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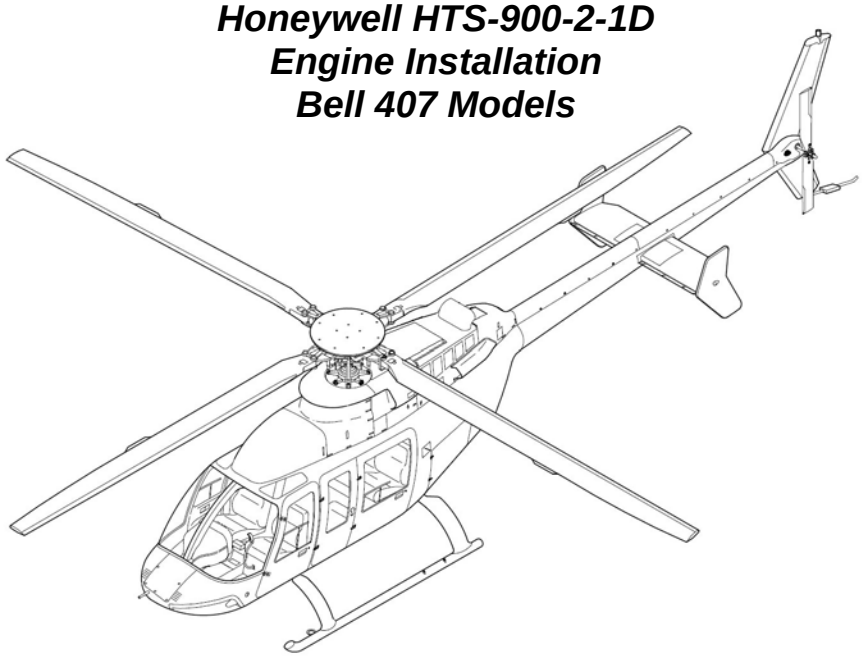
ROTORCRAFT FLIGHT MANUAL SUPPLEMENT

FMS-E407-789-1

Honeywell HTS-900-2-1D Engine Installation Bell 407 Models



Revision: **2**

Unapproved

Date: 23 JAN 2018

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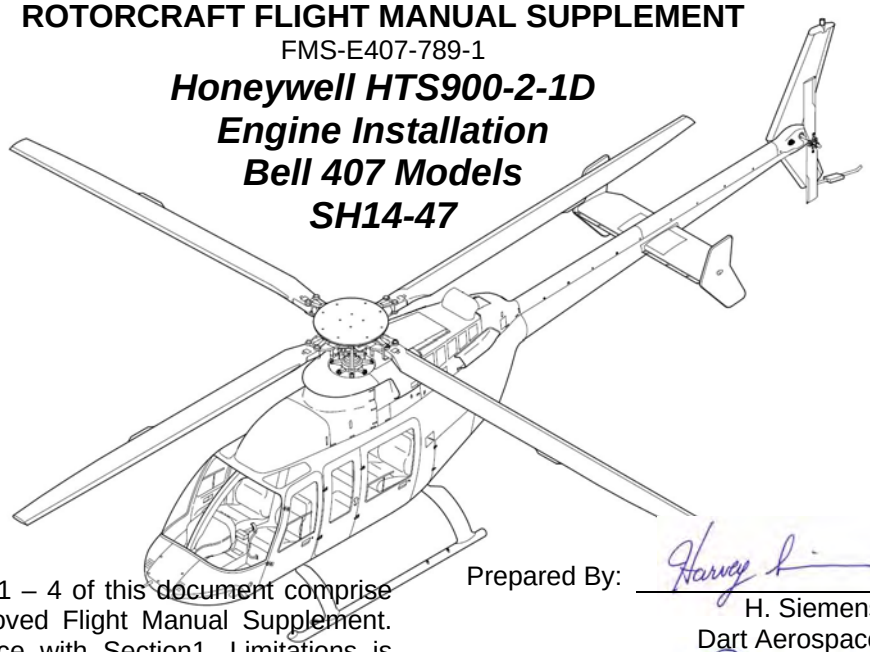
Transport Canada / Transports Canada
AIRCRAFT CERTIFICATION DIVISION
APPROVED
By
Approved Date 2018-APR-13
YY-MM-DD

ROTORCRAFT FLIGHT MANUAL SUPPLEMENT

FMS-E407-789-1

Honeywell HTS900-2-1D Engine Installation Bell 407 Models SH14-47



Sections 1 – 4 of this document comprise the Approved Flight Manual Supplement. Compliance with Section1, Limitations is mandatory. Section 5 is unapproved and is provided for information only.

Prepared By: _____
H. Siemens
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Revision: **2**
TCCA Approved Date: 23 JAN 2018

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Log of Revisions

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Revision 1 .....23 AUG 2016
Revision 2 …….23 JAN 2018

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Note

Revised text is indicated by a black vertical line. A revised page with only a vertical line next to the page number indicates that text has shifted or that non-technical correction(s) were made on that page. Insert latest revision pages; dispose of superseded pages.

General Information

This manual is a Flight Manual Supplement (FMS) to the basic Bell 407 Flight Manual, however, unlike most Flight Manual Supplements, all relevant information from the basic Bell 407 Flight Manual has been incorporated into this FMS for the convenience of the pilot. Therefore, there is no need to refer to the basic Bell 407 Flight Manual.

To indicate which sections are original from the Bell 407 Flight Manual and which sections are specific to this Flight Manual Supplement the following indication has been used.

If the section or paragraph is from the Bell 407 Flight Manual it has an ivory background.

If the section or paragraph is part of the amended information that forms the Flight Manual Supplement it has no special formatting.

Only the material altered/changed/deleted due to the modification is approved by TCCA for this STC program. The remaining material remains TCCA approved per the Bell 407 type certificate.

This FMS is required when the aircraft has been modified with the installation of a Honeywell HTS900-2-1D engine as per TCCA STC SH14-47 (FAA STC SR03496NY) and shall be in the helicopter during all operations.

This flight manual is divided into five sections as follows:

Section 1	Limitations
Section 2	Normal Procedures

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Section 3 Emergency and Malfunction Procedures
Section 4 Performance Data
Section 5 Weight and Balance Data

Sections 1 through 4 contain TCCA approved data necessary to operate the helicopter in a safe and efficient manner.

Section 5 provides weight and balance data essential for safe operation of the helicopter.

The Manufacturer's Data Manual (MD-E407-789-1) consists of additional information to be used in conjunction with this Flight Manual Supplement. This manual contains useful information to familiarize the operator with the helicopter and its systems, to facilitate ground handling and servicing and assist in flight planning and operations.

The Manufacturer's data is divided into three sections:
Section 1 – Systems Description
Section 2 – Handling and Servicing
Section 3 – Conversion Charts and Tables

Terminology

Warnings, cautions and notes are used throughout this manual to emphasize important and critical instructions and are used as follows:

WARNING

AN OPERATING PROCEDURE, PRACTICE ETC., WHICH IF NOT CORRECTLY FOLLOWED, COULD RESULT IN PERSONAL INJURY OR LOSS OF LIFE.

CAUTION

AN OPERATING PROCEDURE, PRACTICE ETC., WHICH, IF NOT STRICTLY OBSERVED, COULD RESULT IN DAMAGE TO OR DESTRUCTION OF EQUIPMENT.

NOTE

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

Use of Procedural Words

Concept of procedural word usage and intended meaning which has been adhered to in preparing this manual is as follows:

SHALL has been used only when application of a procedure is mandatory.

SHOULD has been used only when application of a procedure is recommended.

MAY and **NEED NOT** have been used only when application of a procedure is optional.

WILL has been used only to indicate futurity, never to indicate a mandatory procedure.

Abbreviations and acronyms used throughout this manual are defined as follows:

ADF	Automatic Direction Finder
AIR COND	Air Conditioner
A/F	Airframe
ALT	Altimeter
ANTI COLL LT	Anticollision Light

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ATT	Attitude
AUTO	Automatic
AUX	Auxiliary
BATT	Battery
BIT	Built In Test
BL	Buttock Line
BLO	Blower
BRT	Bright
°C	Degrees Celsius
CAUT	Caution
CAUT LT	Caution Lights
CG	Center of Gravity
CKPT	Cockpit
CM	Centimeter (s)
COMM	Communication
CONT	Control
dBA	Decibel, “0” Type Filter
DG	Directional Gyro
DOT	Department of Transport
ECS	Environmental Control System
ECU	Engine Control Unit
ELT	Emergency Locator Transmitter
ENCDG	Encoding
ENG	Engine
ENG ANTI ICE	Engine Anti Icing
°F	Degrees Fahrenheit
FADEC	Full Authority Digital Engine Control
FS	Fuselage Station
FT or ft	Foot, Feet
FWD	Forward
GEN	Generator
GOV	Governor
GPS	Global Positioning System
GPU	Ground Power Unit
GW	Gross Weight
HD	Density Altitude

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HG	Inches of Mercury
HMU	Hydromechanical Unit
HP	Pressure Altitude
HYD	Hydraulic
HV	Height-Velocity
ICAO	International Civil Aviation Organization
ICS	Intercommunication System
IFL	Inflate
IGE	In Ground Effect
IGNTR	Ignitor
IN	Inch(es)
INSTR CHK	Instrument Check
INSTR LT	Instrument Light
KCAS	Knots Calibrated Airspeed
KG or kg	Kilogram(s)
KIAS	Knots Indicated Airspeed
KTAS	Knots True Airspeed
L	Liter(s)
LB(S) or lb(s)	Pound(s)
LDG LTS	Landing Lights
L/FUEL	Left Fuel
LT	Light
MAN	Manual
MCP	Maximum Continuous Power
MD	Manufacturer's Data
MGT	Measured Gas Temperature
MM or mm	Millimeter(s)
NAV	Navigation
NG	Gas Producer RPM
NP	Power Turbine RPM
NR	Rotor RPM
OAT	Outside Air Temperature
OBS	Omni Bearing Selector
OGE	Out of Ground Effect
OVSPD	Overspeed
PART SEP	Particle Separator

PASS	Passenger(s)
PMA	Permanent Magnetic Alternator
POS LT	Position Light
PRESS	Pressure
PSI	Pounds per Square Inch
PTT	Press to Test
PWR	Power
QTY	Quantity
R/FUEL	Right Fuel
RECP	Receptacle
RLY	Relay
RPM	Revolutions per Minute
RTR	Rotor
s/w Ver	Software Version
SEL	Sound Exposure Level
SHP	Shaft Horsepower
SL	Sea Level
SPKR	Speaker
Sq	Square
SYS	System
T/R	Tail Rotor
TCA	Transport Canada Aviation
TEMP	Temperature
TRQ	Torque
VFR	Visual Flight Rules
VHF	Very High Frequency
VNE	Never Exceed Velocity
VOR	VHF Omnidirectional Range
WL	Water Line
WARN	Warning
XFR	Transfer
XMSN	Transmission
XPDR	Transponder

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Section 1

Limitations

Table of Contents

List of Figures

Section 1

Limitations

1.1 Introduction

Compliance with limitations in this section is required by appropriate operating rules.

Anytime an operating limitation is exceeded, an appropriate entry shall be made in helicopter logbook. Entry shall state which limit was exceeded, duration of time, extreme value attained, and any additional information essential in determining maintenance action required.

Intentional use of transient limits is prohibited.

Torque events shall be recorded. A torque event is defined as a takeoff or lift, internal or external load (MD-E407-789-1).

Landings shall be recorded. Run-on landings shall be recorded separately.

A run-on landing is defined as one where there is forward ground travel of the helicopter greater than 3 feet with the weight on the skids.

1.2 Basis of Certification

This helicopter is certified under FARs Parts 27 and 36, Appendix J. Additionally, it is approved under Canadian Airworthiness Manual Chapters 516 (ICAO Chapter 11) and 527, Sections 1093 (b) (1) (ii) and (iii), 1301-1, 1557 (c) (3), 1581 (e) and 1583 (h). Additionally, the certification basis of the Eagle 407HP modification includes an equivalent level of safety (ELOS) with respect to FAR 27.917 @ 27-11, FAR 27.923 @ 27-29, FAR 27.927 @ 27-23, and FAR 27.571 @ 27-26, and compliance has been demonstrated for 27.1195 at amendment 27-5.

1.3 Types of Operation

1.3.A Passengers

Basic configured helicopter is approved for seven place seating and is certified for land operations under day or night VFR non-icing conditions.

1.3.B Cargo

The maximum allowable cabin deck loading for cargo is 75 pounds per square foot (3.7 kg per 100 cm^2). The maximum allowable baggage compartment deck loading is 86 pounds per square foot (4.2 kg per 100 cm^2) with a maximum allowable weight of 250 pounds (113.4 kg). Refer to MD-E407-789-1 for cargo restraint and tie-down locations.

Cargo must be properly secured by tie-down devices to prevent the load from shifting under anticipated flight and ground operations. If the mission requires both passengers and cargo to be transported together, the cargo must be loaded and secured so that it does not obstruct passenger access to exits.

1.4 Flight Crew

Minimum flight crew consists of one pilot who shall operate helicopter from the right crew seat.

Left crew seat may be used for an additional pilot for VFR day and night operations when approved dual controls are installed.

1.5 Configuration

The Eagle 407HP modification is only eligible on Bell 407 S/N 53000 to 54299.

1.5.A Required Equipment

A functional flashlight is required for night flights.
A functional Outside Air Temperature gauge.
Bell Kit 407-706-020 for gross weight increase to 5250 lb
FADEC system software shall be version 10.0.

1.5.B Optional Equipment

The snow deflector kit (BHT-407-FMS-4) shall be installed when conducting flight operations in falling and/or blowing snow.

With the Eagle 407HP modification, Cargo Hook Kit P/N 206-706-341, Cargo Hook Retrofit Kit P/N 407-704-023 and RFMS BHT-407-FMS-5 are still applicable.

Refer to appropriate flight manual supplement(s) (FMS) for additional limitations, procedures, and performance data required for optional equipment.

1.5.C Doors Removed

NOTE

Indicated altitude may be up to 100 feet lower than actual altitude with crew door(s) removed.

Flight with any combination of doors removed is approved. With litter door removed, left passenger door shall be removed. Refer to Airspeed limitations.

With door(s) removed, determine weight change and adjust ballast if necessary. Refer to Section 5.

NOTE

All unsecured items shall be removed from cabin when any door is removed.

1.6 Weight and Center of Gravity

1.6.A Weight

Maximum approved internal GW for takeoff and landing is 5250 pounds (2381 Kg) or as shown in the IGE Controllability Chart (Fig 4-6)

Minimum GW for flight is 2650 pounds (1202 kg).
Minimum weight at fuselage station 65.0 is 170 pounds (77.1 kg).

CAUTION

LOADS THAT RESULT IN GW ABOVE THE MAXIMUM INTERNAL GW SHALL BE CARRIED ON THE CARGO HOOK AND MUST BE JETTISONABLE.

Maximum approved GW for flight with jettisonable external load is 6000 pounds (2722 kg).

1.6.B Center of Gravity

The pilot is responsible for determining weight and balance to ensure gross weight and center of gravity will remain within limits throughout each flight. Refer to Section 5 for loading tables and instructions.

NOTE

Ballast as required to maintain most forward or most aft CG within GW flight limits (Figure 1-1). For standard passenger and fuel loadings, applicable Empty Weight

Versus Center of Gravity chart in BHT-407-MM-2, Chapter 8 may be used to determine required ballast.

For longitudinal CG limits, refer to Gross Weight Longitudinal Center of Gravity Limits chart (Figure 1-1).

For lateral CG limits, refer to Gross Weight Lateral Center of Gravity Limits (Figure 1-2).

1.7 Airspeed

Basic V_{NE} is 140 KIAS, sea level to 3000 feet H_D. Decrease V_{NE} for ambient conditions in accordance with AIRSPEED LIMITATIONS Placards and Decals (Figure 1-3).

V_{NE} at 93.5 to 100% TORQUE (takeoff power) is 100 KIAS, not to exceed placarded V_{NE}.

V_{NE} is 100 KIAS or placarded V_{NE}, whichever is less, when takeoff loading is in shaded area of the Gross Weight Lateral Center of Gravity Limits (Figure 1-2).

V_{NE} is 100 KIAS with any door(s) removed, not to exceed placarded V_{NE}.

V_{NE} is 100 KIAS or placarded V_{NE}, whichever is less for steady state autorotation.

Maximum allowable airspeed for sideward and rearward flight or crosswind hover is 35 KTAS.

1.8 Altitude

Maximum operating altitude is 20,000 ft H_D or 20,000 ft H_P, whichever is lower

1.9 Maneuvering

1.9.A Prohibited Maneuvers

Aerobatic maneuvers are prohibited.

1.9.B Climb and Descent

Maximum allowable rate of climb is 2,000 feet per minute.

1.9.C Slope Landings

CAUTION

SLOPE LANDINGS HAVE BEEN DEMONSTRATED TO THE SLOPE LANDING LIMITS. OTHER CONDITIONS INCLUDING, BUT NOT LIMITED TO, WIND DIRECTION AND VELOCITY, CENTER OF GRAVITY, AND THE CONDITION OF THE SLOPE (LOOSE ROCK, SOFT MUD, SNOW, WET GRASS, ETC.) MAY LIMIT MAXIMUM SLOPE TO A VALUE LESS THAN THE PUBLISHED LIMITS.

Slope landings are limited to 10° side slopes, 10° nose up slope or 5° nose down slope.

1.10 Not Used

1.11 Ambient Temperature

Maximum sea level ambient air temperature for operation is 51.7°C (125°F) and decreases with H_P at standard lapse rate of 2°C (3.6°F) per 1000 feet.

Refer to Ambient Air Temperature Limitations chart (Figure 1-4).

Minimum ambient air temperature for operation at all altitudes is -25°C (-13°F).

ENG ANTI ICE shall be ON in visible moisture when OAT is below 5°C (40°F).

1.12 Electrical

1.12.A Generator

Continuous operation, up to 10,000 feet H_P	0 to 180 amps
Maximum continuous up to 10,000 feet H_P	180 amps
Continuous operation, above 10,000 feet H_P	0 to 170 amps
Maximum continuous above 10,000 feet H_P	170 amps
Transient, 2 minutes	180 to 300 amps
Transient, 5 seconds	300 to 400 amps

1.12.B Starter

External Power Start	Battery Start
40 seconds ON	60 seconds ON
30 seconds OFF	60 seconds OFF
40 seconds ON	60 seconds ON
30 seconds OFF	60 seconds OFF
40 seconds ON	60 seconds ON
30 minutes OFF	30 minutes OFF

NOTE

28 VDC GPU for starting shall be limited to 500 amps.

1.13 Power Plant

Honeywell HTS900-2-1D with Honeywell Service Bulletin (SB) HTS900-73-10-002

NOTE

Intentional use of any power transient is prohibited.

1.13.A Gas Producer RPM (N_g)

Continuous operation	0 to 101.1%
Takeoff power (5 minutes)	101.1 to 103.6%
Transient (15 seconds)	103.6 to 104.4%
Maximum	104.4%

See Figure 1-5

1.13.B Power Turbine RPM (N_p)

Minimum	95% rpm
Continuous operation	99 to 101% rpm
Transient (15 seconds)	101 to 115% rpm
Maximum	115% rpm

1.13.C Measured Gas Temperature (MGT)

NOTE

If an MGT overtemperature is observed during an engine start, or it is otherwise apparent that an engine overtemperature has occurred while on the ground, execute a shutdown and ventilate the engine in accordance with Section 2.5.A (Dry Motoring Procedure).

Continuous operation	0 to 900°C
Takeoff (5 minutes)	900°C to 958°C
Transient (15 seconds)	958°C to 977°C
Maximum (Start)	977°C

1.13.D Engine Torque

Continuous operation	0 to 93.5%
Maximum Continuous	93.5%
Takeoff, 5 minutes	93.5 to 100%
Transient, 5 seconds	105%

1.13.E Fuel Pressure

Minimum	8 PSI
Continuous	8 – 25 PSI
Maximum	25 PSI

1.13.F Engine Oil Pressure

Minimum below 45% NG	0 PSI
Minimum at idle	20 PSI
Minimum above 80% NG	42 PSI
Continuous Ops 45-80% NG	20-52 PSI
Continuous Ops 80-97% NG	52-90 PSI
Continuous Ops above 97% NG	90-100 PSI
5 minute limit	100-120 PSI
Maximum	120 PSI
Maximum cold start	200 PSI

1.13.G Engine Oil Temperature

Ground Idle Only	-23 – 10°C
Continuous Operation	10 – 110°C
Maximum	110°C

1.14 Transmission

1.14.A Transmission Oil Pressure

Minimum	30 PSI
Continuous operation	40 to 70 PSI
Maximum	70 PSI

1.14.B Transmission Oil Temperature

Continuous operation	15 to 110°C
Maximum	110°C

1.15 Rotor

1.15.A Rotor RPM – Power On

Continuous Operation	99 to 100%
Maximum Continuous	100%

1.15.B Rotor RPM – Power Off

Minimum	85%
Continuous Operation	85 to 107%
Maximum	107%

CAUTION

FOR AUTOROTATIVE TRAINING, MAINTAIN STEADY STATE N_R ABOVE 90%.

1.16 Hydraulic

Hydraulic fluid type MIL-H-5606 (NATO H-515) shall be used at all ambient temperatures.

1.17 Fuel and Oil

1.17.A Fuel

Fuel conforming to following specifications may be used at all ambient temperatures:

ASTM-D-6615, Jet B
MIL-DTL-5624, Grade JP-4 (NATO F-40)

Fuels conforming to following specifications are limited to ambient temperatures of -32°C (-25°F) and above:

ASTM-D-1655, Jet A or A-1
MIL-DTL-5624, Grade JP-5 (NATO F-44)
MIL-DTL-83133, Grade JP-8 (NATO F-34)

1.17.B Oil

1.17.B.1 Oil – Engine

Oil conforming MIL-PRF-23699 (NATO O-156) is limited to ambient temperatures above -40°C (-40°F).

NOTE

Refer to Honeywell Light Maintenance Manual for HTS900-2-1D and MD-E407-789-1 for approved oils and mixing of oils of different brands, types, and manufacturers.

1.17.B.2 Oil – Transmission and Tail Rotor Gearbox

NOTE

It is recommended DOD-PRF-85734 oil be used in transmission and tail rotor gearbox to maximum extent allowed by temperature limitations.

Oil conforming to DOD-PRF-85734 is limited to ambient temperatures above -40°C (-40°F).

Oil conforming to MIL-PRF-7808 (NATO O-148) is limited to ambient temperatures below -18°C (0°F).

1.18 Rotor Brake

Rotor brake application is limited to ground operation after engine has been shut down and NR has decreased to 40% or lower.

For emergency stops, apply rotor brake any time after engine is shut down.

Engine starts with rotor brake engaged are prohibited.

1.19 Not Used

1.20 Instrument Markings and Placards

Refer to Figure 1-3 for Placards and Decals.
Refer to Figure 1-5 for Instrument Markings.

Illustrations shown in Figure 1-5 are artist representations and may or may not depict actual approved instruments due to printing limitations. Instrument operating ranges and limits shall agree with those presented in this section.

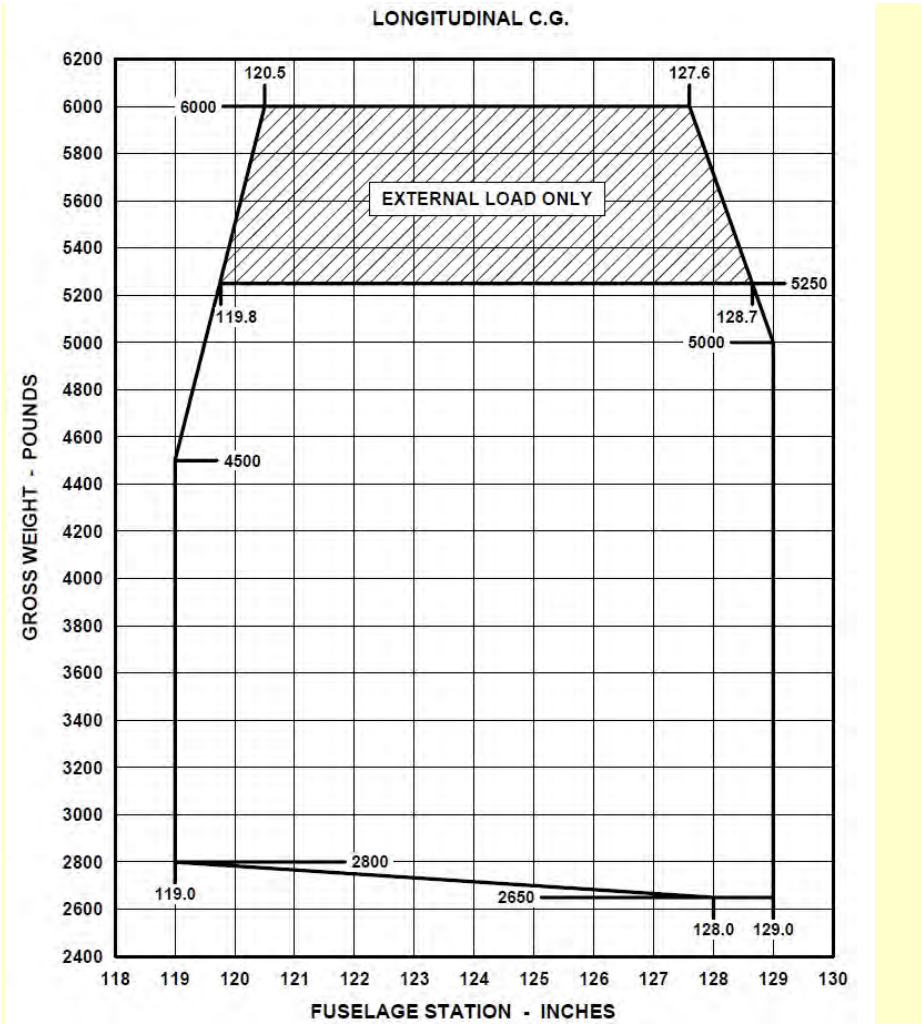


Figure 1-1 – Gross weight longitudinal center of gravity limits (Sheet 1 of 2)

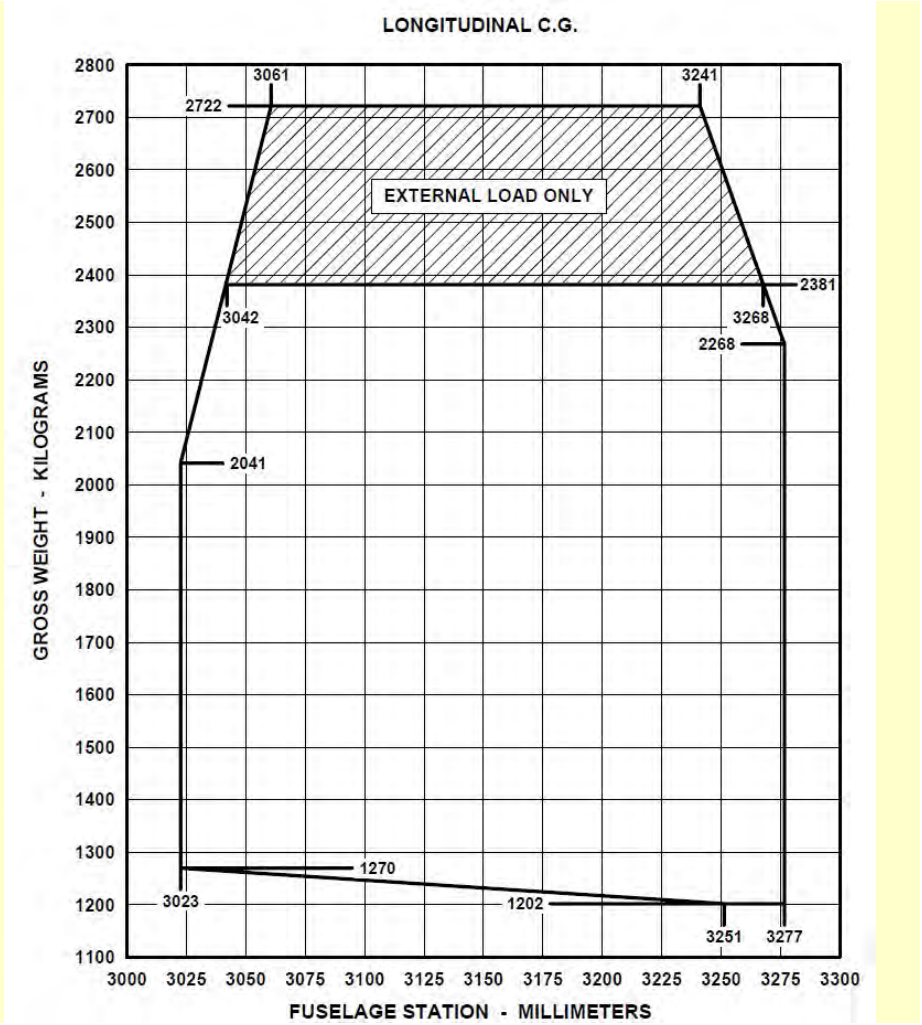


Figure 1-1 – Gross weight longitudinal center of gravity limits (Sheet 2 of 2)

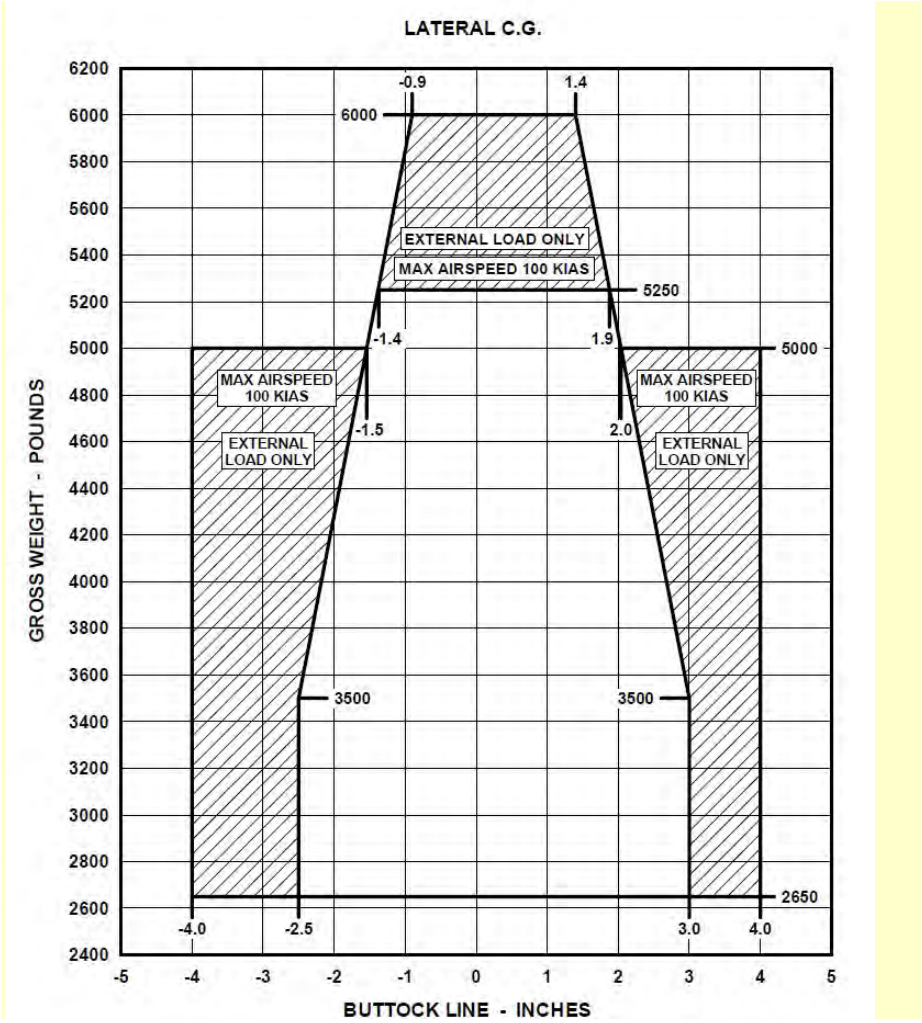


Figure 1-2 – Gross weight lateral center of gravity limits (Sheet 1 of 2)

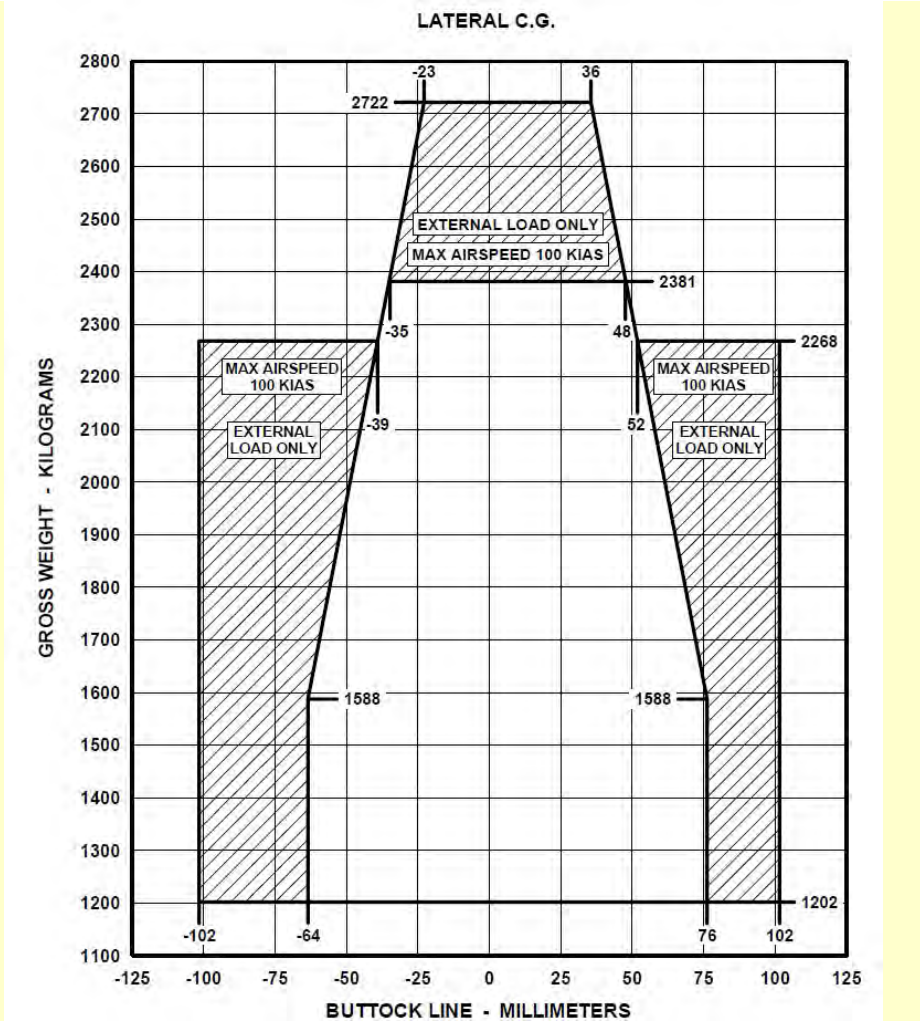


Figure 1-2 – Gross weight lateral center of gravity limits (Sheet 2 of 2)

EMERGENCY PEDAL STOP RELEASE – PULL ONLY– MAINT. RESET REQUIRED

Location: Between Pilot and Copilot Seats

407 (5250 LB) AIRSPEED LIMITATIONS – KIAS											
OAT °C	PRESSURE ALTITUDE FT x 1000										
	0	2	4	6	8	10	12	14	16	18	20
52	137										
45	139	132	123								
40	140	133	125	113							
35	140	135	128	116	104						
30	140	137	129	118	106	99					
25	140	138	131	121	109	100	93	86			
20	140	140	133	124	112	102	94	87	80		
0	140	140	140	132	123	111	101	94	86	79	
-25	140	140	140	135	130	125	114	102	95	88	80
MAXIMUM AUTOROTATION VNE 100 KIAS											

Airspeed limits shown are valid only for corresponding altitudes and temperatures. Hatched areas indicate conditions which exceed approved temperature or density altitude limitations.

Location: Forward of Overhead Console

Figure 1-3 – Placards and Decals (Sheet 1 of 4)

FUEL
FUEL SYSTEM USABLE CAPACITY
BASIC AIRCRAFT 127 U.S. GALLONS - 483 LITERS
WITH 407-706-011 AUX KIT 147 U.S. GALLONS = 559 LITERS
SEE FLIGHT MANUAL FOR APPROVED FUELS

Location: Above fuel filler cap

THIS HELICOPTER MUST BE OPERATED IN
COMPLIANCE WITH THE OPERATING LIMITATIONS
SPECIFIED IN THE APPROVED FLIGHT MANUAL

Location: Bottom and centered on instrument panel

DO NOT APPLY ROTOR BRAKE
ABOVE 40% RPM

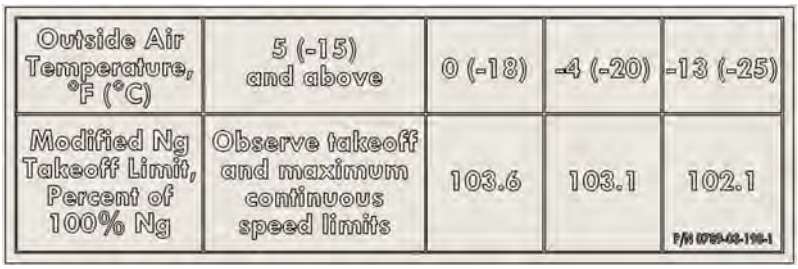
Location: Near rotor brake (if installed)

THIS AIRCRAFT IS EQUIPPED WITH A HONEYWELL HTS900-2-1D ENGINE AND IS APPROVED FOR DAY/NIGHT VFR OPERATIONS ONLY. SEE EAGLE COPTERS LTD FLIGHT MANUAL SUPPLEMENT FMS-E407-789-1 FOR MODIFIED OPERATING LIMITATIONS, PROCEDURES AND PERFORMANCE DATA.

Location: On instrument panel in clear view of pilot

Figure 1-3 – Placards and Decals (Sheet 2 of 4)

Location: Inside of baggage door

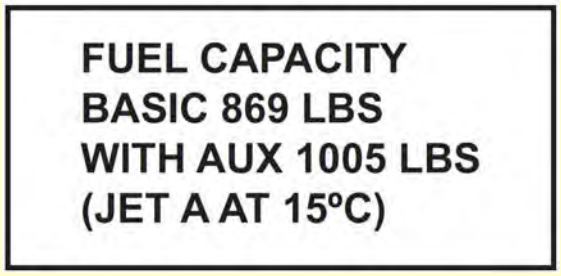


Outside Air Temperature, °F (°C)	5 (-15) and above	0 (-18)	-4 (-20)	-13 (-25)
Modified Ng Takeoff Limit, Percent of 100% Ng	Observe takeoff and maximum continuous speed limits	103.6	103.1	102.1

Location: Above pilot windshield

Location: Inside of baggage door

Figure 1-3 – Placards and Decals (Sheet 3 of 4)



Location: Instrument panel

Location: Instrument panel and passenger compartment

Figure 1-3 – Placards and Decals (Sheet 4 of 4)

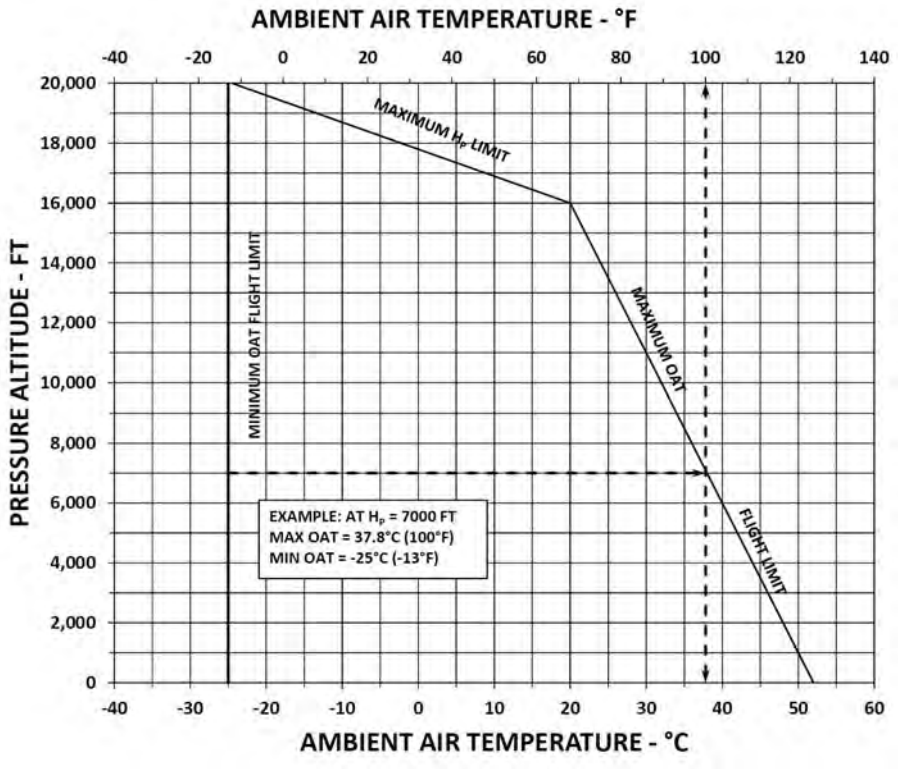


Figure 1-4 – Ambient air temperature limitations

Engine Oil Temperature and Pressure

Engine Oil Temperature

	-23 to 10°C	Minimum
	10 to 110°C	Continuous Operation
	110°C	Maximum

Engine Oil Pressure

	0 PSI (minimum below 45% Ng)
	20 PSI (minimum at idle)
	20 to 52 PSI (continuous operation 45-80% Ng)
	42 PSI (minimum above 80% Ng)
	52 to 90 PSI (continuous operation 80-97 % Ng)
	90 to 100 PSI (continuous operation above 97% Ng)
	100 to 120 PSI (5 minute limit)
	120 PSI (maximum)
	200 PSI (maximum cold start)

Transmission Oil Temperature and Pressure

Transmission Oil Temperature

	15 to 110°C	Continuous Operation
	110°C	Maximum

Transmission Oil Pressure

	30 PSI	Minimum
	40 to 70 PSI	Continuous Operation
	70 PSI	Maximum

Figure 1-5 – Instrument Markings (Sheet 1 of 5)

Gas Producer Tachometer

	0 to 101.1%	Continuous Operation
	101 to 103.6%	5 Minute Takeoff Range
	103.6 to 104.4%	Transient Limit (15 Sec)
▲	104.4%	Maximum

Torquemeter

Torquemeter

	0 to 93.5%	Continuous Operation
	93.5 to 100%	5 min Takeoff Range
	100%	Maximum

Figure 1-5 – Instrument Markings (Sheet 2 of 5)

Measured Gas Temperature (MGT)

	0 to 900°C	Continuous Operation
	900 to 958°C	5 min Takeoff Range
	958°C	Maximum for Takeoff
	977°C	Maximum for Start

Airspeed Indicator

Airspeed

	0 to 140 knots	Continuous Operation
	100 knots	Maximum for autorotation
	140 knots	Maximum

Figure 1-5 – Instrument Markings (Sheet 3 of 5)

Dual Tachometer

Power Tachometer

	95 to 99%	Transient
	99 to101%	Continuous Operations
	101 to 105%	Transient
	105%	Maximum
▲	115%	Transient limit (15 sec)

Rotor Tachometer

	85%	Minimum (Power Off)
	85 to 107%	Continuous Operation (Power Off)
	107%	Maximum (Power Off)

Fuel Quantity

Fuel Quantity (Jet A 6.8 lbs/gal)

0 LBS	All tanks empty (zero useable)
193.1 LBS	Forward tank empty
869 LBS	Forward and aft tanks full
1005 LBS	Forward, aft and auxiliary tanks full

Figure 1-5 – Instrument Markings (Sheet 4 of 5)

Fuel Pressure and Ammeter

DC Load

- 0 to 180 Amps – Continuous Operation
- 170 Amps – Maximum continuous above 10,000 ft H_P
- 180 Amps – Maximum
- 300 Amps – Maximum transient, 2 minutes
- 400 Amps – Maximum transient, 5 seconds

Fuel Pressure

8 PSI	Minimum
8 to 25 PSI	Continuous Operation
25 PSI	Maximum

Vertical Speed Indicator

Vertical Speed Indicator

- 2000 feet per minute up – Maximum

Figure 1-5 – Instrument Markings (Sheet 5 of 5)

Section 2

Normal Procedures

Table of Contents

List of Figures

Section 2

Normal Procedures

2.1 Introduction

This section contains instructions and procedures for operating the helicopter from planning stage, through actual flight conditions, to securing helicopter after landing.

Normal and standard conditions are assumed in these procedures. Pertinent data in other sections is referenced when applicable.

Instructions and procedures contained herein are written for purpose of standardization and are not applicable to all situations.

2.1.A Cold Weather Operations

Battery starts have been demonstrated to -5°C (23°F) with 34 amp-hour battery. APU starts have been demonstrated between -5°C (23°F) and -25°C (-13°F). Aircraft operation has been demonstrated down to -25°C (-13°F).

CAUTION

PERMANENT ENGINE DAMAGE MAY OCCUR IF ENGINE OIL TEMPERATURE IS NOT MAINTAINED AT OR ABOVE -10°F (-23°C) DURING COLD WEATHER STARTING.

Cold weather starting at ambient temperatures below -10°F (-23°C) requires

that engine oil temperature be maintained at or above -10°F (-23°C). This limitation applies to the engine oil pump, oil supply lines, and aircraft-mounted oil tank.

NOTE

It may be necessary to use winter covers and/or heaters in the nacelle to maintain engine oil temperature above -10°F (-23°C).

2.1.B Hot Weather Operations

CAUTION

IF HOVERING WITH A TAILWIND GREATER THAN 10 KNOTS AT OAT ABOVE 37.8°C (100°F), CLOSELY MONITOR ENGINE OIL TEMPERATURE. THE OIL TEMPERATURE MAY BE REDUCED BY EITHER TURNING INTO WIND, REDUCING POWER OR TRANSITION TO FORWARD FLIGHT.

2.2 Flight Planning

Each flight should be planned adequately to ensure safe operations and to provide pilot with data to be used during flight.

Check type of mission to be performed and destination.

Determine that helicopter has adequate performance to complete mission utilizing appropriate performance charts in Section 4.

Determine that helicopter weight and balance will be within limits during entire mission. Utilize appropriate weight and balance charts in Section 5 and limitations in Section 1.

2.3 Preflight Check

Pilot is responsible for determining whether helicopter is in condition for safe flight. Refer to Figure 2-1 for preflight check sequence.

NOTE

Preflight check is not intended to be a detailed mechanical inspection but a guide to check condition of helicopter. This check may be made as comprehensive as conditions warrant at the discretion of pilot.

All areas checked shall include a visual check for evidence of corrosion, particularly when helicopter is flown near or over salt water or in areas of high industrial emissions.

2.3.A Before Exterior Check

1. Flight planning – Completed.

2. Publications – Check.

3. GW and CG – Computed.

4. Helicopter servicing - Completed.

5. Battery – Connected.

2.3.B Exterior Check

2.3.B.1 FUSELAGE – CABIN RIGHT SIDE

WARNING

FAILURE TO REMOVE ROTOR TIEDOWNS BEFORE ENGINE STARTING MAY RESULT IN SEVERE DAMAGE AND POSSIBLE INJURY.

1. All main rotor blades — Tiedowns removed, condition.

2. Right static port — Condition.

3. Cabin doors and hinge bolts — Condition and security.

4. Windows — Condition and security.

5. Landing gear — Condition. Ground handling wheel removed.

6. Forward and aft crosstube fairings (if installed) — Secured, condition, and aligned.

2.3.B.2 FUSELAGE – CENTER RIGHT SIDE

1. Engine inlet — Condition; remove inlet covers.

2. Cabin roof, transmission cowling, and engine air inlet area — Cleaned of all debris, accumulated snow and ice; cowling secured.

3. Forward fairing — Secured.

4. Transmission — Check oil level. Check oil level within OIL LEVEL markings

5. Transmission oil cooler lines — Condition and security.

6. Transmission mounts — Condition and security.

7. Main driveshaft — Condition.

8. Access door — Secured.

9. Fuel filler cap — Visually check fuel level and cap secured.

NOTE

If helicopter is not parked on a level surface, fuel sump may not properly drain contaminants.

10. Fuel sump — Drain fuel sample as follows:

a. RIGHT and LEFT FUEL BOOST/ XFR circuit breaker switches — OFF.
b. BATT switch — BATT (on).
c. EMERG. FUEL VALVE switch — OFF.
d. FWD and AFT FUEL SUMP drain buttons — Press, drain sample, then release.

11. Airframe fuel filter — Drain and check before first flight of day as follows:

a. RIGHT and LEFT FUEL BOOST/ XFR circuit breaker switches — LEFT and RIGHT (on).
b. EMERG. FUEL VALVE switch — ON.
c. Fuel filter drain valve — Open, drain sample, then close.

12. Airframe Fuel filter test switch — Press and check A/F FUEL FILTER caution light illuminates. Release switch and check light extinguishes.

13. EMERG. FUEL VALVE switch — ON.

14. LEFT and RIGHT FUEL BOOST/XFR circuit breaker switches — OFF.

15. BATT switch — OFF.

16. Power plant area:

a. Main driveshaft aft flexure — Condition.
b. Engine and accessories — Condition, security of attachments, evidence of oil leakage, cracks or damage.
c. Engine mounts — Condition and security.
d. Engine fuel pump — Security and condition, evidence of leakage.
e. FMU — Security and condition, evidence of leakage.
f. Combustion Housing and exhaust duct – Condition and security, foreign matter, cracks, damage, dryness, hot spots, buckling. Remove covers and plugs.
g. Oil Filter Bypass Indicator – Check retracted
h. Hoses and tubing — Chafing, security, condition, verify no leaks.
i. Oil and Fuel drains – Clear.
j. Wire harness – Chafing, security, condition.
k. Power Turbine Rotor – Check for foreign matter and damage.
l. Oil cooler blower inlet duct and screen — Clear obstructions, condition and security.

17. Engine cowl — Secured.

18. Oil tank — Leaks, security, cap secured and correct quantity.

19. Access door — Secured.

20. Aft and upper fairing — Secured.

2.3.B.3 FUSELAGE – AFT RIGHT SIDE

1. Fuselage — Condition.

2. Tail rotor driveshaft cover — Condition and security.

3. Tailboom — Condition.

4. Horizontal stabilizer area:
   a. Horizontal stabilizer — General condition and security of attachment.

b. Position light — Condition and security.
c. Forward and aft section of right upper stabilizer support to tailboom area — Condition of tailboom.

2.3.B.4 FUSELAGE – FULL AFT

1. Vertical fin — Condition.

2. Tail rotor guard — Condition and security.

3. Anticollision light — Condition and security of lens.

4. Aft position light — Condition.

5. Tail rotor gearbox — Oil level, leaks and security.

6. Tail rotor — Tiedown removed, condition and free movement.

7. Tail rotor controls — Condition and security.

8. Tail rotor blades:
   a. General condition.
   b. Tip block — Security and seal integrity.
   c. Internal blade root — Clear of snow and ice.

9. Tail rotor yoke — Condition, evidence of static stop contact damage (deformed static stop yield indicator).

2.3.B.5 FUSELAGE – AFT LEFT SIDE

1. Tailboom — Condition.

2. Tail rotor driveshaft cover — Condition and security.

3. Horizontal stabilizer area:
   a. Horizontal stabilizer — General condition and security of

attachment.
b. Position light — Condition and security.
c. Forward and aft section of left upper stabilizer support to tailboom area — Condition of tailboom.

4. Fuselage — Condition.

5. Forward tail rotor driveshaft coupling — Condition of splined adapter.

6. Oil cooler blower shaft hanger bearings — Evidence of grease leakage and overheating.

7. Oil cooler blower — Clear of obstructions and condition.

8. Oil cooler — Condition and leaks.

9. Oil cooler blower access door — Secured.

10. Oil tank sight glass — Check oil level.

11. Aft and upper fairing — Secured.

12. Baggage compartment — Cargo tied down, door secured.

13. Exhaust cover — Removed.

14. Power plant area:
a. Engine and accessories — Condition, security of attachments, evidence of oil leakage, cracks or damage.
b. Engine mounts — Condition and security.
c. Combustion housing and Exhaust duct — Condition and security, foreign matter, cracks, damage, dryness, hot spots, buckling.
d. Evidence of fuel and oil leaks.
e. Fuel filter bypass indicator — Check retracted.
f. Hoses and tubing for chafing and condition, verify no leaks.
g. Pneumatic lines — Condition and security.

h. Tail rotor driveshaft — Condition of splines and couplings.
i. Air induction diffuser duct — Condition and security.
j. Oil and Fuel Drains – Clear
k. Wire harness – Chafing, security, condition.
l. Power Turbine Rotor – Check for foreign matter and damage.
m. Rotor brake disc and caliper — Condition, security of attachment and leakage. Ensure brake pads are retracted from brake disc.
n. Engine cowling — Secured.
o. Oil cooler blower inlet duct and screen — Clear obstructions, condition and security.
p. Air induction cowling — Secured.
q. Cabin roof, transmission cowling, engine air inlet area, and plenum — Clear of all debris, accumulated snow and ice; cowling secured.

15. Transmission area:
a. Transmission mounts — Condition and security of elastomeric mounts.
b. Transmission oil filter — Ensure bypass indicator not extended.
c. Main driveshaft — Condition.
d. Transducers and pressure lines — Condition and security.
e. Access door — Secured.

2.3.B.6 FUSELAGE – CABIN ROOF

1. Main rotor dampers and fairing — Condition and security.

2. Main rotor hub, yoke and frahm — Condition and security.

3. Main rotor blade and skin — Condition.

4. Pitch horn bearing — Wear and security.

5. Main rotor pitch links — Condition and security of attachment bolts and locking hardware.

6. Swashplate assembly — Condition, security of attached controls, and boot

condition.

7. Control linkages to swashplate — Condition, security of attachment bolts and locking hardware.

8. Control tube hydraulics-off balance springs — Condition and security.

9. Hydraulic reservoir filler cap — Closed and locked.

10. Hydraulic system filters — Pop up indicators retracted.

11. Hydraulic actuators and lines — Condition, security, interference, leakage.

12. ECU – Condition and security.

2.3.B.7 FUSELAGE – CABIN LEFT SIDE

1. Forward fairing and access door — Secured.

2. Cabin doors and hinge bolts — Condition and security.

3. Windows — Condition and security.

4. Hydraulic reservoir — Check fluid level.

5. Landing gear — Condition and ground handling wheel removed.

6. Forward and aft crosstube fairings (if installed) — Secured, condition, and aligned.

7. Left static port — Condition.

2.3.B.8 FUSELAGE – FRONT

1. Exterior surfaces — Condition.

2. Windshield — Condition and cleanliness.

3. Battery and vent lines — Condition and security.

4. HOUR METER circuit breaker — In.

5. Battery access door — Secured.

6. Pitot tube — Cover removed, clear of obstructions.

7. External power door — Condition and security.

8. Landing light lamps — Condition.

9. Antennas — Condition and security.

2.4 Interior and Prestart Check

1. Cabin interior — Clean, equipment secured.

2. Fire extinguisher — Installed and secured.

3. Cabin loading — Maintain CG within limits.

4. Passenger seat belts — Secured.

5. Copilot seat belt — Secured (if solo).

6. Doors — Secured.

7. Emergency Pedal Stop Release – Down and witness wired

8. Throttle — Closed.

9. LDG LTS switch — OFF.

10. Communications switches — Set.

11. Emergency Fuel Valve - ON

12. Altimeter — Set.

13. Instruments — Correct indications.

14. Overhead switches — Set:
    a. BATT switch — OFF.
    b. GEN switch — OFF.
    c. PART SEP switch (if installed) — OFF.
    d. ANTI COLL LT switch — ANTI COLL LT (on).
    e. HYD SYS switch — HYD SYS (on).
    f. CABIN LT/PASS switch — OFF.
    g. POS LT switch — As desired.
    h. DEFOG switch — OFF.
    i. PITOT HEATER switch — OFF.
    j. ENG ANTI ICE switch — OFF.
    k. AVIONICS MASTER switch — OFF.
    l. HEATER switch (if installed) — OFF.
    m. INSTR LT rheostat — OFF.

15. Overhead circuit breaker switches — OFF.

16. Overhead circuit breakers — In.

17. Rotor brake handle — Up and latched.

CAUTION

28 VDC EXTERNAL POWER SOURCE SHALL BE 500 AMPERES OR LESS TO REDUCE RISK OF STARTER DAMAGE FROM OVERHEATING.

18. EXTERNAL POWER — Connected (if used).

19. BATT switch — ON for battery start, ON for GPU start, OFF for battery cart start. Observe the following:

a. Low rotor rpm, engine out and FADEC fail audio horn activated.
b. MGT, Fuel Qty, Tq and Ng Indicators
   - Display 8.8.8.8.
   - Display software version
   - Display 0.0
c. MGT, Tq and Ng Indicators
   - Display 0 – indicates no exceedance
   - Display 0E – indicates an exceedance
   - Display details of exceedance
d. MGT, Ng Indicators
   - Display last flight cycle count for power turbine and gas generator respectively.

NOTE

Np/Nr Fuel Pressure, Ammeter, Xmsn Oil Pressure and Engine Oil pressure and temperature needles move from park position to 0.0 or ambient.

NOTE

As part of the instrument self-test FADEC warning/caution lights/horn will cycle on and off.

NOTE

After instrument build-in test, no engine related caution/warning should be annunciated.

20. HORN MUTE button — Press to mute.

21. Caution lights — ENG OUT, XMSN OIL PRESS, RPM, HYDRAULIC SYSTEM, GEN FAIL, L/FUEL BOOST, R/FUEL BOOST, L/FUEL XFR, R/FUEL XFR and ENG OIL PRESS will be illuminated.

NOTE

L/FUEL XFR and R/FUEL XFR will not be illuminated when forward fuel tank is empty.

22. PEDAL STOP PTT switch annunciator:

Pedals — Centered.
Press — Verify PEDAL STOP caution and ENGAGED annunciator illuminated and left pedal travel restricted.
Release — Verify PEDAL STOP caution and ENGAGED annunciator extinguished and both pedals travel unrestricted.

23. Flight controls — Loosen frictions; check travel and verify CYCLIC CENTERING light operation; position for start. Tighten friction as desired.

24. Throttle — Check freedom of travel and appropriate operation at OFF, IDLE, and FLY positions. Return throttle to OFF position.

NOTE

With INSTR LT rheostat on and CAUT LT switch positioned to DIM, caution lights are dimmed to a fixed intensity and cannot be adjusted by INSTR LT rheostat.

25. INSTR LT rheostat — As desired.

26. CAUT LT switch — As desired.

27. FUEL BOOST/XFR circuit breaker switches — LEFT (on) and RIGHT (on) and verify all boost and transfer caution lights extinguish.

CAUTION

IT IS REQUIRED TO HAVE THE BOOST PUMPS ON FOR ALL PHASES OF FLIGHT.

28. FUEL pressure — Check.

29. CAUTION LT TEST button — Press to test.

30. LCD TEST button — Press to test, if desired.

31. FADEC FAIL TEST button — Press to test.

32. FIRE DETECT TEST button – Press to test.

33. CHIP DETECTOR TEST button – Press to test.

34. EMERG FUEL VALVE switch — ON, guard closed, FUEL VALVE light illuminates then extinguishes.

35. FUEL QTY — Check TOTAL and FWD tank quantity.

36. OAT/VOLTS display — Check OAT and select VOLTS.

2.5 Engine Start

CAUTION

ANY ATTEMPT TO START ENGINE WHEN VOLTAGE IS BELOW 24 VOLTS MAY RESULT IN A HOT START. MONITOR FOR FADEC FAILURE. IF FADEC FAILS (FADEC FAIL WARNING LIGHT), ABORT START BY ROLLING THROTTLE TO OFF AND ENGAGE STARTER TO REDUCE MGT.

CAUTION

ABORT START IMMEDIATELY (SEE SECTION 3.3.L) IF ANY OF THE FOLLOWING EVENTS OCCURS:
1) Ng STOPS INCREASING PRIOR TO IDLE RPM.
2) ANY UNUSUAL NOISE OR VIBRATION OCCURS.
3) THE ECU FAILS.
4) THE ROTORCRAFT DC ELECTRICAL POWER FAILS OR DROPS BELOW 18 VDC.

The following normal start procedure is applicable for engine starts to IDLE or FLY. Ground idle is approximately 58 to 64 percent Ng. Starts accomplished with the engine throttle in the FLY position will result in engine acceleration up to the normal operating 100% Np/Nr.

NOTE

ECU power-up testing will be terminated if the engine start sequence is initiated prior to the completion of BIT testing. If power-up testing is interrupted, FADEC warnings, cautions, and advisories will not be displayed.

NOTE

No cockpit indication of Ng is displayed until Ng is greater than 5 percent, and no cockpit indication of Np is displayed until Np is greater than 5 percent.

1. Collective — Minimum pitch

2. Rotorcraft electrical power — ON

NOTE

Allow 20 seconds for the ECU to complete its power-up testing prior to proceeding. Observe warnings, cautions, and advisories panel and verify that no engine indications are illuminated.

3. Anti-ice switch — OFF

4. Both Fuel pump switches — ON

5. Bleed air switch — OFF

6. Generator switch — OFF

7. Cyclic and pedals — Centered and CYCLIC CENTERING light extinguished.

8. Throttle — IDLE or FLY

9. Warning, caution, advisory panel — NORMAL No warnings or cautions

10. Starter switch — Hold for > 0.5 seconds (Activate within 60 seconds of PLA movement.)

11. Warning, caution, advisory panel — START

After this sequence has been completed, the engine ECU will provide automatic sequencing and control of the engine starter/ignition relay, providing electrical power to the starter during the engine starting cycle. Engine fuel flow is automatically regulated to control the Ng rate of acceleration and to maintain turbine temperature within limits. The engine should accelerate to IDLE or FLY, as selected, and stabilize within 1 minute.

12. Ng, Np, MGT, OP, and OT – NORMAL

NOTE

The ECU will automatically cut off fuel flow:
(a) in the event of a failure that results in turbine overtemperature during a start attempt,
(b) if Ng does not reach 10 percent in 10 seconds,
(c) if light-off does not occur within 35 seconds, or
(d) if idle speeds are not achieved in 60 seconds.

NOTE

To reinitiate the start sequence, it will be necessary to terminate the start sequence by returning the engine PLA to OFF.

13. Warning, caution, advisory panel – NORMAL

NOTE

Dispatching the aircraft with any FADEC system faults illuminated is not permitted, except as noted in ICA-E407-789 Chapter 76-00-00 paragraph 76.4.3.

14. Engine and transmission oil pressures — Check.

NOTE

If dual controls are installed, guard throttle to prevent inadvertent manipulation from co-pilot position.

15. BATT switch — ON (if applicable).

NOTE

Ensure BATT switch is positioned to ON prior to disconnecting external power source.

16. EXTERNAL POWER — Disconnect and close door (if applicable).

17. GEN switch — GEN (on); observe GEN FAIL light extinguishes.

NOTE

Turn generator OFF if ammeter indication drops to zero amps after an initial full scale indication. One reset is allowed. RESET generator and then turn generator back ON.

18. Voltmeter — 28.5 ±0.5 volts.

19. FADEC Reset – Test fluctuations on gauges

20. FLIGHT INSTR circuit breaker switches (3) (if installed) — DG, ATT and TURN (on).

NOTE

If dual controls are installed, guard throttle to prevent inadvertent manipulation from co-pilot position.

2.5.A Dry Motoring Run – No Ignition

The following procedure is used for checks that require core engine rotation but do not require fuel flow.

1. Inlet and exhaust – Clear

2. Oil quantity – Adequate

3. Collective – Minimum pitch

4. Rotorcraft electrical power – ON

5. Ignition circuit breaker – Pulled

6. Starter switch – OFF

7. Throttle – OFF

8. Fuel pump switch – ON (for fuel pump lubrication)

9. Starter switch – START (switch held)

10. Ng and Np rpm – Indicating

11. Oil pressure – Positive indication

NOTE

A 15- to 30-second cranking period is recommended for ventilating the engine immediately after a hot shutdown or a start abort due to overtemperature. Longer cranking is acceptable for ventilating the engine depending on starter duty cycle and available power. Additional ventilation motoring cycles spaced 2 to 3 minutes apart are recommended if not limited by starter duty cycle and available power.

12. Starter switch – OFF

13. Fuel Pump switch – OFF (after coast down)

2.5.B Wet Motoring Run – No Ignition

The following procedure is used for checks requiring core engine rotation and fuel flow but no ignition. Failure to disconnect the fuel manifold before performing a wet motoring run may result in an over-temperature event or engine fire.

1. Inlet and exhaust – Clear

2. Oil quantity – Adequate

3. Collective – Minimum pitch

4. Rotorcraft electrical power – ON

5. Ignition circuit breaker – Pulled

6. Starter switch – OFF

7. Throttle – IDLE

8. Both Fuel pump switches – ON

9. Starter switch – START (switch held)

10. Ng and Np rpm – Indicating

11. Oil pressure – Positive indication

12. Fuel Flow – Positive indication

The engine may be motored with fuel ON for 15 seconds. Observe starter limits.

13. Throttle – OFF

Check that fuel flow drops to zero, ensuring positive fuel shutoff.

Continue motoring for 1 minute to purge the engine of residual fuel. Observe starter duty cycle.

14. Starter switch – OFF

15. Both Fuel pump switches – OFF (after coast down)

2.6 Systems Check

2.6.A Preliminary Hydraulic Systems Check

NOTE

Uncommanded control movement or motoring with hydraulic system off may indicate hydraulic system

malfunction.

1. HYD SYS switch — OFF.

2. HYDRAULIC SYSTEM caution light — Illuminated.

3. HYD SYS switch — HYD SYS (on).

4. HYDRAULIC SYSTEM caution light — Extinguished.

2.6.B Deleted

2.6.C Engine Run-Up

1. Throttle — Increase smoothly to FLY detent position while monitoring torque below 40%. Check RPM warning light extinguished at 95% NR.

2. NR and NP needles — Check matching and indicating 100%.

NOTE

Overhead circuit breakers highlighted with arrow graphic; are powered through AVIONICS MASTER switch.

3. AVIONICS MASTER switch — AVIONICS MASTER (on).

4. ELT (if installed) — Check for inadvertent transmission.

5. Flight controls — Check freedom with minimum friction.

6. ENG ANTI ICE switch — ENG ANTI ICE (on); check for MGT increase and illumination of ENGINE ANTI-ICE light.

NOTE

If temperature is below 5°C (40°F) and visible moisture is present, ENG ANTI ICE shall be on.

7. ENG ANTI ICE switch — OFF; check MGT returns to normal and ENGINE ANTI-ICE light extinguishes; then ENG ANTI ICE (on) if required.

8. PITOT HEATER — Confirm operation (increase in ammeter load).

2.6.D Hydraulic Systems Check

NOTE

Hydraulic systems check is to determine proper operation of hydraulic actuators for each flight control system. If abnormal forces, unequal forces, control binding, or motoring are encountered, it may be an indication of a malfunctioning flight control actuator.

1. Collective — Full down.

2. NR — 100% RPM.

3. HYD SYS switch — OFF.

4. HYDRAULIC SYSTEM caution light — Illuminated.

5. Cyclic — Centered.

6. Cyclic control — Check normal operation by moving cyclic forward and aft, then left and right (approximately 1 inch). Center cyclic.

7. Collective — Check normal operation by increasing collective slightly (1 to 2 inches). Repeat two to three times as required. Return to full down position.

8. Pedals — Check normal operation by displacing pedals slightly (1 inch).

9. HYD SYS switch — HYD SYS (on).

10. HYDRAULIC SYSTEM caution light — Extinguished.

11. Cyclic and collective friction — Set as desired.

2.7 Before Takeoff

1. ENG ANTI ICE switch — As required.

2. PITOT HEATER switch — As required.

3. Light switches — As required.

4. INSTR LT rheostat — As desired.

NOTE

For night flight, it is recommended to point the map light at the flight instruments and set to a low intensity. Sufficient night lighting will be provided in the event of an instrument lighting failure.

5. Radio(s) — Check as required.

6. Flight controls — Position and adjust frictions for takeoff.

CAUTION

FAILURE TO POSITION AND MAINTAIN THROTTLE IN

FLY DETENT POSITION PRIOR TO TAKEOFF AND DURING NORMAL FLIGHT OPERATIONS CAN LIMIT AVAILABLE ENGINE POWER.

NOTE

The time required for moving collective from takeoff to the no-load position must be greater than 0.5 seconds. Collective movements of a shorter duration may result in Np overspeed.

NOTE

Dispatching the aircraft with any FADEC system faults is not permitted, except as noted in ICA-E407-789 Chapter 76-00-00 paragraph 76.4.3.

7. Throttle — Open to FLY detent position. Check 99 to 100% NR/NP.

8. Engine, transmission, and electrical instruments — Within limits.

9. Flight and navigation instruments — Check.

10. FUEL QTY — Note indication.

11. FUEL QTY FWD TANK button — Press, note fuel remaining in forward cell.

CAUTION

IN REARWARDS FLIGHT (OR WITH WIND UP THE TAIL) BETWEEN 135 deg AND 225 deg AZIMUTHS, THERE IS A POSSIBILITY OF GAS RE-INGESTION WHICH COULD RESULT IN A SUDDEN RISE IN MGT AND/OR NG.

2.8 Takeoff

1. Rear facing seat headrests — Adjusted to proper position.

NOTE

During takeoffs disregard CYCLIC CENTERING light and position cyclic as required.

2. Collective — Increase to hover.

3. Directional control — As required to maintain desired heading.

4. Cyclic — Apply as required to accelerate smoothly.

5. Increase collective, up to 5% torque above hover power, to obtain desired rate of climb and airspeed. Once clear of the HV diagram shaded areas, adjust power and airspeed as desired.

6. PEDAL STOP PTT switch — Check ENGAGED annunciator illuminated above 55 ±5 KIAS.

2.9 In-Flight Operations

1. AIRSPEED — As desired (not to exceed VNE at flight altitude).

CAUTION

AT HIGH POWER AND HIGH AIRSPEED, CYCLIC ONLY ACCELERATIONS AND MANEUVERING MAY SIGNIFICANTLY INCREASE MGT AND TORQUE WITH

NO COLLECTIVE INPUT. THIS INCREASE IS MORE RAPID AT LOWER OAT.

NOTE

Pilot shall keep feet on tail rotor pedals at all times. Do not press PEDAL STOP PTT switch in flight.

2. PEDAL STOP PTT switch — Check ENGAGED annunciator illuminated above 55 ±5 KIAS.

3. ENG ANTI ICE and PITOT HEATER switches — ENG ANTI ICE and PITOT HEATER switches on in visible moisture when ambient temperature is at or below 5°C (40°F).

4. Altimeter — Within limits.

5. FUEL QTY FWD TANK button — Press, note forward fuel tank indication.

NOTE

Full forward fuel tank quantity (approximately 256.0 pounds) will be indicated at approximately 770.0 pounds or greater total fuel. Fuel transfer will be complete at approximately 193.1 pounds total fuel.

2.10 Descent and Landing

NOTE

Large reductions in collective pitch at heavy GW may permit NR to increase independent of NP (needles split). Main rotor may be reengaged with a smooth increase in collective pitch.

1. Rear facing seat headrests — Adjusted to proper position.

2. Flight controls — Adjust friction as desired.

3. Throttle — Fly detent position. Check 99 to 100% NP.

4. Flight path — As required for type of approach.

5. ENG ANTI ICE — As required.

6. LDG LTS switch — As desired.

NOTE

During run-on or slope landings, disregard CYCLIC CENTERING light and position cyclic as required. After landing is completed and collective is full down, reposition cyclic so that CYCLIC CENTERING light is extinguished.

7. PEDAL STOP PTT switch — Check ENGAGED annunciator extinguished below 50 ±5 KIAS.

2.11 Engine Shutdown

1. Collective — Full down.

2. Cyclic and pedals — Centered and CYCLIC CENTERING light extinguished.

3. Cyclic friction — Increase so that cyclic maintains centered position.

4. LDG LTS switch — OFF.

5. Throttle — IDLE. Check RPM warning light illuminated and audio on at

95% NR.

NOTE

If dual controls are installed, guard throttle to prevent inadvertent manipulation from co-pilot position.

6. HORN MUTE button — Press to mute.

7. MGT — Stabilize at idle for 2 minutes.

9. ENG ANTI ICE switch — OFF.

10. FLIGHT INSTR circuit breakers switches (if installed) — OFF.

11. FUEL BOOST/XFR LEFT circuit breaker switch — OFF.

NOTE

Left fuel boost and transfer pumps will continue to operate until either LEFT FUEL BOOST/XFR circuit breaker switch (highlighted with yellow border) or EMERG FUEL VALVE switch is positioned to OFF. These pumps operate directly from battery and will not be deactivated when BATT switch is OFF. Battery power will be depleted if both switches remain on.

12. EMERG FUEL VALVE – ON.

13. ELT (if installed) — Check for inadvertent transmission.

14. AVIONICS MASTER switch — OFF.

15. GEN switch — OFF.

16. IDLE REL switch — Press and hold.

17. Throttle — OFF; Check MGT and NG decreasing, ENGINE OUT warning light illuminated and audio on at 55 ±1%.

18. HORN MUTE button — Press to mute.

NOTE

Overspeed system including hydromechanical and electromechanical parts in the FMU and the electrical parts of the ECU, is checked at every normal shutdown, thus not requiring an Overspeed Test.

19. Dry motor the engine for 10 seconds after Ng indicates zero.

CAUTION

AVOID RAPID ENGAGEMENT OF ROTOR BRAKE IF HELICOPTER IS ON ICE OR OTHER SLIPPERY OR LOOSE SURFACE TO PREVENT ROTATION OF HELICOPTER.

20. Rotor brake — Apply full rotor brake at or below 40% NR. Return rotor brake handle to stowed position just prior to main rotor stopping.

CAUTION

DO NOT INCREASE COLLECTIVE OR APPLY LEFT TAIL ROTOR PEDAL TO SLOW ROTOR DURING COASTDOWN.

21. Pilot — Remain on flight controls until rotor has come to a complete stop.

22. ANTI COLL LT switch — As desired.

23. All remaining overhead switches, except HYD SYS switch — OFF.

24. Below 5%Ng – Record power turbine cycle indicated by MGT indicator

25. Below 5% Ng- Record gas producer cycle indicated by Ng indicator.

26. Check for FADEC MAINT or FADEC DEGRADED light.

CAUTION

APPLICABLE MAINTENANCE ACTION MUST BE PERFORMED PRIOR TO FURTHER FLIGHT IF A **FADEC MAINT** LIGHT OR **FADEC DEGRADED** LIGHT HAS ILLUMINATED DURING THE PREVIOUS FLIGHT OR ON ENGINE SHUTDOWN.

WARNING

ENSURE ENGINE ROTATION HAS COMPLETELY STOPPED PRIOR TO POSITIONING BATT SWITCH TO *OFF*.

27. BATT switch — OFF, with NG at 0%.

NOTE

If shutting down at, or refueling to, between approximately 193.1 to 211.1 pounds total fuel quantity, up to 18.0 pounds of fuel may remain in forward fuel cell as unusable.

2.12 Postflight Check

If any of following conditions exist:

- Thunderstorms are in local area or forecasted.
- Winds in excess of 35 knots or a gust spread of 15 knots exists or is forecasted.
- Helicopter is parked within 150 feet of hovering or taxiing aircraft that are in excess of basic GW of helicopter.
- Helicopter to be left unattended.

Perform following:

1) Install main rotor blade tie-downs.
2) Secure tail rotor loosely to tailboom with tie-down strap to prevent excessive flapping.
3) Install exhaust cover, engine inlet protective plugs and pitot cover.

NOTE

Refer to MD-E407-789-1 for additional tie-down data.

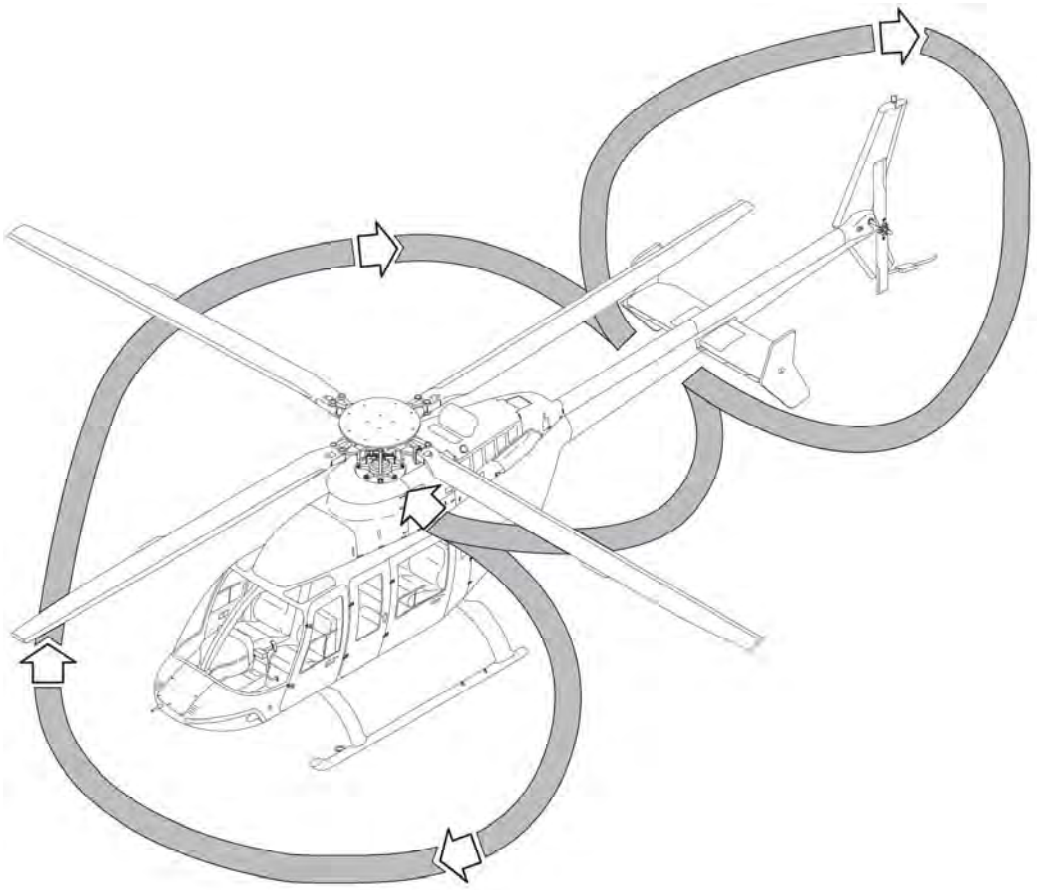


Figure 2-1 – Preflight Check Sequence

Section 3

Emergency/Malfunction Procedures

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Section 3

Emergency/Malfunction Procedures

3.1 Introduction

Following procedures contain indications of failures or malfunctions which affect safety of crew, helicopter, ground personnel or property; use of emergency features of primary and backup systems; and appropriate warnings, cautions, and explanatory notes. Tables 3-1 and 3-2 list fault conditions and corrective actions for warning lights and caution/advisory lights respectively.

NOTE

All corrective action procedures listed herein assume pilot gives first priority to helicopter control and a safe flight path. A tripped circuit breaker should not be reset in flight unless deemed necessary for safe completion of the flight. If a tripped circuit breaker is deemed necessary for safe completion of the flight, it should only be reset one time.

Helicopter should not be operated following any precautionary landing until cause of malfunction has been determined and corrective maintenance action taken.

3.2 Definitions

Following terms indicate degree of urgency in landing helicopter.

LAND AS SOON AS POSSIBLE	Land without delay at nearest suitable area (i.e., open field) at which a safe approach and landing is reasonably assured.

LAND AS SOON AS PRACTICAL	Landing site and duration of flight are at discretion of pilot. Extended flight beyond nearest approved landing area is not recommended.

Following terms are used to describe operating condition of a system, subsystem, assembly, or component.

Affected	Fails to operate in intended or usual manner.
Normal	Operates in intended or usual manner.

3.3 Engine

3.3.A Engine Failure

3.3.A.1 Engine Failure – Hovering

Indications:

1. Left Yaw
2. ENGINE OUT and RPM warning lights illuminated
3. Engine instruments indicate power loss.
4. Engine out audio activated when NG drops below 55%.
5. NR decreasing with RPM warning light and audio on when NR drops below 95%.

Procedure:

1. Maintain heading and attitude control.
2. Collective – Adjust to control N_R and rate of descent.
   Increase prior to ground contact to cushion landing.

NOTE

Amplitude of collective movement is a function of height above ground. Any forward airspeed will aid in ability to cushion landing.

3. Deleted
4. Complete helicopter shut down.

3.3.A.2 Engine Failure – In Flight

Indications:

1. Left yaw.
2. ENGINE OUT and RPM warning lights illuminated.
3. Engine instruments indicate power loss.
4. Engine out audio activated when NG drops below 55%.
5. NR decreasing with RPM warning light and audio on when NR drops below 95%.

Procedure:

1. Maintain heading and attitude control.
2. Collective – Adjust as required to maintain 85 to 107% NR.

NOTE

Maintaining NR at high end of operating range will provide maximum rotor energy to accomplish landing, but will cause an increased rate of descent.

3. Cyclic – Adjust to obtain desired autorotative AIRSPEED.

NOTE

Maximum AIRSPEED for steady state autorotation is 100 KIAS. Minimum rate of descent airspeed is 55 KIAS. Maximum glide distance airspeed is 80 KIAS.

4. Attempt engine restart if ample altitude remains. (Refer to ENGINE RESTART, paragraph 3.3.B).

If engine restart is not attempted or not successful:

5. EMER. FUEL VALVE switch – OFF.

6. At low altitude:
   a. Throttle – closed.
   b. Flare to lose airspeed

7. Apply collective as flare effect decreases to further reduce forward speed and cushion landing. Upon ground contact, collective shall be reduced smoothly while maintaining cyclic in neutral or centered position.

8. Complete helicopter shutdown.

3.3.B Engine Restart In Flight

An engine restart may be attempted in flight if time and altitude permit.

CAUTION

TO INITIATE AN IN-FLIGHT RESTART, Ng MUST BE LESS THAN 10 PERCENT AND THROTTLE MUST BE CYCLED THROUGH THE OFF POSITION.

CAUTION

ABORT START IMMEDIATELY IF ANY OF THE FOLLOWING EVENTS OCCURS:
1) Ng STOPS INCREASING PRIOR TO IDLE RPM.
2) ANY UNUSUAL NOISE OR VIBRATION OCCURS.
3) THE FADEC FAIL WARNING LIGHT ILLUMINATES.
4) THE ROTORCRAFT DC ELECTRICAL POWER FAILS OR DROPS BELOW 18 VDC.

CAUTION

IF CAUSE OF FAILURE IS OBVIOUSLY MECHANICAL, AS EVIDENCED BY ABNORMAL METALLIC OR GRINDING SOUNDS, DO NOT ATTEMPT A RESTART.

Procedure:

1. Anti-ice switch – OFF
2. Generator switch – OFF
3. Ng – Less than 10 percent
4. EMERG. FUEL VALVE – ON
5. Throttle – IDLE (Cycle through OFF first.)
6. Starter switch – Hold for > 0.5 second
7. START advisory light – ILLUMINATED
8. Throttle – Advance smoothly to FLY detent position

If restart is unsuccessful, abort start and secure engine as follows:

9. Throttle – OFF
10. EMERG. FUEL VALVE switch – OFF.
11. Accomplish autorotative descent and landing.

3.3.C Engine Underspeed

No Caution/Warning/Advisory lights illuminated

Indications:

1. Decrease in NG
2. Subsequent decrease in NP
3. Possible decrease in NR
4. Decrease in TRQ

Procedure:

1. Collective – Adjust as required to maintain 85 to 107% NR
2. Throttle – Confirm in FLY detent position
3. NR – Maintain 95 to 100% with collective
4. Land as soon as practical

3.3.D Engine Overspeed

Indications:

1. ENGINE OVSPD warning annunciator is on.
2. Increase in NR.
3. Increase in NP.
4. Increase in NG.
5. Increase in TRQ.

Procedure:

1. Adjust throttle and collective as necessary
2. Monitor gauges.
3. Land as soon as possible.

CAUTION

IF UNABLE TO MAINTAIN NR, NP, NG OR MGT, PREPARE FOR A POWER OFF LANDING BY

LOWERING COLLECTIVE AND SHUTTING DOWN ENGINE.

3.3.E Engine Compressor Stall

Indications:

1. Engine pops
2. High or erratic MGT
3. Decreasing or erratic NG or NP
4. TRQ oscillations

Procedure:

1. Collective – Reduce power, maintain slow cruise flight
2. MGT and NG – Check for normal indications
3. ENG ANTI ICE switch – ON
4. PART SEP switch (if installed) – ON
5. HEATER switch (if installed) – ON

NOTE

Severity of compressor stalls will dictate if engine should be shut down and treated as an engine failure. Violent stalls can cause damage to engine and drive system components, and must be handled as an emergency condition. Stalls of a less severe nature (one or two low intensity pops) may permit continued operation of engine at a reduced power level, avoiding condition that result in compressor stall.

If pilot elects to continue flight:

6. Collective – Increase slowly to achieve desired power level.
7. MGT and NG – Monitor for normal response.
8. Land as soon as practical.

If pilot elects to shut down engine:

9. Enter autorotation
10. Throttle – OFF
11. EMERG. FUEL VALVE switch – OFF
12. Collective – Adjust as required to maintain 85 to 107% NR
13. Cyclic – Adjust as required to maintain desired airspeed
14. Prepare for power-off landing

3.3.F Engine Hot Start/Shutdown

Indications:

1. Excessive MGT
2. Visible smoke or fire

Procedure:

1. Throttle – OFF
2. EMERG. FUEL VALVE switch – OFF
3. STARTER switch – Ensure starter is motoring engine until MGT stabilizes at normal temperature.
4. Shut helicopter down.

3.3.G Engine Oil Pressure Low, High or Fluctuating

Indications:

1. Engine oil pressure below minimum.
2. Engine oil pressure above maximum or fluctuating abnormally.
3. CHECK INSTR caution annunciator is on.
4. ENG OIL PRESS caution annunciator illuminated

Procedure:

1. Engine oil pressure below minimum:
    a. Monitor engine oil pressure and temperature.
    b. Land as soon as possible.
2. Engine oil pressure above maximum or fluctuating abnormally.
    a. Operate at the lowest practical power setting.

b. Monitor engine oil pressure and temperature.
c. Land as soon as practical.

3.3.H Engine Oil Temperature High

Indications:

1. Engine oil temperature increasing above normal.
2. Engine oil temperature above maximum.
3. CHECK INSTR caution annunciator is on.

Procedure:

1. Reduce to the lowest practical power setting.
2. If temperature remains above the maximum limit even after reducing power, land as soon as possible.
3. If the temperature normalizes, monitor gauge and land as soon as practical.

3.3.J Driveshaft Failure

WARNING

FAILURE OF MAIN DRIVESHAFT TO TRANSMISSION WILL RESULT IN COMPLETE LOSS OF POWER TO THE MAIN ROTOR. ALTHOUGH COCKPIT INDICATIONS FOR A DRIVESHAFT FAILURE ARE SIMILAR TO AN ENGINE OVERSPEED, IT IS IMPERATIVE THAT AUTOROTATIVE FLIGHT PROCEDURES BE ESTABLISHED IMMEDIATELY. FAILURE TO REACT IMMEDIATELY TO ROTOR RPM AUDIO, RPM LIGHT AND NP/NR TACHOMETER INDICATIONS CAN RESULT IN LOSS OF CONTROL.

Indications:

1. Left yaw

2. Rapid decrease in NR.
3. Rapid increase in NP.
4. LOW RPM audio tone.
5. Illumination of RPM light.
6. Possible increase in noise level due to overspeeding engine and driveshaft breakage.

NOTE

ECU contains logic to reduce engine fuel flow if either Ng or Np exceeds limit settings (overspeed).

Procedure:

1. Maintain heading and attitude control.
2. Collective – Adjust as required to maintain 85 to 107% NR.

NOTE

Minimum rate of descent airspeed is 55 KIAS. Maximum glide distance airspeed is 80 KIAS.

3. Cyclic – Adjust to obtain desired autorotative airspeed.

NOTE

To maintain tail rotor effectiveness do not shutdown engine.

4. Landing – Complete autorotative landing.
5. Complete helicopter shutdown.

3.3.K FADEC Failures

3.3.K.1 FADEC CH FAIL (Single Ch FADEC Failure)

Indications:

1. FADEC CH FAIL warning light is on.
2. FADEC DEGRADED warning light may illuminate.

Procedure:

1. Press and release FADEC RESET switch.

NOTE

During FADEC RESET, engine instruments may fluctuate.

2. If the FADEC CH FAIL caution clears, continue the flight.
3. If the FADEC CH FAIL reappears, stabilize the rotorcraft, avoid abrupt control inputs, and land as soon as practical.

3.3.K.2 FADEC FAIL (Dual Ch FADEC Failure)

Indications:

1. FADEC FAIL audio activated.
2. FADEC FAIL warning light illuminated.
3. FADEC CH FAIL warning light illuminated
4. Fuel flow fixed at its last commanded value.

Procedure:

1. Maintain collective position.
2. Press and release FADEC RESET switch.

NOTE

During FADEC RESET, engine instruments may fluctuate.

3. If FADEC FAIL warning light extinguishes, land as soon as possible.
4. If FADEC FAIL warning light remains illuminated, then depending on power setting, pilot may choose to perform a run-on landing or an auto-rotation.

WARNING

THE THROTTLE WILL BE INOPERATIVE. USE EMERG. FUEL VALVE SWITCH TO SHUT OFF FUEL.

3.3.K.3 FADEC DEGRADED (In Flight)

Indications:

1. FADEC DEGRADED warning light is on.
2. Engine response may be reduced.

Procedure:

1. Stabilize the rotorcraft and avoid abrupt control inputs to minimize possible Np/Nr variations.
2. Press and release FADEC RESET switch.

NOTE

During FADEC RESET, engine instruments may fluctuate.

3. If the FADEC DEGRADED caution clears, continue the flight.
4. If the FADEC DEGRADED reappears, stabilize the rotorcraft, avoid abrupt control inputs, and land as soon as practical.

3.3.K.4 FADEC MAINT (In Flight)

Indications:

1. FADEC MAINT warning light is on.

NOTE

A FADEC MAINT light in flight is an indication of a frangible fuse fault

Procedure:

1. Stabilize the rotorcraft and avoid abrupt control inputs to minimize possible Np/Nr variations.
2. Land as soon as practical.

3.3.L Emergency Shutdown

Procedure:

1. Throttle – OFF.
2. EMERG. FUEL VALVE switch – OFF.
3. Generator Switch – OFF.
4. Fuel BOOST/XFR – OFF.
5. Complete helicopter shutdown.

3.4 Fire

3.4.A Engine Fire On Ground

Indications:

1. Smoke.
2. Fumes.
3. Fire.
4. ENGINE FIRE warning annunciator illuminated.

Procedure:

1. Throttle – OFF
2. EMERG. FUEL VALVE – OFF
3. Fuel BOOST/XFR – OFF
4. GEN Switch – OFF
5. BATT Switch – OFF
6. Rotor brake – Engage
7. Exit helicopter.

3.4.B Engine Fire During Flight

Indications:

1. Smoke.
2. Fumes.
3. Fire.
4. ENGINE FIRE warning annunciator illuminated.

Procedure:

1. In-flight – Immediately enter autorotation.
2. Throttle – OFF
3. EMERG. FUEL VALVE – OFF
4. Fuel BOOST/XFR – OFF
5. Execute autorotative descent and landing.
6. BATT switch – OFF.

NOTE

Do not restart engine until corrective maintenance has been performed.

3.4.C Cabin Smoke or Fumes

Indications:

1. Smoke.
2. Fumes.

Procedure:

1. In-flight – Start descent.
2. AIR COND BLO switch (if installed) – OFF.
3. HEATER switch (if installed) – OFF.
4. All vents – Open.
5. Side windows – Open.

If time and altitude permits:

6. Source – Attempt to identify and secure.
7. If source is identified and smoke and/or fumes still persist – Land as soon as possible.
8. If source is identified and smoke and/or fumes are cleared – Land as soon as practical.

3.4.D Electrical Fire

Indications:

1. Smoke fumes or fire.
2. Possible indication of abnormal amps.

Procedure:

1. Vents/side windows – Open, as required; ventilate cabin.
2. Begin descent.

NOTE

Maintain safe flight condition and land as soon as possible.

If source of smoke or fire can be positively identified, remove electrical power from the affected equipment by switching it off via switch or circuit breaker.

If source of the smoke or fire cannot be positively identified:

3. GEN switch – OFF.
4. Land as soon as practical.

If smoke/fumes do not decrease:

5. Airspeed – 60 knots or less.
6. BATT switch – OFF.
7. FUEL BOOST/XFR LEFT circuit breaker switch – LEFT (on).

If smoke/fumes do not decrease:

8. Land as soon as possible.

WARNING

PRIOR TO BATTERY DEPLETION, ALTITUDE MUST BE REDUCED BELOW 8000 FEET Hp (JET A) OR 4000 FEET Hp (JET B). UNUSABLE FUEL MAY BE AS HIGH AS 151.0 POUNDS AFTER THE BATTERY IS DEPLETED DUE TO INABILITY TO TRANSFER FUEL FROM FORWARD CELLS.

NOTE

With battery and generator OFF, an 80% charged battery will operate left fuel boost pump and left fuel transfer pump for approximately 3.4 hours with installed 34 amp-hour battery.

NOTE

Pedal stop disengages with loss of electrical power.

When throttle is repositioned to the idle stop (during engine shutdown), the PMA will go offline and the engine may flameout.

3.5 Tail Rotor

There is no single emergency procedure for all types of antitorque malfunctions. One key to a pilot successfully handling a tail rotor emergency lies in the ability to quickly recognize the type of malfunction that has occurred.

3.5.A Complete Loss of Tail Rotor Thrust

This is a situation involving a break in drive system, (eg. severed driveshaft) wherein tail rotor stops turning and delivers no thrust.

Indications:

1. Uncontrollable yawing to right (left side slip).
2. Nose down tucking.
3. Possible roll of fuselage.

NOTE

Severity of initial reaction of helicopter will be affected by AIRSPEED, CG, power being used and H_D.

Procedure:

3.5.A.1 Hovering

Close throttle and perform a hovering autorotation landing. A slight rotation can be expected on touchdown.

3.5.A.2 In Flight

Reduce throttle to idle, immediately enter autorotation, and maintain a minimum AIRSPEED of 55 KIAS during descent.

NOTE

When a suitable landing site is not available, vertical fin may permit controlled flight at low power levels and sufficient AIRSPEED. During final stages of approach, a mild flare should be executed, making sure all power to rotor is off. Maintain helicopter in a slight flare and smoothly use collective to execute a soft, slightly nose-high landing. Landing on aft portion of skids will tend to correct side drift. This technique will, in most cases, result in a run-on type landing.

CAUTION

IN A RUN-ON TYPE LANDING AFTER TOUCHING DOWN, DO NOT USE CYCLIC TO REDUCE FORWARD SPEED.

3.5.B Fixed Pitch Failures

This is a situation involving inability to change tail rotor thrust (blade angle) with anti-torque pedals.

Indications:

1. Lack of directional response.
2. Locked pedals.

NOTE

If pedals cannot be moved with a moderate amount of force, do not attempt to apply a maximum effort, since a more serious malfunction could result. If helicopter is in a trimmed condition when malfunction occurs, TRQ and AIRSPEED should be noted and helicopter flown to a suitable landing area. Certain combinations of TRQ, NR, and AIRSPEED will correct a yaw attitude, and these combinations should be used to land helicopter.

Procedure:

NOTE

Pull pedal stop emergency release to ensure pedal stop is retracted.

3.5.B.1 Hovering

Do not close throttle unless a severe right yaw occurs. If pedals lock in any position at a hover, landing from a hover can be accomplished with greater safety under power controlled flight rather than by closing throttle and entering autorotation.

3.5.B.2 In Flight – Left Pedal Applied

In a high power condition, helicopter will yaw to left when power is reduced. Power and AIRSPEED should be adjusted to a value where a comfortable yaw angle can be maintained. If AIRSPEED is increased, vertical fin will become more effective and an increased left yaw attitude will develop. To accomplish landing, establish a power-on approach with sufficiently low AIRSPEED (zero if necessary) to attain a rate of descent with a comfortable sideslip angle. (A decrease in NP decreases tail rotor thrust.) As collective is increased just before touchdown, left yaw will be reduced.

3.5.B.3 In Flight – Right Pedal Applied

In cruise flight or reduced power situation, helicopter will yaw to right when power is increased. A low power, run-on type landing will be necessary by gradually reducing throttle to maintain heading while adding collective to cushion landing. If right yaw becomes excessive, close throttle completely.

3.6 Hydraulic System

3.6.A Loss of Hydraulic Pressure

Indications:

1. HYDRAULIC SYSTEM caution light illuminated.
2. Grinding or howling noise from pump.
3. Increase in force required to move flight controls.
4. Feedback forces may be evident during flight control movement.

Procedure:

1. Reduce AIRSPEED to 70 to 100 KIAS.
2. HYD SYSTEM circuit breaker – Out. If hydraulic power is not restored, push breaker in.
3. HYD SYS switch – HYD SYS; OFF if hydraulic power is not restored.
4. For extended flight set comfortable AIRSPEED, up to 120 KIAS, to minimize control forces.
5. Land as soon as practical.
6. A run-on landing at effective translational lift and speed (approximately 15 knots) is recommended.

3.6.B Flight Control Actuator Malfunction

An actuator hardover can occur in any flight control axis, but a cyclic cam jam will only occur in the fore and aft axis. An actuator hardover is manifested by uncommanded movements of one or two flight controls. If two controls move, the pilot will find one of these controls will require a higher than normal

control force to oppose the movement. This force cannot be “trimmed” to zero without turning the HYD SYS switch OFF.

Once the hydraulic boost is OFF, the forces on the affected flight control will be similar to the “normal” hydraulic off forces.

Indications:

1. Uncommaned flight control movements.
2. High flight control forces to oppose movement in one axis.
3. Feedback forces only in affected flight control axis.
4. Flight control forces normal in unaffected axis.

Procedure:

1. Attitude – Maintain.
2. HYD SYS switch – OFF.
3. AIRSPEED – Set to 70 to 100 KIAS.
4. Land as soon as possible using procedure from Paragraph 3.6.A.

3.7 Electrical System

3.7.A Generator Failure

Indications:

1. GEN FAIL caution light illuminated.
2. AMPS indicates 0.
3. Voltmeter — Approximately 24 volts.

Procedure:

1. GENERATOR FIELD and GENERATOR RESET circuit breakers — Check in.
2. GEN switch — RESET; then GEN.
3. If power is not restored, place GEN switch to OFF; land as soon as practical.

NOTE

With generator OFF, a fully charged battery will provide approximately 30 minutes of power for basic helicopter and one VHF COMM radio with 34 Amp/hour battery installed.

3.7.B Excessive Electrical Load

Indications:

1. AMPS indicates excessive load.
2. CHECK INSTR caution annunciator is on.
3. Smoke or fumes.

Procedure:

1. GEN switch – OFF.
2. BATT switch – OFF.
3. FUEL BOOST/XFR LEFT circuit breaker switch – LEFT (on)

WARNING

PRIOR TO BATTERY DEPLETION, ALTITUDE MUST BE REDUCED BELOW 8000 FEET HP (JET A) OR 4000 FEET HP (JET B). UNUSABLE FUEL MAY BE AS HIGH AS 151.0 POUNDS AFTER THE BATTERY IS DEPLETED DUE TO INABILITY TO TRANSFER FUEL FROM FORWARD CELLS.

NOTE

With battery and generator OFF, an 80% charged battery will operate left fuel boost pump and left fuel transfer pump for approximately 3.4 hours installed 34 ampere/ hour battery.

4. Airspeed – 60 KIAS

NOTE

Pedal stop disengages with loss of electrical power.

5. Land as soon as practical.

NOTE

When throttle is repositioned to the idle stop (during engine shutdown) the PMA will go offline and the engine may flame out.

3.8 Fuel System

3.8.A Dual Fuel Transfer Failure

Indications:

1. L/FUEL XFR and R/FUEL XFR caution lights illuminate.
2. Last 151.0 pounds of fuel in forward cell may not be usable.
3. Fuel will stop transferring from forward to aft cell at approximately 344.1 pounds total indicated fuel.

Procedure:

1. LEFT and RIGHT FUEL BOOST/XFR circuit breaker switches – Check ON.
2. Determine FUEL QTY in forward cell.
3. Subtract quantity of fuel trapped in forward cell from total to determine usable fuel remaining.
4. Plan landing accordingly.

3.9 Cyclic Cam Jam

A cyclic cam jam can only occur in the fore and aft axis, whereas, an actuator hardover can occur in any flight control axis. A cyclic cam jam is manifested when a commanded control movement requires a higher than normal fore and aft spring force. The force felt when moving the cyclic fore and aft with a cam jam is the result of overriding a spring capsule.

Indications:

1. High (approximately 15 pounds) fore and aft cyclic control forces.
2. Normal pedal, collective and lateral cyclic control forces.

Procedure:

1. Helicopter pitch attitude – Maintain normal pitch attitudes with forward or aft cyclic force.

CAUTION

DO NOT TURN HYDRAULIC BOOST OFF.

3. Land as soon as practical.

3.10 Warning, Caution and Advisory Lights/Messages

Red warning lights/messages, fault conditions and corrective actions are presented in Table 3-1

Amber caution and white advisory lights/messages, and corrective actions are presented in Table 3-2.

Table 3-1: Warning (Red) Lights

Panel Wording	Fault Condition	Corrective Action
ENGINE OUT	NG less than 55 ± 1 % and/or FADEC senses ENGINE OUT	Verify engine condition. Accomplish engine failure procedure.
ENGINE OVSPD	NG exceeds limit NP exceeds 105.4% and exceeds rate of change	1. Accomplish ENGINE OVERSPEED procedure. 2. Maintenance action required before next flight
ENGINE FIRE (In-flight)	Fire detected inside the engine compartment	1. Throttle to OFF 2. EMERG. FUEL VALVE to OFF. 3. Accomplish ENGINE FIRE procedure (3.4.B)
ENGINE FIRE (On ground)	Fire detected inside the engine compartment	1. Throttle to OFF 2. EMERG. FUEL VALVE to OFF. 3. Accomplish ENGINE FIRE procedure (3.4.A)
ENG OIL PRESS (In-flight)	Engine oil pressure is below minimum	1. Reduce power; verify Eng Oil Press < 42 psi and Ng > 80% 2. Land as soon as possible.

Table 3-1: Warning (Red) Lights

Panel Wording	Fault Condition	Corrective Action
FADEC FAIL (During start)	Both FADEC channels failed	1. EMERG. FUEL VALVE to OFF. 2. Accomplish EMERGENCY SHUTDOWN procedure (3.3.L) 3. Applicable maintenance action required prior to next flight.
FADEC FAIL (In-flight)	FADEC has detected a dual channel hard fault. Fuel flow is fixed to the last commanded value.	1. Accomplish FADEC FAILURE procedure (3.3.K.2) 2. Applicable maintenance action required prior to next flight.
RPM (with low RPM audio)	NR below 95%	Reduce collective and ensure throttle is in FLY detent position. Light will extinguish and audio will cease when NR increases above 95%.
RPM (without audio)	NR above 107%	Increase collective and/or reduce severity of maneuver. Light will extinguish when NR decreases below 107%.

Table 3-1: Warning (Red) Lights

Panel Wording	Fault Condition	Corrective Action
XMSN OIL PRESS	Transmission oil pressure is below minimum.	Reduce power; verify fault with gauge. Land as soon as possible.
XMSN OIL TEMP	Transmission oil temperature is at or above red line.	Reduce power; verify fault with gauge. Land as soon as practical.

Table 3-2: Caution (Amber) and Advisory (White/Green) Lights

Panel Wording	Fault Condition	Corrective Action
A/F FUEL FILTER	Airframe fuel filter is in impending bypass.	Land as soon as practical.
BAGGAGE DOOR	Baggage compartment door not securely latched.	Close door securely before flight. If light illuminates during flight, land as soon as practical.
BATTERY RLY	Battery relay has malfunctioned to closed (ON) position with BATT switch OFF. Battery is still connected to DC BUSS.	Land as soon as soon possible.

Table 3-2: Caution (Amber) and Advisory (White/Green) Lights

Panel Wording	Fault Condition	Corrective Action
CHECK INSTR	TRQ, MGT, Ng, Fuel QTY, Fuel Press & Ammeter, or ENG Oil Temp & Press, have detected an exceedance. Flashing digital display on TRQ indicates an overtorque has occurred. Flashing digital display on MGT indicates MGT exceedance. Flashing digital display on Ng indicates Ng exceedance	1. Identify the source of the exceedance. Confirm with indicators. 2. Perform as required: • If **TRQ/MGT/Ng** – press LCD TEST button to display magnitude of exceedance. Applicable maintenance action required prior to next flight • If **Fuel QTY** – Land as soon as practical • If **Fuel Press** – Land as soon as possible • If **Ammeter** – Accomplish Excessive Electrical Load procedure (3.7.B) • **If ENG Oil Temp** – Accomplish Engine Oil Temp. procedure (3.3.H) • **If ENG Oil Press** - Accomplish Engine Oil Pressure procedure (3.3.G)

Table 3-2: Caution (Amber) and Advisory (White/Green) Lights

Panel Wording	Fault Condition	Corrective Action
CYCLIC CENTERING	Cyclic stick is not centered.	Reposition cyclic stick to center position to extinguish CYCLIC CENTERING light.
ENGINE ANTI-ICE (white)	ANTI-ICE switch ON. Engine receiving anti-icing air.	If light remains illuminated with ENGINE ANTI-ICE switch OFF, avoid operations requiring maximum power.
ENGINE CHIP	Ferrous particles in engine oil.	Land as soon as possible.
ENGINE FUEL FILTER	Engine fuel filter is in impending bypass.	Land as soon as practical.
FADEC CH FAIL	One FADEC channel failed	1. Press and release FADEC RESET switch. 2. Applicable maintenance action required prior to next flight. See Single Channel FADEC Failure (3.3.K.1)

Table 3-2: Caution (Amber) and Advisory (White/Green) Lights

Panel Wording	Fault Condition	Corrective Action
FADEC DEGRADED (In-flight)	FADEC transient operation is degraded which may result in NR (NP) droops and overshoots.	1. Make smooth, non-aggressive control movement. 2. Accomplish FADEC DEGRADED procedure (3.3.K.3) 3. Applicable maintenance action required prior to next flight.
FADEC DEGRADED (With engine shutdown)	FADEC has recorded a fault during previous flight or a current fault has been detected.	Applicable maintenance action required prior to next flight.
FADEC MAINT (In-flight)	Frangible fuse fault.	1. Accomplish FADEC MAINT procedure (3.3.K.4) 2. Applicable maintenance action required prior to next flight
FADEC MAINT (With engine shutdown)	Engine maintenance is required.	Applicable maintenance action required prior to next flight.

Table 3-2: Caution (Amber) and Advisory (White/Green) Lights

Panel Wording	Fault Condition	Corrective Action
FLOAT ARM	FLOAT ARM switch is ON. Float inflation solenoid is armed.	1. Normal operation for takeoff and landing over water. FLOAT ARM switch – OFF. If light remains illuminated, FLOATS circuit breaker – Out. 2. Land as soon as practical. **NOTE** *With float inflation solenoid armed, flight should not exceed 60 KIAS and 500 feet AGL.*
FLOAT TEST (green)	Float system in test mode.	None.
FUEL LOW	100 ± 10 pounds of fuel remain in aft tank.	**NOTE** *Aft fuel tank quantity is the total fuel quantity less the forward fuel tank quantity* Verify FUEL QTY. Land as soon as practical

Table 3-2: Caution (Amber) and Advisory (White/Green) Lights

Panel Wording	Fault Condition	Corrective Action
R/FUEL BOOST	Right fuel boost pump has failed.	If practical, descend below 8000 feet H_P if fuel is Jet A or 4000 feet H_P if fuel is Jet B to prevent fuel starvation if other fuel boost pump fails or has low output pressure. Land as soon as practical. **WARNING** **IF BOTH FUEL BOOST PUMPS FAIL, ALTITUDE MUST BE REDUCED TO BELOW 8000 FEET HP (JET A) OR 4000 FEET HP (JET B). LAND AS SOON AS POSSIBLE.**

Table 3-2: Caution (Amber) and Advisory (White/Green) Lights

Panel Wording	Fault Condition	Corrective Action
L/FUEL BOOST	Left fuel boost pump has failed.	If practical, descend below 8000 feet H_P if fuel is Jet A or 4000 feet H_P if fuel is Jet B to prevent fuel starvation if other fuel boost pump fails or has low output pressure. Land as soon as practical. **WARNING** **IF BOTH FUEL BOOST PUMPS FAIL, ALTITUDE MUST BE REDUCED TO BELOW 8000 FEET HP (JET A) OR 4000 FEET HP (JET B). LAND AS SOON AS POSSIBLE.**
FUEL VALVE	Fuel valve position differs from EMERG FUEL VALVE switch indication or FUEL VALVE circuit breaker out.	Check FUEL VALVE circuit breaker in. Land as soon as practical. If on ground cycle EMERG. FUEL VALVE switch.

Table 3-2: Caution (Amber) and Advisory (White/Green) Lights

Panel Wording	Fault Condition	Corrective Action
L/FUEL XFR	Left fuel transfer pump has failed. NOTE Under normal fuel transfer conditions, helicopters S/N 53000 through 53174 L/FUEL XFR and R/FUEL XFR lights will illuminate for 2.5 minutes and then extinguish. This indicates transfer is complete and transfer pumps have been automatically turned off. Helicopters S/N 53175 and subsequent inhibit illumination of the lights.	Land as soon as practical. CAUTION IF BOTH FUEL TRANSFER PUMPS FAIL, UNUSABLE FUEL MAY BE AS HIGH AS 151.0 POUNDS DUE TO INABILITY TO TRANSFER FUEL FORM FORWARD CELL. LAND AS SOON AS PRACTICAL.
R/FUEL XFR	Right fuel transfer pump has failed.	Land as soon as practical.
GEN FAIL	Generator not connected to DC BUSS.	Verify fault with AMPS gauge. GEN switch – RESET, then ON. If GEN FAIL light remains illuminated, GEN switch – OFF. Land as soon as practical

Table 3-2: Caution (Amber) and Advisory (White/Green) Lights

Panel Wording	Fault Condition	Corrective Action
HEATER OVERTEMP	An overtemp condition has been detected by a temperature probe either under pilot seat, copilot seat, or in vertical tunnel.	HEATER switch – OFF immediately.
HYDRAULIC SYSTEM	Hydraulic pressure below limit.	Verify HYD SYS switch position. Accomplish hydraulic system failure procedure (3.6)
LITTER DOOR	Litter door not securely latched.	Close door securely before flight. If light illuminates during flight, land as soon as practical.
PEDAL STOP	Pedal Restrictor Control Unit has detected a failure of part of system.	VNE – 60 KIAS PEDAL STOP emergency release – pull. Land as soon as practical.
START (white)	Start relay is in START mode.	If Start switch has not been engaged and there is zero indication on AMPS gage; START relay has malfunctioned and helicopter is on battery power. START circuit breaker – OUT. Land as soon as practical

Table 3-2: Caution (Amber) and Advisory (White/Green) Lights

Panel Wording	Fault Condition	Corrective Action
START FAULT	Indicates a starter relay failure. Engine may not start.	Throttle to OFF.
T/R CHIP	Ferrous particles in tail rotor gearbox oil.	Land as soon as possible.
XMSN CHIP	Ferrous particles in transmission oil.	Land as soon as possible.

Section 4

Performance Data

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Section 4

Performance Data

4.1 Introduction

Performance data presented herein are derived from engine manufacturer's specification power for engine less installation losses. These data are applicable to basic helicopter without any optional equipment that would appreciably affect lift, drag, or power available.

4.2 Power Assurance Check

Power Assurance Check Charts (Figure 4-1A and Figure 4-1B) are provided for the Honeywell HTS900-2-1D engine. These charts indicate the maximum allowable MGT and NG for an engine meeting minimum Honeywell specification. Engine must develop required torque without exceeding chart MGT/NG in order to meet performance data contained in this manual. Figure 4-1A is used for checking MGT while in level flight and Figure 4-1B is used for checking NG while in level flight. The charts are applicable with or without the IBF installed per TCCA STC SH16-9/FAA STC SR03706NY.

To perform power assurance check, turn off all sources of bleed air, including ENGINE ANTI-ICING. Establish level flight at an airspeed of 85 to 105 KIAS or VNE, whichever is lower.

NOTE

Be sure to dwell at the applicable power conditions in stabilized level flight before taking data.

NOTE

Record pressure altitude to the nearest 100 ft increment.

NOTE

Record OAT and Torque to the most significant digit of the gauges.

NOTE

If PAC value is low, be sure to verify accuracy of aircraft OAT indication by comparing with airfield data. MGT PAC margin is most sensitive to OAT and Torque indication errors.

NOTE

Operators are permitted to use the Excel spreadsheet supplied with the aircraft to ease the calculation of PAC margins. If PAC margins are close to the limits the manual reading of the chart will take precedence.

EXAMPLE: (See Figure 4-1A and 4-1B)
Record following information from cockpit instruments:

A. TRQ – 69%
B. HP – 3,700 ft
C. OAT – 24°C
D. MGT – Actual reading
E. NG – Actual reading

SOLUTION:

Enter Power Assurance Check chart (Figure 4-1A, Power Assurance Check, Level Flight, MGT Chart) at observed Torque (TRQ – 69%), proceed vertically down to intersect HP (3,700 feet), follow horizontally to intersect

indicated OAT (24°C), then drop vertically to read maximum allowable MGT.

If actual MGT is less than or equal to chart MGT, engine performance equals or exceeds minimum specification and performance data contained in this manual can be achieved.

If actual MGT is greater than chart MGT, engine performance is less than minimum specification and performance data contained in this manual may not be achievable. Refer to ICA-E407-789 to determine cause of low power (high MGT).

Enter the Power Assurance Check chart (Figure 4-1B Power Assurance Check, Level Flight NG Chart) at observed Torque (TRQ – 69%), proceed vertically down to intersect HP (3,700 ft), follow horizontally to intersect indicated OAT (24°C), then drop vertically to read maximum NG.

If actual NG is less than or equal to chart NG, engine performance equals or exceeds minimum specification and performance data contained in this manual can be achieved.

If actual NG is greater than chart NG, engine performance is less than minimum specification and performance data contained in this manual may not be achievable. Refer to ICA-E407-789 to determine cause of low power (high NG).

4.3 Density Altitude

A Density Altitude chart (Figure 4-2) is provided to aid in calculation of performance and limitations. HD is an expression of density of air in terms of height above sea level; hence, the less dense the air, the higher the HD. For standard conditions of temperature and pressure, HD is same as HP. As temperature increases above standard for an altitude, HD will also increase to values higher than HP. Figure 4-2 expresses HD as a function of HP and temperature.

Density altitude chart also includes inverse of square root of density ratio:

$$\frac{1}{\sqrt{\sigma}}$$

which is used to calculate true airspeed (KTAS) by relation:

$$KTAS = KCAS \times \frac{1}{\sqrt{\sigma}}$$

EXAMPLE:

If ambient temperature is -15°C and pressure altitude is 7000 feet, find density altitude, and true airspeed for 100 KCAS.

SOLUTION:

Enter bottom of chart at -15°C.

Move vertically upward to 7000 foot pressure altitude line.

From intersection point, move horizontally left and read density altitude value of 5000 feet.

Move horizontally right and read: $\frac{1}{\sqrt{\sigma}}$

True airspeed: $100 \times 1.08 = 108\ KTAS$

4.4 Height Velocity Envelope

The height-velocity envelope diagrams (Figure 4-3 and Figure 4-4) define conditions from which a safe landing can be made on a smooth, level, firm surface following an engine failure. The Height-Velocity Diagram (Figure 4-3) is valid only when helicopter gross weight does not exceed limits of the Altitude Versus Gross Weight for Height-Velocity Diagram (Figure 4-3). Four envelopes (gross weight regions) are specified. Each gross weight region applies for all gross weights within its boundaries. No interpolation is allowed.

For a given ambient outside air temperature, pressure altitude, and gross weight, the appropriate limiting envelope (Region A, B, C, or D) can be determined. Using Altitude Versus Gross Weight for Height-Velocity Diagram (Figure 4-3), move upward vertically from entry OAT to pressure altitude. From that point, move right horizontally to determine the correct weight region. (Examples: 15°C at sea level at 5000 pounds GW = Region B, and 30°C at 2000 feet pressure altitude at 5000 pounds GW = Region D). Once the correct weight region has been determined (A, B, C, or D), the corresponding avoid area is selected from the Height-Velocity Diagram (Figure 4-4).

4.5 Hover Ceiling

NOTE

Hover performance charts are based on 100% rotor RPM.

Hover Ceiling IGE charts (Figure 4-8) and Hover Ceiling OGE charts (Figure 4-9) present hover performance as allowable gross weight for conditions of H_P and OAT. These hovering weights are obtainable in zero wind conditions and assume that the heater is not on above 20°C and anti-ice is not on above 5°C.

Satisfactory stability and control have been demonstrated in each area of the hover ceiling charts with winds as depicted on the IGE Hover Ceiling Controllability Chart (Figure 4-6) or OGE Hover Ceiling Controllability Chart (Figure 4-7) as applicable.

Area A (un-highlighted) of the controllability charts presents hover performance (relative to GW) for conditions where adequate control for all relative wind conditions up to 35 knots for lateral CG not exceeding ±2.5 inches (±63 mm); and up to 17 knots, for lateral CG not exceeding ±4.0 inches (±102 mm); for hover, takeoff and landing. Area B (shaded grey) of the controllability charts present hover performance (relative to CG) for

conditions where adequate control margins exist for relative winds within ±45° of the nose of the helicopter up to 35 knots for lateral CG not exceeding ±2.5 inches (±63 mm); and up to 17 knots for lateral CG not exceeding ±4.0 inches (±102 mm); for hover, takeoff, and landing. Area C (un-highlighted) of the controllability charts present hover performance (relative to C of G) for conditions where adequate control margins exist for winds directly off the helicopter nose for hovering, takeoffs and landings.

NOTE

If lateral CG exceeds ±2.5 inches (±63 mm) and density altitude is above 14,000 feet, all winds should be directly off the nose of the helicopter; for hover, takeoff and landing.

The following example uses a hover ceiling chart at takeoff power. The example is typical for use with all other hover ceiling charts.

EXAMPLE:

What guaranteed OGE GW hover capability could be expected for the following conditions:

A. HEATER and ANTI ICE — OFF
B. H_P — 10,000 feet
C. OAT — +20°C
D. TAKEOFF POWER

SOLUTION:

1) Use Hover Ceiling OGE (Takeoff Power) chart (Figure 4-9, Sheet 1).
   A. Enter OAT scale at +20°C.
   B. Move upward to 10,000 feet H_P curve.
   C. Move horizontally to read maximum gross weight of 5150 Lbs
2) Use the Density Altitude chart (Figure 4-2)
   A. Enter OAT scale at 20°C
   B. Move vertically upward to 10,000 ft H_P curve
   C. Move horizontally left to read 12,750 ft H_D
3) Use OGE Controllability chart (Figure 4-7)
   A. Enter DA scale at 12,750 ft H_D
   B. Move horizontally right to the boundary lines
   C. Move vertically down to read controllability limits for areas A, B and C

Resulting GWs are:
   Area A: up to 4550 lbs
   Area B: 4550 to 4825 lbs
   Area C: 4825 to 5150 lbs

4.6 Not Used

4.7 Climb and Descent

4.7.A Climb

Rate of Climb charts (Figure 4-10 and Figure 4-11) are presented for various combinations of power settings and ENG ANTI ICE switch positions.

Recommended best rate of climb airspeed is 60 KIAS.

Reduce rate of climb data 100 feet per minute when operating with any combination of door(s) removed.

The following example uses a rate of climb chart at takeoff power. The example is typical for use with all other rate of climb charts.

EXAMPLE:
Find the maximum rate of climb that can be attained using takeoff power under the following conditions:
A. Heater — OFF
B. Engine Anti-icing — OFF
C. OAT — 10°C
D. H_P — 14,000 feet
E. GW — 3500 pounds

SOLUTION:

Enter appropriate Rate of Climb Gross Weight chart (Figure 4-10, Sheet 3). At H_P scale of 14,000 feet, proceed horizontally to temperature of 10°C. Drop down vertically and read a rate of climb of 1700 feet per minute.

4.7.B Autorotation

Refer to Figure 4-12 for autorotational glide distance as a function of altitude.

4.8 Airspeed Calibration

Refer to Figure 4-13 for airspeed installation correction during level flight and climb.

4.9 Not Used

4.10 Noise Levels

4.10.A FAR Part 36 Stage 2 Noise Level

This aircraft is certified as a Stage 2 helicopter as prescribed in FAR Part 36, Subpart H, for gross weights up to and including the certificated maximum takeoff and landing weight of 5250 pounds (2381 kg) per Bell kit 407-706-020. There are no operating limitations to meet any of the noise requirements.

The following noise level complies with FAR Part 36, Appendix J, Stage 2 noise level requirements. It was obtained by analysis of approved data from noise tests conducted under the provisions of FAR Part 36, Amendment 36-20.

The certified flyover noise level for the Model 407 is 85.5 dBA SEL (per Bell kit 407-706-020).

NOTE

No determination has been made by the certifying authorities that the noise levels of this helicopter are or should be acceptable or unacceptable for operations at, into, or out of any airport.

V_H is defined as the airspeed in level flight obtained using the minimum specification engine torque corresponding to maximum continuous power available for sea level, 25°C (77°F) ambient conditions at the relevant maximum certificated weight. The value of V_H thus defined for this helicopter is 127 KTAS.

4.10.B Canadian Airworthiness Manual Chapter 516 and ICAO Annex 16 Noise Level

This helicopter complies with the noise emission standards applicable to the aircraft as set out by the International Civil Aviation Organization (ICAO) in Annex 16, Volume 1, Chapter 11, for gross weights up to and including the certificated maximum takeoff and landing weight of 5250 pounds (2381 kg) per Bell kit 407-706-020.
There are no operating limitations to meet any of the noise requirements.

The following noise level complies with ICAO Annex 16, Volume 1, Chapter 11 noise level requirements. It was obtained by analysis of approved data from noise tests conducted under the provisions of ICAO Annex 16, Volume 1, Third Edition-1993.

The flyover noise level for the Model 407 is 85.5 dBA SEL (per Bell kit 407-706-020).

NOTE

ICAO Annex 16, Volume 1, Chapter 11 approval is applicable only after endorsement by the Civil Aviation Authority of the country of aircraft registration.

ENTER CHART AT OBSERVED TORQUE (%)
PROCEED VERTICALLY DOWN TO PRESSURE ALTITUDE
FOLLOW HORIZONTALLY TO THE RIGHT TO OBSERVED OAT
DROP DOWN TO READ MAXIMUM ALLOWABLE MGT

GENERATOR LOAD 35 AMPS OR LESS
POWER TURBINE - 100% RPM
HEATER/ECS OFF
ANTI-ICE OFF

WITH OR WITHOUT INLET BARRIER FILTER

EAGLE 407HP POWER ASSURANCE MGT CHECK - HONEYWELL HTS 900-2-1D ENGINE

CRUISE (85-105 KIAS)

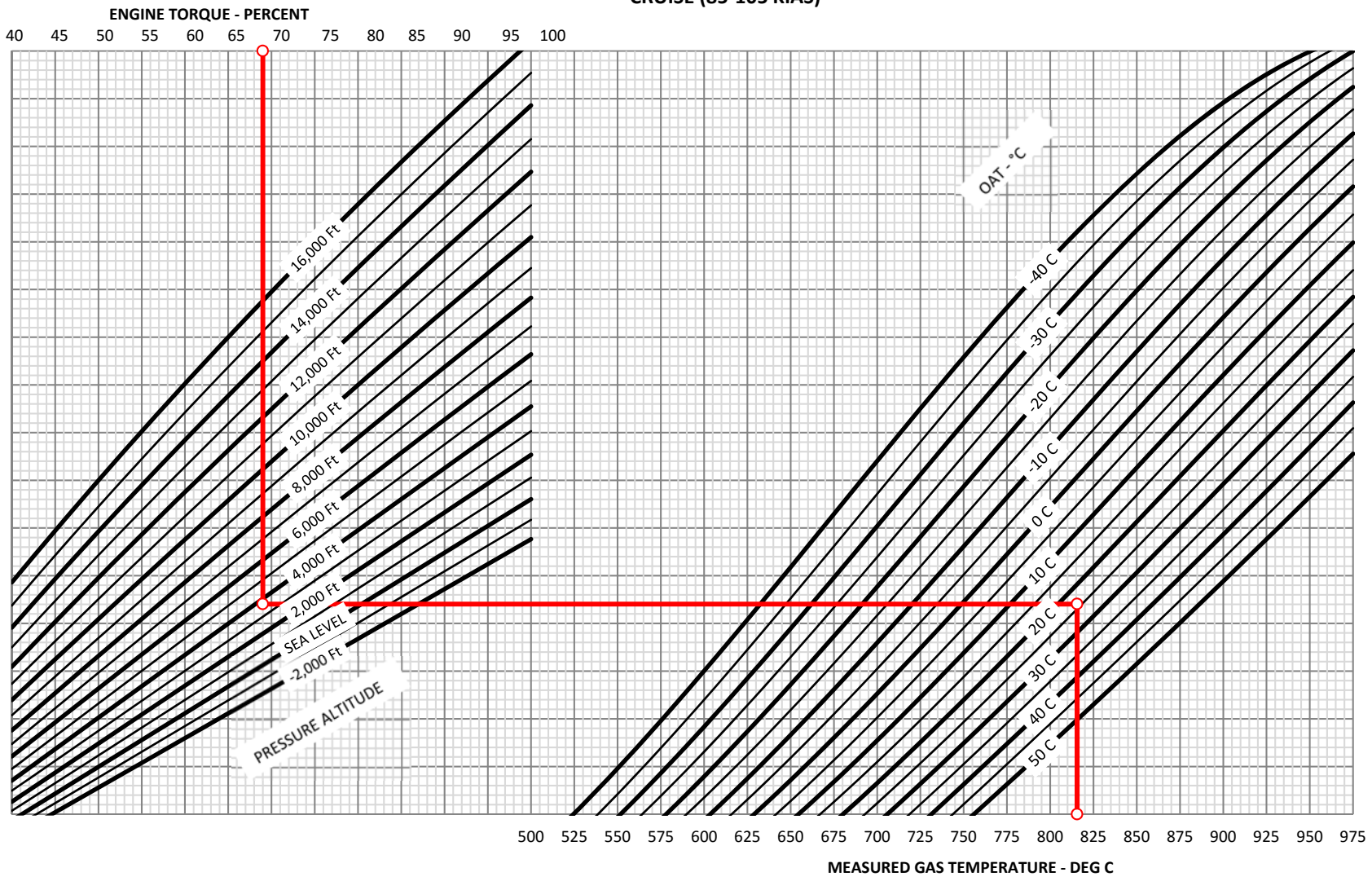


Figure 4-1A – Power Assurance Check, Level Flight MGT Chart

ENTER CHART AT OBSERVED TORQUE (%)
PROCEED VERTICALLY DOWN TO PRESSURE ALTITUDE
FOLLOW HORIZONTALLY TO THE RIGHT TO OBSERVED OAT
DROP DOWN TO READ MAXIMUM ALLOWABLE PERCENT
NG

GENERATOR LOAD 35 AMPS OR LESS
POWER TURBINE - 100% RPM
HEATER/ECS OFF
ANTI-ICE OFF

WITH OR WITHOUT INLET BARRIER FILTER

EAGLE 407HP POWER ASSURANCE NG CHECK - HONEYWELL HTS 900-2-1D ENGINE

CRUISE (85-105 KIAS)

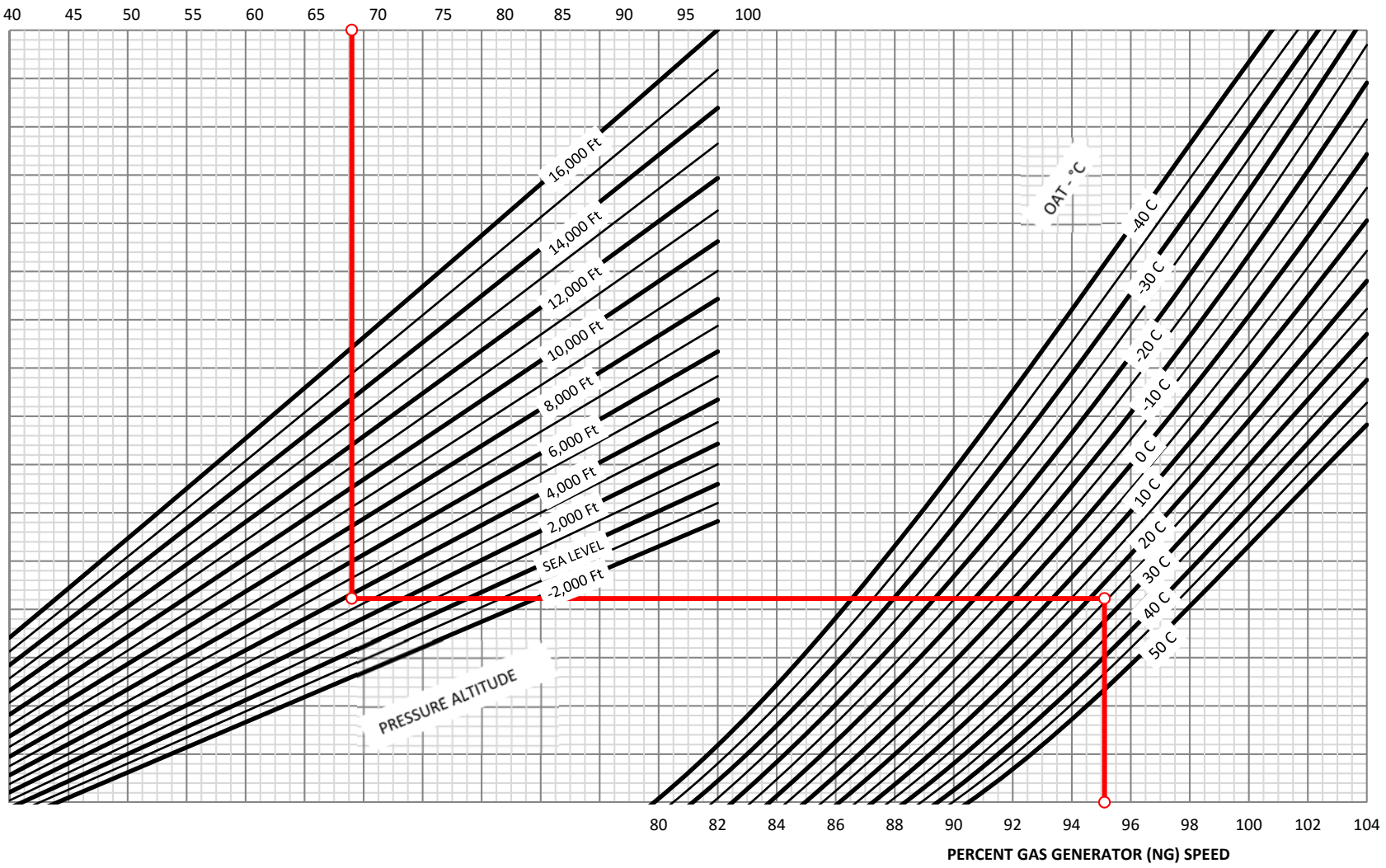


Figure 4-1B – Power Assurance Check, Level Flight NG Chart

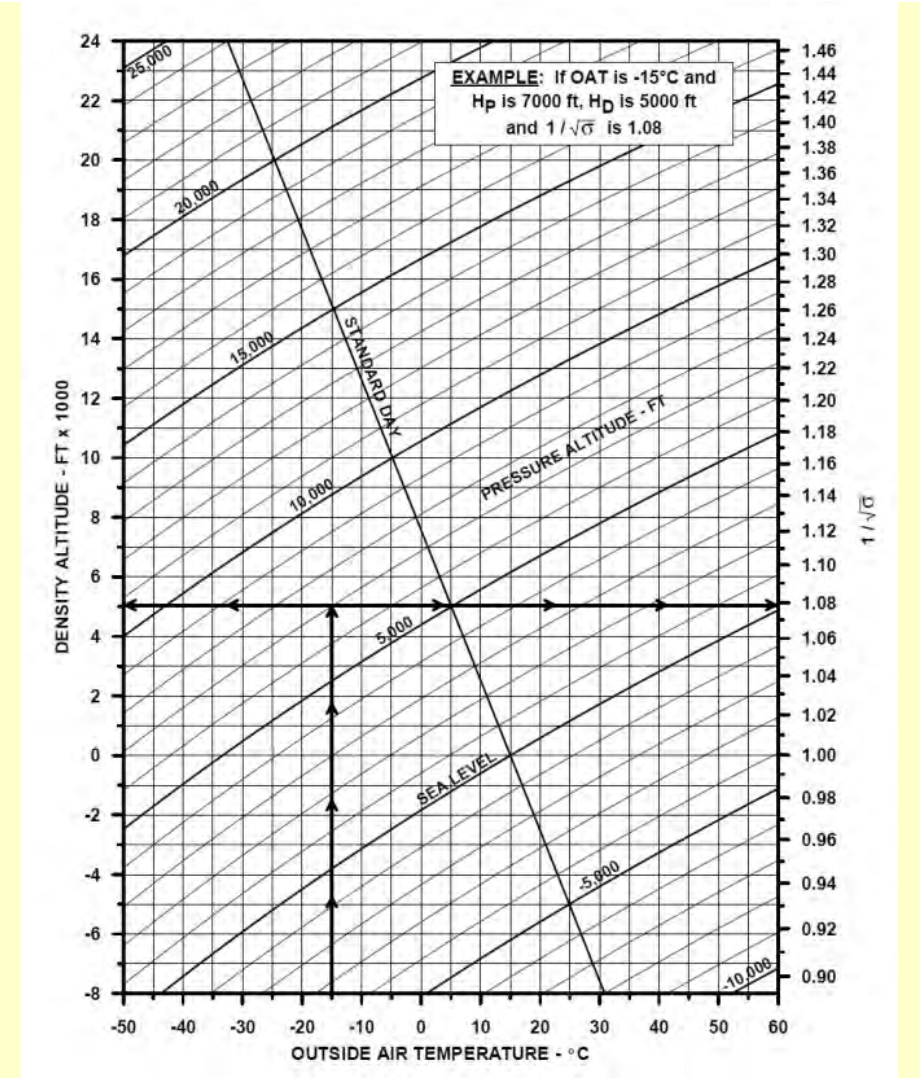


Figure 4-2 – Density Altitude

ALTITUDE VS GROSS WEIGHT
FOR HEIGHT-VELOCITY DIAGRAM

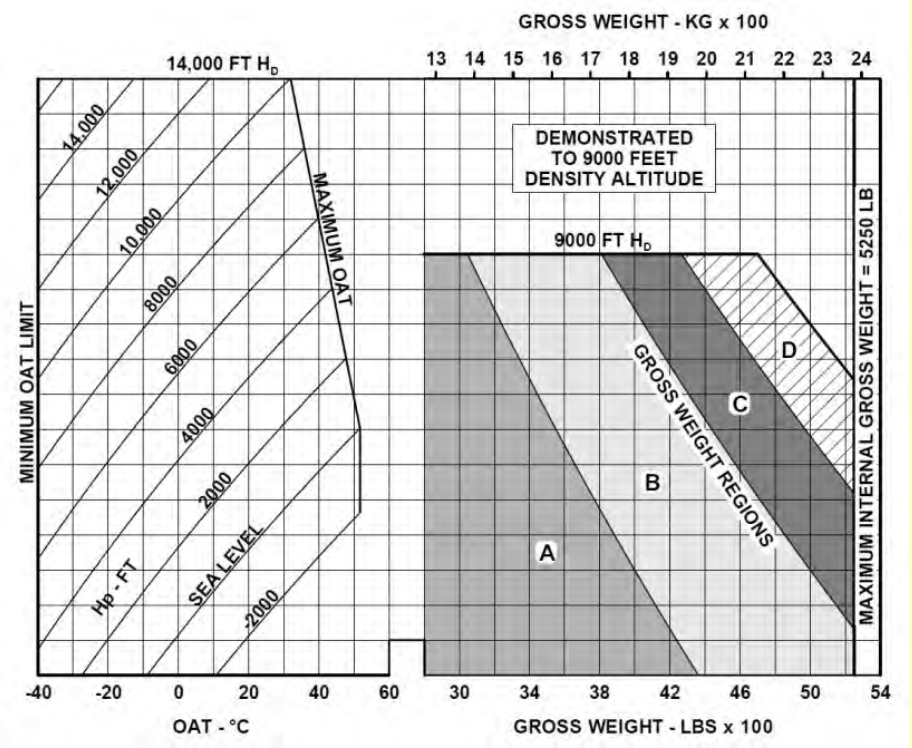


Figure 4-3 – Altitude Versus Gross Weight for Height Velocity Diagram

HEIGHT-VELOCITY DIAGRAM
FOR GROSS WEIGHT REGIONS A TO D

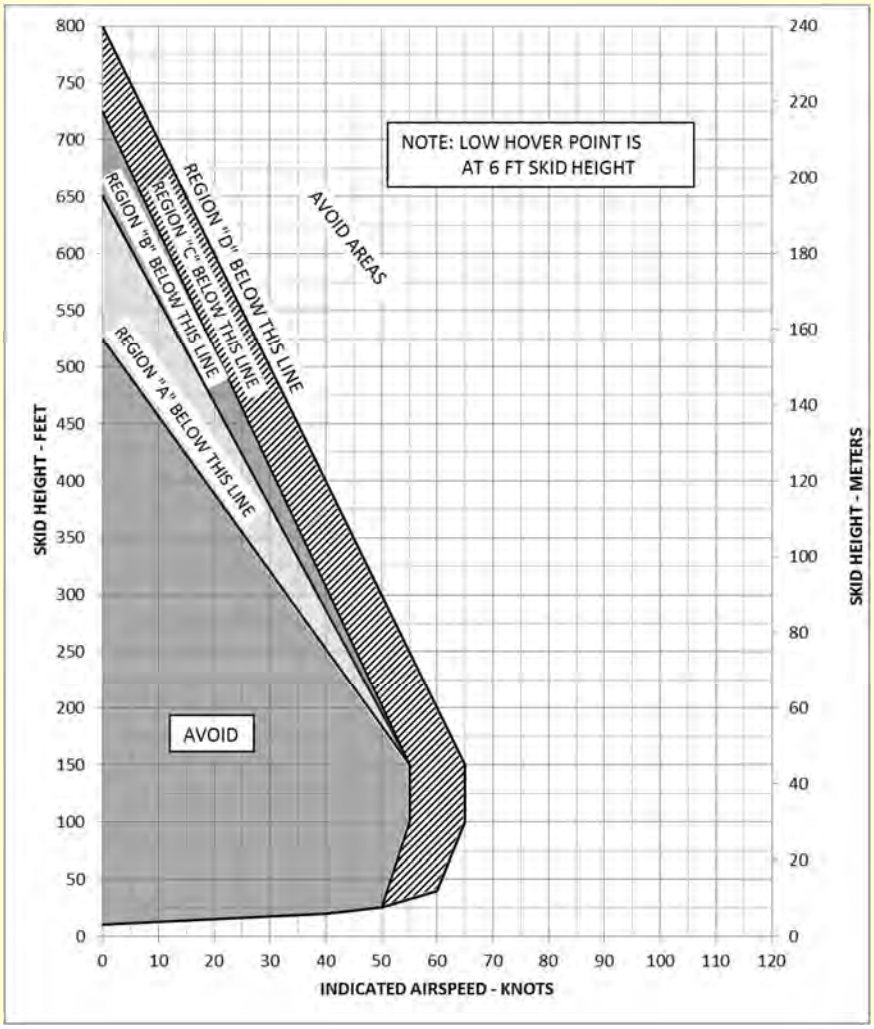
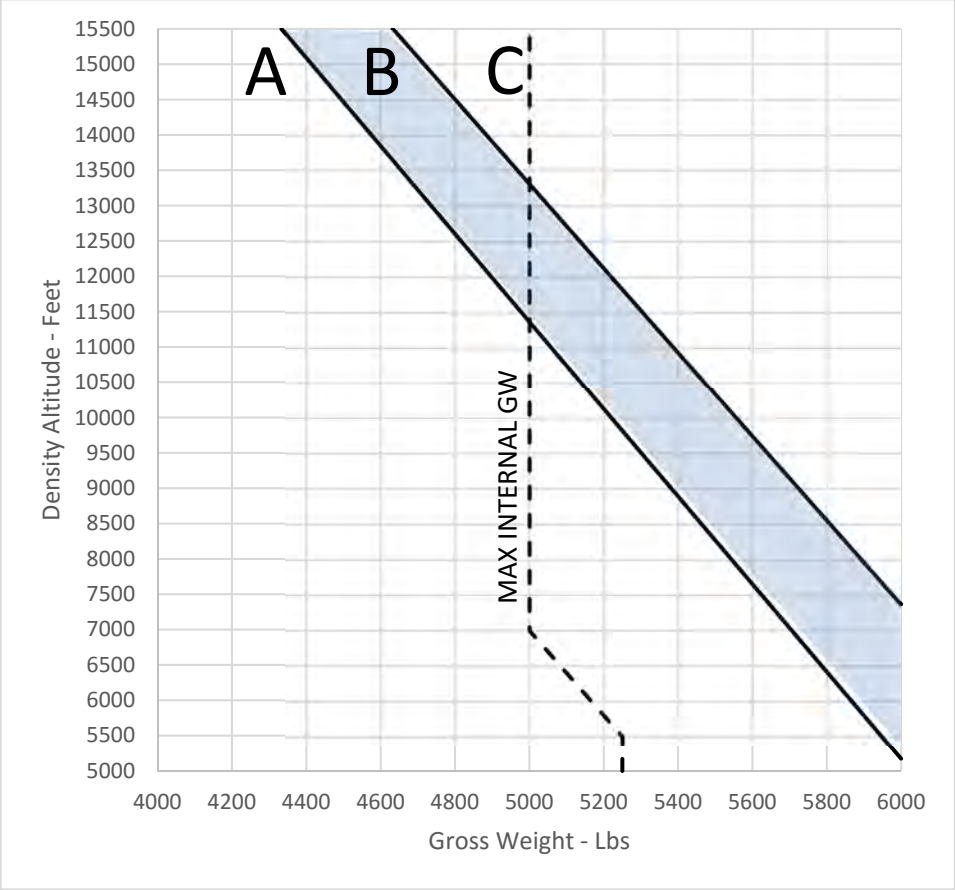


Figure 4-4 – Height Velocity Chart

IGE HOVER CONTROLLABILITY CHART

NOTE

For TCCA/FAA approved hover ceiling **above 15,500' DA** see Figure 4-8A IGE HOVER CEILING in BHT-407-FM-12, Rev. 2 or later



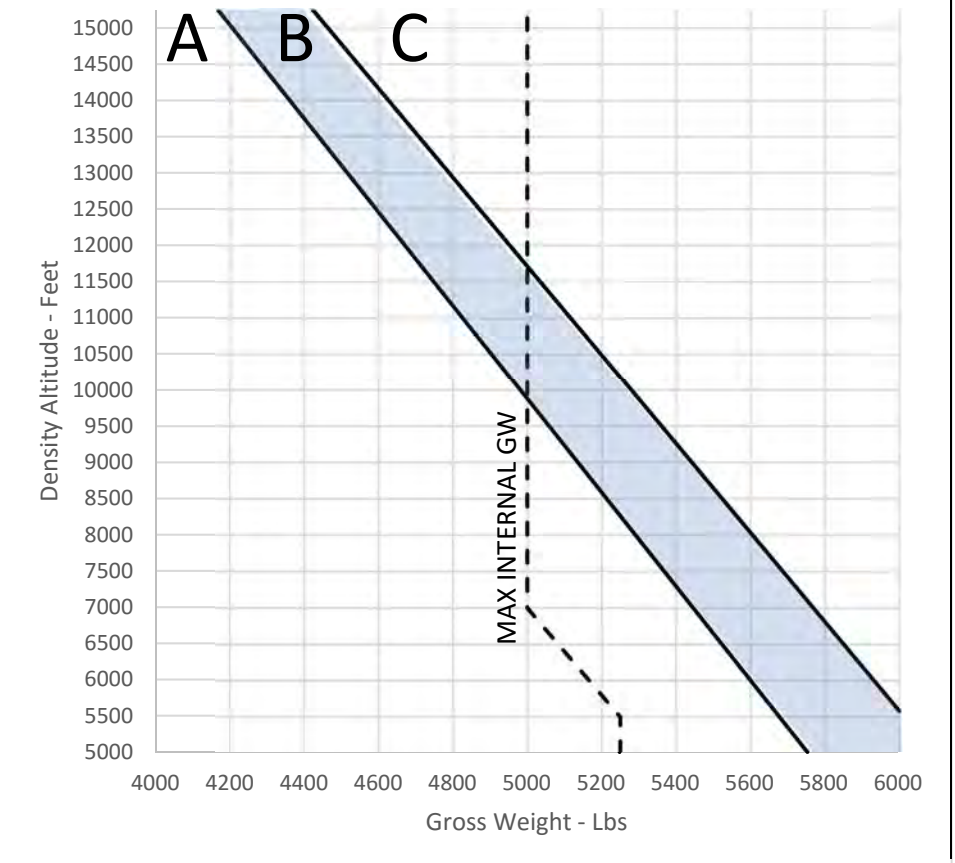
Area A – Winds up to 35 knots acceptable from any azimuth for hover/takeoffs/landings
Area B – Winds up to 35 knots acceptable within ±45° of helicopter nose for hover/take offs/landings
Area C – All winds must be directly off helicopter nose for hover/takeoffs/landings

Figure 4-6 – IGE Hover Controllability Chart

OGE HOVER CONTROLLABILITY CHART

NOTE

For TCCA/FAA approved hover ceiling **above 15,250' DA** see Figure 4-9A OGE HOVER CEILING in BHT-407-FM-12, Rev. 2 or later



Area A – Winds up to 35 knots acceptable from any azimuth for hover/takeoffs/landings
Area B – Winds up to 35 knots are acceptable within ±45° of helicopter nose for hover/take offs/landings
Area C – All winds must be directly off helicopter nose for hover/takeoffs/landings

Figure 4-7 – OGE Hover Controllability Chart

HOVER CEILING
IN GROUND EFFECT

TAKEOFF POWER
ROTOR RPM 100%
GENERATOR 50 AMPS

SKID HEIGHT 4 FT (1.2 METERS)
HEATER OFF / ANTI-ICE OFF
BASIC INLET

NOTE
For TCCA/FAA approved hover ceiling **above 15,500' DA** see Figure 4-8A IGE HOVER CEILING (Sheet 1 of 32) in BHT-407-FM-12 Rev. 2 or later

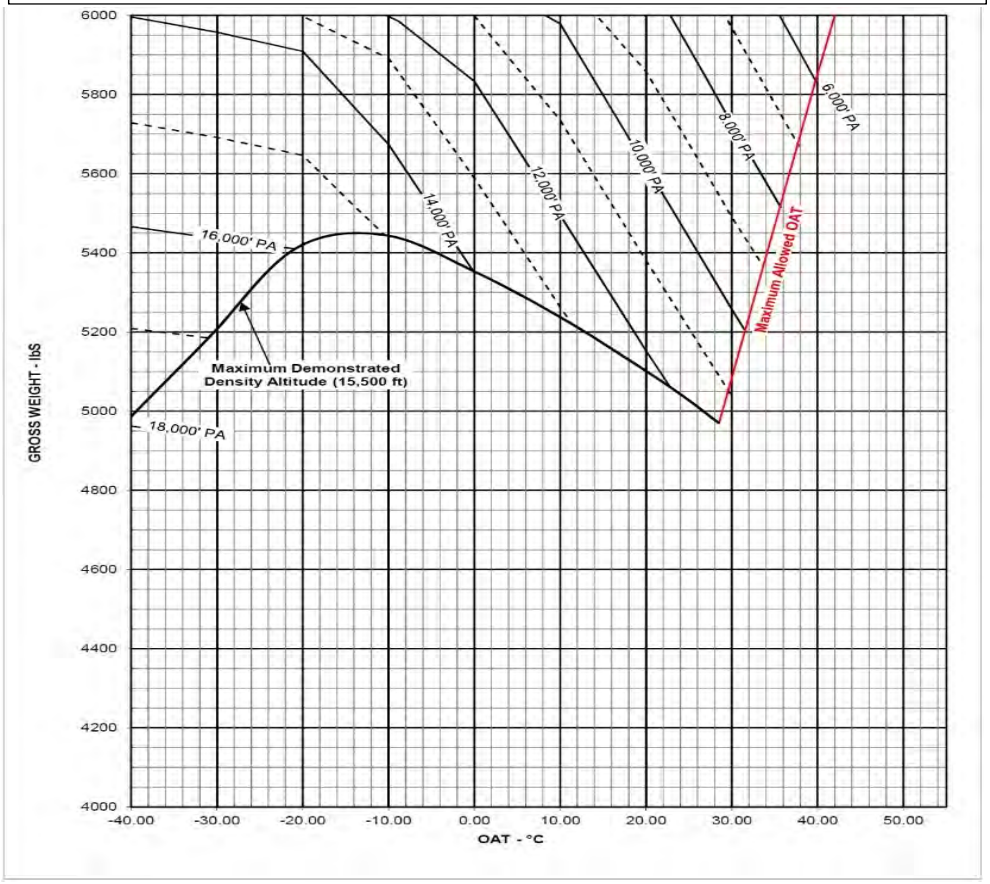


Figure 4-8 – Hover Ceiling IGE (Sheet 1 of 4)

HOVER CEILING
IN GROUND EFFECT

TAKEOFF POWER
ROTOR RPM 100%
GENERATOR 50 AMPS

SKID HEIGHT 4 FT (1.2 METERS)
HEATER OFF / ANTI-ICE ON BELOW 5°C
BASIC INLET

NOTE

For TCCA/FAA approved hover ceiling **above 15,500' DA** see Figure 4-8A IGE HOVER CEILING (Sheet 2 of 32) in BHT-407-FM-12 Rev. 2 or later

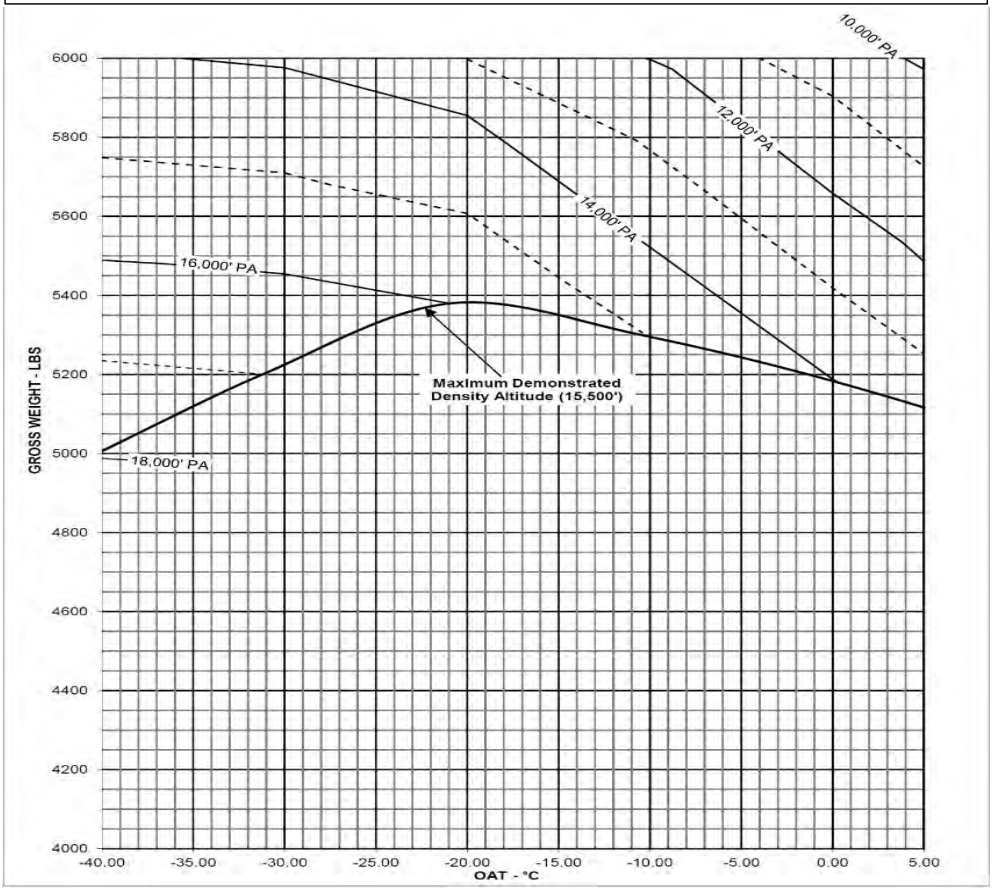


Figure 4-8 – Hover Ceiling IGE (Sheet 2 of 4)

HOVER CEILING
IN GROUND EFFECT

TAKEOFF POWER
ROTOR RPM 100%
GENERATOR 50 AMPS

SKID HEIGHT 4 FT (1.2 METERS)
HEATER ON BELOW 20°C / ANTI-ICE OFF
BASIC INLET

NOTE

For TCCA/FAA approved hover ceiling **above 15,500' DA** see Figure 4-8A IGE HOVER CEILING (Sheet 3 of 32) in BHT-407-FM-12 Rev. 2 or later

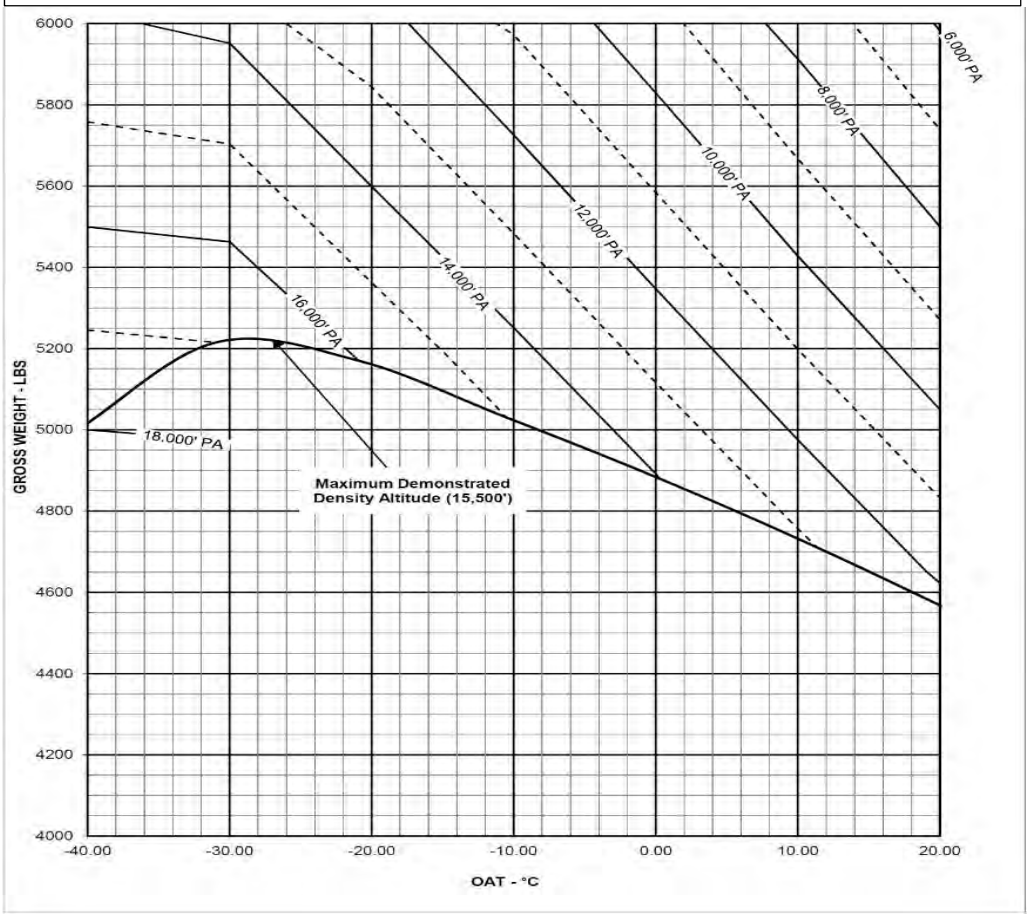


Figure 4-8 – Hover Ceiling IGE (Sheet 3 of 4)

HOVER CEILING
IN GROUND EFFECT

TAKEOFF POWER
ROTOR RPM 100%
GENERATOR 50 AMPS

SKID HEIGHT 4 FT (1.2 METERS)
HEATER ON BELOW 20°C / ANTI-ICE ON BELOW 5°C
BASIC INLET

NOTE

For TCCA/FAA approved hover ceiling **above 15,500' DA** see Figure 4-8A IGE HOVER CEILING (Sheet 4 of 32) in BHT-407-FM-12 Rev. 2 or later

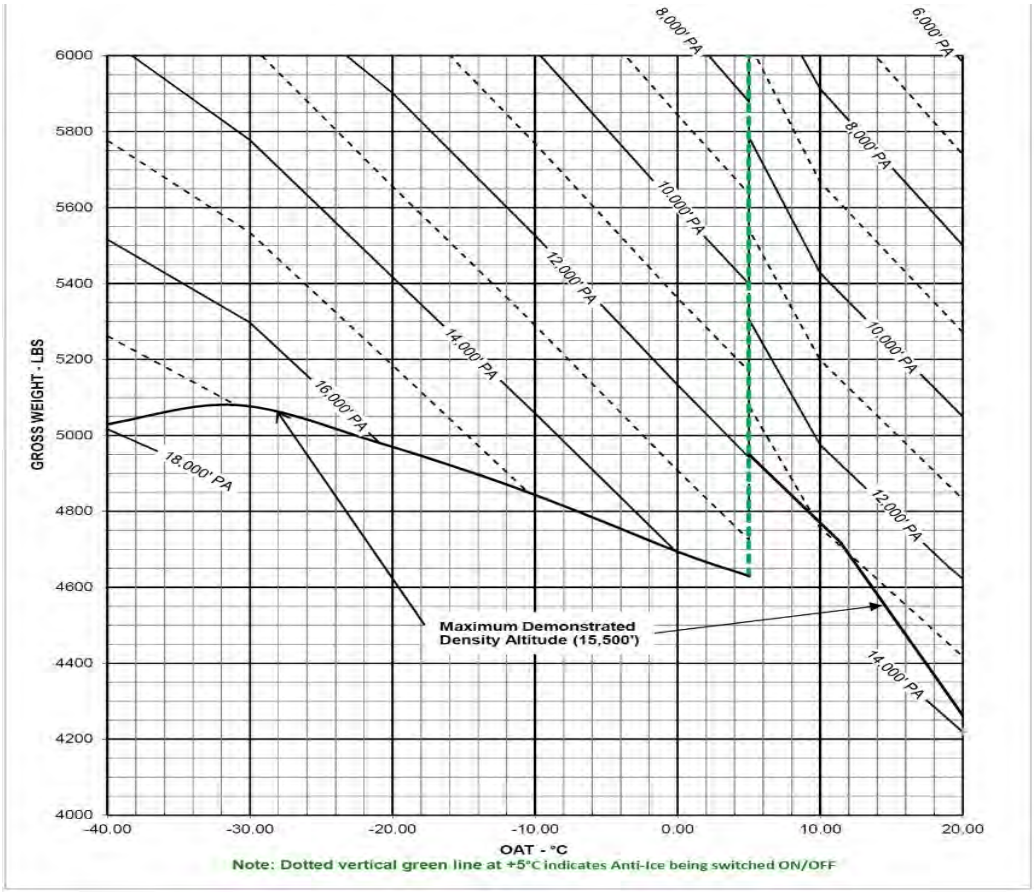


Figure 4-8 – Hover Ceiling IGE (Sheet 4 of 4)

HOVER CEILING
OUT OF GROUND EFFECT

TAKEOFF POWER
ROTOR RPM 100%
GENERATOR 50 AMPS

SKID HEIGHT 40 FT (12.2 METERS)
HEATER OFF / ANTI-ICE OFF
BASIC INLET

NOTE

For TCCA/FAA approved hover ceiling **above 15,250' DA** see Figure 4-9A OGE HOVER CEILING (Sheet 1 of 32) in BHT-407-FM-12 Rev. 2 or later

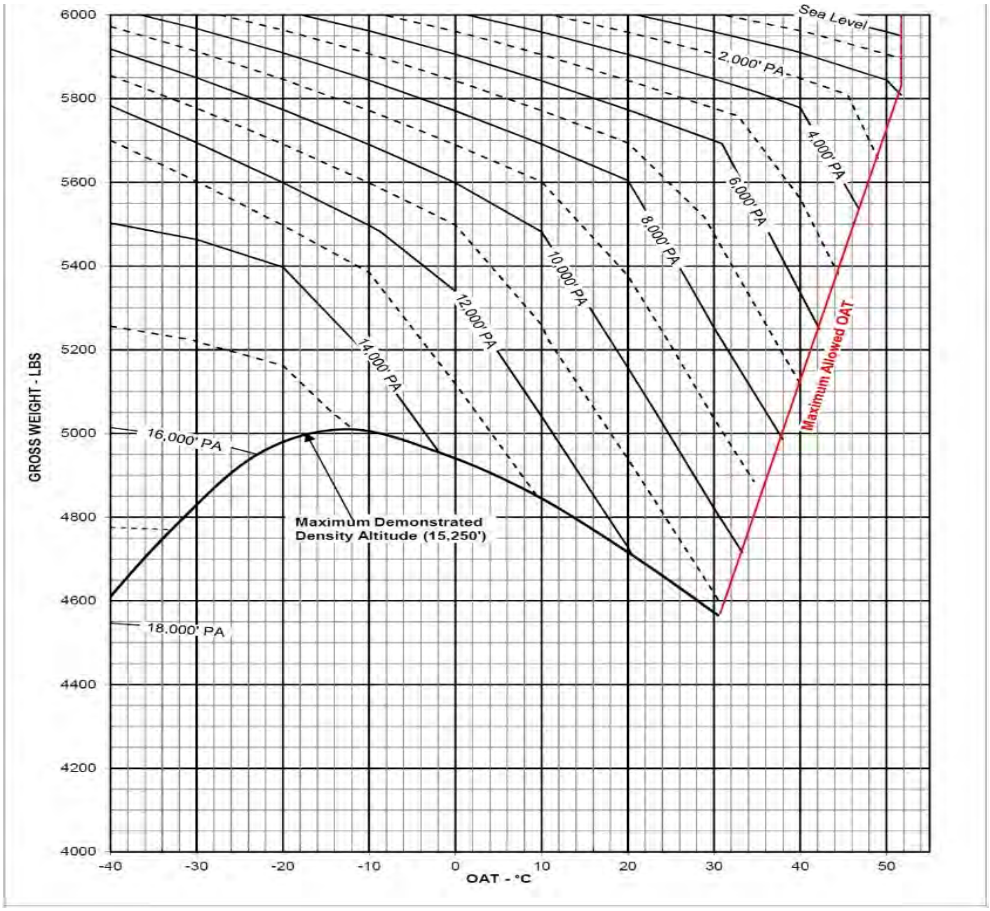


Figure 4-9 – Hover Ceiling OGE (Sheet 1 of 4)

HOVER CEILING
OUT OF GROUND EFFECT

TAKEOFF POWER
ROTOR RPM 100%
GENERATOR 50 AMPS

SKID HEIGHT 40 FT (12.2 METERS)
HEATER OFF / ANTI-ICE ON BELOW 5°C
BASIC INLET

NOTE

For TCCA/FAA approved hover ceiling **above 15,250' DA** see Figure 4-9A OGE HOVER CEILING (Sheet 2 of 32) in BHT-407-FM-12 Rev. 2 or later

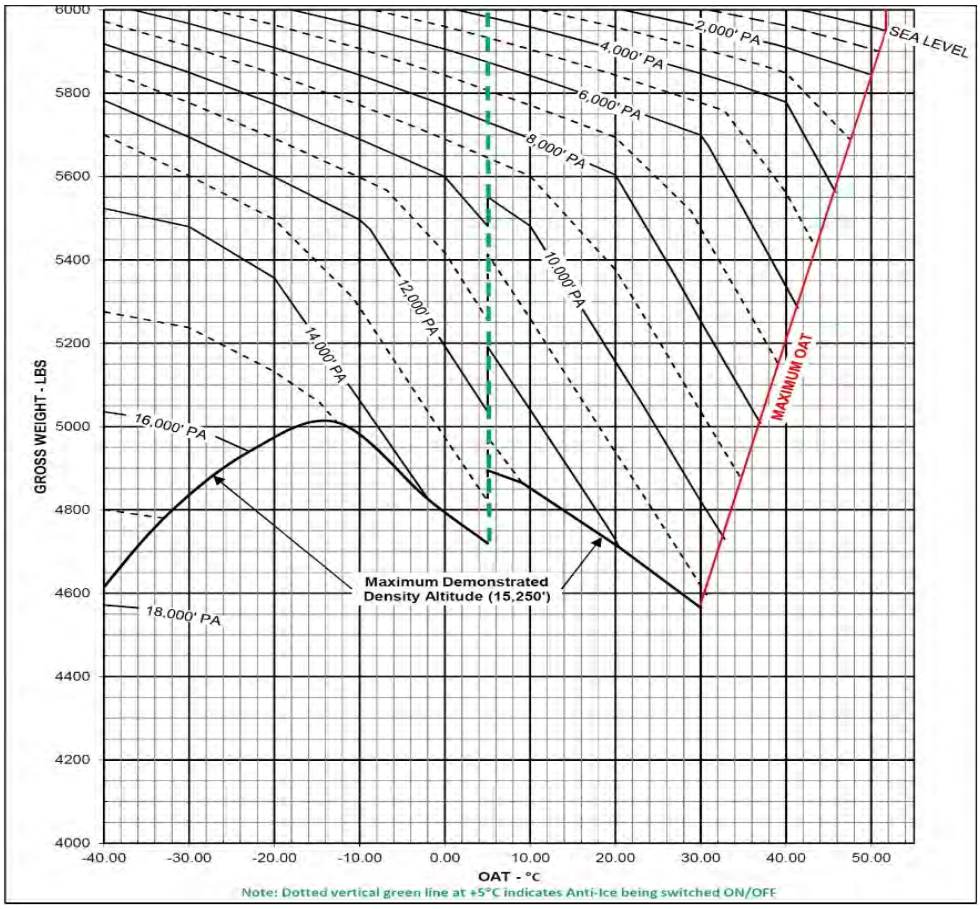


Figure 4-9 – Hover Ceiling OGE (Sheet 2 of 4)

HOVER CEILING
OUT OF GROUND EFFECT

TAKEOFF POWER
ROTOR RPM 100%
GENERATOR 50 AMPS

SKID HEIGHT 40 FT (12.2 METERS)
HEATER ON BELOW 20°C / ANTI-ICE OFF
BASIC INLET

NOTE
For TCCA/FAA approved hover ceiling **above 15,250' DA** see Figure 4-9A
OGE HOVER CEILING (Sheet 3 of 32) in BHT-407-FM-12 Rev. 2 or later

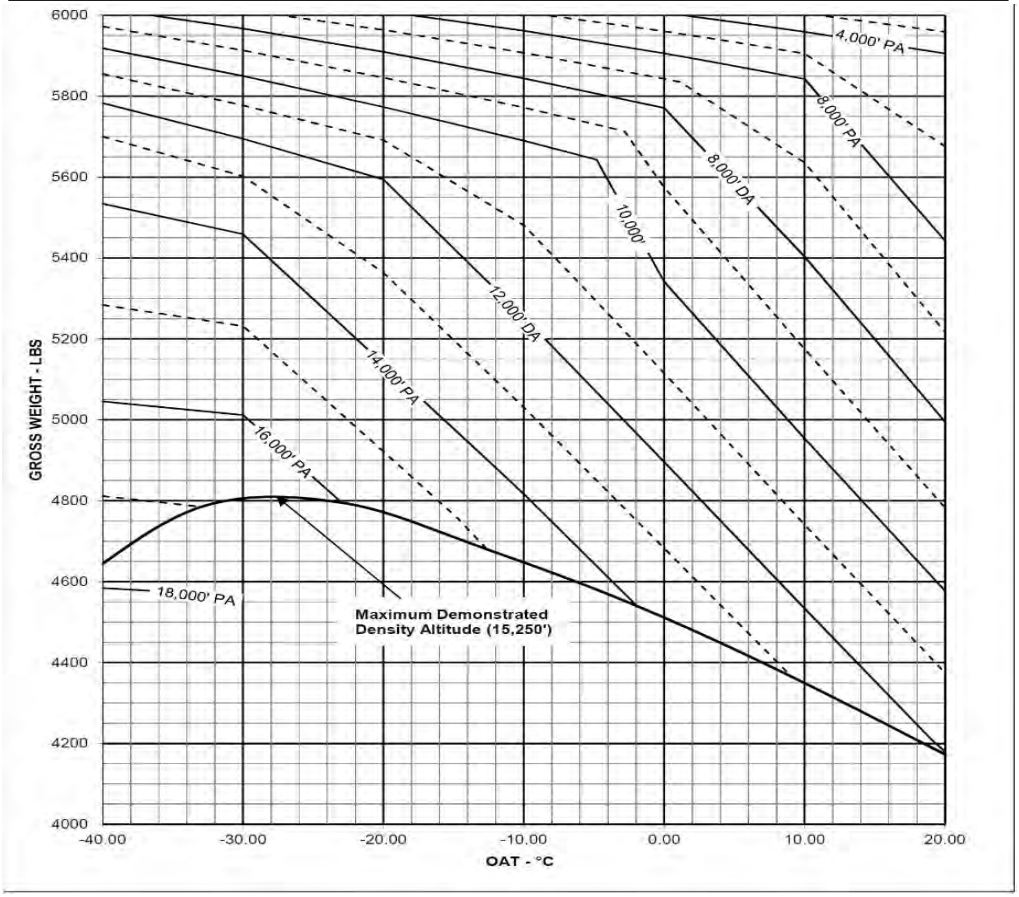


Figure 4-9 – Hover Ceiling OGE (Sheet 3 of 4)

HOVER CEILING
OUT OF GROUND EFFECT

TAKEOFF POWER — **SKID HEIGHT 40 FT (12.2 METERS)**
ROTOR RPM 100% — **HEATER ON BELOW 20°C / ANTI-ICE ON BELOW 5°C**
GENERATOR 50 AMPS — **BASIC INLET**

NOTE
For TCCA/FAA approved hover ceiling **above 15,250' DA** see Figure 4-9A
OGE HOVER CEILING (Sheet 4 of 32) in BHT-407-FM-12 Rev. 2 or later

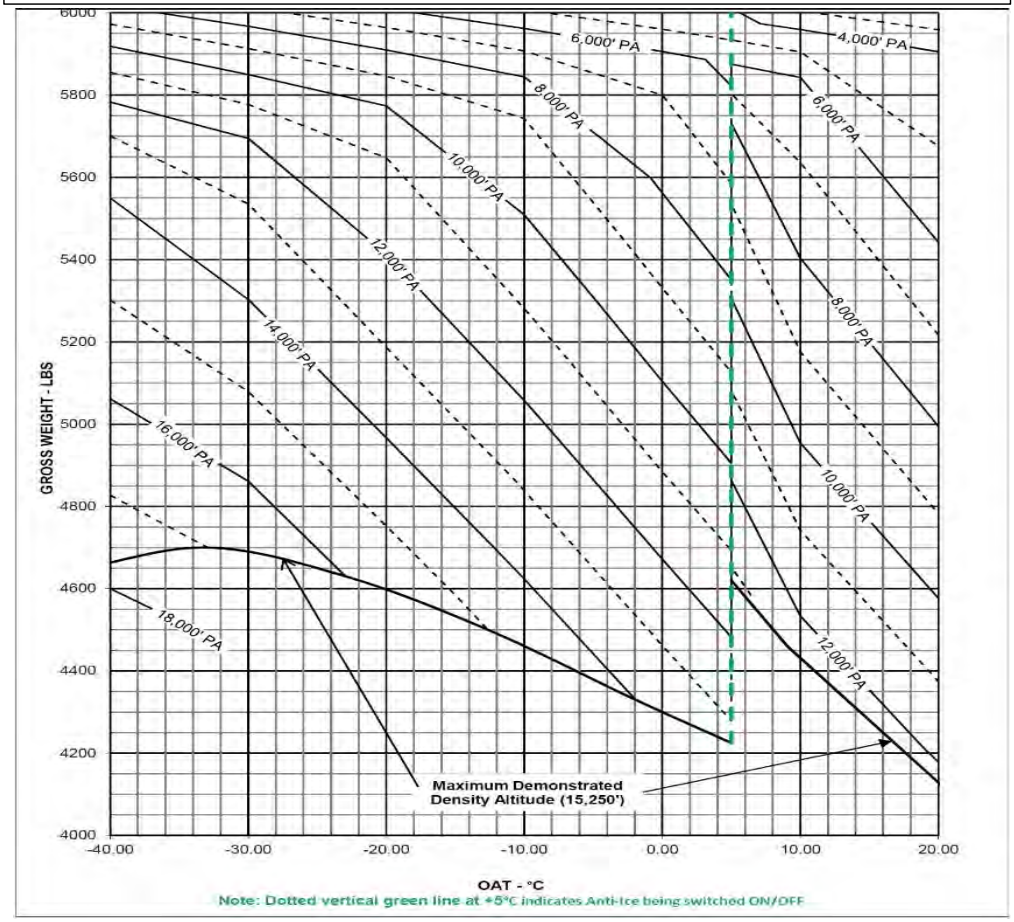


Figure 4-9 – Hover Ceiling OGE (Sheet 4 of 4)

RATE OF CLIMB

TAKEOFF POWER
ENGINE RPM 100%
GENERATOR 180 AMPS

60 KIAS
HEATER OFF
BASIC INLET

REDUCE RATE OF CLIMB 225 FT/MIN ABOVE
15,000 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 3000 lb (1361 kg)

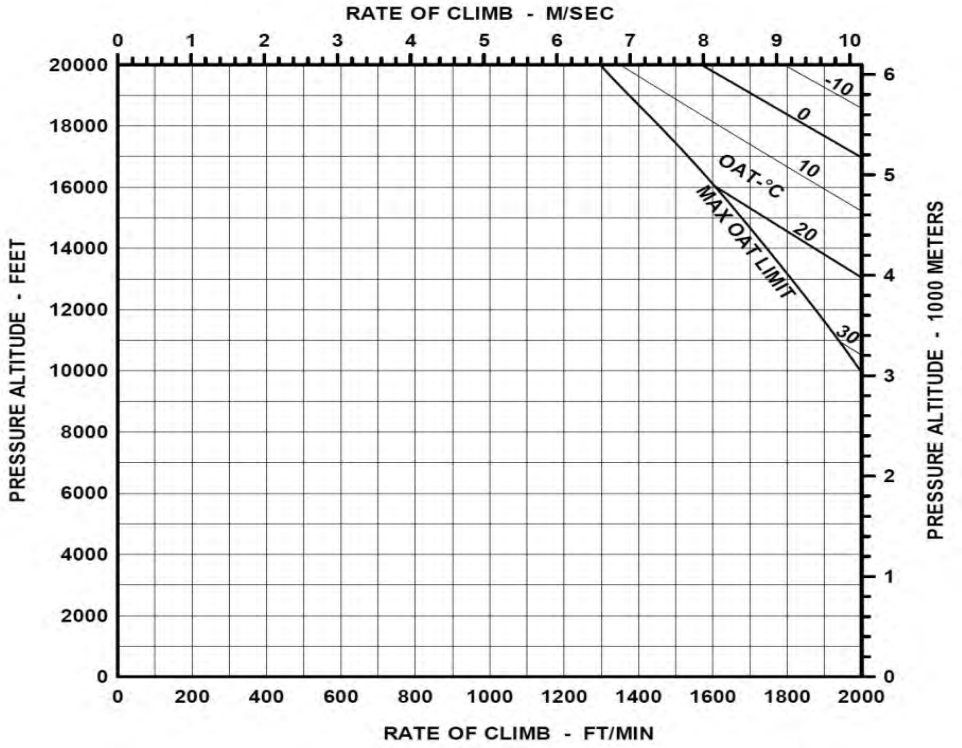


Figure 4-10 – Rate of Climb – Takeoff Power (Sheet 1 of 12)

RATE OF CLIMB

TAKEOFF POWER
ENGINE RPM 100%
GENERATOR 180 AMPS

60 KIAS
HEATER ON
BASIC INLET

REDUCE RATE OF CLIMB 225 FT/MIN ABOVE
11,000 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 3000 lb (1361 kg)

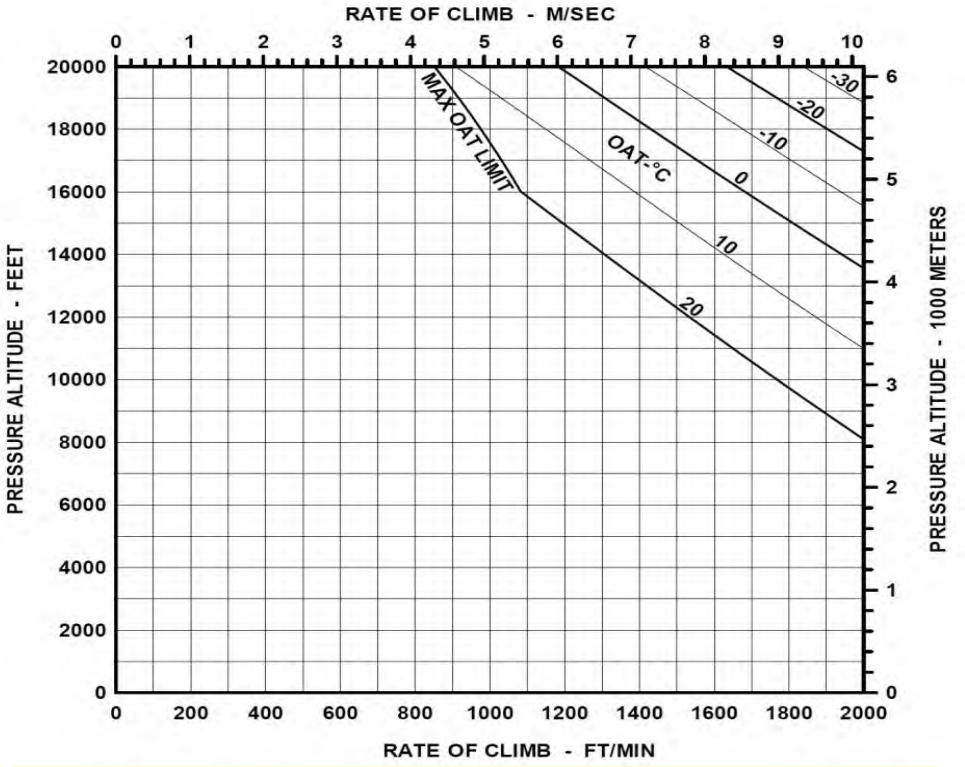


Figure 4-10 – Rate of Climb – Takeoff Power (Sheet 2 of 12)

RATE OF CLIMB

TAKEOFF POWER
ENGINE RPM 100%
GENERATOR 180 AMPS

60 KIAS
HEATER OFF
BASIC INLET

REDUCE RATE OF CLIMB 190 FT/MIN ABOVE
11,500 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 3500 lb (1857 kg)

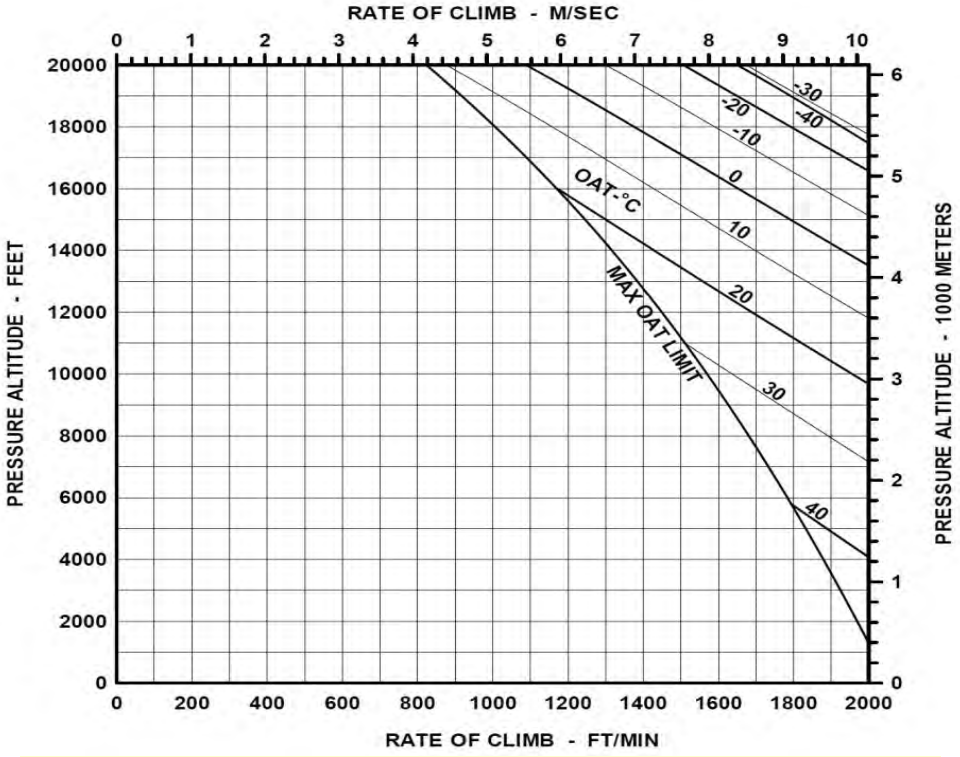


Figure 4-10 – Rate of Climb – Takeoff Power (Sheet 3 of 12)

RATE OF CLIMB

TAKEOFF POWER
ENGINE RPM 100%
GENERATOR 180 AMPS

60 KIAS
HEATER ON
BASIC INLET

REDUCE RATE OF CLIMB 190 FT/MIN ABOVE
7500 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 3500 lb (1857 kg)

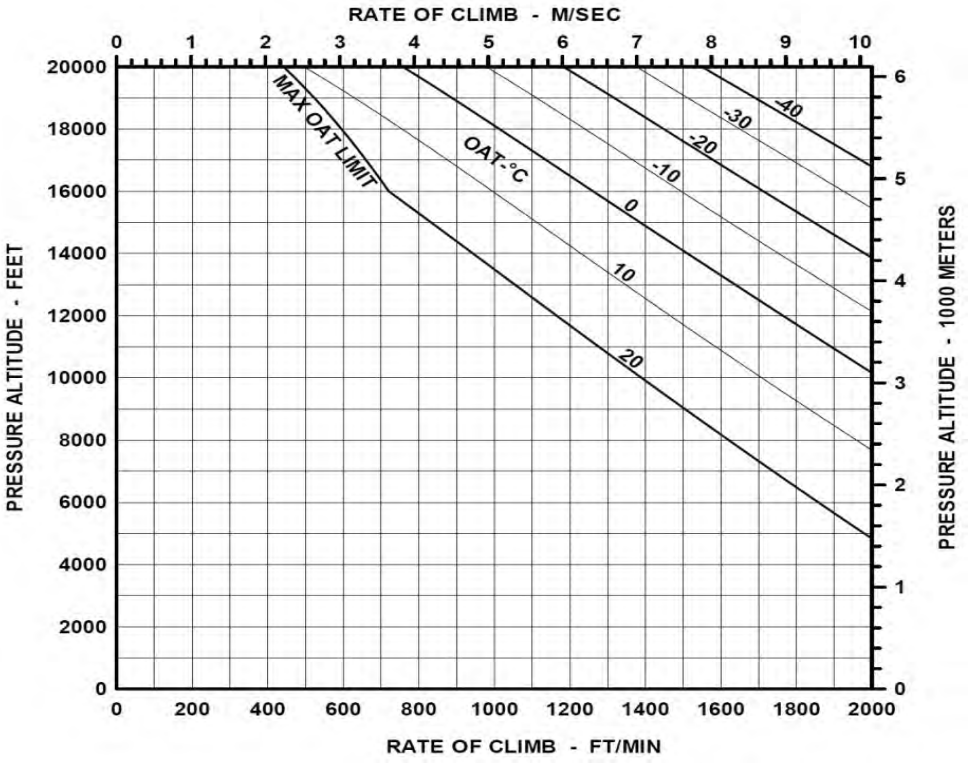


Figure 4-10 – Rate of Climb – Takeoff Power (Sheet 4 of 12)

RATE OF CLIMB

TAKEOFF POWER
ENGINE RPM 100%
GENERATOR 180 AMPS

60 KIAS
HEATER OFF
BASIC INLET

REDUCE RATE OF CLIMB 170 FT/MIN ABOVE
9000 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 4000 lb (1814 kg)

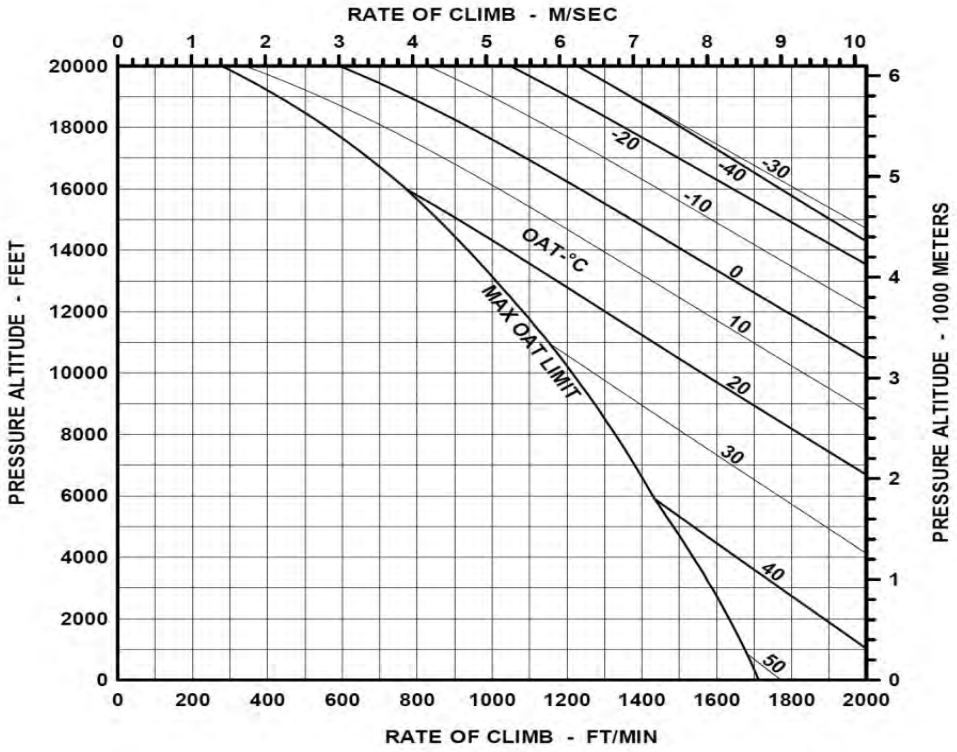


Figure 4-10 – Rate of Climb – Takeoff Power (Sheet 5 of 12)

RATE OF CLIMB

TAKEOFF POWER
ENGINE RPM 100%
GENERATOR 180 AMPS

60 KIAS
HEATER ON
BASIC INLET

REDUCE RATE OF CLIMB 170 FT/MIN ABOVE
4500 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 4000 lb (1814 kg)

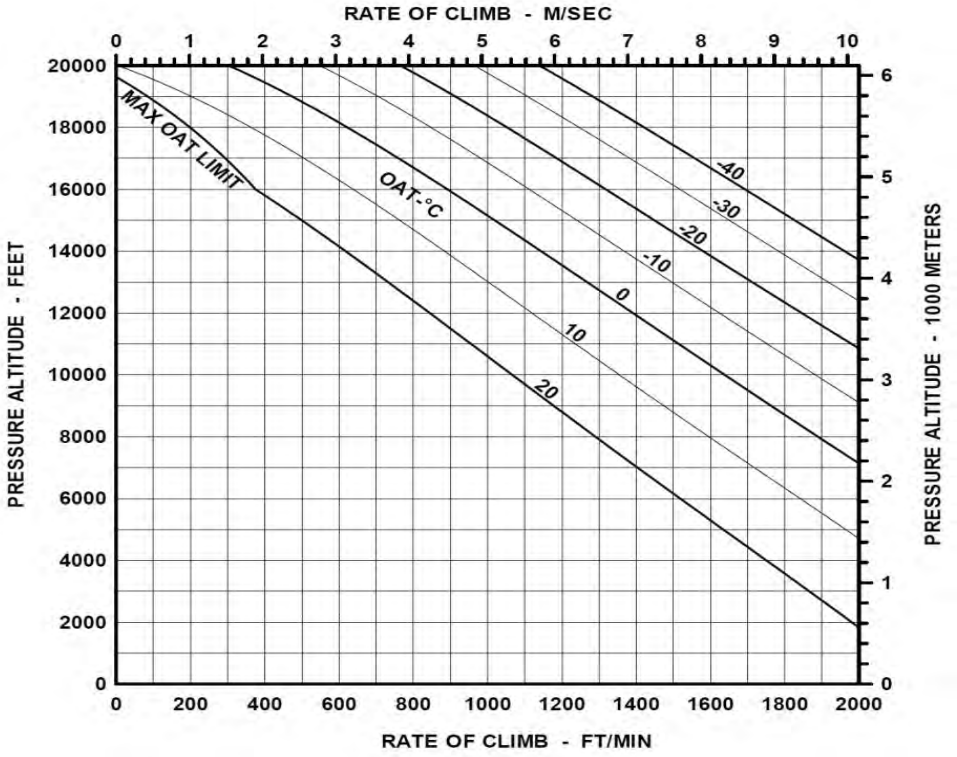


Figure 4-10 – Rate of Climb – Takeoff Power (Sheet 6 of 12)

RATE OF CLIMB

TAKEOFF POWER
ENGINE RPM 100%
GENERATOR 180 AMPS

60 KIAS
HEATER OFF
BASIC INLET

REDUCE RATE OF CLIMB 150 FT/MIN ABOVE
6500 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 4500 lb (2041 kg)

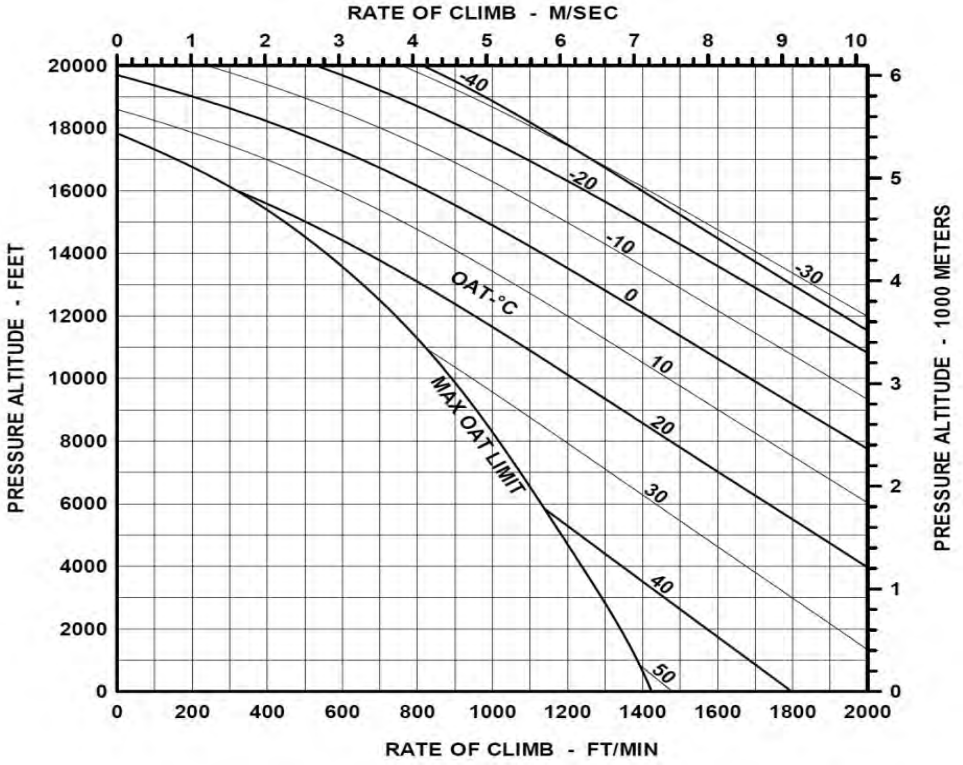


Figure 4-10 – Rate of Climb – Takeoff Power (Sheet 7 of 12)

RATE OF CLIMB

TAKEOFF POWER
ENGINE RPM 100%
GENERATOR 180 AMPS

60 KIAS
HEATER ON
BASIC INLET

REDUCE RATE OF CLIMB 150 FT/MIN ABOVE
2000 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 4500 lb (2041 kg)

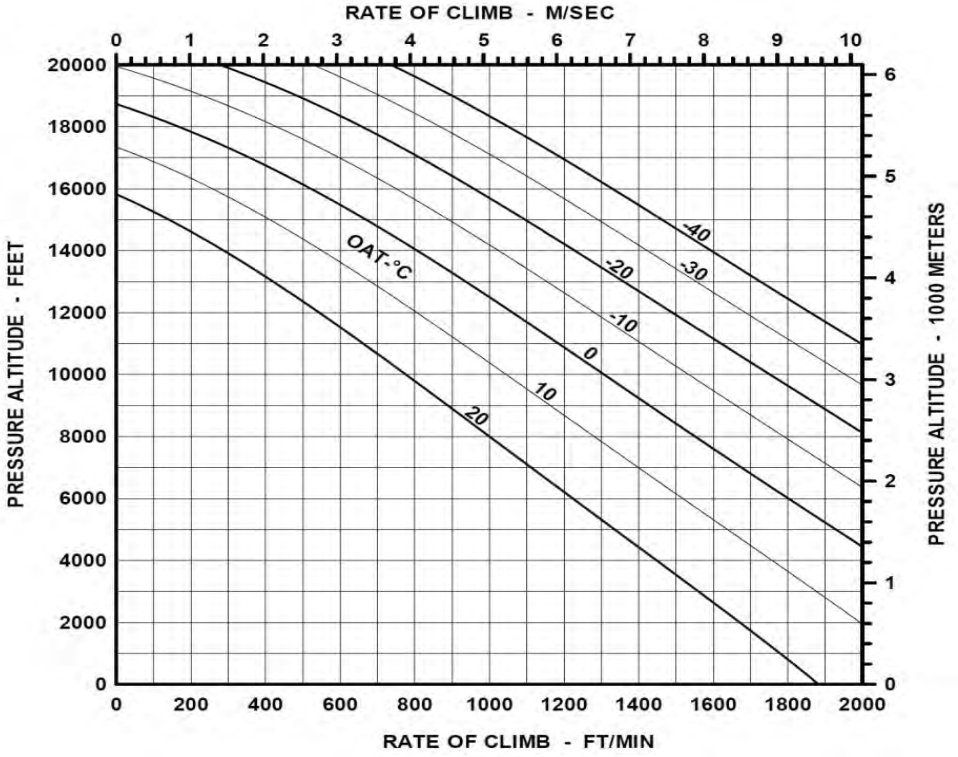


Figure 4-10 – Rate of Climb – Takeoff Power (Sheet 8 of 12)

RATE OF CLIMB

TAKEOFF POWER
ENGINE RPM 100%
GENERATOR 180 AMPS

60 KIAS
HEATER OFF
BASIC INLET

REDUCE RATE OF CLIMB 135 FT/MIN ABOVE
5000 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 5000 lb (2268 kg)

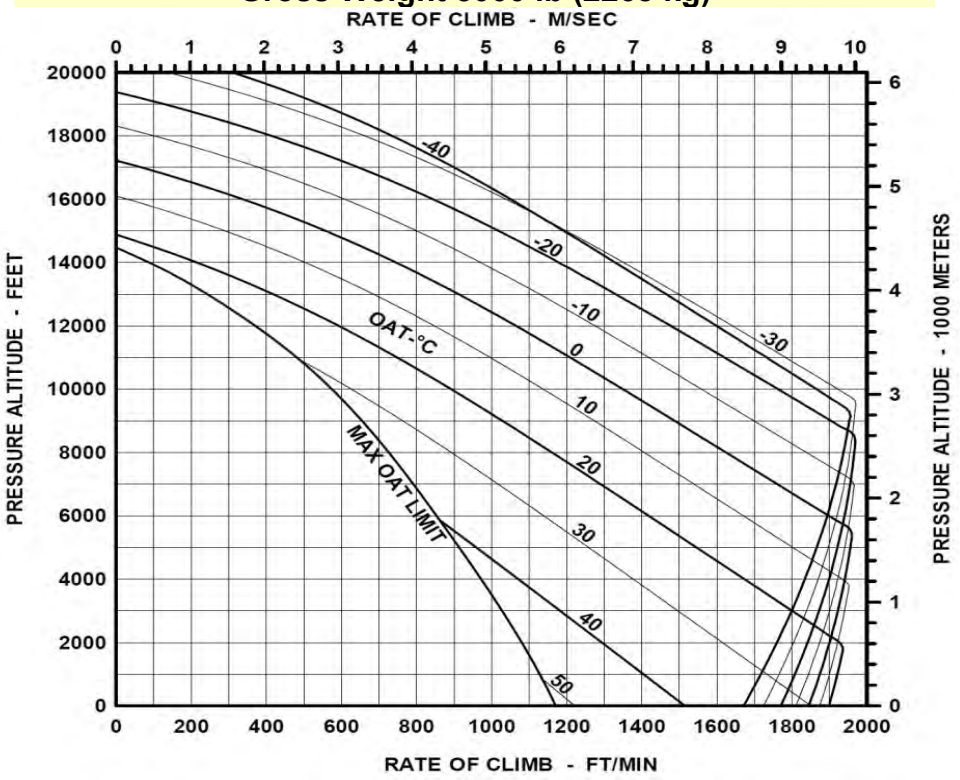


Figure 4-10 – Rate of Climb – Takeoff Power (Sheet 9 of 12)

RATE OF CLIMB

TAKEOFF POWER
ENGINE RPM 100%
GENERATOR 180 AMPS

60 KIAS
HEATER ON
BASIC INLET

REDUCE RATE OF CLIMB 135 FT/MIN ABOVE
1000 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 5000 lb (2268 kg)

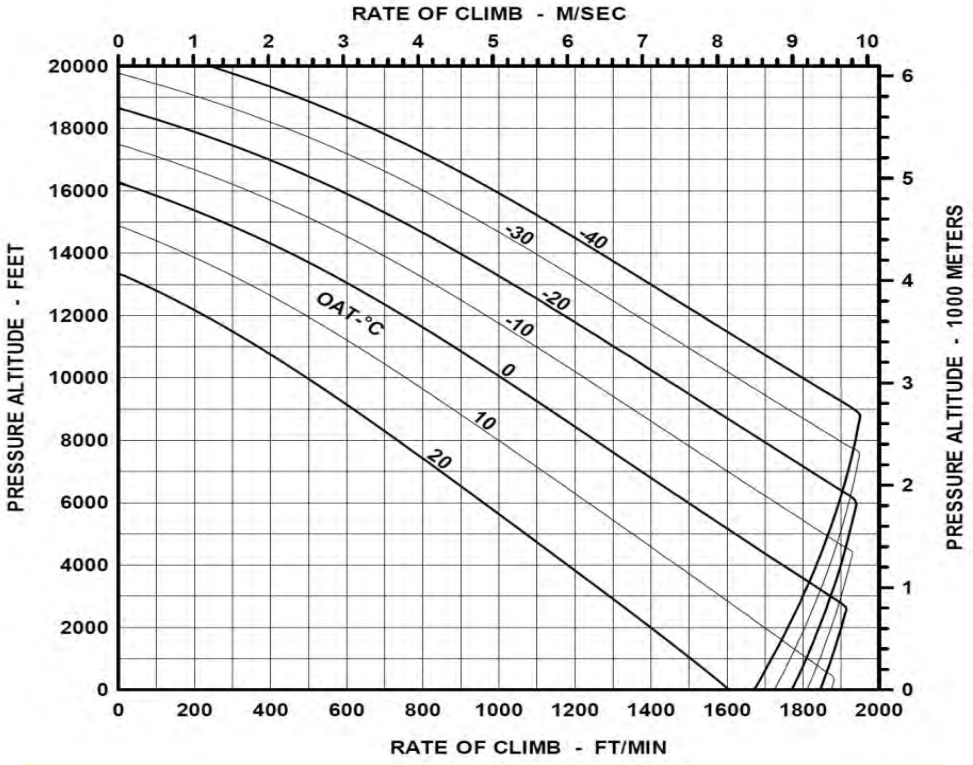


Figure 4-10 – Rate of Climb – Takeoff Power (Sheet 10 of 12)

RATE OF CLIMB

TAKEOFF POWER
ENGINE RPM 100%
GENERATOR 180 AMPS

60 KIAS
HEATER OFF
BASIC INLET

REDUCE RATE OF CLIMB 130 FT/MIN ABOVE
4000 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 5250 lb (2381 kg)

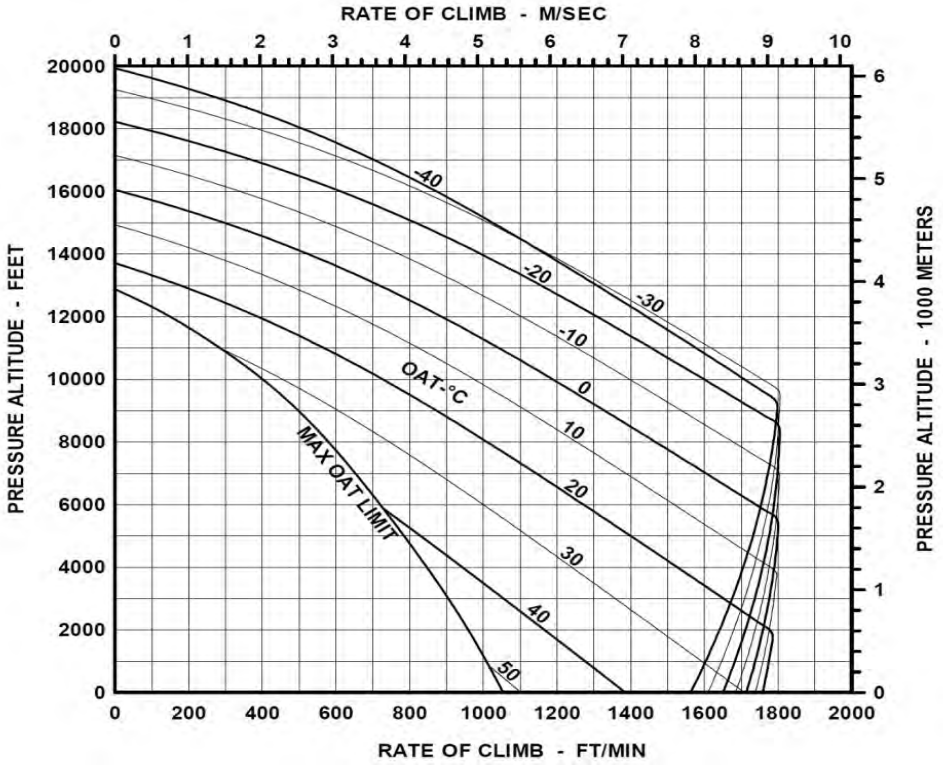


Figure 4-10 – Rate of Climb – Takeoff Power (Sheet 11 of 12)

RATE OF CLIMB

TAKEOFF POWER
ENGINE RPM 100%
GENERATOR 180 AMPS

60 KIAS
HEATER ON
BASIC INLET

REDUCE RATE OF CLIMB 130 FT/MIN ABOVE
1000 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 5250 lb (2381 kg)

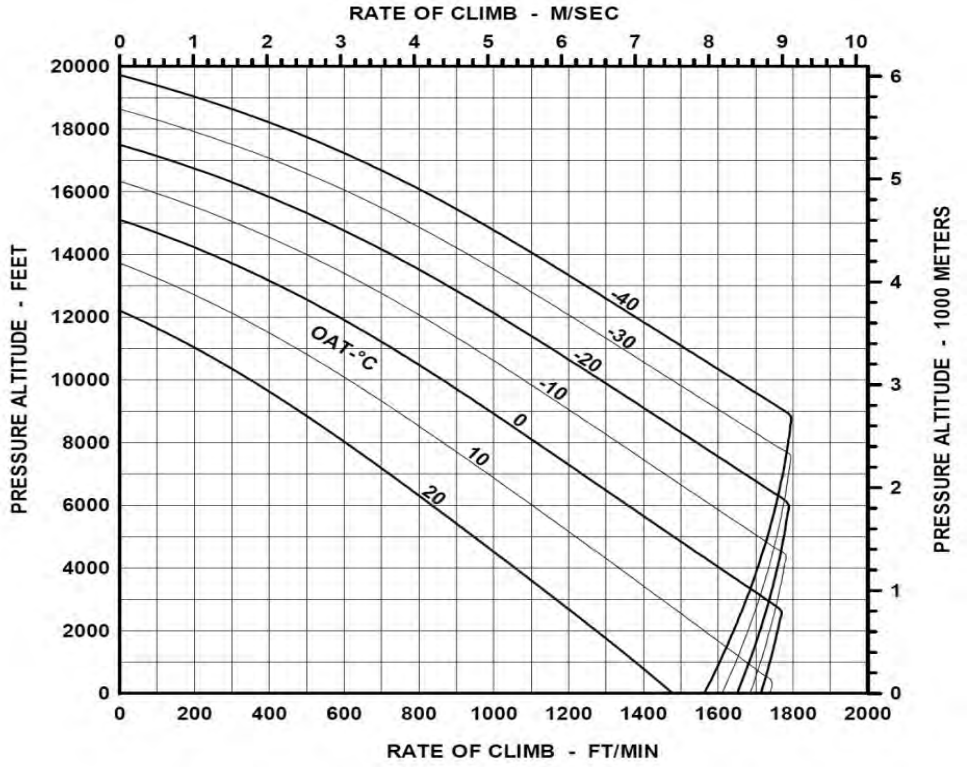


Figure 4-10 – Rate of Climb – Takeoff Power (Sheet 12 of 12)

RATE OF CLIMB

MAXIMUM CONTINUOUS POWER — 60 KIAS
ENGINE RPM 100% — HEATER OFF
GENERATOR 180 AMPS — BASIC INLET

REDUCE RATE OF CLIMB 225 FT/MIN ABOVE
10,000 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 3000 lb (1361 kg)

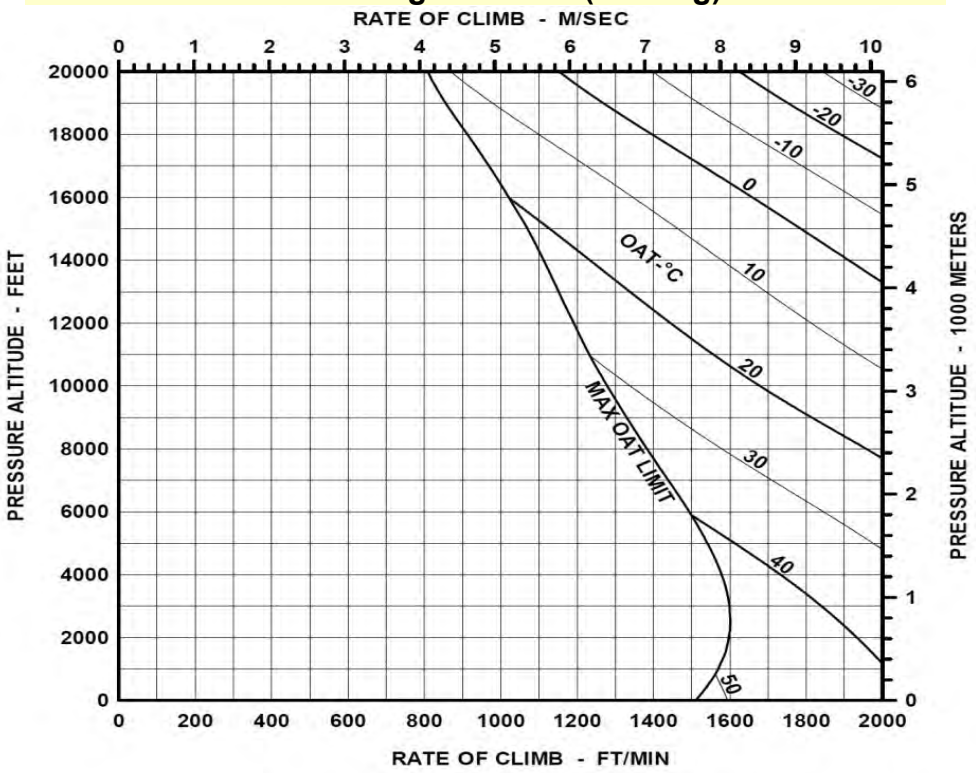


Figure 4-11 – Rate of Climb – Max Continuous Power (Sheet 1 of 12)

RATE OF CLIMB

MAXIMUM CONTINUOUS POWER — 60 KIAS
ENGINE RPM 100% — HEATER ON
GENERATOR 180 AMPS — BASIC INLET

REDUCE RATE OF CLIMB 225 FT/MIN ABOVE
6000 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 3000 lb (1361 kg)

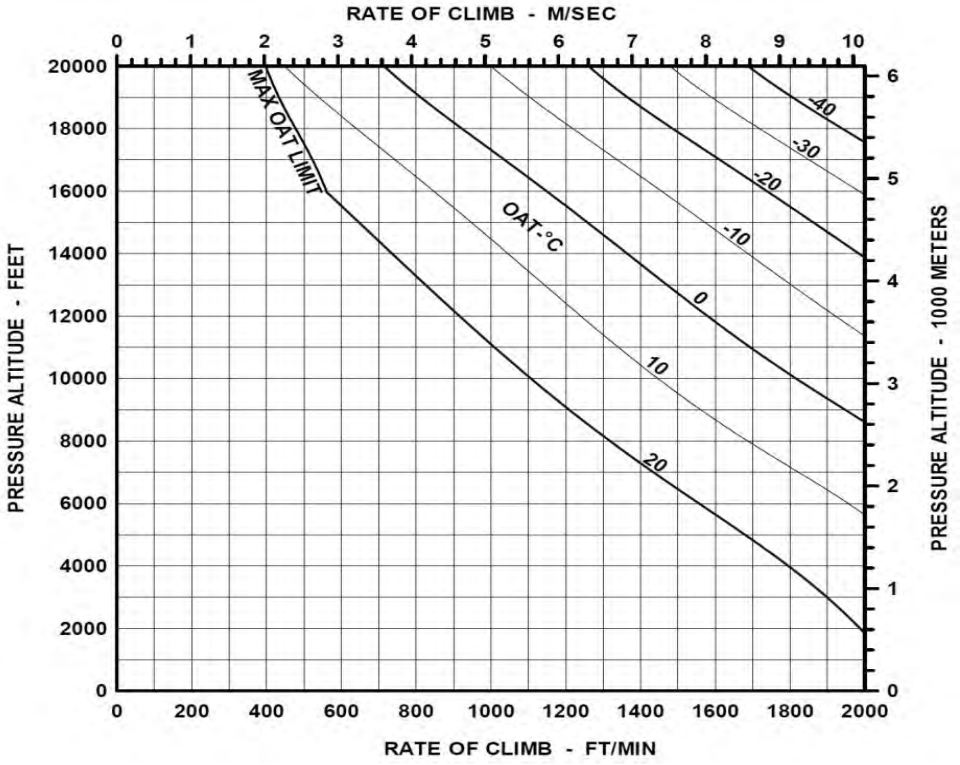


Figure 4-11 – Rate of Climb – Max Continuous Power (Sheet 2 of 12)

RATE OF CLIMB

MAXIMUM CONTINUOUS POWER — 60 KIAS
ENGINE RPM 100% — HEATER OFF
GENERATOR 180 AMPS — BASIC INLET

REDUCE RATE OF CLIMB 190 FT/MIN ABOVE
7500 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 3500 lb (1587 kg)

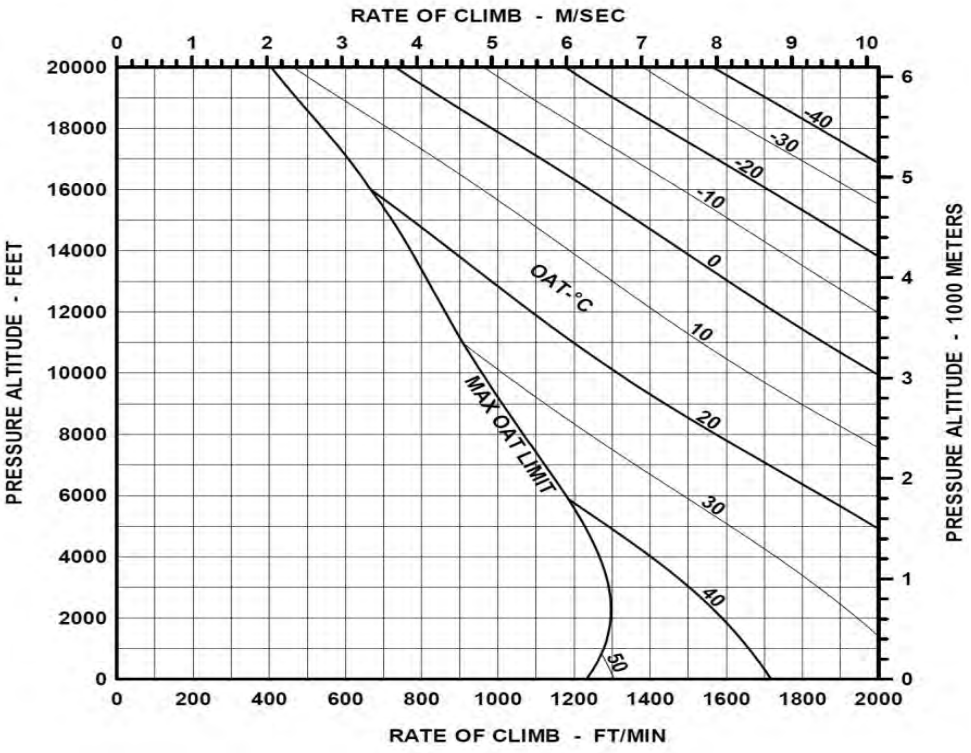


Figure 4-12 – Rate of Climb – Max Continuous Power (Sheet 3 of 12)

RATE OF CLIMB

MAXIMUM CONTINUOUS POWER — 60 KIAS
ENGINE RPM 100% — HEATER ON
GENERATOR 180 AMPS — BASIC INLET

REDUCE RATE OF CLIMB 190 FT/MIN ABOVE
2500 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 3500 lb (1587 kg)

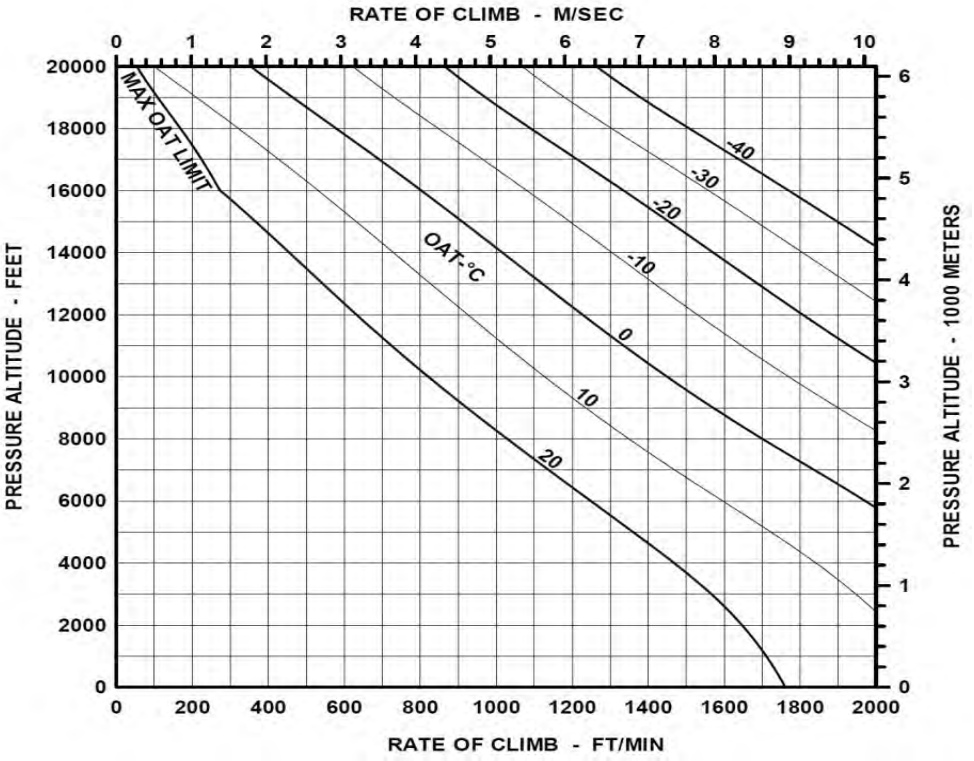


Figure 4-11 – Rate of Climb – Max Continuous Power (Sheet 4 of 12)

RATE OF CLIMB

MAXIMUM CONTINUOUS POWER — 60 KIAS
ENGINE RPM 100% — HEATER OFF
GENERATOR 180 AMPS — BASIC INLET

REDUCE RATE OF CLIMB 170 FT/MIN ABOVE
5000 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 4000 lb (1814 kg)

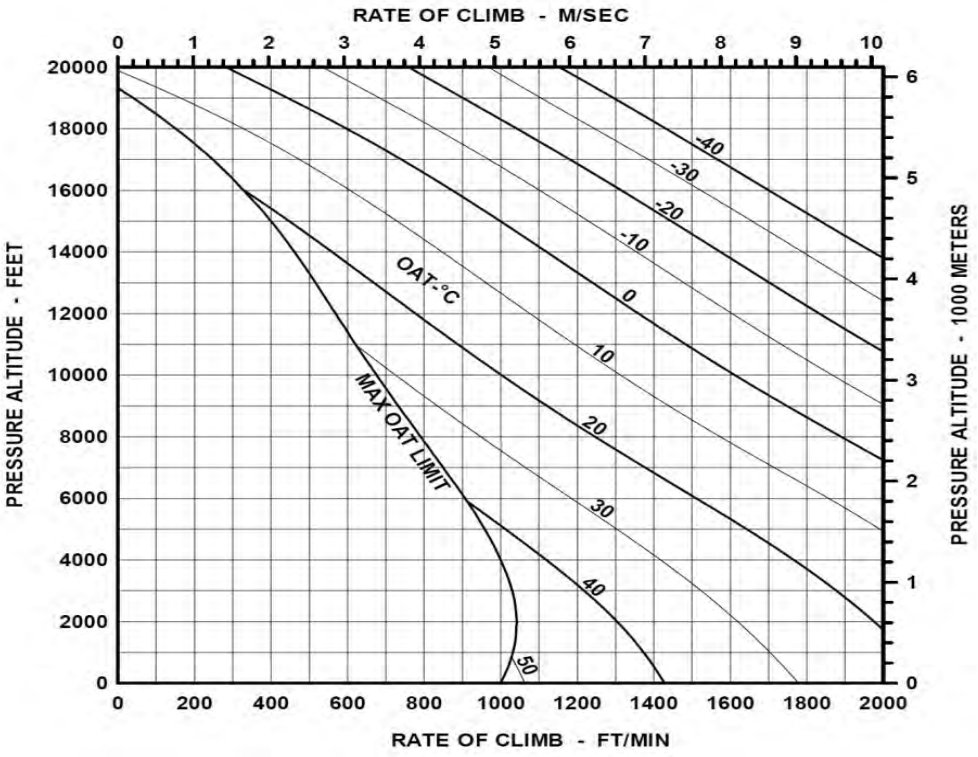


Figure 4-11 – Rate of Climb – Max Continuous Power (Sheet 5 of 12)

RATE OF CLIMB

MAXIMUM CONTINUOUS POWER — 60 KIAS
ENGINE RPM 100% — HEATER ON
GENERATOR 180 AMPS — BASIC INLET

REDUCE RATE OF CLIMB 170 FT/MIN
FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 4000 lb (1814 kg)

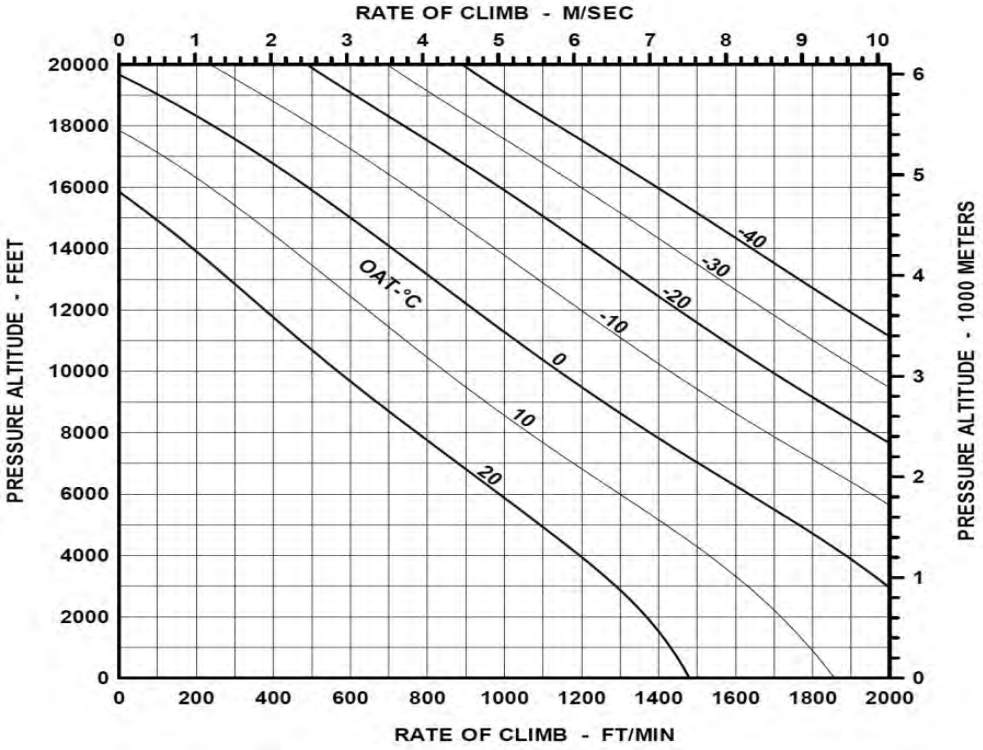


Figure 4-11 – Rate of Climb – Max Continuous Power (Sheet 6 of 12)

RATE OF CLIMB

MAXIMUM CONTINUOUS POWER — 60 KIAS
ENGINE RPM 100% — HEATER OFF
GENERATOR 180 AMPS — BASIC INLET

REDUCE RATE OF CLIMB 150 FT/MIN ABOVE
3000 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 4500 lb (2041 kg)

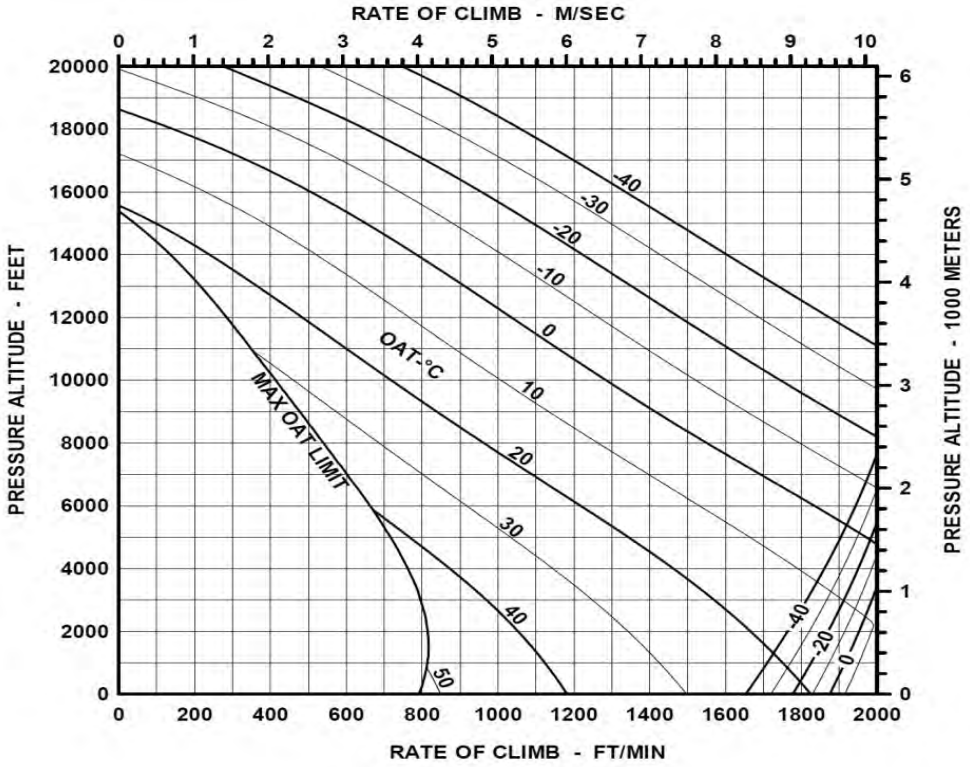


Figure 4-11 – Rate of Climb – Max Continuous Power (Sheet 7 of 12)

RATE OF CLIMB

MAXIMUM CONTINUOUS POWER — 60 KIAS
ENGINE RPM 100% — HEATER ON
GENERATOR 180 AMPS — BASIC INLET

REDUCE RATE OF CLIMB 150 FT/MIN
FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 4500 lb (2041 kg)

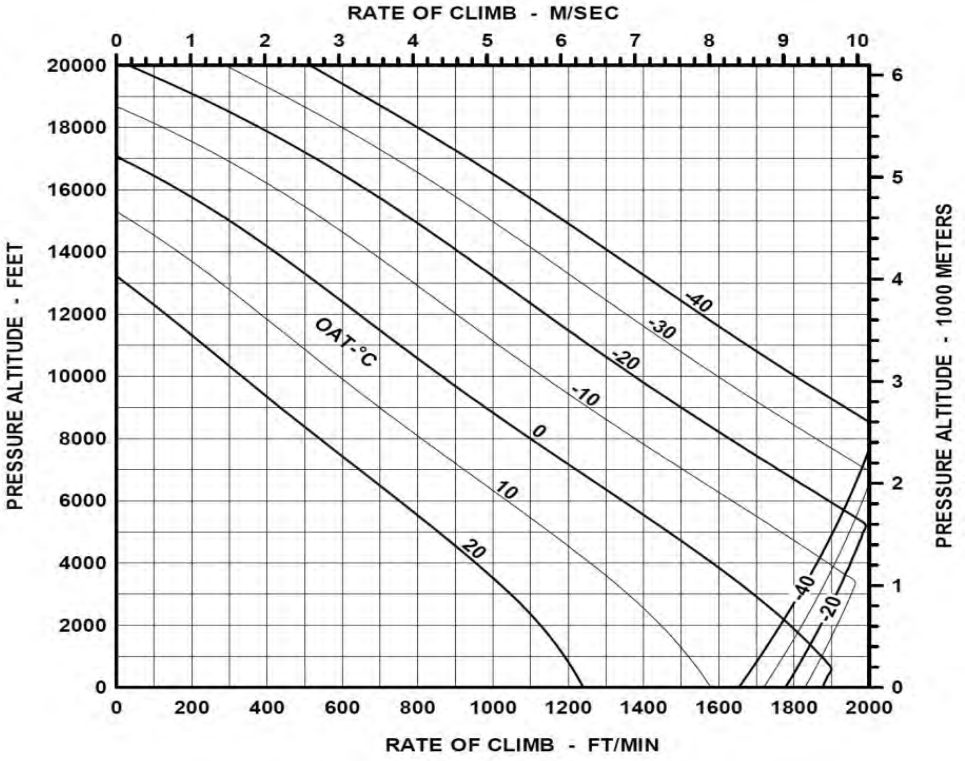


Figure 4-11 – Rate of Climb – Max Continuous Power (Sheet 8 of 12)

RATE OF CLIMB

MAXIMUM CONTINUOUS POWER — 60 KIAS
ENGINE RPM 100% — HEATER OFF
GENERATOR 180 AMPS — BASIC INLET

REDUCE RATE OF CLIMB 135 FT/MIN ABOVE
3000 FT H_P FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 5000 lb (2268 kg)

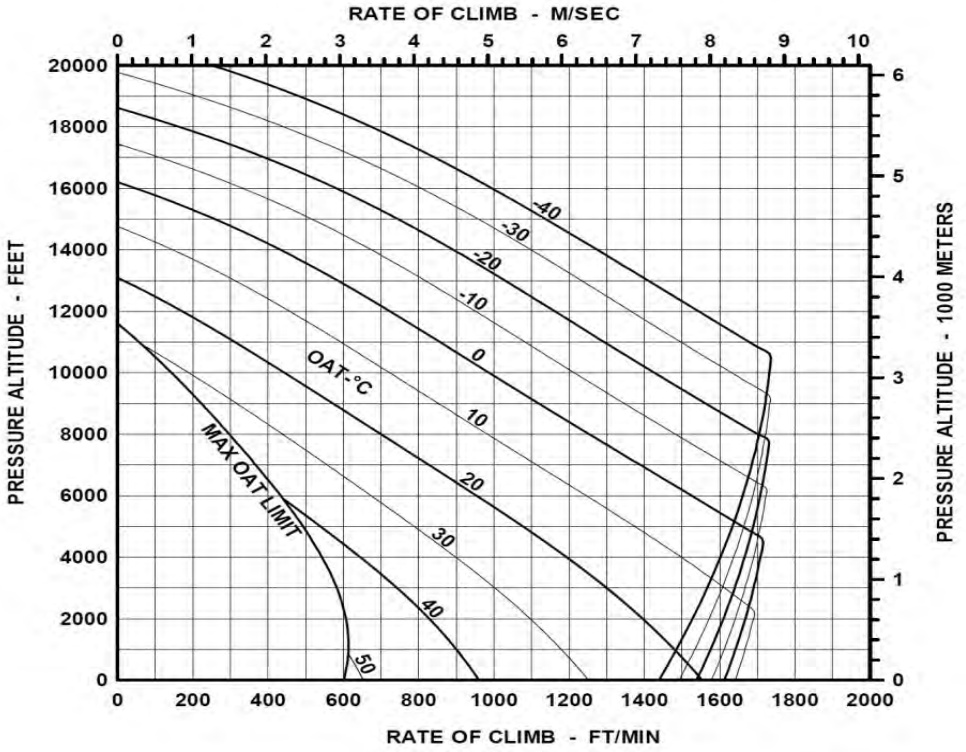


Figure 4-11 – Rate of Climb – Max Continuous Power (Sheet 9 of 12)

RATE OF CLIMB

MAXIMUM CONTINUOUS POWER — 60 KIAS
ENGINE RPM 100% — HEATER ON
GENERATOR 180 AMPS — BASIC INLET

REDUCE RATE OF CLIMB 135 FT/MIN
FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 5000 lb (2268 kg)

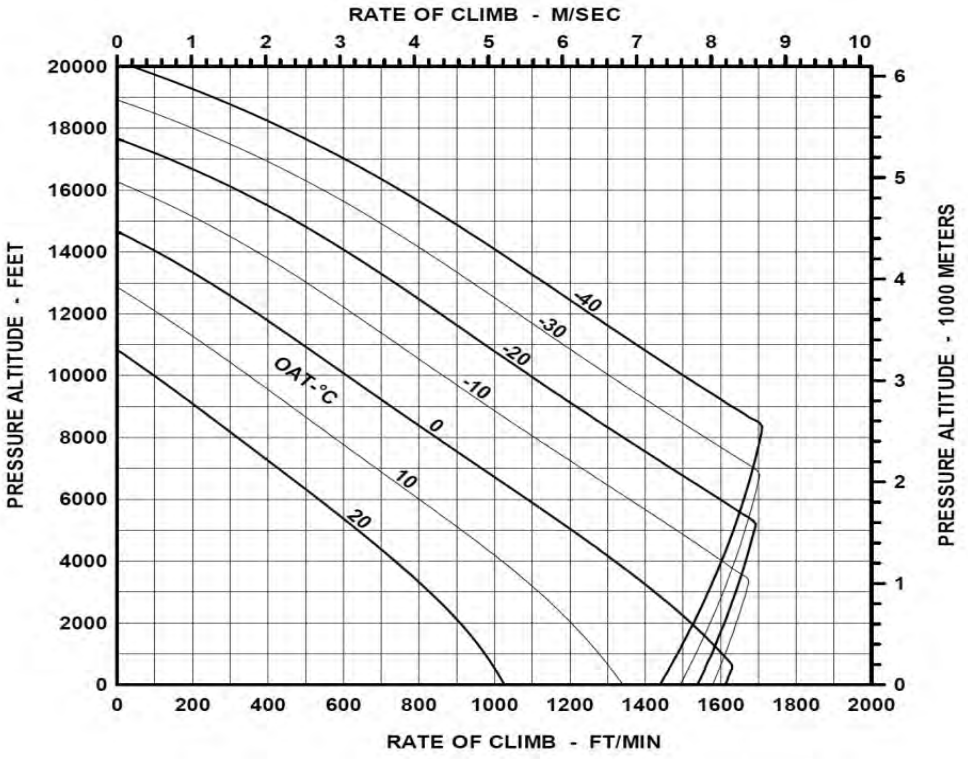


Figure 4-11 – Rate of Climb – Max Continuous Power (Sheet 10 of 12)

RATE OF CLIMB

MAXIMUM CONTINUOUS POWER — 60 KIAS
ENGINE RPM 100% — HEATER OFF
GENERATOR 180 AMPS — BASIC INLET

REDUCE RATE OF CLIMB 130 FT/MIN ABOVE
2500 FT Hp FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 5250 lb (2381 kg)

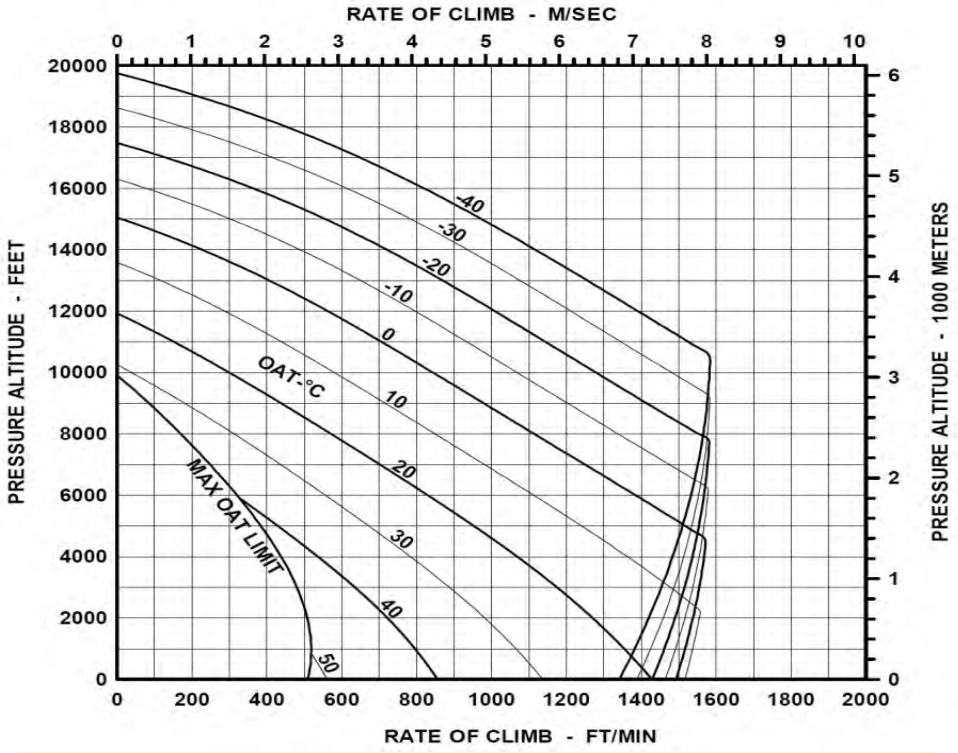


Figure 4-11 – Rate of Climb – Max Continuous Power (Sheet 11 of 12)

RATE OF CLIMB

MAXIMUM CONTINUOUS POWER — 60 KIAS
ENGINE RPM 100% — HEATER ON
GENERATOR 180 AMPS — BASIC INLET

REDUCE RATE OF CLIMB 130 FT/MIN
FOR ANTI-ICE ON (5°C AND COLDER)

Gross Weight 5250 lb (2381 kg)

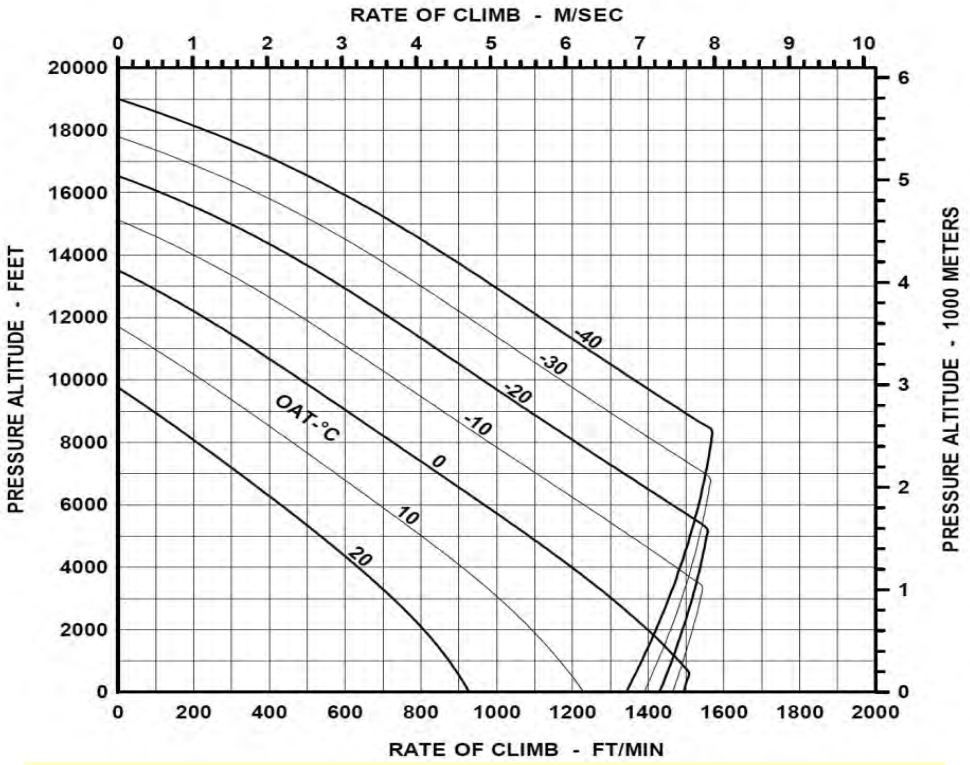


Figure 4-11 – Rate of Climb – Max Continuous Power (Sheet 12 of 12)

AUTOROTATION GLIDE DISTANCE

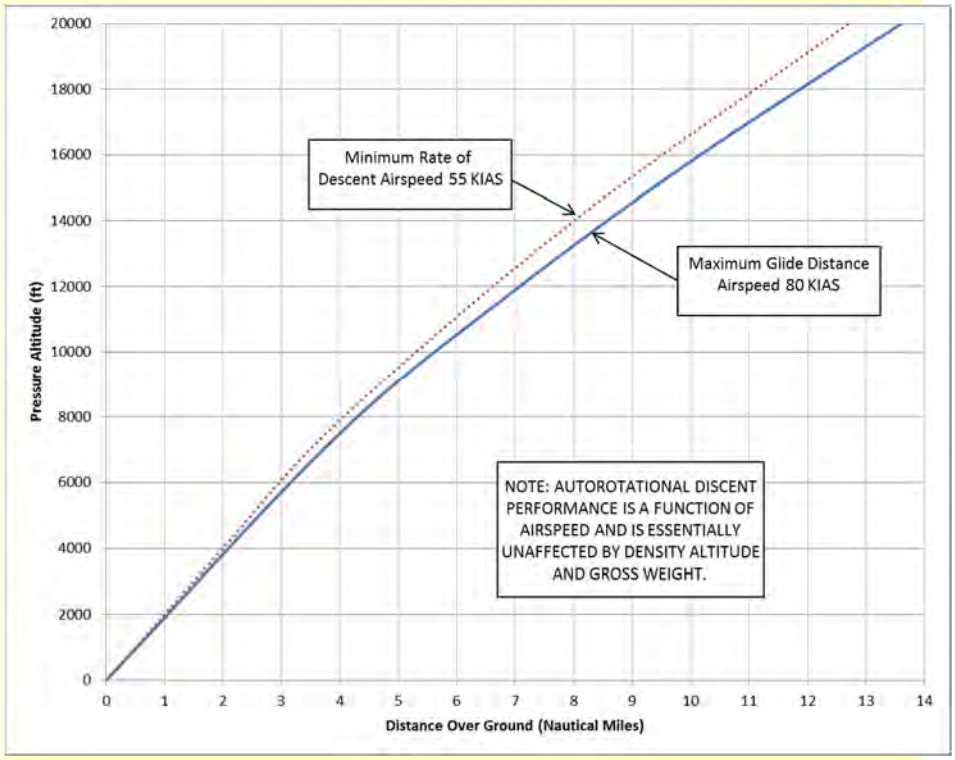


Figure 4-12 – Autorotation Glide Distance

AIRSPEED INSTALLATION CORRECTION TABLE

KCAS = (KIAS – INSTRUMENT ERROR – POSITION ERROR)
NOTE: This chart assumes zero instrument error.

KIAS	CLIMB KCAS	LEVEL FLIGHT KCAS
20	--	22
30	30	33
40	37	43
50	47	52
60	58	63
70	69	73
80	78	82
90	87	92
100	95	100
110	--	110
120	--	121
130	--	131
140	--	144

Figure 4-13 – Airspeed Installation Correction

Section 5

Weight and Balance Data

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Section 5

Weight and Balance Data

5.1 Introduction

This section provides loading information and instructions necessary to ensure that flight can be performed within the approved gross weight and center of gravity limitations, as defined in Section 1.

5.2 Empty Weight Center of Gravity

5.2.A Empty Weight

The empty weight condition consists of the basic helicopter with required equipment, optional equipment kits, transmission and gearbox oils, hydraulic fluid, unusable fuel, undrainable engine oil and fixed ballast. The empty weight and center of gravity are recorded on the Actual Weight Record, a copy of which should be carried in the helicopter to enable weight and balance computations.

5.2.B Center of Gravity

An Empty Weight vs. Center of Gravity chart is provided in ICA-E407-789 Chapter 8 as a guide to simplify computing ballast requirements. This chart was derived from gross weight longitudinal center of gravity limits shown in Section 1, using most forward and most aft useful loads for standard seating and fuel.

Note

Empty weight center of gravity chart is not valid if helicopter has a non-standard fuel system or seating arrangement.

5.3 Gross Weight Center of Gravity

Gross weight condition is empty weight condition plus useful load.

5.3.A Useful Loads

Useful load consists of usable fuel, engine oil, crew, passengers, baggage and cargo. Combinations of these items, which have most adverse effect on helicopter center of gravity, are known as most forward and most aft useful loads. Whenever cargo and/or baggage are carried, these useful loads may be different for each flight, and weight and balance must be computed to ensure gross weight and center of gravity will remain within limits throughout flight.

Standard most forward and most aft useful loads are combinations of fuel, crew and passenger loading only. These loads, in conjunction with empty weight center of gravity chart, allow passengers only (no baggage or other cargo) to be carried within appropriate weight limitations without computing center of gravity for each flight.

If helicopter has a non-standard fuel system or seating arrangement, or is not ballasted in accordance with the Empty Weight Versus Center of Gravity chart in ICA-E407-789, Chapter 8, pilot must determine weight and balance to ensure gross weight and center of gravity will remain within limits throughout each flight.

5.3.B Center of Gravity

It is the responsibility of the pilot to ensure that helicopter is properly loaded to maintain center of gravity throughout each flight within gross weight center of gravity limits shown in Section 1 or appropriate supplement. Gross weight longitudinal and lateral center of gravity can be calculated using Actual Weight Record, diagrams and loading tables in this section, and loading tables in applicable Flight Manual Supplements.

When carrying baggage, cargo, or non-standard loads, effects of fuel consumption and addition/deletion of passengers, baggage, or cargo at intermediate points should be checked prior to flight.

Significant fuselage stations and buttock lines are shown in Figure 5-1 and Figure 5-2 to aid in weight and balance computations.

5.4 Doors Open or Removed

When one or more cabin doors are removed, helicopter may exceed gross weight center of gravity limits during flight. If using the Empty Weight Versus Center of Gravity chart (refer to ICA-E407-789, Chapter 8), a ballast adjustment to offset moment change is necessary (Table 5-1). Otherwise, gross weight center of gravity should be computed for each flight.

5.4.A Door Weights and Moments

Following table provides weight and moment adjustments for cabin doors. Sign convention for buttock lines used to compute lateral moments are:

1. Left is negative.
2. Right is positive.

ACTION	MOMENT CHANGE	
	LEFT DOOR	RIGHT DOOR
Remove	Positive (+)	Negative (-)
Install	Negative (-)	Positive (+)

Example:
When removing a left door only, subtract positive weight value and negative moment value shown in table. Net effect on helicopter is a reduction in weight and a shift in lateral CG to right (positive direction).

5.4.B Ballast Adjustment

Following check can be made to determine if a ballast adjustment is necessary after doors are removed or installed.

1. For helicopters without ballast or with nose ballast, apply weight and moment changes to most aft useful load condition to determine if an increase in nose ballast is required, or a reduction is allowed.

2. For helicopters with tail ballast, apply weight and moment changes to most forward useful load condition to determine if a reduction in tail ballast is allowed, or an increase is required.

Note

Ballast changes are performed by maintenance personnel. After any ballast change, Actual Weight Record must be revised to show new empty weight condition.

5.5 Cockpit and Cabin Loading

Loading tables (Table 5-2 and Table 5-2M) provide weights and moments for each passenger location, litter patient, and baggage compartment in both U.S. and metric units.

To find moments for weights in excess of those shown on tables, multiply weight by fuselage station at which center of gravity of the object is located. An alternate method is to calculate amount of weight in excess of maximum weight listed on table, then read moment for this excess weight from table and add it to moment for maximum weight shown on table. This will give desired moment for the object.

5.5.A Longitudinal Loading

1. A minimum weight of 170 pounds (77.1 kg) is required in cockpit at fuselage station 65.0 when the empty weight center of gravity chart is used.

2. Passenger seating is unrestricted.

3. Cargo loading is restricted only by floor load limit. Refer to Section 1.

5.5.B Most Forward and Most Aft CG

When using empty weight center of gravity chart, following combinations of crew, fuel and passenger loading will have most extreme effects on longitudinal center of gravity, assuming standard weights for all crew and passengers.

1. Most forward CG will occur with forward and mid seats occupied and fuel quantity of 74.8 gallons (283.0 L).

2. Most aft CG will occur with one forward seat occupied (pilot) and fuel quantity of 28.4 gallons (107.5 L).

Since center of gravity of aft passengers is on aft limit, weight of passengers is not included in most aft useful load. However when most aft center of gravity of a configuration is forward of aft limit, addition of aft passengers will shift center of gravity further aft, and should be included in computation.

5.5.C Alternate Loading

Gross weight center of gravity chart must be used to determine cabin loading requirements under following conditions:

1. Whenever cargo and/or baggage are carried.

2. When actual passenger weights are used.

3. When seating arrangement and/or fuel system are non-standard.

4. When performing specialty missions, such as hoisting or rappelling.

5.5.D Cabin Floor Loading

Cabin floor is structurally designed for 75 pounds per square foot (3.7 kg per 100 cm^2).

5.6 Baggage Compartment Loading

When weight is loaded into baggage compartment, the pilot is required to compute weight and balance, regardless of passenger loading.

Baggage compartment is structurally designed for 86 pounds per square foot (4.2 kg per 100 cm^2) for a total weight of 250 pounds (113.4 kg).

Loading of baggage compartment should be from front to rear. Load shall be secured to tie-down fittings if shifting of load in flight could result in structural damage to baggage compartment or in gross weight center of gravity being exceeded.

If load is not secured, center of gravity must be computed with load in most adverse position.

5.7 Fuel Loading

Longitudinal center of gravity of fuel shifts as it is consumed (Figure 5-3). Extreme effects of fuel consumption on helicopter center of gravity for standard fuel system are as follows:

1. Critical fuel for computing most forward useful load is 74.8 gallons (283.0 L).

2. Critical fuel for computing most aft useful load is 28.4 gallons (107.5 L).

Fuel loading tables (Table 5-3 and Table 5-3M) list usable fuel quantities, weight and moments in both U.S. and metric units.

Fuel density versus temperature (Table 5-4), is provided to calculate fuel weight variation for equivalent volumes of fuel caused by a change in temperature. For example weight of 127.8 gallons (full fuel) of JP-5 at -40°F is 913.8 pounds (414.5 kg) versus 869.0 pounds (394.1 kg) shown on Fuel loading chart (Table 5-3 and Table 5-3M).

5.8 Sample Loading Problem

A sample loading problem showing derivation of critical gross weights and center of gravity locations for a typical mission is presented in U.S. and metric units (Table 5-5 and Table 5-5M). Method shown derives a gross weight with zero fuel for each load condition to be checked, then adds appropriate fuel weight and moment read directly from fuel loading table. Center of gravity for each condition is calculated by dividing total moment by total weight.

Forms have been provided (Table 5-6 and Table 5-6M) in both U.S. and metric units, to aid in computing critical load conditions for a flight.

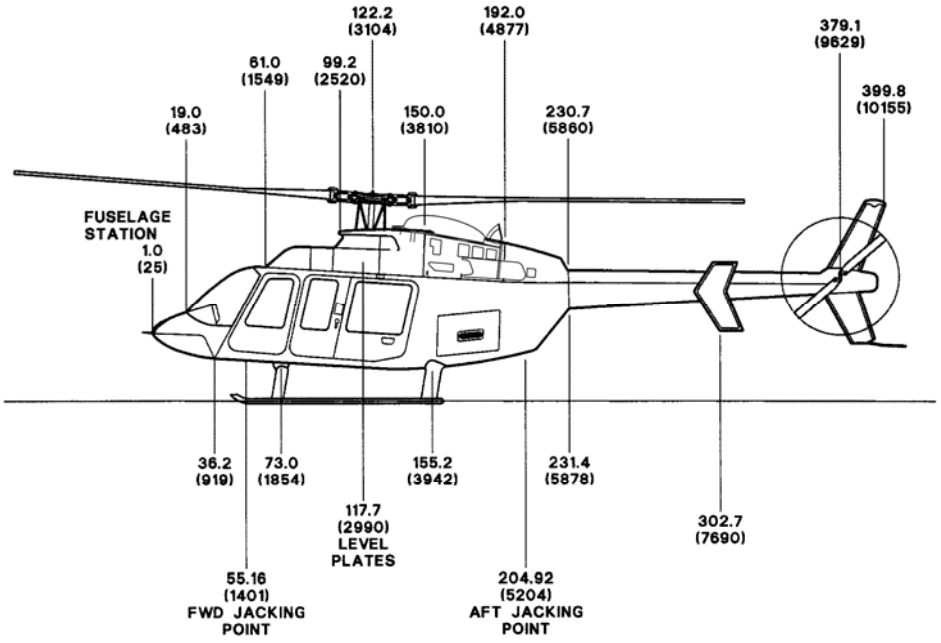

Figure 5-1 – Fuselage Stations

Note

Reference datum line, (Fuselage Station O), is located 55.16 inches (1401 millimeters) forward of the forward jack point center line.

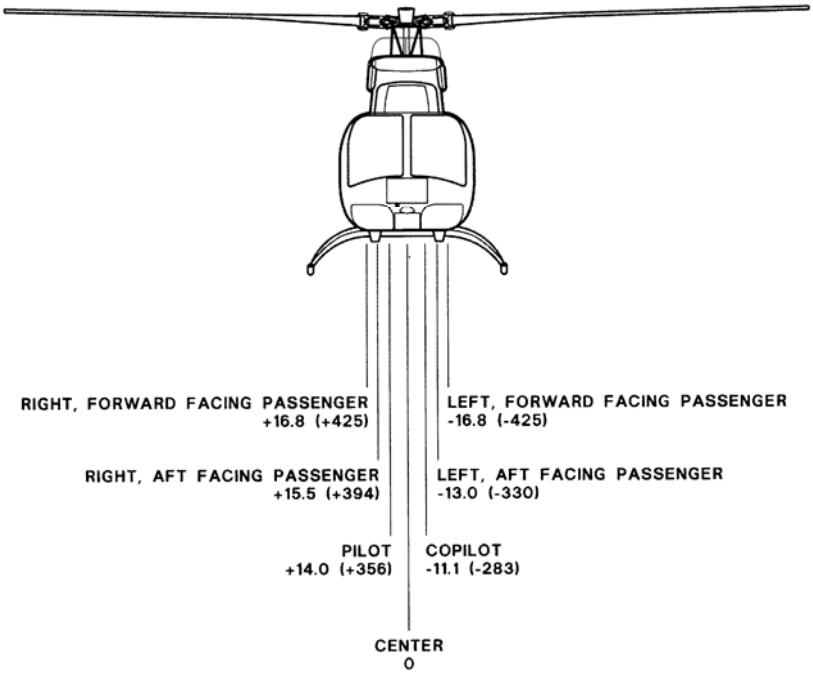

Figure 5-2 – Buttock Lines Inches (Millimeters)

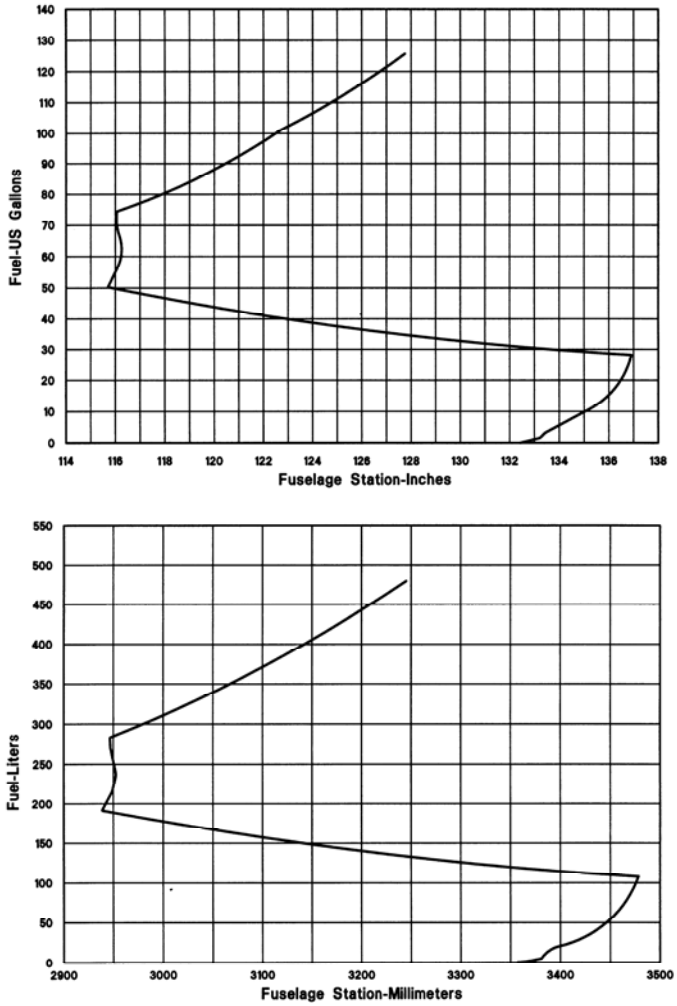

Figure 5-3 – Fuel Center of Gravity

Table 5-1 – Door Weights and Moments (US)

Door	Weight (LB)	CG (IN)	Moment (IN•LB)	CG (IN)	Moment (IN•LB)
One crew door	13	64	832	±26	±338
Both crew doors	26	64	1664	0	0
One passenger door	15	125	1875	±27	±405
Both passenger doors	30	125	3750	0	0
Left passenger door and litter door	29	111	3219	-27	-783

Table 5-1M – Door Weights and Moments (Metric)

Door	Weight (KG)	CG (MM)	Moment (KG•MM /100)	CG (MM)	Moment (KG•MM /100)
One crew door	5.9	1626	95.9	±660	±38.9
Both crew doors	11.8	1626	191.9	0	0
One passenger door	6.8	3175	215.9	±686	±46.6
Both passenger doors	13.6	3175	431.8	0	0
Left passenger door and litter door	13.2	2819	372.1	-686	-90.6

Table 5-2 – Cabin and Baggage Loading (U.S.)

CABIN AND BAGGAGE COMPARTMENT TABLE OF MOMENTS (INCH-POUNDS)					
WEIGHT (LB)	FRONT SEAT FS 65	MID-PASS. (AFT FACING) FS 91	AFT-PASS. (FWD FACING) FS 129	LITTER PATIENT(S) FS 108	BAGGAGE FS 174
10	650	910	1290	1080	1740
20	1300	1820	2580	2160	3480
30	1950	2730	3870	3240	5220
40	2600	3640	5160	4320	6960
50	3250	4550	6450	5400	8700
60	3900	5460	7740	6480	10440
70	4550	6370	9030	7560	12180
80	5200	7280	10320	8640	13920
90	5850	8190	11610	9720	15660
100	6500	9100	12900	10800	17400
110	7150	10010	14190	11880	19140
120	7800	10920	15480	12960	20880
130	8450	11830	16770	14040	22620
140	9100	12740	18060	15120	24360
150	9750	13650	19350	16200	26100
160	10400	14560	20640	17280	27840
170	11050	15470	21930	18360	29580
180	11700	16380	23220	19440	31320
190	12350	17290	24510	20520	33060
200	13000	18200	25800	21600	34800
210	13650	19110	27090	22680	36540
220	14300	20020	28380	23760	38280
230	14950	20930	29670	24840	40020
240	15600	21840	30960	25920	41760
250	16250	22750	32250	27000	43500
260	16900	23660	33540	28080	
270	17550	24570	34830	29160	
280	18200	25480	36120	30240	
290	18850	26390	37410	31320	
300	19500	27300	38700	32400	
310	20150	28210	39990	33480	
320	20800	29120	41280	34560	
330	21450	30030	42570	35640	
340	22100	30940	43860	36720	
350	22750	31850	45150	37800	

Table 5-2M – Cabin and Baggage Loading (Metric)

CABIN AND BAGGAGE COMPARTMENT TABLE OF MOMENTS (MM•KG/100)					
WEIGHT (KG)	FRONT SEAT 1651.0 MM	MID-PASS. (AFT FACING) 2311.4 MM	AFT-PASS. (FWD FACING) 3276.6 MM	LITTER PATIENT(S) 2743.2 MM	BAGGAGE 4419.6 MM
5	82.6	115.6	163.8	137.2	221.0
10	165.1	231.1	327.7	274.3	442.0
15	247.7	346.7	491.5	411.5	622.9
20	330.2	462.3	655.3	548.6	883.9
25	412.8	577.9	819.2	685.8	1104.9
30	495.3	693.4	983.0	823.0	1325.9
35	577.9	809.0	1146.8	960.1	1546.9
40	660.4	924.6	1310.6	1097.3	1767.8
45	743.0	1040.1	1474.5	1234.4	1988.8
50	825.5	1155.7	1638.3	1371.6	2209.8
55	908.1	1271.3	1802.1	1508.8	2430.8
60	990.6	1386.8	1966.0	1645.9	2651.8
65	1073.2	1502.4	2129.8	1783.1	2872.7
70	1155.7	1618.0	2293.6	1920.2	3093.7
75	1238.3	1733.6	2457.5	2057.4	3314.7
80	1320.8	1849.1	2621.3	2194.6	3535.7
85	1403.4	1964.7	2785.1	2331.7	3756.7
90	1485.9	2080.3	2948.9	2468.9	3977.6
95	1568.5	2195.8	3112.8	2606.0	4198.6
100	1651.0	2311.4	3276.6	2743.2	4419.6
105	1733.6	2427.0	3440.4	2880.4	4640.6
110	1816.1	2542.5	3604.3	3017.5	4861.6
113.4	1872.2	2621.1	3715.7	3110.8	5011.8
115	1898.7	2658.1	3768.1	3154.7	
120	1981.2	2773.7	3931.9	3291.8	
125	2063.8	2889.3	4095.8	3429.0	
130	2146.3	3004.8	4259.6	3566.2	
135	2228.9	3120.4	4423.4	3703.3	
140	2311.4	3236.0	4587.2	3840.5	
145	2394.0	3351.5	4751.1	3977.6	
150	2476.5	3467.1	4914.9	4114.8	

Table 5-3 – Fuel Loading (U.S.)

		LONGITUDINAL				LONGITUDINAL	
Quantity (US GAL)	JP-4 Weight (LB)	CG (IN)	Moment (IN-LB)	Quantity (US GAL)	JP-5 Weight (LB)	CG (IN)	Moment (IN-LB)
5	32.5	133.7	4345	5	34.0	133.7	4546
10	65.0	135.0	8775	10	68.0	135.0	9180
15	97.5	135.9	13250	15	102.0	135.9	13862
20	130	136.4	17732	20	136.0	136.4	18550
25	162.5	136.7	22214	25	170.0	136.7	23239
28.4*	184.6	137.0	25290	28.4*	193.1	137.0	26455
30	195.0	134.3	26189	30	204.0	134.3	27397
35	227.5	127.8	29075	35	238.0	127.8	30416
40	260.0	122.9	31954	40	272.0	122.9	33429
45	292.5	119.1	34837	45	306.0	119.1	36445
50	325.0	116.0	37700	50	340.0	116.0	39440
50.6**	328.9	115.7	38054	50.6**	344.1	115.7	39812
55	357.5	116.1	41506	55	374.0	116.1	43421
60	390.0	116.2	45318	60	408.0	116.2	47410
65	422.5	116.2	40095	65	442.0	116.2	51360
70	455.0	116.1	52826	70	476.0	116.1	55264
74.8***	486.2	116.0	56399	74.8***	508.6	116.0	58998
75	487.5	116.1	56599	75	510.0	116.1	59211
80	520.0	117.7	61204	80	544.0	117.7	64029
85	552.5	119.0	65748	85	578.0	119.0	68782
90	585.0	120.3	70376	90	612.0	120.3	73624
95	617.5	121.4	74965	95	646.0	121.4	78424
100	650.0	122.3	79495	100	680.0	122.3	83164
105	682.5	123.4	84221	105	714.0	123.4	88108
110	715.0	124.6	89089	110	748.0	124.6	93201
115	747.5	125.6	93886	115	782.0	125.6	98219
120	780.0	126.6	98748	120	816.0	126.6	103306
125	812.5	127.5	103594	125	850.0	127.5	108375
127.8****	830.7	127.9	106247	127.8****	869.0	127.9	111145

* Critical fuel for most aft CG condition.
** Most forward fuel CG.
*** Critical fuel for most forward CG condition.
**** Full fuel.

Note: All data above represents usable fuel based on nominal density at 15°C (59°F)

Table 5-3M – Fuel Loading (Metric)

		LONGITUDINAL				LONGITUDINAL	
Quantity (L)	JP-4 Weight (KG)	CG (MM)	Moment (KG• MM/100)	Quantity (L)	Weight (KG)	CG (MM)	Moment (KG• MM/100)
15	11.7	3389	397	15	12.2	3389	413
30	23.4	3415	799	30	24.4	3415	833
45	35.1	3439	1204	45	36.7	3439	1262
60	46.7	3455	1613	60	48.9	3455	1689
75	58.4	3465	2024	75	61.1	3465	2117
90	70.1	3472	2435	90	73.3	3472	2545
105	81.8	3478	2845	105	85.6	3478	2977
107.5*	83.7	3479	2912	107.5*	87.6	3479	3048
120	93.5	3352	3134	120	97.8	3352	3278
135	105.2	3228	3396	135	110.0	3228	3551
150	116.9	3129	3658	150	122.2	3129	3824
165	128.5	3049	3918	165	134.4	3049	4098
180	140.2	2982	4181	180	146.7	2982	4375
191.6**	149.3	2938	4386	191.6**	156.1	2938	4586
195	151.9	2940	4466	195	158.9	2940	4672
210	163.6	2949	4825	210	171.1	2949	5046
225	175.3	2951	5173	225	183.3	2951	5409
240	187.0	2953	5522	240	195.6	2953	5776
255	198.6	2950	5859	255	207.8	2950	6130
270	210.3	2948	6200	270	220.0	2948	6486
283.0***	220.5	2948	6500	283.0***	230.6	2948	6798
285	222.0	2951	6551	285	232.2	2951	6852
300	233.7	2983	6971	300	244.5	2983	7293
315	245.4	3012	7391	315	256.7	3012	7732
330	257.1	3038	7811	330	268.9	3038	8169
345	268.8	3061	8228	345	281.1	3061	8604
360	280.4	3083	8645	360	293.3	3083	9042
375	292.1	3103	9064	375	305.6	3103	9483
390	303.8	3123	9488	390	317.8	3123	9925
405	315.5	3147	9929	405	330.0	3147	10385
420	327.2	3169	10369	420	342.2	3169	10844
435	338.9	3190	10811	435	354.5	3190	11309
450	350.6	3210	11254	450	366.7	3210	11771
465	362.2	3228	11692	465	378.9	3228	12231
480	373.9	3245	12133	480	391.1	3245	12691
483.7****	376.8	3249	12242	483.7****	394.1	3249	12804

* Critical fuel for most aft CG condition.
** Most forward fuel CG.
*** Critical fuel for most forward CG condition.
**** Full fuel.

Note: All data above represents usable fuel based on nominal density at 15°C (59°F)

Table 5-4 – Fuel Density Versus Temperature

TEMPERATURE (°F)	DENSITY LB/GAL JP-4	DENSITY LB/GAL JP-5	TEMPERATURE (°C)	DENSITY KG/L JP-4	DENSITY KG/L JP-5
120	6.27	6.59	40	0.759	0.797
100	6.35	6.66	30	0.767	0.805
80	6.42	6.73	20	0.775	0.812
60*	6.50	6.80	15.56*	0.779	0.815
40	6.58	6.87	10	0.784	0.820
20	6.65	6.94	0	0.792	0.827
0	6.73	7.01	-10	0.800	0.835
-20	6.80	7.08	-20	0.808	0.842
-40	6.88	7.15	-30	0.816	0.850
			-40	0.824	0.857

* Standard density, used to derive fuel burn curves.

Table 5-5 – Sample Loading Problem (US)

A helicopter is chartered to transport 4 passengers plus pilot and 200 pounds of baggage on a trip that will require approximately 113 gallons of JP-5 fuel (one way). The pilot will return alone. Compute weight and center of gravity at takeoff and landing, and determine extreme CG conditions for both flights.

OUTBOUND FLIGHT

		LONGITUDINAL		LATERAL	
	Weight (LB)	CG (IN)	Moment (IN-LB)	CG (IN)	Moment (IN-LB)
Empty Weight	*2824.1	131.0	369957	0.1	317
+Oil	13.0	205.0	2665	0.0	0
+Pilot	200.0	65.0	13000	14.0	2800
+Forward Passenger	200.0	65.0	13000	-11.1	-2220
+Mid Passenger	180.0	91.0	16380	15.5	2790
+Aft Passenger	320.0	129.0	41280	0.0	0
+Baggage	200.0	174.0	34800	0.0	0
Gross Weight at Zero Fuel	3937.1	124.7	491082	0.9	3687
+Full Fuel (JP-5)	869.0	127.9	111145	0.0	0
Takeoff Gross Weight	4806.1✓	125.3✓	602227	0.8✓	3687
Gross Weight at Zero Fuel	3937.1	124.7	491082	0.9	3687
+Critical Fuel for Most Fwd	508.6	116.0	58998	0.0	0
Most Forward CG Condition	4445.7✓	123.7✓	550080	0.8✓	3687
Gross Weight at Zero Fuel	3937.1	124.7	491082	0.9	3687
+Critical Fuel for Most Aft	193.1	137.0	26455	0.0	0
Most Aft CG Condition	4130.2✓	125.3✓	517537	0.9✓	3687
Gross Weight at Zero Fuel	3937.1	124.7	491082	0.9	3687
+Fuel at Landing (14.8 Gal)	100.6	135.9	13672	0.0	0
Landing Condition	4037.7✓	125.0✓	50754	0.9✓	3687

RETURN FLIGHT

	Weight (LB)	LONGITUDINAL CG (IN)	LONGITUDINAL Moment (IN-LB)	LATERAL CG (IN)	LATERAL Moment (IN-LB)
Empty Weight	*2824.1	131.0	369957	0.1	317
+Oil	13.0	205.0	2665	0.0	0
+Pilot	200.0	65.0	13000	14.0	2800
Gross Weight at Zero Fuel	3037.1	127.0	385622	1.0	3117
+Full Fuel (JP-5)	869.0	127.9	111145	0.0	0
Takeoff Gross Weight	3906.1✓	127.2✓	496767	0.8✓	3117
Gross Weight at Zero Fuel	3037.1	127.0	385622	1.0	3117
+Critical Fuel for Most Fwd	508.6	116.0	58998	0.0	0
Most Forward CG Condition	3545.7✓	125.4✓	444620	0.9✓	3117
Gross Weight at Zero Fuel	3037.1	127.0	385622	1.0	3117
+Critical Fuel for Most Aft	193.1	137.0	26455	0.0	0
Most Aft CG Condition	3230.2✓	127.6✓	412077	1.0✓	3117
Gross Weight at Zero Fuel	3037.1	127.0	385622	1.0	3117
+Fuel at Landing (14.8 Gal)	100.6	135.9	13672	0.0	0
Landing Condition	3137.7✓	127.3✓	399294	1.0✓	3117

* Example only. Refer to Actual Weight Record for actual empty weight data.
✓A check of weight and CG values against gross weight center of gravity limits chart shows that the loading will be within limits throughout flight. In lateral calculations, - is left side and + is right side.

Table 5-5M – Sample Loading Problem (Metric)

A helicopter is chartered to transport 4 passengers plus pilot and 90.7 kilograms of baggage on a trip that will require approximately 427 liters of JP-5 fuel (one way). The pilot will return alone. Compute weight and center of gravity at takeoff and landing, and determine extreme CG conditions for both flights.

OUTBOUND FLIGHT

		LONGITUDINAL		LATERAL	
	Weight (KG)	CG (MM)	Moment (KG•MM /100)	CG (MM)	Moment (KG•MM/100)
Empty Weight	*1281.0	3327	42618.9	3	36.7
+Oil	5.9	5207	307.2	0	0.0
+Pilot	90.7	1651	1497.5	356	322.9
+Forward Passenger	90.7	1651	1497.5	-283	-256.7
+Mid Passenger (1)	81.6	2311	1885.8	394	321.5
+Aft Passenger (2)	145.2	3277	4758.2	0	0.0
+Baggage	90.7	4420	4008.9	0	0.0
Gross Weight at Zero Fuel	1785.8	3168	56573.9	24	424.4
+Full Fuel (JP-5)	394.1	3249	12804.3	0	0.0
Takeoff Gross Weight	2179.9✓	3183✓	69378.2	19✓	424.4
Gross Weight at Zero Fuel	1785.8	3168	56573.9	24	424.4
+Critical Fuel for Most Fwd	230.6	2948	6798.1	0	0.0
Most Forward CG Condition	2016.4✓	3143✓	63372.0	21✓	424.4✓
Gross Weight at Zero Fuel	1785.8	3168	56573.9	24	424.4
+Critical Fuel for Most Aft	87.6	3479	3047.6	0	0.0
Most Aft CG Condition	1873.4✓	3183✓	59621.5	23✓	424.4✓
Gross Weight at Zero Fuel	1785.8	3168	56573.9	24	424.4
+Fuel at Landing (56.7 L)	46.2	3469	1602.7	0	0.0
Landing Condition	1832.0✓	3176✓	58176.6	23✓	424.4✓

RETURN FLIGHT

	Weight (KG)	LONGITUDINAL CG (MM)	LONGITUDINAL Moment (KG•MM /100)	LATERAL CG (MM)	LATERAL Moment (KG•MM/100)
Empty Weight	*1281.0	3327	42618.9	3	36.7
+Oil	5.9	5207	307.2	0	0.0
+Pilot	90.7	1651	1497.5	356	322.9
Gross Weight at Zero Fuel	1377.6	3225	44423.5	26	359.6
+Full Fuel (JP-5)	934.1	3249	12804.3	0	0.0
Takeoff Gross Weight	2311.7✓	3230✓	57227.8	20✓	359.6
Gross Weight at Zero Fuel	1377.6	3225	44423.5	26	359.6
+Critical Fuel for Most Fwd	230.6	2948	6798.1	0	0.0
Most Forward CG Condition	1608.2✓	3185✓	51221.6	22✓	359.6
Gross Weight at Zero Fuel	1377.6	3225	44423.5	26	359.6
+Critical Fuel for Most Aft	87.6	3479	3047.6	0	0.0
Most Aft CG Condition	1465.2✓	3240✓	47471.1	25✓	359.6
Gross Weight at Zero Fuel	1377.6	3225	44423.5	26	359.6
+Fuel at Landing (56.7 L)	46.2	3469	1602.7	0	0.0
Landing Condition	1423.8✓	3233✓	46026.2	25✓	359.6

* Example only. Refer to Actual Weight Record for actual empty weight data.
✓A check of weight and CG values against gross weight center of gravity limits chart shows that the loading will be within limits throughout flight. In lateral calculations, - is left side and + is right side.

Table 5-6 – Weight and Balance Worksheet (US)

		LONGITUDINAL		LATERAL	
	Weight (LB)	CG (IN)	Moment (IN-LB)	CG (IN)	Moment (IN-LB)
Empty Weight					
+Oil	13.0	205.0	2665	0.0	0
+Pilot		65.0		14.0	
+Forward Passenger		65.0		-11.1	
+Mid Passenger (L)		91.0		-13.0	
+Mid Passenger (R)		91.0		15.5	
+Aft Passenger (L)		129.0		-16.8	
+Aft Passenger (M)		129.0		0.0	
+Aft Passenger (R)		129.0		16.8	
+Baggage					
+Litter					
Gross Weight at Zero Fuel					
+ Fuel				0.0	0
Takeoff Gross Weight					
Gross Weight at Zero Fuel					
+Critical Fuel for Most Fwd		116.0		0.0	0
Most Forward CG Condition					
Gross Weight at Zero Fuel					
+Critical Fuel for Most Aft		137.0		0.0	0
Most Aft CG Condition					
Gross Weight at Zero Fuel					
+Fuel Remaining at Landing				0.0	0
Landing CG Condition					

Table 5-6M – Weight and Balance Worksheet (Metric)

	Weight (KG)	LONGITUDINAL CG (MM)	LONGITUDINAL Moment (KG•MM /100)	LATERAL CG (MM)	LATERAL Moment (KG•MM/100)
Empty Weight					
+Oil	5.9	5207	307.2		0.0
+Pilot		1651		356	
+Forward Passenger		1651		-283	
+Mid Passenger (L)		2311		-330	
+Mid Passenger (R)		2311		394	
+Aft Passenger (L)		3277		-425	
+Aft Passenger (M)		3277		0	
+Aft Passenger (R)		3277		425	
+Baggage					
+Litter					
Gross Weight at Zero Fuel					
+ Fuel				0.0	0
Takeoff Gross Weight					
Gross Weight at Zero Fuel					
+Critical Fuel for Most Fwd		2948		0.0	0
Most Forward CG Condition					
Gross Weight at Zero Fuel					
+Critical Fuel for Most Aft		3479		0.0	0
Most Aft CG Condition					
Gross Weight at Zero Fuel					
+Fuel Remaining at Landing				0.0	0
Landing CG Condition					