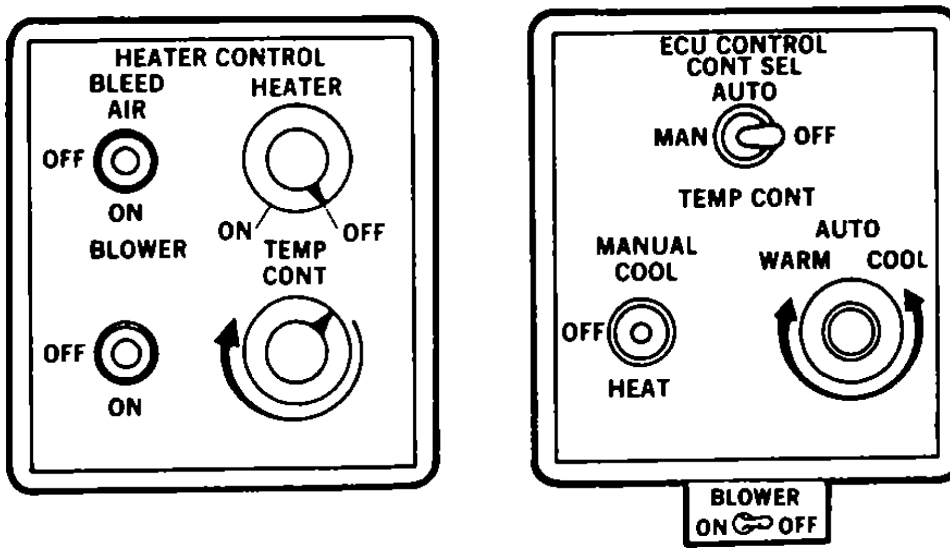

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Figure 1-30. Heater and ECU Control Panels

WINDSHIELD WASHER

The electrically-operated windshield washer is controlled by a WINDSHIELD-WASHER switch on the master switch panel (Figure 1-10) with positions marked ON and OFF. The 6-quart reservoir and pump are installed in the electronics compartment. The windshield washer circuit is connected to the dc essential bus by a circuit breaker marked WSHLD-WSHR.

WINDSHIELD HEATER

Electrically-operated windshield heaters and glass windshields may be installed as optional equipment on helicopters equipped with an ac generator. The pilot's and copilot's windshields are heated by separate systems (hat are controlled by WINDSHIELD-HEATER switches on the master switch panel (Figure 1-10). One switch marked PILOT and the other marked COPILOT have positions marked ON and OFF. Controllers in each system will switch the circuits on and off to keep temperature within limits. The pilot's system will always have priority over the copilot's system. If both systems are switched on, the pilot's system will heat first. When the controller switches the pilot's system off, power will be applied to the copilot's circuit. If the copilot's system does not operate and the pilot's system operates poorly when both systems are switched on, the cause may be a malfunctioning pilot's controller. To correct this, switch off the pilot's system and the copilot's system will be restored to normal operation. The pilot's and copilot's systems are controlled by circuits connected to the No. 2 and No. 1 dc primary buses, respectively, by circuit breakers marked WSHLD HTR CONT.

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Windshield Hot Caution Light

The WINDSHIELD HOT caution light on the caution-advisory panel (Figure 1-26) lights whenever the pilot's or copilot's system does not shut off the heater when the high temperature limit of 58°C (135°F) is exceeded. When the light goes on, shut off both systems. If continued use of windshield heat is required, the system at fault may be identified by switching the pilot's system on and monitoring the caution light. If the light remains off, the copilot's system is at fault. If the caution light goes on, the pilot's system is at fault. Continue using operating system and place windshield heater switch of the failed system to OFF. If necessary to use the system at fault, the system can be cycled on and off manually with the heater switch, while closely monitoring the caution light for overtemp. If the WINDSHIELD HOT caution light remains on after the switch of the system at fault is placed OFF, it is possible that the electrical contactors to that system have become welded together. To eliminate the overheat condition when this occurs, pull the three WSHLD HTR PWR circuit breakers of the system at fault.

PILOT'S SEATS

The pilot's and copilot's seats have lap-type belts and inertia-type shoulder harnesses. A vertical adjustment lever is on the left side of the seat. A two-position (LOCKED-UNLOCKED) inertia reel lock handle is on the left side. LOCKED will lock the shoulder harness in place. UNLOCKED will permit the reel of the shoulder harness to extend, allowing the pilot to lean forward; however, the cable reel will automatically lock when an impact force of 2 to 3 Gs is encountered. Then, to release the lock, it is necessary to move the handle to LOCKED and then back to UNLOCKED. Storage provisions for a life vest are on the bottom of each seat.

DOOR OPEN CAUTION LIGHT

The DOOR OPEN caution light on the caution-advisory panel (Figure 1-26) will go on when any of the four passenger doors, either of the two baggage compartment doors or the external power door, are not fully closed and latched. The light circuit is connected to the dc essential bus by a circuit breaker marked DOOR WARN.

NO SMOKING AND FASTEN SEAT BELT LIGHTS

The no smoking and fasten seat belt lights in the cabin are controlled by NO SMOKING and SEAT BELT switches on the master switch panel (Figure 1-10). Each switch has positions marked ON and OFF. Both light circuits are connected to the No.2 dc primary bus by a circuit breaker marked PASS SIGN.

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CARGO HOOK

A 3300-pound (1500 Kg) capacity cargo hook (Figure 1-31) may be installed on the lower fuselage structure. The hook has an open throat with a spring-loaded keeper to retain the load. The hook may be opened to release loads electrically or mechanically in an emergency from the pilot's compartment. A release lever on the hook may also be used to open the hook. After release of a load, the load beam of the hook is spring-loaded to return to the closed position. The electrical release and advisory light circuits are connected to the No. 1 dc primary bus by circuit breakers marked HOOK CONT and HOOK WARN.

CARGO HOOK ARMING SWITCH AND ADVISORY LIGHT

The CAR HOOK arming switch on the master switch panel (Figure 1-10) has positions marked ARMED and OFF. ARMED provides electrical power to switches on the cyclic stick grips which are used to open the hook. A HOOK ARMED advisory light on the caution-advisory panel goes on when the master switch is ARMED. OFF removes electrical power from the hook circuit. The master switch is normally kept OFF until just before load release.

CARGO SWITCH AND HOOK OPEN ADVISORY LIGHT

The CARGO switches on the cyclic stick grips (Figure 1 -6) are pressed to open the cargo hook. These switches are inoperative unless the cargo hook arming switch is ARMED. A HOOK OPEN advisory light on the caution-advisory panel will go on whenever the hook load beam is not locked in the closed position.

GROUND RELEASE LEVER

A ground release lever on the cargo hook may be used to open the hook.

EMERGENCY CARGO HOOK RELEASE T-HANDLE

The EMERGENCY CARGO HOOK RELEASE T-HANDLE is on the aft end of the center console. The handle is pulled upward to manually open the hook.

UTILITY HOIST

A 600-pound capacity, electrically-operated, two-speed, utility hoist with 180 usable feet of cable may be installed above the aft, right cabin door. The hoist may be operated from the cockpit by the pilot or copilot, or by a crewmember in the cabin. When operated from the cockpit, cable speed for raising or lowering the cable is about 120 feet-per-minute. When operated from a portable hoist pendant installed in the aft right side of the cabin, hoist speed may be selected at about 120 feet-per-minute or 60 feet-per-minute. If one dc generator should fail, cable speed

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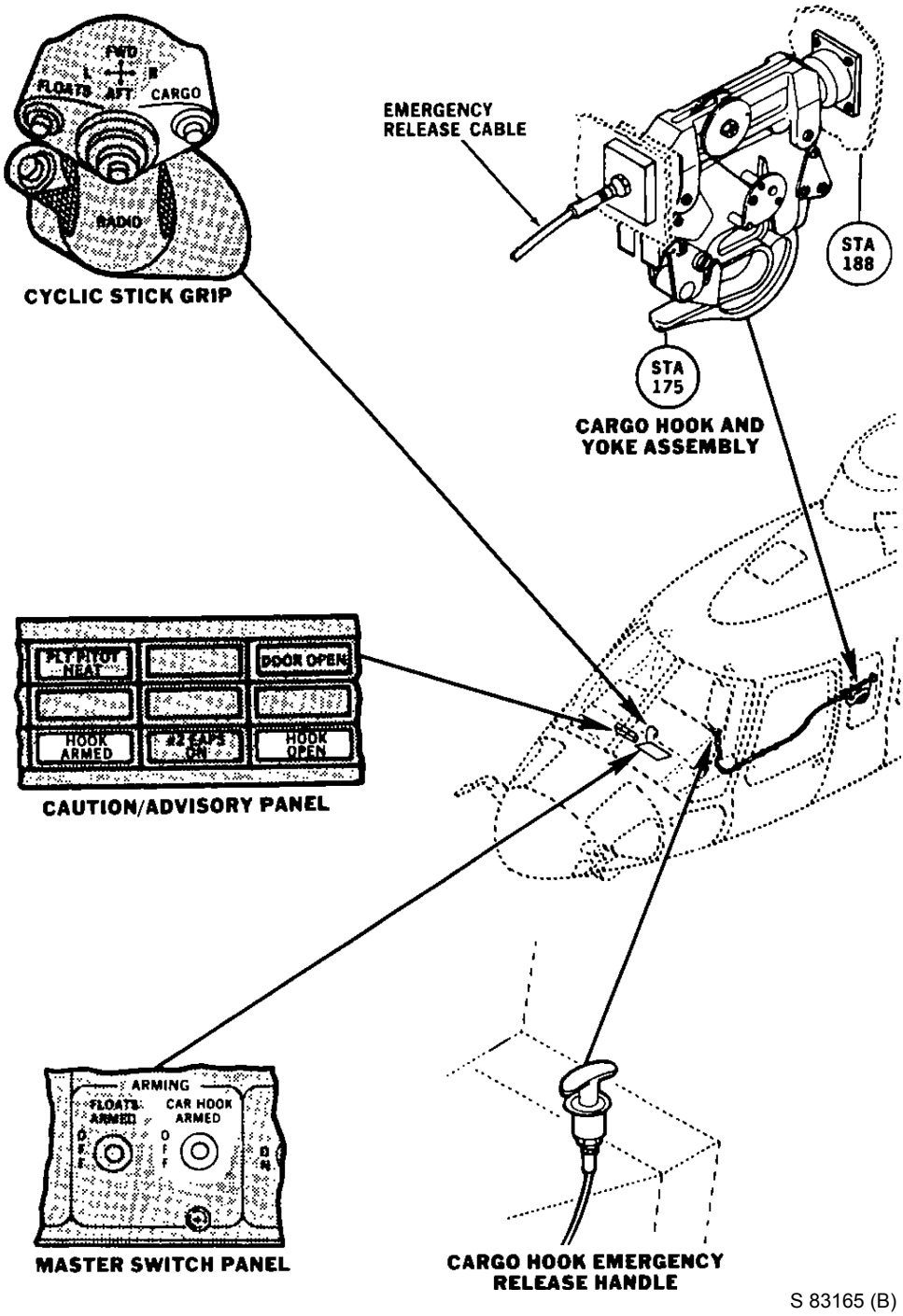

Figure 1-31. Cargo Hook

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is automatically reduced to about 60 feet-per-minute. The hook assembly has one large and one small hook, both equipped with keepers. A 5/8-inch hole in the hook assembly may be used to attach guide ropes or a safety line. A bumper assembly acts as a shock absorber when the cable is reeled in and the bumper contacts the bottom of the hoist. A squib cartridge cable cutter may be used in an emergency to cut the cable at the drum. A manual-type cable cutter attached to a 6-foot chain is stowed in a pouch mounted on the cabin floor forward of the aft right cabin door. A safety harness, for the cabin hoist operator, attaches to a tiedown ring in the floor. The hoist system operates on 28 volts dc and is connected to the hoist bus in the electrical compartment by two circuit breakers marked HOIST POWER and HOIST CONTROL. The squib cartridge circuit is connected to the dc essential bus by a circuit breaker marked HOIST SQUIB. Hoist load limits and ballast requirements are in Part 1 Section I and Part 2 Section III of this manual. If the vent or ECU blower is on when using the hoist, a relay interlock circuit will shut it off.

HOIST CONTROL PANEL

The HOIST CONTROL panel, on the center console, contains all switches required to operate the utility hoist or transfer control of raising and lowering the hoist to the hoist pendant in the cabin, or cut the hoist cable in an emergency.

Hoist Power Switch and Indicator Light

The hoist PWR switch has marked positions ON and OFF. ON provides electrical power to the hoist controller as indicated by the lighting of the green indicator light aft of the switch. OFF disconnects electrical power from the controller.

Hoist Master Switch

The hoist master switch has two marked positions: PILOT and CREW. PILOT permits the hoist to be raised or lowered from the cockpit by use of the HOIST control switch next to the master switch. CREW transfers control of the hoist to the hoist pendant in the cabin.

Hoist Control Switch

The HOIST control switch has three marked positions: UP, OFF, and DWN. The switch will function only when the hoist master switch is placed to PILOT. The switch is spring-loaded to OFF and must be held UP or DOWN to operate the hoist.

Cable Shear Switch

The cable shear switch with one marked position, CABLE SHEAR, may be used in an emergency to cut the hoist cable at the drum. To cut the cable, lift the switch

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guard and place the switch to SHEAR. The shear electrical circuit operates independently of the hoist power switch and is connected electrically to the essential bus by a circuit breaker marked HOIST SQUIB.

HOIST PENDANT

The hoist pendant is a portable hand-held unit used to control the hoist from the cabin. The pendant is connected to a coiled cable which will extend to 12 feet and is stowed below the aft window on the right side of the fuselage. The pendant will function only when the hoist master switch is placed to CREW. Controls on the pendant are as follows:

Power Switch

The power switch on the grip of the pendant is spring loaded to the OFF position. When the power switch is released, the control switch will not function and hoist operation is automatically stopped.

Hoist Control Switch

The thumb-operated hoist control switch has five marked positions: UP FAST, UP SLOW, OFF, DWN SLOW, and DWN FAST. The switch is turned to the desired position to control the speed and direction of the hoist. The switch is spring-loaded to the OFF position.

Hoist High Temperature Warning Light

A temperature warning light marked HI TEMP WARN will light when the hoist motor is approaching its thermal limit. The hoist will continue to operate until its thermal limit is reached and will then stop. When the hoist has cooled below thermal limits it will automatically return to service. The hoist temperature warning light is equipped with a test feature that will light the light during the shear circuit test procedure.

Cable Shear Switches

A CABLE SHEAR switch in the forward part of the pendant control stowage compartment may be used in an emergency to cut the hoist cable at the drum. To cut the cable, lift the switch guard and place the switch to SHEAR.

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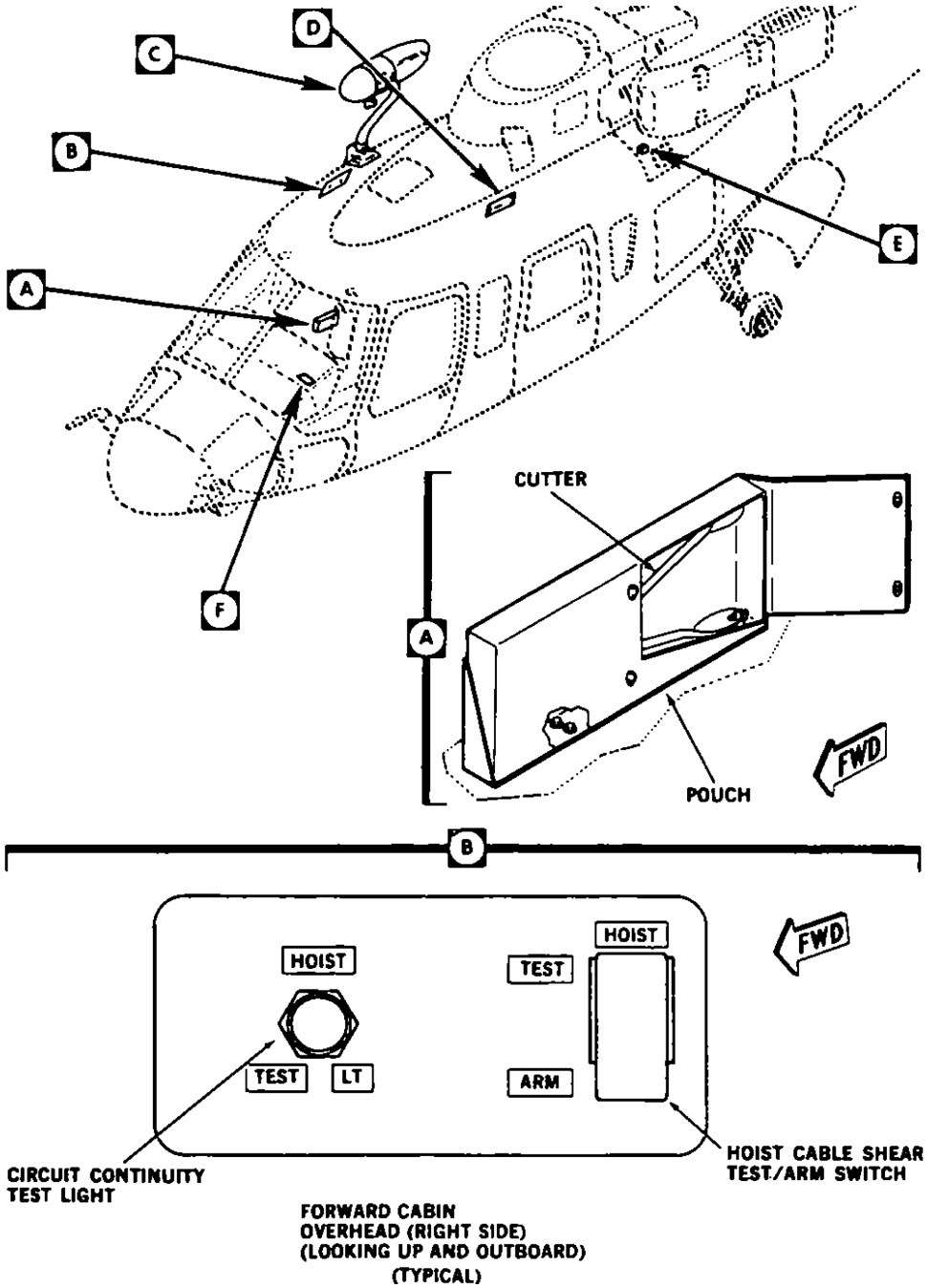

Figure 1-32. Utility Hoist (Sheet 1 of 2)

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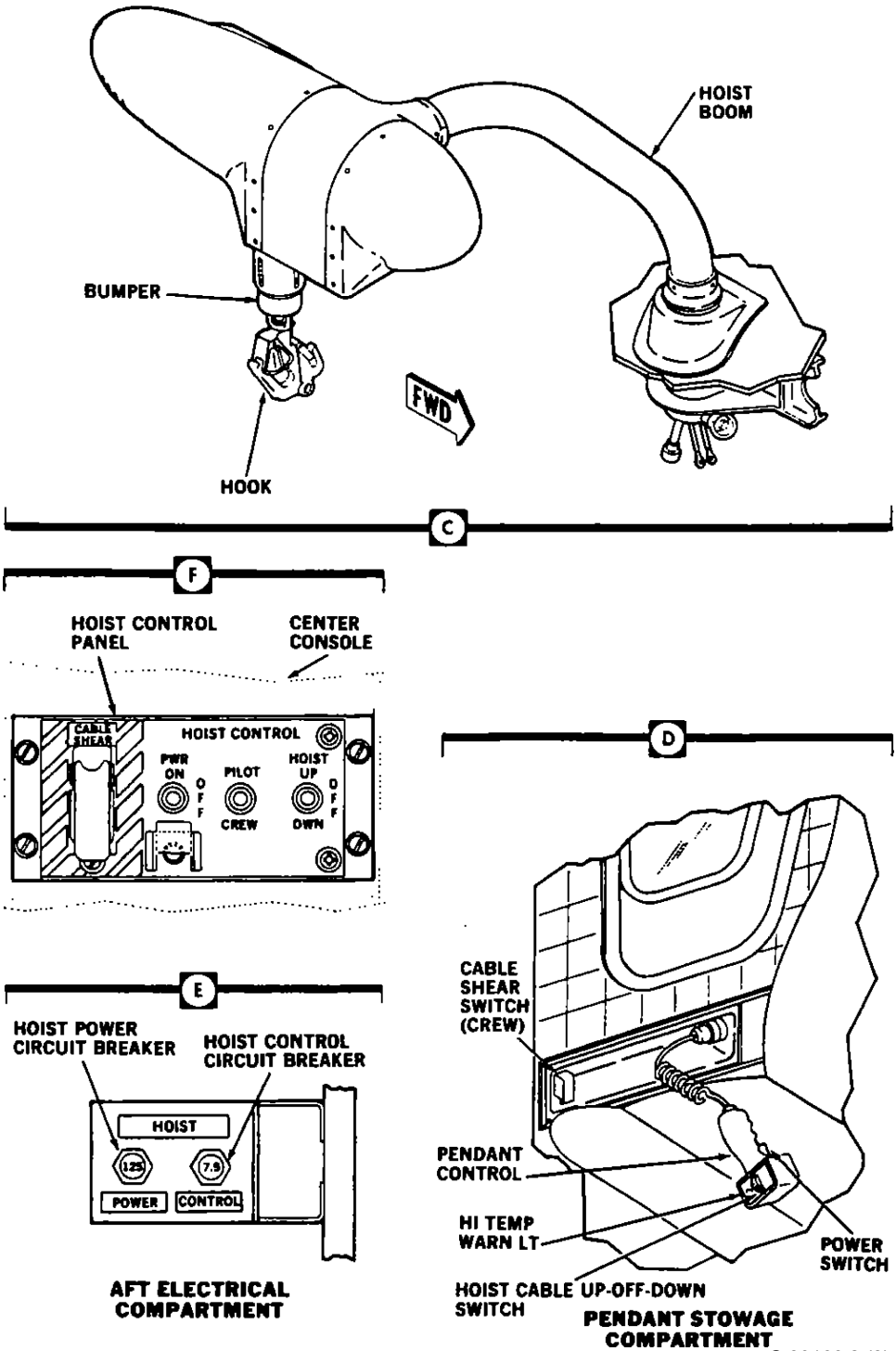

Figure 1-32. Utility Hoist (Sheet 2 of 2)

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SHEAR CIRCUIT TESTER

A cable shear test switch and continuity test light permits checking the hoist squib integrity and the hoist cable shear circuitry at a reduced current below the minimum required to fire the squib cartridge. The switch and light are mounted above the forward right cabin window. The test switch is marked HOIST and has marked positions, TEST and ARMED, and the test light is marked HOIST TEST LT The circuit is tested by first placing the test switch to TEST and then placing the pilot's or crewman's cable shear switch to SHEAR. Lighting of the HOIST TEST LT indicates a satisfactory test. The HOIST TEMP warning light will also be tested (light on) when the switch is placed to SHEAR. After testing the circuit, return the shear switch to OFF, close the guard, then place the test switch to ARM so the shear circuit is ready for use.

CAUTION

To prevent accidental cutting of the cable, be sure that the hoist test switch is at TEST before placing either cable shear switch to SHEAR. After completing the test, be sure that the shear switch guards are closed before placing the test-arm switch to ARM.

T_5 BIAS BOX

To accomplish single engine pilot training without compromising specific RFM limits, an engine limiter device has been developed. The T_5 bias box (Figure 1-33) is a portable device that applies an artificial indicated T_5 increase to the selected engine resulting in lower power attained when limited by the EEC at 844°C T_5. When loaded to the reduced gross weight WAT curves that supplement the bias box, realistic handling and performance is preserved by maintaining the standard power to weight ratio, while the lowered training weight also provides enhanced safety margins for single engine landback maneuvers.

The correct bias box adjustment is accomplished prior to flight by using collective to set the target torque on the desired engine and then increasing the displayed T_5 value with bias until just 844°C T_5 is attained. If additional bias is incorrectly applied, reduced torque below the target and resultant rotor droop will be seen at the fixed collective position, while increasing collective at the correct bias setting will result in rotor droop at fixed power (indicated torque will increase as RPM decreases). Essentially, the single engine T_5 limiter is being used to set reduced available power through application of a measured, artificial T_5 bias.

The flight is initiated and progresses normally with both engines in FLY. When engine failure training is desired, the instructor retards the normal, unbiased engine to IDLE, and the biased engine is left at reduced, but proportionately correct power. The correct indication of a single engine condition is given in T_5, and performance is representative of maximum gross weight.

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To accomplish comprehensive pilot training or recurrency checks, one or two simulated engine failures only per flight are suggested. If done to a Category A standard, simulated failures from hover, before CDP, after CDP, and before LDP are considered the critical cuts. A simulated engine failure at high speed cruise can be similarly critical.

The procedures in section V are to be followed carefully. Published performance will not be attained if excessive bias is applied or if the loading exceeds that derived from the training WAT curve. Before takeoff, recheck that the loading is correct for the prevailing ambients, that the correct target torque was set for bias, and that the bias vernier value remains unchanged. During the portion of the flight when the bias box is ON, large indicated T_5 splits between engines are expected. Do not use the T_5 matching function.

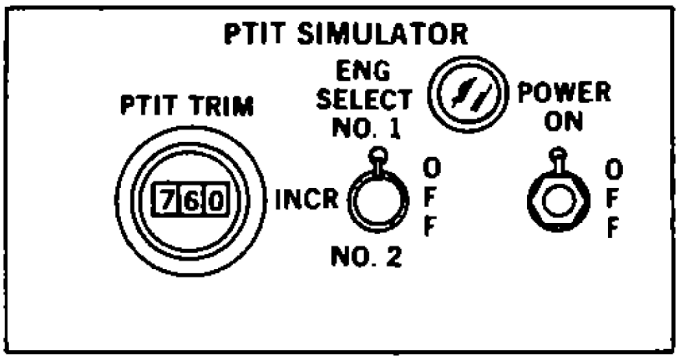

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Figure 1-33. T_5 Bias Box

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SECTION II

LOADING INFORMATION

NOTE

- Each copy of this manual which is assigned to a specific aircraft (i.e. aircraft copy) must contain all data referred to herein and must be maintained to the current aircraft configuration. Copies issued on general distribution only need not contain such data. The Chart As provided, with these general distribution copies, reflect the latest type design configuration.
- Use this section for helicopters without a utility hoist installed, or for helicopters with a utility hoist installed but carrying no hoist load.
- Use Section III for helicopters carrying a load on the utility hoist, since both horizontal and lateral center of gravity must be determined.

EMPTY WEIGHT AND HORIZONTAL CENTER OF GRAVITY LOCATION

The current empty weight, moment/100 and center of gravity location of this aircraft are as shown in the Empty Weight and Balance Record, Chart C herein.

1. The current empty weight includes all items marked (✓) in the Empty Weight Check List, Chart A, herein. Items not included are marked (0).
2. Chart C (Figure 2-9) must be kept up to date. If any items of equipment are added to or removed from the aircraft, Charts A and C must be updated as follows:
   a. When items are added, make the appropriate entry in the Empty Weight and Balance Record, Chart C. On Chan A mark (✓) in both the "In Aircraft" and "Chart C Entry" columns opposite the items added, dating the columns where indicated. Add the new entry or entries on Chan C to the previous totals of empty weight and moment/100 shown on Chan C and compute the new empty weight, moment/100 and center of gravity location.
   b. When items are removed from the aircraft, follow a similar procedure to (a) above except mark (0) in the "In Aircraft" column and (✓) in the "Chart C Entry" column of Chan A, and subtract the new entry or entries from the previous totals of empty weight and moment/100, shown on Chart C (Figure 2-9).

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c. New items to be added to the aircraft and not previously listed, may be "written in" on the next available line in the appropriate aircraft compartment. Do not erase or obliterate any Chart A entry when items are removed from the aircraft.

d. The aircraft empty weight center of gravity location (CG) is initially obtained by actual weighing (Figure 2-8). The updated CG is obtained by dividing the updated moment/100 by the updated empty weight and multiplying the result by 100.

e. The "In Aircraft" column in Chart A may be used for periodic checking of the aircraft inventory. It is recommended that the first check be made prior to the first flight by a new operator.

The original empty weight and center of gravity location values were determined by Sikorsky Aircraft, as shown in the Aircraft Actual Weight and Balance Form Chart B (Figure 2-8), which is included in the aircraft copy of this manual for reference.

FOR AIRCRAFT WITHOUT THE UTILITY HOIST OPTION INSTALLED

NOTE

Lateral center of gravity limits permit indiscriminate lateral loading of passengers or cargo if maximum fuel loading imbalance is kept below 250 lbs with baggage compartment symmetrically loaded. Maximum cargo compartment and baggage floor loading is 75 pounds per square foot.

or

NOTE

Lateral center of gravity limits permit indiscriminate lateral loading of passengers or cargo if maximum baggage imbalance is kept below 150 pounds with fuel symmetrically loaded. Maximum cargo compartment and baggage floor loading is 75 pounds per square foot.

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FOR HELICOPTER OPERATION WITH THE UTILITY HOIST OPTION INSTALLED BUT NOT OPERATED DURING FLIGHT

NOTE

Provided that the first passenger (170 pounds) or the first 275 pounds of cargo is loaded to the left (port) side of the helicopter centerline, lateral center of gravity limits permit indiscriminate lateral loading of the remainder of passengers or cargo if the maximum fuel loading imbalance is kept below 50 pounds with the baggage compartment symmetrically loaded. The maximum uniform cargo compartment and baggage compartment floor loading is 75 pounds per square foot.

or

NOTE

Provided that the first passenger (170 pounds) or the first 275 pounds of cargo is loaded to the left (port) side of the helicopter centerline, lateral center of gravity limits permit indiscriminate lateral loading of the remainder of passengers or cargo if the maximum baggage imbalance is kept below 30 pounds with the fuel symmetrically loaded. The maximum uniform cargo compartment and baggage compartment floor loading is 75 pounds per square foot.

LOADING INSTRUCTIONS

1. Obtain the current aircraft empty weight and aircraft empty weight moment/100 from Chart C (Figure 2-9) and enter each in the appropriate columns of the manifest.
2. Obtain the aircraft takeoff gross weight and moment/100 by adding, to the current aircraft empty weight and moment/100, the weight and moment/100 of each useful load item to be carried. The weight and moment/100 of useful load items is shown in Chart E Weight Moment Charts. Useful load items include fuel, oil, crew, passengers, baggage and/or cargo. Do not exceed the specified compartment capacities at any time.
3. Determine by reference to the Center of Gravity (CG) Chart, Figure 2-1, that the takeoff gross weight and moment/100 thus obtained is within the recommended weight and CG limits.

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4. Check that the aircraft will remain within CG limits throughout the flight: (a) deduct the Weight and Moment/100 of expendable items (e.g. fuel), (b) compute the landing gross weight and moment/100 and (c) determine by reference to the CG Chart, Figure 2-1, if the landing gross weight and moment/100 is within the recommended weight and CG limits. Bring the aircraft weight and/or balance within limits if either the weight or moment/100 is outside of the recommended limits by off-loading and/or redistribution of useful load.

5. The CG limits are tabulated below and are also shown for reference in Figure 2-2.

Gross Weight (pounds)	Forward CG Limit (Station)	Aft CG Limit (Station)
7350	208.30	208.30
7500	199.00	208.43
7600	198.50	208.52
7800	197.50	208.70
8000	196.50	208.88
8200	195.50	209.06
8400	194.50	209.24
8500	194.00	209.33
9000	194.00	209.78
9250	194.00	210.00
9500	194.00	209.42
9600	194.20	209.19
9800	194.60	208.72
10,000	195.00	208.26
10,200	195.40	207.79
10,400	195.80	207.33
10,600	196.20	206.86
10,800	196.60	206.40
11,000	197.00	205.93
11,200	197.63	205.47
11,400	198.26	205.00
11,600	198.89	204.53
11,700	199.20	204.30

6. The maximum permissible gross weight is 11,700 pounds.

7. Sample loading conditions are shown in Figure 2-15.

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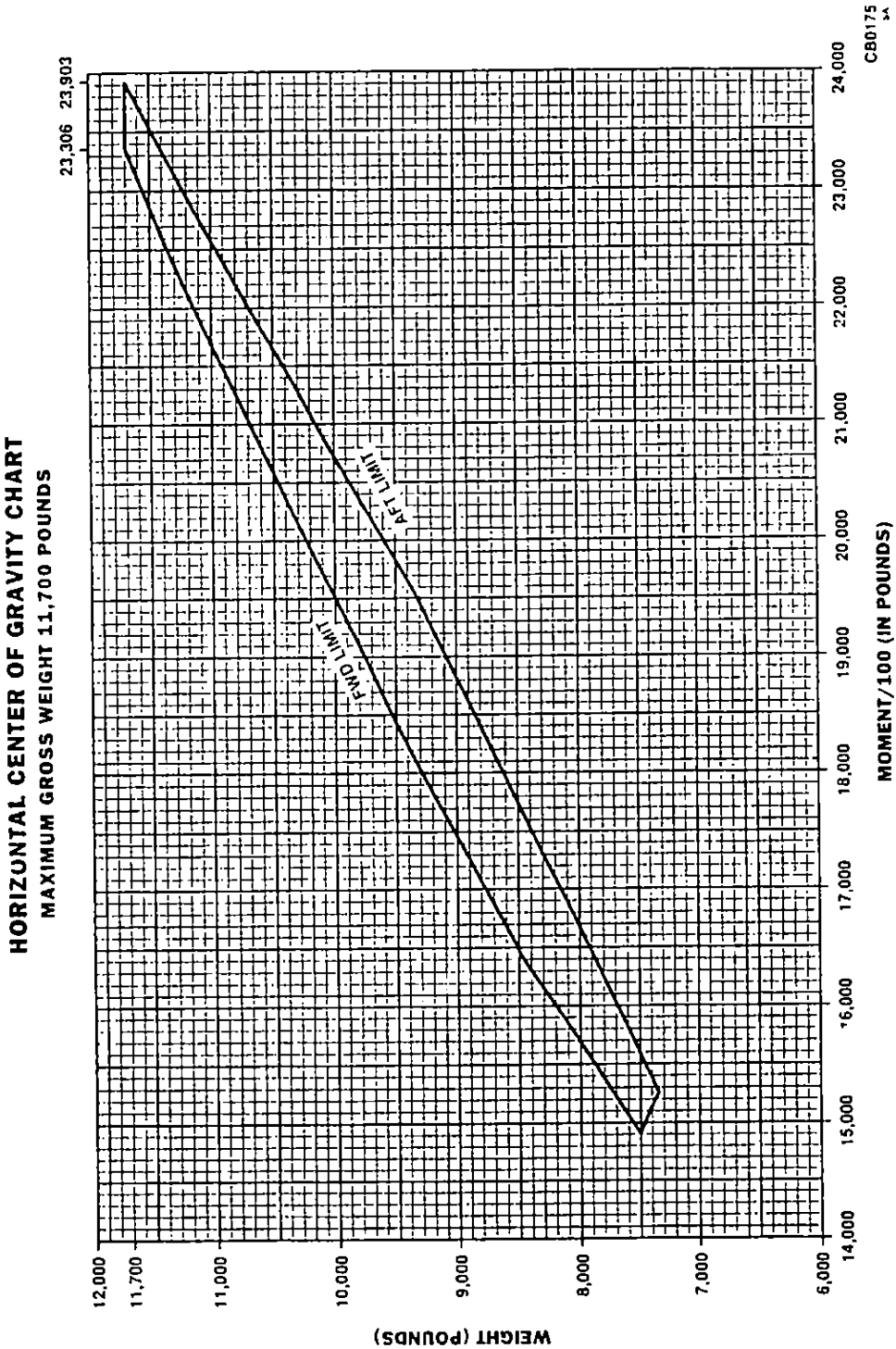

Figure 2-1. Center of Gravity Chart

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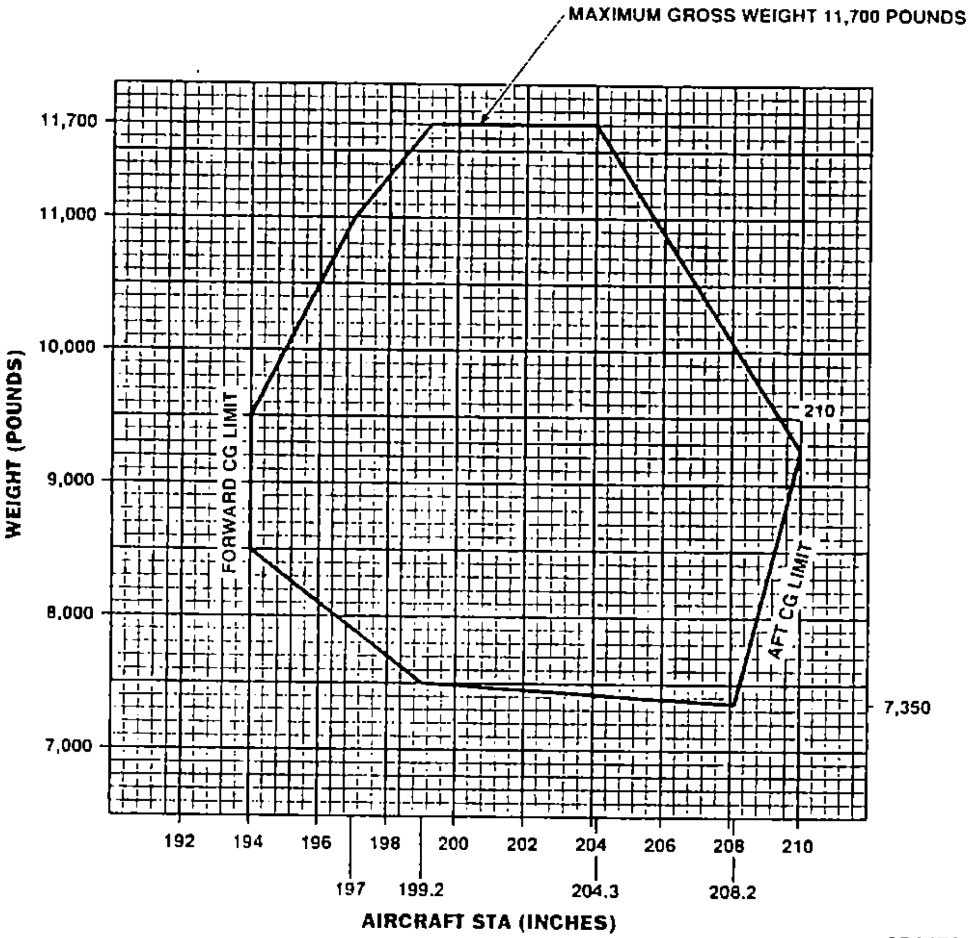

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Figure 2-2. Weight and Center of Gravity Envelope

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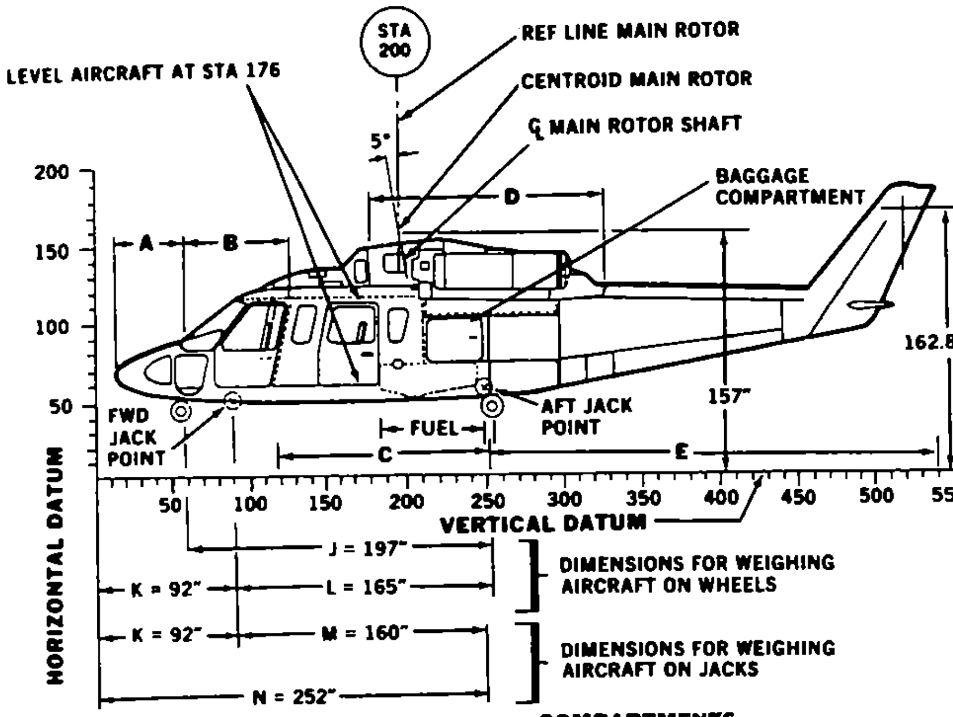

Figure 2-3. Aircraft Diagram

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S-76 WEIGHING PROCEDURE

1. THE AIRCRAFT MUST BE LEVEL WHEN WEIGHED. IT IS RECOMMENDED THAT THE AIRCRAFT BE WEIGHED ON JACK POINTS TO PROVIDE EASE IN LEVELING.
2. SUSPEND A PLUMB BOB ABOVE THE LEVEL PLATE (LOCATED ON THE LEFT HAND PASSENGER DOOR FRAME AT STATION 176) FOR LEVELING THE AIRCRAFT DURING WEIGHING.
3. WHEN WEIGHING ON JACK POINTS, ACTUAL MEASUREMENTS DURING WEIGHING ARE NOT NECESSARY. AFTER LEVELING THE AIRCRAFT THE FOLLOWING DIMENSIONS MAY BE ADDED DIRECTLY TO THE WEIGHING FORM (CHART B):

   K (HORIZONTAL DATUM TO ℄ OF FORWARD JACK POINTS) = 92.0 INCHES
   N (HORIZONTAL DATUM TO ℄ OF AFT JACK POINTS) = 252.0 INCHES

4. WHEN WEIGHING ON WHEELS, MEASURE DIMENSIONS J AND L AFTER LEVELING AND DURING WEIGHING. USING THESE ACTUAL DIMENSIONS AND THE FORWARD JACK POINT (AIRCRAFT STATION 92.0), DETERMINE THE DISTANCE FROM THE HORIZONTAL DATUM TO THE ℄ OF THE NOSE WHEEL, AND TO THE ℄ OF THE MAIN WHEELS.

FOR CHECKING PURPOSES THESE DIMENSIONS ARE APPROXIMATELY AS FOLLOWS:

   HORIZONTAL DATUM TO THE ℄ OF THE NOSE WHEEL = 60.0 INCHES
   HORIZONTAL DATUM TO THE ℄ OF THE MAIN WHEELS = 257.0 INCHES

NOTE: WHEN WEIGHING ON WHEELS, THE MAIN AND NOSE OLEO'S SHOULD BE RESERVICED TO PROPER FLUID LEVELS WITH HYDRAULIC FLUID IF THE OLEO'S HAVE BEEN USED TO LEVEL THE AIRCRAFT. REFER TO INSTRUCTION PLATES FOR PROPER SERVICING PROCEDURES.

5. IF BLADES ARE INSTALLED, THEY MUST BE EQUALLY SPACED DURING WEIGHING.

S 83197.1 (B)

Figure 2-4. Weighing Procedure (Sheet 1 of 2)

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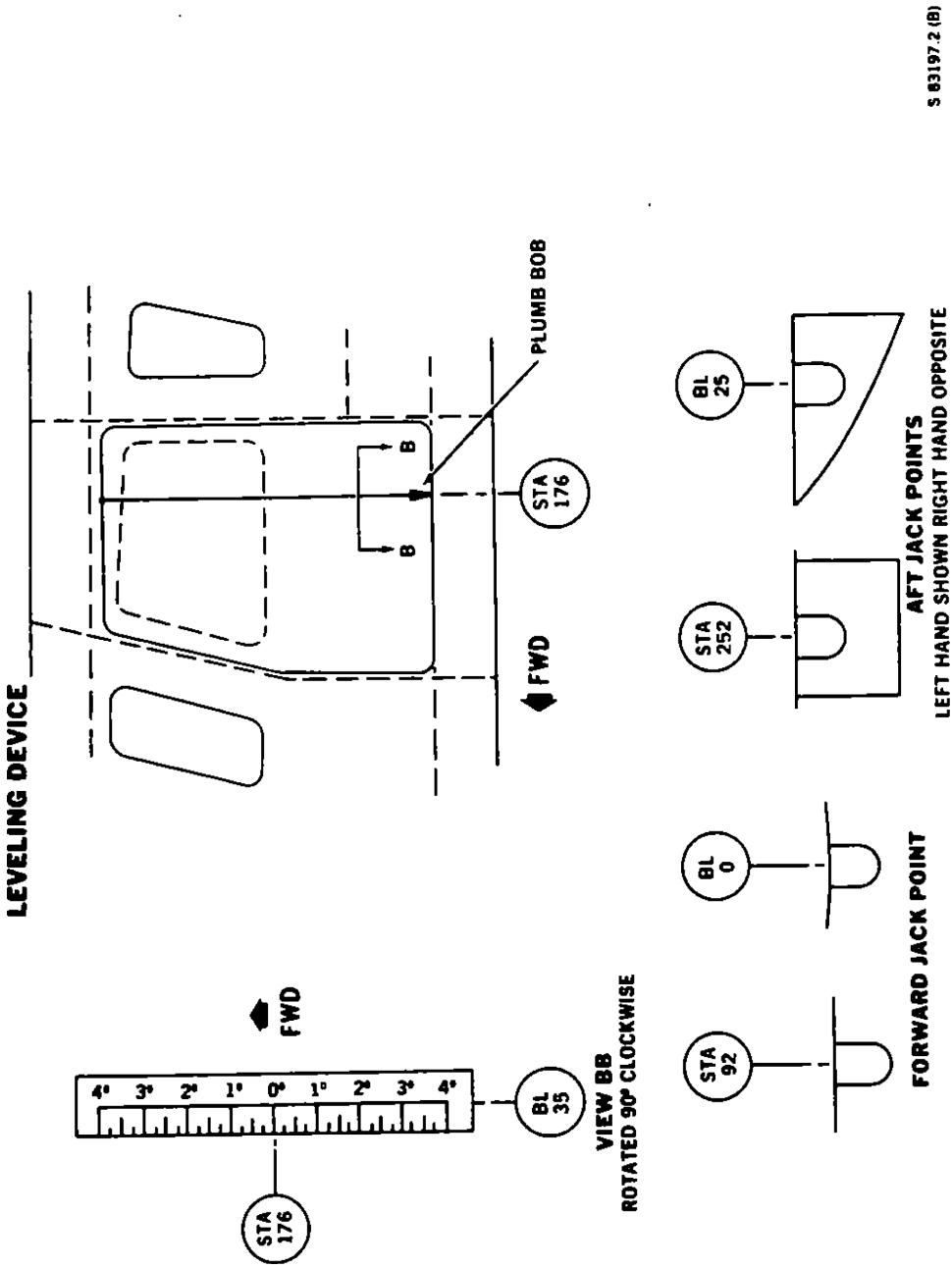

Figure 2-4. Weighing Procedure (Sheet 2 of 2)

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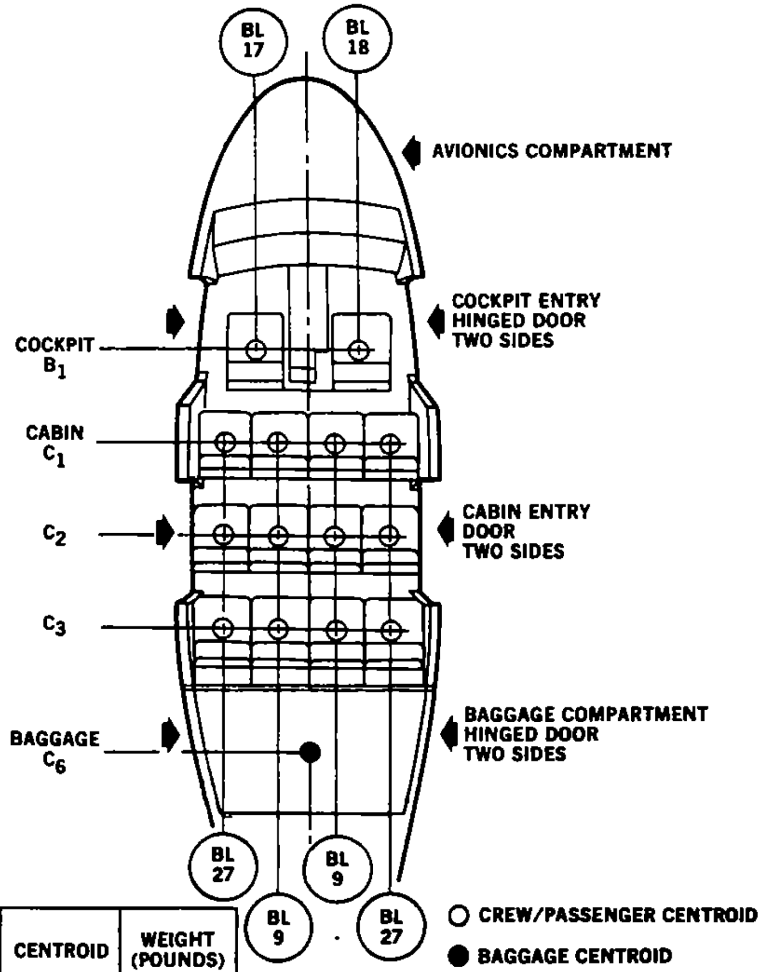
CREW, PASSENGER,AND BAGGAGE CENTROIDS



COMPARTMENT	CENTROID	WEIGHT (POUNDS)
COCKPIT B_1	102.5	340
CABIN C_1	135.5	680
C_2	166.5	680
C_3	197.5	680
BAGGAGE C_6	235.0	600

S 83198 (B)

Figure 2-5. Standard 14-Place Configuration - Crew, Passenger and Baggage Centroids

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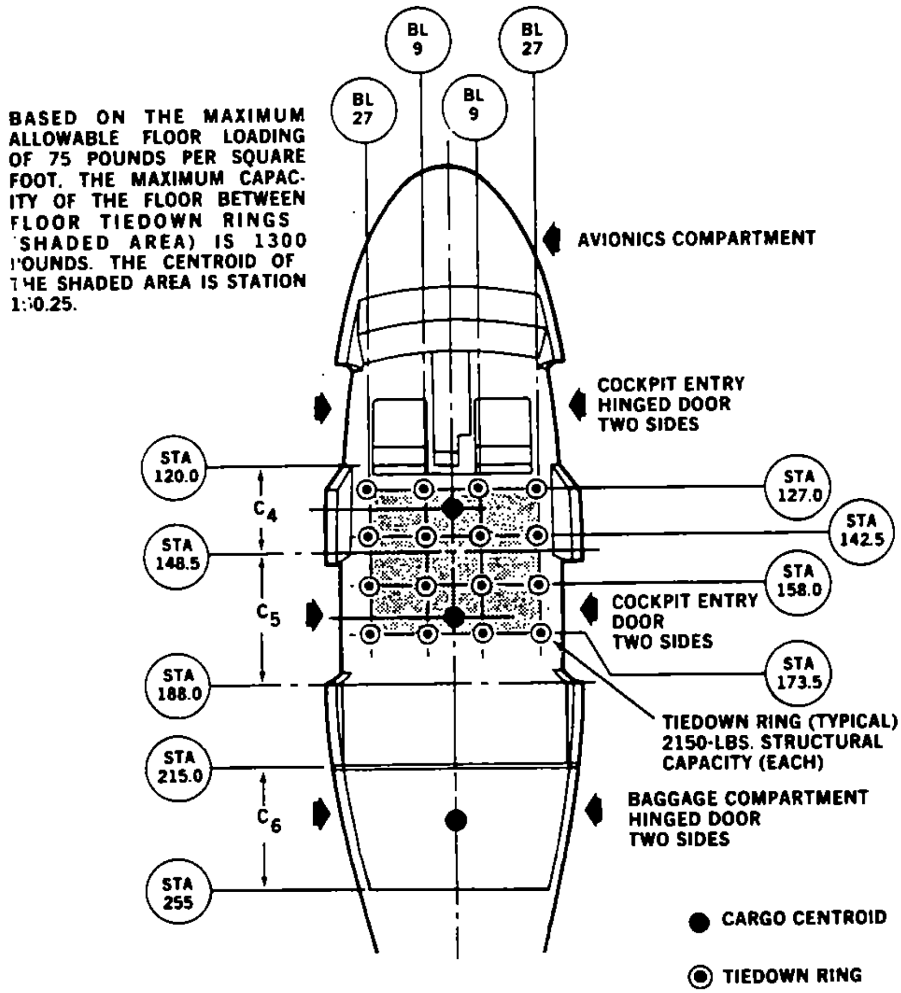
CARGO CENTROIDS



COMPARTMENT	CENTROID	MAXIMUM WEIGHT (POUNDS)
C_4	134.25	965*
C_5	168.25	1337*
C_6	235.00	600*

* MAXIMUM ALLOWABLE FLOOR LOADING FOR CABIN FLOOR IS 75 POUNDS PER SQUARE FOOT MAXIMUM ALLOWABLE FLOOR LOADING FOR BAGGAGE COMPARTMENT FLOOR IS 75 POUNDS PER SQUARE FOOT FOR WEIGHTS UP TO THE MAXIMUM BAGGAGE COMPARTMENT WEIGHT OF 600 POUNDS

S 83199 (B)

Figure 2-6. Standard Cargo Configuration - Cargo Centroids

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CHART A – EMPTY WEIGHT CHECK LIST

MODEL **S-76B** SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	ARM	MOMENT/100	DELIVERY EQUIPMENT	CHECK 1		CHECK 2		CHECK 3		CHECK 4		CHECK 5		CHECK 6		CHECK 7	
						IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY
A	ELECTRONICS COMPARTMENT (STA 19-65)																		
	CENTER NOSE COMPARTMENT																		
A-01	NOSE FAIRING - RADOME 76600-02110	8	30	2.4															
A-02	BLOW DOWN BOTTLE 76650-01801	2	50	1.0															
A-03	WIPER MOTOR 76550-01013	3	73	2.2															

Figure 2-7. Chart A (Sheet 1 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A – EMPTY WEIGHT CHECK LIST

MODEL **S-76B** SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	ARM	MOMENT/100	DELIVERY EQUIPMENT	CHECK 1 IN AIRCRAFT	CHECK 1 CHART C ENTRY	CHECK 2 IN AIRCRAFT	CHECK 2 CHART C ENTRY	CHECK 3 IN AIRCRAFT	CHECK 3 CHART C ENTRY	CHECK 4 IN AIRCRAFT	CHECK 4 CHART C ENTRY	CHECK 5 IN AIRCRAFT	CHECK 5 CHART C ENTRY	CHECK 6 IN AIRCRAFT	CHECK 6 CHART C ENTRY	CHECK 7 IN AIRCRAFT	CHECK 7 CHART C ENTRY
A	ELECTRONICS COMPARTMENT (STA 19-65)—CONTINUED																		
	UPPER RIGHT HAND SHELF																		
A-04	C-14 SYNCH GYRO 76600-02125	5	42	2.1															
A-05	SHELF-UPPER RIGHT 76204-21001	2	50	1.0															
A-06	DIMMING UNITS (2) 76550-01008	3	55	1.7															
A-07	AVIONICS JUNCTION-BOX 76600-02038	1	62	0.6															

Figure 2-7. Chart A (Sheet 2 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A – EMPTY WEIGHT CHECK LIST

MODEL S-76B SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	ARM	MOMENT/100	DELIVERY EQUIPMENT	CHECK 1 IN AIRCRAFT	CHECK 1 CHART C ENTRY	CHECK 2 IN AIRCRAFT	CHECK 2 CHART C ENTRY	CHECK 3 IN AIRCRAFT	CHECK 3 CHART C ENTRY	CHECK 4 IN AIRCRAFT	CHECK 4 CHART C ENTRY	CHECK 5 IN AIRCRAFT	CHECK 5 CHART C ENTRY	CHECK 6 IN AIRCRAFT	CHECK 6 CHART C ENTRY	CHECK 7 IN AIRCRAFT	CHECK 7 CHART C ENTRY
A	ELECTRONICS COMPARTMENT (STA 19-65)–CONTINUED																		
	LOWER RIGHT HAND SHELF																		
A-08	VHF-22 RCVR/XMTR 76600-02001	5	38	1.9															
A-09	SHELF-LOWER RIGHT 76204-21002	3	49	1.5															
A-10	VERTICAL GYRO (2) 76600-02113	9	54	4.9															
A-11	DIMMING UNITS (2) 76550-01008	3	55	1.7															

Figure 2-7. Chart A (Sheet 3 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A - EMPTY WEIGHT CHECK LIST

MODEL **S-76B** SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	ARM	MOMENT/100	DELIVERY EQUIPMENT	CHECK 1 IN AIRCRAFT	CHECK 1 CHART C ENTRY	CHECK 2 IN AIRCRAFT	CHECK 2 CHART C ENTRY	CHECK 3 IN AIRCRAFT	CHECK 3 CHART C ENTRY	CHECK 4 IN AIRCRAFT	CHECK 4 CHART C ENTRY	CHECK 5 IN AIRCRAFT	CHECK 5 CHART C ENTRY	CHECK 6 IN AIRCRAFT	CHECK 6 CHART C ENTRY	CHECK 7 IN AIRCRAFT	CHECK 7 CHART C ENTRY
A	ELECTRONICS COMPARTMENT (STA 19-65)—CONTINUED																		
	UPPER LEFT HAND SHELF																		
A-12	SHELF-UPPER LEFT 76204-21001	3	50	1.5															

Figure 2-7. Chart A (Sheet 4 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A – EMPTY WEIGHT CHECK LIST

MODEL S-76B SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	ARM	MOMENT/ 100	DELIVERY EQUIPMENT	CHECK 1		CHECK 2		CHECK 3		CHECK 4		CHECK 5		CHECK 6		CHECK 7	
						IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY
A	ELECTRONICS COMPARTMENT (STA 19-65)–CONTINUED																		
	LOWER LEFT HAND SHELF																		
A-13	40 AMP BATTERY 76550-03009	83	42	34.9															
A-14	SHELF-LOWER LEFT 76204-21002	3	49	1.5															

Figure 2-7. Chart A (Sheet 5 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A – EMPTY WEIGHT CHECK LIST

MODEL S-76B SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT		WEIGHT	ARM	MOMENT/ 100	DELIVERY EQUIPMENT	CHECK 1 IN AIRCRAFT	CHECK 1 CHART C ENTRY	CHECK 2 IN AIRCRAFT	CHECK 2 CHART C ENTRY	CHECK 3 IN AIRCRAFT	CHECK 3 CHART C ENTRY	CHECK 4 IN AIRCRAFT	CHECK 4 CHART C ENTRY	CHECK 5 IN AIRCRAFT	CHECK 5 CHART C ENTRY	CHECK 6 IN AIRCRAFT	CHECK 6 CHART C ENTRY	CHECK 7 IN AIRCRAFT	CHECK 7 CHART C ENTRY
B	COCKPIT COMPARTMENT (STA 61-133)																			
	STANDARD EQUIPMENT																			
B-01	GAS GEN TACH IND (2)	76450-00903	4	75	3.0															
B-02	PTIT IND (2)	76450-00904	4	76	3.0															
B-03	AIRSPEED IND (2)	76450-01090	2	76	1.5															
B-04	BAROMETRIC ALT (2)	76450-01090	4	76	3.0															
B-05	CAUTION/ADVISORY PNL	76550-20700	3	76	2.3															
B-06	MASTER CAUTION PANEL	76550-00915	1	76	0.8															
B-07	FUEL TOTALIZER IND	76450-01090	1	76	0.8															
B-08	VHF COMM CNTL 313N-5A	76450-01090	1	77	0.8															
B-09	ENG OIL PRESS/TEMP (2)	76450-00906	2	77	1.5															
B-10	DUAL TORQUEMETER (2)	76450-00902	3	77	2.3															
B-11	VERT VELOCITY IND (2)	76450-01090	4	77	3.1															
B-12	FUEL FLOW RATE IND (2)	76450-01090	1	77	0.8															
B-13	XMSN OIL PRESS IND	76450-00907	1	77	0.8															
B-14	HYDRAULIC PRESS IND	76450-01078	1	77	0.8															
B-15	TRIPLE TACH IND (2)	76450-00901	5	78	3.9															
B-16	MAIN FUEL QUANTITY	76450-01078	1	78	0.8															
B-17	OAT THERMOMETER	76450-01004	1	79	0.8															
B-18	CLOCKS (2)	76450-01090	1	80	0.8															
B-19	WINDSHIELD-GLASS	76206-01001	89	81	72.1															
B-20	LANDING GEAR CNTL PNL	76450-01005	1	81	0.8															

Figure 2-7. Chart A (Sheet 6 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A – EMPTY WEIGHT CHECK LIST

MODEL 5-76B SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT		WEIGHT	ARM	MOMENT/ 100	DELIVERY EQUIPMENT	CHECK 1		CHECK 2		CHECK 3		CHECK 4		CHECK 5		CHECK 6		CHECK 7	
							IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY
B	COCKPIT COMPARTMENT (STA 61-133)–CONTINUED																			
	STANDARD EQUIPMENT																			
B-21	ICS CNTL A301-61A (2)	76450-01090	3	81	2.4															
B-22	COMPASS-STANDBY	76450-01001	1	85	0.9															
B-23	CVR CNTL - 93-A151-30	76450-02087	1	87	0.9															
B-24	AFCS (SAS) IND (2)	76900-01804	2	94	1.9															
B-25	AFCS (SAS) CONTROL (2)	76900-01803	1	94	0.9															
B-26	EEC DISCRETE INTRFACE	76550-02500	1	98	1.0															
B-27	PARKING BRAKE HANDLE	76250-01104	3	99	3.0															
B-28	ASH TRAYS (2)	76207-10002	1	102	1.0															
B-29	HEADSET JTHM-575 (2)	76450-01090	2	104	2.1															
B-30	SEAT CUSHION-PILOT	76210-02000	2	105	2.1															
B-31	SEAT COVER-PILOT	76213-03001	1	105	1.1															
B-32	SEAT CUSHION-COPILOT	76210-02000	2	105	2.1															
B-33	SEAT COVER-COPILOT	76213-03001	1	105	1.1															
B-34	COMPASS CONTROL PANEL	76450-01010	1	107	1.1															
B-35	MASTER CYLINDER-MRB	76650-01901	4	111	4.4															
B-36	SEAT STRUCT-PILOT	76210-02000	18	111	20.0															
B-37	SEAT STRUCT-COPILOT	76210-02000	18	111	20.0															
B-38	RESTRAINT SYS-PILOT	76210-02000	3	113	3.4															
B-39	RESTRAINT SYS-COPILOT	76210-02000	3	113	3.4															
B-40	BACK COVER-PILOT	76213-03001	2	114	2.3															

Figure 2-7. Chart A (Sheet 7 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A - EMPTY WEIGHT CHECK LIST

MODEL S-76B SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT		WEIGHT	ARM	MOMENT/ 100	DELIVERY EQUIPMENT	CHECK 1 IN AIRCRAFT	CHECK 1 CHART C ENTRY	CHECK 2 IN AIRCRAFT	CHECK 2 CHART C ENTRY	CHECK 3 IN AIRCRAFT	CHECK 3 CHART C ENTRY	CHECK 4 IN AIRCRAFT	CHECK 4 CHART C ENTRY	CHECK 5 IN AIRCRAFT	CHECK 5 CHART C ENTRY	CHECK 6 IN AIRCRAFT	CHECK 6 CHART C ENTRY	CHECK 7 IN AIRCRAFT	CHECK 7 CHART C ENTRY
B	COCKPIT COMPARTMENT (STA 61-133)–CONTINUED																			
	STANDARD EQUIPMENT																			
B-41	BACK CUSHION-PILOT	76210-02000	2	114	2.3															
B-42	BACK COVER-COPILOT	76213-03001	2	114	2.3															
B-43	BACK CUSHION-COPILOT	76210-02000	2	114	2.3															
B-44	HEADLINERS-COCKPIT (2)	76211-03012	3	115	3.5															
B-45	DUCTING-DEFROSTER	76212-03005	1	118	1.2															
B-46	DUCT-VENT	76212-03018	1	120	1.2															
B-47	FIRST AID KIT	76211-03040	1	120	1.2															
B-48	FIRE EXTINGUISHER	76211-03027	4	122	4.9															

Figure 2-7. Chart A (Sheet 8 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A – EMPTY WEIGHT CHECK LIST

MODEL S-76B SERIAL NO ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT		WEIGHT	ARM	MOMENT/ 100	DELIVERY EQUIPMENT	CHECK 1 IN AIRCRAFT	CHECK 1 CHART C ENTRY	CHECK 2 IN AIRCRAFT	CHECK 2 CHART C ENTRY	CHECK 3 IN AIRCRAFT	CHECK 3 CHART C ENTRY	CHECK 4 IN AIRCRAFT	CHECK 4 CHART C ENTRY	CHECK 5 IN AIRCRAFT	CHECK 5 CHART C ENTRY	CHECK 6 IN AIRCRAFT	CHECK 6 CHART C ENTRY	CHECK 7 IN AIRCRAFT	CHECK 7 CHART C ENTRY
C	CABIN COMPARTMENT (STA 120-255)																			
	STANDARD EQUIPMENT																			
C-01	CONTROL CLOSET PAD	76211-03047	3	121	3.6															
C-02	CURTAINS-NIGHT FLIGHT	76213-03004	3	121	3.6															
C-03	VERTICAL DUCT-LH	76212-23004	3	130	3.9															
C-04	VERTICAL DUCT-RH	76212-23004	3	130	3.9															
C-05	FIRE EXTINGUISHER	76211-03027	4	137	5.5															
C-06	SIDE PANELS-FWD	76211-03013	10	137	13.7															
C-07	LATERAL ABSORBER	76080-20501	57	144	82.1															
C-08	GASPERS-FRESH AIR (6)	76212-03020	2	158	3.2															
C-09	UPPER PANEL-DOOR (2)	76217-03002	5	168	8.4															
C-10	LOWER PANEL-DOOR (2)	76217-03002	5	169	8.5															
C-11	MID PANEL-DOOR (2)	76217-03002	1	169	1.7															
C-12	HEADLINERS-CABIN	76211-03011	27	169	45.6															
C-13	REVEALS (INCL WINDOW)	76217-03002	13	170	22.1															
C-14	DUCTS CABIN	76212-03020	3	175	5.3															
C-15	DUCT-ECU	76212-03016	15	180	27.0															
C-16	BLANKET-DUCTING	76211-03016	20	190	38.0															
C-17	SIDE PANELS-AFT	76211-03013	8	202	16.2															
C-18	BLANKET-215 BULKHEAD	76211-03010	6	211	12.7															
C-19	UNUSABLE FUEL 5.3 GAL	76307-07501	35	216	75.6															
C-20	SMOKE DETECTOR	76550-03025	1	216	2.2															

Figure 2-7. Chart A (Sheet 9 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A - EMPTY WEIGHT CHECK LIST

MODEL S-76B SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT		WEIGHT	ARM	MOMENT/ 100	DELIVERY EQUIPMENT	CHECK 1 IN AIRCRAFT	CHECK 1 CHART C ENTRY	CHECK 2 IN AIRCRAFT	CHECK 2 CHART C ENTRY	CHECK 3 IN AIRCRAFT	CHECK 3 CHART C ENTRY	CHECK 4 IN AIRCRAFT	CHECK 4 CHART C ENTRY	CHECK 5 IN AIRCRAFT	CHECK 5 CHART C ENTRY	CHECK 6 IN AIRCRAFT	CHECK 6 CHART C ENTRY	CHECK 7 IN AIRCRAFT	CHECK 7 CHART C ENTRY
D	ENGINE & XMISSION COMPT (STA 182-330)																			
	STANDARD EQUIPMENT																			
D-01	SPEED SENSOR (2)	76450-00905	1	212	2.1															
D-02	BLOWER-LUBRICATION (2)	76308-07952	21	220	46.2															
D-03	OIL RESERVOIR (2)	76308-07501	9	224	20.2															
D-04	PUMPS-LUBRICATION (2)	76351-09081	4	224	9.0															
D-05	OIL-MAIN GEAR BOX	76351-09600	22	225	49.5															
D-06	ACCUMULATOR-MRB	76650-09809	6	227	13.6															
D-07	TRAPPED OIL-ENG LUBE	76308-07500	5	230	11.5															
D-08	CALIPERS-RB (2)	76363-09103	14	232	32.5															
D-09	ROTOR BRAKE DISC	76363-09103	12	232	27.8															
D-10	HYDRAULIC PUMP (2)	76650-09808	14	232	32.5															
D-11	OIL COOLER-ENGINE	76308-07951	13	233	30.3															
D-12	OIL COOLER-XMISSION	76308-07951	8	233	18.6															
D-13	VALVE-CABIN AIR MIX	76500-07900	3	233	7.0															
D-14	BLOWER-HEAT & VENT	76500-07901	5	235	11.8															
D-15	STARTER GENERATORS (2)	76550-00911	50	237	118.5															
D-16	EXTINGUISH-CONTAIN (2)	76306-07901	10	249	24.9															
D-17	TRAPPED ENGINE FLUIDS	76300-07500	6	264	15.8															
D-18	ENGINE PT6B-36A LH	76300-07500	384	265	1017.6															
D-19	ENGINE PT6B-36A RH	76300-07500	384	265	1017.6															
D-20	AC GENERATOR	76550-09005	17	287	48.8															

Figure 2-7. Chart A (Sheet 10 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A – EMPTY WEIGHT CHECK LIST

MODEL S-76B SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT		WEIGHT	ARM	MOMENT/ 100	DELIVERY EQUIPMENT	CHECK 1		CHECK 2		CHECK 3		CHECK 4		CHECK 5		CHECK 6		CHECK 7	
							IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY
E	TAIL COMPARTMENT (STA 255-540)																			
	STANDARD EQUIPMENT																			
E-01	GENERATOR CONTROL	76550-09005	3	260	7.8															
E-02	AMP-PITCH BIAS ACT	76900-01825	2	265	5.3															
E-03	VOLTAGE REGULATOR (2)	76550-09006	3	267	8.0															
E-04	STATIC INVERTER 600VA	76550-03007	15	267	40.1															
E-05	RATE GYRO (2)	76900-01808	2	277	5.5															
E-06	CVR 93-A100-83	76600-02087	25	291	72.8															
E-07	POWER SUPPLY-STROBE	76550-03011	2	292	5.8															
E-08	FLUX VALVE 2594484	76600-04113	1	429	4.3															
E-09	OIL-INTERMEDIATE GB	76357-05600	2	480	9.6															
E-10	OIL-TAIL GEAR BOX	76358-05600	2	516	10.3															

Figure 2-7. Chart A (Sheet 11 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A – EMPTY WEIGHT CHECK LIST

MODEL **S-76B** SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	ARM	MOMENT/ 100	DELIVERY EQUIPMENT	CHECK 1 IN AIRCRAFT	CHECK 1 CHART C ENTRY	CHECK 2 IN AIRCRAFT	CHECK 2 CHART C ENTRY	CHECK 3 IN AIRCRAFT	CHECK 3 CHART C ENTRY	CHECK 4 IN AIRCRAFT	CHECK 4 CHART C ENTRY	CHECK 5 IN AIRCRAFT	CHECK 5 CHART C ENTRY	CHECK 6 IN AIRCRAFT	CHECK 6 CHART C ENTRY	CHECK 7 IN AIRCRAFT	CHECK 7 CHART C ENTRY
F	EXTERNAL EQUIPMENT (STA 19-540)																		
	STANDARD EQUIPMENT																		
F-01	SEARCH LIGHT 76550-02005	7	38	2.7															
F-02	WINDSHIELD WIPERS (2) 76200-01006	13	73	9.5															
F-03	ELT ANTENNA 76600-04118	1	414	4.1															
F-04	VHF NAV (2) ANTENNA 76202-04014	3	419	12.6															
F-05	VHF COMM ANTENNA 76600-04103	1	528	5.3															

Figure 2-7. Chart A (Sheet 12 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A - EMPTY WEIGHT CHECK LIST

MODEL S-76B SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT		WEIGHT	ARM	MOMENT/ 100	DELIVERY EQUIPMENT	CHECK 1 IN AIRCRAFT	CHECK 1 CHART C ENTRY	CHECK 2 IN AIRCRAFT	CHECK 2 CHART C ENTRY	CHECK 3 IN AIRCRAFT	CHECK 3 CHART C ENTRY	CHECK 4 IN AIRCRAFT	CHECK 4 CHART C ENTRY	CHECK 5 IN AIRCRAFT	CHECK 5 CHART C ENTRY	CHECK 6 IN AIRCRAFT	CHECK 6 CHART C ENTRY	CHECK 7 IN AIRCRAFT	CHECK 7 CHART C ENTRY
G	ALIGHTING GEAR																			
	STANDARD EQUIPMENT																			
G-01	NOSE WHEEL	76250-01000	4	60	2.4															
G-02	NOSE TIRE	76250-01000	9	60	5.4															
G-03	MAIN WHEELS (2)	76250-02500	11	257	28.3															
G-04	MAIN TIRES (2)	76250-02500	24	257	61.7															
G-05	MAIN BRAKES (2)	76250-02500	13	257	33.4															

Figure 2-7. Chart A (Sheet 13 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A - EMPTY WEIGHT CHECK LIST

MODEL **S-76B** SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	ARM	MOMENT/100	DELIVERY EQUIPMENT	CHECK 1 IN AIRCRAFT	CHECK 1 CHART C ENTRY	CHECK 2 IN AIRCRAFT	CHECK 2 CHART C ENTRY	CHECK 3 IN AIRCRAFT	CHECK 3 CHART C ENTRY	CHECK 4 IN AIRCRAFT	CHECK 4 CHART C ENTRY	CHECK 5 IN AIRCRAFT	CHECK 5 CHART C ENTRY	CHECK 6 IN AIRCRAFT	CHECK 6 CHART C ENTRY	CHECK 7 IN AIRCRAFT	CHECK 7 CHART C ENTRY
H	ROTOR AND ROTOR EQUIPMENT																		
	STANDARD EQUIPMENT																		
H-01	3-P BI-FILAR 76107-08100	105	200	210.0															
H-02	BLADES-MAIN ROTOR (4) 76105-09100	349	200	698.0															
H-03	BLADES-TAIL ROTOR (4) 76101-05501	35	518	181.3															
H-04	RETAINING PLATE 76102-05001	5	518	25.9															
H-05	PITCH BEAM-TAIL ROTOR 76103-05001	2	518	10.4															
H-06	CONTROL RODS-TR (4) 76103-05003	2	518	10.4															

Figure 2-7. Chart A (Sheet 14 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A – EMPTY WEIGHT CHECK LIST

MODEL S-76B SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	ARM	MOMENT/100	DELETE EQUIPMENT	CHECK 1		CHECK 2		CHECK 3		CHECK 4		CHECK 5		CHECK 6		CHECK 7	
						IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY

Figure 2-7. Chart A (Sheet 15 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A - EMPTY WEIGHT CHECK LIST

MODEL **S-76B** SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	ARM	MOMENT/100	DELIVERY EQUIPMENT	CHECK 1		CHECK 2		CHECK 3		CHECK 4		CHECK 5		CHECK 6		CHECK 7	
						IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY

Figure 2-7. Chart A (Sheet 16 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A - EMPTY WEIGHT CHECK LIST

MODEL S-76B

SERIAL NO

ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	ARM	MOMENT/100	DELIVERY EQUIPMENT	CHECK 1		CHECK 2		CHECK 3		CHECK 4		CHECK 5		CHECK 6		CHECK 7	
						IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY

Figure 2-7. Chart A (Sheet 17 of 17)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

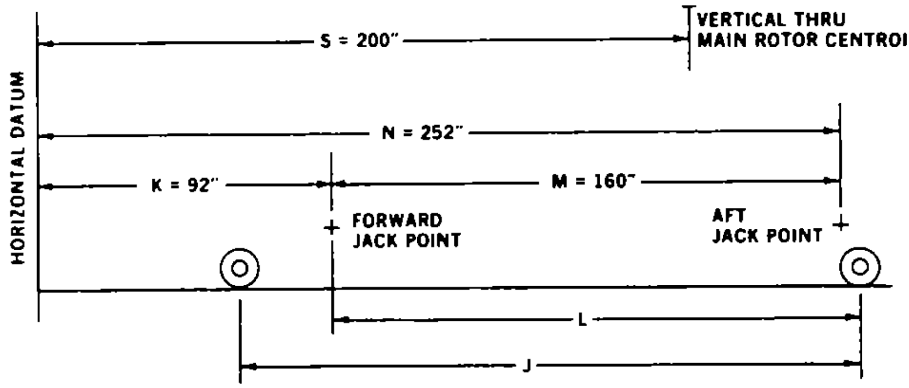
AIRCRAFT ACTUAL WEIGHT AND HORIZONTAL BALANCE FOR S-76 MODEL HELICOPTER

Prepared By _____ Sheet _____ of _____

Date _____

Reg. No _____ Serial No. _____

REACTION WHEEL OR JACK POINT	SCALE NO	SCALE READING (LB)	TARE	SCALE ERROR	SYMBOL	NET WEIGHT
LEFT MAIN					W_L	
RIGHT MAIN					W_R	
NOSE					W_N	
TOTAL WEIGHT					W	



AIRCRAFT HORIZONTAL C.G

WEIGHING ON JACKS $\frac{92'' \times WN}{W} + \frac{(WL + WR) \times 252''}{W} = C.G.$

WEIGHING ON WHEELS $92'' + L - \frac{(WN \times J)}{W} = C.G.$

CORRECTED WEIGHT AND HORIZONTAL BALANCE

ITEMS ADDED & SUBTRACTED	WEIGHT (LB)	HORIZONTAL DIST (in) C.G. TO FWD DATUM	MOMENT (lb in.)
Aircraft as Weighed			
Plus –			
Minus –			
TOTAL EMPTY / GROSS WEIGHT			
BALANCE (Corrected) Horizontal Dist - s = in Fwd / Aft of Main Rotor Centroid			

Witnessed By _____

S 83201.1 (B)

Figure 2-8. Chart B (Sheet 1 of 4)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

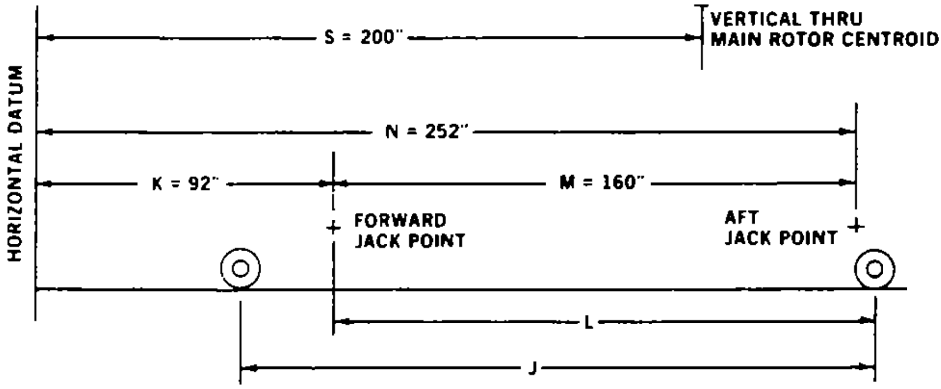
AIRCRAFT ACTUAL WEIGHT AND HORIZONTAL BALANCE FOR S-76 MODEL HELICOPTER

Prepared By _____ Sheet _____ of _____

Date _____

Reg No _____ Serial No _____

REACTION WHEEL OR JACK POINT	SCALE NO.	SCALE READING (LB)	TARE	SCALE ERROR	SYMBOL	NET WEIGHT
LEFT MAIN					W_L	
RIGHT MAIN					W_R	
NOSE					W_N	
TOTAL WEIGHT					W	



AIRCRAFT HORIZONTAL C G

WEIGHING ON JACKS $\frac{92'' \times WN}{W} + \frac{(WL + WR) \times 252''}{W} = C.G$

WEIGHING ON WHEELS $92'' + L - \frac{(WN \times J)}{W} = C.G.$

CORRECTED WEIGHT AND HORIZONTAL BALANCE

ITEMS ADDED & SUBTRACTED	WEIGHT (LB)	HORIZONTAL DIST (in) C.G TO FWD DATUM	MOMENT (lb in.)
Aircraft as Weighed			
Plus –			
Minus –			
TOTAL EMPTY / GROSS WEIGHT			
BALANCE (Corrected) Horizontal Dist · s = in Fwd / Aft of Main Rotor Centroid			

Witnessed By _____

S 83201.2 (B)

Figure 2-8. Chart B (Sheet 2 of 4)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

ITEMS ADDED

ITEM	WEIGHT	ARM	MOMENT
TOTAL			

ITEMS SUBTRACTED

ITEM	WEIGHT	ARM	MOMENT
TOTAL			

S 83201.3 (B)

Figure 2-8. Chart B (Sheet 3 of 4)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

ITEMS ADDED

ITEM	WEIGHT	ARM	MOMENT
TOTAL			

ITEMS SUBTRACTED

ITEM	WEIGHT	ARM	MOMENT
TOTAL			

S 83201.4 (B)

Figure 2-8. Chart B (Sheet 4 of 4)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

EMPTY WEIGHT and BALANCE RECORD

CONTINUOUS HISTORY OF CHANGES IN STRUCTURE OR EQUIPMENT AFFECTING WEIGHT & BALANCE

MODEL _____ SERIAL NO _____

CHART **C** SHEET

DATE	ITEM NO. IN	ITEM NO. OUT	DESCRIPTION OF ARTICLE OR MODIFICATION	WEIGHT CHANGE ADDED (+) WEIGHT	WEIGHT CHANGE ADDED (+) MOMENT/100	WEIGHT CHANGE REMOVED (−) WEIGHT	WEIGHT CHANGE REMOVED (−) MOMENT/100	RUNNING TOTAL EMPTY AIRCRAFT WEIGHT	RUNNING TOTAL EMPTY AIRCRAFT MOMENT/100	RUNNING TOTAL EMPTY AIRCRAFT C.G.	INDEX

S 83202 1 (B)

Figure 2-9. Chart C (Sheet 1 of 2)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART
C
SHEET

EMPTY WEIGHT and BALANCE RECORD
CONTINUOUS HISTORY OF CHANGES IN STRUCTURE OR EQUIPMENT AFFECTING WEIGHT & BALANCE

MODEL _____ SERIAL NO. _____

DATE	ITEM NO. IN	ITEM NO. OUT	DESCRIPTION OF ARTICLE OR MODIFICATION	WEIGHT CHANGE ADDED (+) WEIGHT	WEIGHT CHANGE ADDED (+) MOMENT/100	WEIGHT CHANGE REMOVED (−) WEIGHT	WEIGHT CHANGE REMOVED (−) MOMENT/100	RUNNING TOTAL EMPTY AIRCRAFT WEIGHT	RUNNING TOTAL EMPTY AIRCRAFT MOMENT/100	RUNNING TOTAL EMPTY AIRCRAFT C.G.	RUNNING TOTAL EMPTY AIRCRAFT INDEX

S 83202.2 (B)

Figure 2-9. Chart C (Sheet 2 of 2)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

WEIGHT (POUNDS)	COCKPIT	CABIN			
	PILOT AND CO-PILOT/ PASSENGER	PASSENGERS			BAGGAGE/ CARGO
	B_1	C_1	C_2	C_3	C_6
	ARM = 102.5 MOMENT/100	ARM = 135.5 MOMENT/100	ARM = 166.5 MOMENT/100	ARM = 197.5 MOMENT/100	ARM = 235.0 MOMENT/100
50	51	68	83	99	118
60	62	81	100	119	141
70	72	95	117	138	165
80	82	108	133	158	188
90	92	122	150	178	212
100	103	136	167	198	235
110	113	149	183	217	259
120	123	163	200	237	282
130	133	176	216	257	306
140	144	190	233	277	329
150	154	203	250	296	353
160	164	217	266	316	376
170	174	230	283	336	400
180	185	244	300	356	423
190	195	257	316	375	447
200	205	271	333	395	470
210	215	285	350	415	494
220	226	298	366	435	517
230	236	312	383	454	541
240	246	325	400	474	564
250	256	339	416	494	588
260	267	352	433	514	611
270	277	366	450	533	635
280	287	379	466	553	658
290	297	393	483	573	682
300	308	407	500	593	705
310	318	420	516	612	729
320	328	434	533	632	752
330	338	447	549	652	776
340	349	461	566	672	799
350		474	583	691	823
360		488	599	711	846
370		501	616	731	870
380		515	633	751	893
390		528	649	770	917
400		542	666	790	940
410		556	683	810	964
420		569	699	830	987
430		583	716	849	1011
440		596	733	869	1034
450		610	749	889	1058

S 83203.1 (B)

Figure 2-10. Chart E - Cockpit and Cabin Compartment Weight and Moment Table (Sheet 1 of 2)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

WEIGHT (POUNDS)	COCKPIT	CABIN			
	PILOT AND CO-PILOT/ PASSENGER	PASSENGERS			BAGGAGE/ CARGO
	B_1	C_1	C_2	C_3	C_6
	ARM = 102.5 MOMENT/100	ARM = 135.5 MOMENT/100	ARM = 166.5 MOMENT/100	ARM = 197.5 MOMENT/100	ARM = 235.0 MOMENT/100
460		623	766	909	1081
470		637	783	928	1105
480		650	799	948	1128
490		664	816	968	1152
500		678	833	988	1175
510		691	849	1007	1199
520		705	866	1027	1222
530		718	882	1047	1246
540		732	899	1067	1269
550		745	916	1086	1293
560		759	932	1106	1316
570		772	949	1126	1340
580		786	966	1146	1363
590		799	982	1165	1387
600*		813	999	1185	1410
610		827	1016	1205	
620		840	1032	1225	
630		854	1049	1244	
640		867	1066	1264	
650		881	1082	1284	
660		894	1099	1304	
670		908	1116	1323	
680		921	1132	1343	

NOTE:

1. CAUTION MUST BE TAKEN TO BE SURE THAT PASSENGER AND/OR BAGGAGE/CARGO COMPARTMENT LOADING DOES NOT CAUSE AIRCRAFT MAXIMUM GROSS WEIGHT AND/OR C.G. LIMITS TO BE EXCEEDED.
2. BAGGAGE/CARGO CENTROID MUST BE LOCATED AT COMPARTMENT CENTROID.
3. MAXIMUM ALLOWABLE FLOOR LOADING FOR BAGGAGE COMPARTMENT IS 75 POUNDS PER SQUARE FOOT FOR WEIGHTS UP TO 600 POUND MAXIMUM COMPARTMENT WEIGHT.

MAXIMUM CAPACITY OF COMPARTMENT C6

S 83203.2 (B)

Figure 2-10. Chart E - Cockpit and Cabin Compartment Weight and Moment Table (Sheet 2 of 2)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

FUEL SYSTEM - 2 TANKS					
CAPACITY = 281.2 GALLONS (2 TANKS)					
TOTAL WEIGHT - LB	MOMENT/100	TOTAL WEIGHT - LB	MOMENT/100	TOTAL WEIGHT - LB	MOMENT/100
20	44	640	1379	1360	2944
40	86	680	1465	1400	3031
60	128	720	1552	1440	3118
80	171	760	1639	1480	3204
100	213	800	1727	1520	3292
120	255	840	1814	1560	3379
160	341	880	1901	1600	3466
200	426	920	1988	1640	3552
240	512	960	2075	1680	3641
280	598	1000	2161	1720	3727
320	685	1040	2248	1760	3814
360	772	1080	2335	1800	3901
400	858	1120	2423	*1828 (JP-4)	3961
440	946	1160	2509	1840	3987
480	1032	1200	2597	1880	4074
520	1119	1240	2683	**1884 (JP-8)	4083
560	1205	1280	2770	***1898 (JP-1)	4113
600	1292	1320	2856	****1912 (JP-5)	4143

NOTES:

1. (*) The single asterisk indicates the approximate weight and moment/100 for full fuel tanks using JP-4 fuel at 6.5 pounds per gallon under standard conditions (60°F).
2. (**) The double asterisk indicates the approximate weight and moment/100 for full fuel tank using JP-8 fuel at 6.7 pounds per gallon under standard conditions (60°F).
3. (***) The triple asterisk indicates the approximate weight and moment/100 for full fuel tanks using JP-1 fuel at 6.75 pounds per gallon under standard conditions (60°F).
4. (****)The quadruple asterisk indicates the approximate weight and moment/100 for full fuel tanks using JP-5 fuel at 6.8 pounds per gallon under standard conditions (60°F).
5. The total usable capacity of 281.2 U.S. gallons (140.6 gallons per tank) is based on actual test results.
6. The usable fuel table (gravity fueling) and the fuel arm table are for equal weights of fuel in each tank.
7. The standard S-76 helicopter is equipped with a capacitor type fuel quantity gage which is calibrated in pounds. Aircraft fuel varies in weight per gallon dependent upon the specific gravity and temperature of the fuel. Therefore, the notation "full" does not appear on the instrument dial. The pilot should anticipate variations in the instrument readings when tanks are full.
8. The fuel arm table is included for reference.

FUEL ARM TABLE

FUEL SYSTEM - 2 TANKS			
FUEL QUANTITY	TOTAL WEIGHT (POUNDS)	ARM	MOMENT/100
1/4 FULL	457	215.1	983
1/2 FULL	914	216.1	1975
3/4 FULL	1371	216.5	2968
FULL JP-4	*1828	216.7	3961
FULL JP-8	**1884	216.7	4083
FULL JP-1	***1898	216.7	4113
FULL JP-5	****1912	216.7	4143

Figure 2-11. Chart E - Usable Fuel Weight and Moment Table (Gravity Fueling)

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ENGINE OIL TABLE

ENGINE OIL SYSTEM - 2 TANKS				
TOTAL CAPACITY = 4.8 U.S. GALLONS (2 TANKS)				
ARM = 224.0				
GALLONS	MIL-L-7808 OIL		MIL-L-23699 OIL	
	WEIGHT - POUNDS	MOMENT/100	WEIGHT - POUNDS	MOMENT/100
1	7.7	17	8.4	19
2	15.4	35	16.8	38
3	23.1	52	25.2	56
4.8	37	83	40.3	90

* TWO OIL COOLER/TANKS CONTAIN 2.4 GALLONS EACH FOR A TOTAL CAPACITY OF 4.8 GALLONS

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Figure 2-12. Chart E - Engine Oil Weight and Moment Table

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INTERNAL CARGO TABLE

WEIGHT (POUNDS)	CABIN		WEIGHT (POUNDS)	CABIN	
	C_4	C_5		C_4	C_5
	ARM = 134.25 MOMENT/100	ARM = 168.25 MOMENT/100		ARM = 134.24 MOMENT/100	ARM = 168.25 MOMENT/100
10	13	17	550	738	925
20	27	34	600	806	1010
30	40	50	650	873	1094
40	54	67	700	940	1178
50	67	84	750	1007	1262
60	81	101	800	1074	1346
70	94	118	850	1141	1430
80	107	135	900	1208	1514
90	121	151	950	1275	1598
100	134	168	965*	1296	1624
150	201	252	1000		1683
200	269	337	1050		1767
250	336	421	1100		1851
300	403	505	1150		1935
350	470	589	1200		2019
400	537	673	1250		2103
450	604	757	1300		2187
500	671	841	1337**		2250

* MAXIMUM CAPACITY OF COMPARTMENT C_4

** MAXIMUM CAPACITY OF COMPARTMENT C_5

NOTE:

1. CAUTION MUST BE TAKEN TO BE SURE THAT CARGO LOADING DOES NOT CAUSE AIRCRAFT MAXIMUM GROSS WEIGHT AND/OR C.G. LIMITS TO BE EXCEEDED.
2. CARGO CENTROID MUST BE LOCATED AT COMPARTMENT CENTROID.
3. MAXIMUM ALLOWABLE FLOOR LOADING FOR CARGO IS 75 POUNDS PER SQUARE FOOT.
4. SEE COCKPIT AND CABIN COMPARTMENT TABLE FOR BAGGAGE COMPARTMENT (C6) WEIGHT AND MOMENT/100 VALUES AND LOADING REQUIREMENTS.

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Figure 2-13. Chart E - Internal Cargo Weight and Moment Table

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EXTERNAL CARGO TABLE

WEIGHT (POUNDS)	ARM = 181.5 MOMENT/100	WEIGHT (POUNDS)	ARM = 181.5 MOMENT/100
25	45	2100	3812
50	91	2200	3993
75	136	2300	4175
100	182	2400	4356
200	363	2500	4538
300	545	2600	4719
400	726	2700	4901
500	908	2800	5082
600	1089	2900	5264
700	1271	3000	5445
800	1452	3100	5627
900	1634	3200	5808
1000	1815	*3300	5990
1100	1997		
1200	2178		
1300	2360		
1400	2541		
1500	2723		
1600	2904		
1700	3086		
1800	3267		
1900	3449		
2000	3630		

* MAXIMUM EXTERNAL CARGO WEIGHT

NOTE:

1. THIS TABLE IS APPLICABLE ONLY WHEN THE EXTERNAL LOAD SYSTEM OPTION IS INSTALLED.
2. CAUTION MUST BE TAKEN TO BE SURE THAT EXTERNAL CARGO LOADING DOES NOT CAUSE AIRCRAFT MAXIMUM GROSS WEIGHT AND/OR C.G. LIMITS TO BE EXCEEDED.

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Figure 2-14. Chart E - External Cargo Weight and Moment Table

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S-76B SAMPLE LOADING CONDITIONS

ITEM	PASSENGER MISSION		CARGO MISSION		EXTERNAL LOAD MISSION	
	WEIGHT (POUNDS)	MOMENT/100 (IN-POUNDS)	WEIGHT (POUNDS)	MOMENT/100 (IN-POUNDS)	WEIGHT (POUNDS)	MOMENT/100 (IN-POUNDS)
EMPTY WEIGHT	7093	14,874	6,924	14,595	6,939	14,622
PILOT	170	174	170	174	170	174
COPILOT	150	154	150	154	170	174
ENGINE OIL	37	83	37	83	37	83
FORWARD PASSENGERS (3 @ 170 LB)	510	691				
AFT PASSENGERS (2 @ 170 LB)	340	672				
BAGGAGE	150	353				
FUEL-USABLE	1,820	3,944	1,000	2,161	1,600	3,466
FLOOR CARGO, FORWARD			300	403		
FLOOR CARGO, AFT			800	1,346		
GROSS WEIGHT TAKE-OFF[1]	10,270	20,945	9,381	18,916	8,916	18,519
EXTERNAL LOAD					2,200	3,993
GROSS WEIGHT HOVER-START[1]	10,270	20,945	9,381	18,916	11,116	22,512
MINUS FUEL-USABLE	−1,820	− 3,944	−1,000	− 2,161	−1,600	− 3,466
PLUS RESERVE/LANDING FUEL	+ 200	+ 426	+ 200	+ 426	+1,000	+2,161
MINUS EXTERNAL LOAD					−2,200	− 3,993
GROSS WEIGHT LANDING[1]	8,650	17,427	8,581	17,181	8,316	17,214

SAMPLE

NOTE:

1. SAMPLE LOADING CONDITIONS - DETERMINE ACTUAL LOADING FOR EACH FLIGHT USING LATEST WEIGHT AND MOMENT/100 DATA.
2. FROM C.G. CHART, FIGURE 2-1, THE AIRCRAFT WEIGHT AND MOMENT/100 IS WITHIN LIMITS AND THEREFORE IN BALANCE.

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Figure 2-15. Sample Loading Conditions

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SECTION III

LOADING INFORMATION

UTILITY HOIST LOADS

NOTE

Each copy of this manual which is assigned to a specific aircraft (i.e. aircraft copy) must contain all data referred to herein and must be maintained to the current aircraft configuration. Copies issued on general distribution only need not contain such data.

NOTE

Use this section for helicopters carrying a load on the utility hoist. Use Section II for helicopters without a utility hoist or for helicopters with a utility hoist installed but carrying no hoist load.

EMPTY WEIGHT AND HORIZONTAL AND LATERAL CENTER OF GRAVITY LOCATION

The current empty weight, horizontal moment/100, lateral moment/100, horizontal center of gravity location and lateral center of gravity location are shown in the Empty Weight and Balance Record, Chart C herein.

1. The current empty weight includes all items marked (✓) in the Empty Weight Check List, Chart A, herein. Items not included are marked (0).
2. Chart C (Figure 3-11) must be kept up to date. If any items of equipment are added to or removed from the aircraft, Charts A and C must be updated as follows:
   a. When items are added, make the appropriate entry in the Empty Weight and Balance Record, Chart C. On Chart A mark (✓), in both the "In Aircraft" and "Chart C Entry" columns opposite the items added, dating the columns where indicated. Add the new entry or entries on Chart C to the previous totals of empty weight, horizontal moment/100, and lateral moment/100 and compute the new empty weight, horizontal moment/100, lateral moment/100, horizontal center of gravity location and lateral center of gravity location.

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b. When items are removed from the aircraft, follow a similar procedure to (a) above except mark (0) in the "In Aircraft" column and mark (0) in the "Chart C Entry" column of Chart A, and subtract the new entry or entries from the previous totals of empty weight, horizontal moment/100 and lateral moment/100, shown on Chart C (Figure 3-11).

c. New items to be added to the aircraft and not previously listed, may be "written in" on the next available line in the appropriate aircraft compartment. Do not erase or obliterate any Chart A entry when items are removed from the aircraft.

d. The aircraft empty weight center of gravity location both horizontal and lateral is initially obtained by actual weighing (Figure 3-10). The updated horizontal center of gravity location is determined by dividing the updated horizontal moment/100 by the updated empty weight and multiplying the result by 100. The updated lateral center of gravity is obtained by dividing the updated lateral moment/100 by the updated empty weight and multiplying the result by 100.

e. When determing the updated lateral moment and updated lateral center of gravity the correct sign convention must be used. For items located on the port side of the helicopter longitudinal centerline (left-hand side facing forward) the lateral moment/100 and corresponding lateral center of gravity are positive (+). For items located on the starboard side of the helicopter longitudinal centerline (right-hand side facing forward) the lateral moment/100 and corresponding lateral center of gravity are negative (-).

f. The "In Aircraft" column in Chart A may be used for periodic checking of the aircraft inventory. It is recommended that the first check be made prior to the first flight by a new operator.

The original empty weight, horizontal and lateral center of gravity locations were determined by Sikorsky Aircraft, as shown in the Aircraft Actual Weight and Balance Form Chart B (Figure 3-10) which is included in the aircraft copy of this manual for reference.

Any changes to charts A, B, or C must be made in both Sections II and III loading information and the utility hoist loading information.

LOADING INSTRUCTIONS

1. Obtain the current aircraft empty weight, aircraft empty weight horizontal moment/100 and aircraft empty weight lateral moment/100 from Chart C (Figure 3-11) and enter each in the appropriate columns of the manifest.

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2. Obtain the aircraft take-off gross weight, horizontal and lateral centers of gravity by adding to the aircraft empty weight, horizontal moment/100 and lateral moment/100 for the weight, horizontal moment/100 and lateral moment/100 of each useful load item to be carried. The weight, horizontal moment/100 and lateral moment/100 of each useful load item are provided in Chart E Weight and Moment Charts. Useful load items include fuel, oil, crew, passengers, utility hoist load, baggage and/or cargo. Do not exceed the specified compartment capacities at any time.

3. Determine by reference to the Horizontal Center of Gravity Chart (Figure 3-1) and the Lateral Center of Gravity Chart (Figure 3-3), that the take-off gross weight, horizontal moment/100 and lateral moment/100 are within the recommended weight and horizontal center of gravity and lateral center of gravity limits.

4. FOR AIRCRAFT WITH THE UTILITY HOIST OPTION INSTALLED AND OPERATED DURING FLIGHT, CHECK THAT THE AIRCRAFT WILL REMAIN WITHIN WEIGHT AND CG LIMITS THROUGHOUT THE FLIGHT.

   (a) Compute the inflight and landing gross weight horizontal moment/100 and lateral moment/100 for landing, and each inflight use of the utility hoist considering fuel burn-off, sliding door operation, hoist operator movement, and any useful load added or removed during the flight.

   (b) Using the Allowable Hoist Load Chart (Figure 3-4) determine the maximum allowable hoist load for each use of the utility hoist.

   (c) Determine by reference to the Horizontal Center of Gravity Chart (Figure 3-1) and Lateral Center of Gravity Chart (Figure 3-3) that the aircraft will remain within the recommended weight, horizontal center of gravity limits and lateral center of gravity limits with and without a hoist load. Bring the aircraft within weight, horizontal and lateral balance if either is outside the recommended limits by reducing allowable hoist load and/or redistribution of useful load.

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5. The horizontal center of gravity limits are tabulated below and are also shown for reference in Figure 3-2.

Gross Weight (pounds)	Forward CG Limit (Station)	Aft CG Limit (Station)
7350	208.30	208.30
7500	199.00	208.43
7600	198.50	208.52
7800	197.50	208.70
8000	196.50	208.88
8200	195.50	209.06
8400	194.50	209.24
8500	194.00	209.33
9000	194.00	209.78
9250	194.00	210.00
9500	194.00	209.42
9600	194.20	209.19
9800	194.60	208.72
10,000	195.00	208.26
10,200	195.40	207.79
10,400	195.80	207.33
10,600	196.20	206.86
10,800	196.60	206.40
11,000	197.00	205.93
11,200	197.63	205.47
11,400	198.26	205.00
11,600	198.89	204.53
11,700	199.20	204.30

6. The lateral center of gravity limits left or right are 3-1/2 inches for gross weights up to 11,400 and 2 1/2 inches left or right for gross weights 11,401 to 11,700 pounds.

7. The maximum permissible gross weight is 11,700 pounds.

8. The maximum permissible hoist load is 600 pounds.

9. A sample loading condition is shown in Figure 3-20. The sample loading conditions are intended to present typical calculations and do not utilize actual aircraft data. Determine actual loading information for each flight using the latest weight, horizontal moment/100 and lateral moment/100 data for the particular helicopter being used.

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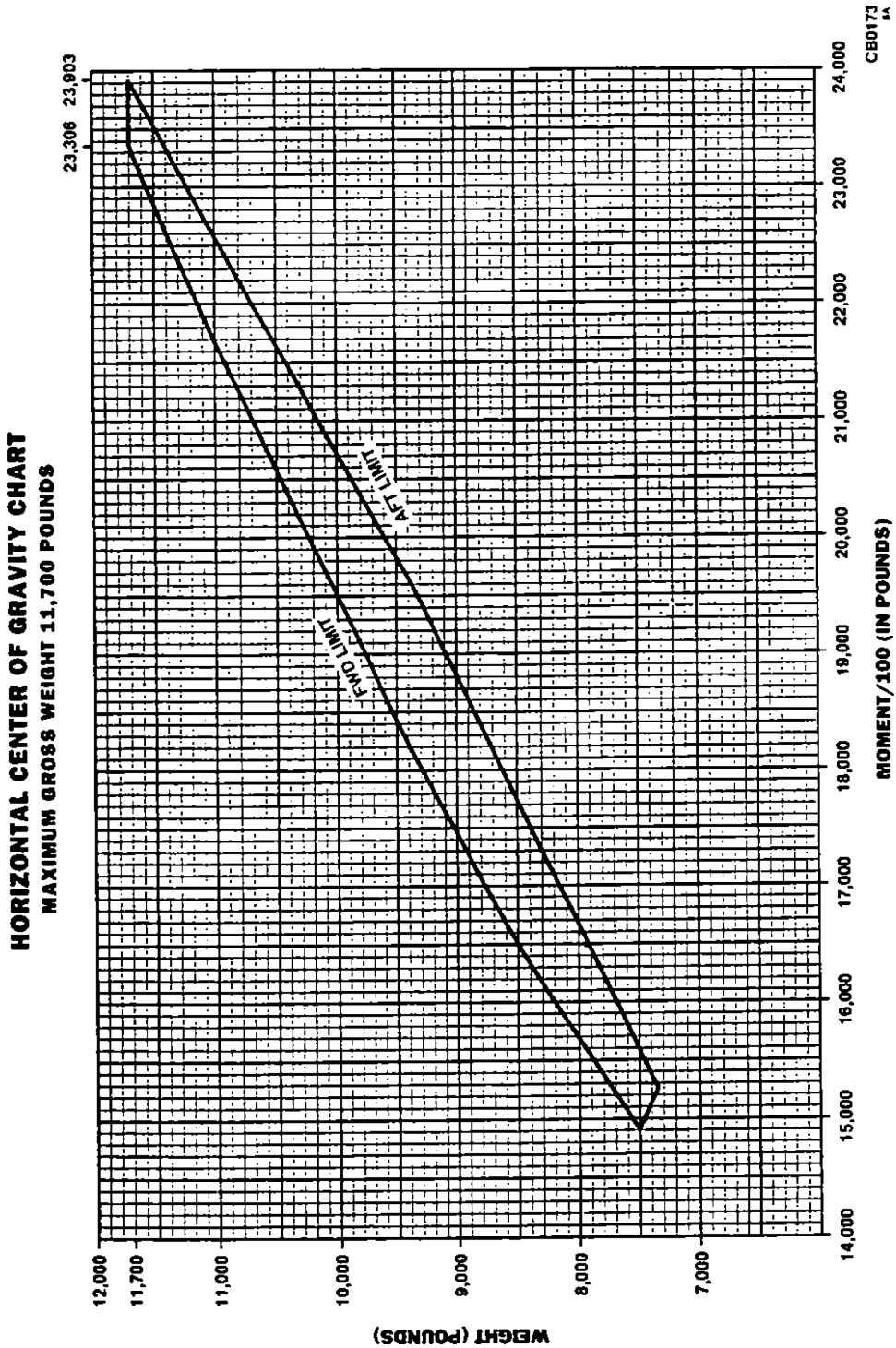

Figure 3-1. Horizontal Center of Gravity Chart

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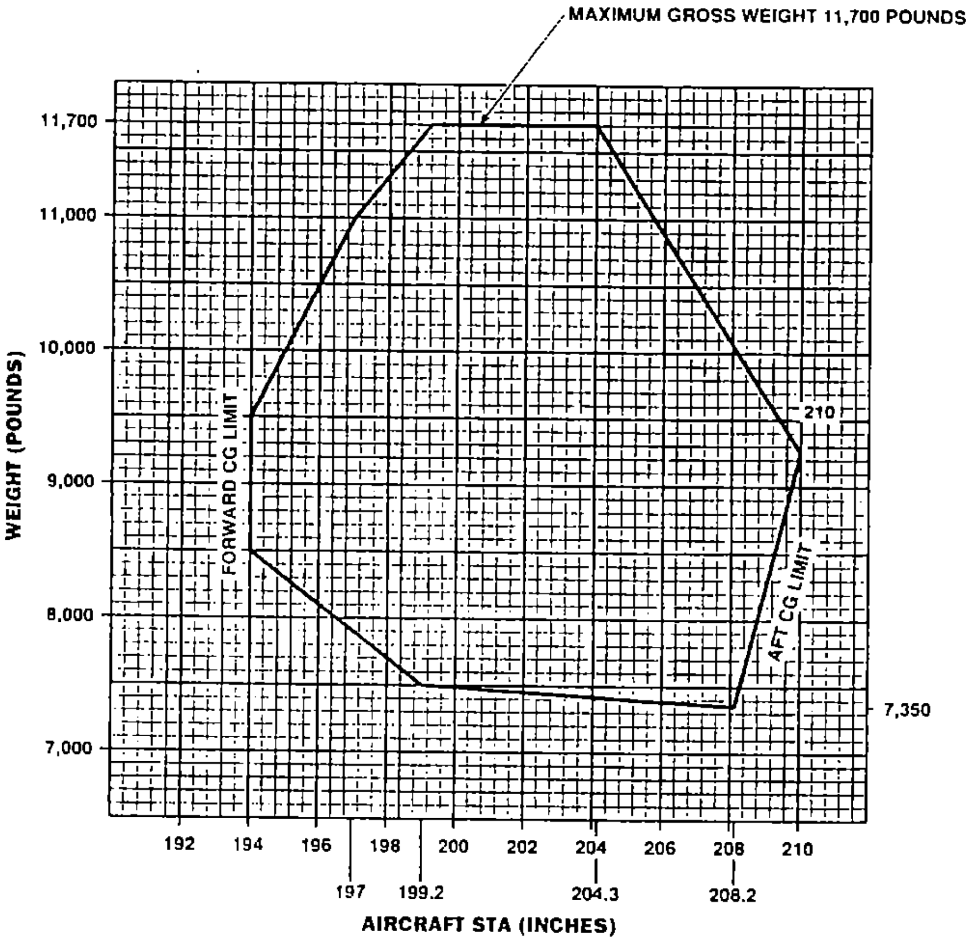

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Figure 3-2. Weight and Horizontal Center of Gravity Envelope

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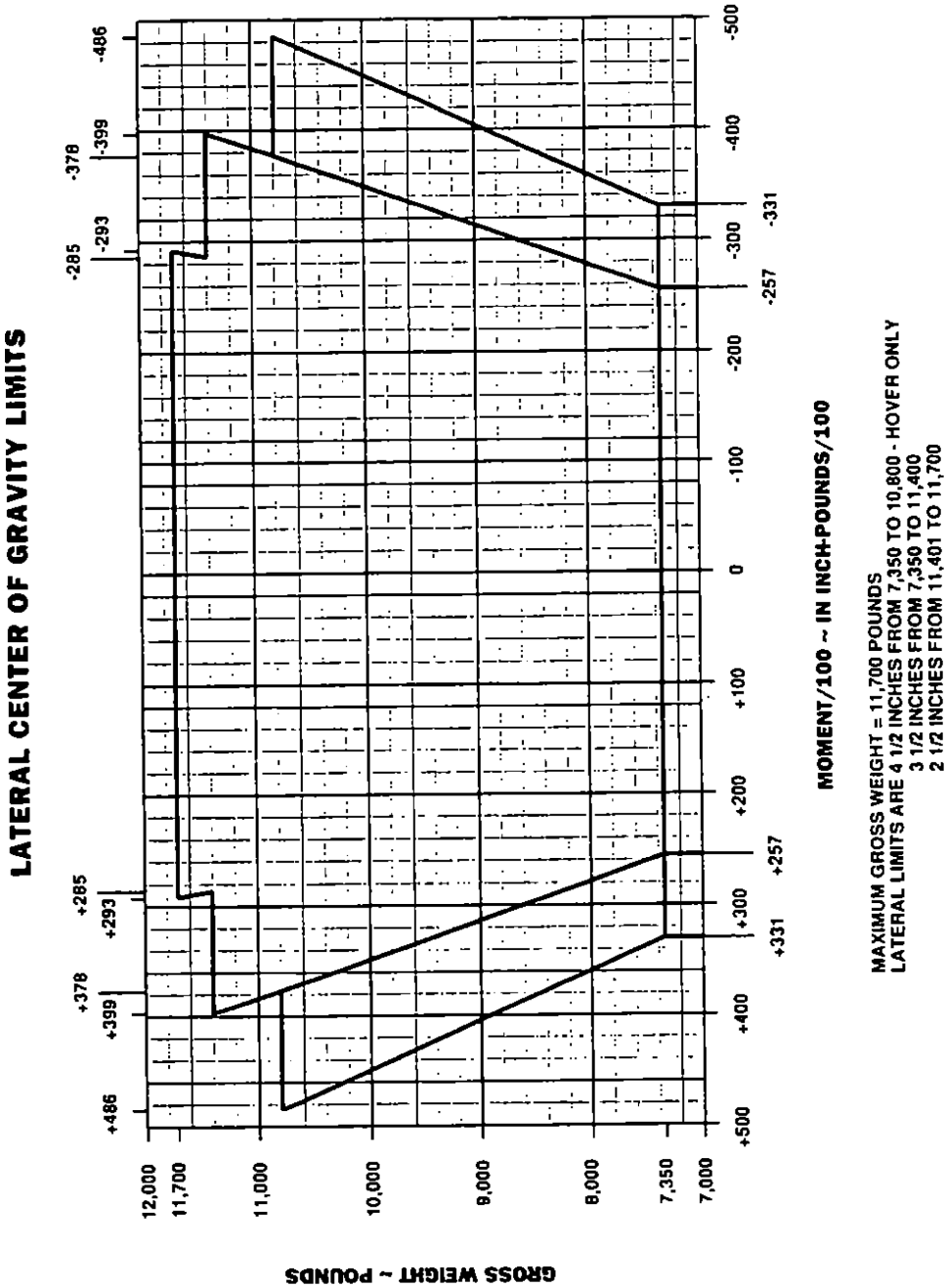

Figure 3-3. Lateral Center of Gravity

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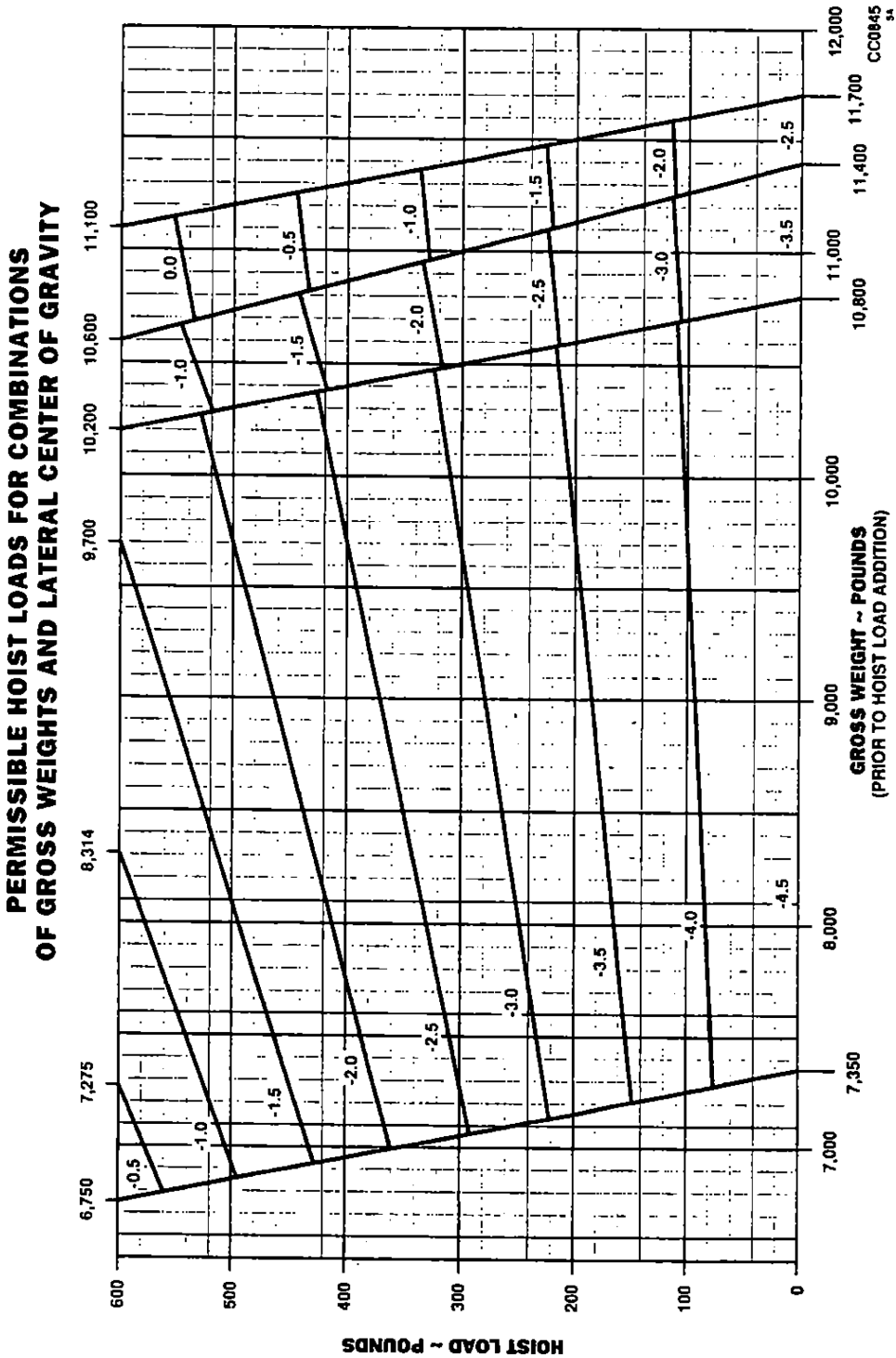

Figure 3-4. Permissible Hoist Load for Combinations of Gross Weight and Lateral Center of Gravity

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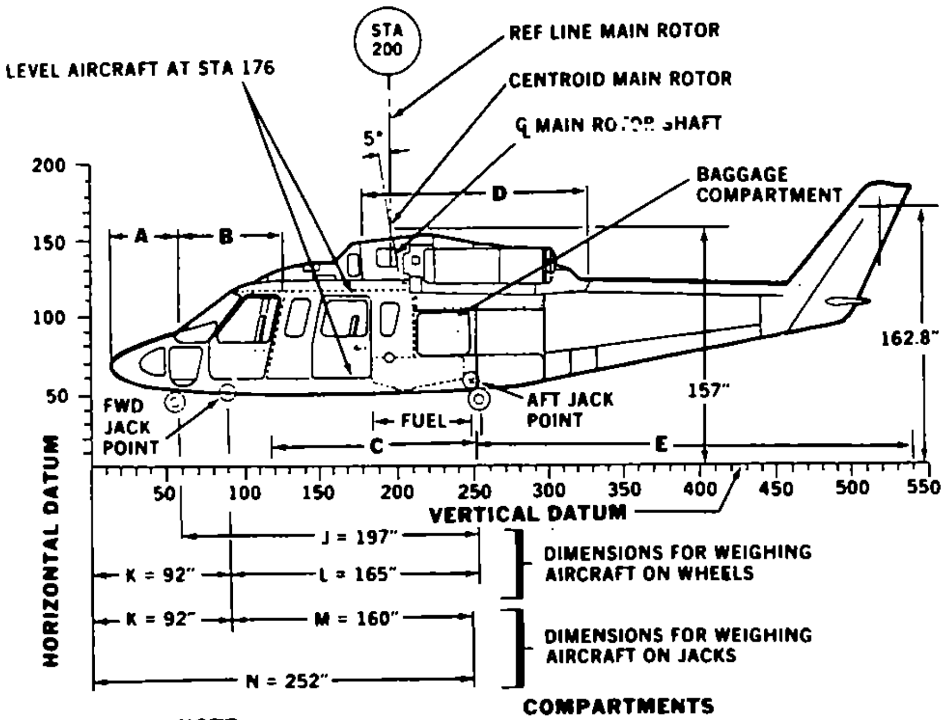

NOTE

ALL DIMENSIONS ARE APPROXIMATE. DIMENSIONS FOR WEIGHING ON WHEELS (J AND L) MUST BE DETERMINED BY ACTUAL MEASUREMENT.

COMPARTMENTS

A ELECTRONICS COMPARTMENT
B COCKPIT
C CABIN
D ENGINE AND TRANSMISSION COMPARTMENT
E TAIL
F EXTERNAL EQUIPMENT

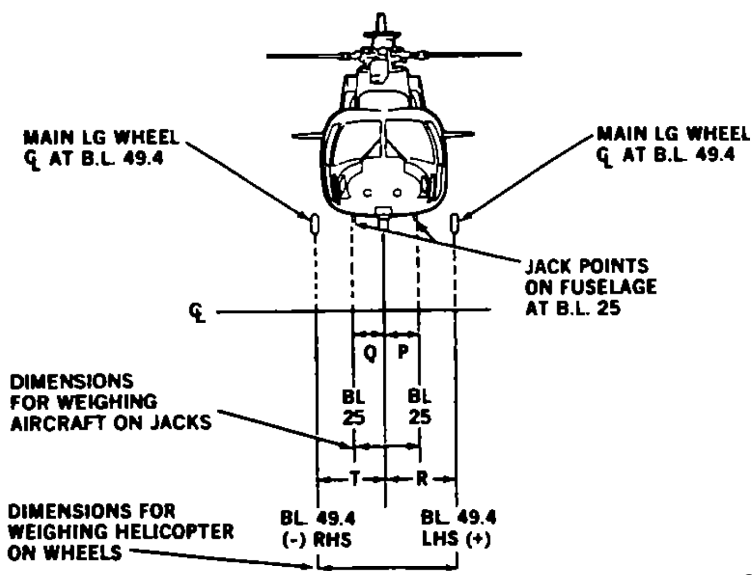

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Figure 3-5. Aircraft Diagram

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WEIGHING PROCEDURE

1. THE AIRCRAFT MUST BE LEVEL HORIZONTALLY AND LATERALLY WHEN WEIGHED. IT IS RECOMMENDED THAT THE AIRCRAFT BE WEIGHED ON JACK POINTS TO PROVIDE EASE IN LEVELING.

2. SUSPEND A PLUMB BOB ABOVE THE LEVEL PLATE (LOCATED ON THE LEFT HAND PASSENGER DOOR FRAME AT STATION 176) FOR LEVELING THE AIRCRAFT DURING WEIGHING.

3. WHEN WEIGHING ON JACK POINTS, ACTUAL MEASUREMENTS DURING WEIGHING ARE NOT NECESSARY. AFTER LEVELING THE AIRCRAFT THE FOLLOWING DIMENSIONS MAY BE ADDED DIRECTLY TO THE WEIGHING FORM (CHART B):

K (HORIZONTAL DATUM TO ℄ OF FORWARD JACK POINTS)	=	92.0 INCHES
N (HORIZONTAL DATUM TO ℄ OF AFT JACK POINTS)	=	252.0 INCHES
P (LATERAL DATUM TO ℄ LEFT JACK POINT)	=	25 INCHES
Q (LATERAL DATUM TO ℄ RIGHT JACK POINT)	=	25 INCHES

4. WHEN WEIGHING ON WHEELS, MEASURE DIMENSIONS J,L,R,T, AFTER LEVELING AND DURING WEIGHING. USING THESE ACTUAL DIMENSIONS AND THE FORWARD JACK POINT (AIRCRAFT STATION 92.0,BL0), DETERMINE THE DISTANCE FROM THE HORIZONTAL DATUM TO THE ℄ OF THE NOSE WHEEL, AND TO THE ℄ OF THE MAIN WHEELS. ALSO MEASURE THE DISTANCE FROM THE LATERAL DATUM TO THE ℄ OF THE MAIN WHEELS USING BOTH FORWARD AND AFT JACK POINT (SEE LATERAL C G MEASUREMENT PROCEDURE).

FOR CHECKING PURPOSES THESE DIMENSIONS ARE APPROXIMATELY AS FOLLOWS:

HORIZONTAL DATUM TO THE ℄ OF THE NOSE WHEEL	=	60.0 INCHES
HORIZONTAL DATUM TO THE ℄ OF THE MAIN WHEELS	=	257.0 INCHES
LATERAL DATUM TO THE ℄ OF THE NOSE WHEEL	=	0 INCHES
LATERAL DATUM TO THE ℄ OF THE LEFT MAIN WHEEL	=	49.4 INCHES
LATERAL DATUM TO THE ℄ OF THE RIGHT MAIN WHEEL	=	49.4 INCHES

NOTE: WHEN WEIGHING ON WHEELS, THE MAIN AND NOSE OLEOS SHOULD BE RESERVICED TO PROPER FLUID LEVELS WITH HYDRAULIC FLUID IF THE OLEOS HAVE BEEN USED TO LEVEL THE AIRCRAFT. REFER TO INSTRUCTION PLATES FOR PROPER SERVICING PROCEDURES.

5. IF BLADES ARE INSTALLED, THEY MUST BE EQUALLY SPACED DURING WEIGHING.

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Figure 3-6. Weighing Procedure (Sheet 1 of 3)

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PROCEDURE FOR WEIGHING ON WHEELS

TO CALCULATE THE AIRCRAFT LATERAL CENTER OF GRAVITY THE DISTANCE FROM THE NOSE AND MAIN WHEELS FROM LATERAL DATUM (BL 0) MUST BE MEASURED.

BL 0 OF THE AIRCRAFT CAN BE DETERMINED FROM MEASUREMENT BY SUSPENDING A PLUMB BOB FROM THE THREE JACKING POINTS AT STA 92, BL0, STA 252, BL 25 (LHS), BL 25 (RHS). MEASURE CENTER OF THE AFT JACKING POINTS AT STA 252 AND JOIN THIS POINT LONGITUDINALLY WITH THE POINT AT STA 92. THIS WILL SET UP A LONGITUDINAL LINE AT BL 0. THE DISTANCE FROM THE ℄ OF THE LEFT AND RIGHT MAIN WHEELS CAN THEN BE MEASURED FROM THIS BL 0 LINE.

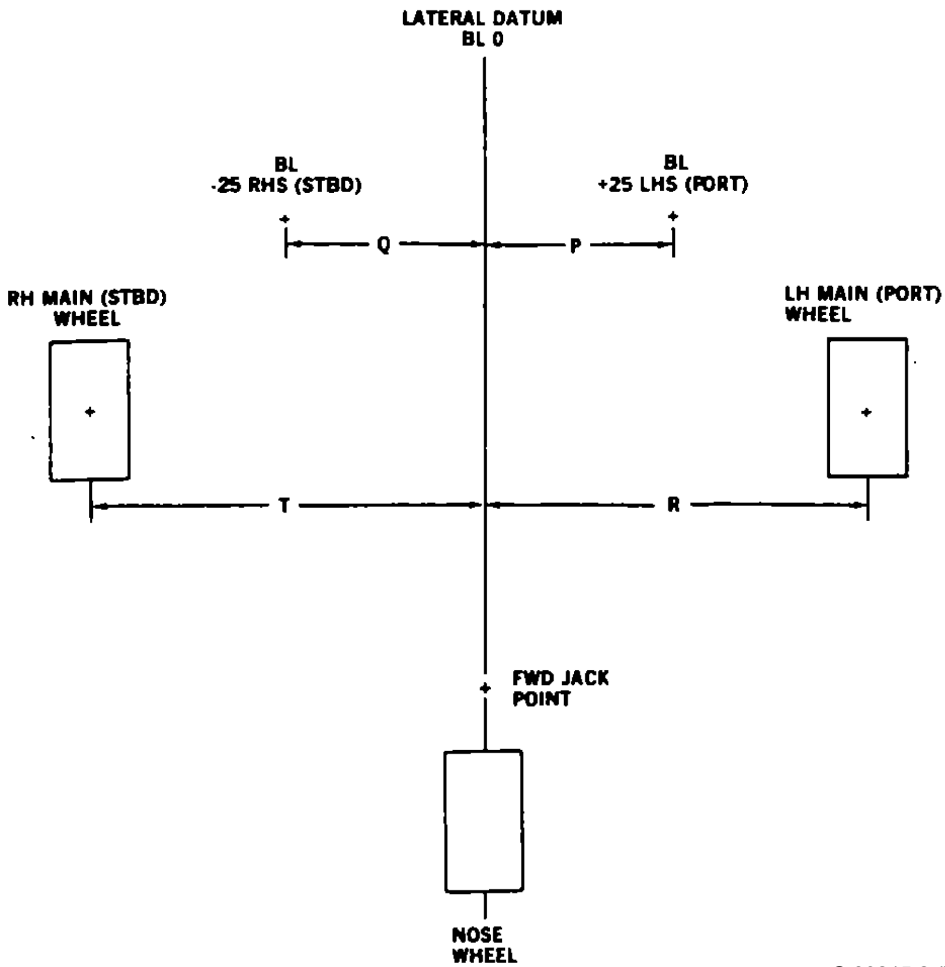

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Figure 3-6. Weighing Procedure (Sheet 2 of 3)

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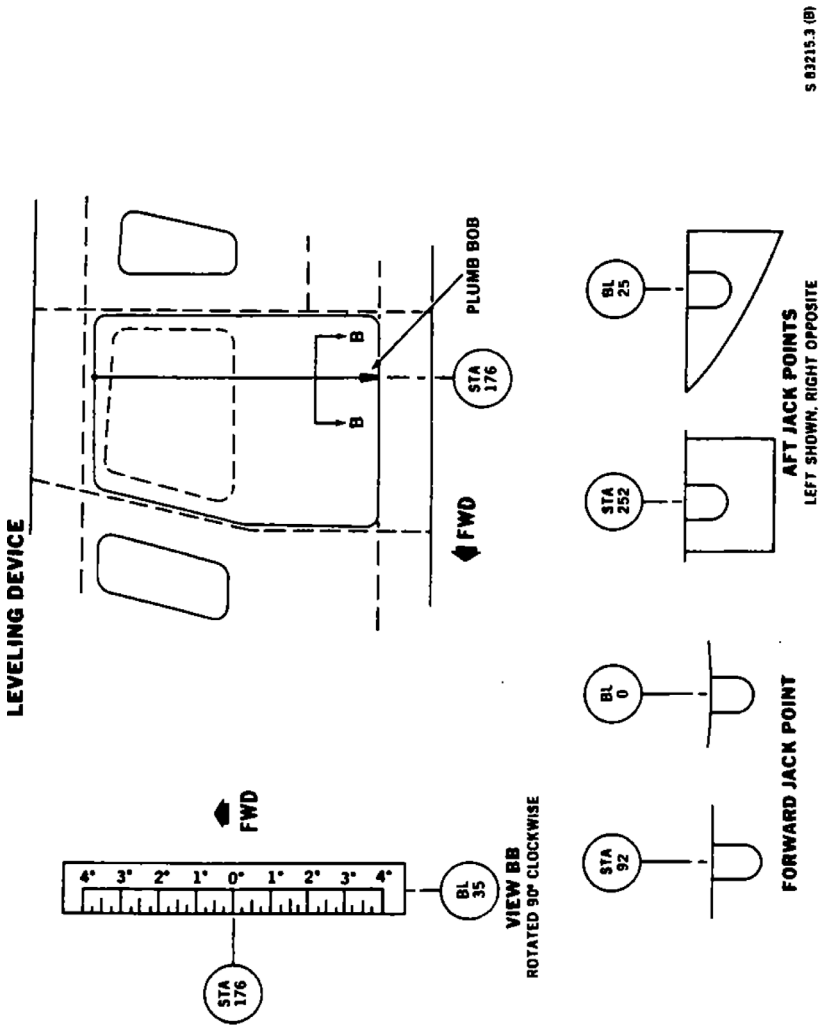

Figure 3-6. Weighing Procedure (Sheet 3 of 3)

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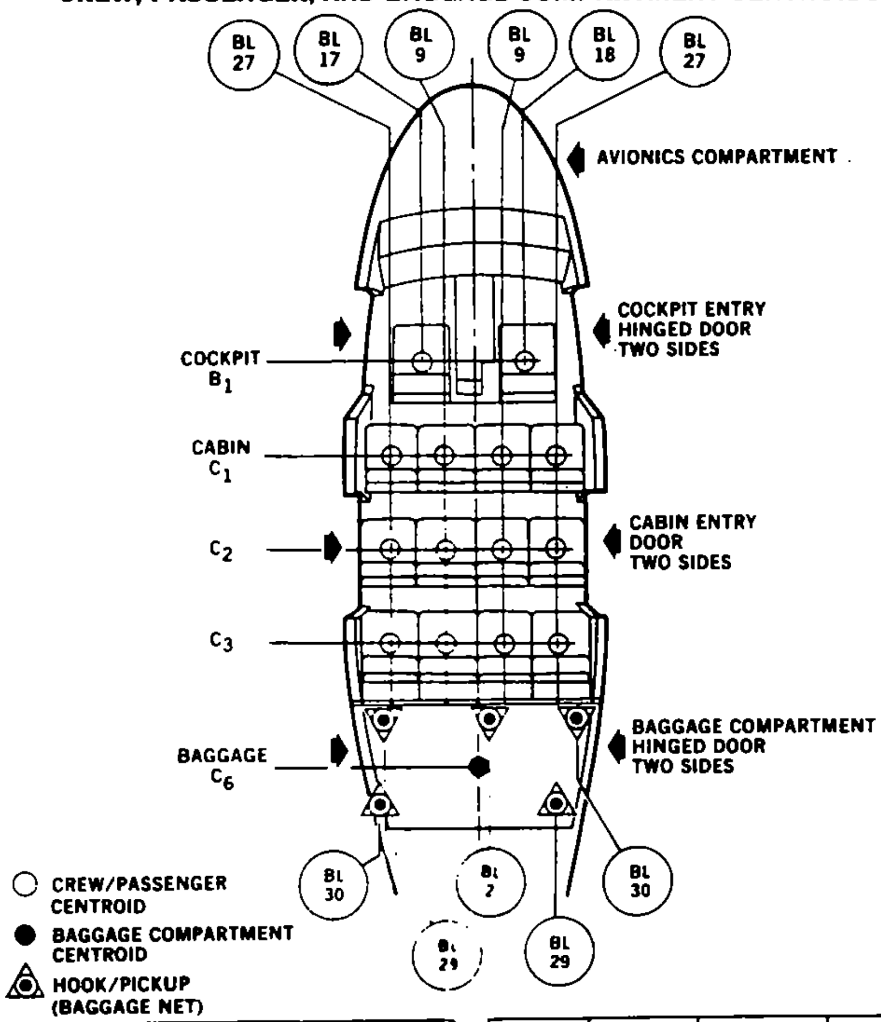
CREW, PASSENGER, AND BAGGAGE COMPARTMENT CENTROIDS



COMPARTMENT	WEIGHT (POUNDS)	HORIZONTAL CENTROID	LATERAL CENTROID
COCKPIT			
B_1	170	102.5	+17.0
B_1	170	102.5	-18.0
CABIN			
C_1	170	135.5	+27.0
C_1	170	135.5	+9.0
C_1	170	135.5	-9.0
C_1	170	135.5	-27.0
C_2	170	166.5	+27.0
C_2	170	166.5	+9.0

COMPARTMENT	WEIGHT (POUNDS)	HORIZONTAL CENTROID	LATERAL CENTROID
C_2	170	166.5	-9.0
C_2	170	166.5	-27.0
C_3	170	197.5	+27.0
C_3	170	197.5	+9.0
C_3	170	197.5	-9.0
C_3	170	197.5	-27.0
BAGGAGE			
C_6	300	235.0	+18.3
C_6	300	235.0	-18.3

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Figure 3-7. Standard 14 Place Configuration, Crew Passenger and Baggage Centroids

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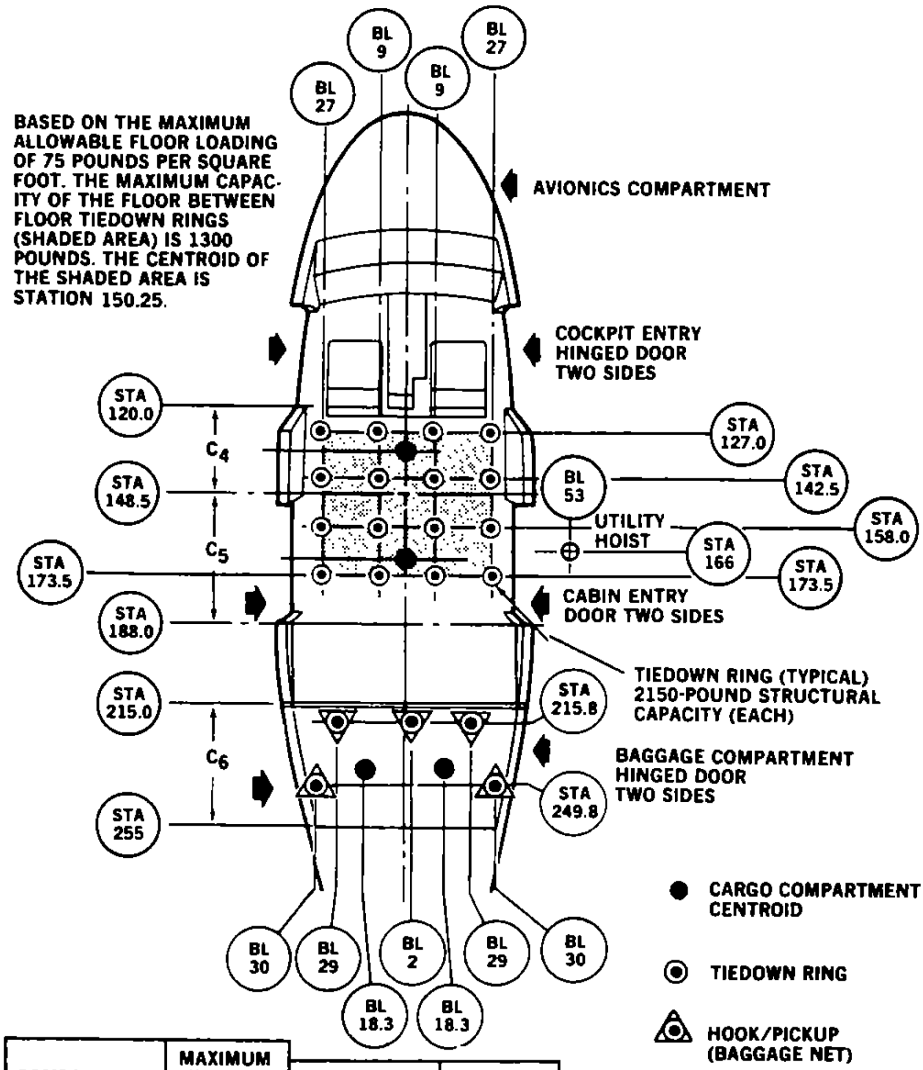


COMPARTMENT	MAXIMUM WEIGHT (POUNDS)	HORIZONTAL CENTROID	LATERAL CENTROID
C_4	482*	134.25	+16.3
C_4	482*	134.25	-16.3
C_5	668*	168.25	+16.3
C_5	668*	168.25	-16.3
C_6	300*	235.00	+18.3
C_6	300*	235.00	-18.3

*MAXIMUM ALLOWABLE FLOOR LOADING FOR CABIN FLOOR IS 75 POUNDS PER SQUARE FOOT MAXIMUM ALLOWABLE FLOOR LOADING FOR BAGGAGE COMPARTMENT FLOOR IS 75 POUNDS PER SQUARE FOOT FOR WEIGHTS UP TO THE MAXIMUM BAGGAGE COMPARTMENT WEIGHT OF 600 POUNDS

S 83217 (B)

Figure 3-8. Standard Cargo Configuration - Cargo Centroids

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A - EMPTY WEIGHT CHECK LIST

MODEL SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	HORIZONTAL ARM	HORIZONTAL MOMENT/100	LATERAL ARM	LATERAL MOMENT/100	DELIVERY EQUIPMENT	CHECK 1 IN AIRCRAFT	CHECK 1 CHART C ENTRY	CHECK 2 IN AIRCRAFT	CHECK 2 CHART C ENTRY	CHECK 3 IN AIRCRAFT	CHECK 3 CHART C ENTRY	CHECK 4 IN AIRCRAFT	CHECK 4 CHART C ENTRY

CHART A - EMPTY WEIGHT CHECK LIST

MODEL

SERIAL NO

ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	HORIZONTAL ARM	HORIZONTAL MOMENT/100	LATERAL ARM	LATERAL MOMENT/100	DELIVERY EQUIPMENT	CHECK 1 IN AIRCRAFT	CHECK 1 CHART C ENTRY	CHECK 2 IN AIRCRAFT	CHECK 2 CHART C ENTRY	CHECK 3 IN AIRCRAFT	CHECK 3 CHART C ENTRY	CHECK 4 IN AIRCRAFT	CHECK 4 CHART C ENTRY

S 83218.2 (B)

Figure 3-9. Chart A (Sheet 2 of 6)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A - EMPTY WEIGHT CHECK LIST

MODEL

SERIAL NO.

ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	HORIZONTAL ARM	HORIZONTAL MOMENT/100	LATERAL ARM	LATERAL MOMENT/100	DELIVERY EQUIPMENT	CHECK 1		CHECK 2		CHECK 3		CHECK 4	
								IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY

CHART A - EMPTY WEIGHT CHECK LIST

MODEL | SERIAL NO. | ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	HORIZONTAL ARM	HORIZONTAL MOMENT/100	LATERAL ARM	LATERAL MOMENT/100	DELIVERY EQUIPMENT	CHECK 1 IN AIRCRAFT	CHECK 1 CHART C ENTRY	CHECK 2 IN AIRCRAFT	CHECK 2 CHART C ENTRY	CHECK 3 IN AIRCRAFT	CHECK 3 CHART C ENTRY	CHECK 4 IN AIRCRAFT	CHECK 4 CHART C ENTRY

S 63218.4 (B)

Figure 3-9. Chart A (Sheet 4 of 6)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A - EMPTY WEIGHT CHECK LIST

MODEL SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	HORIZONTAL ARM	HORIZONTAL MOMENT/100	LATERAL ARM	LATERAL MOMENT/100	DELIVERY EQUIPMENT	CHECK 1 IN AIRCRAFT	CHECK 1 CHART C ENTRY	CHECK 2 IN AIRCRAFT	CHECK 2 CHART C ENTRY	CHECK 3 IN AIRCRAFT	CHECK 3 CHART C ENTRY	CHECK 4 IN AIRCRAFT	CHECK 4 CHART C ENTRY

§ 13218.5 (B)

Figure 3-9. Chart A (Sheet 5 of 6)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

CHART A - EMPTY WEIGHT CHECK LIST

MODEL SERIAL NO. ENTER DATE

ITEM NUMBER	ITEMS AND LOCATION GROUPED BY COMPARTMENT	WEIGHT	HORIZONTAL ARM	HORIZONTAL MOMENT/100	LATERAL ARM	LATERAL MOMENT/100	DELIVERY EQUIPMENT	CHECK 1		CHECK 2		CHECK 3		CHECK 4	
								IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY	IN AIRCRAFT	CHART C ENTRY

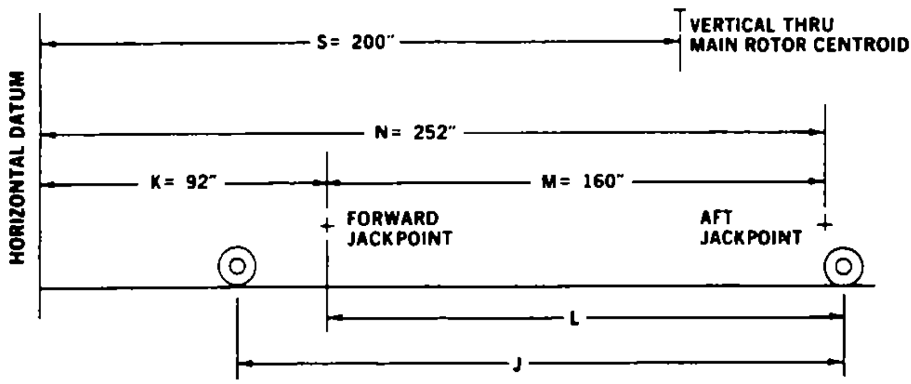
AIRCRAFT ACTUAL WEIGHT AND HORIZONTAL BALANCE FOR S-76 MODEL HELICOPTER

PREPARED BY _____ SHEET ____ OF ____

DATE _____

REG. NO. _____ SERIAL NO. _____

REACTION WHEEL OR JACKPOINT	SCALE NO.	SCALE READING (LB)	TARE	SCALE ERROR	SYMBOL	NET WEIGHT
LEFT MAIN					W_L	
RIGHT MAIN					W_R	
NOSE					W_N	
TOTAL WEIGHT					W	



AIRCRAFT HORIZONTAL C G

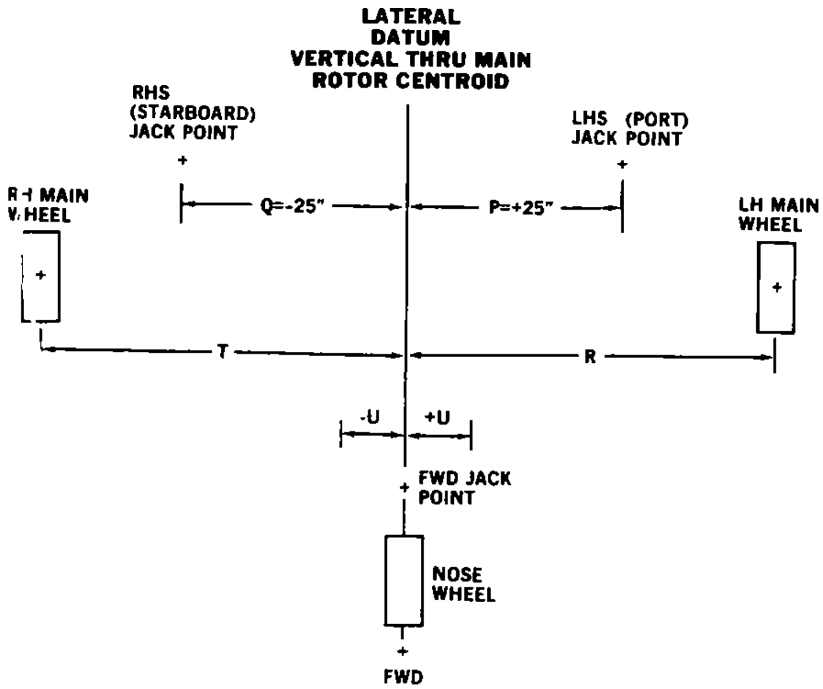
WEIGHING ON JACKS $\frac{92'' \times WN}{W} + \frac{(WL + WR)}{W} \times 252'' = C\,G$

WEIGHING ON WHEELS $92'' + L - \frac{(WN \times J)}{W} = C\,G$

S83219.1 (B)

Figure 3-10. Chart B (Sheet 1 of 6)

This document contains technical data subject to EAR. See WARNING and classifications on first page.



AIRCRAFT LATERAL C.G.

NOTE NEGATIVE C.G.= RIGHT SIDE (STARBOARD)

WEIGHING ON JACKS $\frac{(W_L \times 25) + (W_R \times -25)}{W} =$ C.G.

WEIGHING ON WHEELS $\frac{(W_L \times R) + (W_R \times -T)}{W} =$ C.G.

CORRECTED WEIGHT AND BALANCE

ITEMS ADDED AND SUBTRACTED	WEIGHT (LB)	HORIZONTAL DISTANCE		LATERAL DIST (IN) C G TO LATERAL DATUM	MOMENT (LB IN)
		(IN) C G TO FWD DATUM	MOMENT (LB IN)		
AIRCRAFT AS WEIGHED					
PLUS-					
MINUS-					
TOTAL EMPTY WEIGHT GROSS					

BALANCE (CORRECTED)

HORIZONTAL DIST - S= IN FWD / AFT OF MAIN ROTOR CENTROID

LATERAL DIST U= IN LEFT / RIGHT OF MAIN ROTOR CENTROID

S 83219.2 (B)

Figure 3-10. Chart B (Sheet 2 of 6)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

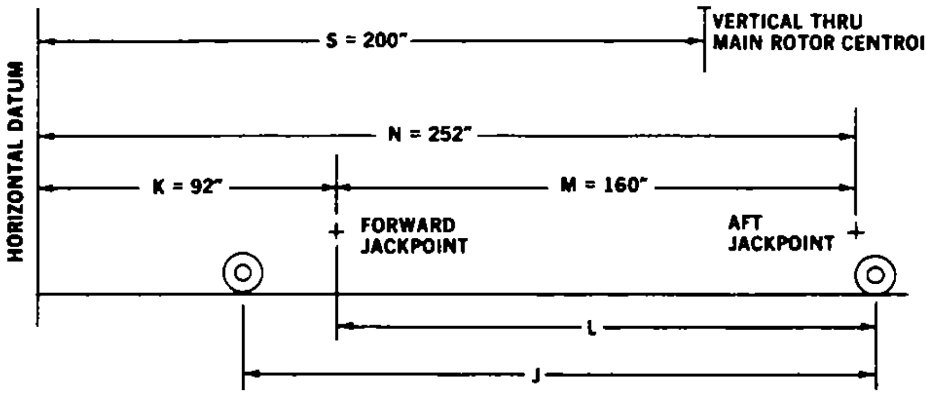
AIRCRAFT ACTUAL WEIGHT AND HORIZONTAL BALANCE FOR S-76 MODEL HELICOPTER

PREPARED BY _____ SHEET ____ OF ____

DATE _____

REG. NO. _____ SERIAL NO. _____

REACTION WHEEL OR JACKPOINT	SCALE NO.	SCALE READING (LB)	TARE	SCALE ERROR	SYMBOL	NET WEIGHT
LEFT MAIN					W_L	
RIGHT MAIN					W_R	
NOSE					W_N	
TOTAL WEIGHT					W	



AIRCRAFT HORIZONTAL C G

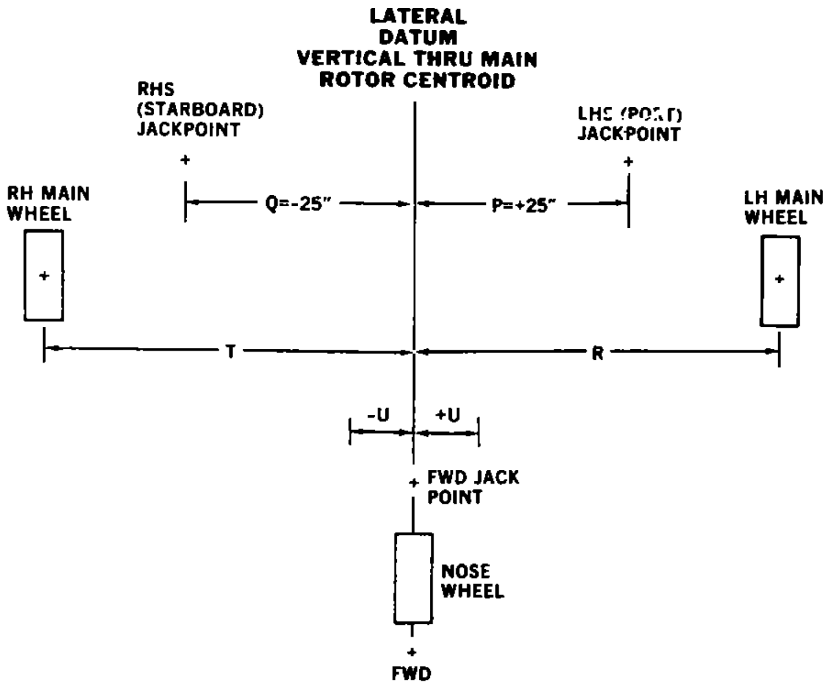
WEIGHING ON JACKS $\frac{92'' \times WN}{W} + \frac{(WL + WR)}{W} \times 252'' = CG$

WEIGHING ON WHEELS $92'' + L - \frac{(WN \times J)}{W} = CG$

S 83219.3 (B)

Figure 3-10. Chart B (Sheet 3 of 6)

This document contains technical data subject to EAR. See WARNING and classifications on first page.



AIRCRAFT LATERAL C G

NOTE NEGATIVE C G = RIGHT SIDE (STARBOARD)

$$\text{WEIGHING ON JACKS } \frac{(W_L \times 25) + (W_R \times -25)}{W} = \text{C G}$$

$$\text{WEIGHING ON WHEELS } \frac{(W_L \times R) + (W_R \times -T)}{W} = \text{C G}$$

CORRECTED WEIGHT AND BALANCE

ITEMS ADDED AND SUBTRACTED	WEIGHT (LB)	HORIZONTAL DISTANCE		LATERAL DIST (IN) C G TO LATERAL DATUM	MOMENT (LB IN)
		(IN) C G TO FWD DATUM	MOMENT (LB IN)		
AIRCRAFT AS WEIGHED					
PLUS-					
MINUS-					
TOTAL WEIGHT EMPTY / GROSS					

BALANCE (CORRECTED)

HORIZONTAL DIST S= IN FWD / AFT OF MAIN ROTOR CENTROID

LATERAL DIST U= IN LEFT / RIGHT OF MAIN ROTOR CENTROID

S 83219.4 (B)

Figure 3-10. Chart B (Sheet 4 of 6)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

ITEMS ADDED

ITEM	WEIGHT	ARM	MOMENT
TOTAL			

ITEMS SUBTRACTED

ITEM	WEIGHT	ARM	MOMENT
TOTAL			

S 83219.5 (B)

Figure 3-10. Chart B (Sheet 5 of 6)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

ITEMS ADDED

ITEM	WEIGHT	ARM	MOMENT
TOTAL			

ITEMS SUBTRACTED

ITEM	WEIGHT	ARM	MOMENT
TOTAL			

S 83219.6 (B)

Figure 3-10. Chart B (Sheet 6 of 6)

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EMPTY WEIGHT AND BALANCE RECORD

CONTINUOUS HISTORY OF CHANGES IN STRUCTURE OF EQUIPMENT AFFECTING WEIGHT & BALANCE

MODEL _____ SERIAL NO _____

DATE	ITEM NO		DESCRIPTION OF ARTICLE OR MODIFICATION	WEIGHT CHANGE						RUNNING TOTAL EMPTY AIRCRAFT				
				ADDED (+)			REMOVED (−)							
	IN	OUT		HEIGHT	HORIZONTAL MOMENT/100	LATERAL MOMENT/100	WEIGHT	HORIZONTAL MOMENT/100	LATERAL MOMENT/100	WEIGHT	HORIZONTAL MOMENT/100	HORIZONTAL C G	LATERAL MOMENT/100	LATERAL C G

NOTE: POSITIVE LATERAL C G 'S ARE LEFT (PORT) SIDE.
NEGATIVE LATERAL C G 'S ARE FOR RIGHT (STARBOARD) SIDE

S 83220.1 (B)

Figure 3-11. Chart C (Sheet 1 of 2)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

EMPTY WEIGHT AND BALANCE RECORD

CONTINUOUS HISTORY OF CHANGES IN STRUCTURE OF EQUIPMENT AFFECTING WEIGHT & BALANCE

MODEL _____ SERIAL NO _____

DATE	ITEM NO.		DESCRIPTION OF ARTICLE OR MODIFICATION	WEIGHT CHANGE						RUNNING TOTAL EMPTY AIRCRAFT			
	IN	OUT		ADDED (+)			REMOVED (−)				HORIZONTAL		LATERAL
				WEIGHT	HORIZONTAL MOMENT/100	LATERAL MOMENT/100	WEIGHT	HORIZONTAL MOMENT/100	LATERAL MOMENT/100	WEIGHT	MOMENT/100	C G	MOMENT/100	C G

WEIGHT POUNDS	COCKPIT - B_1			CABIN PASSENGERS							BAGGAGE/CARGO - C6		
	PILOT AND COPILOT/ PASSENGER HORIZONTAL ARM= 102.5 MOMENT/100	PILOT LATERAL ARM= −18.0 MOMENT/100	COPILOT/ PASSENGER LATERAL ARM= +17.0 MOMENT/100	HORIZONTAL			LATERAL				HORIZONTAL ARM= 235.00 MOMENT/100	LATERAL ARM= +18.3 MOMENT/100	LATERAL ARM= −18.3 MOMENT/100
				C_1	C_2	C_3	C_1, C_2, and C_3						
				ARM= 135.5 MOMENT/100	ARM= 166.5 MOMENT/100	ARM= 197.5 MOMENT/100	ARM= +27.0 MOMENT/100	ARM= +9.0 MOMENT/100	ARM= −9.0 MOMENT/100	ARM= −27.0 MOMENT/100			
10	+10	−2	+2	+14	+17	+20	+3	+1	−1	−3	+24	+2	−2
20	+21	−4	+4	+27	+33	+40	+5	+2	−2	−5	+47	+4	−4
30	+31	−5	+5	+41	+50	+59	+8	+3	−3	−8	+71	+5	−5
40	+41	−7	+7	+54	+67	+79	+11	+4	−4	−11	+94	+7	−7
50	+51	−9	+9	+68	+83	+99	+14	+5	−5	−14	+118	+9	−9
60	+62	−11	+10	+81	+100	+119	+16	+5	−5	−16	+141	+11	−11
70	+72	−13	+12	+95	+117	+138	+19	+6	−6	−19	+165	+13	−13
80	+82	−14	+14	+108	+133	+158	+22	+7	−7	−22	+188	+15	−15
90	+92	−16	+15	+122	+150	+178	+24	+8	−8	−24	+212	+16	−16
100	+103	−18	+17	+136	+167	+198	+27	+9	−9	−27	+235	+18	−18
110	+113	−20	+19	+149	+183	+217	+30	+10	−10	−30	+259	+20	−20
120	+123	−22	+20	+163	+200	+237	+32	+11	−11	−32	+282	+22	−22
130	+133	−23	+22	+176	+216	+257	+35	+12	−12	−35	+306	+24	−24
140	+144	−25	+24	+190	+233	+277	+38	+13	−13	−38	+329	+26	−26
150	+154	−27	+26	+203	+250	+296	+41	+14	−14	−41	+353	+27	−27
160	+164	−29	+27	+217	+266	+316	+43	+14	−14	−43	+376	+29	−29
170	+174	−31	+29	+230	+283	+336	+46	+15	−15	−46	+400	+31	−31
180											+423	+33	−33
190											+447	+35	−35
200											+470	+37	−37
210											+494	+38	−38
220											+517	+40	−40
230											+541	+42	−42
240											+564	+44	−44
250											+588	+46	−46
260											+611	+48	−48
270											+635	+49	−49
280											+658	+51	−51
290											+682	+53	−53
300*											+705	+55	−55

NOTES:

1. CAUTION MUST BE TAKEN TO BE SURE THAT PASSENGER AND/OR BAGGAGE/CARGO COMPARTMENT LOADING DOES NOT CAUSE AIRCRAFT MAXIMUM GROSS WEIGHT AND/OR CG LIMITS TO BE EXCEEDED.
2. BAGGAGE/CARGO CENTROID MUST BE LOCATED AT COMPARTMENT CONTROID.
3. MAXIMUM ALLOWABLE FLOOR LOADING FOR BAGGAGE COMPARTMENT IS 75 POUNDS PER SQUARE FOOT FOR WEIGHTS UP TO 600 POUND (300 POUND/SIDE) MAXIMUM COMPARTMENT WEIGHT.
4. LATERAL PASSENGER CG DATA IS TO BE CONSIDERED FOR EACH SEAT ROW (C_1, C_2, C_3)
5. LATERAL CG DATA LEFT IS POSITIVE (+) RIGHT IS NEGATIVE (−).

*MAXIMUM CAPACITY OF COMPARTMENT C_6 (PER SIDE)

S 83221 (B)

Figure 3-12. Chart E - Cockpit and Cabin Compartment Weight and Moment Table

This document contains technical data subject to EAR. See WARNING and classifications on first page.

FUEL SYSTEM - 2 TANKS					
CAPACITY = 281.2 GALLONS (2 TANKS)					
TOTAL WEIGHT - LB	MOMENT/100	TOTAL WEIGHT - LB	MOMENT/100	TOTAL WEIGHT - LB	MOMENT/100
20	44	640	1379	1360	2944
40	86	680	1465	1400	3031
60	128	720	1552	1440	3118
80	171	760	1639	1480	3204
100	213	800	1727	1520	3292
120	255	840	1814	1560	3379
160	341	880	1901	1600	3466
200	426	920	1988	1640	3552
240	512	960	2075	1680	3641
280	598	1000	2161	1720	3727
320	685	1040	2248	1760	3814
360	772	1080	2335	1800	3901
400	858	1120	2423	*1828 (JP-4)	3961
440	946	1160	2509	1840	3987
480	1032	1200	2597	1880	4074
520	1119	1240	2683	**1884 (JP-8)	4083
560	1205	1280	2770	***1898 (JP-1)	4113
600	1292	1320	2856	****1912 (JP-5)	4143

NOTES:

1. (*) The single asterisk indicates the approximate weight and moment/100 for full fuel tanks using JP-4 fuel at 6.5 pounds per gallon under standard conditions (60°F).
2. (**) The double asterisk indicates the approximate weight and moment/100 for full fuel tank using JP-8 fuel at 6.7 pounds per gallon under standard conditions (60°F).
3. (***) The triple asterisk indicates the approximate weight and moment/100 for full fuel tanks using JP-1 fuel at 6.75 pounds per gallon under standard conditions (60°F).
4. (****) The quadruple asterisk indicates the approximate weight and moment/100 for full fuel tanks using JP-5 fuel at 6.8 pounds per gallon under standard conditions (60°F).
5. The total usable capacity of 281.2 U.S. gallons (140.6 gallons per tank) is based on actual test results.
6. The usable fuel table (gravity fueling) and the fuel arm table are for equal weights of fuel in each tank.
7. The standard S-76 helicopter is equipped with a capacitor type fuel quantity gage which is calibrated in pounds. Aircraft fuel varies in weight per gallon dependent upon the specific gravity and temperature of the fuel. Therefore, the notation FULL does not appear on the instrument dial. The pilot should anticipate variations in the instrument readings when tanks are full.
8. The fuel arm table is included for reference.

FUEL ARM TABLE

FUEL SYSTEM - 2 TANKS			
FUEL QUANTITY	TOTAL WEIGHT (POUNDS)	ARM	MOMENT/100
1/4 FULL	457	215.1	983
1/2 FULL	914	216.1	1975
3/4 FULL	1371	216.5	2968
FULL JP-4	*1828	216.7	3961
FULL JP-8	**1884	216.7	4083
FULL JP-1	***1898	216.7	4113
FULL JP-5	****1912	216.7	4143

Figure 3-13. Chart E - Usable Fuel Weight and Moment Table (Gravity Fueling) (Sheet 1 of 3)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

FUEL SYSTEM - 2 TANKS					
CAPACITY = 140.6 GALLONS PER TANK					
LEFT TANK			RIGHT TANK		
WEIGHT (POUNDS)	HORIZONTAL MOMENT/100	LATERAL MOMENT/100	WEIGHT (POUNDS)	HORIZONTAL MOMENT/100	LATERAL MOMENT/100
20	+43	+3	20	+43	−3
40	+85	+5	40	+85	−5
60	+128	+8	60	+128	−8
80	+170	+11	80	+170	−11
100	+213	+14	100	+213	−14
120	+256	+17	120	+256	−17
140	+299	+20	140	+299	−20
160	+342	+24	160	+342	−24
180	+386	+27	180	+386	−27
200	+429	+30	200	+429	−30
220	+473	+33	220	+473	−33
240	+516	+37	240	+516	−37
260	+560	+40	260	+560	−40
280	+603	+43	280	+603	−43
300	+647	+47	300	+647	−47
340	+733	+54	340	+733	−54
380	+820	+61	380	+820	−61
420	+907	+68	420	+907	−68
460	+944	+75	460	+944	−75
500	+1081	+82	500	+1081	−82
540	+1168	+89	540	+1168	−89
580	+1255	+96	580	+1255	−96
620	+1342	+103	620	+1342	−103
660	+1429	+111	660	+1429	−111
700	+1516	+118	700	+1516	−118
740	+1603	+125	740	+1603	−125
780	+1689	+132	780	+1689	−132
820	+1776	+139	820	+1776	−139
860	+1863	+147	860	+1863	−147
900	+1950	+154	900	+1950	−154
*914 (JP-4)	+1981	+156	*914 (JP-4)	+1981	−156
940	+2037	+161	940	+2037	−161
**942 (JP-8)	+2041	+161	**942 (JP-8)	+2041	−161
***949 (JP-1)	+2056	+162	***949 (JP-1)	+2056	−162
****956 (JP-5)	+2072	+163	****956 (JP-5)	+2072	−163

Figure 3-13. Chart E - Usable Fuel Weight and Moment Table (Gravity Fueling) (Sheet 2 of 3)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

NOTES:

1. (*) The single asterisk indicates the approximate weight and movement/100 for full fuel tanks using JP-4 fuel at 6.5 pounds per gallon under standard conditions (60°F).
2. (**) The double asterisk indicates the approximate weight and moment/100 for full fuel tanks using JP-8 fuel at 6.7 pounds per gallon under standard conditions (60°F).
3. (***) The triple asterisk indicates the approximate weight and moment/l00 for full fuel tanks using JP-1 fuel at 6.75 pounds per gallon under standard conditions (60°F).
4. (****) The quadruple asterisk indicates the approximate weight and moment/l00 for full fuel tanks using JP-5 fuel at 6.8 pounds per gallon under standard conditions (60°F)
5. The total usable capacity of 281.2 U.S. gallons (140.6 gallons per tank) based on actual test results.
6. The standard S-76 helicopter is equipped with a capacitor type fuel quantity gage which is calibrated in pounds. Aircraft fuel varies in weight per gallon dependent upon the specific gravity and temperature of the fuel. Therefore, the notation FULL does not appear on the instrument dial. The pilot should anticipate variations in the instrument readings when tanks are full.
7. The fuel arm table is included for reference.
8. Laterial CG data left is positive (+) right is (-).

FUEL SYSTEM - 2 TANKS							
PER TANK QUANTITY	PER TANK WEIGHT LB	HORIZONTAL		LEFT LATERAL		RIGHT LATERAL	
		ARM	MOMENT/100	ARM	MOMENT/100	ARM	MOMENT/100
1/4 FULL	228	215.1	+490	+15.2	+35	−15.2	−35
1/2 FULL	457	216.1	+988	+16.2	−74	−16.2	−74
3/4 FULL	685	216.5	+1483	+16.8	+115	−16.8	−115
FULL JP-4	914	216.7	+1981	+17.1	+156	−17.1	−156
FULL JP-8	942	216.7	+2041	+17.1	+161	−17.1	−161
FULL JP-1	949	216.7	+2056	+17.1	+162	−17.1	−162
FULL JP-5	956	216.7	+2072	+17.1	+163	−17.1	−163

Figure 3-13. Chart E - Usable Fuel Weight and Moment Table (Gravity Fueling) (Sheet 3 of 3)

This document contains technical data subject to EAR. See WARNING and classifications on first page.

ENGINE OIL TABLE

ENGINE OIL SYSTEM - 2 TANKS				
TOTAL CAPACITY = 4.8 U.S. GALLONS (2 TANKS)				
MIL-L-7808 OIL				
GALLONS	WEIGHT (POUNDS)	HORIZONTAL ARM = 224 MOMENT/100	LATERAL ARM = +27.6 MOMENT/100	LATERAL ARM = -27.6 MOMENT/100
0.5	3.9	9	+1	-1
1.0	7.7	17	+2	-2
2.4	18.5	41	+5	-5
MIL-L-23699 OIL				
0.5	4.2	9	+1	-1
1.0	8.4	19	+2	-2
2.4	20.2	45	+6	-6

S 83223 (B)

Figure 3-14. Chart E - Engine Oil Weight and Moment Table

This document contains technical data subject to EAR. See WARNING and classifications on first page.

INTERNAL CARGO TABLE

CABIN						
	C4			C5		
WEIGHT (POUNDS)	HORIZONTAL ARM = 134.25 MOMENT/100	LATERAL ARM = +16.3 MOMENT/100	LATERAL ARM = −16.3 MOMENT/100	HORIZONTAL ARM = 168.25 MOMENT/100	LATERAL ARM = +16.3 MOMENT/100	LATERAL ARM = −16.3
10	+13	+2	−2	+17	+2	−2
20	+27	+3	−3	+34	+3	−3
30	+40	+5	−5	+50	+5	−5
40	+54	+7	−7	+67	+7	−7
50	+67	+8	−8	+84	+8	−8
60	+81	+10	−10	+101	+10	−10
70	+94	+11	−11	+118	+11	−11
80	+107	+13	−13	+135	+13	−13
90	+121	+15	−15	+151	+15	−15
100	+134	+16	−16	+168	+16	−16
150	+201	+24	−24	+252	+24	−24
200	+269	+33	−33	+337	+33	−33
250	+336	+41	−41	+421	+41	−41
300	+403	+49	−49	+505	+49	−49
350	+470	+57	−57	+589	+57	−57
400	+537	+65	−65	+673	+65	−65
450	+604	+73	−73	+757	+73	−73
482*	+647	+79	−79	+811	+79	−79
500				+841	+82	−82
550				+925	+90	−90
600				+1010	+98	−98
650				+1094	+106	−106
668**				+1124	+109	−109

* MAXIMUM CAPACITY OF COMPARTMENT C_4 (PER SIDE)
** MAXIMUM CAPACITY OF COMPARTMENT C_5 (PER SIDE)

NOTE:
1. CAUTION MUST BE TAKEN TO BE SURE THAT CARGO LOADING DOES NOT CAUSE AIRCRAFT MAXIMUM GROSS WEIGHT AND/OR HORIZONTAL AND LATERAL CG LIMITS TO BE EXCEEDED.
2. CARGO CENTROID MUST BE LOCATED AT COMPARTMENT CENTROID.
3. MAXIMUM ALLOWABLE FLOOR LOADING FOR CARGO IS 75 POUNDS PER SQUARE FOOT.
4. SEE COCKPIT AND CABIN COMPARTMENT TABLE FOR BAGGAGE COMPARTMENT (C_6) WEIGHT AND MOMENT/100 VALUES AND LOADING REQUIREMENTS.
5. LATERAL CG DATA LEFT IS POSITIVE (+) RIGHT IS NEGATIVE (−).

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Figure 3-15. Chart E - Internal Cargo Weight and Moment Table

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EXTERNAL CARGO TABLE

WEIGHT (POUNDS)	ARM= 181.5 MOMENT/100	WEIGHT (POUNDS)	ARM= 181.5 MOMENT/100
25	45	2100	3812
50	91	2200	3993
75	136	2300	4175
100	182	2400	4356
200	363	2500	4538
300	545	2600	4719
400	726	2700	4901
500	908	2800	5082
600	1089	2900	5264
700	1271	3000	5445
800	1452	3100	5627
900	1634	3200	5808
1000	1815	*3300	5990
1100	1997		
1200	2178		
1300	2360		
1400	2541		
1500	2723		
1600	2904		
1700	3086		
1800	3267		
1900	3449		
2000	3630		

*MAXIMUM EXTERNAL CARGO WEIGHT

NOTE:
1. THIS TABLE IS APPLICABLE ONLY WHEN THE EXTERNAL LOAD SYSTEM IS INSTALLED.
2. CAUTION MUST BE TAKEN TO BE SURE THAT EXTERNAL CARGO LOADING DOES NOT CAUSE AIRCRAFT MAXIMUM GROSS WEIGHT AND/OR C G LIMITS TO BE EXCEEDED.
3. THERE IS NO LATERAL C G MOMENT EFFECT DUE TO EXTERNAL CARGO LOADS.

S 83226 (B)

Figure 3-16. Chart E - External Cargo Weight and Moment Table

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UTILITY HOIST LOAD TABLE

WEIGHT (POUNDS)	HORIZONTAL ARM = 166.0 MOMENT/100	LATERAL ARM = −53.0 MOMENT/100	WEIGHT (POUNDS)	HORIZONTAL ARM = 166.0 MOMENT/100	LATERAL ARM = -53.0 MOMENT/100
25	42	−13	325	540	−172
50	83	−27	350	581	−186
75	125	−40	375	623	−199
100	166	−53	400	664	−212
125	208	−66	425	706	−225
150	249	−80	450	747	−239
175	291	−93	475	789	−252
200	332	−106	500	830	−265
225	374	−119	525	872	−278
250	415	−133	550	913	−292
275	457	−146	575	955	−305
300	498	−159	600*	996	−318

*MAXIMUM UTILITY HOIST LOAD

NOTE:
1. THIS TABLE IS APPLICABLE ONLY WHEN THE UTILITY HOIST OPTION IS INSTALLED.
2. CAUTION MUST BE TAKEN TO BE SURE THAT UTILITY HOIST OPERATION DOES NOT CAUSE AIRCRAFT MAXIMUM GROSS WEIGHT AND/OR HORIZONTAL AND LATERAL CENTER OF GRAVITY LIMITS TO BE EXCEEDED.
3. LATERAL C G DATA RIGHT IS NEGATIVE (−)

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Figure 3-17. Chart E - Utility Hoist Load Weight and Moment Table

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SLIDING DOOR TABLE

SLIDING DOOR POSITION	WEIGHT (POUNDS)	HORIZONTAL MOMENT/100	LATERAL MOMENT/100
EXTERNAL DOOR:			
FORWARD (CLOSED)	39	67	-16
AFT (OPEN)	39	82	-16
PLUG DOOR UTILITY INTERIOR:			
FORWARD (CLOSED)	58	99	-23
AFT (OPEN)	58	122	-26
PLUG DOOR VIP INTERIOR.			
FORWARD (CLOSED)	65	111	-26
AFT (OPEN)	65	137	-29

Figure 3-18. Chart E - Sliding Door Weight and Moment Table

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HOIST OPERATOR WEIGHT AND MOMENT TABLE

WEIGHT (POUNDS)	HORIZONTAL ARM = 166.0 MOMENT/100	LATERAL ARM = −38.0 MOMENT/100
10	+17	−4
20	+33	−8
30	+50	−11
40	+66	−15
50	+83	−19
60	+100	−23
70	+116	−27
80	+133	−30
90	+149	−34
100	+166	−38
110	+183	−41
120	+199	−46
130	+216	−49
140	+232	−53
150	+249	−57
160	+266	−61
170	+282	−65
180	+299	−68
190	+315	−72
200	+332	−76
210	+349	−80
220	+365	−84
230	+382	−87
240	+398	−91
250	+415	−95

1. THIS TABLE REPRESENTS THE HOIST OPERATOR AT THE DOOR STATION. FOR SEATED VALUE SEE FIGURE 3-12

2. LATERAL C.G. DATA RIGHT IS NEGATIVE (−)

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Figure 3-19. Chart E - Hoist Operator Weight and Moment Table

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SAMPLE UTILITY HOIST BALANCE CALCULATION

SAMPLE

ITEM	WEIGHT POUNDS	HORIZONTAL ARM	HORIZONTAL MOMENT/100	LATERAL ARM	LATERAL MOMENT/100	COMMENTS
EMPTY WEIGHT	7093	209.7	14,874	−1.3	−92	FROM CHART C
	170	102.5	174	−18.0	−31	FROM FIGURE 3-12
	170	102.5	174	17.0	+29	FROM FIGURE 3-12
	37	224	83	0	0	LH AND RH VALUES COMBINED FROM FIGURE 2-14
	50	235.0	118	18.3	+9	FROM FIGURE 3-12
	60	235	141	−18.3	−11	FROM FIGURE 3-12
	1828	216.7	3962	0	0	LH AND RH VALUES COMBINED - FROM FIGURE 3-13
	170	197.5	336	+9.0	+15	CABIN SEAT LOCATION - FROM FIGURE 3-12
GROSS WEIGHT - TAKEOFF	9578	207.4	19,862	−0.8	−81	CHECK WEIGHT AND C.G.'S ARE WITHIN LIMITS
MINUS HOIST OPERATOR SEATED	−170	197.5	−336	+9.0	−15	FROM ABOVE
PLUS HOIST OPERATOR - HOISTING STATION	170	166.0	282	−38.0	−65	FROM FIGURE 3-19
MINUS SLIDING DOOR CLOSED MOMENT	—	—	−99	—	+23	FROM FIGURE 3-18
PLUS SLIDING DOOR OPEN MOMENT	—	—	122	—	−26	FROM FIGURE 3-18
MINUS FUEL (LH AND RH)	−428	217.3	−930	0	0	DIFFERENCES BETWEEN TAKEOFF AND MISSION POINT FUELS - FROM FIGURE 3-13
						FROM ABOVE
GROSS WEIGHT - MISSION POINT	9150	206.6	18,901	−1.79	−164	CHECK WEIGHT AND C.G.'S ARE WITHIN LIMITS
PICK UP HOIST LOAD	250	166.0	415	−53.0	−133	FROM FIGURE 3-17
GROSS WEIGHT - MISSION POINT	9400	205.5	19,315	−3.2	−297	CHECK WEIGHT AND C.G.'S ARE WITHIN LIMITS
MINUS LOAD ON HOIST	−250	165.0	−415	−53.0	+133	FROM ABOVE
PLUS LOAD IN CABIN	250	134.3	336	16.3	+41	LOCATE LOAD IN CABIN - FROM FIGURE 3-15
GROSS WEIGHT - MISSION POINT	9400	204.6	19,237	−1.3	−123	CHECK WEIGHT AND C.G.'S ARE WITHIN LIMITS
PICK UP HOIST LOAD	450	166.0	747	−53.0	−239	FROM FIGURE 3-17
GROSS WEIGHT - MISSION POINT	9850	202.9	19,984	3.7	−362	CHECK WEIGHT AND C.G.'S ARE WITHIN LIMITS
MINUS LOAD ON HOIST	−450	166.0	−747	−53.0	+239	FROM ABOVE
PLUS LOAD IN CABIN	450	168.3	757	16.3	+73	LOCATE LOAD IN CABIN - FROM FIGURE 3-15
GROSS WEIGHT - MISSION POINT	9850	203.0	19,994	−0.5	−50	CHECK WEIGHT AND C.G.'S ARE WITHIN LIMITS
PICK UP HOIST LOAD	600	166.0	996	−53	−318	FROM FIGURE 3-17
GROSS WEIGHT - MISSION POINT	10,450	200.9	20,970	3.5	−368	CHECK WEIGHT AND C.G.'S ARE WITHIN LIMITS
MINUS LOAD ON HOIST	−600	166.0	−996	−53.0	+318	FROM ABOVE
PLUS LOAD IN CABIN	600	168.3	1010	−16.3	−98	LOCATE LOADING CABIN - FROM FIGURE 3-15
GROSS WEIGHT - MISSION POINT	10,450	201.0	21,004	−1.4	−148	CHECK WEIGHT AND C.G. ARE WITHIN LIMITS
MINUS FUEL (LH AND RH)	−400	217.5	−970	0	0	DIFFERENCE BETWEEN MISSION POINT FUELS FIGURE 3-13
GROSS WEIGHT MISSION POINT	10,050	199.3	20,034	−1.5	−148	CHECK WEIGHT AND C.G.'S ARE WITHIN LIMITS
MINUS LOAD IN CABIN	−600	168.3	−1010	16.3	+98	FROM ABOVE
PLUS LOAD ON HOIST	600	166.0	995	−53.0	−318	FROM ABOVE
GROSS WEIGHT MISSION POINT	10,050	199.2	20,020	−3.7	−368	CHECK WEIGHT AND C.G.'S ARE WITHIN LIMITS
MINUS LOAD ON HOIST	−600	166.0	−995	−53.0	+318	FROM ABOVE
GROSS WEIGHT - MISSION POINT	9450	201.3	19,024	−0.5	−50	CHECK WEIGHT AND C.G.'S ARE WITHIN LIMITS
MINUS LOAD IN CABIN	−450	168.3	−757	16.3	−73	FROM ABOVE
PLUS LOAD ON HOIST	450	166.0	747	−53	−239	FROM ABOVE
GROSS WEIGHT - MISSION POINT	9450	201.2	19,012	−3.8	−362	CHECK WEIGHT AND C.G.'S ARE WITHIN LIMITS
MINUS LOAD ON HOIST	−450	166.0	−747	−53.0	+239	FROM ABOVE
GROSS WEIGHT MISSION POINT	9000	202.9	18,266	−1.4	−123	CHECK WEIGHT AND C.G.'S ARE WITHIN LIMITS
MINUS SLIDING DOOR OPEN MOMENT	—	—	−122	—	+26	FROM ABOVE
PLUS SLIDING DOOR CLOSED MOMENT	—	—	99	—	−23	FROM ABOVE
MINUS HOIST OPERATOR HOISTING STATION	−170	166.0	−282	−38.0	+65	FROM ABOVE
PLUS HOIST OPERATOR SEATED	170	197.5	336	+9.0	+15	FROM ABOVE
MINUS FUEL USABLE (LH AND RH)	−1000	216.2	−2162	0	0	REMOVE ALL REMAINING FUEL - FROM FIGURE 3-13
PLUS RESERVE/LANDING FUEL (LH AND RH)	400	214.5	858	0	0	ADD RESERVE/LANDING FUEL - FROM FIGURE 3-13
GROSS WEIGHT - LANDING	8400	202.3	16,992	−0.5	−40	CHECK WEIGHT AND C.G.'S ARE WITHIN LIMITS

SAMPLE

NOTES

1. SAMPLE LOADING CONDITION. DETERMINE ACTUAL LOADING FOR EACH FLIGHT USING LATEST WEIGHT AND MOMENT/100 DATA.
2. FROM CG CHARTS FIGURE 3-1 AND 3-3 THE AIRCRAFT WEIGHT HORIZONTAL MOMENT/100 AND LATERAL MOMENT/100 ARE WITHIN LIMITS AND THEREFORE IN BALANCE.
3. EFFECT ON GROSS WEIGHT OF FUEL BURN OFF MUST BE CONSIDERED WHEN DETERMINING THE MAXIMUM HOIST LOAD THAT CAN BE APPLIED WHEN LOADING OR UNLOADING USING THE UTILITY HOIST.
4. CARE SHOULD BE TAKEN TO ENSURE THAT THE CORRECT SIGN CONVENTION IS USED. SUBTRACTION OF A MINUS MOMENT WILL CHANGE THE MOMENT SIGN TO POSITIVE.

* MAXIMUM ALLOWABLE HOIST LOAD FOR THIS GROSS WEIGHT CONDITION IS 490 POUNDS. SEE EXAMPLE ON FIGURE 3-4.

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Figure 3-20. Sample Loading

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SECTION IV

NOISE ABATEMENT

NOISE ABATEMENT PROCEDURES

GENERAL PROCEDURES RECOMMENDED TO MINIMIZE ACOUSTICAL IMPACT

1. In general, maximum distance/altitude separation from noise sensitive areas is the most effective noise abatement procedure.
2. Control inputs should be made in as gradual a manner as possible.
3. Noise exposure is lower upwind from the helicopter than downwind.
4. Noise exposure is lower on the inside of a turn than on the outside.
5. Noise exposure is lower during right turns than left turns.

Approach Procedure

1. Plan routes and approach paths to keep noise sensitive areas to the left side of the helicopter.
2. Maintain airspeed at 80 KIAS or greater as long as possible. Avoid low speed low rate-of-descent (creeping) approaches.
3. Descend at 85 KIAS and 1200 to 1400 fpm rate of descent (ROD) to minimize noise and maximize separation from noise-sensitive areas.
4. If more moderate approach angles are required, descend at 95 KIAS and 700 to 900 fpm ROD or 105 KIAS at 500 to 700 fpm ROD.
5. Delay deceleration to touchdown speed or hover as long as practical.
6. When clear of the noise sensitive area, return to Category A or Category B flight procedures as applicable.

Take-Off Procedure

1. If possible, plan takeoff path away from noise sensitive areas.
2. Keep noise sensitive areas to the right side of the helicopter.
3. If possible, takeoff into the wind to maximize climb angle.

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4. Avoid right hand crosswinds as additional tail rotor torque can significantly increase climb noise levels. In general, avoiding right hand crosswinds takes precedence over keeping noise sensitive areas to the right side of the helicopter.
5. Climb to cruise altitude at takeoff power and at an airspeed lower than best rate of climb (approximately 65 to 70 KIAS) to achieve a higher climb angle.

Enroute Procedure

1. Maintain a minimum altitude of 2000 feet when transiting noise sensitive areas.
2. When 2000 feet cannot be maintained, reduce airspeed to not exceed 120 KIAS.
3. Plan routes to keep noise sensitive areas to the right side of the helicopter.
4. If noise complaints arise, altitude should be increased.

NOTE

The procedures described in this section are to be considered as guidelines and should not take precedence over the requirements of normal operating procedures, Part 1 Section II, of the flight manual.

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SECTION V

SUPPLEMENTAL PERFORMANCE DATA

SINGLE-ENGINE PILOT TRAINING PROCEDURES WITH T_5 BIAS BOX

NOTE

THESE PROCEDURES ARE INTENDED FOR TRAINING USE ONLY WITH A QUALIFIED FLIGHT INSTRUCTOR OCCUPYING THE CO-PILOT'S SEAT.

REQUIREMENTS

- T_5 BIAS BOX INSTALLED
- TRAINING WAT CURVE
- QUALIFIED FLIGHT INSTRUCTOR

NORMAL PROCEDURES

PRE-FLIGHT

1. Determine OAT and pressure altitude of site to be used for single engine proficiency training.
2. Using the training WAT curve, Figure 5-1, determine gross weight and torque for the prevailing ambients (adjust OAT to suit ETD) and desired EAPS configuration.
3. Have aircraft loaded as required, confirm that a new 9V battery has been installed in the T_5 bias box, and that the unit has been properly connected and secured in the center console.

BEFORE STARTING ENGINES

1. Both batteries or external power - ON.
2. PTIT TRIM vernier - Minimum, confirm fully counter-clockwise.
3. Check indicated T_5; that value is reasonable (ambient for cold engine).
4. T_5 bias box POWER switch - ON, amber light illuminates.
5. ENG SELECT switch – ON, Engine 1 or 2 as desired.

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6. PTIT TRIM vernier - rotate clockwise while observing increasing T_5 values. Increase only enough T_5 to verify operation. Do not exceed 50° bias,
7. ENG SELECT switch - OFF, observe T_5 value returns to that shown at step 3.
8. ENG SELECT switch - ON, T_5 returns to last value displayed at step 6.
9. POWER switch - OFF, observe T_5 value returns to that shown at step 3 and amber light off.
10. PTIT TRIM vernier - Minimum, fully counter-clockwise and engine select switch off.

PRE-TAKEOFF

1. In ended failed engine - IDLE.
2. Remaining engine - FLY.
3. T_5 bias box POWER switch - ON, amber light illuminates.
4. ENG SELECT switch - ON for remaining engine.
5. Remaining engine - Increase collective to set training torque determined at pre-flight.
6. Rotary vernier knob - Rotate clockwise while observing increasing T_5 values. Reduce rate of increase when values reach 790° T_5.
7. Continue adjusting vernier knob slowly until attaining 835° T_5.
8. Incrementally, further increase T_5 until 843° T_5 is attained and then increase slightly to reach 844° T_5.
9. Read number displayed on vernier, set drag lock, and recheck that number remains unchanged.
10. Reduce collective and then reapply to confirm that training torque is attainable at 107% N_r with indicated T_5 844° ± 4°.
11. Reduce collective, both engines in FLY, and matched torques at 107% N_r.
12. T_5 bias box POWER switch - OFF and amber light off, if single engine training scheduled for later in the flight.

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SIMULATED SINGLE ENGINE FAILURE TRAINING

NOTE

It is recommended that the bias box be selected on at low to moderate dual engine powers prior to the training maneuver, and that it be left on for the duration of that training for which its use is required. The bias box may be switched off using the power switch or the engine select switch at any time if full power is required or abnormal operation is observed.

1. T_5 bias box POWER switch - ON, amber light on, recheck that vernier number has remained unchanged.
2. Simulated failed engine throttle - sharply retard to idle without use of throttle trigger.

CAUTION

The remaining engine will not reach full training power unless the simulated failed engine is at idle or actually failed. Similarly, excessive power loss will result transiently if the simulated failed engine throttle is retarded slowly.

3. Monitor pilot reaction to simulated failure and be prepared to intercede in lowering collective or returning failed engine to FLY as necessary.

CAUTION

Engine runup time from idle to providing full power at FLY can be as much as 5-7 seconds. If needed, select FLY immediately and return to the flight controls in order to back up the other pilot if necessary.

4. Monitor remaining engine's displayed parameters and N_r during single-engine flight and be prepared to restore the failed engine.

SECURE T_5 BIAS BOX - Single engine training completed.

1. Both engines - FLY.
2. Power switch - OFF. Amber light - Off.
3. Check indicated T_5 relationship between engines - Normal.

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4. ENG SELECT switch - OFF.

5. PTIT TRIM vernier - Rotate fully counter-clockwise.

POST-FLIGHT

Remove T_5 bias box from aircraft and restore connector and console panel to basic configuration.

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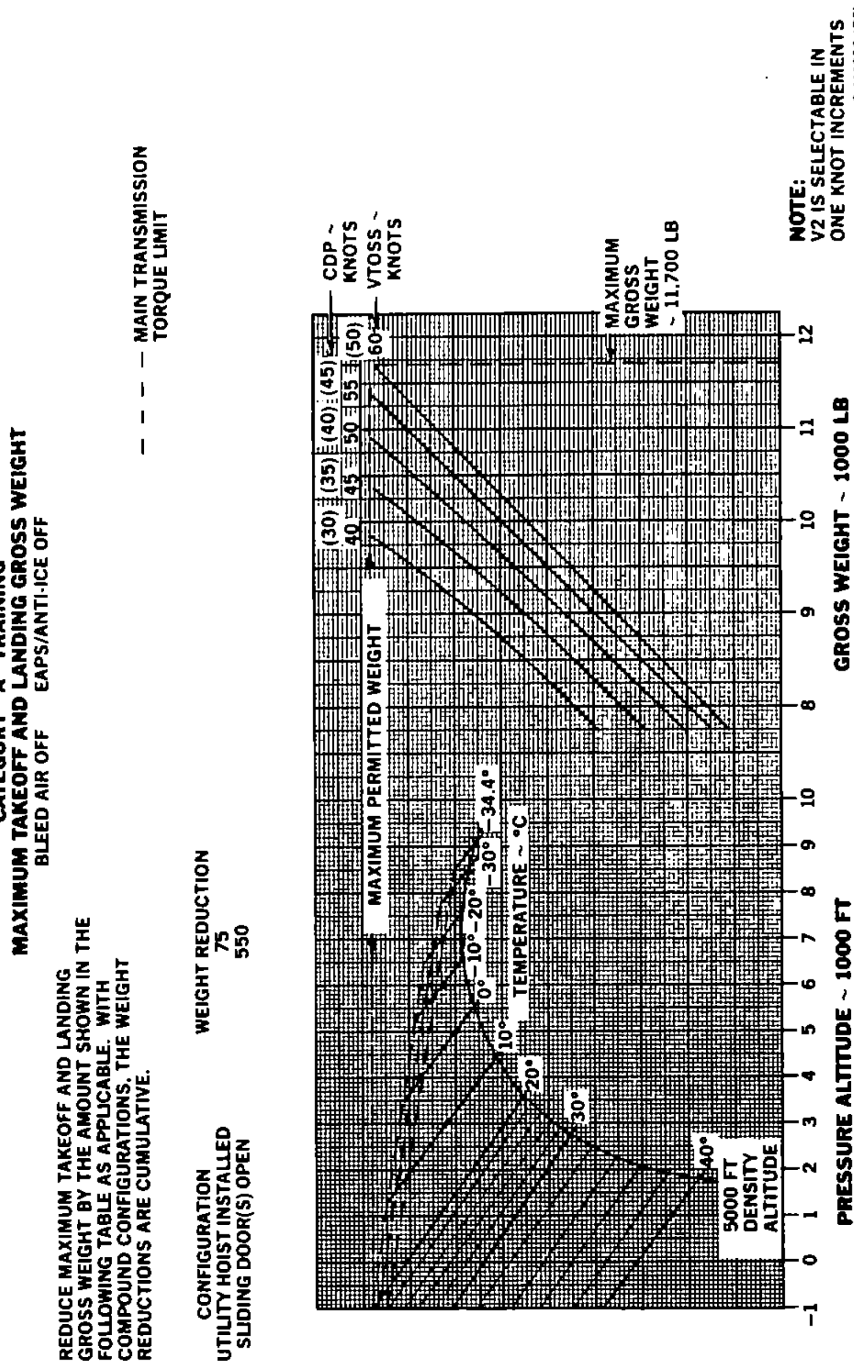

Figure 5-1. Category "A" Training Maximum Takeoff and Landing Gross Weight, PT6B-36A Engines

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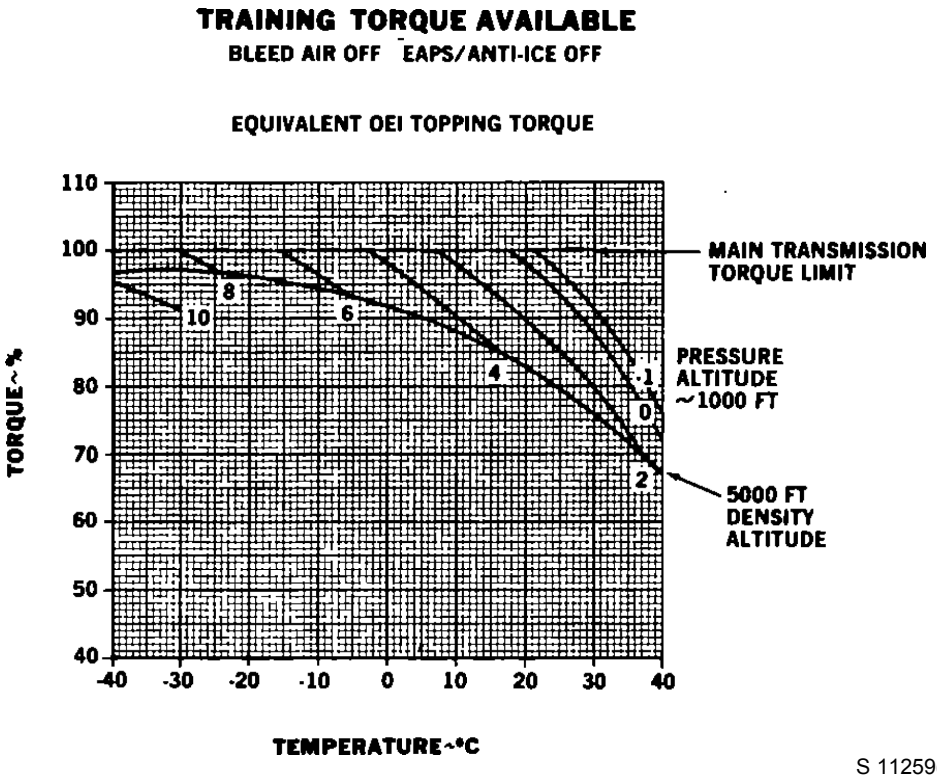

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Figure 5-2. Torque Available - Pilot Training

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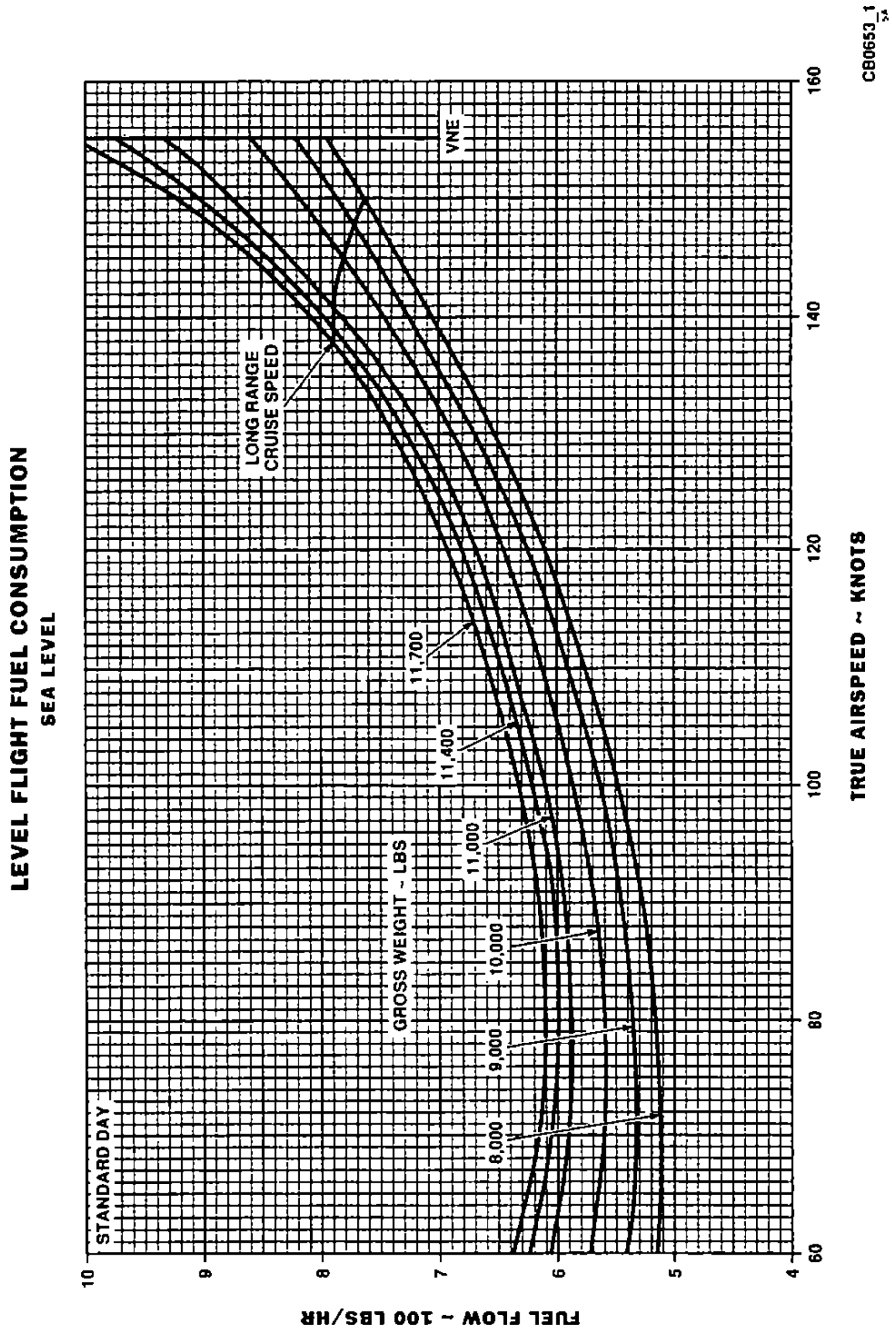

Figure 5-3. Fuel Consumption - Dual-Engine, Level Flight, 107% N_r (Sheet 1 of 10)

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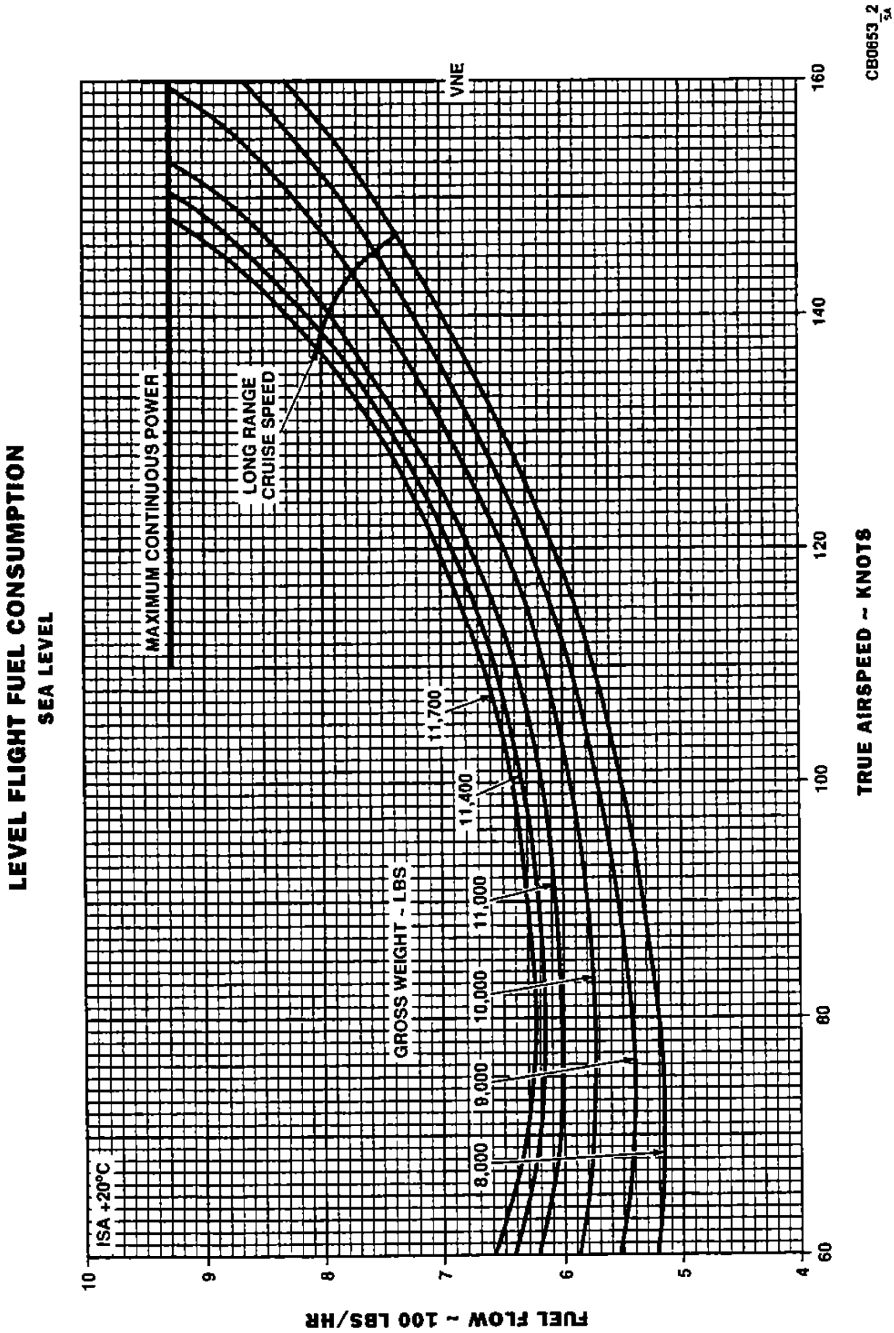

Figure 5-3. Fuel Consumption - Dual-Engine, Level Flight, 107% N_r (Sheet 2 of 10)

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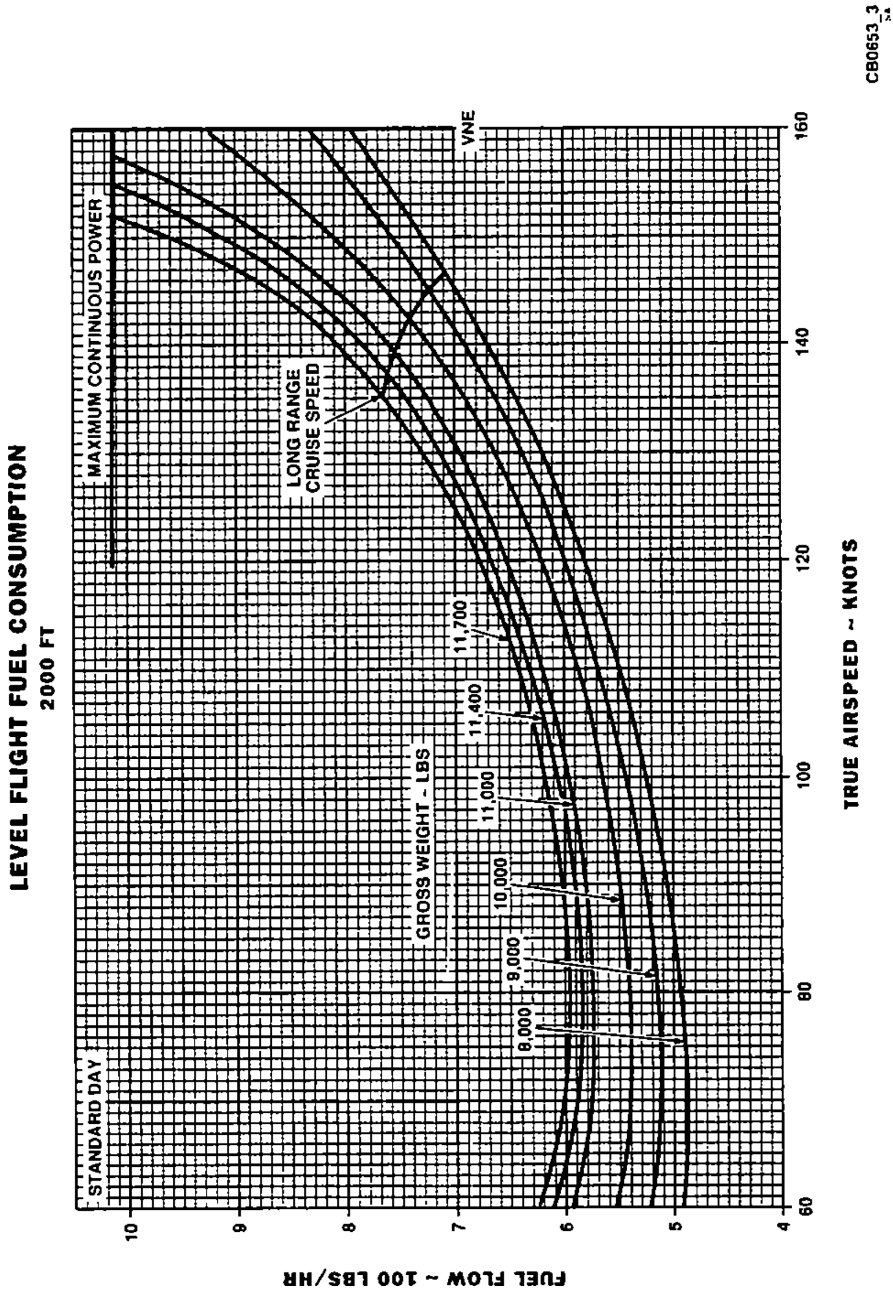

Figure 5-3. Fuel Consumption - Dual-Engine, Level Flight, 107% N_r (Sheet 3 of 10)

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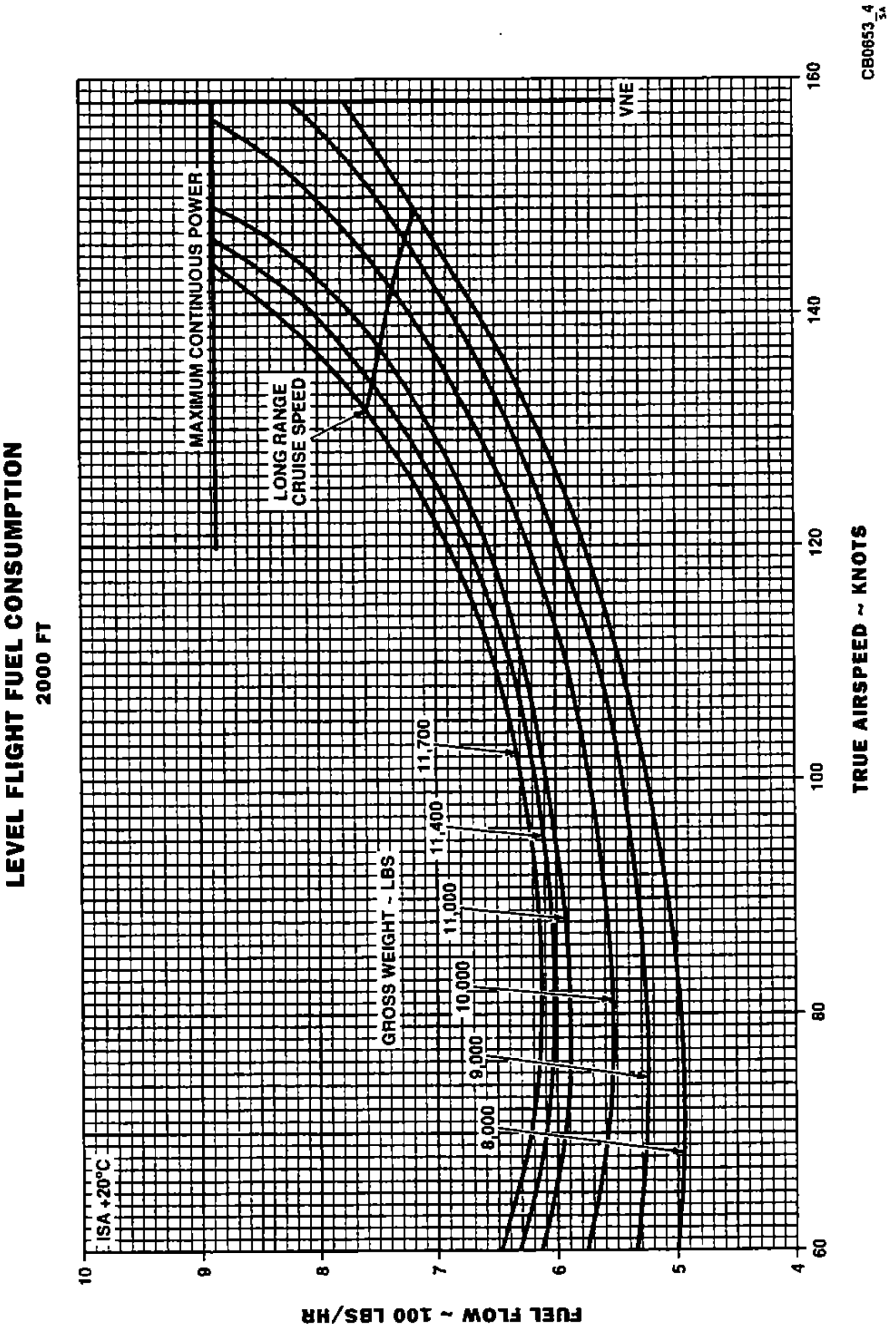

Figure 5-3. Fuel Consumption - Dual-Engine, Level Flight, 107% N_r (Sheet 4 of 10)

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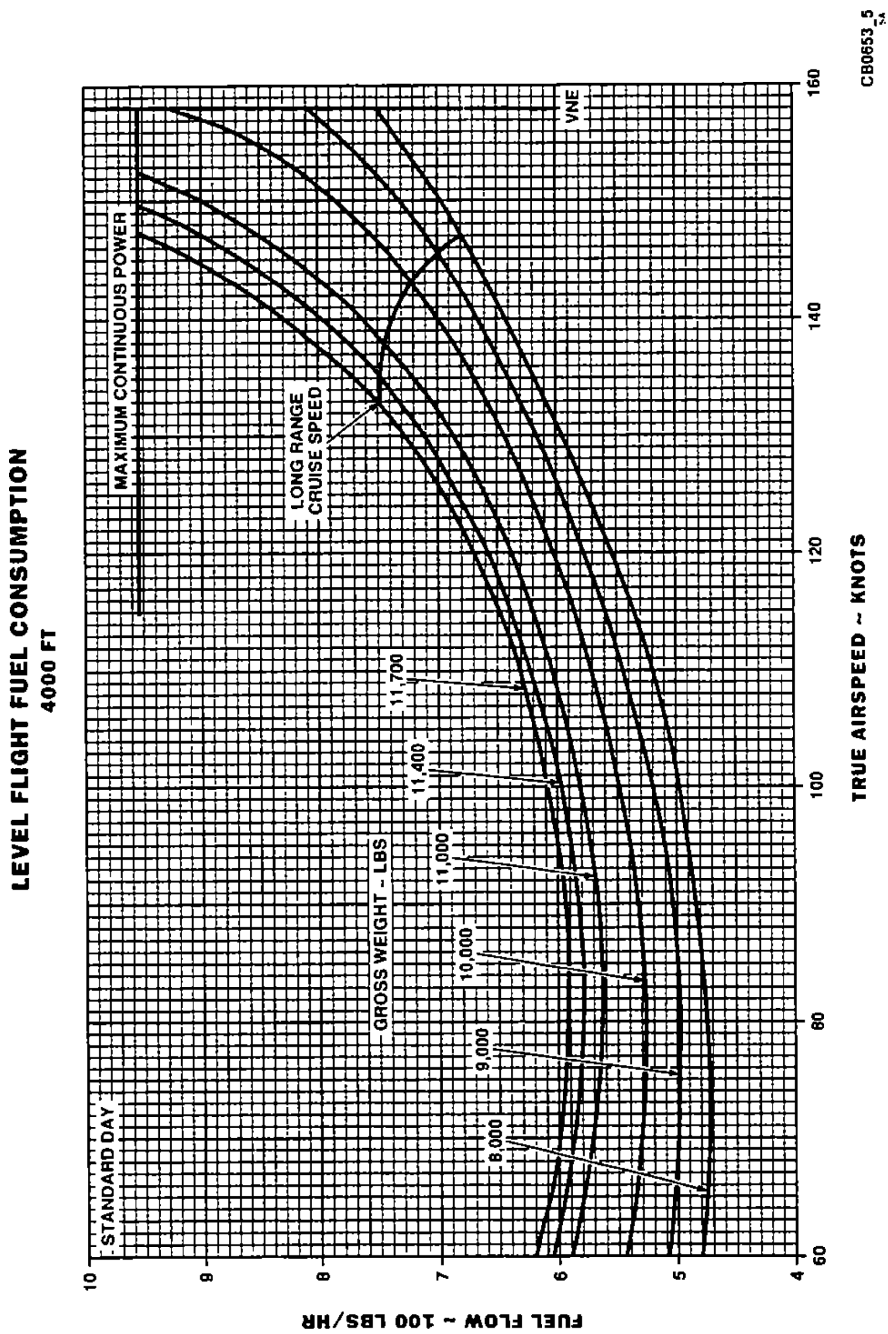

Figure 5-3. Fuel Consumption - Dual-Engine, Level Flight, 107% N_r (Sheet 5 of 10)

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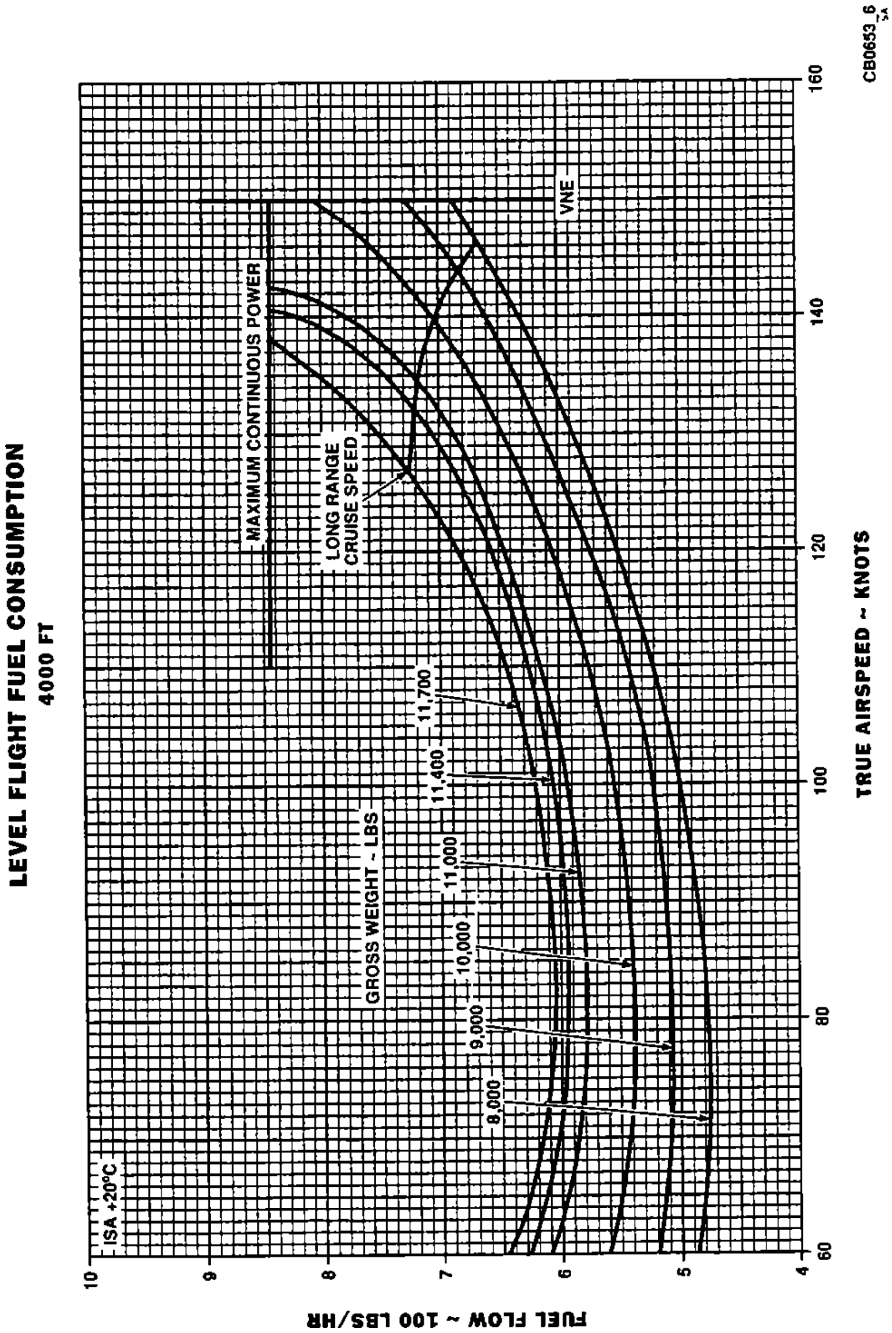

Figure 5-3. Fuel Consumption - Dual-Engine, Level Flight, 107% N_r (Sheet 6 of 10)

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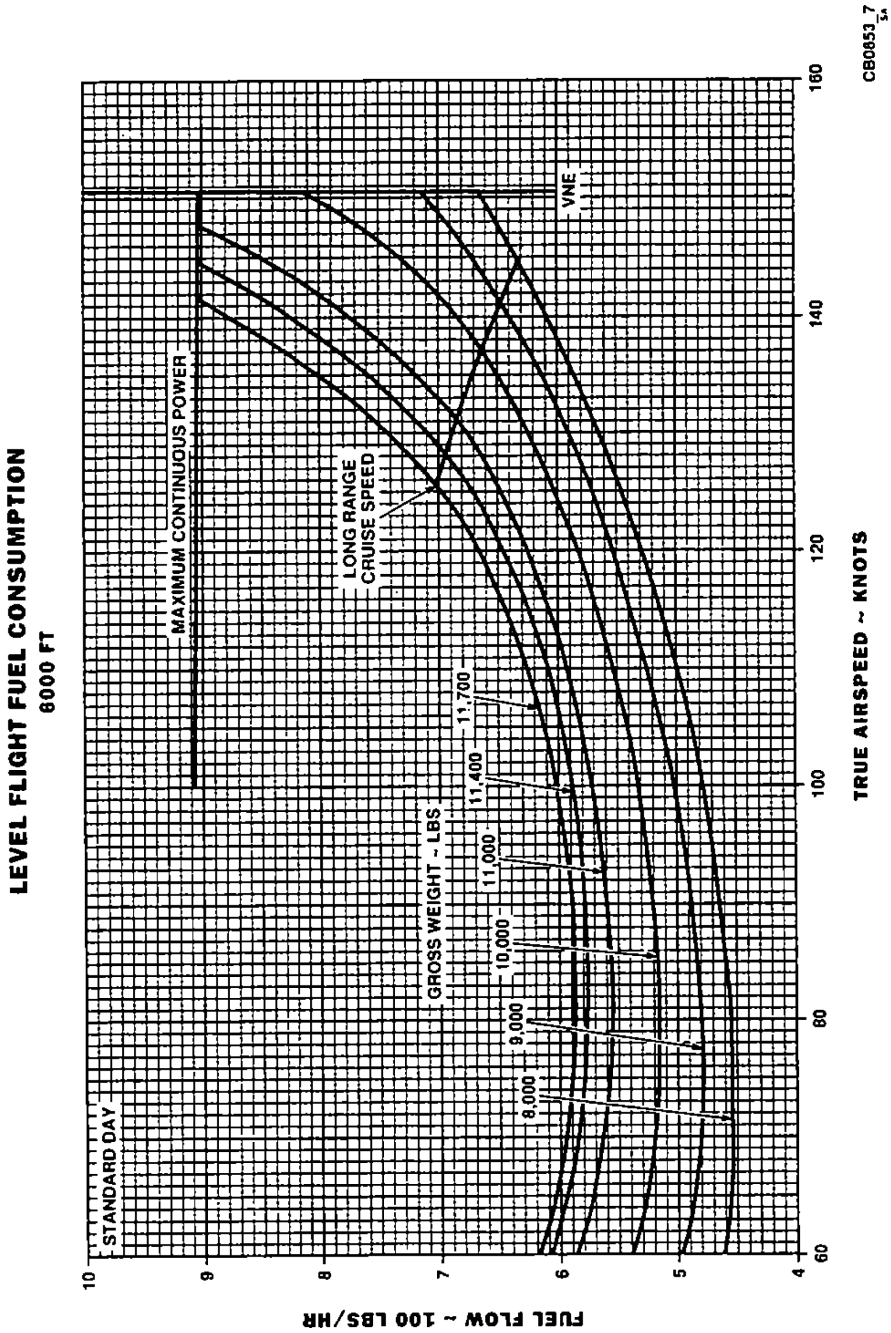

Figure 5-3. Fuel Consumption - Dual-Engine, Level Flight, 107% N_r (Sheet 7 of 10)

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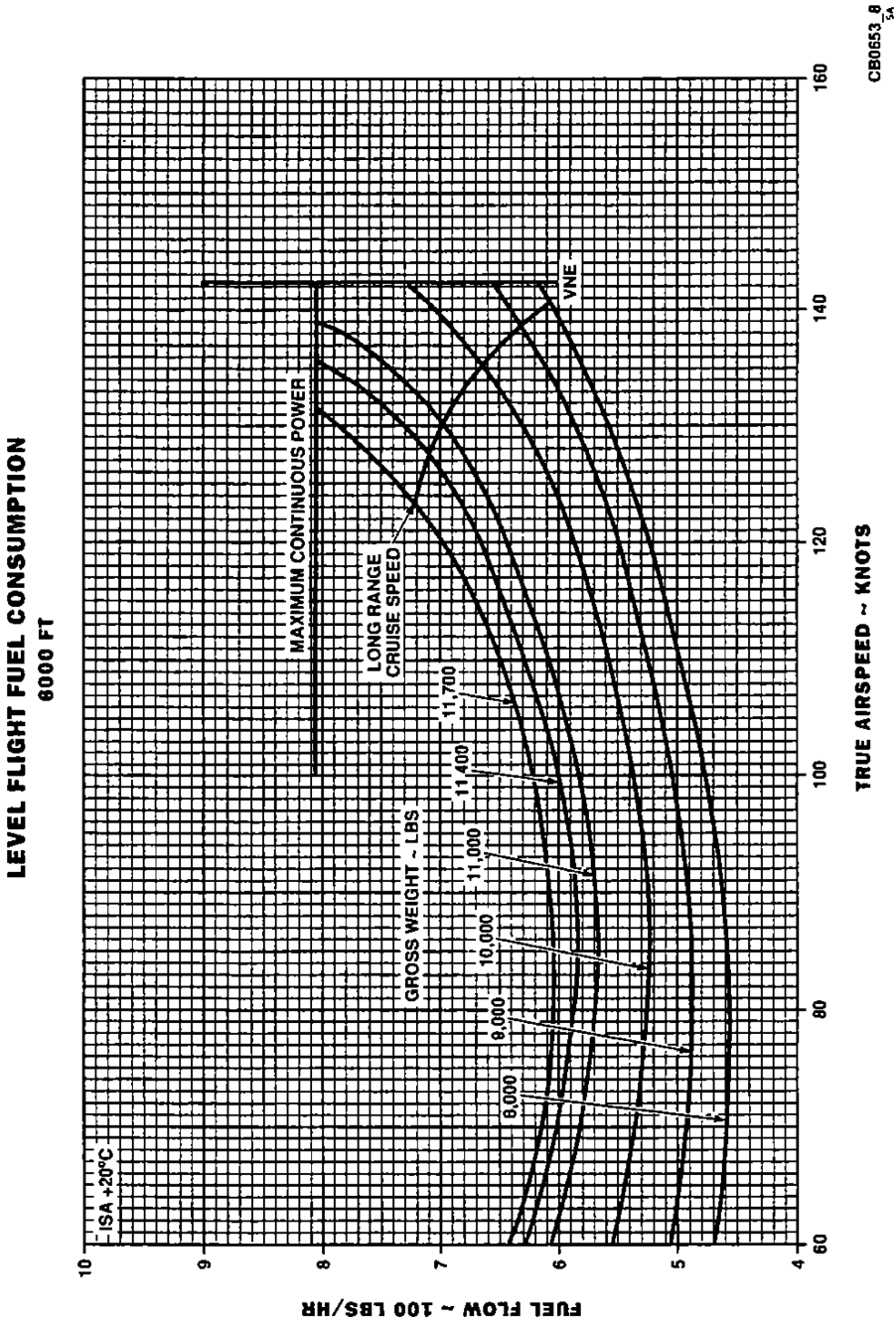

Figure 5-3. Fuel Consumption - Dual-Engine, Level Flight, 107% N_r (Sheet 8 of 10)

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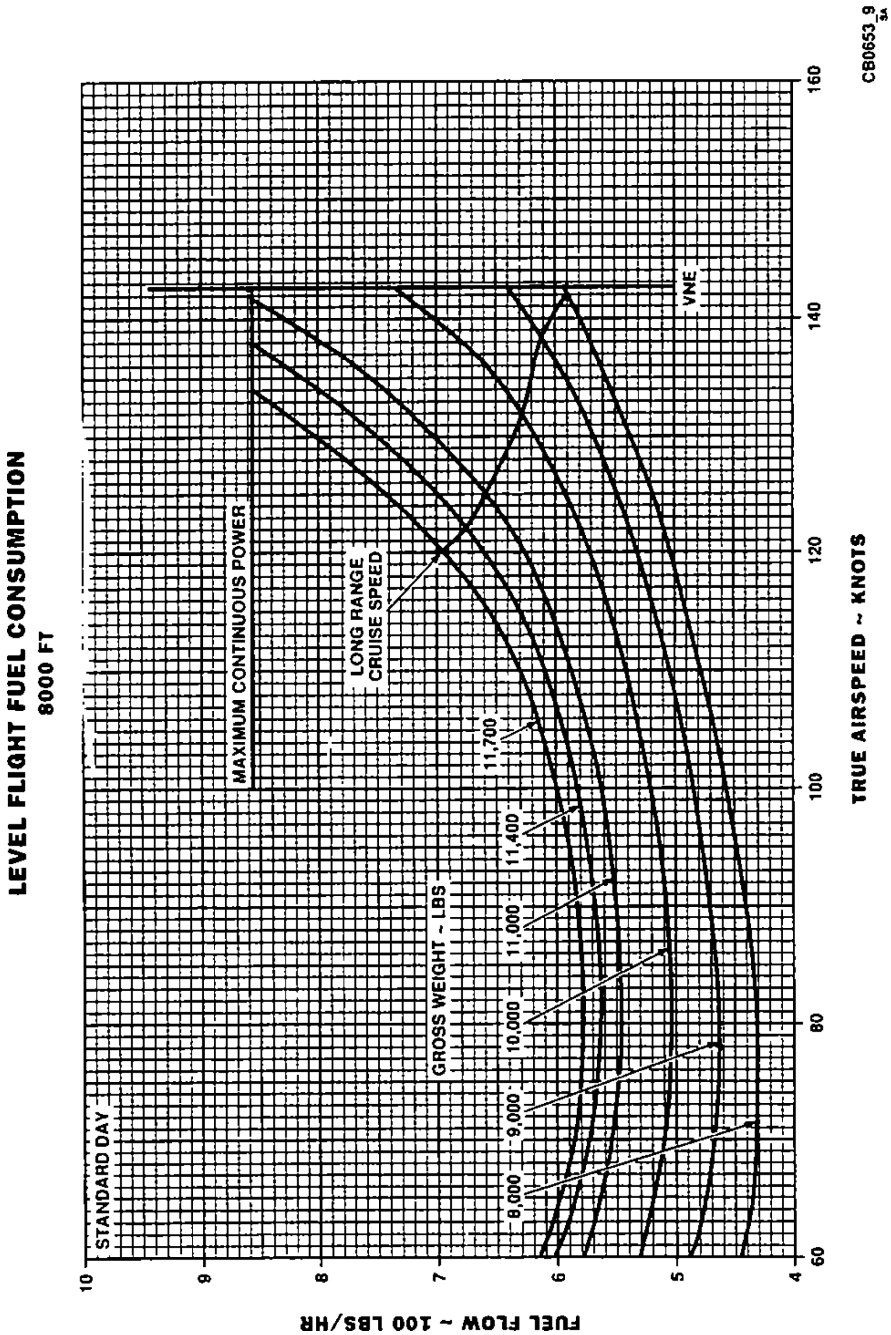

Figure 5-3. Fuel Consumption - Dual-Engine, Level Flight, 107% N_r (Sheet 9 of 10)

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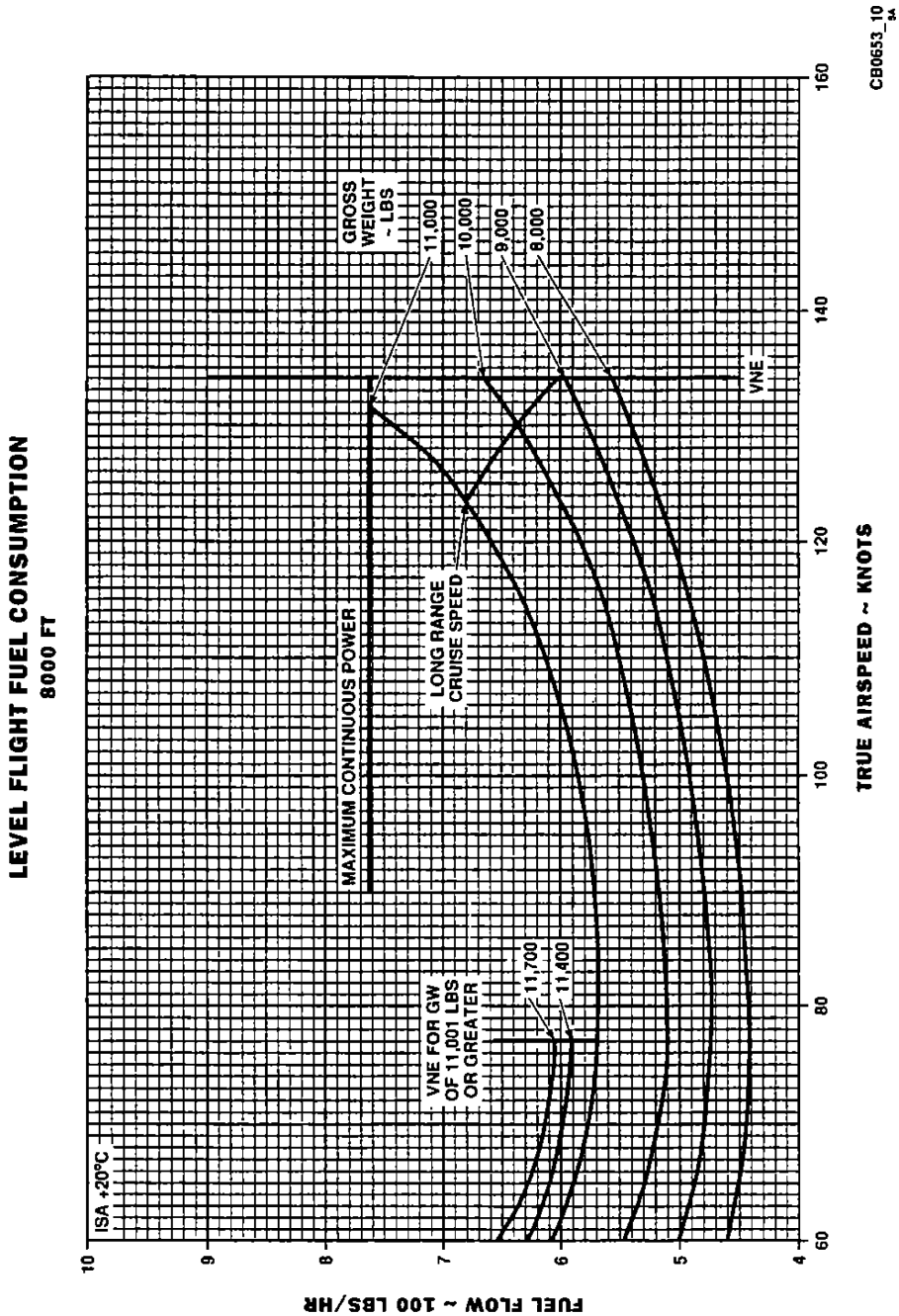

Figure 5-3. Fuel Consumption - Dual-Engine, Level Flight, 107% N_r (Sheet 10 of 10)

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OPERATIONAL PERFORMANCE DATA

This section provides the performance information necessary to comply with the Operating Rules set forth by the various Regulatory Authorities.

Operators are responsible for obtaining operational approvals from their cognizant National Aviation Authority.

The AEO Takeoff Power HIGE WAT curve is shown in Part 1, Section I, Figure 1-1.

The AEO Takeoff Power HOGE WAT curve is shown in Part 1, Section IV, Figure 4-18.

The OEI 30-Minute Power climb performance data contained in Part 1, Section IV, Figure 4-15 were cross plotted to obtain the Figure 5-4 maximum takeoff and landing gross weight based on the ability of the helicopter to achieve 150 fpm climb at 1,000 ft above the takeoff surface with one engine inoperative and the remaining engine operating at OEI 30-Minute Power.

AIRFIELD TAKEOFF AND LANDING

Category A and Category B airfield takeoff and landing procedures are given in Part 1.

The Category A procedure provides zero exposure engine failure accountability during takeoff or landing when operating in accordance with the specified weight, altitude, temperature, TDP/V_{TOSS}, and field length conditions. Takeoff from airfields shorter than those specified may result in a forced landing outside the confines of the airfield, in the event of engine failure before reaching the TDP.

The Category B procedure is an AEO procedure that requires a specified horizontal takeoff distance from HIGE to 50 ft height and a specified horizontal landing distance from 50 ft height to HIGE. Single engine stay-up-ability is not assured when operating at Category B weights.

ELEVATED HELIDECK TAKEOFF AND LANDING

The following vertical takeoff and landing procedures are provided in support of elevated helideck operations where performance is available for OEI continued flight or landing at all times when operating in accordance with the Figure 5-5 takeoff and landing WAT curves.

VERTICAL TAKEOFF - ELEVATED HELIDECK

The vertical takeoff profile with scheduled dropdown is shown diagrammatically in Figure 5-6.

1. Determine the maximum takeoff gross weight and V_{TOSS} from Figure 5-5.

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2. Determine the takeoff torque from Figure 5-7.
3. Set parking brake.
4. Set 30 feet TDP on the radar altimeter.
5. Arm floats (if over water).
6. Establish a wheels light hover in the takeoff position.
7. Check engine instruments.
8. Establish a vertical climb by rapidly increasing collective pitch to achieve the takeoff torque determined from step 2. Do not exceed the Takeoff Power limit (100% N_1, 100%Q, or 816°C T_5).
9. Confirm that ascending flight path is vertical; correct as necessary. At least a corner of the helideck should be visible through the chin window or lower door window (if installed) at all times.
10. Cross-check Q, T_5, and N_1, confirm Takeoff Power limit, adjust appropriately.
11. When climbing through the TDP (30 ft AGL), input longitudinal cyclic to rotate to a 22° ± 2° nose down pitch attitude in 2 or less seconds. The cyclic input defines the TDP; if an emergency, including engine failure, occurs prior to cyclic input, a reject is executed, and during or after input, a continued takeoff is performed.
12. Allow nose down pitch attitude to lessen due to translational recovery with increasing airspeed, establish 50 KIAS initially and continue acceleration to V_{BROC} airspeed, 74 KIAS.
13. Floats - OFF.
14. Retract landing gear.

SINGLE ENGINE FAILURE ON TAKEOFF - ELEVATED HELIDECK

The procedure to follow after an engine failure during a vertical takeoff depends on where in the takeoff sequence the failure occurs. If the engine fails before the TDP, the takeoff is rejected and the aircraft is landed on the helideck. The TDP is 30 feet above the takeoff surface. If the failure occurs after the TDP, the takeoff will be continued.

Rejected Takeoff

1. Sharply reduce collective to a mid-range position to minimize ballooning and excessive height.

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2. With maximum height achieved and as aircraft begins to settle, increase collective to achieve Maximum Contingency OEI power and allow rotor to droop to 104-106% N_r.
3. Keep the helideck in sight at all times and adjust position as necessary with cyclic to control a vertical descent to the landing surface.

WARNING

Crosswind can cause large horizontal repositioning at the apex of the reject. Anticipate this effect and correct as required.

4. Maintain 104 to 106% N_r, fixed collective, and accept the resultant vertical descent to the helideck.
5. When closure rate and altitude dictate that contact with the landing surface is imminent, apply collective at a rate and amount sufficient to cushion the landing. A slow, gradual collective input applied at excessive altitude must be avoided.
6. Upon ground contact, lower collective slightly to prevent excessive rotor droop, neutralize cyclic position, then continue lowering collective smoothly.
7. Floats - OFF.

Continued Takeoff

1. Continue nose down pitch rotation to 22° ± 2° nose down pitch attitude in 2 or less seconds.
2. Hold collective fixed initially and then reduce as necessary to arrest droop at 94% ± 2% N_r. Do not allow rotor speed to droop below 91% N_r.
3. Allow nose down pitch attitude to lessen when passing through effective translational lift. Reduce collective slightly to result in a gradual rotor speed increase to 100% N_r.
4. Closely monitor the airspeed indicator and level the aircraft pitch attitude immediately when an indication is observed to achieve a roundout at 50 KIAS. Continue a level acceleration to V_{TOSS}.
5. Switch floats OFF and retract landing gear with a positive rate of climb established.
6. Reduce collective slowly to return rotor speed to 100% N_r and observe OEI 2½-Minute Power limits.

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7. When obstacles are cleared and after passing 200 feet AGL, continue climb at OEI 2½-Minute Power and gradually accelerate to V_{BROC}, then observe 30-Minute OEI Power limits.
8. Land as soon as practicable.
9. For single engine climb or cruise at airspeeds above V_{BROC}, use 107% N_r.

APPROACH AND LANDING – ELEVATED HELIDECK

The elevated helideck approach and landing profile with scheduled dropdown is shown diagrammatically in Figure 5-8 The landing procedure employs an approach path offset at least one rotor radius to the side of the helideck to permit an un-obstructed go-around path in case of engine failure. It has been determined that the OEI balked landing dropdown will not exceed the Figure 5-5 scheduled OEI continued takeoff dropdown for the same weight, altitude, and temperature conditions.

1. Determine maximum landing gross weight and V_{TOSS} from Figure 5-5.
2. The landing gear should be down, the floats armed (if over water) at or below 74 KIAS, and the parking brake set.
3. Initiate a constant angle continually decelerating approach to the helideck, commencing at 45 KIAS at a height of 400 feet above the landing surface. For headwind components up to 20 knots, add one half of the estimated component to the 45 KIAS target. For headwind components greater than 20 knots, add 10 knots plus the difference above 20 knots to the no wind 45 KIAS target.
4. When passing through 100 feet above the helideck, allow the approach angle to flatten to a descent rate of not more than 150 feet per minute at an airspeed of 30 KIAS in zero wind or the equivalent airspeed adjusted for headwind component.
5. Continue to reduce altitude to arrive at the landing decision point (LDP), a point 25 feet above, 25 feet to the left or right of, and 150 feet (3 helicopter lengths) short of the helideck (where the closest corner of the helideck visually touches the glare shield / master caution light cluster) in level flight at 30 KIAS. At the LDP the aircraft is flared to reduce airspeed. During this flare, the pilot should maneuver the aircraft over the helideck, and complete the landing vertically or transition to hover as the ground speed is reduced to zero knots.

SINGLE ENGINE FAILURE DURING APPROACH TO AN ELEVATED HELIDECK

The procedure to follow after an engine failure during a landing approach depends on where in the landing sequence the failure occurs.

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The Landing Decision Point (LDP) is defined as a point 25 feet above, 25 feet to the left or right of, and 150 feet (3 helicopter lengths) short of the helideck in level flight at 30 KIAS, the point at which the pilot begins the sidestep maneuver toward the helideck. If an engine failure occurs prior to beginning the sidestep maneuver, the pilot must perform a "Go Around". If the engine failure occurs after beginning the sidestep maneuver, the aircraft is committed to a landing and the approach must continue to touchdown.

Balked Landing (Go Around)

1. Increase collective sufficiently to droop the rotor to at least 100% N_r, but no lower than 91% N_r.
2. Gradually adjust pitch attitude to accelerate to V_{TOSS}.
3. Switch floats OFF and retract landing gear with a positive rate of climb established.
4. Reduce collective slowly to return rotor speed to 100% N_r and observe OEI 2½-Minute Power limits.
5. When obstacles are cleared, and after passing 200 ft AGL, continue climb at OEI 2½-Minute Power and gradually accelerate to V_{BROC}, then observe OEI 30-Minute Power limits.
6. Land as soon as practicable.
7. For single engine climb or cruise at airspeeds above V_{BROC}, use 107% N_r.

Single Engine Landing

1. Maneuver aircraft above landing surface.
2. Use collective to cushion touchdown. A slow, gradual collective input applied at excessive altitude must be avoided. Ensure pitch attitude is 10° or less at touchdown to provide tail clearance.
3. Upon ground contact, lower collective slightly to prevent excessive rotor droop, neutralize cyclic position, and then continue lowering collective smoothly.

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S–76B OPERATIONAL PERFORMANCE DATA

MAXIMUM TAKEOFF AND LANDING GROSS WEIGHT
BASED ON 150 FPM OEI CLIMB AT 1000 FT ABOVE THE TAKEOFF SURFACE
30 MINUTE POWER **BEST ROC SPEED**

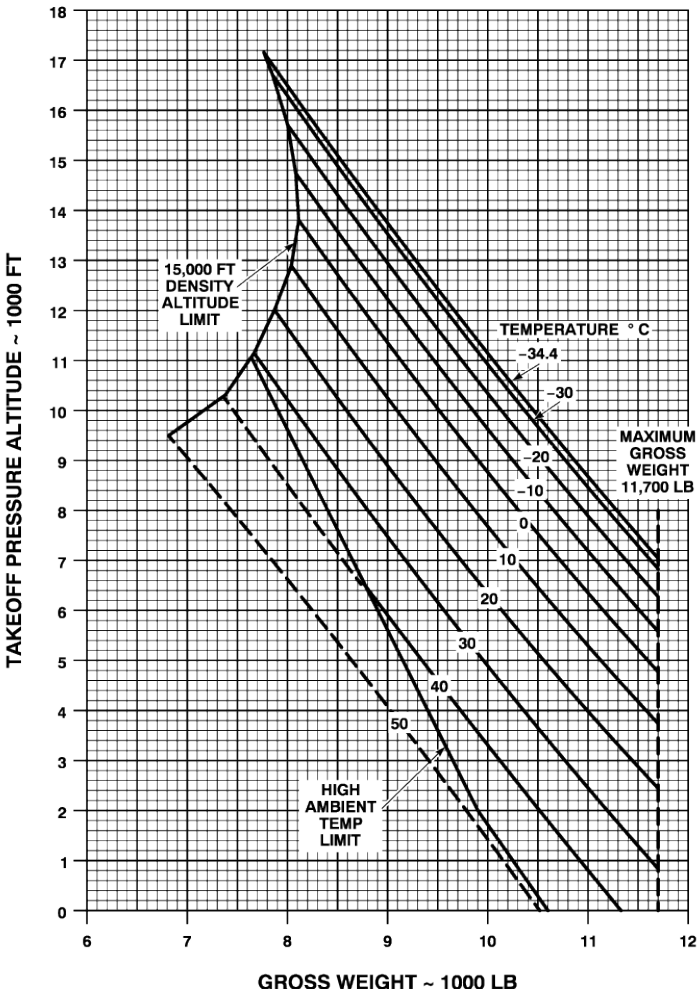

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Figure 5-4. Takeoff and Landing Gross Weight Based on 150 FPM OEI Climb

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VERTICAL OPERATIONS FROM ELEVATED HELIDECK

MAXIMUM TAKEOFF AND LANDING GROSS WEIGHT
EAPS/ANTI–ICE OFF BLEED AIR OFF

REDUCE GROSS WEIGHT DETERMINED FROM CHART BY THE AMOUNT SHOWN IN THE FOLLOWING TABLE AS APPLICABLE. WITH COMPOUND CONFIGURATIONS, THE WEIGHT REDUCTIONS ARE CUMULATIVE.

CONFIGURATION	WEIGHT REDUCTION
UTILITY HOIST INSTALLED	75 POUNDS
EXTERNAL SLIDING DOOR(S) OPEN	150 POUNDS
EXTERNAL SLIDING DOOR(S) CLOSED	50 POUNDS

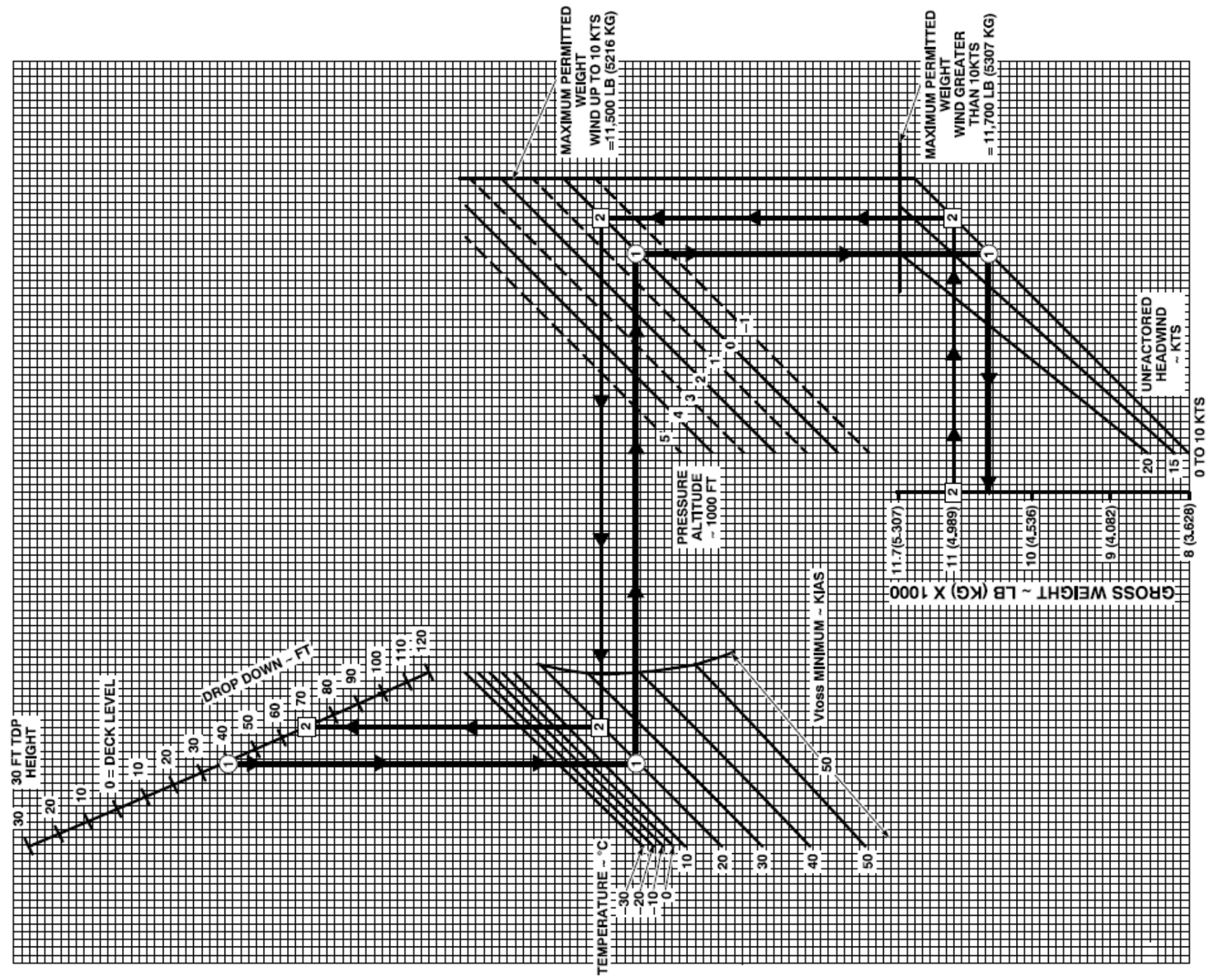

Figure 5-5. Elevated Helideck Maximum Takeoff and Landing Gross Weight (Sheet 1 of 2)

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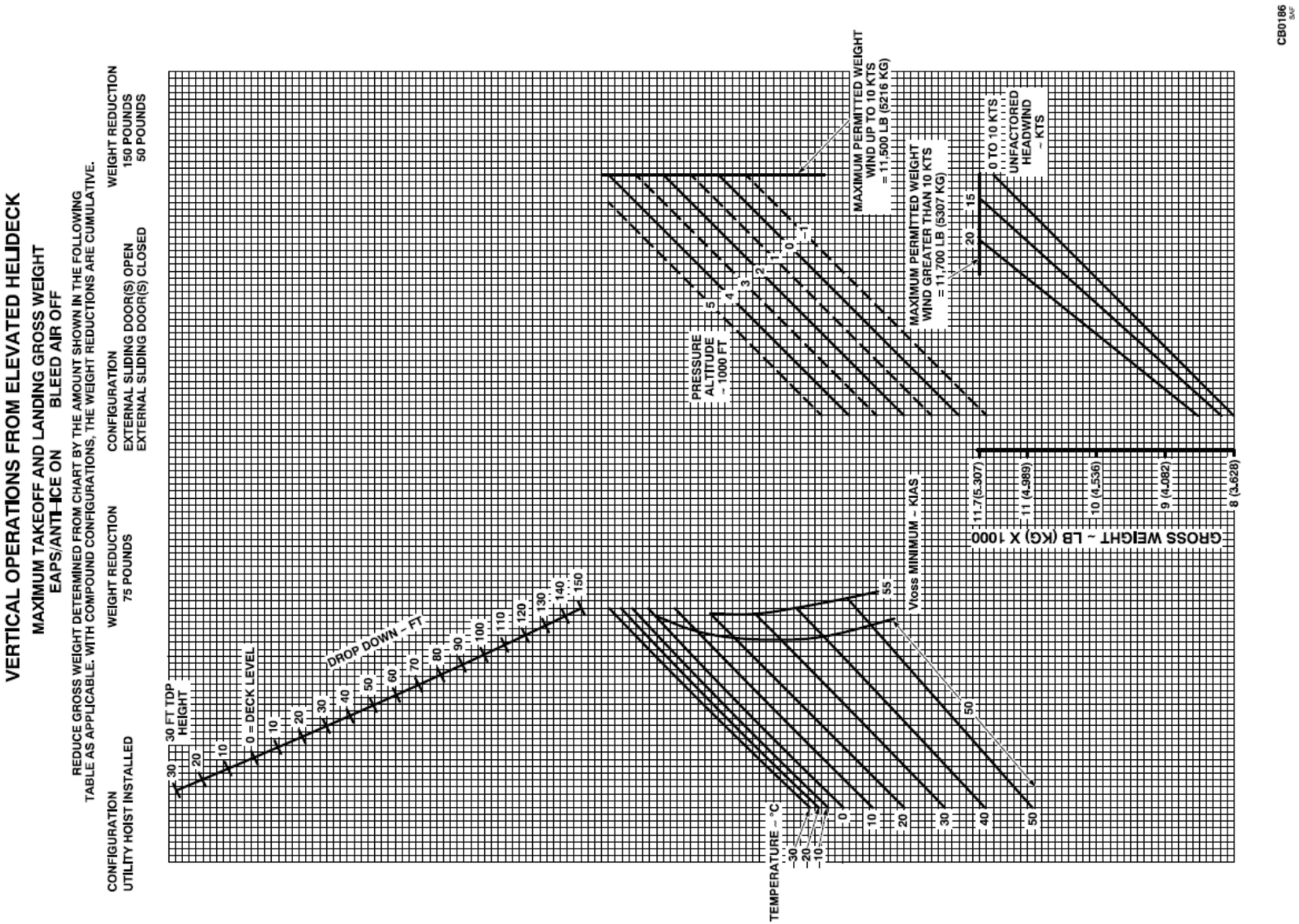

Figure 5-5. Elevated Helideck Maximum Takeoff and Landing Gross Weight (Sheet 2 of 2)

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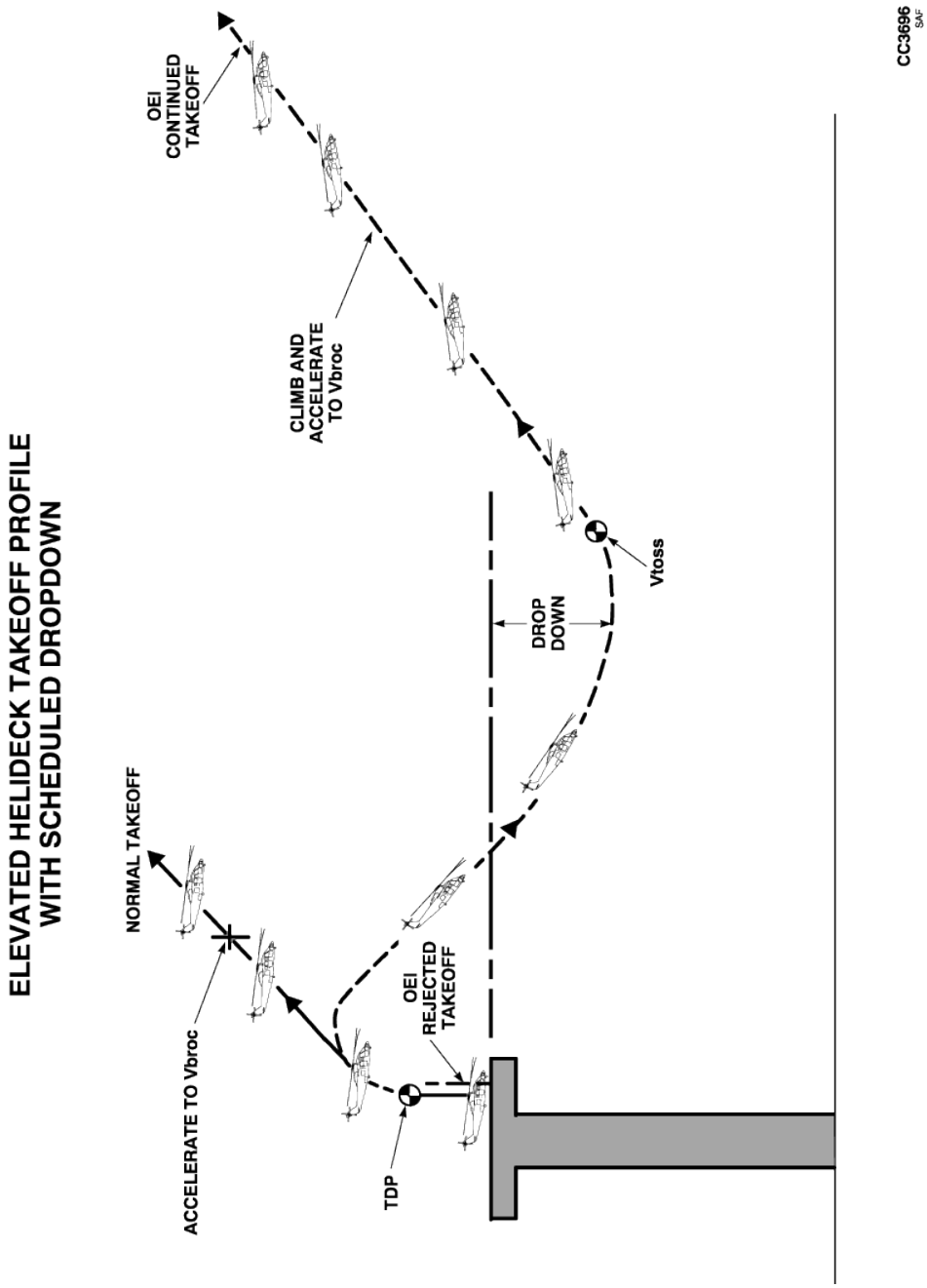

Figure 5-6. Elevated Helideck Takeoff Profile with Scheduled Dropdown

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ELEVATED HELIDECK OPERATIONS
TARGET DUAL ENGINE TAKEOFF TORQUE
PT6B–36A/B ENGINE EAPS/ANTI–ICE OFF

TEMP	PRESSURE ALTITUDE						
~ ° C	–1000	0	1000	2000	3000	4000	5000
0	100	100	100	100	100	100	100
2	100	100	100	100	100	100	100
4	100	100	100	100	100	100	99
6	100	100	100	100	100	100	
8	100	100	100	100	100	100	
10	100	100	100	100	100	100	
12	100	100	100	100	100	98	
14	100	100	100	100	100	96	
16	100	100	100	100	99		
18	100	100	100	100	98		
20	100	100	100	100	96		
22	100	100	100	99	95		
24	100	100	100	97	93		
26	100	100	99	95	91		
28	100	100	98	94			
30	100	100	96	92			
32	100	99	95	91			
34	100	97	93	89			
36	99	95	91	87			
38	97	93	89				
40	96	92	87				

ABOVE 5000 FT DENSITY ALTITUDE

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Figure 5-7. Elevated Helideck Target Dual Engine Takeoff Torque (Sheet 1 of 2)

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ELEVATED HELIDECK OPERATIONS
TARGET DUAL ENGINE TAKEOFF TORQUE
PT6B–36A/B ENGINE EAPS/ANTI–ICE ON

TEMP	PRESSURE ALTITUDE						
~ ° C	–1000	0	1000	2000	3000	4000	5000
0	100	100	100	100	100	100	94
2	100	100	100	100	100	98	93
4	100	100	100	100	100	97	92
6	100	100	100	100	100	96	
8	100	100	100	100	98	94	
10	100	100	100	100	97	93	
12	100	100	100	100	96	92	
14	100	100	100	99	94	90	
16	100	100	100	98	93		
18	100	100	100	96	91		
20	100	100	99	94	90		
22	100	100	98	93	89		
24	100	100	96	91	87		
26	100	99	94	90	85		
28	100	97	93	88			
30	100	95	91	87			
32	98	94	90	85			
34	96	92	88	84			
36	94	90	86	82			
38	93	89	84				
40	91	87	82				

ABOVE 5000 FT DENSITY ALTITUDE

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Figure 5-7. Elevated Helideck Target Dual Engine Takeoff Torque (Sheet 2 of 2)

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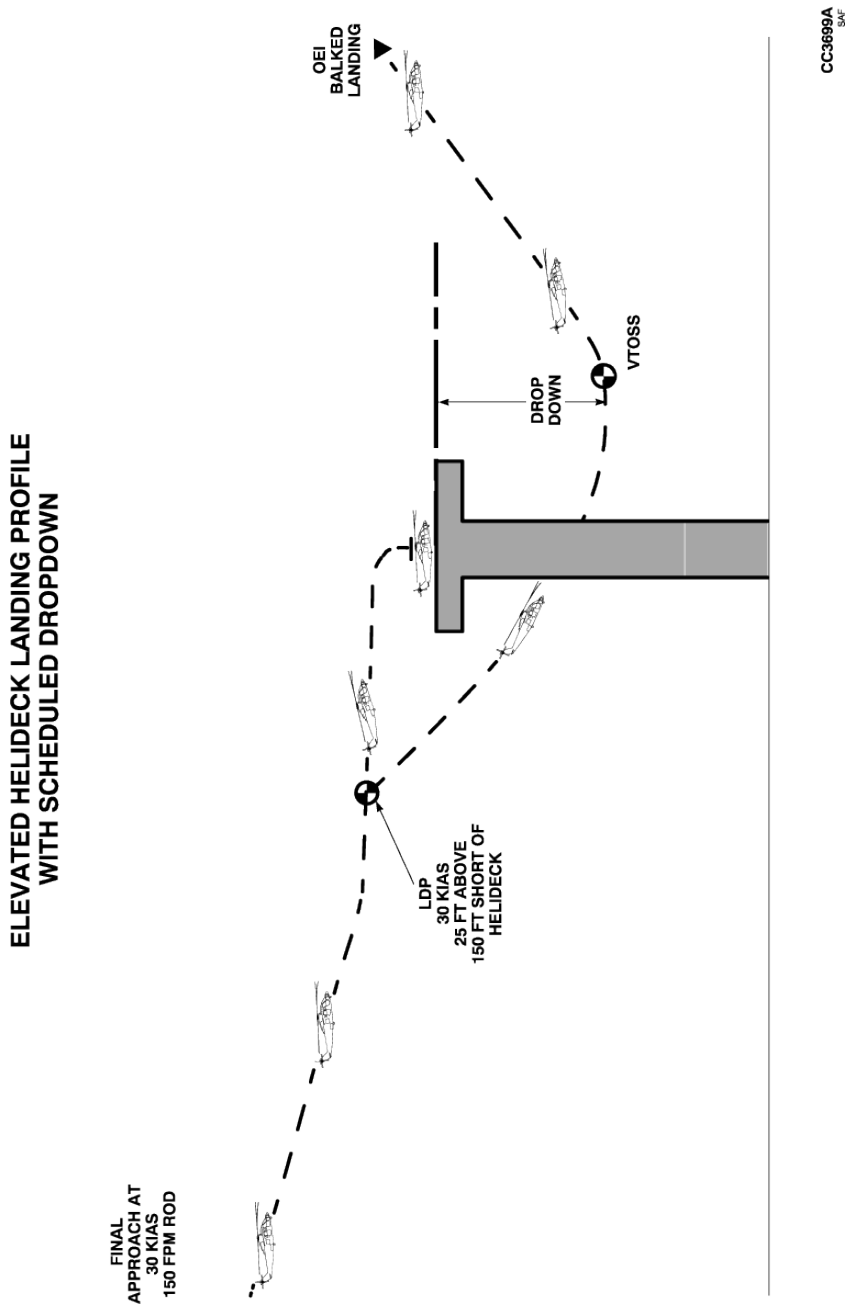

Figure 5-8. Elevated Helideck Landing Profile with Scheduled Dropdown

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TEMPORARY REVISION NO. 1

FILING INSTRUCTIONS: Insert this Temporary Revision immediately following page 5-28, dated February 12, 2010.

SUBJECT: Performance Charts

This temporary revision adds Performance Charts to the Supplemental Performance Data.

MANUAL CHANGES:

Add the following list of Performance Charts immediately following Figure 5-8, Elevated Helideck Landing Profile with Scheduled Dropdown:

TEMPORARY REVISION NO. 1

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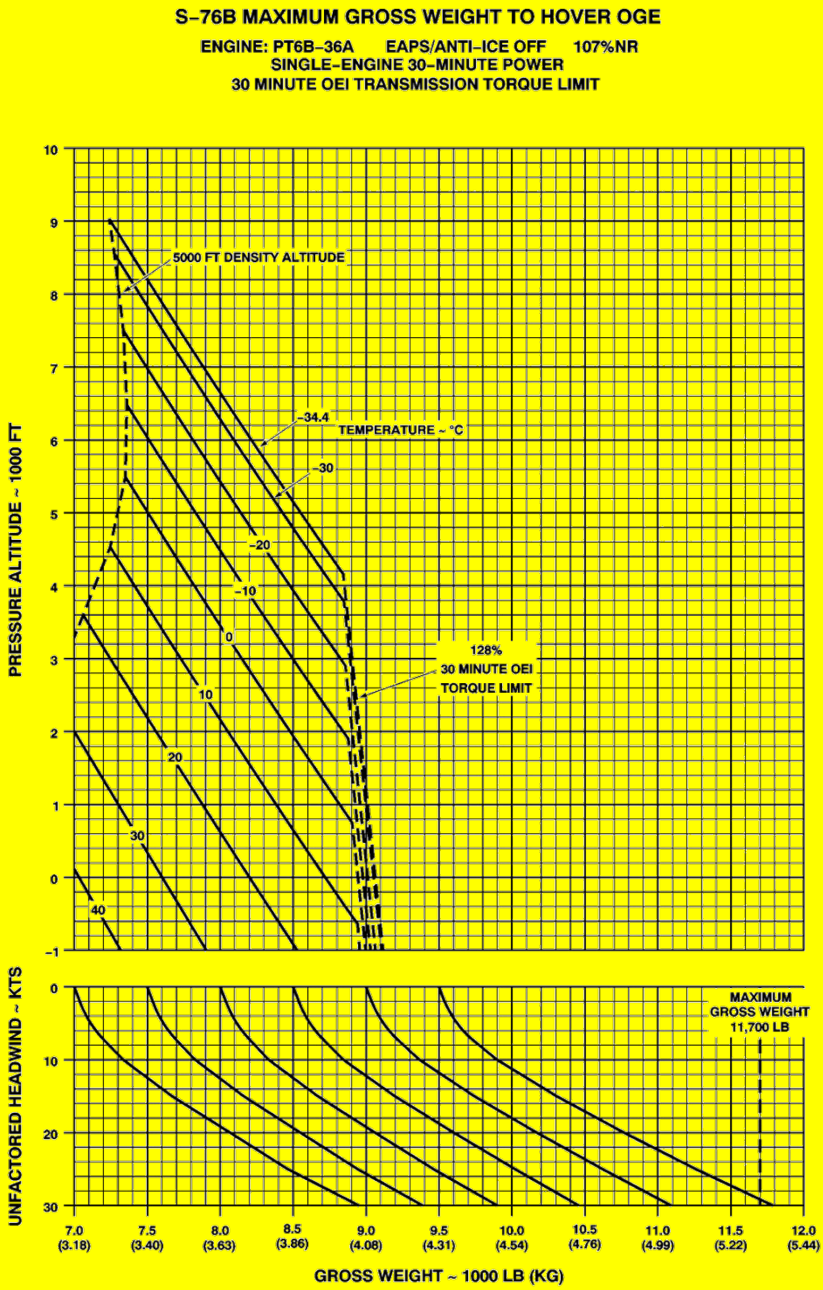

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Figure 5-9. Hover Out of Ground Effect – Single-Engine - EAPS OFF, 30-Minute Transmission Limit, PT6B-36A Engines

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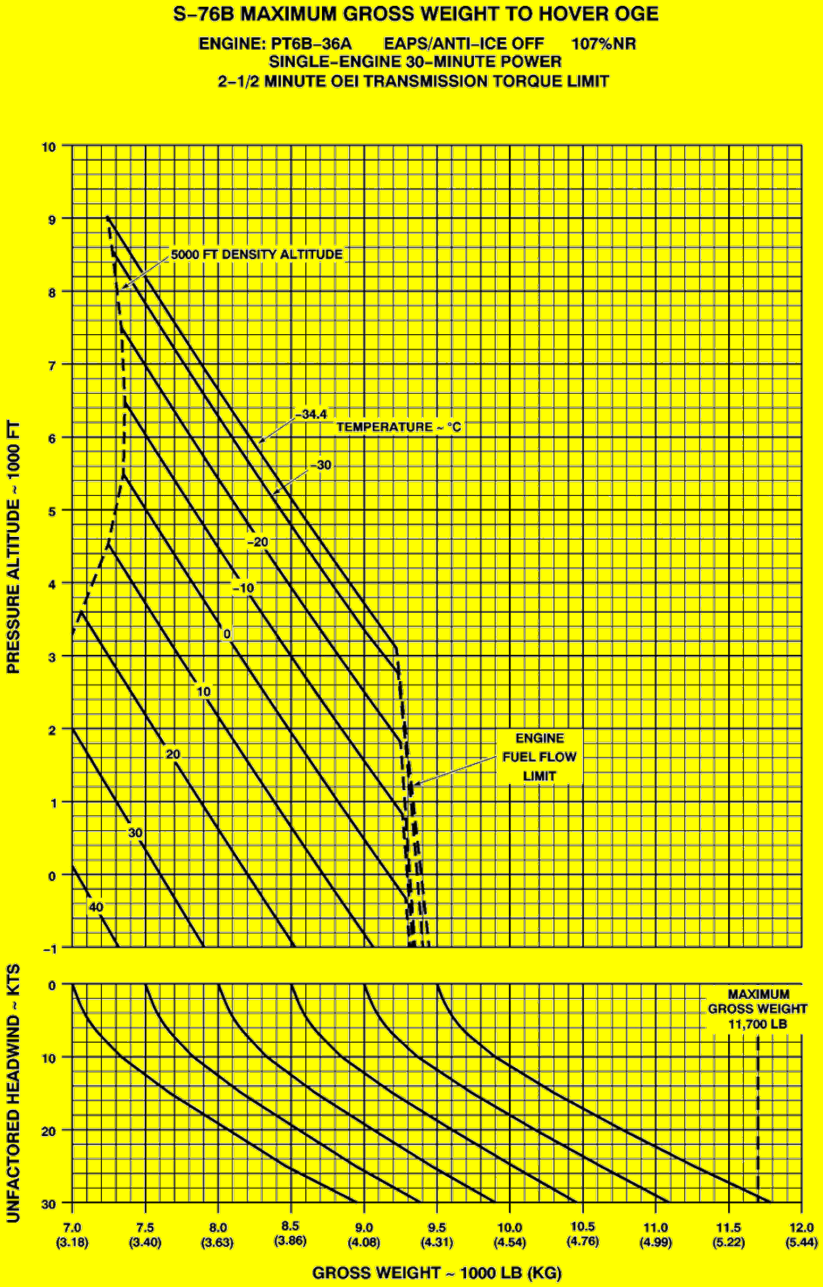

Figure 5-10. Hover Out of Ground Effect - Single-Engine - EAPS OFF, 2-1/2 Minute Transmission Limit, PT6B-36A Engines

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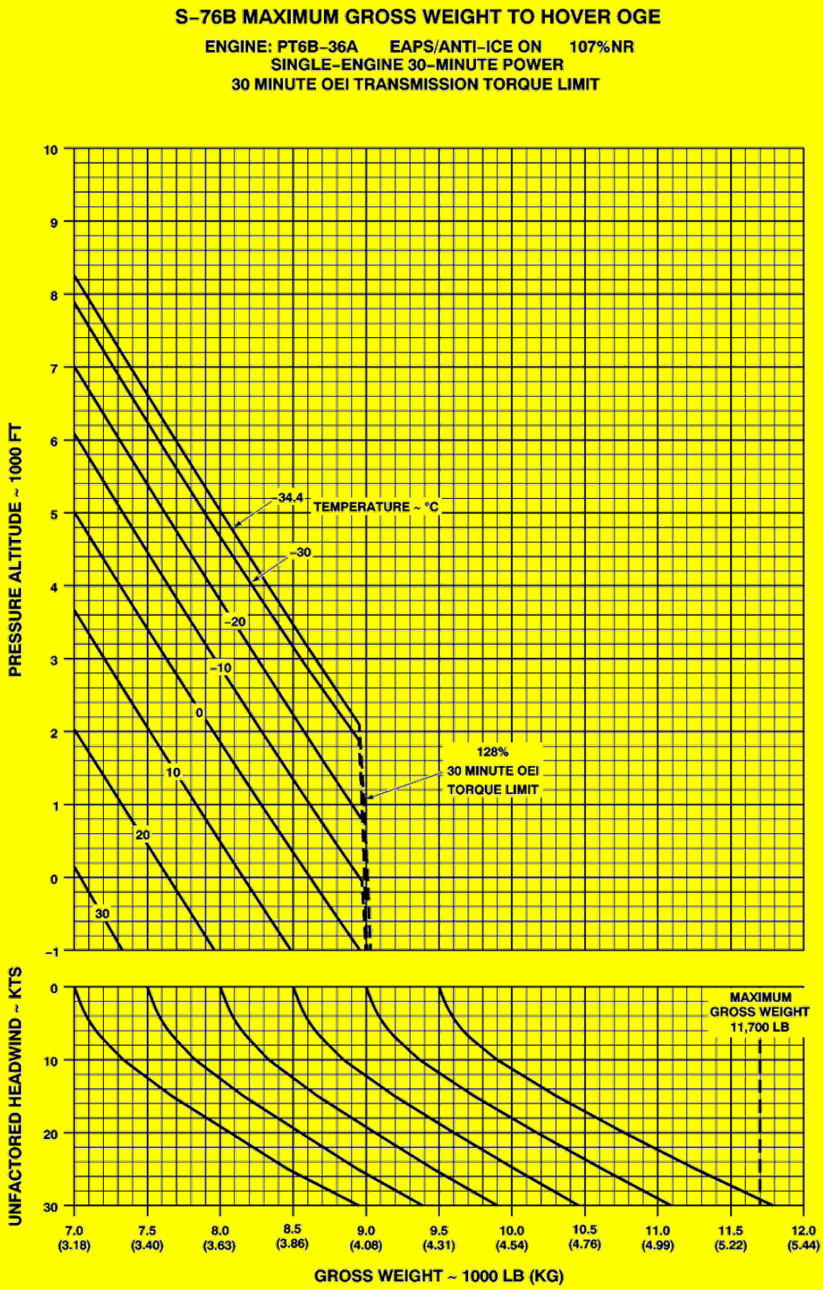

Figure 5-11. Hover Out of Ground Effect - Single-Engine - EAPS ON, 30-Minute Transmission Limit, PT6B-36A Engines

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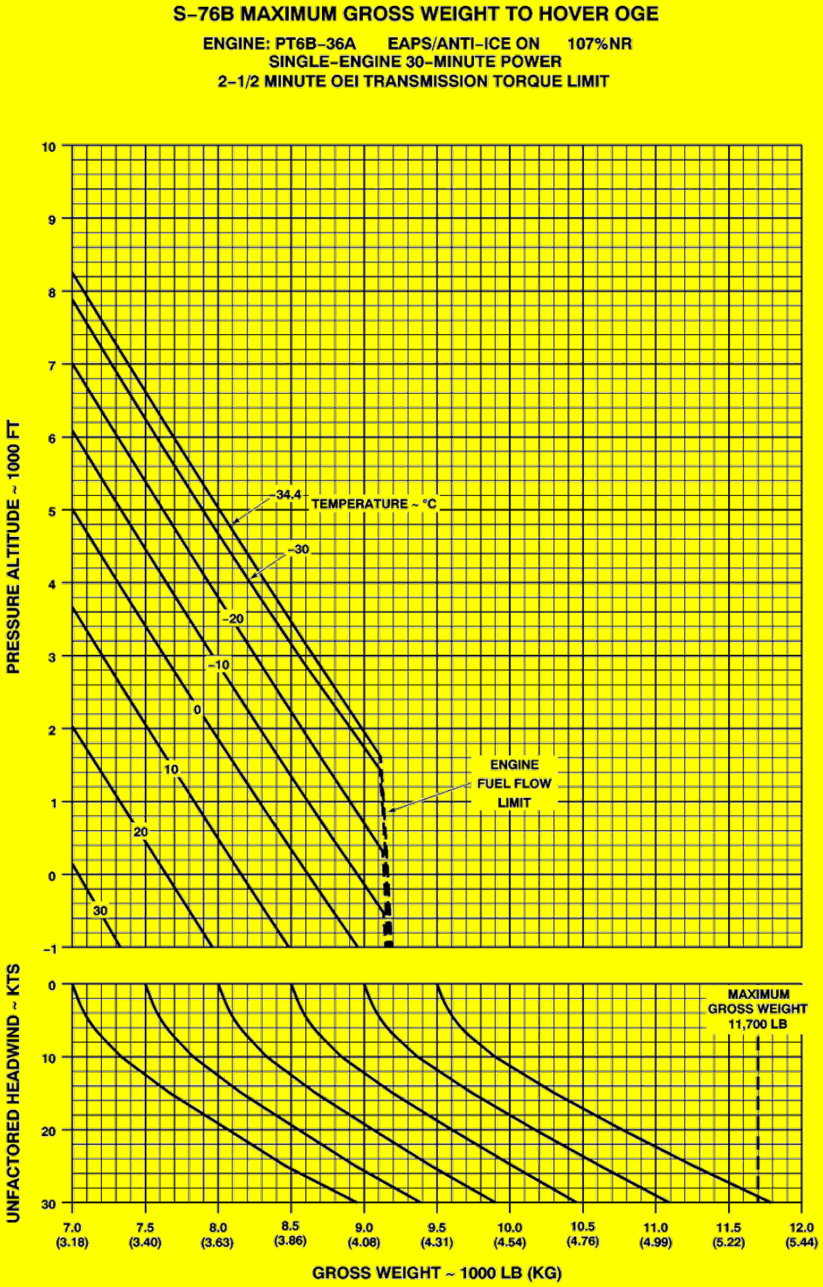

Figure 5-12. Hover Out of Ground Effect - Single-Engine - EAPS ON, 2-1/2 Minute Transmission Limit, PT6B-36A Engines

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