Ka-32A11BC

Rotorcraft Flight Manual

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Designer:

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Status notice

The present Rotorcraft Flight Manual Ka-32A11BC (RFM) approved by the Aviation authorities of the Russian Federation.

RFM is issued in two versions – Russian and English, both being equally authentic, of equal importance and identical in contents.

Applicability

The present RFM is sole for all operating organizations and is applicable to all Ka-32A11BC helicopter versions (including Ka-32A12) unless otherwise specified by the designer.

The instructions of this RFM shall be fulfilled by all organizations operating Ka-32A11BC helicopters.

Copyrights

REVISIONS NOTICE

In the course of the helicopter operation the RFM is clarified and brought in conformity with the helicopter status with due account for changes in the design and installation of new equipment as well as for experience gained and improved in service.

The basic Flight Manual (Section 1 to 6) and the Manufacturer's Data have separate Log of Revisions and Revision Record Sheets.

Normal and Temporary Revisions concerning the basic Flight Manual have to be approved.

A vertical line on the left side of the left column and on the right side of the right column of the text marks a revision or addition.

Timely and correct introduction of all issued revisions and alterations into the RFM is the responsibility of the helicopter Operator.

Revision Instructions:

1. Normal Revisions (White pages):

   Replace the pages by inserting the new ones and removing the old ones.

2. Temporary Revisions (Yellow pages):

   Place the yellow pages in front of the original page. Do not remove white original pages.

3. Always record the updating in the Revisions Record Sheets.

LOG OF REVISIONS

Revisions	Date
ISSUE 4 (Revision 0)	November 24, 2011
Revision 1	July 05, 2012
Revision 2	August 20, 2012
Revision 3	March 22, 2013
Revision 4	March 27, 2013
Revision 5	April 3, 2013
Revision 6	February 18, 2014
Revision 7	April 28, 2014
Revision 8	May 06, 2014
Revision 9	June 11, 2015
Revision 10	December 08, 2015
Revision 11	March 21, 2016
Revision 12	April 05, 2017
Revision 13	November 01, 2017
Revision 14	September 12, 2018
Revision 15	November 25, 2019
Revision 16	December 29, 2020
Revision 17	May 21, 2021
Revision 18	September 30, 2021

RECORD OF REVISIONS

Rev. No.	Section, Sub-Section, Subject	Page			Authorizing document No.	Transmittal letter reference No. and date	Signed by	Date
		Revised	Added	Deleted				
1		Title page; LR; LEP.1, LEP.6						14.08.12
2		Title page; LR; LEP.1, LEP.5/6		LEP.6				03.09.12
3	3	Title page; LR; LEP.1, LEP.2, LEP.3, 3.4, 3.89						11.04.13
4	6	Title page; LR; LEP.1, LEP.5/6, 6.6, 6.9, 6.10	6.11/6.12					11.04.13
5	6	Title page; LR; LEP.1, LEP.5/6, 6.11/6.12						11.04.13
6	6	Title page; LR; LEP.1, LEP.5/6, 6.11/6.12						20.02.14
7	2	Title page; LR; LEP.1, LEP.2, 2.22						09.06.14
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10	6	Title page; LR; LEP.1, LEP.5/6; 6.7, 6.9						08.04.16
11	4, 6	Title page; LR; LEP.1, LEP.3, LEP.5/6; 4.18, 4.19; 6.9						08.04.16
12	6	Title page; LR; LEP.1, LEP.5/6; 6.4, 6.6, 6.7, 6.9, 6.11, 6.12						26.12.16
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12	6	Title page; LR; LEP.1, LEP.5/6; 6.4, 6.6, 6.7, 6.9, 6.11, 6.12						12.04.17
13	6	Title page; LR; LEP.1, LEP.5/6; 6.12						28.04.18
14	6	Title page; LR; LEP.1, LEP.5/6; 6.9, 6.10, 6.12						25.09.18
15	6	Title page; LR; LEP.1, LEP.5/6; 6.9, 6.12						29.11.19
16	6	Title page; LR; LEP.1, LEP.5/6; 6.4, 6.6, 6.7, 6.9, 6.11, 6.12						11.02.21
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				1.17	0
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				1.19	0
Record of revisions	RR	0		1.20	0
				1.21	0
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				1.23	0
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NOTE. Revised text is indicated by a black vertical line. Insert latest revision pages; dispose of superseded pages.

GENERAL INFORMATION

Organization

The Rotorcraft Flight Manual consists of two parts: approved part (RFM) and not approved part (Manufacturer’s Data).

The RFMl approved part is divided into six sections as follows:

Section 1 LIMITATIONS

Section 2. NORMAL PROCEDURES

Section 3. EMERGENCY AND MALFUNCTION PROCEDURES

Section 4. PERFORMANCE

Section 5. WEIGHT AND BALANCE

Section 6. OPTIONAL EQUIPMENT SUPPLEMENTS.

Sections 1 through 5 contain the AR IAC approved date necessary to operate the basic helicopter in a safe and efficient manner.

Section 6 contains the AR IAC approved supplements for optional equipment, which shall be used in conjunction with the basic Flight Manual when the respective optional equipment kits are installed.

Manufacturer’s Data contains information to be used in conjunction with the Flight Manual.

The manual is divided into three sections:

Section 1. SYSTEM DESCRIPTION

Section 2. HANDLING/SERVICING/MAINTENANCE

Section 3. OPERATIONAL INFORMATION

If necessary the revisions or additions are introduced by JSC Kamov or by operators in coordination with JSC Kamov.

Terminology

WARNINGS, CAUTIONS AND NOTES

Warning, Caution and Notes are used throughout this manual to emphasize important and critical instructions 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

Abbreviations

AC – Alternating Current

ADF – Automatic Direction Finder

AIS – Anti-Icing System

ALTN – ALTerNate

AM – Amplitude Modulation

AP – AutoPilot

API – Actuator Position Indicator

AST – AirSpeed Transmitter

ATT or ATTD – Attitude

AUX – Auxiliary

BAT – Battery

BCU – Bus Control Unit

C – Celsius

CDD – Central Distribution Device

CG – Center of Gravity

CP – Contingency Power

CS – Compass System

CTR – Control

CYC – Cyclic

DC	– Direct Current
DG	– Directional Gyroscope
EEG	– Engine Electronic Governor
FDI	– Flight Director Indicator
FDR	– Flight Data Recorder
FM	– Frequency Modulation
GEN	– Generator
GRBX	– GeaRBox
HF	– High Frequency
HOR	– gyro HORizon
Hp	– Pressure Altitude
HSI	– Horizontal Situation Indicator
HV	– Height-Velocity
HYDR	– Hydraulic
IAS	– Indicated AirSpeed
IC	– InterCommunication system
IFR	– Instrument Flight Rules
IGE	– In Ground Effect
OGE	– Out of Ground Effect
INV	– Inverter
ITT	– InterTurbine Temperature
kgf/sq.cm	– kilogram per square centimeter
km/h	– kilometer per hour
km/h IAS	– kilometer per hour Indicated AirSpeed
LH	– Left
LSS	– Limiting Signal System
LT	– Light
m/s	– meter per second
MAG	– Magnetic

MWL	– Master Warning Light
MH	– Magnetic Heading
N_1	– Gas Generator RPM
N_R	– Rotor RPM
OEI	– One Engine Inoperative
PC	– Path Computer
PNL	– Panel
RA	– Radio Altimeter
OAT	– Outs Air Temperature
R_{ALT}	– Radio Altitude
RCRD	– Recorder
RCVR	– Receiver
RECT	– Rectifier
RFM	– Rotorcraft Flight Manual
RH	– Right Hand
RPM	– Revolution Per Minute
RPM (N_1)	– Gas Generator RPM
RPM (N_R)	– Rotor RPM
SL	– Sea Level
STBY	– Standby
SYS	– System
TRANS	– Transformer
VAC	– Volts Alternating Current
VDC	– Volts Direct Current
VFR	– Visual Flight Rules
VG	– Vertical Gyro
VHF	– Very High Frequency
VMC	– Visual Meteorological Conditions
Vmin	– Minimum Airspeed

VNE	– Never Exceeded Speed
VNEI	– Never Exceeded Speed IFR operation
XFEED	– Crossfeed

SECTION 1. LIMITATIONS

TABLE OF CONTENTS

Paragraph **Page**

Paragraph **Page**

LIST OF FIGURES

LIST OF TABLES

SECTION 1. LIMITATIONS

OPERATING LIMITATIONS

Compliance with the limitations in this section is mandatory. Anytime an operating limitation is exceeded, an appropriate entry shall be made in the helicopter logbook. The entry shall state which limit was exceeded, the duration of time, the extreme value attained, and any additional information essential in determining the maintenance action required.

BASIS OF CERTIFICATION

This helicopter is certified in the transport category A and B in compliance with НЛГ 32.29 (equivalent to FAR and Chapter 529 of the Canadian Airworthiness Manual).

TYPE OF OPERATIONS

The helicopter is approved for operation in compliance with the operating limitations specified in the RFM for VFR operations, day and night, including internal load transportation, underslung load transportation and ferry flights.

The helicopter is approved for flights in icing conditions.

OCCUPANTS LIMITATIONS

Maximum number of occupants on the board: 2 crewmembers and 13 persons essential to aerial works

When transporting underslung loads transportation of personnel essential to aerial works is prohibited.

Prior to carrying personnel essential to aerial works a crew seat located behind the co-pilot seat must be removed.

Smoking is prohibited during the whole flight.

Safety harness must be fastened in flight.

OPTIONAL EQUIPMENT

Refer to appropriate Flight Manual Supplements for additional limitations, procedures and performance data with optional equipment installed.

FLIGHT CREW LIMITATIONS

The minimum crew for helicopter VFR operations is one pilot on the left seat.

DOORS OPEN

Helicopter may be flown with crew doors open.

Flight operation is approved for the following alternative configurations:

- Both sliding crew doors fully open and secured at hover and at speeds of 0 KIAS (0 km/h IAS) to 27 KIAS (50 km/h IAS);
- One of the sliding crew doors (left or right) open for not more than 4 in (10 cm) and secured at speeds of 27 KIAS (50 km/h IAS) to 108 KIAS (200 km/h IAS).

The doors must be kept closed and locked at speeds above 108 KIAS (200 km/h IAS).

NOTE. Prior to opening any door, check if all personal equipment and flight documents are reliably fastened.

WEIGHT/CG LIMITATIONS

WEIGHT LIMITS

Maximum allowable weight..24250 lb (11000 kg)

Refer to Fig. 1-1 for maximum allowable take-off weight versus altitude and air temperature.

Minimum gross weight...15870 lb (7200 kg)

Example 1:
Determine: max allowable take-off weight IGE
Known: OAT +35 °C
Pressure altitude 1000 ft
Power rating Take-off power
AIS OFF
Solution: Staring at +35 point at the OAT axis on the graph move up to the Pressure Altitude 1000 line. Obtained max weight exceeds the max permissible m_{MAX} – we get max allowable take-off weight of 24250 lb.

Example 2:
Determine: max allowable take-off weight IGE
Known: OAT +22 °C
Pressure altitude 9000 ft
Power rating Take-off power
AIS OFF
Solution: Staring at +22 point at the OAT axis on the graph move up to the Pressure Altitude 9000 line. Moving leftwards to the Weight axis from the cross section point we get the max allowable take-off weight of 24000 lb.

IGE HOVER – HEIGHT 6 FT
TAKE-OFF POWER
ANTI-ICE SYST OFF

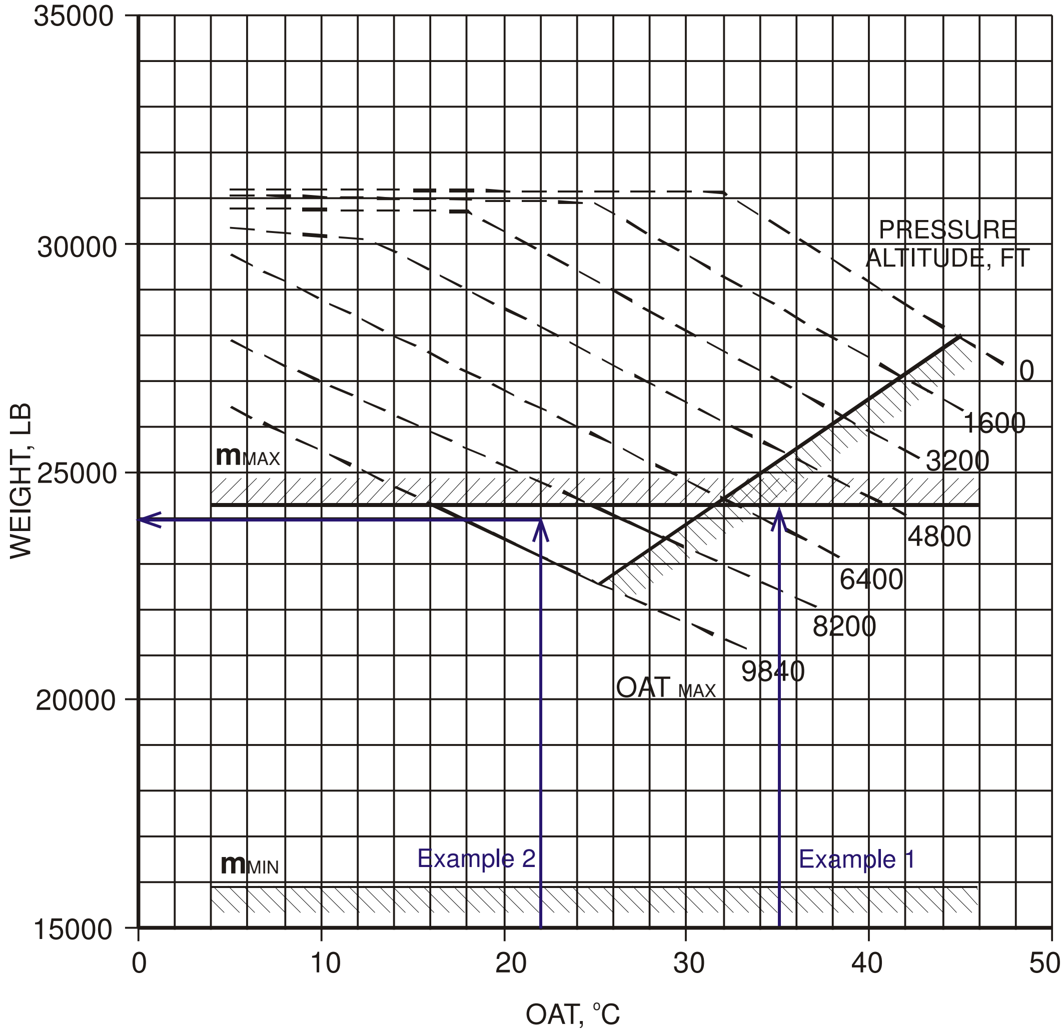


Fig. 1-1. (Sheet 1 of 2). Weight – Altitude – TO temperature limitations.
Category B.
(BRITISH SYSTEM)

IGE HOVER – HEIGHT 2 M
TAKE-OFF POWER
ANTI-ICE SYSTEM OFF

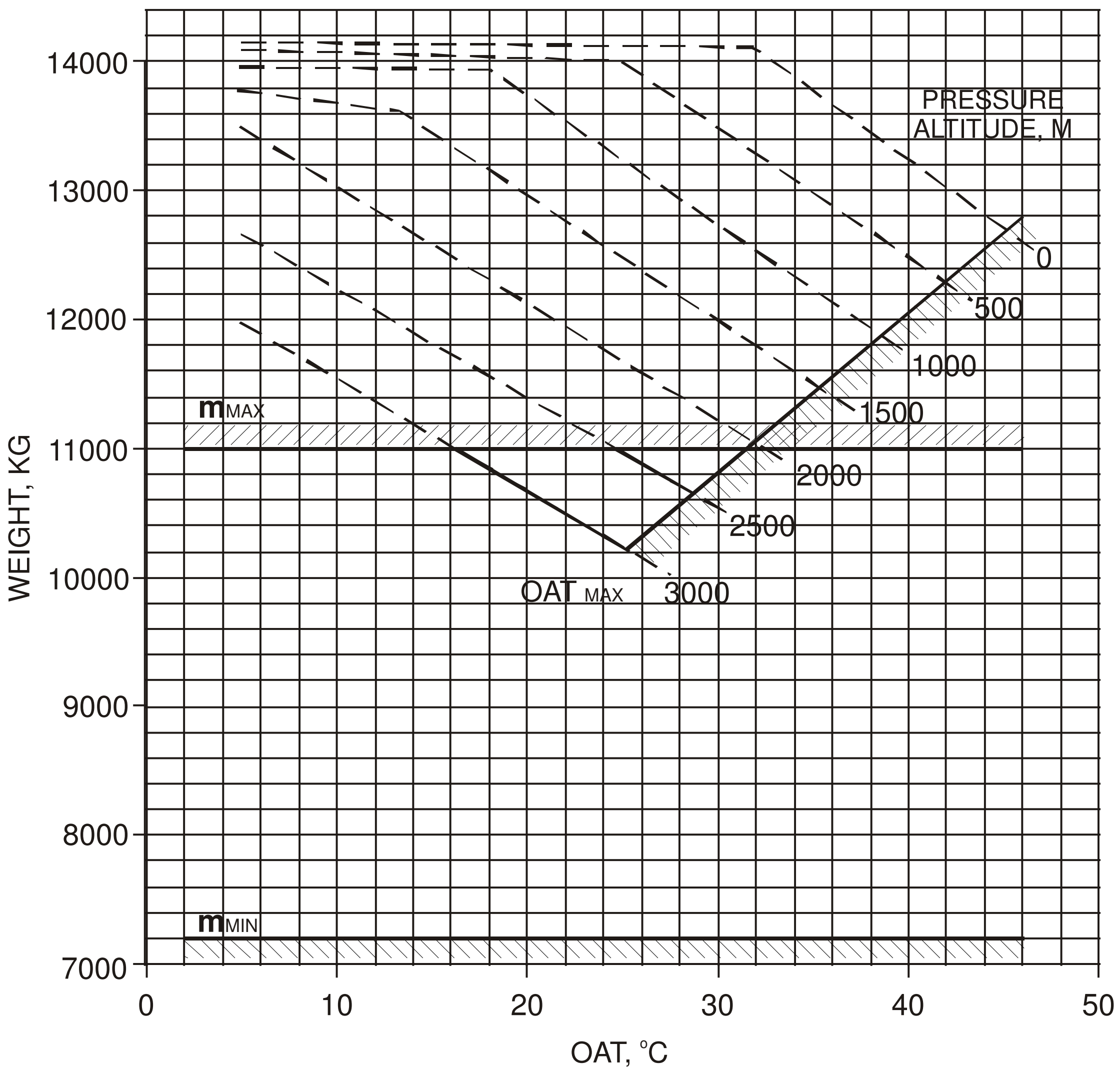


Fig. 1-1. (Sheet 2 of 2). Weight – Altitude – TO temperature limitations.
Category B.
(METRIC SYSTEM)

LONGITUDINAL CENTER OF GRAVITY LIMITS

Reference datum line (Station zero) is located 5.28 m (207.87 inches) forward of the main rotor axis.

Longitudinal center of gravity limits vary from stations 5.0 to 5.31 m (196.85 to 209.06 inches).

LATERAL CENTER OF GRAVITY LIMITS

Lateral center of gravity is not critical if the loads are located in compliance with the instructions of the present RFM, Section5.

INTERNAL LOAD LOCATIONS

Maximum load weight ....8157 lb (3700 kg)

Maximum allowable deck loading for cargo

- between frames No. 4 to No. 7 ....614 lb/sq.ft (3000kgf/sq.m);
- between frames No. 7 to No. 13 ....307 lb/sq.ft (1500 kgf/sq.m).

AIRSPEED LIMITATIONS

Basic V_{NE} .... 140 KIAS (260 km/h IAS) at sea level.

V_{NE} is limited for ambient conditions and weights in accordance with the position of the red index on pilot ASI.

Refer to Table 1-1 for V_{NE} limits in case of airspeed limiting system failure or when the static pressure selector is switched to EMERGENCY.

V_{NE} during autorotation .... 95 KIAS (180 km/h IAS)

Minimum airspeed in level flight at altitudes higher than OGE hover ceiling .... 27 KIAS (50 km/h IAS).

Minimum airspeed during steady autorotation .... 54 KIAS (100 km/h IAS).

WITH UNDERSLUNG LOAD WEIGHT ≤ 28000 LB (12700 KG)

H_P,ft \ t,°C	-40	-20	0	+20	+40	
0	100	100	100	100	100	V_{ne}, kts
2000	100	100	100	100	100	
4000	100	100	100	100	80	
6000	100	100	100	80	60	
8000	100	100	80	60	40	
10000	100	80	60	40		
12000	80	60	40			
14000	60					

WITHOUT UNDERSLUNG LOAD WEIGHT ≤ 24250 LB (11000 KG)

H_P,ft \ t,°C	-40	-20	0	+20	+40	
0	125	125	125	125	120	V_{ne}, kts
2000	120	125	120	120	115	
4000	115	125	120	115	105	
6000	110	120	115	105	90	
8000	105	115	105	90	70	
10000	100	105	85	70	55	
12000	95	85	65	55	35	
14000	85	65	50			
16000	70	45				

(BRITISH SYSTEM)

WITH UNDERSLUNG LOAD WEIGHT ≤ 12700 KG

H_P,m \ t,°C	-40	-20	0	+20	+40	
0	190	190	190	190	190	V_{ne}, km/h
500	190	190	190	190	190	
1000	190	190	190	190	165	
1500	190	190	190	170	135	
2000	190	190	175	140	105	
2500	190	180	145	110	70	
3000	190	150	110	70		
3500	160	120	75			
4000	125	80				
4500	90	75				
5000	55					

WITHOUT UNDERSLUNG LOAD WEIGHT ≤ 11000 KG

H_P,m \ t,°C	-40	-20	0	+20	+40	
0	230	230	230	230	220	V_{ne}, km/h
500	225	230	230	220	210	
1000	215	230	220	210	200	
1500	210	225	215	205	190	
2000	205	220	210	190	160	
2500	195	210	195	160	130	
3000	190	200	165	135	105	
3500	180	170	135	105	70	
4000	175	140	105	70		
4500	150	110	70			
5000	120	75				

(METRIC SYSTEM)

Table 1-1. V_{NE} limits in case of airspeed limiting system failures or when static pressure selector set to EMERGENCY position.

WINDSPEED LIMITATIONS

Sideward flight or crosswind hover and rearward flight or tailwind hover has been demonstrated up to 20 knots (10 m/s).

The engine startup and shutdown have been demonstrated on ground for:

- headwind.. up to 20 knots (10 m/s), gusts of up 30 knots (15 m/s) are tolerable;
- crosswind and tailwind.. up to 20 knots (10 m/s).

DESCENT LIMITATIONS

Maximum allowable rate of descent

- 590 ft/min (3 m/s) at 27 KIAS (50 km/h IAS) and below;
- 1575 ft/min (8 m/s) at 108 KIAS (200 km/h IAS) and above.

ALTITUDE LIMITATIONS

Maximum operational pressure altitude .... 16400 ft (5000 m).

Maximum pressure altitude for takeoff and landing .... 9840 ft (3000 m).

AMBIENT AIR TEMPERATURE LIMITATIONS

The maximum ambient air temperature is (t_{ISA} + 30) °C for operations at all altitudes.

The minimum ambient air temperature − minus 50 °C for operation at all altitudes.

ICING FLIGHT LIMITATIONS

Minimum outside temperature in flights in icing conditions .... minus 23 °C

MANEUVERING LIMITATIONS

Acrobatic maneuvers are prohibited.

PITCH LIMITS

Maximum in straight flight during acceleration: .... –30 degrees

Maximum in straight flight during deceleration: .... +25 degrees

Maximum in all other modes: .... ±20 degrees

ROLL LIMITS

Airspeed 32 KIAS to 108 KIAS (60 to 200 km/h IAS) and pressure altitude up to 3280 ft (1000 m) maximum bank angle: .... ±35 degrees

All other airspeeds and pressure altitudes above 3280 ft (1000 m) maximum bank angle.. ±20 degrees

YAW LIMITS

Yaw is limited to two ball diameters of deviation to the left and right sides.

SLOPE LANDING LIMITATIONS

Slope landings are limited to slopes not exceeding 6 degrees in any direction.

ROTOR RPM (N_R) LIMITATIONS

ROTOR RPM (N_R) LIMITS – POWER ON

Maximum continuous..92 %

Maximum transient at airspeeds
below 108 KIAS (200 km/h IAS) ....98 % (not to exceed 8 s if above 92 %)

Maximum transient at airspeeds
above 108 KIAS (200 km/h IAS)...................................94 %

Minimum continuous...87 %

Minimum transient ....83 % (not to exceed 30 s if below 87 %)

ROTOR RPM (N_R) LIMITS OEI

Maximum continuous..92 %

Maximum transient at airspeeds
below 108 KIAS (200 km/h IAS) ....98 % (not to exceed 8 s if above 92 %)

Maximum transient at airspeeds
above 108 KIAS (200 km/h IAS)...................................94 %

Minimum continuous...87 %

Minimum transient ....83 % (not to exceed 30 s if below 87 %)

Minimum at OEI landing touchdown ....73 % (not to exceed 10 s if below 83 %, 4 times during the engine service life only)

ROTOR RPM (N_R) LIMITS – POWER OFF

Maximum continuous..92 %

Maximum transient ....98 % (not to exceed 8 s if above 92 %)

Minimum...ref. to Chart (fig.1-2)

<u>Example</u>:
Determine: min rotor RPM at autorotation
Known:
Weight 20400 lbs (9250 кг),
Pressure altitude 11500 ft
Solution:
From point 20400 at the graph Weight axis move upwards to line Pressure Altitude 11500. Move from the crossing point leftwards to the rotor RPM axis and get the min N_R value of 82.5%.

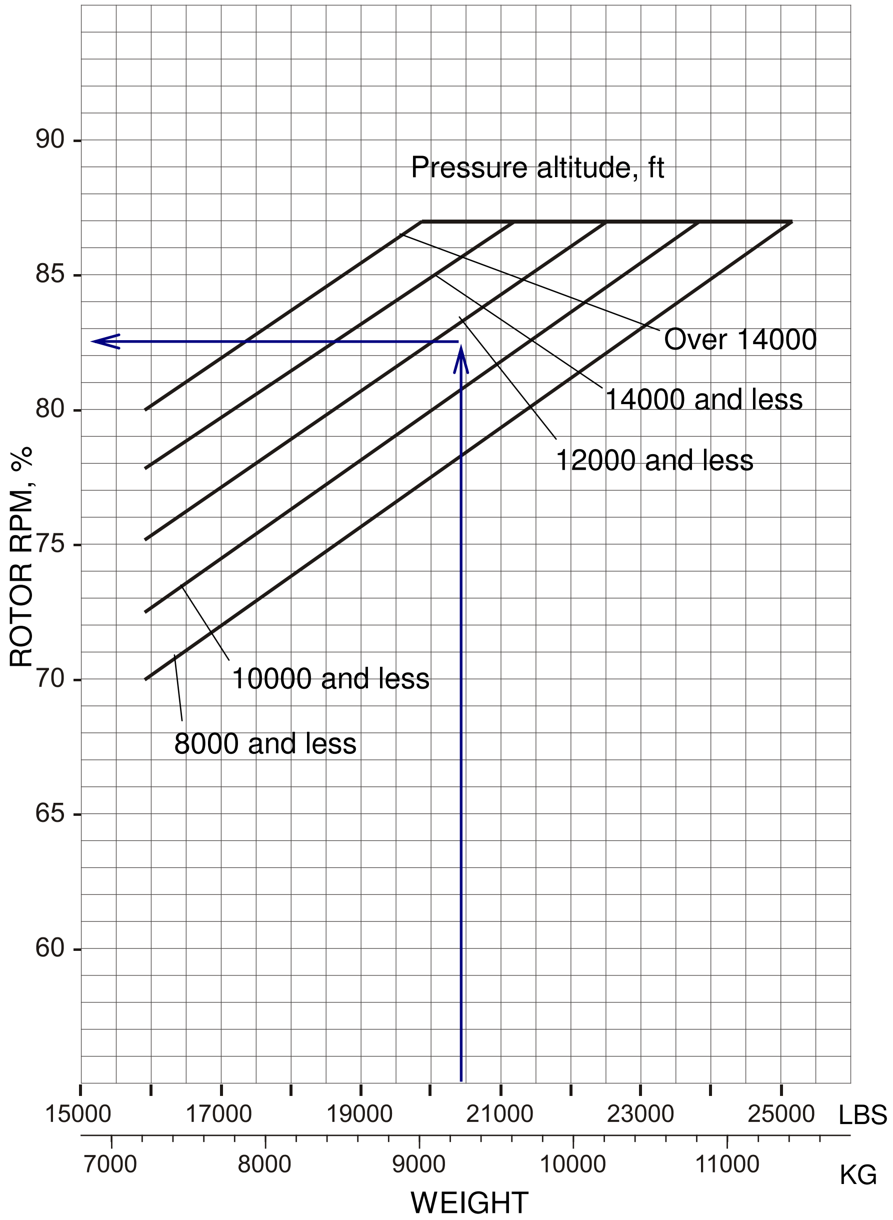


Fig. 1-2. (Sheet 1 of 2). Min rotor RPM at autorotation

(BRITISH SYSTEM)

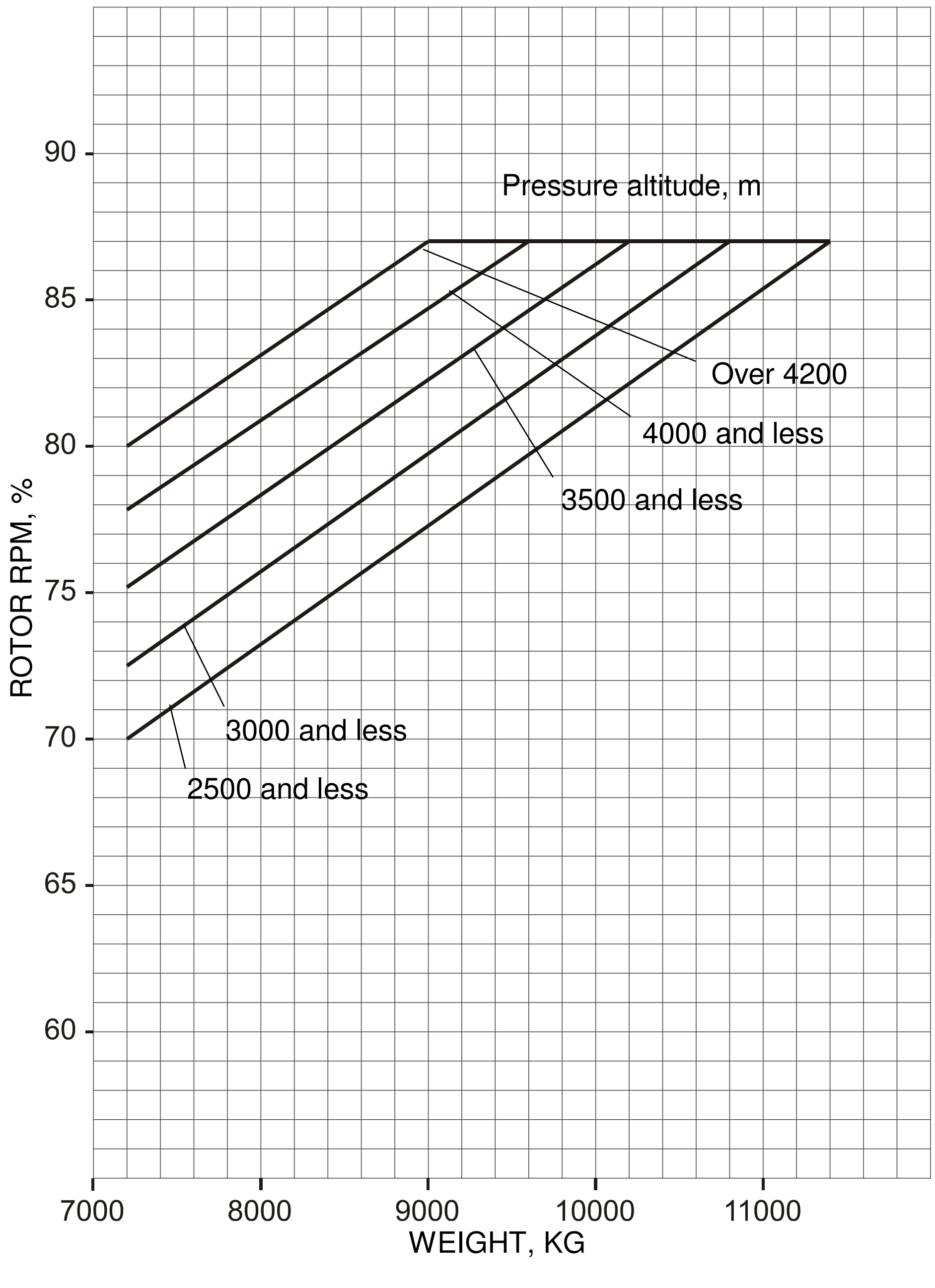


Fig. 1-2. (Sheet 2 of 2). Min rotor RPM at autorotation

(METRIC SYSTEM)

ROTOR RPM (N_R) LIMITS FOR BRAKE APPLICATION

Rotor brake application is limited to ground operation with both engines shut down and rotor RPM N_R reduced to 20 % or below.

CAUTION AT A WIND SPEED EXCEEDING 16 KNOTS (8 M/S) TRANSFER OF THE BRAKE LEVER UPWARDS AGAINST THE STOP TO BRAKE THE ROTOR IS OBLIGATORY

POWERPLANT LIMITATIONS

NOTE. 2.5 min OEI rating has been demonstrated at the bench and flight tests. The helicopter performance data are indicated in this RFM without consideration to this rating.

DURATION OF MODES

ALL ENGINE OPERATING (AEO)

Takeoff ....not exceeding 5 min

IDLE ....not exceeding 20 min

ONE ENGINE INOPERATIVE (OEI)

2.5 min rating..not exceeding 2.5 min

30 min rating..not exceeding 30 min

CAUTION. UTILIZATION OF 2.5 MINUTE OEI RATING IS ALLOWED 8 TIMES AND 30 MINUTE RATING 2 TIMES ONLY FOR THE PERIOD OF THE ENGINE TIME BETWEEN OVERHAUL

Minimum interval between usage of 2.5 min, 30 min and takeoff ratings is 5 min.

ENGINE START LIMITATIONS

Refer to figure 1-3 for gas generator rotor RPM (N1) and inlet turbine temperature (ITT) limitations at engine start up

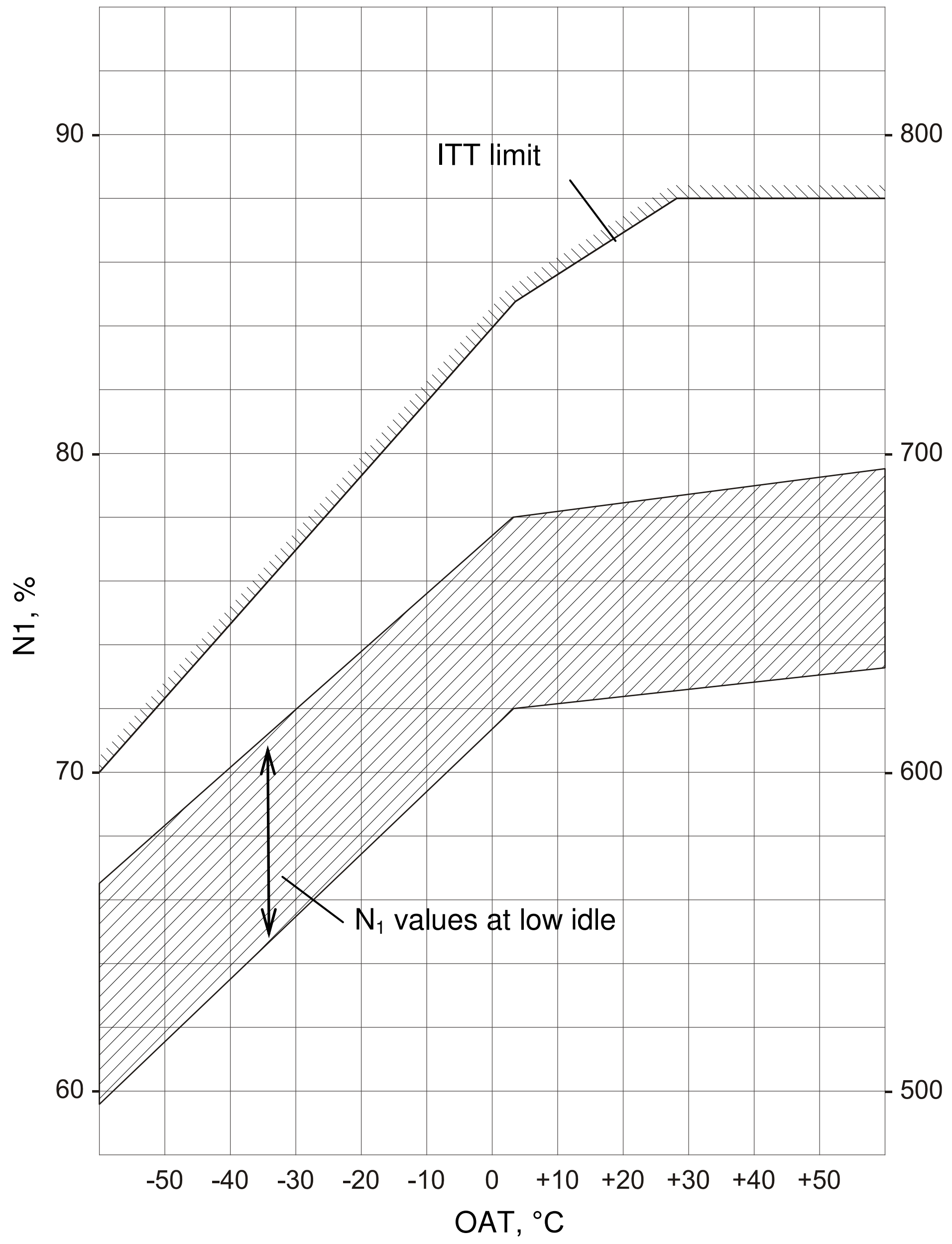


Fig. 1-3. Gas generator IDLE rotor RPM (N_1) and
inlet turbine temperature (ITT) limits at engine start up.

GAS GENERATOR ROTOR RPM (N_1) LIMITS

ALL ENGINES OPERATING (AEO)

Takeoff rating ....not exceeding 101 %

Max continuous..not exceeding 99 %

The difference between LH and RH engine gas generator rotors RPM (N_1) is limited to:

- in steady-state conditions...not exceeding 2 %
- at takeoff rating, when ITT limiter operates ....not exceeding 3 %

NOTE. In transient conditions the difference between gas generators RPM (N_1) is not limited.
The maximum gas generator RPM (N_1)
prior to engine start up in flight ....7 %

ONE ENGINE INOPERATIVE (OEI)

2.5 min rating...not exceeding 101 %

30 min rating...not exceeding 101 %

Max continuous rating...not exceeding 99 %

INLET TURBINE TEMPERATURE LIMITS

At engine starting...not exceeding 780 °C

ALL ENGINE OPERATING (AEO)

Takeoff rating ....not exceeding 990 °C

Max continuous...not exceeding 955 °C

ONE ENGINE INOPERATIVE (OEI)

2.5 min rating...990 °C

30 min rating...990 °C

Max continuous...955 °C

OIL PRESSURE LIMITS

At IDLE rating... not below 2.0 kgf/sq.cm

At ratings exceeding IDLE .... not below 3.0 kgf/sq.cm

Max allowable oil pressure at engine starting .... 4.8 kgf/sq.cm

OIL TEMPERATURE LIMITS

Min oil temperature is limited to:

- at engine start up on the ground and in flight......................... minus 38 °C
- at ratings exceeding IDLE.. +30 °C

Max oil temperature .... +150 °C

NOTES: Carry out dry motoring run (cranking) prior to engine start up at oil temperatures below minus 35 °C.

AIR CONDITIONING SYSTEM LIMITATIONS

Air conditioning system may be switched on not earlier than 5 min after completion of the engine compressor wash.

TRANSMISSION (MAIN GEARBOX) LIMITATIONS

TRANSMISSION OIL PRESSURE LIMITS

Minimum oil pressure

- at IDLE..0.5 kgf/sq.cm
- at ratings exceeding IDLE...2.5 kgf/sq.cm

Maximum oil pressure at engine starting ....5.0 kgf/sq.cm

TRANSMISSION OIL TEMPERATURE LIMITS

Minimum oil temperature at engine start up......................................minus 40 °C

Minimum oil temperature before
increasing the power above IDLE..minus 15 °C

Minimum oil temperature
for continuous operation...+30 °C

Maximum allowable oil temperature ....+90 °C

AUXILIARY POWER UNIT LIMITATIONS

Maximum pressure altitude to start up APU.................................... 9840 ft (3000 m)

Refer to figure 1-4 for ambient air temperature limits for APU in-flight operation

NOTE. For starting APU on ground at ambient temperatures of minus 25 °C or below it is recommended to preheat the APU with hot air or to crank it before starting.

Turbine Exhaust Gas Temperature (EGT) is limited:

- during APU starting up .... to 850 °C;
- during air bleeding at the main engines starting up .... to 720 °C for OAT +15 °C and below; to 750 °C for OAT exceeding +15 °C.

Maximum number of APU successive attempted starts,
cranking or false starts .... 3, with minimum 3 min cooling intervals between them.

After three successive APU attempted starts, crankings or false starts at least a 15-min cool down is required.

Cool down period for APU re-start .... minimum 15 min.

The period of APU continuous operation .... not more than 13 min.

For the period of the APU continuous operation not more than 5 APU air bleeds for the main engine startings, crankings or false startings are allowed.

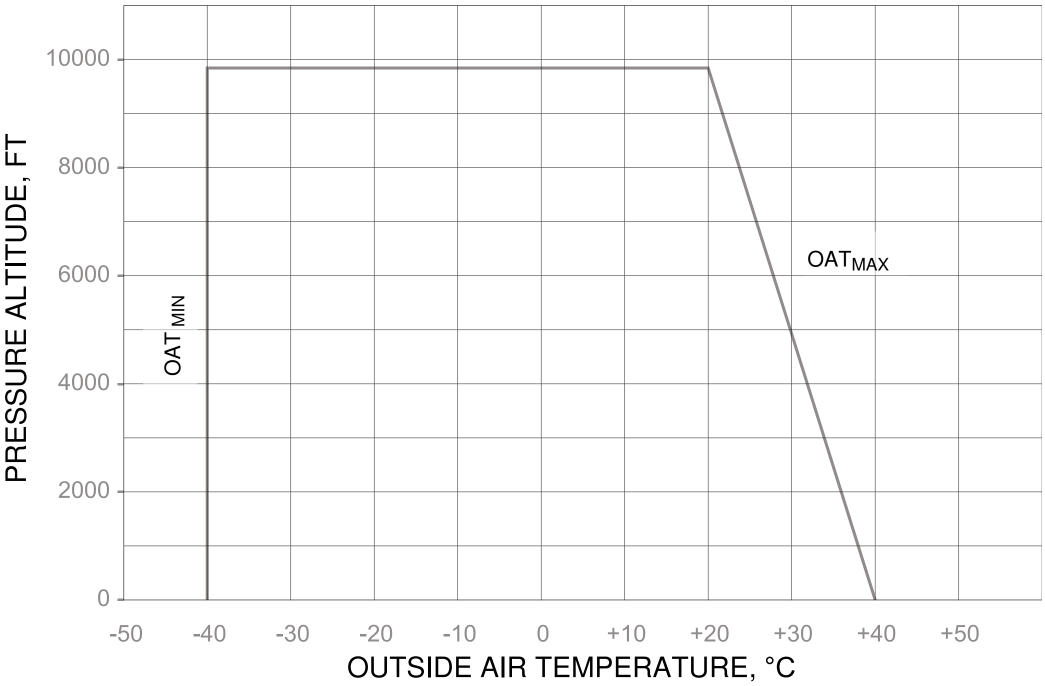


Fig. 1-4. (Sheet Лист 1 of 2). Outside air temperature limits for APU operation and starting on ground and in flight.
(BRITISH SYSTEM)

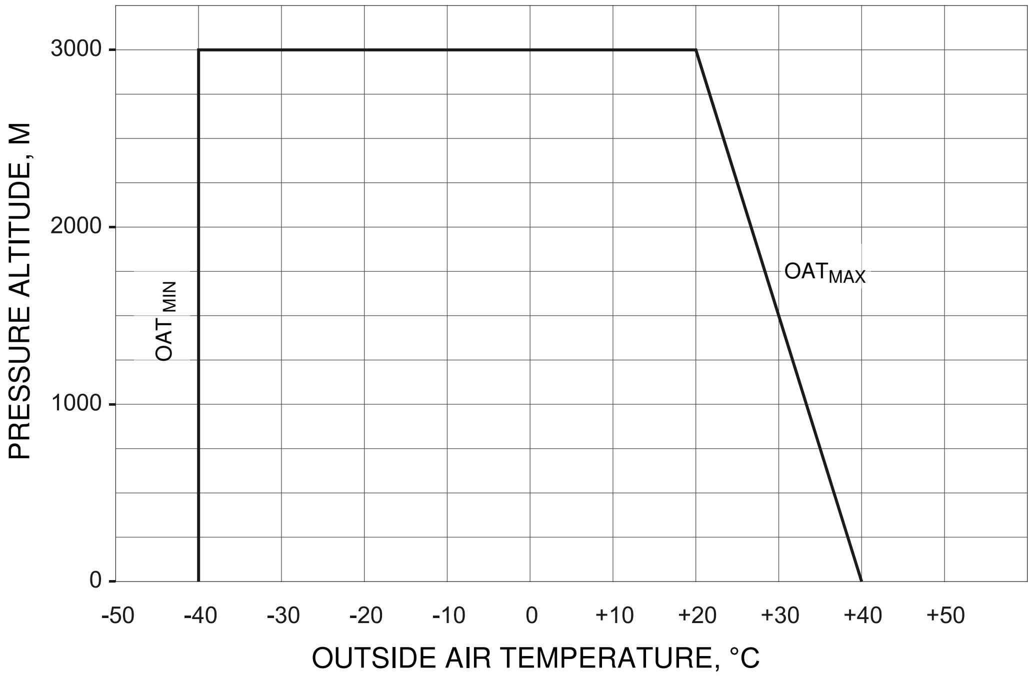


Fig. 1-4. (Sheet Лист 2 of 2). Outside air temperature limits for APU operation and starting on ground and in flight.
(METRIC SYSTEM)

FUEL AND OIL LIMITATIONS

CAUTION. ONLY PRESSURE REFUELING POINT MAY BE USED FOR HELICOPTER REFUELING WITH RUNNING ENGINES.

FUEL/OIL GRADE LIMITATIONS

FUEL GRADES

Grades of fuel and anti-ice additives authorized for use are listed in Table 1-2.

NOTE. The anti-ice additive is to be used at OAT +5° and below in accordance with to Table 1-2.

Table 1-2. Engine and APU Fuels

FUEL GRADES		GOST, Specifications	Airport air temperature for which the use of fuel is recommended
Basic	Alternative		
TC-1 (TS-1)		GOST 10227-86	Any
PT (RT)		GOST 10227-86	Any
	Jet A-1	DEF STAN 91-91	Any
		DERD 2494	Any
		ASTM D1655	Any
		CAN CGSB 3-23	Any
	Jet A	ASTM, D1655	> −20 °C
		CAN CGSB 3-23	> −20 °C

NOTE. At airport ambient temperatures below +5 °C anticrystallization fluid shall be added to fuels:

- russian fuels need ethyl cellosolve [liquid “И” (“I”), GOST 8313-88] in the amount of 0.1% of the fuel volume;
- fuels Jet A-1, Jet A needs methyl cellosolve (AL-31) DEF STAN 68-251 (DERD 2451) or MIL-I- 27686E, or CAN CGSB 3.526 to be added in the amount of 0.1–0.15 % of the fuel volume.

OIL GRADES

Grades of oil authorized for use in engines, APU and gear box are listed in Table 1-3.

Table 1-3. Engine and Gearbox Oils

Basic	Alternative	GOST, Specifications
Б-3В (B-3V)	–	ТУ 38.101295-85
	Castrol 98	DERD 2487
	Mobil-Jet Oil 254	MIL-L-23699

ELECTRICAL SYSTEM LIMITATIONS

BATTERY LIMITATIONS

Maximum battery temperature, as indicated by illumination
of LH BAT HOT and/or RH BAT HOT warning lights .... +65 °C

Minimum DC voltage .... 20 V

HYDRAULIC LIMITATIONS

HYDRAULIC PRESSURE LIMITS

MAIN HYDRAULIC SYSTEM

Minimum oil pressure .... 64 kgf/sq.cm.

Maximum oil pressure .... 90 kgf/sq.cm.

STANDBY HYDRAULIC SYSTEM

Minimum oil pressure .... 64 kgf/sq.cm

Maximum oil pressure .... 90 kgf/sq.cm

AUXILIARY HYDRAULIC SYSTEM

Minimum oil pressure .... 75 kgf/sq.cm

Maximum oil pressure .... 90 kgf/sq.cm

AUXILIARY PUMP

Minimum oil pressure .... 200 kgf/sq.cm

Maximum oil pressure .... 240 kgf/sq.cm

MAIN WHEEL BRAKES

Maximum pressure for taxiing .... 13 kgf/sq.cm

Maximum pressure for parking .... 30 kgf/sq.cm

Maximum time of brakes applications for parking is limited by pressure in main wheel brakes as follows:

- maximum continuous .... 17 kgf/sq.cm
- maximum 30 min .... 17–25 kgf/sq.cm
- maximum 5 min .... 25–30 kgf/sq.cm

HYDRAULIC TEMPERATURE LIMITS

Minimum hydraulic oil temperature before engine start up .... minus 50 °C

Maximum hydraulic oil temperature is limited to .... +100 °C

Minimum hydraulic oil temperature before takeoff .... minus 10 °C

AUXILIARY PUMP LIMITS

Maximum time of auxiliary pump operation is limited to:

- on ground... not exceeding 30 min
- in flight.. not exceeding 150 min

HYDRAULIC FLUID

Grades of oil authorized for use in the hydraulic system are listed in Table 1-4.

Table 1-4. Hydraulic Oil

Basic	Alternative	Specifications
АМГ-10 (AMG-10)	– AeroShell Fluid 41 Grade OM-15 Brayco Micronic 756D Royco Micronic 756B FH-51 FH-15	GOST 6794-78 MIL-H-5606F DEF STAN 91-48/1, Gade Supperclean AIR-3520/B MIL-H-5606F MIL-H-5606F AIR 3520/B, MIL-H-5606F DEF STAN 91-48/1 –

CAUTION. THE PURITY OF HYDRAULIC FLUID BEFORE FILLING THE HYDRAULIC SYSTEM SHALL BE NOT BELOW CLASS 6 BY GOST 17216-71 OR CLASS 10/7 BY ISO 4406

AVIONIC LIMITATIONS

CAUTION: HELICOPTER OPERATION WITHOUT USING HEADSET IS PROHIBITED.

LIMITATIONS ON AUTO FLIGHT CONTROL SYSTEM USAGE

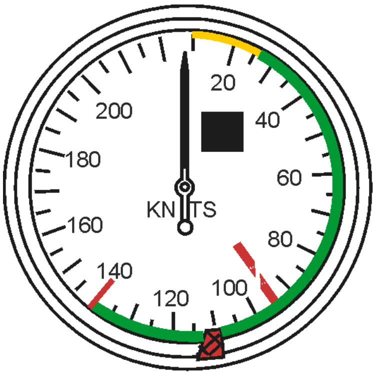
LIMITATIONS ON THE ROUTE MODE USAGE

Minimum pressure altitude for ROUTE mode actuation .... 1000 ft (300 m)

Minimum airspeed for ROUTE mode actuation... 39 KIAS (70 km/h)

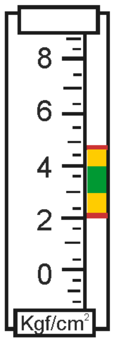
Maximum airspeed for ROUTE mode actuation.. (Vne – 11) KIAS, (Vne – 20) km/h

NOTE. Additional equipment may be required depending on operating regulations.



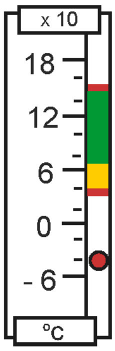
AIRSPEED INDICATOR

RED	95 knots	– Maximum speed at autorotation
RED		– V_{NE} (movable symbol)
RED	140 knots	– Basis V_{NE} limit at sea level
YELLOW	0–27 knots	– Caution range
GREEN	27–140 knots	– Normal operating



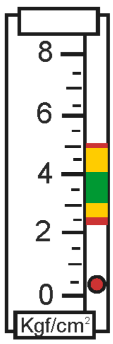
OIL PRESSURE MAIN ENGINES INDICATOR

RED	2 kgf/sq.cm	– minimum limit
YELLOW	(2–3) kgf/sq.cm	– caution range
GREEN	(3–4) kgf/sq.cm	– normal operating
YELLOW	(4–4.8) kgf/sq.cm	– caution range
RED	4.8 kgf/sq.cm	– maximum limit



OIL TEMPERATURE MAIN ENGINES INDICATOR

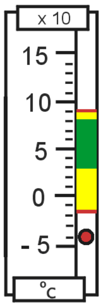
RED	minus 38 °C	– minimum limit for start
RED	30 °C	– minimum limit
YELLOW	(30–70) °C	– caution range
GREEN	(70–150) °C	– normal operating
RED	150 °C	– maximum limit



OIL PRESSURE MAIN GEARBOX

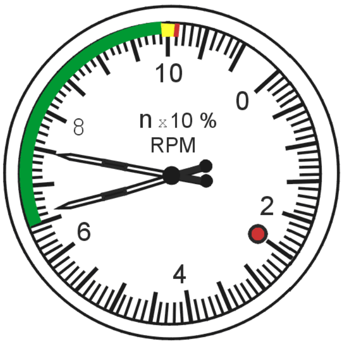
RED	0.5 kgf/sq.cm	– minimum limit at starting (IDLE)
RED	2.5 kgf/sq.cm	– minimum limit
YELLOW	(2.5–3) kgf/sq.cm	– caution range
GREEN	(3–4) kgf/sq.cm	– normal operating
YELLOW	(4–5) kgf/sq.cm	– caution range
RED	5 kgf/sq.cm	– maximum limit

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



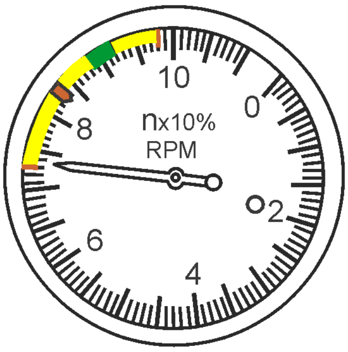
OIL TEMPERATURE MAIN GEARBOX

RED	minus 40 °C	– minimum limit for start
RED	minus 15 °C	– minimum limit
YELLOW	(minus 15° - + 30°C)	– caution range
GREEN	(30–80) °C	– normal operating
YELLOW	(80–90) °C	– caution range
RED	90 °C	– maximum limit



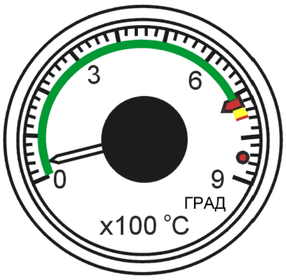
ENGINES RPM N_1 INDICATOR

RED	25 %	– maximal speed when rotors are to start rotating
RED	101 %	– maximum limit for normal and OEI operating
YELLOW	(99–101) %	– caution range for normal and OEI operating
GREEN	(65–99) %	– normal operating range, OEI included



ROTOR RPM N_R INDICATOR

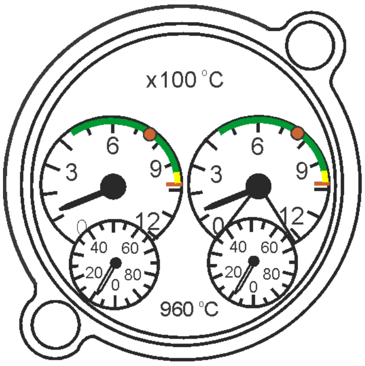
WHITE	20 %	– maximum limit when rotor brake is set ON
RED	73 %	– minimum limit, OEI
RED	83 %	– minimum limit with two engines operating
YELLOW	(73–87) %	– caution range
GREEN	(87–92) %	– normal operating
YELLOW	(92–98) %	– maximum limit
RED	98 %	– maximum limit



TOT APU INDICATOR

GREEN	(0–720) °C	– normal operating
RED	720 °C	– maximum limit (during bleeding at T_R < 15 °C)
YELLOW	(720–750) °C	– caution range
RED	750 °C	– maximum limit (during bleeding at T_R > 15 °C)
RED	850 °C	– maximum limit for start

Figure 1-6 (Sheet 2 of 4). Instrument Markings



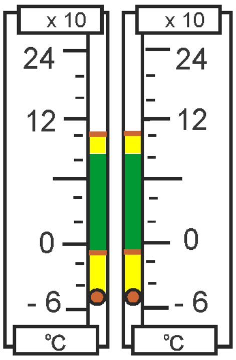
ITT ENGINES INDICATOR

RED 780 °C – maximum limit start

RED 990 °C – maximum limit

YELLOW (955–990) °C – caution range for normal operating and OEI

GREEN (450–955) °C – normal operating



OIL TEMPERATURE MAIN AND STANDBY
HYDRAULIC SYSTEM

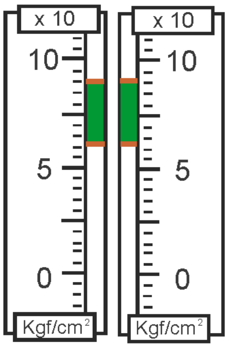
RED minus 50 °C – minimum limit for start

YELLOW minus (50–10) °C – caution range
(+ 85 – + 100) °C

RED minus 10 °C – minimum limit for takeoff

GREEN (-10 – +85) °C – normal operating

RED +100 °C – maximum limit

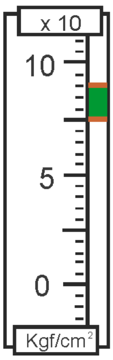


OIL PRESSURE MAIN AND STANDBY
HYDRAULIC SYSTEM

RED 64 kgf/sq.cm – minimum limit

GREEN (64–90) kgf/sq.cm – normal operating

RED 90 kgf/sq.cm – maximum limit



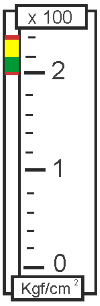
OIL PRESSURE AUXILIARY
HYDRAULIC SYSTEM

RED 75 kgf/sq.cm – minimum limit

GREEN (75–90) kgf/sq.cm – normal operating

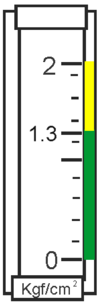
RED 90 kgf/sq.cm – maximum limit

Figure 1-6 (Sheet 3 of 4). Instrument Markings



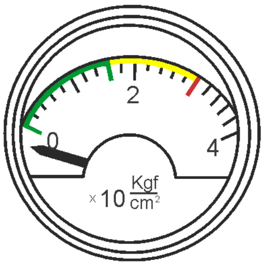
OIL PRESSURE HYDRAULIC PUMP

Red	200 kgf/sq.cm	– minimum limit
Green	(200–220) kgf/sq.cm	– normal operating
Yellow	(220–240) kgf/sq.cm	– caution range
Red	240 kgf/sq.cm	– maximum limit



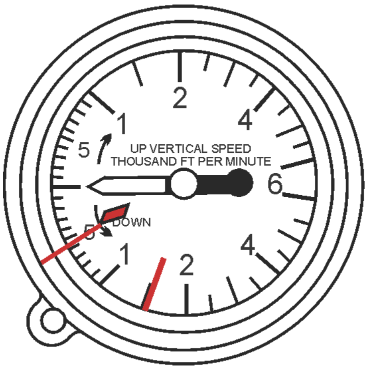
PRESSURE DROP INDICATOR ON THE GEAR BOX FINE OIL FILTER

Green	(0–1.3) kgf/sq.cm	– normal working range
Yellow	(1.3–2.0) kgf/sq.cm	– partial contamination



WHEEL BRAKE PRESSURE INDICATOR

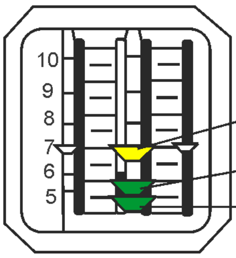
Green	(0–17) kgf/sq.cm	– normal operating
Yellow	(17–30) kgf/sq.cm	– caution range
Red	30 kgf/sq.cm	– maximum limit (5 min max.)



VERTICAL SPEED INDICATOR

Red	590 ft/min	– maximum rate of descent limit at speed 27 knots and below
Red	1575 ft/min	– maximum rate of descent limit at speed above 108 knots

POWER INDICATOR

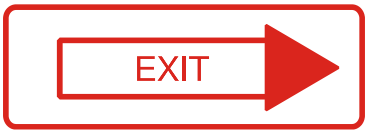


Yellow 2200 h/p
Green 1700 h/p
Green 1500 h/p

Figure 1-6 (Sheet 4 of 4). Instrument Markings

PULL THE HANDLE PUSH THE DOOR	placard is arranged above the left door of the cargo compartment. Red letters and frame against white background
TO OPEN THE DOOR PRESS THE HANDLE BUTTON	placards are arranged near the crew compartment door handles on the portside and starboard. Red letters and frame against white background
NO SMOKING FASTEN SEAT BELTS	placards are arranged on the rear wall of the cargo compartment at fr. No. 13 and on the starboard behind fr. No. 9. Red letters and frame against white background
EXIT	placard is arranged on the left side of the overheard panel. White letters and frame on black background
THIS HELICOPTER MUST BE OPERATED IN COMPLIANCE WITH THE OPERATING LIMITATIONS SPECIFIED IN APPROVED ROTORCRAFT FLIGHT MANUAL	White letters and frame on black background

Fig. 1-6. (Sheet 1 of 6). Placards



–placards are arranged on the cargo compartment front wall on the portside and in the upper part of the partition along fr. No. 13. Red letters, arrow and frame against white background

–placard is arranged above the cargo compartment door handle on the portside. Red letters, arrow and frame against white background

–placard is arranged on the inner side of the cargo compartment door, the lower left corner. Red letters and frame against white background

–placard is arranged on the cargo compartment front wall on the portside. Red letters and frame against white background

–placard is arranged on the cargo compartment front wall on the portside. Red letters and frame against white background

Fig. 1-6. (Sheet 2 of 6). Placards

THIS SEAT MUST BE REMOVED WHEN PASSENGERS ARE TRANSPORTED OR LIFE RAFTS ARE INSTALLED

–placard is arranged on the operator's seat back. White letters and frame against red background

CLOSED

FOR PASSENGERS EVACUATION TURN HANDLE DOWN AND FOLD SEAT BACK FORWARD

OPEN

– placard is arranged on the co-pilot's seat back in the crew compartment. White letters and frame against red background

FIREX IS INSTALLED UNDER THIS SEAT

– placard is arranged above seat No. 7. White letters and frame against red background

TO JETTISON DOOR PULL COVER OFF TURN HANDLE AND PUSH DOOR

– placard is arranged on the wall of fr. No. 4 near the crew compartment right door. Red letters and frame against white background

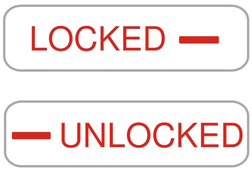
CAUTION!
INTER LOCK POSITION BEFORE FLIGHT

INTER LOCK POSITION AT PARKING

– placard is arranged on the emergency exit door. Red letters and frame against white background

Fig. 1-6. (Sheet 3 of 6). Placards

– placard is arranged in the area of fr. No. 4 on the cargo compartment starboard. Red letters against colourless background



–placards are arranged under the handle in the lower part of the cargo compartment door. Red letters and line against colourless background

–placards are arranged on the cargo cabin starboard in the area of the emergency exit and on the cargo compartment front partition. White letters and frame against red background

–placard is arranged on the emergency exit door above the handle.
Red letters and frame against white background

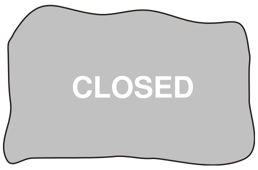
–marking is arranged on the emergency exit door, starboard.
Red letters and arrow against white background

–placards arranged above the cargo cabin compartment and in the area of fr. No. 4, starboard.
White letters against red background

Fig. 1-6. (Sheet 4 of 6). Placards

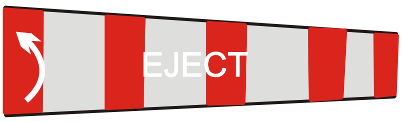
–placards arranged above the cargo cabin compartment and in the area of fr. No. 4, starboard.
White letters against red background

– placards arranged near the emergency exit handle and in the area of fr. No. 4 in the cargo compartment, starboard. Red arrow against colourless background

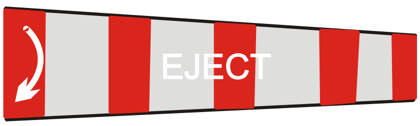


– markings are applied in the crew compartment door lower part, portside and starboard. White letters against grey background

–placard is arranged in the area of the emergency door in the cargo compartment starboard.
White letters and frame against red background.



–engraved marking is applied to the handle installed on the forward section of the crew compartment door opening, portside. White letters against reddish-grey background



–two engraved markings: on the front and rear handles installed on the forward section of the crew compartment door opening, starboard. White letters against red-grey background

Fig. 1-6. (Sheet 5 of 6). Placards

PUSH BUTTON → SLIDE DOOR

–engraved marking is applied near the outer handle of the crew compartment door, port-side. Black letters against white background

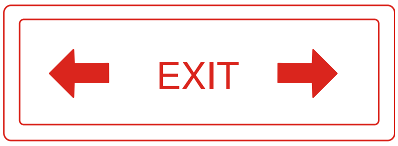
–placard is arranged near the outer handle of the cargo compartment door, portside. Black letters against white background

PUSH BUTTON ← SLIDE DOOR

–engraved marking is applied near the outer handle of the crew compartment door, port-side. Black letters against white background

–annunciator is arranged on the front wall of the cargo compartment, portside.

Red letters against white background



–annunciators are arranged in the upper part of the partition along fr. No.13 and on the starboard between fr. Nos.5 and 6.

Red letters, frame and arrow on white background

Fig. 1-6. (Sheet 6 of 6). Placard

SECTION 2. NORMAL PROCEDURES

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SECTION 2. NORMAL PROCEDURES

INTRODUCTION

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

Normal and standard conditions are assumed in these procedures without helicopter optional use, stipulated in Supplements.

OPERATING LIMITATIONS

The minimum and maximum limits, and the normal and cautionary operating ranges for the helicopter and its subsystems are indicated by instrument markings, placards, and lights representing careful aerodynamic calculation which are substantiated by flight test data.

Refer to Section 1 RFM, for a detailed explanation of each operating limitation.

FLIGHT PLANNING

Each flight should be planned adequately to ensure safe operations and to provide the pilot with the data to be used during flight. Check type of mission to be performed and destination. Determine the initial data for calculation, determine the most favorable flight level and speed, calculate estimated flight time and fuel consumption determine the required fuel quantity, determine the maximum Gross Weight for takeoff, landing, and enroute flight, calculate the position of CG for takeoff and landing, determine the permissible payload, determine the maximum ITT and minimum N_1.

Select appropriate performance data and charts to be used from RFM Section 4 and Section 5 and Manufacturer’s Data Section 2 and Section 3.

COLD WEATHER OPERATION

When the outside air temperature is below than minus 40 °C it is necessary to preheat by hot air:

- engines and their oil system (ref. TB3-117 Maintenance Manual);
- gearbox (ref. BP-252 Maintenance Manual);
- cockpit to +10..+15 °C.

BEFORE EXTERIOR CHECK

Flight planning ....COMPLETED

Publications ....CHECKED

Helicopter servicing ....COMPLETED

Helicopter equipment ....As required

Helicopter fueling...As required

Ground fire-extinguishing aids ....AVAILABLE

Residue drain ....COMPLETED

EXTERIOR CHECK

Exterior check is performed visually as per check sequence shown in Fig. 2-1.

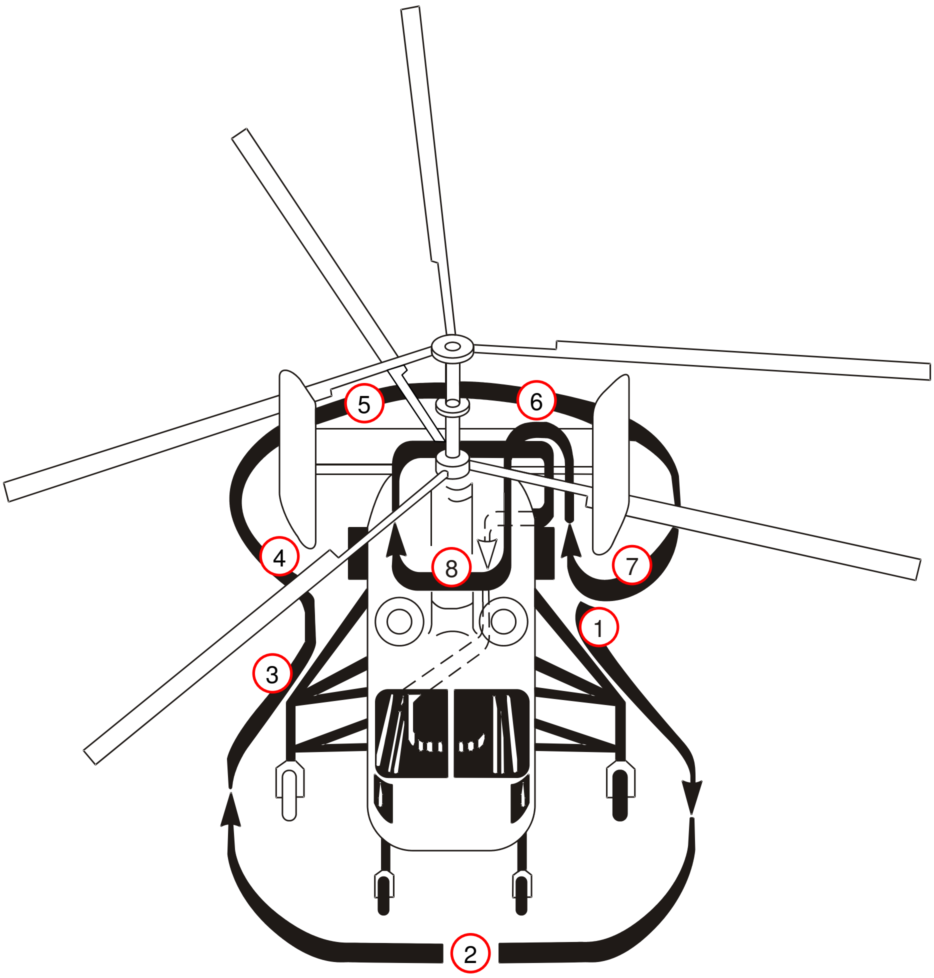

Fig. 2-1. Preflight Exterior Check Sequence.

1. FUSELAGE – CABIN LEFT SIDE

Exterior surfaces .... CONDITION

Side hatches .... CLOSED

LH landing gear strut .... CONDITION

LH landing gear shock struts
(shock strut piston face is inspected visually) .... CONDITION

LH landing gear strut tire
(inspected visually for bottoming and wear) .... CONDITION

Brake shoes .... REMOVED

Engine nacelle cowling .... CONDITION, SECURITY

Main engine exhaust outlet cover .... REMOVED

Engine nacelle drain lines .... CLEAN

Filler cap 5th fuel tank .... SECURITY

Filler cap 1st fuel tank .... SECURITY

LH battery .... INSTALLED, CONNECTED

LH battery access hatch .... CLOSED, CHECK

Crew cabin LH door .... CONDITION, OPERATION, SECURITY

Glass .... CLEANLINESS

Static vents and pitot tubes .... COVERS REMOVED, TUBES CLEAN

Rotor blades .... TIE DOWN REMOVED

- Surfaces .... CONDITION
- Position .... OUT OF THE ENGINE EXHAUST GAS ZONE

Side drain lines .... CLEAN

2. FUSELAGE – FRONT

Front view – helicopter position without banking, uniform mussing of shock struts (LH and RH)

Cabin cover..REMOVED

Cabin glass..CONDITION, CLEANLINESS

Nose landing gear support tire
(inspected visually for bottoming and wear) ....CONDITION

Nose landing gear support shock struts..........................CONDITION

Wipers ....INSTALLED

Pitot-static tube cover ....REMOVED

Exterior surfaces...CONDITION

Lights..RETRACTED, CLEAN, CONDITION

Antennas ....CONDITION

Engine inlet covers ....REMOVED

Inlet protective screen (if required)...........................CONDITION

Oil and fuel leakage ....CHECK

Rotor blades ....TIE DOWN REMOVED

Surfaces ....CONDITIONS

3. RH SIDE

Static vent...COVER REMOVED, VENT CLEAN

Crew cabin RH door..CONDITION, OPERATION, SECURITY

Glass ....CLEANLINESS

RH battery ....INSTALLED, CONNECTED

RH battery access hatch...CLOSED, CHECK

Side hatches..CLOSED

RH landing gear shock struts
(shock strut piston face is inspected visually) .... CONDITION

RH landing gear strut tire
(inspected visually for bottoming and wear) .... CONDITION

Brake shoes .... REMOVED

Engine nacelle cowling .... CONDITION, CLOSED

RH engine exhaust outlet covers and APU inlet covers............. REMOVED

Engine nacelle cowling locks .... SECURED

Filler cap 1st fuel tank .... SECURITY

Filler cap 5th fuel tank .... SECURITY

Engine drain lines... CLEAN

Cargo compartment emergency hatch .... CLOSED

Rotor blades .... TIE DOWN REMOVED

Surfaces .... CONDITION

Position.. OUT OF THE ENGINE EXHAUST GAS ZONE

Side drain lines... CLEAN

4. TAIL BOOM RIGHT SIDE

Exterior surfaces .... CONDITION

HF radio antenna .... CONDITION

Tail .... CONDITION

RH navigation light .... CONDITION

Slat.. CONDITION

Fillets.. CONDITION, TIGHT FITTING

VHF radio antennas .... CONDITION

5. TAIL RIGHT SIDE

RH rudder .... CONDITION

Fillets .... CONDITION, TIGHT FITTING

RH stabilizer .... CONDITION

Rear navigation light .... CONDITION

6. TAIL LEFT SIDE

LH rudder .... CONDITION

Fillets .... CONDITION, TIGHT FITTING

LH stabilizer .... CONDITION

LH navigation light .... CONDITION

Fin slat .... CONDITION

7. TAIL BOOM LEFT SIDE

Exterior surfaces .... CONDITION

Electronic equipment access hatch .... CLOSED

Drain holes .... CLEAN, CONDITION

All LH side hatches .... CLOSED

Cargo compartment door .... OPERATION, SECURITY

Blister .... CONDITION, CLEAN

8. HELICOPTER TOP

Rear part of engine nacelle .... CONDITION, LOCKS SECURED, NO LEAKAGE

APU exhaust outlet cover .... REMOVED

Rotor mast .... CONDITION

Unfolded blade fixing devices .... IN PLACE FOR FLIGHT, SECURED

Electric cables .... CONDITION

Blades .... CONDITION

Front part of engine nacelle.. CONDITION LOCKS SECURED, NO LEAKAGE

Engine inlet screens .... CONDITION

Ice detector cover (if installed) .... REMOVED

Antennas... CONDITION

After completing the visual inspection of the helicopter the pilot should brief the occupants on the rules of accommodation and behavior during the flight in compliance with the Instructions. An example of Safety regulations for carrying occupants is given in Section 3, Manufacturer's Data

INTERIOR CHECK

CARGO COMPARTMENT

Flight data recorder ....INFORMATION INSTALLED

EMRG EXT LGHT switch .... …OFF (cap closed)

Interior...CONDITION

Cargo ....SECURED

Fire extinguisher...INSTALLED

Seats and safety belts ....CONDITION

Transportation cabin door..CLOSED, LOCKED

Security device under cover ....STOWED

Cover ....CLOSED

CREW COMPARTMENT

Interior...CLEAN

Equipment...CONDITION

Seats, safety belts, controls...ADJUSTED

NOTE. The pilot's seat position is considered correctly adjusted when the estimated point of view (the eye position height of sitting pilot) will be situated on the same line with the upper part of the moved out sun visor

Safety belts .... FASTENED

Crew cabin left door .... OPERATION SECURED

LH door emergency release handle.. LOCKED, SECURED

RH door emergency release handle .... LOCKED, SECURED

Copilot seat back folding handle... LOCKED, SECURED

Anti-hijacking device on center pedestal... REMOVED

Main Wheel Brakes .... ON

Separate throttle control levers .... IDLE

Engine shut-off levers .... CLOSED

SWITCH POSITION CHECK

ADDITIONAL INSTRUMENT PANEL

Pressure altitude indicator .... 1013 mBars (760 mm. Hg), check

CARGO CABIN HEATING switch .... neutral

ILLUM BRIGHT CTL rheostat .... OFF

ILLUM switch .... off

CVR switch .... off

HDG MORE – HDG LESS selector switch .... neutral

FAN switch .... off

EMERG CABIN switch .... OFF (cap closed)

EMERG LGT – EXIT SIGH switch .... OFF (cap closed)

T/O FUEL QTY selector switch .... fuel quantity

RH PNL regulator .... OFF

DEVIATION COMPENSATOR position .... set as required

OVERHEAD PANEL

Circuit Breaker Panel

Circuit breakers .... off

Fire Extinguishing Panel

OPER-TEST switch .... OPER (cap closed)

DETECTOR TEST – GR 1 – GR 2 – GR 3 .... neutral

Squibs Test Panel

SQUIB TEST switch .... OFF

AC Volts and AMPS Control Panel

Voltage EXT PWR switch .... A

Current LH GEN switch .... A

DC Voltage Control Panel

DC VOLTAGE switch .... OFF

VHF Radio Set Control Panel

AP led .... off

AP switch .... lower position

Noise suppressor switch .... NS

Indicator .... off

Heat Pitot Panel

HEAT PITOT CLOCK switch .... off

Light Control Panel

Selector switch MAIN CABIN 2 LAMPS – OFF – 3 LAMPS........ OFF

NAV LTS selector switch .... OFF

ANTI-COLL LT switch .... off

BLADE TIP LTS switch .... off

ILLUM switch... off

Selector switch EMERG EXT .... OFF

Selector switch EMERG CABIN .... OFF

Hydraulic System Panel

AUX PUMP EMERG ON-OFF-AUTO switch .... AUTO (cap closed)

TO MAIN-MAIN ON-MAIN OFF switch .... MAIN ON (cap closed)

STBY OFF -ON switch .... ON (cap closed)

Power Supply Panel

AC SYSTEM

AC SYS LH GEN switch .... off

AC SYS RH GEN switch .... off

EXT PWR switch .... off

MAIN TRANS – STBY TRANS selector switch .... MAIN TRANS (cap closed)

INVERT AUTO-MAN selector switch .... AUTO (cap closed)

DC SYSTEM

RECT LH switch ....off

RECT RH switch ....off

BAT LH switch..off (cap open)

BAT RH switch ....off (cap open)

BAT BUS switch ....off (cap closed)

EXT PWR switch..off

Navigation Panel

HOR 1 switch...off

HOR 2 switch...off

HSI PILOT switch ....off

HSI NAVIG switch..off

AST switch...off

CRS SYS switch ....off

RALT switch...off

AP switch ....off

PC, FDI switch ....off

ADF switch...off

VG switch ....off

Communication Equipment Control Panel

VHF 1 switch..off

VHF 2 switch..off

HF switch ....off

ICS switch..off

Pilot's Intercom Selector Panel

RNU1 switch ....off

RNU2 switch ....off

RNU3 switch ....off

RNU4 switch ....off

RS1 switch .... off

RS2 switch .... off

RS3 switch .... off

OFF-RS1-RS2-IC switch .... OFF

IC Volume Control .... to the left stop

RAD Volume Control .... to the left stop

ADF Control Panel

CHANNL selector switch .... to 1

PH-TLG switch .... PH

COMP-ANT switch .... COMP

Volume Control .... set to the left

INNER BCN – OUTER BCN selector switch .... set as desired

HF Radio Set Control Panel

NS – OFF switch .... OFF

FREQUENCY .... as required

OFF-OM-AM selector switch .... set as desired

Volume Control .... set to the left

With control panel Б7А3-ЯрI installed:

NS – OFF switch .... OFF

EMRG LED .... off

Volume Control .... set to the left

ON switch .... lower position

Buttons ⇦ ⇨ .... not pressed

ENTER switch .... arbitrary position

TEST button .... not pressed

Indicator .... not illuminated

Air Supply Heating and Ventilation Panel

PILOT FAN switch .... off

AIR SUPPLY-OFF – BLOWOUT selector switches .... OFF

External Lights Control Panel

LOAD LT-OFF-RETR selector switch .... OFF

LDG LT-RETR-CTL selector switch .... CTL (cap closed)

N-S selector switch .... S

RETR-EXTEND selector switch .... neutral

SEARCH LIGHT switch .... off

SEARCH LT NAVIG-OFF-OPERATOR selector switch .... OFF

Anti-icing System Control Panel

AUTO ROTORS-OFF-MAN ROTORS selector switch .... OFF

AUTO ENG LH (RH)-OFF-MAN ENG switches .... AUTO (cap closed)

LH Subpanel

TL BOOM UP-DOWN selector switch .... neutral (cap closed)

FSLG UP-DOWN selector switch .... neutral (cap closed)

FASTEN SEAT BELTS switch .... off

EMERG COMM switch .... off

WIPER START-1SPD-2SPD-RETURN .... neutral

RH Subpanel

FAN switch .... off

WIPER START-1SPD-2SPD-RETURN .... neutral

INSTRUMENT PANELS

Radio Altitude alert .... set as required

Altimeter setting .... set pressure altitude, verify field elevation

Clock .... actual time, verify

LIM SIG SYS switch .... off

T/O WEIGHT switch .... as calculated

Transponder Control Panel

Power switch .... off

READY GCA, ATC (ATC-M)-AC-A selector switch .... READY

Code selector .... as required

CENTRAL PEDESTAL

Fire Panel

LH ENG FIRE button .... cap closed

RH ENG FIRE button .... cap closed

APU FIRE button .... cap closed

DISCH 1-2 switch .... 1 (cap closed)

LH ENG SHUT-OFF VLV switch .... OPEN
(cap closed)

RH ENG SHUT-OFF VLV switch .... OPEN
(cap closed)

X-FEED VLV switch .... off
(cap closed)

LH TANK PUMPS 1 switch .... off
(cap open)

LH TANK PUMPS 2 switch .... off
(cap open)

LH TANK PUMPS 3+4 switch .... off
(cap open)

TANK PUMPS FRONT switch .... off
(cap open)

TANK PUMPS REAR switch .... off
(cap open)

RH TANK PUMPS 1 switch .... off
(cap open)

RH TANK PUMPS 2 switch .... off
(cap open)

RH TANK PUMPS 3+4 switch .... off
(cap open)

ADF frequency .... as required

Control valves check panel:

CTRL VALVES – MAIN HYD – STBY HYD –
NORMAL – TEST switches...NORMAL (caps closed)

External Load Control Panel

PILOT-OPERATOR/PILOT switch ....PILOT (cap closed)

LOAD RELEASE MAIN-STBY switch..MAIN (cap closed)

LINE POSN FLIGHT-HOVER switch ....HOVER

Compass System Control Panel

LATITUDE ....set a latitude

MODE MAG-DG selector switch ....MAG

MODE M-MS-S selector switch..MS

USER M-S selector switch ....M

AP Central Control Panel

YAW switch ....off

ROLL switch ....off

PITCH switch...off

PA switch..PA (ON)

VHF1 Radio Set Control Panel

AP led..off

AP switch..lower position

Noise suppressor switch ....NS

Indicator..off

Engine Electronic Governor (EEG) Test and Switching Panel

LH 2.5 MIN PWR switch ....on (cap closed)

RH 2.5 MIN PWR switch...on (cap closed)

EEG LH switch...on (cap closed)

EEG RH switch ....on (cap closed)

EEG TEST TC-OPER switch ....OPER (cap closed)

EEG TEST FT1-OPER-FT2 selector switch..................................OPER (cap closed)

Engine Starting Panel

APU VALVE OPEN-CLOSED switch.. OPEN (cap closed)

ENG APU selector switch START-CRANK-FALSE START........ START

MAIN ENG START-STOP LH-RH switch .... as required

MAIN ENG START-CRANK selector switch .... START

Helicopter and Powerplant Controls

Collective Lever... full down

ROUTE OFF switch .... OFF

LAND light STBY-OFF-MAIN selector switch (Collective lever) .. OFF

Cyclic stick .... neutral

Pedals.. neutral

ENG SHUT-OFF LEVERS .... CLOSED

ENGINE THROTTLE LEVERS.. IDLE

Rotor Brake .... on (APPLIED)

Brightness Control Panel

PILOT PNL regulator.. OFF

CENTER-OVER PNLS regulator .... OFF

PRESTART CHECK

Engines starting can be selected from batteries or from external power. Battery starting procedure is described below.

Circuit Breakers Panel

All circuit breakers .... on

NOTE. Circuits breakers ENG TEMP REG LH, RH don't switch off in flight.

Batteries serviceability check:

Wafer switch on DC test panel... LH BAT

DC Voltmeter .... minimum 25.5 V, check

Wafer switch on DC test panel... RH BAT

DC Voltmeter .... minimum 25.5 V, check

LH BAT, RH BAT switches .... on (close caps)

Emergency lighting turn on

Selector switch EMERG EXT... ARM

Selector switch EMERG CABIN.. ARM

FASTEN SEAT BELTS switch .... ON

For performing the subsequent checks:

INVERT AUTO-MAN switch... MAN (cap open)

36 V INV ON light .... on

115 V INV ON light .... on

VHF 1 switch... on

VHF 2 switch... on

ICS switch... on

Warning, Caution Light Systems Check

WARN SYS CHECK button (on instrument panel)................. press to hold

MWL .... flickers

All warning, caution, annunciation lights .... on

Audio signal .... sounds (3 s)

Second audio signal (continuous) .... appears after 3 s (both signals are heard)

MWL .... press to reset

MWL and audio signal.. off

WARN SYS CHECK button... release

ENGINE WARNING AND CAUTION SYSTEMS CHECK

Engine Thermocouple Check

ENGS INOPER button .... press, hold

ITT .... (950–1270) °C, verify

ENGS INOPER button .... release

ITT instrument pointers .... returned to the initial position, verify

Engine Vibration Transducers Check

VIBR METER button .... press, hold

MWL .... flickers

Audio signal (headset).. on

Amber LH ENG VIBR, RH ENG VIBR lights........................... on, verify

Red LH ENG VIBR/RH ENG VIBR lights............................... on, verify

VIBR METER button .... release

Audio signal .... off

MWL .... off

Red and amber LH ENG VIBR/RH ENG VIBR lights .... off, verify

Helicopter Systems Serviceability Transducers Operational Test

Engine throttle levers ....AUTO

MWL ....flickers

AUDIO signal in headset..on

Red light GRBX OIL PRES LOW ....on

Red LH ENG FAIL light...on

Red RH ENG FAIL light ....on

Amber LH ENG OIL PRESS light...on

Amber RH ENG OIL PRESS light ....on

Amber BAT BUS light ....on

Amber LH GEN OFF light ....on

Amber RH GEN OFF light...on

Amber LH RECT OFF light ....on

Amber RH RECT OFF light...on

Amber MAIN TRNS OFF light ....on

Amber 36 V INV ON light ....on

Amber 115 V INV ON light...on

Amber COMPASS FAIL light ....on

Amber VG FAIL light..on

Amber RALT FAIL light ....on

Amber MAIN HYD FAIL light...on

Amber STBY HYD FAIL light ....on

Amber AUX HYD SYS FAIL...on

Engine throttle levers ....IDLE

Red light GRBX OIL PRES LOW ....on

Amber LH ENG OIL PRESS light...off

Amber RH ENG OIL PRES light ....off

Red LH ENG FAIL light .... off

Red RH ENG FAIL light.. off

Amber BAT BUS light.. on

Amber LH GEN OFF light... off

Amber RH GEN OFF light .... off

Amber LH RECT OFF light.. off

Amber RH RECT OFF light .... off

Amber MAIN TRNS OFF light .... on

Amber 36 V INV ON light .... on

Amber 115 V INV ON light .... on

Amber COMPASS FAIL light... on

Amber VG FAIL light .... off

Amber RALT FAIL light .... on

Amber MAIN HYD FAIL light .... off

Amber STBY HYD FAIL light... off

Amber AUX HYD SYS FAIL light... off

MWL .... press to release

MWL .... off

AUDIO signal .... off

FIRE EXTINGUISHING SYSTEM CHECK

OPER-TEST selector switch .... TEST

DETECTOR TEST selector switch .... GR 1

MWL .... flickers

AUDIO signal .... on

Red CHECK FIRE PNL light... flickers

Red RH ENG FIRE light .... on

Red LH ENG FIRE light... on

Red APU FIRE light .... on

DETECTORS TEST selector switch.. neutral

Audio signal .... off

MWL .... off

FIREX WARN switch .... off, then on

CHECK FIRE PNL light .... off

Red LH ENG FIRE light .... off

Red RH ENG FIRE light .... off

Red APU FIRE light .... off

Repeat similar test for pickups GR 2 and GR 3.

FIREX SYS OPER-TEST selector switch .... OPER (cap closed)

FUEL SYSTEM CHECK

Fuel quantity indicator

Fuel quantity .... check tanks separately

Total fuel quantity .... as required by flight planning, verify

ENGINE STARTING

APU STARTING

LH TANK PUMPS 2 switch .... on (cap closed)

RH TANK PUMPS 2 switch.......... on (cap closed)

LH TANK 2 PUMP light.......... on

RH TANK 2 PUMP light .... on

APU VALVE OPEN-CLOSED switch .... OPEN, verify

ENG APU START-STOP-CRANK-FALSE START selector switch . START

START button.......... press for 1 or 2 s (simultaneously start a stop watch)

Watch the Automatic Start:

CAUTION. PRESS STOP BUTTON IF:

- AFTER 9 S EGT DOES NOT RISE
- AFTER 24 S “APU ON” LIGHT DOES NOT LIGHT
- APU EGT – MORE THAN 850 °C

Turbine EGT .... rises

APU OIL PRESS NORM light.......... on

APU ON light.......... on

After failed start, repeat start, first performing cranking.

APU cranking

LH (RH) TANK PUMPS 2 switches .... on, check

LH (RH) TANKS 2 PUMP lights.......... on, check

APU VALVE OPEN-CLOSED switch.......... OPEN, verify

APU VLV CLOSED light.......... off, check

ENG APU START-STOP-CRANK-FALSE START selector switch.......... CRANK

APU START button .... press for 1-2 s

CRANKING..complete 10-15 s

APU STOP button...press

ENG APU START-STOP-CRANK-FALSE STAR
selector switch ....START

Warm-up of the APU

Time to warm ....1 to 2 min

APU ON light ....on, verify

EGT ....within limits,
monitor

APU OIL PRESS NORM light ....on, verify

MAIN ENGINES STARTING

NOTE. • Either engine may be started first.

COLLECTIVE...full down

CYCLIC STICK...approx. neutral

PEDALS..neutral

ENGINE THROTTLE levers ....IDLE

ENGINE SHUT-OFF levers ....closed

Main rotor brake ....released, check

ENG SHUT-OFF VLVS (LH and RH) switches...............OPEN (caps closed),
check

LH VLV CLOSED light...off, check

RH VLV CLOSED light ....off, check

LH TANK PUMPS 1, 2, 3+4 switches ....on (caps closed)

RH TANK PUMPS 1, 2, 3+4 switches ....on (caps closed)

LH TNK 1 PUMP and RH TNK 1 PUMP light..................on

LH TNK 2 PUMP and RH TNK 2 PUMP light..................on

LH TNK 3+4 PUMP and RH TNK 3+4 PUMP light...........on

Selector switch MAIN ENG LH-RH .... to engine being started

START-CRANK selector switch .... START

MAIN ENGS START button .... press for 1 or 2 s

START VALVE light .... on

ENG SHUT-OFF lever .... open

NOTE. Time to gain IDLE N1 is not more than 60 s. For ITT and N1 limits during start up refer to RFM Section 1.

CAUTION. IT IS PROHIBITED TO SHIFT THE ENGINE THROTTLE LEVERS IN THE PROGESS OF STARTING.

CAUTION. BE READY TO PRESS MAIN ENGS STOP BUTTON FOR (1–2) S AND CLOSE ENGINE SHUT-OFF LEVER IF:

- NO FUEL IGNITION AT N1 = 20 %
- MAIN ROTORS DO NOT START TO ROTATE AT N1 = 25 %;
- ITT EXCEEDS THE MAX LIMIT VALUE;
- N1 DOES NOT RISE CONTINUOUSLY (HANG UP FOR MORE THAN 3 S)
- GAS GENERATOR HAS NOT REACHED CALCULATED IDLE N1 IN 60 SECONDS;
- START VALVE LIGHT ON AT N1 = 67 %;
- OIL PRESSURE LESS THAN 2 KGF/SQ.CM AT IDLE;
- NO PRESSURE IN MAIN HYD SYS;
- NO PRESSURE IN STBY HYD SYS;
- NO PRESSURE IN AUX HYD SYS;
- THERE IS EXTRANEOUS NOISE IN THE ENGINE-TO-GEARBOX JOINT ZONE;
- GROUND PERSONNEL GIVES COMMAND TO STOP ENGINE STARTING.

Watch During Start:

Gas Generator RPM N1 .... Increases

ITT .... Increases,
not beyond 780 °C

N1 = 20–25 % .... Rotors start to rotate

NOTE. Move the cyclic stick into the wind or set to a near-neutral position if the rotor blades start hitting the droop stops until hitting ceases.

Oil Pressure .... Increases to 2 kgf/sq.cm

START VALVE light .... Off up to N1= 65 %

Oil Pressure in MAIN HYD SYS .... Increases

Oil Pressure in STBY HYD SYS .... Increases

IDLE N1 as calculated .... verify

NOTE. If engine fails to start, make the next starting after cranking.

CRANKING (DRY MOTORING RUN)

For main engines cranking:

Engine SHUT-OFF lever .... close, verify

Engine SHUT-OFF valve .... open

Corresponding booster fuel pump(LH or RH) .... on

MAIN ENGS START-CRANK selector switch .... CRANK

MAIN ENG START button .... press for 1 or 2 s

When cranking is over, set MAIN ENGS START-CRANK selector switch to START.

THE OTHER ENGINE STARTING

Selector switch MAIN ENG LH-RH .... to engine being started (LH or RH)

Follow the start procedure as described on preceding pages for the other engine.

APU SHUTDOWN

CAUTION. APU MANUAL CUT OFF IS TO BE MADE NOT LATER THAN 12 MIN AFTER STARTING. IF THE APU HAS NOT BEEN CUT OFF AFTER 12 MIN OF CONTINUOUS OPERATION IT WILL BE CUT OFF AUTOMATICALLY AFTER 13 MIN OF OPERATION.

For the APU cutoff:

APU STOP button on the engine start panel .... press

APU ON light on the APU panel .... Off, verify

APU OIL PRESS light on the APU panel.................................... Off, verify

ENGINES AND GEARBOX WARM-UP

Engine throttle levers....................IDLE

Engines Oil temperature....................not below +30 °C, check

Engines Oil Pressure....................not below 2 kgf/sq.cm, check

Gearbox oil temperature....................not below minus 15 °C, check

Gearbox Oil Pressure....................not below 0.5 kgf/sq.cm, check

Engine throttle levers....................AUTO

Rotor RPM N_R ....(88–92) %, check

NOTE. A slightly reduced N_R value is explained by the automatic engine control system specific operation on the ground.

Engines Oil Pressure....................(3.0 to 4.0) kgf/sq.cm, check

Gearbox Oil Pressure....................not below (3.0 – 4.0) kgf/sq.cm, check

LH GEN OFF light ....on

RH GEN OFF light....................on

LH RECT OFF light ....on

RH RECT OFF light....................on

BAT BUS light ....on

MAIN TRANS-STBY TRANS switch ....MAIN TRANS (cap closed)

LH GEN switch....................on

RH GEN switch ....on

LH GEN OFF light ....off

RH GEN OFF light....................off

LH rectifier switch....................on

RH rectifier switch ....on

LH RECT OFF light ....off

RH RECT OFF light .... off

BAT BUS light .... off

INV AUTO-MAN switch .... AUTO

115 V INV ON light .... off

36 V INV ON light .... off

MAIN TRANS OFF light .... off

DC SYSTEM CHECK

DC Voltmeter .... 27–29 V, check

AC SYSTEM CHECK

AC voltmeter .... 115–119 V, check

MAIN TRANS-STBY TRANS selector switch .... STBY TRANS

MWL .... on

MAIN TRANS OFF light .... on

MAIN TRANS-STBY TRANS selector switch .... MAIN TRANS

MWL .... off

MAIN TRANS OFF light .... off

INV AUTO-MAN selector switch .... MAN

MWL .... on

36 V INV ON light .... on

115 V INV ON light .... on

INV AUTO-MAN selector switch .... AUTO

36 V INV ON light .... off

115 V INV ON light .... off

MWL .... off

Inverters Automatic Switching Check

LH GEN switch .... Off

RH GEN switch .... Off

MWL .... on

LH GEN OFF light ....on

RH GEN OFF light..on

36 V INV ON light ....on

115 V INV ON light ....on

MAIN TRANS OFF light..on

BAT BUS light ....on

LH RECT OFF light ....on

RH RECT OFF light..on

LH GEN switch ....On

RH GEN switch ....On

LH GEN OFF light ....off

RH GEN OFF light..off

36 V INV ON light ....off

115 V INV ON light ....off

BAT BUS light ....off

LH RECT OFF light ....off

RH RECT OFF light..off

MAIN TRANS OFF light..off

MWL...off

LOW RPM light and LH (RH) GEN OFF lights

Engine throttle levers – move smoothly to IDLE up to N_R = 75 % and back:

LOW RPM light ....on at N_R = (83–8,5) %

Audio signal..on

LH GEN OFF light ....on at N_R = (82–84) %

RH GEN OFF light...on at N_R = (82–84) %

NOTE. Procedure will follow with switching ON other warning and caution lights connected to generators failure.

Engine throttle levers .... move smoothly to AUTO

LOW RPM, LH &RH GEN OFF and other warning lights .... off

PRE-FLIGHT ENGINE CHECK (at the beginning of each flying day)

EEG FREE TURBINE CIRCUIT CHECK

Throttle levers both engines .... IDLE

EEG Free Turbine TEST switch .... to FRT-1

Throttle levers both engines .... move towards AUTO to attain R RPM 88.5 %

LH ENG OVERSPD light .... on (rotor RPM 84.5 - 88.5 %)

RH ENG OVERSPD light .... on (rotor RPM 84.5 - 88.5 %)

MWL.. on

Audio signal.. on

Throttle levers of both engines .... smoothly move towards IDLE, to reduce NR by 5 or 7 %

LH ENG OVERSPD light .... remains on

RH ENG OVERSPD light .... remains on

Throttle levers of both engines .... IDLE

EEG TEST switch.. OPER

LH ENG OVERSPD light .... off

RH ENG OVERSPD light .... off

MWL.. off

Audio signal.. off

EEG Free Turbine TEST switch FRT-2

Throttle levers of both engines .... move towards AUTO to attain Rotor RPM 88.5 %

LH ENG OVERSPD light .... on (Rotor RPM 84.5 - 88.5 %)

RH ENG OVERSPD light...on (Rotor RPM 84.5 - 88.5 %)

MWL...on

AUDIO signal...on

Throttle levers of both engines...smoothly move towards IDLE to reduce NR by 5 or 7%

LH ENG OVERSPD light ....remains on

RH ENG OVERSPD light...remains on

Throttle levers of both engines...IDLE

EEG TEST switch ....OPER

LH ENG OVERSPD light ....off

RH ENG OVERSPD light...off

MWL...off

AUDIO signal...off

Throttle levers of both engines...AUTO

PARTIAL ACCELERATION TIME CHECK

Throttle levers of both engines...AUTO, check

Gas Generator RPM N_1 ....Write down N_1 LH and N_1 RH

Throttle levers of both engines...IDLE

Throttle levers of both engines...to AUTO in 1 or 2 s

Watch the time required by gas generators to reach speed that is by 1-1.5 % less than the earlier recorded value starting with the beginning of the throttle motion.

Example: Gas Generator RPM N_1 reading at AUTO: 92% (record).

Deduction of 1.5% from 92% gives: 92 – 1.5 = 90.5 %. Time counting should be stopped when Gas Generator RPM N_1 value reading reaches 90.5 %.

In normal operation it takes 3 to 6 sec.

POWER ASSURANCE CHECK

Perform when required.

Refer to RFM, Section 4 for power assurance check procedure.

ENGINES ANTI-ICING SYSTEM CHECK

AUTO ENG: LH (RH)-OFF-MAN ENG selector switch ....MAN ENG

LH ENG ANTI-ICE SYS light ....on, verify

RH ENG ANTI-ICE SYS light ....on, verify

ITT ....increased by (20–50) °C, verify

Gas Generator RPM N1 ....increased by 1 or 2 %, verify

AUTO ENG: LH (RH)-OFF-MAN ENG selector switches.................AUTO

LH ENG ANTI-ICE SYS light ....off

RH ENG ANTI-ICE SYS light ....off

INTEGRATED FLIGHT SYSTEM CHECK

HOR 1 switch .... On

HOR 2 switch .... On

HSI PILOT switch .... On

HSI NAVIG switch .... On

AST switch .... On

CRS switch .... On

R ALT switch .... On

AP switch .... On

PC, FDI switch .... On

ADF switch .... On

VG switch .... On

HF switch .... On

Transponder switch .... On or Off (as required)

LIM SIG SYST switch .... On

ROTOR ANTI-ICING SYSTEM CHECK

NOTE. Carrying out this check will verify correct function of the rotor AIS for use in an emergency.

ICE DETECTOR button .... press and release

MWL .... on

ICE amber light .... on, check

ICE light in 8 s .... off, check

MWL .... off

Green ICE DTCT OK light in (41±11) s .... on, check

Green ICE DTCT OK light in (77±22) s .... off, check

ROTORS selector switch .... OFF, verify

AC CURRENT LH GEN phase selector switch .... position A, B, C (in succession)

Ammeter Pointer .... insignificant deflection from "0"

ROTORS selector switch.. MAN ROTORS

AMMETER READING .... (70–95) A, verify

Green ROTOR ANTI-ICE light... on

ROTORS selector switch.. AUTO ROTORS

Green ROTOR ANTI-ICE light... off

AC CURRENT LH GEN phase selector switch .... position A, B, C (in succession)

Ammeter Pointer .... insignificant deflection from "0"

ROTORS selector switch.. OFF

COMPASS SYSTEM CHECK

MODE MAG-DG selector switch.. MAG

SLAVE BUTTON .... Press

HSI reading .... parking heading

MODE MAG-DG selector switch.. DG

AUTOPILOT CHECK

VG ERECT button (2 min after switching on) .... Press until erect

VG FAIL light.. off

RED INDEX FDI "HOR" .... out of sight

FDI HORIZON LINE .... corresponding to the natural horizon

CENTRAL CONTROL PANEL

YAW switch... On

YAW light .... on

ROLL switch .... On

ROLL light... on

PITCH switch.. On

PITCH light .... on

ROUTE selector switch on collective lever..................................... ROUTE

ROUTE light .... on

PA SWITCH .... PA

PA light .... flickers

The autopilot emergency disengagement
button AP OFF on cyclic .... Press and Hold

YAW light... flickers

ROLL light... flickers

PITCH light .... flickers

CHECK AP PANEL light .... on

AP OFF button on cyclic .... release

YAW switch .... Off, then On

YAW light... on, verify

ROLL switch .... Off, then On

ROLL light... on, verify

PITCH switch.. Off, then On

PITCH light .... on, verify

CHECK AP PANEL light .... off, verify

ROUTE selector switch.. Off

ROUTE light .... off

PA light .... off

RADIO ALTIMETER CHECK

TEST button .... Press

Indicator pointer .... (15–20) m

ALT ALERT light .... off

TEST button .... Release

Indicator pointer .... 0 (zero)

ALT ALERT light .... on, if altitude alert index is set to 20 m and above

FDI INDICATOR CHECK

TEST button .... Press

Roll Pointer .... (10±5) deg., RH roll

Pitch Dial .... (10±5) deg., down

Director .... (10±5) deg., LH roll and (15±5) mm up

Low Altitude Pointer .... (10+5) mm up and to the left

Roll Failure Flag (R) .... in sight

Pitch Failure Flag (P) .... in sight

Horizon Failure Flag (HOR) .... in sight

TEST button .... Release

Roll Failure Flag (R) .... out of sight

Pitch Failure Flag (P) .... out of sight

Horizon Failure Flag (HOR) .... out of sight

GYRO HORIZON CHECK

Ungage Handle (3 min after switching on) .... Pull Out, turn counter clockwise and release

FAILURE FLAG .... out of sight

Gyro horizon indications .... correspond to helicopter parking angle in roll and pitch, verify

Repeat the check procedure for the second gyro horizon.

HSI CHECK

TEST button .... Press

Course Scale .... (20+5) deg, clockwise

Selected Course pointer .... (20+5) deg, counterclockwise

Desired Course pointer .... (20+5) deg, counterclockwise

Azimuth 1 pointer .... (20+5) deg, counterclockwise

RB1 pointer .... (20+5) deg, counterclockwise

Flag CS on HSI .... in sight

TEST button .... Release

Flag CS on HSI .... out of sight

Pointers .... initial positions

ADF CHECK

A. Built-in system check

Intercom panel switch RNU1

Control panel channel selector switch .... T

COMP-ANT selector switch .... COMP

OUTER-INNER selector switch .... INNER

HSI RB pointer .... readout 16 degrees

B. Function check

COMP-ANT selector switch .... ANT

Channel selector switch .... as required

Headset .... call signs of the beacon

COMP-ANT selector switch .... COMP

HSI RB pointer readout .... correct

Volume CHECK .... adjust as required

FRAME button .... Press, check dual rotation of RB pointer

Check of Lighting Equipment

Nav LTS selector switch .... 100 %

ANTI-COLL light switch .... On

BLADE TIP LTS switch .... On

ILLUM switch .... On

LT BRIGHT rheostat .... set the desired brightness

LIMIT SIGNAL SYSTEM CHECK

LSS TEST button on instrument panel .... Press

MWL .... on

Audio signal .... on

Index V_{NE} on Speed Indicator .... approx. 108 Kts (190–200 km/h)

LSS TEST button .... Release

MWL .... off

Audio signal .... off

HYDRAULIC SYSTEM CHECK

Avoiding helicopter displacement, make sure that COLLECTIVE lever, CYCLIC STICK and PEDALS function without jamming and jerks and:

MAIN HYD SYS Pressure .... (64 to 90) kgf/sq.cm

STBY HYD SYS Pressure.. (64 to 90) kgf/sq.cm

AUX HYD SYS Pressure within:

- PUMP pressure .... (200 to 220) kgf/sq.cm
- reducing valve exit pressure .... (75 to 90) kgf/sq.cm

STBY ON – OFF switch .... STBY OFF (cap open)

MWL and STBY HYD FAIL light .... on

MAIN HYD FAIL light .... off

Controls function without jamming and jerks.................................. check

STBY ON – OFF switch .... ON (cap closed)

MWL and STBY HYD FAIL LIGHT .... off

STBY HYD SYS gauge pressure .... (64 to 90) kgf/sq.cm

TO MAIN – MAIN ON – MAIN OFF switch .... MAIN OFF

MWL and MAIN HYD FAIL LIGHT .... on

STBY HYD FAIL light... off

Controls function without jamming and jerks.................................. Check

TO MAIN – MAIN ON – MAIN OFF switch .... MAIN ON

MWL and MAIN HYD FAIL LIGHT .... off

MAIN and STBY HYD SYS gauge pressure .... (64 to 90) kgf/sq.cm

Check of interlock excluding possibility of the main and standby systems simultaneous switching-off (performed at scheduled maintenance).

STBY ON – OFF switch .... STBY OFF (cap open)

MWL and STBY HYD FAIL light .... on

TO MAIN – MAIN ON – MAIN OFF switch......................................MAIN OFF

MAIN HYD FAIL light...off

Controls function without jamming and jerks ....Check

TO MAIN – MAIN ON – MAIN OFF switch......................................MAIN ON (cap closed)

STBY ON – OFF switch..ON (cap closed)

MWL and STBY HYD FAIL light ....off

STBY HYD SYS gauge pressure...(64 to 90) kgf/sq.cm

TO MAIN – MAIN ON – MAIN OFF switch......................................MAIN OFF

MWL and MAIN HYD FAIL light ....on

STBY ON – OFF switch..STBY OFF

STBY HYD FAIL light ....off

Controls function without jamming and jerks ....Check

STBY ON – OFF switch..ON (cap closed)

TO MAIN – MAIN ON – MAIN OFF switch......................................MAIN ON

MWL and MAIN HYD FAIL LIGHT..off

MAIN and STBY HYD SYS gauge pressure....................................(64 to 90) kgf/sq.cm

Backup control valves check at primary control valves jam simulation (performed at scheduled maintenance).

BACKUP CTRL VALVES – MAIN HYD switch.................................TEST

MWL and MAIN HYD CTRL VALVE light ....on at the moment the controls start to move and off when they stop

Load on controls..increases

BACKUP CTRL VALVES – MAIN HYD switch.................................NORMAL

MAIN HYD CTRL VALVE light..off

MWL..off

BACKUP CTRL VALVES – STBY HYD switch .... TEST

MWL and STBY HYD CTRL VALVE light .... on at the moment the controls start to move and off when they stop

Load on controls .... increases

BACKUP CTRL VALVES -STBY HYD switch .... NORMAL

STBY HYD CTRL VALVE light... off

MWL... off

NOTE. If after changing of BACKUP CTRL VALVES – MAIN (STBY) HYD switches from TEST to NORMAL the corresponding lights fail to extinguish change switch positions once again as above.

If the main (standby) hydraulic system is off, MAIN (STBY) HYD CTRL VALVE light may be ON. In this case after setting MAIN (STBY) HYD BACKUP CTRL VALVE switch to TEST position and then to NORMAL position, the light must be OFF.

WHEEL BRAKE SYSTEM CHECK

Parking brake lever... Full down

Pressure, max .... 1 kgf/sq.cm, check

Brake lever on cyclic stick.. Press to the stop

Pressure .... (12±1) kgf/sq. cm, check

Brake lever on cyclic stick.. Release

Pressure, max .... 1 kgf/sq.cm, verify

Parking brake lever .... Up to illuminate BRAKE LEVER light

Pressure with BRAKE LEVER light illuminated .... (17+1) kgf/sq.cm, check

Parking brake lever... Up to the stop

Parking brake pressure.. (21 to 25) kgf/sq.cm, check

Parking brake lever .... Down to attain the required pressure

CAUTION. DURING THE CHECK, EXCEEDING PARKING BRAKE PRESSURE ABOVE 25 kgf/sq.cm IS NOT ALLOWABLE

TAXIING

Taxiway .... clear

Brake.. released

Collective lever .... Increase to 4-6 degrees

Cyclic stick .... Push slightly to begin forward movement

CAUTION. IF THE MAIN ROTOR BLADES STRIKE AGAINST THE LOWER FLAPPING STOPS, DEFLECT THE CYCLIC STICK OR INCREASE THE COLLECTIVE PITCH.

IN CASE OF SKIDDING SMOOTHLY DEFLECT THE PEDAL IN SKIDDING DIRECTION, SET THE CYCLIC STICK IN NEUTRAL POSITION, AND REDUCE THE COLLECTIVE PITCH.

NEVER TAXI BACKWARD NOR PERFORM PIVOTING AROUND ONE WHEEL.

BEFORE TAKEOFF

Flight Controls .... position for takeoff

Readings of gyro horizons with respect to the helipad slope.......... Check

Engines, transmission, instruments .... within operating ranges

Flight, Navigation instruments.......... Check

Fuel quantity .... Note indication

Autopilot.......... Check

Caution and warning lights.......... off, check

TAKEOFF

HOVER

Collective pitch.......... Increase to hover

Directional control .... on landmarks

Cyclic control .... As required to maintain desired position

Collective .... As required to maintain desired height

Trim button .... Press to unload controls

HOVER CHECK

Engines .... within limits

NOTE. When the engines are correctly adjusted Rotor RPM at hover and in flight is automatically maintained within the limits of ($90^{+0.5}_{-1}$) % except for the maximum and minimum power ratings

Controls .... deflection of the controls leads to respective changes in the helicopter attitude

Balancing ....Cyclic position close to neutral

Instrument Reading ....normal

CATEGORY B TAKEOFF

Test hover height before acceleration ....2 m (6 ft)

Cyclic...Apply as required to attain pitch of 10 to 15 degrees nose down and start acceleration with a simultaneous climb

Collective..Apply minimum necessary to obtain a rate of climb and airspeed 65 km/h (35 kt) IAS at 15 m (50 ft) height.

NOTE. During takeoff, pitch attitude must be adjusted commensurate with power application to prevent entering the AVOID area of the Height-Velocity diagram

Continue climb and acceleration to attain the best rate of climb speed at 30 m (100 ft).

CLIMB

Climb at the best rate of climb speed (ref. RFM, Section 4).

Do not allow rotor RPM droop below 87 %.

Change over to level flight when the required altitude is reached by reducing the collective pitch.

LEVEL FLIGHT

The level flight is allowed, depending upon gross weight, within altitude and speed limits indicated in Section 1.

Speed and altitude – adjust, as required, by changing pitch angle and collective pitch accordingly.

IN FLIGHT OPERATIONS

AUTOMATIC ATTITUDE HOLD

Piloting with autopilot engaged:

Use the cyclic to establish the desired attitude and the collective to set the power, then depress and release the cyclic TRIM button. Repeat the above actions to make corrections or changes.

When autopilot actuators come to a stop (it is felt by cessation of stabilization and it is shown on the actuator indicator) to re-activate the stabilization mode depress and release the cyclic TRIM button.

Autopilot stabilization may be completely deactivated by depression of the AP OFF button on the cyclic. Separate channels may be switched off by setting to OFF the corresponding YAW, ROLL or PITCH switches on the Central Control Panel.

Complete AP deactivation may also be accomplished by setting the AP circuit breaker to OFF position.

AUTOMATIC ALTITUDE HOLD

NOTE: Refer to RFM, Section 1 for limitations in flight with Automatic Altitude Hold mode (ROUTE) switched ON.

In level flight establish and maintain the desired altitude, engage the Automatic Altitude Hold as follows:

PA switch .... ON (PA)

ROUTE selector switch on collective pitch lever......................... ROUTE

PA light on Central Pedestal panel .... on

Autopilot will automatically maintain the flight level pressure altitude.

Altitude in flight ....observe

To change altitude with Automatic Altitude Hold mode activated

(A) Within ±328 ft (±100 m) of preset altitude:

Collective lever trigger...Press, hold

Altitude...adjust by deflecting the collective lever

Collective lever trigger...Release

(B) More than ±328 ft (±100 m) of preset altitude:

ROUTE switch on the collective ....Off

PA switch ....Off

PA light on the central panel ....off

Change collective pitch to set new ALTITUDE

PA switch ....PA

ROUTE switch on the collective ....ROUTE

PA light on the central panel ....on

DESCENT

Before descent disengage altitude stabilization mode as follow:

ROUTE switch on the collective .... Off

PA switch .... Off

PA light on Central Pedestal panel .... off

Pre-selected speed... obtain by setting the corresponding helicopter pitch angle

Required vertical descent speed (within the limits) .... obtain by decreasing the collective pitch

NOTE. Slightly change the collective pitch when variations of rotor rpm and engine instrument readings occur that may be caused by bleed valves cycling in engine derated power conditions

APPROACH

By 50 ft (15 m) height obtain speed of 30 kt (55 km/h) and vertical rate of descent not above 300 ft/min (1,5 m/s).

Starting from 50 ft (15 m), smoothly decrease speed and rate of descent (pitch angle 13 degrees nose up, maximum limit value) to hover at 6 ft (2 m) height.

Hover height prior to landing.. 6 ft (2 m)

Decent velocity after hover .... not exceeding 100 ft/min (0.5 m/s)

Collective after landing .... full down

AFTER LANDING

AT THE PLACE OF PARKING

Wind direction and speed .... within the rotor stop limits

Parking brake lever .... up

Pressure 17 kgf/sq.cm .... 17 kgf/ sq.cm, check

NOTE. If required the parking braking pressure of 17 kgf/sq.cm can be exceeded within the established time limits (ref. to Section 1).

NAVIGATION panel switches .... Off

ANTI-ICE SYS switches .... Off

ENGINES SHUTDOWN

Engine throttle levers .... IDLE

Cool off the engines for 2 min at IDLE

Shut-Off Levers .... CLOSE

LH GEN switch .... Off

RH GEN switch .... Off

LH RECT switch .... Off

RH RECT switch .... Off

All overhead circuit breakers .... Off

ROTOR BRAKE .... Apply at Rotor RPM = 20 % or less

Rotor Brake Lever .... Upper stop

LH BAT switch .... Off

RH BAT switch .... Off

Cyclic stick .... Neutral

Pedals .... Neutral

AFTER EXITING HELICOPTER

If conditions allow, perform the following:

- Check general condition of helicopter and its systems;
- Make entries concerning malfunctions, failures, and post-flight inspection in Helicopter Logbook;
- Install main rotor blade tiedown socks on blade and secure to mooring points;
- Close and lock all doors;
- Cover powerplant with slip covers.

NOTE. Refer to RFM, Section 2 of Manufacturer's Data for additional information.

SECTION 3. EMERGENCY AND MALFUNCTION PROCEDURES

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SECTION 3. EMERGENCY AND MALFUNCTION PROCEDURES

INTRODUCTION

The following procedures contains the indications of failures or malfunctions which affect safety of the crew, the helicopter, ground personal or property; the use of emergency features of primary and backup systems; and appropriate warnings, cautions, and explanatory notes.

All corrective action procedures listed herein assumed the pilot gives first priority to aircraft control and a safe flight path.

The helicopter should not be operated following any emergency landing or shutdown until the cause of the malfunction has been determined and corrective maintenance action taken.

Tables 3-1 and 3-2 list fault conditions and corrective actions for warning and caution lights, respectively.

DEFINITIONS

The following terms indicate the degree of urgency in landing the helicopter.

Land as soon as possible – Land without delay at the nearest suitable area (i.e., open field) at which a safe approach and landing is reasonably assured.

Land as soon as practical – The landing site and duration of flight are at the discretion of the pilot. Landing at the nearest airfield is recommended.

The following terms are used to describe the operating condition of a system, subsystem, assembly, or component:

Affected – Fails to operate in the intended or usual manner.

Normal – Operates in intended or usual manner.

Table 3-1.

WARNING LIGHTS (RED)

When warning lights are "ON" and simultaneously red Master Warning Light (MWL) becomes flickering and audio signal sounds in the earphones.

Panel wording	Fault condition	Corrective action
CHECK FIRE PNL	Fire in the engine compartments	Determine fire place.
LH ENG FIRE	Fire in the left engine compartment	Shutdown LH engine. Eliminate fire. Land as soon as possible.
RH ENG FIRE	Fire in the right engine compartment	Shutdown RH engine. Eliminate fire. Land as soon as possible.
APU FIRE	Fire in APU compartment	Shutdown APU, eliminate fire. Land as soon as possible.
LH ENG FAIL	Engine N1 less than 60 %	Shutdown LH engine. Land as soon as practical
RH ENG FAIL	Engine N1 less than 60 %	Shutdown RH engine. Land as soon as practical
LH ENG VIBR	LH engine critical vibration	Shutdown affected engine. Land as soon as practical
RH ENG VIBR	RH engine critical vibration	Shutdown affected engine. Land as soon as practical
GRBX OIL PRESS LOW	Main gearbox oil pressure low	Reduce power. Land as soon as possible
GRBX CHIP	Chips in main gearbox oil	Reduce power. Land as soon as possible
125 L LH TANK	Fuel quantity in LH tanks less than 125 L	Open XFEED valve. Land depending on total fuel remainder

Table 3-1 (cont.)

Panel wording	Fault condition	Corrective action
125 L RH TANK	Fuel quantity in RH tanks less than 125 L	Open XFEED valve. Land depending on total fuel remainder
LH BAT HOT	LH storage battery overheating	LH BAT switch – OFF
RH BAT HOT	RH storage battery overheating	RH BAT switch – OFF
HIGH RPM	Rotor RPM N_R above maximum limit 99.4 %	Collective UP to reduce Rotor RPM
LOW RPM	Rotor RPM N_R lower minimum limit 85.0 %	Collective DOWN to restore Rotor RPM
LH ENG OVERSPD	Max permissible speed of the LH engine free turbine exceeded	If engine has stopped, follow the engine failure procedure. If engine is operating, follow the free turbine control circuit failure procedure (false warning operation)
RH ENG OVERSPD	Max permissible speed of the RH engine free turbine exceeded	If engine has stopped, follow the engine failure procedure. If engine is operating, follow the free turbine control circuit failure procedure (false warning operation)
ROTOR BRAKE	Rotor brake applied	Switch off the rotor brake before engine starting
LH 2.5 MIN PWR LIMIT (LH light)	LH engine at 2.5 min Contingency power rating	Reduce collective pitch after max 2.5 min to rotor RPM > 88 % and warning light OFF
RH 2.5 MIN PWR LIMIT (RH light)	RH engine at 2.5 min Contingency power rating	Reduce collective pitch after 2.5 min. max to rotor RPM > 88 % and warning light OFF

NOTE. When LH (RH) 2.5 min PWR LIMIT warning lights are ON, red MWL does not flicker and audio signal does not sound in the earphones.

FIRE

ENGINE FIRE ON GROUND

Indications:

MWL..on

CHECK FIRE light ....on

Audio signal (headset) ....on

LH (or RH) ENG FIRE light ....on

BOTTLES-1 light..off (at automatic operation of the fire extinguishing system)

Visible smoke of fire

Fumes

Procedure:

Affected engine shut-off lever ....Closed

ENG SHUTOFF VLVS LH (OR RH) switch ....Off (cap open)

If BOTTLES-1 light remains ON:

- LH (OR RH) ENG FIRE button...Press, Cap close
- BOTTLES-1 light..off

If CHECK FIRE light, MWL and audio signal remain ON:

- BOTTLES 1-2 switch ....2, Cap closed
- LH (OR RH) ENG FIRE button (Cap open).................................Press
- BOTTLES-2 light..off
- CHECK FIRE light, MWL and audio signal ....off, Check

Good Engine..Shutoff

Deenergized helicopter.

Exit helicopter.

Use Helicopter fire extinguishers (if required).

ENGINE FIRE IN FLIGHT

Indications:

MWL .... on

Audio signal (headset).. on

CHECK FIRE light .... on

LH (OR RH) ENG FIRE light .... on

BOTTLES-1 light .... off (at automatic operation of the fire extinguishing system)

Smell of burning and smoke of fire are possible.

Procedure:

Affected engine shut-off lever .... Closed

ENG SHUTOFF VLVS LH (OR RH) switch .... Off (cap open)

If BOTTLES-1 light remains ON:

LH (OR RH) ENG FIRE button .... Press, Cap close

BOTTLES-1 light .... off

If CHECK FIRE light, MWL and audio signal remain ON:

BOTTLES 1-2 switch (Cap open) .... 2, Cap closed

LH (OR RH) ENG FIRE button (Cap open) .... Press

BOTTLES-2 light .... off

CHECK FIRE light, MWL and audio signal .... off, Check

AIR SUPPLY switch .... Off

FIREX WARN switch .... Off, then On

LH (OR RH) ENG FIRE light .... Off, Check

Land as soon as possible.

After landing:

Good Engine..Shutoff

Deenergized helicopter.

Exit helicopter.

Use Helicopter fire extinguishers (if required).

APU FIRE

Indication:

MWL .... on

Audio signal (headset) .... on

CHECK FIRE light .... on

APU FIRE light .... on

BOTTLES-1 light .... off (at automatic operation of the fire extinguishing system)

Procedure:

APU VALVE OPEN – CLOSED .... CLOSED

If BOTTLES-1 light is still ON:

APU FIRE button (Cap open), ... Press, Cap closed

BOTTLES-1 light .... off

If CHECK FIRE light, MWL and audio signal remain ON:

BOTTLES 1-2 switch .... 2, Cap closed

APU FIRE button .... Press

BOTTLES-2 light .... off

APU FIRE light .... off, Check

CHECK FIRE light, MWL and audio signal .... off, Check

If APU fire occurred in flight:

FIREX WARN switch .... Off, then On

Land as soon as possible.

After landing:

Main Engines .... Shutoff

Deenergized Helicopter.

Exit helicopter. Use helicopter fire extinguishers (if required).

SMOKE OR FUMES IN CABIN

Indications:

Smoke, smell of burning, toxic fumes, etc., in cabin.

Plumes behind the helicopter.

Procedure:

Smoke protection mask ....On

Open cockpit doors to remove smoke.

When flying according to VFR:

Master switch of emergency power
supply switching off...Off

When smoke generation source can be determined apply onboard fire extinguishers, if required.

Land as soon as possible.

After landing:

Main Engines ....Shut down

Deenergize helicopter.

Exit helicopter.

Use extinguishers, if required.

SINGLE ENGINE FAILURE – HOVER IGE, HEIGHT UP TO 20 FT (6 M)

Indications:

Helicopter out of trim and height loss

MWL .... on

Audio signal (headset).. on

LH (or RH) ENG FAIL light.. on

Affected engine Gas Generator RPM.. decreases

Affected engine ITT.. decreases

Running engine Gas Generator RPM.. increases

Rotor RPM .... decreases

LOW RPM warning light.. on, when Rotor RPM = 85 % and below

Audio signal.. changed frequency

Sound – Engine coming to stop.

Procedure:

Maintain heading and landing attitude.

Collective Lever.. Increase as required to control the rate of descent

Accomplish landing on main wheels.

After landing:

Collective Lever.. Full down

Wheel brake.. Apply

Main Engines .... Shut down

Deenergize Helicopter.

SINGLE ENGINE FAILURE DURING TAKEOFF (HEIGHT BELOW 50 FT / 15 METERS)

Indications:

Helicopter out of trim and altitude loss.

MWL .... on

Audio signal (headset) .... on

(LH or RH) ENG FAIL light .... on

Affected engine Gas Generator RPM .... decreases

Affected engine ITT .... decreases

Running engine Gas Generator RPM .... increases

Rotor RPM .... decreases

LOW RPM warning light .... on, when Rotor RPM = 85 % and below

Audio signal .... changed frequency

Sound – Engine coming to stop.

Procedure:

Proceed as follows:

Collective Lever .... Maintain Rotor RPM 85 %, minimum

Cyclic Stick .... Pull to reduce speed (pitch angle 13°, maximum)

Descend at constant visual attitude control:

By 7–3 ft (2–1 m) altitude .... attain the helicopter landing attitude (pitch angle 8–10°)

From 7–3 ft (2–1 m) altitude .... increase the collective as required while helicopter approaches the ground.

Cyclic Stick – prevent an abrupt nose downward movement while touchdown.

After landing:

Collective Lever .... Full down

Cyclic Stick .... Neutral

Wheel brake .... Apply

Engine shut-off levers .... Close

Deenergize Helicopter.

SINGLE ENGINE FAILURE DURING TAKEOFF (HEIGHT ABOVE 50 FT / 15 METERS)

Indications:

Helicopter out of trim and altitude loss.

MWL .... on

Audio signal (headset) .... on

LH (or RH) ENG FAIL light .... on

Affected engine Gas Generator RPM .... decreases

Affected engine ITT .... decreases

Running engine Gas Generator RPM .... increases

Rotor RPM .... decreases

LOW RPM warning light .... on, when Rotor RPM = 85 % and below

Audio signal .... changed frequency

Sound – Engine coming to stop.

Procedure:

For Cat. B takeoff – reject takeoff, accomplish single-engine landing as soon as possible:

Collective Lever .... maintain Rotor RPM 85 %, minimum

Airspeed .... Reduce up to 40 kts (70 km/h)

Change over to descent at vertical speed 300 ft/min (1.7 m/s), maximum.

From altitude 100 ft (30 m) AGL and below .... decelerate at descent by a gradual pitch angle increase to 13° and corresponding collective pitch increase as the helicopter approaches the ground.

NOTE. The helicopter deceleration rate must ensure a decrease of the forward and vertical speeds to minimum by 3–7 ft (1–2 m) height.

At height of 3 to 7 ft (1–2 m) .... reduce flare attitude (pitch 8-10° nose up, maximum)

At height of 3 to 7 ft (1–2 m) .... increase the collective as required while the helicopter approaches the ground

Cyclic Stick – prevent an abrupt nose downward movement while touchdown.

After landing:

Collective Lever .... Full down

Cyclic Stick .... Neutral

Wheel Brakes .... Apply

Good Engine .... Shutoff

Engine Shut-Off Valves .... Close

Deenergize Helicopter.

SINGLE ENGINE FAILURE IN FLIGHT

CAUTION. RELIANCE SHOULD NOT BE PLACED ON ENGINE RESTART CAPABILITY IN FLIGHT.

Indications:

MWL .... on

Audio signal (headset) .... on

LH (or RH) ENG FAIL light .... on

Affected engine Gas Generator RPM .... decreases

Affected engine ITT .... decreases

Running engine Gas Generator RPM .... increases

Rotor RPM .... decreases

LOW RPM warning light .... on, when Rotor RPM = 85 % and below

Audio signal .... changed frequency

Sound – Engine coming to stop.

Procedure:

Collective Lever .... Maintain Rotor RPM 87 %, (if engine power is sufficient)

WARNING. TO MAINTAIN ROTOR RPM WITHIN THE RANGE OF 87 % TO 92 %, PUSH THE THROTTLE LEVER OF THE OPERATING ENGINE TO THE FORWARD STOP

Airspeed .... maintain 60–65 KIAS (100–120 km/h IAS)

Determine the affected engine.

Complete shutdown of affected engine as follows:

WARNING. BE EXTREMELY CAREFUL NOT TO SHUT DOWN THE RUNNING ENGINE

SHUT-OFF LEVER affected engine .... Close

FUEL SHUT-OFF VALVE affected engine .... Close

Altitude .... Descent to 1640 ft (500 m), if practical

MWL .... Press to reset

Land as soon as practical.

NOTE. The combination of altitude and speed in OEI flight depends on helicopter gross weight and power of running engine. The greatest excess power is provided at airspeeds 65 KIAS (110–120 km/h IAS), and the best range consumption (kg per kilometer) is provided at 97 KIAS (180 km/h IAS).

AUTOMATIC ENGINE SHUT-OFF WITH SIMULTANEOUS ILLUMINATION OF LH (RH) ENG OVERSPD LIGHT

Indications:

MWL .... on

Audio signal (headset) .... on

LH (RH) ENG FAIL light .... on

LH (RH) ENG OVERSPD light .... on

Sound – Engine coming to a stop

Other indications of stopping engines .... Check by control instruments

Procedure:

Collective Lever .... maintain Rotor RPM 87 %

Further actions – as prescribed in Section 3 for engine failures at various stages of takeoff, flight and landing.

WARNING. IT IS FORBIDDEN TO START THE FAILED ENGINE IF *LH (RH) ENG OVERSPD* LIGHT IS ILLUMINATED.

ENGINE RESTART IN FLIGHT

The decision to attempt an engine restart in flight is the pilot's responsibility.

Procedure:

Altitude .... Descend to 9,480 feet (3,000 m) or less.

Position controls of affected engine to attempt restart as follows:

Fuel shut-off lever (stopped engine) .... Closed

Fuel shut-off valve (stopped engine) .... open

Engine throttle lever .... IDLE

APU START

CAUTION. APU STARTING CAN ONLY BE ACHIEVED IN THE OAT ENVELOPE DESCRIBED IN SECTION 1

RH TANK PUMPS 2 selector switch .... on, Check (cap closed)

APU shut-off valve .... OPEN, Check

APU START-CRANK-FALSE START selector switch .... START

APU START button (Cap open) .... Press for 1 or 2 s, Cap close

Watch the automatic start:

APU EGT .... Rises

APU OIL PRESS NORM light .... on

APU ON light .... on

NOTES: Press APU STOP button if:

- In 9 s EGT does not rise
- In 24 s APU ON light does not light
- APU EGT – more than 850 °C

In case of a failed APU start crank the APU.

APU WARM-UP

Time to warm up .... 1 min

APU ON light .... on, Check

APU OIL PRESS NORM light .... on, Check

APU EGT .... Within allowable range, Check

ENGINE START

MAIN ENG LH-RH selector switch .... To engine being started

Perform Cranking as follows:

MAIN ENG START – CRANK selector switch .... CRANK

MAIN ENG START button (Cap open) .... Press for 1 or 2 s, Cap close

NOTE. During cranking the shut-off lever of restarted engine should be in CLOSED position.

After (5–10) s .... Stop cranking by pressing MAIN ENG STOP button (Cap close)

Perform Starting as follows:

MAIN ENGS START – CRANK selector switch .... START

ITT (restarted engine) .... below 200 °C, Check

Gas Generator RPM .... not above 7 %, Check

MAIN ENGS START button .... Press for 1 or 2 s, (Cap close)

START VALVE light .... on, Check

Fuel Shut-off Lever (restarted engine) .... Open

CAUTION. IT IS PROHIBITED TO SHIFT THE ENGINE THROTTLE LEVERS IN THE PROCESS OF STARTING.

Check during start:

Gas Generator RPM N1 .... increases

ITT .... increases, within limits

Oil Pressure .... increases to 2 kgf/sq.cm, minimum

START VALVE light .... off at N1 = 60–65 %

CAUTION. BE READY TO PRESS MAIN ENGS STOP BUTTON AND CLOSE FUEL SHUT-OFF LEVER IF:

- STRANGE NOISE IS HEARD IN THE BEGINNING OR IN THE COURSE OF STARTING
- ITT DOES NOT INCREASE AT N1 = 20 %
- ITT EXCEEDS THE LIMIT
- N1 HAS NOT GRADUALLY INCREASED FOR MORE THAN 3 s
- GAS GENERATOR HAS NOT REACHED IDLE RPM IN 60 s
- START VALVE LIGHT STILL ON AT N1 = 67 %
- OIL PRESSURE LESS THAN 2 kgf/sq.cm

After one minute Engine throttle lever ....AUTO

APU SHUT DOWN

APU STOP button (Cap open) ....Press for 1 or 2 s

APU ON light..off

APU OIL PRESS NORM light...off, Verify

LANDING OEI

Procedure:

Airspeed .... Reduce to 40 KIAS (70–75 km/h IAS).

At 100 ft (30 meters) AGL .... initiate flare to reduce forward speed and rate of descent.

By Cyclic Stick .... establish nose-up pitch 12–13 degrees

Collective Lever .... smoothly increase as required when approaching the landing site.

At 3–7 ft (1–2 meters) height .... establish landing attitude (pitch angle 8-10 degrees)

Collective Lever .... increase as required while the helicopter approaching the ground.

Cyclic Stick .... prevent abrupt nose downward movement while touchdown

After landing

Collective Lever .... Full down

Wheel Brakes .... Apply

DUAL ENGINE FAILURE

Indications:

MWL	on
Audio signal (headset)	on
LH ENG FAIL light	on
RH ENG FAIL light	on
LOW RPM light	on
Sound – Engines coming to stop	
Gas Generator RPM N1 (both engines)	below 60 % and decreasing
ITT (both engines)	decreasing
LH ENG OIL LOW light	on
RH ENG OIL LOW light	on
LH GEN OFF light	on
RH GEN OFF light	on
36 V INV ON light	on
115 V INV ON light	on
LH RECT OFF and RH RECT OFF light	on
MAIN TRNS OFF light	on
BAT BUS light	on

Procedure:

Collective Lever .... Full down immediately

WARNING. IF CORRECTIVE ACTION IS NOT INITIATED IMMEDIATELY, ROTOR RPM COULD DECAY EXCESSIVELY

Descent Airspeed .... 70 KIAS (130 km/h IAS)

Turn to the direction of the nearest landing site.

Accomplish autorotation landing.

If time permits, before landing perform double engines shut down procedure, close shut-off valves.

AUTOROTATION LANDING

Proceed:

Approach	Upwind (if possible)
At 200 ft (60 meters) AGL	Establish airspeed 65 KIAS (120 km/h IAS)
At 150–100 ft AGL (50–30 m) flare attitude	Establish pitch angle (approx. to 12..13°) to reduce forward speed to 35 kt (65 km/h)
At 15-10 ft (3-5 m) flare attitude	establish landing attitude (pitch angle 8-10°degrees)
Collective Lever	Raise to reduce rate of descent and cushion landing
Cyclic Stick	Prevent abrupt nose downward movement while touchdown

After landing:

Collective Lever	Smoothly full down

DANGEROUS OR INCREASED ENGINE VIBRATION

Indications:

MWL ....on

Audio signal (headset)..on

LH (RH) ENG VIBR light (red)...on

LH (RH) ENG VIBR light (amber)..on

Procedure:

Collective Lever...reduce the power setting

MWL ....Press to reset

Engine operation parameters ....Check

If red and amber LH (RH) ENG VIBR lights remain ON:

Affected engine ....Shut down

Land as soon as practical.

If red LH (RH) ENG VIBR lights have extinguished but amber LH (RH) ENG VIBR lights remain ON:

Monitor engine operation parameters.

Continue flight.

If red LH (RH) ENG VIBR light is ON but amber LH (RH) ENG VIBR light is OFF:

VIBR METER button on upper panel
and WARN CHECK button ....Press one by one

If with one of the buttons pressed amber LH (RH) ENG VIBR light does not glow and red LH (RH) ENG VIBR light continues to glow with the button released:

Affected engine...Shut down

Land as soon as practical.

If after pressing LH (RH) VIBR METER and WARN CHECK buttons one by one amber light starts to glow each time it indicates:

A false operation of warning (red) LH (RH) ENG VIBR indication.

In this case monitor the engine with a faulty vibration indication more closely.

Continue flight.

MAIN GEARBOX OIL PRESSURE BELOW LIMIT

Indications:

MWL .... on

Audio signal (headset) .... on

GRBX OIL PRESS LOW light .... on

Oil pressure .... less than 1.3 kgf/sq.cm

Oil temperature .... increases

Procedure:

Collective Lever .... Reduce power

MWL .... Press to reset

Land as soon as possible.

CHIPS IN MAIN GEARBOX OIL

Indications:

MWL .... on

Audio signal (headset) .... on

GRBX CHIP light .... on

Oil pressure .... reduces

Oil temperature .... increases

Procedure:

Collective Lever .... Reduce power

MWL .... Press to reset

Land as soon as possible.

LOW REMAINING FUEL

FUEL LOW IN LH TANKS GROUP

Indications:

MWL .... on

Audio signal (headset) .... on

125 L LH TNKS light .... on

Procedure:

Remaining fuel in tank # 2 LH.. Check

XFEED valve .... Open

XFEED VLV OPEN light .... on

MWL .... Press to reset

Plan landing according to remaining fuel.

FUEL LOW IN RH TANKS GROUP

Indications:

MWL .... on

Audio signal (headset).. on

125 L RH TNKS light.. on

Procedure:

Remaining fuel in tank # 2 RH... Check

XFEED valve... Open

XFEED VALVE light .... on

MWL .... Press to reset

Plan landing according to remaining fuel.

FUEL LOW IN LH AND RH TANKS GROUPS

Indications:

MWL .... on

Audio signal (headset) .... on

125 L LH TNKS light .... on

125 L RH TNKS light .... on

Procedure:

Total remaining fuel in tanks # 2 LH and # 2 RH................................ Check

X-FEED valve .... Open

X-FEED VALVE light.. on

MWL .... Press to reset

Plan landing according to remaining fuel.

WARNING. WHEN TOTAL FUEL QUANTITY IS 250 LITERS, THE HELICOPTER CAN COVER A DISTANCE OF 27 Nm (50 km) AT ALTITUDE 3,300 ft (1,000 m) AND SPEED 108 KIAS (200 km/h IAS), OR ENDURANCE IS 15 min ONLY UNTIL ALL FUEL IS CONSUMED.

BATTERY CASE TEMPERATURE ABOVE LIMIT

ONE BATTERY

Indications:

MWL .... on

Audio signal (headset).. on

LH (RH) BAT HOT light .... on

Procedure:

LH (RH) BAT switch .... Off

MWL .... Press to reset

LH (RH) BAT HOT light .... off, Check

Continue flight.

TWO BATTERIES

Indications:

MWL .... on

Audio signal (headset) .... on

LH BAT HOT light .... on

RH BAT HOT light .... on

Procedure:

LH BAT switch .... Off

RH BAT switch .... Off

MWL .... Press to reset

LH BAT HOT and RH BAT HOT lights .... off, Check

Land as soon as practical.

NOTE. The batteries after overheating may be used in flight till discharge in case of two generators or rectifiers off (failure).

SIMULTANEOUS OIL TEMPERATURE INCREASE ABOVE LIMIT IN BOTH ENGINES AND GEARBOX

(Oil cooler fan failure)

Indications:

- MWL .... on
- GRBX OIL HOT light .... on
- GRBX OIL PRES light .... on (expected)
- Audio signal (headset) .... on (if GRBX OIL PRES light illuminates simultaneously)
- Gearbox oil temperature .... 100 °C or above
- Both engines oil temperature .... approaches or exceeds 150 °C

Procedure:

- Collective Lever .... Reduce power
- MWL .... Press to reset

Land as soon as possible.

Table 3-2.

CAUTION LIGHTS (AMBER)

When caution lights are ON, red Master Warning Light (MWL) starts flickering

Panel Wording (amber)	Fault Conditions	Corrective Action
LH ENG OIL PRES	LH engine oil pressure below limit	Refer to procedure
RH ENG OIL PRES	RH engine oil pressure below limit	Refer to procedure
LH ENG CHIP	Metal particles in LH engine oil	Check oil temperature and pressure Land as soon as practical
RH ENG CHIP	Metal particles in RH engine oil	Check oil temperature and pressure Land as soon as practical
GRBX PR β_{MAX}	Gearbox oil pressure drop at excessive tolerable slip angle	Reduce slip angle
GRBX OIL HOT	Gearbox oil temperature above limit	Land as soon as possible
1 LH TNK	1st LH tank overflowing	TNK PUMPS FRONT switch – OFF Monitor Total fuel quantity
4 RH TNK	4th RH tank overflowing	6 TNK PUMPS REAR switch – OFF
5 LH TNK	5th LH tank overflowing	1 LH TNK PUMP switch – OFF 3+5 LH TNK PUMP switch – OFF Monitor total fuel quantity
5 RH TNK	5th RH tank overflowing	1 RH TNK PUMP switch – OFF, 3+4 RH TNK PUMP switch – OFF Monitor Total fuel quantity

Table 3-2 (cont.)

Panel Wording (amber)	Fault Conditions	Corrective Action
LH FUEL FILTER	LH fuel filter is partially blocked	Land as soon as practical
RH FUEL FILTER	RH fuel filter is partially blocked	Land as soon as practical
LH GEN OFF	Failure of LH AC generator	Check LH GEN Land as soon as practical
RH GEN OFF	Failure of RH AC generator	Check RH GEN Land as soon as practical
LH RECT OFF	Failure of LH rectifier	Check RH RECT Land as soon as practical
RH RECT OFF	Failure of RH rectifier	Check LH RECT Land as soon as practical
MAIN TRNS OFF	Failure of main 36 V transformer	Selector switch MAIN TRANS – STBY TRANS – STBY TRANS. Land as soon as practical
36 V INV ON	36 V inverter ON	Check generators. Land as soon as practical
115 V INV ON	115 V inverter ON	Check generators Land as soon as practical
BAT BUS	Dual AC generator failure and/or Dual rectifier failure	Cut out all fuel transfer pumps Endurance 30 min
ICE	Helicopter icing	Anti-ice System switches – ON, CHECK
RTR AIS FAIL	Failure of the rotor anti-ice	Leave icing condition zone or land as soon as possible
LH PITOT FAIL	LH pitot heating failure	Use copilot (flight-navigator) ASI reading

Table 3-2 (cont.)

Panel Wording (amber)	Fault Conditions	Corrective Action
RH PITOT FAIL	RH pitot heating failure	Use pilot ASI reading only
LH EEG OFF	Failure of LH Engine Electronic Governor	LH EEG switch – OFF, then – ON Continue flight
RH EEG OFF	Failure of RH Engine Electronic Governor	RH EEG switch – OFF then – ON Continue flight
VG FAIL	Failure of the vertical gyro	Autopilot switch – OFF Land as soon as practical Do not use the flight director
HOR 1 FAIL	Failure of the gyro horizon	Use attitude indication of FDI, STANDBY HOR 2
RAD ALT FAIL	Radioaltimeter failed	Do not use radioaltimeter
CS FAIL	Compass System failure	Use Standby magnetic compass. YAW switch on the central control panel – OFF
V_{NE}	Airspeed exceeds V_{NE}	Reduce speed
CHECK AP PNL	Autopilot failures	Autopilot central Control panel – VERIFY Flight – continue
MAIN HYD FAIL	Failure of the main hydraulic system	Check STBY HYD SYS temperature and pressure (64–90) kgf/sq.cm Land as soon as possible
STBY HYD FAIL	Failure of the standby hydraulic system	Check MAIN HYD SYS temperature and pressure (64–90) kgf/sq.cm Land as soon as possible
AUX HYD FAIL	Failure of the auxiliary hydraulic system	Check MAIN and STBY SYS Land as soon as practical
MAIN HYD CTRL VALVE	Main hydraulic system primary valve failure	Land as soon as possible

Table 3-2 (cont.)

Panel Wording (amber)	Fault Conditions	Corrective Action
STBY HYD CTRL VALVE	Standby hydraulic system primary control valve failure	Land as soon as possible
NO HYD TNK PRES	Hydraulic system pressurization pressure low	AUX Pump selector switch – ON before landing
PARKING BRAKE	Parking brake is applied. Pressure – 17 kgf/sq.cm and above	At taxiing RELEASE the parking brake
LH AFT PAX DOOR	Cargo compartment door open	Close the door
EMG HTCH OPEN	Emergency hatch open	Close the hatch
LH VLV CLOSED	LH fuel shut-off valve is closed	Before LH engine start, LH valve must be opened
RH VLV CLOSED	RH fuel shut-off valve is closed	Before RH engine start, RH valve must be opened
APU OVERSPD	The max permissible speed of APU turbine exceeded	APU auto cutoff – Check
FDR FAIL	Flight data recorder fail	Flight – continue
EXT AC PWR	The exterior AC power source is connected	Before taxiing, disconnect the exterior AC power source
EXT DC PWR	The exterior DC power source is connected	Before taxiing, disconnect the exterior DC power source
SW ON PITOT HT	Icing condition or OAT below +5 °C	HEAT PITOT CLOCK switch – ON

Table 3-2 (cont.)

Panel Wording (amber)	Fault Conditions	Corrective Action
LH ENG VIBR	Maximum tolerable vibration of LH engine	Continue flight. Monitor the engine operation more closely
RH ENG VIBR	Maximum tolerable vibration of RH engine	Continue flight. Monitor the engine operation more closely
LH EEG 2.5 MIN	LH engine can attain 2.5 min OEI	Attaining the 2.5 min contingency if required
RH EEG 2.5 MIN	RH engine can attain 2.5 min OEI	Attaining the 2.5 min contingency if required
LH ENG PWR LIMIT	Maximum Gas Generator RPM and/or ITT of LH engine	Monitor Rotor RPM
RH ENG PWR LIMIT	Maximum Gas Generator RPM and/or ITT of RH engine	Monitor Rotor RPM

NOTE. When caution lights LH (RH) VLV CLOSED, FDR FAIL, EXT DC (AC) PWR APU OVERSPD, LH (RH) ENG PWR LIMIT are on, MWL is off.

NOTE. SW ON PITOT HT light illumination is not connected with any PITOT HT system failure (ref. MM Section 1).

ENGINE OIL PRESSURE BELOW LIMIT

Indications:

MWL .... on

LH (RH) ENG OIL PRES light .... on

Procedure:

Engine oil pressure and temperature indication................................. Check

If affected engine oil pressure does not drop below 2.0 kg/sq.cm, and oil temperature does not exceed 150 °C:

MWL.. Press to reset

Monitor the engine operation more closely.

Continue the flight.

If engine oil pressure drops below 2.0 kg/sq.cm or oil temperature exceeds 150 °C:

MWL.. Press to reset

Affected engine .... Shutdown

Affected engine SHUT-OFF lever... Close

Land as soon as possible.

ENGINE OIL TEMPERATURE ABOVE LIMIT

Indications:

Engine oil temperature above 150 °C

Procedure:

Collective Lever .... Reduce power

Oil temperature (affected engine) .... drop below 150 °C, Monitor

If oil temperature of affected engine remains above 150 °C:

Affected engine .... Shutdown

Land as soon as practical

CHIPS IN ENGINE OIL

Indications:

MWL .... on

LH (RH) ENG CHIP lights .... on

Procedure:

MWL .... Press to reset

Land as soon as practical.

MAIN GEARBOX OIL PRESSURE BELOW NORMAL
(AT MAXIMUM SLIP ANGLE)

Indications:

MWL .... on

GRBX PR β_{MAX} light .... on

Oil pressure .... below 2.5 kgf/sq.cm

Procedure:

MWL .... Press to reset

Reduce slip angle less than two slip ball diameters indicated by FDI.

GRBX PR β_{MAX} light .... off, Verify

MAIN GEARBOX OIL TEMPERATURE ABOVE LIMIT

Indications:

MWL .... on

GRBX OIL HOT light .... on

Gearbox oil temperature... above 100 °C

Procedure:

Collective Lever.. Reduce power

MWL .... Press to reset

Land as soon as possible.

FUEL TANKS OVERFLOW

1ST LH TANK OVERFLOW

Indications:

MWL .... on

On TANKS OVERFLOW Caution Lights Panel
LH TNK 1 light .... on

Procedure:

FRONT TANK # 6 transfer pump switch .... Off

MWL .... Press to reset

Monitor by indicator the quantity of fuel and transfer fuel from auxiliary front tank to 1ST LH tank by switching ON and OFF TANK #6 PUMPS FRONT switch.

Maintain quantity of fuel in the 1ST LH tank within 50 to 200 L.

3RD+4TH RH TANK OVERFLOW

Indications:

MWL .... on

On TANKS OVERFLOW Caution Lights Panel
RH TNK 4 light .... on

Procedure:

TANK #6 PUMPS REAR switch .... Off

MWL .... Press to reset

Monitor by indicator the quantity of fuel and transfer fuel from auxiliary front tank to 3RD+4TH RH tanks by switching ON and OFF TANK #6 PUMPS REAR switch.

Maintain quantity of fuel in 3RD+4TH RH tank within 100 to 300 L.

5TH LH TANK OVERFLOW

Indications:

MWL .... ON

On TANKS OVERFLOW Caution Lights Panel
LH TNK 5 light .... ON

Procedure:

LH TANK PUMPS 1 switch .... Off (cap open)

LH TANK PUMPS 3+4 switch .... Off (cap open)

MWL .... Press to reset

Monitor quantity of fuel and transfer fuel from tanks 1ST LH and 3+4 LH to 5 LH tank by switching ON and OFF LH TANK PUMPS 1 and LH TANK PUMPS 3+4 switches.

Maintain quantity of fuel in 5 LH tank within 50 to 200 L.

5TH RH TANK OVERFLOW

Indications:

MWL .... on

On TANKS OVERFLOW Caution Lights Panel
RH TNK 5 light .... on

Procedure:

RH TANK PUMPS 1 switch (cap open) .... Off

RH TANK PUMPS 3+4 switch (cap open) .... Off

MWL .... Press to reset

Monitor quantity of fuel and transfer fuel from tank 1 and 3+4 to 5 RH tank by switching ON and OFF RH TANK PUMPS 1 and RH TANK PUMPS 3+4 switches.

Maintain quantity of fuel in 5 RH tank within 50 to 200 L.

TRANSFER PUMP FAILURES

1ST LH TANK PUMP FAILURE

Indications:

On the left side of Indication Light Panel
1 LH TNK PUMP light.. off

Fuel from the 1st LH TANK .... not transferred

Procedure:

Fuel quantity in the 1st LH TANK .... Check

LH TANK PUMPS 1 switch.. off (cap open)

TANK 6 PUMPS FRONT switch
(if auxiliary tanks are installed) .... Off

XFEED VALVE OPEN switch .... OPEN (cap open)

XFEED VLV OPEN light .... on, Verify

LH TANK PUMPS 2 switch.. off (cap open)

Fuel quantity in the 3+4 RH TANKS .... Monitor

NOTE. If before takeoff the initial CG position was not within the range of 206 to 202 in (5.23 to 5.14 m) the RH TANK PUMPS 3+4 switch – OFF TANK PUMPS REAR switch (if auxiliary tanks are installed) – Off.

As fuel quantity in the 3+4 RH TANKS comes to zero:

LH TANK PUMPS 2 switch .... On

XFEED valve .... Close

XFEED VLV OPEN light .... off

CAUTION. FUEL TRAPPED IN THE 1ST LH TANK IS UNUSABLE AND MUST BE SUBTRACTED FROM TOTAL FUEL QUANTITY

3+4 LH TANKS PUMP FAILURE

Indications:

On the left side of Indication Light Panel
3+4 TANK PUMP light .... off

Fuel from the 3+4 LH TANKS .... not transferred

Procedure:

Fuel quantity in the 3+4 LH TANKS .... Check

LH TANK PUMPS 3+4 switch .... Off (cap open)

XFEED VALVE OPEN switch .... OPEN (cap open)

XFEED VLV OPEN light .... on, Verify

LH TANK PUMPS 2 switch .... Off (cap open)

Fuel quantity in the 1st RH TANK .... Monitor

NOTE. If before takeoff the initial CG position was not within the range of 206 to 202 in (5.23 to 5.14 m), the RH TANK PUMPS 1 switch – Off (cap open).

As fuel quantity in the 1st RH TANK comes to zero:

LH TANK PUMPS 3+4 switch .... On

XFEED valve .... Close

XFEED VLV OPEN light .... off

CAUTION. FUEL TRAPPED IN THE 3+4 LH TANKS IS UNUSABLE AND MUST BE SUBTRACTED FROM TOTAL FUEL QUANTITY.

1ST RH TANK PUMP FAILURE

Indications:

On the right side of Indication Light Panel
1 RH TNK PUMP light .... off

Fuel from the 1st RH TANK... not transferred

Procedure:

Fuel quantity in the 1st RH TANK.. Check

RH TANK PUMPS 1 switch .... Off (cap open)

XFEED VALVE OPEN switch .... OPEN (cap open)

XFEED VLV OPEN light .... on

RH TANK PUMPS 2 switch .... Off (cap open)

Fuel quantity in the 3+4 LH TANKS... Monitor

NOTE. If before takeoff the initial CG position was not within the range of 206 to 202 in (5.23 to 5.14 m), the LH TANK PUMPS 3+4 switch – Off.

As fuel quantity in the 3+4 LH TANKS comes to zero:

RH TANK PUMPS 2 switch... On (cap open)

XFEED valve .... Close (cap closed)

XFEED VLV OPEN light .... off

CAUTION. FUEL TRAPPED IN THE 1ST RH TANK IS UNUSABLE AND MUST BE SUBTRACTED FROM TOTAL FUEL QUANTITY.

3+4 RH TANKS PUMP FAILURE

Indications:

On the right side of Indication Light Panel
3+4 TANK PUMP light .... off

Fuel from the 3+4 RH TANKS .... not transferred

Procedure:

Fuel quantity in the 3+4 RH TANKS .... Check

RH TANK PUMPS 3+4 switch .... Off (cap open)

TANK PUMPS REAR switch
(if auxiliary tanks are installed).. Off (cap open)

XFEED VALVE OPEN switch .... OPEN (cap open)

XFEED VLV OPEN light .... on

RH TANK PUMPS 2 switch .... Off (cap open)

Fuel quantity in the 1st LH TANK.. Monitor

NOTE. If before takeoff the initial CG position was not within the range of 206 to 202 in (5.23 to 5.14 m), the LH TANK PUMPS 1 switch – OFF TANK PUMPS FRONT switch (if auxiliary tanks are installed) – OFF

As fuel quantity in the first LH TANK 3 comes to zero:

RH TANK PUMPS 2 switch.. On (cap open)

XFEED valve.. Close (cap closed)

XFEED VLV OPEN light.. off

CAUTION. FUEL TRAPPED IN THE 3+4 RH TANKS IS UNUSABLE AND MUST BE SUBTRACTED FROM TOTAL FUEL QUANTITY

BOOSTER PUMPS FAILURE

Indications:

On the Indication Light Panel
LH 2 TNK PUMP light and/or RH 2 TNK PUMP light .... off

Procedure:

In flight at up to 9840 ft (3000 m) altitude:

Continue flight.

In flight at altitudes above 9840 ft (3000 m):

Descent to 9840 ft (3000 m)

Continue flight.

Periodically monitor fuel quantity in the 2nd LH TANK and 2nd RH TANK.

TRANSFER AND BOOSTER PUMPS FAILURE

Indications:

Failed pumps light .... off

Procedure:

Evaluate the possibility to continue flight.

Fuel will be used only from tanks #5 and #2 of LH and RH group.

FUEL FILTER CLOGGING

Indications:

MWL .... on

LH (RH) FUEL FILTER light .... on

Procedure:

COLLECTIVE .... Reduce power

MWL .... Press to reset

Land as soon as practical.

ELECTRICAL POWER FAILURE

AC GENERATOR FAILURE

Indications:

MWL .... on

LH (RH) GEN OFF light.. on

Procedure:

Generators switches .... Off and then On

If LH GEN OFF and RH GEN OFF lights remain ON and inverters fail to switch on automatically:

AC AMPS .... in accordance with circuit load, Verify

AC VOLTS.. 115–119 V, Verify

MWL.. Press to reset

AC AMPS .... Monitor

Land as soon as practical.

DUAL AC GENERATORS FAILURE

Indications:

MWL .... on

LH GEN OFF light .... on

RH GEN OFF light .... on

36 V INV ON light .... on

115 V INV ON light .... on

LH RECT OFF light .... on

RH RECT OFF light .... on

MAIN TRNS OFF light .... on

BAT BUS light .... on

AC Ammeter .... zero

AC Voltmeter .... zero

Procedure:

Generators switches .... Off and then On

If LH GEN OFF and RH GEN OFF lights remain ON and inverters fail to switch on automatically:

INVERT AUTO – MAN selector switch .... MAN

36 V INV ON light .... on, Verify

115 V INV ON light .... on, Verify

MWL .... Press to reset

Land as soon as possible.

NOTE. The following equipment receive power supply from battery bus:

(1) Inverters, three-phase and single-phase, of the emergency AC power supply.

(2) Fuel pumps.

(3) Fuel quantity gage.

(4) Shut-off valves.

(5) Engine and system instruments.

(6) Navigation lights.

(7) Aircraft position lights.

(8) Rear position light.

(9) Cabin lamp and dome light.

(10) Landing and search light.

(11) Radio altimeter.

(12) Ice detector.

(13) Windshield wiper electric actuator.

(14) Direction finder.

(15) Warning system.

(16) Pitot tubes heater

(17) Shutter valves of engine air intake anti-ice system.

(18) Emergency location transmitter.

(19) Airborne intercommunication and switching equipment.

(20) Compass system.

(21) Flight director indicator (FDI), horizontal situation indicator (HSI)

(22) Autopilot

(23) Standby gyro horizon

(24) Flight data recorder.

NOTE. To extend flight time to 30 min, switch off all fuel transfer pumps and lighting emergency in cabin.

WARNING. WHEN PUMPS ARE SWITCHED OFF, FUEL TRANSFERS ONLY FROM TANKS #5 AND #2 OF LH AND RH GROUP.

RECTIFIER FAILURE

Indications:

MWL .... on

LH (or RH) RECT OFF light .... on

Procedure:

DC VOLTS.. (27–30) V, Verify

MWL .... Press to reset

Continue flight.

DUAL RECTIFIERS FAILURE

Indications:

MWL .... on

Audio signal (headset).. on

LH RECT OFF light .... on

RH RECT OFF light .... on

BAT BUS light .... on

Procedure:

MWL .... Press to reset

Land as soon as possible.

NOTE. To extend flight time to 30 min, switch off all fuel transfer pumps and emergency lighting in cabin.

WARNING. WHEN PUMPS ARE SWITCHED OFF FUEL TRANSFERS ONLY FROM TANKS #5 AND #2 OF LH AND RH GROUPS.

MAIN TRANSFORMER FAILURE

Indications:

MWL .... on

MAIN TRNS OFF light .... on

36 V INV light.. on

Procedure:

MAIN TRANS – STBY TRANS selector switch .... STBY TRANS

MWL .... Press to reset

Continue flight.

ROTOR ANTI-ICING SYSTEM FAILURE

Indications:

MWL .... on

ICE light .... on

RTR AIS FAIL light .... on

Green ROTOR ANTI-ICE light .... off

Procedure:

In icing conditions proceed as follows:

AUTO ROTORS – OFF – MAN ROTORS selector switch ..... MAN, immediately

If rotor anti-icing system is operative:

ROTOR ANTI-ICE LIGHT .... on

RTR AIS FAIL light .... off

AC AMPS .... not below 75 AMPS, Verify

MWL .... Press to reset

If rotor anti-icing system remains inoperative:

MWL .... on

RTR AIS FAIL light .... on

Green ROTOR ANTI-ICE light .... off

AC AMPS .... less than 75 AMPS

If icing conditions persist:

MWL .... Press to reset

Land as soon as possible.

LH PITOT HEAT FAILURE

Indications:

MWL .... on

LH PITOT HEAT light .... on

Procedure:

In icing conditions proceed as follows:

MWL .... Press to reset

Monitor airspeed by copilot ASI.

Land as soon as practical.

RH PITOT HEAT FAILURE

Indications:

MWL .... on

RH PITOT HEAT light .... on

Procedure:

In icing conditions proceed as follows:

MWL.. Press to reset

Monitor airspeed by PILOT ASI only.

Land as soon as practical.

DUAL PITOTS HEAT FAILURE

Indications:

MWL .... on

LH PITOT HEAT light .... on

RH PITOT HEAT light .... on

Procedure:

MWL .... Press to reset

If practical, leave icing condition zone.

NOTE. If airspeed and pitch angle do not match, maintain pitch angle 0° corresponding to 65 KIAS (120 km/h IAS)

Land as soon as practical.

ENGINE ANTI-ICING SYSTEM FAILED TO SWITCH ON AUTOMATICALLY

Indications:

With OAT below +5 °C and Engine Anti-icing System ON in the automatic mode LH (RH) ENG ANTI-ICE light(s) does (do) not switch on.

Procedure:

CAUTION. SWITCH ON THE ENGINE ANTI-ICING SYSTEM MANUALLY IMMEDIATELY.

CAUTION. AFTER ONE MINUTE DELAY WITH ACTION DO NOT SWITCH ON THE ENGINE ANTI-ICING SYSTEM MANUALLY.

ANTI-ICE AUTO ENG-OFF-MAN ENG selector switch .... MAN ENG (cap open)

LH (RH) ENG ANTI-ICE light(s) after (20–40) s .... on, Check

If LH(RH) ENG ANTI-ICE light(s) does(do) not switched on:

ANTI-ICE AUTO ENG-OFF-MAN ENG selector switch .... OFF (cap open)

Monitor the operating parameters of engine (engines) with affected Anti-icing system.

Land as soon as practical.

ENGINE ANTI-ICING SYSTEM FAILED TO SWITCH OFF AUTOMATICALLY

Indications:

With OAT above +10 °C and Engine Anti-icing System ON in the automatic mode, LH (RH) ENG ANTI-ICE light(s) on

Procedure:

ANTI-ICE AUTO ENG-OFF-MAN ENG selector switch.......... OFF (cap open)

LH (RH) ENG ANTI-ICE light(s) .... off, Check

If LH (RH) ENG ANTI-ICE light(s) on:

Monitor the operating parameters of engine with affected Anti-icing system.

Continue flight.

EEG AUTOMATIC CUTOUT

Indications:

MWL .... on

LH (RH) EEG OFF light.. on

Procedure:

MWL .... Press to reset

LH (RH) EEG switch.. Off, then – On

Even if LH (RH) EEG OFF light remains on, continue the flight.

Monitor the operating parameters of engine.

CAUTION. DO NOT EXCEED TAKE-OFF POWER.

GAS GENERATOR CIRCUIT EEG FAILURE

Indications:

LH (RH) ENG PWR LIMIT light .... on

N_1 (affected engine) .... spontaneous drop to about 85%

Procedure:

Set a flight mode like as if an engine failed.

LH (or RH) EEG switch on central control pedestal .... Off, then – On

If N_1 (affected engine) has not restored:

LH (or RH) EEG switch .... Off

The engine operating parameters .... restored

CAUTION. DO NOT EXCEED TAKE-OFF POWER.

Land as soon as practical.

FREE TURBINE CIRCUIT FAILURE (FALSE OPERATION OF LH OR RH ENG OVERSPEED LIGHT)

Indications:

MWL .... on

LH (or RH) ENG OVERSPD light .... on

Audio signal (headset)... on

Engine operating parameters .... no change

NOTE. If EEG is operable, the affected engine is automatically cut out after illumination of the corresponding (LH/RH) ENG OVERSPD light

Procedure:

Switch LH (or RH) EEG... Off, then On

If LH (or RH) ENG OVERSPD light is still on:

LH (or RH) EEG switch.. Off

MWL.. Press to reset

CAUTION. DO NOT EXCEED TAKE-OFF POWER

Land as soon as practical.

FREE TURBINE RPM GOVERNOR FAILURE

Indications:

Spontaneous rise of the Rotor RPM

MWL .... on (at N_R 99.4 %)

HIGH RPM light at N_R 99.4 % .... on

Audio signal (headset) .... on (at N_R 99.4 %)

N_1 affected engine(s) (affected automatic).............................. maximum

EEG 2.5 MIN light (affected engine) .... may be on

Procedure:

Collective Lever ....Pull abruptly to obtain the Rotor RPM normal value

2.5 MIN PWR switch (affected engine) ....Off

MWL ....Press to reset

Check the Synchronization System cut out as follows:

Collective Lever...move smoothly downward, monitoring the Rotor RPM

Indications that Synchronization System has been cut out:

The power of one engine (normal operating) decreases and power of affected engine does not change in response to collective pitch reduction, Rotor RPM remains close to the normal.

Shift the THROTTLE lever of the affected engine ....To position marked by a red line

Collective Lever..Move smoothly to control the engines power and Rotor RPM

Indications that Synchronization System has not been cut out:

The power of both engines changes slightly in response to collective pitch reduction, ROTOR RPM rises.

Collective Lever .... Move smoothly further down to increase the ROTOR RPM to (99–103 %).

CAUTION. THE ROTOR RPM INCREASE ABOVE 98 % TO CUT OUT THE SYNCHRONIZATION SYSTEM IN THIS CASE IS ALLOWED FOR NOT MORE THAN 3 SECONDS.

CAUTION DO NOT ALLOW THE ROTOR RPM EXCEED 103 % TO AVOID THE ENGINE SWITCHING OFF BY THE ELECTRONIC GOVERNOR AT ROTOR RPM (106.5±2) %

When Synchronization System is cut out, the normally operating engine N_1 and ROTOR RPM should decrease.

Shift the THROTTLE lever of the affected engine........... To position marked by a red line

Collective Lever .... Move smoothly to control the engines power and Rotor RPM

Land as soon as practical.

NOTE. Difference between Gas Generator RPM of both engines is not limited

An entry regarding exceeding the Rotor RPM limitation shall be made by the pilot in the logbook after the flight is completed

VERTICAL GYRO FAILURE

Indications:

MWL .... on

VG FAIL light .... on

CHECK AP PNL light .... on

Autopilot (roll, pitch channels) .... off (spontaneously)

ROLL light.. on

PITCH light .... on

FDI warning flag HOR.. in sight

Discrepancy between FDI indications and helicopter actual attitude

Discrepancy between FDI (pitch and roll) and HOR 1 and HOR 2 indications by more than 5°

Procedure:

MWL .... Press to reset

Transfer to piloting HOR.

YAW switch .... Off

ROLL switch .... Off

PITCH switch .... Off

Land as soon as practical

HORIZON FAILURE

HORIZON FAILURE HOR-1

Indications:

MWL .... on

HOR 1 FAIL light .... on

HOR 1 warning flag HOR .... in sight

Discrepancy between HOR 1, HOR 2 and FDI roll and/or pitch indications exceeding 10°

Procedure:

MWL .... Press to reset

Leave switch of affected HOR-1 .... on

Do not use indications of affected HOR-1.

Monitor helicopter attitude by FDI and HOR -2 indications.

Continue flight.

HORIZON FAILURE HOR-2

Indications:

HOR 2 warning flag HOR .... in sight

Discrepancy between HOR 2, HOR 1 and FDI roll and/or pitch indications exceeding 10°

Procedure:

MWL .... Press to reset

Leave switch of affected HOR-2 .... on

Do not use indications of affected HOR-2.

Monitor helicopter attitude by FDI and HOR -1 indications.

Continue flight.

RADIO ALTIMETER FAILURE

Indications:

MWL .... on

RALT FAIL light .... on

Radio altimeter warning flag .... in sight

Radio altimeter needle .... in dark sector

Radio altimeter warning flag on FDI .... in sight

Procedure:

Circuit breaker RALT .... Off

MWL .... Press to reset

Monitor altitude by pressure altimeter, rate-of-climb indicator and visually.

Continue flight.

COMPASS SYSTEM FAILURE

MAIN CHANNEL FAILURE

Indications:

MWL .... on

CS FAIL light .... on

CHECK PNL AP light .... on

AP Central Control Panel YAW light .... on

M light on CS control panel .... on

HSI CS warning flag .... in sight, course reading incorrect

Procedure:

MWL .... Press to reset

USER selector switch M-S .... to position S

If case of YAW light is flickering:

YAW switch on central control panel .... Off, then On

Copilot HSI warning flag .... in sight, course reading incorrect

Make sure that Pilot HSI readings are restored.

During flight determine the course by Pilot HSI and Magnetic compass readings.

Continue flight.

STANDBY CHANNEL FAILURE

Indications:

MWL .... on

CS failure light .... on

S light on CS control panel .... on

Copilot HSI warning flag .... in sight, reading incorrect

Procedure:

MWL .... Press to reset

USER M -S selector switch .... to position M

Pilot HSI reading .... normal, Check

During flight use Pilot HSI and Magnetic compass readings.

Monitor compass system and HSI readings.

Continue flight.

SIMULTANEOUS FAILURE OF BOTH CS CHANNELS

Indications:

MWL ....on

CS FAIL light...on

CHECK PNL AP light ....on

YAW light on AP central control panel...on

M and S lights on CS control panel ....on

Pilot HSI warning flag...in sight, course reading incorrect

Copilot HIS warning flag...in sight, course reading incorrect

Procedure:

MWL ....Press to reset

YAW switch on CCP ....Off

During flight determine the course by Magnetic compass.

Land as soon as practical.

DIFFERENCE OF HSI PILOT AND COPILOT INDICATIONS

Indications:

Discrepancy of more than 5 degrees between indications of HIS Pilot and Copilot

Procedure:

Compare both HSI indications with Magnetic compass indications.

If Magnetic compass and Pilot HSI indications are the same:

USER M-S switch .... To position M

If Magnetic compass and HSI Copilot indications are the same:

USER M-S switch .... To position S

Copilot HSI warning flag .... in sight, course readings incorrect

Make sure that Pilot HSI normal reading restored.

During flight determine the course by Pilot HSI and Magnetic compass reading

Monitor compass system and HIS.

Continue flight.

FLIGHT DIRECTOR INDICATOR (FDI) FAILURE

Indications:

MWL .... on

FDI warning flag .... in sight

Discrepancy between FDI and horizons reading.

Discrepancy between FDI readings and the helicopter actual attitude.

FDI does not react to roll changes.

FDI does not react to pitch changes during acceleration and deceleration.

Procedure:

MWL .... Press to reset

Do not use FDI indications.

Control the helicopter attitude against serviceable horizons.

Continue flight.

LIMITING SIGNALS SYSTEM FAILURE

Indications:

Airspeed indicator warning flag .... in sight

Procedure:

Refer to Table 1-1, Section 1, RFM for V_{NE} limits.

Continue flight.

AUTOPILOT FAILURE

Indications:

Helicopter does not get stabilized in failed channel (YAW, ROLL, PITCH, PA)

MWL .... on

CHECK AP PNL light .... on

Failed channel lamp (yaw, roll, pitch) on central control panel........... off

Actuator Indicator marks
of the failed channel .... set to zero

Procedure:

TRIM button on the cyclic .... Press and release

MWL .... Press to reset

Using cyclic, collective and pedals .... Restore the helicopter balance position

Failed channel switch on central control panel .... Off

CHECK AP PNL light .... off

Autopilot Emergency Disconnection:

AP OFF button on the cyclic .... Press and release

MWL .... off

Using cyclic, collective and pedals .... Restore the helicopter balance position

YAW, ROLL, PITCH, PA switches
on the Autopilot panel .... Off

Continue flight.

MAIN HYDRAULIC SYSTEM FAILURES

MAIN HYDRAULIC SYSTEM OIL PRESSURE BELOW LIMIT

Indications:

MWL .... on

MAIN HYD FAIL light .... on

Pressure in main hydraulic system drops below (50±5) kgf/sq.cm

Actuator Indicator marks .... set to zero

Auxiliary pump .... on

Procedure:

MWL .... Press to reset

YAW, ROLL, PITCH, PA switches
on the Autopilot panel .... Off

Pressure in standby hydraulic system .... (64 to 90) kgf/sq.cm, Verify

Auxiliary pump start .... on, Check

Pump hydraulic pressure .... (200 to 220) kgf/sq.cm, Verify

Pressure in auxiliary hydraulic system .... (75 to 90) kgf/sq.cm, Verify

If pump fails to start automatically .... switch it on manually before landing

Monitor the standby hydraulic system status.

Land as soon as possible.

NOTE. If pressure in the main hydraulic system comes back to the normal, the autopilot can be switched ON once again.

HYDRAULIC OIL TEMPERATURE BEYOND THE LIMITS

Indications:

MWL .... on

MAIN HYD FAIL light.. on

Oil temperature in the main hydraulic system.................................... (88.5 to 96) °C

Oil pressure in the main hydraulic system .... within the norm (64 to 90) kgf/sq.cm,

Procedure:

MWL .... Press to reset

Oil pressure 64 to 90 kgf/sq.cm and temperature (not above 85 °C) in standby hydraulic system.................................. Verify

If oil temperature does not exceed 100 °C:

Land as soon as practical.

NOTE: Oil temperature increase above +85 °C is allowed during no more than 30 minutes.

If oil temperature exceeds 100 °C:

Land as soon as possible.

STANDBY HYDRAULIC SYSTEM FAILURES

HYDRAULIC OIL PRESSURE BELOW LIMITS

Indications:

MWL .... on

STBY HYD FAIL light .... on

Pressure in standby hydraulic system .... below 50 kgf/sq.cm

Procedure:

MWL .... Press to reset

Pressure in main hydraulic system .... (64 to 90) kgf/sq.cm, Verify

Land as soon as possible.

HYDRAULIC OIL TEMPERATURE ABOVE LIMITS

Indications:

MWL .... on

STBY HYD FAIL light .... on

Standby hydraulic system oil temperature .... (88.5 to 96) °C

Standby hydraulic system oil pressure .... within the norm (64 to 90) kgf/sq.cm

Procedure:

MWL .... Press to reset

Oil pressure (64 to 90) kgf/sq.cm and temperature (not above 85 °C) in main hydraulic system .... Verify

If oil temperature does not exceed 100 °C:

Land as soon as practical.

NOTE: Oil temperature increase above +85 °C is allowed during no more than 30 minutes.

If oil temperature exceeds 100 °C:

Land as soon as possible.

MAIN OR STBY SYSTEM PRIMARY CONTROL VALVES JAMMING

Indications:

MWL .... on

MAIN HYD (STBY HYD) CTRL VALVE light .... on

Procedure:

MWL .... Press to reset

Pressure in main and standby systems
(64 to 90) kgf/sq.cm .... Verify

Monitor the hydraulic systems instruments

Land as soon as possible.

AUXILIARY HYDRAULIC SYSTEM FAILURE

Indications:

MWL .... on

AUX HYDR FAIL light.. on

NOTE: In case of an auxiliary hydraulic system failure the AUX HYD FAIL light is on only in the following cases:

- in a flight with the main hydraulic system failed;
- on the ground when the hydraulic tanks are pressurized.

Pressure in AUXILIARY hydraulic system .... below 50 kgf/sq.cm

Procedure:

MWL .... Press to reset

Continue flight.

Before landing:

AUX PUMP EMERG ON – AUTO selector switch .... EMERG ON (cap open)

Check Aux pump start by instruments.

If the auxiliary pump has failed to start:

The engines can be switched off at parking only after putting the chocks under the wheels.

PRESSURE INCREASE IN AUXILIARY HYDRAULIC SYSTEM WHEN MAIN AND STANDBY HYDRAULIC SYSTEMS ARE SERVICEABLE

In case of pressure increase in auxiliary hydraulic system more than 95 kgf/cm^2 or pressure increase behind pumping unit more than 240 kgf/ cm^2 it is required to check the operating fluid temperature in the main hydraulic system.

If the temperature of operating fluid in the main hydraulic system is more than 85°C perform the procedures according to item HYDRAULIC OIL TEMPERATURE BEYOND THE LIMITS.

If the temperature of operating fluid in the main hydraulic system is less than 85°C - continue flight.

HYDRAULIC SYSTEM PRESSURIZATION FAILURE

Indications:

MWL .... on

NO HYD TNK PRES light .... on

Procedure:

MWL .... Press to reset

Continue flight.

Before landing:

AUX PUMP EMERG ON – AUTO selector switch...................... EMERG ON (cap open)

CAUTION. AFTER LANDING WITH NO HYD TNK PRES LIGHT – ON THE AUXILIARY PUMP WILL CUT OUT AUTOMATICALLY.

THE FIRST SUB-SYSTEM OF FUSELAGE STATIC PRESSURE SYSTEM FAILURE

Indications:

Discrepancy between pilot and co-pilot altimeter indications (with account for correction charts) by more than 100 ft (30 m)

Procedure:

Pilot and co-pilot altimeter indications ....Compare with the indications on additional panel

If pilot altimeter indications and altimeter indications on the additional panel are the same:

Co-pilot altimeter indications.. Do not use

If co-pilot altimeter indications and altimeter on the additional panel indications are the same:

Emergency selector switch .... EMEG

Control the helicopter against pilot speed indicator.

Monitor V_{NE} against Table 1-1, Section 1.

Continue flight.

LIGHTNING STRIKES IN THE HELICOPTER STRUCTURE IN FLIGHT

Procedure:

Reduce airspeed to 65 KIAS (120 km/h)

Avoid extreme maneuvers.

Land as soon as possible.

EMERGENCY EGRESS

GENERAL

In case of emergency landing the main task of the crew is to take the necessary measures to ensure safety of the occupants and crewmembers during landing, and their timely evacuation.

Before flight the captain should instruct occupants on-board on sequence of emergency egress after landing.

BEFORE EMERGENCY LANDING

The captain should command the crewmembers and occupants to prepare for landing.

The crewmembers should make sure that their seat belts are fastened.

People on-board must make sure that safety belts and harnesses are fastened securely and properly. Take the right position to avoid traumas and pose properly in order to prevent injury.

AFTER LANDING

The captain shuts down engines, closes shut-off valves, stops the rotors and de-energizes the helicopter by shifting a common bar PWR to the EMERG DISCOUNT position.

The captain should command the crewmembers to act in compliance with the emergency schedule before the rotors stop in case of landing on an even pad, with no considerable banking and pitching of the helicopter.

If otherwise, the captain should command the crewmembers to act in compliance with the emergency schedule after the rotors stop.

EMERGENCY SCHEDULE

Proceeding from the emergency situation on the land the occupants evacuation can be performed through the cargo compartment door, and/or crew compartment doors, and/or the emergency escape hatch.

The captain should supervise evacuation of occupants and take the survival radio set.

The co-pilot should open the RH crew compartment door, evacuate the people through its doorway, and should lead them aside to a safe distance.

The flight-operator should open or jettison the cargo compartment door, evacuate the occupants, take the survival kit and first aid kit, and should lead the people aside to a safe distance.

SECTION 4. PERFORMANCE

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SECTION 4. PERFORMANCE

INTRODUCTION

The performance data presented herein are derived from the engine manufacturer's specification power and flight test data. These data are spread by means of calculation to all approved operation conditions. These data are applicable to the basic helicopter without optional equipment which would appreciably affect available power, helicopter thrust and drag.

Takeoff and landing data presented for the level, smooth, dry surface with zero wind.

Unless otherwise specified, the performance data are presented for throttle levers in AUTO position.

MAIN DEFINITIONS

CATEGORY B TAKEOFF – takeoff operation of the helicopter during which at least one of the conditions of Category A takeoff is not met, first of all – continued takeoff.

Takeoff distance – the horizontal distance along the takeoff path from the start of the takeoff to the height of 50 ft (15 m).

Rejected takeoff distance – the horizontal distance the helicopter covers from the start of the takeoff to the complete stop point after takeoff rejection in case of one engine failure.

CATEGORY B LANDING – landing operation of the helicopter during which at least one of the conditions of Category A landing is not met, first of all – rejected landing.

Landing distance – the horizontal distance from the height of 50 ft (15 m) to the landing point (landing without landing run) or to the point of complete stop on the landing field (landing with landing run).

True airspeed V_{TAS} means the airspeed of a helicopter relative to still air in no wind conditions.

Indicated airspeed V_{IAS} means the speed of a helicopter as shown on its Pitot static airspeed indicator calibrated to reflect standard atmosphere adiabatic compressible air flow at sea level uncorrected for airspeed system errors.

Calibrated airspeed V_{CAS} means the indicated airspeed of a helicopter, corrected for position and instrument error.

Minimum airspeed V_{MIN} means the lowest allowable helicopter speed for given helicopter weight and operation conditions.

Never exceed airspeed V_{NE} means the highest allowable helicopter airspeed for given helicopter weight and operation conditions.

Maximum takeoff (landing) weight means the maximum allowable takeoff (landing) helicopter weight under actual conditions.

AIRSPEED CALIBRATIONS

The Airspeed Calibration chart (Fig. 4-1) provides calibrated airspeeds for all indicated airspeeds on pilot's ASI during level flight, climb and descent.

The Airspeed Calibration chart (Fig. 4-2) provides calibrated airspeeds for all indicated airspeeds on co-pilot's ASI during level flight, climb and descent.

The Airspeed Calibration chart (Fig. 4-3) provides calibrated airspeeds for all indicated airspeeds on pilot's ASI during level flight, climb and descent when the static air pressure valve is set to EMERGENCY position.

PILOT AIRSPEED INDICATOR

STATIC AIR PRESSURE VALVE MAIN POSITION

CLIMB, LEVEL FLIGHT, DESCENT

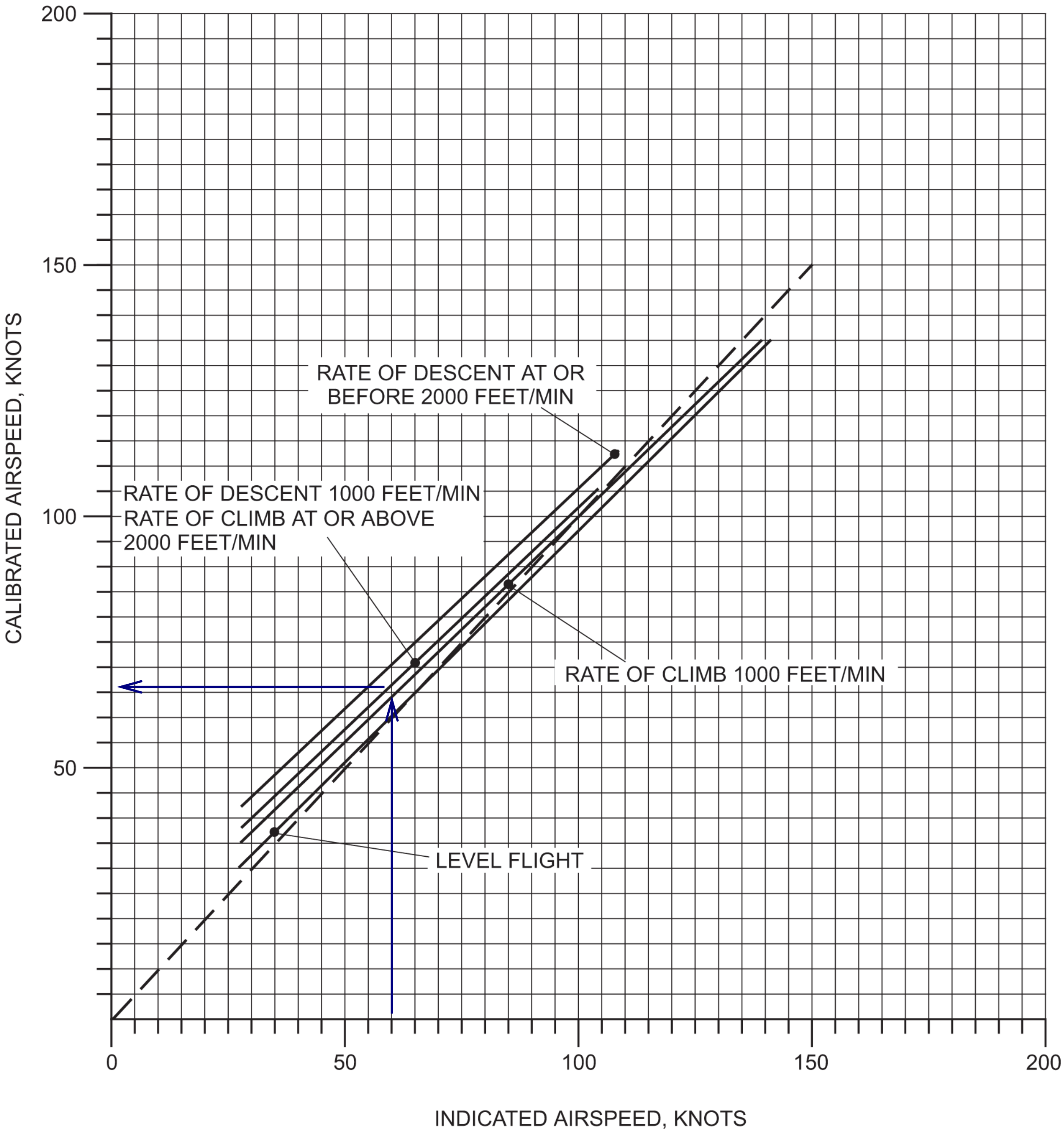

Fig.4-1 (Sheet 1 of 2). Airspeed calibrations (Pilot)
(BRITISH SYSTEM)

PILOT AIRSPEED INDICATOR

STATIC AIR PRESSURE VALVE MAIN POSITION

CLIMB, LEVEL FLIGHT, DESCENT

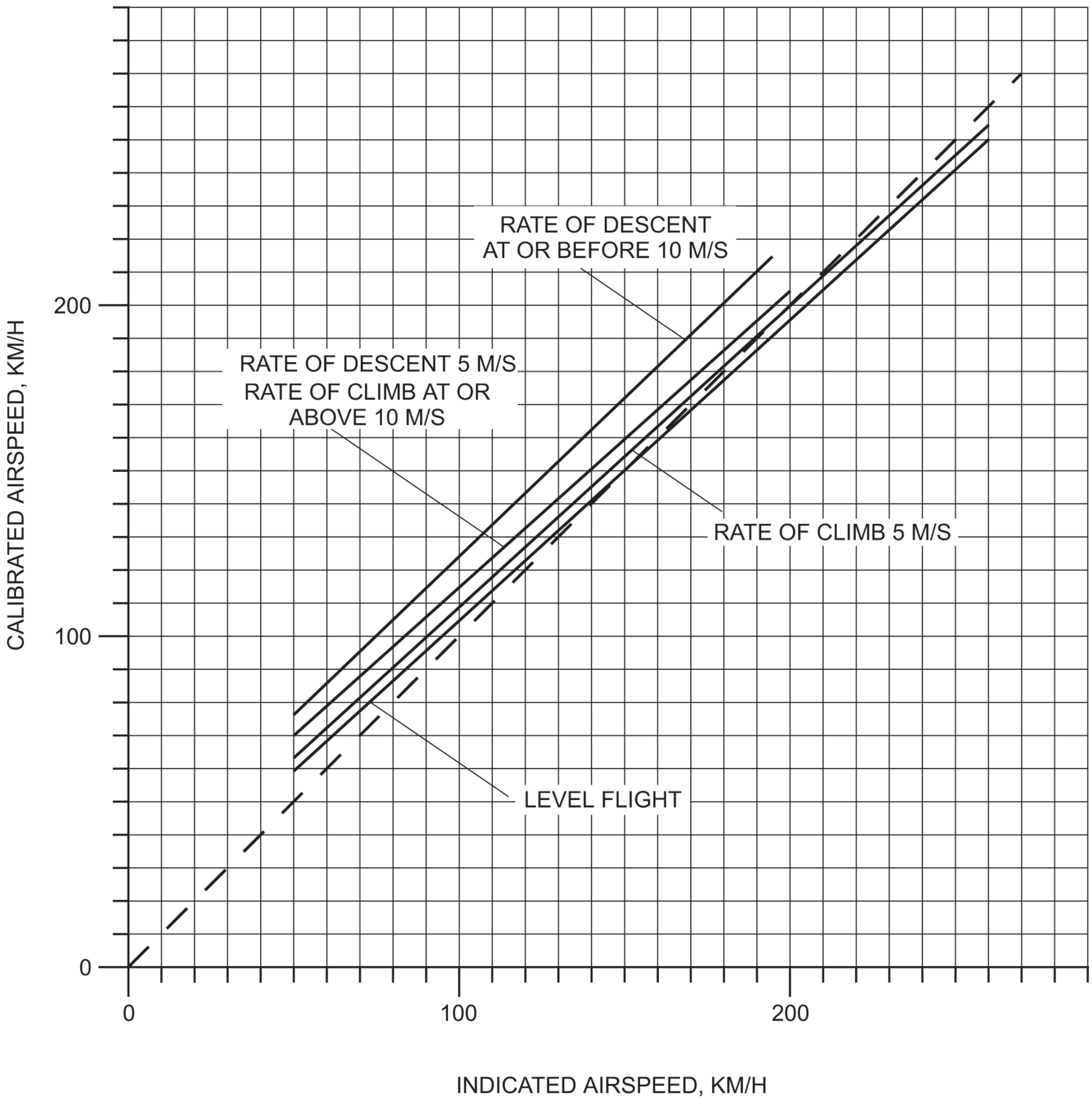

Fig.4-1 (Sheet 1 of 2). Airspeed calibrations (Pilot)

(METRIC SYSTEM)

CO-PILOT INDICATOR AIRSPEED
STATIC AIR PRESSURE VALVE IN MAIN POSITION
CLIMB, LEVEL FLIGHT, DESCENT

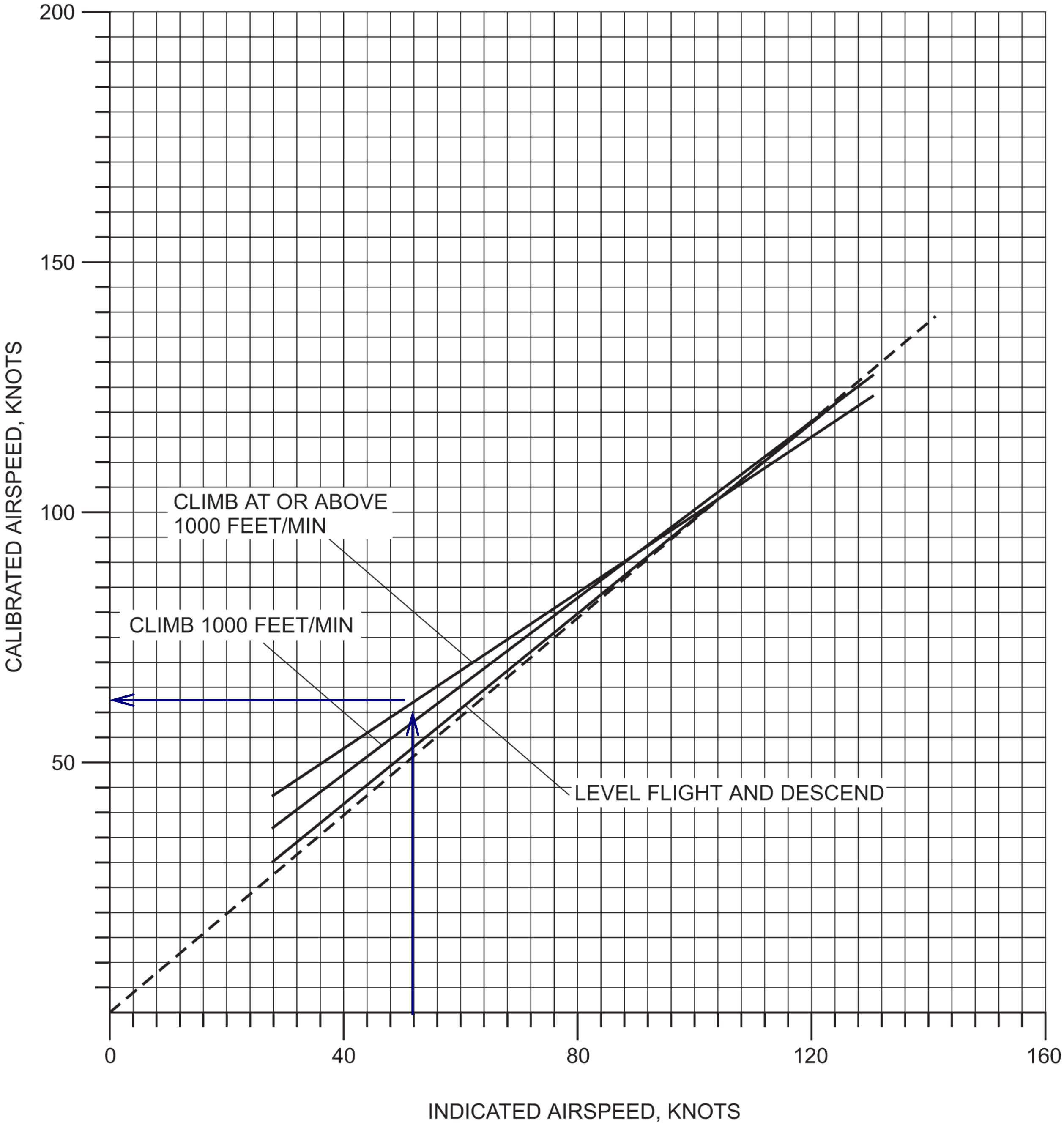

Fig.4-2 (Sheet 1 of 2). Airspeed calibrations (Co-pilot)
(BRITISH SYSTEM)

CO-PILOT INDICATOR AIRSPEED
STATIC AIR PRESSURE VALVE IN MAIN POSITION
CLIMB, LEVEL FLIGHT, DESCENT

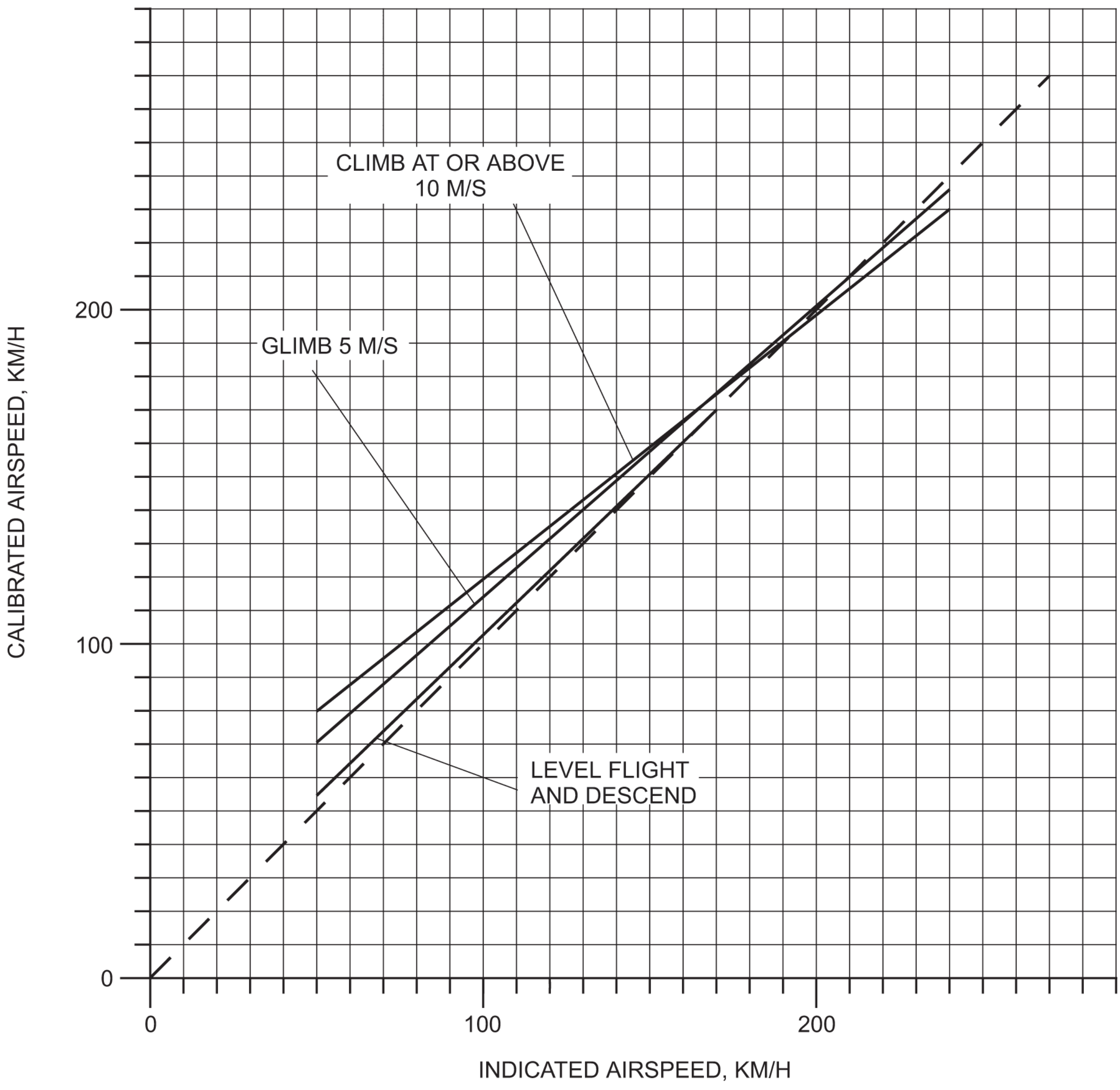

Fig.4-2 (Sheet 2 of 2). Airspeed calibrations (Co-pilot)
(METRIC SYSTEM)

PILOT AIRSPEED INDICATOR

STATIC AIR PRESSURE VALVE IN EMERGENCY POSITION

CLIMB, LEVEL FLIGHT, DESCENT

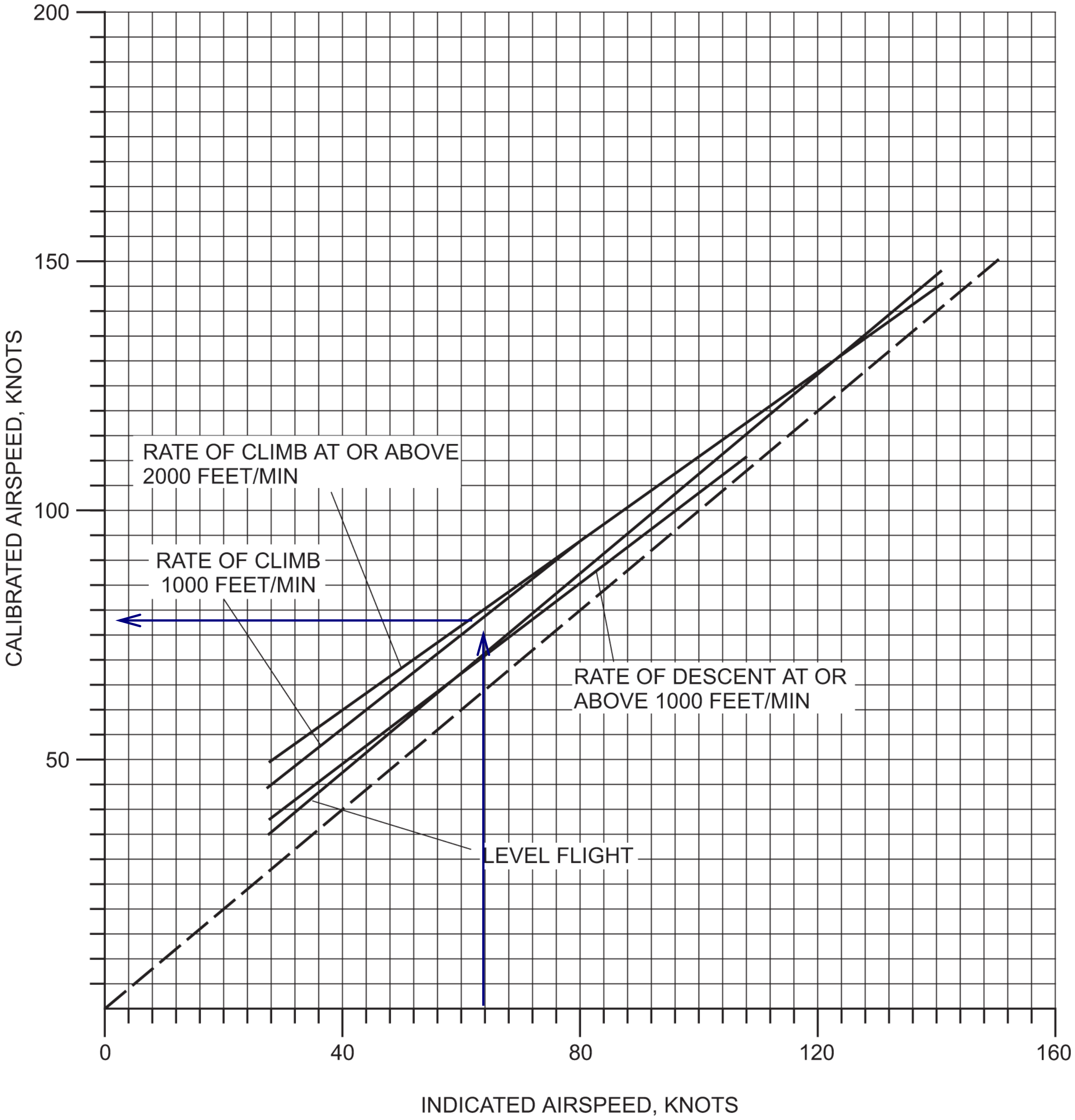

Fig.4-3 (Sheet 1 of 2). Airspeed calibrations (Pilot, Emergency Static)

(BRITISH SYSTEM)

PILOT AIRSPEED INDICATOR
STATIC AIR PRESSURE VALVE IN EMERGENCY POSITION
CLIMB, LEVEL FLIGHT, DESCENT

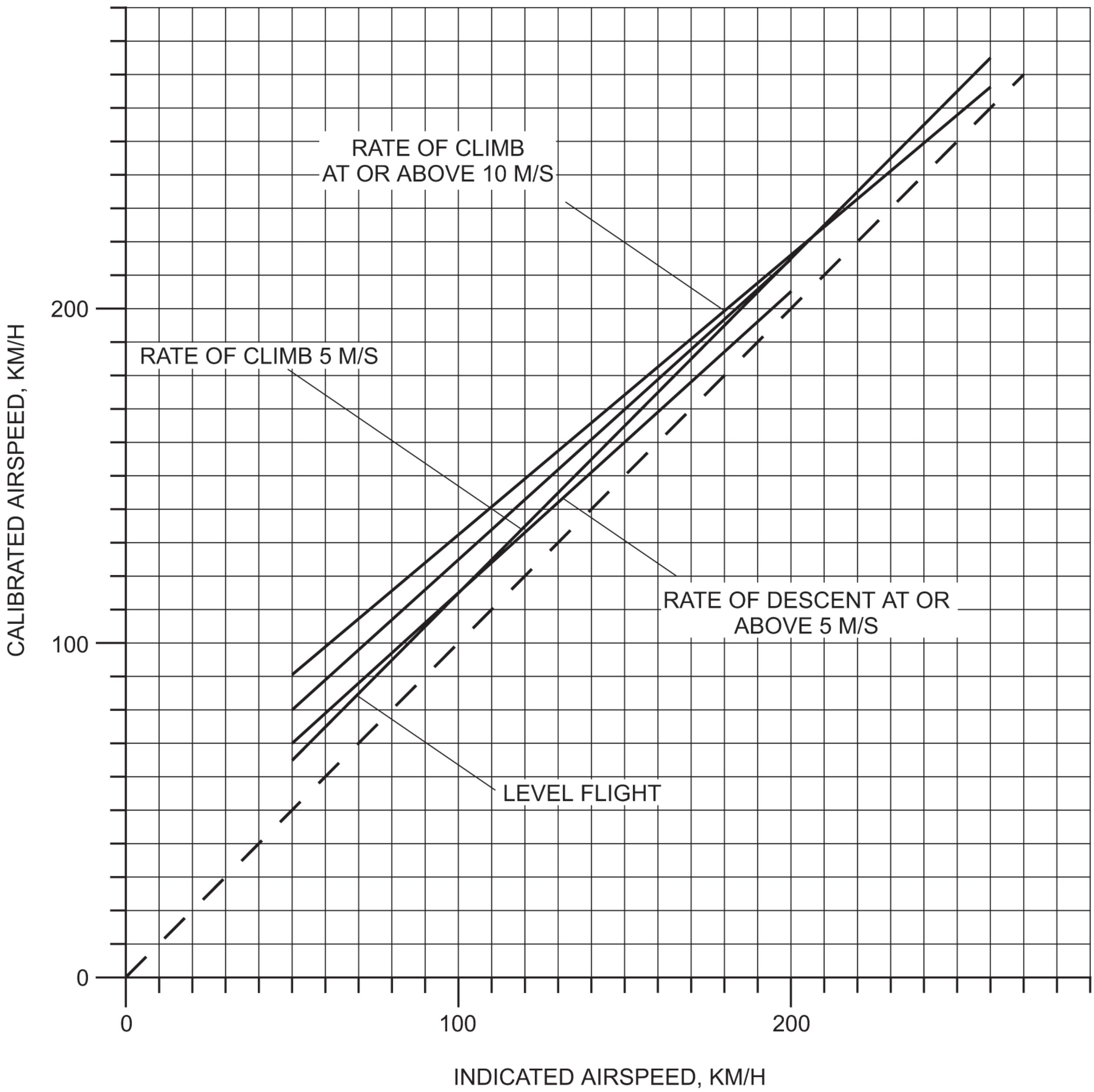

Fig.4-3 (Sheet 2 of 2). Airspeed calibrations (Pilot, Emergency Static)
(METRIC SYSTEM)

ALTIMETER CORRECTIONS

The Altimeter Correction chart (Fig. 4-4) provides height increment ∆H for all indicated altitudes versus IAS and the position of the static air pressure valve.

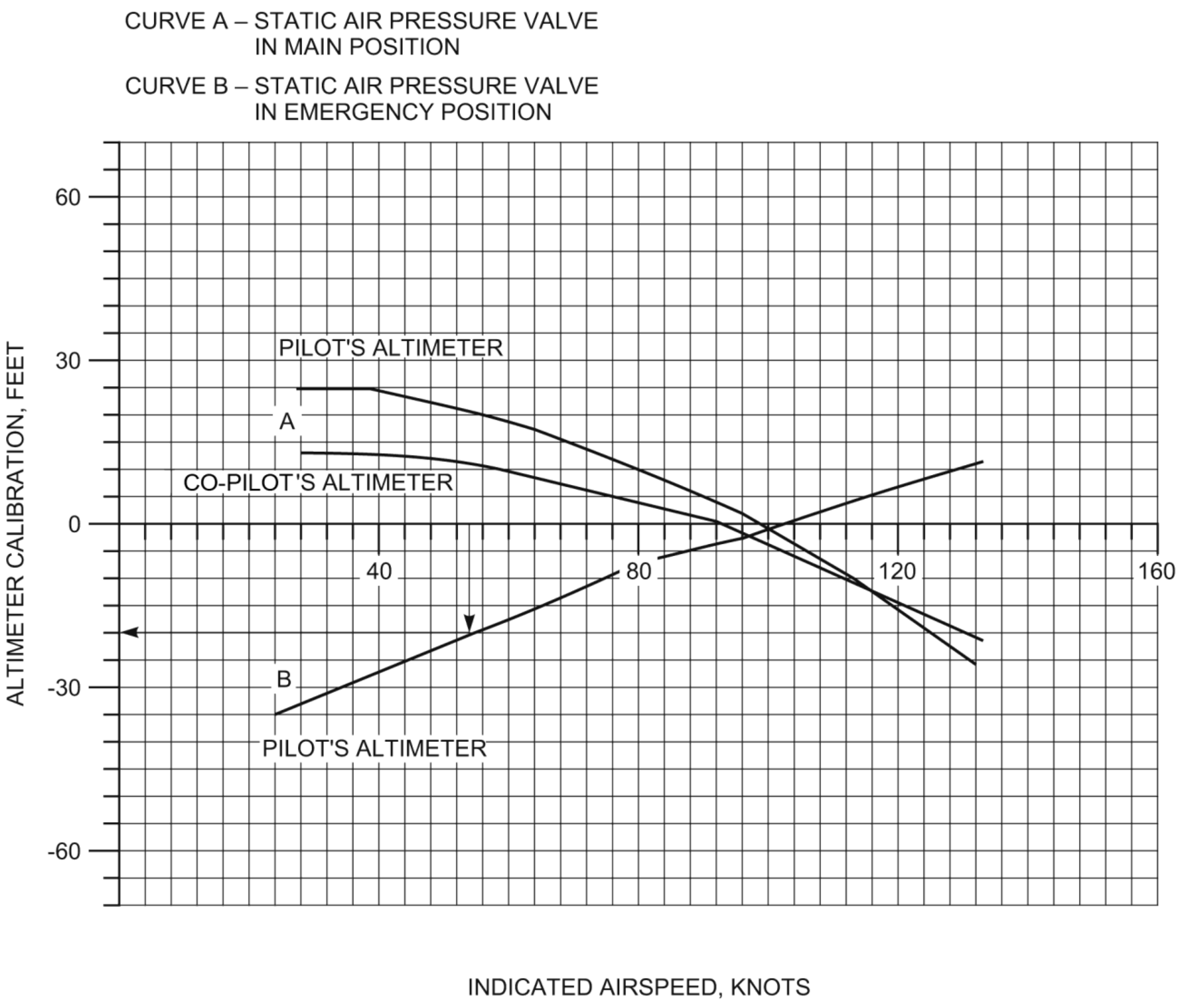

Fig. 4-4 (Sheet 1 of 2). Altimeter error correction.
(BRITISH SYSTEM)

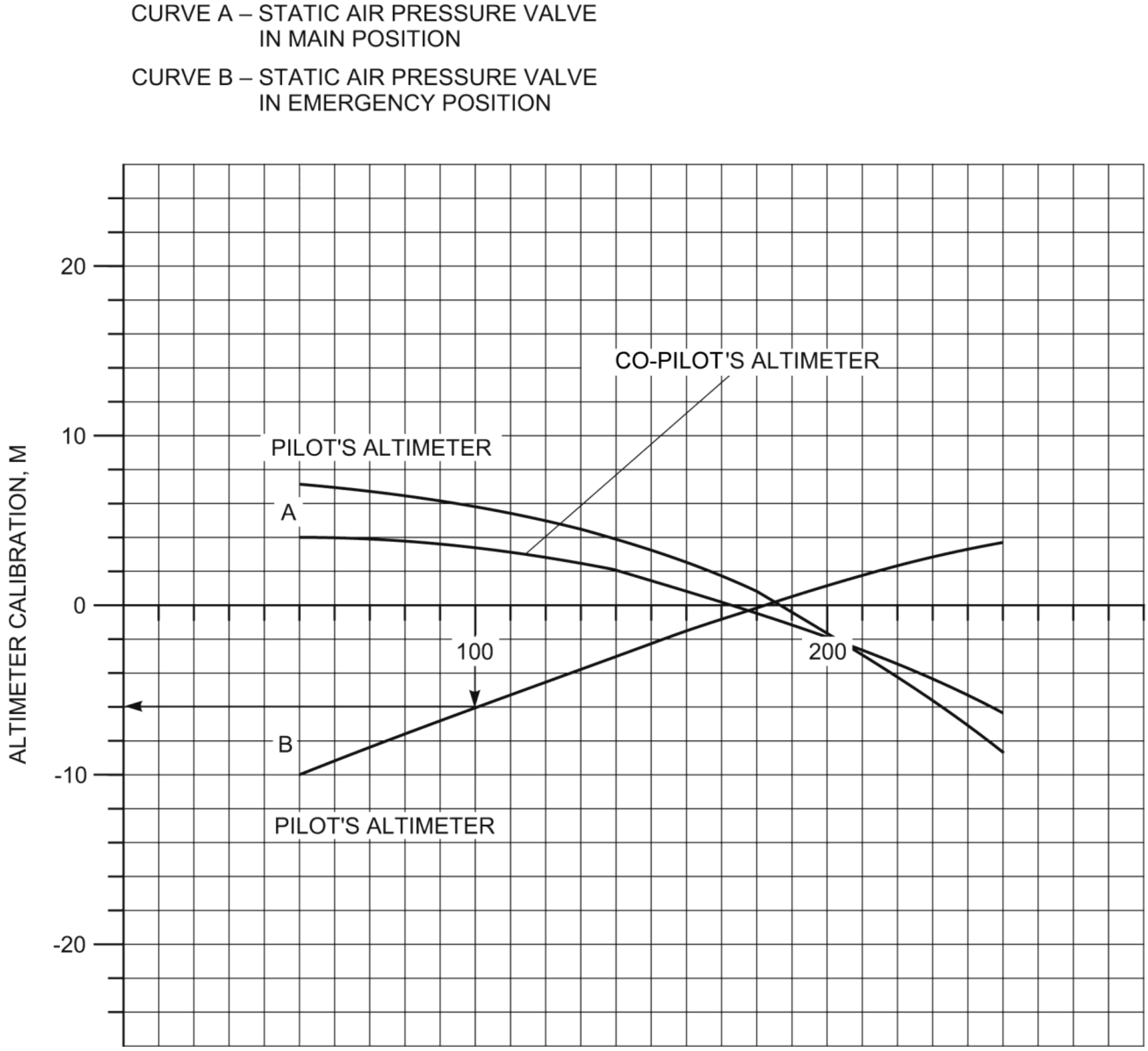

Fig. 4-4 (Sheet 2 of 2). Altimeter error correction.

(METRIC SYSTEM)

POWER ASSURANCE CHECK

POWER ASSURANCE CHECK ON GROUND

Power assurance check is performed on ground when required.

The wind velocity should be no less than 10 knots (5 m/s).

Before check, proceed as follows:

- according to Fig. 4-5 determine the gas generator RPM N_1 and gas temperature ITT under specific conditions on ground (according to the OAT and pressure);
- write down the obtained result to be used during the check.

<u>Example:</u> (see chart fig. 4-5)

Determine: Gas Generator RPM N_1 and ITT

Known: OAT +18°C

Pressure 1000 mBars

Solution: Enter chart at temperature +18°C

1. Move upward vertically to pressure value known 1000 mBars
2. Move horizontally to the left left and read ITT= 895 °C
3. Move horizontally to the right and read N_1= 97.6%

Procedure:

Engines...Start, Warm up

AUTO ENG LH (and RH) – OFF-MAN ENG switches on engine icing panel..OFF, Verify

AIR SUPPLY CARGO CABIN PILOT switches ....OFF, Verify

Helicopter ....Turn into wind

Throttle lever of the engine under test...............................AUTO

Throttle lever of the other engine....................................... towards IDLE till N_1 reaches 78…80% (no less than 78%)

By smooth upward movement of the collective lever, with the highest accuracy possible match the side index of the engine under test with the top edge of the central middle mark on the power indicator.

NOTE. The collective pitch lever must be moved one-way, only upward. If the center mark is passed over, lower the collective lever to the stop and repeat the procedure.

Maintain the power after matching the side index with the upper edge of the central middle mark without changing the position of the collective lever for 20 s.

Make sure that the index positions are not changed.

Compare the gas generator RPM and the gas temperature ITT values measured by the corresponding instruments of the engine under test with the values taken from the chart.

If gas generator RPM and gas temperature ITT values do not exceed the values taken from the chart the engine is capable to develop the required power. If the obtained values exceed those taken from the chart the engine is subject to an additional check and adjustment according to the Maintenance manual.

The checking procedure for the second engine is similar.

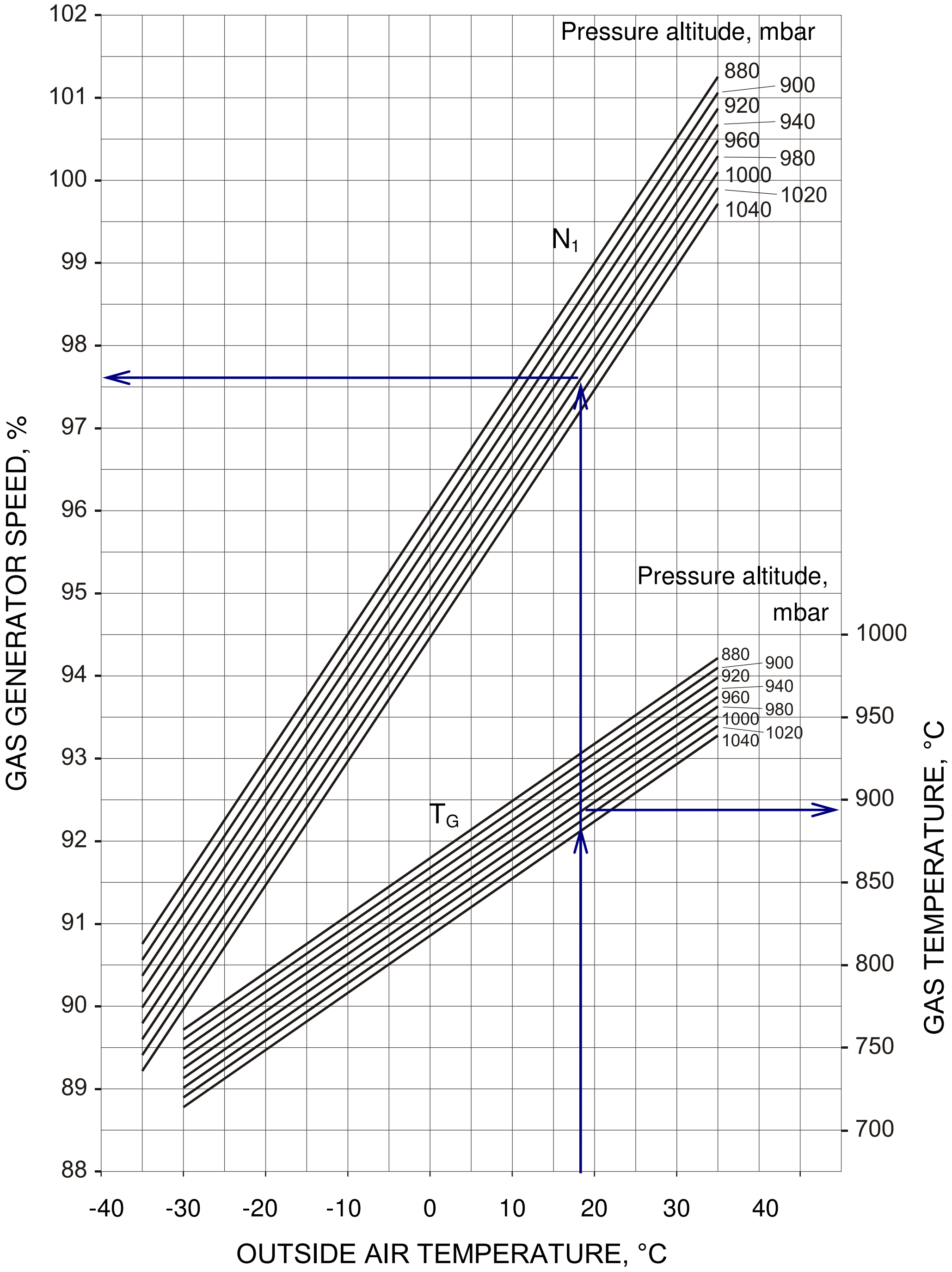

Fig. 4-5 (Sheet 1 of 2). Power assurance check chart.

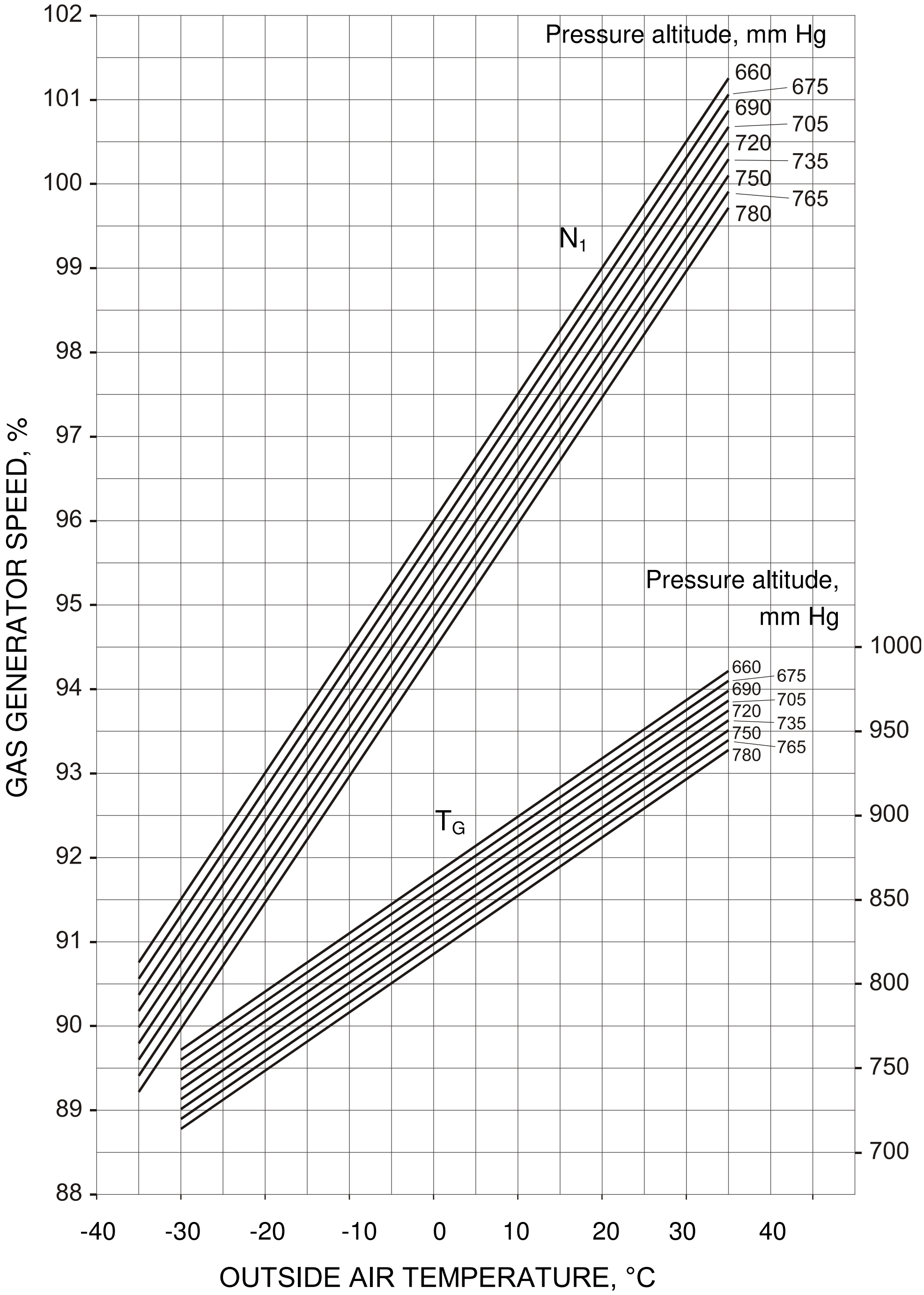

Fig. 4-5 (Sheet 2 of 2). Power assurance check chart.

POWER ASSURANCE CHECK IN FLIGHT

Before check, proceed as follows:

- according to Fig. 4-5 determine the gas generator RPM N_1 and gas temperature ITT under specific conditions (according to the OAT and pressure);
- write down the obtained result to be used during the check.

Example: (see chart fig. 4-5)

Determine: Gas Generator RPM N_1 and ITT

Known: OAT +18°C

Pressure 1000 mBars

Solution: Enter chart at temperature +18°C

1. Move upward vertically to the pressure value known 1000 mBars
2. Move horizontally to the right and read ITT= 895°C
3. Move horizontally to the left and read N_1= 97.6%

Procedure:

Airspeed ....40 KIAS (70 km/h), Maintain

AUTO ENG LH (and RH) – OFF-MAN ENG switches on engine icing panel...OFF, Verify

AIR SUPPLY CARGO CABIN PILOT switches ....OFF, Verify

Throttle levers of both engines...AUTO

By smooth upward movement of the collective lever, with highest accuracy possible match the side indexes on the power indicators of the engines under test with the top edge of the central middle mark.

NOTE. The collective pitch lever must be moved one-way, only upward. If the center mark is passed over, lower the collective lever to the stop and repeat the procedure.

NOTE. Due to power excess, the helicopter may proceed to climb.

Maintain the power after matching the side indexes with the upper edge of the central middle mark without changing the position of the collective lever for 20 s.

Make sure that the index positions are not changed.

Compare the instrument-measured values of the gas generators RPM and the gas temperature ITT of the engines under test with the values taken from the chart.

If gas generator RPM and gas temperature ITT values do not exceed the values taken from the chart, the engine is capable to develop the required power. If the values exceeded those taken from the chart, the engine is subject to additional check and adjustment according to the Maintenance manual.

HEIGHT-VELOCITY ENVELOPE

The height-velocity envelope (H-V envelope) versus OAT is shown in the height-velocity diagram (Fig. 4-6). The diagram indicates the area which is critical for the helicopter operation in case of one engine failure during takeoff, landing or while carrying out other operations near the ground.

The diagram specifies the conditions under which the helicopter can be safely landed onto smooth and firm surfaces when the engine suddenly becomes inoperative.

It is recommended to avoid entering the specified area.

WARNING. THE H-V ENVELOPE HAS BEEN DEMONSTRATED FOR DENSITY ALTITUDES OF UP TO 3000 FT (914 METERS).

THE H-V ENVELOPE HAS BEEN CALCULATED FOR DENSITY ALTITUDES HIGHER THAN 3000 FT (914 METERS).

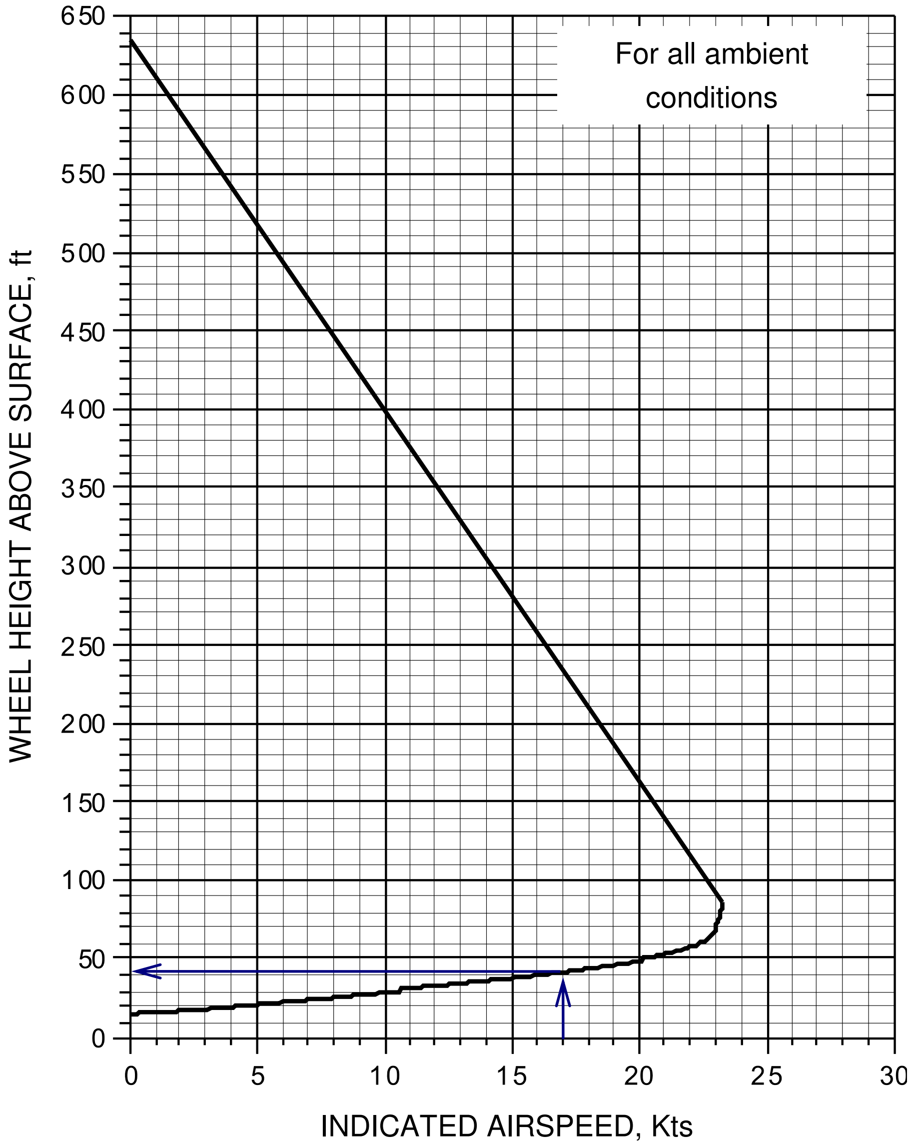

Fig. 4-6 (Sheet 1 of 2). Height-Velocity Diagram.

(BRITISH SYSTEM)

WARNING. THE H-V ENVELOPE HAS BEEN DEMONSTRATED FOR DENSITY ALTITUDES OF UP TO 3000 FT (914 METERS).

THE H-V ENVELOPE HAS BEEN CALCULATED FOR DENSITY ALTITUDES HIGHER THAN 3000 FT (914 METERS).

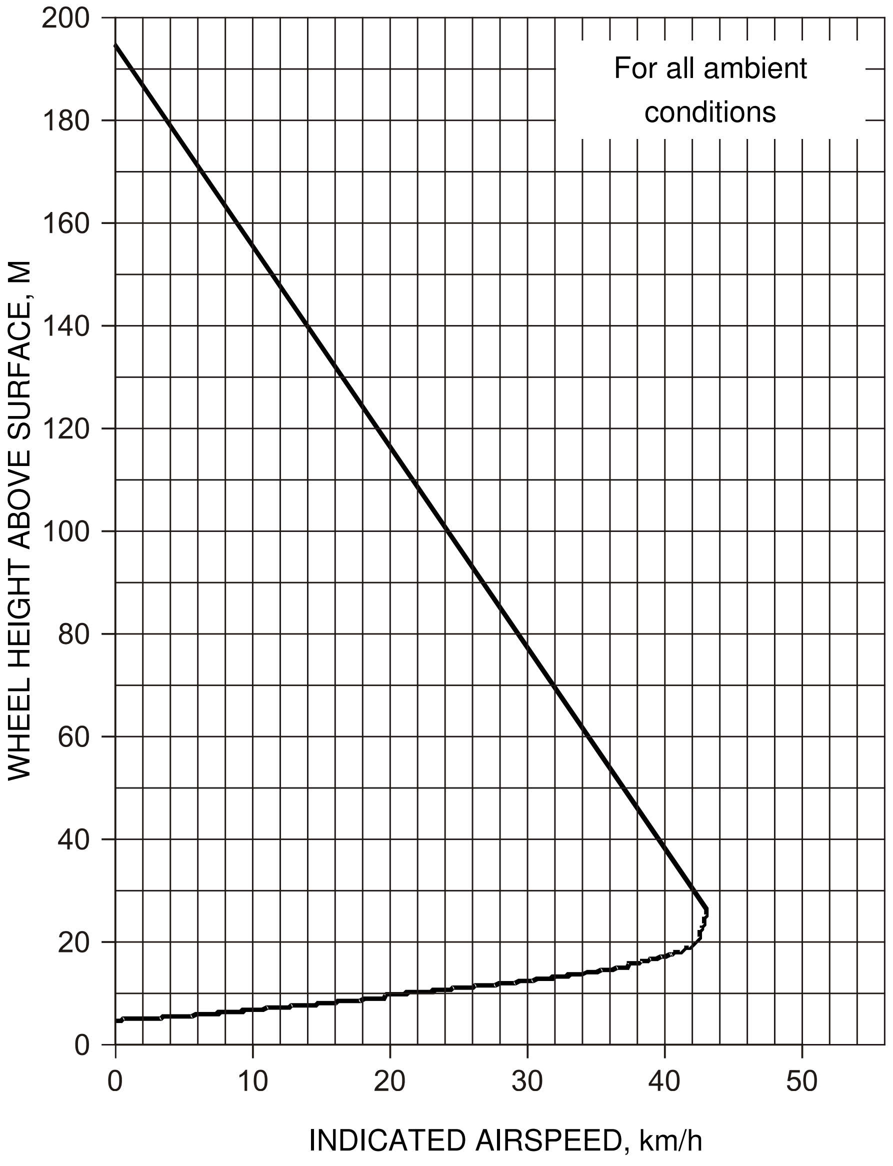

Fig. 4-6 (Sheet 2 of 2). Height-Velocity Diagram.

(METRIC SYSTEM)

HOVER CEILING

The Hover Ceiling charts (Fig. 4-7) specify maximum weights when hovering OGE and IGE for all pressure altitudes and outside air temperatures with anti-ice system (AIS) ON or OFF.

CAUTION. HOGE OPERATION MAY RESULT IN VIOLATION OF HEIGHT-VELOCITY ENVELOPE LIMITATIONS.

Hover ceiling charts (Fig. 4-7, Sheets 5, 6, 7 and 8) specify maximum weights while OGE hovering at maximum continuous engine power rating if it is required to hover OGE for extended period of time.

NOTE. All the charts are calculated for zero wind and zero humidity conditions. The wind does not reduce the helicopter performance.

<u>Example</u>: (see chart on fig. 4-7)

Determine: OGE Hover ceiling

Known:	OAT:	minus 16 °C
	Weight:	22250 lb
	Power rating:	Takeoff power (TOP)
	Anti-Icing Sys:	ON

Solution:
1. Enter the chart at OAT known (-16°C), move upwards;
2. Starting from the weight value known (22250 lb) move horizontally to the left;
3. At the lines crossing read pressure altitude (13000 ft).

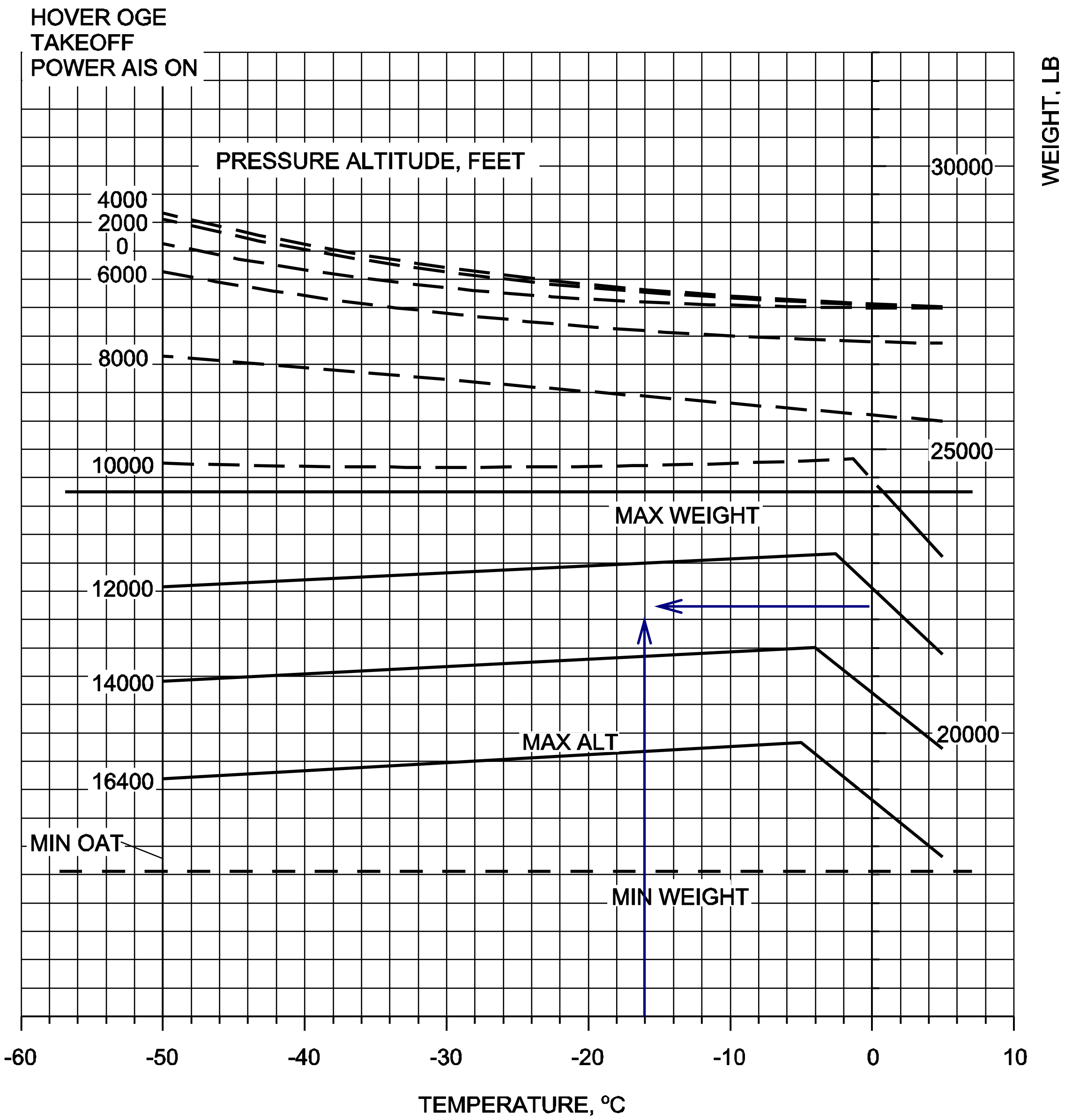

Fig. 4-7 (Sheet 1 of 10). Hover Ceiling.

(BRITISH SYSTEM)

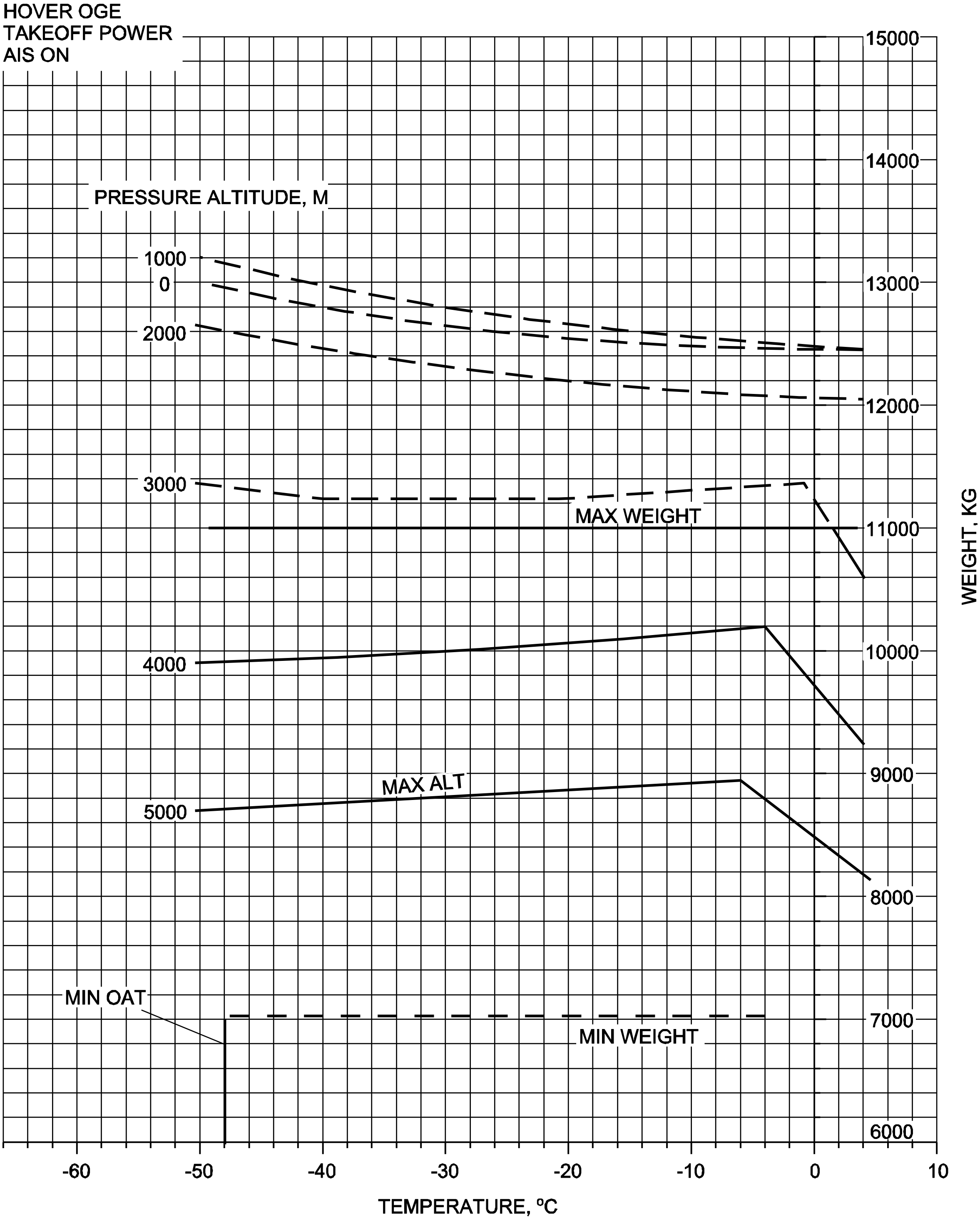

Fig. 4-7 (Sheet 2 of 10). Hover Ceiling.

(METRIC SYSTEM)

Example 1:
Determine: Max takeoff weight, HOGE
Known: OAT +35 °C
Pressure Altitude 1000 ft
Power rating Takeoff power (TOP)
AIS OFF
Solution:
1. Enter the chart at OAT +35.
2. Move upward vertically to the known altitude 1000 ft
3. The obtained max weight exceeds the maximum allowable weight mMAX
4. So, max takeoff weight – 24250 lb

Example 2:
Determine: Max takeoff weight, HOGE
Known: OAT +18 °C
Pressure Altitude 9000 ft
Power rating Takeoff power (TOP)
AIS OFF
Solution:
1. Enter the chart at OAT +18.
2. Move upward vertically to the known altitude 9000 ft
3. Starting from the point of intersection move to the left and read the maximum allowable weight mMAX
4. So, max takeoff weight – 23500 lb

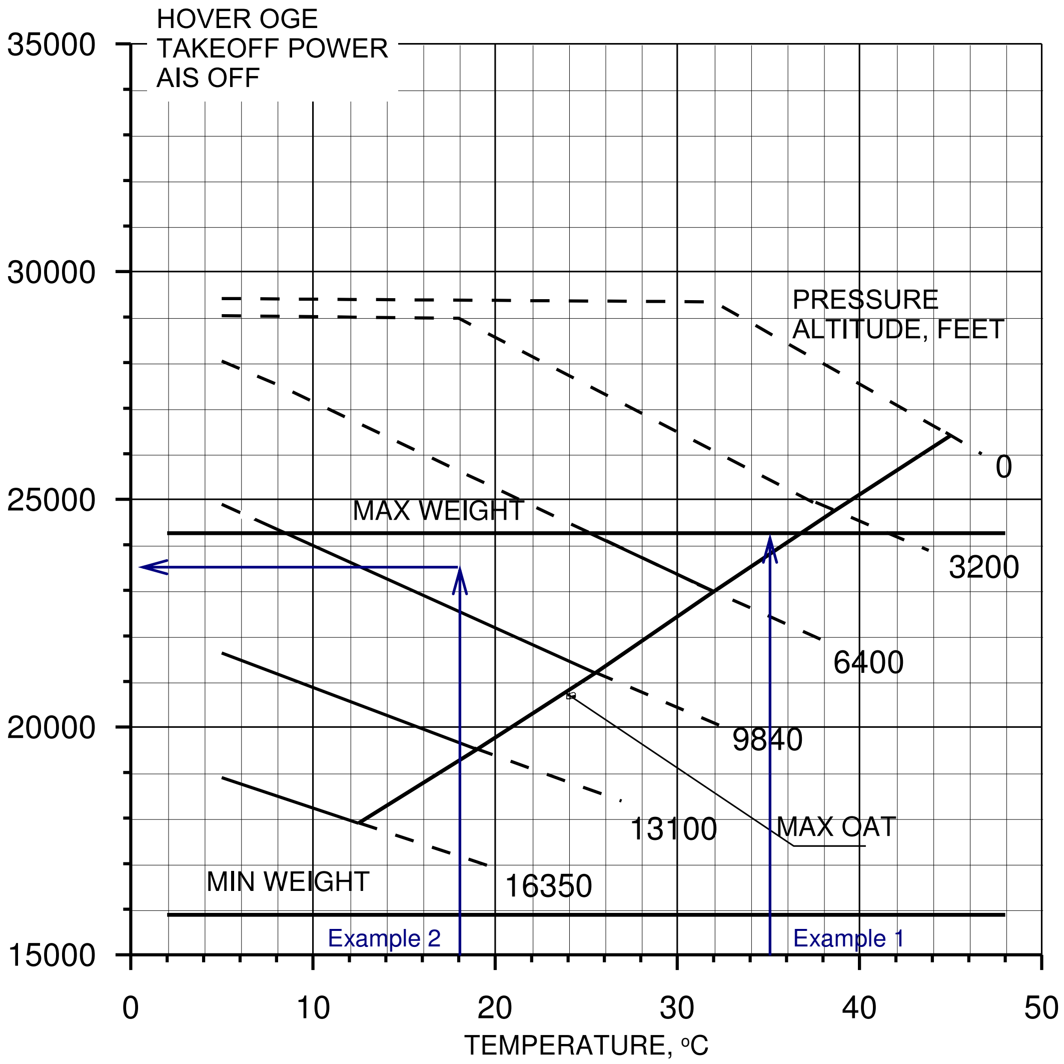

Fig. 4-7 (Sheet 3 of 10). Hover Ceiling.

(BRITISH SYSTEM)

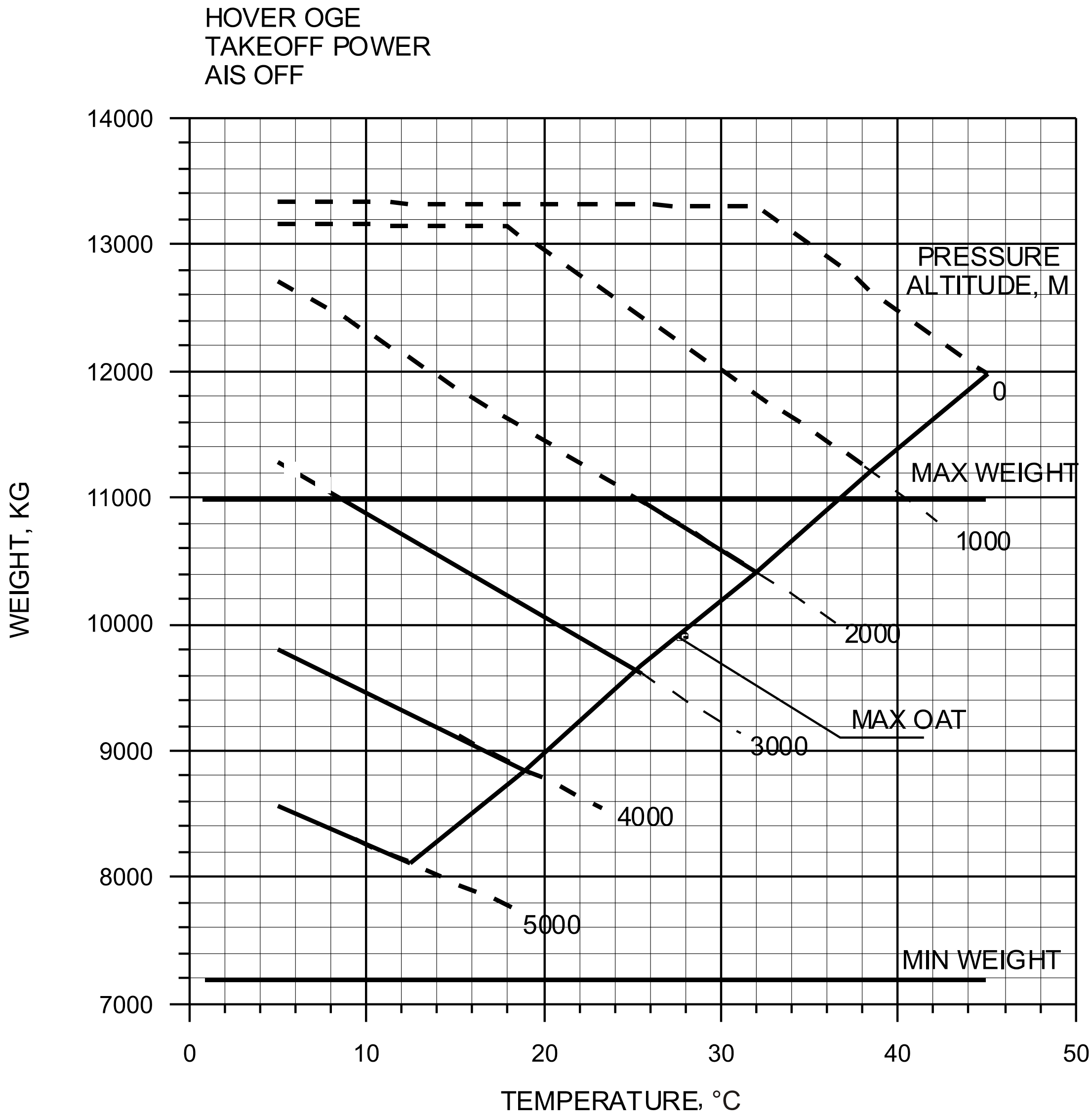

Fig. 4-7 (Sheet 4 of 10). Hover Ceiling.

(METRIC SYSTEM)

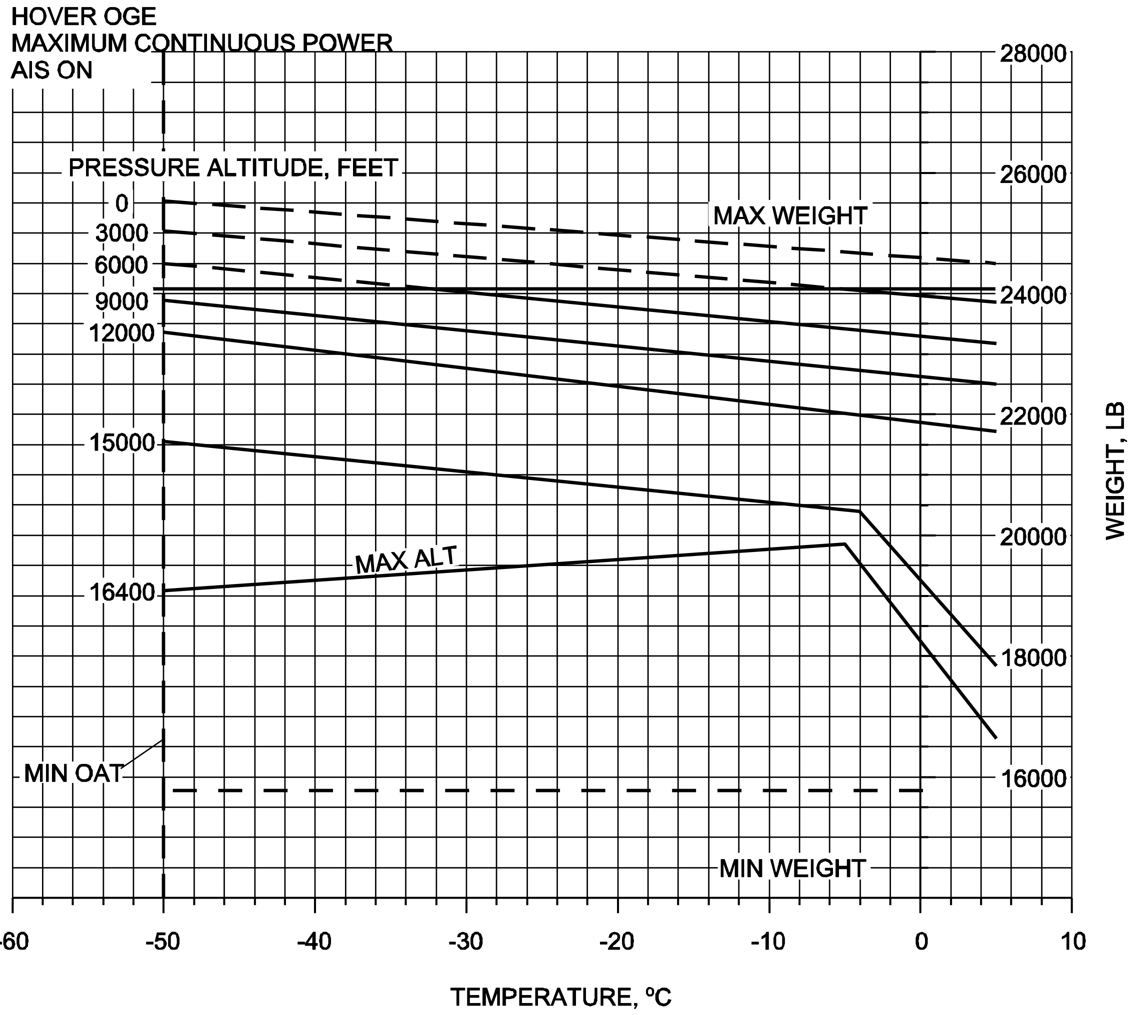

Fig. 4-7 (Sheet 5 of 10). Hover Ceiling.

(BRITISH SYSTEM)

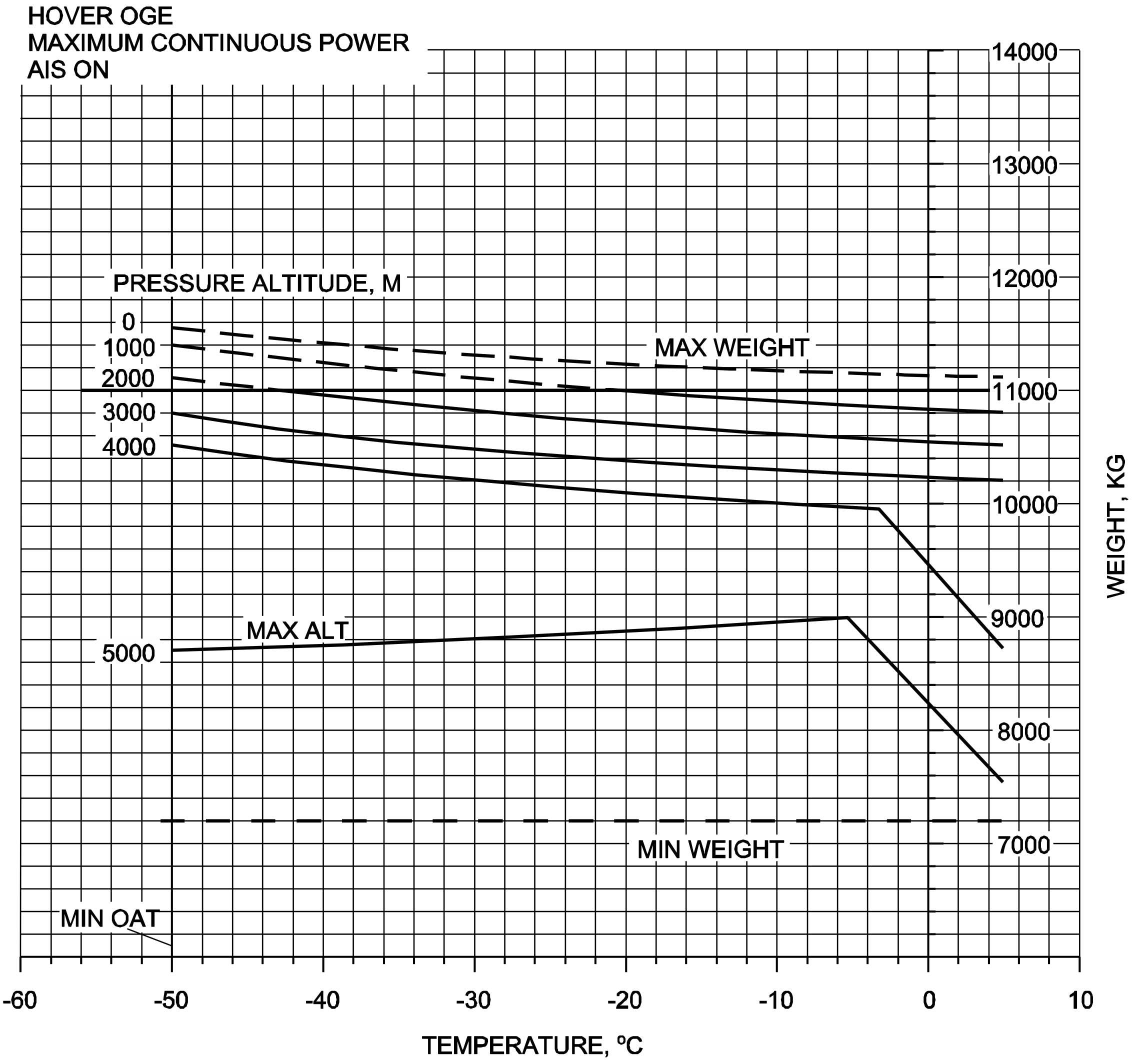

Fig. 4-7 (Sheet 6 of 10). Hover Ceiling.

(METRIC SYSTEM)

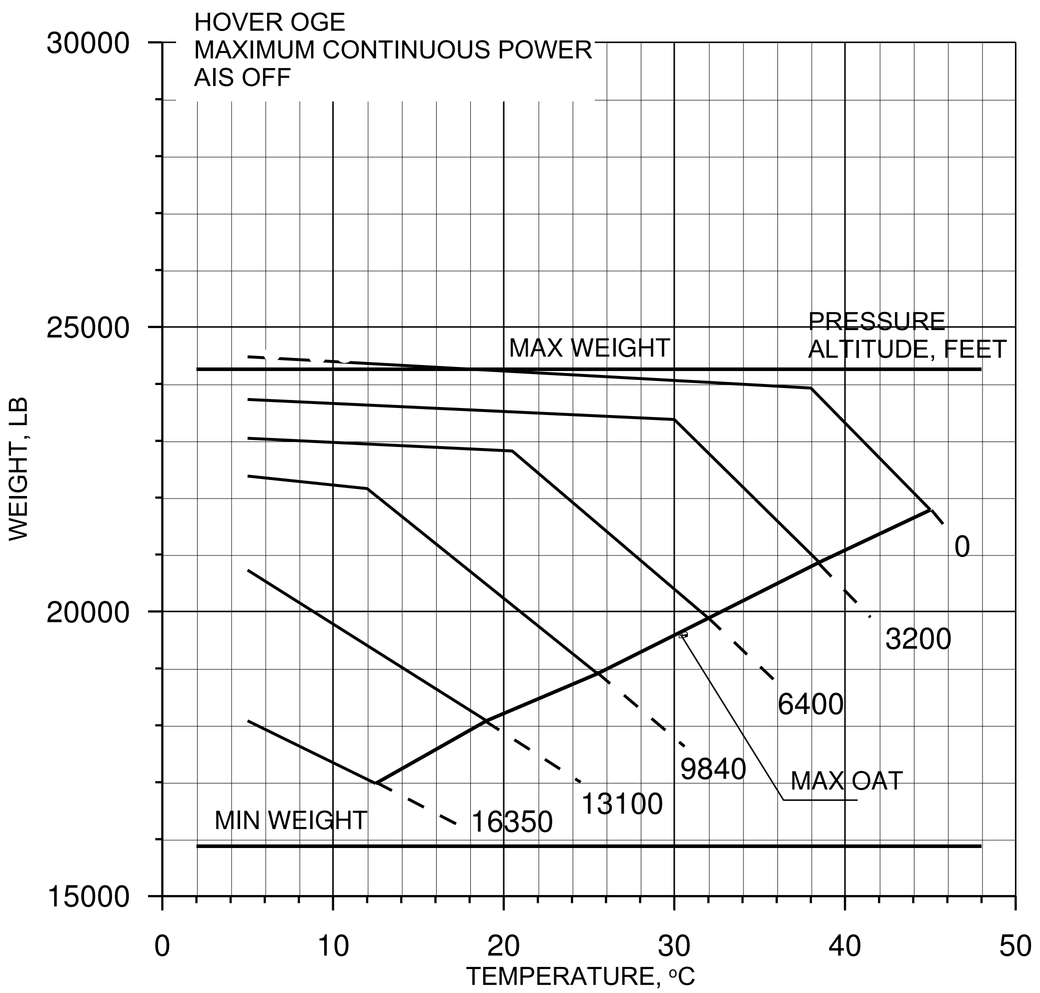

Fig. 4-7 (Sheet 7 of 10). Hover Ceiling.

(BRITISH SYSTEM)

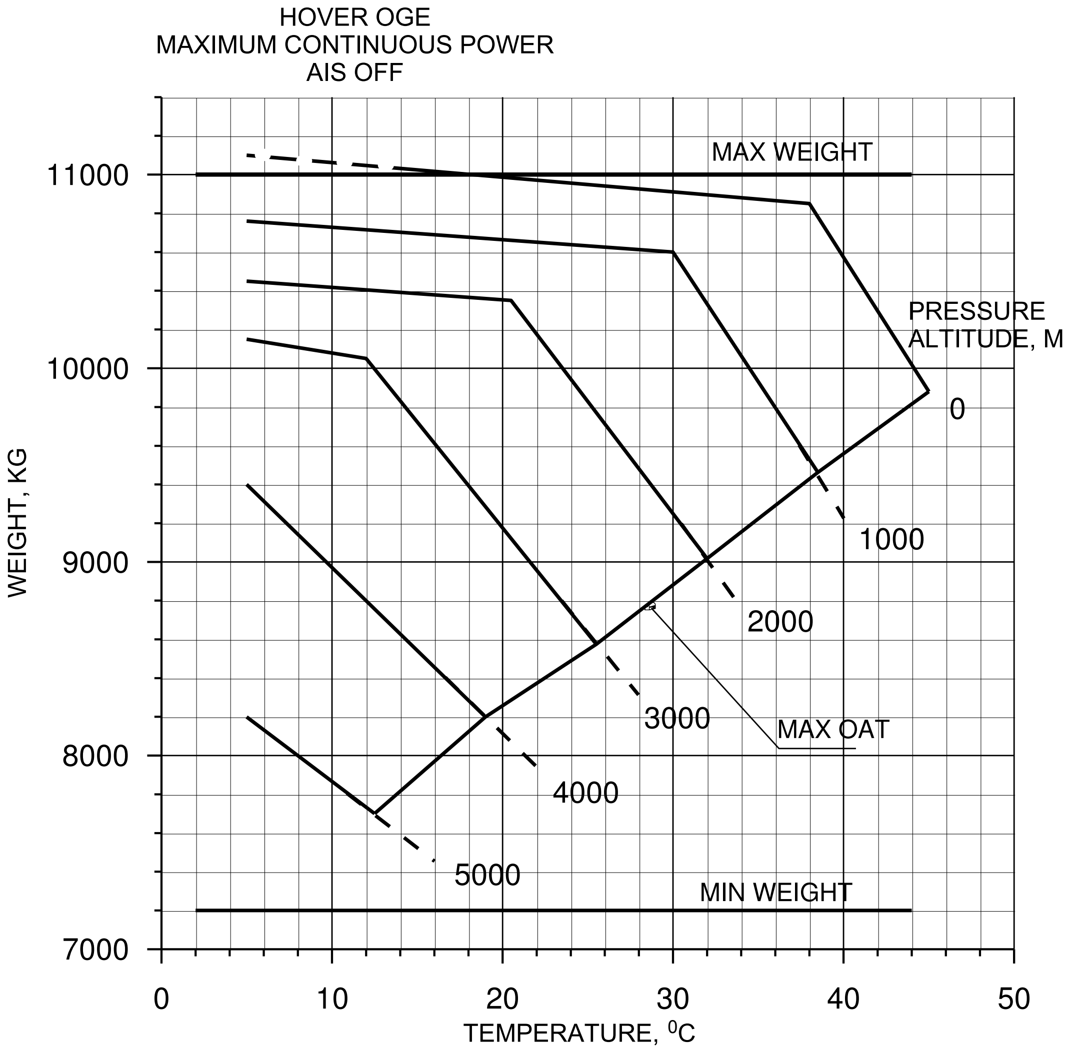

Fig. 4-7 (Sheet 8 of 10). Hover Ceiling.

(METRIC SYSTEM)

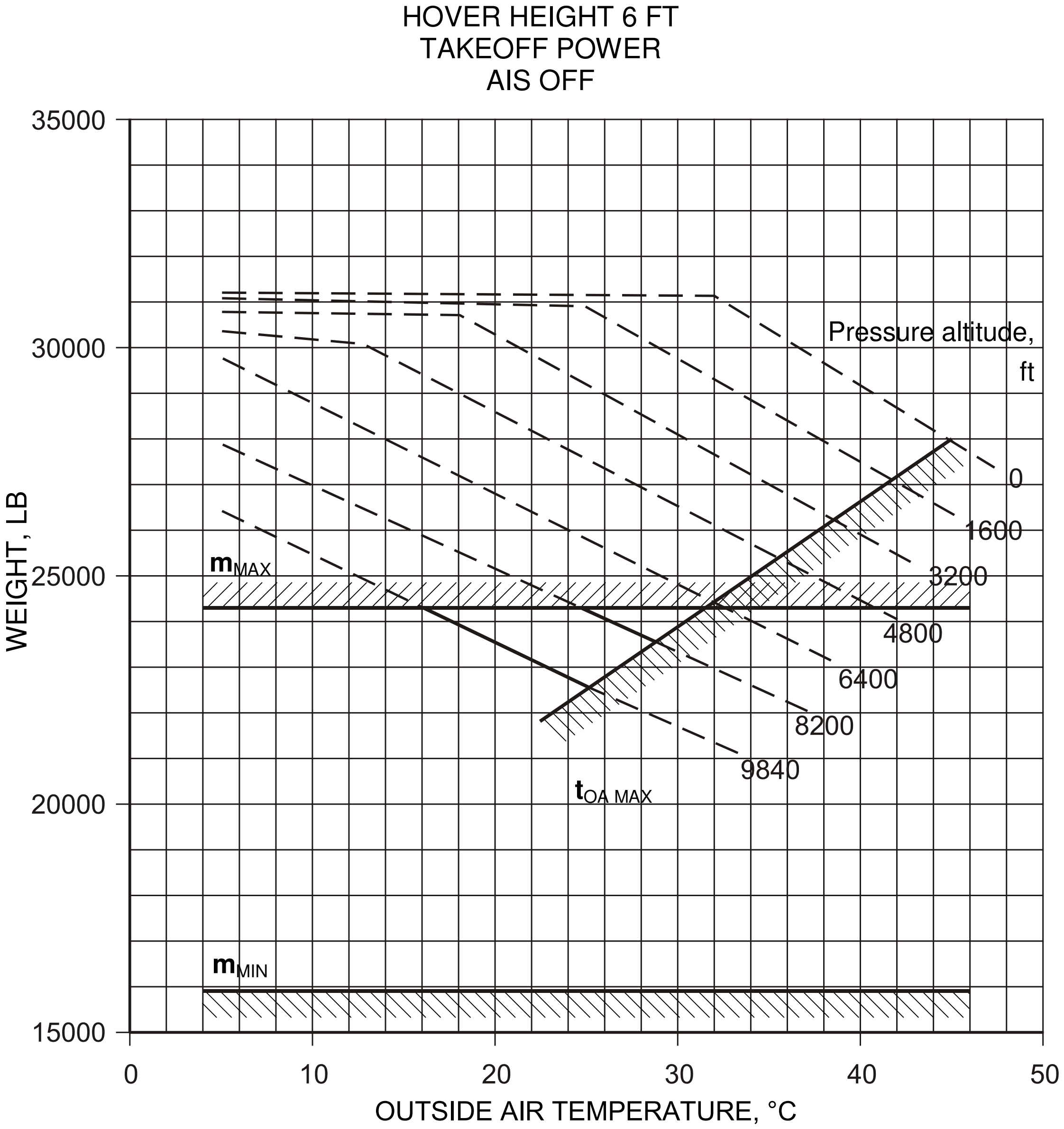

Fig. 4-7 (Sheet 9 of 10). Hover Ceiling.

(BRITISH SYSTEM)

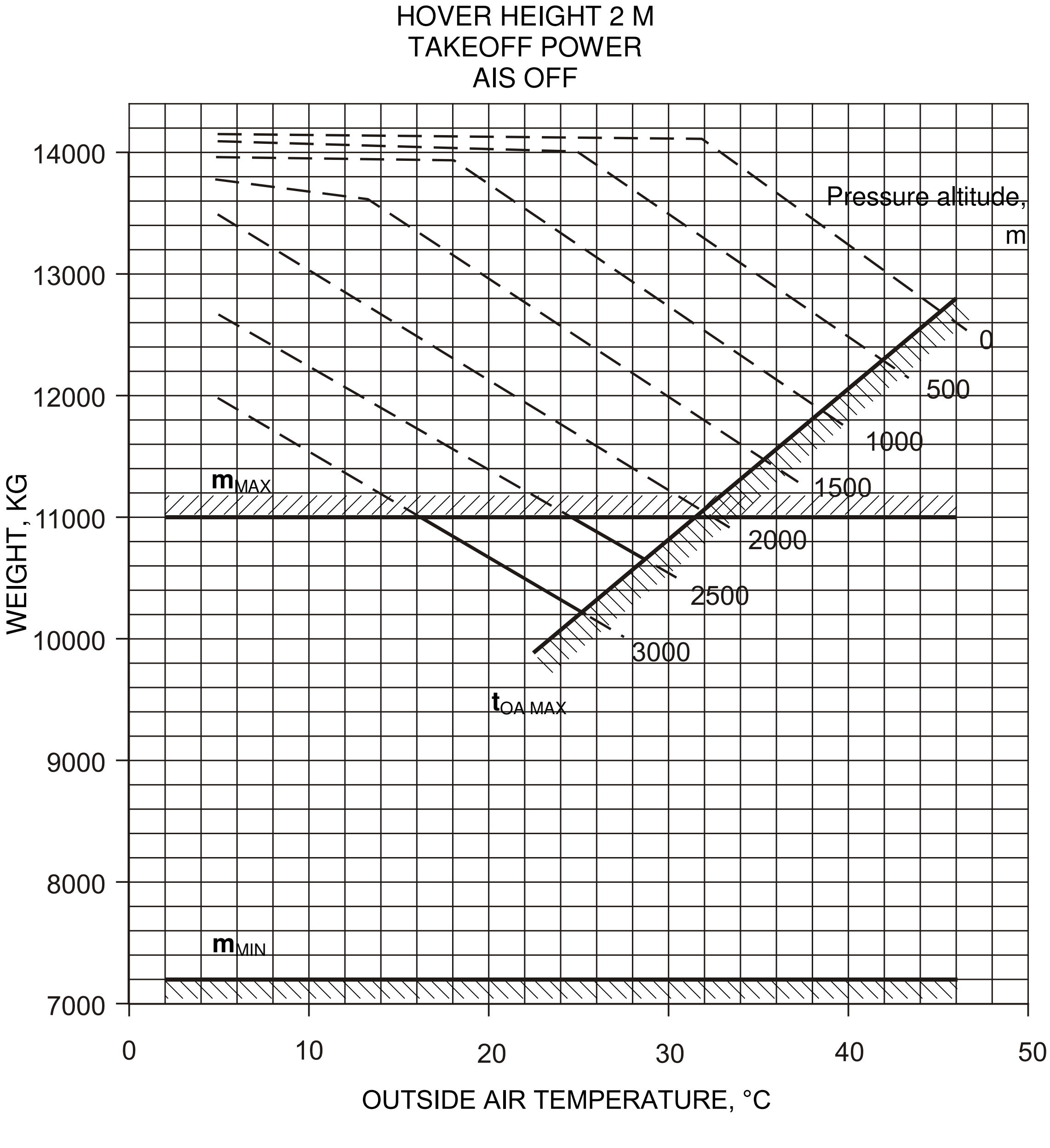

Fig. 4-7 (Sheet 10 of 10). Hover Ceiling.

(METRIC SYSTEM)

TAKEOFF. CATEGORY B

The recommended hover height for takeoff is 6 feet (2 m).

TAKEOFF DISTANCE FROM HOVER TO 15 METERS (50 FEET) HEIGHT

The takeoff distance is determined from the chart (Fig.4-9) provides takeoff performance data utilizing a takeoff profile as shown in Fig. 4-8.

The chart provides the takeoff distance from hover at 6 feet (2 m) to a height of 50 feet (15 m) at various combinations of gross weight, pressure altitude, outside air temperature and in zero wind conditions.

Continued takeoff and climb capability is NOT assured (Category B) if an engine failure occurs during takeoff. Category B takeoff profile (Fig. 4-8) assures the capability to land safely (on a smooth level surface) from any point of the takeoff profile in case of one engine failure.

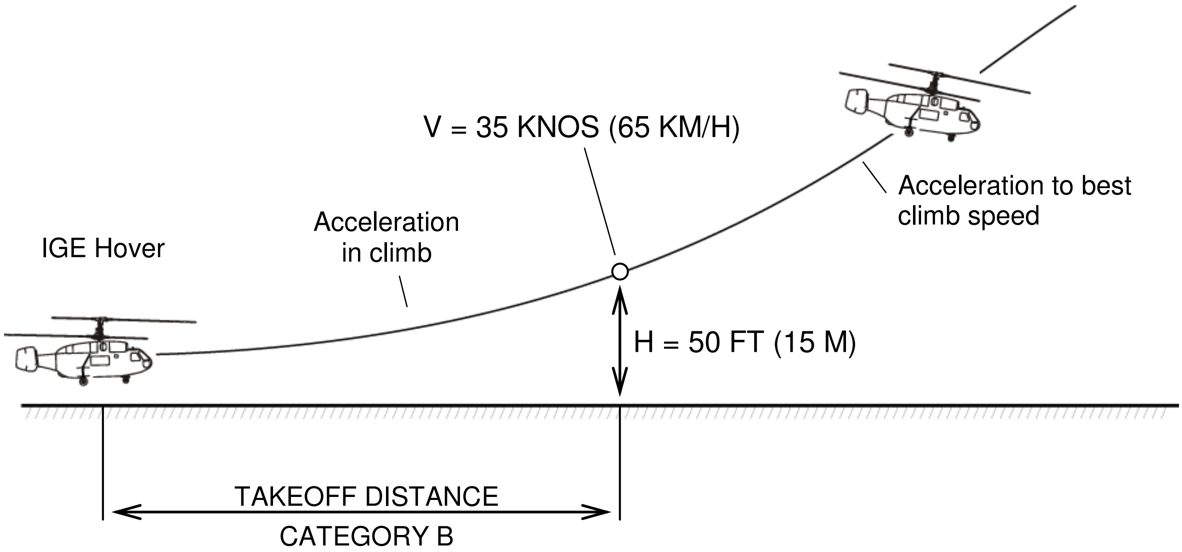

Fig. 4-8. Takeoff profile. Category B

Example: Determine takeoff distance

Known: Pressure Altitude 4900 ft

OAT +17 °C

Solution: 1. Enter chart at +17°C

2. Move vertically upwards to altitude line 4900 ft

3. Move horizontally left and read takeoff distance - 550 ft

AIS ON AT OAT +5 °C AND BELOW

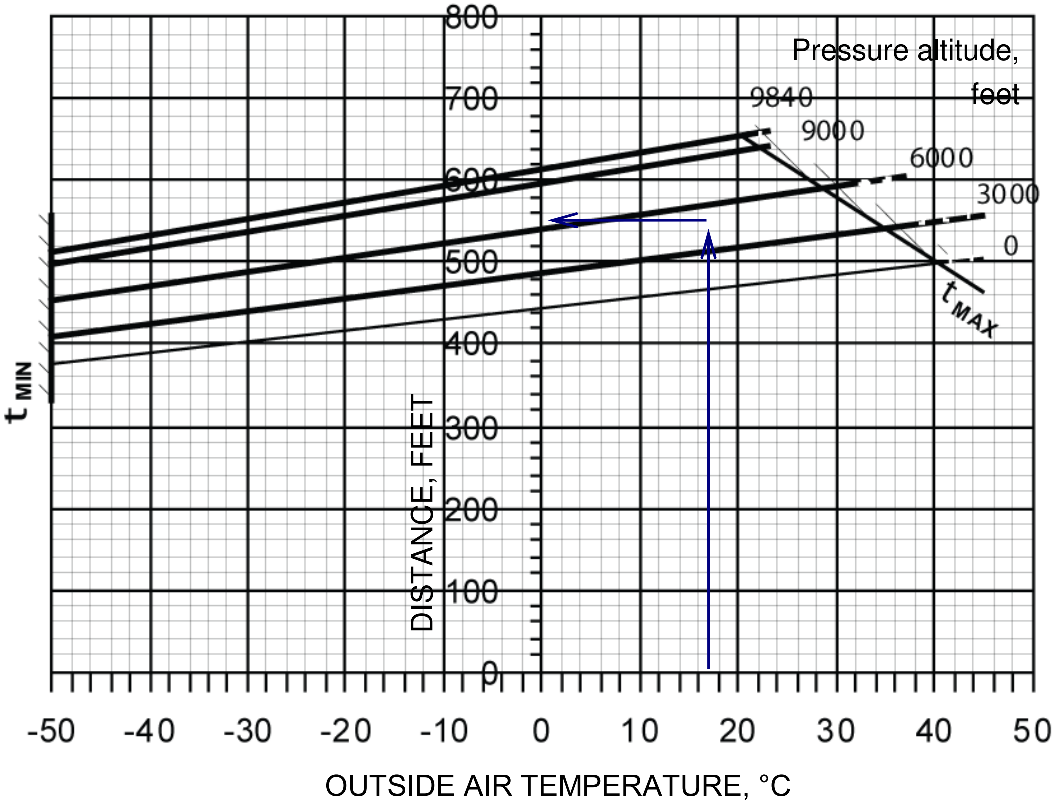

Fig. 4-9 (Sheet 1 of 2). Takeoff Distance.
(BRITISH SYSTEM)

AIS ON AT OAT +5 °C AND BELOW

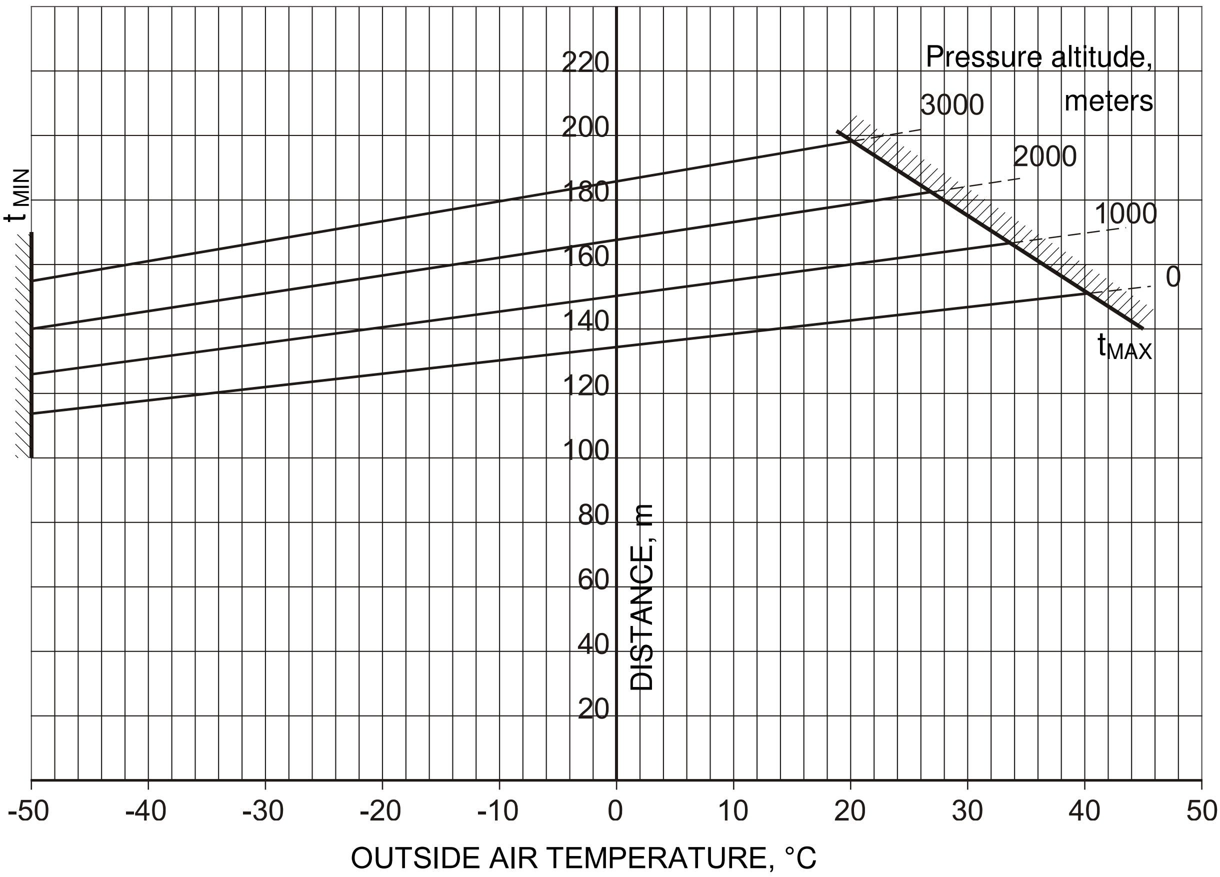

Fig. 4-9 (Sheet 2 of 2). Takeoff Distance.

(METRIC SYSTEM)

CLIMB

The Best Climb Speed chart (Fig. 4-10) provides the best climb speed that can be obtained at AEO takeoff power rating, ISA.

The change of the best climb speed versus Gross Weight is insignificant.

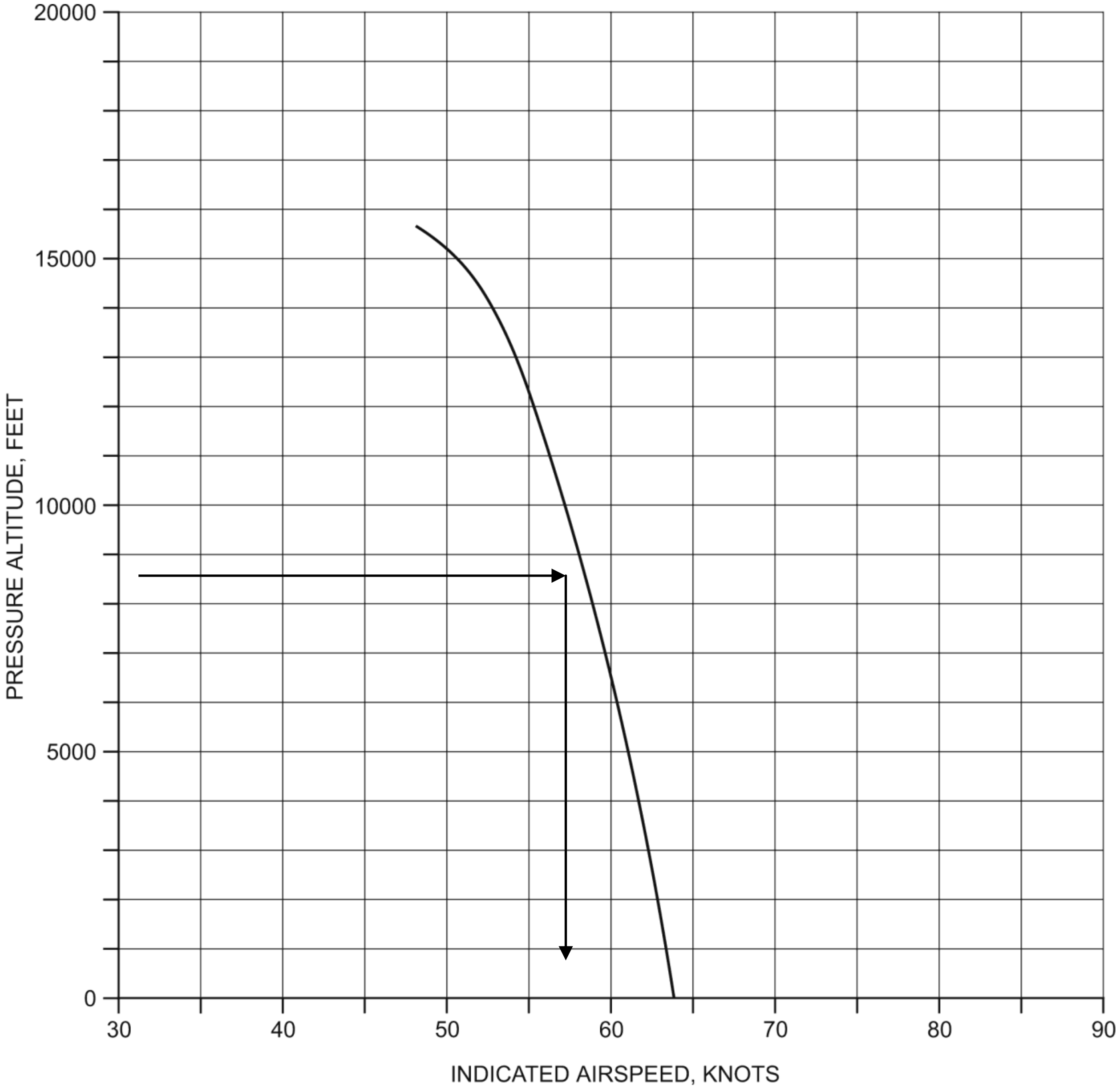

Fig. 4-10 (Sheet 1 of 2). Best Climb Speed.
(BRITISH SYSTEM)

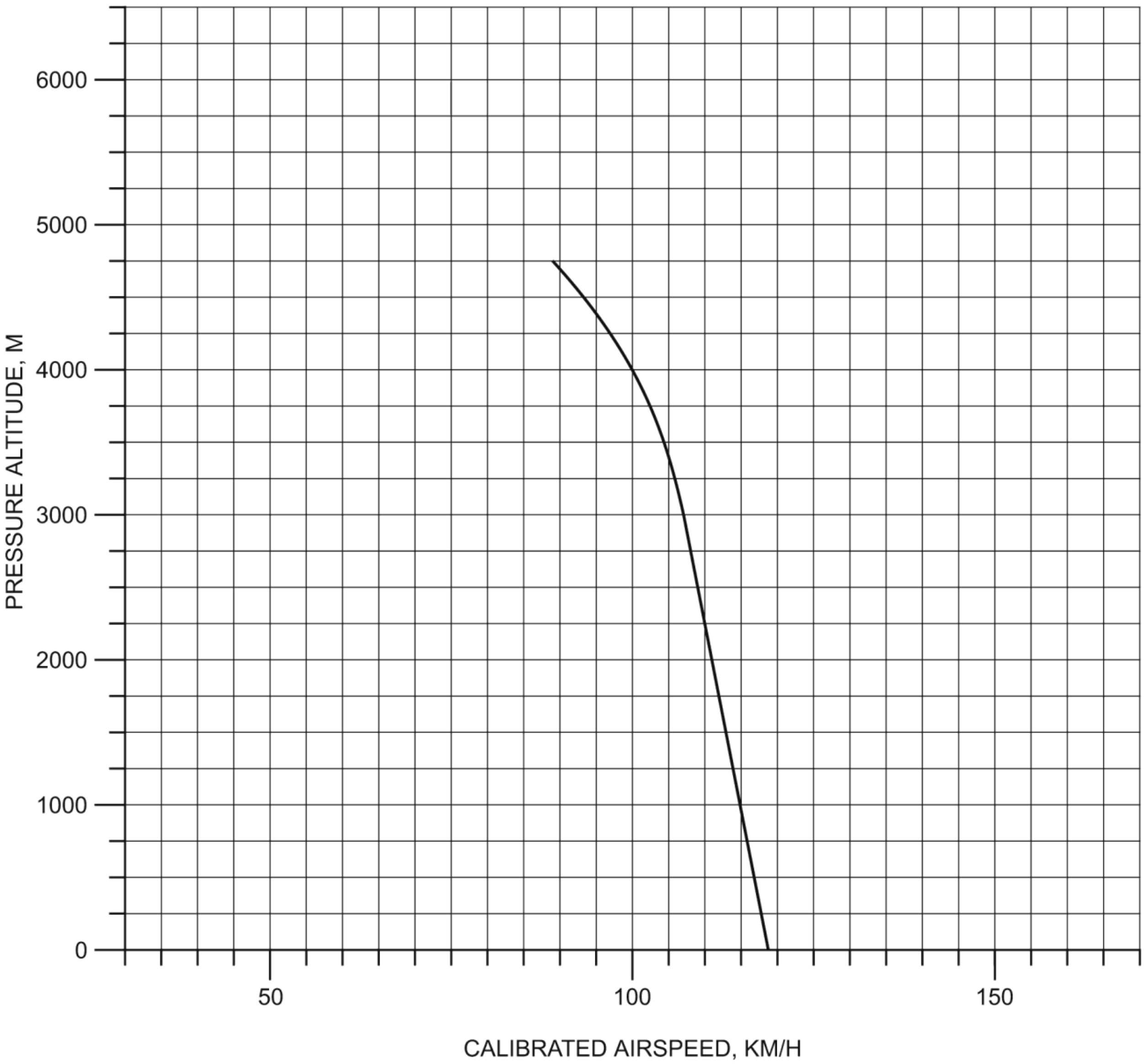

Fig. 4-10 (Sheet 2 of 2). Best Climb Speed
(METRIC SYSTEM)

RATE OF CLIMB

The charts (Fig. 4-11) show the AEO rate of climb at best climb speed with various combinations of pressure altitude, outside air temperature and gross weight, at maximum continuous engine power rating.

The charts (Fig. 4-12) show the rate of climb in OEI operation conditions at best climb speed with various combinations of pressure altitude, outside air temperature and gross weight, at 30-min. OEI power rating.

Example: Determine rate of climb

Known: Gross weight 23150 lb

Pressure altitude 0 (Sea level)

OAT +18 °C

Power rating: Maximum Continuous

Solution: 1. Enter the chart at OAT +18°C

2. Move vertically upward to intersection with the line Weight 23150 lb

3. Move horizontally left and read the rate of climb 2130 ft/min.

MAXIMUM CONTINUOUS POWER
AIS ON AT OAT + 5^{0}C AND BELOW

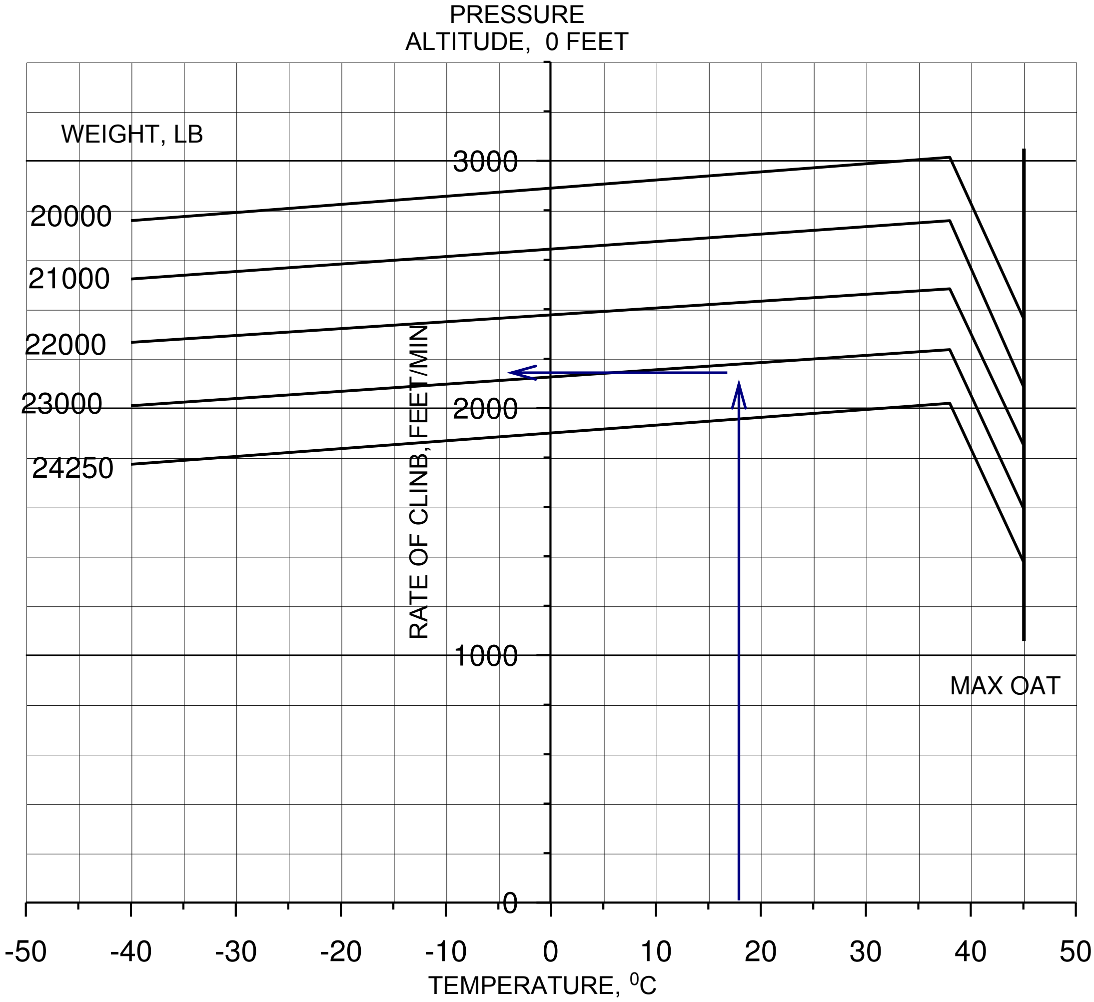

Fig. 4-11 (Sheet 1 of 12). AEO rate of climb.

(BRITISH SYSTEM)

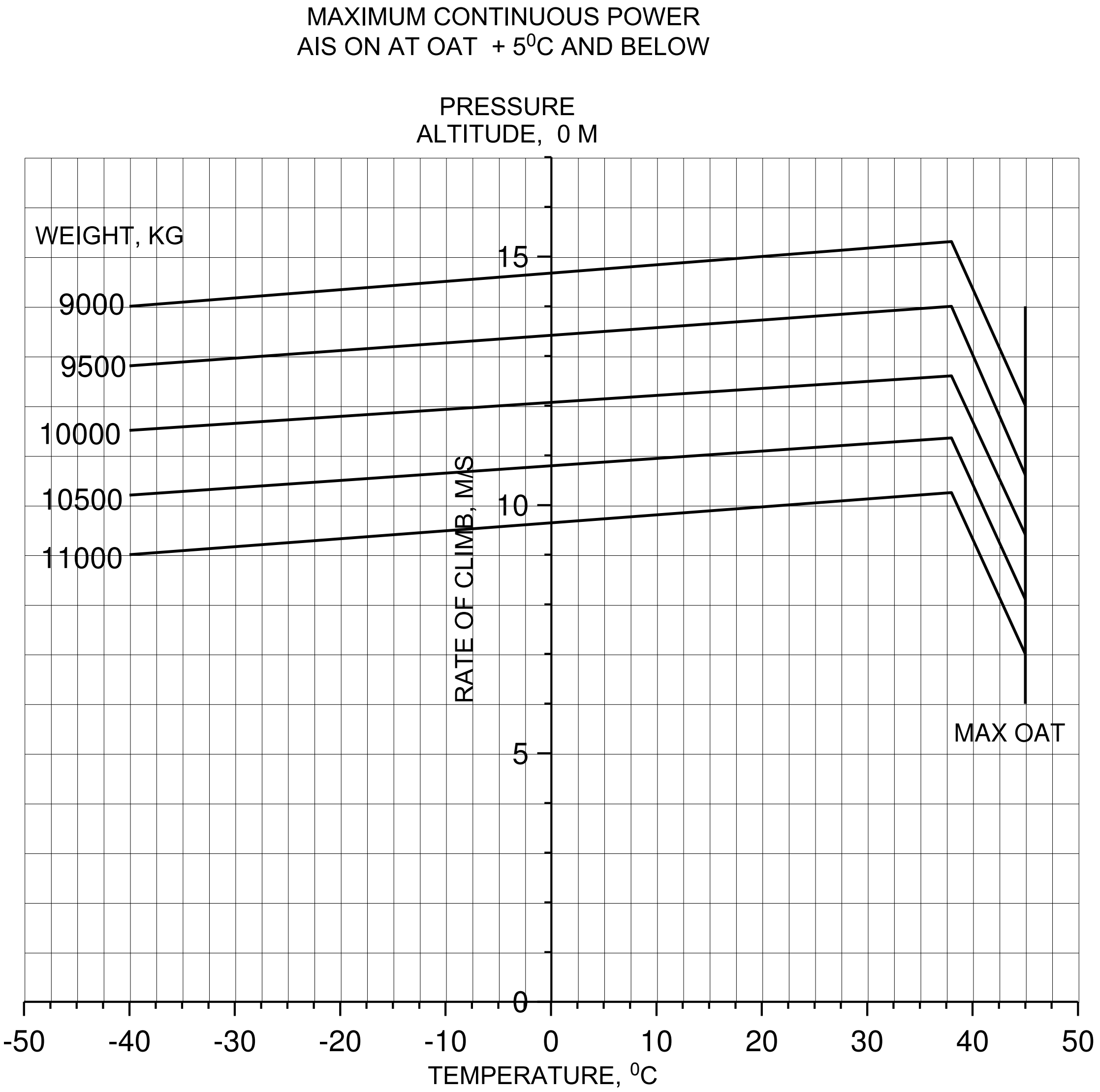

Fig. 4-11 (Sheet 2 of 12). AEO rate of climb.

(METRIC SYSTEM)

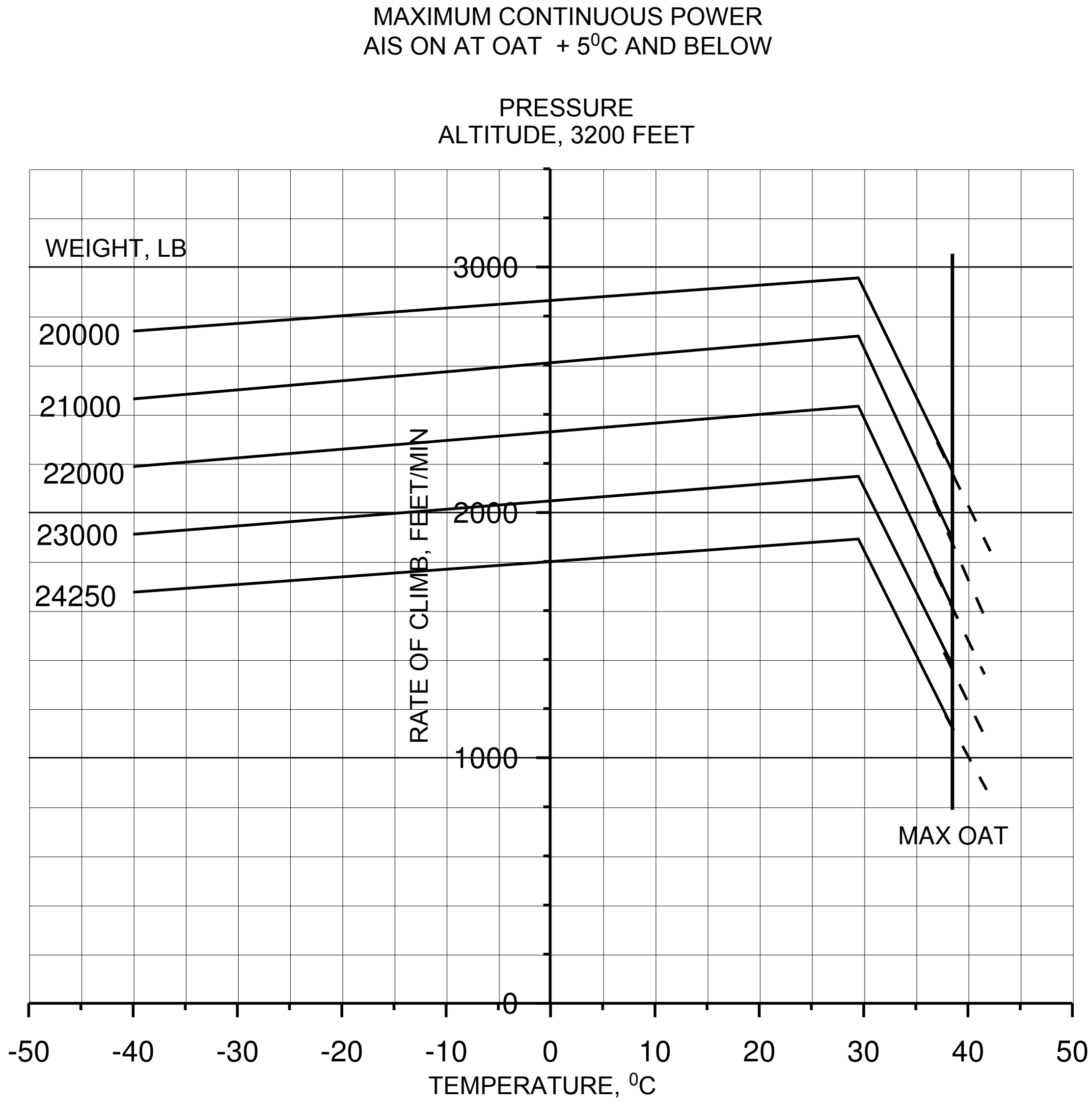

Fig. 4-11 (Sheet 3 out of 12). AEO rate of climb.

(BRITISH SYSTEM)

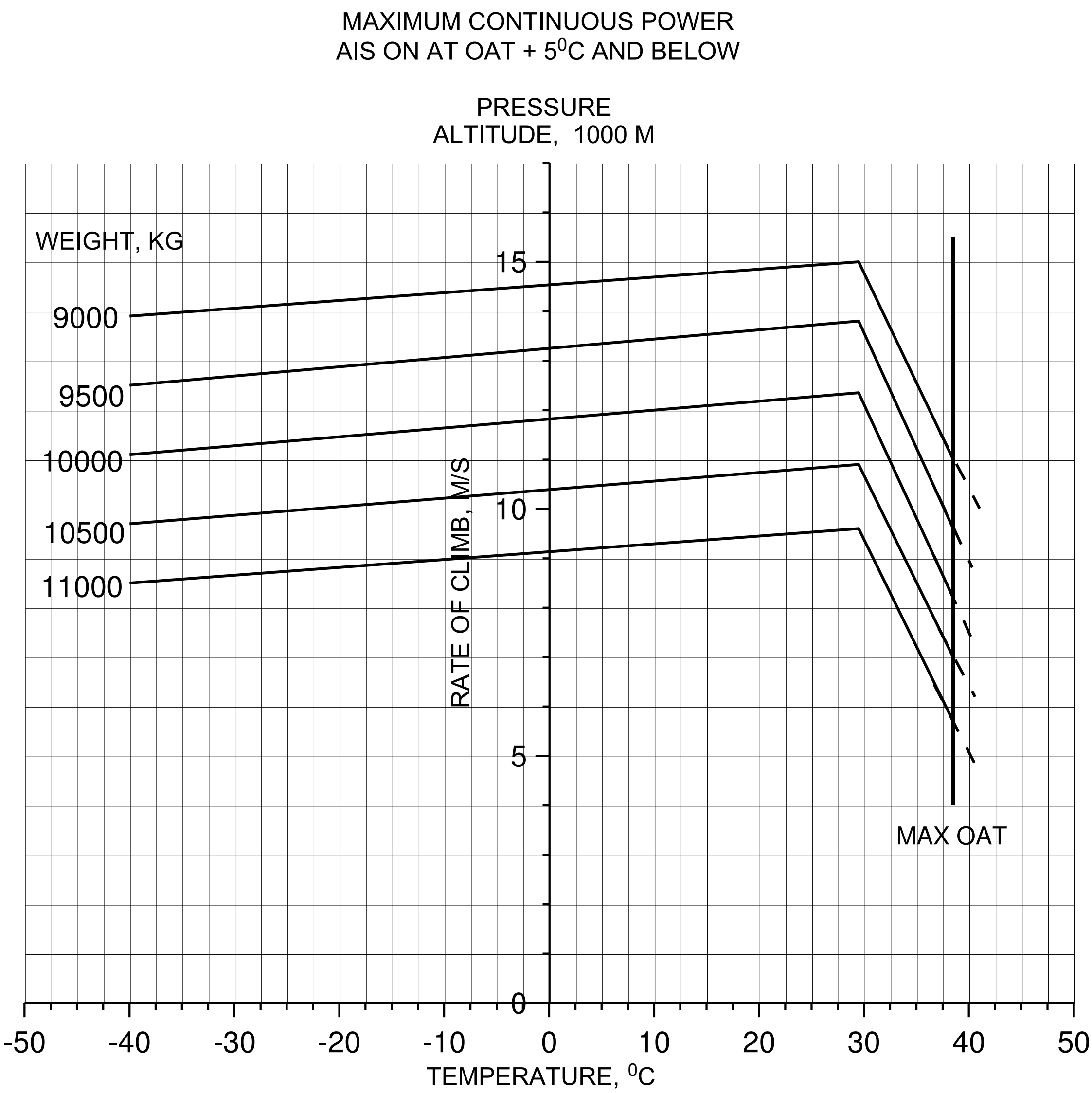

Fig. 4-11 (Sheet 4 of 12). AEO rate of climb.

(METRIC SYSTEM)

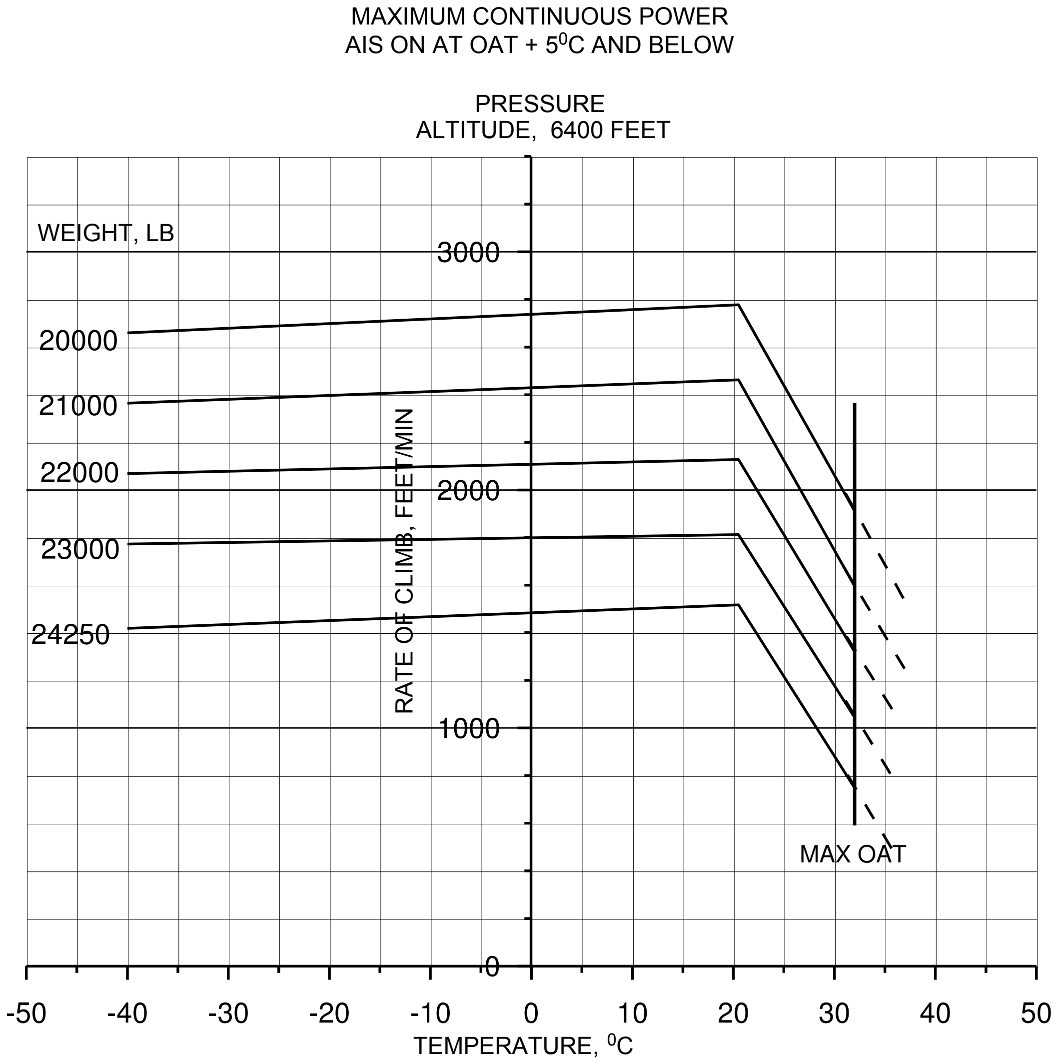

Fig. 4-11 (Sheet 5 of 12). AEO rate of climb.

(BRITISH SYSTEM)

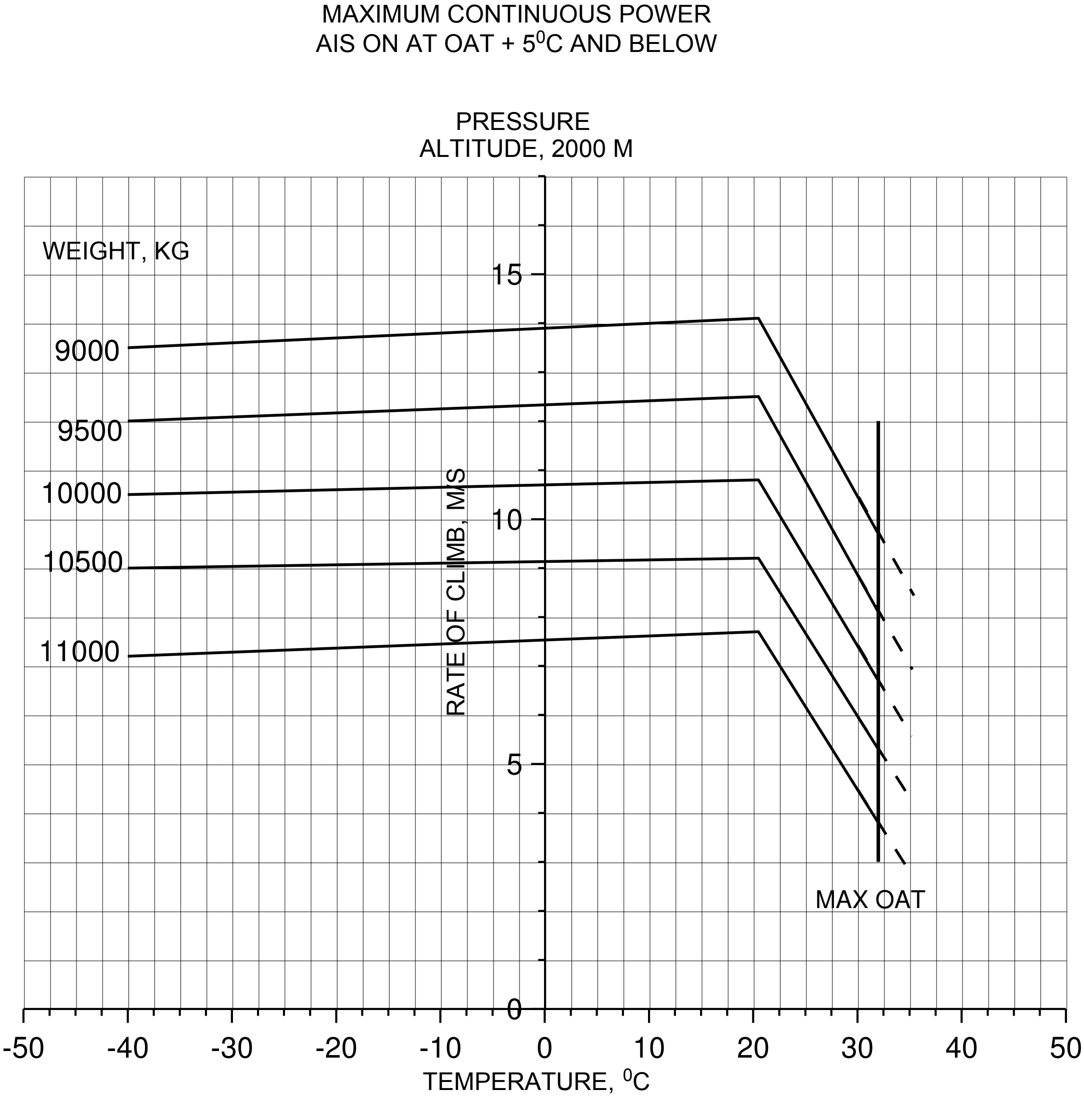

Fig. 4-11 (Sheet 6 of 12). AEO rate of climb.

(METRIC SYSTEM)

MAXIMUM CONTINUOUS POWER
AIS ON AT OAT + 5⁰C AND BELOW

PRESSURE
ALTITUDE, 9840 FEET

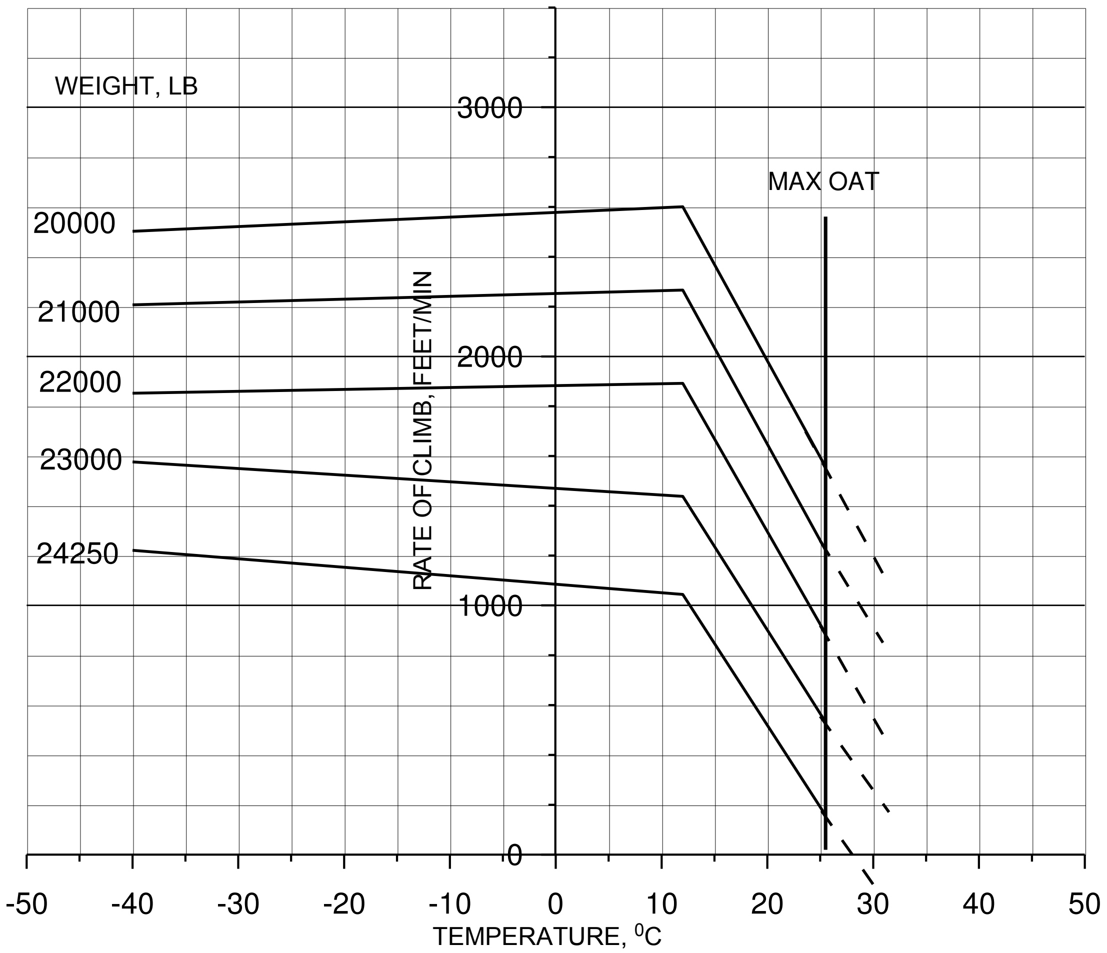

Fig. 4-11 (Sheet 7 of 12). AEO rate of climb.

(BRITISH SYSTEM)

MAXIMUM CONTINUOUS POWER
AIS ON AT OAT + 5⁰C AND BELOW

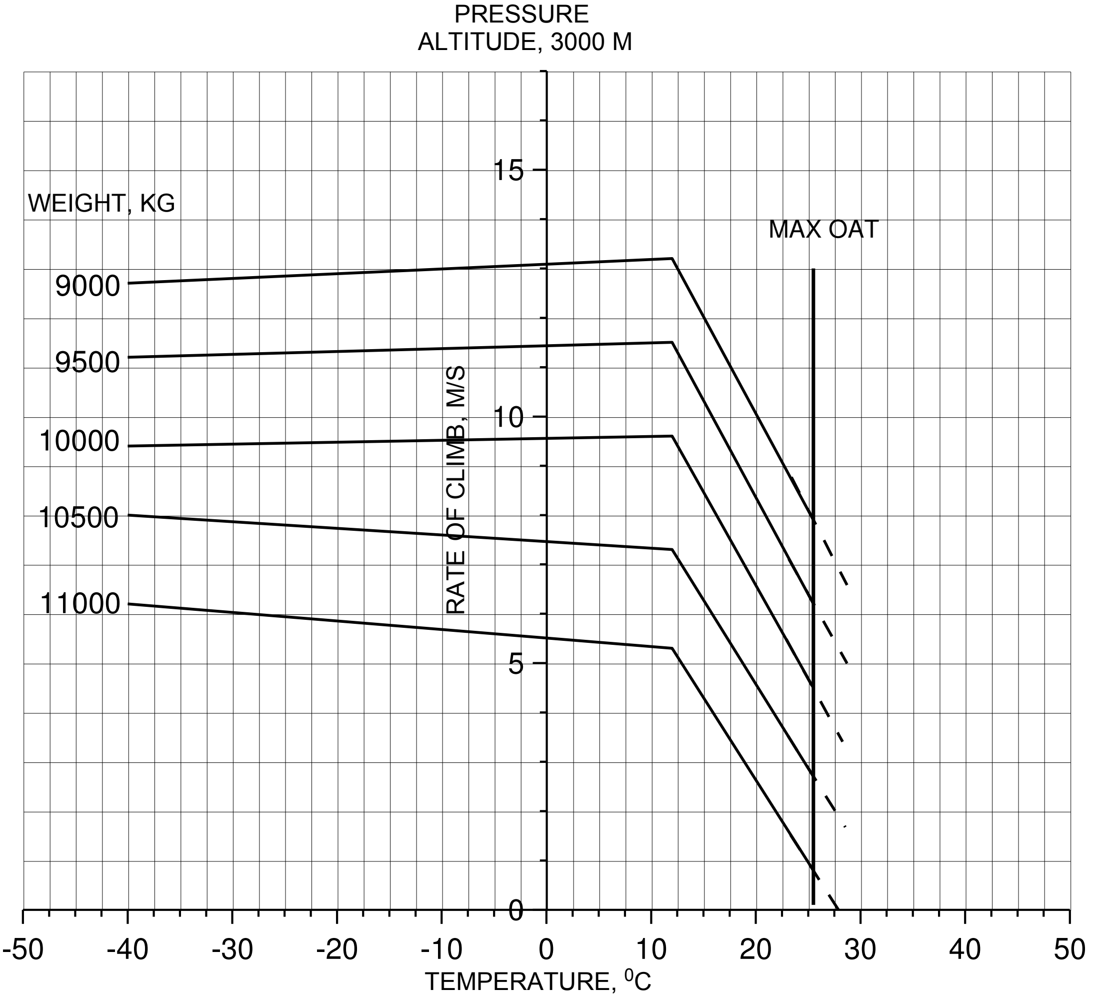

Fig. 4-11 (Sheet 8 of 12). AEO rate of climb.

(METRIC SYSTEM)

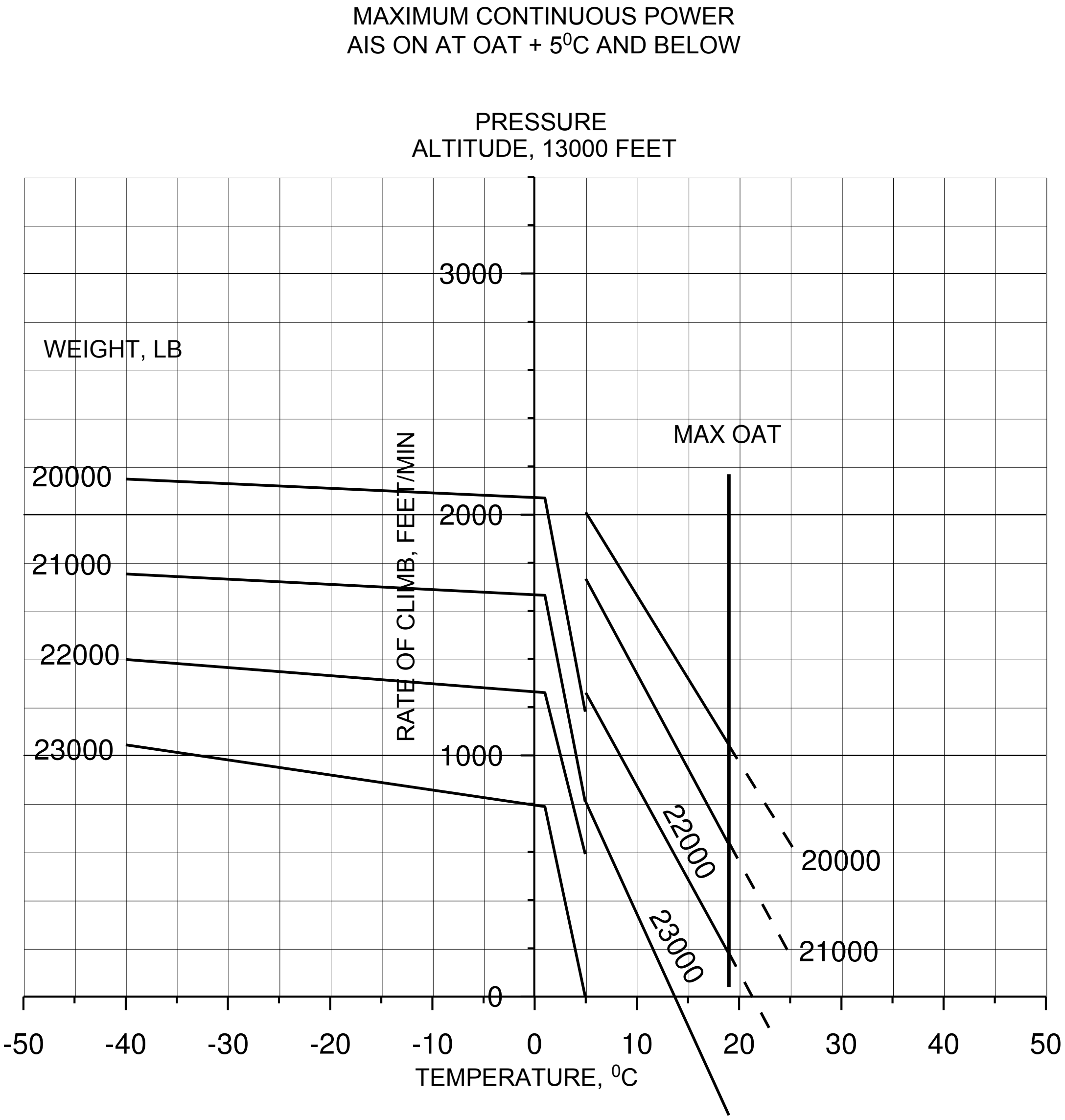

Fig. 4-11 (Sheet 9 of 12). AEO rate of climb.

(BRITISH SYSTEM)

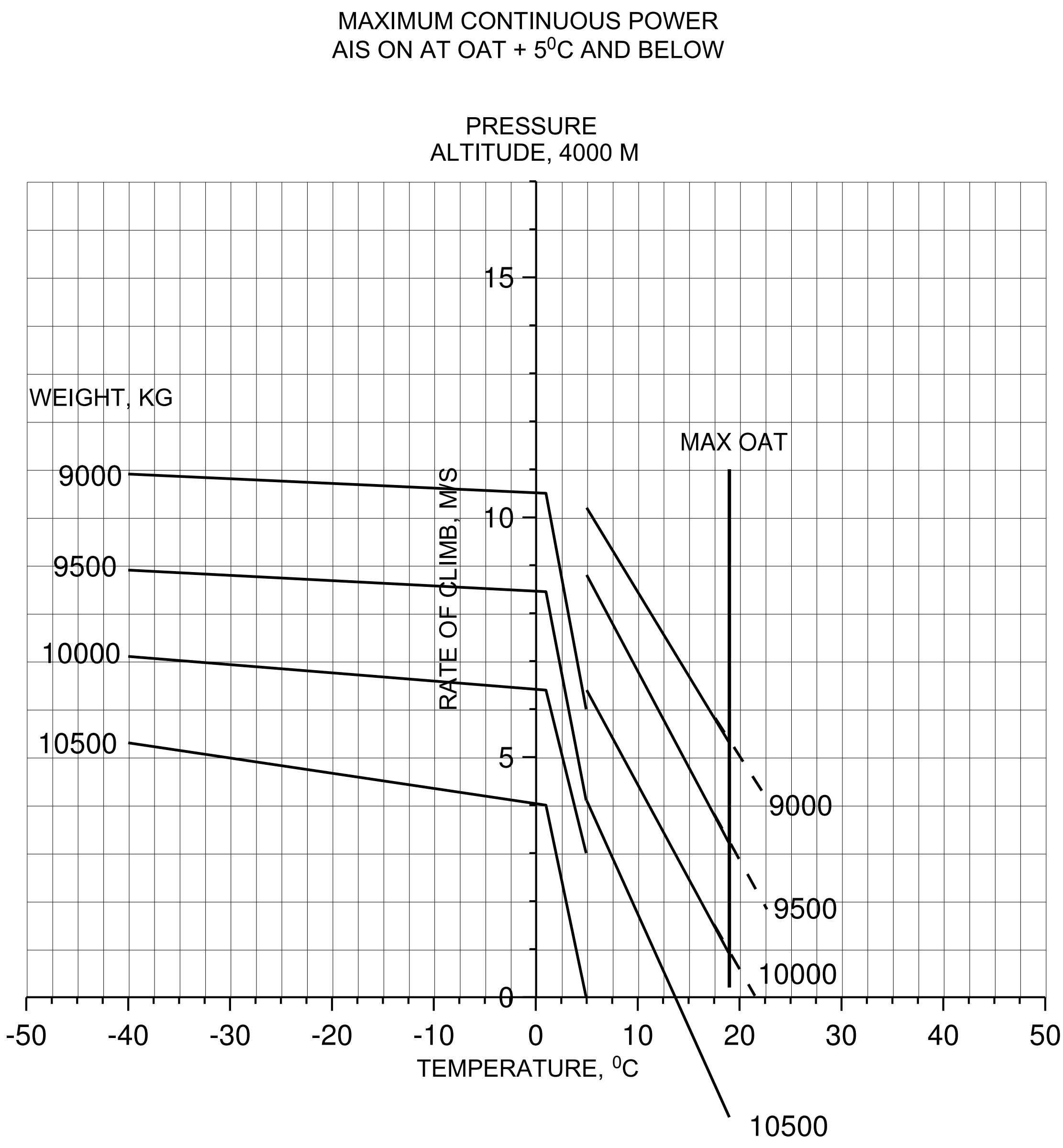

Fig. 4-11 (Sheet 10 of 12). AEO rate of climb.

(METRIC SYSTEM)

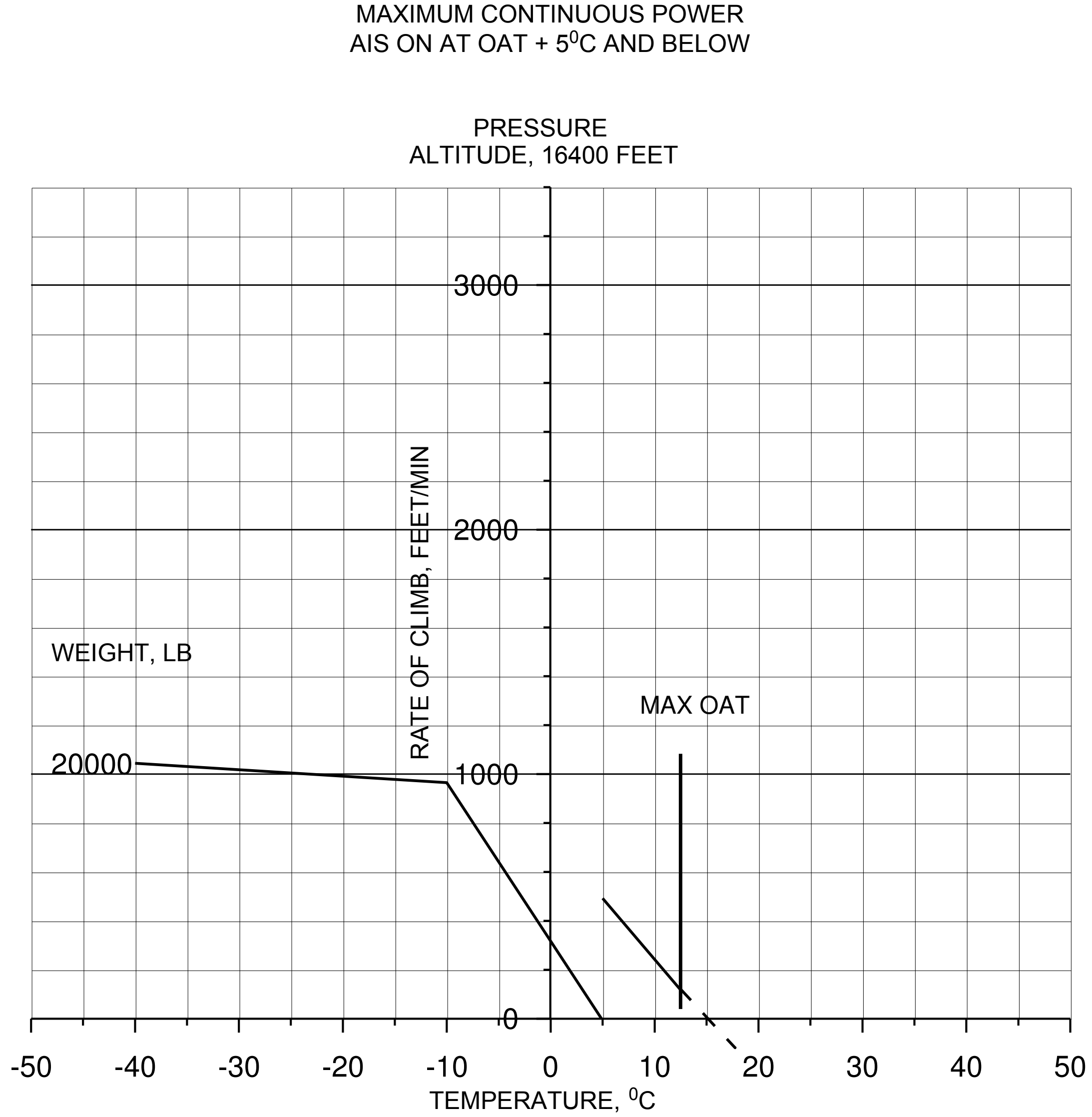

Fig. 4-11 (Sheet 11 of 12). AEO rate of climb.

(BRITISH SYSTEM)

MAXIMUM CONTINUOUS POWER
AIS ON AT OAT + 5^0C AND BELOW

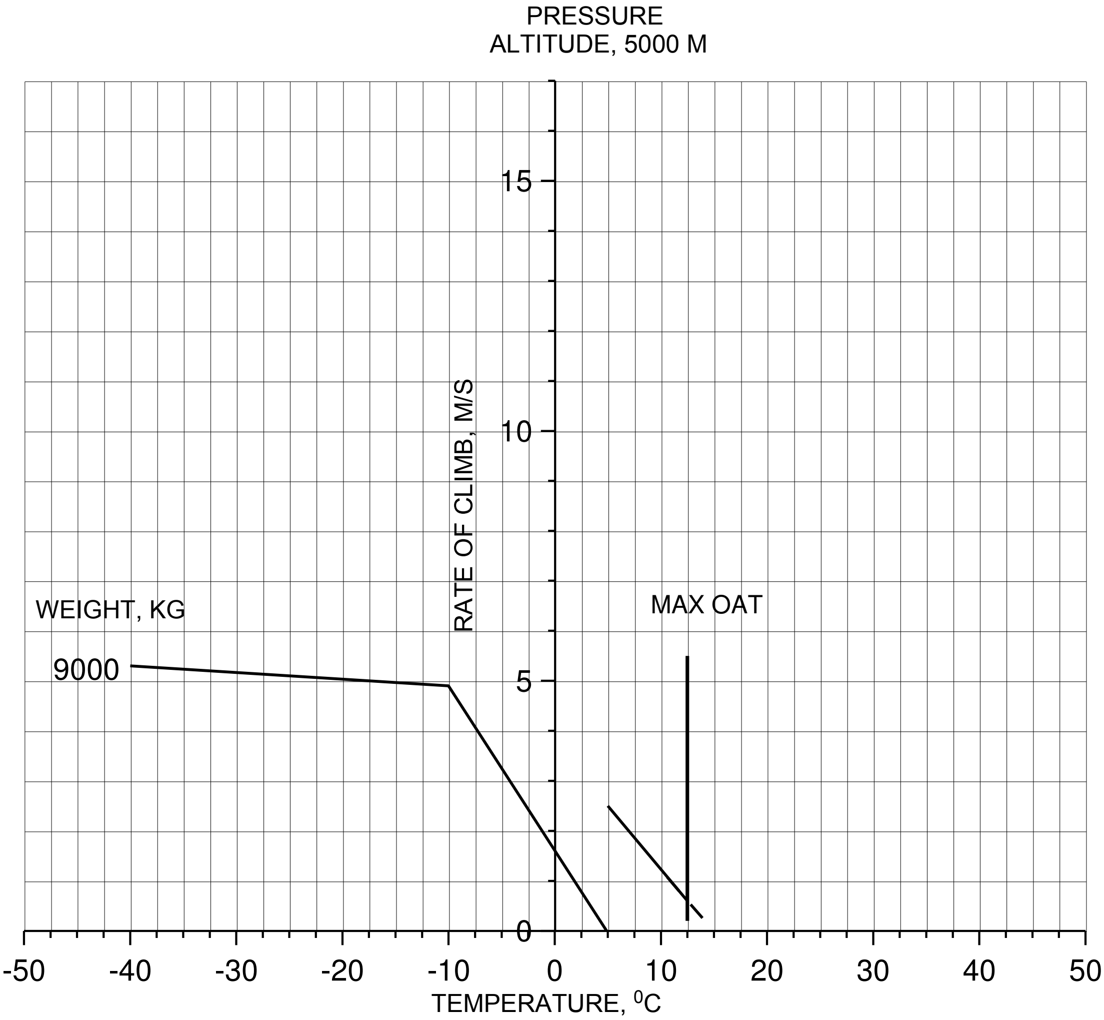

Fig. 4-11 (Sheet 12 of 12). AEO rate of climb.

(METRIC SYSTEM)

Example: Determine Rate of climb

Known: Gross weight 23150 lb Pressure altitude Sea Level
OAT +18°C Engine power 30-min. OEI power rating

Solution: 1. Enter the chart at OAT +18°C
2. Move vertically upward to intersection with the Weight line 23150
3. Move horizontally right and read rate of climb=525 ft/min

30 MINUTE OEI POWER
AIS ON AT OAT +5ºC AND BELOW

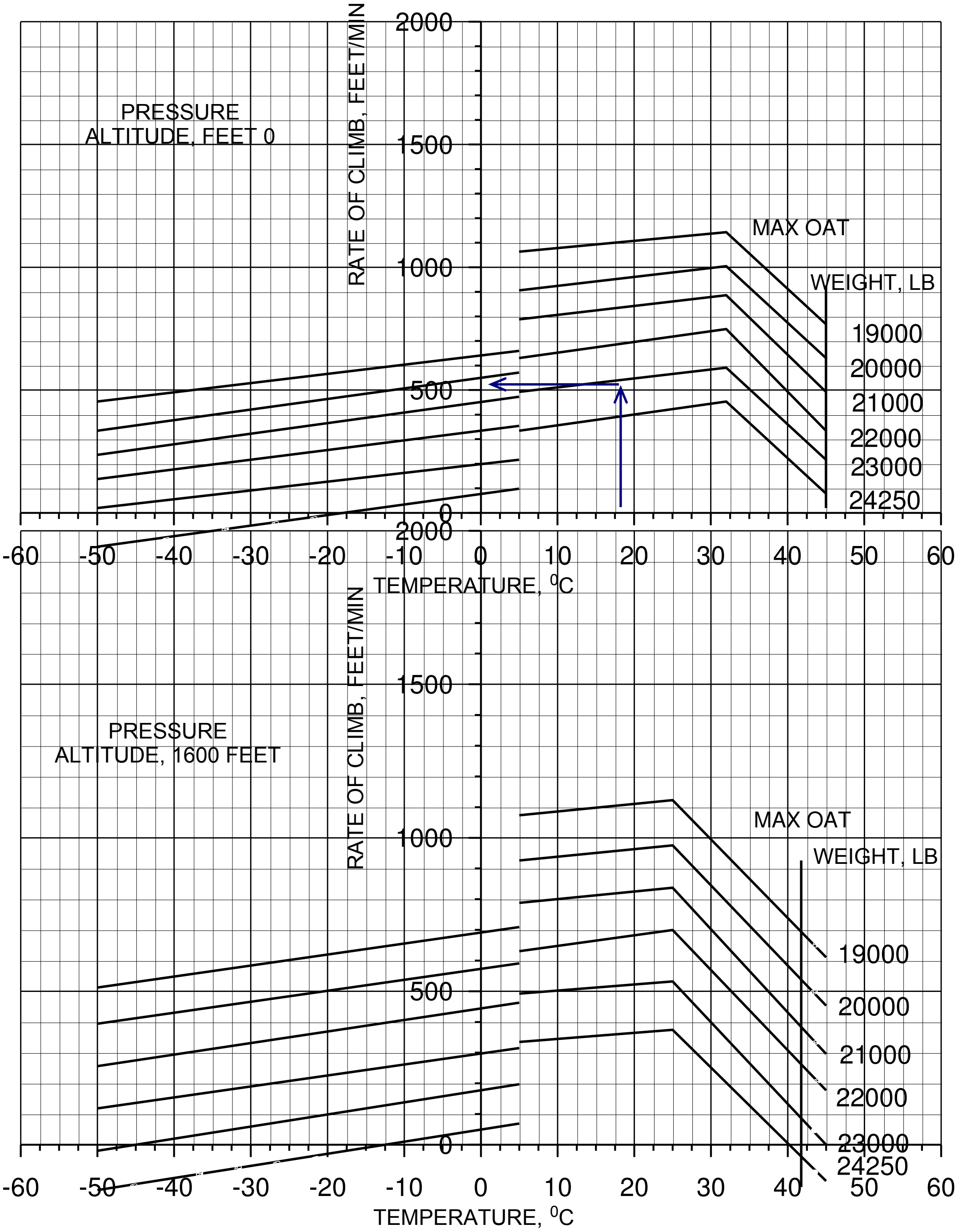

Fig. 4-12 (Sheet 1 of 8). OEI rate of climb.

(BRITISH SYSTEM)

30 MINUTE OEI POWER
AIS ON AT OAT + 5⁰C AND BELOW

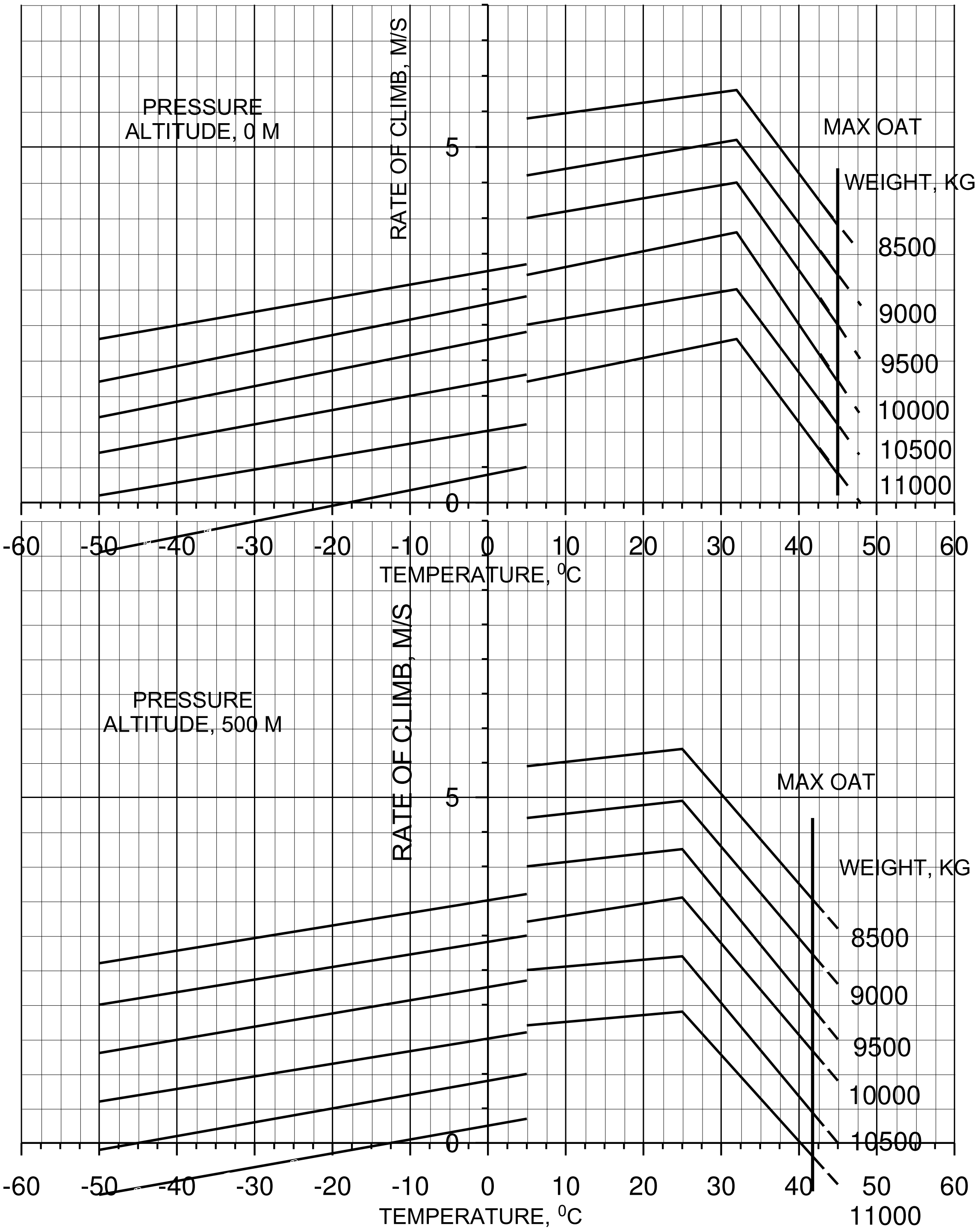

Fig. 4-12 (Sheet 2 of 8). OEI rate of climb.

(METRIC SYSTEM)

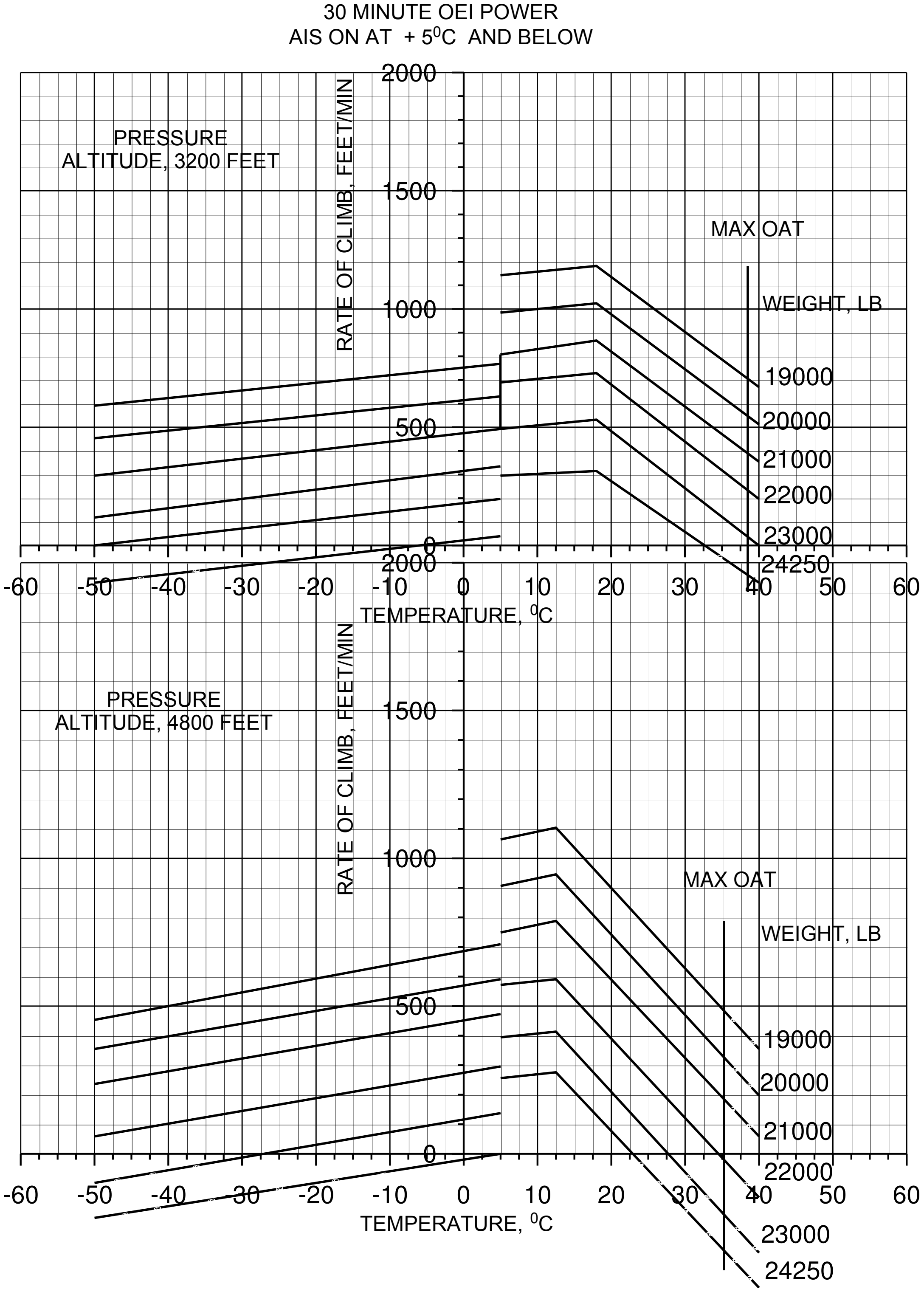

Fig. 4-12 (Sheet 3 of 8). OEI rate of climb.

(BRITISH SYSTEM)

30 MINUTE OEI POWER
AIS ON AT OAT + 5⁰C AND BELOW

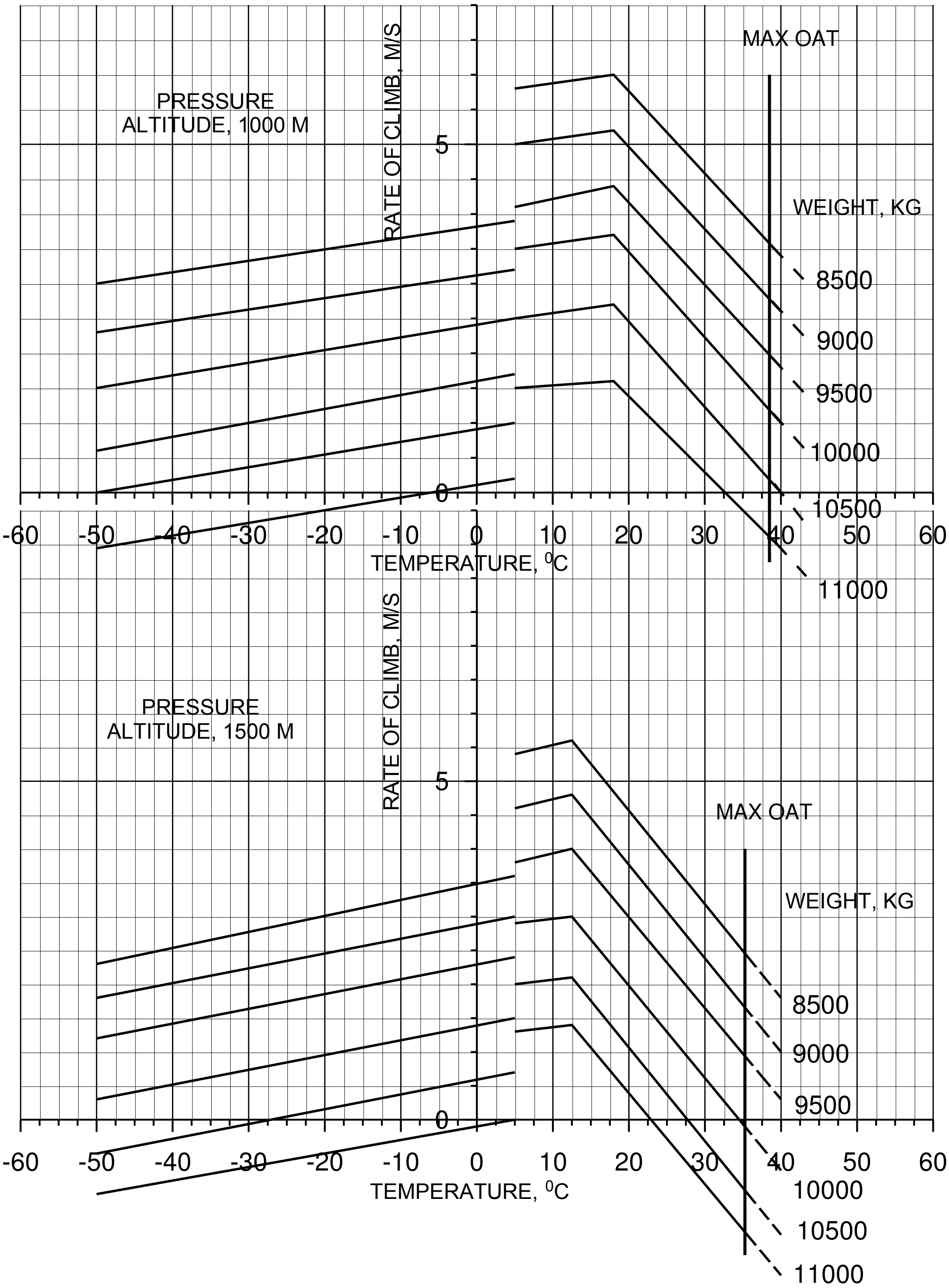

Fig. 4-12 (Sheet 4 of 8). OEI rate of climb.

(METRIC SYSTEM)

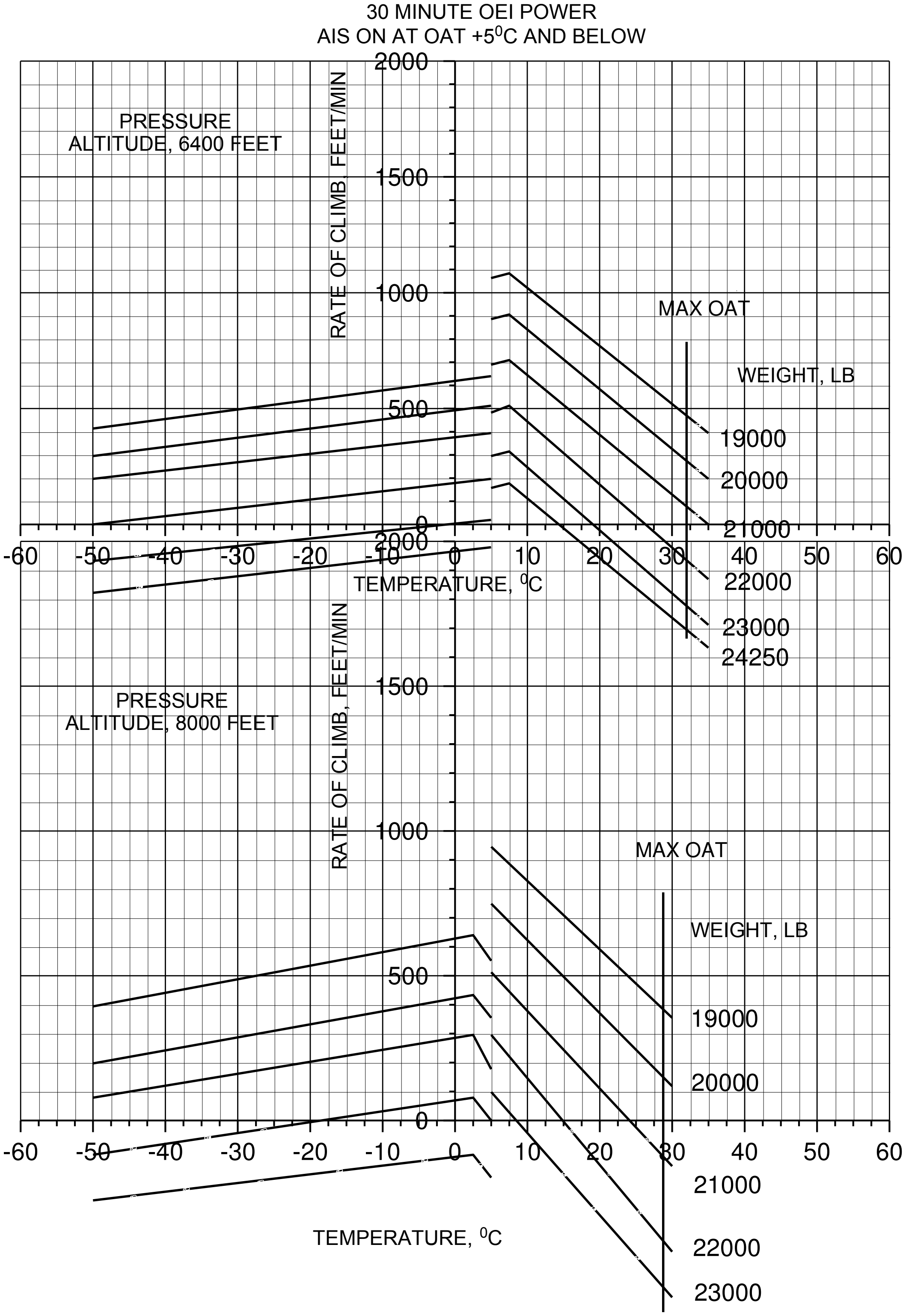

Fig. 4-12 (Sheet 5 of 8). OEI rate of climb.

(BRITISH SYSTEM)

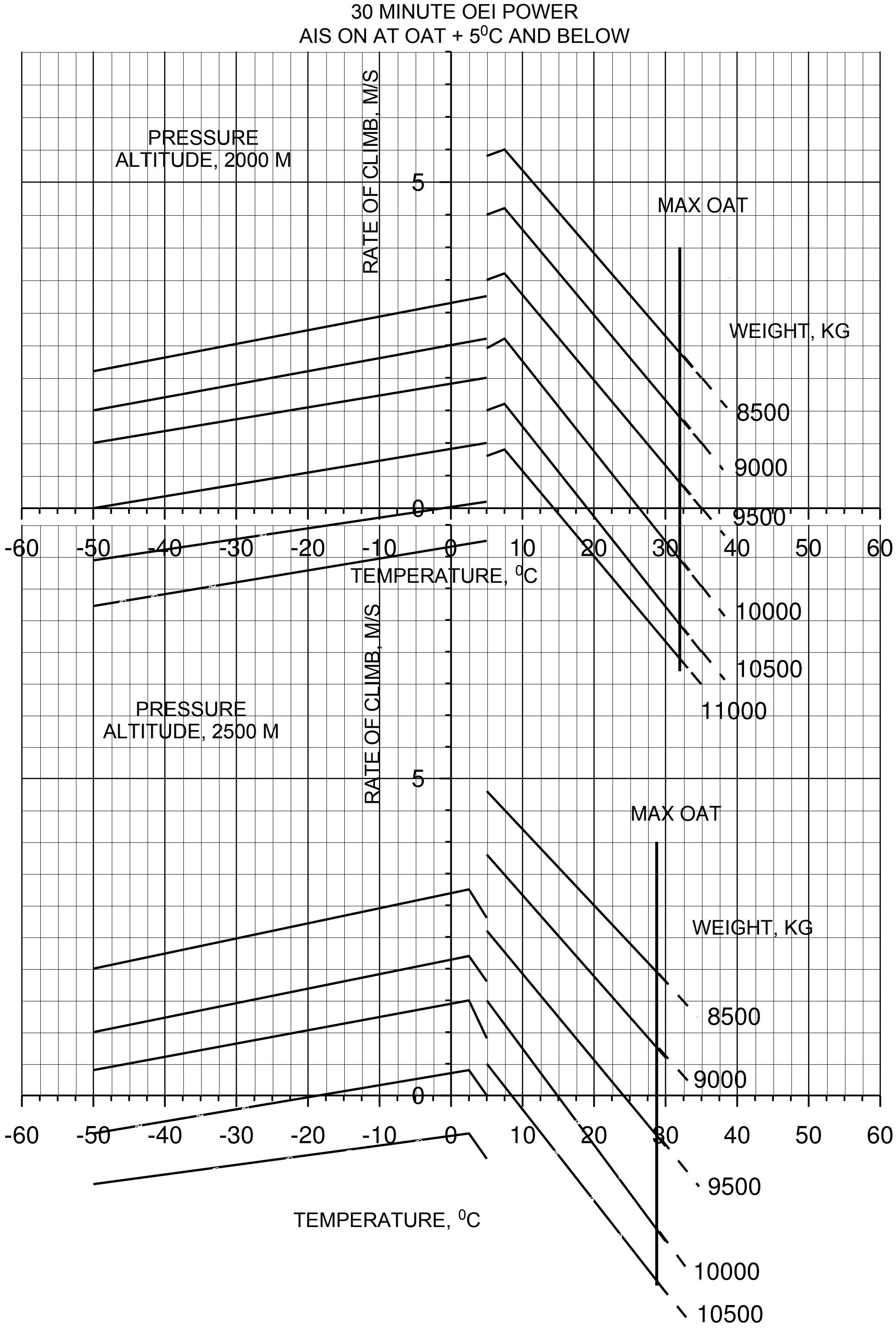

Fig. 4-12 (Sheet 6 of 8). OEI rate of climb.

(METRIC SYSTEM)

30 MINUTE OEI POWER
AIS ON AT OAT + 5^{0}C AND BELOW

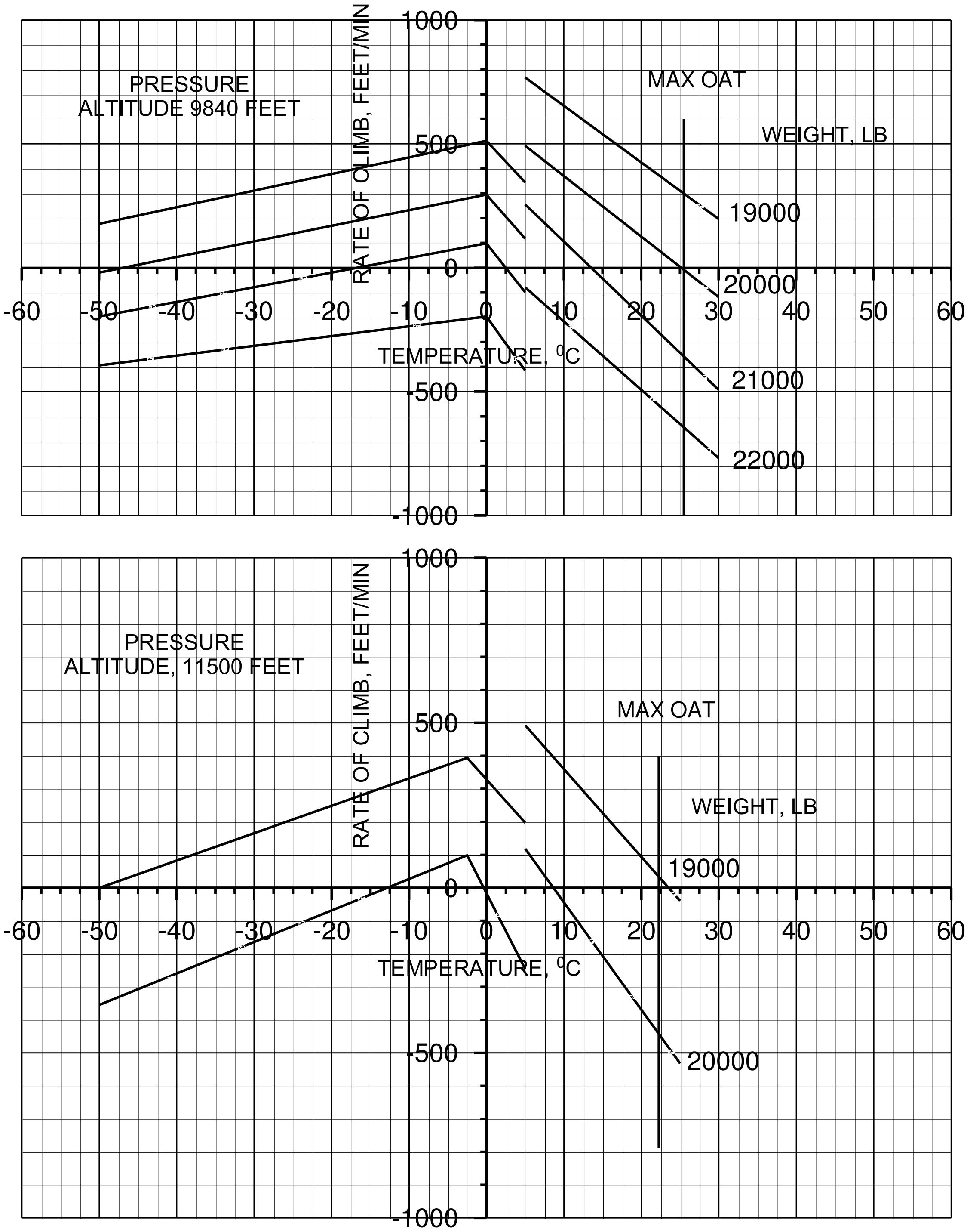

Fig. 4-12 (Sheet 7 of 8). OEI rate of climb.

(BRITISH SYSTEM)

30 MINUTE OEI POWER
AIS ON AT OAT + 5^0C AND BELOW

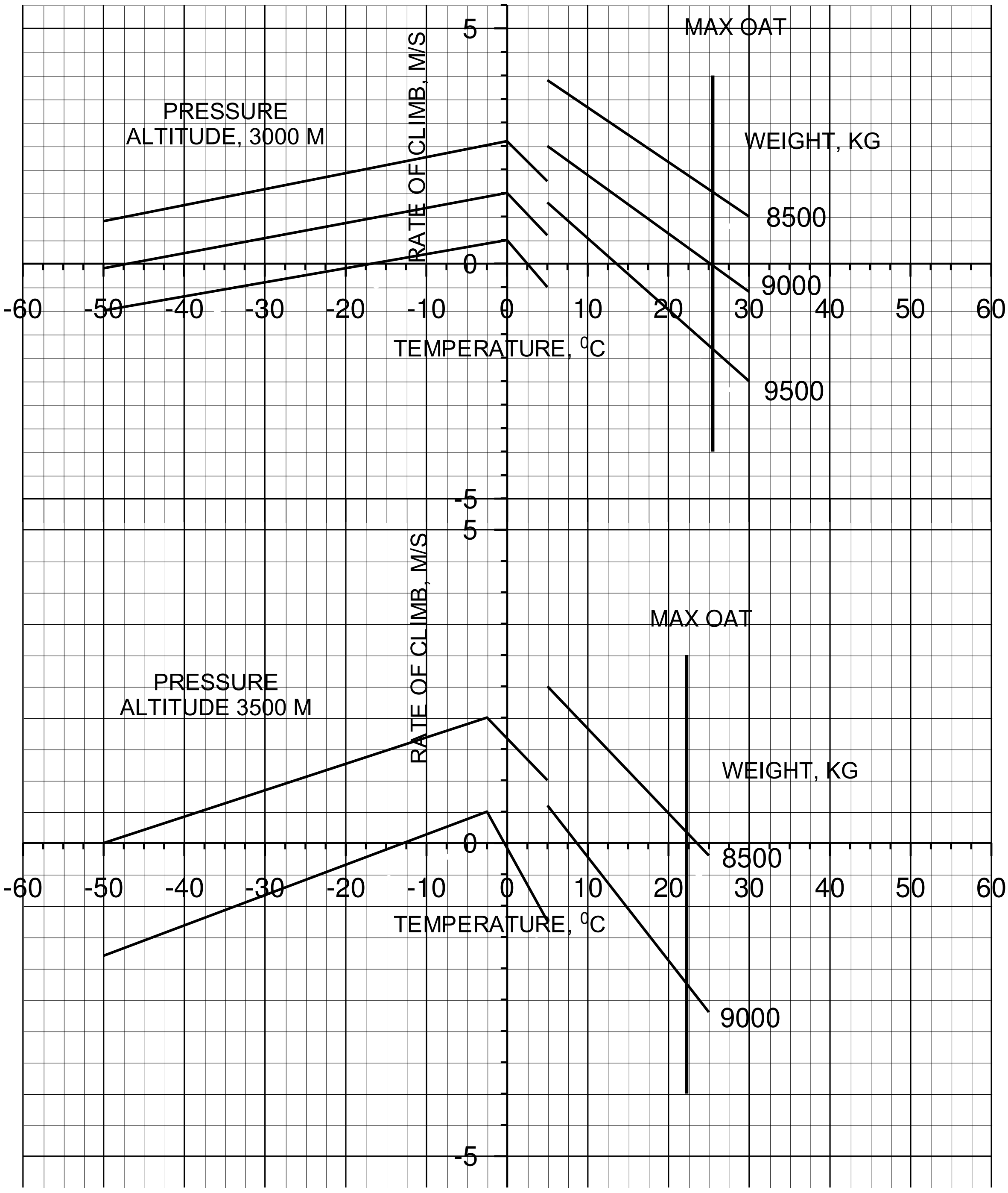

Fig. 4-12 (Sheet 8 of 8). OEI rate of climb.

(METRIC SYSTEM)

DESCENT

NOTE. Rate of descent limitations AEO at various flight conditions – see Section 1.

Rate of descent charts (Fig. 4-13) shows the combinations of rates of descent with forward speeds having which it is possible to enter Vortex ring zone in power-on flight.

At flight speed of 27 knots (50 km/h) and less it is prohibited to exceed rate of descent of 500 ft/min (3 m/s).

During power-on descent at rate of descent close to autorotation within the flight speed range from 38 knots (70 km/h) to 27 knots (50 km/h) at MR speed more than 91 %, the helicopter can tend to turn to the right. To eliminate such a tendency it is recommended simultaneously with the displacement of the left pedal to increase the collective pitch and to decrease MR speed down to 91% and/or to roll left (within limitations) until the helicopter stops turning.

Chart of Rate of Descent in Autorotation (Fig.4-14) shows rates of descent with weights of or 20950..23150 lb (9500..10500 kg). These rates of descent can be reached within the whole range of speeds at sea level, ISA.

Minimum indicated gliding speed in autorotation mode is limited by 54 knots (100 km/h). This speed assures the directional control effectiveness required in autorotation.

Maximum gliding distance in autorotation is assured at flight speed 92 knots (170 km/h) irrespective of the gross weight.

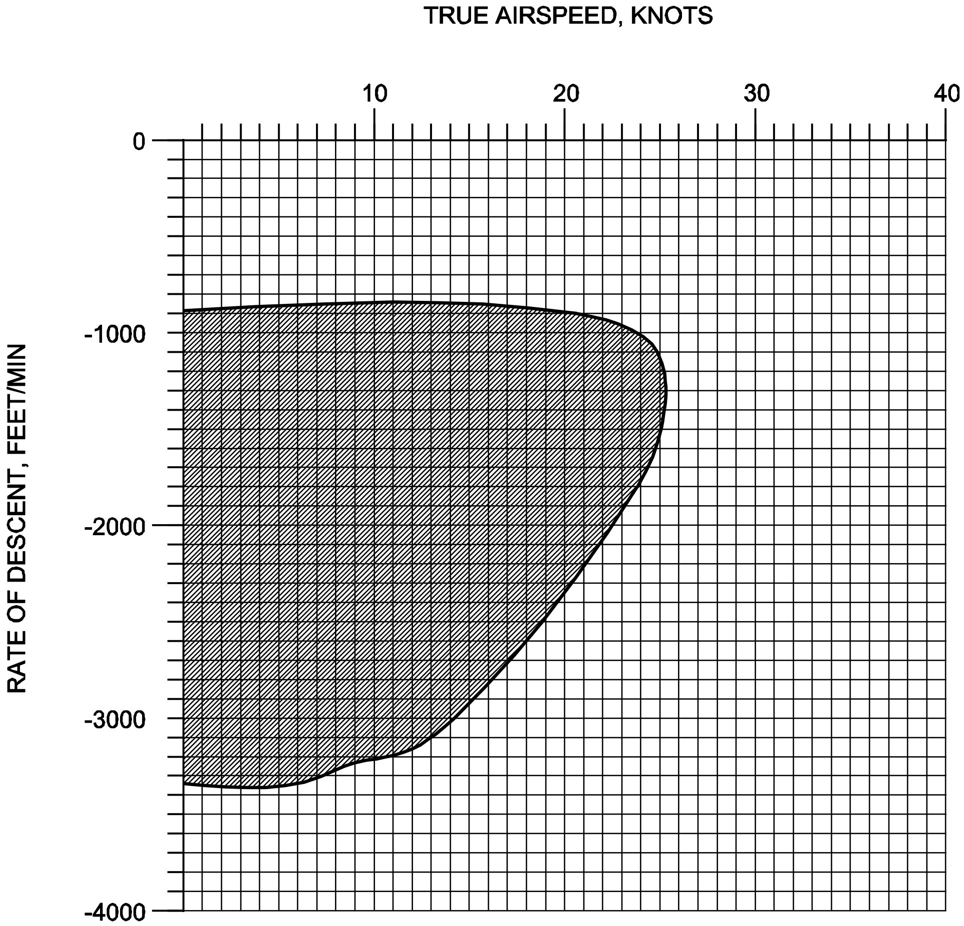

Fig. 4-13 (Sheet 1 of 2). Vortex ring zone.
(BRITISH SYSTEM)

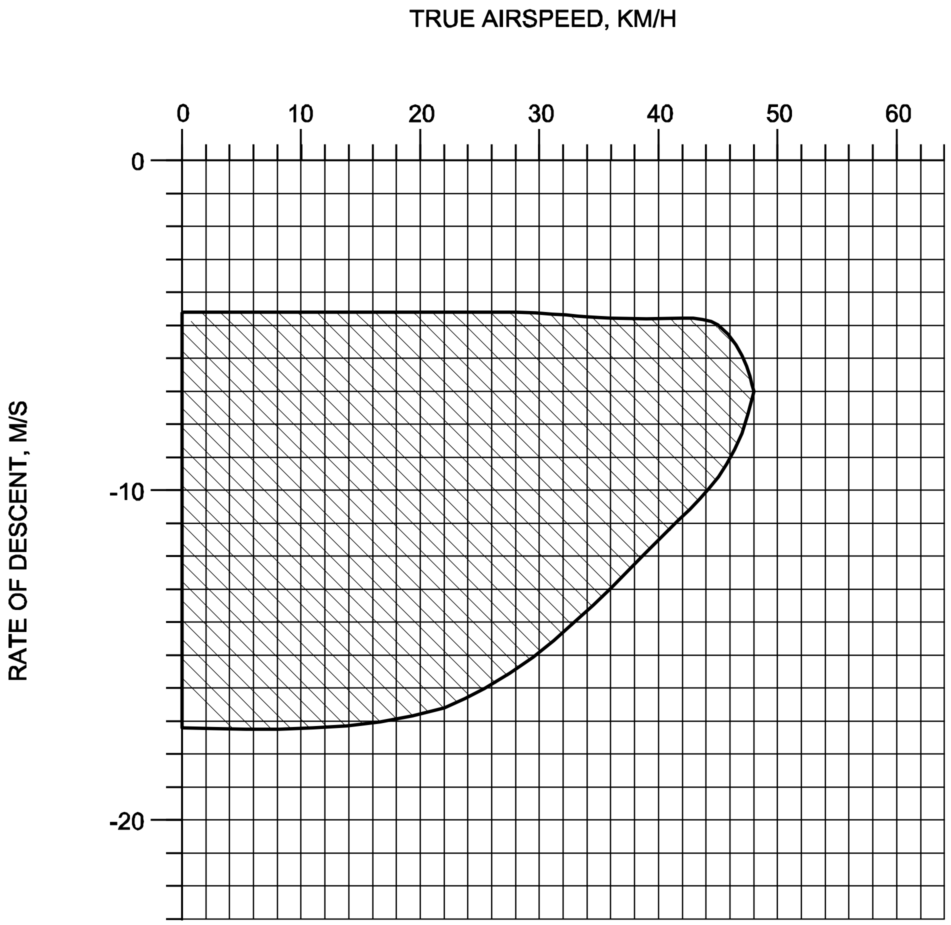

Fig. 4-13 (Sheet 2 of 2). Vortex ring zone.

(METRIC SYSTEM)

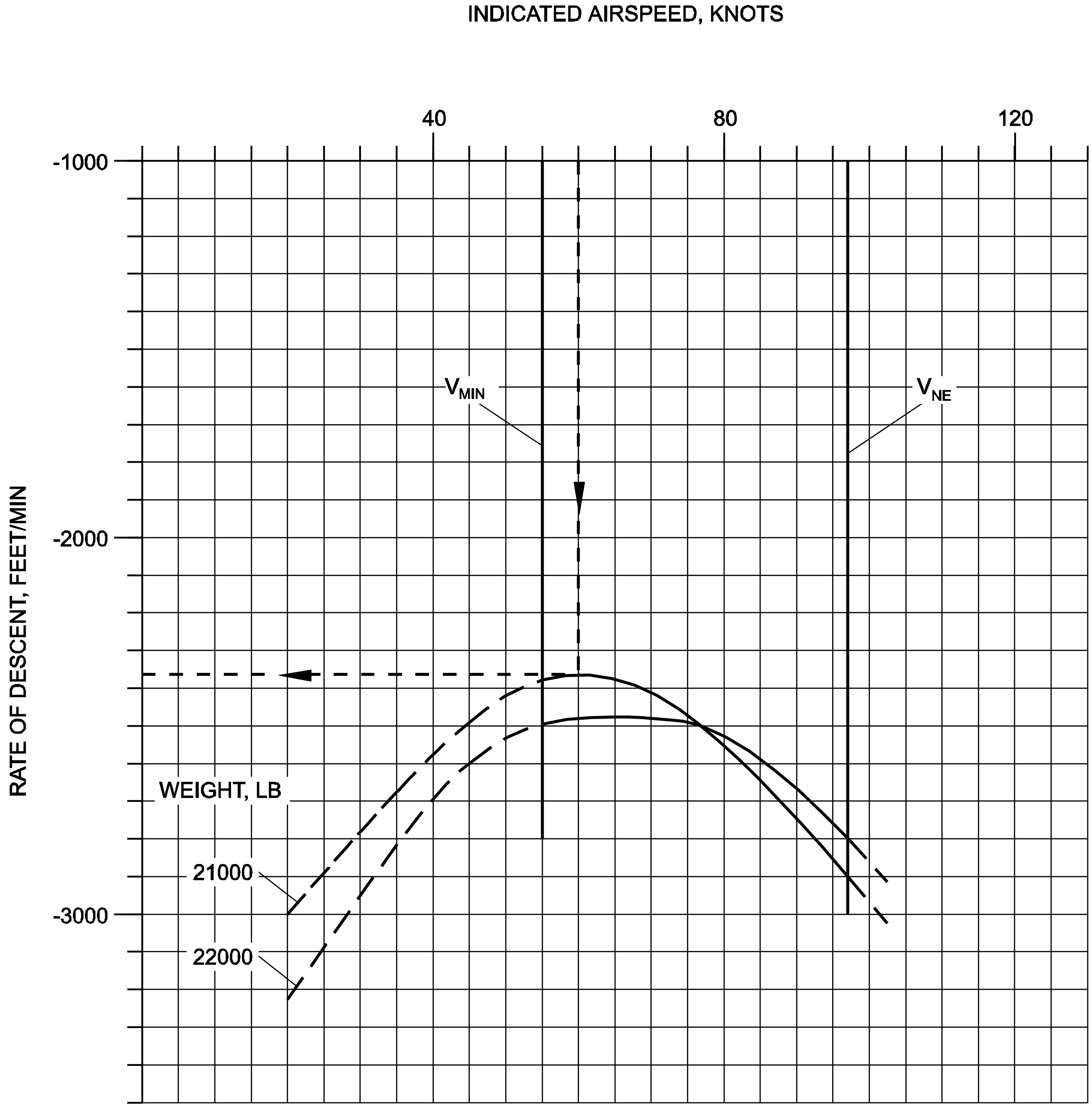

Fig. 4-14 (Sheet 1 of 2). Rate of Descent in autorotation.

(BRITISH SYSTEM)

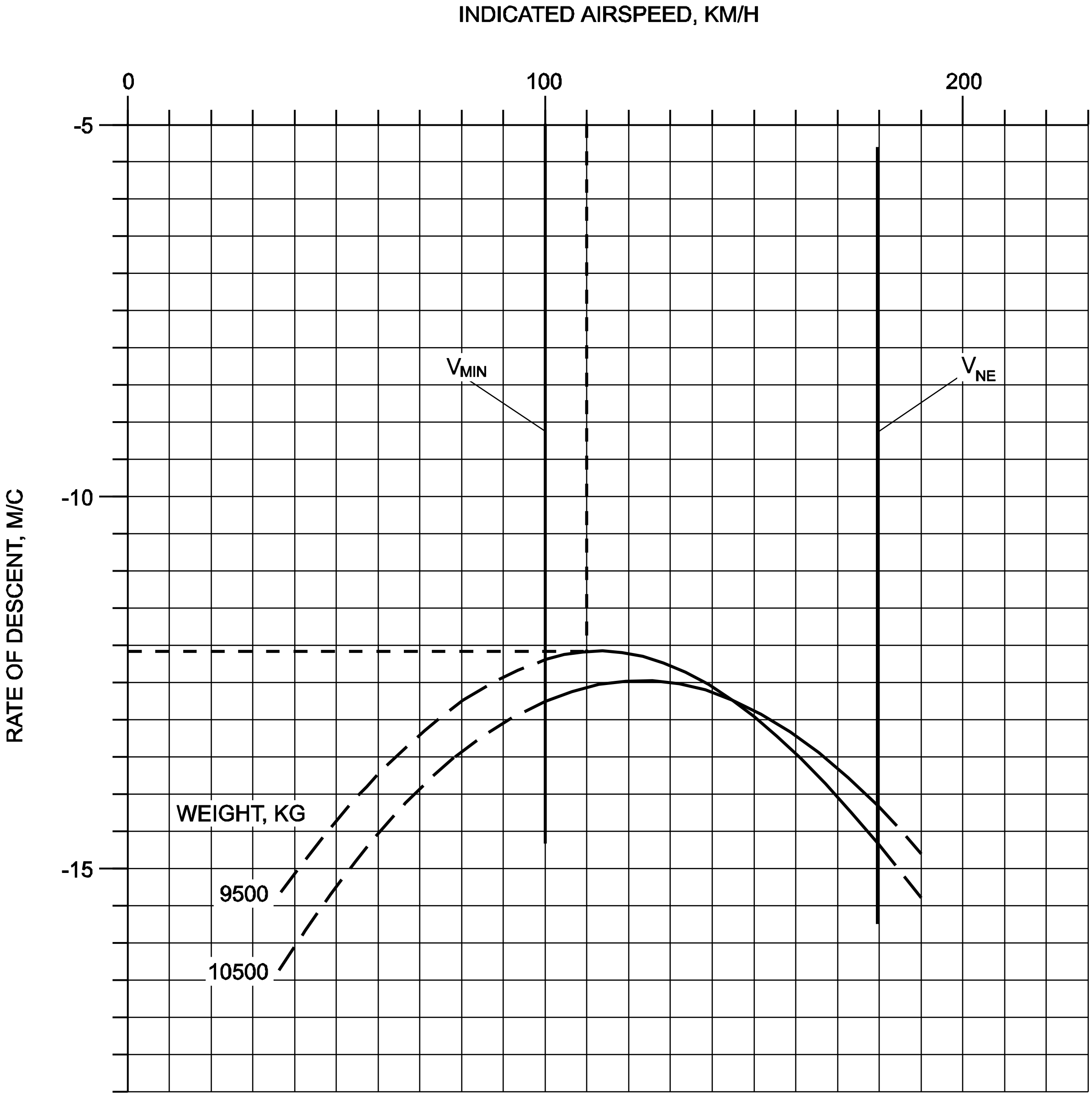

Fig. 4-14 (Sheet 2 of 2). Rate of Descent in autorotation.

(METRIC SYSTEM)

LANDING. CATEGORY B

Category B landing profile (Fig. 4-15) assures the capability to land safely (on a smooth level surface) should an engine failure occurs any time prior to or during an approach.

Under certification basis (Category B), go-around capability is NOT assured during OEI operation.

LANDING DISTANCE FROM 15 M (50 FT) HEIGHT TO A COMPLETE STOP ON GROUND

The landing distance required for AEO landing on a smooth, hard and dry level surface until the helicopter comes to a complete stop is 500 ft (150 m).

The landing distance required for OEI landing on a smooth, hard and dry level surface until the helicopter comes to a complete stop is 650 ft (200 m).

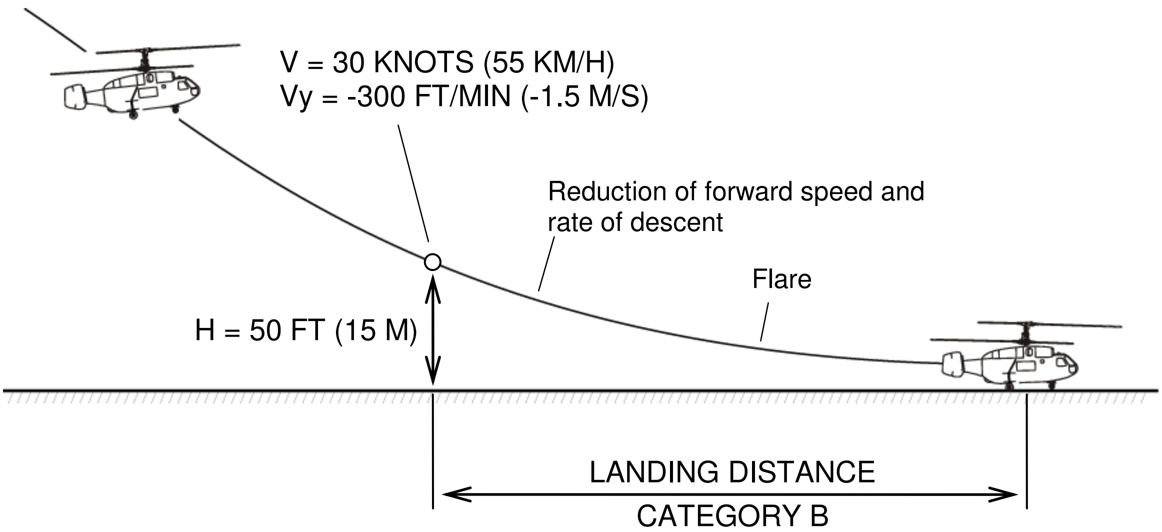

Fig. 4-15. Landing profile. Category B.

NOISE LEVELS

The helicopter complies with ICAO Annex 16, Volume 1, Chapter 8 Environmental Protection requirements.

For the certified maximum takeoff and landing weight of 24,255 lb (11,000 kg) the noise levels are:

Stage of Flight	Noise levels obtained in certification tests (EPNdB)	Requirements (EPNdB)
Takeoff	93.5	100.4
Level flight at 0.9 V_{NE} equal to 235 km/h IAS	99.4	99.4
Approach	96.8	101.4

The values have been obtained in the modes and flight paths regulated by ICAO Annex 16, Volume 1, Chapter 8.

There are no additional operating limitations in meeting the takeoff, approach or flyover noise requirements.

STANDARD ATMOSPHERE								
STANDARD CONDITIONS: TEMPERATURE 15 °C (59 °F) PRESSURE 29,921 INCH HG (2116,216 LB/FT²) DENSITY 0,0023769 SLUG/FT² VELOCITY OF SOUND 1116,89 LB/SEC (661,7 KNOTS)					CONVERSION OF VALUES: 1 INCH HG = 70,727 LB/FT² 1 INCH HG = 0,49116 LB/INCH² 1 KNOT = 1,151 MILE/HOUR 1 KNOT = 1,688 FT/SEC			
ALTITUDE FT	DENSITY COEFFICIENT, δ	$\frac{1}{\sqrt{\delta}}$	TEMPERATURE °C	°F	VELOCITY OF SOUND KNOTS	PRESSURE INCH HG	PRESSURE COEFFICIENT	
0	1,0000	1,0000	15,000	59,000	661,7	29,921	1,0000	
1000	0,9711	1,0148	13,019	55,434	659,5	28,856	0,9644	
2000	0,9428	1,0299	11,038	51,868	51,868	27,821	0,9298	
3000	0,9151	1,0454	9,056	48,302	48,302	26,817	0,8962	
4000	0,8881	1,0611	7,076	44,735	44,735	25,842	0,8637	
5000	0,8617	1,0773	5,094	41,169	41,169	24,896	0,8320	
6000	0,8359	1,0938	3,113	37,603	648,7	23,978	0,8014	
7000	0,8106	1,1107	1,132	34,037	645,6	23,088	0,7716	
8000	0,7860	1,1279	- 0,850	30,471	643,3	22,225	0,7428	
9000	0,7620	1,1456	- 2,831	26,905	604,9	21,388	0,7148	
10,000	0,7385	1,1637	- 4,812	23,338	638,6	20,577	0,6877	
11,000	0,7155	1,1822	- 6,793	19,772	636,2	19,791	0,6614	
12,000	0,6932	1,2011	- 8,774	16,206	633,9	19,029	0,6360	
13,000	0,6713	1,2205	- 10,756	12,640	631,5	18,292	0,6113	
14,000	0,6500	1,2403	- 12,737	9,074	692,0	17,577	0,5875	
15,000	0,6292	1,2606	- 14,718	5,508	626,6	16,886	0,5643	
16,000	0,6090	1,2315	- 16,699	1,941	624,2	16,216	0,5420	
17,000	0,5892	1,3038	- 18,680	- 1,625	621,8	15,569	0,5203	
18,000	0,5699	1,3246	- 20,662	- 5,191	619,4	14,942	0,4994	
19,000	0,5511	1,3470	- 22,643	- 8,757	617,0	14,336	0,4791	
20,000	0,5328	1,3700	- 24,624	- 12,323	614,6	13,750	0,4595	
21,000	0,5150	1,3935	- 26,605	- 15,899	612,1	13,184	0,4406	
22,000	0,4976	1,4176	- 28,587	- 19,456	609,6	12,636	0,4223	
23,000	0,4806	1,4424	- 30,568	- 23,022	607,1	12,107	0,4046	
24,000	0,4642	1,4678	- 22,549	- 26,588	604,6	11,597	0,3874	
25,000	0,4481	1,4938	- 34,530	- 30,154	602,1	11,103	0,3711	

Table 4-1. Standard Atmosphere

DRY ATMOSPHERE											
Pressure altitude, m	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
T_{OA}, °C	DENSITY COEFFICIENT										
-50	1,291	1,220	1,115	1,078	1,013	0,952	0,893	0,838	0,785	0,735	0,688
-40	1,236	1,165	1,096	1,031	0,969	0,911	0,855	0,802	0,752	0,704	0,658
-30	1,185	1,117	1,051	0,989	0,930	0,873	0,820	0,769	0,721	0,657	0,631
-20	1,138	1,073	1,010	0,950	0,893	0,839	0,788	0,739	0,692	0,648	0,606
-10	1,095	1,032	0,971	0,914	0,859	0,807	0,758	0,711	0,666	0,623	0,583
0	1,055	0,994	0,936	0,880	0,828	0,777	0,730	0,685	0,641	0,601	0,562
+10	1,018	0,959	0,903	0,849	0,798	0,750	0,704	0,660	0,619	0,579	0,542
+20	0,983	0,926	0,872	0,820	0,771	0,724	0,680	0,638	0,598	0,560	0,523
+30	0,951	0,896	0,843	0,793	0,746	0,700	0,658	0,617	0,578	0,541	0,506
+40	0,920	0,867	0,816	0,768	0,722	0,678	0,637	0,597	0,559	0,524	0,490
+50	0,892	0,840	0,791	0,744	0,699	0,657	0,617	0,579	0,542	0,508	0,475
Barometric pressure, mm. H.G.	760	716	674	634	596	560	526	493	462	433	405
T_{OA}, °C	$\sqrt{\Delta}$										
-50	1,136	1,103	1,070	1,038	1,007	0,976	0,945	0,915	0,886	0,857	0,829
-40	1,112	1,079	1,047	1,016	0,985	0,954	0,925	0,896	0,867	0,839	0,811
-30	1,089	1,057	1,025	0,994	0,964	0,935	0,905	0,877	0,849	0,821	0,794
-20	1,067	1,036	1,005	0,975	0,945	0,916	0,887	0,859	0,832	0,805	0,778
-10	1,047	1,016	0,986	0,956	0,927	0,898	0,870	0,843	0,816	0,790	0,764
0	1,027	0,997	0,967	0,938	0,910	0,882	0,854	0,827	0,801	0,775	0,749
+10	1,009	0,979	0,950	0,922	0,893	0,866	0,839	0,813	0,786	0,761	0,736
+20	0,991	0,962	0,934	0,906	0,878	0,851	0,825	0,799	0,773	0,748	0,723
+30	0,975	0,946	0,918	0,891	0,863	0,837	0,811	0,786	0,760	0,736	0,711
+40	0,959	0,931	0,903	0,876	0,850	0,823	0,798	0,773	0,748	0,724	0,700
+50	0,949	0,917	0,889	0,863	0,836	0,811	0,785	0,761	0,736	0,712	0,689

Table 4-2. (Sheet 1 of 2). Relative Air Density.

DAMP ATMOSPHERE											
Pressure altitude, m	0	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
t_{AO}, °C	RELATIVE DENSITY, Δ										
-50	1,291	1,220	1,115	1,078	1,013	0,952	0,893	0,838	0,785	0,735	0,688
-40	1,236	1,165	1,096	1,031	0,969	0,911	0,855	0,802	0,752	0,704	0,658
-30	1,185	1,117	1,051	0,989	0,930	0,873	0,820	0,769	0,720	0,675	0,631
-20	1,138	1,072	1,009	0,949	0,892	0,838	0,788	0,739	0,691	0,648	0,609
-10	1,094	1,030	0,970	0,912	0,858	0,806	0,756	0,709	0,665	0,622	0,582
0	1,053	0,992	0,933	0,878	0,825	0,775	0,727	0,682	0,639	0,598	0,559
+10	1,013	0,954	0,898	0,844	0,793	0,745	0,699	0,655	0,614	0,575	0,547
+20	0,974	0,917	0,863	0,811	0,762	0,716	0,671	0,629	0,589	0,551	0,515
+30	0,935	0,880	0,828	0,778	0,730	0,685	0,642	0,602	0,563	0,526	0,491
+40	0,895	0,841	0,790	0,742	0,696	0,653	0,611	0,572	0,534	0,499	0,465
+50	0,850	0,799	0,750	0,703	0,658	0,616	0,575	0,537	0,501	0,467	0,434
Barometric pressure, mm. Hg	760	716	674	634	596	560	526	493	462	433	405
t_{OA}, °C	$\sqrt{\Delta}$										
-50	1,136	1,103	1,070	1,033	1,007	0,976	0,945	0,915	0,886	0,857	0,829
-40	1,112	1,079	1,047	1,016	0,985	0,954	0,925	0,896	0,867	0,839	0,811
-30	1,089	1,057	1,025	0,994	0,964	0,935	0,905	0,877	0,848	0,821	0,794
-20	1,067	1,035	1,004	0,974	0,944	0,915	0,887	0,859	0,831	0,805	0,778
-10	1,046	1,015	0,985	0,955	0,926	0,897	0,869	0,842	0,815	0,789	0,763
0	1,026	0,996	0,966	0,937	0,908	0,880	0,853	0,826	0,799	0,773	0,748
+10	1,006	0,977	0,947	0,919	0,891	0,863	0,836	0,810	0,783	0,758	0,733
+20	0,987	0,958	0,929	0,901	0,873	9,846	0,819	0,793	0,767	0,742	0,717
+30	0,967	0,938	0,910	0,882	0,855	0,828	0,801	0,776	0,750	0,725	0,701
+40	0,946	0,917	0,889	0,862	0,834	0,808	0,782	0,756	0,731	0,706	0,682
+50	0,922	0,894	0,866	0,838	0,811	0,785	0,758	0,733	0,708	0,683	0,659

Table 4-2. (Sheet 2 of 2). Relative Air Density.

UNIT CONVERSION

1 MM HG. = 0.039 INCH HG = 1.333 MILLIBAR

1 METER = 3.279 FEET

ALTITUDE, M	ALTITUDE, FT	PRESSURE, MM HG	PRESSURE, INCH HG	PRESSURE, MBAR
0	0	760	29,921	1013,2
50	163,9	756	29,763	1007,9
100	327,9	751	29,567	1001,2
200	655,7	742	29,212	989,2
300	983,6	733	28,858	977,2
400	1311,5	725	28,543	966,5
500	1639,3	716	27,914	954,5
600	1967,2	708	27,569	943,9
700	2295,1	699	27,223	931,1
800	2622,9	690	26,878	919,9
900	2950,8	682	26,850	909,2
1000	3278,7	675	26,576	899,9
1500	4918,0	634	24,974	845,2
2000	6557,4	595	23,438	793,2
2500	8196,7	560	22,033	746,6
3000	9836,1	527	20,734	702,6
3500	11475,4	492	19,357	655,9
4000	13114,7	462	18,177	615,9
4500	14754,1	434	17,075	578,6
5000	16393,4	403	15,856	537,3
5500	18032,8	379	14,911	505,3
6000	19677,1	356	14,006	474,6
6500	21311,5	329	12,944	438,6
7000	22950,8	309	12,157	411,9

Table 4-3. Conversion of Altitude Units (meters – feet)
and Pressure Units (mm Hg – inch Hg - mbar).

KILOGRAMS										
kg	0	1	2	3	4	5	6	7	8	9
	POUNDS									
0	–	2,205	4,410	6,615	8,82	11,025	13,23	15,435	17,64	19,845
10	22,05	24,255	6,415	28,665	30,87	33,075	35,28	37,485	39,69	44,1
20	44,10	46,305	48,510	50,715	52,92	55,125	57,33	59,535	61,74	63,945
30	66,15	68,355	70,56	72,765	74,97	77,175	79,38	81,585	83,79	85,995
40	88,20	90,405	92,61	94,815	97,02	99,225	101,43	103,635	105,84	108,045
50	110,25	112,455	114,66	116,865	119,07	121,275	123,48	125,685	127,89	130,095
60	132,30	134,505	136,71	138,915	142,12	143,325	145,53	147,735	149,94	152,145
70	154,35	156,555	158,76	160,965	163,17	165,783	167,58	169,785	171,99	174,195
80	176,40	178,605	180,81	183,015	185,22	187,425	189,63	192,04	194,04	196,245
90	198,45	200,655	202,86	205,065	207,27	209,475	211,68	213,885	216,09	218,295
100	220,5	222,705	224,91	227,115	229,32	231,525	233,73	235,935	238,14	240,345

Table 4-4. Kilograms to Pounds Conversion.

POUNDS										
Pounds	0	1	2	3	4	5	6	7	8	9
	KILOGRAMS									
0	–	0,454	0,907	1,361	1,814	2,268	2,722	3,175	3,629	4,082
10	4,536	4,990	5,443	5,897	6,350	6,804	7,257	7,711	8,165	8,618
20	9,072	9,525	9,979	10,433	10,886	11,340	11,793	12,247	12,701	13,154
30	13,608	14,061	14,515	14,969	15,422	15,876	16,329	16,783	17,237	17,690
40	18,144	18,597	19,051	19,504	19,958	20,412	20,865	21,319	21,722	22,226
50	22,680	23,133	23,587	24,040	24,494	24,948	25,401	25,855	26,308	26,762
60	27,216	27,669	28,123	28,576	29,030	29,484	29,937	30,390	30,834	31,298
70	31,751	32,205	32,659	33,112	33,566	34,019	34,473	34,927	35,380	35,834
80	36,287	36,741	37,195	37,648	38,102	38,555	39,009	39,463	39,916	40,370
90	40,823	41,277	41,730	42,184	42,638	43,091	43,545	43,498	44,453	44,906
100	45,359	45,813	46,266	46,720	47,174	47,627	48,081	48,577	48,908	49,442

Table 4-5. Pounds to Kilograms Conversion.

METERS										
Meters	0	1	2	3	4	5	6	7	8	9
	FEET									
0	0	3,279	6,557	9,836	13,115	16,393	19,672	22,951	26,230	29,508
10	32,787	36,066	39,344	42,623	45,902	49,180	52,459	55,738	59,016	62,295
20	65,574	68,852	72,131	75,410	78,689	81,957	85,246	88,526	91,803	95,082
30	98,361	101,639	104,918	108,197	111,475	114,754	118,033	121,311	124,590	127,869
40	131,148	134,429	137,705	140,984	144,262	147,541	150,820	154,098	157,377	160,656
50	163,934	167,213	170,492	173,770	177,049	180,328	183,607	186,885	190,164	193,443
60	196,721	200,000	203,279	206,557	209,836	213,115	216,393	219,672	222,951	226,230
70	229,508	232,787	236,066	239,344	242,623	245,902	249,180	252,459	255,738	259,016
80	262,295	265,574	268,852	272,131	275,410	278,689	281,967	285,246	288,525	291,703
90	295,082	298,361	301,639	304,918	308,197	311,475	314,754	318,033	321,313	324,590
100	327,869	331,148	334,426	337,705	340,984	344,262	347,541	350,820	354,098	357,327

Table 4-6. Meters to Feet Conversion.

FEET										
Feet	0	1	2	3	4	5	6	7	8	9
	METERS									
0	---	0,305	0,610	0,914	1,219	1,527	1,829	2,134	2,438	2,743
10	3,048	3,353	3,658	3,962	4,267	4,572	4,877	5,182	5,486	5,791
20	6,096	6,401	6,706	7,010	7,315	7,620	7,925	8,229	8,534	8,839
30	9,144	9,449	9,753	10,058	10,363	10,668	10,972	11,277	11,582	11,887
40	12,192	12,496	12,801	13,106	13,411	13,716	14,020	14,325	14,630	14935
50	15,230	15,544	15,849	16,154	16,459	16,763	17,068	17,373	17,678	17,983
60	18,287	18,592	18,897	19,202	19,507	19,811	20,116	20,421	20,726	21,031
70	21,335	21,640	21,945	22,250	22,555	22,859	23,164	23,469	23,774	24,070
80	24,383	24,688	24,993	25,298	25,602	25,907	26,212	26,517	26,822	27,126
90	27,431	27,736	28,041	28,346	28,651	28,955	29,260	29,565	29,870	30,174
100	30,479	30,784	31,089	31,394	31,698	32,003	32,308	32,613	32,918	33,222

Table 4-7. Feet to Meters Conversion.

km/h	knots	km/h	knots	km/h	knots	km/h	knots
1	0,54	20	10,75	110	59,40	210	113,40
2	1,08	30	16,13	120	64,80	220	118,80
3	1,61	40	21,51	130	70,20	230	124,20
4	2,15	50	26,88	140	75,10	240	129,60
5	2,69	60	32,26	150	80,65	250	135,00
6	3,23	70	37,63	160	86,02	260	140,40
7	3,76	80	43,01	170	91,80		
8	4,30	90	48,39	180	97,20		
9	4,84	100	53,76	190	102,60		
10	5,38			200	108,29		

Table 4-8. Speed Units Conversion (km/h – knots).

knots	km/h	knots	km/h	knots	km/h	knots	km/h
1	1,85	15	27,78	55	101,85	105	194,44
2	3,70	20	37,04	60	111,11	110	203,70
3	5,56	15	46,30	65	120,37	115	212,96
4	7,41	30	55,56	70	129,63	120	222,22
5	9,26	35	64,82	75	138,89	125	231,48
6	11,11	40	74,07	80	148,15	130	240,74
7	12,96	45	83,33	85	157,41	135	250,00
8	14,82	50	92,59	90	166,67	140	259,26
9	16,67			95	175,93		
10	18,52			100	185,19		

Table 4-9. Speed Units Conversion (knots – km/h).

SECTION 5. WEIGHT AND BALANCE

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SECTION 5. WEIGHT AND BALANCE

ADOPTED COORDINATE SYSTEM

The longitudinal coordinate of the cargo, unit and all helicopter center of gravity (Figs 5-1 and 5-2) (hereinafter called as Arm) is defined by the distance between the helicopter longitudinal axis intersection point (Arm 0) with the Arm passing through the center of gravity. All the Arms are parallel to the rotor shaft axis.

ARM-0 is located in front of the helicopter at a conditional distance where, for convenience of calculations, the extreme forward helicopter CG position is expressed by an integer (5.0 m or 207 inches). The coordinate of the main rotor shaft axis intersection point with the helicopter longitudinal axis is 5.28 m (208 inches) and the extreme aft CG position is 5.31 m (209 inches).

NOTE. To convert the coordinate system data relative to the main rotor shaft into the coordinate system data relative to Arm 0, it is necessary to subtract the coordinate value relative to the main rotor shaft (with its sign) from 5.28 m (208 inches).

The centre-of-mass transversal coordinates are defined relative to the projection of the longitudinal helicopter axis to the cargo cabin floor plane: to the left – "minus", to the right – "plus" according to the flight direction.

The vertical coordinates of various helicopter component mounting points are defined relatively to Water Line 0 passing in the plane of the lower rotor blade flapping hinges: down – "plus", up - "minus".

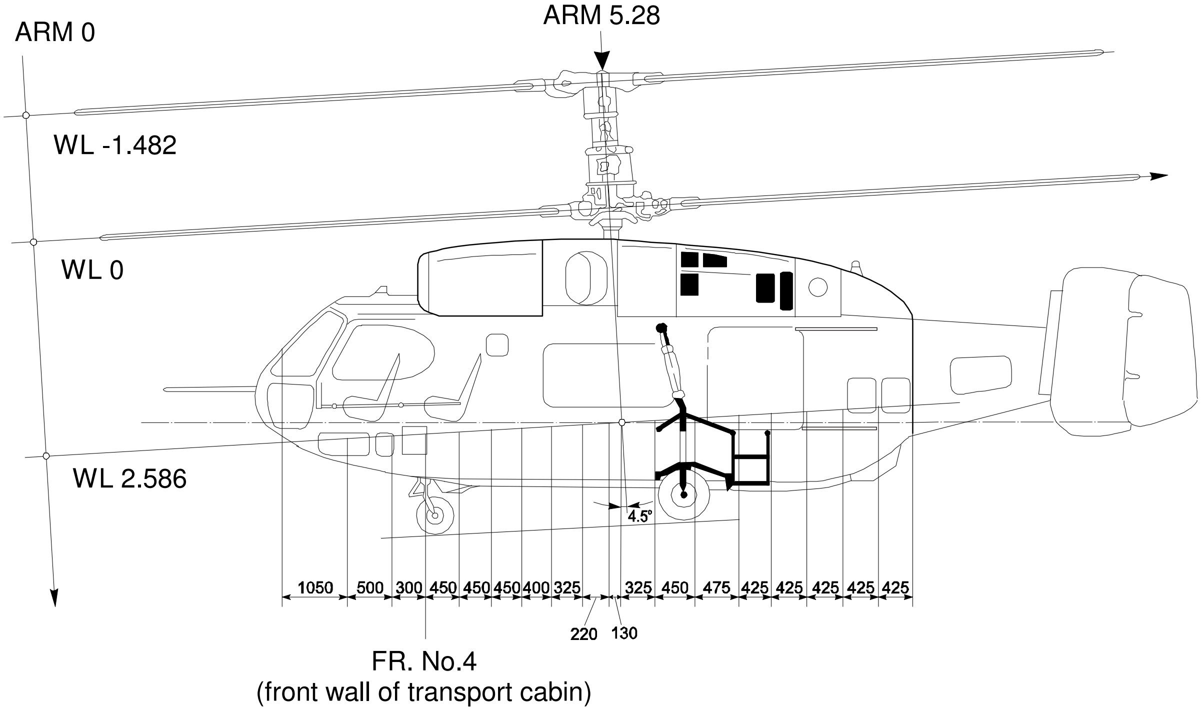
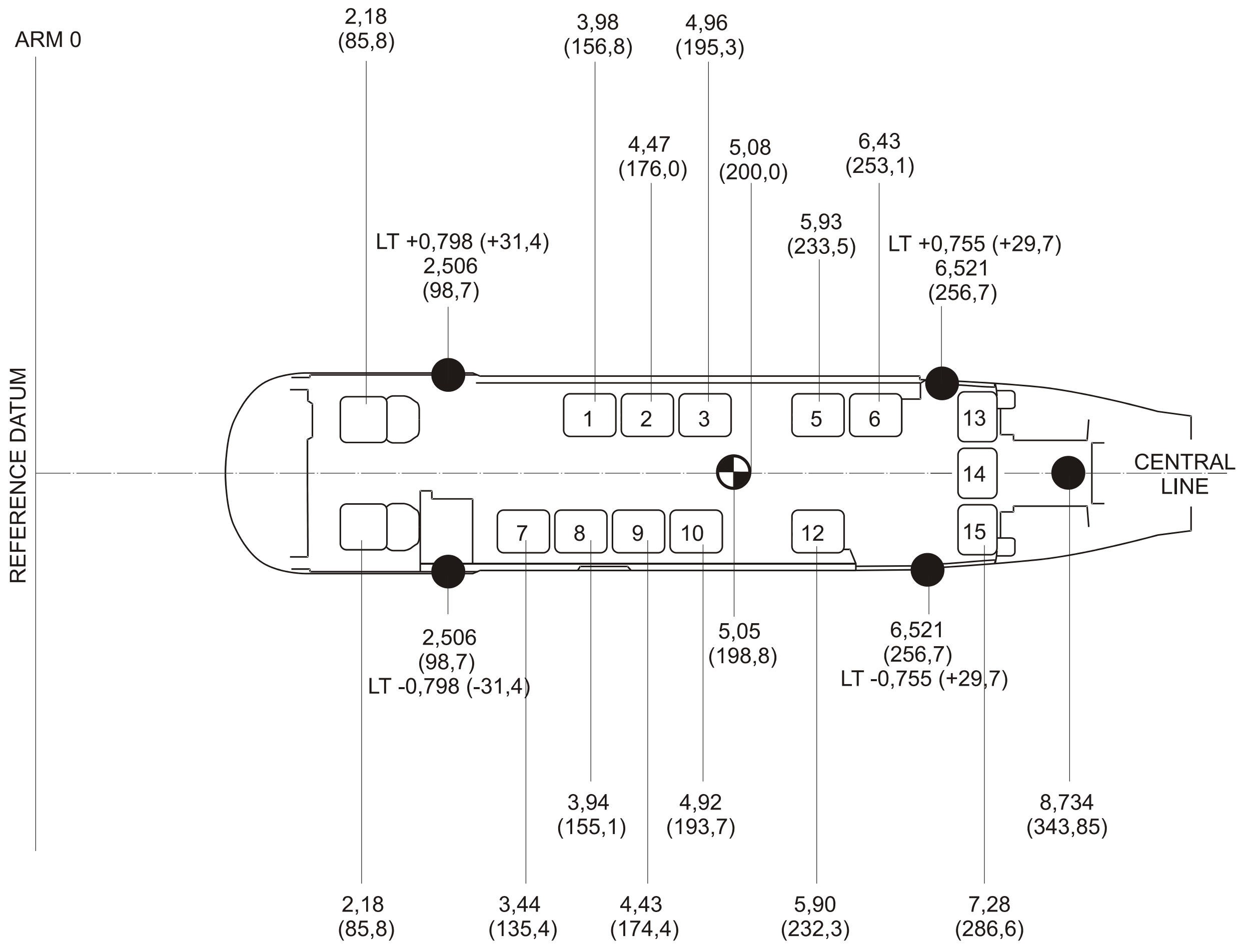


Fig. 5-1. Reference Plane Location Diagram.



5,90 (232,3) – Occupants longitudinal CG (versus reference datum), m (inch)

LT +0,755 (+29,7) – Lateral CG left (-) or right (+) to central line, m (inch)

● – Jacking point

⊕ – External load sling

Fig. 5-2. Main ARM Location Diagram.

CARGO CABIN AND ITS COMPONENTS DIMENSIONS

Cargo cabin:

Length along the floor......................4.52 m (14.83 ft)

Width across the floor......................1.30 m (4.26 ft)

Height (maximum) ....1.32 m (4.33 ft)

Floor area ....5.90 sq.m (63.4 sq.ft)

Cargo cabin door:

Width ....1.14 m (3.74 ft)

Height ....1.15 m (3.77 ft)

Emergency hatch (RH side):

Width ....0.60 m (1.97 ft)

Height ....0.90 m (2.95 ft)

Floor hatch on the cargo cabin floor (between Frame 7a and Frame 8a):

Width ....0.35 m (1.15 ft)

Height ....0.60 m (1.97 ft)

EMPTY WEIGHT AND EMPTY-WEIGHT CENTER OF GRAVITY POSITION

The helicopter empty weight consists of the weight of:

- airframe
- rotor system
- power plant
- transmission
- control system
- hydraulic systems
- electric power supply systems
- flight and navigation integrated system
- radiocommunication system
- instrument panels and consoles
- furnishing equipment
- heating and ventilation system
- de-icing system
- fire extinguishers
- hydraulic oil
- chladon fluid
- seats in cargo cabin
- fastening parts for copilot controls
- fastening components for floats
- flight date recorder
- undrainable fuel and oil

The helicopter empty weight and its CG position are given in the Helicopter Logbook.

CREWMEMBERS WEIGHT AND MOMENT

Average weight of a crewmember is determined as 80 kg and may be changed to actual weight of the crewmembers.

Positions of crewmembers CG (Longitudinal coordinates), and Moments are shown in Tables 5-1 and 5-1a.

Table 5-1. Crewmembers Table of Moments (metric system)

Crewmember	Weight, kg	ARM, m	Moment, kg·m
Pilot	80	2.18	174.40
Co-pilot	80	2.18	174.40
Flight-operator:			
• frame No. 8	80	5.08	406.40
• frames Nos 10–13	80	7.28	582.40

Table 5-1. Crewmembers Table of Moments (British system)

Crewmember	Weight, lb	ARM, inch	Moment, lb-inch
Pilot	176	85.8	15139.8
Co-pilot	176	85.8	15139.8
Flight-operator:			
• frame No. 8	176	200.0	35279.9
• frames Nos 10–13	176	286.6	50558.6

Table 5-1a. Crewmembers Weight and Moments (metric system)

Crewmember Weight, kg	60	70	80	90	100
MOMENT = WEIGHT x ARM, kg·m					
Pilot (left seat) ARM 2.18	131	153	174	196	218
Copilot (right seat) ARM 2.18	131	153	174	196	218
Flight-operator:					
• frame No. 8 ARM 5.08	305	356	406	457	508
• frames Nos 10–13 ARM 7.28	437	510	582	655	728

Table 5-1a. Crewmembers Weight and Moments (British system)

Crewmember Weight, lb	130	150	170	190	210
MOMENT = WEIGHT x ARM, lb- inch					
Pilot (left seat) ARM 85.8	11157	12874	14591	16307	18024
Copilot (right seat) ARM 85.8	11157	12874	14591	16307	18024
Flight-operator:					
• frame No. 8 ARM 200.0	26000	30000	34000	38000	42000
• frames Nos 10–13 ARM 286.6	37260	42992	48724	54457	60189

OPTIONAL EQUIPMENT WEIGHT AND MOMENT

Weight and Moments of Optional Equipment which can be installed on the Customer's request are shown in Table 5-2.

Table 5-2. Optional Equipment Table of Moments (metric system)

Items	Weight, kg	ARM, m	Moment, kg·m
Rafts:			
– RH Frame No. 4	38	3.03	115.14
– RH Frame No. 12	38	7.08	269.04
– LH Frame Nos 5–6	38	3.68	139.84
RH Inst Desk	17.5	1.43	25.025
FDI	3.5	1.43	5.005
RH Controls	11	1.98	21.78

Table 5-2. Optional Equipment Table of Moments (British system)

Items	Weight, lb	ARM, inch	Moment, lb-inch
Rafts:			
– RH Frame No. 4	83,8	119,3	9995
– RH Frame No. 12	83,8	278,7	23355
– LH Frame Nos 5–6	83,8	144,9	12139
RH Inst Desk	38.6	56,3	2172
FDI	7,7	56,3	434
RH Controls	24,2	77,9	1890

REMOVABLE EQUIPMENT WEIGHT AND MOMENT

Weight and Moment of Removable Equipment which is removed during transportation are shown in Table 5-3.

Table 5-3. Removable Equipment Table of Moments (metric system)

Units Drawing	Weight, kg	ARM, m	Moment, kg·m
1. Mounting of transceiver VHF first unit 521.7107.0010.000	2.32	9.13	21
2. Mounting of transceiver VHF second unit 521.7107.0010.000	2.32	9.13	21
3. Mounting of transceiver HF 521.7108.0010.000	16.65	7.15	119
4. ADF ARK-19			
– Receiver 501.7713.0010.000	7.3	8.13	59
– ITU 501.7713.0010.000	1.2	7.96	10
– CTU 500.7713.0090.000	1.3	1.78	2
5. Heat insulation of the cargo compartment 521.0100.0400.000	43	5.589	240
6. Seat in the cargo compartment 521.7510.0210.000	24	5.105	123
7. Additional seats installation 521.7510.0010.000	11.4	7.3	83
8. Mounting of the extinguisher 323.7910.2000.000	2.85	3.04	9
9. Mounting of the right seat in cockpit 500.7500.0800.000	17	2.16	37
10. Mounting of the navigator instrument desk 500.7910.0800.000	1.40	1.68	2
11. Cargo compartment cover plate 521.0100.4000.000	5	5.28	26

Table 5-3. Removable Equipment Table of Moments (British system)

Units Drawing	Weight, lb	ARM, inch	Moment, lb-inch
1. Mounting of transceiver VHF first unit 521.7107.0010.000	5.12	359.45	1840
2. Mounting of transceiver VHF second unit 521.7107.0010.000	5.12	359.45	1840
3. Mounting of transceiver HF 521.7108.0010.000	36.71	281.5	10335
4. ADF ARK-19			
– Receiver 501.7713.0010.000	16.10	320.08	5152
– ITU 501.7713.0010.000	2.65	313.39	829
– CTU 500.7713.0090.000	2.87	70.08	201
5. Heat insulation of the cargo compartment 521.0100.0400.000	94.82	220.08	20867
6. Seat in the cargo compartment 521.7510.0210.000	52.92	201.18	10646
7. Additional seats installation 521.7510.0010.000	25.14	287.40	7224
8. Mounting of the extinguisher 323.7910.2000.000	6.28	119.68	752
9. Mounting of the right seat in cockpit 500.7500.0800.000	37.49	85.04	3188
10. Mounting of the navigator instrument desk 500.7910.0800.000	3.09	66.14	204
11. Cargo compartment cover plate 521.0100.4000.000	11.025	207.87	2292

FUEL AND OTHER FLUIDS WEIGHTS AND MOMENTS

The helicopter fuel system consists of 10 main fuel tanks and 2 auxiliary tanks that can be installed (Fig. 5-3).

The capacity, CG coordinate and moment of fuel in each tank are shown in Table 5-4.

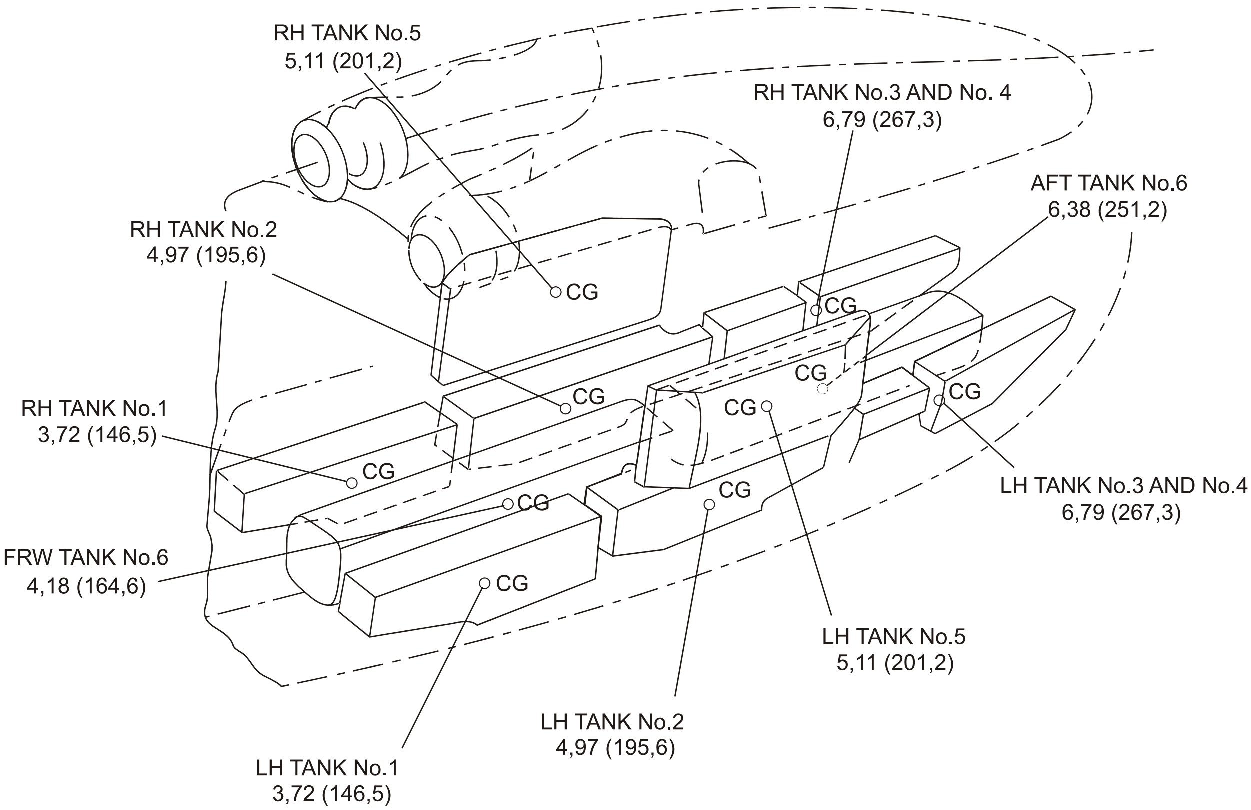


Fig. 5-3. Fuel Tank Balance Diagram.

To preserve the helicopter CG within the limits, the following automatic sequence of fuel consumption is established:

- 1st priority – LH Tank No. 1, and RH Tanks Nos 3+4
- 2nd priority – LH Tanks Nos 3+4, and RH Tank No. 1
- 3rd priority – LH Tank No. 5, and RH Tank No. 5
- 4th priority – LH Tank No. 2, and RH Tank No. 2

CAUTION. THE MAIN TANKS OF LH AND RH GROUPS, AND AUXILIARY FORWARD AND AFT TANKS SHOULD BE REFUELLED IN EQUAL PARTS IN ACCORDANCE WITH CONSUMPSION PRIORITY.

With the auxiliary fuel tanks installed the fuel from the forward tank is transferred to LH Tank No. 1, from the aft tank it is transferred to RH Tank No. 4.

Table 5-4. Fuel Loading Table (metric system)

Fuel Density (0.8 kg/cm³)							
Tank	Arm, m	Quantity, Pressure Refuelling, L	Weight, kg	Moment, kg·m	Quantity, Manual Refuelling, L	Weight, kg	Moment, kg·m
RH No. 1	3.72	260	208	774	285	228	848
LH No. 1	3.72	260	208	774	285	228	848
RH No. 2	4.97	280	224	1113	280	224	1113
LH No. 2	4.97	280	224	1113	280	224	1113
RH Nos 3+4	6.79	330	264	1793	410	328	2227
LH Nos 3+4	6.79	330	264	1793	410	328	2227
RH No. 5	5.11	220	176	899	250	200	1022
LH No. 5	5.11	220	176	899	250	200	1022
Frw No. 6	4.18	450	360	1505	500	400	1672
Aft No. 6	6.38	450	360	2297	500	400	2552
Total:							
Main Tanks only		2180	1744	9158	2450	1960	10421
Main and Aux. Tanks		3080	2456	12960	3450	2760	14645

Table 5-4. Fuel Loading Table (British system)

Fuel Density 6.67 lb/gal							
Tank	Arm, inch	Quantity, Pressure Refuelling, USA gallon	Weight, lb	Moment lb- inch	Quantity, Manual Refuelling, USA gallon	Weigh t, lb	Moment, lb-inch
RH No. 1	146.5	68.7	458.6	67171	75.3	502.7	73629
LH No. 1	146.5	68.7	458.6	67171	75.3	502.7	73629
RH No. 2	195.7	74.0	493.9	96644	74.0	493.9	96644
LH No. 2	195.7	74.0	493.9	96644	74.0	493.9	96644
RH Nos 3+4	267.3	87.2	582.1	155613	108.3	723.2	193338
LH Nos 3+4	267.3	87.2	582.1	155613	108.3	723.2	193338
RH No. 5	201.2	58.1	388.1	78074	66.1	441.0	88720
LH No. 5	201.2	58.1	388.1	78074	66.1	441.0	88720
Frw No. 6	164.6	118.9	793.8	130633	132.1	882.0	145147
Aft No. 6	251.2	118.9	793.8	199387	132.1	882.0	221541
Total:							
Main tanks only		576.0	3845.5	795004	641.3	4321.8	904664
Main and Aux. Tanks		813.7	5433.1	1125024	911.5	6085.8	1271352

OIL WEIGHT AND MOMENT

The helicopter oil system contains 90 kg (198.45 lb) of oil.

Oil consumption (of no more than 0.4 kg/h) does not influence the helicopter CG during flight.

DE-ICING FLUID WEIGHT AND MOMENT

Weight of de-icing fluid is 15 kg (33 lb), and its moment is 49 kg·m (4253 lb·in).

Full de-icing fluid consumption shifts the helicopter CG aftward by 3-4 mm (0.1-0.15 in).

Weight of water in thermoses is 6 kg (13 lb), and its moment is ·14 kg·m (1215 lb·in).

Water consumption does not influence the CG.

OCCUPANT WEIGHT AND CG

There are 13 seats installed in the cargo compartment.

To determine the seats enumeration and location, refer to Fig. 5-2.

NOTE. To prevent CG from exceeding the allowable limits, it is necessary to embark the occupant beginning with forward LH seats and RH seats by turns. The three seats in the rear of the cargo compartment should be taken last.

The occupant Weight, Arm and Moment are shown in Table 5-5.

Table 5-5. Occupant Table of Moments (metric system)

Item	Weight, kg	ARM, m	Moment, kg·m
RH seat No. 1	80	3.98	318
RH seat No. 2	80	4.47	358
RH seat No. 3	80	4.96	397
RH seat No. 5	80	5.93	474
RH seat No. 6	80	6.43	514
LH seat No. 7	80	3.44	275
LH seat No. 8	80	3.94	315
LH seat No. 9	80	4.43	354
LH seat No. 10	80	4.92	394
LH seat No. 12	80	5.90	472
Aft seat No. 13	80	7.28	582
Aft seat No. 14	80	7.28	582
Aft seat No. 15	80	7.28	582

Table 5-5. Occupant Table of Moments (British system)

Item	Weight, lb	ARM, in	Moment, lb-in
RH seat No. 1	176	157	27641
RH seat No. 2	176	176	31044
RH seat No. 3	176	195	34447
RH seat No. 5	176	233	41183
RH seat No. 6	176	253	44656
LH seat No. 7	176	135	23890
LH seat No. 8	176	155	27363
LH seat No. 9	176	174	30766
LH seat No. 10	176	194	34169
LH seat No. 12	176	232	40975
Aft seat No. 13	176	287	50559
Aft seat No. 14	176	287	50559
Aft seat No. 15	176	287	50559

LOADED HELICOPTER GROSS WEIGHT AND CG CALCULATION

It shall be the pilot's responsibility to ensure that the helicopter is properly loaded so that the entire flight is conducted within the limits of Center of Gravity Limitations.

The gross weight center of gravity may be calculated from the Actual Weight and Balance Record and the loading tables in this section or appropriate Flight Manual Supplements to assure safe flight in all the stages.

Arms for weight and balance calculations are shown in Fig. 5-1 and 5-2.

To determine if the Gross Weight and Center of Gravity for a given flight are within the limits, proceed as follows:

- obtain the aircraft weight and moment from the Weight and Balance Record in the Helicopter Logbook;
- determine the weight of crewmembers and the moment (Table 5-1 and 5-1a);
- determine the weight of equipment and the moment (Tables 5-2 and 5-3);
- determine the weight of fuel and the moment (Table 5-4);
- determine the quantity and location of occupants;
- determine the occupants CG coordinates, their weight and moment (Fig. 5-2, Table 5-5);
- determine the weight of cargo;
- determine the location of the cargo CG and its moment.

LOADING INSTRUCTIONS

CG of all cargo should be, as far as possible, in front of Zero marking made along the helicopter RH side scale (recommended position is from Zero to +0.23 on the blue arrow). In any case the loaded helicopter CG must not go beyond the limits from +0.28 (blue arrow) to -0.03 (red arrow) (see position A, Fig. 5-4).

Before the takeoff, the crew should be sure that based on the calculations made (see below) the helicopter CG position does not exceed the allowed limits.

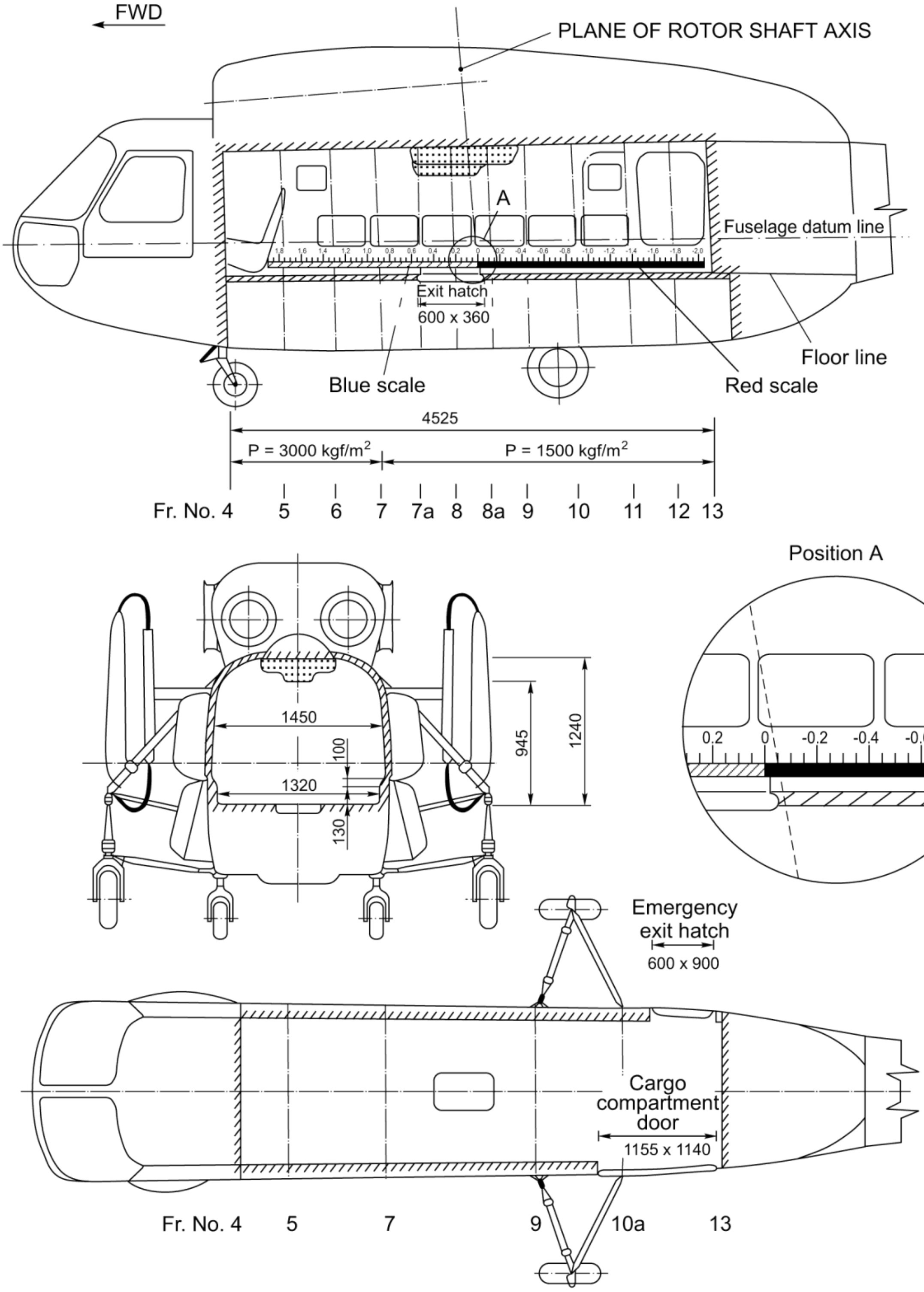


Fig. 5-4. Marks for Cargo Loading on RH side and Dimensions of Cargo Compartment.

Cargo loading accuracy (CG coordinate):

- longitudinally, within ±0.05 m (±2 in) of the appropriate marking on the RH side;
- laterally, within ±0.05 m (±2 in) of the centerline.

NOTE. Refer to Maintenance Manual regarding cargo arrangement and usage of mooring devices when transporting cargo and luggage.

When people and cargo are transported together in the cargo cabin, the cargo must be located in the front part of the cargo cabin in front of the seats occupied by people.

For luggage arrangement seats Nos. 7, 8, 9 should be folded and tied down. After arrangement of the cargo it is to be lashed with a special net. Maximum allowable luggage weight is 150 kg (330 lb).

EXAMPLE OF CG CALCULATION

Initial data for calculation:

The helicopter has to transport 5 occupants and 400 kg of cargo.

Fuel required (navigation calculation): 2580 kg.

Return to home airfield without occupants, cargo and co-pilot.

Formula for helicopter CG calculation:

$$CG_{H/C} = \left[\frac{(W \times CG)_{EMPTY\ H/C} + \sum (W \times CG)_{LOADED\ H/C}}{W_{FLYING\ H/C}} \right],$$

where:

$CG_{H/C}$	– loaded helicopter CG, m (in);
$(W \times CG)_{EMPTY\ H/C}$	– empty helicopter CG static moment, kg·m (lb·in);
$(W \times CG)_{LOADED\ H/C}$	– CG static moment of each helicopter loading element, kg·m (lb·in);
$W_{FLYING\ H/C}$	– loaded and fuelled helicopter mass, kg (lb)

Table 5-6. Helicopter CG Calculation Procedure (METRIC)

OUTBOUND FLIGHT

	WEIGHT, kg	CG coordinate, m	MOMENT, kg·m
Helicopter Empty Weight	**6800**	**5.234**	**35591.20**
+ Removable Equipment (auxiliary fuel tanks)	110		580.80
+ Skies, front	17		51.51
+ main	33		197.34
+ Thermoses (3 L)	4.6		14.17
+ Oil	90		518.40
+ De-icing fluid	15		49.20
+ Water	6		18.66
+ Captain (left seat)	80		174.40
+ Co-pilot (right seat)	80		174.40
Equipped helicopter	**7236**		**37370**
Cargo:			
in the area of mark 1.12 (along the blue scale marked on the helicopter RH side, between frames No. 6 and 7)	400	4.16	1663
Occupants:			
+ seat No. 9	80		354
+ seat No. 10	80		394
+ seat No. 5	80		474
+ seat No. 12	80		472
+ seat No. 6	80		514
Total Load incl. people	**800**		**3871**

Fuel (refueling)			
+ tank No. 1 LH	228		848
+ tank No. 1 RH	228		848
+ tank No. 2 LH	224		1113
+ tank No. 2 RH	224		1113
+ tanks Nos 3+4 LH	328		2227
+ tanks Nos 3+4 RH	328		2227
+ tank No. 5 LH	200		1022
+ tank No. 5 RH	200		1022
+ Auxiliary tanks	620		3274
Total Fuel Load	**2580**		**13694**
Helicopter Takeoff Weight	**10616**	**5.175**	**54935**
Fuel consumption in flight (ref. Sec. 3 of Manufacturer's Data)			
– Auxiliary tanks	-620		-3274
– tank No. 1 LH	-228		-848
– tanks Nos 3+4 RH	-267		-1813
– tanks Nos 3+4 LH	-39		-265
Total Fuel Consumption	**-1154**		**-6200**
Helicopter Landing Weight	**9462**	**5.151**	**48735**
– Unloading (occupants/cargo)	-800		-3871
– Co-pilot left behind	-80		-174.4
Total unloaded weight	**-880**		**-4045.4**

RETURN FLIGHT

Takeoff Weight	**8582**	**5.208**	**44689**
Fuel Consumption in flight (ref. Sec. 3 of Manufacturer's Data)			
– tanks Nos 3+4 LH	-289		-1962.31
– tanks Nos 3+4 RH	-61		-414.19
– tank No. 1 RH	-228		-848.16
– tank No. 5 LH	-200		-1022
– tank No. 5 RH	-200		-1022
– tank No. 2 LH	-88		-437.36
– tank No. 2 RH	-88		-437.36
Total Fuel Consumption	**-1154**		**-6143.38**
Helicopter Landing Weight	**7426**	**5.19**	**38545.6**
Remaining fuel after landing	192		

Table 5-6. Helicopter CG Calculation Procedure (British system)

OUTBOUND FLIGHT

	WEIGHT, lb	CG coordinate, in	MOMENT, lb-in
Helicopter Empty Weight	14994	206,1	3089702
+ Removable Equipment (auxiliary fuel tanks)	242,55		50420
+ Skies: front	37,485		4472
+ main	72,765		17131
+ Thermoses (3 L)	10,143		1230
+ Oil	198,45		45003
+ De-icing fluid	33,075		4271
+ Water	13,23		1620
+ Pilot (left seat)	176,4		15140
+ Co-pilot (right seat)	176,4		15140
Equipped helicopter	**15954**		**3244128**
Cargo:			
– in the area of mark 1,12 (along the blue scale marked on the helicopter RH side between frames No. 6 и 7).	880	161,4	144383
Occupants:			
+ seat No.9	176		30766
+ seat No.10	176		34169
+ seat No.5	176		41183
+ seat No. 12	176		40975
+ seat No. 6	176		44656
Total load incl.people	**1764**		**336132**

Fuel (refueling)	**503**		**73629**
+ tank No.1 LH	503		73629
+ tank No.1 RH	494		96645
+ tank No.2 LH	494		96645
+ tank No.2 RH	723		193338
+ tank No.3+4 LH	723		193338
+ tank No.3+4 RH	441		88721
+ tank No.5 LH	441		88721
+ tank No.5 RH	1367		284184
+ Auxiliary tanks			
Total Fuel Load	**5689**		**1188850**
Helicopter Takeoff Weight	**23407**	**203,7**	**4749110**
Fuel consumption in flight (ref. Sec. 3 of Manufacturer's Data)			
Auxiliary tanks	-1367		-284184
+ tank No.1 LH	-503		-73629
+ tank No.3+4 RH	-589		-157382
+ tank No.3+4 LH	-86		-22988
Total Fuel Consumption	**–2545**		**–538183**
Helicopter Landing Weight	**20863**	**202,8**	**4230926**
Unloading (cargo/occupants)	-1764		-336132
Co-pilot left behind	- 76,4		-15140
Total Unloaded Weight	**-1940,4**		**-351272**

RETURN FLIGHT

Takeoff Weight	**18923**	**205,0**	**3879654**
Fuel consumption in flight			
(ref. Sec. 3 of Manufacturer's Data)			
- tank No.3+4 LH	-637		-170350
- tank No.3+4 RH	-135		-35956
- tank No.1 RH	-503		-73629
- tank No.5 LH	-441		-88721
- tank No.5 RH	-441		-88721
- tank No.2 LH	-194		-37968
- tank No.2 RH	-194		-37968
Total Fuel Consumption	**-2545**		**-538183**
Helicopter Landing Weight	**16208**	**206,5**	**3346343**
Remaining fuel after landing	423		

LIMITING SIGNALS SYSTEM (LSS)

The values of the helicopter takeoff weight and the fuelling quantity should be introduced into LSS in order to calculate maximal allowable speed (V_{NE}).

The fuel quantity (fuel volume in thousand of litres) is introduced after fuelling by the selector that is located on the additional instrument panel.

The helicopter takeoff weight (or flying weight) value in tons is introduced by the selector that is located on the pilot's instrument panel.

After starting the engines the system automatically takes account of changes in the helicopter weight caused by fuel consumption.

The helicopter flying weight is defined by the following formula:

$$W_{T/O} = W_{EQPD.HLPT} + 0.8\,(V_{T/O\ FUEL}) + W_{CARGO}$$

Where:

$W_{EQPD.HLPT}$ – Equipped helicopter (zero fuel), kg

$V_{T/O\ FUEL}$ – Takeoff fuel quantity, L

W_{CARGO} – Cargo Weight, kg

NOTES:
1. If the fuel quantity and the helicopter takeoff weight do not coincide with the digits on the selectors, the selector switches shall be set to the next higher value.
2. The on-board fuel quantity is corrected by the selector on the additional instrument panel if only the engines were shut down.
3. The takeoff weight is always corrected when cargo weight changes.

Example:

To calculate the helicopter takeoff weight.

Known: Equipped helicopter	7236 kg
On-board fuel quantity	1500 L
Cargo weight on board	1000 kg

Solution:

The helicopter takeoff weight:

$W_{T/O}$ = 7236 kg + 0.8 (1500 L) + 1000 kg = 9436 kg

The fuel quantity selector switch and the takeoff weight selector switch should be set to positions accordingly:

$T/O_{FUEL\ QTY}$ .... to position 1.6

T/O_{WT}.. to position 9.5

If after landing the helicopter unloading has been made without engine shutdown, set the takeoff weight selector switch in the position:

$W_{T/O}$ = 9.5 – 1.0 = 8.5

SECTION 6. OPTIONAL EQUIPMENT SUPPLEMENTS

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SECTION 6. OPTIONAL EQUIPMENT SUPPLEMENTS

OPTIONAL EQUIPMENT

Only the equipment listed in this Section requires Flight Manual Supplements.

Flight Manual Supplements are listed in Table 6-1. The Table contains:

- Supplement number;
- Supplement designation and name;
- Drawing number (Dwg No.), if available, of the equipment to which the Supplement refers;
- Instructions on the necessity of installation of other optional equipment and/or its application together with other Supplements;
- Instructions on the impossibility of simultaneous installation with other optional equipment and/or simultaneous application together with other Supplements;

The above-listed optional equipment can be installed on the baseline helicopter by maintenance personnel having permission for this kind of operations.

Table 6-1. Flight Manual Supplements for Optional Equipment.

No	Supplement's name	Equipment Dwg No.	Requires	Excludes
1	Ka-32A11BC-Д-1.1 External cargo operation	323.9600.9000.000	–	1A, 21, 25, 28, 37, 61, 68, 78, 81, 91, 93
1A	Ka-32A11BC-Д-1A.1 External cargo operation	323.9600.9000.000	68	1, 4, 21, 25, 28, 37, 61, 78, 81, 91, 93
2	Ka-32A11BC-Д-2.1 Skies	521.4711.0000.000 521.4712.0000.000	–	–
3	Ka-32A11BC-Д-3.1 Emergency floats	500.4500.0000.000	–	34, 78, 81, 91, 93
4	Ka-32A11BC-Д-4.1 IFR flights		–	28, 61, 68, 78, 81, 91, 93
5	Ka-32A11BC-Д-5.1 Flight Procedure in icing conditions		–	24, 28, 39, 61, 78, 81, 91, 93
6	Ka-32A11BC-Д-6.1 Helicopter operation in Spain		–	All, except 1, 2, 24, 39
7	Ka-32A11BC-Д-7.1 Helicopter operation in Portugal		–	1A, 68
8	Ka-32A11BC-Д-8.1 Two cargo cabin doors with sliding windows		–	–
9	Ka-32A11BC-Д-9.1 САУ-32 Automatic Flight Control System		26	–
10	Ka-32A11BC-Д-10.1 KNR 634A Navigation System		–	–

No	Supplement's name	Equipment Dwg No.	Requires	Excludes
11	Ka-32A11BC-Д-11.1 KDM 706A Distance Measuring Equipment		–	–
12	Ka-32A11BC-Д-12.1 KT 73 Transponder		–	41
13	Ka-32A11BC-Д-13.1 АГБ-98Р-С-10 Standby Gyro Horizon		–	–
14	Ka-32A11BC-Д-14.1 PRIMUS 701A Weather Radar		–	–
15	Ka-32A11BC-Д-15.1 MDF-124F (V2) Direction Finder		–	–
16	Ka-32A11BC-Д-16.1 ПРИМА-КВ HF Radio Set		–	–
17	Ka-32A11BC-Д-17.1 СПГУ-35 Interphone and Passenger Address System		–	–
18	Ka-32A11BC-Д-18.1 ME406ELT Emergency Locator Transmitter		–	44, 53
19	Ka-32A11BC-Д-19.1 РПИ-2-02 Onboard Parameters and Audio Information Recording System		–	–
20	Ka-32A11BC-Д-20.1 PSAIR 22 Loudspeaker System		–	–

No	Supplement's name	Equipment Dwg No.	Requires	Excludes
21	Ka-32A11BC-Д-21.1 Ambulance Equipment		–	1, 1A, 25, 28, 37, 61, 63, 78, 81, 91, 93
22	Ka-32A11BC-Д-22.1 SRT-651/ N-GDF VHF Radio Set		–	–
23	Ka-32A11BC-Д-23.1 SX-16 Searchligt		–	–
24	Ka-32A11BC-Д-24.1 Air Intake Screen for Engine Protection from Foreign Objects Ingress	323.6580.0000.000	–	5, 36
25	Ka-32A11BC-Д-25.1 Emergency Equipment Set		–	21, 28, 37, 61, 63, 78, 81, 91, 93
26	Ka-32A11BC-Д-26.1 СЭИ-32-Э Electronic Flight Instrument System		9	–
27	Ka-32A11BC-Д-27.1 GNS 530 Navigation System		–	92
28	Ka-32A11BC-Д-28.1 Bambi Bucket, Type HL5000, provided with Torrentula valve, PowerFill I quick-filling pumps and Sacksafoam Generation System 1, Type SFF03-5550		1	4, 5, 21, 25, 37, 61, 63, 78, 81, 91, 93
29	Ka-32A11BC-Д-29.1 УСВИЦ-180-Э-1 Speed Indicator		–	–

No	Supplement's name	Equipment Dwg No.	Requires	Excludes
30	Ka-32A11BC-Д-30.1 Pilot's, Co-pilot's and Operator's Seats		–	–
31	Ka-32A11BC-Д-31.1 Lower Hemisphere-View Mirror		–	–
32	Ka-32A11BC-Д-32.1 Flight Environment Data System		26	–
33	Ka-32A11BC-Д-33.1 GOODRICH P/N 44311 Hoist		–	60
34	Ka-32A11BC-Д-34.1 Bambi Bucket Transportation Pod		–	3, 78, 81, 91, 93
35	Ka-32A11BC-Д-35.1 УБРПИ-32 Flight Data Recording/Indicating System		26	–
36	Ka-32A11BC-Д-36.1 Engine Dust Protection Devices		–	24
37	Ka-32A11BC-Д-37.1 СПАС (PLUS) System		–	1, 1A, 21, 25, 28, 61, 63, 78, 81, 91, 93
38	Ka-32A11BC-Д-38.1 RT-5000 Radio Set		–	–
39	Ka-32A11BC-Д-39.1 Wire Strike Protection System		–	5, 78
40	Ka-32A11BC-Д-40.1 Helicopter Operation in Japan		1	1A, 68

No	Supplement's name	Equipment Dwg No.	Requires	Excludes
41	Ka-32A11BC-Д-41.1 KT-70 Transponder and KEA-130A Encoding Altimeter		–	12
42	Ka-32A11BC-Д-42.1 KTR 908 Radio Set		–	–
43	Ka-32A11BC-Д-43.1 GI 106A Course Deviation Indicator		–	–
44	Ka-32A11BC-Д-44.1 C406-1HM Emergency Locator Transmitter		–	18, 53
45	Ka-32A11BC-Д-45.1 KRA 405B Radar Altimeter		–	–
46	Ka-32A11BC-Д-46.1 Helicopter Operation in South Korea		1	1A, 68
47	Ka-32A11BC-Д-47.1 KDF 806A Direction Finder		–	–
48	Ka-32A11BC-Д-48.1 UI5934D-3 Altimeter		–	–
49	Ka-32A11BC-Д-49.1 UI7060 Rate of Climb Indicator		–	–
50	Ka-32A11BC-Д-50.1 HRCFAR Anti-Collision Light		–	–
51	Ka-32A11BC-Д-51.1 Helicopter Operation in China		–	1A, 68
52	Ka-32A11BC-Д-52.1 KHF 1050 (PRIMUS) HF Radio Set		–	–

No	Supplement's name	Equipment Dwg No.	Requires	Excludes
53	Ka-32A11BC-Д-53.1 Automatic Portable Radio Beacon АРМ-406П (ARM-406P)		–	18, 44
54	Reserved			
55	Ka-32A11BC-Д-55.1 "Prima-MV" VHF Radio Set		–	–
56	Reserved			
57	Reserved			
58	Ka-32A11BC-Д-58.1 Aircraft Responder CO-96 (SO-96)		–	89
59	Reserved			
60	Ka-32A11BC-Д-60.1 Lift Rigging Driven by LPG-300/ЛПГ-300 Hoist Operation		–	33
61	Ka-32A11BC-Д-61.1 Helibucket ВСУ-5 water discharge device and СДП-1 foam generator metered flow system		1	4, 5, 21, 25, 28, 37, 63, 78, 81, 91, 93
62	Ka-32A11BC-Д-62.1 Radio Direction Finder RT-600/SAR-DF 517		–	–
63	Ka-32A11BC-Д-63.1 Helicopter medical accessories (The present Supplement is issued only in Russian)		–	1, 1A, 21, 25, 28, 37, 61, 78, 81, 91, 93
64	Reserved			
65	Reserved			
66	Reserved			

No	Supplement's name	Equipment Dwg No.	Requires	Excludes
67	Ka-32A11BC-Д-67.1 The present Supplement is issued only in Russian			
68	Ka-32A11BC-Д-68.1 Peculiarities in Operation of Helicopters Complying with EASA Certificate		71, 72	All, except 1A, 2, 24, 71 ,72
69	Ka-32A11BC-Д-69.1 Ka-32A12 Features		68	–
70	Ka-32A11BC-Д-70.1 Category A Flights		–	68, 78, 81
71	Ka-32A11BC-Д-71.1 Electronic Pressure Altimeter ВБЭ-СВС-ЦМ		–	–
72	Ka-32A11BC-Д-72.1 Updated Indication System (2009)		–	–
73	Ka-32A11BC-Д-73.1 Helicopter Operation in Brazil		–	All, except 1, 2, 3, 24, 71, 72
74	Ka-32A11BC-Д-74.1 The present Supplement is issued only in Russian			
75	Ka-32A11BC-Д-75.1 Helicopter Operation in Canada		–	All, except 1, 2, 24, 70
76	Reserved			

No	Supplement's name	Equipment Dwg No.	Requires	Excludes
77	Reserved			
78	Ka-32A11BC-Д-78.1 Horizontal fire-fighting system	521.9205.8000.000	1, 81	3, 4, 5, 21, 25, 28, 34, 37, 39, 61, 70, 91, 93
79	Ka-32A11BC-Д-79.1 Reserve power supply system		–	–
80	Reserved			
81	Ka-32A11BC-Д-81.1 SIMPLEX system	Mod. 328	1	3, 4, 5, 21, 25, 28, 34, 37, 61, 63, 70, 91, 93
82	Reserved			
83	Ka-32A11BC-Д-83.1 Traffic Collision Avoidance System TCAS		–	–
84	Ka-32A11BC-Д-84.1 "QUAD" hydro-stabilized optoelectronic system (GOES) for video surveillance		–	–
85	Ka-32A11BC-Д-85.1 "KOLOTUN" Air Conditioning System (ACS)		–	–
86	Ka-32A11BC-Д-86.1 The present Supplement is issued only in Russian			
87	Reserved			

No	Supplement's name	Equipment Dwg No.	Requires	Excludes
88	Ка-32А11ВС-Д-88.1 MOTOROLA XiR M8268 Radio		–	–
89	Ка-32А11ВС-Д-89.1 Aircraft Transponder CO-2010 (SO-2010)		–	58
90	Ка-32А11ВС-Д-90.1 Operation of helicopter in Thailand		–	1A, 68
91	Ка-32А11ВС-Д-91.1 FAS-32 Fire-Attack System		–	1, 1A, 3, 4, 5, 21, 25, 28, 34, 37, 61, 78, 81, 93
92	Ка-32А11ВС-Д-92.1 IFD 540 Navigation System		–	27
93	Ка-32А11ВС-Д-93.1 Vertical and Horizontal Fire-Extinguishing System		–	1, 1A, 3, 4, 5, 21, 25, 28, 34, 37, 61, 63, 78, 81, 91

NOTE. Equipment under Supplements point 24 or point 36 is subject to mandatory installation.

Ka-32A11BC

Manufacturer's Data

This part of RFM includes the minimum of necessary data concerning the helicopter design and its system, the procedures of its servicing in which the pilot usually takes part and also other data which can be used simultaneously with the instructions of RFM approved part in some flight types.

Helicopter Maintenance Manual includes the detailed data.

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RECORD OF REVISIONS

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SECTION 1. SYSTEM DESCRIPTION

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SECTION 1. SYSTEM DESCRIPTION

The helicopter, its primary and auxiliary systems, and emergency equipment are described with in this section.

HELICOPTER DESCRIPTION

The helicopter is a twin engine, fifteen-seat coaxial type rotorcraft with two rotors. The helicopter fuselage does not protrude over the rotor disk area and has an all-metal semi-monocoque beam-stringer structure with metal skin. The helicopter is equipped with a four-wheel non-retractable landing gear.

The principal exterior dimensions are shown in Fig. 1-1.

GENERAL ARRANGEMENT

The fuselage forward section contains a crew compartment, equipment bays under compartment floor, a cargo compartment, bays for avionics in the back portion of the cargo compartment, bays for fuel tank containers.

Two main engines, gearbox, APU, power plant oil system, control unit, hydraulic and electrical equipment, extinguishers and other equipment are housed in the engine nacelle mounted on the top of the fuselage forward section.

The fuselage tail section carries the empennage.

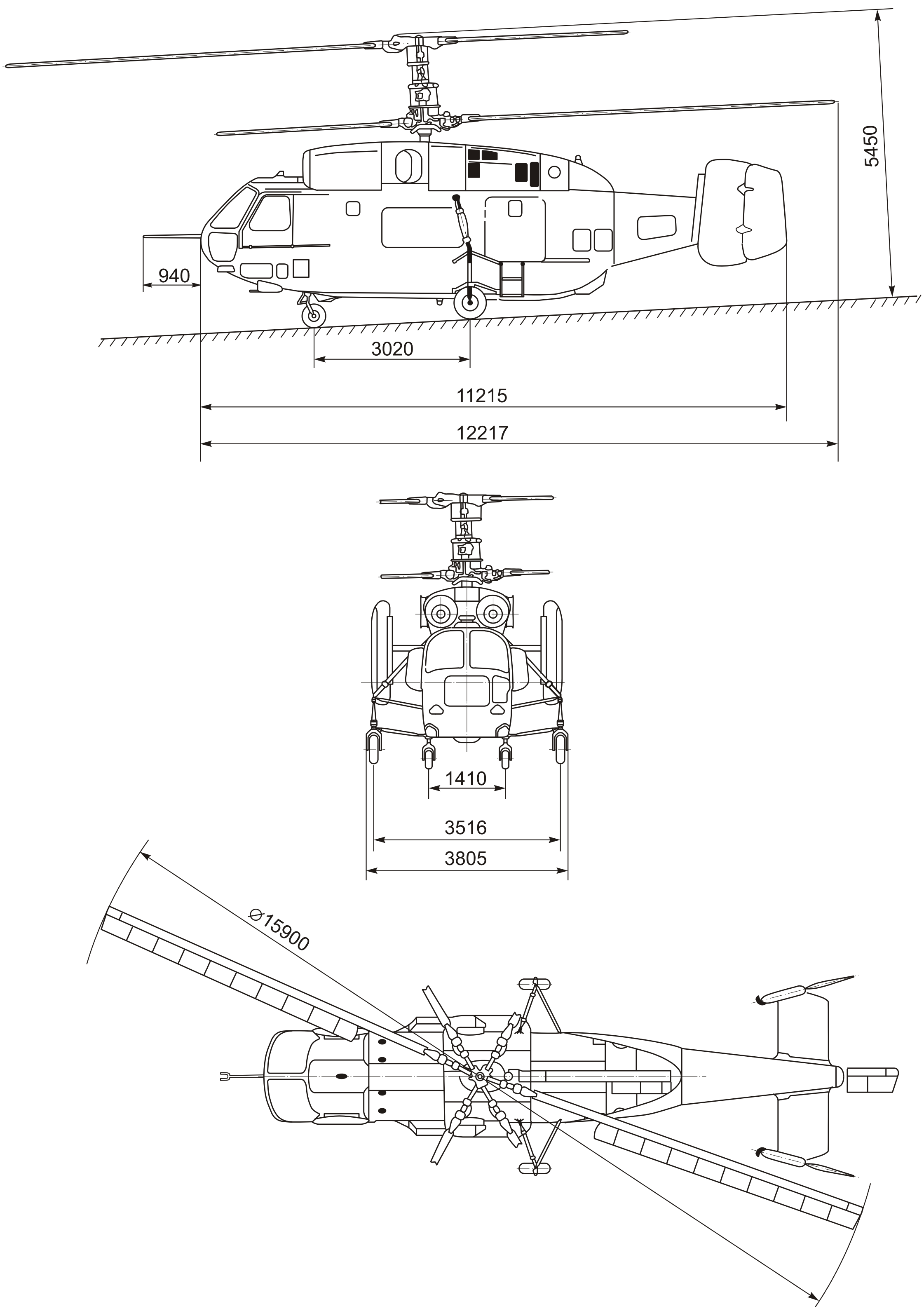
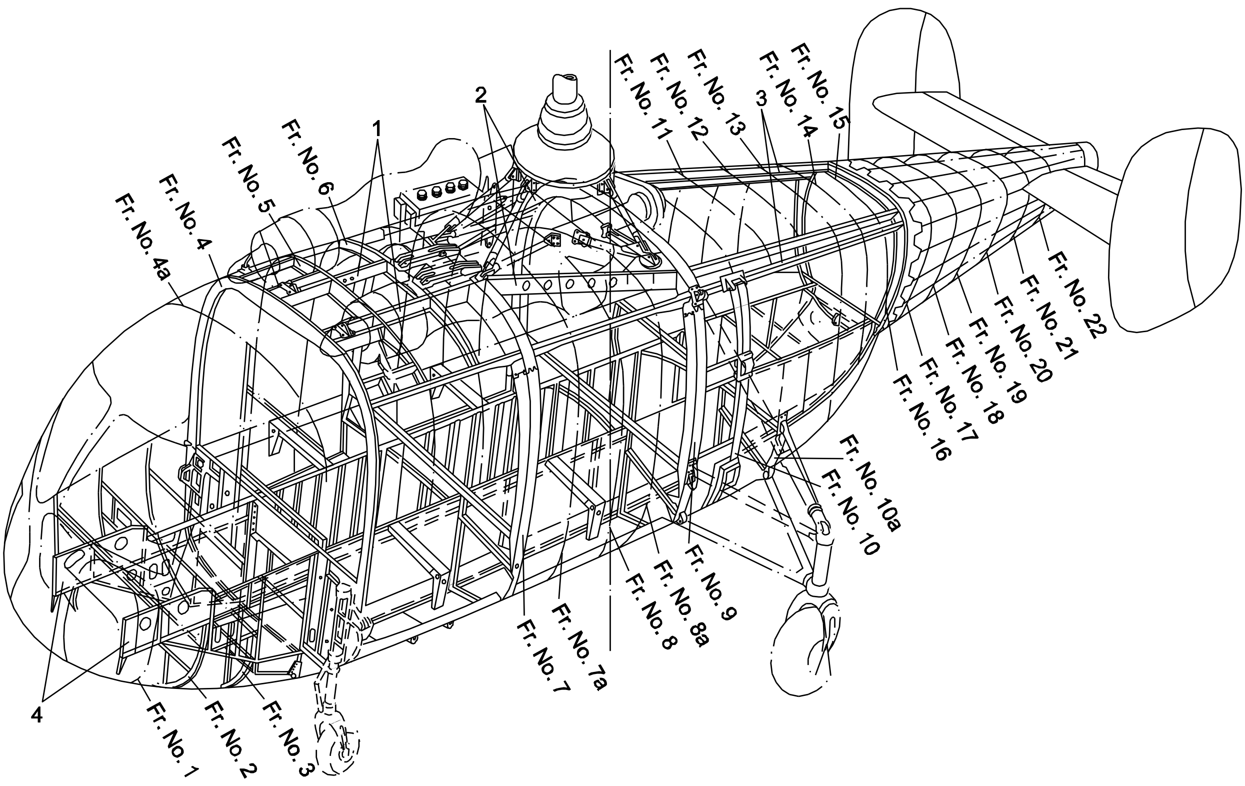


Fig. 1-1. Principal Dimensions.

FUSELAGE

The fuselage structure main elements arrangement is presented in Fig. 1-2.

The fuselage contains a fuselage forward section and a fuselage tail section, joined at Fr. No. 16. The fuselage forward section encloses a crew compartment (up to Frame 4) and a cargo compartment (between Frames 4 and 16).



1. Upper Strong Beams
2. Beams Under Gearbox
3. Longerons
4. Lower Longitudinal Beams

Fig. 1-2. Fuselage Structure.

CREW COMPARTMENT

Pilot and co-pilot seats, instrument panels and consoles are mounted in the crew compartment. The pilot seat is at the left and the co-pilot seat is at the right. The pilot and co-pilot seats are height-adjustable. Pilot seat have 5 fixed vertical positions. The tilt angle of the seat backs can be adjusted within 14 to 25 degrees. The co-pilot seat have 3 fixed height adjustable vertical positions and can be displaced in the longitudinal direction. The crew member seats are furnished with seat belts and shoulder harnesses.

CARGO COMPARTMENT

Thirteen folding seats are mounted in the cargo compartment. Each seat is equipped with a seat belt.

NOTE. All seats are numerated from 1 to 15. Seats Nos 4 and 11 are not installed

An additional operator’s seat can be mounted on the right side of fuselage between Frames 4 and 5. The seat back tilt angle can be adjusted within 14 to 20 degrees and the seat can be swiveled through 105 degrees to the left and fixed in eight positions. The seat is furnished with a seat belt.

DOORS

The helicopter have two crew compartment doors (the left door is for the pilot and located between Frames 2 and 4a; the right door is for the co-pilot/operator and located between Frames 2 and 4) and a cargo compartment door on the fuselage portside between Frames 10 and 13. The doors slide rearward along the fuselage sides for opening. The left crew compartment door and the cargo compartment door are locked from the outside. With the cargo compartment door open, LH AFT PAX DOOR light is illuminated at the crew compartment upper console. All helicopter doors are glazed.

LANDING GEAR

The helicopter is equipped with a four-wheel non-retractable landing gear (Fig. 1-2) ensuring takeoff, landing, taxing and towing. The landing gear consists of independent legs: two main legs and two nose ones. The main leg wheels are equipped with brakes. The brake control is hydraulic (from the helicopter hydraulic system).

The nose leg wheels are furnished with castoring devices for changing the helicopter movement direction during towing and taxiing.

The nose legs are provided with a device setting their wheels in the line of flight and with shimmy dampers. Angle of turn of nose leg wheels must not exceed ±89 degrees from helicopter longitudinal axis direction. The soil density for safety parking and taxing is 6 kgf/sq.cm and more.

The pressure in wheel tires:

– main wheels – (11 – 11.5) kgf/sq.cm;

– nose wheels – (6 – 6.5) kgf/sq.cm.

All landing gear shock struts are equipped with a device for damping ground resonance oscillations. On the starboard shock strut of the main landing gear, there is a collar with a stem which, after the helicopter lift-off, acts upon the pusher of limit switches controlling the operation of some helicopter systems.

INSTRUMENT PANELS AND CONSOLES

Flight controls, instruments and gauges, indication and warning devices used by the crew in flight are arranged in the flight compartment on the instrument panels, control panels, and boards (Fig. 1-3). Besides, some controls are arranged on the collective pitch control lever and cyclic pitch control stick (Fig. 1-12).

The panels and boards are illuminated with white light which facilitates rapid retinal adaptation during night flights. Illumination of inscriptions is effected by small-size illumination lamps, dials of pointer instruments are illuminated by light fixtures or built-in lamps.

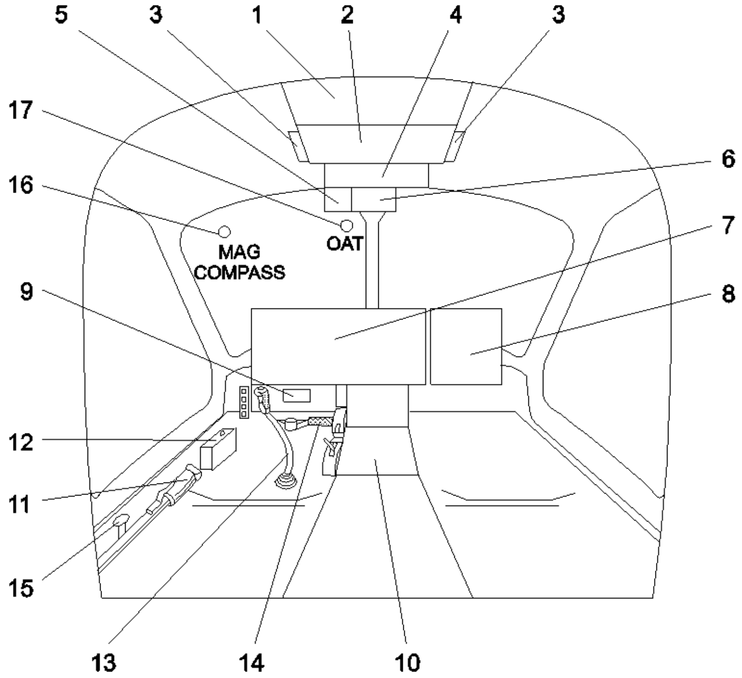
Panels are neutral grayish-blue in colour.

Devices combined as to their common function are framed with a white line with an inscription introduced in the break: LIGHTS, TEST, HEATING, ANTI-ICE, FUEL, etc.

The ON – OFF and selector switches of systems, that require special attention, are locked in position with caps, and those belonging to emergency systems, with caps of red colour.

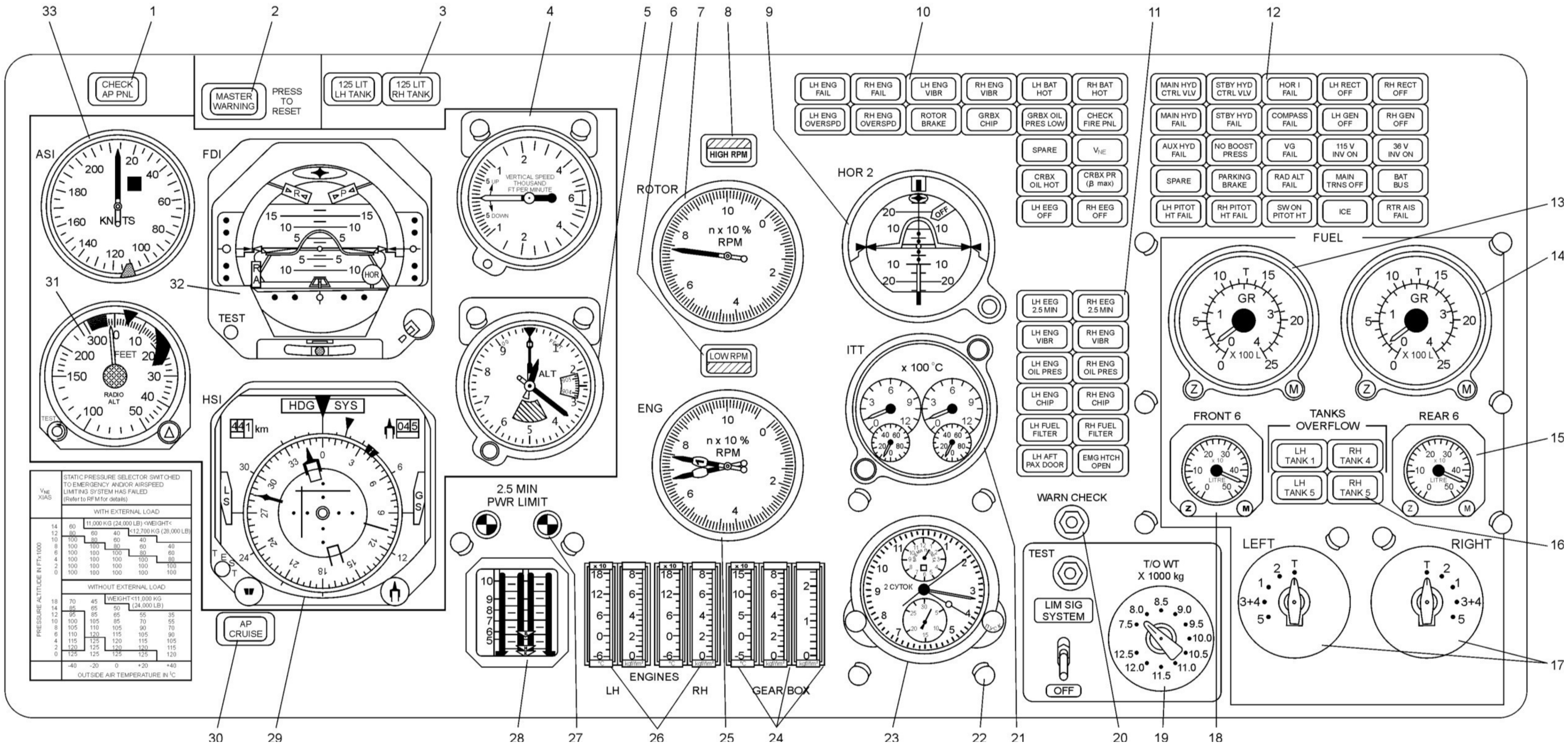
Arranged on the pilot instrument panel (Fig. 1-4), directly in front of the pilot, are the instruments required for helicopter piloting. The instruments and annunciator panels giving information on the power plant and helicopter systems operation, warning about their emergency and dangerous operating conditions are arranged on the panel middle part and to the right of it.

The overhead panel (Fig. 1-5) is arranged on the flight compartment ceiling. The overhead panel comprises the LH and RH side panels and annunciator unit. To the left and right from the overhead panel, the correction diagram holders are attached to the flight compartment roof.



1. Overhead Panel (Upper Part)
2. Overhead Panel (Lower Part)
3. LH and RH Side-Panel
4. Annunciators Panel, Actuator and Trim Indicator
5. Hydraulic Instruments Panel
6. Transponder Control Panel
7. Pilot's Instrument Panel
8. Co-pilot's Instrument Panel
9. Lower Panel
10. Central Pedestal
11. Collective Pitch Control Lever
12. Engine and Rotor Brake Control Levers
13. Cyclic Pitch Control Stick
14. Directional Control Pedals
15. Parking Brake Lever
16. Magnetic Compass
17. OAT Indicator

Fig. 1-3. General Arrangement of Instrument Panels and Control Levers.



1. Integrated Flight-Navigation System Caution Annunciator
2. Master Warning Light (MWL)
3. Low Fuel Warning Annunciators
4. Vertical Speed Indicator (VSI)
5. Pressure Altimeter Indicator
6. Rotor Low Speed Warning Annunciator
7. Rotor Speed Indicator
8. Rotor High Speed Warning Annunciator
9. HOR2 Standby Gyro Horizon
10. Warning and Caution Annunciator Panel
11. Caution Annunciator Panel
12. Caution Annunciator Panel
13. Fuel Quantity Gauge System Indicator for LH Tank Group
14. Fuel Quantity Gauge System Indicator for RH Tank Group
15. Fuel Quantity Indicator for Rear Tank
16. Tank Overflow Caution Annunciator Panel
17. Water Rotary Selector Switches of Fuel Quantity Gauge System for LH and RH Tank Groups
18. Fuel Quantity Indicator for Front Tank
19. Limiting Signal System Control Panel
20. Warning System Test Button
21. EGT Indicator
22. Instruments Integral Light
23. Aircraft Clock
24. Gear Box Oil Temperature and Pressure Indicators, Gear Box Oil Filter Pressure Difference Indicator
25. Two-Pointer Engine Speed Indicator
26. Engine Oil Temperature and Pressure Indicators
27. Maximum Permissible Power Mode Selection Caution Lights
28. Engine Power Indicator
29. Horizontal Situation Indicator (HSI)
30. CRUISE (МАРШРУТ) Annunciator
31. Radio Altimeter Indicator
32. Attitude Director Indicator (ADI)
33. Airspeed Indicator

Fig. 1-4. Pilot's Instrument Panel

1. Circuit Breaker Panel
2. DC Voltage Control Panel
3. Lighting Control Panel
4. AC Voltage Control Panel
5. Squib Test Panel
6. Pitot-Static Tube Control Panel
7. Radio Control Panel
8. Engine Instruments Control Panel
9. LIM/LOM Selector Switch
10. Fire Protection Control Panel
11. Lighting Brightness Rheostat

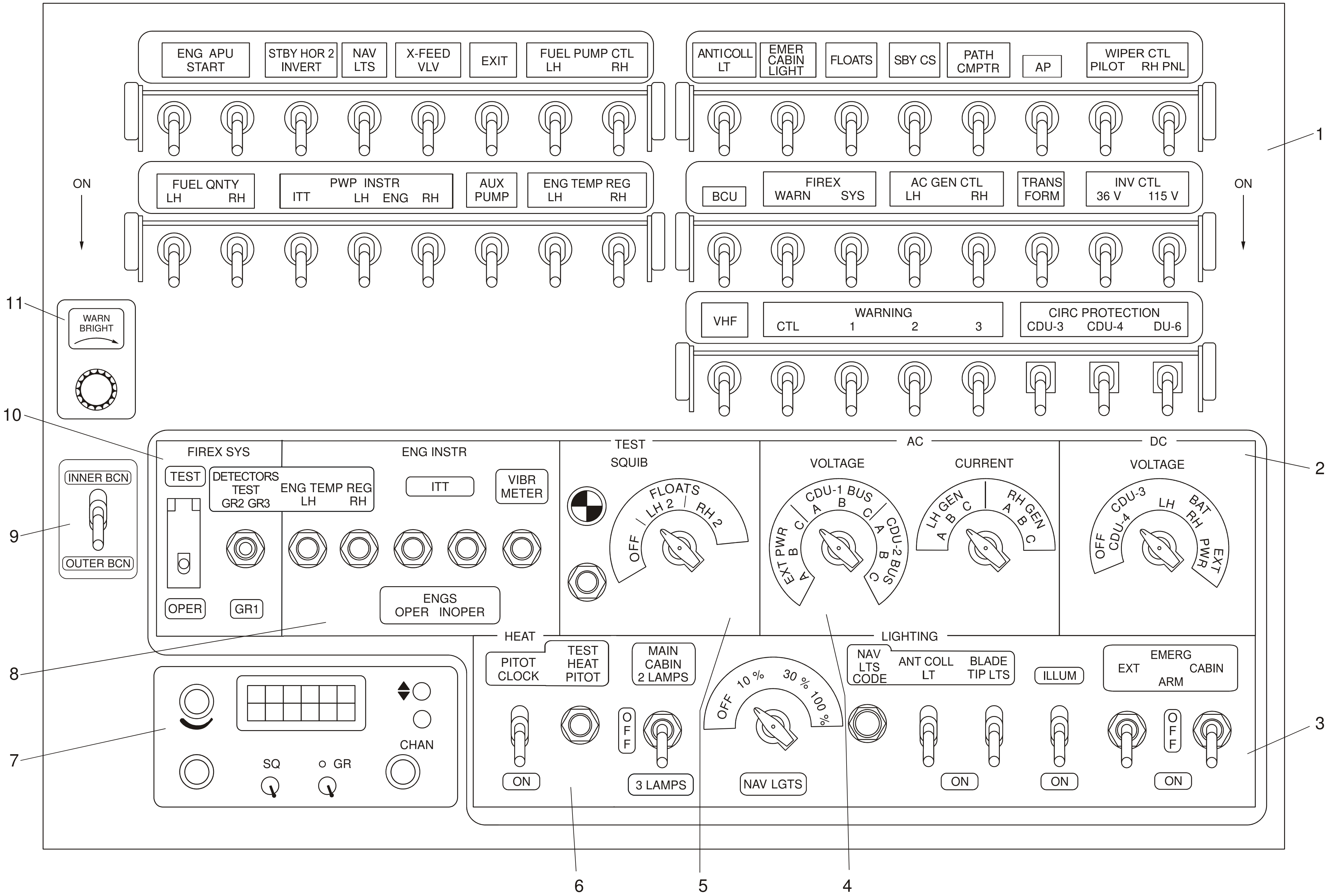
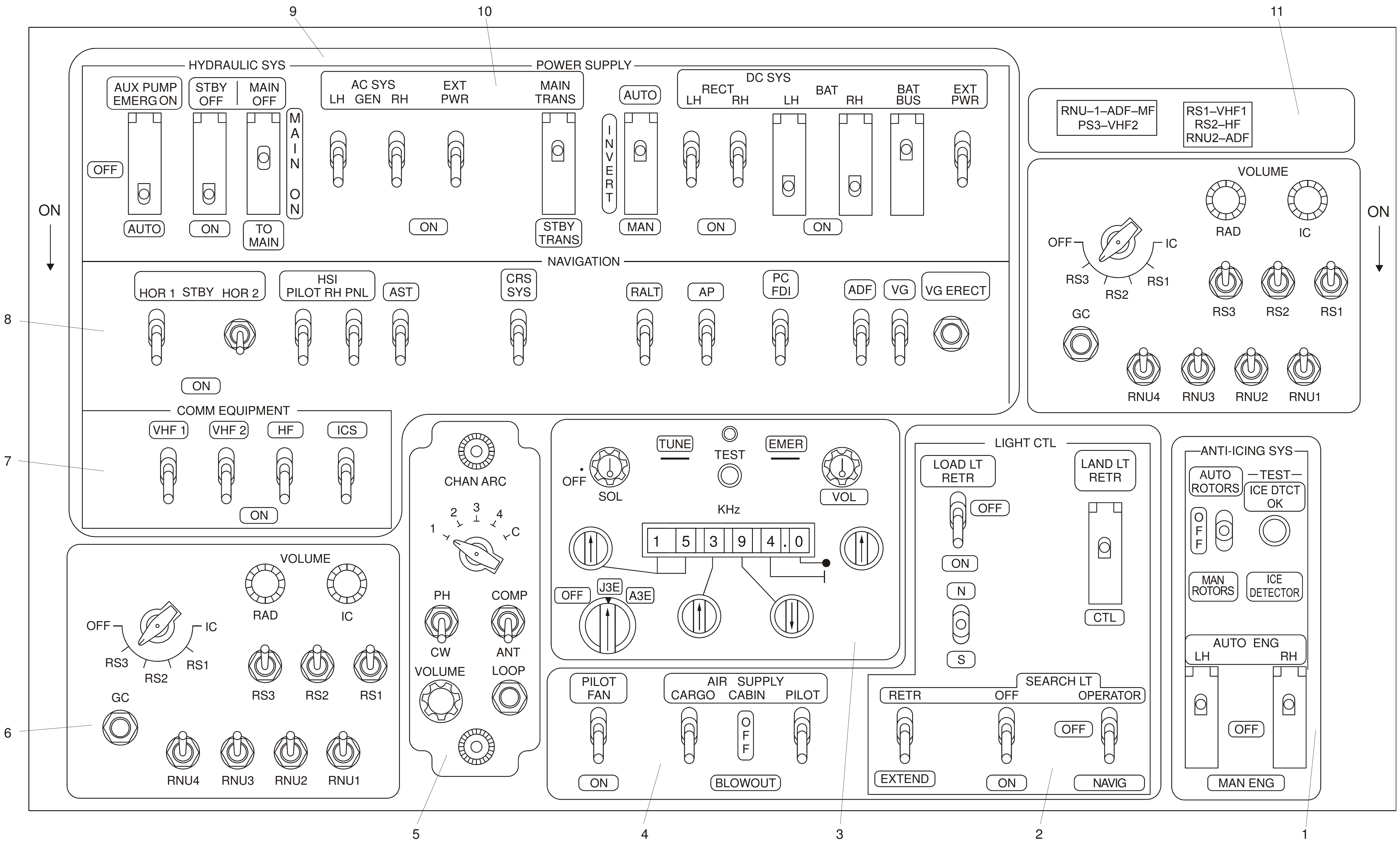
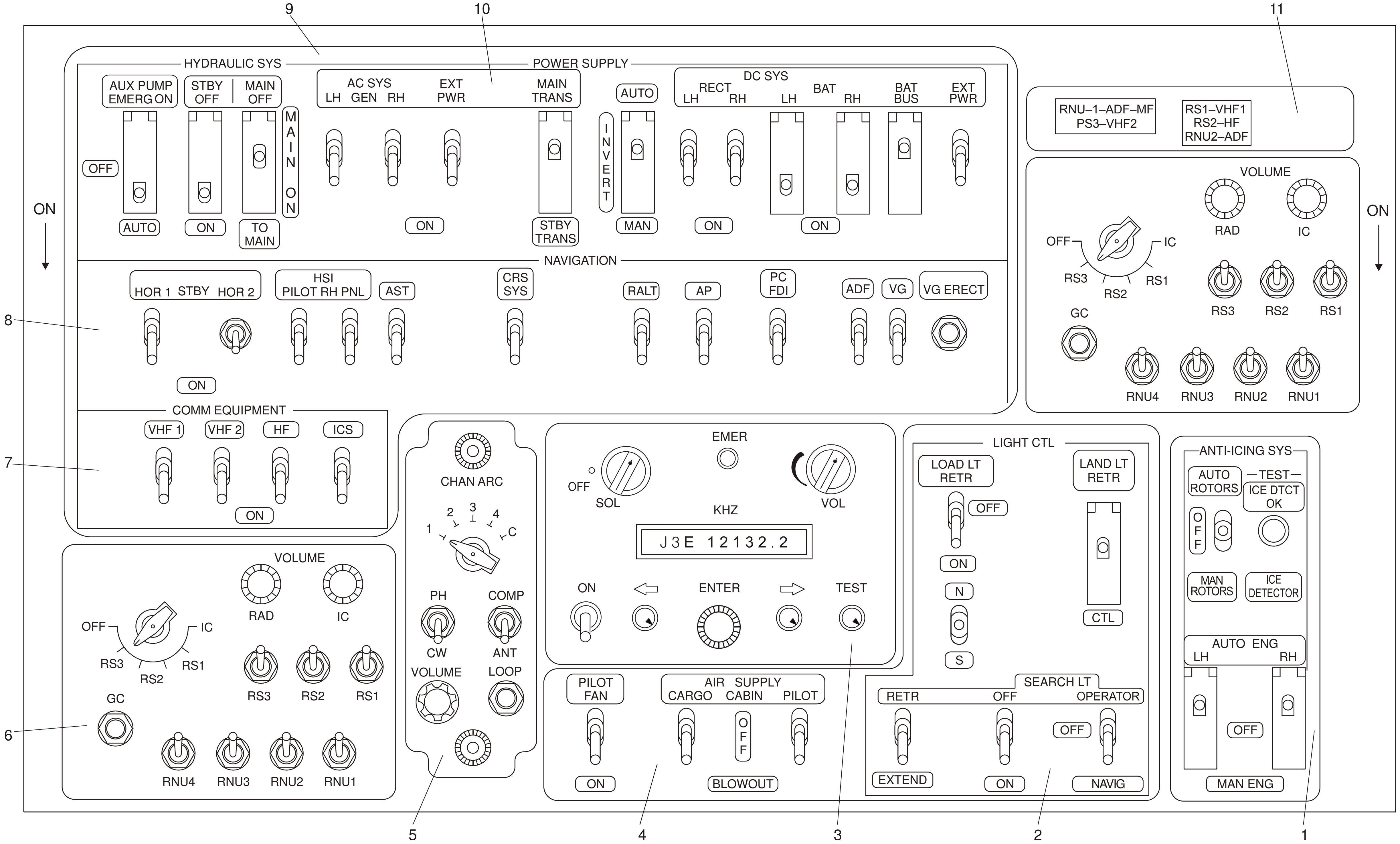


Fig. 1-5 (Sheet 1 of 3). Overhead Panel (Upper Part).



1. Anti-Icing System Control Panel
2. External Lights Control Panel
3. Radio Control Panel
4. Fan Control Panel
5. ADF Control Panel
6. Pilot's Interphone Control Box
7. Communications Control Panel
8. Navigation Equipment Control Panel
9. Hydraulic System Control Panel
10. Electrical System Control Panel
11. Co-Pilot's Interphone Control Box

Fig. 1-5 (Sheet 2 of 3) Overhead Panel (Lower Part).



1. Anti-Icing System Control Panel
2. External Lights Control Panel
3. Radio Control Panel
4. Fan Control Panel
5. ADF Control Panel
6. Pilot's Interphone Control Box
7. Communications Control Panel
8. Navigation Equipment Control Panel
9. Hydraulic System Control Panel
10. Electrical System Control Panel
11. Co-Pilot's Interphone Control Box

Fig. 1-5a (Sheet 2 of 3) Overhead Panel (Lower Part).

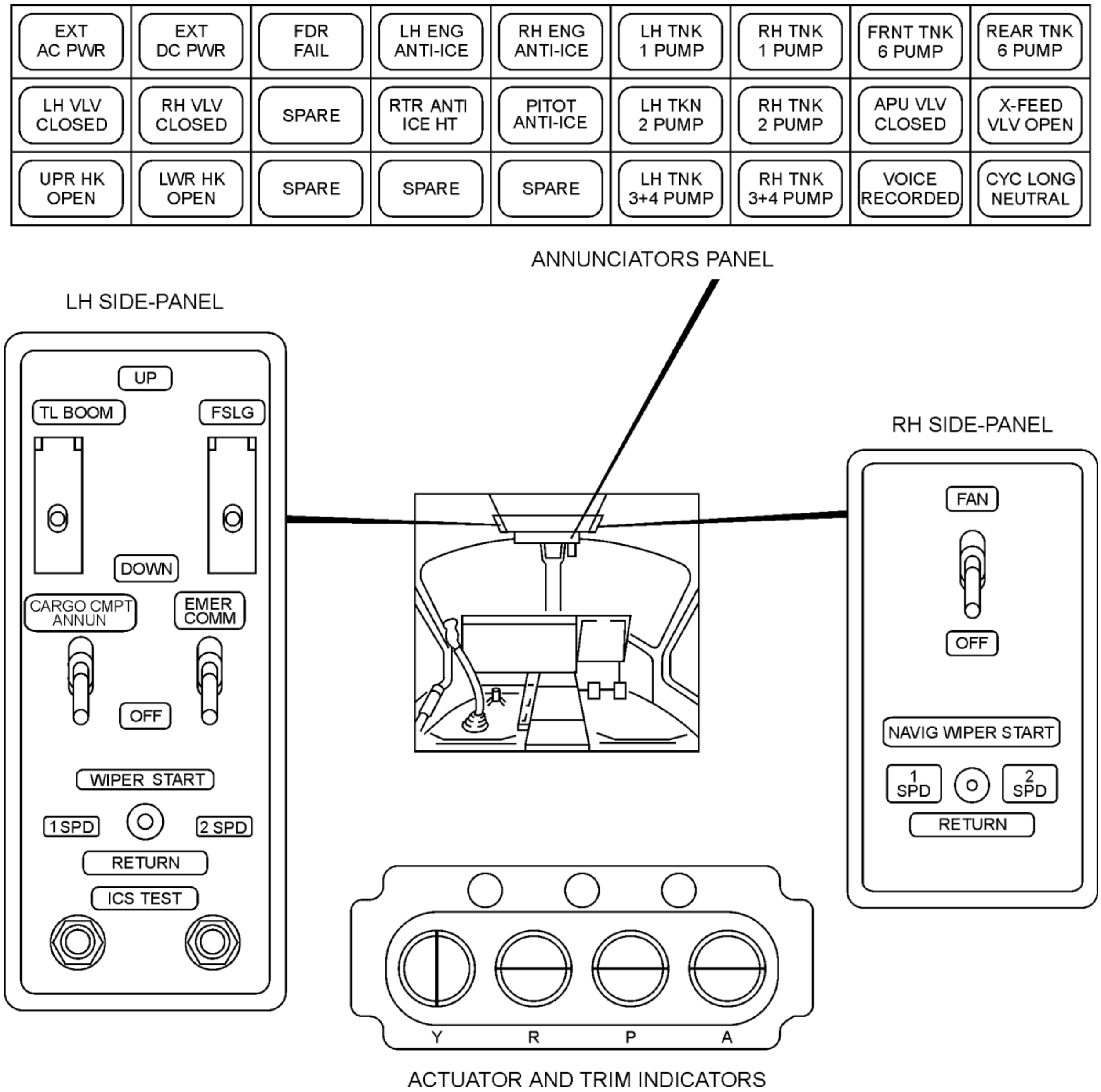


Fig. 1-5 (Sheet 3 of 3). Overhead Switch Panel – Indicator Light and Side Panels

The hydraulic system instrument panel (Fig. 1-6) instruments are secured above the pilot's instrument panel.

The co-pilot's instrument panel carries instruments that visualize the helicopter flight conditions (Fig. 1-7).

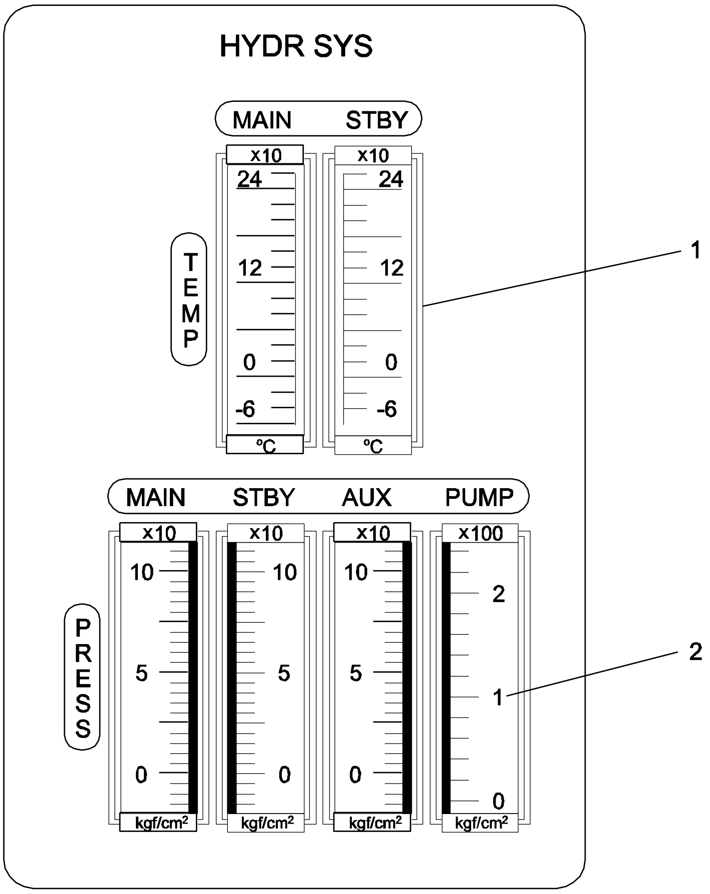
The lower panel (Fig. 1-8) carries electrical system instruments, collective pitch indicator and brake pressure indicator.

The instruments light brightness control panel (Fig. 1-9) is located on the wall to the right from the pilot's seat.

The central pedestal (Fig. 1-10) is arranged between the pilot's and co-pilot's seats.

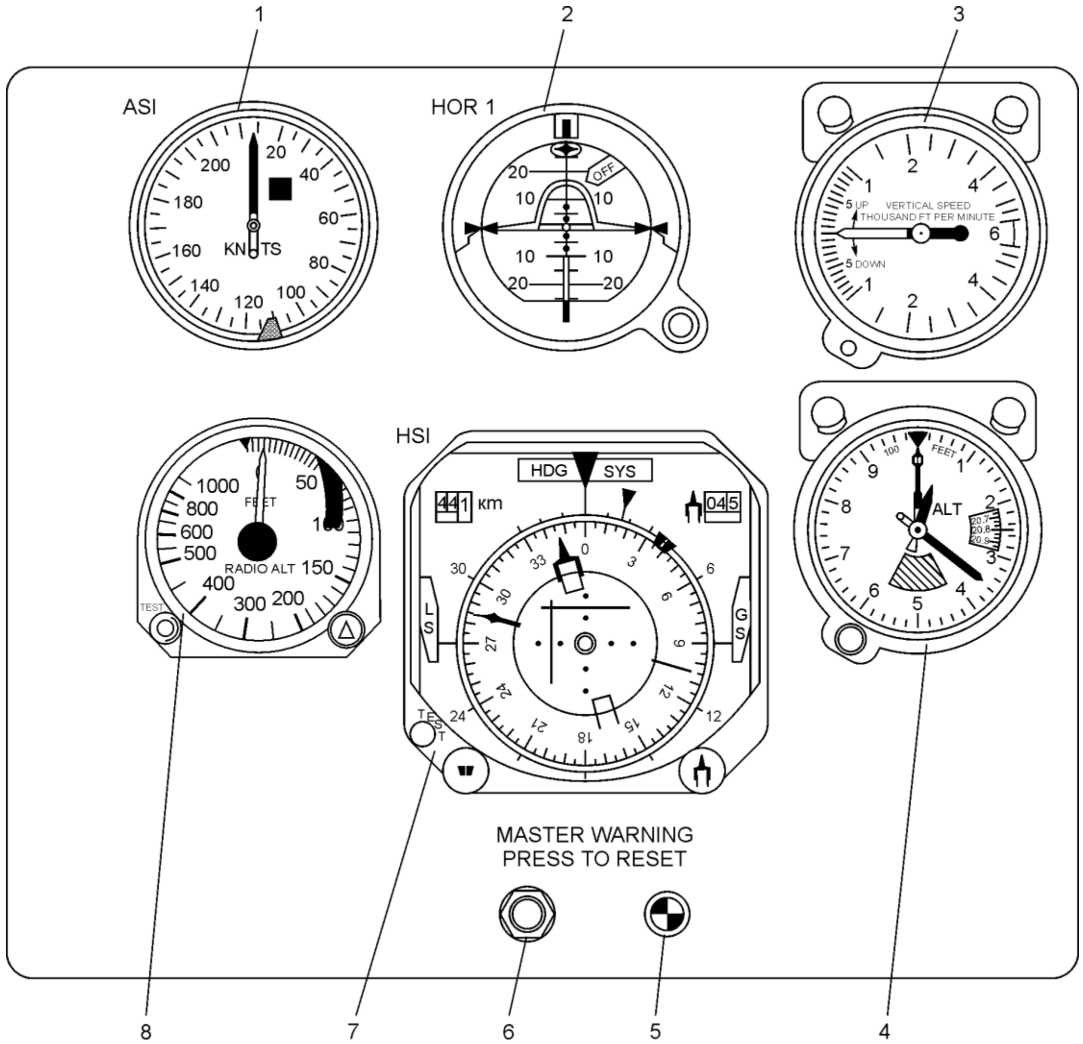
The left side of the central pedestal carries the engines and rotors brake control panel that accommodates two engine throttle levers, two engine shut-off valve levers and the rotors brake control lever.

The additional instrument panel (Fig. 1-11) is located in the cargo compartment, in front of the auxiliary seat.



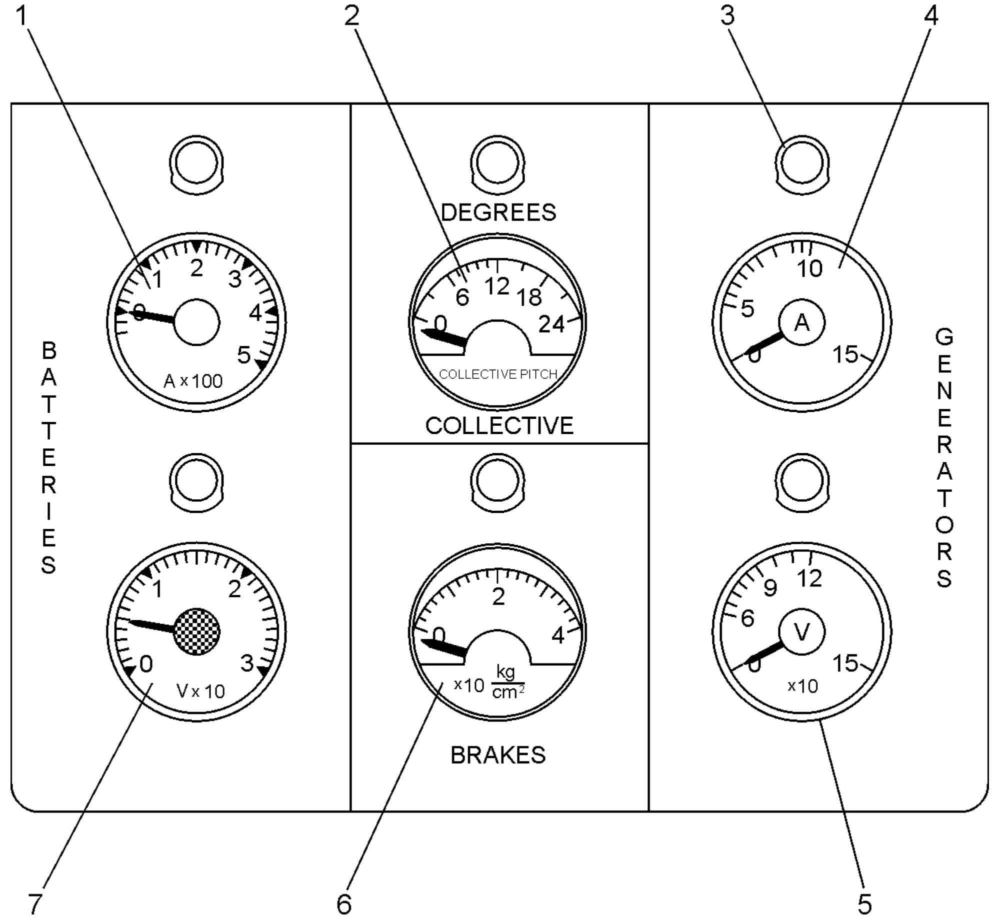
1. Temperature Indicator of Main and Standby Hydraulic Systems
2. Pressure Indicator of Hydraulic Systems

Fig. 1-6. Hydraulic Instruments Panel.



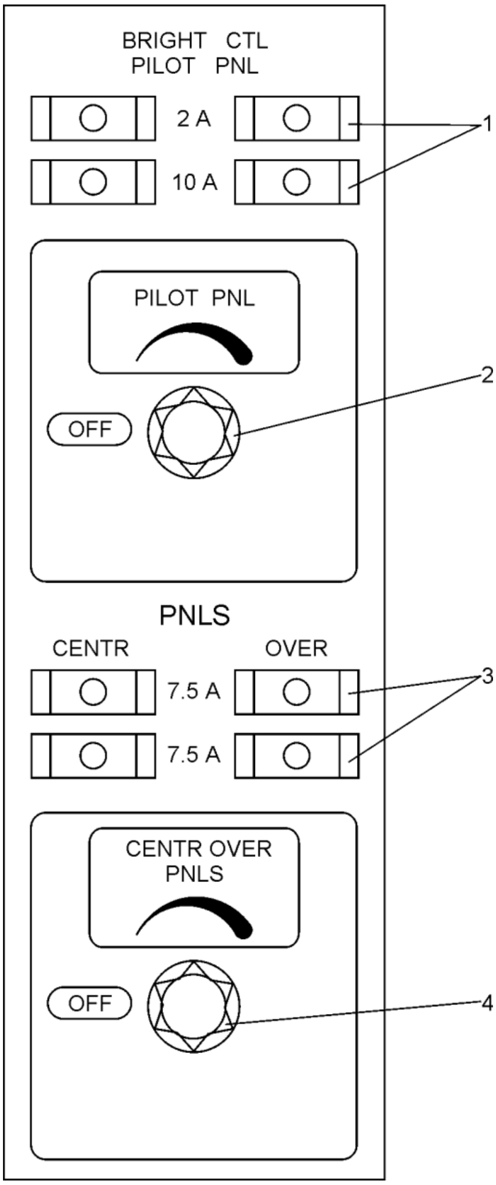
1. Airspeed Indicator
2. Gyro Horizon HOR 1
3. Vertical Speed Indicator
4. Pressure Altimeter
5. Master Warning Light
6. Master Warning Light Switch-Off Button
7. Horizontal Situation Indicator
8. Radio Altimeter

Fig. 1-7. Co-pilot's (RH) Instrument Panel.



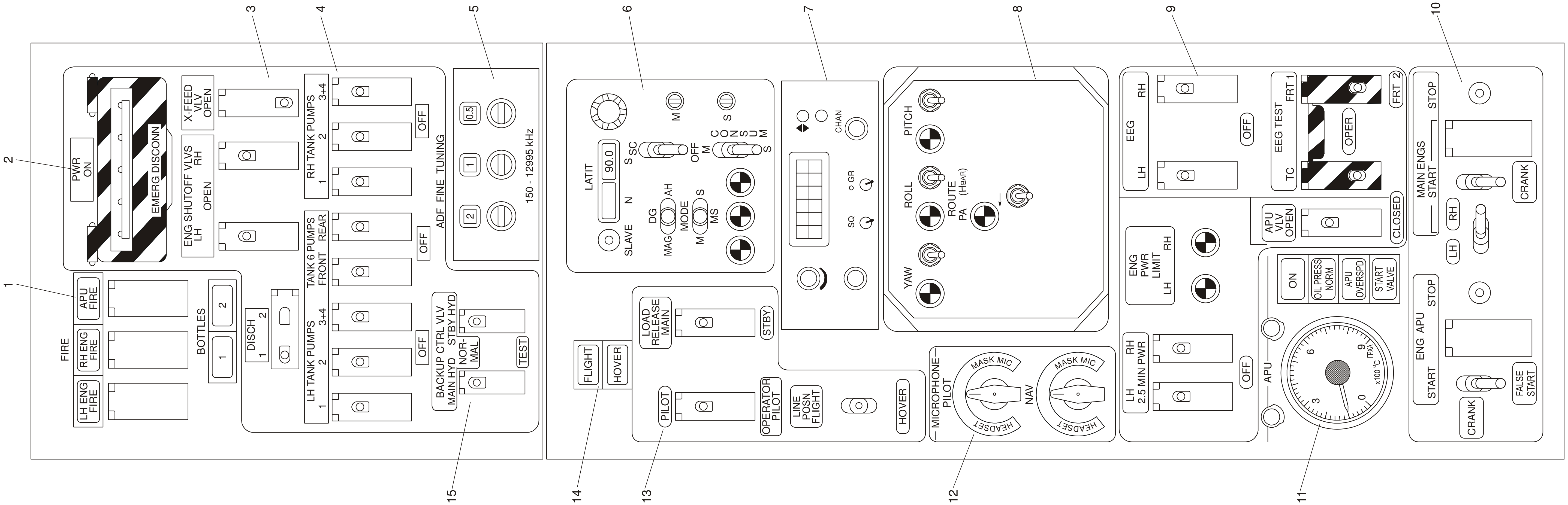
1. DC Altimeter
2. Collective Pitch Indicator
3. Instrument Integral Light
4. AC Ammeter
5. AC Voltmeter
6. Braking Pressure Indicator
7. DC Voltmeter

Fig. 1-8. Lower Instrument Sub-Panel.



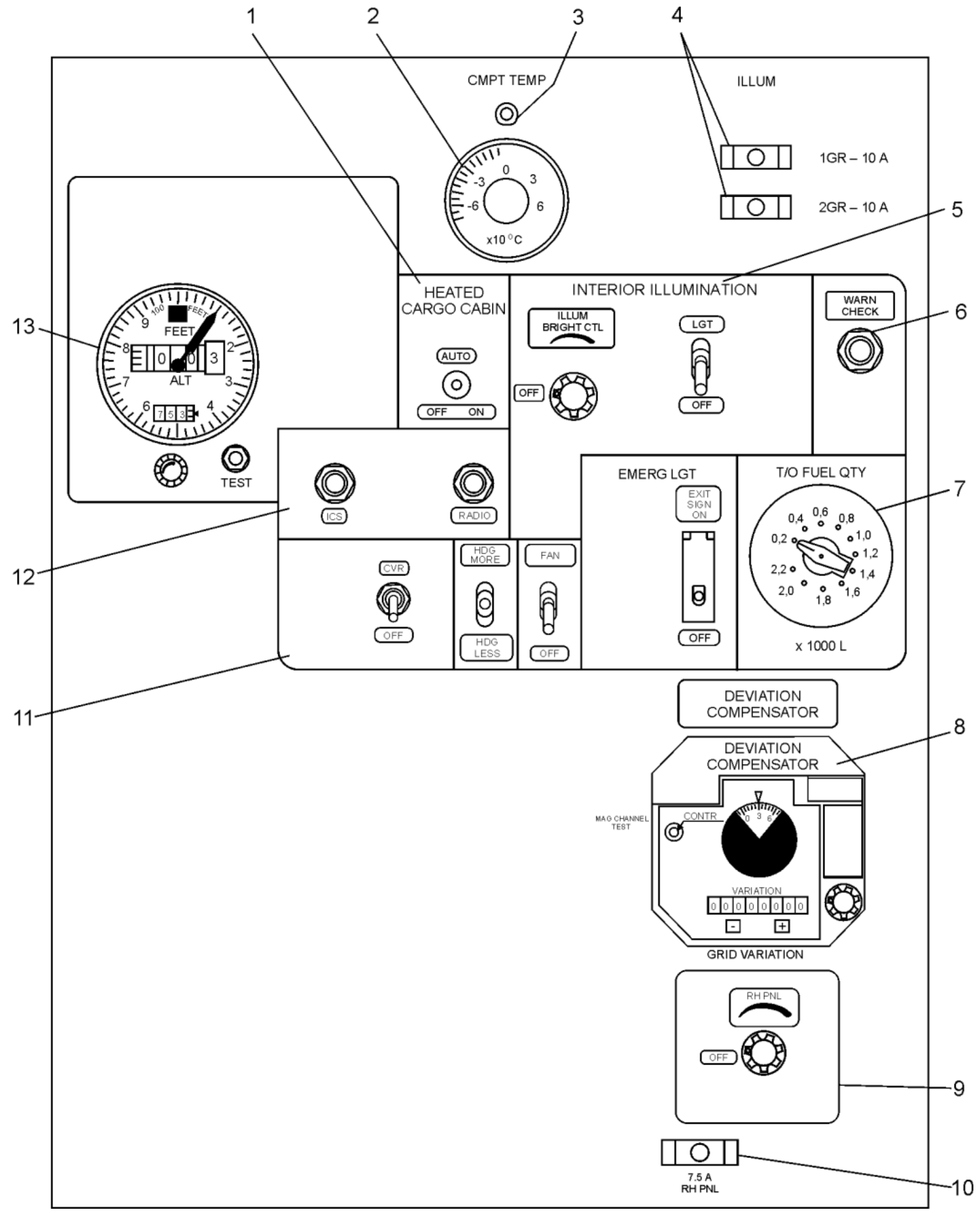
1. Pilot's (Co-Pilot's) Instrument Panels Lighting Circuit Fuses
2. Voltage Regulator
3. Center Control Pedestal and Overhead Switch Panel Integral Lighting Circuit Fuses
4. Center Control Pedestal and Overhead Switch Panel Integral Lighting Circuit Voltage Regulator

Fig. 1-9. Integral Lighting Brightness Control Panel
(Located on the Wall to the Right of the Pilot's Seat).



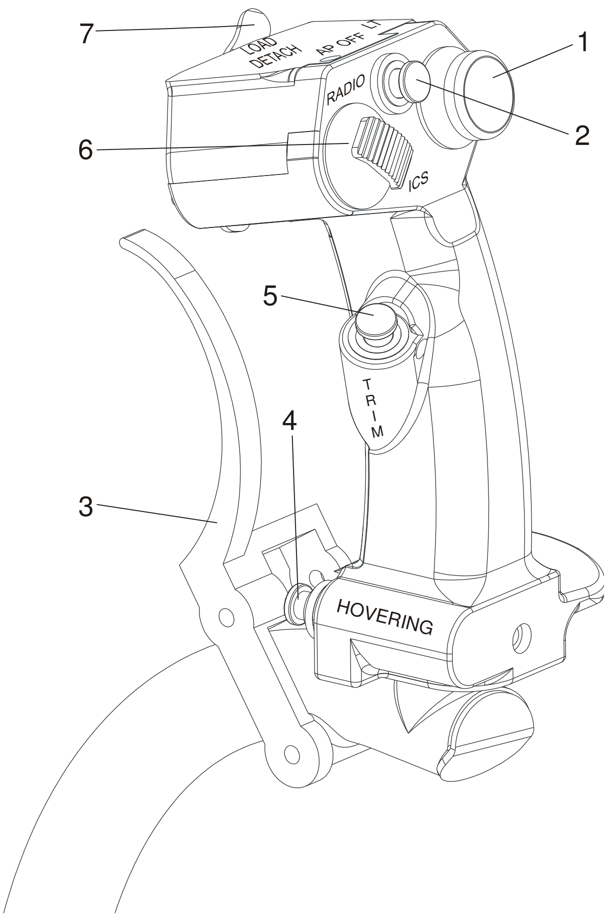
1. Fire Extinguishing Panel
2. Power Supply Emergency Cut-Out Switch
3. Fuel Shut-Off Valve Control Panel
4. Fuel Pump Control Panel
5. Automatic Direction Finder Smooth Tuning Control Panel
6. Compass System Control Panel
7. Radio Control Panel
8. Integrated Flight System Control Centre
9. EEG Control Panel
10. Engine Start Control Panel
11. Exhaust Gas Temperature Indicator (APU)
12. Microphone Switching Panel
13. External Load Sling Control Switch Panel
14. FLIGHT (ПОЛЕТ) – Mode Selection Annunciator
15. Standby Slide Valve Test Panel

Fig. 1-10. Central Pedestal.



1. Cargo Compartment Heating Control Panel
2. Cargo Compartment Temperature Indicator
3. Temperature Indicator Scale Integral Light
4. Integral Lighting Circuit Fuses
5. Interior Lighting Switching and Brightness Control Panel
6. Warning Test Button
7. Wafer Rotary Selector Switch of Takeoff Fuel Weight Selector
8. Compass System Compensator
9. Voltage Regulator of Integral Lighting Brightness Control Circuits
10. Integral Lighting Circuit Fuses
11. Switches and Selector Switches Control Panel
12. Interphone and Radio Communication Buttons
13. Pressure altimeter

Fig. 1-11. Auxiliary Instrument Panel.



CYCLIC PITCH CONTROL STICK

1. Light Control Button (Not in Use in the Helicopter)
2. Autopilot Emergency Cut-Out Button
3. Brake Application Lever
4. HOVERING Button (Not in Use in the Helicopter)
5. Trimming Mechanism Cut-In Button
6. ICS – RADIO Change-Over Button
7. External Load Release Button Found Under the Trigger Switch

COLLECTIVE PITCH CONTROL LEVER

1. Button for Emergency Release of External Load
2. Selector Switch for Selection of Landing Light Mode of Operation
3. Button for Control of Landing Light Operation
4. Autopilot Altitude Position Signal Limit Switch
5. Trigger for Disengaging of Friction Mechanism of Collective Pitch Control Lever and Switching off Autopilot Altitude Position Signal
6. Floats Inflation Button
7. Selector Switch for Selection of Modes of Operation of Integrated Flight System

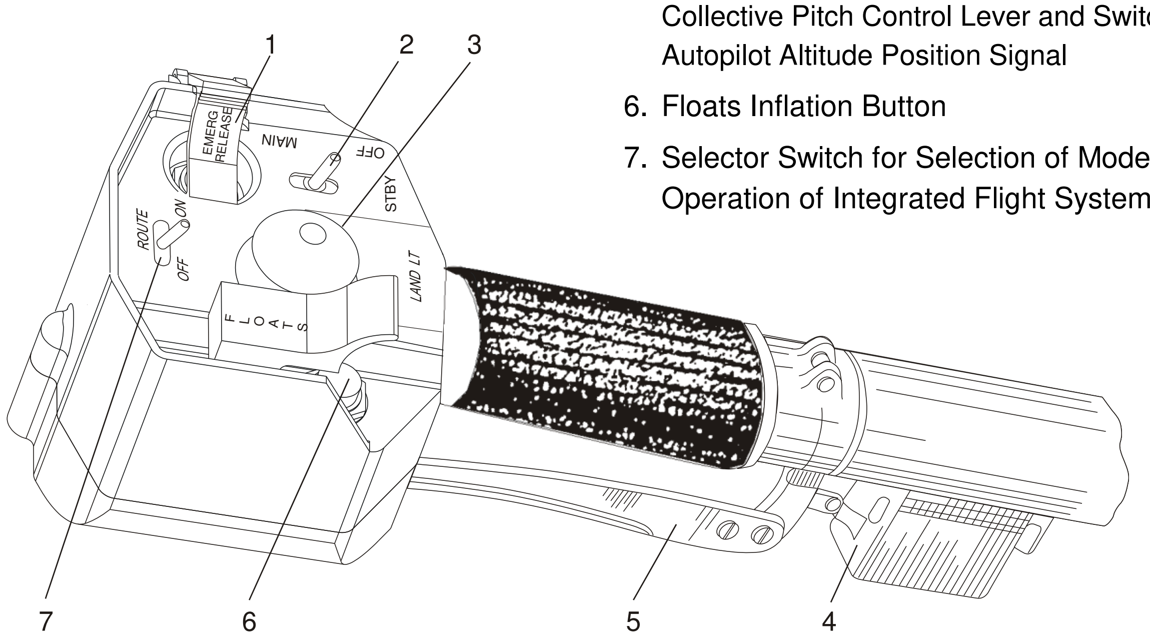


Fig. 1-12. Control Units Arranged on Collective Pitch Control Lever and Cyclic Pitch Control Stick.

ROTOR SYSTEMS

The helicopter rotor system includes two coaxial three-bladed rotors, a rotor mast and a part of the helicopter control system.

The upper rotor as viewed from top rotates clockwise while the lower rotor rotates counter-clockwise.

ROTOR BLADES

The rotor blades are fabricated of glass and carbon-reinforced plastic. The blades are furnished with electric AIS. For reducing the helicopter vibrations pendulous weights are mounted at each lower rotor blade.

NOTE. The upper rotor blades are not interchangeable with the lower rotor blades.

ROTOR MAST

The rotor mast consists of upper and lower rotors, swashplate assemblies, sliders, anti-icing system slip rings, a collective and differential pitch control mechanism and a blade folding mechanism.

The rotor mast kinematic diagram is presented in Fig. 1-13.

Each rotor hub consists of a body and three blade attachment sleeves. Each sleeve has three independent hinges (flapping, drag and feathering ones).

A. Upper Rotor Hub
B. Upper Slider
C. Upper Swash Plate Assembly
D. Upper Slip Ring Assembly
E. Lower Slider
F. Lower Rotor Hub
G. Lower Swash Plate Assembly
I. Collective and Differential Pitch Control Mechanism

1. Feathering Hinge
2. Drag Hinge
3. Blade Carrier
4. Flapping Hinge
5. Slider Bellcrank
6. Differential Pitch Control Threaded Sleeve
7. Lower Threaded Sleeve of Upper Slider Rod
8. Upper Slider Rod
9. Upper Threaded Sleeve of Lower Slider Rod
10. Lower Slider Rod
11. Upper Rotor Shaft
12. Lower Rotor Shaft
13. Lower Swash Plate Control Ring
14. Rod
15. Torque Links
16. Torque Links
17. Rod
18. Torque Links
19. Rod
20. Rod
21. Collective Pitch Lever of Collective and Differential Pitch Control Mechanism
22. Differential Pitch Rod of Collective and Differential Pitch Control Mechanism
23. Differential Pitch Bellcrank of Collective and Differential Pitch Control Mechanism

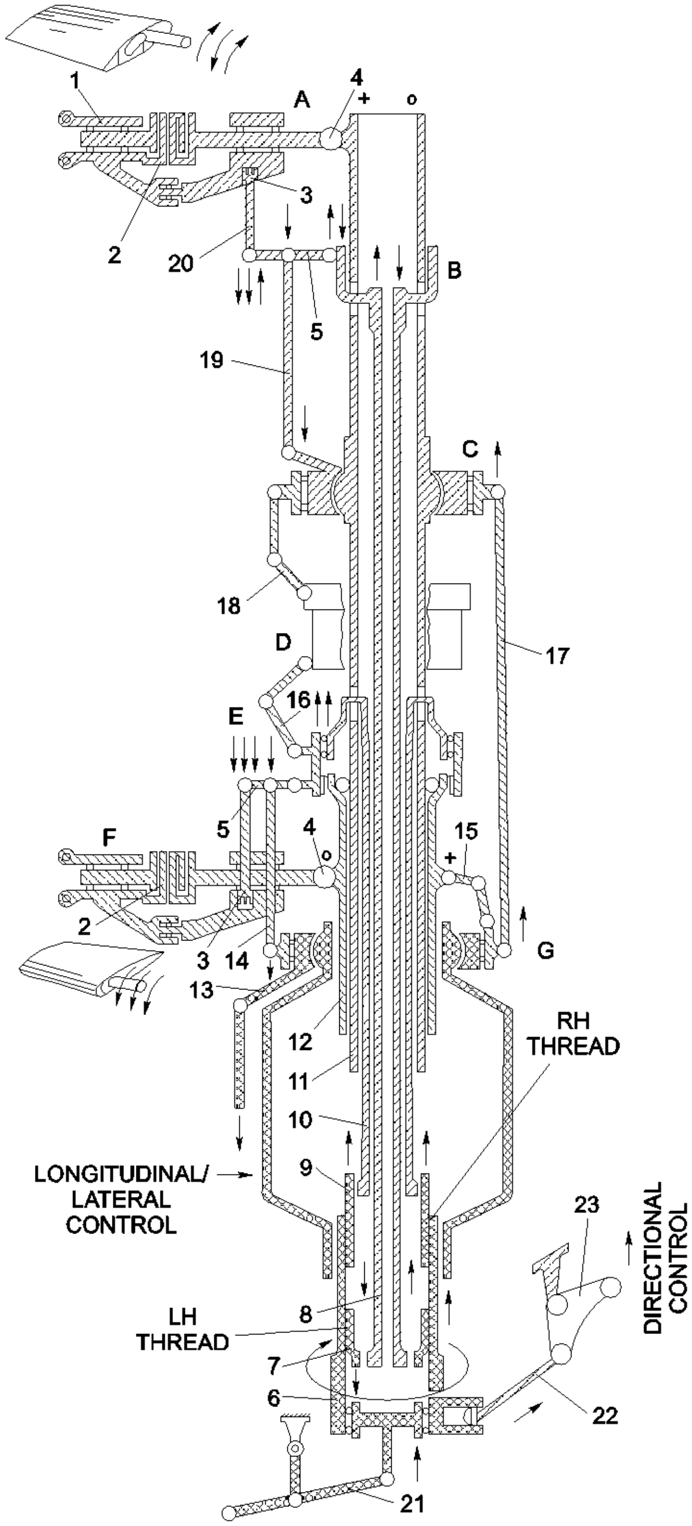


Fig. 1-13. Kinematic Diagram of Rotor System Mast.

The upper rotor hub (Fig. 1-14) is mounted on the inner shaft of the gearbox. Each sleeve has a centrifugal blade droop stops.

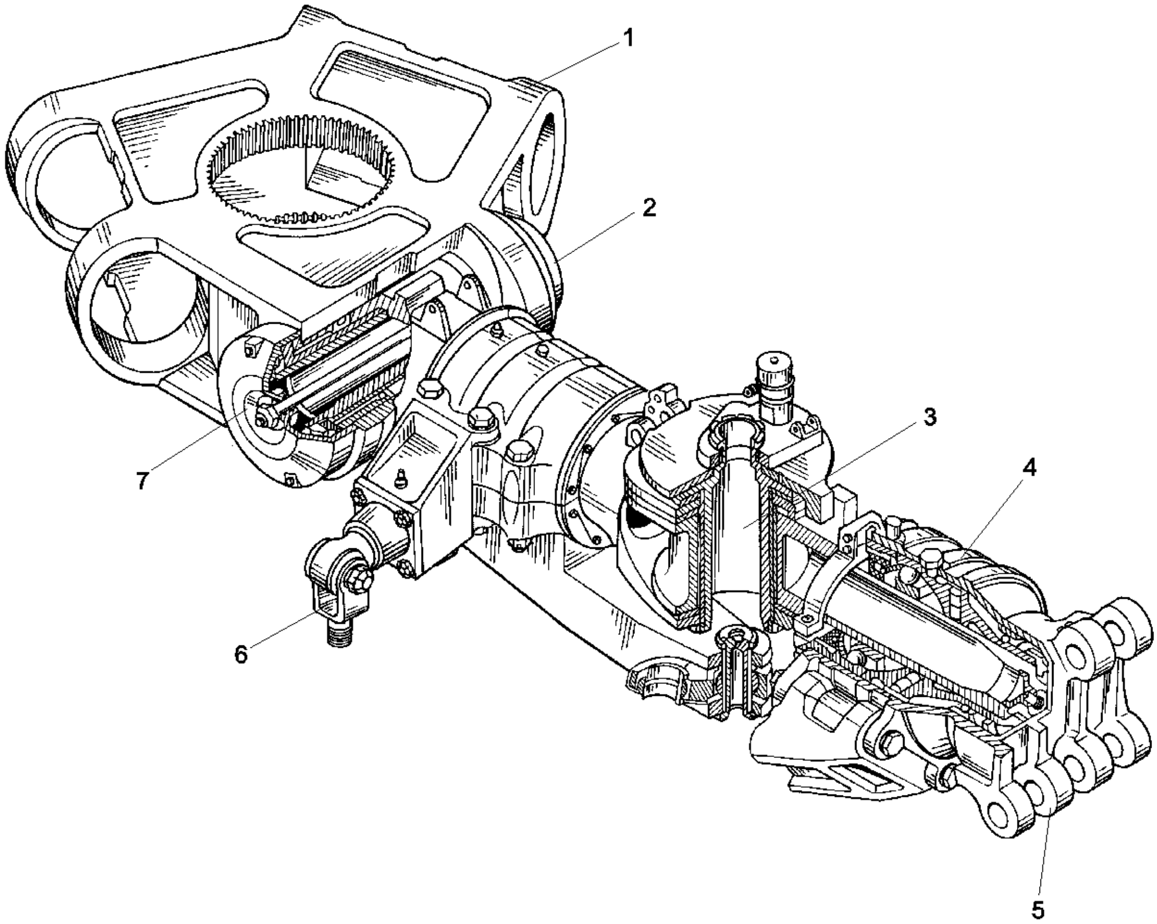
The lower rotor hub is mounted on the outer shaft of the gearbox. Its design is similar to that of the upper rotor hub but each sleeve has centrifugal flapping stops instead of centrifugal blade droop stops.

Sliders are necessary for a simultaneous change of the blade setting angles.

Collective and differential pitch control mechanism (see Fig. 1-15) is of the lever-and-thread type. It is necessary to control the collective pitch, i.e. to increase the blade setting angles on both rotors simultaneously, and to control the differential pitch, i.e. to increase the blade setting angles on one rotor and to simultaneously decrease the blade setting angles on the other rotor by the same value.

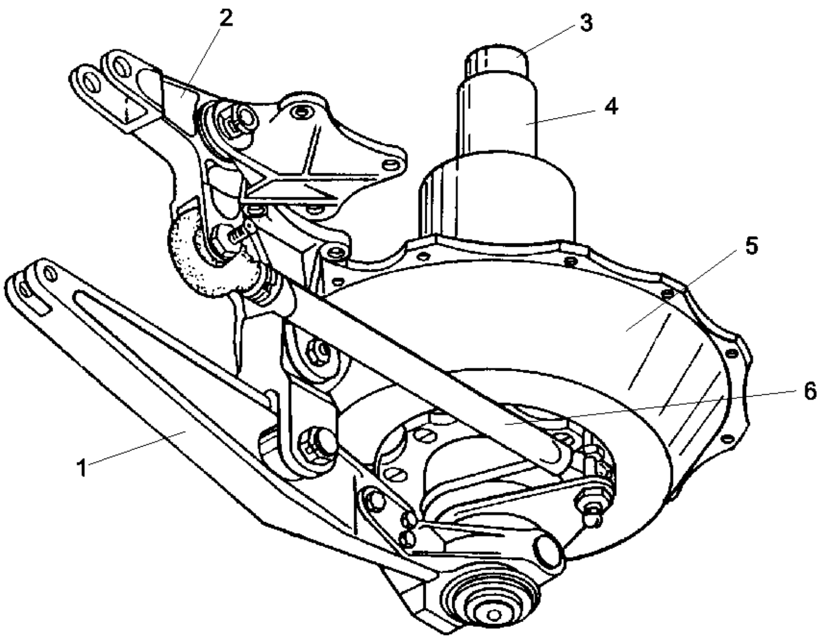
The blade folding mechanism is intended for decreasing the helicopter lateral dimensions. To fold the blades, the rotors are furnished with blade folding mechanisms (see Fig. 1-16) installed on all rotor hub sleeves.

For being folded, the blades are turned around their drag hinge pins to be arranged along the tail boom. The blades should be turned manually with the help of a rod with a grip.



1. Hub Body
2. Flapping Hinge
3. Drag Hinge
4. Feathering Hinge
5. Blade Attachment Point
6. Blade Pitch Link Rod
7. Oil Gauge Glass of Flapping Hinge

Fig. 1-14. Upper Rotor Hub.



1. Collective Pitch Control Lever
2. Differential Pitch Bellcrank
3. Upper Slider Rod
4. Lower Slider Rod
5. Casing of Collective and Differential Pitch Control Mechanism
6. Differential Pitch Rod

Fig. 1-15. Collective and Differential Pitch Control Mechanism.

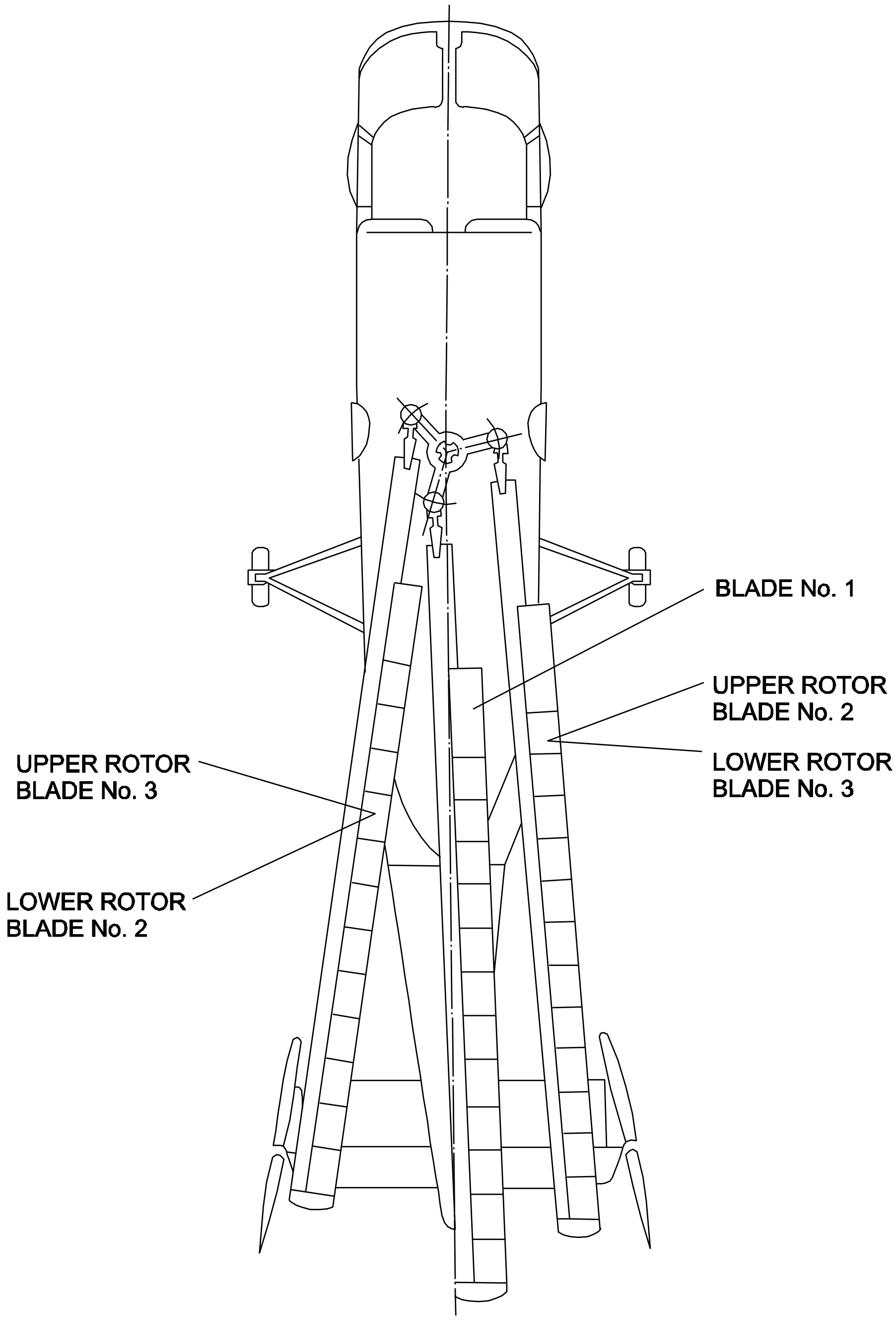
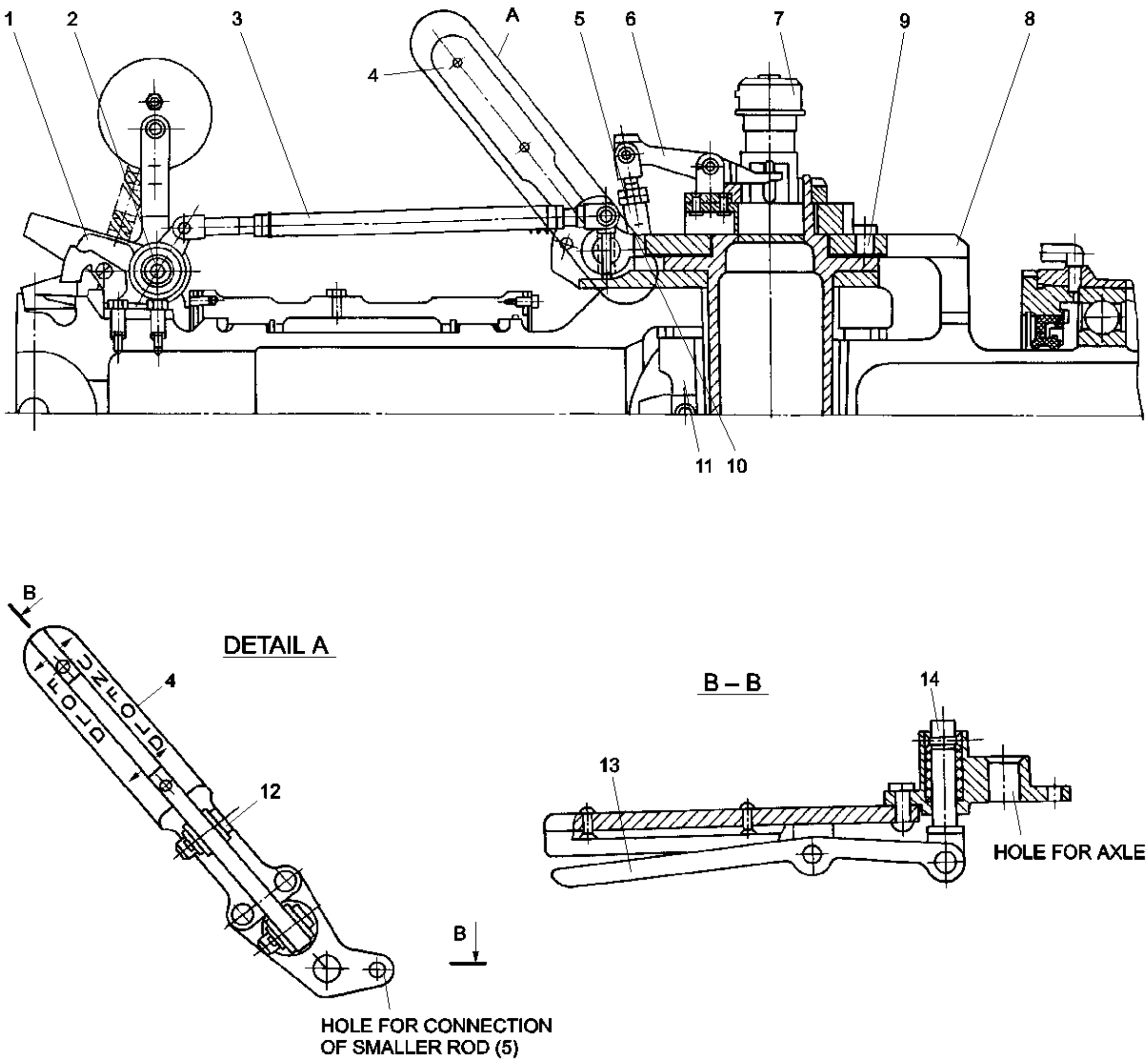


Fig. 1-16. Rotor Blades in Folded Position.



1. Blade Flapping Control Lever
2. Axle
3. Rod
4. Handle
5. Smaller Rod
6. Double-Arm Lever
7. Blade Folded Position Lock
8. Disk
9. Overswing Stop
10. Blade Operating Position Lock
11. Overswing Stop
12. Nut
13. Trigger
14. Locking Pin

Fig. 1-17. Blade Folding Mechanism.

HELICOPTER CONTROL SYSTEM

The general helicopter control principles are shown in Fig. 1-18.

The helicopter control system is composed of the following systems:

- longitudinal control system (Fig. 1-19);
- lateral control system (Fig. 1-20);
- directional control system (Fig. 1-21);
- collective pitch control system (Fig. 1-22).

The longitudinal, lateral control and collective pitch control acts only on the rotor blades, the directional control acts on the rotor blades and on the rudders.

Each control system incorporates command control elements and control linkage to rockers and levers of the rotor mast and rudders.

Hydraulic actuators are included into the control linkages of all the control systems. They provide for a combined control, i.e. manual pilot control with stabilization from the autopilot.

The helicopter longitudinal and lateral control is effected by means of a cyclic pitch control stick. A deflection of the stick through a system of rods and rockers and the hydraulic control actuators causes a deflection of the swashplate to the respective side which results in varying the direction and magnitude of the resultant rotor thrust force and, hence, in the helicopter turn around its longitudinal or lateral axis.

The directional control is effected by deflection of the pedals. Pedal deflection is transmitted through a system of rods and rockers and hydraulic control actuators to the collective and differential pitch control mechanism and to the rudders.

Varying the rotor blade setting angles and deflection of the rudders result in variation of aerodynamic moments acting on the helicopter which ensures the helicopter turn around its vertical axis.

The position of the pedals is checked against the pedal position indicator consisting of a dial and a pointer and installed in the flight compartment. The indicator show the deflection of the pedals from the neutral position (in mm).

The collective pitch control lever displacement (up/down) through a system of rods and rockers and hydraulic control actuators results in varying the blade setting angles of both rotors to the same value thus causing variation of the rotor thrust. Simultaneously, the displacement of the collective pitch control lever varies power ratings of the engines (with separate throttle levers occupying the AUTO position).

In the control system, in parallel with the control linkages of longitudinal, lateral and directional control, trimming mechanisms are introduced to fulfill the following functions:

- creation of a certain gradient of efforts on the cyclic pitch control stick and control pedals to simulate aerodynamic loads;
- removal of loads from the control levers and pedals throughout the whole range of their travel (trimming the command levers in any position).

A trimming mechanism consists of a load feel mechanism and an electromagnetic brake.

The load feel mechanism ensures a gradual increase of loads with the deflection of a control lever.

With the TRIM button depressed, the electromagnetic brake is released, and the brake lever is shifted to another position under the action of the load feel mechanism spring. The load applied to the control lever drops to zero.

In the longitudinal control trimming mechanism, there is a device indicating the neutral position of the electromagnetic brake lever (the CYC LONG NEUTRAL indicator light is glowing).

For the training purposes, the dual control elements are installed on the helicopter: the right cyclic pitch control stick, the right directional control pedals and the right collective pitch control lever. The left and right control elements are intercoupled and fully duplicate each other.

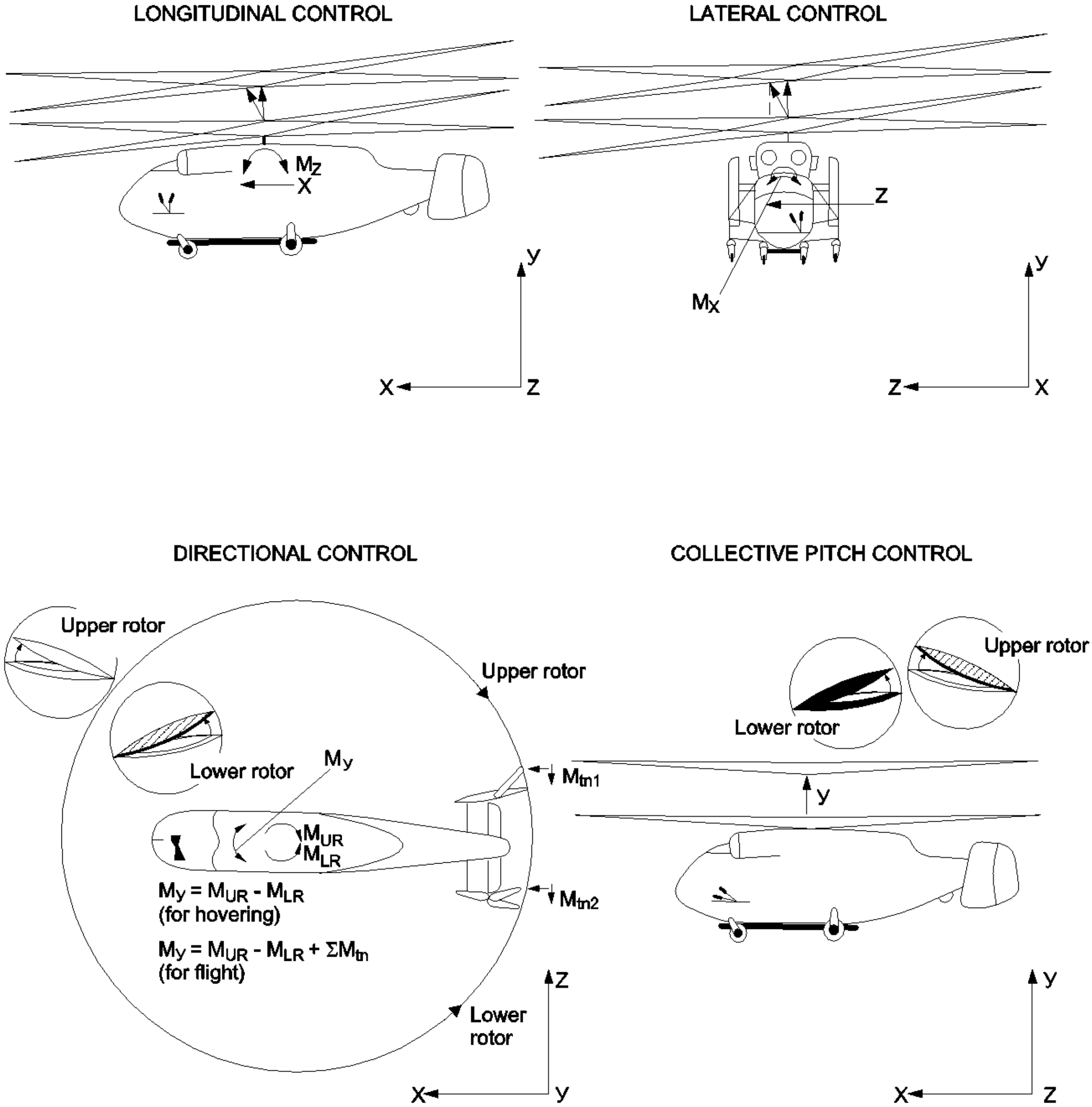


Fig. 1-18. Helicopter Control Principles.

1. Cyclic Pitch Control Stick
2. Control Actuator System
3. Swash Plate Longitudinal Tilt Rod
4. Link Rods
5. Lower Slider
6. Upper Swash Plate
7. Dynamic Adjustment Rod
8. Upper Slider
9. Static Adjustment Rod
10. Blade Pitch Link
11. Lower Swash Plate
12. Longitudinal Control Linkage

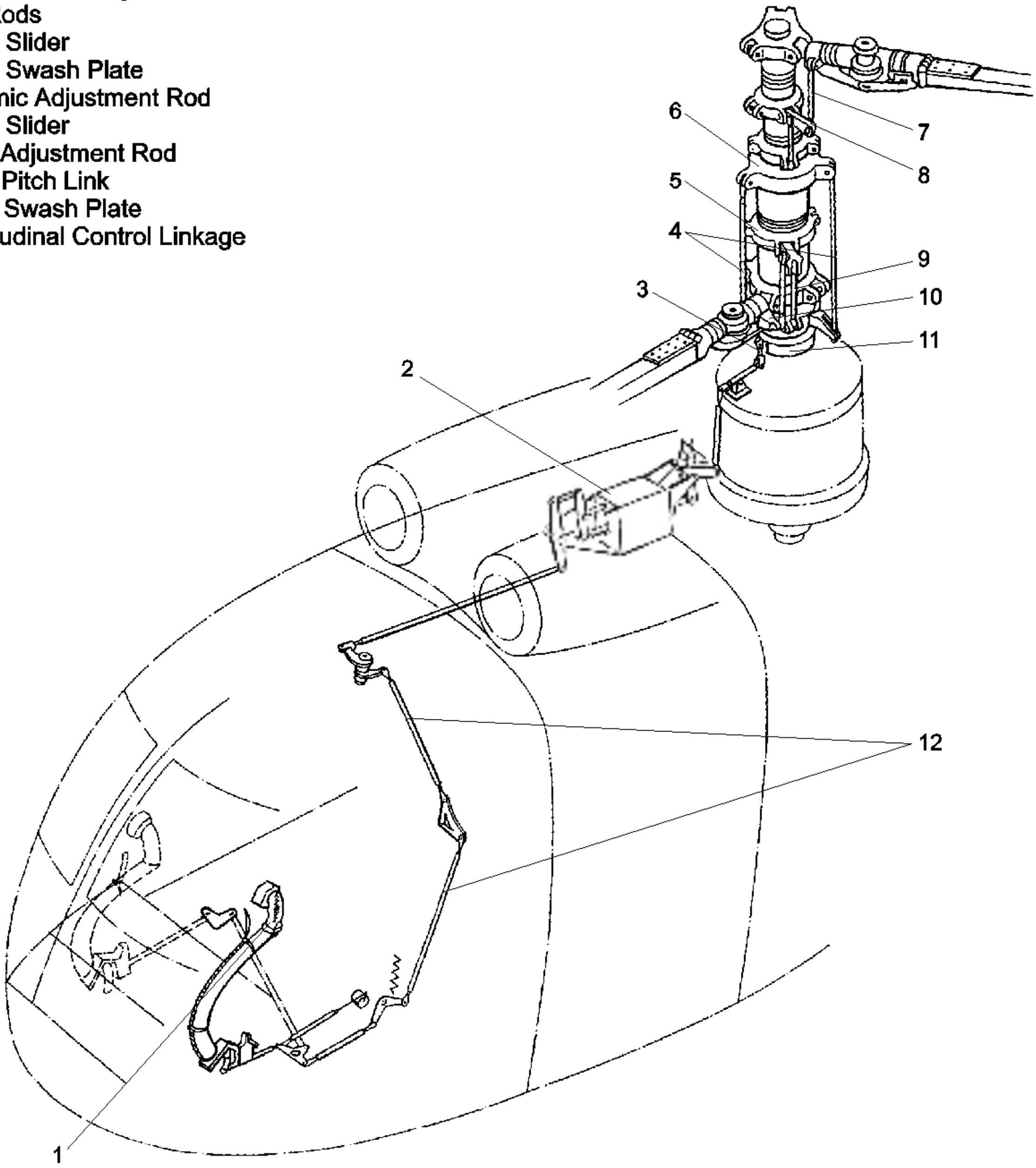


Fig. 1-19. Longitudinal Control System.

1. Cyclic Pitch Control Stick
2. Control Actuator System
3. Swash Plate Lateral Tilt Rod
4. Link Rods
5. Lower Slider
6. Upper Swash Plate
7. Dynamic Adjustment Rod
8. Upper Slider
9. Static Adjustment Rod
10. Blade Pitch Link
11. Lower Swash Plate
12. Lateral Control Linkage

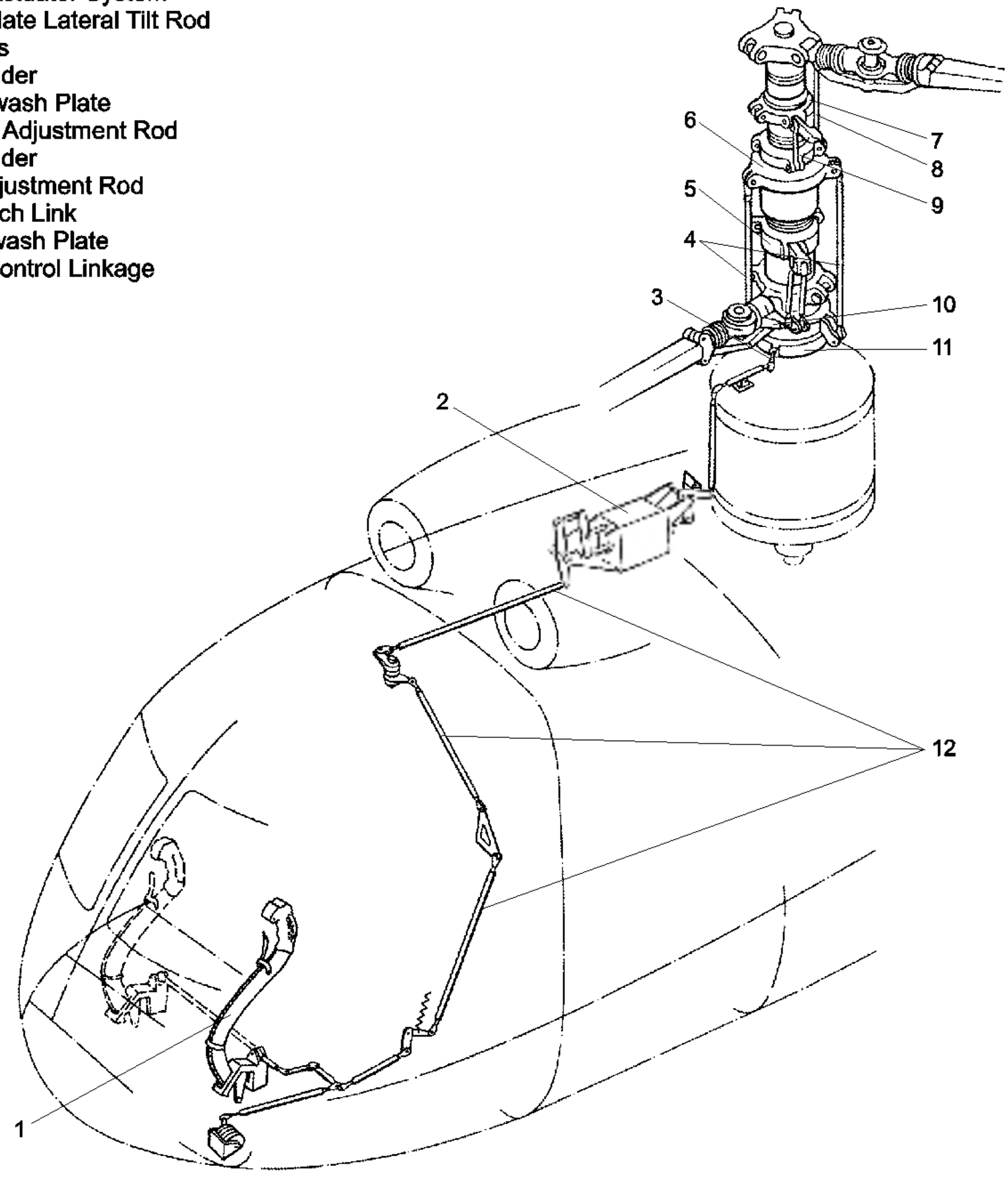
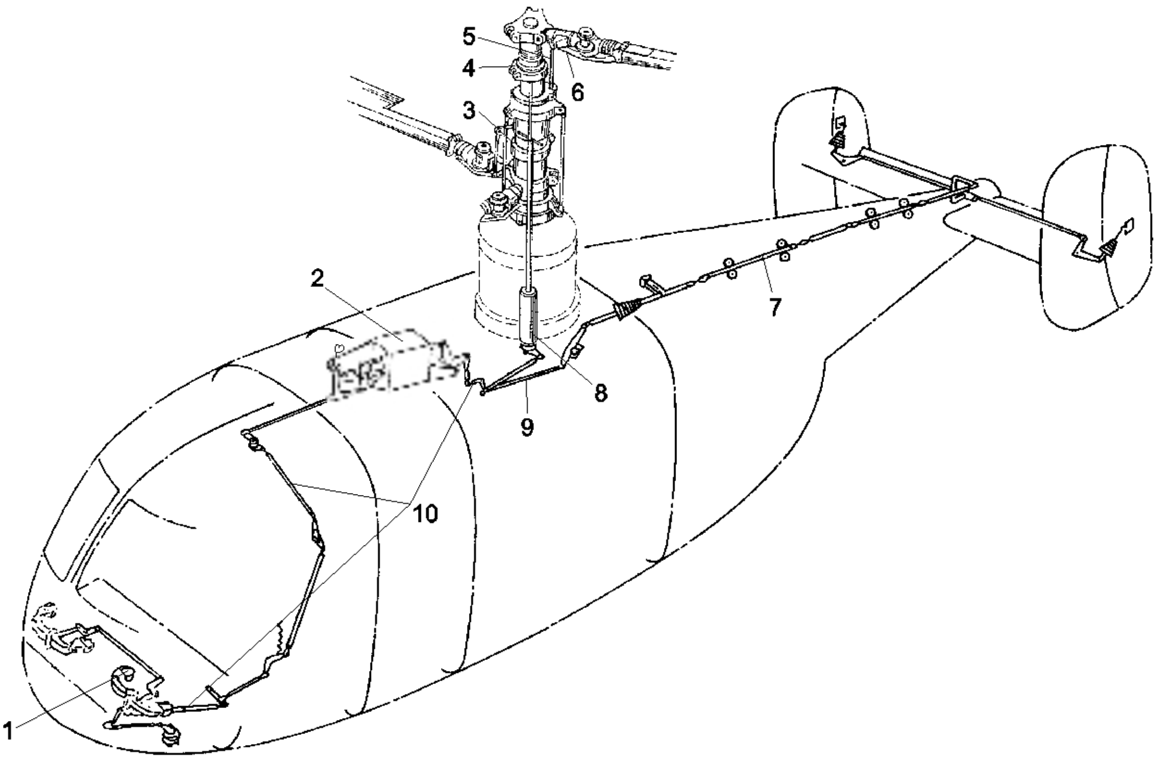


Fig. 1-20. Lateral Control System.



1. Directional Control Pedals
2. Control Actuator System
3. Lower Slider
4. Upper Slider
5. Dynamic Adjustment Rod
6. Blade Pitch Link
7. Rudder Linkage
8. Collective and Differential Pitch Control Mechanism
9. Differential Pitch Control Rod of Collective and Differential Pitch Control Linkage
10. Directional Control Linkage

Fig. 1-21. Directional Control System.

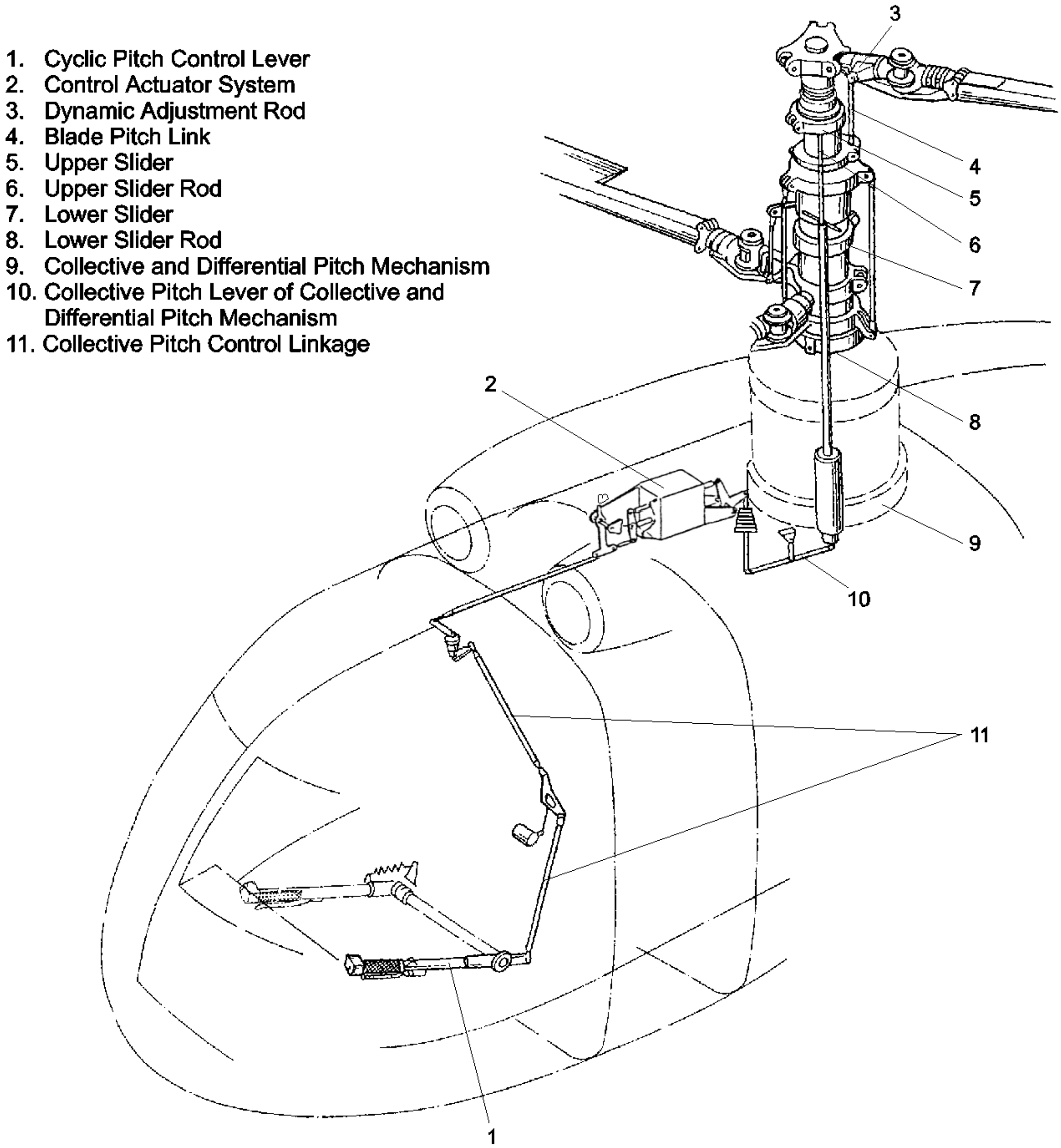


Fig. 1-22. Collective Pitch Control.

POWER PLANT

Two main engines ТВ3-117ВМА (TV3-117VMA) or ТВ3-117ВМА серии 02 (TV3-117VMA series 02), auxiliary power unit АИ-9 (AI-9) and transmission form an integrated power plant of the helicopter.

The transmissions designed for summing up and transforming the main engines torque's and transmitting their power to the rotors as well as to helicopter accessories.

The transmission is composed of the main gearbox, drive shaft of the cooling system fan and rotors brake.

The engines and rotors brake control panel and EEG control panel are presented in Fig. 1-23.

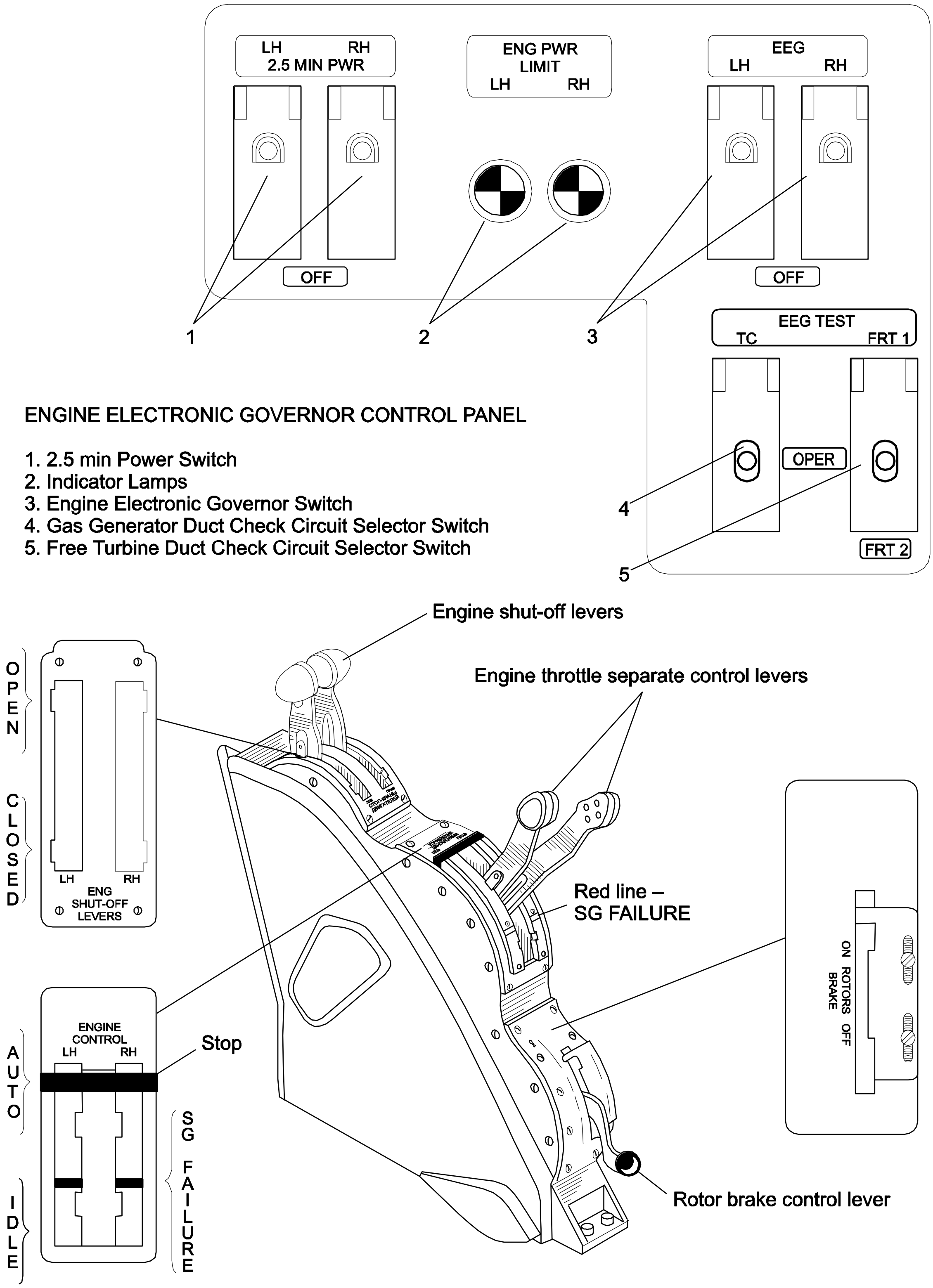


Fig. 1-23. Engine and Rotors Brake Control Panel and EEG Control Panel.

ENGINE

The main parameters of main engine are presented in Tables 1-1 and 1-2.

Gas generator RPM versus engine inlet air temperature is presented in Fig. 1-24.

ENGINE STRUCTURE

Engine TV3-117VMA is a turboshaft engine with a free turbine cinematically uncoupled from the gas generator rotor.

Power developed by the free turbine is transmitted to the main gearbox to make up the engine effective power.

The engine consists of an axial compressor, combustion chamber, turbine assembly, drives of accessories providing for its operation.

The engine is furnished with an air intake provided with a heating system that uses hot air bled from the compressor.

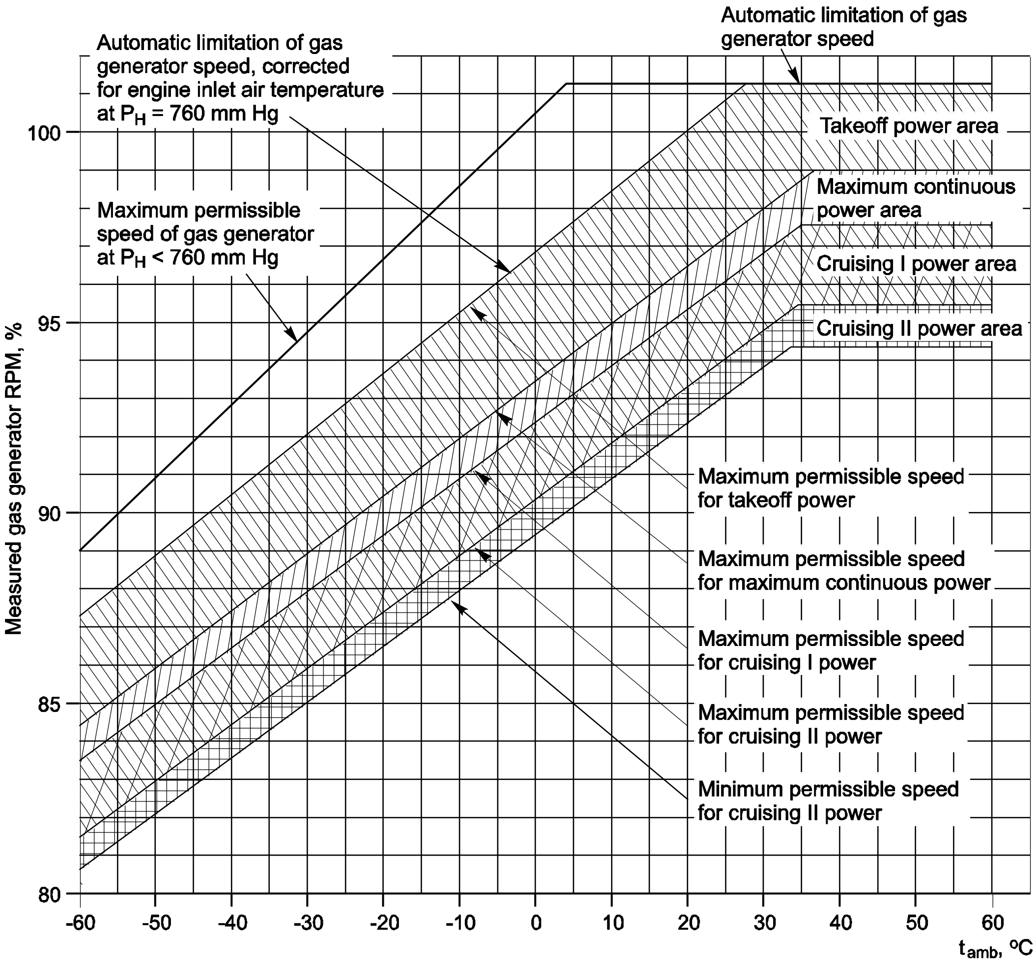
The heated protection screen is installed at the air intake inlet to prevent the ingestion of the birds in the main engine.

This screen is a stainless steel tube welded structure shaped as a truncated cone. In the front narrow portion of the screen there is an inlet manifold to which tube of heating air supply is connected. In the large rear portion of the screen there is an outlet manifold with two tubes exhausting the used air to the atmosphere and with three brackets which attach the screen to the air intake lip by the bolts.

The inlet and outlet manifolds are connected with each other by 36 heated tubes.

The screen is heated by the hot air bled from the engine through the electrical flap valve which is a part of the engine anti-icing system.

Engine compartments are separated by firewalls to prevent any advance of fire.



NOTES: 1. The gas generator takeoff RPM is limited automatically, depending on the ambient air temperature and pressure.

2. The takeoff power zone is valid for the entire family of TV3-117VMA engines. The gas generator RPM at takeoff power at P_H = 760 mm Hg is determined for each particular engine from the EEG chart enclosed to the engine Log-Book, with accuracy of ±0.5 %.

3. In case of high altitude flight, the gas generator RPM at takeoff power, with no limitations imposed on ITT, is determined for each particular engine from the EEG chart, accurate to within ±0.5 %, provided required corrections for the atmospheric pressure are duly taken into account, but it should not exceed the maximum permissible values for P_H < 760 mm Hg.

4. In case of high altitude flight, the gas generator RPM maximum continuous and cruising power, is determined from the given chart, must be increased by 1.3xH, where H is the pressure altitude, km, if the following requirements are met:

   - $t_{amb} \leq 40$ °C
   - no limitations are imposed on maximum values of ITT and gas generator RPM in the given power condition.

5. The chart is plotted for the engine operating with the air bleed switched ON.

6. The given chart is valid for engine complete ground testing. Do not use this chart in flight.

Fig. 1-24. Gas Generator RPM Versus Engine Inlet Air Temperature.

Table 1-1. Main Parameters of Engine TV3-117VMA
(sea level, zero airspeed, ISA conditions)

RATING	OUTPUT SHAFT POWER - h.p.	RPM, %			ITT, °C max	SPECIFIC FUEL CONSUMPTION - g/cu.cm·h max
		gas generator	free turbine	rotor		
Takeoff	2200	97.7±0.5	98±1	88±1	920	230
Maximum continuous	1700	95+0.5	100±2	90±2	845	248
Cruising I	1500	93.9±0.5	100±2	90±2	815	258
Cruising II	1200	92.9±0.5	100±2	90±2	770	278
IDLE (measured data)	200, max	–	–	55±15	780	*

* Fuel flow does not exceed 165 kg/h.

NOTES: 1. 100 % against gas generator tachometer indicator correspond to 19,537.48 RPM.

2. 90.2 % against rotor tachometer indicator correspond to 15,000 RPM or 100 % of free turbine RPM.

3. The rotor RPM may be found lower than the low limit values indicated in the table, reaching 3 % in the following cases:

- when the throttle control levers of both engines are set in the AUTO position and the collective is FULL DOWN or near it;
- during the test of one engine with its throttle control lever in the AUTO position and the collective pitch control lever in any position (the other engine is shut down or runs at the ground idle power, i.e. its control lever is in the IDLE position).

Table 1-2. Main Parameters with One Engine Inoperative

RATING	OUTPUT SHAFT POWER, h.p.	RPM, %			ITT, °C
		GG rotor, max	FT rotor	main rotor	
2.5-min power (CP)	2400	101	–	–	990
30-min power	2200	101	98±1	88±1*	990
Maximum continuous power	1700	95±0.5	100±2	90±2	955

* Tested engine throttle lever – on the forward stop. If it is set to AUTO position, the rotor RPM may be found lower than values low limit indicated in the table, reaching 3 %.

ENGINE GOVERNING SYSTEM

The engine governing system ensures its automatic starting, steady operation at all power ratings, limitation of maximum allowable gas generator RPM, limitation of maximum allowable value of compressor-drive turbine inlet temperature, free turbine constant RPM governing, adjustment of acceleration and deceleration time, prevention of free turbine overspending and synchronization of modes.

The helicopter is equipped with engine electronic governors used as components of the engine fuel control equipment and designed for:

- giving command for engine shutdown and warning light illumination in case the free turbine RPM reaches its limit;
- limiting the gas generator maximum corrected RPM;
- governing the gas generator maximum RPM versus pressure altitude and ambient temperature.

NOTE. With the electronic governors (EEG) disengaged, the above functions are not activated

Engine operation synchronization is effected by power equalizers. In case one engine fails, the operating engine automatically changes over for operation at contingency power (CP).

ENGINE POWER CONTROL

Engine power control is effected by the automatic engine governing system (automatic fuel control system) that maintains constant rotor RPM with the assigned accuracy under all operating conditions.

All the control units of the system are incorporated in the fuel-flow control unit (FCU).

Each engine is furnished with the FCU of its own, equipped with three control levers:

- shut-off valve lever;
- control lever of gas generator rotor speed governor;
- free turbine speed change-over lever.

The shut-off valve levers are connected with the shut-off valve control levers on engines control panel.

The control levers of the gas generator rotor speed governors are connected with the separate engine throttle control levers on the engines control panel and, at the same time, with the collective pitch control lever.

The free turbine speed change-over lever of the FCU is fixed in position of 66 degrees of the dial and its position can be changed on the ground during the unit adjustment.

ENGINE START SYSTEM

The engines are provided with an air starting system with the air bled from the auxiliary power unit.

Either starting, or cranking or false start is performed depending on respective position of controls.

Compressed air is fed to the air starter, which, through the accessory drive gear box, cranks the gas generator rotor of the engine to be started.

Engine starting time is controlled by the automatic starting control unit, engine RPM are controlled by fuel flow control unit microswitch.

The cycle of cranking is similar to that of starting but without switching on ignition and without supplying fuel to the combustion chamber.

Cranking and false start may be performed with the helicopter main rotors braked. During a false start the engine shut-off valve must be open.

ENGINE OPERATION CONTROL

The following instruments are installed on the helicopter for monitoring the engines operation:

- engine dual tachometer indicator;
- rotor tachometer indicator;
- dual gas temperature indicator;
- power indicator;
- emergency warning system annunciator lights;
- annunciator lamps;
- engine pressure and oil temperature indicators.

The power indicator is a means to indicate the power of the left and right engines by the relative position of the side indexes and the three central marks linked rigidly with each other.

The central marks form the movable power scale which sets automatically versus pressure altitude and OAT so in the all conditions the following is applicable:

- upper edge of upper central mark corresponds to 2200 h.p. (takeoff or 30-min OEI power ratings);
- upper edge of central mark corresponds to 1700 h.p. (maximum continuous or continuous OEI power ratings);
- upper edge of lower central marks corresponds to 1500 h.p. (cruise power rating).

To warn the crew about rotors RPM drop, the LOW RPM light is provided on the instrument panel, simultaneously an audio signal of 400 Hz tone is heard in the earphones and Master Warning Light (MWL) lights up. The red HIGH RPM annunciator lights up on the helicopter instrument panel in case rotor RPM exceed 99.4 %.

LH (RH) ENG CHIP annunciators warning the crew about chips in oil and LH (RH) ENG OIL PRES annunciators warning about oil pressure drop are provided on the instrument panel.

Special equipment is provided for monitoring the engine casing vibration. The equipment switches on amber LH (RH) ENG VIBR and red LH (RH) ENG VIBR annunciators if vibration reaches its limit level (in the first case) or dangerous level (in the second case) when the engine operation is impermissible.

ENGINE OPERATION IN FLIGHT OEI

In OEI flight, the 2.5-min OEI power (contingency power) rated at 2400 h.p. may be used under certain conditions. The EEG transfers from 30-min OEI power limitation to 2.5-min OEI power limitation if the following three conditions are present:

- LH (RH) 2.5 MIN PWR ON – OFF switches are set to ON (cap closed);
- normal operating engine gas generator RPM is at least 80 % and exceeds the gas generator RPM of another engine by (5 – 9) %;
- normal operating engine power is (2000 – 2200) h.p.

When EEG transfers from 30-min OEI power limitation to 2.5 min OEI power limitation, the LH (RH) EEG 2.5 MIN PWR light turns on at the pilot instrument panel.

When the engine develops 2.5-min OEI power, the side index of the power indicator sets above the upper edge of the central upper mark and with further limitation of the 2.5 min OEI power by the EEG the corresponding red LH (RH) ENG PWR LIMIT light glows on the pilot instrument panel over the power indicator.

Under certain conditions the 30-min OEI power is limited to 2000 h.p. and below (for example, at sea level conditions with OAT equal to +40 °C, or at 9840 ft (3000 m) pressure altitude, ISA conditions). In such cases the EEG does not transfers to 2.5-min OEI power and this rating is not available.

It should be remembered that the characteristics of the engine control system (the "collective pitch control lever – engine lever on fuel-flow control unit" system) are calculated for normal operation of the two engines. When one of the engines fails with the setting of the collective pitch control lever unchanged, the free turbine RPM adjustment level reduces by 2 or 3 %. In connection with this, the on-speed condition RPM of the rotor will be also found 2 or 3 % lower at all engine ratings. So, a reduction of the rotor RPM to 84 to 85 % may be required to effect – complete realization of the takeoff and contingency power.

It should be also remembered that the rotor RPM of 85 % and less is evidenced by glowing of the LOW RPM annunciator ("zebra" light) and that AC generators get disconnected at the rotor RPM of 83 %.

That is why, when a necessity arises to completely use the 30-min and the 2.5-min OEI power of the operating engine, the special attention should be paid to the rotor RPM indications when the LOW RPM annunciator comes alive.

After the transfer to a steady single-engine flight, the throttle lever of the operating engine must be shifted all the way forward beyond the AUTO position and the on-speed condition RPM of the rotor will get stabilized within the normal range.

REGISTRATION OF ENGINE IN-FLIGHT OPERATION TIME

The engine in-flight operation time at takeoff (or 30-min OEI) power rating is recorded from the moment the red LH (RH) ENG PWR LIMIT light, located at the EEG control panel, turns on.

The engine in-flight operation time for 2.5-min OEI power rating is recorded from the moment the red LH (RH) ENG CONTNG light, located above the power indicator, turns on.

AUXILIARY POWER UNIT

APU is a turboshaft engine with compressed air bled behind the compressor for supplying the air starting systems of the main engines.

Engine is composed of an air intake, internal wheel case, centrifugal compressor, combustion chamber, single-stage turbine, exhaust nozzle, receiver with air bleed valve and engine accessories.

Air delivered to the compressor is compressed there and divided into two flows:

- the first flow is supplied for ensuring fuel combustion in the combustion chamber and for cooling the engine hot parts;
- the second flow is supplied to the receiver from which, via the automatic bleed valve, air is directed to the air starting system of the main engines or, if its consumption is not required, to the atmosphere.

Engine starting is automatic, electrically powered from the helicopter storage batteries or from the ground DC power source.

Units of the starting system are remotely controlled.

Engine starting is provided up to an altitude of 9840 ft (3000 m), ISA within the OAT range indicated in the RFM, Section 1.

GEARBOX

The BP-252 (VR-252) gearbox is a self-contained unit, it serves for transmitting the torque from the engines to power consuming units of the helicopter.

The gearbox sums up the power of the engines and transmits it to the rotor shafts providing also the drive of the helicopter accessories.

The gearbox is equipped with two free wheeling clutches to ensure the helicopter flight with only one engine running and with the rotors autorotating. The clutches automatically uncouple the inoperative engines from gear box.

To reduce the run-down time of the rotors and to brake them at parking, a brake is mounted on the gearbox left-hand accessory drive.

The braking lever may be set to the ROTORS BRAKE OFF or ROTORS BRAKE ON position.

Braking should be started at the rotor RPM not higher than 20 % against the rotor speed indicator. Braking time to a complete stop of the rotors is 30 to 45 s.

To prevent engine starting with the rotors braked, there is a microswitch.

Allowed time of gearbox operation under different conditions throughout its service life (% of service life):

• at takeoff power of two engines	4 %
including at 30-min power of one engine	1 % (0.5 % of each engine);
• at maximum continuous power of two engines	40 %
including at maximum continuous power of one engine	4 % (2 % of each engine);
• at cruising power of two engines	not limited
at cruising power of one engine	5 % (2.5 % of each engine).

Scale segments on the engine and gearbox instruments and gauges are marked as follows:

- minimum and maximum allowable values for safety operation are marked by red radial lines;
- value ranges requiring cautious operation are marked by yellow arcs;
- normal operation ranges are marked by green arcs.

OIL SYSTEM

The power plant oil system comprises the oil systems of the main engines, APU and the gearbox oil system. All the oil systems are self-contained.

For checking temperature and pressure, the engine and the gearbox are provided with the relevant sensors and transducers supplying the information to the instruments and indicators installed on the pilot's instrument panel.

The oil pressure drop below the allowable level is signaled by the warning units, and presence of chips in the engine oil – by the chip detector.

Their annunciators LH (RH) ENG OIL PRES and LH (RH) ENG CHIP are installed on the instrument panel.

In case the oil temperature in the gearbox exceeds the maximum allowable value (100°), the GRBX OIL HOT annunciator illuminates on the instrument panel.

The instrument panel is also provided with the GRBX OIL PRES LOW annunciator which lights up if the gearbox oil pressure drop is lower than the minimum allowable value (1.3 kgf/sq.cm) and with the GRBX CHIP annunciator.

A pressure drop sensor is installed on the gear box fine oil filter and its indicator is located on the instrument panel. The indicator scale has coloured markings.

Increase of the oil pressure drop beyond the normal operating range indicates a partial fine filter contamination.

The pressure drop is 1.3-1.6 kgf/sq.cm when 50 % or less of the filtering element is contaminated. When more than 50 % of the area is contaminated the pressure drop is 1.6 – 2.0 kgf/sq.cm. In this case, the flight is continued, after landing filter inspection and flushing, as indicated in the MM, are required.

NOTE. At oil temperature of minus (15 – 40) °C in the gearbox the allowed oil pressure is not more than 5 kgf/sq.cm

COOLING SYSTEM

Power plant cooling system serves for cooling:

- oil in oil coolers of the engine and gear box oil system;
- generators and hydraulic pumps;
- external surfaces of the engines and of the power plant accessories.

Oil and accessories are cooled by the air supplied from the air intakes into the under-cowling space as well as by the air supplied from the fan through pipelines.

The main portion of the cooling air supplied by the fan is used for cooling the oil in the coolers, the remaining portion – for cooling the generators and hydraulic pumps.

Air flow supplied by the fan is controlled by changing the position of the guide vanes at transitions from "summer" to "winter" operation and vice versa.

FUEL SYSTEM

The helicopter fuel system is designed for accommodating the required amount of fuel and for uninterrupted fuel supply of the main engines and auxiliary power unit at any rating under various operating conditions.

The principal scheme of fuel system and fuel system arrangement is presented in Fig. 1-25.

The fuel system operating data is presented in Table 1-3.

The fuel system consists of reservoirs for fuel, booster and transfer pumps, fuel distribution system, pipelines and devices for fueling and draining, vent system as well as of control units and fuel system operation monitoring instruments.

The fuel system is divided into two separate sub-systems providing for independent supply of each engine.

The only common point is the cross-feed valve connecting the RH and LH branches of the fuel system.

The fuel system LH branch supplies the LH engine, the RH branch supplies the RH engine and the APU. 10 flexible fuel tanks and 2 rigid tanks are used as fuel reservoirs.

The fuel tanks are arranged along the LH and RH sides of the fuselage and in the cargo compartment.

Tanks Nos 2 and 5 form service tank groups of which tanks No. 2 are the service tanks.

Tanks No. 6 are quick-detachable welded tanks which are removed when external load is attached to the helicopter.

The fuel is delivered to the engines from service tanks by electrically-driven intra-tank booster pumps.

As fuel is consumed from service tank groups, they are replenished with fuel from tanks Nos 1, 3 and 4 through transfer pumps installed in tanks Nos 1 and 4.

Tank No. 1 of the LH group is replenished from forward tanks No. 6, tanks Nos 3 and 4 of the RH group – from rear tank No. 6 through transfer pumps installed in these tanks.

All pumps are engaged manually.

Indication of each pump operation appears on an annunciator in the overhead panel annunciator unit.

Annunciators light up in response to operation of pressure switches installed in the pipelines behind fuel transfer and booster pumps.

Fuel transfer pumps of tanks Nos 1 and 4 are disengaged automatically after fuel is completely used and fuel transfer pumps of tanks No. 6 are disengaged manually.

In case of a booster pump failure, fuel is sucked in the engine by the fuel boost pump of the engine through an open middle non-return valve of tank No. 2.

Monitoring of the helicopter fuel system operation is effected by means of fuel quantity gauges, pressure switches, level switches, fuel indicators and indication lights. Fuel quantity indicators and their wafer switches are located on the instrument panel.

With fuel amount of (125±8) L remaining in any tank No. 2, transmitters switch on red flickering annunciators 125 L LH TANKS or 125 L RH TANKS. Simultaneously, the MWL switches on and an intermittent audio signal is heard in the earphones.

Transmitters-switches arranged in drainage pipelines of fuel tanks Nos 1 LH, 5 LH, 4 RH, 5 RH switch on the amber light annunciators that read OVERFLOW of LH TNK1, LH TNK5, RH TNK4, and RH TNK5 in case of tanks overfilling.

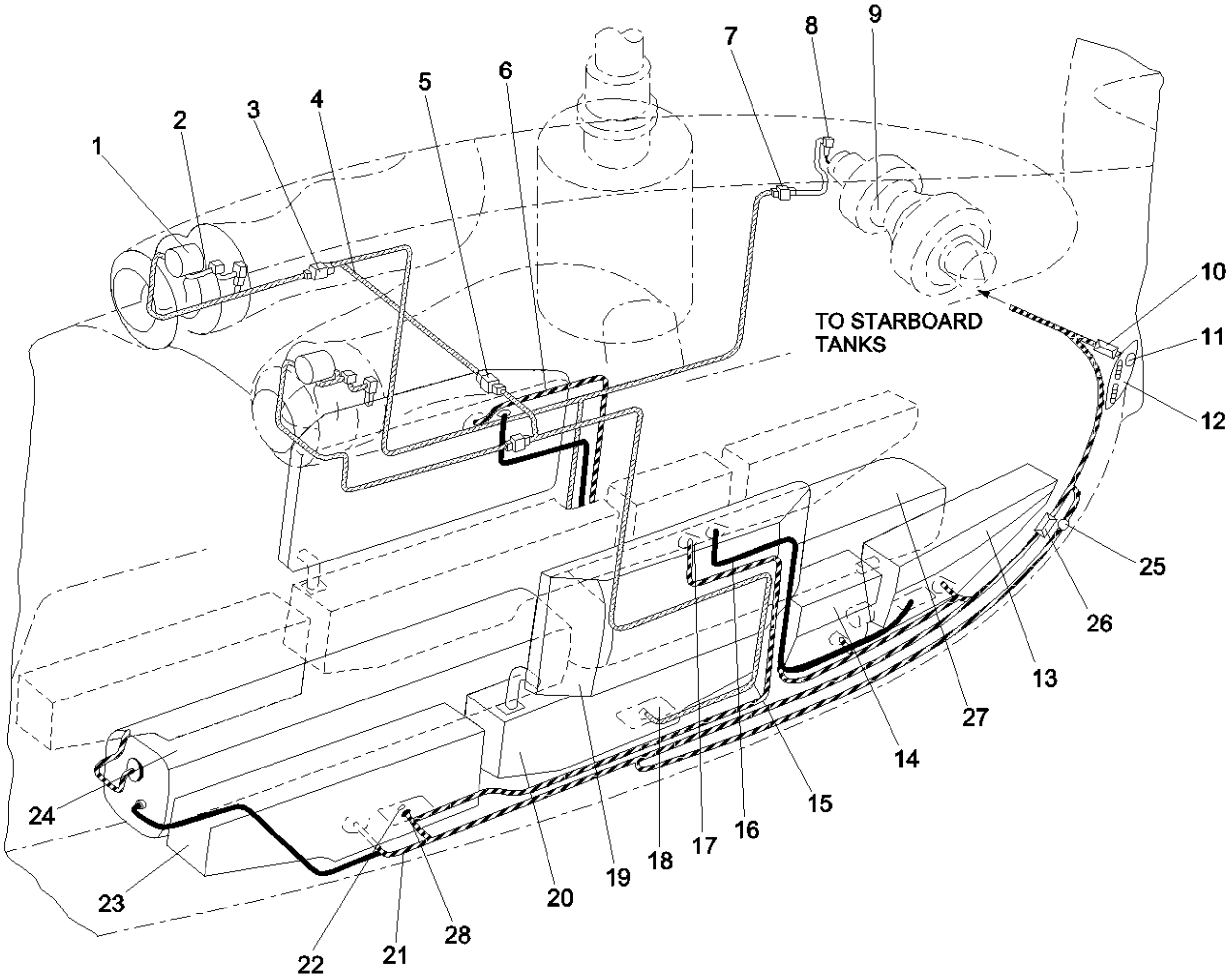
Fuel tanks are either pressure-filled with the use of a single-point method or filled through their filling necks.

When fueling through the filling necks, 370 L may be added to the amount filled with the use of the single-point method.

Additional single-point method of fuel filling makes it possible to fill only fuel tanks Nos 2 LH, 5 LH, 2 RH and 5 RH (general fuel amount is 1000 L).

When the single-point method of fuel filling is used, the process is checked by indicator lamps on the fueling control panel.

In the helicopter fuel system, electrically driven valves are used as shut-off valves, cross-feed valve and filling valve. The filling valves are remotely controlled from the fueling panel and other shut-off valves are remotely controlled from the central pedestal.



1. Air Separator
2. Preservation Filler
3. Main Engine Shut-Off Valve
4. Cross-Feed Pipeline
5. Cross-Feed Valve
6. Single-Point Pressure Fueling And Transfer Pipeline
7. Auxiliary Engine Shut-Off Valve
8. Filter
9. Auxiliary Engine
10. Fueling Valve
11. Single-Point Pressure Refuel Connection
12. Refuel Panel
13. LH Tank No. 4
14. LH Tank No. 3
15. Supply Pipeline
16. Transfer Pipeline
17. Fuel Level Float Valve
18. Boost Pumping Unit
19. LH Tank No. 5
20. LH Tank No. 2
21. Single-Point Pressure Fueling Pipeline
22. Transfer Pumping Unit
23. Tank No. 1, LH
24. Front Tank No. 6
25. Non-Return Valve
26. Shut-Off Valve in Fueling System of Tank No. 1, LH; No. 3, LH; No. 4, LH and No. 6, Rear
27. Tank No. 6, Rear
28. Non-Return Valve

Fig. 1-25. Fuel System Arrangement.

Operation of the engines is provided with home-produced fuels and their mixtures as well as with their substitutes of foreign make.

At the ambient temperature of +5 °C and below the Russian additive fluid “И” ("I") or its western substitutes are added to fuel to prevent formation of ice crystals.

Table 1-3. Fuel System Operating Data

Parameter	Parameter value		
	min	normal	max
Fuel system total capacity, L	3370	3450	3530
Same at single-point fueling, L	3000	3080	3160
Emergency minimum fuel remainder, L:			
– in each tank group		125±8	
– in fuel system		250±16	
Fuel pressure at single-point fueling, kgf/sq.cm	1	2.5±0.5	5
Time of single-point fueling, min	8	10.5	12
Time of fueling through filling necks, min		22	
Fuel flow rate from refueler when fueling through filling necks, L/min	400	450	500
Amount of added fuel when fueling through filling necks, L			370

HYDRAULIC SYSTEM

The hydraulic system is designed for driving hydraulic actuators of various helicopter systems.

The helicopter hydraulic system is composed of three systems: main, standby and auxiliary (Figs 1-26 and 1-27).

In the helicopter hydraulic system, АМГ-10 (AMG-10) oil is used as working fluid.

The main hydraulic system serves for supplying helicopter control system actuators, main wheel brake chambers and to control the hydraulic cylinder of the Rescue Hoist Boom (if installed).

The standby hydraulic system supplies only actuators.

The auxiliary hydraulic system serves for emergency supply of the main wheel brakes in case of the main hydraulic system failure and for changing the helicopter clearance. Besides, the auxiliary system may be connected to the main system for supplying all its consumers (during parking for checking the helicopter systems).

The main and standby hydraulic system power sources are hydraulic pumps.

The auxiliary hydraulic system is supplied from electrically-driven hydraulic auxiliary pump. A hand-operated pump is connected in parallel with this pump.

Automatic and emergency (forced) starting of the auxiliary pump is envisaged depending upon the position of the AUX PUMP EMERG ON – OFF – AUTO switch on the hydraulic control panel. The pump is started automatically (with the switch in auto position) in case of the main hydraulic system failure in flight or on the ground (with the landing gear struts pressed and only with the hydraulic tanks pressurized). Forced starting of the pump (with the switch in EMERG ON position) is initiated by the pilot if the pump failed to switch on automatically in case of the main hydraulic system failure and on the ground it can be done only provided the hydraulic tanks are pressurized.

AUX PUMP EMERG ON OFF – AUTO switch OFF position is effective only on the ground. If it is necessary to switch off the pump when it is operating in flight, it can be done only with AUX PUMP circuit breaker.

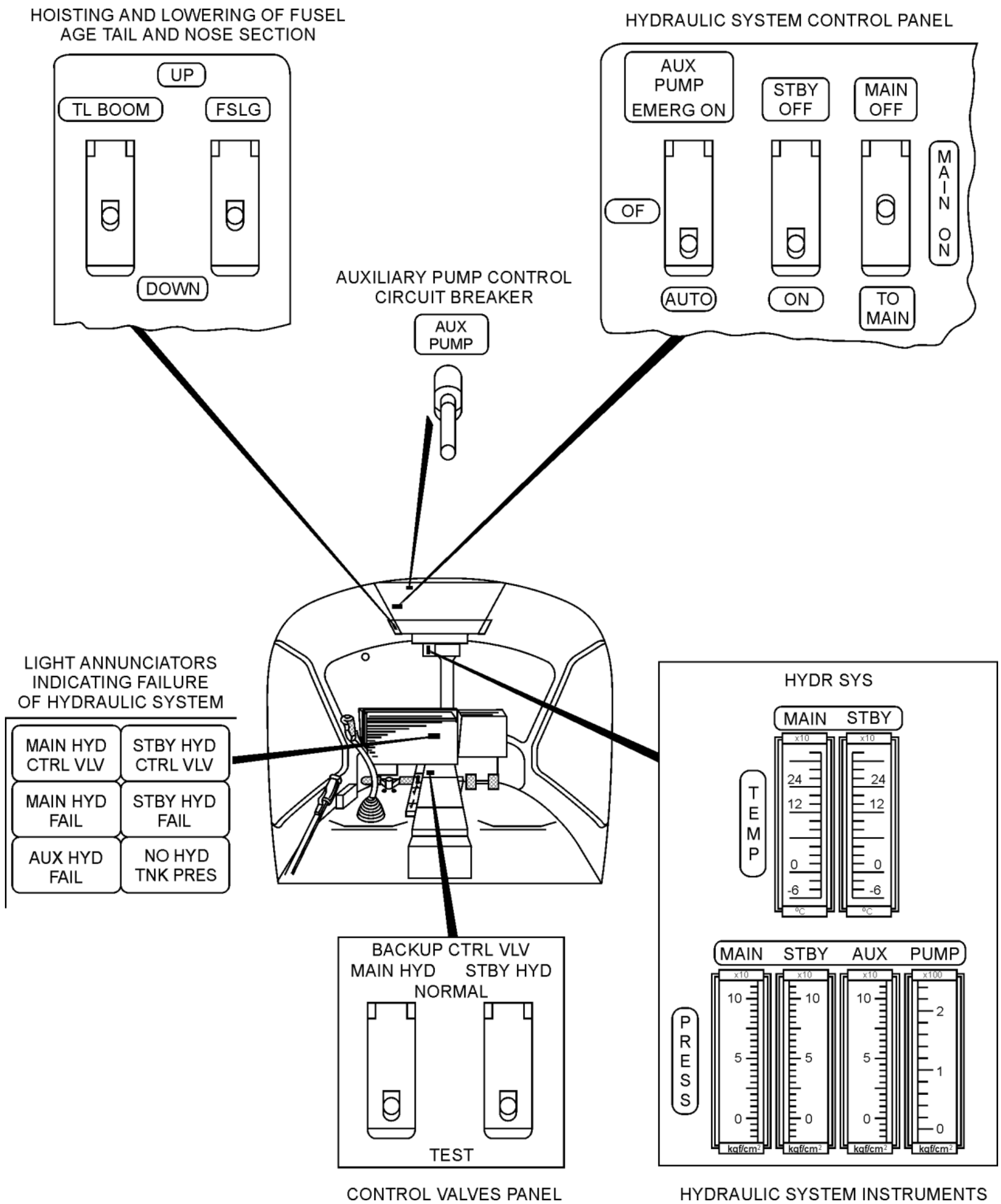
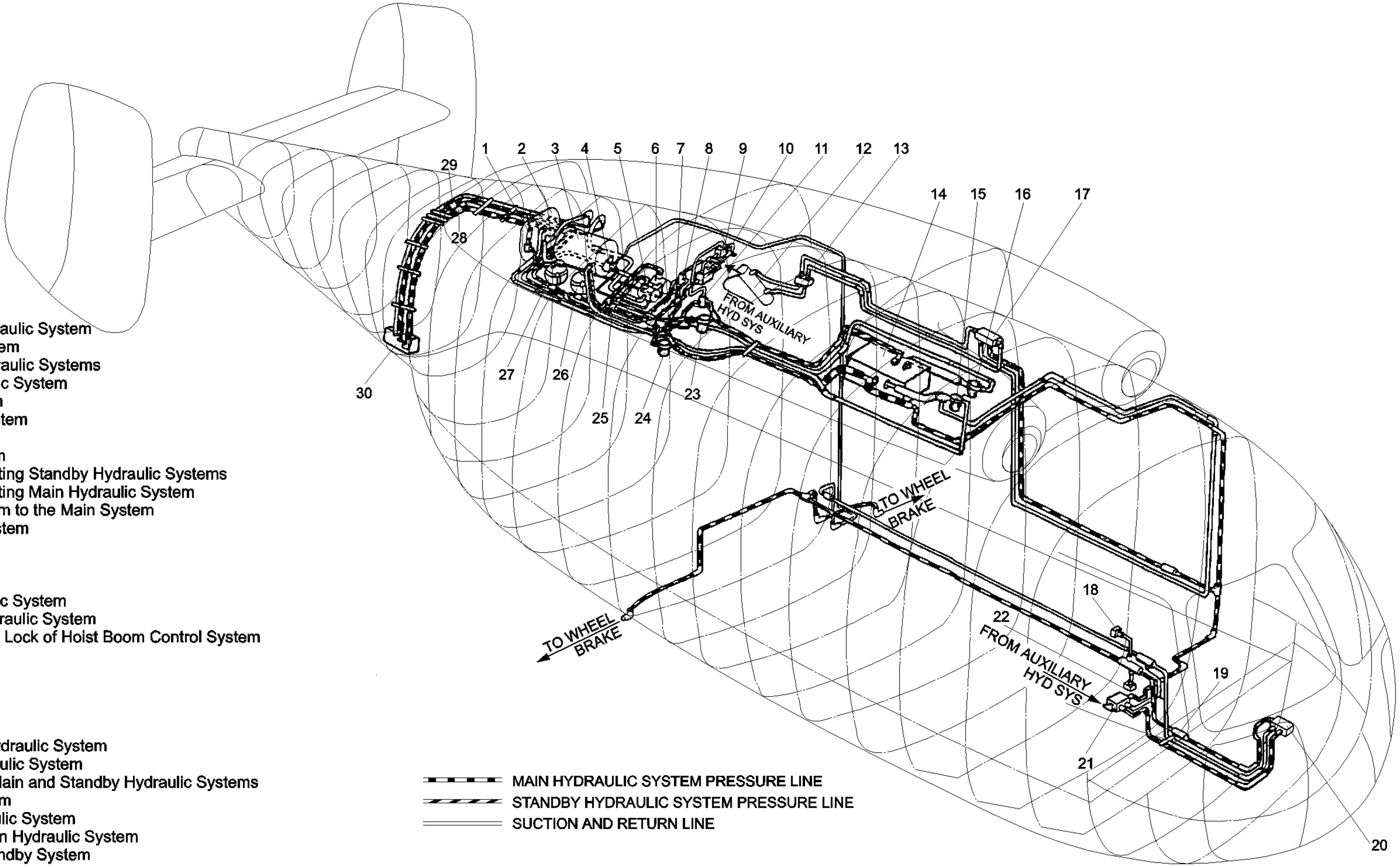


Fig. 1-26. Arrangement of Controls, Indication and Warning Devices of Hydraulic System.



1. Fine Filter of Return Line of Standby Hydraulic System
2. Hydraulic Tank of Standby Hydraulic System
3. Hydraulic Tank of Main and Auxiliary Hydraulic Systems
4. Fine Filter of Return Line of Main Hydraulic System
5. Hydraulic Pump of Main Hydraulic System
6. Hydraulic Pump of Standby Hydraulic System
7. Non-Return Valves
8. Discharge Valve of Main Hydraulic System
9. Electrohydraulic Distributor for Disconnecting Standby Hydraulic Systems
10. Electrohydraulic Distributor for Disconnecting Main Hydraulic System and Connecting Auxiliary Hydraulic System to the Main System
11. Discharge Valve of Standby Hydraulic System
12. Hoist Boom (Winch) Control Cylinder
13. Disconnect Valves
14. Actuating System
15. Fine Filter in Return Line of Main Hydraulic System
16. Fine Filter on Return Line of Standby Hydraulic System
17. Electrohydraulic Distributor with Hydraulic Lock of Hoist Boom Control System
18. Pressure Switch of Braking System
19. Metering Device
20. Pressure Reducing Valve
21. Hydraulic Switch
22. Pressure Transmitter of Braking System
23. Fine Filter in Pressure Line of Standby Hydraulic System
24. Fine Filter in Pressure Line of Main Hydraulic System
25. Non-Return Valves in Pressure Lines of Main and Standby Hydraulic Systems
26. Hydraulic Accumulator of Hydraulic System
27. Hydraulic Accumulator of Standby Hydraulic System
28. Non-Return Valve in Pressure Line of Main Hydraulic System
29. Non-Return Valve in Pressure Line of Standby System
30. External Charging Panel

Fig. 1-27. Main and Standby Hydraulic System Circuit Diagram.

The helicopter control system uses a PC-60F (RS-60F) actuator unit (hereinafter referred to as RS).

RS is a unit comprising combined blocks containing four dual servoactuators to move the helicopter control (pitch, roll, heading and collective pitch) members. The RS actuator chambers are fed separately and simultaneously. One chamber is fed from the main hydraulic system and the other is fed from the standby hydraulic system. Besides, the autopilot actuator works only from the main system.

In case of the main hydraulic system failure the autopilot actuator rods are blocked, and it is recommended to switch the autopilot off with a button located on the cyclic stick.

In case the RS feed channels from one of the hydraulic systems fail there are no changes in the helicopter control. In autonomous RS feed and control channels hydraulic distributors with two control valves (primary and backup) are envisaged for each chamber separately to improve the system reliability. In case of the primary control valve failure the backup valve takes over thus retaining the RS functional ability when it is fed from the corresponding hydraulic system. The pilot efforts on the helicopter controls (cyclic stick, pedals and collective lever) increase in the channel whose control valve failed.

A hydraulic system and RS serviceability check is envisaged on the ground for which purpose:

- there are a three-position PUMP to MAIN-MAIN ON – MAIN OFF switch and a STBY OFF switch on the upper panel. An intermediate position of the MAIN ON switch and the lower position of the STBY OFF switch are fixed with closed caps (both hydraulic lines are connected to RS). It is possible to cut off the main or standby hydraulic system using these switches but only if the auxiliary hydraulic system is pressurized. There is a provision to block a simultaneous cut out of the main and standby hydraulic systems in case of one system failure or switching off and a check is provided for this blocking.
- there are two similar CTRL VALVE MAIN HYD (STBY HYD) TEST – NORMAL switches on the control valve panel that can be used to imitate the main control valve jamming.

The procedure for checking the cutout blocking of the normally operating hydraulic system and operation of the backup control valves are presented in the RFM, Section 2.

Wheel brakes are controlled during taxiing by means of a lever mounted on the cyclic pitch control stick.

The helicopter is braked with a parking brake lever located on the LH side of the pilot's seat. To brake the helicopter, the lever is pulled up to the stop, the PARKING BRAKE annunciator lights up with the throttle lever set to the AUTO position (with the pressure exceeding 17 kgf/sq.cm).

A short-time (5 min) parking pressure increase to 30 kgf/sq.cm in the braking system is allowed and shall be checked against the indicator.

When the pumping unit operates on the ground, the time of its continuous operation should not exceed 30 min. In case of the main hydraulic system failure in flight, the duration of the pumping unit operation is up to 2.5 h.

Operating data of hydraulic system are presented in Table 1-4.

Table 1-4. Hydraulic System Operating Data

Parameter	Parameter value		
	min	normal	max
Pressure in systems, kgf/sq.cm: main	64	80	90
standby	64	80	90
auxiliary:			
– from pumping unit to pressure reducing valve	200	210	240
– after pressure reducing valve	75	80	90
Operating fluid temperature, °C	minus 40 minus 10 (at take-off)	70	85
Operating fluid temperature, °C at which MAIN HYD FAIL, STBY HYD FAIL lights start to glow	+87		92
Pressure in main hydraulic system at which supply of serves is switched over to standby system, kgf/sq.cm	45	50	55
Pressure of MAIN HYD FAIL annunciator lighting up, kgf/sq.cm	52	55	58
Pressure of STBY HYD FAIL annunciator lighting up, kgf/sq.cm	52	55	58
Pressurization pressure, kgf/sq.cm	0.25	0.4	0.45
Pressure in brakes, kgf/sq.cm:			
taxiing	11	12	13
long parking	15	16	17
parking up to 30 min	23	24	30
Operating pressure for short-time maintaining heli-copter on slopes up to 10° for 5 min, max	–	28	30
Oil amount, L:			
total amount			38
MAIN SYS tank			12
AUX SYS tank			12
STANDBY SYS tank			11
Pressurization pressure in tank at which NO BOOST PRESS annunciator comes alive, kgf/sq.cm	lower than 0.25		

ELECTRICAL POWER SUPPLY

The electrical power supply system of the helicopter includes:

- system of supply with alternating three-phase current at rated voltage of 200/115 V and rated frequency of 400 Hz.
  It is composed of the generating system and power distribution system;
- system of supply with alternating three-phase current at voltage of 36 V and frequency of 400 Hz;
- system of supply with direct current at voltage of 27 V;
- emergency system of supply with alternating current of 115 V and 36 V;
- emergency system of supply with direct current of 27 V.

Arrangements of DC and AC equipment are presented in Figs 1-28 and 1-29, respectively.

The electrical system operating data are presented in Table 1-5.

Two generators of three-phase alternating current are used as electrical power sources in the helicopter. The generating and power distribution system is designed as a three-wire circuit.

The generator phase windings are star-connected and the zero point is connected to the helicopter airframe which is used as the fourth wire in the power distribution system.

It also permits to employ a single-wire circuit for supplying electrical power consumers with the 115-V voltage of 400-Hz frequency.

The generating system consists of two channels laid separately along the helicopter port and starboard sides. Each channel incorporates a generator, voltage regulator unit, protection and control unit, current transformer unit.

The system ensures separate operation of the generators. Each generator feeds its own consumer network.

In case of one generator failure, a contactor operates which switches over the buses of the failed generator distribution device to the buses of the operating generator distribution device.

The system of supply with the 36-V three-phase alternating current is fed from the 200/115-V three-phase AC generating systems via two three-phase step-down transformers.

The system of electric power supply with direct current is fed from the AC system of 200/115-V voltage via two rectifiers each of which is connected in the circuit of its own generator.

In case of one rectifier failure, the other one automatically changes over to supplying all the helicopter consumers with DC.

In case of the AC generating system failure, the consumers necessary for continuing the flight are supplied with AC of 115 V and 36 V from two storage batteries via inverters that are cut in automatically or manually.

On the helicopter there is a storage battery state check system. At the battery overheating (above +65 °C) MWL, LH BAT OVERH, RH BAT OVERH lights glow and an audio signal is heard in a headset. In this case, the storage battery must be switched off. A switched off battery in case of its overheating is allowed to be used in the flight only to discharge when the rectifiers are switched off. After the flight such storage battery must be removed from the helicopter and sent to repairs.

The causes of overheating and/or overheating signal appearance shall be established.

The storage battery overheating warning system check is made by pressing BAT WARN TEST button on the overhead panel. In this case, MWL and LH (RH) BAT OVERH lights glow and audio signal appears in the headset.

On the helicopter left side, plug connectors are installed for coupling external electrical power sources of 200/115-V AC and 27-V DC.

All metal parts of the helicopter and its equipment are brought to a common electrical potential (through the helicopter bonding).

The helicopter is equipped with electrical dischargers.

The dischargers are grounding cables electrically coupled to the helicopter body and attached to the landing gear.

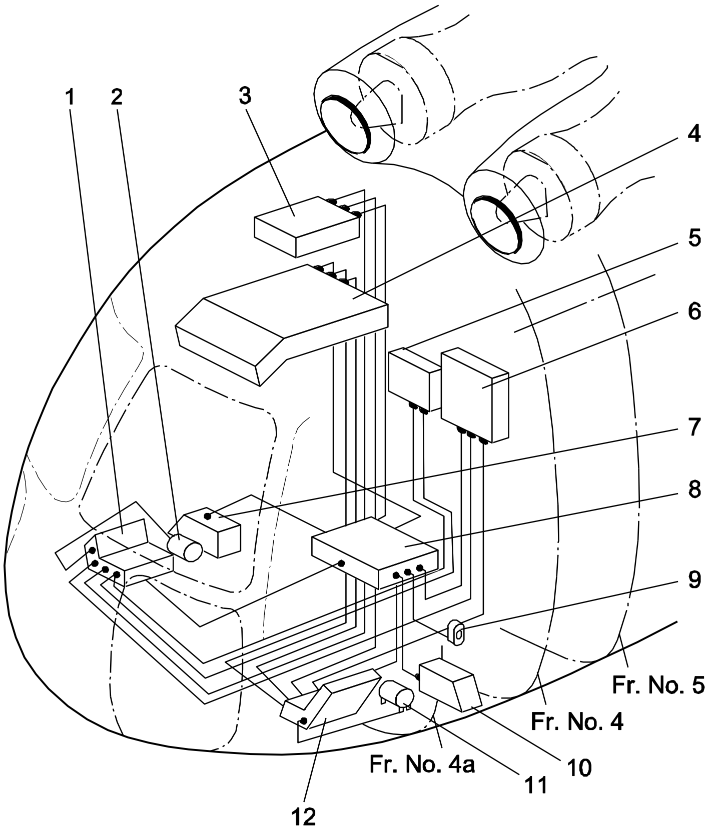
For removal of the static electricity charges from the helicopter body, it is furnished with a device for grounding the airframe at parking.

For cases of necessity to immediately deenergize the helicopter electrical 27-V DC and 115-V 400-Hz AC circuits in emergency, the center pedestal carries a switch unit for helicopter deenergization and for actuation of the emergency location transmitter.

A simultaneous cutout of all the five switches of the unit is effected by displacing a common bar arranged under a guard cap with the EMERG DISCONNECT inscription.

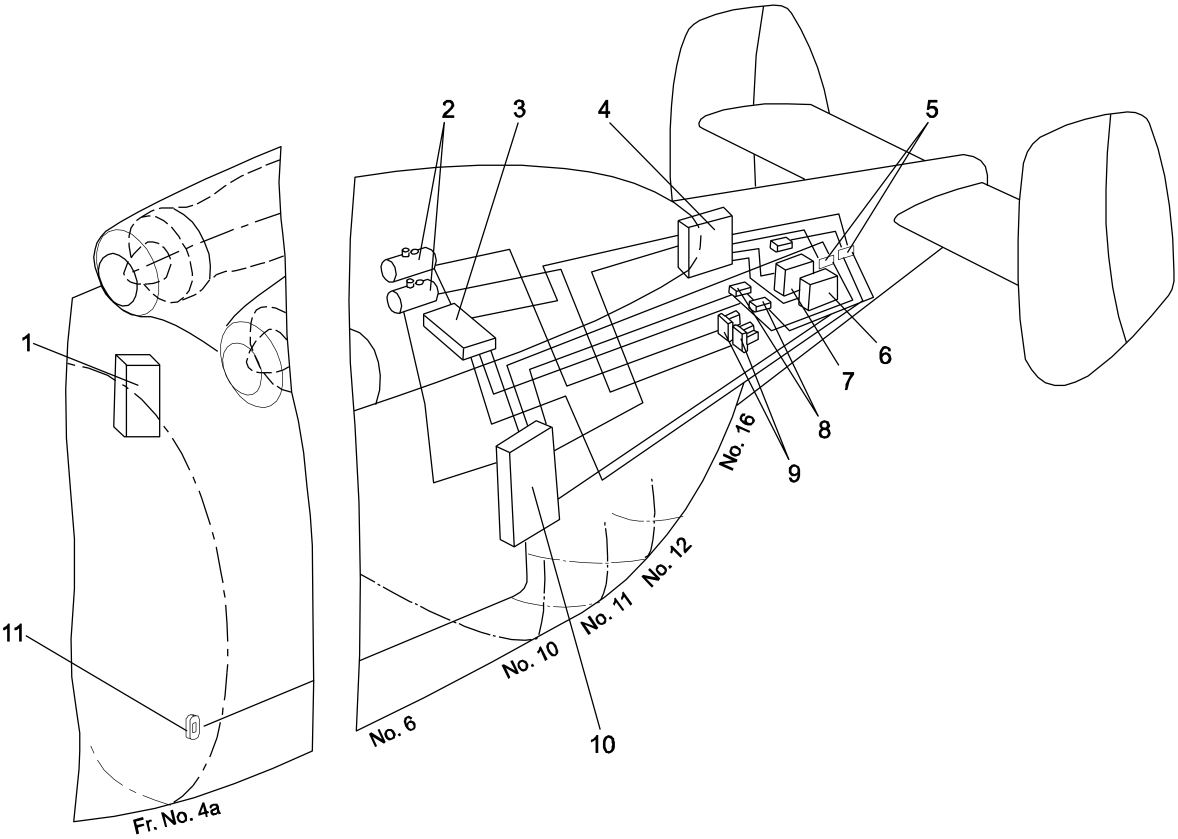
Table 1-5. Electrical System Operating Data

Parameter	Parameter value		
	min	normal	max
System main specifications:			
rated voltage, V	–	200/115	–
phase voltage, V	115	117	119
frequency, Hz	380	400	420
rated power, kV·A:			
– of the system	–	80	–
– of each channel	–	40	–
direct current voltage, V	24	27	30
voltage of storage battery open circuit (EMF), V	25.5	–	–
time of supplying consumers with two batteries, min	–	–	30



1. Main Distributor
2. Rectifier
3. Distributor
4. Distributor
5. Distributor
6. Distributor
7. Storage Battery
8. Distributor
9. External Power Supply Connector
10. Storage Battery
11. Rectifier
12. Main Distributor

Fig. 1-28. DC Electrical System Arrangement.



1. Distributor
2. Generators
3. Main Distributor
4. Distributor
5. Transformers
6. Three-Phase Inverter
7. Single-Phase Inverter
8. Bus Change-Over Units
9. Frames with Voltage Control and Protection Units
10. Main Distributor
11. Receptacle to Connect External Power Supply Source

Fig. 1-29.. AC Electrical System Arrangement.

HELICOPTER INTEGRATED FLIGHT SYSTEM (HFS)

Helicopter integrated flight system (HFS) is designed for improving the helicopter stability and controllability to ensure maintaining of steady flight conditions, shaping and transmitting to flight instruments the data for semi-automatic control of the helicopter, based on the information obtained from the navigation equipment, and delivery of course, roll and pitch angles and altitude data.

The HFS consists of the following items:

- four-channel autopilot, with yaw, roll, pitch, altitude control panels;
- central control panel;
- line position sensor;
- horizontal situation indicator;
- flight director indicator;
- trim indicator;
- switching unit;
- position signal disabling transmitter;
- small-size vertical gyro;
- altitude controller with arming unit;
- radio altimeter;
- rate gyro unit.

The HFS interacts with the following items:

- compass system;
- airspeed sensor;
- servo system.

The HFS operating data are presented in Table 1-6.

The HFS controls, check and indication elements are arranged on the central control panel, cyclic pitch control stick, collective pitch control lever, instrument panel and overhead panel (see Fig. 1-30); their purpose is presented in Tables 1-7 and 1-8.

The central control panel is used for engagement and disengagement of the autopilot channels and the HFS sub-modes, for indicating their ON and OFF conditions, absence of transmitter armed signals and warning of failures in the system.

Indication of flight and navigation parameters is displayed on the flight director indicator and horizontal situation indicator.

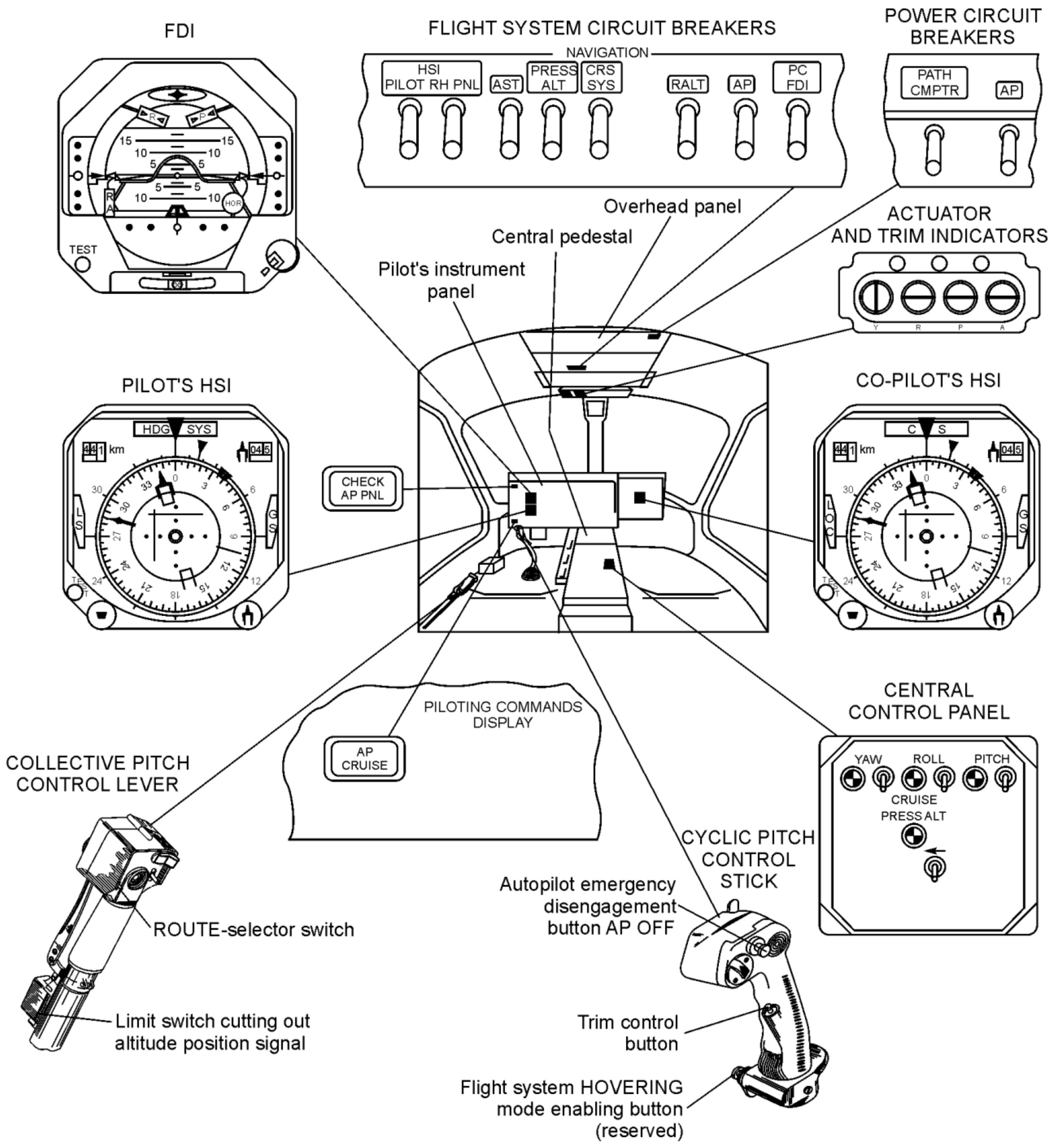


Fig. 1-30. HFS Controls and Indication Elements.

Table 1-6. HFS Operating Data

Parameter	Parameter value		
	min	normal	max
Accuracy of holding:			
• course, roll, pitch, deg	–	±1	–
• pressure altitude, ft (m):			
up to 3280 ft (1000 m)	–	±20 (±6)	–
above 3280 ft (1000 m)	–	±40 (±12)	–
Time of readiness, min	–	–	3

Table 1-7. Control and Indication Elements of HFS

Controls	Functional purpose	Location
AP switch	Power supply switch of autopilot	Overhead panel
FDI PC switch	Power supply switch of helicopter integrated flight system and of FDI	Overhead panel
HSI PILOT switch	Power supply switch of pilot's HSI	Overhead panel
HSI NAVIG switch	Power supply switch of co-pilot's HSI	Overhead panel
Central control panel	ON/OFF switches of sub-modes of course, roll and pitch hold, sub-modes ROUTE (PA)	Central control pedestal
AP OFF button	Autopilot emergency disengagement	Cyclic pitch control stick (pilot's or instructor's)
ROUTE selector switch	Engagement/disengagement of ROUTE mode	Collective pitch control lever
Trim control button	Disabling of position signals in roll, pitch and course channels when pilot interferes with control while flying with autopilot	Cyclic pitch control stick (pilot's or instructor's)
Altitude position signal disabling switch	Disabling of altitude position signal	Collective pitch control lever
Vertical gyro erection button	Rapid erection of vertical gyros	Overhead panel
VG switch	ON/OFF switch of vertical gyro	Overhead panel

Table 1-8. HFS Indicator Lights

Annunciator	Information	Location
AP CRUISE	Comes alive with engagement of AP CRUISE mode	Pilot's instrument panel
RAD ALT FAIL	RAD ALT FAIL red annunciator comes alive	Pilot's instrument panel
CHECK AP PNL	Failure of one of autopilot channels	Pilot's instrument panel
HOR 1 FAIL	Comes alive with loss of power supply	Pilot's instrument panel
VG FAIL	Comes alive with loss of power supply	Pilot's instrument panel

AUTOPILOT

The four-channel autopilot is a component of the HFS, designed for improving the helicopter piloting performance at all flight operating conditions.

The autopilot is checked with the use of built-in test elements.

The autopilot receives data on variations in the helicopter angular position and shapes control signals to predetermined laws.

For receiving data on angular position variations and flight altitude, the autopilot makes use of sensitive elements: course angle transmitter (compass system), roll and pitch angle transmitters (vertical gyro), rate gyro unit, radio altimeter and altitude controller.

Signals from the sensitive elements are supplied to the autopilot, where they are converted and amplified and then they act on control surfaces via flight controls.

The autopilot operates in two modes: STABILIZATION and CONTROL.

STABILIZATION is the mode when the pilot does not interfere with piloting and a functionally closed system HELICOPTER – AUTOPILOT operates.

CONTROL is the mode when the pilot controls the helicopter without disengaging the autopilot, i.e. two closed systems HELICOPTER – AUTOPILOT and HELICOPTER – PILOT operate. Besides, there is SYNCHRONIZATION operating mode in which zeroing (resetting to initial position) of autopilot input signals is performed with the use of the synchronizing mechanisms.

FLIGHT DIRECTOR INDICATOR

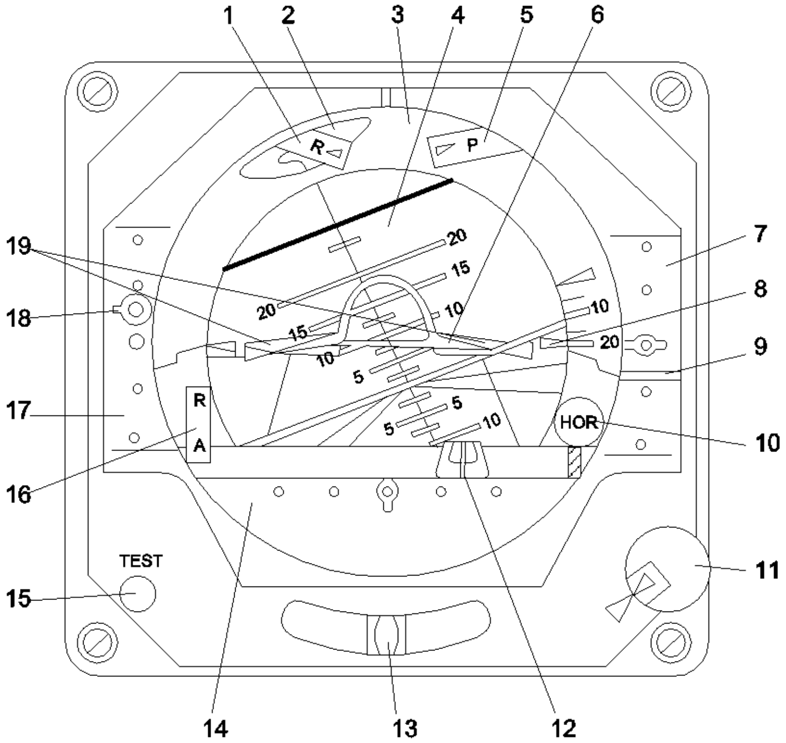
The flight director indicator (FDI) is designed for indicating the helicopter attitude relative to the center of gravity and assigned flight path in horizontal and vertical planes. The FDI face panel is presented in Fig. 1-31.

The FDI employs "view from helicopter to ground" kind of indication and indicates the following parameters: roll, pitch and slipping. The FDI also supplies data on failures of gyro horizon HOR and radio altimeter RA.

Roll indication is determined by relative positions of the roll pointer and zero mark of the roll scale; pitch indication – by position of the helicopter symbol relative to the line of horizon. The roll angles are counted within ±90°. On the roll scale, marks are applied in five degree increments within the angle range from 0 to 30°, then marks of 45°, 60°, 90°; marks of 10°, 20°, 30°, 45° are numbered. Located above the roll scale is the zenith pointer that shows the Earth's vertical and serves for rolling out the helicopter to a horizontal flight in case the pilot occasionally loses orientation in space.

On the pitch scale, marks are applied in 2.5-degree increments within the angle range from 0 to 20°, in five-degree increments within the range from 20° to 70°, then mark 90° is applied.

Marks ±5°, ±10°, ±15°, ±20°, ±30°, ±50°, ±70°, ±90° are numbered.



1. K-Roll Channel Failure Flag (Not Used)
2. Zenith Pointer
3. Roll Scale
4. Pitch Scale
5. T – Pitch Channel Failure Flag (Not Used)
6. Miniature Helicopter Symbol
7. Selected Altitude Deviation Scale (Not Used)
8. Roll Pointer
9. Selected Altitude Deviation Pointer (Not Used)
10. AΓ – Gyro Horizon Failure Flag
11. Initial Pitch Setting Knob
12. Low Altitude Pointer
13. Slip Indicator
14. Localizer Deviation Scale (Not Used)
15. TEST Check Button
16. PB-Radio Altitude Failure Flag
17. Selected Speed Deviation Scale (Not Used)
18. Selected Speed Deviation Pointer (Not Used)
19. Roll and Pitch Command Pointer

Fig. 1-31. Face Panel of FDI.

HORIZONTAL SITUATION INDICATOR

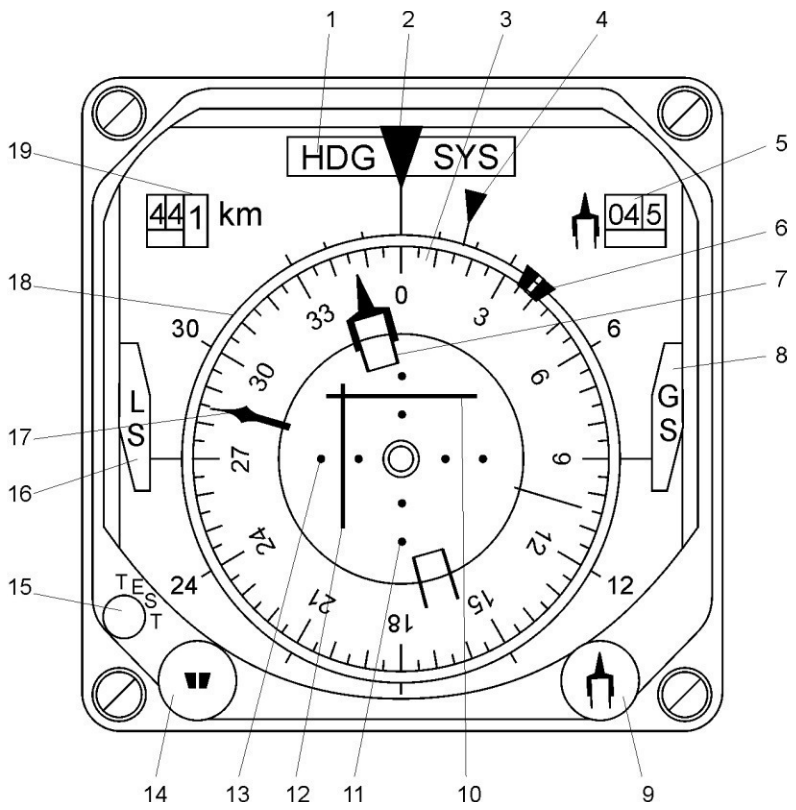
The horizontal situation indicator (HSI) is designed for indication and monitoring the helicopter position relative to the selected route line during a route flight and landing approach. The HSI face panel is presented in Fig. 1-32.

It is recommended to use the HSI in combination with the FDI. The instrument employs the "view from helicopter to ground" kind of indication and indicates the following parameters: present course, selected course, present azimuth, relative bearing.

The instrument also supplies data on failures of the present course channel and heading transmitter (HDG SYS flag), localized (LS flag) and glide slope (GS flag) radio receivers.

Division values of the instrument scales:

- the present course scale is graduated in five-degree increments and numbered in 30-degree increments;
- the combined drift and relative bearing scale is graduated in 10-degree increments within the range of 30 degrees and in 30-degree increments within the remaining range and marks 6, 12, 24, 30 are numbered.



1. Compass System Failure Flag
2. Course Line
3. Compass Card
4. Drift Angle Index (Not Used)
5. Selected Course Angle or Selected Azimuth Readout*
6. Selected Course Pointer
7. Selected Directional Angle Arrow
8. Glide Slope Indicator Failure Flag
9. Selected Course Angle Knob
10. Glide Slope Deviation Pointer**
11. Glide Slope Deviation Scale
12. Selected Course or Localizer Deviation Pointer**
13. Selected Course or Localizer Deviation Scale
14. Selected Course Knob
15. TEST-CHECK Button
16. Localized Failure Flag
17. Present Azimuth and Relative Bearing Arrow
18. Drift Angle and Relative Bearing Scale
19. DME Readout*

* Not used.

** In flights with external cargo on the hook the needles indicate the external rope position.

Fig. 1-32. Face Panel of HIS.

SMALL-SIZE VERTICAL GYRO

The small-size vertical gyro (VG) is designed for determining the helicopter attitude relative to the horizon. It is the main roll and pitch angles transmitter for delivery of electrical signals proportional to the helicopter roll and pitch angles to the helicopter integrated flight system (HFS) and to the FDI.

VG is a twin-gyro platform with powered stabilization and correction to the vertical introduced from single-axis liquid pendulums.

The electrical pick-ups placed on the measuring axes of the transmitter produce signals proportional to the helicopter roll and pitch angles.

The pilot's FDI, autopilot and compass system are connected to VG.

If VG ERECT button on overhead panel is pressed and АГ flag at FDI is removed, the VG erection is finished.

RADIO ALTIMETER

The radio altimeter is designed for measuring the true flight altitude.

The radio altimeter operates within the range of 0 – 990 ft (0 – 300 m). It supplies the crew and the HFS with the data on the present geometrical altitude of flight.

The radio altimeter set includes:

- transceiver;
- altitude indicator;
- two antennas (one receiving and one transmitting).

The altitude accuracy is ±1 m at up to 10 meters and ±10 % of the measured value at altitudes above 10 meters.

The radio altimeter is actuated with the R ALT switch on the overhead panel.

Checking of the radio altimeter in flight is performed by depressing the CHECK button on the radio altimeter indicator and the arrow must show an altitude of approximately (15 – 20) m.

When flying at an altitude higher than the radio altimeter working range, a flag should appear on the indicator, and the indicator pointer should settle within the scale shaded sector. If any of the radio altimeter units fails, the flag deflects into view and the pointer travels into the scale shaded sector. The RAD ALT FAIL annunciator becomes illuminated on the instrument panel.

NOTE. Do not use the radio altimeter information in case HF radio is transmitting at frequencies above 8.0 MHz.

The LIMIT ALTITUDE setting is done with the knob combined with the CHECK button on the indicator.

The LIMIT ALTITUDE marker is set opposite the indicator scale line corresponding to the limit altitude.

During the helicopter descent, at the instant of LIMIT ALTITUDE passage, an amber warning lamp should light up on the indicator and audio signal should be heard in the earphones. The lamp continues to glow in flight at altitudes below the limit.

CAUTION. IN FLIGHT ABOVE SURFACE WITH DEEP SHOW AND THICK ICE THE RADIO ALTIMETER MAY INDICATE ALTITUDE WITHOUT ACCOUNT TO THICKNESS OF COVERING.

WHEN FLYING OVER CONTINENT ICE, THE RADIO ALTIMETER SHOULD NOT BE USED.

IN FLIGHT ABOVE FOREST THE RADIO ALTIMETER INDICATIONS MAY BE FOUND DECREASED DUE TO REFLECTION OF RADIO WAVES FROM THE TREE CROWNS

ACTUATOR INDICATOR

The indicator is designed for providing visual data on displacement of the actuator system autopilot rods (yaw, roll, pitch and altitude channel rods).

The direction of the pointer deflection indicates the direction of the rod displacement from its neutral position, the pointer deflection angle corresponds to the value of the rod displacement.

CONNECTION OF HFS TO HELICOPTER CONTROL SYSTEM

The helicopter as an aircraft is characterized with its own instability, especially in a low speed flight; therefore, for maintaining the selected flight condition, the pilot has to correct its attitude in space with the help of flight controls.

For ensuring a combined control of the helicopter, an actuator system is introduced to function as hydraulic boosters and actuators of the integrated flight system.

The integrated flight system improves the helicopter stability and controllability, it helps to reduce the load upon the pilot under any flight conditions from takeoff to landing.

The autopilot actuating mechanism is differentially inserted into the helicopter control linkage.

With the autopilot engaged, the pilot can at any moment interfere with control in all four channels, using the flight controls.

In case of a turn with the trim button released, to avoid a possible directional jerk, at turns to angles of more than 180° (due to phase shift of the signal produced by the compass system gyro unit every 180°), a comparison circuit is provided in the switching unit that at roll angles exceeding 8°, sets the synchronizing mechanism of the autopilot yaw channel to the SYNCHRONIZATION mode.

The pilot interaction with the automatic system consists in the pilot's deflection of controls creating the respective helicopter attitude that is maintained by the autopilot after the TRIM button is pressured on the cyclic stick.

In the mode set to the autopilot the pilot has enough time to expand the automatic system abilities by moving the controls in the direction where the actuator unit travel is not sufficient to maintain the flight parameter.

The other peculiarity is that the pilot should only help the automatic system but not counteract it since otherwise the respective autopilot actuator units are instantly set to the stop and after that the desired condition is not maintained and the helicopter is left without automatic stabilization.

HFS OPERATING MODES

The HFS has the following operating modes:

- CONTROL AND HOLD;
- ROUTE.

The CONTROL AND HOLD mode is effected by the autopilot which ensures automatic hold of angular positions and automatic damping of yaw, roll and pitch angular variations.

In the ROUTE mode, the barometric altitude automatic hold is insured.

HFS ENGAGEMENT/DISENGAGEMENT

The HFS is supplied with power from the helicopter mains. When the autopilot circuit breaker is ON, the HFS gets energized and it becomes ready for operation.

The autopilot is actuated channel by channel with the switches on the central control panel.

With a channel (of yaw, roll, pitch) actuated and its normal operation, an indicator lamp is ON; with abnormal operation of a channel, the lamp is flickering.

The altitude channel is actuated with ROUTE selector switch on the collective pitch control lever set to the ROUTE position.

The autopilot should be engaged during flight from takeoff to landing. However, if required, the pilot can disengage the autopilot with the AP OFF button on the cyclic pitch control stick.

For channel disengagement, selector switches on the central control panel should be set to middle positions. For disengagement of the altitude channel, the ROUTE selector switch on the collective pitch control lever should occupy the neutral position.

NAVIGATION EQUIPMENT

The navigation equipment includes:

- compass system;
- automatic direction finder;
- magnetic compass.

COMPASS SYSTEM

The compass system is designed for determining the helicopter course and for providing the HFS with course signals and is composed of:

- control panel;
- two gyro units (main and standby ones);
- two amplifier units;
- compensator;
- flux-gate detector.

The compass system is energized with the switch located on the overhead panel.

The compass system operation is based on the operation of a gyro supplying heading data (with correction for the latitude) to the indicators and HFS in the DG mode.

A latitude correction is introduced automatically after setting the latitude of the flight zone on the compass system control panel located on the central pedestal.

The helicopter gyro heading can be set (compensated) in one of the following modes:

- magnetic correction (MAG) from the flux gate detector on the helicopter (on the ground and in flight);
- correction upon the known course from the manual course selector (SC) only on the ground.

The course is compensated with or without taking into account the variation

If the course is compensated taking into account the variation, a true heading is indicated on the HSI. If the course is compensated without taking into account the variation, a magnetic heading is indicated on the HSI. The gyro heading on each route section is calculated respective to the true or magnetic meridian passing through a point of the last compensation.

When the course is compensated in the MAG mode taking into account the variation, an actual variation value in the flight area must be set on the compensator (additional instrument panel) and when the variation is not taken into account a zero value must be set there.

After that proceed as follows on the central pedestal:

MODE switch on the compass system control panel .... MAG

SC – OFF switch .... OFF, Check

SLAVE button after a true or magnetic course is indicated on the HSI .... Press and release

MODE switch .... DG

To compensate the course in the SC mode the known (true or magnetic) course value must be set on the compensator (additional instrument panel) and after that proceed as follows:

MODE switch .... DG, Check

SC – OFF switch .... SC

SLAVE button after the course is corrected .... Press and release

SC OFF switch .... OFF

NOTE. To expedite the course compensation (in any mode), it is recommended, prior to pressing the slave button, to set an approximate course using the HDG MORE – HDG LESS switch located on the additional instrumental panel (with the SC-OFF switch in ON position)

The compass system is checked by pressing the MAG CHANNEL TEST 315 button on the compass system compensator panel and the indicators must show a test course value of 315°.

The purpose of the controls is described in Table 1-9 and the operational data is presented in Table 1-10.

Table 1-9. Compass System Controls

Control	Functioning
CONTROL PANEL	
MODE selector switch	Selection of DG, MAG operating modes
M-M/S-S selector switch	Selection of correction mode of the main, standby gyro units and both gyro units simultaneously
SC switch	Selection of SC mode
CONSUM selector switch	Coupling course data consumers to the main or standby gyro unit
Latitude counter scale	Indication of the flight area latitude
Latitude select knob	Selection of the flight area latitude
SLAVE button	Fast slaving in MC and SC modes
Holes labeled M and S	Adjustment of gyro unit (main and standby) balancing potentiometers
M-M/S-S annunciators	Warning of gyro units tilting
ADDITIONAL INSTRUMENT PANEL	
MAG CHANNEL TEST 315° button	Check of CS magnetic channel and course channel functional ability
0° to 360° course scale	Indicator from flix-gate detector
SC indicator lamp	Indicator of course selector mode
Scale of variation ±180° counter	Setting and indication of variation
Variation input knob	Fine setting of variation or selected course
HDG MORE – HRD LESS switch	Coarse setting of selected course

Table 1-10. Compass System Operating Data

Parameter	Parameter value
Compass system readiness time:	
in MAG, course selector modes	3 min, max
in DG mode	5 min, max
Rate of slaving:	
normal	2 to 4° per min
fast	at least 10° per s

COMPASS SYSTEM CHECK

The system is checked when in MAG mode. The control mode provides for a quick and efficient compass system check before the flight.

Procedure:

MODE selector switch....................MAG

Mag Channel TEST 315° button....................Press

HSI reading....................(315 ±10)°

Mag Channel TEST 315° button....................Release

AUTOMATIC DIRECTION FINDER (ADF)

The automatic direction finder is used in the helicopter as a radio navigation aid, it ensures solution of the following problems:

- flight to a radio beacon and from it with the relative bearing visually indicated;
- automatic determination of a radio beacon relative bearing;
- helicopter landing approach by reference to the instrument landing system;
- reception of and listening to ground communication radio stations operating within the ADF frequency band.

The ADF employs a standard circuit of radio direction finder with amplitude comparison at the input and servo drive at the output. The ADF frequency band is from 150 kHz to 1299.5 kHz.

The ADF set includes the following components:

- receiver, control panel;

- fixed internal fuselage frame antenna;
- frequency pretuning unit (memory unit);
- continuous tuning panel, antenna matching device.

The ADF operating modes are:

- COMPASS mode of automatic bearing taking;
- ANTENNA mode of signal reception by omnidirectional antenna.

COMPASS mode is the main operating mode. In this mode, with the ADF tuned to the frequency of a ground station, the pointers of the HSI instruments automatically settle in the RB position. Radio station signals are identified by hearing.

ANTENNA mode is used for listening and identification of radio station call signals. When switched over from the COMPASS mode to the ANTENNA mode, the ADF operates as a communication receiver of the ground stations.

NOTE. Do not use the ADF indications when:

- the frequency is 1000 kHz and above during the main rotor heating system operation;
- the HF YADRO-1J1 (ЯДРО 1Ж1) radio station operates for transmission

During a flight in icing conditions if it is necessary to determine the magnetic radio bearing (relative bearing of radio station) in momentary way (30 s, maximum) the rotor AIS should be off. Having listened to beacon call signals, determine the magnetic radio bearing (relative bearing of radio station) on the rotor AIS ON again.

The automatic direction finder control panel is located on the overhead panel. Course indication is effected by the HSI instrument. The frequency pretuning unit (memory unit) ensures pretuning to any of eight selected frequencies by knobs and selector switches.

The operational tuning unit located on the central pedestal effects the fine tuning to homing radio station.

Selection of inner and outer homing radio beacon channel is carried out with the use of the INNER – OUTER selector switch on the overhead panel.

Functioning of the control elements is specified in Table 1-11 and the ADF operating data are presented in Table 1-12.

MAGNETIC COMPASS

The magnetic liquid-supported compass serves for determining magnetic course as duplicating instrument. It ensures correct reading of course at roll angles up to 17°. The proper compass deviation is 2.5°, maximum, at the courses N, 90°, S, 270°.

Table 1-11. ADF Control

Control elements	Functioning
ADF CONTROL PANEL	
Selector switch of radio beacons: 1, 2, 3, 4	Selection of radio beacon frequencies pretuned on the ground before flight
C	Continuous tuning to operating beacon
PH-TLG selector switch:	Selection of beacon listening mode
PH	Listening to voice messages
TLG	Listening to carrier wave messages
COMP-ANT selector switch:	Operating mode selection
COMP	Listening to beacon call signal and indication of relative bearing in COMPASS mode
ANT	Listening to beacon call signal in ANTENNA mode
VOLUME knob	Adjustment of signal volume
FRAME button	Check of compass channel operation
FINE TUNING UNIT PANEL	
Tuning scale and 4-digit counter	Indication of beacon frequency tuning
Tuning knobs	Tuning to beacon frequency
PRETUNING UNIT MICROSWITCHES	
Microswitches	Pretuning to ADF fixed frequencies before flight

Table 1-12. ADF Operating Data

Parameter	Parameter value
Accuracy of RB indication	±2°
Operating temperature range	±60 °C
Time required for retuning	4 s

PITOT STATIC SYSTEM AND INDEPENDENT SYSTEMS NOT INTEGRATED INTO FLIGHT COMPLEX

The pitot system consists of two independent sub-systems.

Each of them is supplied with one pitot/static tube.

Both pitot/static tubes are mounted on a boom protruding in front of the fuselage nose section.

Pitot tube I (Fig. 1-33) supplies pitot pressure to pilot airspeed indicator on the pilot's instrument board and to airspeed transmitters and airspeed sensors producing electric signals proportional to the airspeed to the limiting signals system and to the emergency recorder, respectively.

Pitot tube II supplies pitot pressure to airspeed indicator on the co-pilot's instrument panel.

Pitot tubes are equipped with built-in heating to prevent icing.

The heating control and check elements are located on the overhead panel. In case of malfunctions in the pitot tube heating circuits, a signal from the check unit is delivered to the indication system and PITOT HEAT LH or PITOT HEAT RH annunciator comes alive on the instrument board.

NOTE. The time of pitot-static tube heating continuous operation on the ground with the engines inoperative should not exceed two minutes

The static pressure system consists of three independent sub-systems. Two of them (I and II) include two fuselage static vents each installed on the helicopter both sides.

The third sub-system (III) operates from pitot tubes.

The first sub-system (with vents I) supplies pressure instruments on the pilot's instrument panel, transmitters producing information of airspeed and flight altitude to limiting signals system as well as transmitters (airspeed sensor and altitude sensor) producing information of the same parameters to the recorder.

The second sub-system (with vents II) supplies the flight instrument group on the co-pilot's instrument panel: altimeter, airspeed indicator and vertical airspeed indicator.

The third sub-system supplies static pressure from pitot tubes to the third pressure altimeter on the additional instrument panel, altitude controller (component of HFS) and the transmitters issuing air pressure proportional signals to the engine systems.

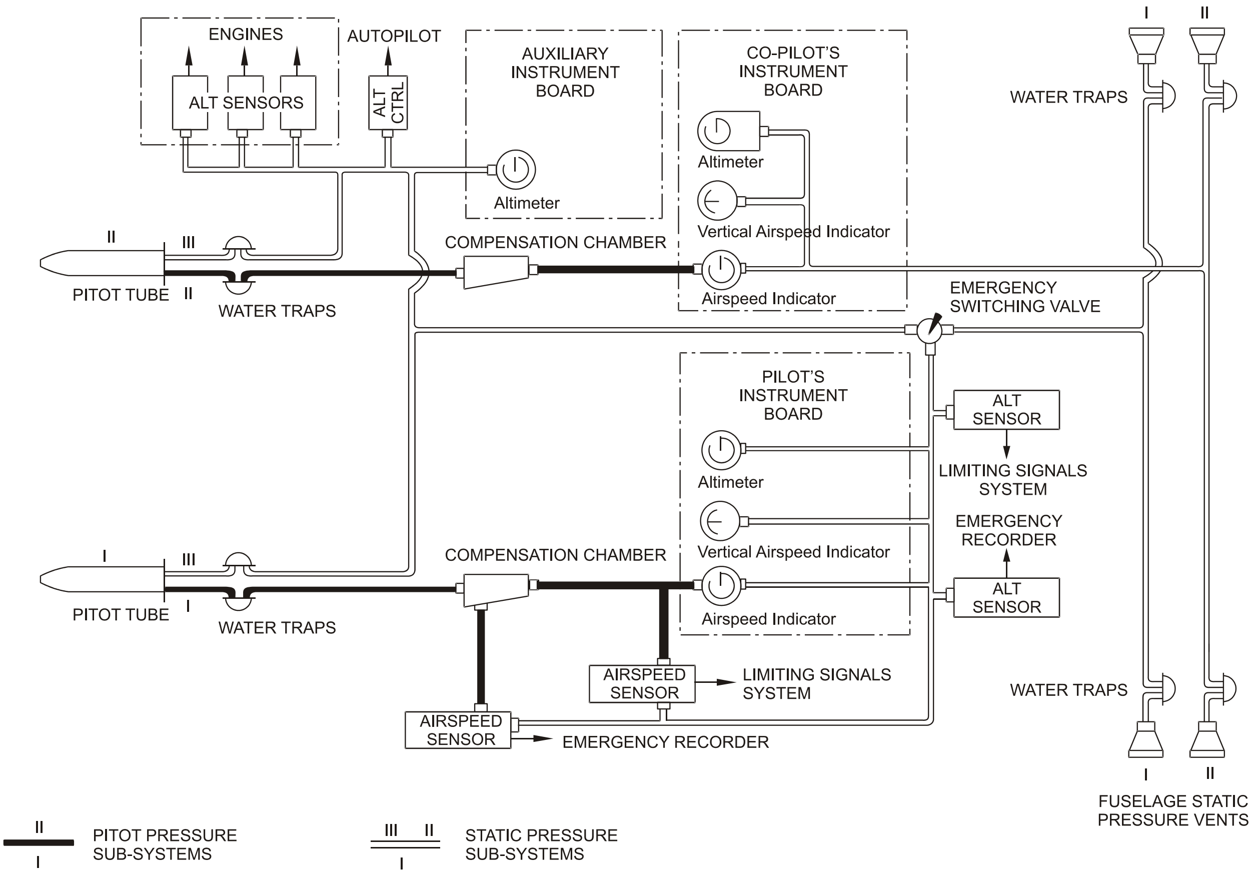


Fig. 1-33. Pitot Static Systems.

In case the first sub-system of static pressure gets faulty, it is possible to switch the instruments and devices connected to it over to the third sub-system.

To do that, reset the emergency static system switching valve, located on the LH side wall of the central control panel, from OPER to EMERG position. The second sub-system of static pressure is not duplicated.

PRESSURE ALTIMETER

The altimeter serves for measuring flight pressure altitude and issuing it to transponder.

The altimeter is composed of the indicator and amplifier unit. Altitude measuring range is from -450 m to +12300 m (from minus 1500 ft to +41000 ft). The range of pressure introduced at the ground level is P_o = 700 to 1075 hPa or 525 to 806 mm Hg.

The SELF MONITORING mode is selected by depressing the button on the front panel of the indicator.

GYRO HORIZON

The gyro horizon is supplied with the 36 V 400 Hz voltage.

The readiness time does not exceed 3 min.

The gyro horizon ensures a direct indication of the helicopter attitude relative to the horizon line (according to the principle "view from helicopter to the ground").

The roll indication is determined by the position of the roll index and the roll scale zero mark whereas the pitch indication is determined by the position of the miniature aircraft relative to the horizon line.

The caging system serves for rapid setting of the gyro gimbals to the initial position. The caging knob is arranged in the instrument lower part.

The power-lost warning flag is brought to the face panel to provide power-lost indication. The built-in internal illumination is provided for night conditions.

AIRCRAFT CLOCK

The clock is used for indicating the current time, for measuring flying time and for measuring short time intervals up to 1 hour.

The clock is equipped with electrical heaters. The PITOT CLOCK HEAT – OFF switch and heater check button are arranged on the overhead panel.

The clock mechanism rating is 3 days, daily run error is within ±20 s.

LIMITING SIGNALS SYSTEM (LSS)

LSS system is provided for calculation and issue to the crew of information on the current value of the helicopter V_{NE} and for generation of warning signals on reaching (exceeding) the V_{NE}.

The V_{NE} value is calculated by the LSS computer automatically according to a selected algorithm with taking into account an actual (flight) mass of the helicopter and depending on the data coming from the corresponding sensors regarding the barometric pressure (altitude), total pressure (airspeed) and ambient air temperature.

<u>Data entry procedure into the LSS system is given in Section 5 on the basic RFM and Ka-32A11BC-Д-1.1.</u>

The calculation of the helicopter actual flight mass is performed by the computer for each moment of flight taking into account the fuel consumption.

The V_{NE} value is marked on the airspeed indicator by movable index of red color. At reaching the V_{NE} value by the helicopter (the indicator pointer coincides with the movable index) MWL and V_{NE} light indicator are illuminated and an audio signal is heard in the crew headphones.

NOTE. An audio signal is delivered to the headsets only when RNU2 switch on each crew member intercom panel is in on position

LSS engagement is activated by LIM SIG SYSTEM switch on the instrument panel.

The system incorporates build-in test means for compulsory and automatic check. The compulsory check is carried out by pressing a TEST button on the instrument panel, at the same time the movable index is set in the middle position near 200 km/h (180 knots), MWL indicator and V_{NE} light indicator are illuminated and an intermittent signal of (800^{+160}) Hz frequency is heard in the headset. Break frequency is approximately 1.5 Hz.

In case of LSS failure a warning flag appears on the airspeed indicator.

ANTI-ICING SYSTEM

The anti-icing system comprises:

- engine air intake heating system (engine AIS);
- rotor blade heating system (blade AIS);
- flight compartment windshield heating system;
- flight compartment windshield cleaning system;
- pitot-static tubes and clock heating system;
- icing warning system.

ENGINE AIS

The anti-icing system control and warning elements are arranged on the overhead panel. The ICE and RTR AIS FAIL annunciators are located on the instrument panel; the ROTOR ANTI-ICE, LH ENG ANTI-ICE, RH ENG ANTI-ICE annunciators are to be found in the information lights unit.

For heating the engine air intakes, the hot air bled downstream of the compressors is used. Electrically driven valves are mounted on the engine to pass the hot air for heating the air intakes and inlet parts.

With the ANTI-ICE ENG AUTO – OFF – ENG MAN selector switch on the overhead panel occupying the ENG AUTO position, the system is actuated automatically at ambient air temperatures below +5 °C; for manual actuation of the engine anti-icing system, set the selector switch to the ENG MAN position.

At temperature of +5 °C and below, all flights should be performed with the air intake heating actuated irrespective of the fact if icing is registered or not; heating should be switched on after engine starting and switched off before engine shutdown. At temperatures of +10 °C and above, the engine anti-icing system must be switched off. When the ambient air temperature before departure is higher than +5 °C and the air intake heating is not engaged, but during the flight the air temperature becomes +5 °C or lower, engage heating immediately if the anti-icing system automatic engagement does not take place. And vice versa, when the ambient air temperature rises to +10 °C in flight, disengage the anti-icing system if its automatic disengagement does not take place.

CAUTION. RETARDED ACTUATION OF HEATING MAY RESULT IN ENGINE FAILURE BECAUSE OF ENGINE INGESTION OF COLLECTED ICE

ROTOR AIS

Heating elements are embedded in the blade leading edges and cut in by a programming switch. The control circuits of the heating system are fed with the DC voltage whereas the heating elements are supplied with the three-phase AC power.

The blade heating system is actuated by setting the AUTO ROTORS – MAN ROTORS selector switch of the ANTI-ICE SYS panel on the overhead panel to MAN ROTORS position.

WARNING. CUT IN THE ROTOR ANTI-ICING SYSTEM ONLY WITH GENERATORS OPERATING

Blade anti-icing is activated automatically upon receipt of ICE signal from the ice detector, if the crew have not switched on Rotors anti-ice manually in due time (MAN ROTORS position). Switch on blade anti-icing manually (MAN ROTORS):

– before taxiing out, at outside air temperature of +5 °C and below in precipitation conditions (rain, wet snow, drizzle, etc.);

– in flight, at outside air temperature of +5 °C in precipitation conditions or (2…3) min. before entering clouds.

In flight, with the heating systems actuated, periodically check the rotor blade anti-icing system operation, referring to the ROTOR ANTI-ICE annunciator and to the current load of the LH generator which should amount to (70 – 95) A in each phase against the AC ammeter.

NOTE. Ammeter readings may be higher than the above values depending on the consumers connected to the LH generator

Set the ROTOR ANTI-ICE selector switch to the OFF position 2-3 min after leaving the icing zone.

FLIGHT COMPARTMENT WINDSHIELD HEATING

To prevent windshield misting, the windshield is blown with hot air from the heating system manifold through an electrically-driven air bleed valve, filter and pressure regulator. The amount of air coming to the blow pipe is regulated by a manual shutter.

For actuating the windshield blowing, open the electrically-driven air bleed valve, by setting the AIR SUPPLY CARGO CABIN – PILOT OFF-BLOW OUT selector switch to BLOW OUT position and use the manual shutter located to the left from the central pedestal to adjust the air flow rate.

FLIGHT COMPARTMENT WINDSHIELD CLEANING

The flight compartment windshield cleaning system is used for removing ice and hoar-frost appearing on the glass panels during the flight and also for cleaning the glass panels from other contamination covering the glass panels and impairing their transparency.

The cleaning system comprises the mechanical windshield wiper and fluid feed system supplying cleaning fluid to the wiper blades.

The control elements of the windshield wipers are arranged on the overhead panel sides (LH for the pilot and RH for the co-pilot). For actuating the windshield wiper, set the WIPER selector switch first to the START position and then to the 1 SPD or 2 SPD position.

For stopping the windshield wiper, set the selector switch to the neutral position. When the selector switch is placed in the WIPER RETURN position, the windshield wipers get returned to the extreme positions. With the system completely filled with fluid (10 L), continuous operation of one windshield wiper is ensured for 2.5 h, and that of two wipers for 1.3 h.

COMMUNICATION FACILITIES

The communication facilities provided in the helicopter include the following equipment:

- intercommunication and switching equipment;
- HF radio set;
- main and standby VHF radio set.

The equipment control elements are arranged on the overhead panel and central pedestal, on the additional instrument panel, cyclic pitch control stick and foot-operated pedal.

INTERCOMMUNICATION AND SWITCHING EQUIPMENT

The intercom and switching equipment is used for establishing communication between the crew members and for establishing the external radio communication with the aid of a VHF radio set and HF radio set as well as for receiving the signals through medium-frequency automatic direction finder.

It is controlled from the crew intercom selector panels. The intercom selector panels of the pilot and co-pilot are arranged on the overhead panel, that of the operator – above the additional instrument panel and on two panels in the cargo compartment front and rear parts.

The intercom is fed from the distribution board and energized by switching-on the ICS switch on the overhead panel.

Interlock switching unit provides connection of the radio sets, automatic direction finder and emergency warning system to the intercom selector panels. Since only four selector panels can be connected to the switching unit at a time, either one or the other intercom selector panel in the cargo compartment can be engaged. On these selector panels, there are the INTERCOM ON switches which rule out simultaneous operation from two working stations.

The earphone is coupled to the intercom selector panel.

Intercommunication volume is adjusted with the IC volume control knob, that of the external communication, with the RADIO volume regulator.

NOTE. In helicopters fitted with the instructor's set of controls the intercom – radio button is located on the instructor's cyclic pitch control stick instead of the foot-operated push-button

For establishing communication, cut in the intercom system supply arranged on the radio equipment panel of the overhead panel, set the communication type and direction selector switch on the intercom selector panel to the IC position and the IC volume control knob to the required volume.

For establishing communication with crew members:

- the pilot should depress the INTERCOM – RADIO button on the cyclic pitch control stick to the INTERCOM position or depress the GC button on the intercom selector panel;
- the co-pilot should depress the LH foot-operated push-button or the GC button on the selector panel. For reception, the button or push-button should be released;
- the operator should set the IC ON selector switch to the position coupling his panel to the intercom system and depress the IC button on the operator's panel;
- the user in the cargo compartment should set the INTERCOM ON selector switch to the position coupling his panel to the intercom system and set the IC – OFF switch on the rescue operations control panel to the IC position;
- the second user in the cargo compartment should set the IC – OFF switch on his intercom selector panel to the IC position.

For listening to the signals transmitted by ground radio stations through one of the VHF or HF radio sets, turn on listening switches RS1 or RS3 of the intercom selector panel. The receivers of both radio sets are turned for reception one by one when the communication type and direction selector switches are set to positions RS1, RS3 or RS2, correspondingly.

Fr is listening to the signals of automatic direction finder, turn on RNU1 listening switch.

The position of the communication type and direction selector switch is arbitrary.

Listening to the selected channel occurs at full volume if the communication type and direction selector switch is placed in any position except for the IC one.

For conducting radio transmission through one of the VHF or HF radio sets, set the communication type and direction selector switch to required position RS1 or RS3 or RS2, respectively, and depress the INTERCOM – RADIO button to the RADIO position or depress the RADIO RH foot-operated push-button. The radio signals are heard in the earphones at the rated volume whereas messages through the intercom line are heard at a decreased volume.

The volume of external communication is adjusted by the RAD volume control knob of the selector panel, the intercommunication volume is adjusted by the IC knob.

Other channels may also be listened to in parallel with the operation of the VHF or HF radio set; to this end, it is required to turn on the respective RNU1, RS1 or RS3, or RS3 listening switch on the selector panel. In this case, the selected channel is listened to at a rated volume.

If the communication type and direction selector switch is placed in the IC position and any listening switch is turned on, the intercom messages are heard at full volume and the external communication signals are heard at a decrease volume.

The equipment serviceability is checked by depressing successively the ICS TEST buttons arranged on the side panel of the overhead panel.

If, with one of the buttons depressed, the signal volume decreases by one half, the intercom system leg deenergized by this button is serviceable. If the signal volume does not change, the leg is faulty. In this case, with the second button depressed, no signal at all is heard in the intercom system.

The uncontrollable signals from the emergency warning system are heard in the crew member's earphone through the intercom line irrespective of the position occupied by selector switches on the intercom selector panels.

MAIN AND STANDBY VHF RADIO SETS

Two (one main, one standby) VHF radios «Юрок» ("Yurok") installed in the helicopter are similar in design.

The «Юрок» VHF station provides for the following:

- tuning to any fixed frequency communication channel in the range of 118.000 to 136.975 MHz in 25 KHr or 8.33 kHz steps;
- transfer from reception to transmission and back;
- monitoring the TEST mode;
- transfer from main to standby frequency;

- setting of standby frequency;
- election of pre-set standby frequency;
- setting and memorizing of 9 frequencies;
- frequency indicator brightness adjustment in day/night conditions;
- suppression of noise;
- Mayday signal listening watch at 121.5 MHz.

Total number of channels is 760 or 2278.

The radio is ready for operation in three seconds after switching on.

The main radio is switched on with the VIH 1 switch and the standby radio with the VHF 2 switch.

The main radio is powered by 27 V picked up from the upper panel battery bus, the standby radio is powered by 27 V picked up from MJB-4.

Both radios are controlled from remote controlled panels located on the central pedestal (the main radio control) and on the overhead panel (the standby radio control).

The following controls are located on the remote radio control panel cover:

- volume control knob;
- frequency indicator showing the operating channel in the upper line. When operating in 25 kHz steps five digits are displayed and when operating in 8.33 kHz steps six digits. When a pre-set channel is selected a digit ranging from 1 to 9 is displayed in the upper line and the lower line shows the next frequency ready for operation. When a new frequency is set directly the lower line is dark;
- the CHANNEL pushbutton allows to select a standby frequency channel among 9 earlier pre-set frequency channels;
- the ▲▼ pushbutton allows to transfer from the main to a standby channel and allows to change the position of the indicator upper and lower lines. To set the frequency directly; keep the button pressed and press it again for return to the previous function;

- the right knob allows to set the frequency in kHz and to select the channel number;
- ER emergency reception indicator shows the presence of a signal in Mayday channel;
- ER switch activates the Mayday signal (121.5 MHz) listening watch;
- NS noise suppressor switch;
- the right knob allows to set the frequency in MHz and controls the indicator brightness.

To operate the radio set its controls in the following positions:

- CB VHF at the overhead panel – ON;
- VHF 1 (VHF2) power switch – ON;
- interphone control box communication mode and direction selector switch in position PC1 or PC3 (when using the standby radio) – SET.
- Two lines will appear on the indicator. The upper line shows the main frequency and the lower line shows a standby frequency.

To set and memorize 1 to 9 frequencies:

- pushbutton CHANNEL – press;
- the upper line of the indicator will show Ch and a digit – (1 to 9);
- required frequency channel by rotating kHz knob – SELECT;
- pushbutton CHANNEL – PRESS and keep pressed until the indicator lower line starts to blink;
- required frequency by rotating knobs MHz and kHz – SET;
- pushbutton CHANNEL to memorize the set frequency – PRESS
- Repeat the above procedure for selecting a standby frequency.

To select a pre-set standby frequency from memory:

- pushbutton CHANNEL – PRESS;
- required frequency channel by rotating kHz knob – SELECT.

This mode will be abandoned after 5 to 10 seconds or by pressing the CHANNEL pushbutton.

When operating the radio at a standby frequency, select one of 9 pre-set channels as follows:

- pushbutton CHANNEL – PRESS;
- indicator Ch and a digit (1 to 9) are displayed in the indicator upper line – VERIFY;

- the corresponding standby channel frequency is displayed in the lower line;
- required channel by rotating kHz knob – SELECT.

This mode can be abandoned by pressing the CHANNEL pushbutton or automatically after 3 seconds.

To exchange the position of the upper and lower lines when operating in a standby channel press and release the ▲▼ pushbutton.

To transfer from standby channel operation to a direct setting of frequency:

- pushbutton ▲▼ till the lower line indication is extinguished – PRESS and HOLD;
- required frequency by rotating kHz and MHz knobs -SET;
- pushbutton ▲▼ for abandoning the mode – PRESS;
- the frequency is displayed in the lower line of the indicator– VERIFY.

To enable external communications in case of ICSE failure put EMERG COMM switch. The pilot headset is connected in this case only to VHF1.

WARNING. SIMULTANEOUS OPERATION OF THE MAIN AND STANDBY RADIOS FOR TRANSMISSION IS PROHIBITED.

HIGH-FREQUENCY RADIO SET

The HF radio set is used for establishing communication at the maximum range of the helicopter flight.

The radio set operates on the frequency band from 2 MHz to 17.999 MHz with a 100-Hz frequency spectrum.

The radio set is energized with the HF switch arranged on the radio equipment panel of the overhead panel.

The radio set is controlled from the control panel located on the overhead panel. The control panel accommodates: the frequency selection knobs, the OM – AM – OFF function selector switch, the NS noise suppressor switch, volume control knob, the TEST lamp and button, the TUNE and EMERG annunciators.

Four frequency selection knobs permit to select the required frequency.

The OM – AM – OFF function selector switch is used for setting the required operating mode: single-sideband modulation (OM) or double-sideband modulation (AM).

For switching on and tuning the radio set, proceed as follows:

- HF supply switch... ON
- OM-AM-OFF selector switch .... To the required operating mode

- operating frequency ....Select
- NS switch..On

The radio set is ready for operating at the normal stability 15 min after its energizing.

Set the communication type and direction selector switch to RS2 position, use the VOLUME knob on the radio set control panel and the RAD knob the intercom selector panel to adjust the required volume.

For transmitting through the radio set, depress the INTERCOM – RADIO button on the cyclic pitch control stick to the RADIO position or the RADIO RH push-button of the co-pilot or the RADIO button on the additional instrument panel.

For reception, the buttons should be released.

NOTE. For standby listening to the VHS radio set while operating the HF radio set, turn on RS1 listening switch of the selector panel.

At combined operation of the radio transmitter and radar altimeter do not use the radio set transmitter at (8900 – 10580) kHz and (13250 – 15250) kHz frequencies, otherwise do not use radar altimeter readings

With the radio set operating, the EMERG warning annunciator may light up on the control panel. It is indicative of the operation of the overload and short circuit protection system which deenergizes the radio set.

It is necessary to find out whether the overload is random or the radio set is faulty. For this purpose, switch off the radio set, then switch it on again. If the EMERG annunciator comes alive again, the radio set is faulty.

With change of a communication channel, the TUNE annunciator lights up on the control panel and goes out after tuning to the selected channel. If the annunciator fails to light up, reset the selector switch to the adjacent channel, then reset it again to the required channel. If the annunciator goes on shining, the channel is faulty.

The radio set is checked for serviceability with the use of the built-in check. When the CHECK button is depressed on the control panel in the reception mode, noise is heard in the earphones and the CHECK lamp comes alive.

When the CHECK button is depressed in the transmission mode, an audio signal of about 800 Hz is heard in the earphones and the CHECK lamp comes alive.

At installation of Б7А3-ЯрI (B7A3-JArI) unit arranged on the «Ядро» ("Yadro") radio set control panel are: VOL volume control, SOL switch, EMER light-emitting diode if the radio set is in emergency condition, radio set supply switch, TEST built-in check button, buttons for indicator digit cursor movement to the left/right, ENTER selector switch for setting frequency, operation types and indicator brightness, twelve-digits indicator.

For switching on the radio set proceed as follows:

- HF ON switch to the ON position – set;
- power supply switch to the ON position on the radio set control panel – set;
- operating frequency to the required operating mode – select;
- SOL switch – on.

When switching on the radio set the J3E operation type and frequency of 2182.0 kHz will appear on the indicator.

When depressing one of the cursor buttons ⇦ ⇨ the tens digit in kHz starts to flash.

At repeated depressing any of the cursor buttons the flashing digit will move to the left or to the right including digits that display the operation types.

The information in the flashing digit changes by rotating the ENTER selector switch.

When setting a operation type all the word A3E or J3E will flash and change.

During tuning the TEST will be displayed on the indicator instead of the operation type to the tuning finishing.

At attempt of the frequency setting below or higher than the operating range the frequency equal to upper or lower limit will be displayed on the indicator. When switching off the radio set the selected information will be written to the nonvolatile memory and at switching on the earlier written frequency will be displayed on the indicator.

The radio set is checked for serviceability with the use of the built-in check.

After depressing the TEST button the TEST will appear on the indicator instead of the operation type (A3E or J3E) up to the check mode termination.

During trouble shooting after the TEST button depressing the selected operation type will be displayed on the indicator.

OPERATING DATA

The VHF and HF operating data are presented herein.

Main and Standby VHF Radio Sets

With the noise suppressor engaged, the radio set operating range decreases.

Time of channel retuning is not more than 1 s.

Time of transfer from reception to transmission is 0.5 s.

Normal operating cycle: 1 min – for transmission, 4 min – for reception.

The HF radio set transmitter operation is not allowed when VHF radio set is operated

WARNING. SIMULTANEOUS OPERATION OF ONE VHF RADIO SET IN TRANSMITTING MODE AND THE OTHER VHF RADIO SET IN RECEIVING MODE IS PROHIBITED.

HF Radio Set

The radio set in transmission mode can interfere with the ADF operation.

Time of channel retuning is 5 s.

Time of transfer from reception to transmission is 0.5 s.

Normal operating cycle: 1 min – for transmission, 3 min – for reception.

Establishing Communication with Use of Oxygen Masks and Breathing Protection Equipment

Oxygen masks ДКМ-1м connected to helicopter IC cable and oxygen supply units are located in the casings on the racks arranged behind and between the pilot's and co-pilot's seats. Communication is ensured due to use of the microphone built into the mask and earphones of the pilot's (or co-pilot's) headset.

To use the mask, proceed as follows:

- throw the headset microphone holder upwards, shift the spring-loaded shackle backward on neck, and let the earphones down;
- supply the oxygen to the mask by moving the lever on the oxygen supply unit to ON;
- take the mask out of the casing and put it on;
- put on the headset with the thrown-up microphone holder, placing the earphones above the oxygen fastening straps;
- set the HEADSET – MASK selector switch located on the central pedestal to MASK.

HEATING AND VENTILATION SYSTEM

The system is designed for heating the flight and cargo compartments, storage battery compartments, for blowing the flight compartment windshield.

The system employs hot air bled from the engines. Prior to feeding the air to the system with the engines operating under AUTO condition, set the AIR SUPPLY – BLOWOUT selector switch to the BLOWOUT position for at least 2 min. During that time, the contaminated air flows from the engine compressors through corresponding shutters and is discharged into the atmosphere. Then reset the selector switches to the AIR SUPPLY (working) position.

The air used for heating of the flight compartment, storage battery compartments and for blowing the flight compartment windshield is supplied through the pressure regulator, manually-controlled shutter and two ejectors from the RH engine.

The pressure regulator maintains constant air pressure at its outlet.

The manually-controlled shutter installed on the central pedestal serves to adjust the amount of the air delivered.

Atmospheric air is mixed with hot air in the ejectors. The mixed air heated to a temperature of 50 to 100 °C is supplied to the consumers via manifolds.

The air for cargo compartment heating is fed through two pressure regulators, electrically-driven valve and three ejectors from the LH engine.

The air delivery to the compartment is adjusted by the electrically-driven valve that is controlled by a temperature controller automatically or manually, depending on the position of the CARGO CABIN HEAT AUTO-OFF-ON selector switch on the additional instrumental panel.

For automatic temperature adjustment, set the selector switch to the AUTO position.

For manual adjustment, the selector switch is set to the ON or OFF position; the air delivery to the cargo compartment increases or decreases, respectively.

CAUTION. BEFORE SWITCHING ENGINES THROTTLES TO THE IDLE SETTING WHEN ENGINE IS NOT SHUT DOWN, THE HEATING SYSTEM MUST BE OFF

PLENUM VENTILATION

The flight compartment plenum ventilation is ensured with the ram air supplied from the air intakes in the flight compartment upper skin.

The air is supplied into the compartment through the ventilation sleeve. The adjustment of the air flow rate is effected by turning the ring on the ventilation unit casing inside the flight compartment.

NOTE. When flying within the precipitation zone, check that the adjustment ring is in the CLOSED position

For plenum ventilation of the cargo compartment, the air intake on the fuselage left side is used. The air flow rate is adjusted with the handle installed on the ventilation sleeve.

NOTE. When refitting the helicopter to winter conditions or if required, the flight compartment ventilation air intakes and sleeves are removed and the openings in the skin are blanked

INDIVIDUAL VENTILATION FACILITIES

For ventilating the crew working stations, there are three fans installed. The fans of the pilot and co-pilot are arranged on the windshield central profile; they are actuated by the PILOT FAN and NAVIG FAN switches on the overhead panel. The operator's fan is installed on the LH upper beam, it is actuated by the OPERATOR FAN switch located on the additional instrument panel.

The individual ventilation facilities may be used both in flight and on the ground with the engines inoperative.

LIGHTING EQUIPMENT

The lighting equipment is divided into groups:

- external lighting;
- external light indication;
- internal lighting;
- internal light indication;
- emergency internal and external lighting.

The external light indication comprises:

- navigation lights;
- rotor blade tip lights;
- flashing beacons.

The navigation lights are intended for marking the place occupied by the helicopter and the direction of its movement in adverse weather conditions and at night. They are installed on the helicopter tail unit fins (red one on the port fin, green one on the starboard fin) and on the fuselage tail portion (colorless one).

A wafer selector switch serves to vary the light lamp intensity (100, 30 and 10 percent).

Coded flickering (conventional intermittent flashing) of the lights is provided with the use of the NAV LTS CODE button located on the ILLUMINATION panel of the overhead panel. Wafer selector switch NAV LTS located at the same place should occupy the OFF position.

To mark the rotor disk contour (helicopter overall dimensions) for safe flying at night the rotor blade tip lights are installed on the tips of the upper rotors blades.

To increase safety of night flights and flights under adverse weather conditions, the helicopter is equipped with two flashing beacons.

One beacon is installed in the fuselage front portion under the flight compartment, the other – on top of the fuselage in the rear part of the engine nacelle.

CAUTION. THE TIME OF THE FLASHING BEACON CONTINUOUS OPERATION ON THE GROUND WITHOUT FORCED AIR COOLING SHOULD NOT EXCEED 10 MIN

HELICOPTER EXTERNAL LIGHTING

The helicopter is equipped with two (main and standby) retractable search and landing lights to facilitate taxiing, takeoff and landing at night when there is no enough light. The ground surface is made visible from an altitude of 98…164 ft.

The lights are installed under the crew compartment. They can rotate within 0°..120° by elevation and without any limitations in azimuth.

LIGHTING EQUIPMENT OF FLIGHT COMPARTMENT

The flight compartment is illuminated with white flood light of the dome light. The dome light is installed above the RH side panel of the overhead panel.

At the bottom, right side, at frame No. 1, there is a socket for connecting an inspection lamp. Besides, the co-pilot's and operator's working stations are illuminated with individual lights.

Instrument boards and panels are illuminated with built-in white lights.

The instruments are illuminated with incorporated lamps or lamps accommodated in glade shields.

Inscriptions on the panels are illuminated by lamps whose light flux uniformly dissipates over the light plate.

The internal light indication equipment is divided into three groups:

- warning system;
- caution system;
- indicating system.

Signal brightness control is gradual, it is effected with the aid of a potentiometer located on the overhead panel.

The emergency warning system informs the crew with red light signals about especially dangerous failures, faults and operating modes of the helicopter systems and units requiring the crew immediate response.

To draw the crew attention to an especially important signal, it may be shining in a flickering mode.

The caution system informs the crew with amber light signals about failures, faults and dangerous operating modes of the helicopter systems and units.

The indicating system informs the crew with green light signal about conditions of systems and units and their operating modes.

LIGHTING EQUIPMENT OF CARGO COMPARTMENTS AND EMERGENCY EXTERNAL LIGHTING

The cargo compartment is provided with the main and emergency lighting.

The main lighting is powered by aircraft sources and the emergency lighting can be powered both by aircraft and independent power sources.

Cargo compartment is illuminated by lamps (dome lights) located on the cargo compartment ceiling. Lamps are turned on by the MAIN CABIN 2 LAMPS-OFF-3 LAMPS selector switch installed on the overhead panel.

NO SMOKING, FASTEN SEAT BELTS light panel in the cargo compartment is turned on by CARGO CMPT ANNUN switch located on the LH side panel of the overhead panel.

Emergency cabin lighting is provided by emergency lighting lamps and two light panels EXIT powered by autonomous batteries.

Emergency lighting lamps and EXIT light panel are turned on by LIGHTING EMERG CABIN selector switch that can be set in three positions ARM-OFF-ON and located on LIGHTING panel of the overhead panel.

When the selector switch is set to ON position main lighting lamps and EXIT light panel start to glow.

When the selector switch is set to ARM position main lighting lamps of EXIT light panel are turned on and connecting circuit of main lighting emergency lights is prepared for turning on.

When failure of rectifiers units and DC generators the main lighting lamps and EXIT light panel from battery bus start to glow.

In case of disconnection of aircraft power supply it is provided an automatic transfer of the emergency lighting lamps and EXIT light panel to emergency lighting lamps from autonomous batteries.

Emergency lighting provides for the required illumination level in critical conditions for no less than 10 min after primary electrical power supply failure.

EMERG LGT EXIT SIGN standby switch is located on the additional instrument panel. OFF position is fixed by the cap. When the switch is set to ON position and emergency bus is energized lamps of panel main lighting start to glow, when it is de-energized – lamps of panel emergency lighting.

Emergency lights are located:

– on the cargo compartment forward partition;

– on the RH side of cargo compartment in the area of emergency exit hatch.

EXIT light panels are located:

– on the RH side of cargo compartment;

– on the rear partition of cargo compartment.

Emergency external lighting is provided by lamps built into the stabilizer.

Lamps are turned on by LIGHTING EMERG EXT selector switch and EMERG LT EXT switch connected parallel with each other.

LIGHTING EMERG EXT selector switch is located on the LT panel of overhead panel and could be set into three positions: ARM-OFF-ON.

With the switch in ARM position the lamps are turned on automatically after failure or disconnection of rectifiers and batteries connected to the aircraft power supply.

With the LIGHTING EMERG EXT selector switch and EMERG LT EXT switch in ON position the lamps start to glow when connected to the aircraft DC power supply.

With the selector switch and switch in OFF position the lamps are off.

Switch EMERG LT EXT is located in cargo compartment in OFF position, fixed by cap.

FLIGHT DATA RECORDER

Flight data recorder (FDR) is designed for recording and collecting flight data and for its preservation in case of a flight accident.

The flight data recorder comprises:

- flight data acquisition unit (FDAU);
- control unit (CU);
- flight data recorder (FDR);
- transmitting and matching devices.

The control unit is designed for introduction, storing and displaying on the display panel the helicopter identification data, for remote and manual engagement of the flight data recorder and for checking the FDR serviceability on the ground. The control unit is installed in cargo compartment.

The flight data recorder is used for recording the data into magnetic integrator and ensuring its preservation in case of a flight accident.

For the purpose, the tape transport mechanism is encased in a heat-insulating and shock-proof container.

Container (protected flight data recorder unit) ensures preservation of the record after being exposed to:

- the effect of a temperature of 1100 °C for 15 min;
- the effect of aviation fuel, hydraulic and other destructive fluids for 5 min;
- impact acceleration loads up to 1000 g for 10 ms;
- static loads of up to 2260 kg for 5 min;
- the effect of sea water for 36 hours.

The tape transport mechanism of the protected flight data recorder unit is actuated by depressing the auxiliary power unit starting button which is duplicated by operation of the limit switch on the RH main leg shock strut during lift-off.

Magnetic flight data recorder records the flight parameters and discrete commands.

ANALOG PARAMETERS AND DISCRETE COMMANDS LIST:

Analog parameters:

- pressure and geometric altitudes, OAT;
- indicated airspeed, present course;
- angles of roll, pitch, acceleration (vertical axis);
- cyclic and differential pitch of the rotors;
- gas generator RPM and rotor RPM;
- position of the collective pitch lever and pedals;
- DC voltage across distributor busbars;
- engine (LH, RH) compressor output air pressure.

Discrete commands:

- landing gear shock strut release;
- engagement of floats (if installed);
- HOR 1 FAIL, HOR 2 FAIL, VG FAIL;

- LH EEG 2.5 min;
- RH EEG 2.5 min;
- chip in gearbox oil;
- fuel emergency remainder (in LH and RH groups of tanks);
- BAT BUS;
- minimum oil pressure in engine (LH, RH);
- chip in engine (LH, RH) oil;
- oil pressure in engine (LH, RH);
- icing warning;
- shut off valves (LH, RH) in closed position;
- minimum oil pressure in gearbox, maximum oil temperature in gearbox;
- minimum pressure in hydraulic system (main, standby);
- engagement of engine (LH, RH) anti-icing system;
- engagement of rotor blade anti-icing system;
- external load release;
- autopilot disengagement;
- establishment of external communication through VHF radio set;
- establishment of external communication through HF radio set;
- engine (LH, RH) fire;
- auxiliary power plant fire;
- engine (LH, RH) vibration critical level;
- engine (LH, RH) failure.

Time of the equipment readiness for operation after being energized:

- at an ambient air temperature from +60 °C to minus 40 °C – Not in excess of 3 min
- at a temperature from minus 40 °C to minus 60 °C – 15 min

Time of continuous operation – 15 hours.

With the supply disengaged, the selected identification data of the flight are zeroed. In such a case, it is required to set repeatedly the flight identification data.

Duration of data preservation in the protected recorder unit is (50 ±10) h.

AUDIO INFORMATION RECORDER

The audio information recorder МАРС-БМ (MARS-BM) is protected against damage in case of a flight incident and is used for recording inter-crew messages, air-to-air communications, air-to-ground (ship) communications and for recording onboard audio situation. The information recorded during the last 30 min of its operation can be played back.

The П-507М solid-state audio information recorder could be installed instead of МАРС-БМ equipment. The П-507М has the same function as МАРС-БМ. The recording is done using "loops" (loop recording) with erasing the previously recorded data. The recorded data is stored for at least 8 hours.

The recorder is automatically engaged by pressing the APU START button (irrespective of the CVR – OFF switch position) and turned off with complete helicopter deenergization. The CVR – OFF switch on is used during ground checks for manual turning it on/off.

EMERGENCY EQUIPMENT

Equipment used in case of emergency is described below.

FIRE EXTINGUISHING EQUIPMENT

The helicopter is provided with the system for detecting the fire and warning about it and the system for extinguishing the fire in the compartments of LH, RH engines and APU engine (Fig. 1-34).

In case of the fire outbreak, when the temperature reaches a certain value at the places where sensors are installed, the fire detection/warning system operates. As a result, the MWL is flickering and the CHECK FIRE annunciator is shining on the instrument panel, the annunciator located on the central pedestal illuminates to indicate the compartment on fire and an intermittent audio signal is heard in the earphones.

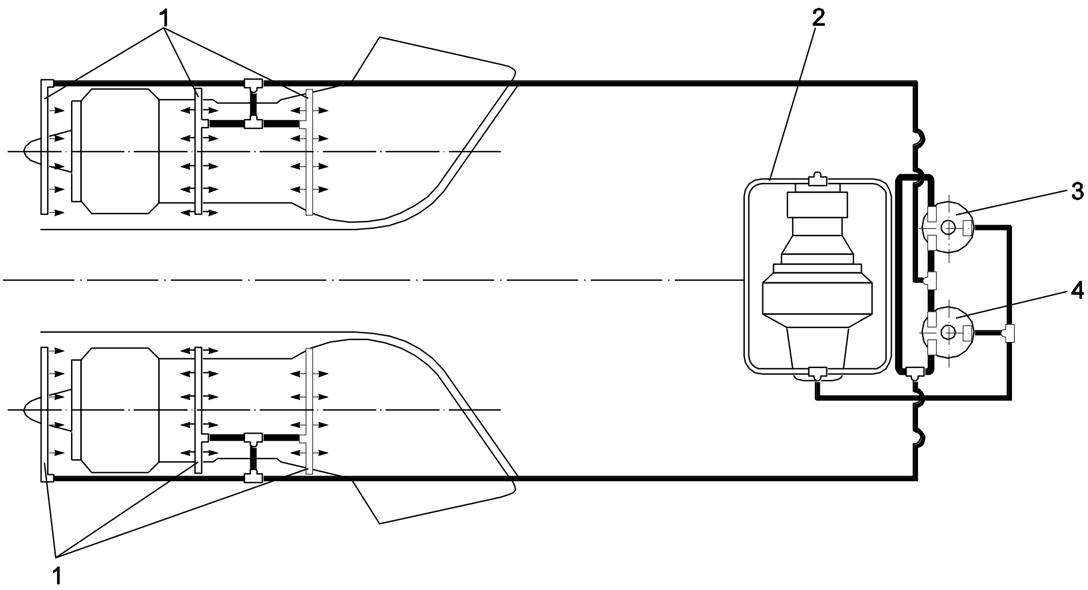
Simultaneously, the fire detection system produces a signal to the fire extinguishing system; in response to this signal, the respective fire extinguisher squib control head operates and the fire extinguishing agent is delivered over the pipeline to the fire zone.

Fire is extinguished in two shots (discharges). For this purpose, the system is equipped with two fire extinguishers.

The main fire extinguisher is discharged automatically when the fire detection system operates or manually. In both cases the BOTTLE 1 annunciator goes out on the central pedestal.

The alternate fire extinguisher is actuated manually if the fire fails to be extinguished after complete usage of the main discharge fire extinguishing agent, the MWL continues flickering and the CHECK FIRE annunciator illuminates.

For this purpose, set the DISCH 1 – DISCH 2 selector switch on the central pedestal to the DISCH 2 position. As soon as the DISCH 2 fire extinguisher operates, the BOTTLE 2 annunciator goes out.



1. Manifolds in Main Engine Compartment
2. Manifold in Auxiliary Engine Compartment
3. Alternate Discharge Fire Extinguisher
4. Main Discharge Fire Extinguisher

Fig. 1-34. Fire Extinguishing System Diagram.

If the fire is extinguished, the CHECK FIRE annunciator and the MWL go out, while the light indicating the compartment in which fire was detected is still glowing. To extinguish this light, set the fire indication system circuit breaker to OFF and immediately set it to ON again. The fire extinguishers may be actuated manually by the crew by depressing the respective button if the signal of fire is absent (the fire is detected by other signs). The fire extinguisher charging pressure is checked in ground conditions by the readings of the pressure gauges installed on each of the bottles.

It must not be lower than the value tabulated in the fire extinguisher certificate (for respective temperature).

The system controls are arranged on the overhead panel and central pedestal.

For extinguishing the fire in the flight compartment, use the two manual fire extinguishers mounted on the walls therein and in the cargo compartment.

After fire extinguishing with manual fire extinguishers, all the crew members should put on oxygen masks.

Engage the plenum ventilation devices, slightly open the doors in the compartments for airing the inner spaces.

BREATHING PROTECTION EQUIPMENT

To protect breathing organs and eyes of the pilot and co-pilot from the action of smoke and toxic gases, the helicopter is furnished with a special breathing protection equipment.

The equipment is arranged in the flight compartment. It is intended for use by 2 persons and it includes:

- two oxygen supply units (cylindrical oxygen bottle and shutter-and-pressure control device, with a charging connection in each);
- two smoke-protection oxygen masks, consisting of a face mask provided with panoramic-view glass, oxygen flow regulator and a headset;
- adapter hoses.

Each oxygen supply unit has a bottle containing 2 L of oxygen with pressure of 210 kgf/sq.cm.

The shutter-and-pressure-control device has a pressure gauge for checking the pressure in the oxygen bottle and a lever for starting the oxygen supply. The supply of 100 % oxygen is started by setting the lever to the ON position. Further oxygen supply for breathing is controlled by the mask oxygen flow regulator.

Time of continuous oxygen supply is (10 – 17) min.

FIRST AID KIT

First aid kit is attached in crew compartment at Fr. No 4 and in transportation cabin to Fr. No 13.

EMERGENCY EXITS

The flight compartment door openings, cargo compartment door and emergency hatch in the cargo compartment starboard side are used as emergency exits.

All doors are equipped with devices for their emergency jettisoning, the emergency hatch is closed with a door released by a jettisoning mechanism. With the emergency hatch open, the HATCH OPEN annunciator lights up on the instrument panel.

PROCEDURE OF EMERGENCY JETTISONING OF DOORS AND EMERGENCY HATCH

Emergency jettisoning of the LH door is effected by pulling the handle. The guide rail is jettisoned together with the door.

Emergency jettisoning of the RH door may be effected from the front and rear handles. With any of the handles turned clockwise, the guide rail is jettisoned together with the door.

Emergency jettisoning handle of the cargo compartment door is placed in the pan recess on the internal side of the compartment skin. There is a marking over the door reading: PULL THE HANDLE PUSH THE DOOR

There is a marking in the door left corner reading: PUSH HERE

The door of the emergency hatch is jettisoned by turning one of the handles (inside or outside) up to the stop. There is a marking on the hatch cover reading TURN THE HANDLE AND PUSH THE COVER.

EMERGENCY PORTABLE RADIO SET (IF INSTALLED)

The helicopter has space (with seats Nos 4 and 11 raised) reserved for accommodating an emergency portable radio set and a survival kit the necessity of which is determined by the Operator.

WARNING, CAUTION AND INDICATING SYSTEM

The warning, caution and indication system combines the operation of the respective groups of annunciators with transmitters and sensors of the helicopter systems and units, with the master warning light and intercommunication and switching equipment.

The signal brightness control is effected with the aid of a potentiometer located on the overhead panel.

The system provides for cancellation of a certain portion of the signals with the throttle lever placed in the IDLE position; in this case, the following signals are canceled:

- emergency warning signals LIMIT ALTITUDE; LOW RPM; HIGH RPM; LH (RH) ENG FAIL
- caution signals LH (RH) GEN OFF, VG FAIL, PARKING BRAKE; LH AFT PAX DOOR; EMG HTCH OPEN; RH (LH) RECT OFF; MAIN HYD FAIL, STBY HYD FAIL, AUX HYD FAIL, NO BOOST PRESS.

When any of the throttle levers is placed in the AUTO position, the system is ready for receiving all the warning and caution signals.

The Warning system warns the crew members with light and audio signals about especially dangerous failures and operation modes of helicopter units and systems.

Warning annunciators have red light filters.

With arrival of an emergency signal, the following information is presented to the crew:

- the red MASTER WARNING light comes alive in a flashing mode;
- the red emergency annunciator with corresponding informative inscription is illuminated in a flashing mode;
- an audio signal is heard in the crew member headsets.

The audio signal can be of the following types:

- intermittent signal of 2000-Hz tone interrupted at a frequency of 2.6 Hz. The signal is supplied when any red warning light comes alive.
- continuous signal of high frequency tone (2000 Hz). The signal is supplied when the main rotor RPM exceeds 99 % and the HIGH RPM light is illuminated;
- intermittent signal of low frequency tone (400 Hz interrupted at a frequency of 4 Hz). The signal is supplied when the main rotor RPM drops below 85 % and the LOW RPM light is illuminated;
- intermittent signal of medium frequency (800 Hz interrupted at a frequency of 1.5 Hz). The signal is supplied when the maximum allowable indicated airspeed is attained and V_{NE} light is illuminated.

NOTE. Formation of the maximum allowable V_{NE} value on the airspeed indicator, V_{NE} light signal on the instrumentation board and the audio signal is described in the description of the Limiting Signal System (LSS)

MWL and warning indication of any type (light and audio) is switched off automatically as soon as a failure situation (hazardous conditions) disappear.

The pilot can switch off the MWL and the audio signal manually by pressing the MWL button but after that the red light annunciator with the informative marking corresponding to the present failure situation will stay illuminated throughout to the elimination of the failure (hazardous conditions) and the warning system is brought into readiness for reception of the next signal.

Manual extinguishing of the LOW RPM light and the accompanying audio signal is done by pressing the light in question. After the main rotor RPM rises above 85 %, the main rotor RPM drop control systems automatically are brought into readiness to supply a LOW RPM signal in case the RPM again drops below 85 %.

<u>The caution system</u> operates in the same way as the warning system but without audio signals. The caution annunciators have amber light filters.

<u>The indicating system</u> informs the crew members with light signals about the helicopter systems and components operation.

The indicating annunciators have green light filters.

The emergency warning, caution and indicating system are actuated with the aid of the WARNING (1, 2, 3) circuit breakers on the overhead panel. The check is performed by pressing the WARN CHECK button on the instrument board.

AIR TRAFFIC CONTROL RADAR TRANSPONDER (if installed)

The helicopter is equipped with a transponder for cooperation with secondary radars of air traffic control systems and for automatic transmission (in response to interrogations from ground radar systems) of information concerning the helicopter coordinates, helicopter number, altitude of flight and fuel capacity.

Then this information is transferred to control towers with the following display of the above information on air traffic control displays.

The control panel of transponder is presented in Fig. 1-35.

The transponder has the following main operating modes: READY, GCA, ATC, ATC-M, AC, A.

READY mode is selected during taxiing the helicopter before takeoff with the aim of reducing intra-system mutual interference. In this mode, the response signals are not emitted.

The GCA, ATC, ATC-M modes are the main modes of the transponder for operation with CIS (former USSR) radar stations of the air traffic control system.

A and AC modes are intended for operation with secondary radars, ATC RBS type, used aboard and KOREN-AC type radars, used within CIS territories in compliance with the ICAO regulations. In these modes, the transponder emits signals conveying information in response to the interrogation code and depending on the operating mode.

A mode is engaged only when transponder transmits the code of tactical number only.

AC mode is the main mode used in flights over non-CIS countries for transmitting information about the altitude of flight and tactical number.

In addition to the above operating modes, the transponder enables selection of:

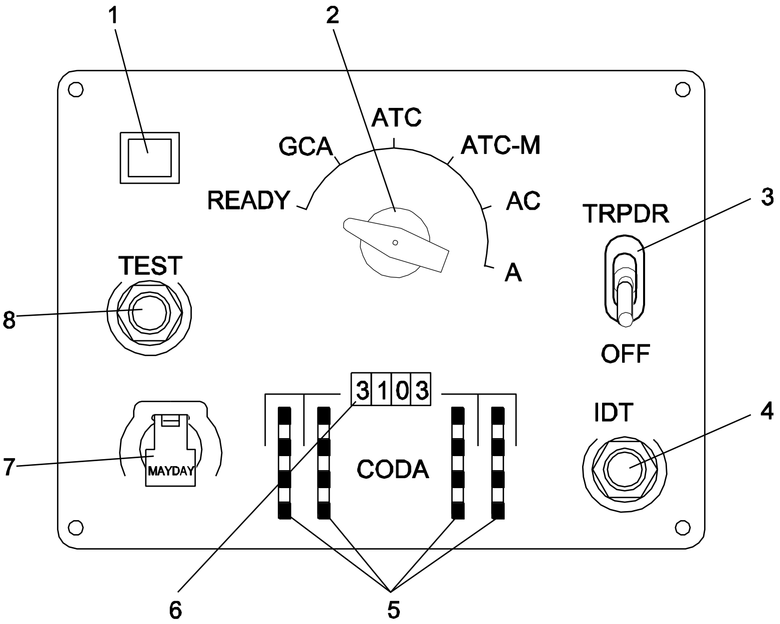
- IDT mode for transmitting the signal for individual identification of the helicopter on the radar scope. Informative codes are not transmitted in this mode;
- MAY DAY mode or transmitting an emergency signal (distress signal) while operating in GCA, ATC, ATC-M modes;
- TEST mode for checking transponder serviceability with the use of the built-in test system and for display of respective indication on the light panel. If the transponder is serviceable, the glowing annunciator is white; in case of a fault, the annunciator, with the TEST button pressed, glows red.

The transponder set includes:

- the transponder unit arranged at the fuselage RH side, under the floor of the flight compartment;

- antennas (front and rear) arranged, respectively, on the front wall of the flight compartment and on the tail boom; and two antennas arranged in the lower part of the fuselage;
- control panel;
- altimeter switching unit arranged at frame No. 1 in the fuselage nose portion.

NOTE. In order to transmit pressure altitudes in the AC mode the altimeter must be set to a pressure 760 mm Hg. (1013.25 hPa). Should any other pressure is set, no altitude signals will be transmitted.



1. Light Annunciator for Indication of Transponder Response and Serviceability
2. Mode Selector Switch
3. Transponder Switch
4. IDT Button for Helicopter Individual Identification On the Radar Screen
5. Four-Digit Number Selector Switches (ICAO)
6. Windows for Display of Selected Number
7. MAY DAY Switch for Transmission of Accident Signal In GCA, ATC, ATC-M Modes
8. TEST Button for Testing Transponder Serviceability

Fig. 1-35. Transponder Control Panel

SECTION 2. HANDLING/SERVICING/MAINTENANCE

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LIST OF FIGURES

LIST OF TABLES

SECTION 2. HANDLING/SERVICING/MAINTENANCE

HANDLING

Handling of the helicopter consists of towing, parking, covering and blade's mooring.

Refer to Maintenance Manual for more detailed ground handling information.

TOWING

The helicopter may be towed by a towing vehicle or by hand over the prepared surface using a standard tow bar leaded to nose landing gear (Fig. 2-1).

The tow bar has the replacement shear pin. It may NOT BE REPLACED by another part.

For towing, the following limitations must be observed:

- the angle between longitudinal bar axis and towing direction must not exceed 40°;
- towing over surface with slope above 12° is not permitted;
- towing velocity of helicopter:

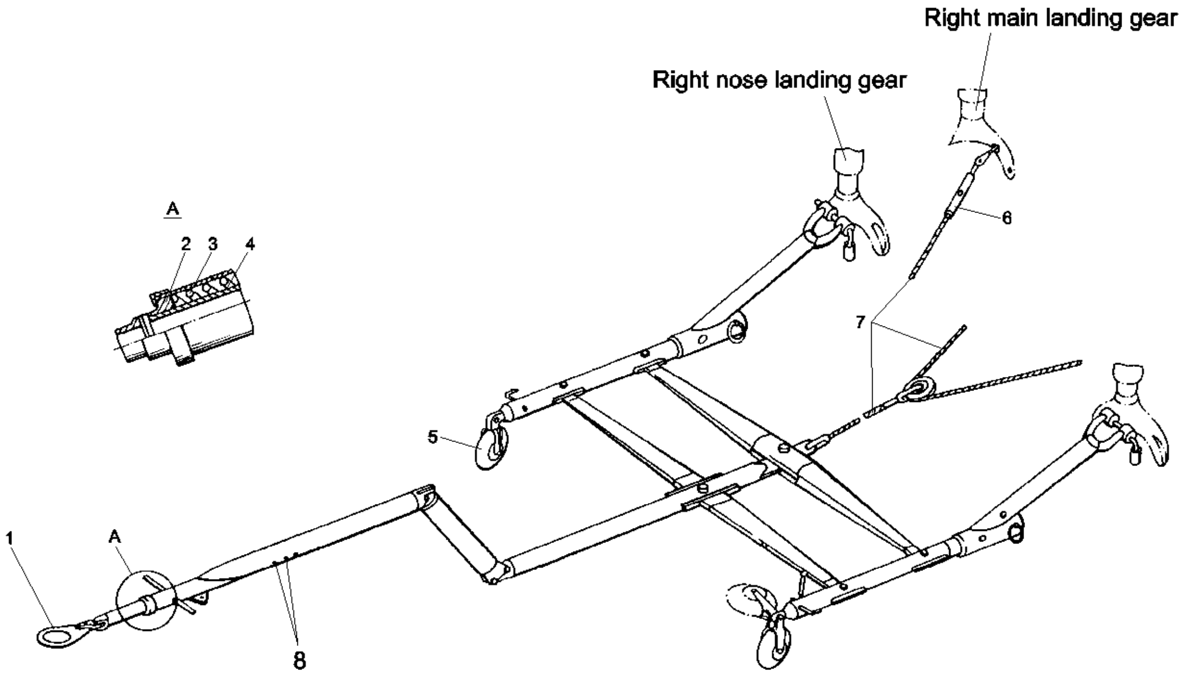
with installed blades	not exceed 5 km/h
with removed blades	not exceed 15 km/h;

- helicopter towing over loose, flooded or deeply snowed grounds is not allowed.

Prior to movement, clear towing area of support equipment, such as work stands, power units, fire extinguishers, etc., disconnect static ground wire, lead the bar and remove the wheel chocks, release the helicopter wheel brakes.

During towing the wheel brakes may be applied in case of emergency only (such as damage to the tow bar, shear pin, etc.).

CAUTION. IF THE HELICOPTER IS MOVED BY HAND, DO NOT PUSH ON ANY PART THAT COULD RESULT IN DAMAGE TO THE HELICOPTER, I.E. ANTENNA, RUDDERS, ETC.



1. Shackle
2. Ring
3. Spring
4. Piston
5. Wheel
6. Turnbuckle
7. Cable
8. Replacement Share Pin

Fig. 2-1. Tow Bar.

PARKING

Helicopter should be disposed in desired parking area on even surface when possible. Distance to the nearest helicopter or aircraft must be equal to two main rotor diameters or more. The parking area should be equipped with the fire extinguishing facilities.

For parking operate as follows:

Helicopter wheels .... Brake

Wheel chocks... Install

Static ground wire .... Attach

All helicopter buses .... Deenergize

Doors and hatches .... Close and lock

Pitot static tube .... Cover

Protective cover on the ice detector .... Fit

Protective covers on the air intakes, exhaust nozzles
and fuel tank vent inlets .... Install

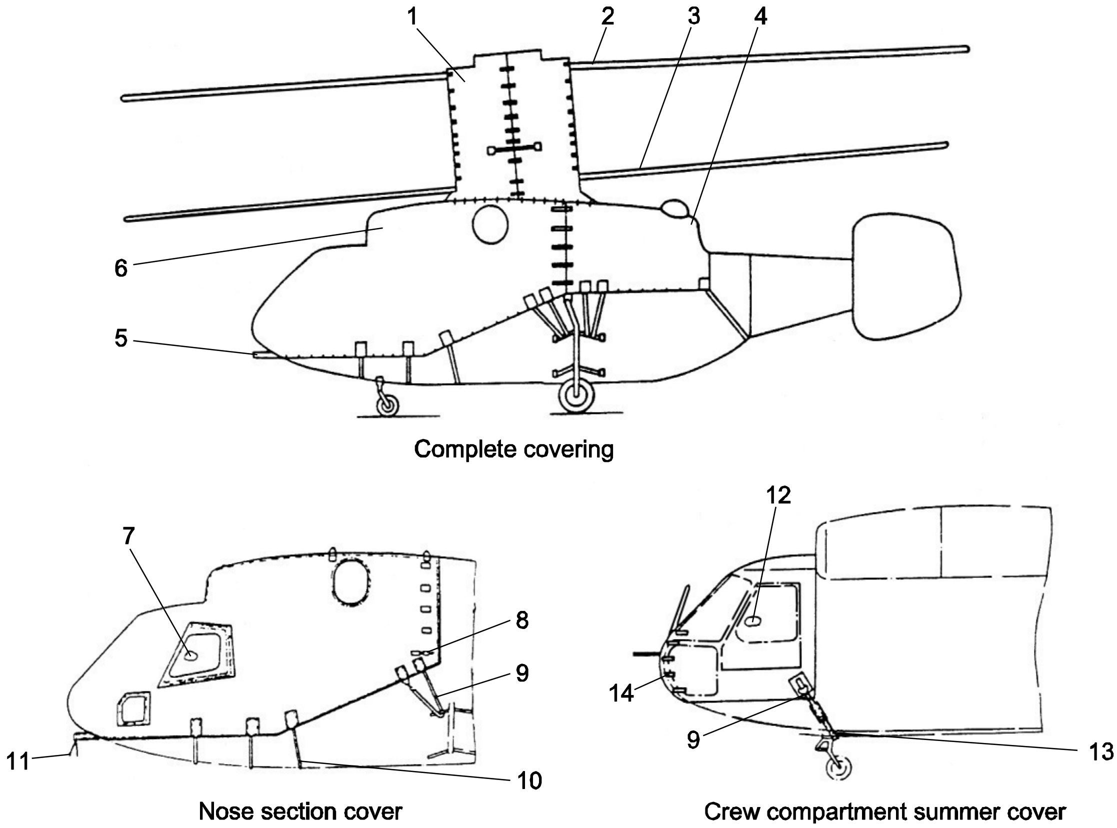
Clamps on the rudders .... Mount

NOTE. If high wind velocity is forecasted, it is recommended to head the helicopter in the wind, fill fuel tanks and remove unmoored auxiliary equipment from the parking site.

COVERING

The helicopter is covered with a complete set of covers (Fig. 2-2) in bad weather conditions or its forecast as well as in case of placing the helicopter for storage.

For short period parking (duration up to 7 days) only the fuselage nose section is covered using fuselage nose section cover or crew compartment summer cover (Fig. 2-2). The crew compartment summer cover is intended to protect windows against exposure to solar radiation.



1. Mast Cover
2. Upper Blade Cover
3. Lower Blade Cover
4. Engine Nacelle Rear Section Cover
5. Pitot-Static Tube Cover
6. Fuselage Nose Section Cover
7. Lining
8. Belt with Band
9. Chock Cord
10. Shock Absorber
11. Cord
12. Pad
13. Band
14. Fasteners

Fig. 2-2. Helicopter Covering.

MOORING

The helicopter blades are moored by means of flexible tie-down in unfolded position (Fig. 2-3) if high wind velocity is forecasted and helicopter hangering or evacuation is not possible.

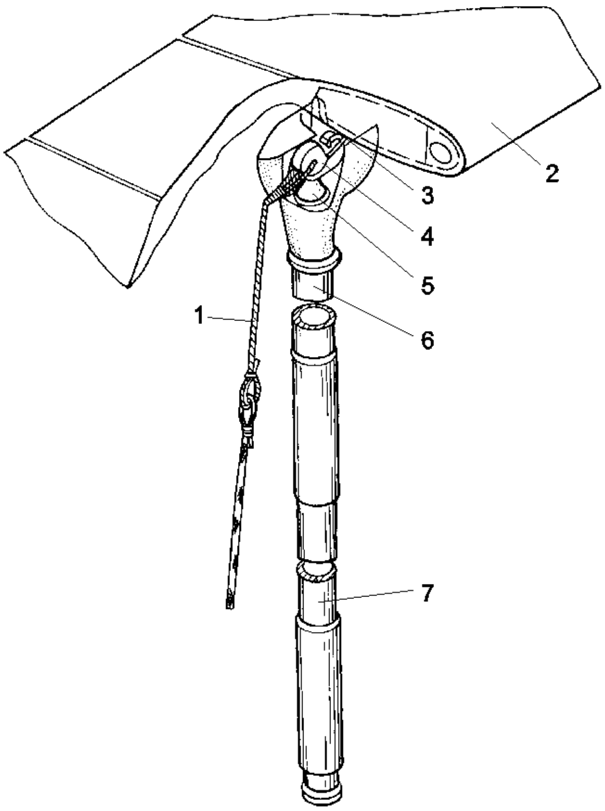
For mooring, proceed as follows:

Turn the rotors so that one of the upper rotor blades faces forward at an angle of 10 degrees relative to the helicopter center line.

Fit the hook of rope on pin of rod so that the hook enters the slot of catch. Lead the hook to blade mooring fitting and engage the hook with the fitting. Disengage the rod from the hook.

Tie the rope to the nearest nose or main leg. The rope tension should be 10 to 15 kgf.

Repeat the prescribed procedure for each blade.



1. Rope
2. Blade
3. Blade Mooring Fitting
4. Rope Hook
5. Pin
6. Catch
7. Rod

Fig. 2-3. Blade Tie-Down.

SERVICING

Information required for the preflight helicopter servicing is presented herein. Refer to Maintenance Manual for more detailed servicing information.

HELICOPTER SERVICING POINTS

Depending on the function the helicopter servicing points are subdivided into three categories:

- points intended for connection of the ground servicing facilities, for filing systems and preparing for flight;
- points intended for connection of the ground servicing facilities for inspection, checking of systems, for scheduled maintenance and approved repairs;
- points providing safety of the maintenance personnel and safe condition of the helicopter.

The symbols of the servicing points are marked on the external skin or on hatch panels in the immediate vicinity of the servicing point.

The hatch leading to the servicing point is lined out so that the colour of the drawn line matches that of the symbol. With the symbol-marked point or hatch located outside the field of view, provision is made for the arrows whose colour matches that of the symbol and applied so as to indicate the appropriate location.

The symbols of the helicopter servicing points are presented in Table 2-1 and in Fig. 2-4.

Table 2-1. Helicopter Servicing Points.

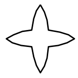
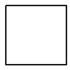
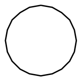
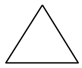
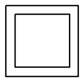
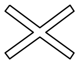
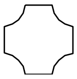
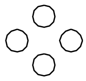
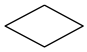
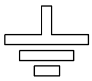
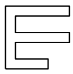
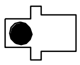
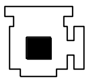
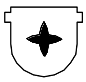
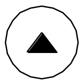
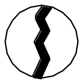
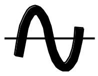
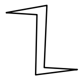
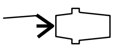
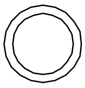
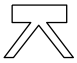
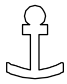
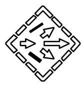
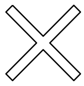
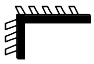
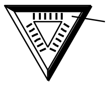
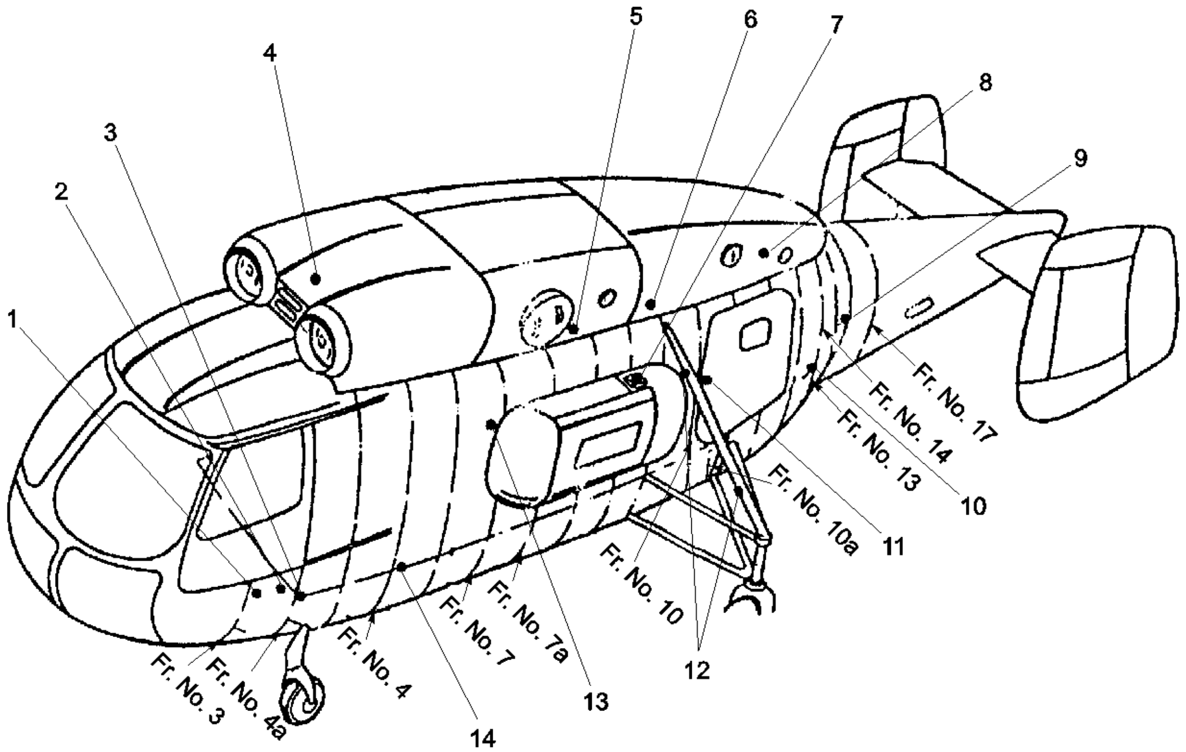
Purpose	Symbol (yellow-coloured)
Fuelling	
Filling with oil	
Filling hydraulic system with working fluid	
Filling of anti-icing system	
Preservation	
Charging with air	
Charging with nitrogen	
Air start	
Connection of air conditioner or heater	
Servicing fire-extinguishing system	
Grounding	
Electrical connector	
Symbol testing for leakage	
Draining of fuel/oil and other fluids	
Inspection of fuel, oil and other filters	
Test of systems	

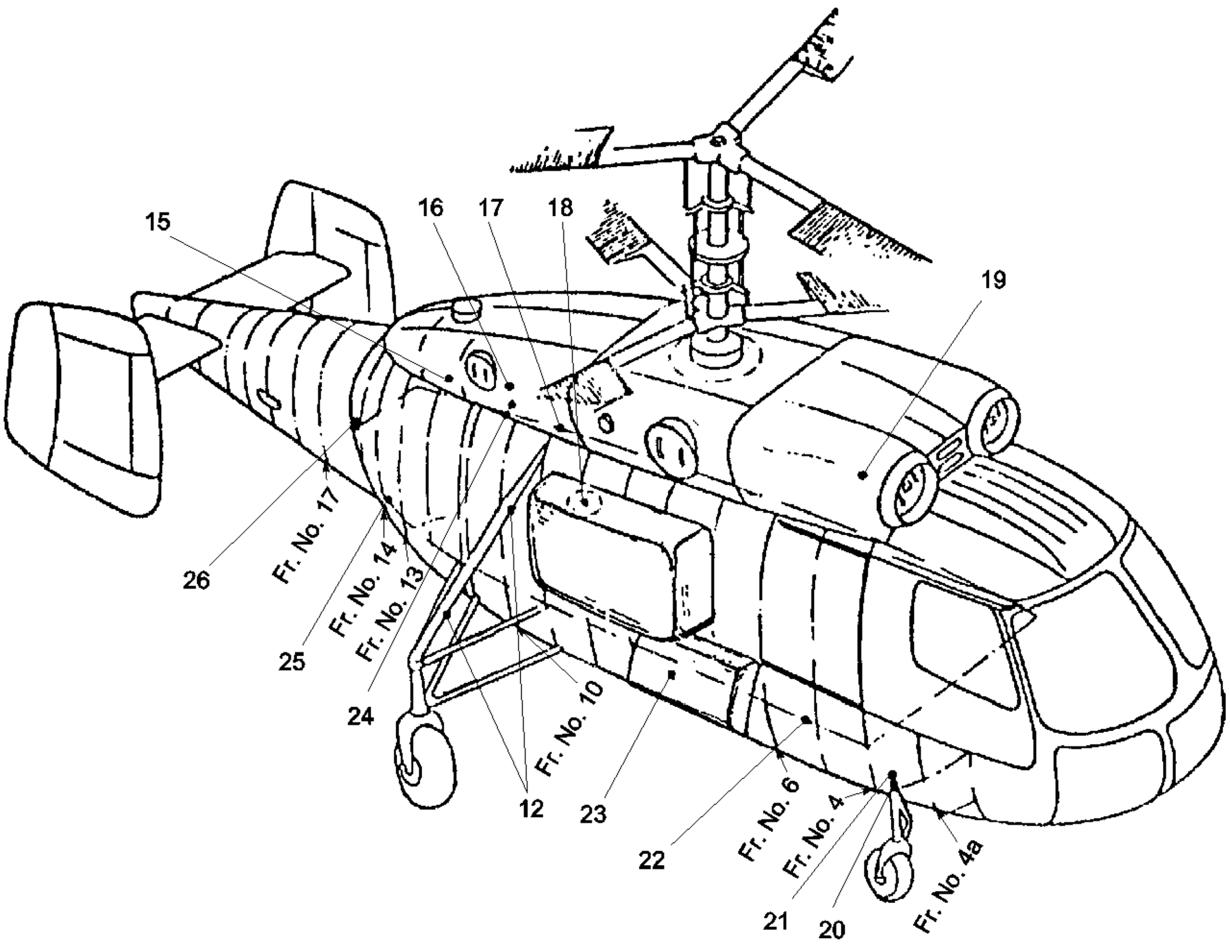
Table 2-1 (cont.). Helicopter Servicing Points.

Purpose	Symbol (yellow-coloured)
Static pressure test	
Electronic equipment test	
Inspection of storage batteries	
Igniter plug	Red-coloured 
Towing point	
Jacking point	
Mooring point	
Hoist point	
Point of air intakes and engine turbine gas outlets	
No access to fragile parts	
Passage ways over skin	
Explosive devices	 White-coloured
Locking rudder	Appliances painted red and red flags
Blanks of air intakes, nozzles and other openings	Blanks painted red and red flags



1. DC Plug Connector Receptacle
2. AC Plug Connector Receptacle
3. Grounding Jack
4. Filler Neck of De-Icing Fluid Tank
5. Gearbox Oil Filling Neck
6. Filler Neck of Port Engine Oil Tank
7. Filler Neck of Port Fuel Tanks Nos 5+2
8. Filler Neck of APU Engine Oil Tank
9. Single-Point Fueling Connection
10. Filler Neck of Port Fuel Tanks Nos 3+4
11. Filler Neck of Rear Drop Fuel Tank No. 6 Located on Cargo Compartment Floor
12. Charging Valves of Main Landing Gear Shock Strut
13. Filler Neck of Front Drop Fuel Tank No. 6 Located on Cargo Compartment Floor
14. Filler Neck of Port Fuel Tank No. 1

Fig. 2-4 (Sheet 1 of 2). Helicopter Servicing Points.



15. APU Engine Preservation Union
16. Filler Necks of Hydraulic Tanks
17. Filler Neck of Starboard Engine Oil Tank
18. Filler Neck of Starboard Fuel Tanks Nos 5+2
19. TV3-117 Engine Preservation Union
20. Ground Air Conditioner Union
21. Charging Valve of Nose Landing Gear Shock Strut
22. Filler Neck of Starboard Fuel Tank No. 1
23. Ballonnets
24. Charging Valves of Hydraulic Accumulators
25. Filler Neck of Starboard Fuel Tanks Nos 3+4
26. Air Charging Unions of Hydraulic System Tanks

Fig. 2-4 (Sheet 2 of 2). Helicopter Servicing Points.

FUELS

The list of fuels approved for the helicopter filling is presented in the RFM Section 1.

It shall be the responsibility of the operator and his fuel supplier to ensure that the fuel conforms to the approved specifications.

FUELING

Prior to fueling, the helicopter and the fueling truck should be grounded and the grounding cable of the fueling truck should be connected with the helicopter for equalizing their electrical potentials.

When preparing for fueling make sure that wheel chocks are in place.

During the helicopter fueling, any operations which may cause sparking are prohibited at a distance less than 82 ft (25 m).

When fueling the helicopter, it is prohibited:

- to connect/disconnect electric power sources to helicopter, to use electrical tools which may produce sparks;
- to leave wires connecting the helicopter with the electrical power source, on route of approach/departure of ground servicing vehicles;
- to start fueling if fuel is spilled in parking area and if fuel or its fumes are detected inside helicopter;
- to start and warm up the helicopter equipment, engines and systems;
- to use open fire, defective inspection lights (torches) to monitor fueling operations;
- to begin fueling if there is no free departure route for the fueling truck from helicopter and if the wheel brakes are overheated.

Helicopter may be fueled via fuel tank filler necks or under pressure via a single-point fueling connection located on the fuselage port side between frames Nos 15 and 16.

SINGLE POINT FUELING

- couple the end of the filling hose with the helicopter single-point fueling connection and insert the tip of the hose bonding strip into the grounding socket located near the single-point fueling connection. Actuate the automatic circuit breaker on the fueling control panel by pressing the SIGNAL button on the fueling control panel so that the FUEL OFF lamp comes alive. Press the LAMP CONTROL button and check if the lamp illuminates;
- open the fueling valve on the fueling control panel, setting the valve selector switch to position FULL FUELING; FUEL STOP lamp will extinguish and VALVE OPEN lamp will come alive on the panel;
- switch on fuel supply from the truck fueling system and REFUELING lamp will come alive on the fueling control panel. When the next tank is filled, the respective lamp will come alive.

CAUTION. DURING FUELING STEADILY WATCH LAMPS ON THE FUELING CONTROL PANEL. IF IT IS REQUIRED TO URGENTLY STOP FUELING IN EMERGENCY, SET THE VALVE SELECTOR SWITCH ON THE FUELING CONTROL PANEL TO THE "FUEL OFF" POSITION. DURING SINGLE-POINT FUELING THE SHUT-OFF VALVES SHOULD BE CLOSED.

- when all the lamps on the fueling control panel come alive to testify filling of the tanks, continue fueling for 10 s more, then set the fueling valve selector switch to the FUEL OFF position, VALVE OPEN and REFUELING lamps extinguish, FUEL STOP lamp comes alive and the fuel supply from the fueling truck ceases;
- check fuel quantity in the tanks against fuel quantity indicators;
- reset the SIGNAL button on the fueling control panel.

SINGLE-POINT FUELING OF TANKS NOS 2+5 WITH THE ENGINES RUNNING

On central pedestal in crew compartment set the LH (RH) TANK PUMPS selector switch to the OFF (DOWN) position, caps open.

Procedure for this type of fueling is the same as for a usual single-point fueling but at the beginning set the fueling valve selector switch to FUEL 1000 L position.

After fueling set the LH (RH) TANK PUMPS selector switch to the ON (Up) position, caps closed.

CAUTION: PERFORM HELICOPTER REFUELING ON HELIPAD THAT SATISFIES THE FOLLOWING REQUIREMENTS:

HELIPAD SHOULD BE THE HELIPAD DIAMETER IS NOT LESS THAN 25 FT (7.6 M), WITHOUT SLOPES.

THE HELIPAD AND THE GROUND OF SERVICE LANDING MUST BE SOLID ENOUGH TO SUPPORT THE HELICOPTER WEIGHT.

APPROACH AND TAKEOFF AREAS SHOULD BE FREE FROM ANY OBSTACLES AND SHOULD PROVIDE THE HELICOPTER SAFE LANDING AND TAKEOFF.

The pilots will assume responsibility for rotor clearances and will have the final say in the safety and orientation of the service landing.

<u>FUELING VIA FILLER NECKS OF FUEL TANKS</u>

- open the tank filler neck, put the fueling truck hose pistol into it and fill the tank with fuel so that the fuel level in the tank is 1.5" (30 to 40 mm) lower than the lower filler neck edge;
- close and lock with wire the filler neck and filler access door;
- fill other tanks similarly;
- energize the helicopter and check filling of the tanks against fuel quantity indicators.

NOTES: 1. In case of complete filling of all the helicopter tanks the sequence of filling (except tanks No. 6) is arbitrary but it should be kept in mind that tank No. 2 is filled via a filler neck of the respective tank No. 5 and tank No. 3 – via a filler neck of the respective tank No. 4.

2. If partial filling of fuel tanks is required, the following sequence of filling should be observed:
    - First – tanks Nos 2+5, RH and LH;
    - Second – tanks Nos 1 RH and Nos 3+4 LH;
    - Third – tanks No. 1 LH and Nos 3+4 RH

CAUTION. TANKS No. 6 ARE FILLED ONLY BY SINGLE-POINT FUELING. THEIR FUELING VIA FILLER NECKS IS PROHIBITED.

Fueling completed, drain sediment in compliance with regulations, visually inspect sediment for absence of water and admixtures. After checking, drain fuel sediment into vessels specially prepared for that in the vicinity of the helicopter parking area.

OILS

Approved oils are listed in RFM, Section 1.

An appropriate entry shall be made in the helicopter Logbook when oil has been added to the engine or gearbox. The entry shall show the type and brand name of oil used to prevent inadvertent mixing of oils.

CAUTION. DO NOT MIX BRANDS OR TYPES OF OIL. IF OILS GET MIXED, THE SYSTEM SHALL BE DRAINED AND FLUSHED. OTHERWISE, AN OIL LEAKAGE THROUGH THE SEALS COULD RESULT.

Refer to RFM, Section 1 for ambient air temperature limits.

POWER PLANT SERVICING

The engines and gearbox have three independent oil systems each with its own filler and oil level sight glass. The engine oil systems are filled through the oil tank filler necks.

Maximum amount of oil filled into the engine oil system is (10.0 ±0.5) L, and the minimum amount is (6.5 ±0.5) L. These quantities correspond to FULL and MINIMUM marks on the oil lever sight glass. Another (center) mark on the oil lever sight glass labeled REPLENISH correspond to the amount of (8.0 ±0.5) L.

CAUTION. THE HELICOPTER FLIGHT OPERATION WITH TANK OIL LEVEL BELOW THE REPLENISH MARK AND ENGINE GROUND OPERATION WITH TANK OIL LEVEL BELOW THE MINIMUM MARK IS PROHIBITED

The gearbox oil system is filled through the filler neck of the gearbox pan wherein oil level should be between the FULL and REPLENISH marks as indicated by the oil dipstick. The amount of oil to fill the gearbox (with oil cooler system disregarded) is 51 L. The general gearbox capacity is 62 L.

Refer to the helicopter, engine and gearbox Maintenance Manuals for servicing instructions and replacement procedure for the engine and gearbox oil filters.

HYDRAULIC FLUIDS

The hydraulic fluids listed in the RFM, Section 1 are approved for use in the helicopter hydraulic system.

HYDRAULIC SYSTEM SERVICING

The main and auxiliary hydraulic system tanks are combined into one tank that has a central partition. This common tank and standby hydraulic system tanks are located in the fan bay of the engine nacelle. Each part of common tank and standby hydraulic system tanks is provided with filler necks and sight glasses to determine the quantity of hydraulic fluid in each tank. Each sight glass has marks corresponding to the NOMINAL, MAXIMUM and MINIMUM hydraulic fluid levels. Each section of the common tank has a 12 L capacity. Standby hydraulic system tank has an 11 L capacity.

Prior to flight:

- check for hydraulic fluid leaks;
- determine hydraulic fluid levels in each tank;
- check the brake pressure.

COLLECTIVE PITCH LEVER, CYCLIC STICK AND PEDALS CHECK FOR SMOOTH AND FULL DEFLECTION WITH ENGINES INOPERATIVE

Check made according to one of the following procedure variants:

WITH GROUND HYDRAULIC UNIT CONNECTED:

- Pressure in main hydraulic system (64 – 90) kgf/sq.cm – Check
- Pressure in standby hydraulic system (64 – 90) kgf/sq.cm – Check
- Smooth deflection of collective, cyclic and pedals for their full travels – Verify

All other checks of the main and standby hydraulic systems from a ground power source are made similar to the hydraulic systems check with the engines operating (RFM, Section 2). It should be kept in mind that during the checks from a ground power source the main and the standby hydraulic systems can be switched off only if pressure is available in the auxiliary hydraulic system.

WITH THE MAIN HYDRAULIC SYSTEM FED FROM AIRBORNE AUXILIARY PUMP:

- AUX PUMP EMERG ON-OFF-AUTO switch..AUTO, Check
- 200/115 V AC external power supply source ....Connect
- Hydraulic tank boost pressure available...Check
- NO HYD TNK PRES light ....on

NOTE. Hydraulic tank boost pressure is created by a hand pneumatic pump on the aircraft hydraulic charging panel

- AUX PUMP EMERG ON-OFF-AUTO switch..EMERG ON
- AUX HYD FAIL light after a short time illumination ....off
- Pressure against PUMP indicator ....(200 – 220) kgf/sq.cm
- Pressure against AUX indicator ....(75 – 90) kgf/sq.cm
- AUX PUMP TO MAIN-MAIN ON-MAIN OFF switch ....TO MAIN
- AUX PUMP EMERG ON-OFF-AUTO selector switch ....AUTO (Cap closed)
- AUX HYD FAIL light OFF, parameters of the auxiliary pump operation maintained ....Check
- Pressure in main hydraulic system against the MAIN indicator ....64 kgf/sq.cm, minimum
- Smooth deflection of collective, cyclic and pedals for their full travels ....Check

NOTE. Taking into account the auxiliary pump insufficient capacity for supplying the main hydraulic system, deflect the controls during the check on after another and do it slowly in order to avoid getting an effect of the actuator temporary blocking because of a too fast deflection of the controls

- AUX PUMP TO MAIN-MAIN ON-MAIN OFF switch ....MAIN ON (Cap closed)

Refer to the Maintenance Manual for more detailed servicing instructions.

ROTOR SYSTEM CHECKS AND ADJUSTMENTS

The rotor system checks and adjustments are performed after replacement of the rotor mast, rotor mast units or parts, blades, gearbox as well as upon the pilot's comments concerning the rotor system operation and after static tracking.

CAUTION. ROTOR SYSTEM CHECK WITH RUNNING ENGINES IS PERFORMED BY THE PILOT. ALL CHECKS AT WIND VELOCITY ABOVE 8 m/s OR UNDER GUSTY WIND CONDITION ARE PROHIBITED.

BLADE TRACKING

PREPARATION FOR BLADE TRACKING IS PERFORMED AS FOLLOWS:

- turn the helicopter to headwind;
- install an appliance for determining in-track condition in front and to the left from the helicopter. When the appliance is tilted toward the rotor, the blade tips should pierce the flag to the depth of 0.3" (5 to 10 mm) and when it is tilted aside from the rotor, the blades should not brush the flag;
- use soft crayons to colour the tips of the upper and lower rotors:

  blade No. 1 – red colour;

  blade No. 2 – blue colour;

  blade No. 3 – black colour;
- on the blades of both rotors set the trim tabs to the initial positions according to the blade certificates.

BLADE TRACKING WITH IDLE POWER

- start the engines and accelerate them to the idle power;
- measure the main rotor blade tracks by tilting the appliance so that the blade tips brush the flag and immediately moving it aside;
- shut down the engines;
- measure the distance on the flag between traces of blades of each rotor (the distance between the upper and lower traces is called blade tip run-out); the allowable run-out does not exceed 0.78" (20 mm);

- if the run-out exceeds 0.78" (20 mm), decrease it by changing the length of the rotor mast dynamic adjustment rods. One complete revolution of the rod screwing-in/out changes the position of the blade trace by 2.55" (60 to 70 mm). Shortening of the rod increases the lower rotor blade setting angle.

CAUTION. DURING THE ROD LENGTH ADJUSTMENT, CHECK TO SEE THAT THE FORK THREAD DOES NOT PROTRUDE BEYOND THE CHECK HOLE IN THE ROD. LOCK THE ROD AFTER ADJUSTMENT

- when all rods are adjusted, start the engines and check the tracking of the rotor blades at IDLE power. If the run-out of the blade traces is within the allowable limits, proceed to tracking with variation of the rotor RPM, if it is beyond the limit, go on adjusting the rod length and tracking until the required run-out is obtained.

<u>BLADE TRACKING WITH ROTOR RPM 90 %</u>

- start the engines, accelerate them to the IDLE power and check the rotor blade out-of-tracking;
- accelerate the engines to 90 % RPM and check out-of-tracking;
- shut down the engines;
- judging by the blade tip traces on the flag, determine whether the blade run-over takes place, i.e. whether there are changes in relative position of the blade traces after transition from low rotor RPM to the higher one;
- eliminate the detected blade run-over by bending trim tabs on the blades. Bending of one trim tab section up displaces the blade upward; its bending down displaces the blade downward (bending of one trim tab section by 0.04" (1 mm) displaces the blade trace by 0.5" (10 to 15 mm));
- start the engines and check the blade tracking at the IDLE power and at rotor 90 % RPM again;

If the blade run-over is within allowable limits, proceed to the following operations.

HELICOPTER VIBRATION LEVEL CHECK

- record the helicopter vibration level at upwind hovering at a height of 5 ft (1..2 m) using portable vibrograph with dual transmission adjusted for double amplification (the levers are introduced into the middle holes);
- perform landing and engines shutdown;
- decode the record on the vibrograph tape;
- if the vibration curve on the tape has an amplitude not in excess of 2 mm, the rotor balancing is satisfactory and its adjustment is not required. If the curve amplitude is higher than 2 mm, it is required to calculate the values and places of installation of balancing weights on the upper rotor according to Maintenance Manual;
- carry out the vibration check measurement with balancing weight installed on the upper rotor blades.

ELIMINATING HOVERING TURN

For eliminating the helicopter hovering turn with the pedals in the neutral position the required adjustment of the neutral position of the directional control pedals during hovering is performed.

The adjustment is carried out as follows:

Lock the pedals and all the components of directional control with special pins in the neutral position and ascertain the indicator pointer coincides with the zero of the scale.

If required, adjust the zero position of the pointer as recommended in Maintenance Manual.

Check turning tendency with the pedals in the neutral position at headwind hovering at 32 ft (10 m) height or below with flying weight of approximately 23148 lbs (10500 kg).

The autopilot yaw channel should be disengaged. The position of the pedals is determined by the pilot visually by deflection of the indicator pointer and should be put down by the crew on the chart. To increase accuracy, it is recommended to repeat the check several times (3 to 6) and to determine an average value.

If the average value of the pedal position determined in the above procedure is within 0 to 10 mm on the indicator (that corresponds to the position of the right pedal from 0 to 10 mm forward), the position of the pedals is normal and does not require any adjustment.

If the average value of the position of the pedals is beyond the limits of 0 to 10 mm on the indicator, adjust the rotor system by changing the blade angles of the lower and upper rotors as recommended in Maintenance Manual.

MAINTENANCE

The procedures that are necessary for the APU and main engines maintenance are presented herein. Refer to the APU and main engine Maintenance Manuals for more detailed instructions.

APU MAINTENANCE

The usual APU start, operation and shut-down procedures are prescribed in the RFM, Section 2.

THE PECULIARITIES OF APU PRESTARTING WHEN FEEDING FROM THE EXTERNAL POWER

When the APU is started from an external power source (AC or DC), check it for proper connection to the helicopter.

Start from a DC external power source:

- DC CHECK selective switch .... EXT PWR
- DC voltage of (27 – 29) V .... check
- EXT PWR DC SYS-OFF switch .... EXT PWR
- MAIN TRANS – STBY TRANS, AUTO INV-MAN switches (cap closed) .... check

Lights on instrument panel:

- MAIN TRANS OFF light .... off
- 36 V INV ON light .... on
- 115 V INV ON light .... on
- DC EXT PWR light on annunciator panel .... on

Start from an AC external power source:

- EXT PWR AC check rotary switch in succession to A-B-C .... Set
- AC voltage of (115 – 119) V .... Check
- EXT PWR AC SYS-OFF switch .... EXT PWR
- AC EXT PWR light on annunciator .... on

- LH (RH) RECT DC SYS-OFF switch .... LH (RH) RECT

APU FALSE START

APU false start is performed for checking the system and in case of the APU preservation or depreservation.

To perform APU false start proceed as follows:

- APU fuel shut-off valve is OPEN .... Check
- 2 RH fuel booster pumps .... On (at preservation Off)
- APU START-CRANKING-FALSE START selector switch .... FALSE START
- APU START button .... Press for 1 to 2 s
- To stop the APU false start, the APU STOP button............................ Press for 1 to 2 s

After the APU false start, it is necessary to crank the APU.

MAIN ENGINE MAINTENANCE

The main engine false start, complete testing and check of the engine operation at takeoff and contingency power in flight are presented herein. Usual start, operating, stop and cranking procedures are prescribed in RFM, Section 2.

ENGINE FALSE START

Engine false start is performed for checking the systems check and in case of the fuel system preservation or depreservation (without switching on ignition).

To perform an engine false start, proceed as follows:

- Rotor brake.. On
- 2 RH (LH) fuel booster pump of the fuel system .... On
- ENG SHUT-OFF VLVS switch... Open, Check
- SHUT-OFF lever of the engine being started.......................... Open
- MAIN ENG START-CRANKING selector switch .... CRANKING
- LH (RH) START selector switch.. To the engine being started
- MAIN ENG START button .... Press for 1 to 2 s

When a false start is completed, it is necessary to perform cranking.

ENGINE COMPLETE TESTING

The main engine complete testing is performed after entry into service of a new engine, after fuel flow control unit replacement, after scheduled maintenance. Individual elements of complete testing procedures are performed after fuel flow control unit adjustment and upon comments from the crew.

The engine complete testing is performed when only the tested engine is operative. The second engine must be shut down.

- Helicopter .... Head in the wind
- Tested engine.. Start, Warm-up

Then proceed as follows:

Physical values of the N_1 RPM for corrected RPM (84 – 87) % at which the air bleed valves close and for not less than N_1 RPM 82 %, when the valves open for the given OAT – CALCULATE

Using A, B, C charts, supplied with the engine Logbook (sample in Fig. 2-6) DETERMINE N_1 RPM at take-off rating, rotor speed regulator adjustment mode and power indicator adjustment mode

The complete testing of the engine must be done in two stages in accordance with the graph in Fig. 2-5 in the following sequence:

FIRST STAGE

Air Bleed Valves Operation Check

By moving the throttle smoothly forward from IDLE to STOP – CAUSE BLEED VALVE to CLOSE and make sure it is closed by ear (the noise of the air jet escaping from the air bleed pipe stops) and/or by an ITT decrease by (20 – 50) °C

NOTES:
1. The air bleed valve can close when or after the throttle lever is set to the AUTO position or above it.
2. During one engine ground testing at different auto ratings (see below) to provide the nominal rotor speed it is recommended to set the throttle lever to the upper (or maintenance, see below) stop above the AUTO position.

Record N_1 RPM at the air bleed valve closing

By moving the throttle smoothly backwards to IDLE – CAUSE BLEED VALVE to OPEN and make sure it is opened by ear (the noise of the air jet escaping from the air bleed pipe starts) and/or by an ITT increase by (20 – 50) °C

Record N_1 RPM at the air bleed valve opening

Verify to the estimated and measured N_1 correlate well.

Engine Anti-Icing System Check

At OAT above +5 °C the ANTI-ICE SYS is checked manually and at OAT below +5 °C it is checked both automatically and manually.

Throttle lever of tested engine...AUTO

- At OAT below +5 °C:

LH (RH) ENG ANTI-ICE SYS light ON in automatic mode ....Check

LH (RH) ENG ANTI-ICE SYS selector switch...OFF

LH (RH) ENG ANTI-ICE SYS light .... off, Check

LH (RH) ENG ANTI-ICE SYS selector switch .... MAN ENG

LH (RH) ENG ANTI-ICE SYS lights .... on, Check
(simultaneously ITT increases to 60 °C and N_1 can rise by 2 %)

LH (RH) ENG ANTI-ICE SYS selector switch .... AUTO (Cap close)

LH (RH) ENG ANTI-ICE SYS lights .... on

- At OAT above +5 °C:

  LH (RH) ENG ANTI-ICE SYS selector switch .... MAN ENG

  LH (RH) ENG ANTI-ICE SYS lights .... on, Check
  (simultaneously ITT can increase to 60 °C and N_1 value can increase by 2 %)

  LH (RH) ENG ANTI-ICE SYS selector switch .... OFF

  LH (RH) ENG ANTI-ICE SYS lights .... off, Check

  LH (RH) ENG ANTI-ICE SYS selector switch .... AUTO (Cap close)

Partial Acceleration Time Check

- Throttle .... upper stop
- N_1 RPM .... determine
- Throttle .... IDLE
- Move the throttle from IDLE to upper stop during (1 – 2) s and using a stop watch mark the time of the throttle reversal to N_1 RPM that is 1 – 1.5 % lower than that determined value for the throttle upper position. The time shall be (3 – 6) s.

Rotor RPM Governor Check

The check is performed with the help of a special maintenance stop installed in the engine control system according to the Maintenance Manual

- Using Graph B (supplied with the engine Logbook) determine the gas generator rotor speed (N_1) for the given ambient temperature
- Shift the throttle lever of the tested engine to the maintenance stop
- by smooth one way motion of the collective pitch control lever set gas generator rotor speed value, determined from Graph B with accuracy of ±0.5 %
- Check steady rotor speed is (89.2 – 90.2) % (preferably in the lower part of this range)

NOTE. If the helicopter is operated with an underslung load (at logging) the N_R value shall be (90 +0.5) %

- Collective – Full down.

EEG Gas Generator Circuit Check

- Using Graph A of the engine Logbook, determine N_1 RPM for the measured temperature.
- With the throttle lever at the upper stop, EEG TEST TC selector switch – TC.
- Gradually increase the collective pitch until POWER LIMIT light of this engine lights up. At this moment N_1 shall be (4 ±1) % less than the N_1 value by Graph A and shall not increase with a further increase of collective pitch that testifies to the proper operation of the EEG TC circuit.
- EEG TEST TC switch – OPER
- Collective – Full down

EEG free turbine circuit check

- Throttle lever – IDLE
- EEG TEST FRT1 – FRT2 selector switch – FRT-1
- At the minimum collective pitch move smoothly the throttle lever forward till red LH (RH) ENG OVERSPEED light and MWL start to glow and an audio signal is head in the crew headsets at N_1 = (84.5 – 88.5) %
- Using the throttle lever reduce N_1 by (5 – 7) %. The lights and audio signal shall remain on
- Set the EEG TEST selector switch to OPER position. The lights and audio signal should go dead
- EEG TEST selector switch – FT-2
- Move smoothly the throttle forward till the above mentioned lights illuminate at N_1 = (81.5 – 88.5) %
- Using the throttle lever reduce main rotor speed by (5 – 7) %. The lights shall still be on
- Set vigorously the selector switch from FT-2 to FT-1 position without fixing it in the OPER position. The lights shall still be on
- Move forward the throttle lever to accelerate the rotor. With N_1 reaching (84.5 – 88.5) % the engine shall stop automatically
- Close the shut-off valve of the tested engine after N_1 becomes 2 to 5 % lower than N_1 at IDLE
- Deenergize the EEG, check the warning lights to go out
- EEG TEST selector switch – OPER

Having completed First Stage of testing, remove the maintenance stop from the engine control system.

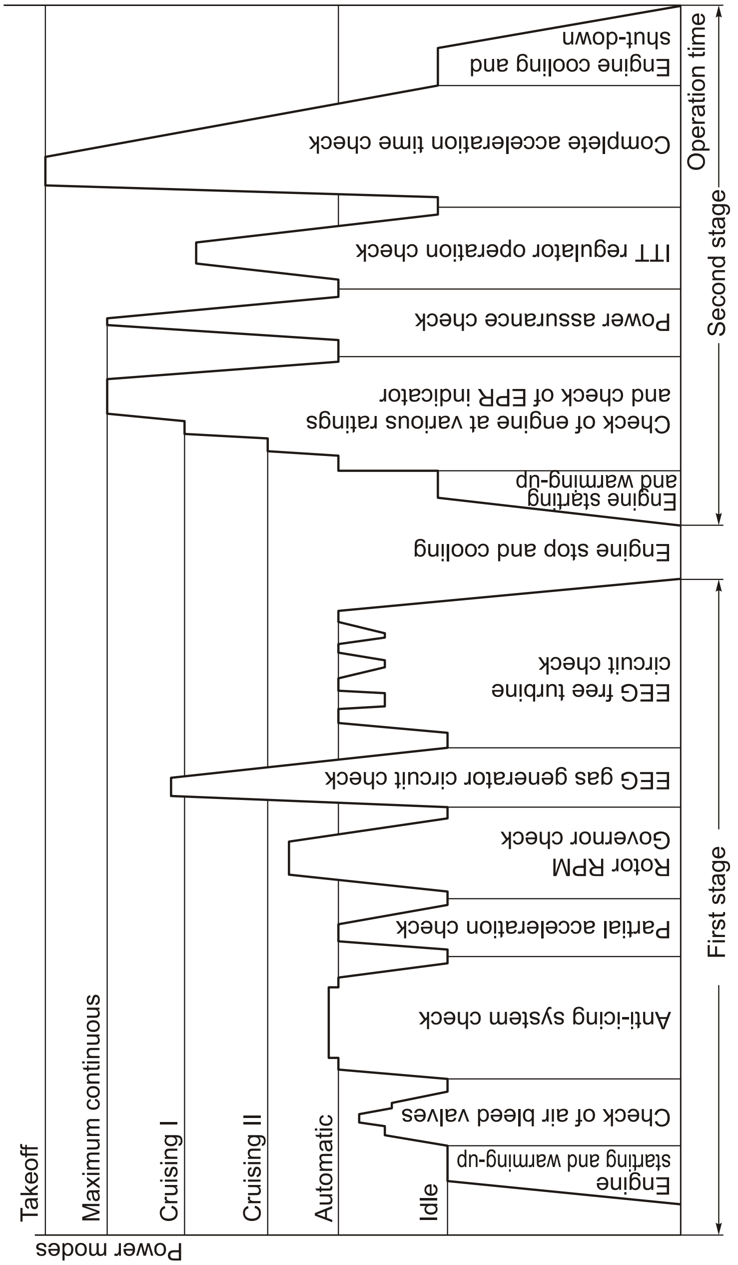


Fig. 2-5. Main Engine Complete Testing Chart.

SECOND STAGE

Start the engine.

Power Indicator Adjustment

NOTE. The power indicator is adjusted to the engine with which it interacts, when a new engine or power meter is installed or both of them are installed; as well as after scheduled maintenance or in other cases if required

The power indicator adjustment shall be done according to Maintenance Manual.

Power Assurance Check

CAUTION. THIS CHECK SHALL BE MADE ONLY USING A POWER INDICATOR THAT IS ADJUSTED TO THE GIVEN ENGINE

The check shall be done according to RFM, Section 4.

ITT Regulator Operation Check

NOTE. This check shall be made only under such t_{amb} values on the ground when the gas temperature of 850 °C and N_1 = 87 % can be reached prior to the helicopter lift off with one engine inoperative.

- By using collective lever select the engine power rating at which the gas temperature is lower than 850 °C but N_1 is not less than 87 %
- Press ENG TEMP REG TEST push button
- Check POWER LIMIT light ON, gas temperature and N_1 decrease (not below 84 %)
- Release ENG TEST push button
- Check POWER LIMIT light OFF, gas temperature and N_1 increase
- Collective – Full down
- Throttle – IDLE

Complete Acceleration Time Check

This check is carried out with the EEG switched on and 2.5 min contingency power off. (Both switches are located on the central pedestal).

- Abruptly move the throttle from the initial IDLE position to the upper stop and at the same time start a stop watch.

- When N_1 becomes (1 – 1.5) % lower than Graph A value, stop the watch and return the throttle abruptly to IDLE position

The complete acceleration time of the properly adjusted engine must not exceed 6 s.

NOTE. N_R of the unduly adjusted engine can approach the nominal value of 90 % while N_1 value has not yet approached its maximal value. Do not allow N_R to exceed 96 % by increasing the collective pitch during this check.

CHECK OF ENGINE OPERATION AT TAKEOFF POWER IN FLIGHT

Engine operation at takeoff and contingency power is checked with AIS and HEATER OFF in flight. Before flight, the single engine airspeed range must be determined according to Manufacturer's Data Section 3.

In a level flight at selected airspeed proceed as follows:

- EEG .... on, Check
- 2.5 MIN PWR selector switch .... OFF
- Throttle lever of tested engine .... Up to the upper stop
- Throttle lever of the other engine .... Smoothly to IDLE till N_1 reaches 78…80% (no less than 78%)
- Collective .... Increase to (85.5 – 86.5) % rotor RPM
- POWER LIMIT light .... on, Check

NOTE. When the collective increases, the throttle lever of the tested engine may displace towards the AUTO position. Do not correct the throttle lever of the tested engine.

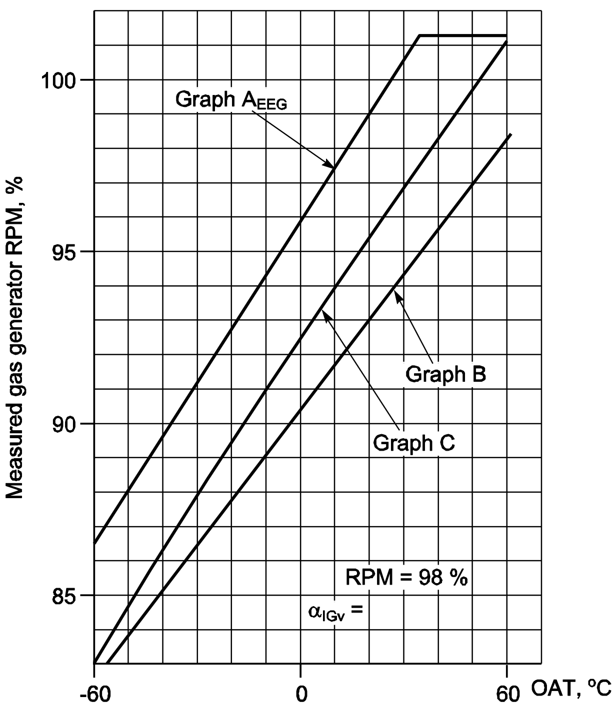
- After steady power duration for 10 to 20 s, Gas Generator RPM N_1 and Rotor RPM .... Write down
- 2.5 MIN PWR selector switch .... ON for 10 to 20 s

- 2.5 MIN EEG light .... on
- LH (RH) 2.5 MIN PWR LIMIT light .... on, Check
- Gas Generator RPM N1 increase by 1 % above the takeoff limit ..... Check
- 2.5 MIN PWR selector switch.. OFF
- Smoothly moving throttle lever of the other (not tested) engine from IDLE to AUTO at constant collective pitch and altitude, increase the rotor RPM to (88.5 – 89) %
- Airspeed increase .... Check

NOTE. While increasing the Rotor RPM determine the tested engine N_1 variation. Its reduction by not more than 0.5 % is allowed which testifies to the absence of fuel flow decrease at take-off power

- Both throttles.. AUTO

Check the other engine according to the prescribed procedure (if necessary).



Graph A_{EEG} – observed gas generator rotor speed versus temperature sensing probe inlet air temperature at takeoff power condition

Graph B – observed gas generator rotor speed versus temperature sensing probe inlet air temperature at constant (330±10) kg/h fuel flow rate

Graph C – observed gas generator rotor speed versus temperature sensing probe inlet air temperature at maximum continuous power condition

Fig. 2-6. Gas Generator RPM Versus OAT (Sample).

SECTION 3. OPERATIONAL INFORMATION

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SECTION 3. OPERATIONAL INFORMATION

This section contains additional information that can be useable for flight planning.

CALCULATION OF REQUIRED FUEL

The required fuel quantity shall be calculated as the sum of fuel consumed at each flight stage, en-route fuel reserve and unusable fuel.

The unusable fuel quantity is 44 lb (20 kg).

Fuel consumption on the ground is 13.23 lb/min (6 kg/min).

The charts for calculating fuel flow rate are presented for all expected operational conditions: for outside air temperatures from minus 50 °C to (t_{ISA}+ 30) °C, for pressure altitudes from sea level to 16000 feet (5000 m), for helicopter flight weights from minimum to maximum.

The given fuel flow data are presented with account for anti-icing system (AIS) on at outside air temperature of +5 °C and lower.

FUEL FLOW RATE AT HOVER

Hourly fuel flow rate at hover is given in Fig. 3-1.

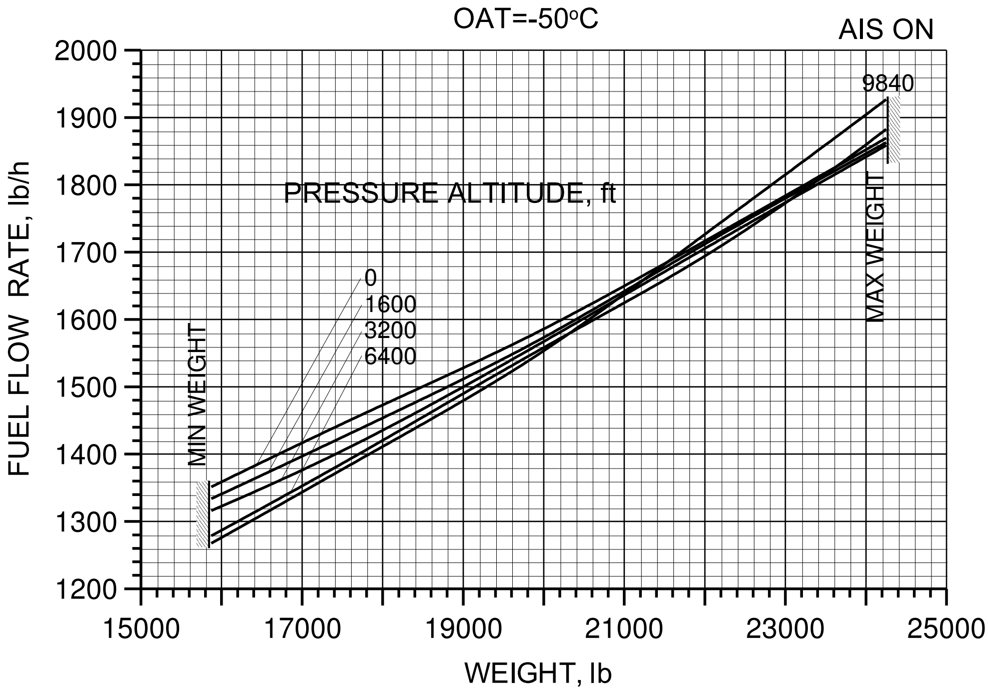
Example:

To determine the hourly fuel flow rate of the 9000 kg (19840 lbs) helicopter in hover at pressure altitude of 500 m (1600 feet) in conditions of (t_{ISA}+ 20) °C.

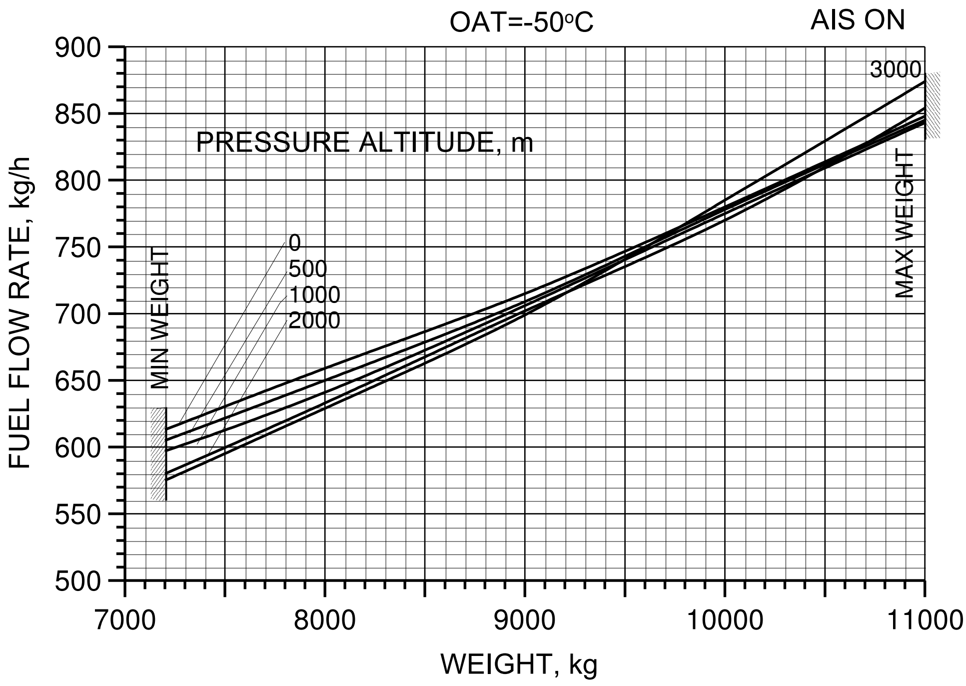
Solution: On the chart of Figure 3-1 (sheet 6) find a point 9000 kg (19840 lbs) on «Weight» axis and from this point move vertically upward until intersection with «Pressure altitude» 500 m (1600 feet) line;

from the intersection point with this line move leftward and read the answer on «Fuel flow rate» axis.

Answer: For 9000 kg (19840 lbs) helicopter at pressure altitude of 500 m (1600 feet) at outside air temperature of (t_{ISA}+ 20) °C the hourly fuel flow r at hover makes 695 kg/h (1530 lb/h).

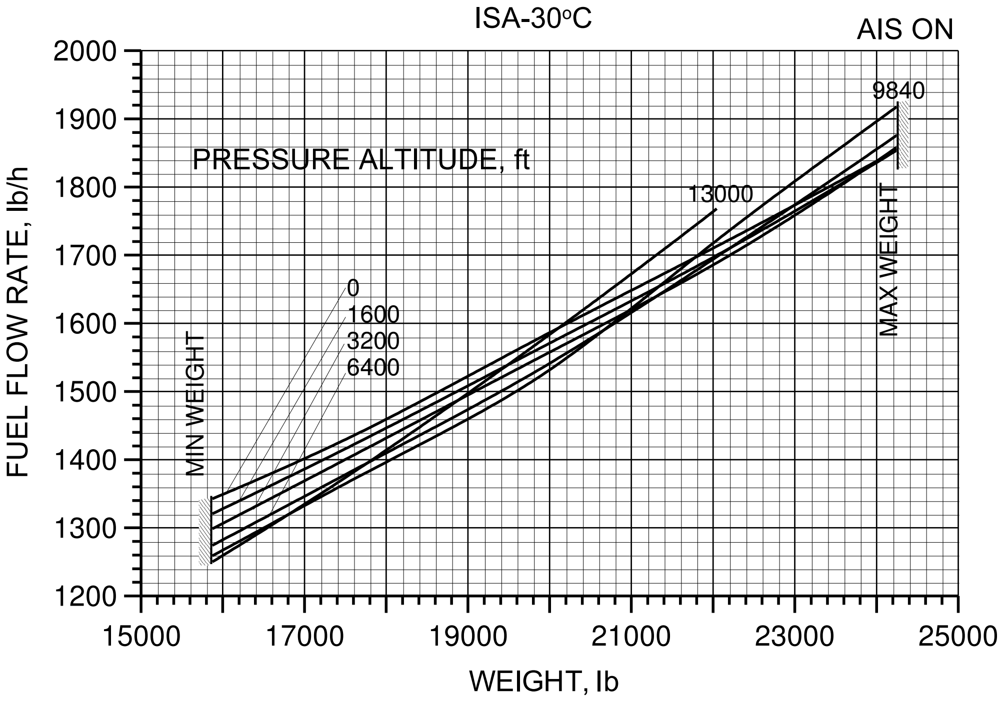


(BRITISH SYSTEM)

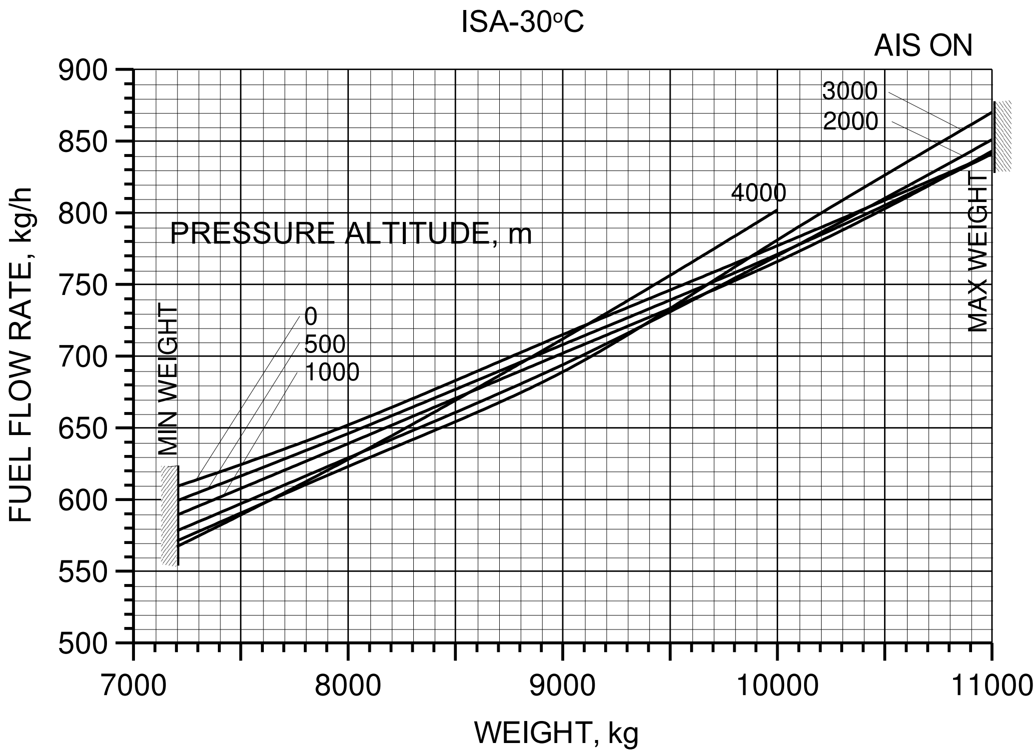


(METRIC SYSTEM)

Fig.. 3-1 (Sheet 1 of 7). Fuel Flow Rate at Hover.

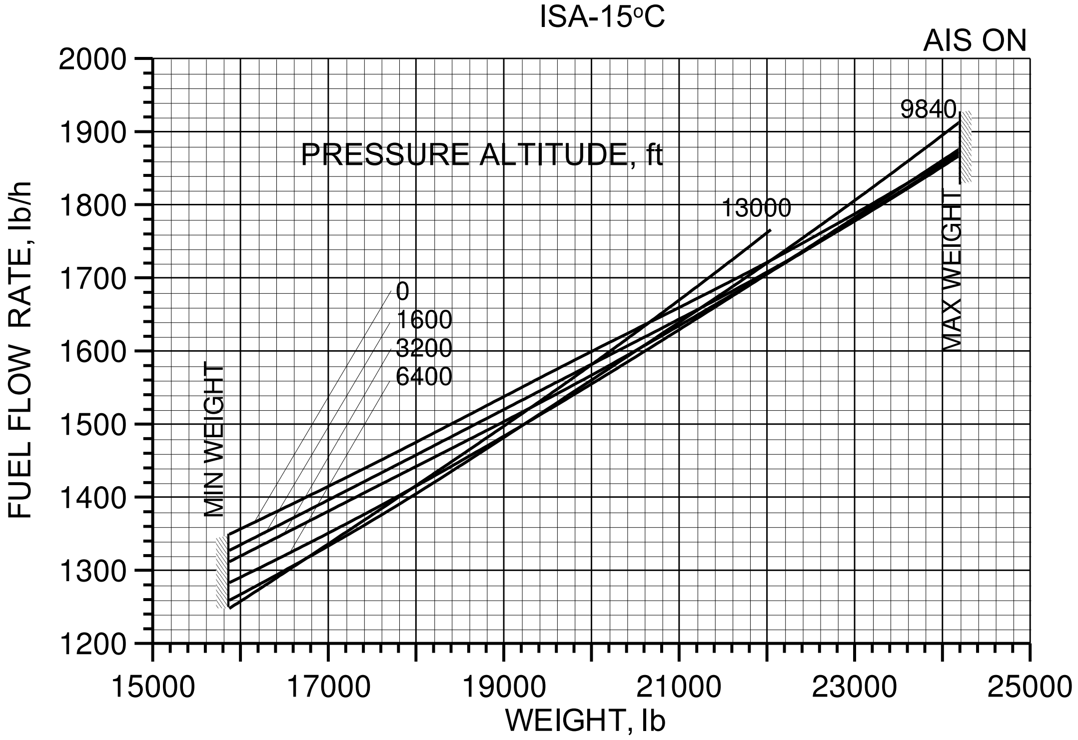


(BRITISH SYSTEM)

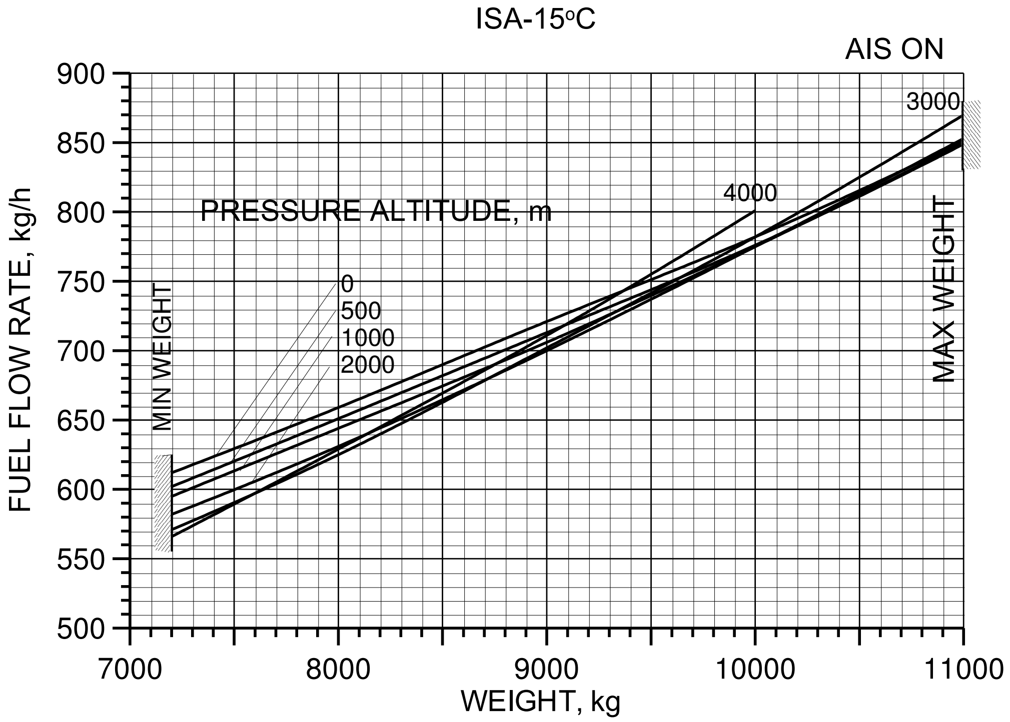


(METRIC SYSTEM)

Fig. 3-1 (Sheet 2 of 7). Fuel Flow Rate at Hover.

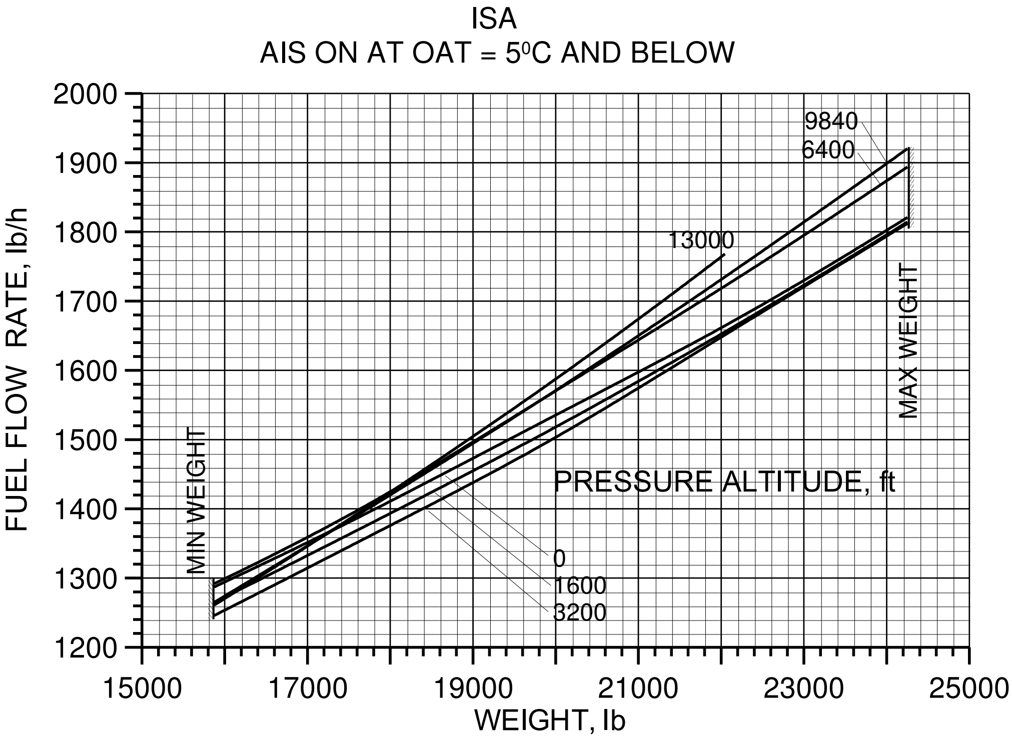


(BRITISH SYSTEM)

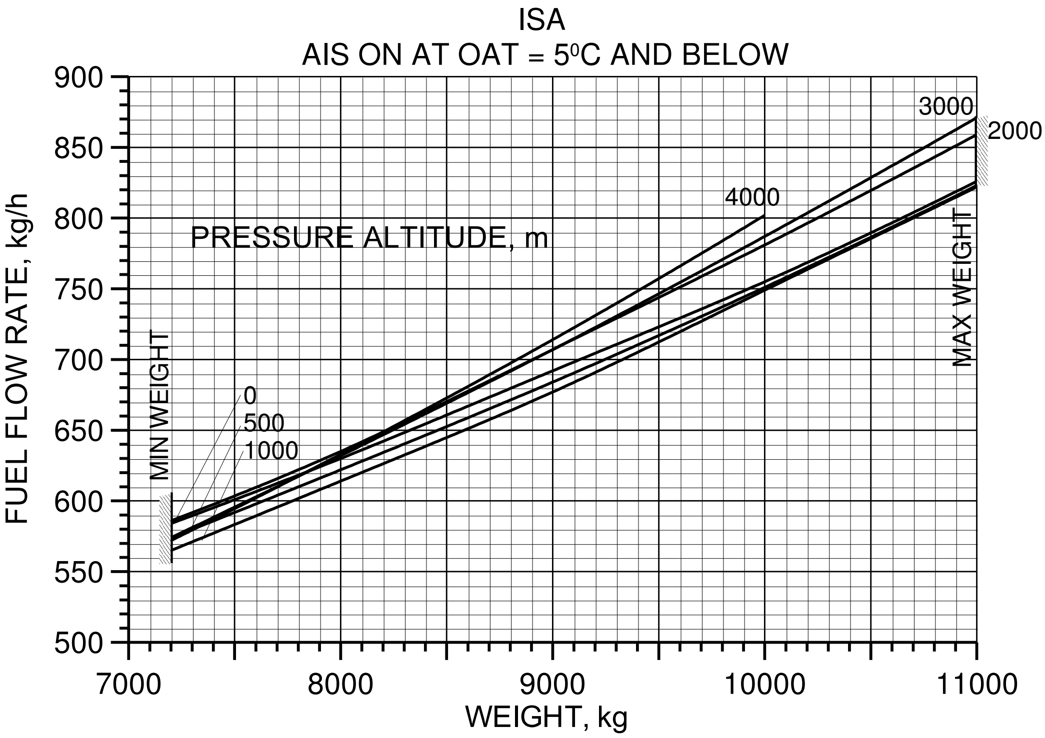


(METRIC SYSTEM)

Fig. 3-1. (Sheet 3 of 7). Fuel Flow Rate at Hover.



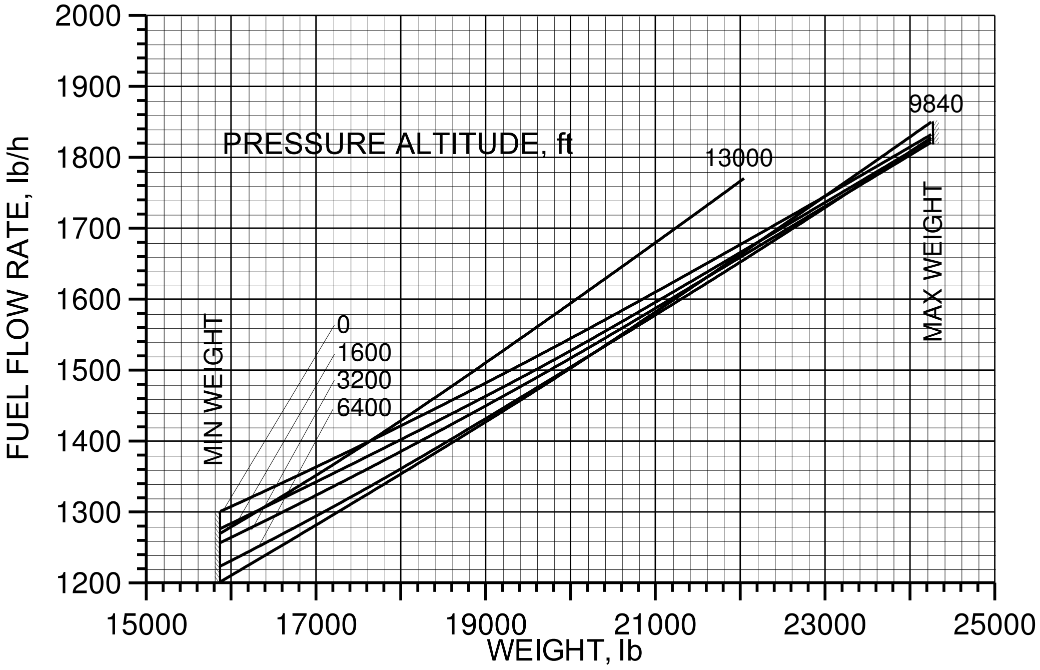
(BRITISH SYSTEM)



(METRIC SYSTEM)

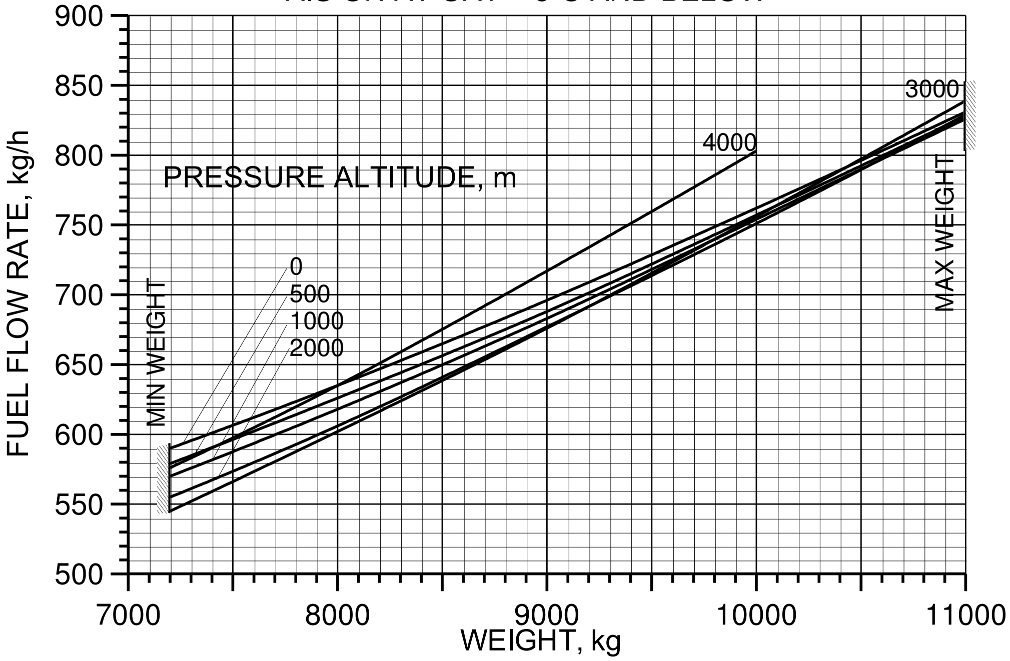
Fig. 3-1. (Sheet 4 of 7). Fuel Flow Rate at Hover.

ISA+10°C
AIS ON AT OAT = 5°C AND BELOW



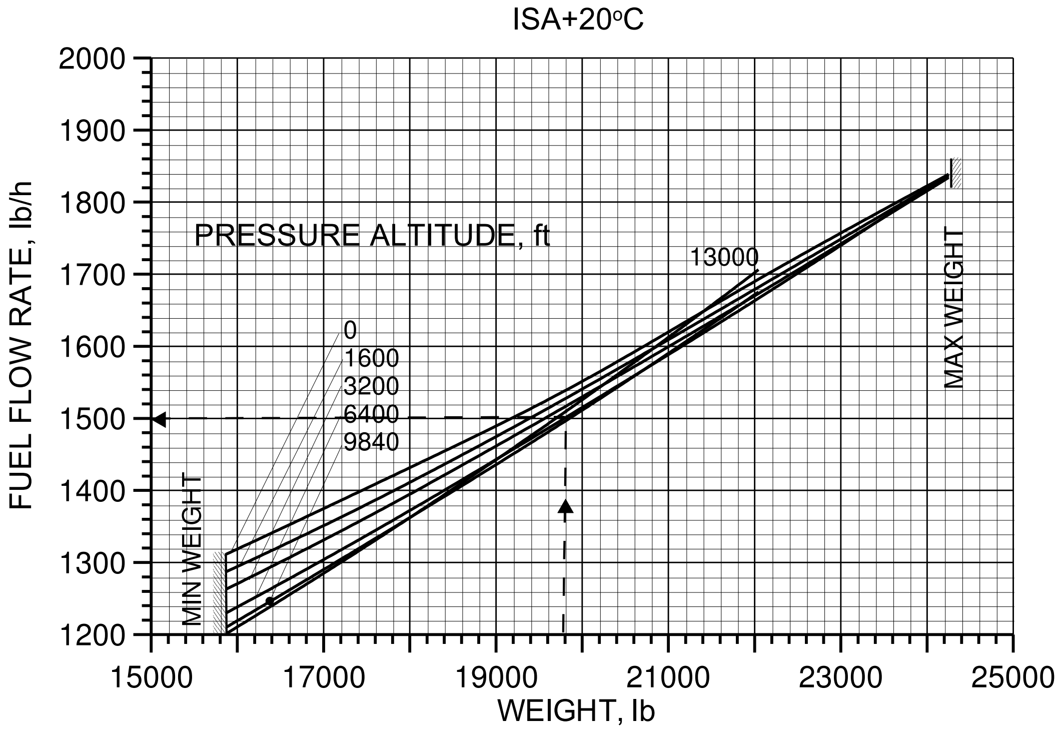
(BRITISH SYSTEM)

ISA+10°C
AIS ON AT OAT = 5°C AND BELOW

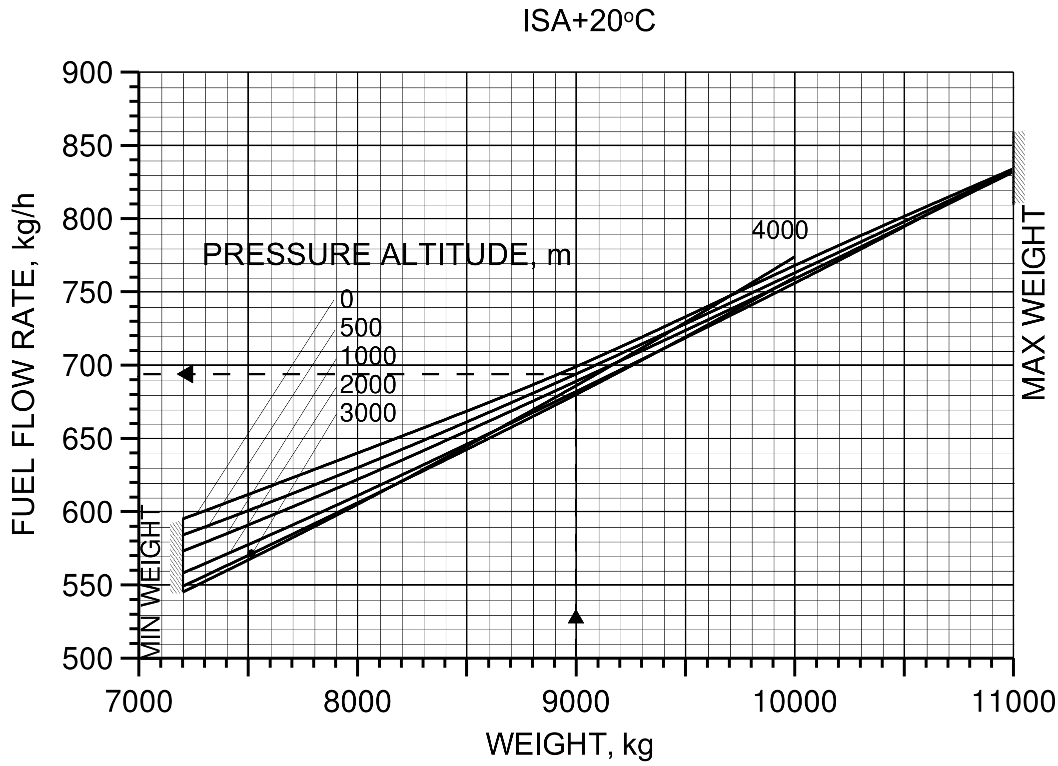


(METRIC SYSTEM)

Fig. 3-1. (Sheet 5 of 7). Fuel Flow Rate at Hover.

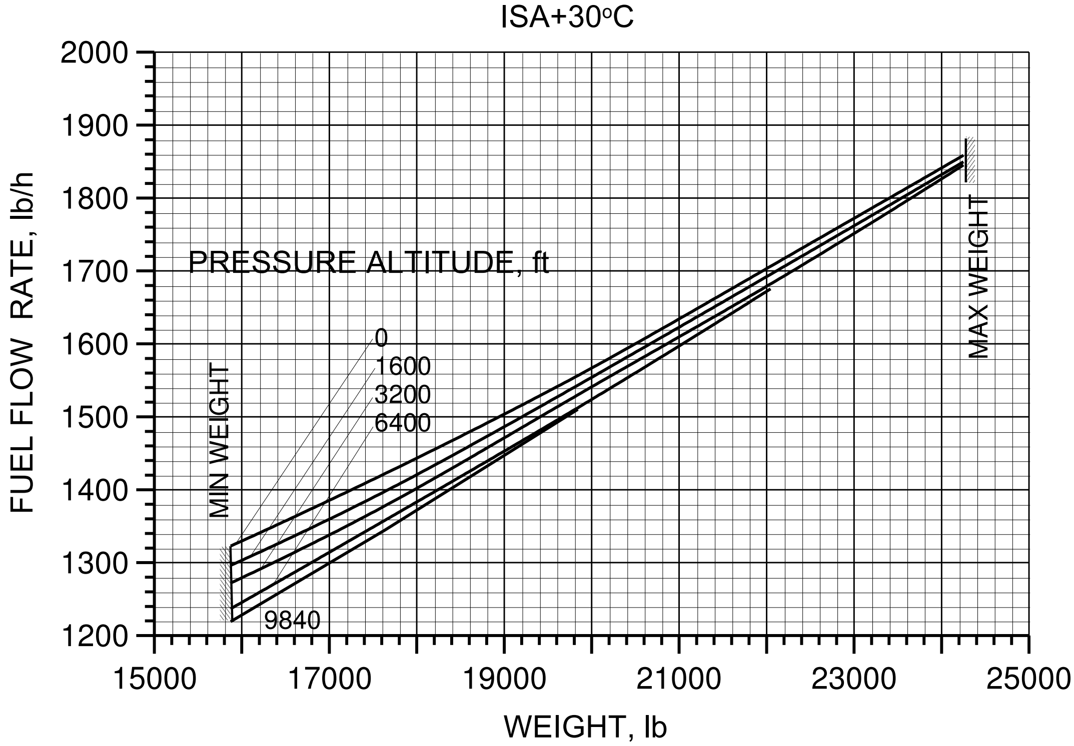


(BRITISH SYSTEM)

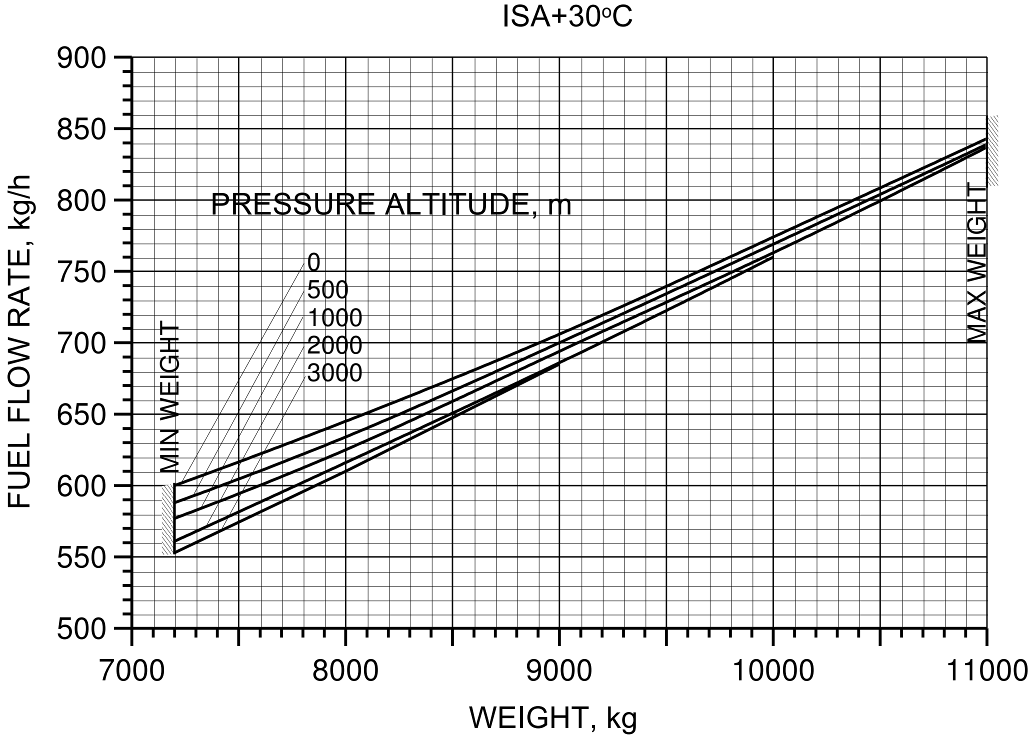


(METRIC SYSTEM)

Fig. 3-1. (Sheet 6 of 7). Fuel Flow Rate at Hover.



(BRITISH SYSTEM)



(METRIC SYSTEM)

Fig. 3-1. (Sheet 7 of 7). Fuel Flow Rate at Hover.

FUEL CONSUMPTION PER MILE (KM) AT BEST FLIGHT SPEED IN MAXIMUM RANGE FLIGHT

Minimum fuel consumption per mile (km) in maximum range flight for various conditions is presented on the charts of Fig. 3-2. The respective best indicated airspeed in maximum range flight is given in the charts of Fig. 3-3.

Example:

To determine minimum fuel consumption per mile (km) and the best airspeed for a 10000 kg (22000 lb) helicopter in flight at pressure altitude of 1000 m (3200 feet) in ISA conditions.

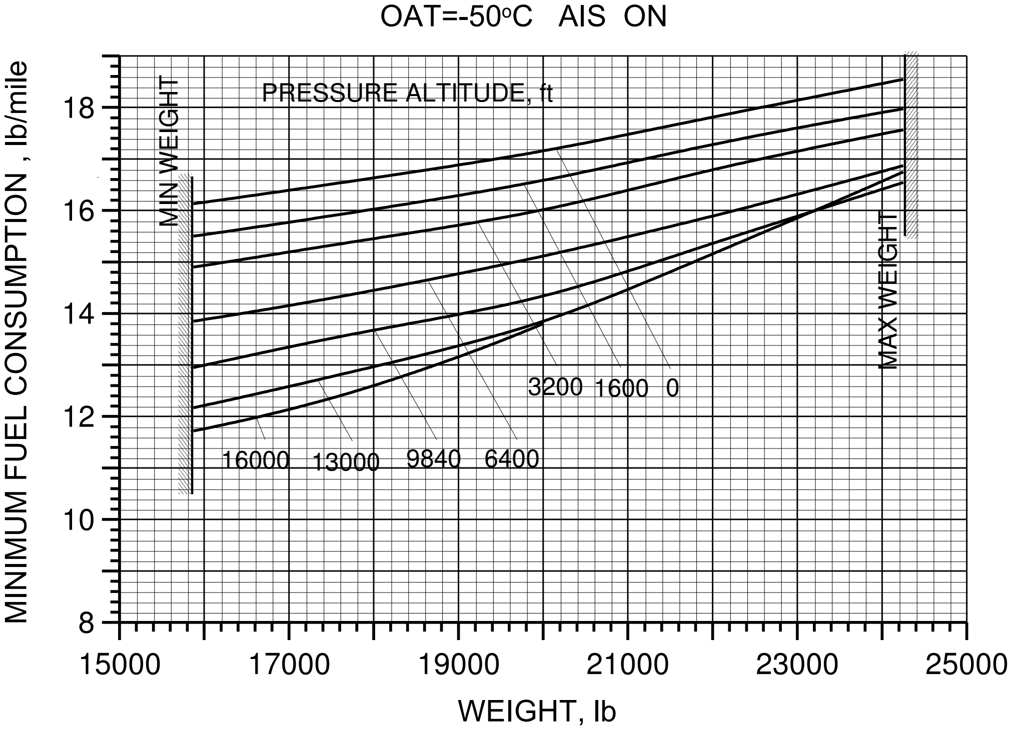
Solution: On the chart of Fig. 3-2 (sheet 4) from 10000 kg (22000 lb) point on «Weight» horizontal axis move vertically upward until the intersection with «Pressure altitude» of 1000 m (3200 feet) line;

from this point move leftward to «Minimum fuel consumption» axis and read 3 kg/km (12,3 lb/mile).

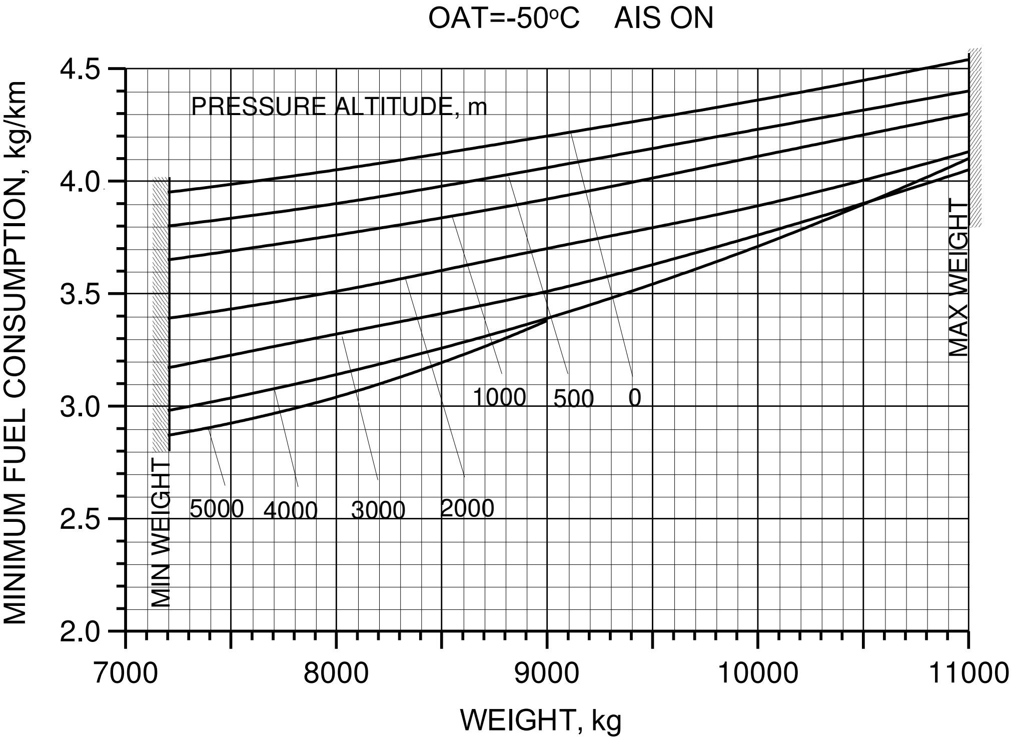
On the chart of Fig. 3-3 (sheet 3) from 10000 kg (22000 lb) point on «Weight» horizontal axis move vertically upward until the intersection with «Pressure altitude» of 1000 m (3200 feet);

from this intersection point move leftward to «Indicated Airspeed» vertical axis and read the indicated speed in maximum range flight of ≈ 212 km/h (≈ 115 knots).

Answer: For the given conditions the minimum fuel consumption per mile (km) is 3 kg/km (12,3 lb/mile), flight speed at maximum range is 212 km/h (115 knots).

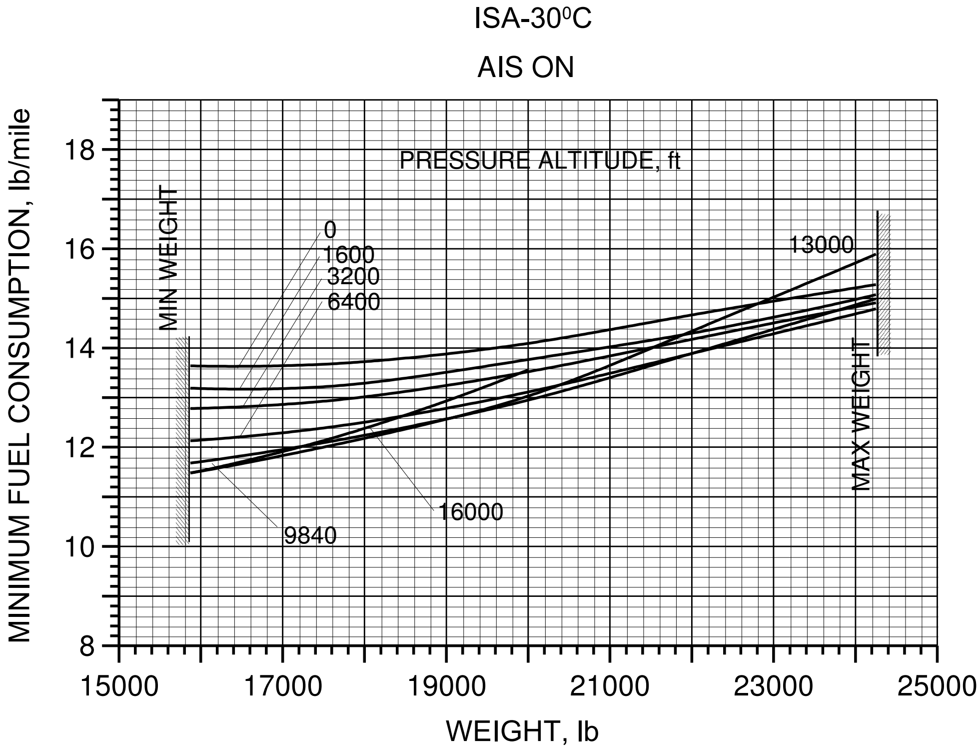


(BRITISH SYSTEM)

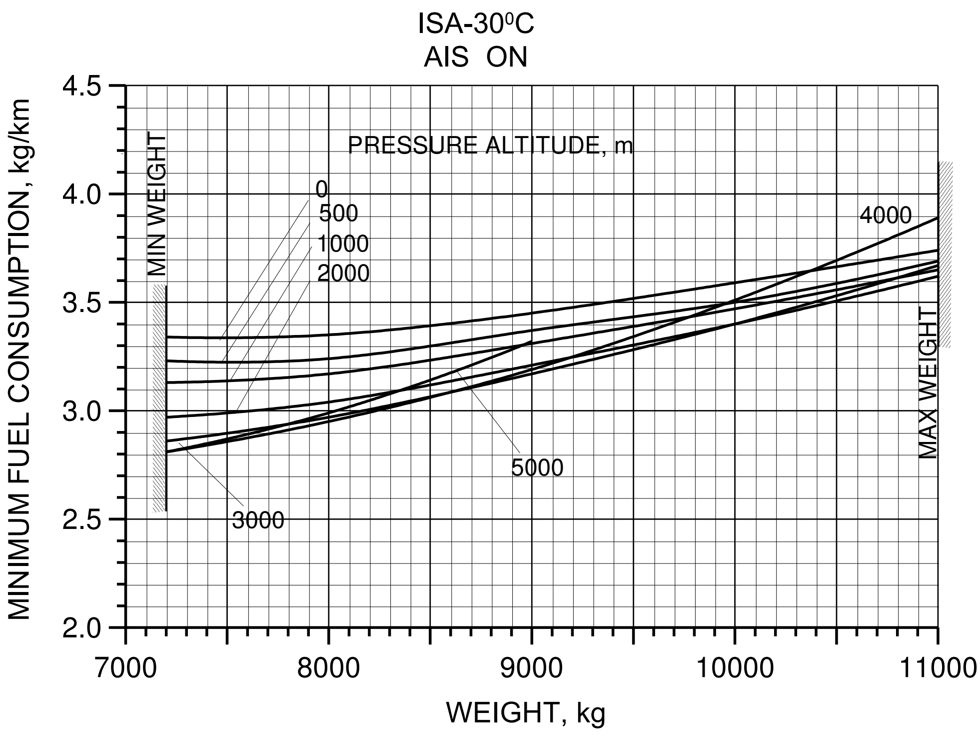


(METRIC SYSTEM)

Fig. 3-2. (Sheet 1 из 7). Fuel Consumption per mile (km) at Best Range Speed in Maximum Range Flight.

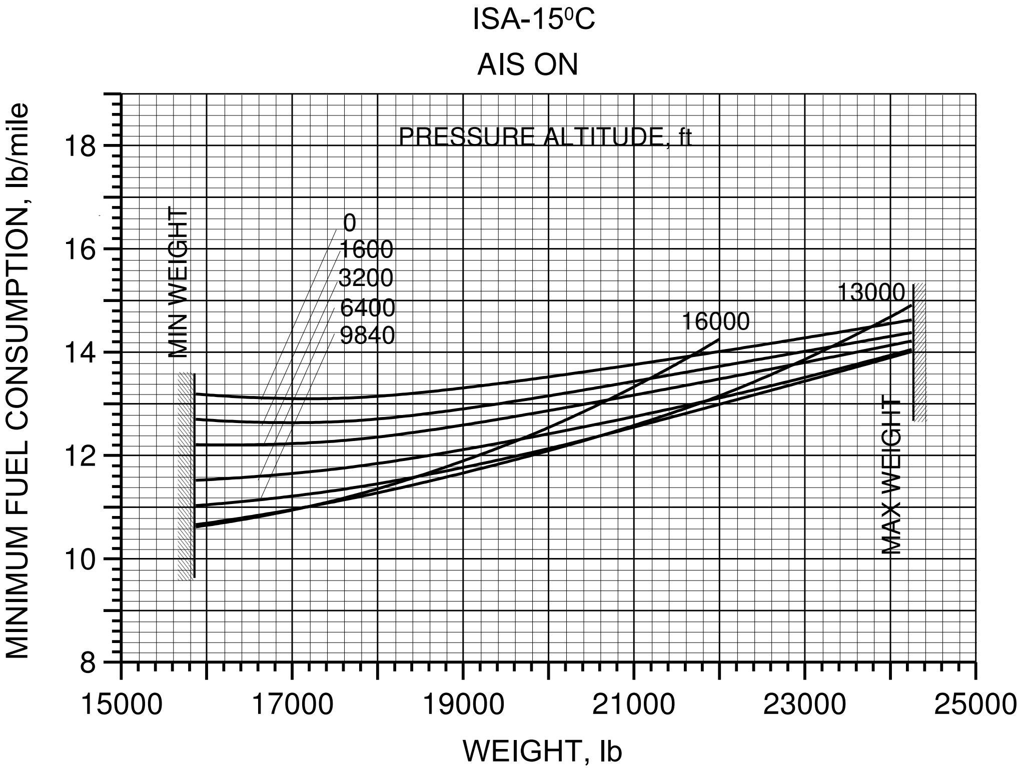


(BRITISH SYSTEM)



(METRIC SYSTEM)

Fig. 3-2. (Sheet 2 из 7). Fuel Consumption per mile (km) at Best Range Speed in Maximum Range Flight.



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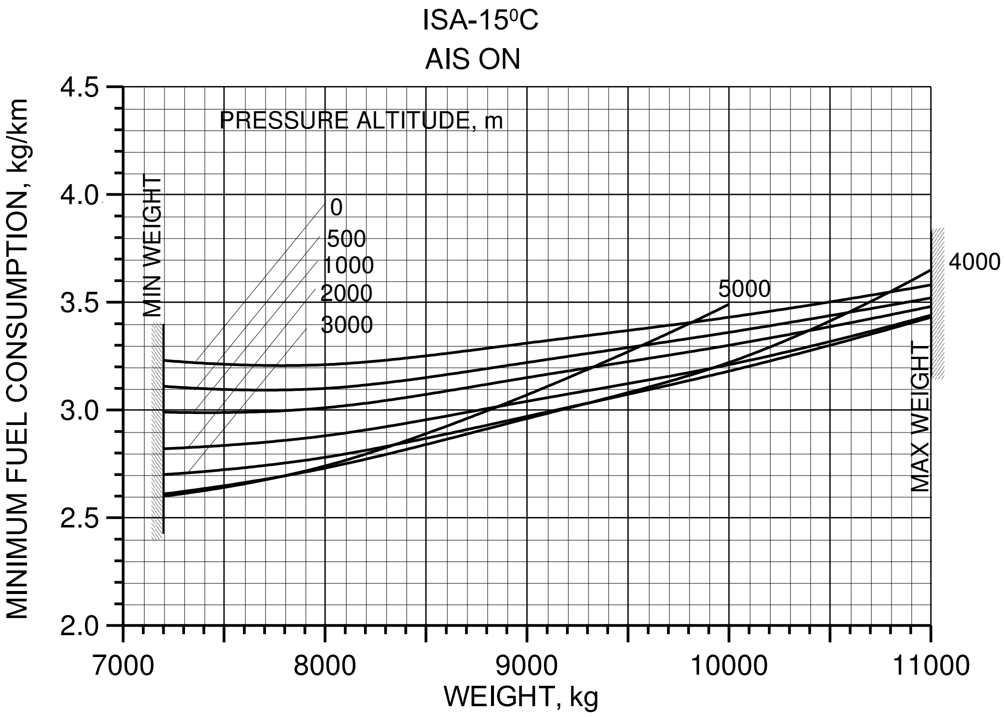
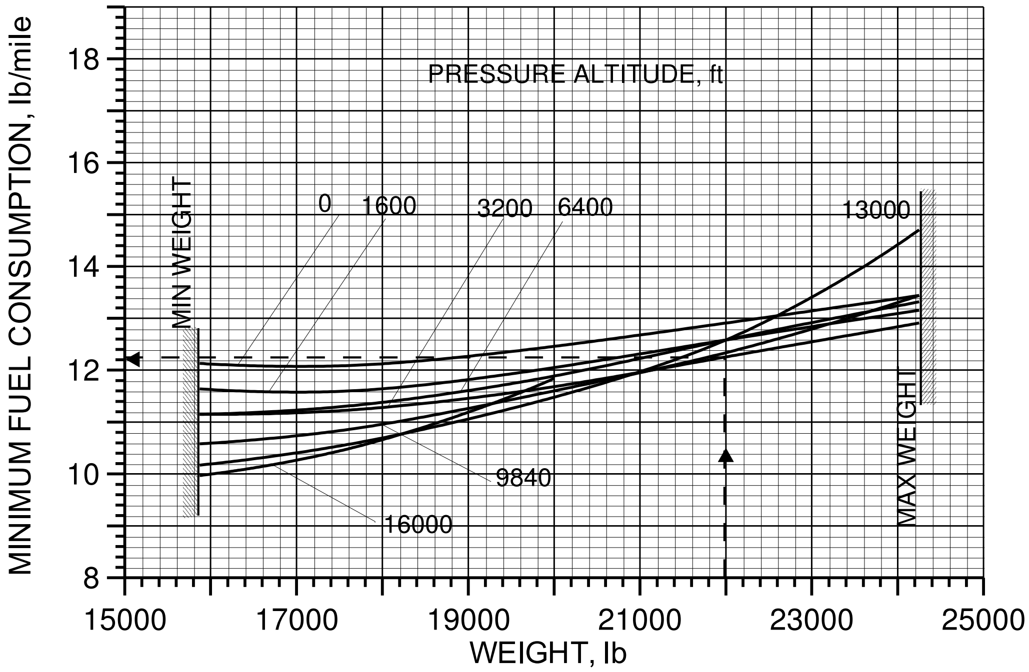


(METRIC SYSTEM)

Fig. 3-2. (Sheet 3 из 7). Fuel Consumption per mile (km) at Best Range Speed in Maximum Range Flight.

ISA

AIS ON AT OAT = 5⁰C AND BELOW



(BRITISH SYSTEM)

ISA

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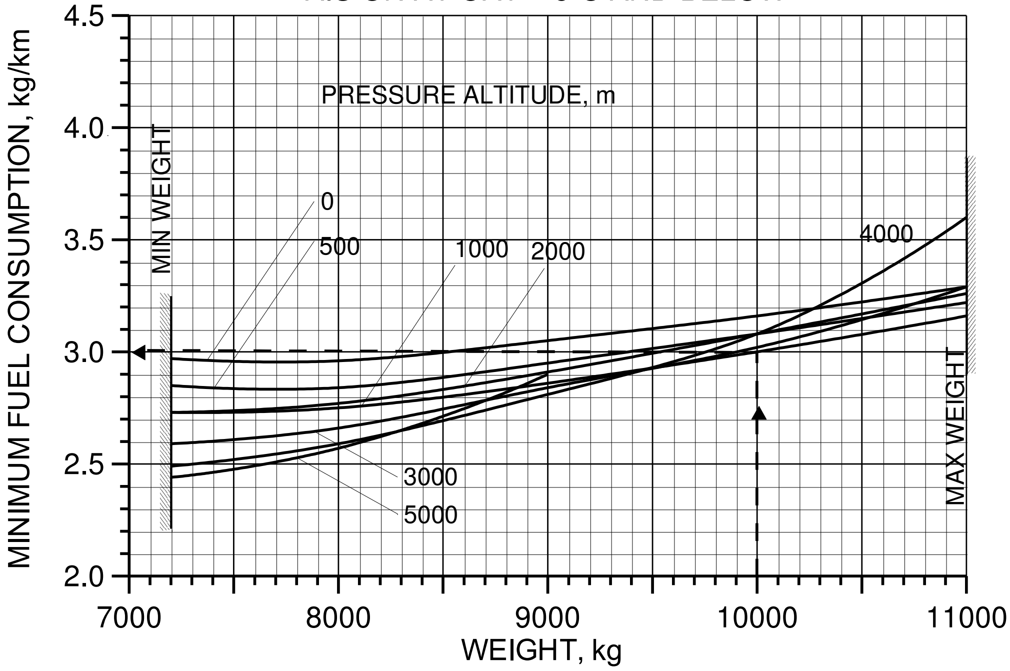
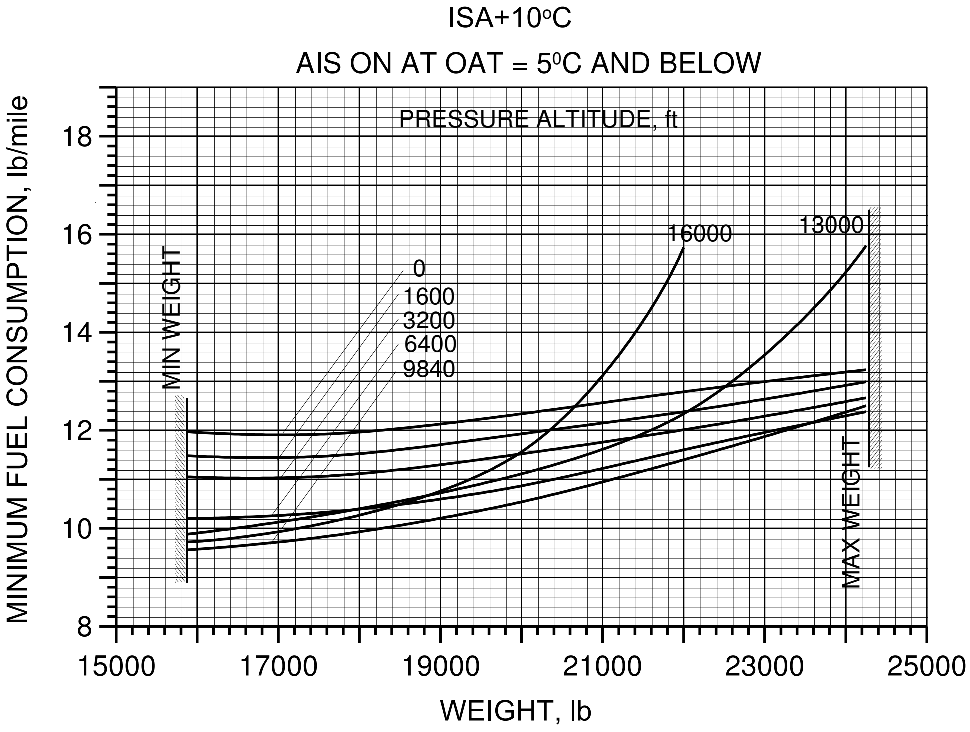


(METRIC SYSTEM)

Fig. 3-2. (Sheet 4 из 7). Fuel Consumption per mile (km) at Best Range Speed in Maximum Range Flight.



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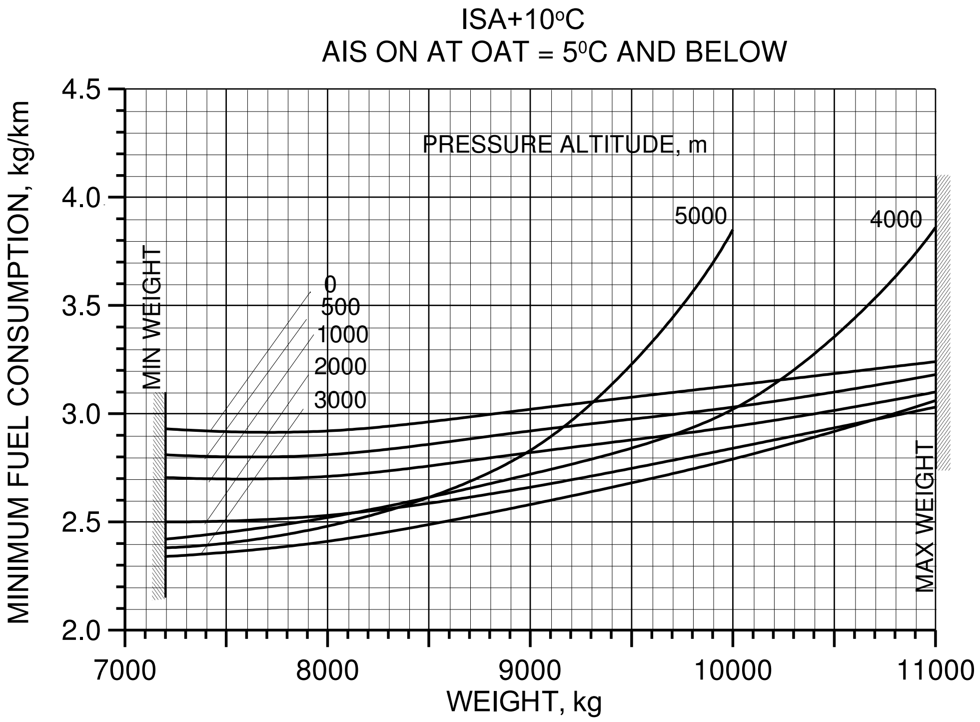
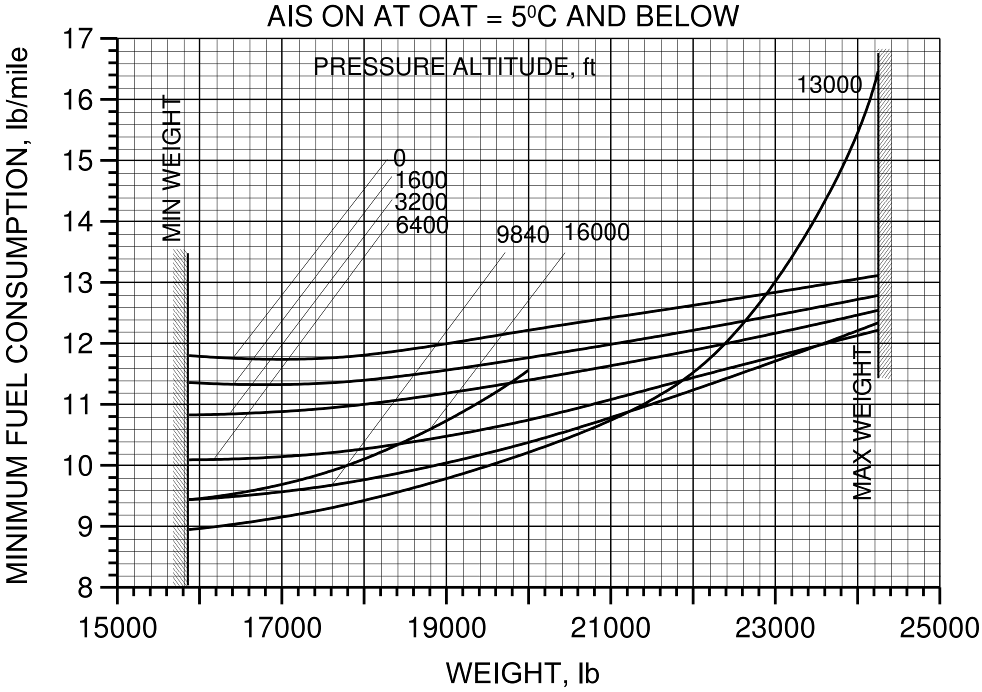


(METRIC SYSTEM)

Fig. 3-2. (Sheet 5 из 7). Fuel Consumption per mile (km) at Best Range Speed in Maximum Range Flight.

ISA+20°C

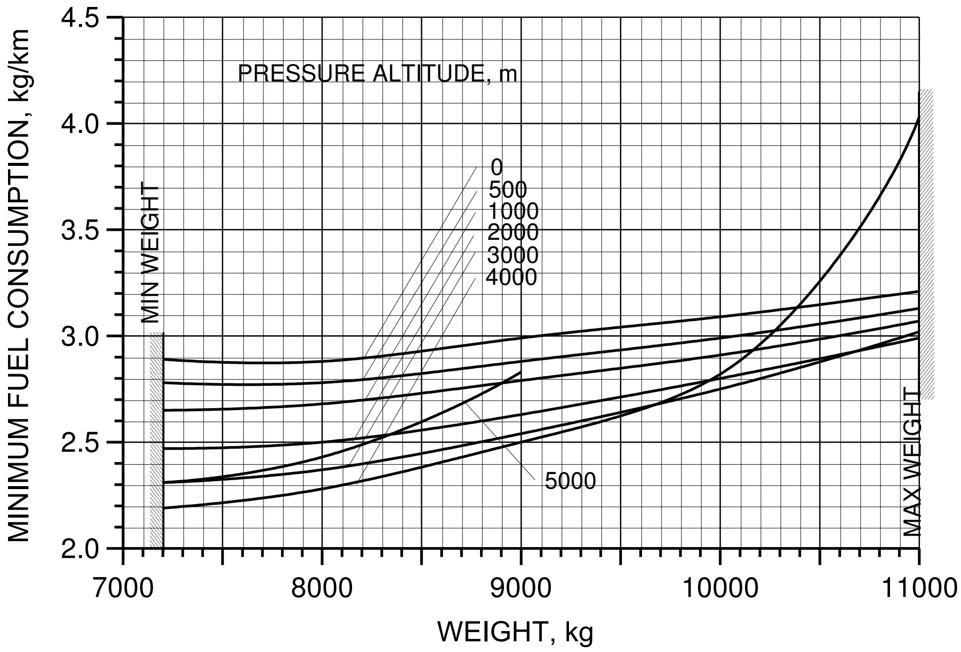
AIS ON AT OAT = 5°C AND BELOW



(BRITISH SYSTEM)

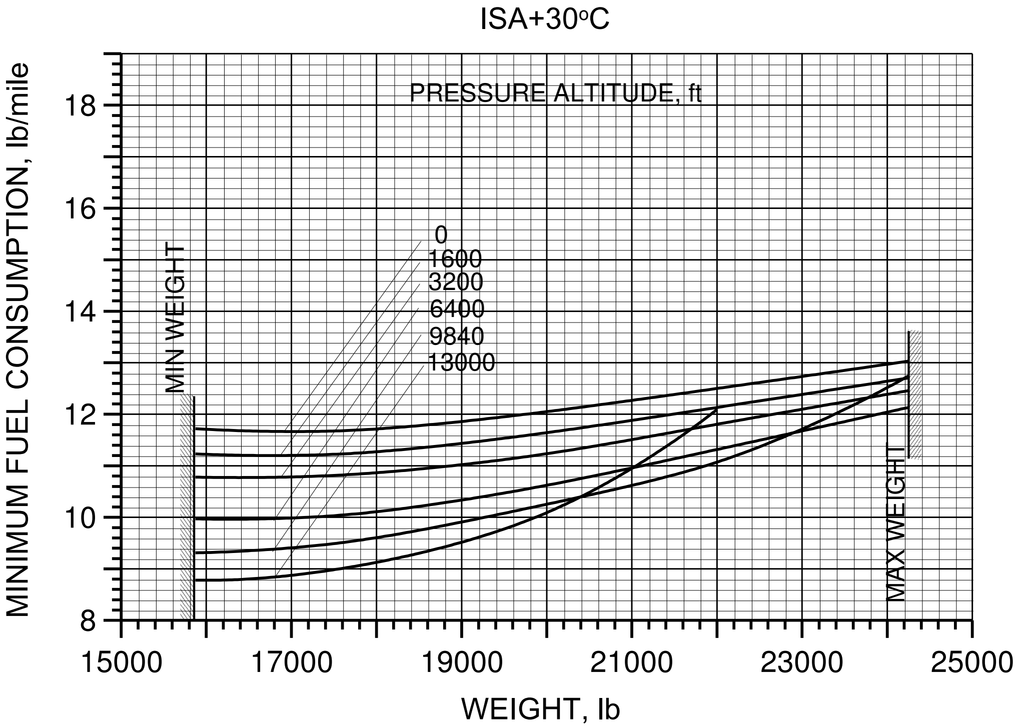
ISA+20°C

AIS ON AT OAT = 5°C AND BELOW



(METRIC SYSTEM)

Fig. 3-2. (Sheet 6 из 7). Fuel Consumption per mile (km) at Best Range Speed in Maximum Range Flight.



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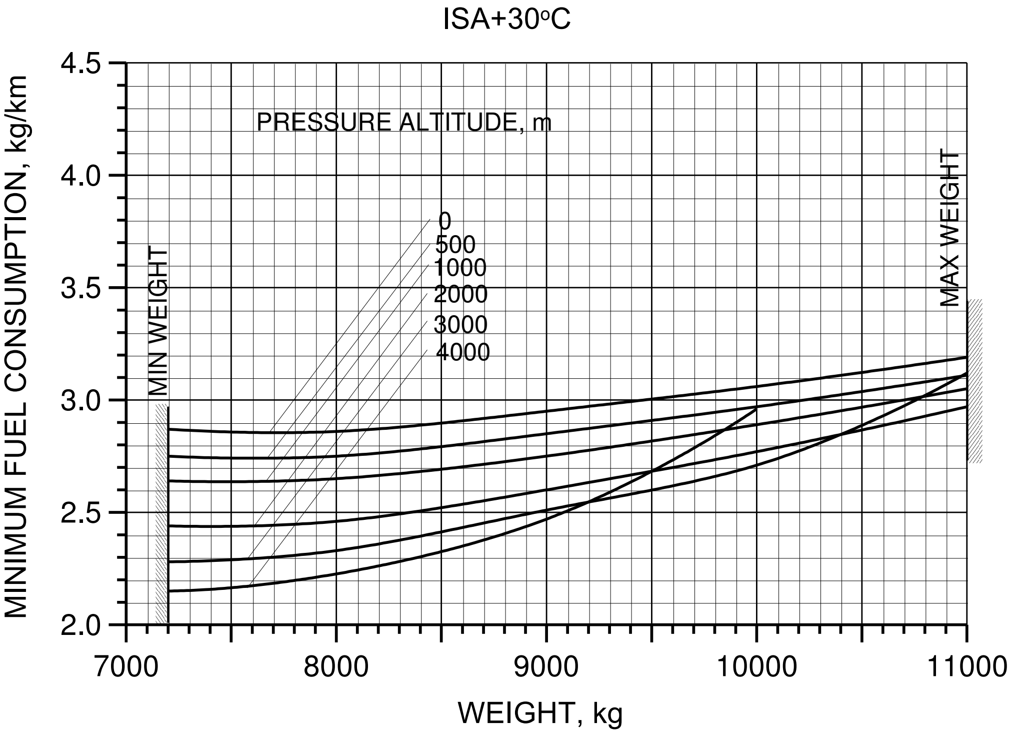
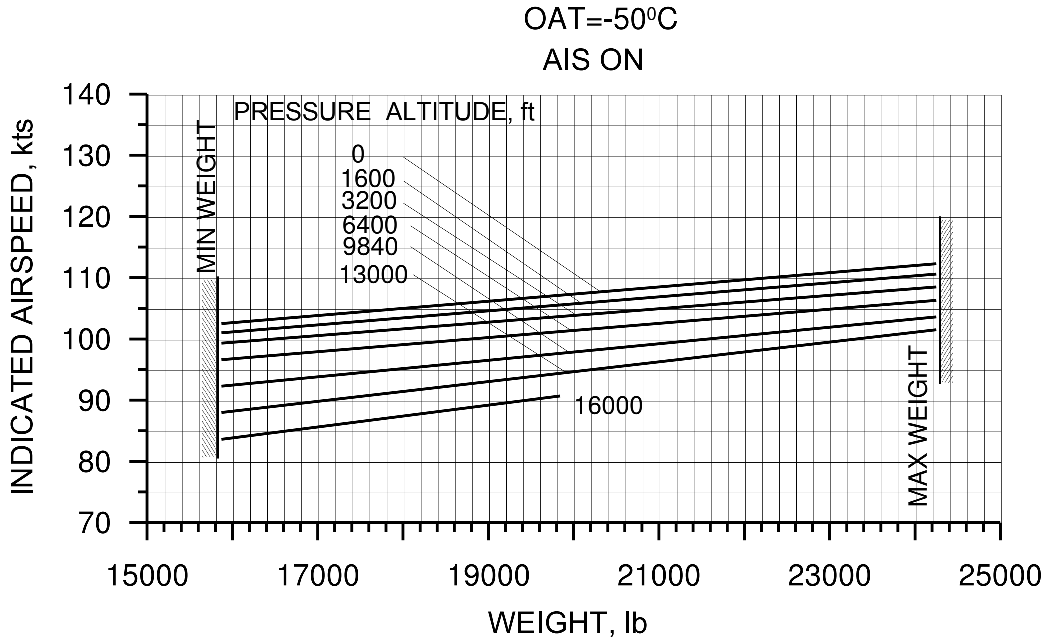


(METRIC SYSTEM)

Fig. 3-2. (Sheet 7 из 7). Fuel Consumption per mile (km) at Best Range Speed in Maximum Range Flight.



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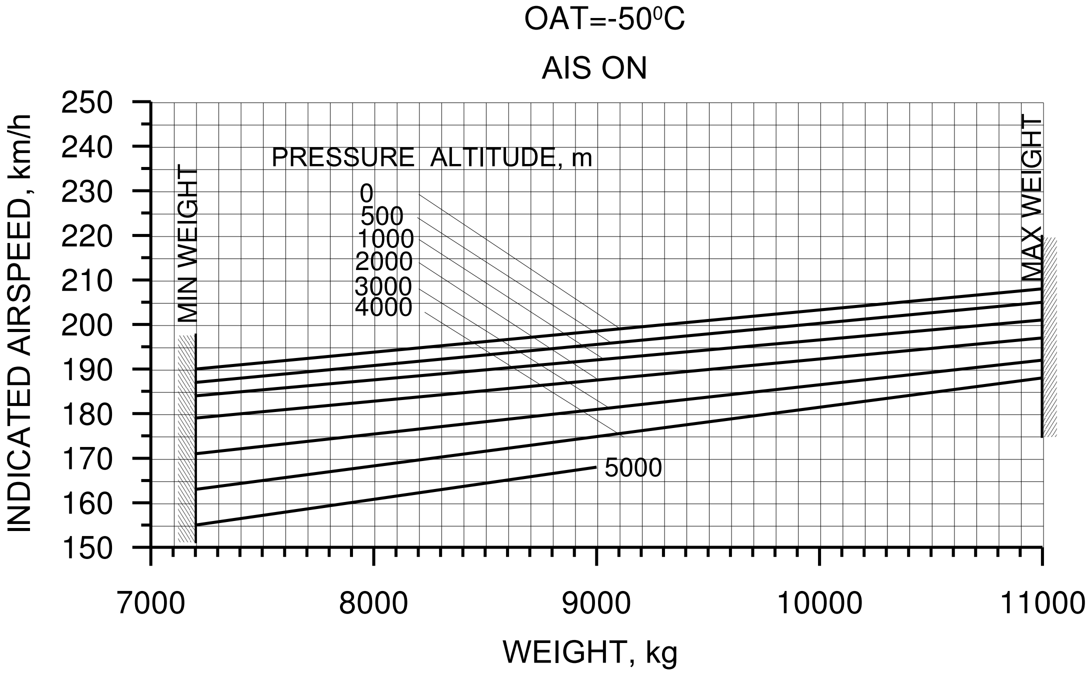
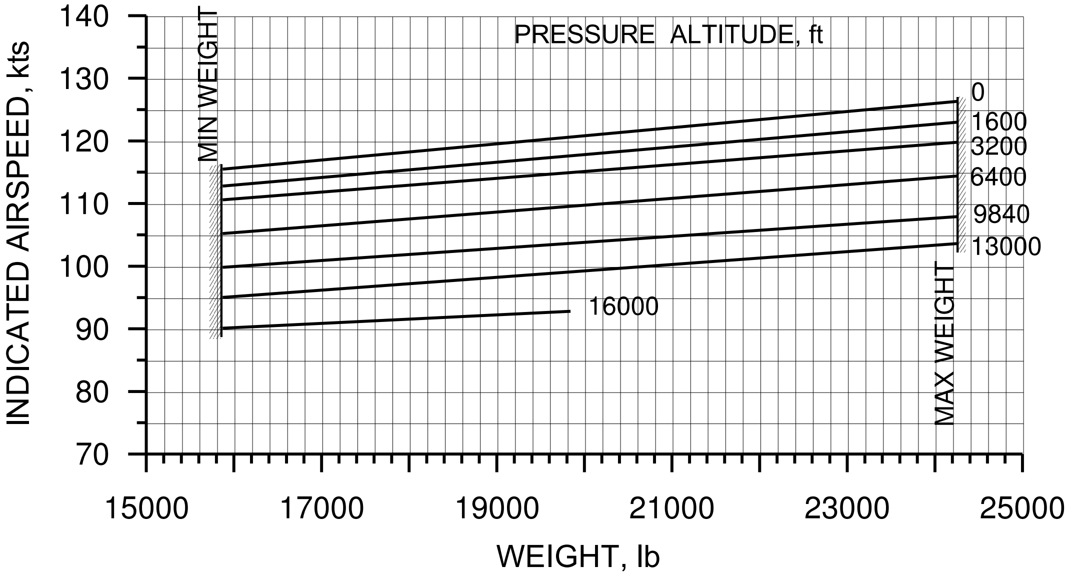


(METRIC SYSTEM)

Fig. 3-3. (Sheet 1 of 5). Best Range Speed in Maximum Range Flight.

ISA-30⁰C; ISA-15⁰C

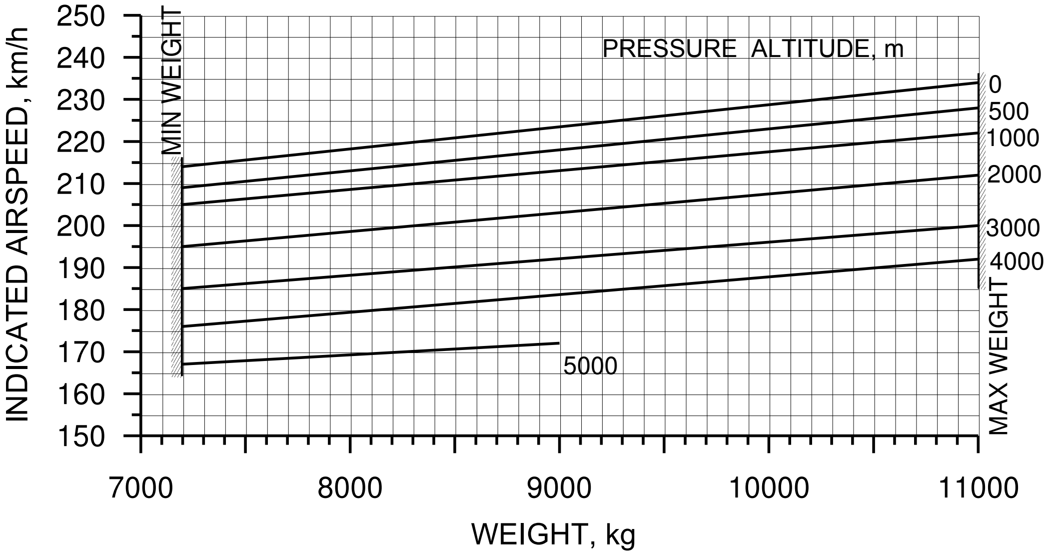
AIS ON



(BRITISH SYSTEM)

ISA-30⁰C; ISA-15⁰C

AIS ON

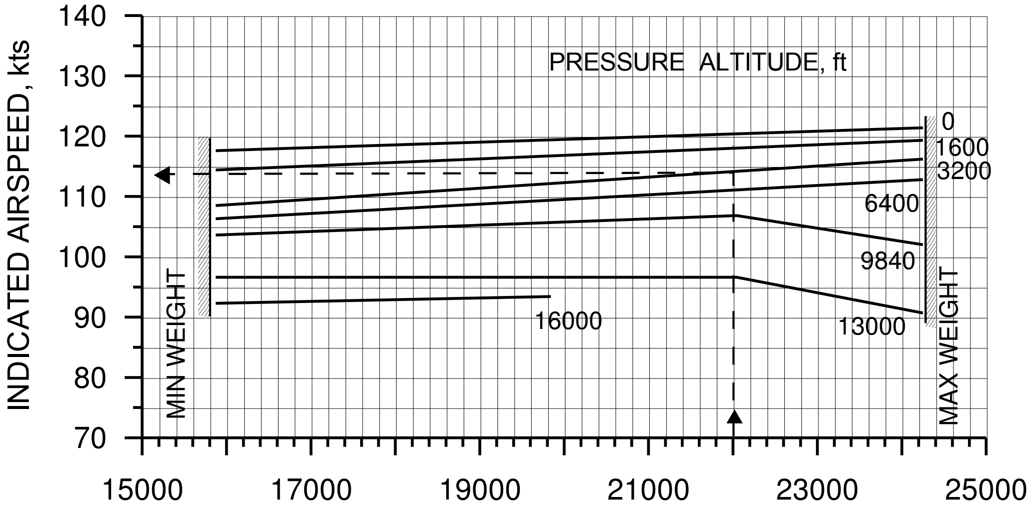


(METRIC SYSTEM)

Fig. 3-3. (Sheet 2 of 5). Best Range Speed in Maximum Range Flight.

ISA; S ±10⁰C

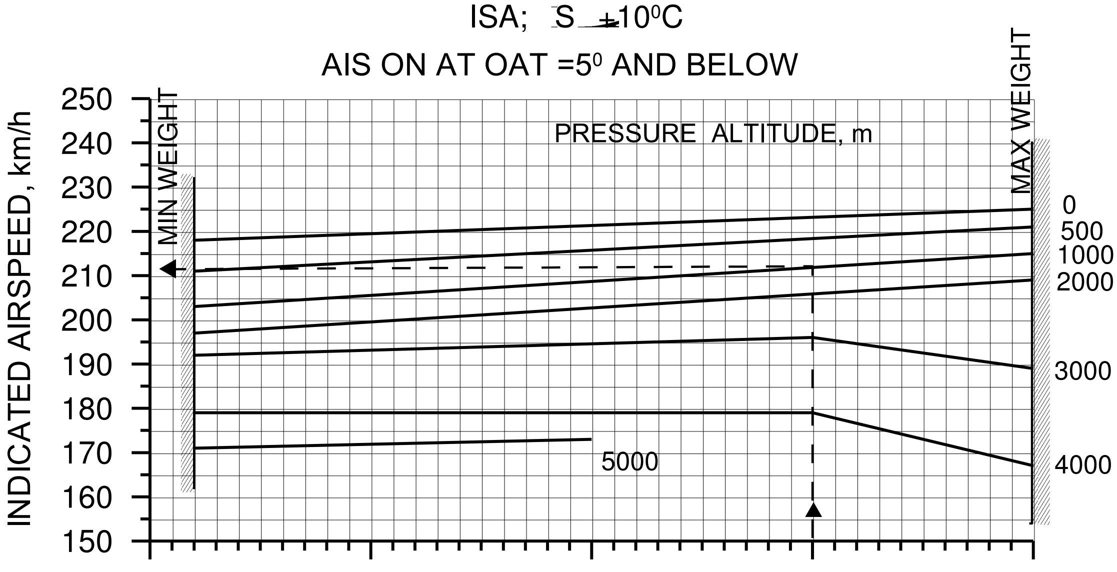
AIS ON AT OAT =5⁰ AND BELOW



(BRITISH SYSTEM)

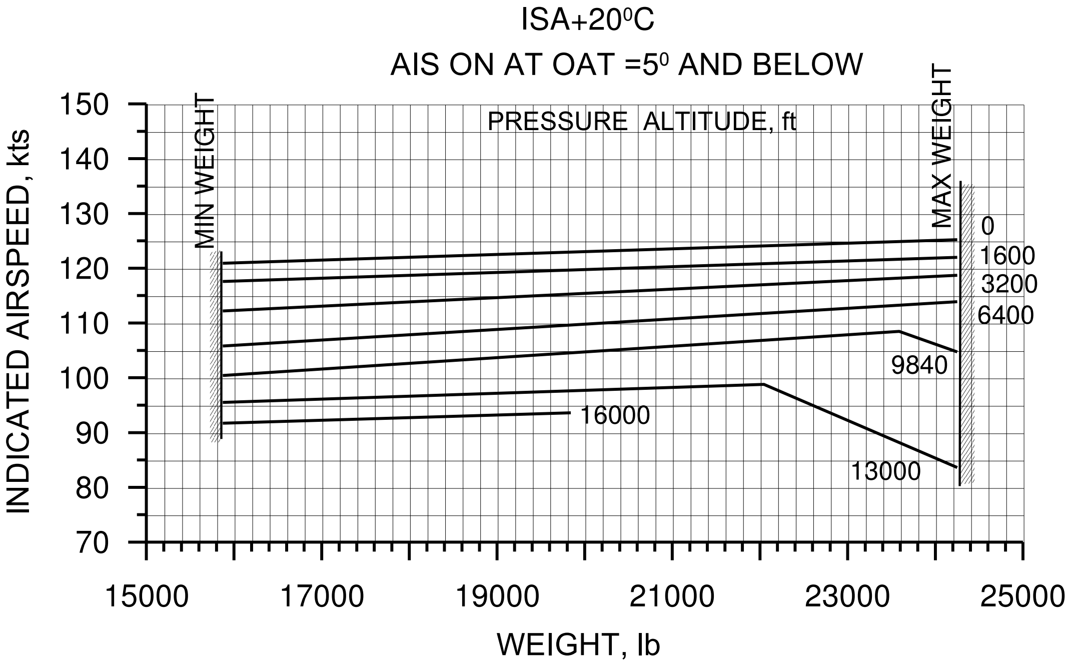
ISA; S ±10⁰C

AIS ON AT OAT =5⁰ AND BELOW



(METRIC SYSTEM)

Fig. 3-3. (Sheet 3 of 5). Best Range Speed in Maximum Range Flight.



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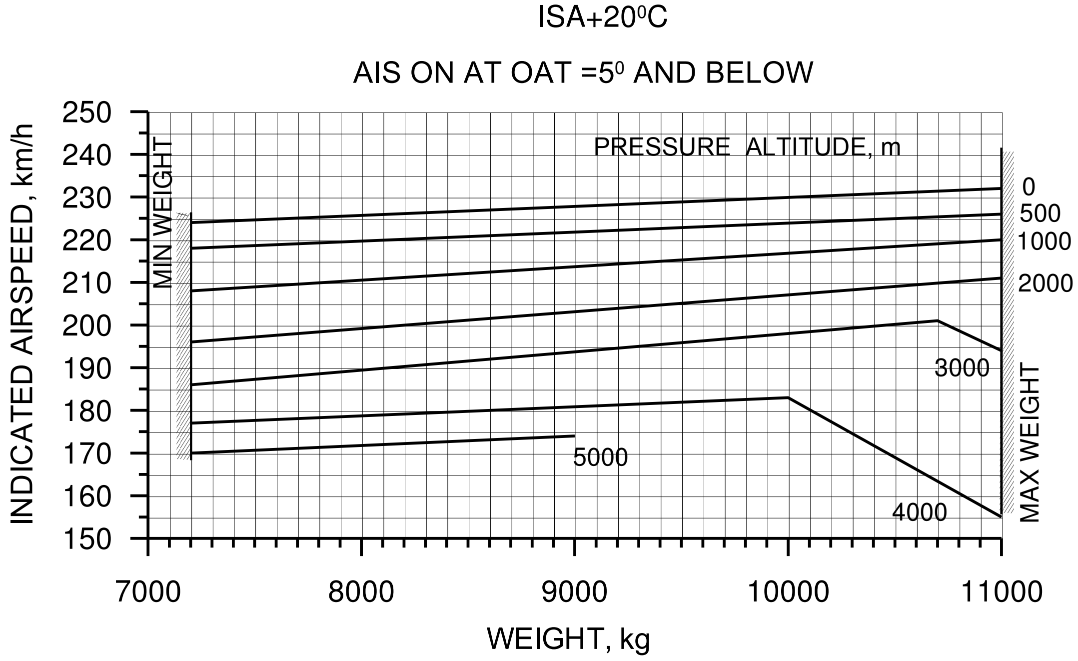
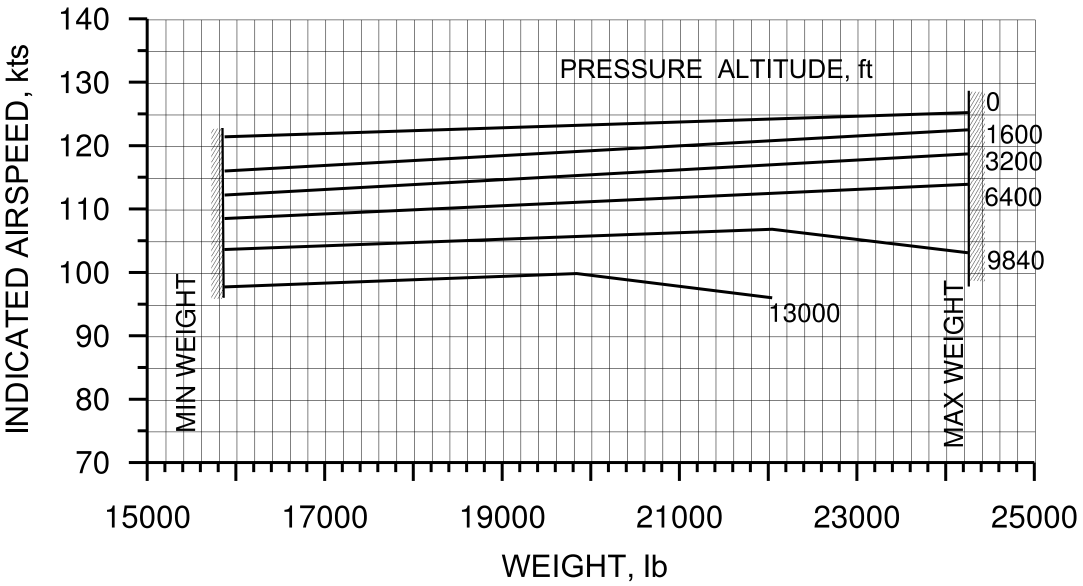


(METRIC SYSTEM)

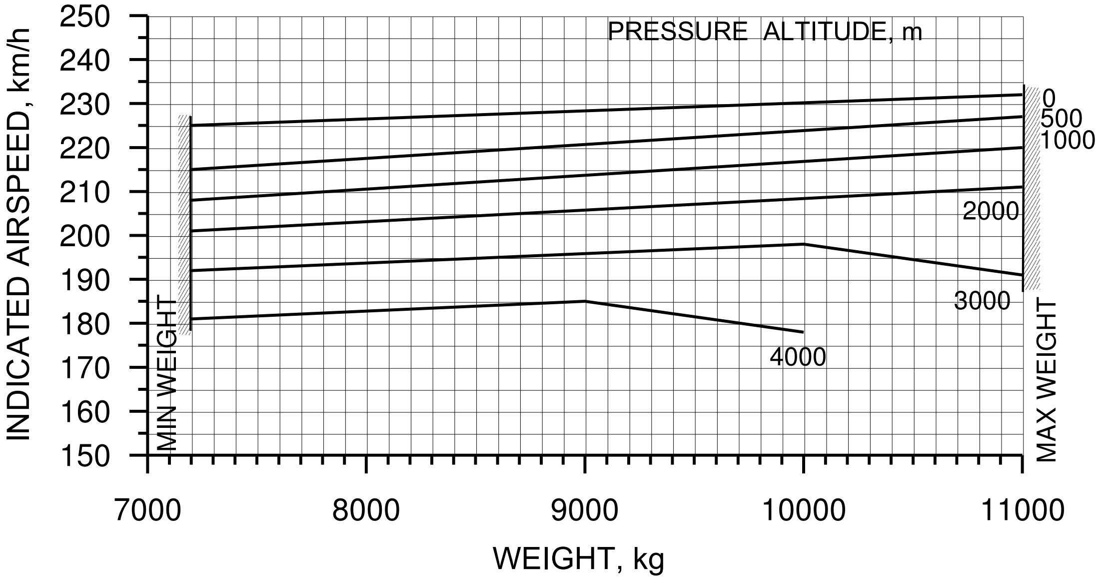
Fig. 3-3. (Sheet 4 of 5). Best Range Speed in Maximum Range Flight.

ISA+30⁰C



(BRITISH SYSTEM)

ISA+30⁰C



(METRIC SYSTEM)

Fig. 3-3. (Sheet 5 of 5). Best Range Speed in Maximum Range Flight.

FUEL FLOW RATE AT BEST ENDURANCE SPEED

Minimum fuel flow rate at best endurance speed for various conditions is given in the charts of Fig. 3-4. The respective best indicated speed in maximum endurance flight is given in the charts of Fig. 3-5.

Example:

To determine minimum fuel flow rate at best endurance speed for a 11000 kg (24250 lb) helicopter at pressure altitude of 500 m (1600 feet) for conditions (t_{ISA} + 20) °C.

Solution: On the charts of Fig. 3-4 (sheet 6) find a point of 11000 kg (24250 feet) on «Weight» horizontal axis and move vertically upward until the intersection with «Pressure altitude» 500 m (1600 feet) line;

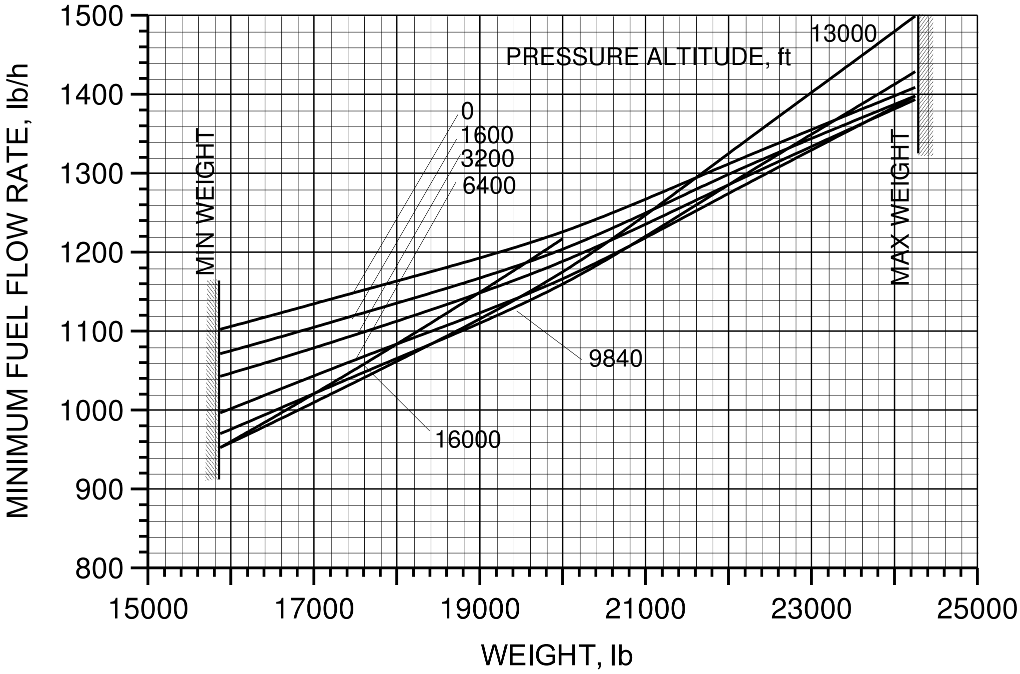
from this point move leftward to «Minimum fuel flow rate» axis and read: 560 kg/h (1235 lb/h).

On the chart of Fig. 3-5 (sheet 4) from 11000 kg (24250 lb) point on «Weight» horizontal axis move vertically upward until the intersection with «Pressure altitude» of 0…1000 m (0…3200 feet);

from this intersection point move leftward to «Indicated Airspeed» vertical axis and read the indicated speed in maximum endurance flight of ≈ 125 km/h (≈ 67 knots).

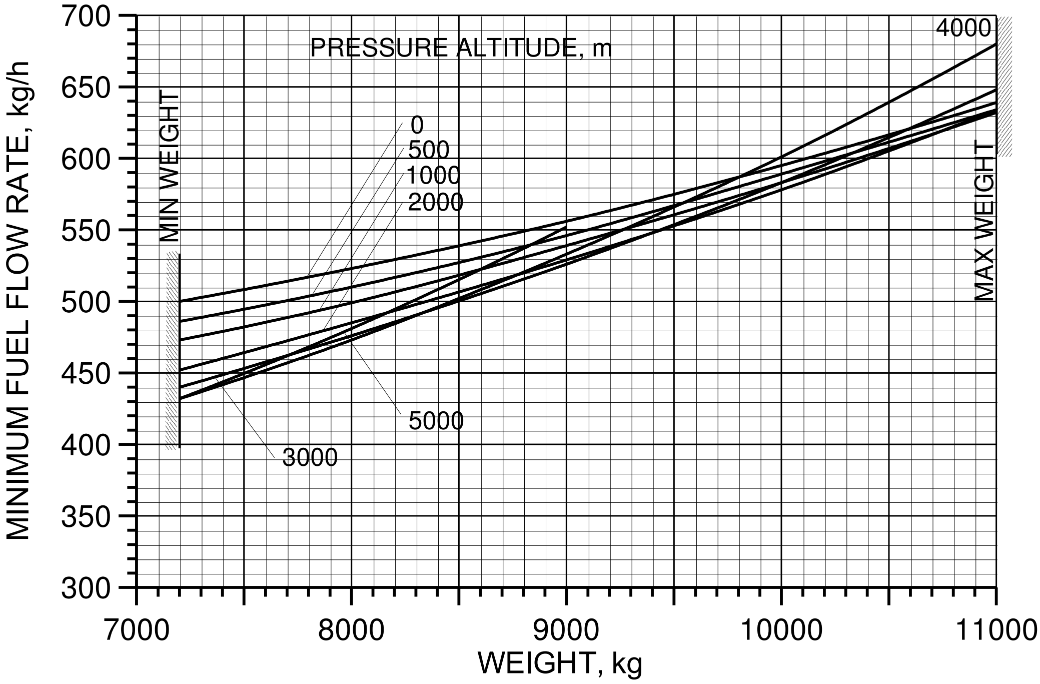
Answer: For the given conditions the minimum fuel flow rate is 560 kg/h (1235 lb/h), flight speed at maximum endurance is 125 km/h (67 knots).

OAT=-50°C
AIS ON



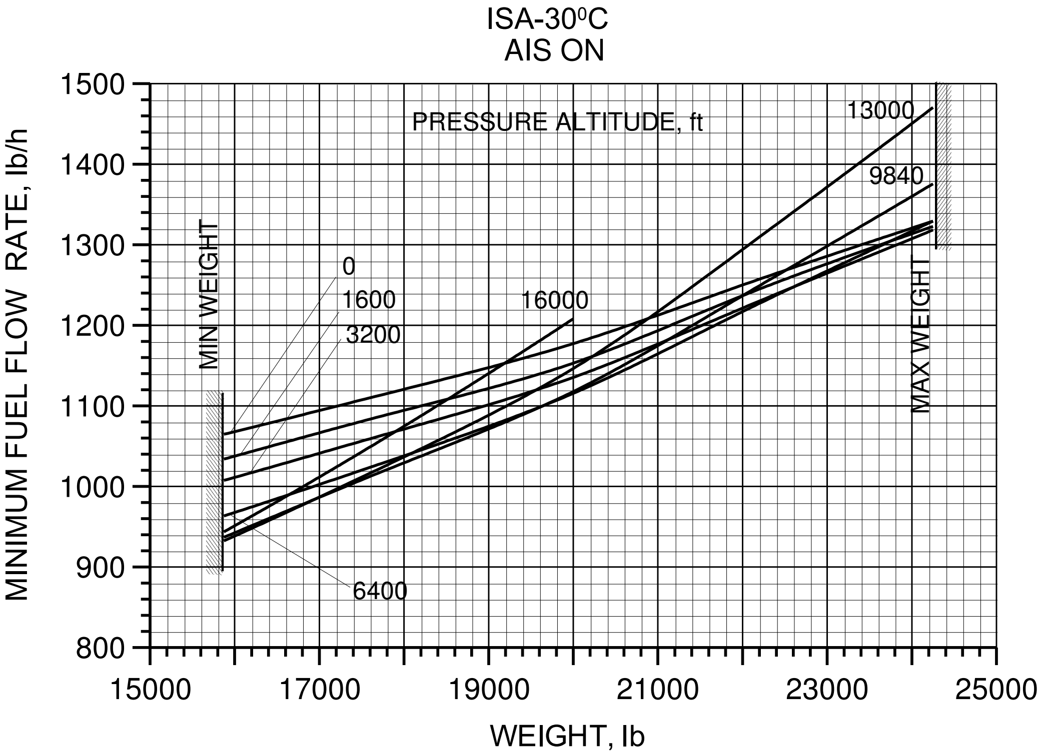
(BRITISH SYSTEM)

OAT=-50°C
AIS ON



(METRIC SYSTEM)

Fig. 3-4 (Sheet 1 of 7). Fuel Flow Rate at Best Endurance Speed.



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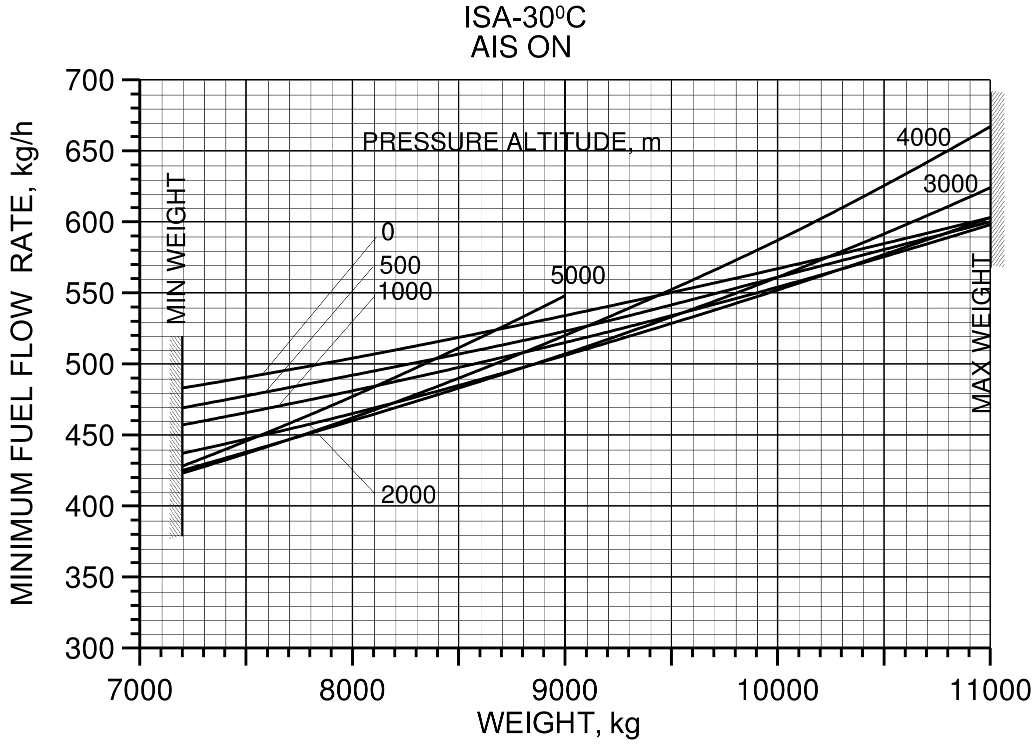
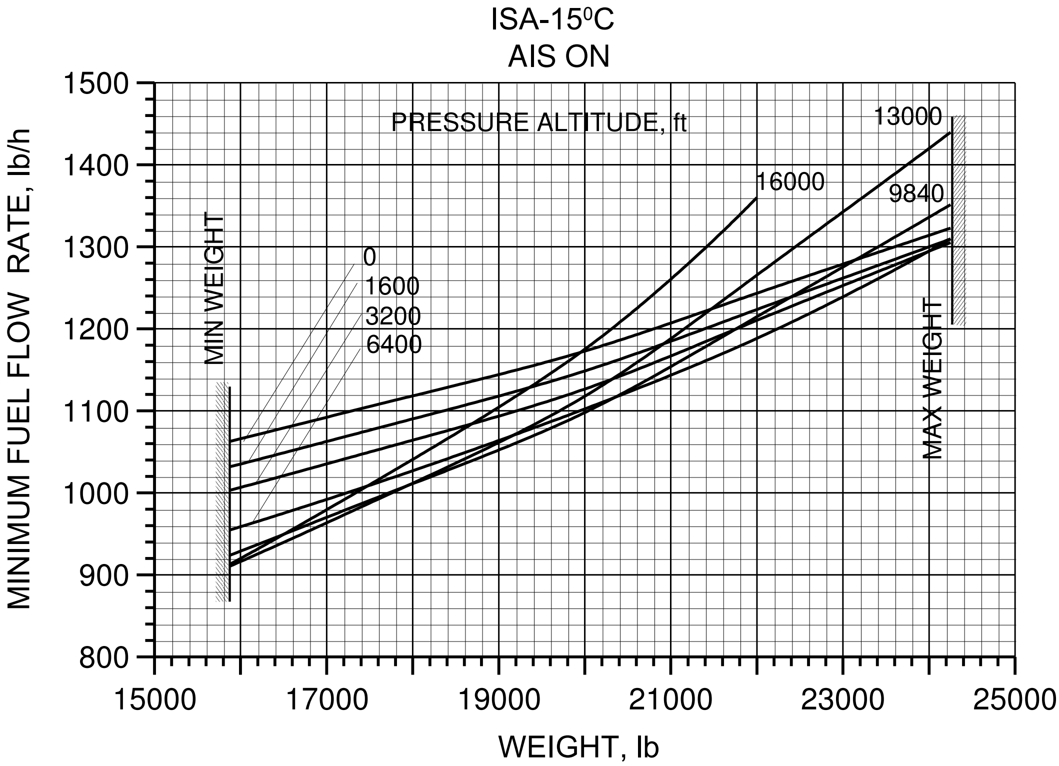


(METRIC SYSTEM)

Fig. 3-4 (Sheet 2 of 7). Fuel Flow Rate at Best Endurance Speed.



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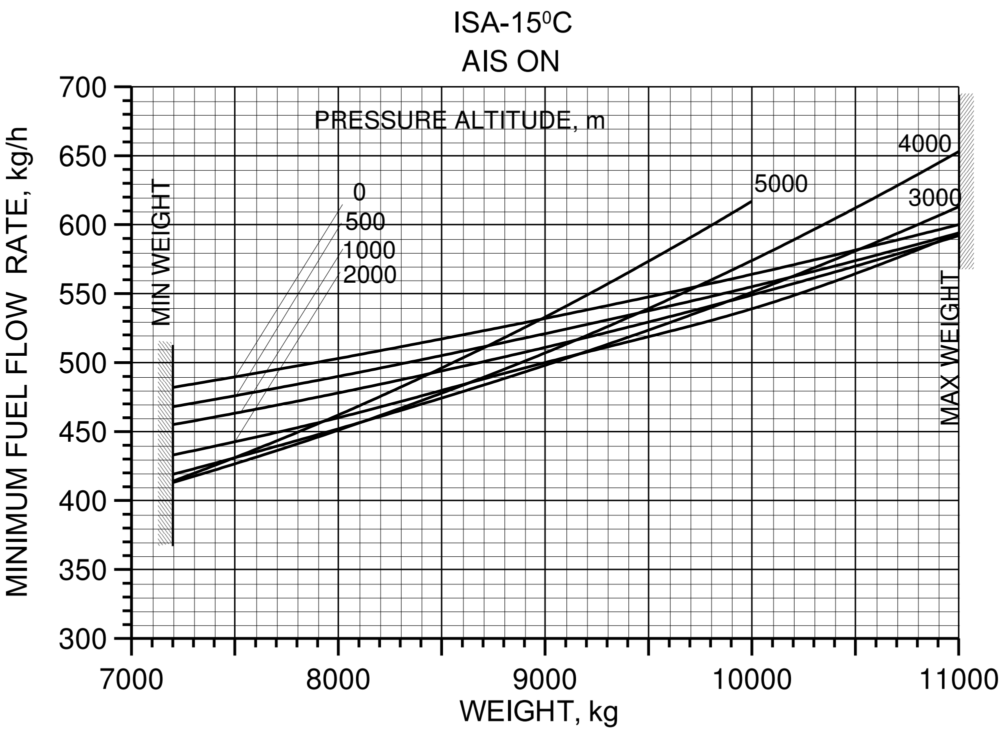
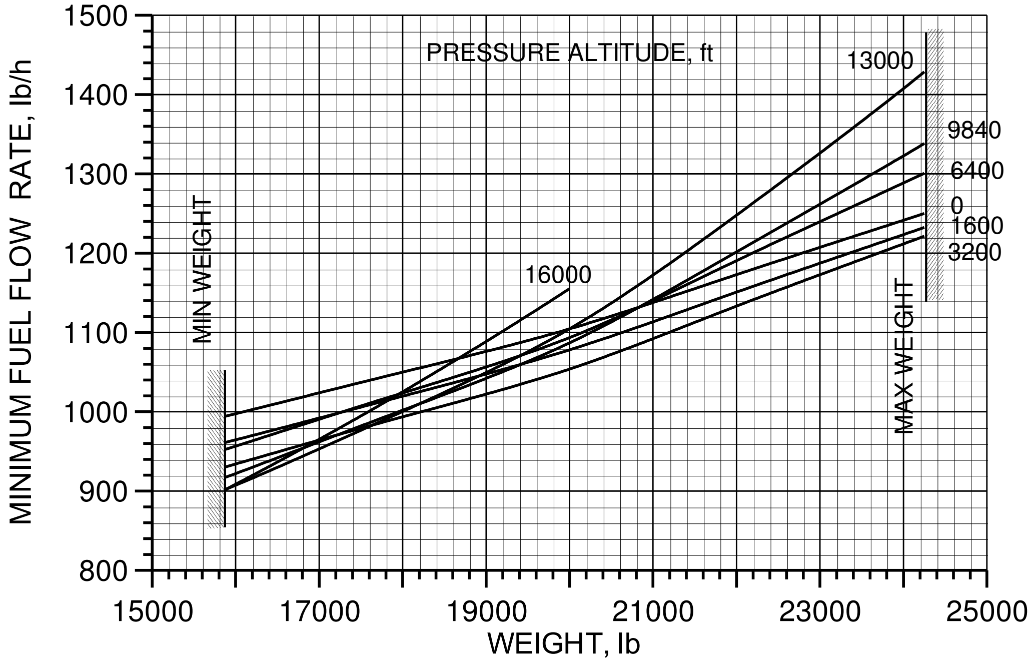


(METRIC SYSTEM)

Fig. 3-4 (Sheet 3 of 7). Fuel Flow Rate at Best Endurance Speed.

ISA

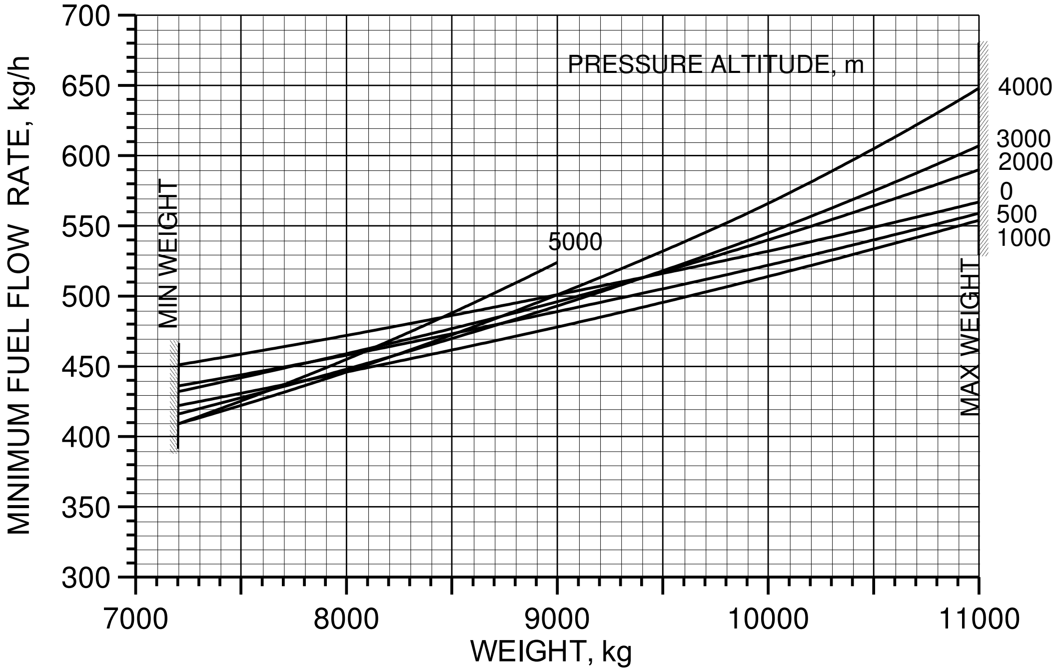
AIS ON AT OAT = 5⁰C AND BELOW



(BRITISH SYSTEM)

ISA

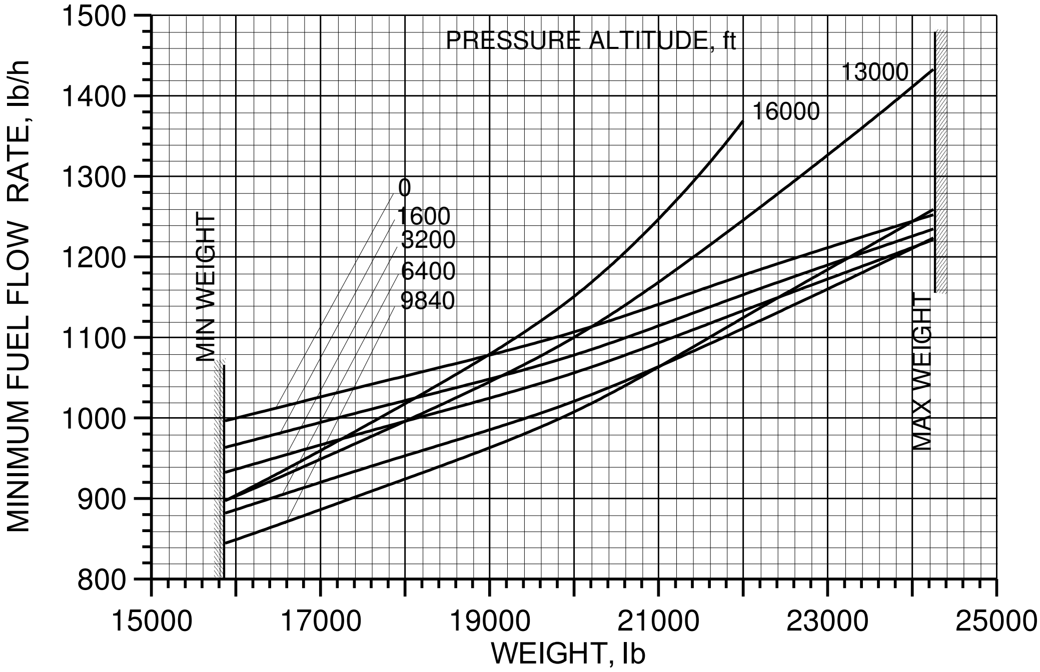
AIS ON AT OAT = 5⁰C AND BELOW



(METRIC SYSTEM)

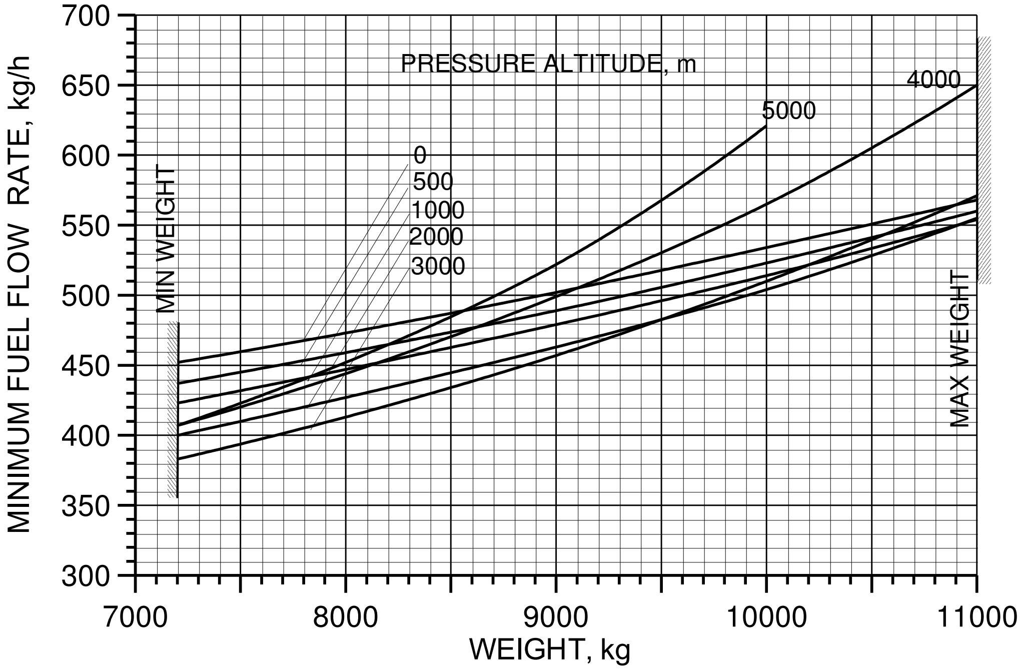
Fig. 3-4 (Sheet 4 of 7). Fuel Flow Rate at Best Endurance Speed.

ISA+10°C
AIS ON AT OAT = 5°C AND BELOW



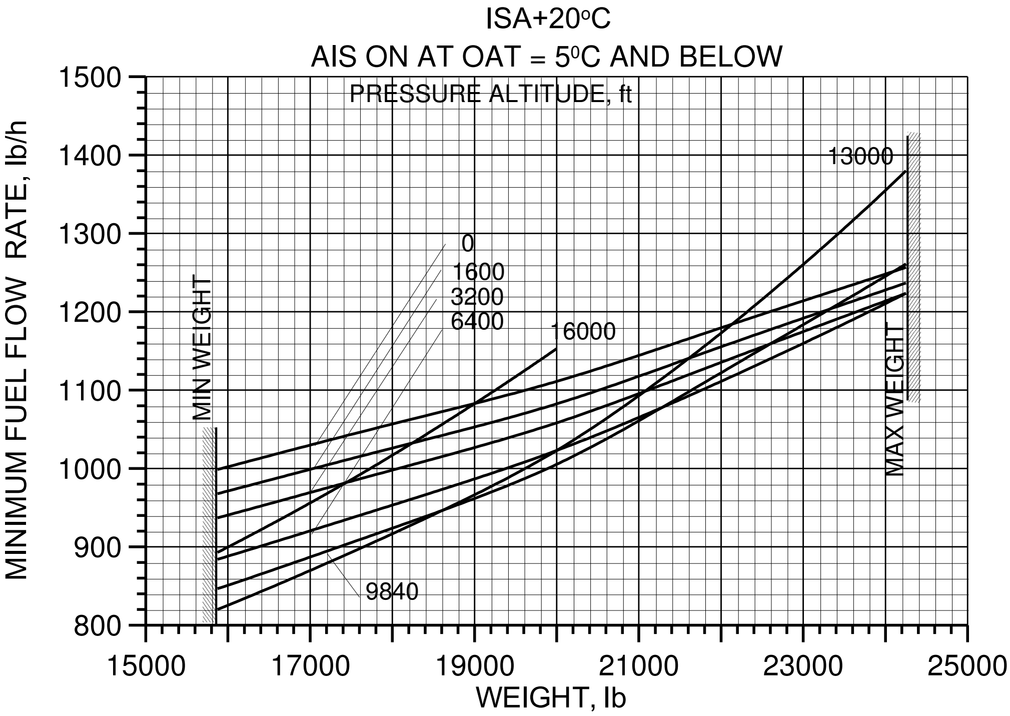
(BRITISH SYSTEM)

ISA+10°C
AIS ON AT OAT = 5°C AND BELOW



(METRIC SYSTEM)

Fig. 3-4 (Sheet 5 of 7). Fuel Flow Rate at Best Endurance Speed.



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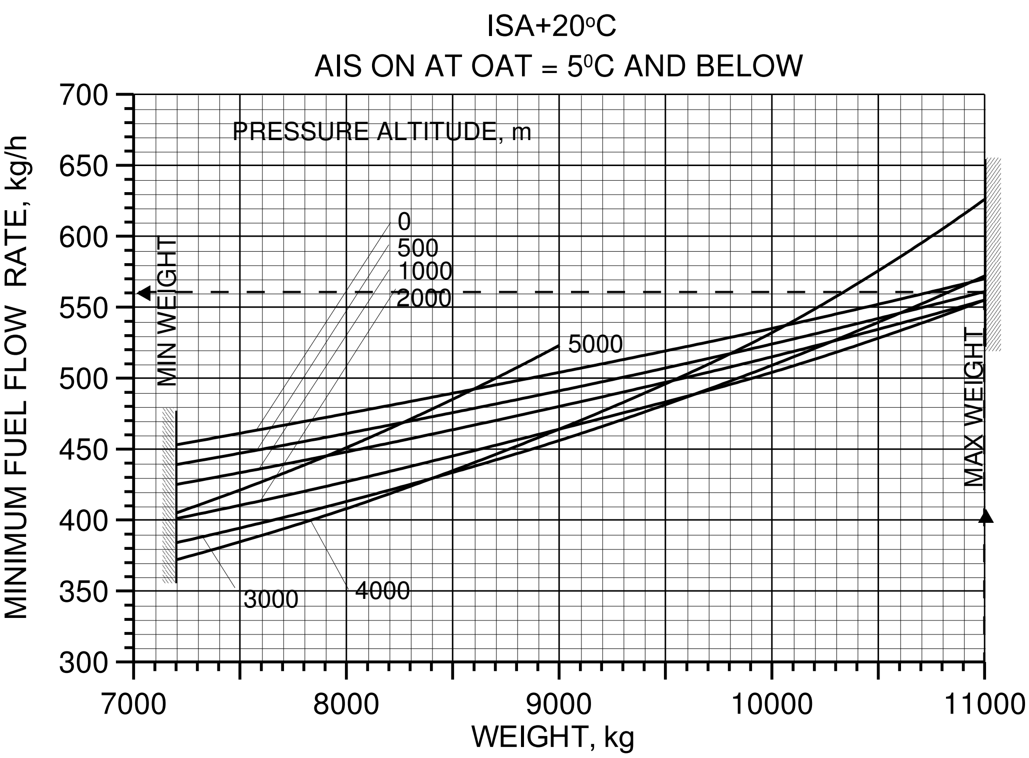
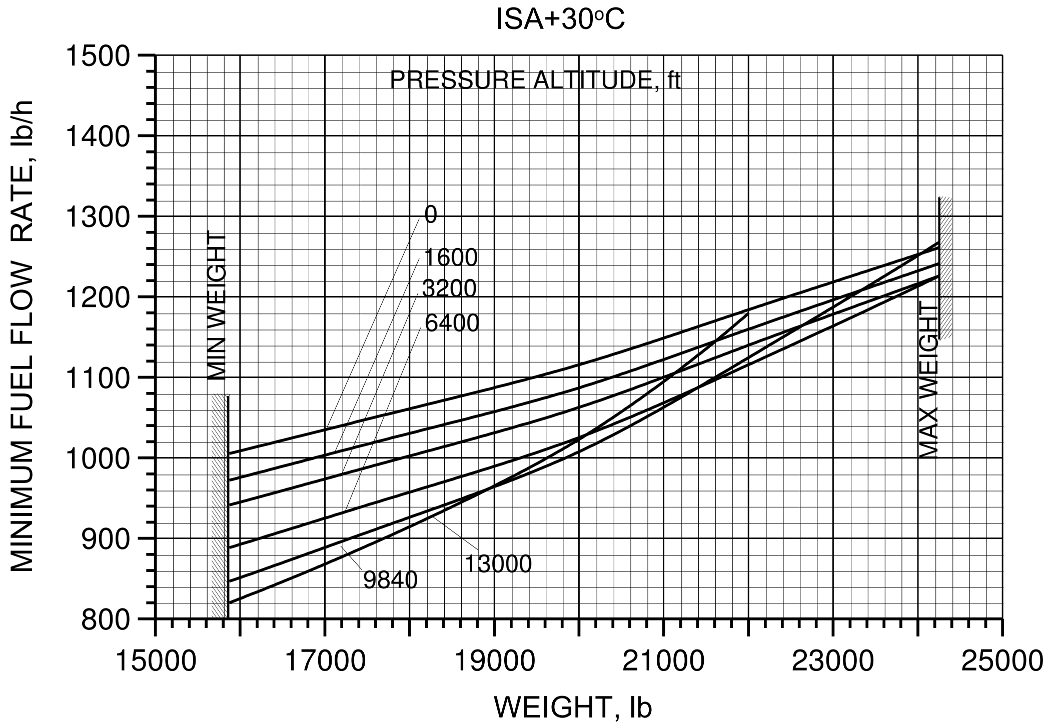


(METRIC SYSTEM)

Fig. 3-4 (Sheet 6 of 7). Fuel Flow Rate at Best Endurance Speed.



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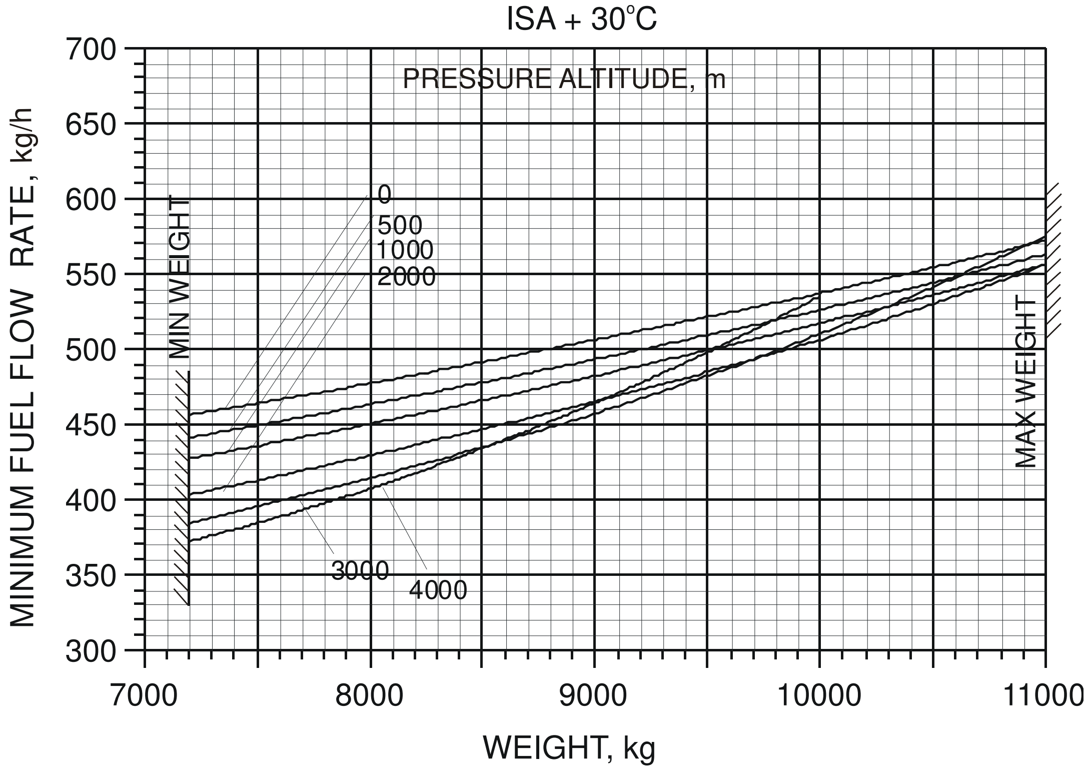
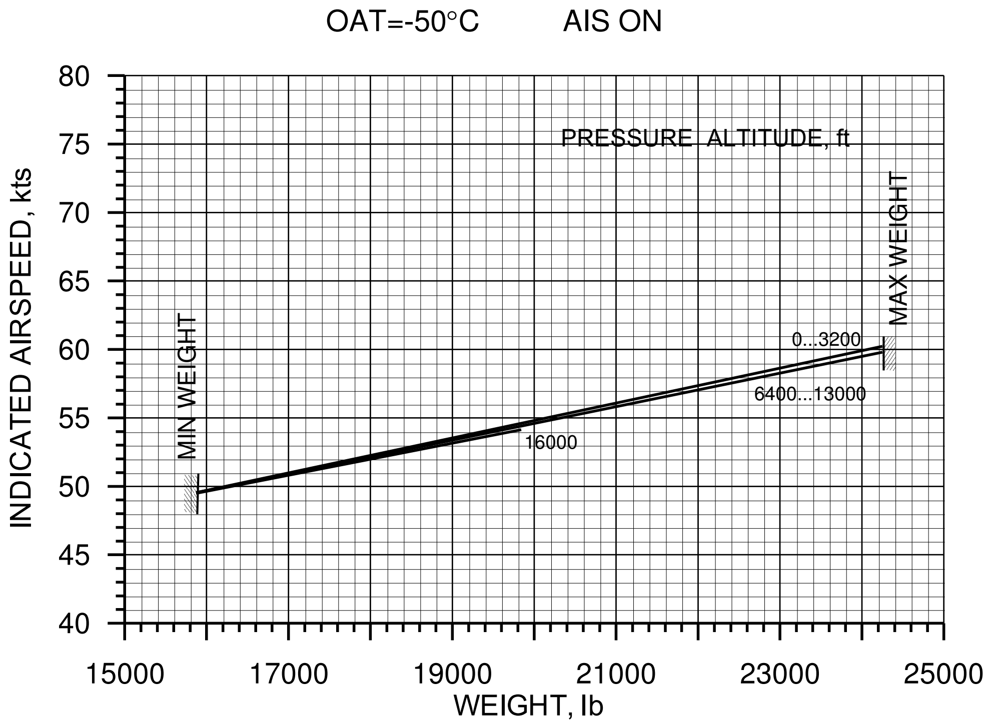
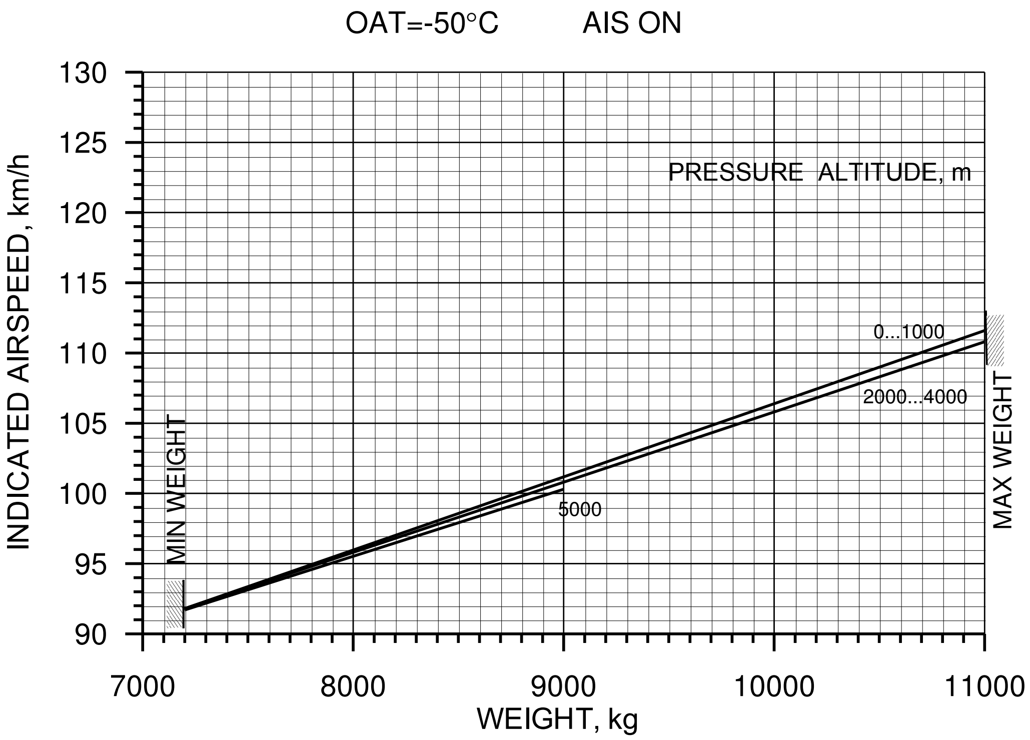


(METRIC SYSTEM)

Fig. 3-4 (Sheet 7 of 7). Fuel Flow Rate at Best Endurance Speed.

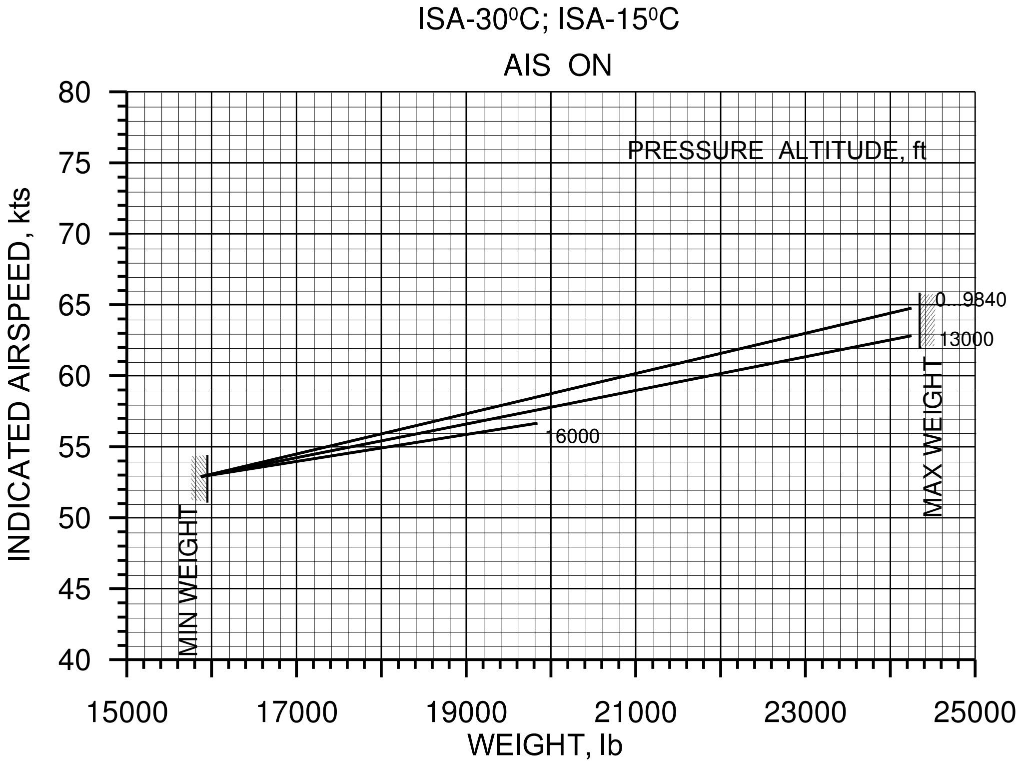


(BRITISH SYSTEM)



(METRIC SYSTEM)

Fig. 3-5 (Sheet 1 of 5). Best Endurance Speed.



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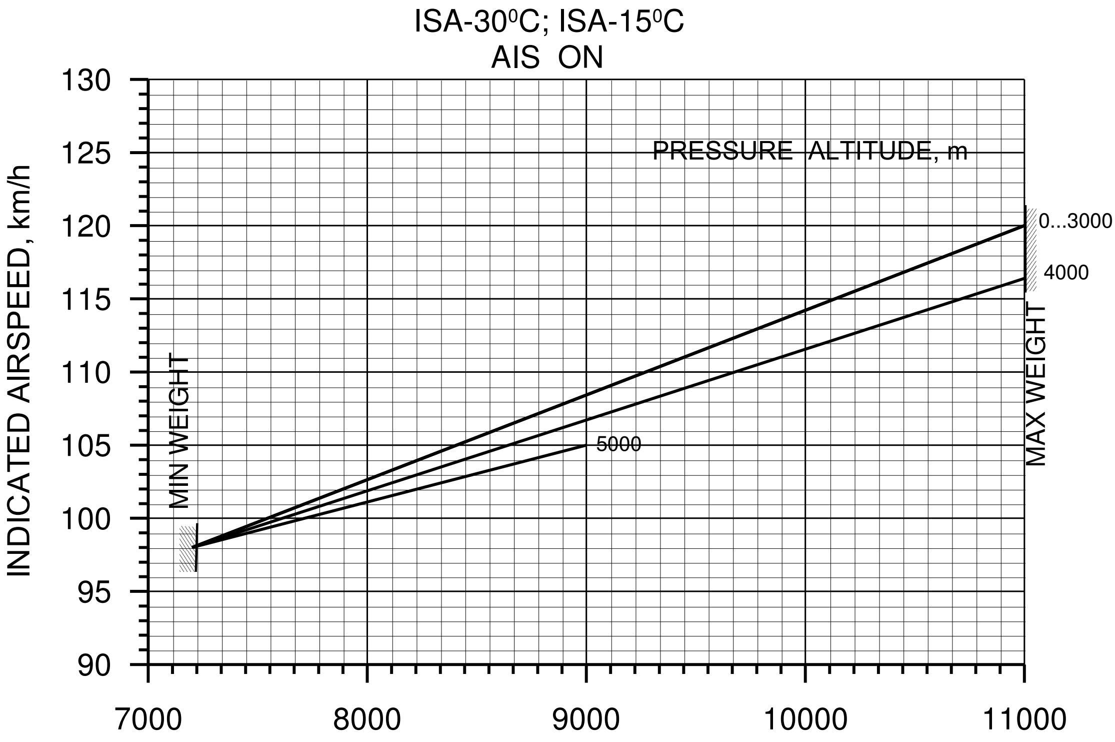
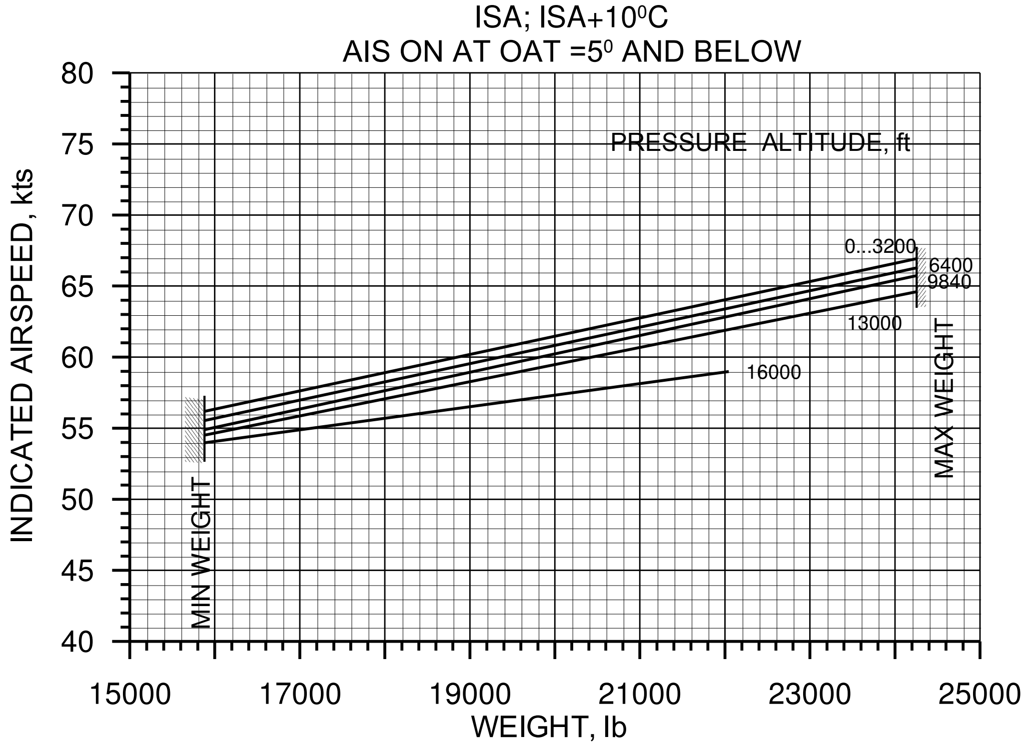


(METRIC SYSTEM)

Fig. 3-5 (Sheet 2 of 5). Best Endurance Speed.



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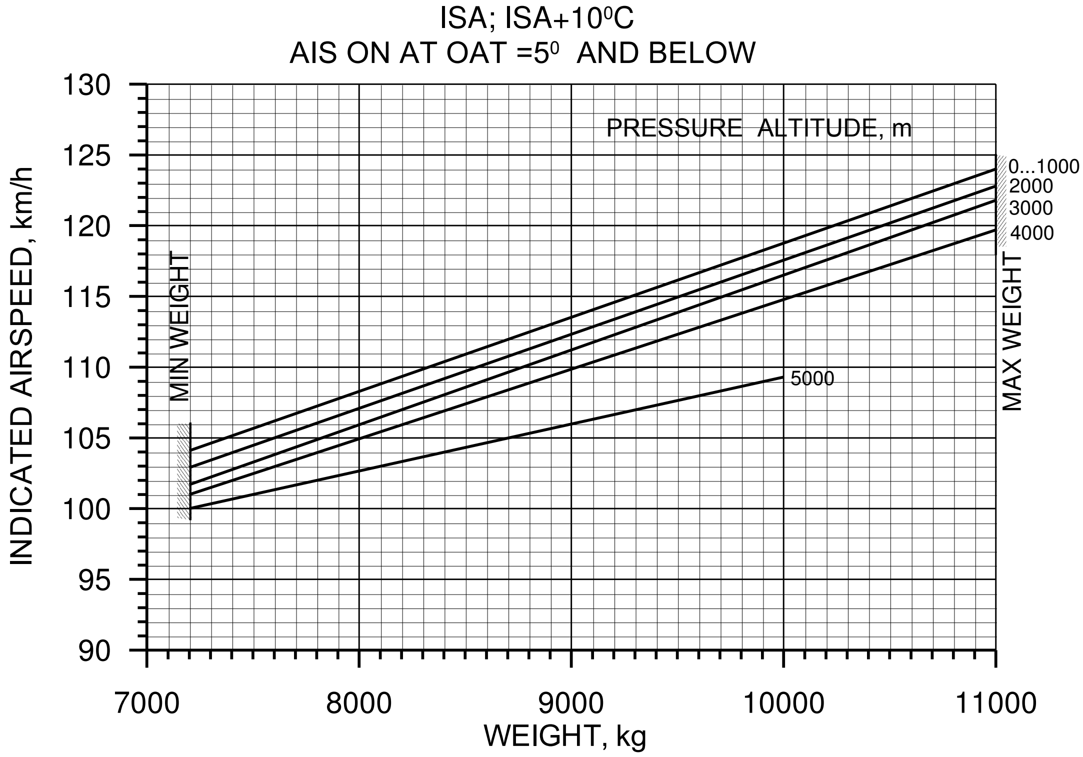
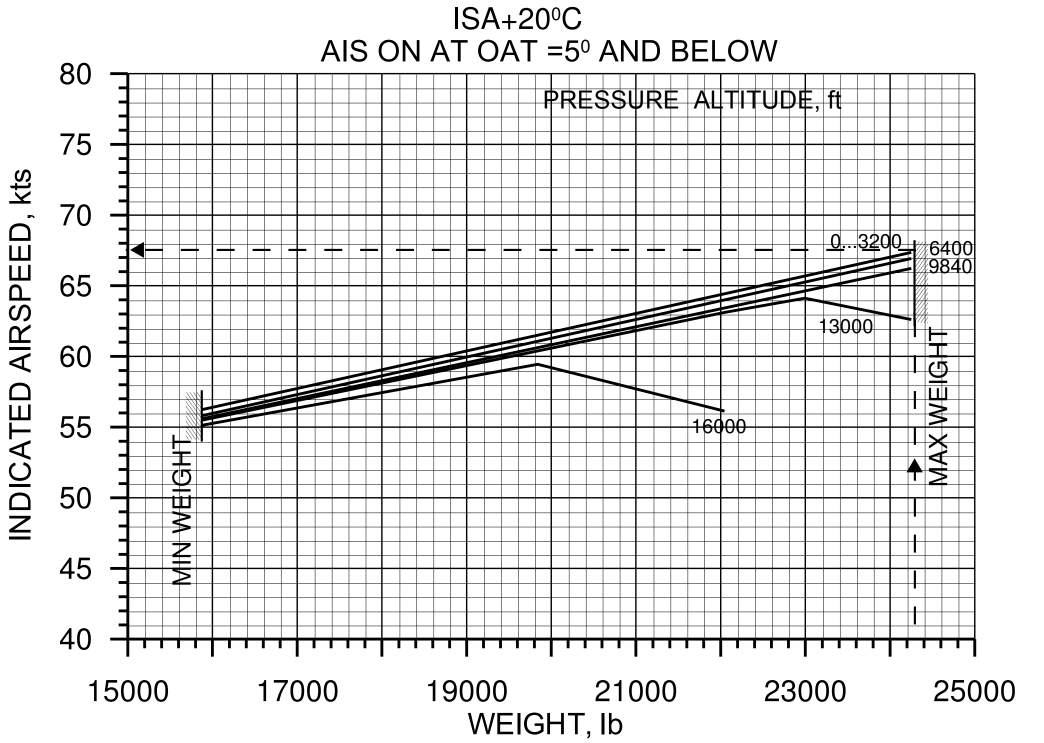
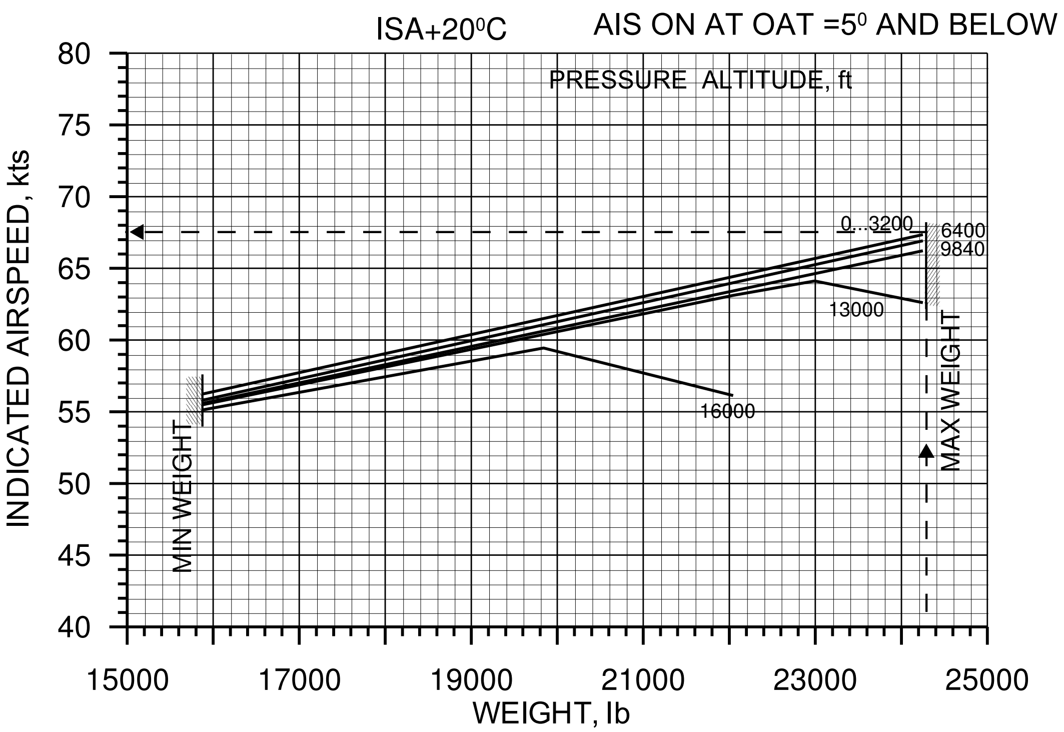


(METRIC SYSTEM)

Fig. 3-5 (Sheet 3 of 5). Best Endurance Speed.

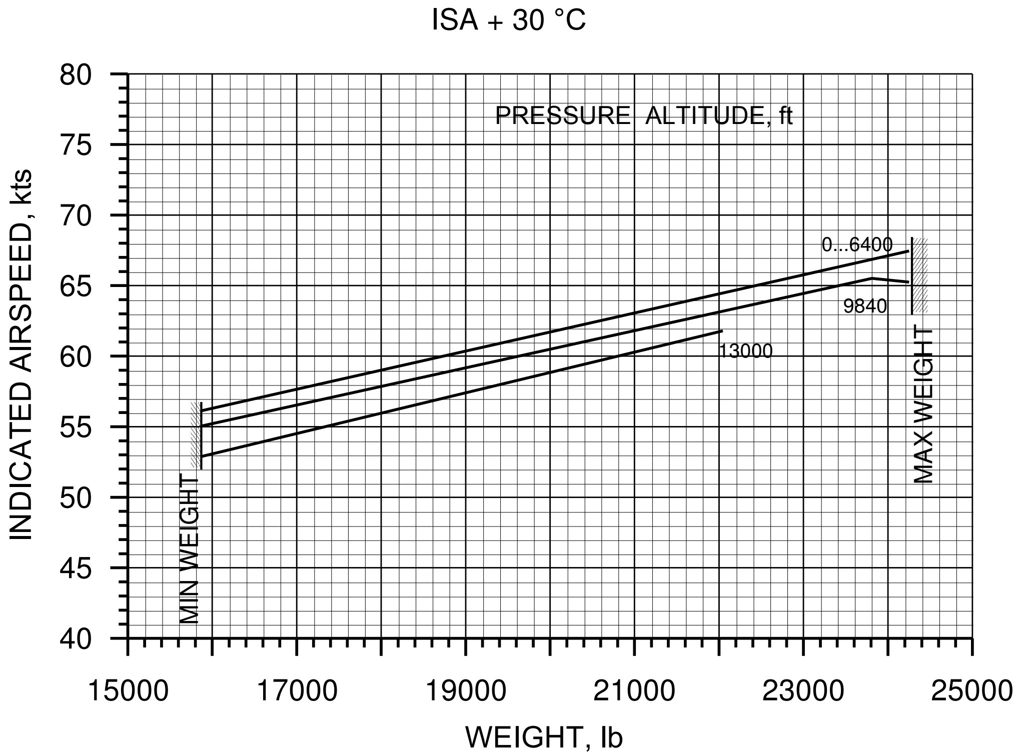


(BRITISH SYSTEM)

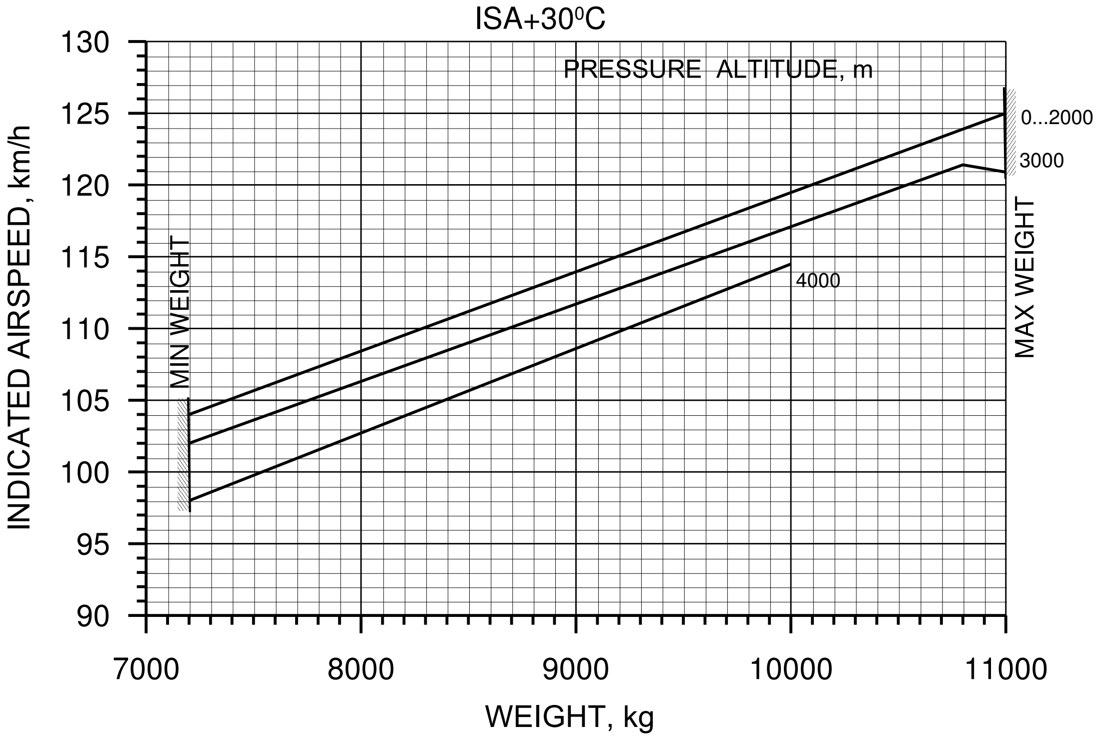


(METRIC SYSTEM)

Fig. 3-5 (Sheet 4 of 5). Best Endurance Speed.



(BRITISH SYSTEM)



(METRIC SYSTEM)

Fig. 3-5 (Sheet 5 of 5). Best Endurance Speed.

FUEL CONSUMPTION, HORIZONTAL DISTANCE AND TIME IN CLIMB AND DESCENT

Fuel consumption, horizontal distance and time in climb from 0 m (0 feet) to various pressure altitudes are given in the charts of Fig. 3-6.

Fuel consumption in descent is function of flight speed and vertical descent rate. When descending with a rate close to the best maximum range speed as defined against the charts of Fig. 3-5, fuel consumption shall be determined by the charts of Fig. 3-4. Horizontal distance and time are functions of flight speed and vertical descent rate.

Example:

To determine fuel consumption, horizontal distance and time in climb when transiting from the reference pressure attitude of 1000 m (3200 feet) to a specified pressure altitude of 2000 m (6400 feet) for a helicopter with flying weight of 10000 kg (22000 lb).

Solution: On the chart of Figure 3-6 (sheet 1) for 10000 kg (22000 lb) weight determine:

fuel consumption in climb from 0 m (0 feet) to 1000 m (3200 feet) $G_{0 \div 1000} \approx$ 20 kg (44 lb);

fuel consumption in climb from 0 m (0 feet) to 2000 m (6400 feet) $G_{0 \div 2000} \approx$ 38 kg (84 lb).

Calculate fuel consumption in climb from 1000 m (3200 feet) to 2000 m (6400 feet):

$G_{1000 \div 2000} \approx G_{0 \div 2000} - G_{0 \div 1000}$ = 38 kg - 20 kg = 18 kg (40 lb).

On the chart of Fig. 3-6 (Sheet 2) for 10000 kg (22000 lb) weight determine:

horizontal distance in climb from 0 m (0 feet) to 1000 m (3200 feet) $L_{0 \div 1000} \approx$ 2500 m (8200 feet);

horizontal distance in climb from 0 m (0 feet) to 2000 m (6400 feet) $L_{0 \div 2000} \approx$ 7000 m (22950 feet).

Calculate the horizontal distance in climb from 1000 m (3200 feet) to 2000 m (6400 feet):

$L_{1000 \div 2000} \approx L_{0 \div 2000} - L_{0 \div 1000}$ = 7000m – 2500m = 4500 m (14750 feet).

On the chart of Fig. 3-6 (Sheet 3) for 10000 kg (22000 lb) weight determine:

time of climb from 0 m (0 feet) to 1000 m (3200 feet): $\tau_{0 \div 1000} \approx$ 1,5 min;

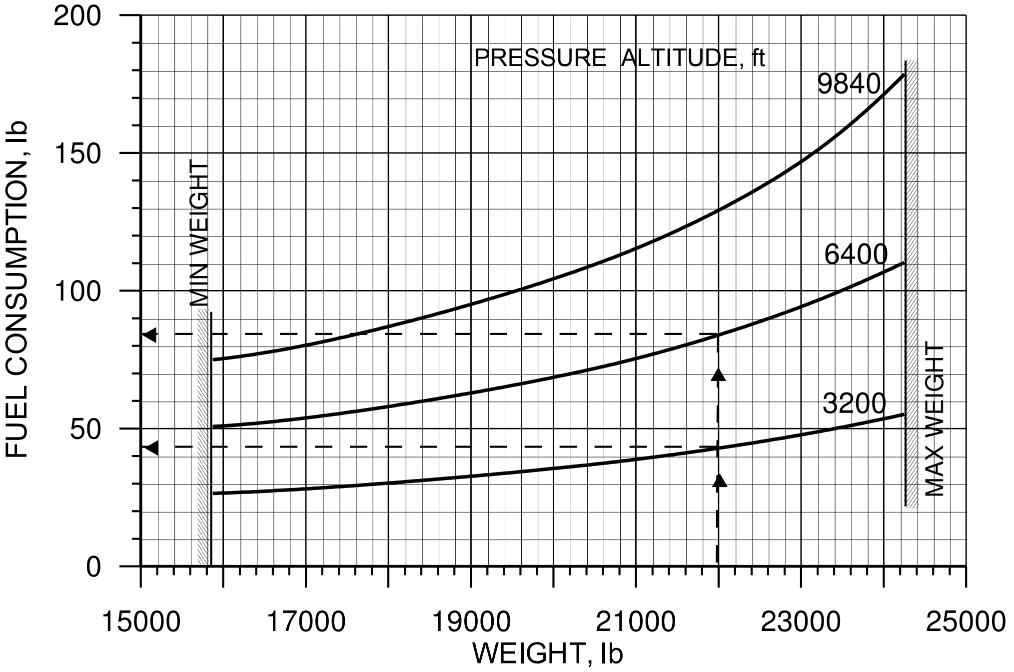
time of climb from 0 m (0 feet) to 2000 m (6400 feet): $\tau_{0 \div 2000} \approx$ 3,2 min.

Calculate the time of climb from 1000 m (3200 feet) to 2000 m (6400 feet):

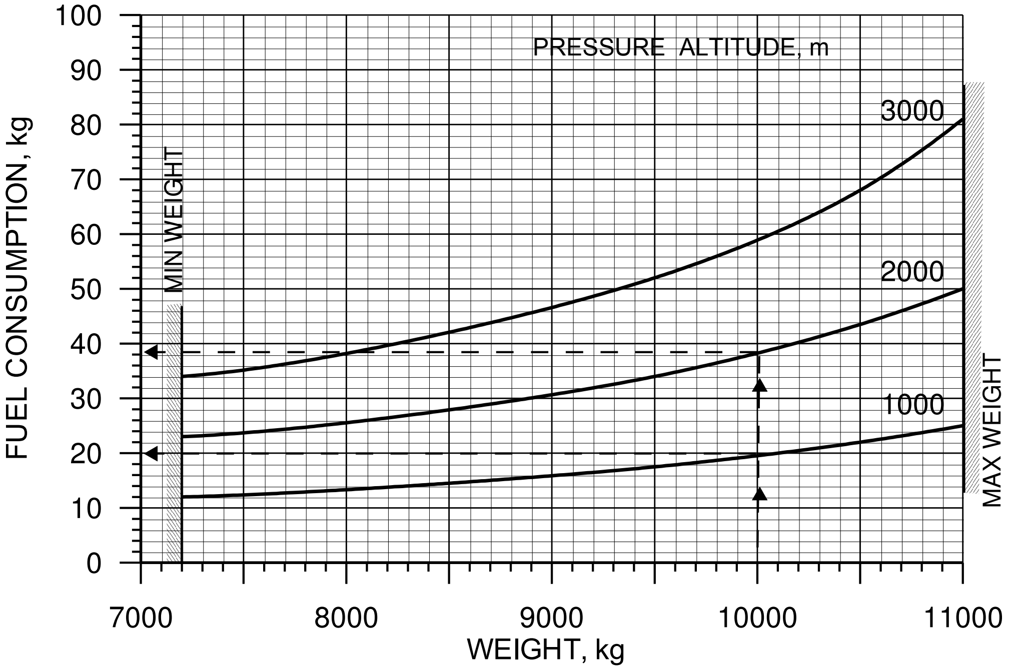
$\tau_{1000 \div 2000} \approx \tau_{0 \div 2000} - \tau_{0 \div 1000}$ = 3,2 min - 1,5 min = 1,7 min.

Answer: the time of climb to specified altitude is ≈ 1,7 min; horizontal distance ≈ 4500 m (14750 feet); fuel consumption ≈ 18 kg (40 lb).

MAXIMUM CONTINUOUS POWER
BEST RATE OF CLIMB SPEED



(BRITISH SYSTEM)

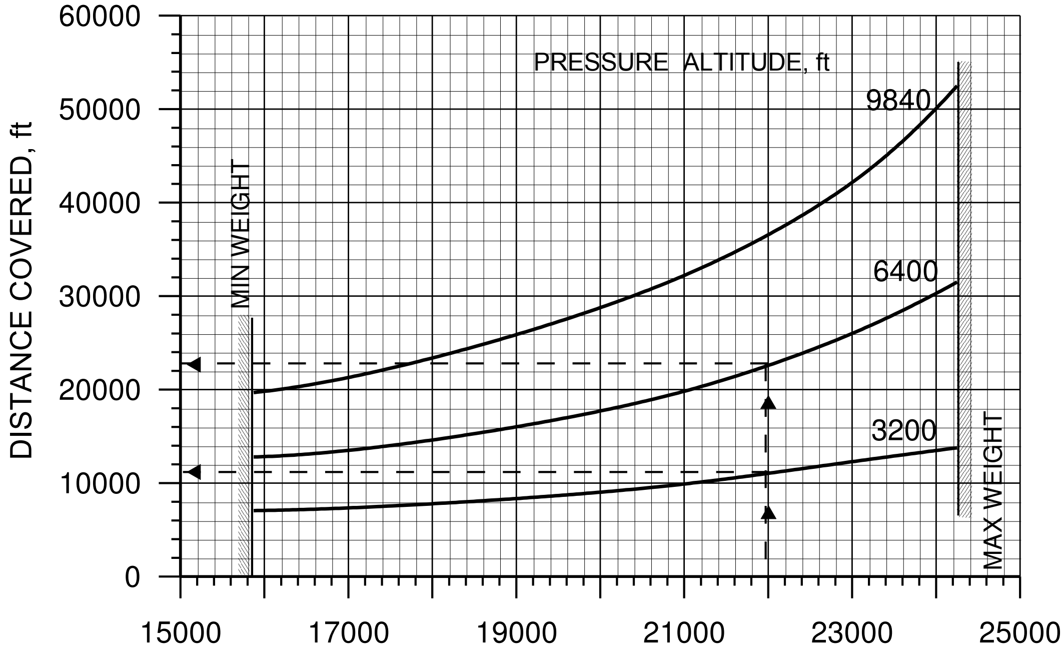


(METRIC SYSTEM)

Fig. 3-6. (Sheet 1 of 3). Fuel Consumption at Climbing Versus Helicopter Weight and Pressure Altitude.

MAXIMUM CONTINUOUS POWER.

BEST RATE OF CLIMB SPEED



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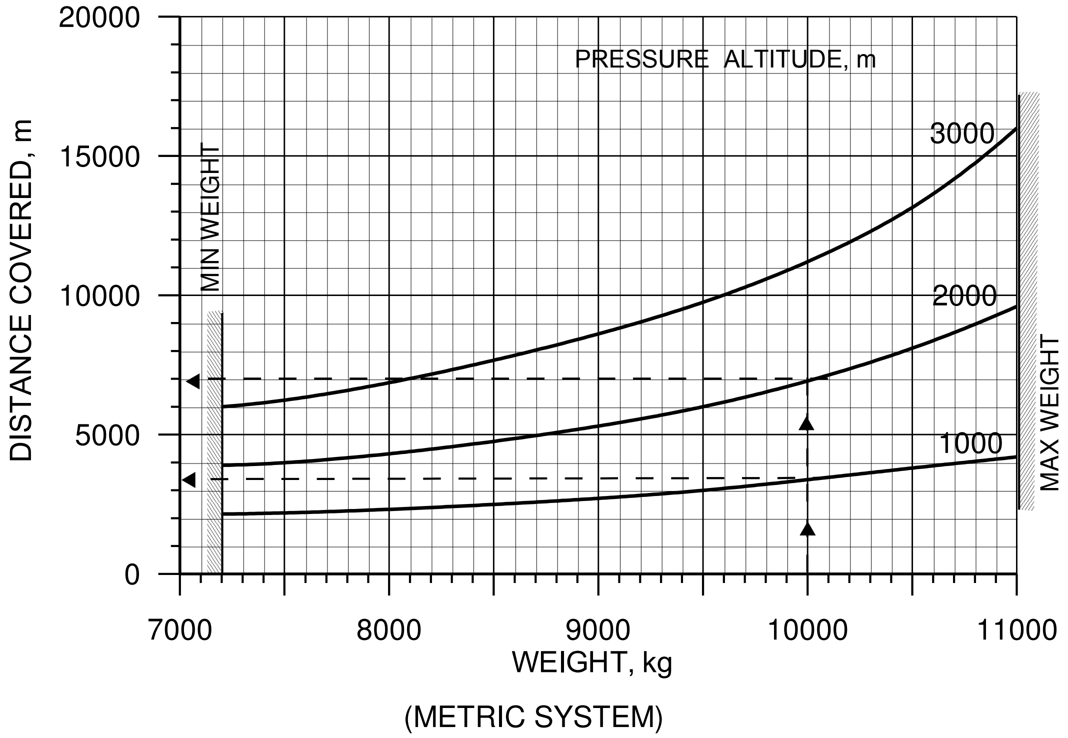
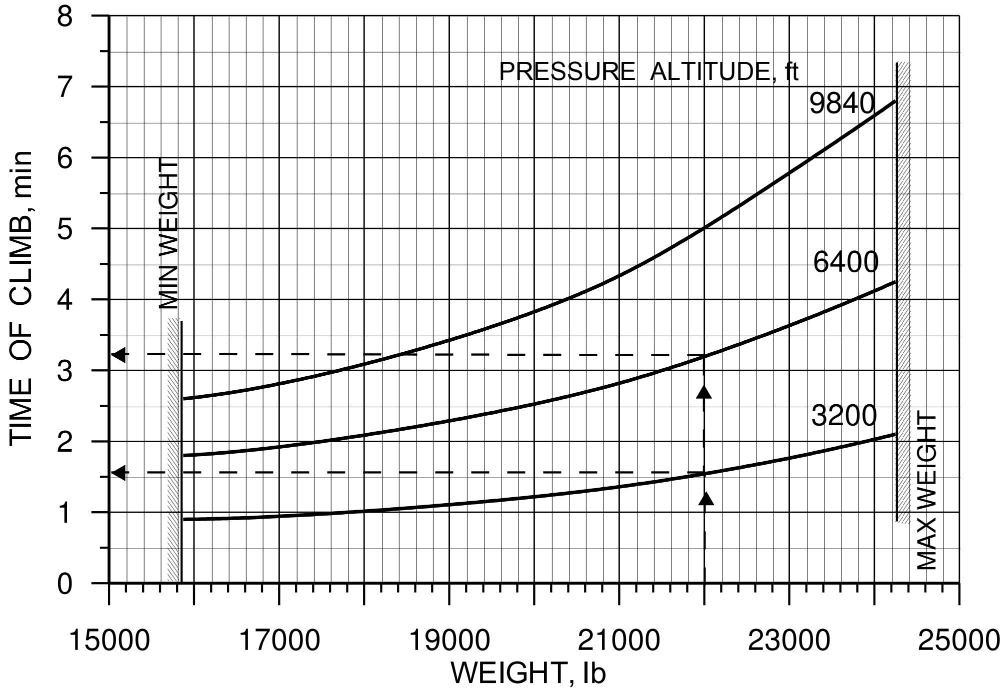


(METRIC SYSTEM)

Fig. 3-6. (Sheet 2 of 3). Horizontal Distance Covered at Climbing Versus Helicopter Weight and Pressure Altitude.

MAXIMUM CONTINUOUS POWER.
BEST RATE OF CLIMB SPEED



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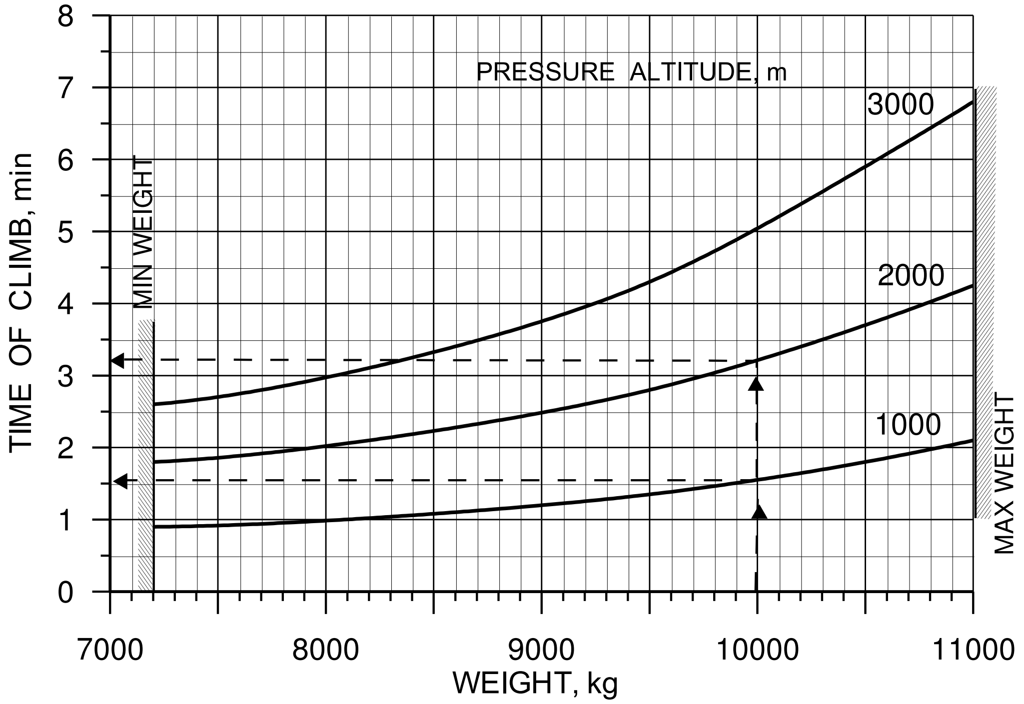


(METRIC SYSTEM)

Fig. 3-6. (Sheet 3 of 3). Time of Climb Versus Helicopter Weight and Pressure Altitude.

ADJUSTMENTS TO FUEL CONSUMPTION

When air conditioning system is on fuel consumption increases by 9 kg/h (20 lb/h).

When dust protection device (DPD) is installed the fuel consumption determined from the charts of Fig. 3-1, 3-2, 3-4 and 3-6 increases by 1%.

When DPD ejection is ON the fuel consumption determined from the charts of Fig. 3-1, 3-2, 3-4 and 3-6 increases by 3%.

When external luggage rack is installed and with the cargo in it minimum hourly fuel consumption determined from the charts of Figures 3-4, and fuel consumption determined from the charts of Fig. 3-6 (Sheet 1) increases by 1%, and minimum fuel consumption per km determined from the charts of Figures 3-2 increases by 3%.

THRUST INCREASE COEFFICIENT

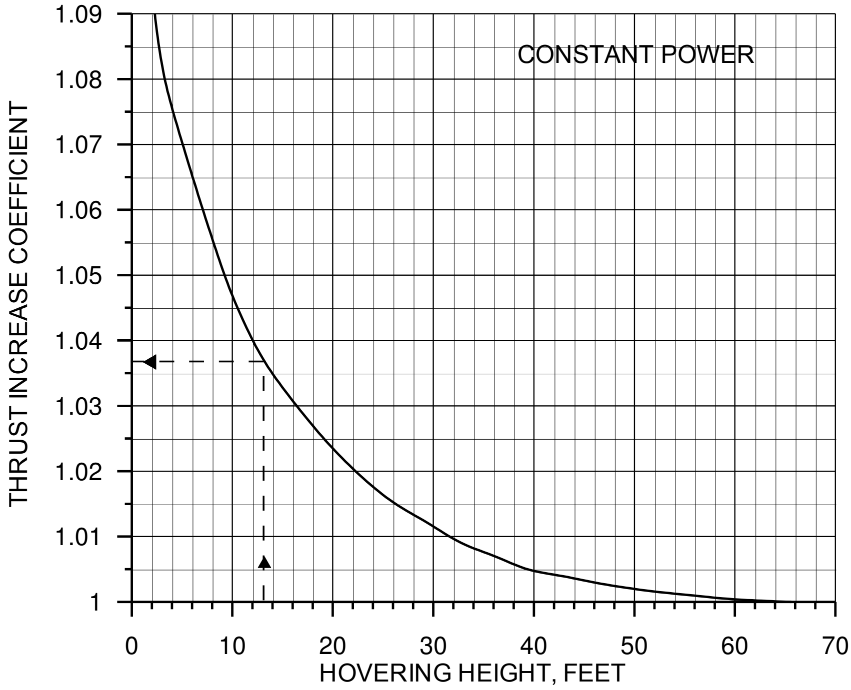
«Thrust increase coefficient» is the ratio of the helicopter thrust in IGE hover to the helicopter thrust in OGE hover. Thrust increase coefficient as function of hovering altitude for constant power is presented in the chart of Fig. 3-7.

Example:

To determine thrust increase coefficient when the helicopter in hover IGE at 4 m (13 feet) from the wheels to the ground.

Solution: On the chart of Fig. 3-8 find the point 4 m (13 feet) on «Hover altitude» axis and from this intersection point move leftward and read the parameter on «Thrust increase coefficient » axis

Answer: When the helicopter is in hover IGE at 4 m (13 feet) from the wheels to the ground thrust increase coefficient is equal to 1.038.



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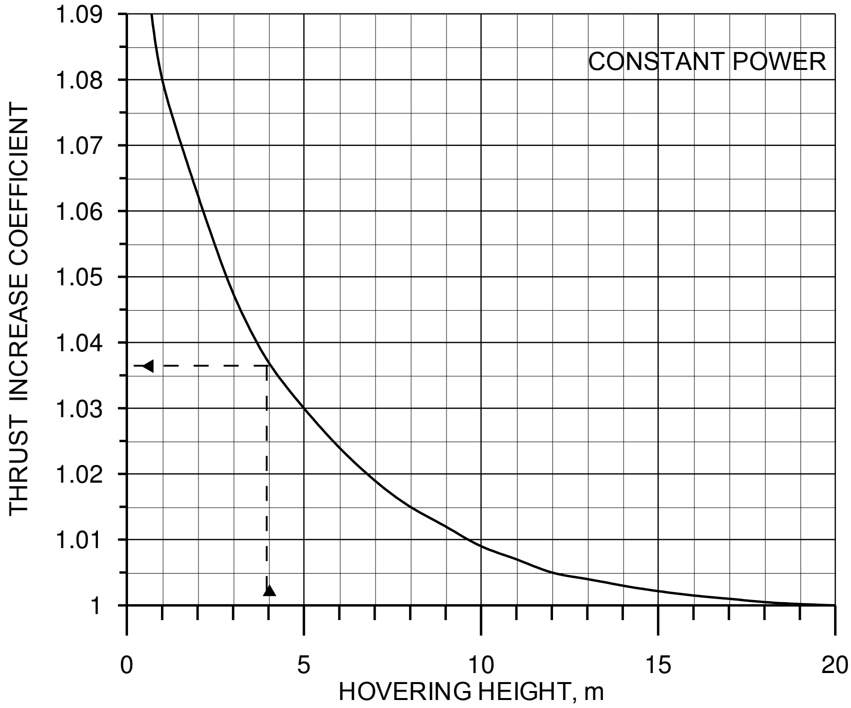

(METRIC SYSTEM)

Fig. 3-7. Thrust Increase Coefficient.

AIRSPEED CALIBRATIONS IN SLIP FLIGHT

Airspeed calibrations for the pilot's and pilot-navigator's airspeed indicators in slip flight are presented in Fig. 3-8.

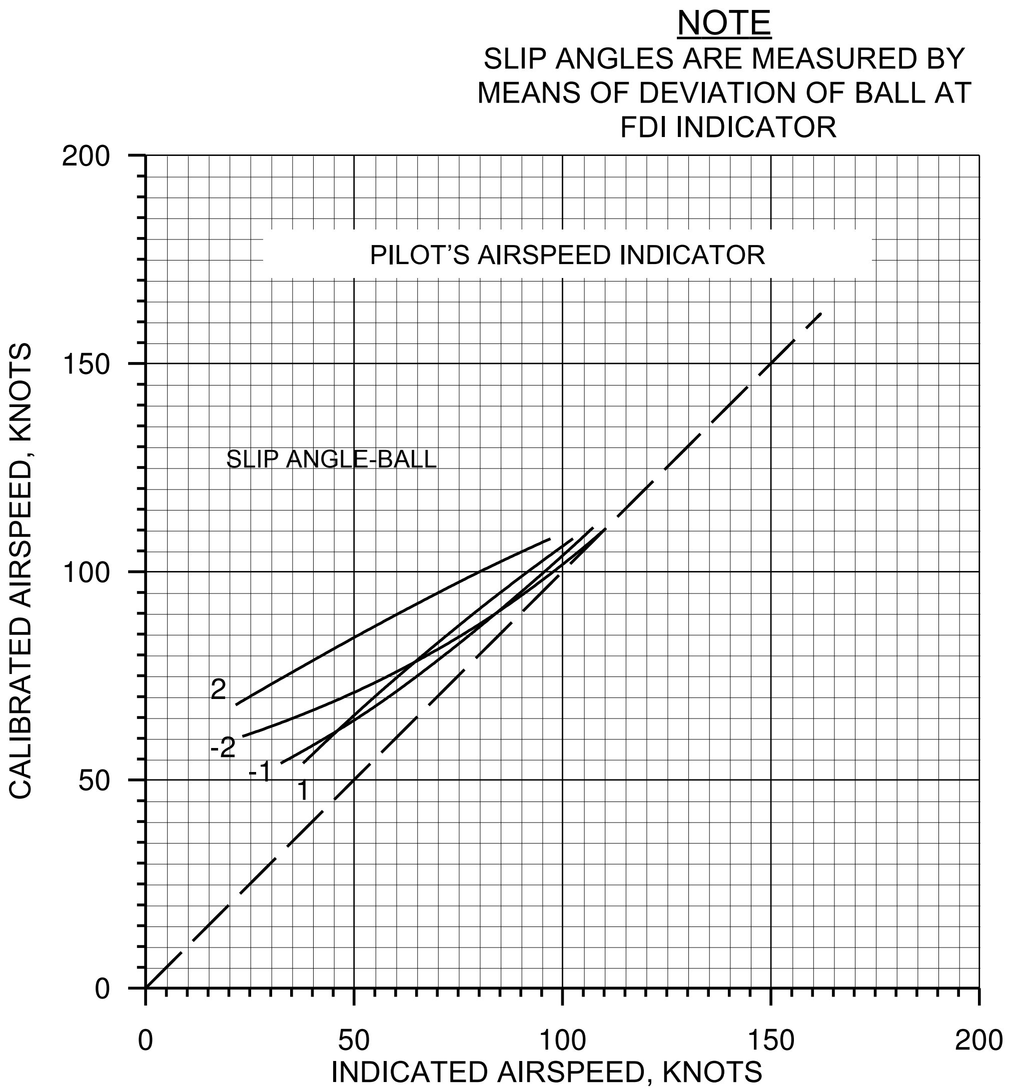

Fig. 3-8 (Sheet 1 of 4). Airspeed Calibrations in Sideslip Flight.

(BRITISH SYSTEM)

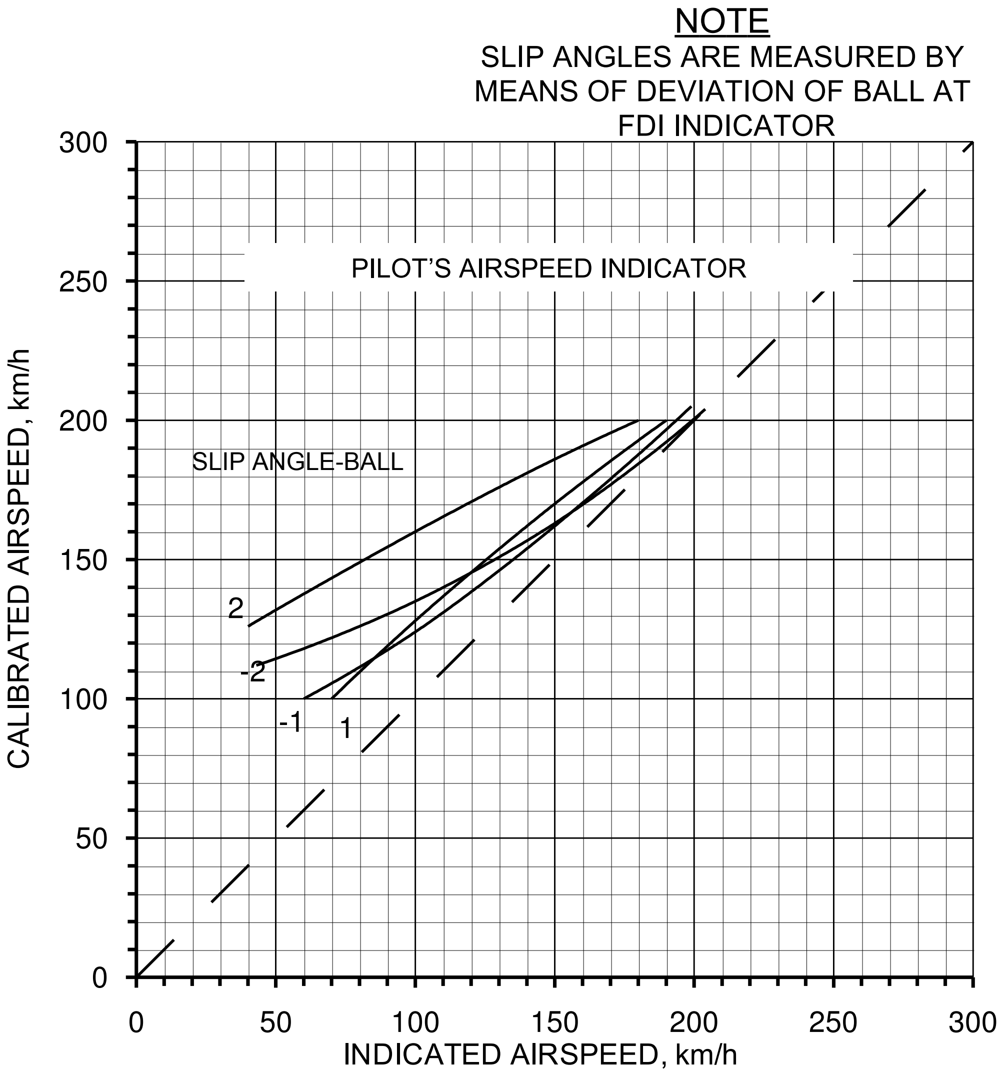

Fig. 3-8 (Sheet 2 of 4). Airspeed Calibrations in Sideslip Flight.

(METRIC SYSTEM)

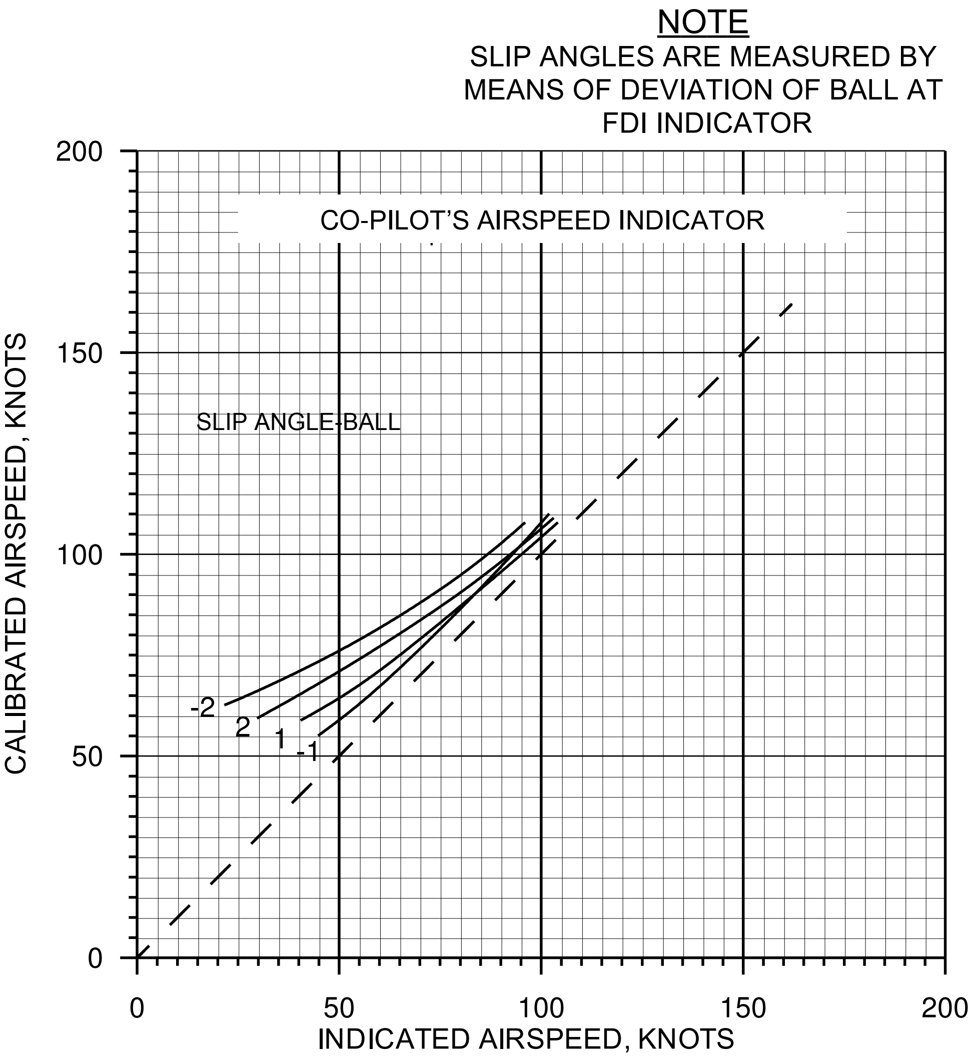

Fig. 3-9 (Sheet 3 of 4). Airspeed Calibrations in Sideslip Flight.

(BRITISH SYSTEM)

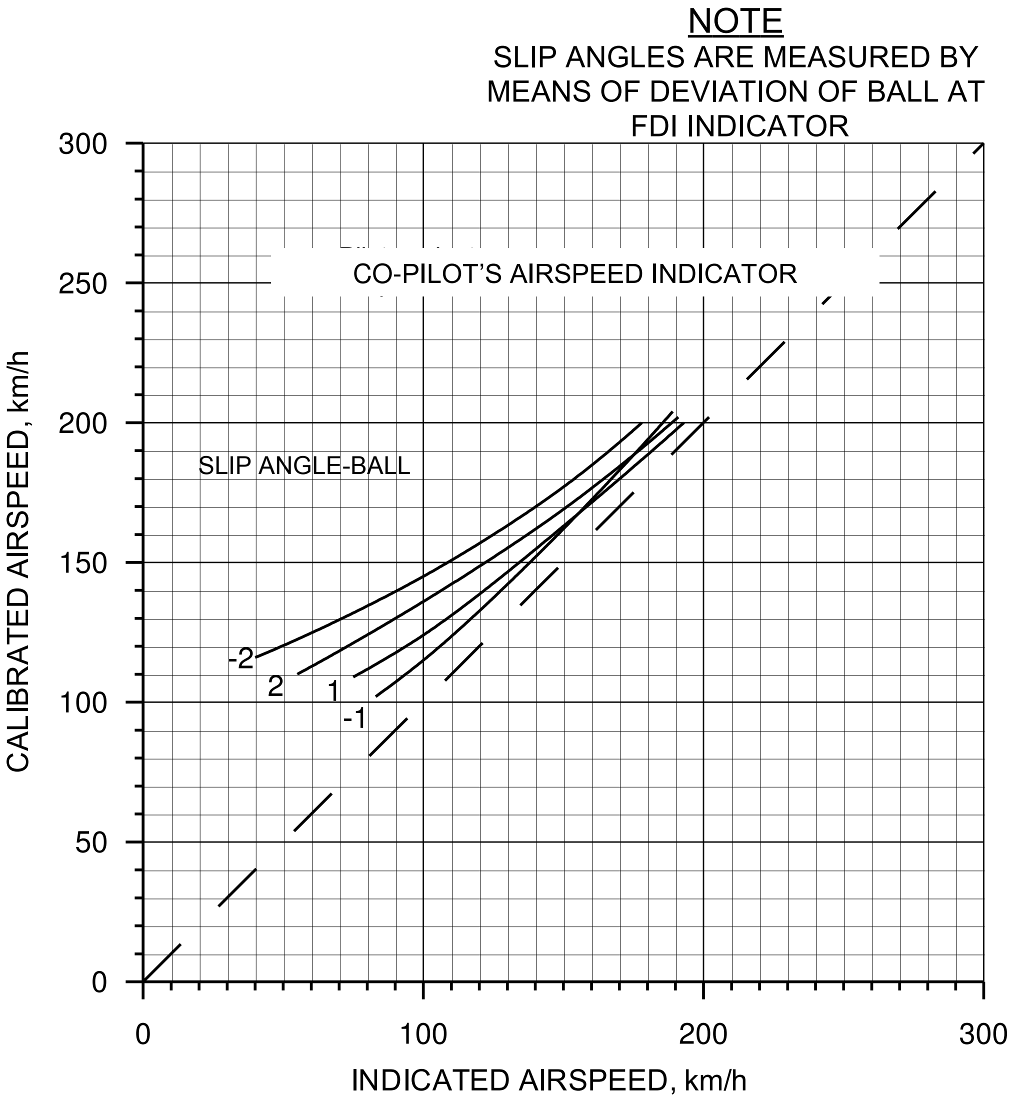

Fig. 3-9 (Sheet 4 of 4). Airspeed Calibrations in Sideslip Flight.

(METRIC SYSTEM)

STATIC AIR PRESSURE RECEIVER CALIBRATIONS

Calibrations of the MAIN and RESERVE static air pressure receivers are presented in Table 3-1.

Table 3-1. Static Air Pressure Receivers Calibrations

Main static air pressure receivers

Pressure altitude, m (ft)	Indicated airspeed, km/h (knots)							
	50 (27)	75 (40,5)	100 (54)	125 (67,5)	150 (81)	175 (94,5)	200 (108)	225 (125,5)
900 (2952)	- 10	- 10	- 5	- 5	- 5	- 10	- 15	- 20
1200 (3936)	- 10	- 10	- 5	- 5	- 5	- 10	- 15	- 20
1500 (4920)	- 10	- 10	- 5	- 5	- 5	- 10	- 15	- 20
1800 (5904)	- 10	- 10	- 5	- 5	- 5	- 10	- 15	-
2100 (6888)	- 10	- 10	- 5	- 5	- 5	- 10	- 15	-
2400 (7882)	- 10	- 10	- 5	- 5	- 5	- 10	- 15	-
2700 (8856)	- 10	- 10	- 5	- 5	- 5	- 10	- 15	-
3000 (9840)	- 10	- 10	- 5	- 5	- 5	- 10	- 15	-
3200 (10496)	- 10	- 10	- 5	- 5	- 5	- 10	- 20	-
3600 (11808)	- 10	- 10	- 5	- 5	- 5	- 10	- 20	-

Reserve static air pressure receivers

Pressure altitude, m (ft)	Indicated airspeed, km/h (knots)							
	50 (27)	75 (40,5)	100 (54)	125 (67,5)	150 (81)	175 (94,5)	200 (108)	225 (125,5)
900 (2952)	0	5	10	15	20	20	15	10
1200 (3936)	0	5	10	15	20	20	15	15
1500 (4920)	0	5	10	15	20	20	15	15
1800 (5904)	0	5	10	15	20	20	15	-
2100 (6888)	0	5	10	15	20	20	15	-
2400 (7882)	0	5	10	15	20	20	15	-
2700 (8856)	0	5	10	15	20	20	15	-
3000 (9840)	0	5	10	15	20	20	15	-
3200 (10496)	0	5	10	15	20	20	15	-
3600 (11808)	0	5	10	15	20	20	15	-

EMERGENCY LANDING INSTRUCTION FOR OCCUPANTS (SAMPLE)

Prior to the engine's start the captain must provide the occupants with the following information.

For safety ensuring you must know and observe the following rules.

Five seats at left side and five seats at right side and three seats along the back of the cargo compartment are installed for occupants using.

Each seat is equipped with a seat belt for safety ensuring. Some seats are equipped with additional breast belt. All belts should be locked before takeoff and must be kept locked during flight. The occupants movement along the cargo compartment during takeoff, route flight and landing IS PROHIBITED.

CAUTION. PRIOR TO THE EMERGENCY LANDING, THE FOLLOWING SAFETY PRECAUTIONS MUST BE FULFILLED:

- GLASSES AND SETS OF FALSE TEETH – TAKE OFF;
- THE SHARP OBJECTS, PENS, KNIVES, LIGHTERS – TAKE OUT FROM THE POCKETS AND PUT TO THE LOWER SEAT POCKET;
- THE FOOT-WEAR WITH SHARP HEELS – TAKE OFF;
- COLLAR – UNDO;
- TIE – LOOSEN;
- PRESS THE BACK TO THE BACK PILLOW AND CHECK THE SEATS FASTENING

Fixed this position up to helicopter full stop. After the pilot's command, the occupants must unlock the seat belts and immediately leave the helicopter through the nearest exit (cargo compartment door on the left side, crew compartment door and emergency hatch on the right side.

The emergency hatch is located opposite the cargo compartment door and has the placard EXIT).

For exit hatch jettisoning, remove the jacket, turn handle down to stop and push hatch outside.

For cargo door inside opening, turn handle down to stop and move door to left side. In case the door is jammed it is necessary to jettison the door. Proceed as follows:

- remove the jacket located above the door;
- pull handle and push door outside.

Emergency exits opening instructions are located on the doors and on the emergency hatch.

These instructions and the doors are illuminated by emergency portable lanterns that may be taken off (by means of button's pressing) and used during evacuation.

The following can be also used in escaping the helicopter through emergency exits:

- outside and inside fuselage handles;
- staircase – evacuation through the cargo compartment door;
- step – evacuation through the right crew compartment door;
- right shock strut prop – evacuation through the emergency hatch.

The occupants must keep the tranquillity and obey all crewmember commands.

CAUTION. THE DOOR'S AND HATCH'S EMERGENCY JETTISON CONTROLS USAGE WITHOUT THE PILOT'S COMMAND IS PROHIBITED.

IT IS PROHIBITED TO BLOCK UP THE LONGITUDINAL PASSAGE AND THE EMERGENCY EXIT APPROACH WITH BAGGAGE

Crew control the occupants loading in the cargo compartment and should check the correct usage of the seat belts.

The most strong men must be seated close to the emergency exits (seats Nos 1, 6, 12, 13, 15). They must be instructed about the emergency exit's control additionally.