Beechcraft

DUKE® B60

(P-247 and after)

PILOT'S OPERATING MANUAL

This book is incomplete without a current FAA Airplane Flight Manual, P/N 60-590000-11, consisting of FAA Data, FAA Revision Log, FAA Limitations, FAA Normal Procedures, FAA Emergency Procedures, FAA Performance, and FAA Flight Manual Supplements.

P/N 60-590000-9
Issued: August 31, 1973

P/N 60-590000-9A11
Revised: October, 1990

THANK YOU . . .

for displaying confidence in us by selecting a BEECHCRAFT airplane. Our design engineers, assemblers, and inspectors have utilized their skills to ensure that the new BEECHCRAFT Duke B60 meets the high standards of quality and performance for which BEECHCRAFT airplanes have become famous throughout the world.

IMPORTANT NOTICE

This manual should be read carefully in order to become familiar with the operation of the Duke B60. Suggestions and recommendations have been made within it to aid in obtaining maximum performance without sacrificing economy. Be familiar with and operate the airplane in accordance with the Pilot's Operating Manual and FAA Approved Airplane Flight Manual and/or the FAA Approved Placards which are located in the airplane.

As a further reminder, the owner and operator should also be familiar with the Federal Aviation Regulations applicable to the operation and maintenance of the airplane, and FAR Part 91 General Operating and Flight Rules. Further, the airplane must be operated and maintained in accordance with FAA Airworthiness Directives which may be issued against it.

The Federal Aviation Regulations place the responsibility for the maintenance of this airplane on the owner and the operator, who should make certain that all maintenance is done by qualified mechanics in conformity with all airworthiness requirements established for this airplane.

All limits, procedures, safety practices, time limits, servicing, and maintenance requirements contained in this manual are considered mandatory for continued airworthiness to maintain the airplane in a condition equal to that of its original manufacture. Refer to the maintenance manual for any exceptions.

Authorized BEECHCRAFT Parts and Service Outlets will have recommended modification, service, and operating procedures issued by both FAA and Beech Aircraft Corporation, which are designed to get maximum utility and safety from the airplane.

Beech Aircraft Corporation expressly reserves the right to supersede, cancel and/or declare obsolete, without prior notice, any part, part number, kit, or publication referenced in this manual.

USE OF THE MANUAL

It is the Owner/Pilot's responsibility to have a current BEECHCRAFT Duke B60 Pilot's Operating Manual. The following information is provided to show the divisions of the book and the proper manner of updating the revision records and amending the content of the book as the material becomes available.

DIVISIONS OF THE MANUAL

The Pilot's Operating Manual is divided into two basic parts; the FAA Approved portion which includes the FAA Approved Airplane Flight Manual and Supplements (each page being folioed as such with the FAA approval and date), and the portion that is not FAA Approved (folioed as Pilot's Operating Manual), which includes the remainder of the manual. The FAA Approved sections of the manual are distinguished from the non-approved sections in that the quick reference divider tabs are marked "FAA" preceding the title of the section.

The FAA Approved Airplane Flight Manual bears its own part number and is a complete manual in itself, but the Pilot's Operating Manual bears a separate part number and is incomplete without the Flight Manual.

PILOT'S OPERATING MANUAL REVISION RECORD

On the back side of the Title Page is a List of Effective Pages or the "A" Page, as it is normally called. Take a moment, now, to examine this page. A complete listing of all pages is presented along with the current status of the material contained; i.e. Original, Reissued, Revised or described in another section. Also, in the lower right corner of the blocked portion is a box containing a capital letter which denotes reissue of the manual. It will be advanced one letter, alphabetically, per reissue. A reissue of the manual or the revision of any portion that does not require another revision log, will be received with a new "A" Page to replace the previous one.

FAA APPROVED AIRPLANE FLIGHT MANUAL REVISION RECORD

Note the reference to the FAA Airplane Flight Manual Log of Revisions which is located under the tab of that name in the first part of the manual. This page is used for description of all material covered under the FAA Approved portion except the Airplane Flight Manual Supplements. When a revision of any information contained in this portion of the manual is made, a new Log of Revisions sheet will be issued for insertion immediately ahead of all previously issued Log of Revisions sheets. All Log of Revisions pages must be retained in the manual to provide a current record of material status until a reissue of the manual is made at which time all pages are removed. On this page, under the column labeled Revision Number, there will be a letter indicating the current issue, followed by a number indicating the numerical revisions. The revised pages will be listed along with the description. As noted at the bottom of the page, each revised portion of the pages issued will have a black border indicating the portion changed. All revised pages listed in the new Log of Revisions are to be removed and replaced with the current page.

AIRPLANE FLIGHT MANUAL SUPPLEMENTS REVISION RECORD

Within the section entitled FAA Approved Airplane Flight Manual Supplements is a Log of Revisions page. Provided here is a listing of the FAA Approved Supplemental Equipment available for installation on the BEECHCRAFT Duke B60. When new supplements are received the new "Log" sheet will replace the previous one, since it contains a listing of all previous approvals, plus the new approval. The Supplemental material will be added to the grouping in accordance with the descriptive listing.

NOTE

In an effort to provide as complete coverage as possible, applicable to any configuration of the BEECHCRAFT Duke B60, standard optional equipment has been included in the scope of these manuals. Because of the versatility of the appointments and arrangements of the airplane, the equipment described or depicted herein may not be designated as optional equipment in every case.

Service Publications, Reissues, or Revisions are not automatically provided to the holder of this manual. For information on how to obtain "Revision Service" applicable to this manual, consult a BEECHCRAFT Parts and Service Outlet or refer to latest revision of BEECHCRAFT Service Instructions No. 0250-010.

ABBREVIATIONS AND TERMINOLOGIES

The following Abbreviations and Terminologies have been listed for your convenience and ready interpretation where used within this manual. Whenever possible, they have been categorized for ready reference.

AIRSPEED TERMINOLOGY

IAS — Indicated airspeed is the speed of an aircraft as shown on its airspeed indicator. As used within this manual IAS assumes no instrument error.

CAS — Calibrated Airspeed is indicated airspeed of an aircraft, corrected for position error.

TAS — True Airspeed is equivalent airspeed corrected for temperature and pressure. Equivalent airspeed may be assumed to be approximately equal to CAS.

GS — Ground Speed, though not an airspeed, is directly calculable from True Airspeed if the True wind speed and direction are known.

M — Mach Number is the ratio of true airspeed to the speed of sound.

V_{mc} — Minimum Control Speed - The minimum flight speed at which the airplane is controllable with a maximum of 5° bank when one engine suddenly becomes inoperative and the remaining engine is operating at take-off power.

V_a — Maneuvering Speed - The maximum speed at which application of full available aerodynamic control will not overstress the airplane.

V_f — Design flap speed is the highest speed permissible at which wing flaps may be actuated.

V_{fe} — Maximum "flap extended speed" is the highest speed permissible with wing flaps in a prescribed extended position.

V_c — The design cruising speed.

V_{le} — Maximum landing gear extended speed is the maximum speed at which an aircraft can be safely flown with the landing gear extended.

V_{lo} — Maximum landing gear operating speed is the maximum speed at which the landing gear can be safely extended or retracted.

V_s — The stalling speed or the minimum steady flight speed in a specified flap, landing gear, and power configuration.

V_{so} — The stalling speed or the minimum steady flight speed, power off, in the landing configuration.

V_x — The best angle of climb speed.

V_y — The best rate of climb speed.

METEOROLOGICAL TERMINOLOGY

Pressure Altitude — Altitude measured from standard sea-level pressure (29.92 in. Hg) by a pressure or barometric altimeter.

Station Pressure — Actual atmospheric pressure at field elevation.

OAT	Outside Air Temperature - The free air static temperature, obtained either from ground meteorological sources or from inflight temperature indications, adjusted for compressibility effects.
Wind	The wind velocities recorded as variables on the charts of this manual are to be understood as the headwind or tailwind components of the actual winds at 50 feet above runway surface (tower winds).
ISA	International Standard Atmosphere in which (1) The air is a dry perfect gas; (2) The temperature at sea level is 59 degrees Fahrenheit; (3) The pressure at sea level is 29.92 inches Hg; (4) The temperature gradient from sea level to the altitude at which the temperature is -69.7 degrees Fahrenheit is -0.003566 Fahrenheit per foot and zero above that altitude.
ICAO	International Civil Aviation Organization

POWER TERMINOLOGY

Maximum Continuous	Is the highest power rating not limited by time.
Normal Operating	Highest power rating within the normal operating range. Noise characteristics requirements of FAR 36 have been demonstrated at this power rating.
Cruise Climb	Is the power recommended for normal climb.
Critical Altitude	Is that altitude for a given rpm where the desired manifold pressure can no longer be maintained.

CONTROL AND INSTRUMENT TERMINOLOGY

Throttle Control	Is the lever used to control the forced introduction of a fuel-air mixture into the intake passages of an engine by means of a pressure differential other than that caused by the induction airflow in the engine.
Propeller Control	This lever requests the governor to maintain rpm at a selected value and, in the maximum decrease rpm position, feathers the propellers.
Mixture Control	This lever, in the idle cut-off position, stops the flow of fuel at the injectors and in the intermediate to the full rich position regulates the fuel air mixture.
Propeller Governor	This governor will maintain the selected rpm requested by the propeller control lever.
Manifold Pressure Gage	An instrument that measures the pressure in the intake manifold of an engine, measured from zero, and expressed in inches of mercury (in. Hg).
Tachometer	An instrument that indicates the rotation of the propeller in revolutions per minute (rpm).
Turbo Supercharger	A turbine type compressor, driven by engine exhaust gases, that forces more air or fuel-air mixture into an internal combustion reciprocating engine than the engine would induct under the prevailing atmospheric pressures.

CHART AND GRAPH TERMINOLOGY

Climb Gradient	The demonstrated ratio of the change in height during a portion of a climb, to the horizontal distance traversed in the same time interval.

Best Rate of Climb	The best rate-of-climb speed is the airspeed which delivers the greatest gain in altitude in the shortest possible time.
Best Angle of Climb	The best angle-of-climb speed is the airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.
Demonstrated Crosswind	The demonstrated crosswind velocity is the velocity of the crosswind component for which adequate control of the airplane during take-off and landing was actually demonstrated during certification tests.
Accelerate-stop Distance	The distance required to accelerate an airplane to a specified speed and, assuming failure of an engine at the instant that speed is attained, to bring the airplane to a stop.
MEA	Minimum enroute IFR altitude.
Route Segment	A part of a route. Each end of that part is identified by: (1) a geographical location; or (2) a point at which a definite radio fix can be established.

WEIGHT AND BALANCE TERMINOLOGY

Empty Weight	The airplane weight with fixed ballast, hydraulic fluid, and in other aspects as required by applicable regulatory standards.
Basic Empty Weight	The airplane empty weight with unusable fuel, full oil, and full operating fluids.
Maximum Weight	The largest weight allowed by design, structural, performance, or other limitations.
Ramp Weight	The weight of the airplane before engine start. Included is the take-off weight plus a fuel allowance for start, taxi, run-up, and take-off ground roll to lift off.
Take-off Weight	The airplane weight at lift off.
Landing Weight	The airplane weight at touchdown.
Zero Fuel Weight	The airplane ramp weight minus the weight of fuel on board.
Unusable Fuel	The fuel remaining after comsumption of usable fuel.
Usable Fuel	That portion of the total fuel which is available for consumption as determined in accordance with applicable regulatory standards.
Fuel Capacity	The amount of fuel which can be placed in a dry airplane and is equal to the combination of usable and unusable fuel.
Engine Oil	The amount of oil which can be placed in a dry airplane engine and is equal to the combination of drainable and undrainable oil.
Useful Load	The difference between the airplane take-off weight and the basic empty weight.
Center of Gravity	A point at which the weight of an object may be considered concentrated for weight and balance purposes.
Datum	A vertical plane perpendicular to the airplane longitudinal axis from which fore and aft (usually aft) measurements are made for weight and balance purposes.
Arm	The distance from the center of gravity of an object to a line about which moments are to be computed.

Moment	A measure of the rotational tendency of a weight, about a specified line, mathematically equal to the product of the weight and the arm.
Loading Condition	That combination of airplane weight and corresponding moment applicable to various loadings, computed for weight and balance purposes.
Approved Loading Envelope	Those combinations of airplane weight and center of gravity which define the limits beyond which loading is not approved.
Station	The longitudinal distance from some point to the zero datum or zero fuselage station.
Jack Point	Points on the airplane identified by the manufacturer as suitable for supporting the airplane for weighing or other purposes.
Tare	The apparent weight which may be indicated by a scales before any load is applied.
Leveling Points	Those points which are used during the weighing process to level the airplane.

SECTION I

LIMITATIONS

Airspeeds quoted in this section are Calibrated Airspeeds (CAS) unless otherwise noted.

Observance of the limitations listed is mandatory.

ENGINES

Take-off and Maximum Continuous Power.. 2900 rpm at 41.5 in. Hg

Maximum Normal Operating Power (Serials P-523 and after).......................... 2750 rpm and 36.5 in. Hg

Cruise Power above 27,000 ft.. 2750 rpm and 31 in. Hg. (Minimum)

Engine must be preheated before starting when ambient temperatures are below 10°F (-12°C).

Oil Cooler Baffles are to be removed when OAT exceeds 20°C.

PROPELLERS

Two Hartzell constant speed, full feathering, three-bladed propellers using: HC-F3YR-2 hubs with C7479-2R or C7479B-2R blades or; HC-F3YR-2F hubs with FC7479-2R or FC7479B-2R blades or; HC-F3YR-2UF hubs with FC7479-2R or FC7479B-2R blades, and C3273 spinner assemblies. Pitch setting at 30-inch station: Low, 14°; High 81.7°. Diameter 74 inches, no cutoff permitted.

STARTERS

When restarting an engine in flight do not use the starter above 20,000 feet.

FUEL GRADE

100 (Green) Aviation Gasoline minimum grade
115/145 (Purple) Aviation Gasoline alternate grade

FUEL CAPACITY

147-Gallon Fuel System	142 Gallons Usable
207-Gallon Fuel System	202 Gallons Usable
237-Gallon Fuel System	232 Gallons Usable

FUEL MANAGEMENT

Do not take-off if fuel quantity gages indicate in Yellow Arc or with less than 25 gallons of fuel in each wing system.

Both engine-driven fuel pumps and both electric fuel boost pumps must be operable for takeoff. Electric fuel boost pumps must be on for takeoff.

INSTRUMENT MARKINGS

Oil Temperature	
Minimum (Red Radial)	38°C
Normal Operating Range (Green Arc)	38 to 118°C
Maximum (Red Radial)	118°C
Oil Pressure	
Minimum Idle (Red Radial)	10 psi or 25 psi
Normal Operating Range (Green Arc)	60 to 90 psi
Maximum (Red Radial)	100 psi
Fuel Flow (Serials P-535 and after)	
Green Arc	60 to 330 pph
Fuel Flow (Serials prior to P-535)	
Green Arc	60 to 330 pph
55%	93 to 110 pph
65%	110 to 131 pph
75%	131 to 142 pph
Manifold Pressure	
Normal Operating Range (Green Arc) (Serials P-523 and After)	14 to 36.5 in. Hg
Normal Operating Range (Green Arc) (Serials P-247 thru P-522)	14 to 41.0 in. Hg
Maximum (Red Radial)	41.5 in. Hg
Tachometer	
Normal Operating Range (Green Arc) (P-523 and After)	2350 to 2750 rpm
Normal Operating Range (Green Arc) (P-247 thru P-522)	2350 to 2900 rpm
Maximum (Red Radial)	2900 rpm
Cylinder Head Temperature	
Normal Operating Range (Green Arc)	121 to 232°C
Maximum (Red Radial)	246°C
Turbine Inlet Temperature (Red Radial)	900°C
Instrument Air	
Minimum Operating Range (Yellow Arc)	2.5 to 3.5 in. Hg
Normal Operating Range (Green Arc)	3.5 to 5.5 in. Hg
Maximum Operating Range (Yellow Arc)	5.5 to 6.5 in. Hg
Red Button Source Failure Indicators	
Pneumatic Pressure	
Normal Operating Range (Green Arc)	7 to 20 psi
(Red Radial)	20 psi
Cabin Differential	
Normal Operating Range (Green Arc)	0 to 4.7 psi
Maximum (Red Arc)	4.7 psi
Propeller Deice	
Normal Operating Range (Green Arc)	14 to 18 amps
Fuel Quantity Indicators	
No Take-off (Yellow Arc)	0 to 25 gals

AIRSPEED LIMITATIONS (CAS) *(Serials Prior to P-486 without Kit 60-5023)*

Maximum Allowable (Red Radial) (Glide or Dive, Smooth Air)	270 mph/235 kts
Caution Range (Yellow Arc)	240 to 270 mph/208 to 235 kts
Normal Operating Range (Green Arc)	98 to 240 mph/85 to 208 kts
Flap Operating Range (White Arc)	88 to 162 mph/76 to 141 kts
Approach Position - 15°	202 mph/175 kts
Full Down Position - 30°	162 mph/141 kts
Single-Engine Best Rate-of-Climb (Blue Radial)	129 mph/112 kts
Minimum Single-Engine Control Speed (Red Radial)	101 mph/88 kts
Maximum Gear Operation Speed	202 mph/175 kts
Maximum Gear Extended Speed	202 mph/175 kts
Maximum Design Maneuvering	186 mph/161 kts

AIRSPEED LIMITATIONS (IAS) *(Serials P-486 and after or with Kit 60-5023)*

Maximum Allowable (Red Radial) (Glide or Dive, Smooth Air)	268 mph/233 kts
Caution Range (Yellow Arc)	238 to 268 mph/207 to 233 kts
Normal Operating Range (Green Arc)	94 to 238 mph/82 to 207 kts
Flap Operating Range (White Arc)	85 to 161 mph/74 to 140 kts
Approach Position - 15°	200 mph/174 kts
Full Down Position - 30°	161 mph/140 kts
Single-Engine Best Rate-of-Climb (Blue Radial)	127 mph/110 kts
Minimum Single-Engine Control Speed (Red Radial)	98 mph/85 kts
Maximum Gear Operation Speed	200 mph/174 kts
Maximum Gear Extended Speed	200 mph/174 kts
Maximum Design Maneuvering	184 mph/160 kts

ALTITUDE LIMITATION .... 30,000 ft

MANEUVERS

This is a normal category aircraft. Acrobatic maneuvers, including spins, are prohibited.
Maximum slip duration .... 30 seconds

FLIGHT LOAD FACTORS

At design Gross Weight of 6775 lbs: Positive; Flaps Up 3.5 G, Flaps Down 2.0 G.

CENTER OF GRAVITY (Landing Gear Extended)

Forward Limits: 128.0 inches aft of datum at 5100 lbs and under, then straight line variation to 134.6 inches aft of datum at gross weight of 6775 lbs.
Aft Limits: 139.2 inches aft of datum at all weights.

WEIGHTS

Maximum Take-off Weight	6775 lbs
Maximum Landing Weight (10-Ply Rated Tires)	6775 lbs
Maximum Landing Weight (8-Ply Rated Tires)	6600 lbs
Maximum Ramp Weight	6819 lbs

CABIN PRESSURIZATION

Maximum operating cabin pressure differential is 4.7 psi.
Fuselage pressure vessel structural life limit - 15,000 hrs.

AFT FACING CHAIRS

Only aft facing seats are authorized in the aft facing position.
The headrest and seat back of the aft facing seat must be in the fully raised position for take-off and landing.

PLACARDS

On right sidewall:
P-523 and After

AIRSPEED LIMITATIONS

GEAR | MAX. EXTEND 174 KTS IAS
MAX. OPERATION 174 KTS IAS

FLAP | MAX. APPROACH 174 KTS IAS
MAX. FULL 140 KTS IAS

MIN SINGLE ENGINE CONTROL 85 KTS IAS - MAX. MANEUVERING 160 KTS IAS
TWIN ENGINE CLIMBS, BEST ANGLE 99 KTS IAS,
RECOMMEND BELOW 14,000 FT. 110 KTS IAS
RECOMMEND 14,000 FT. AND ABOVE 120 KTS IAS

CAUTION
DO NOT LAND WHILE PRESSURIZED

RECOMMENDED APPROACH
98 KTS IAS

DEMONSTRATED CROSSWIND
25 KTS

OPERATION LIMITATIONS

THIS AIRPLANE MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUALS.

NO ACROBATIC MANEUVERS INCLUDING SPINS ARE APPROVED
THIS AIRPLANE IS APPROVED FOR VFR, IFR, DAY & NIGHT OPERATIONS
THIS AIRPLANE IS NOT APPROVED FOR FLIGHT IN KNOWN ICING CONDITIONS

On right sidewall:
P-247 to P-522

AIRSPEED LIMITATIONS

GEAR | MAX. EXTEND 174 KTS IAS
MAX. OPERATION 174 KTS IAS

FLAP | MAX. APPROACH 174 KTS IAS
MAX. FULL 140 KTS IAS

MIN SINGLE ENGINE CONTROL 85 KTS IAS - MAX. MANEUVERING 160 KTS IAS
TWIN ENGINE CLIMBS, BEST ANGLE 99 KTS IAS, BEST RATE 120 KTS IAS

CAUTION
DO NOT LAND WHILE PRESSURIZED

RECOMMENDED APPROACH
98 KTS IAS

DEMONSTRATED CROSSWIND
25 KTS

OPERATION LIMITATIONS

THIS AIRPLANE MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUALS.

NO ACROBATIC MANEUVERS INCLUDING SPINS ARE APPROVED
THIS AIRPLANE IS APPROVED FOR VFR, IFR, DAY & NIGHT OPERATIONS
THIS AIRPLANE IS NOT APPROVED FOR FLIGHT IN KNOWN ICING CONDITIONS

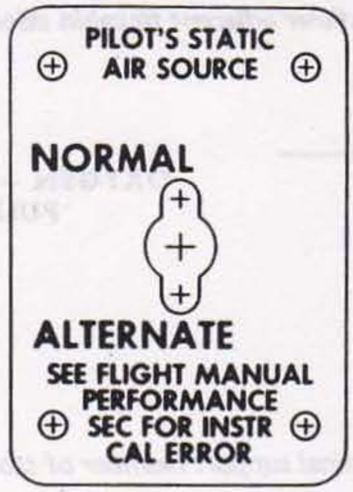
Airplanes equipped in accordance with Airplane Flight Manual Supplement FLIGHT IN KNOWN ICING CONDITIONS, P/N 60-590001-17 are approved for flight in known icing conditions and the following placard will be placed on the Operation Limitation panel:

NO ACROBATIC MANEUVERS INCLUDING SPINS ARE APPROVED
THIS AIRPLANE IS APPROVED FOR VFR, IFR, DAY & NIGHT OPERATIONS
THIS AIRPLANE IS APPROVED FOR FLIGHT IN KNOWN ICING CONDITIONS

PLACARDS (Continued)

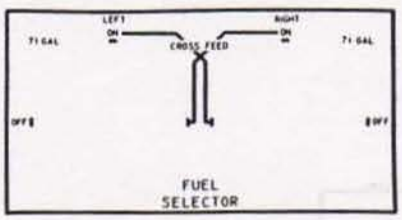
On the copilot's sidewall:
P-247 to P-262

On the copilot's sidewall:
P-263 and after and all prior airplanes incorporating Kit 60-5019

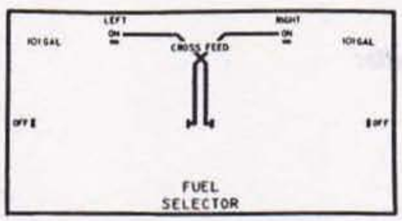


On Fuel Selector Panel on Floor Between Seats:

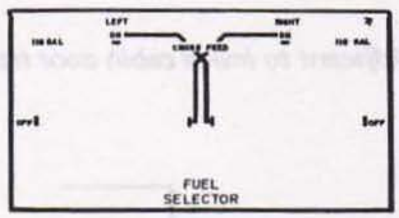
147-Gallon Fuel System



207-Gallon Fuel System



237-Gallon Fuel System



Above magnetic compass:

-CAUTION-
MAGNETIC COMPASS IS ERRATIC WHEN HEATED WINDSHIELD IS IN OPERATION

On the main spar cover between the pilot and copilot seats:

EMERGENCY LANDING GEAR INSTRUCTIONS TO EXTEND

ENGAGE HANDLE IN REAR OF FRONT SEAT AND TURN CLOCKWISE AS FAR AS POSSIBLE (50 TURNS)

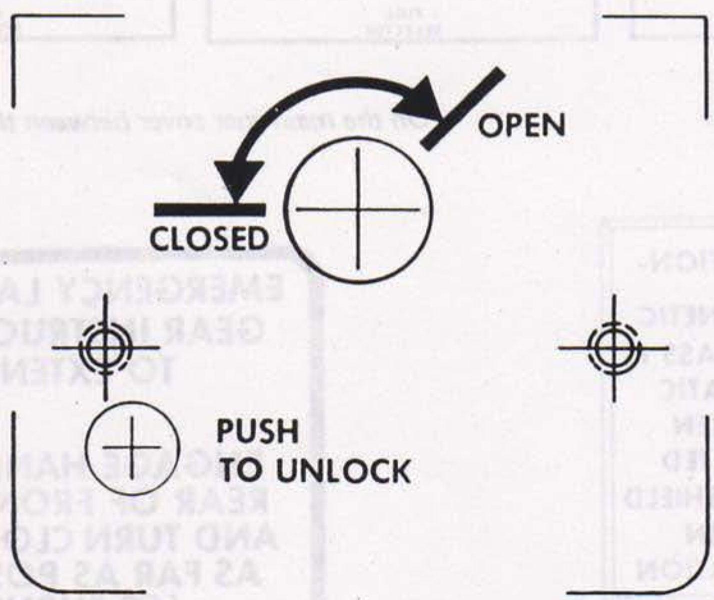
On headliner adjacent to cabin door, if oxygen is installed:

OXYGEN – NO SMOKING WHILE IN USE
PULL PLUG TO STOP FLOW

On vertical support member of table:

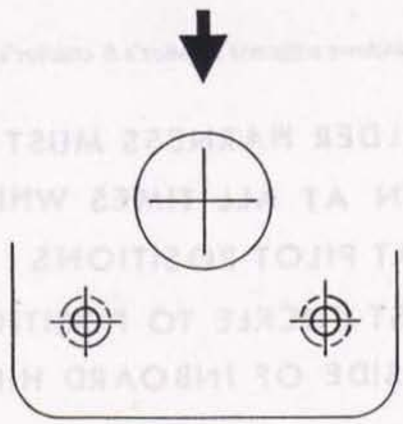
STOW BEFORE TAKE-OFF AND LANDING

Adjacent to inside cabin door handle:



Near cabin door handle:

EMERGENCY PULL TO
DEFEAT PRESSURE LOCK
CAUTION: DO NOT PULL
WHILE CABIN IS
PRESSURIZED



On headliner above emergency exit window:

EMERGENCY EXIT
PULL CURTAIN ASIDE

On emergency exit:

EMERGENCY EXIT
LIFT COVER, RELEASE CATCH
& PULL HANDLE DOWN FULLY

On right cabin sidewall:

OCCUPANT OF AFT FACING SEAT MUST HAVE
HEAD SUPPORTED AND SEAT BACK FULLY
UPRIGHT DURING TAKE-OFF AND LANDING

When shoulder harness installed, on windows adjacent to pilot's & copilot's seats:

SHOULDER HARNESS MUST BE
WORN AT ALL TIMES WHILE
AT PILOT POSITIONS
ADJUST BUCKLE TO POSITION
AT SIDE OF INBOARD HIP

or;

SHOULDER HARNESS
MUST BE WORN AT
ALL TIMES WHILE AT
PILOT POSITIONS

When shoulder harness installed, on windows adjacent to 3rd & 4th forward facing seats and 5th and 6th seats:

SHOULDER HARNESS
MUST BE WORN DURING
TAKE-OFF AND LANDING
WITH SEAT BACK UPRIGHT

In nose baggage compartment:

COMPARTMENT LOADING
WEIGHT LIMITATIONS

STD LOADING 500 LBS MAX.

SEE WEIGHT & BALANCE SECTION OF FLIGHT MANUAL
FOR ADD'L LIMITATIONS FROM OPTIONAL EQUIP.

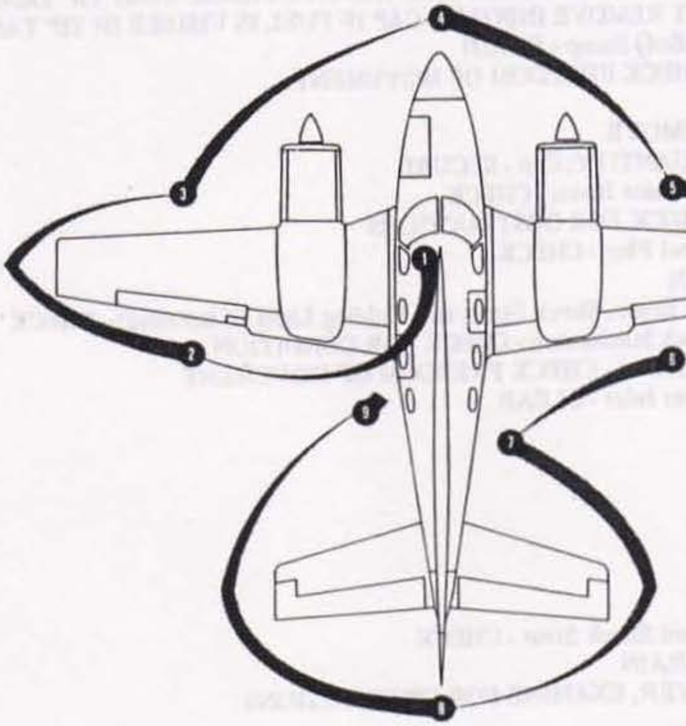
On aft cabin bulkhead upholstery panel:

MAX. BAGGAGE LOAD
ON FLOOR
WITH AFT SEATS 70 LBS
WITHOUT AFT SEATS 315 LBS

SECTION II

NORMAL PROCEDURES

All speeds quoted in this section are Indicated Airspeeds (IAS)



PREFLIGHT INSPECTION

1. Cockpit Check

1. Control Locks - REMOVE and STOW
2. Parking Brake - SET
3. All Switches - OFF
4. Landing Gear Handle - DOWN
5. Battery Switch - ON
6. Fuel Quantity Indicators - CHECK QUANTITY (See LIMITATIONS for take-off fuel)
7. Cowl Flap Switches - OPEN
8. Battery Switch - OFF
9. Oxygen Pressure - CHECK
10. Trim Tabs (3) - SET TO ZERO

2. Left Wing, Trailing Edge

1. Wing Root Fuel Sump - DRAIN
2. Flaps - CHECK
3. Aileron - CHECK FREEDOM OF MOVEMENT, TAB NEUTRAL WHEN AILERON NEUTRAL

3. Left Wing, Leading Edge

1. Position Light and Wing Tip Landing Light (if installed) - CHECK
2. Fuel - CHECK QUANTITY; CAP(S) SECURE. ALWAYS CHECK WING TIP TANK FIRST (IF INSTALLED); DO NOT REMOVE INBOARD CAP IF FUEL IS VISIBLE IN TIP TANK.
3. Wing Tip Tank (if installed) Sump - DRAIN
4. Stall Warning Vane - CHECK FREEDOM OF MOVEMENT
5. Deice Boots - CHECK
6. Tie Down, Chocks - REMOVE
7. Engine Oil - CHECK QUANTITY; Cap - SECURE
8. Propeller and Propeller Deice Boots - CHECK
9. Engine Air Intakes - CHECK FOR OBSTRUCTIONS
10. Engine Cowling and Cowl Flap - CHECK
11. Fuel Sumps (2) - DRAIN
12. Wheel Well Doors, Tire, Brake, Shock Strut, and Landing Light (if installed) - CHECK
13. Landing Gear Down-Lock Mechanism - CHECK FOR CONDITION
14. Landing Gear Up-Lock Roller - CHECK FREEDOM OF MOVEMENT
15. Pressurization Intercooler Inlet - CLEAR

4. Nose Section

1. Baggage Door - CHECK
2. Wheel Well Door, Tire and Shock Strut - CHECK
3. Heater Fuel Strainer - DRAIN
4. Pitot(s) - REMOVE COVER, EXAMINE FOR OBSTRUCTIONS
5. Nose Cone - CHECK
6. Ram Air Inlet - CLEAR

5. Right Wing, Leading Edge

1. Pressurization Intercooler Inlet - CLEAR
2. Wheel Well Doors, Tire, Brake, Shock Strut, and Landing Light (if installed) - CHECK
3. Landing Gear Down-Lock Mechanism - CHECK FOR CONDITION
4. Landing Gear Up-Lock Roller - CHECK FREEDOM OF MOVEMENT
5. Fuel Sumps (2) - DRAIN
6. Engine Cowling and Cowl Flap - CHECK
7. Engine Oil - CHECK QUANTITY; Cap - SECURE
8. Propeller and Propeller Deice Boots - CHECK
9. Engine Air Intakes - CHECK FOR OBSTRUCTIONS
10. Tie Down, Chocks - REMOVE
11. Deice Boots - CHECK
12. Fuel - CHECK QUANTITY; CAP(S) SECURE. ALWAYS CHECK WING TIP TANK FIRST (IF INSTALLED); DO NOT REMOVE INBOARD CAP IF FUEL IS VISIBLE IN TIP TANK.
13. Wing Tip Tank (if installed) Sump - DRAIN
14. Position Light and Wing Tip Landing Light (if installed) - CHECK

6. *Right Wing, Trailing Edge*

1. Aileron - CHECK FOR FREEDOM OF MOVEMENT
2. Flaps - CHECK
3. Wing Root Sump - DRAIN

7. *Fuselage, Right Side*

1. Static Port - CLEAR OF OBSTRUCTIONS
2. Antennas - CHECKED
3. Emergency Locator Transmitter - ARMED

8. *Empennage*

1. Position Light - CHECK
2. Rudder Mounted Rotating Beacon - CHECK
3. Control Surfaces - CHECK
4. Tab - ELEVATOR TAB NEUTRAL WITH ELEVATOR NEUTRAL
5. Deice Boots - CHECK
6. Tie Down - REMOVE

9. *Fuselage, Left Side*

1. Static Port - CLEAR OF OBSTRUCTIONS

CAUTION

Never taxi with a flat shock strut.

NOTE

If night flight is anticipated, exterior lights should be checked for operation.

BEFORE STARTING

1. Cabin Door, Escape Hatch and Baggage - SECURED
2. Seat and Rudder Pedals - ADJUSTED. SEAT BACKS UPRIGHT
3. Seat Belts and Shoulder Harnesses - FASTEN
4. Flight Controls - FREEDOM OF MOVEMENT and PROPER RESPONSE
5. Cowl Flaps - CHECK OPEN
6. Circuit Breakers - IN
7. Fuel Selectors - ON

STARTING

1. Propeller Controls - FORWARD (Low Pitch)
2. Mixture Controls - IDLE CUT-OFF
3. Battery Switch - ON

CAUTION

If voltmeter indicates less than 20 volts, the battery must be recharged or replaced with a battery indicating 20 volts or greater before using external power as described later in this section.

NOTE

If external power is used, start right engine first.

4. Boost Pumps - ON
5. Start Engines

   a. Cold Starts:
      (1) Throttle 1000 rpm position (approximately 1/2 inch open).
      (2) Mixture control FULL FORWARD for 2 to 3 seconds to prime then to IDLE CUT-OFF.
      (3) Magneto/Start Switch - START
      (4) When the engine starts, return the Magneto/Start switch to BOTH, Slowly advance the mixture control to FULL RICH.

   b. Flooded Engine:
      (1) Mixture Control - IDLE CUT-OFF
      (2) Throttle - 1/2 OPEN
      (3) Magneto/Start Switch - START
      (4) When engine starts, return the Magneto/Start switch to BOTH. Retard the throttle and slowly advance the mixture control to FULL RICH position.

   c. Hot Starts:
      (1) Throttle 1300 to 1500 rpm position (approximately 1 inch open).
      (2) Mixture Controls - IDLE CUT-OFF
      (3) Magneto/Start Switch - START

      NOTE

      A small prime may be necessary if the engine does not start after a few revolutions.

      (4) When the engine starts, return the Magneto/Start switch to BOTH. Slowly advance the mixture control to FULL RICH.

6. Throttle 1000 to 1500 rpm
7. Oil Pressure - ABOVE RED RADIAL WITHIN 30 SECONDS
8. Generator Switch - ON
9. External Power (if used) - DISCONNECT
10. Annunciator Light (BATTERY CHARGE) - CHECK

NOTE

Provided sufficient energy is used from the battery during the first engine start, the amber caution light, placarded BATTERY CHARGE, will illuminate approximately 6 seconds after the generator is on the line. This indicates a charge current in excess of 3 amperes. The light should extinguish within 5 minutes. Failure to do so indicates a partially discharged battery. Continue to charge battery. Make a check each 90 seconds using the Shutdown Battery Condition Check procedure until the charge rate fails to decrease and the light extinguishes. Failure of the light to extinguish indicates an unsatisfactory condition. The battery should be removed and checked by a qualified nickel-cadmium battery shop.

11. Use the same procedure to start other engine.
12. Fuel Boost Pumps - OFF

NOTE

Use of the fuel boost pumps is recommended for ground operation in ambient temperature of 90°F (32°C) or above.

AFTER STARTING AND TAXI

1. Brakes - CHECK
2. Voltage and Loadmeters - CHECK
3. Avionics - ON
4. Lights - AS REQUIRED
5. Cabin Temperature and Mode - AS REQUIRED
6. Annunciator Warning Lights - PRESS-TO-TEST
7. Instruments - CHECK

BEFORE TAKEOFF

NOTE

All reclining seats must be in the upright position before takeoff.

1. Seat Belts and Shoulder Harnesses - CHECK
2. Parking Brake - SET
3. Engine Warm-up - 1000 TO 1500 RPM
4. Fuel Boost Pumps - ON

NOTE

With engine speed below 2000 rpm, a diaphragm failure in the engine driven pump will cause engine roughness and a drop in rpm when the fuel pump is turned on.

5. Fuel Selectors - CROSSFEED (for 10-15 seconds)
6. Fuel Selectors - RETURN BOTH TO ON POSITION
7. Instruments - CHECK, NORMAL INDICATION AND SET
8. Flaps - CHECK OPERATION AND SET
9. Electric Trim - CHECK OPERATION
10. Trim - SET TO TAKE-OFF RANGE
11. Propeller Synchronizer - OFF
12. Autopilot - CHECK
13. Throttles - 2000 RPM
14. Magnetos - CHECK (175 rpm maximum drop within 50 rpm of each other.)

NOTE

Avoid operation on one magneto for more than 5 to 10 seconds.

15. Throttles - 1500 RPM
16. Propellers - FEATHER CHECK (No more than 500 rpm drop) Repeat 2 or 3 times in cold weather
17. Gyro Pressure and Load Meters - CHECK
18. Throttles - IDLE
19. Pressurization - SET
20. Parking Brake - RELEASE

TAKEOFF

POWER SETTINGS:

Take-off and Maximum Continuous . . . . 41.5 in. Hg 2900 RPM

1. Power - SET take-off power before brake release.
2. Airspeed - ACCELERATE to and maintain take-off speed
3. Landing Gear - RETRACT when aircraft is positively airborne.
4. Airspeed - ESTABLISH DESIRED CLIMB SPEED when clear of obstacles.

MAXIMUM PERFORMANCE CLIMB

1. Power - SET (Serials P-247 thru P-522) MAXIMUM CONTINUOUS POWER (41.5 in. Hg 2900 rpm)
   (Serials P-523 and After) NORMAL OPERATING POWER (36.5 in. Hg 2750 rpm)
2. Fuel Boost Pumps - ON
3. Mixtures - FULL RICH
4. Cowl Flaps - OPEN
5. Propeller Synchronizer - ON
6. Airspeed - ESTABLISH TWO-ENGINE RECOMMENDED CLIMB SPEED

CRUISE CLIMB

1. Power - SET CRUISE CLIMB POWER (36.5 in. Hg 2750 rpm)
2. Fuel Flow - 198 LBS/HR/ENGINE
3. Propeller Synchronizer - ON
4. Airspeed - ESTABLISH TWO-ENGINE RECOMMENDED CLIMB SPEED
5. Pressurization Directional Toggle Switch - UP
6. Cowl Flaps - AS REQUIRED (MAINTAIN 225°C CYLINDER HEAD TEMPERATURE OR LESS)
7. Boost Pumps - AS REQUIRED

NOTE

Use of fuel boost pump may be discontinued at any time except when excessive fluctuations of fuel flow readings indicate a need for continued use.

CRUISE

1. Power - SET AS DESIRED (Use Cruise Power Settings tables)

NOTE

The minimum and maximum limits of manifold pressure and rpm will not be shown on the Horsepower Calculator.

2. Fuel Flow - LEAN AS REQUIRED (Lean to recommended fuel flow if Turbine Inlet Temperature (TIT) is below 900°C).
3. Fuel Boost Pumps - OFF (Unless needed to prevent fuel flow fluctuations.)
4. Cowl Flaps - AS REQUIRED (Maintain 225°C cylinder head temperature or less)
5. Battery - MONITOR CONDITION

NOTE

If the amber caution light, placarded BATTERY CHARGE, illuminates in flight, turn the Battery Switch - OFF and proceed to destination. (The battery switch should be turned on for landing in order to avoid electrical transients caused by power fluctuations.) A battery condition check as outlined under Shutdown Battery Condition Check procedures should be made after landing. If the battery indicates unsatisfactory, it should be removed and checked by a qualified nickel-cadmium battery shop.

OPERATIONAL SPEEDS

Minimum Single-Engine Control ....98 mph/85 kts

Single-Engine Best Angle-of-Climb....................115 mph/100 kts

Single-Engine Best Rate-of-Climb ....127 mph/110 kts

Two-Engine Best Angle-of-Climb.................... 114 mph/99 kts

Two-Engine Best Rate-of-Climb
(Serials P-247 thru P-522) .... 138 MPH/120 KTS
(Serials P-523 and after) ....RECOMMENDED BELOW 14,000 ft. .... 110 KTS IAS
RECOMMENDED 14,000 Ft. and above.................... 120 KTS IAS

Cruise Climb:

SL - 20,000 feet ....161 mph/140 kts
20 - 25,000 feet ....150 mph/130 kts
25 - 30,000 feet ....138 mph/120 kts

Maximum Demonstrated Crosswind ....29 mph/25 kts

DESCENT

1. Altimeter - SET
2. Cowl Flaps - CLOSED
3. Windshield Anti-ice and Defroster - AS REQUIRED (On before descent into warm, moist air.)
4. Pressurization - SET
5. Power - AS REQUIRED (to maintain cabin pressurization)

BEFORE LANDING

1. Pressurization - ZERO DIFFERENTIAL PRESSURE
2. Seat Belts and Shoulder Harnesses - FASTEN. SEAT BACKS UPRIGHT
3. Fuel Boost Pumps - ON
4. Propeller Synchronizer - OFF
5. Mixtures - FULL RICH
6. Flaps - APPROACH (15°) (Maximum Extension Speed 200 mph/174 kts)
7. Landing Gear DOWN (Maximum Extension Speed 200 mph/174 kts)
8. Flaps - FULL DOWN (30°) (Maximum Extension Speed 161 mph/140 kts)
9. Airspeed - ESTABLISH LANDING APPROACH SPEED
10. Propeller Levers - FULL FORWARD

BALKED LANDING

1. Power - 2900 RPM and 41.5 in Hg
2. Airspeed - BALKED LANDING CLIMB SPEED
3. Flaps - UP
4. Gear - UP
5. Cowl Flaps - AS REQUIRED

AFTER LANDING

1. Landing and Taxi Lights - AS REQUIRED
2. Flaps - UP
3. Trim Tabs - SET TO ZERO
4. Cowl Flaps - OPEN
5. Fuel Boost Pumps - AS REQUIRED

NOTE

Fuel boost pumps may be turned off if ambient temperature is below 90°F (32°C).

SHUT DOWN

1. Parking Brake - SET
2. Battery - CONDITION AND CHARGE. If the BATTERY CHARGE annunciator light is extinguished, the battery is charged and the condition is good. If the light is illuminated, perform the following check:

   a. One Generator - OFF
   b. Engine Speed (engine with generator on) - 1000 RPM (Voltmeter approximately 28 volts)
   c. After loadmeter needle stabilizes, momentarily turn the Battery switch OFF and note change in meter indication.

NOTE

The change in loadmeter indication is the battery charge current and should be no more than .025 (only perceivable needle movement). If the result of the first test is not satisfactory, allow the battery to charge repeating the test each 90 seconds. If the results are not satisfactory within 3 minutes, the battery should be removed and checked by a qualified Nickel-Cadmium Battery shop.

3. Electrical and Avionics Equipment - OFF
4. Cabin Temp Mode - OFF
5. Propellers - LOW PITCH (High rpm)
6. Throttles - 1000 RPM
7. Fuel Boost Pumps - OFF
8. Mixtures - IDLE CUT-OFF
9. Magneto/Start Switches - OFF, after engines stop
10. Battery and Generator Switches - OFF
11. Controls - LOCKED
12. If airplane is to be parked for an extended period of time, install wheel chocks and release the parking brake, as greatly varying ambient temperatures may build excessive pressures on the hydraulic system.

ENVIRONMENTAL CONTROLS

PRESSURIZATION SYSTEM

If, for any reason, both pressurization air shut-off controls are in the PULL TO SHUT-OFF position, the Test/Dump switch must be in the DUMP position to provide adequate ventilation.

BEFORE TAKE-OFF, MANUAL CONTROLLER (P-247 through P-307)

1. Pressurization Air Shut-Off Controls - OPEN (In)
2. Pressure/Dump Switch - PRESSURE POSITION
3. Cabin Altitude Controller - SET 1000 FEET BELOW FIELD ELEVATION
4. Throttles - 2500 RPM
5. Test Switch - PRESS-TO-TEST (Note momentary cabin descent); RELEASE SWITCH
6. Cabin Altitude Controller - SET 1000 FEET ABOVE TAKE-OFF FIELD OR DESTINATION FIELD ELEVATION, WHICHEVER IS HIGHEST

BEFORE TAKE-OFF, MOTORIZED CONTROLLER (P-247 through P-307)

1. Pressurization Air Shut-Off Controls - OPEN (In)
2. Test/Dump Switch - OFF
3. Directional Toggle Switch - OFF
4. Cabin Altitude Controller - MANUALLY SET TO 1000 FEET BELOW FIELD ELEVATION
5. Throttles - 2500 RPM
6. Test/Dump Switch - HOLD TO TEST (Note momentary cabin descent); RELEASE TO OFF POSITION
7. Directional Toggle Switch - UP (Manually set to 1000 feet above field elevation), THEN OFF
8. Red Altitude Selector Ring - SET TO 500 FEET ABOVE CRUISE ALTITUDE

BEFORE TAKE-OFF, CONTROLLER (P-308 and after)

1. Pressurization Air Shut-Off Controls - OPEN (In)
2. Test/Dump Switch - NOR
3. Cabin Altitude Controller - SET OUTER SCALE 1000 FEET BELOW FIELD ELEVATION
4. Throttles - 2500 RPM
5. Test/Dump Switch - HOLD TO TEST (Note momentary cabin descent); RELEASE TO NOR POSITION
6. Cabin Altitude Controller - SET OUTER SCALE TO DESIRED CABIN ALTITUDE OR INNER SCALE TO CRUISE ALTITUDE PLUS 500 FEET
7. Rate Control - SET POINTER TO VERTICAL POSITION

IN FLIGHT, MOTORIZED CONTROLLER (P-247 through P-307)

When Cabin Rate-of-Climb indicates zero

1. Directional Toggle Switch - UP (To raise cabin to selected altitude).

On descent when differential pressure is below 4.0 psi

1. Directional Toggle Switch - DOWN (To lower cabin to 1000 feet above destination field elevation).

CAUTION

Insure that cabin differential pressure is ZERO to avoid landing with a pressurized cabin.

IN FLIGHT, CONTROLLER (P-308 and after)

Before descent

1. Cabin Altitude Controller - SET OUTER SCALE TO FIELD ELEVATION PLUS 500 FEET
2. Rate Control - SET TO ACHIEVE ZERO PRESSURE DIFFERENTIAL BEFORE LANDING

NOTE

During descent, adjust power as required to maintain pressurization.

COLD WEATHER OPERATION

PREFLIGHT INSPECTION

In addition to the normal preflight exterior inspection, remove ice, snow, and frost from the wings, tail, control surfaces and hinges, propellers, windshield, fuel cell filler caps and fuel vents. The wing contour may be changed by these formations sufficiently that its lift qualities are considerably disturbed and sometimes completely destroyed. Complete your normal preflight procedures, including a check of the flight controls for complete freedom of movement.

Conditions for accumulating moisture in the fuel cells are most favorable at low temperatures due to the condensation increase and the moisture that enters as the systems are serviced. Therefore, close attention to draining the fuel system sumps will assume particular importance during cold weather.

ENGINES

Use engine oil in accordance with the Consumable Materials. At temperatures of 10°F and below preheat engines prior to start. Give particular attention to the oil cooler and engine sump to ensure proper preheat. A start with congealed oil in the system may produce an indication of normal pressure immediately after the start, but then the oil pressure may decrease when residual oil in the engine is pumped back with the congealed oil in the sump. If an engine heater capable of heating both the engine sump and cooler is not available, the oil should be drained while the engines are hot and stored in a warm area until the next flight.

The airplane is equipped with an external power receptacle, and, during very cold weather, it is advisable to use external power for starting, when available.

Normal engine starting procedures will be used. If there is no oil pressure within the first 30 seconds of running, or if oil pressure drops after a few minutes of ground operation, shut down and check for broken oil lines, oil cooler leaks or the possibility of congealed oil.

During warm-up, watch engine temperatures closely, since it is quite possible to exceed the cylinder head temperature limit in trying to bring up the oil temperature. Exercise the propellers several times to remove cold oil from the pitch change mechanisms. The propellers should also be cycled occasionally in flight. During letdown and landing, give special attention to engine temperatures, since the engines cool quickly.

STARTING ENGINES USING EXTERNAL POWER

1. Battery switch - ON
2. Generator, Electrical and Avionics Equipment Switches - OFF
3. Connect external power unit
4. Set the output of the power unit at 27.0 to 28.5 volts
5. Auxiliary power unit - ON
6. Start right engine first (use normal start procedures)
7. After engine has been started, turn auxiliary power unit OFF
8. Generator Switches - ON
9. Disconnect external power before starting left engine

TAXIING

Avoid taxiing through water, slush, or muddy surfaces if possible. In cold weather, water, slush, or mud, when splashed onto landing gear mechanisms or control surface hinges may freeze, preventing free movement and resulting in structural damage.

OXYGEN SYSTEM

OPERATION

1. Place the system in operation by rotating the valve to the fully ON position. (The shutoff valve on the oxygen cylinder must also be open.)

CAUTION

The shutoff valves of all high pressure oxygen systems should be opened slowly to prevent possiblity of damage to the system.

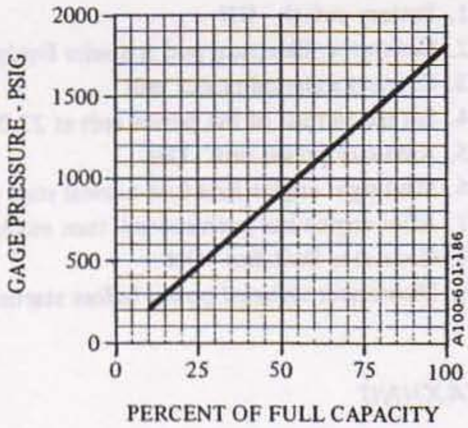
2. Select mask and hose. All are identical and provide the same flow to both pilot and passengers. Check for proper fit of mask and adjust if necessary. Proper fit is important at higher altitudes.
3. Plug in the oxygen mask and check for oxygen flow by noting whether the bag expands or by checking the flow indicator in the hose.
4. Discontinue use by unplugging outlets. The control valve should also be off to ensure complete oxygen flow stoppage. Closing the control valve on the bottle is not recommended except during servicing or prolonged periods of inactivity.

DURATION

Prior to the flight, check for an adequate oxygen supply for the number of people and the trip duration. Determine the supply pressure and convert it to percent of capacity on the Oxygen Available Graph. Find the duration on the Oxygen Duration Table and multiply by the percent of capacity.

OXYGEN AVAILABLE WITH PARTIALLY FULL BOTTLE

1. Determine percent of full bottle from airplane gage pressure.
2. Multiply oxygen duration in minutes by percent of full bottle.



OXYGEN DURATION

Oxygen duration is computed for Scott oxygen masks which regulate the flow rate to 2.5 Standard Liters Per Minute (SLPM). These masks, identified by an aluminum anodized color coded plug-in, are approved for altitudes up to 27,000 feet.

Cylinder Volume Cubic Feet	NUMBER OF PEOPLE USING 1	2	3	4	5	6
	DURATION IN MINUTES					
11	112	55	37	28	22	18
22	222	112	74	54	44	37
49	501	250	167	125	100	83
64	668	334	222	167	133	111

OXYGEN DURATION

Oxygen duration is computed for Scott oxygen masks which regulate the flow rate to 3.0 Standard Liters Per Minute (SLPM). These masks, identified by a green color coded plug-in, are approved for altitudes up to 30,000 feet.

Cylinder Volume Cubic Feet	NUMBER OF PEOPLE USING 1	2	3	4	5	6
	DURATION IN MINUTES					
11	93	46	31	23	18	15
22	187	93	62	46	37	31
49	415	208	138	103	83	69
64	543	271	181	135	108	90

NOISE CHARACTERISTICS

Approach to and departure from an airport should be made so as to avoid prolonged flight at low altitude near noise-sensitive areas. Avoidance of noise-sensitive areas, if practical, is preferable to overflight at relatively low altitudes.

For VFR operations over outdoor assemblies of persons, recreational and park areas, and other noise-sensitive areas, pilots should make every effort to fly not less than 2000 feet above the surface, weather permitting, even though flight at a lower level may be consistent with the provisions of government regulations.

NOTE

The preceding recommended procedures do not apply where they would conflict with Air Traffic Control clearances or instructions, or where, in the pilot's judgement, an altitude of less than 2000 feet is necessary to adequately exercise his duty to see and avoid other airplanes.

Flyover noise level established in compliance with FAR 36 is:

Serials P-523 and after:

Using NOP 79.6 dB(A)

NOTE

Flyover noise levels given are not applicable for Serials prior to P-523.

No determination has been made by the Federal Aviation Administration that the noise level of this airplane is or should be acceptable or unacceptable for operation at, into, or out of any airport.

SECTION III

EMERGENCY PROCEDURES

All airspeeds quoted in this section are indicated airspeeds (IAS)

The following information is presented to enable you to form, in advance, a definite plan of action for coping with the most probable emergency situations which could occur. Where practicable, the emergencies requiring immediate corrective action are treated in check list form for easy reference and familiarization. Other situations, in which more time is usually permitted to decide on and execute a plan of action, are discussed at some length. In order to supply one safe speed for each type of emergency situation the airspeeds presented are derived at 6775 lbs.

SINGLE-ENGINE OPERATION

The two major factors that govern single-engine operation are airspeed and lateral/directional control. The airplane can be safely maneuvered or trimmed for normal hands-off operation and sustained in this configuration by the operative engine AS LONG AS SUFFICIENT AIRSPEED IS MAINTAINED.

SINGLE-ENGINE BEST RATE-OF-CLIMB SPEED, 127 MPH/110 KTS

The single-engine best rate-of-climb speed is the airspeed which delivers the greatest gain in altitude in the shortest possible time with gear up, flaps up, and inoperative propeller feathered.

SINGLE-ENGINE BEST ANGLE-OF-CLIMB SPEED, 115 MPH/100 KTS

The single-engine best angle-of-climb speed is the airspeed which delivers the greatest gain in altitude in the shortest possible horizontal distance with gear up, flaps up, and inoperative propeller feathered.

MINIMUM SINGLE-ENGINE CONTROL SPEED, 98 MPH/85 KTS

The minimum single-engine control speed is the airspeed below which the airplane cannot be controlled laterally and directionally in flight with one engine operating at take-off power and the other engine with its propeller windmilling.

DETERMINING INOPERATIVE ENGINE

The following checks will help determine which engine has failed.

1. DEAD FOOT - DEAD ENGINE. The rudder pressure required to maintain directional control will be on the side of the good engine.
2. THROTTLE. Partially retard the throttle for the engine that is believed to be inoperative; there should be no change in control pressures or in the sound of the engine if the correct throttle has been selected. AT LOW ALTITUDE AND AIRSPEED THIS CHECK MUST BE ACCOMPLISHED WITH EXTREME CAUTION.

Do not attempt to determine the inoperative engine by means of the tachometer or the manifold pressure. These indicators often indicate near normal readings.

ENGINE FIRE ON GROUND

1. Mixture Controls - IDLE CUT-OFF
2. Continue to crank affected engine
3. Fuel Selector Valves - OFF
4. Throttle - FULL OPEN
5. Battery and Generator Switches - OFF
6. Shut-down other engine
7. Extinguish with fire extinguisher

ENGINE FAILURE DURING GROUND ROLL

1. Throttle - CLOSED
2. Braking - MAXIMUM
3. Fuel Selector Valves - OFF
4. Battery and Generator Switches - OFF

NOTE

Braking effectivity is improved if the brakes are not locked.

ENGINE FAILURE AFTER LIFT-OFF OR IN FLIGHT

The most important aspect of engine failure is the necessity to maintain lateral and directional control, and to achieve and maintain normal take-off airspeed or above. If practicable, an immediate landing should be made. The following procedures provide for minimum diversion of attention while flying the airplane.

NOTE

If airspeed is below 98 mph/85 kts reduce power on operative engine as required to maintain lateral and directional control.

1. Landing Gear and Flaps - UP
2. Throttle (inoperative engine) - CLOSE
3. Propeller (inoperative engine) - FEATHER
4. Power (operative engine) - AS REQUIRED
5. Airspeed - AT OR ABOVE NORMAL TAKE-OFF SPEED

After positive control of the airplane is established:

6. Secure inoperative engine:
   a. Mixture - IDLE CUT-OFF
   b. Fuel Selector - OFF
   c. Fuel Boost Pump - OFF
   d. Magneto/Start Switch - OFF
   e. Generator Switch - OFF
   f. Cowl Flap - CLOSED
7. Electrical Load - MONITOR (Maximum load of 1.0 on remaining engine)

ENGINE FIRE IN FLIGHT

Shut down the affected engine according to the following procedure and land immediately.

1. Mixture - IDLE CUT-OFF
2. Fuel Selector Valve - OFF
3. Propeller - FEATHERED
4. Pressurization Air Shutoff Control - PULL
5. Fuel Boost Pump - CHECK OFF
6. Magneto/Start Switch - OFF
7. Generator Switch - OFF
8. Oxygen - AS REQUIRED

EMERGENCY DESCENT

1. Propeller Controls - 2900 RPM
2. Throttles - CLOSED
3. Airspeed - 200 MPH/174 KTS
4. Landing Gear - DOWN
5. Flaps - APPROACH (15°)
6. Oxygen - AS REQUIRED

MAXIMUM GLIDE (FORCED LANDING)

Feather propellers, retract the wing flaps, landing gear, and cowl flaps. The glide ratio in this configuration is slightly over 2 nautical miles of gliding distance for each 1000 feet of altitude at an airspeed of 127 mph/110 kts.

SINGLE-ENGINE LANDING

On final approach and when it is certain that the field can be reached:

1. Landing Gear - DOWN
2. Flaps - APPROACH
3. Airspeed - NORMAL LANDING APPROACH SPEED
4. Power - AS REQUIRED to maintain 800 ft/min rate of descent

When it is certain there is no possibility of go-around:

5. Flaps - DOWN
6. Execute Normal Landing

SINGLE-ENGINE GO-AROUND

WARNING

Level flight might not be possible for certain combinations of weight, temperature and altitude. In any event, DO NOT attempt a single-engine go-around after flaps have been fully extended.

1. Power - MAXIMUM ALLOWABLE
2. Flaps - UP
3. Landing Gear - UP
4. Airspeed - AT OR ABOVE TAKE-OFF SPEED

LANDING GEAR MANUAL EXTENSION

1. Airspeed - BELOW 200 MPH/174 KTS (lower airspeeds make landing gear extension easier)
2. Landing Gear Motor Circuit Breaker (right upper side panel) - PULL
3. Landing Gear Position Handle - DOWN
4. Engage handcrank and turn clock wise as far as possible (approximately 50 turns)
5. If electrical system is operative, check landing gear position lights and warning horn

WARNING

Do not operate the landing gear electrically with the handcrank engaged, as damage to the mechanism could occur.

After emergency landing gear extension, do not stow handcrank or move any landing gear controls or reset any switches or circuit breakers until airplane is on jacks, as failure may have been in the gear-up circuit and gear might retract with the airplane on the ground.

Do not attempt to retract the landing gear manually.

GEAR-UP LANDING

Make a normal approach and when the landing spot is assured:

1. Cowl Flaps - CLOSED
2. Wing Flaps - DOWN
3. Throttle(s) - CLOSED
4. Mixture(s) - IDLE CUT-OFF
5. Fuel Selector Valves - OFF
6. Battery, Generator and Magneto Switches - OFF
7. Keep wings level during touch-down
8. Evacuate airplane as soon as it stops

EMERGENCY EXIT

The emergency exit door is located at the forward right cabin window with the handle behind the curtain and may be opened as follows:

1. Lift cover and release latch.
2. Pull handle fully down.
3. Pull door into the cabin.

AIR START

CAUTION

The pilot should determine the reason for the engine failure before attempting an air start.

Do not use engine starter above 20,000 feet.

NOTE

The oil cooler may be damaged during an air start after a prolonged shut down, if the temperature is 0°C or below.

For the engine to be started:

1. Mixture - IDLE CUT-OFF
2. Fuel Selector Valve - ON
3. Fuel Boost Pump - ON
4. Magneto/Start Switch - ON
5. Throttle - NORMAL START POSITION (1/2 inch open)
6. Prime - MIXTURE FULL RICH THEN IDLE CUT-OFF
7. Propeller

   a. WITHOUT UNFEATHERING ACCUMULATORS:

      (1) Pressurization Air Shut-off Valve - CLOSE (Pull Red Handle)
      (2) Propeller Control - MOVE FORWARD OF THE FEATHERING DETENT TO MID-RANGE
      (3) Magneto/Start Switch - START
      (4) Mixture - FULL RICH AT 1000 RPM
      (5) Open PRESSURIZATION AIR SHUT-OFF Valve - AFTER ENGINE IS RUNNING SMOOTHLY.

   b. WITH UNFEATHERING ACCUMULATORS:

      (1) Propeller Control - FORWARD OF FEATHERING DETENT UNTIL ENGINE ATTAINS 600 RPM; THEN BACK TO DETENT
      (2) Oil Pressure - STABILIZED

      NOTE

      If propeller does not unfeather or the engine does not turn, return the propeller control to the feather position and secure the engine.

      (3) Mixture - FULL RICH AT 1000 RPM

8. Throttle - AS NECESSARY TO PREVENT OVERSPEED; wàrm up at 15 inches Hg manifold pressure
9. Oil Pressure, Oil and Cylinder Head Temperatures - NORMAL INDICATION
10. Generator Switch - ON
11. Power - AS REQUIRED

SINGLE-ENGINE OPERATION ON CROSSFEED

Left engine inoperative and fuel being supplied from left side.

1. Left Fuel Boost Pump - ON
2. Left Fuel Selector - OFF
3. Right Fuel Selector - CROSSFEED
4. Left Fuel Boost Pump - OFF

Right engine inoperative and fuel being supplied from right side.

1. Right Fuel Boost Pump - ON
2. Right Fuel Selector - OFF
3. Left Fuel Selector - CROSSFEED
4. Right Fuel Boost Pump - OFF

CAUTION

Continuous operation of Fuel Boost Pump may be required if excessive fuel flow fluctuations are encountered.

EMERGENCY STATIC AIR SOURCE (P-247 through P-262)

THE EMERGENCY STATIC AIR SOURCE SHOULD BE USED FOR CONDITIONS WHERE THE NORMAL STATIC SOURCE HAS BEEN OBSTRUCTED. When the aircraft has been exposed to moisture and/or icing conditions (especially on the ground), the possibility of obstructed static ports should be considered. Partial obstructions will result in the rate of climb indication being sluggish during a climb or descent. Verification of suspected obstruction is possible by switching to the alternate system and noting a sudden sustained change in rate of climb. This may be accompanied by abnormal indicated airspeed and altitude changes beyond normal calibration differences.

Whenever any obstruction exists in the normal static air system or, the emergency static air source is desired for use:

1. Alternate Static Air Valve (Red knob) - ROTATE COUNTERCLOCKWISE APPROXIMATELY 9 TURNS TO STOP
2. For Airspeed Calibration and Altimeter Correction, refer to FAA Performance Section

CAUTION

Be certain the Alternate Static Air Valve is in the CLOSED position when system is not needed.

ALTERNATE STATIC AIR SOURCE (P-263 and after and all prior airplanes incorporating Kit 60-5019)

THE ALTERNATE STATIC AIR SOURCE SHOULD BE USED FOR CONDITIONS WHERE THE NORMAL STATIC SOURCE HAS BEEN OBSTRUCTED. When the aircraft has been exposed to moisture and/or icing conditions (especially on the ground), the possibility of obstructed static ports should be considered. Partial obstructions will result in the rate of climb indication being sluggish during a climb or descent. Verification of suspected obstruction is possible by switching to the alternate system and noting a sudden sustained change in rate of climb. This may be accompanied by abnormal indicated airspeed and altitude changes beyond normal calibration differences.

Whenever any obstruction exists in the normal static air system or, the alternate static air source is desired for use:

1. Alternate Static Air Switch - ON.
2. For Airspeed Calibration and Altimeter Correction, refer to FAA Performance Section

CAUTION

Be certain the Pilot's Static Air Source is in the NORMAL position when the alternate system is not needed.

UNSCHEDULED ELECTRIC ELEVATOR TRIM (Without Autopilot)

1. Airplane Attitude - MAINTAIN using elevator control.
2. Actuate Thumb Switch in the opposite direction to open circuit breaker.
3. ON-OFF Switch (On Instrument Panel) - OFF.
4. Retrim with manual trim wheel.

PRESSURIZATION SYSTEM

Any time the differential pressure goes into the red arc, either reschedule the cabin altitude selector or dump all pressure with the DUMP switch.

LOSS OF PRESSURIZATION

1. When operating at Cabin Altitudes below 10,000 feet, (Cruise Altitudes up to 25,000 feet), illumination of the CABIN ALT annunciator light indicates a loss of pressurization.
2. When operating at Cabin Altitudes above 10,000 feet (Cruise Altitudes above 25,000 feet), a loss of pressurization is indicated by the Cabin Altitude Indicator.
3. In the event of pressurization loss, USE OXYGEN AND DESCENT AS REQUIRED.

CAUTION

Idle power on both engines will cause a loss of pressurization. Use oxygen masks as required.

The following table sets forth the average time of Useful Consciousness (time from onset of hypoxia until loss of effective performance at various altitudes).

30,000 ft MSL	1 to 2 minutes
28,000 ft MSL	2-1/2 to 3 minutes
25,000 ft MSL	3 to 5 minutes
22,000 ft MSL	5 to 10 minutes
12 - 18,000 ft MSL	30 min. or more

LANDING GEAR RETRACTION AFTER PRACTICE MANUAL EXTENSION

After a practice manual extension of the landing gear, the gear may be retracted electrically, as follows:

1. Handcrank - CHECK STOWED
2. Landing Gear Motor Circuit Breaker - IN
3. Landing Gear Handle - UP

SIMULATED SINGLE-ENGINE PROCEDURE

ZERO THRUST (Simulated Feather)

Use the following power setting (only on one engine at a time) to establish zero thrust. Use of this power setting avoids the difficulties of restarting an engine and preserves the availability of engine power.

The following procedure should be accomplished by alternating small reductions of propeller and then throttle, until the desired setting has been reached.

1. Propeller Lever - RETARD TO FEATHER DETENT
2. Throttle Lever - SET 12 in. Hg MANIFOLD PRESSURE

NOTE

This setting will approximate Zero Thrust at low altitudes using recommended Single-Engine Climb Speeds.

ILLUMINATION OF CABIN DOOR WARNING LIGHT

WARNING

If the cabin is pressurized and the door is not completely latched, any movement of the door handle toward the unlocked position may cause loss of pressurization and opening of the door.

1. If the cabin door light on the annunciator panel indicates that the cabin door may not be secure, depressurize the cabin (consider altitude before depressurizing).
2. Do not attempt to check cabin door for security until cabin is depressurized.

SPINS

If a spin is entered inadvertently:

Immediately move the control column full forward, apply full rudder opposite to the direction of the spin and reduce power on both engines to idle. These three actions should be done as near simultaneously as possible; then continue to hold this control position until rotation stops and then neutralize all controls and execute a smooth pullout. Ailerons should be neutral during recovery.

NOTE

Federal Aviation Administration Regulations do not require spin demonstration of airplanes of this weight; therefore, no spin tests have been conducted. There recovery technique is based on the best available information.

SECTION IV

FAA PERFORMANCE

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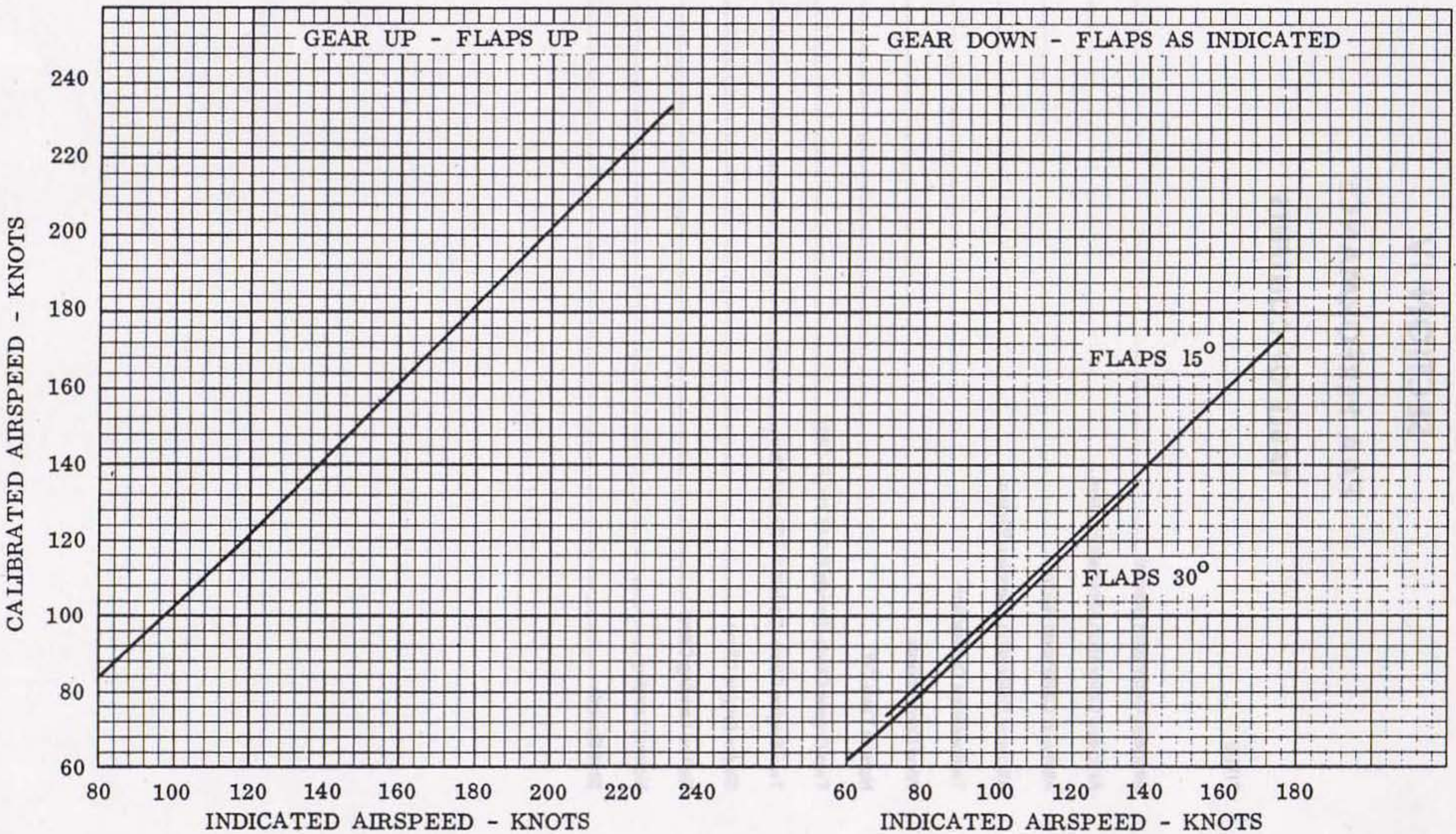
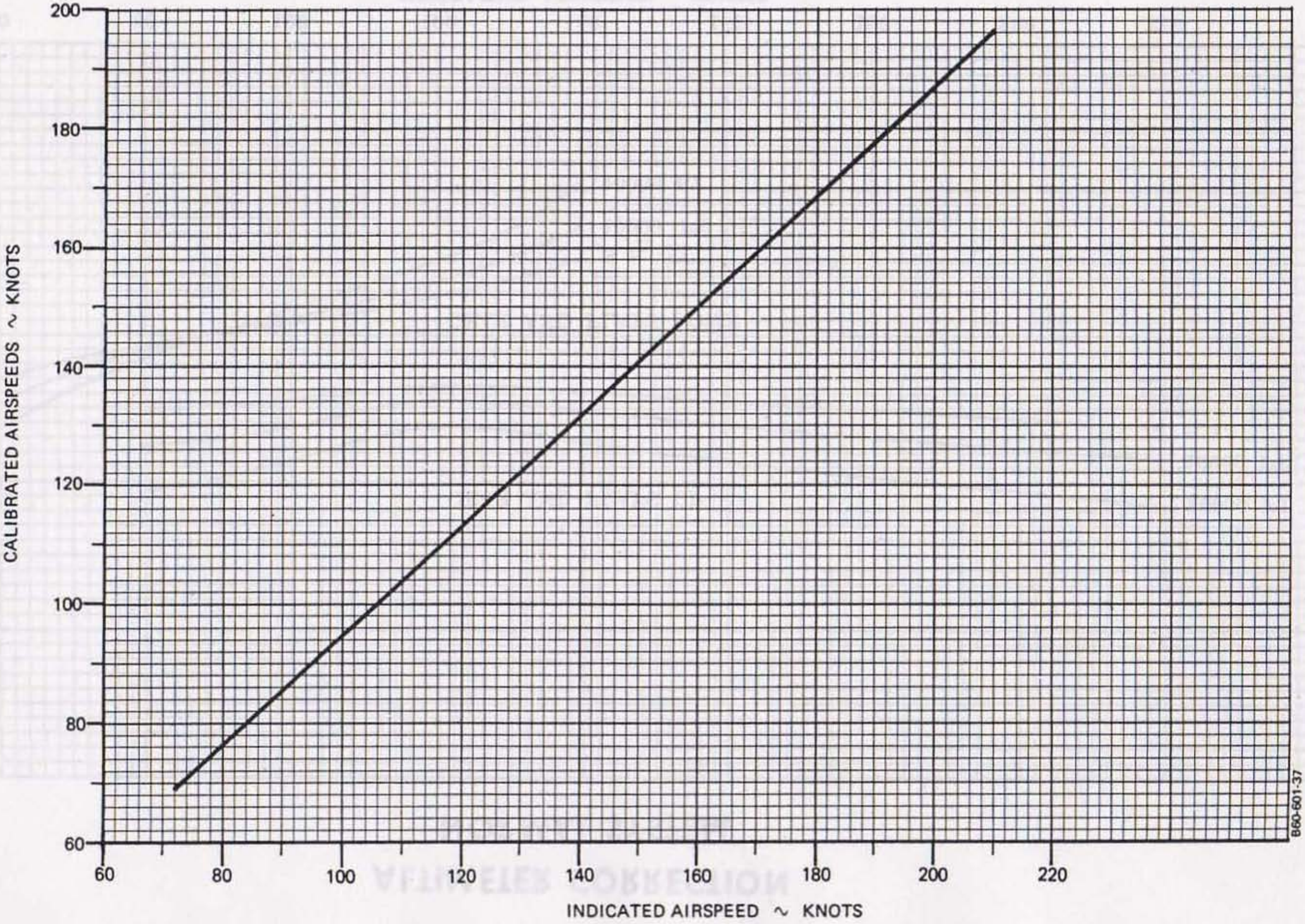
AIRSPEED CALIBRATION
NORMAL SYSTEM

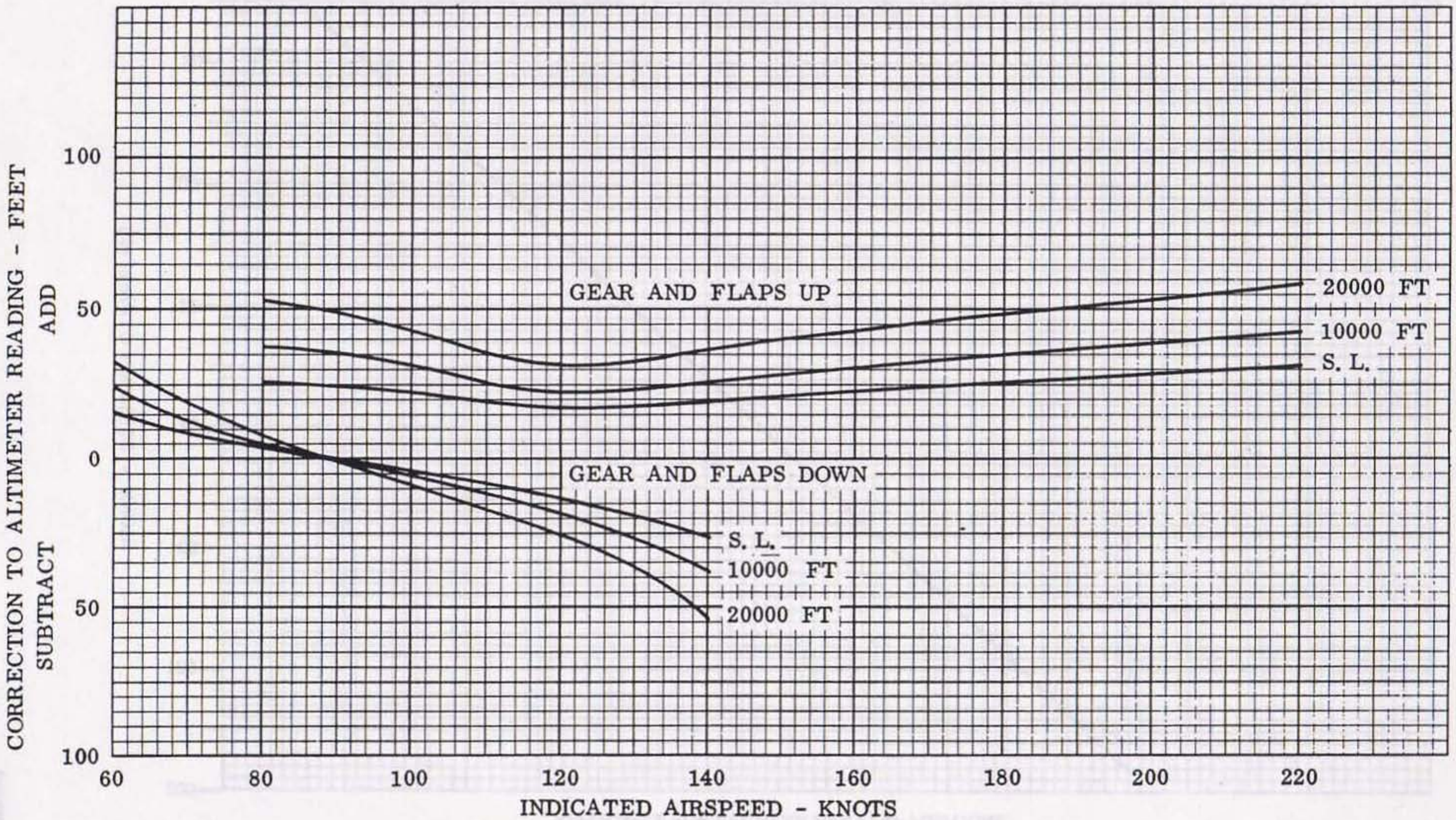


AIRSPEED CALIBRATION — ALTERNATE SYSTEM

NOTE: INDICATED AIRSPEED ASSUMES ZERO INSTRUMENT ERROR
APPLICABLE FOR ALL GEAR AND FLAP POSITIONS

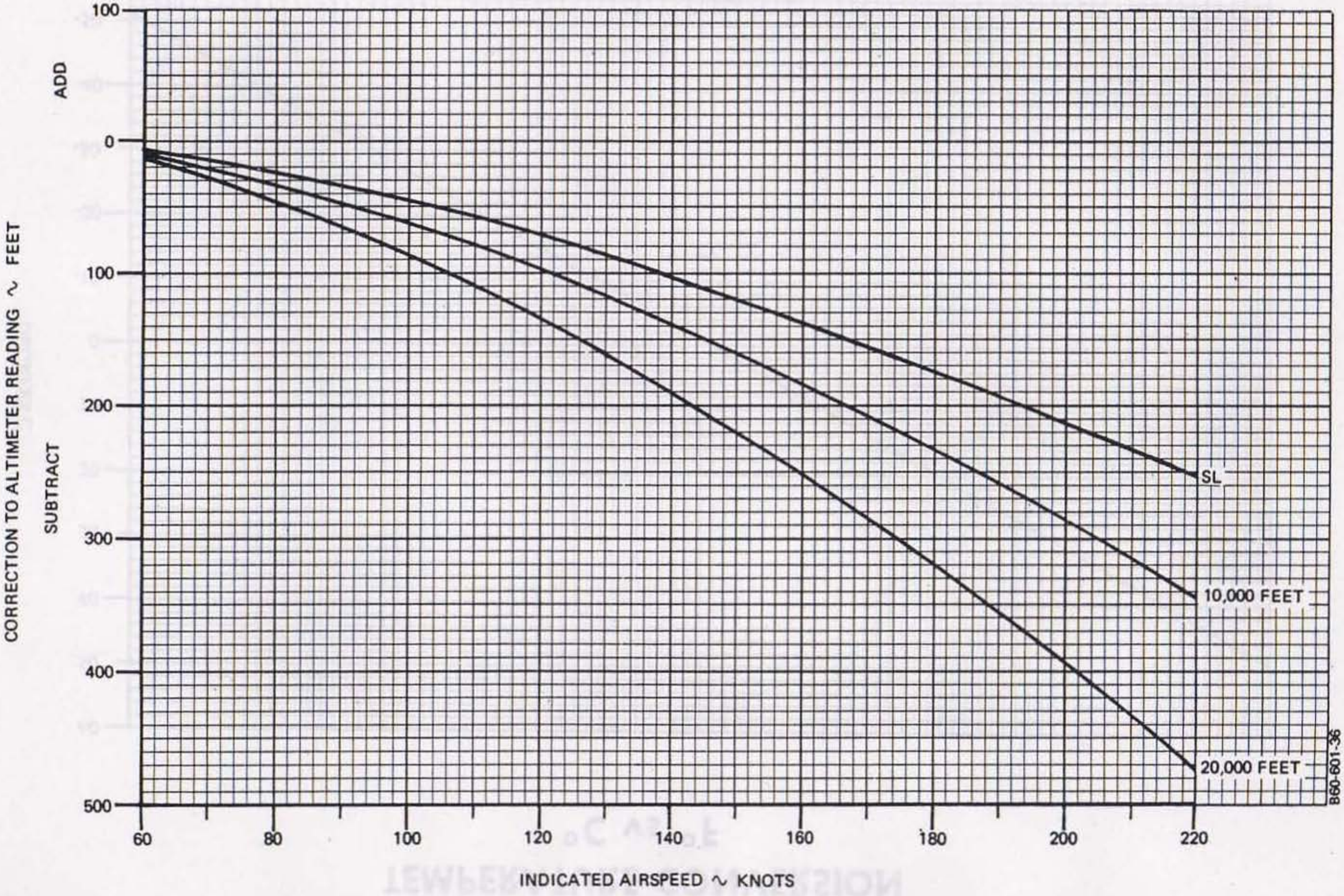


ALTIMETER CORRECTION
NORMAL SYSTEM



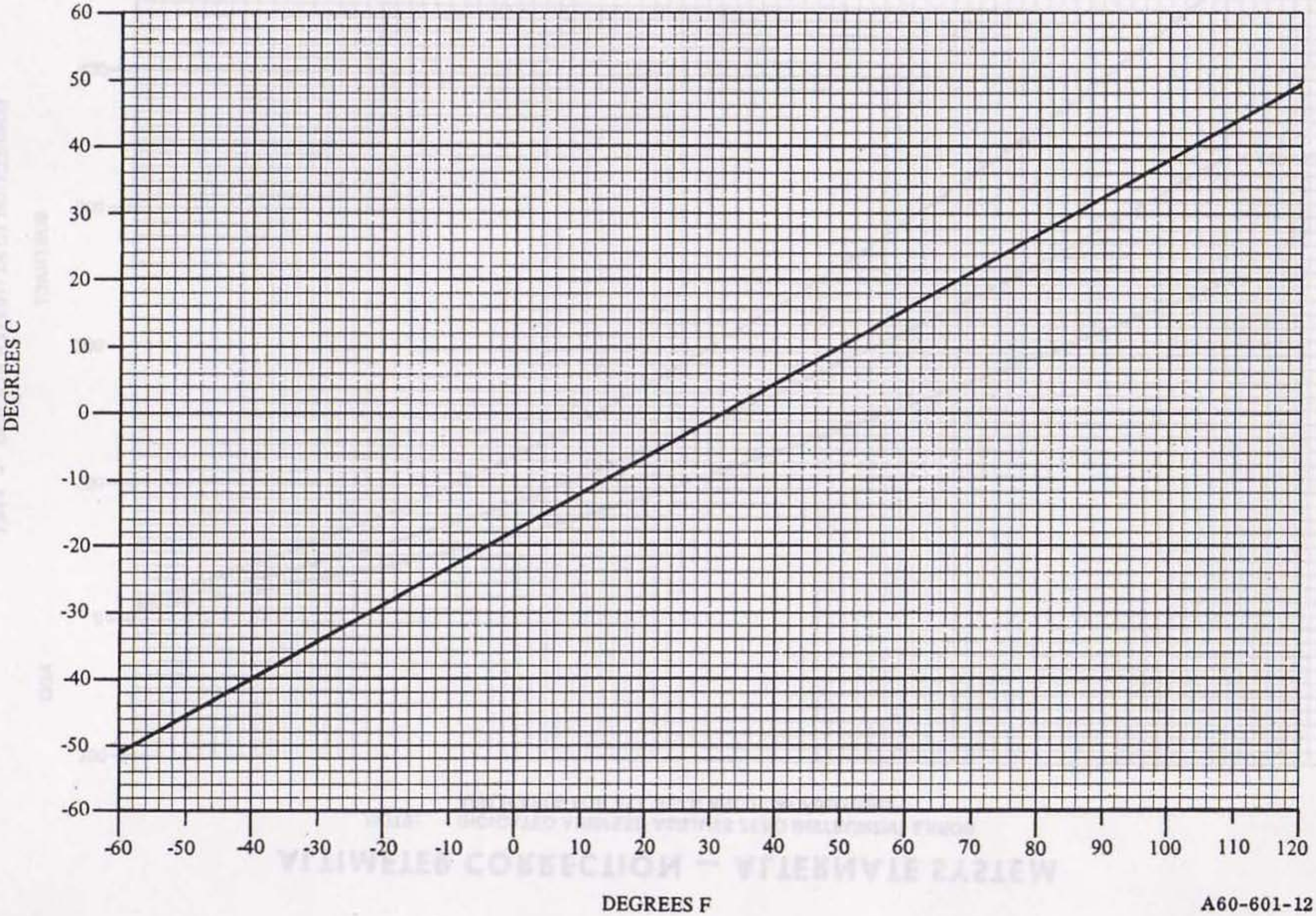
ALTIMETER CORRECTION — ALTERNATE SYSTEM

NOTE: INDICATED AIRSPEED ASSUMES ZERO INSTRUMENT ERROR
APPLICABLE FOR ALL GEAR AND FLAP POSITIONS



TEMPERATURE CONVERSION

°C vs °F



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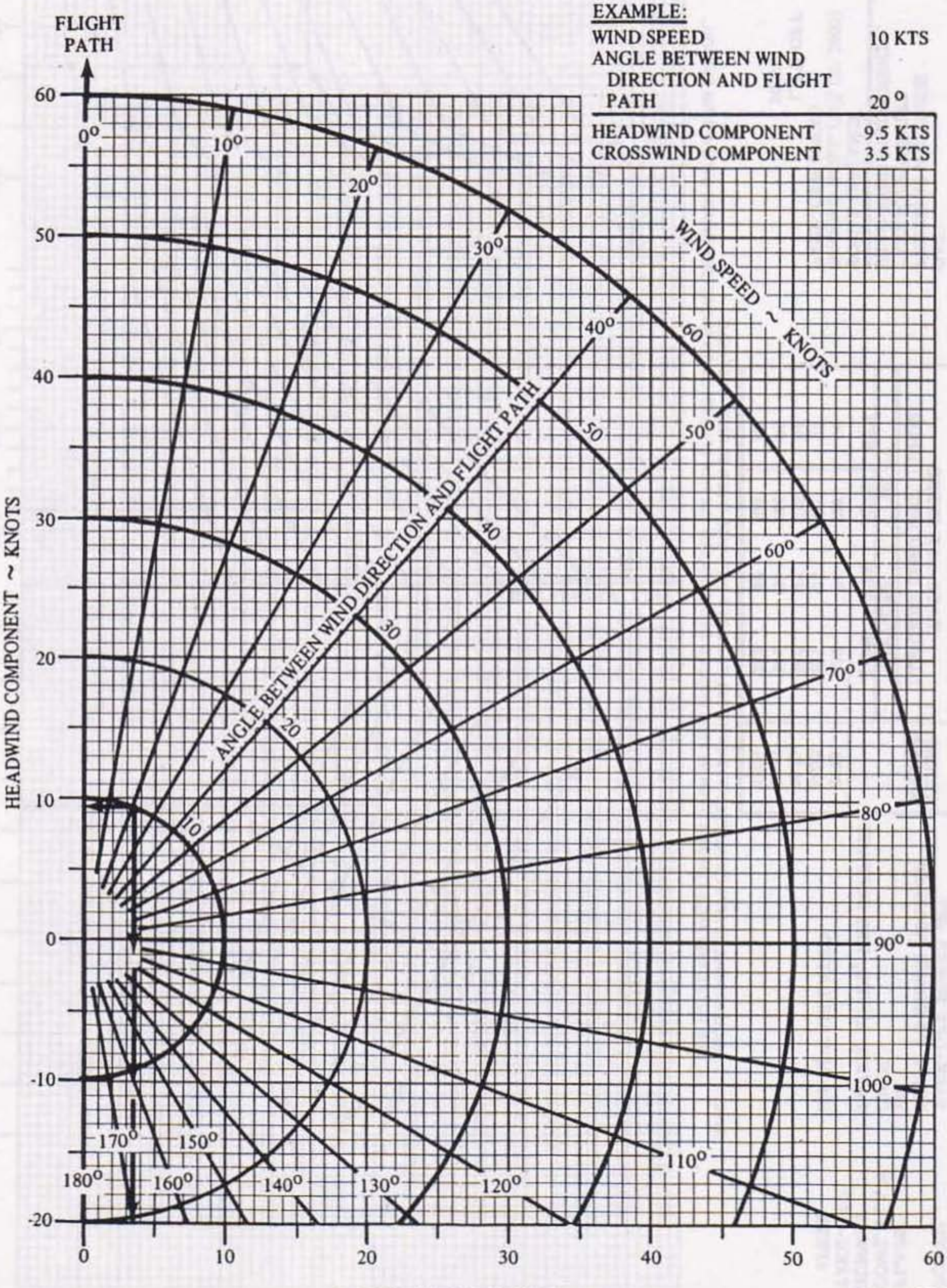
WIND COMPONENTS

DEMONSTRATED CROSSWIND IS 25 KNOTS



STD-601-1

NORMAL TAKE-OFF

ASSOCIATED CONDITIONS:

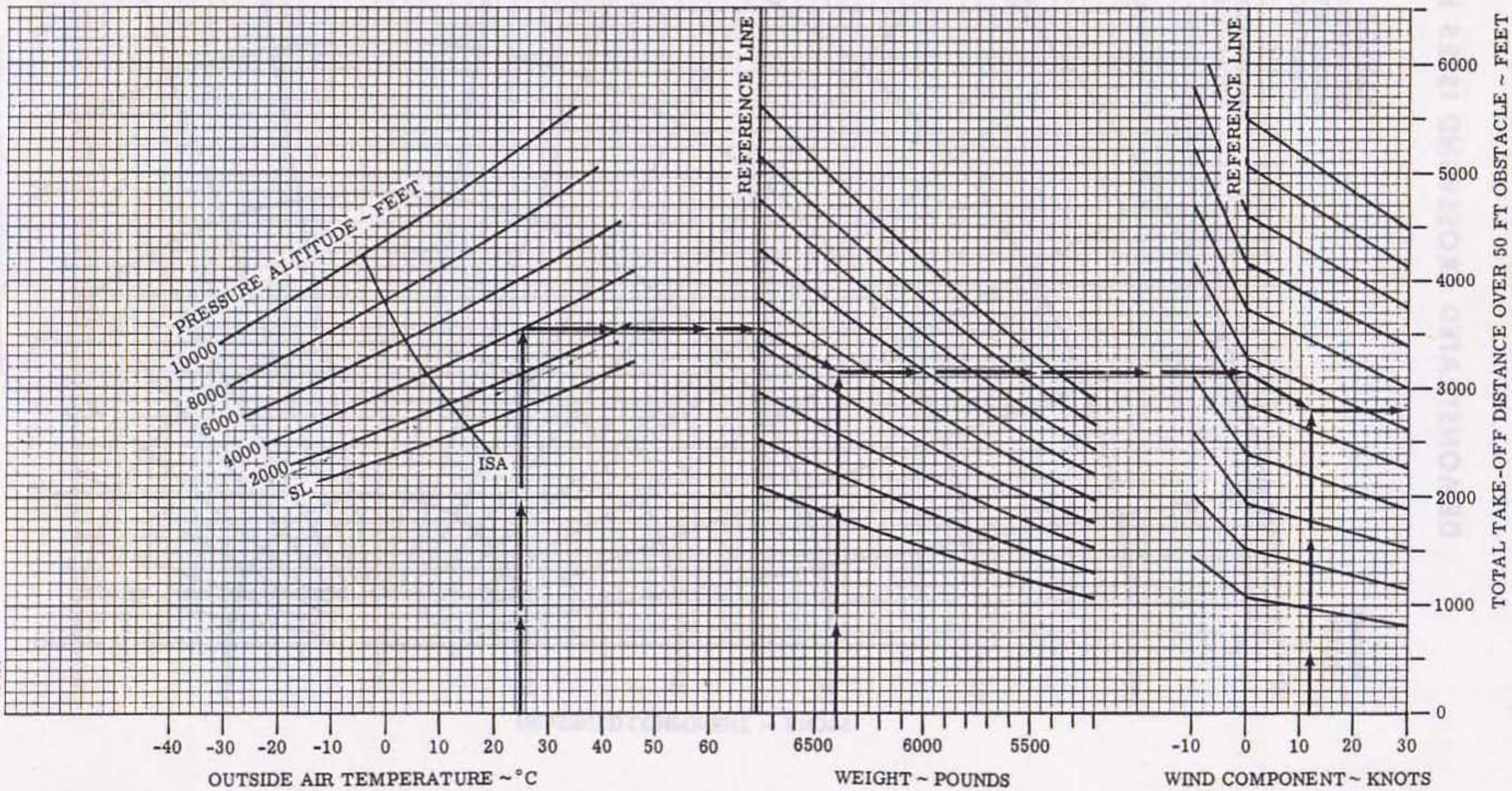
POWER	TAKE-OFF POWER SET PRIOR TO BRAKE RELEASE
FLAPS	UP
COWL FLAPS	OPEN
RUNWAY	PAVED, LEVEL, DRY SURFACE
TAKE-OFF SPEED	IAS AS TABULATED

WEIGHT POUNDS	TAKE-OFF SPEED (ASSUMES ZERO INST. ERROR)			
	LIFT-OFF		50 FT	
	MPH	KTS	MPH	KTS
6775	108	94	108	94
6400	107	93	107	93
6000	106	92	106	92
5600	104	90	104	90
5200	102	89	102	89

EXAMPLE:

OAT	25°C
PRESSURE ALTITUDE	4000 FT
TAKE-OFF WEIGHT	6400 LBS
HEAD WIND COMPONENT	12 KNOTS
TOTAL DISTANCE	2800 FT
GROUND ROLL (79% OF 2800)	2212
TAKE-OFF SPEED	
LIFT-OFF	93 KIAS
50 FT	93 KIAS

NOTE: 1. GROUND ROLL IS APPROXIMATELY 79% OF TOTAL TAKE-OFF DISTANCE OVER 50 FOOT OBSTACLE.
2. THE TOTAL DISTANCES SHOWN OVER 50 FEET SHOULD BE INCREASED 18% FOR OPERATION ON SHORT DRY GRASS WITH A FIRM SUBSOIL.



TWO-ENGINE CLIMB

(Serials P-247 thru P-522)

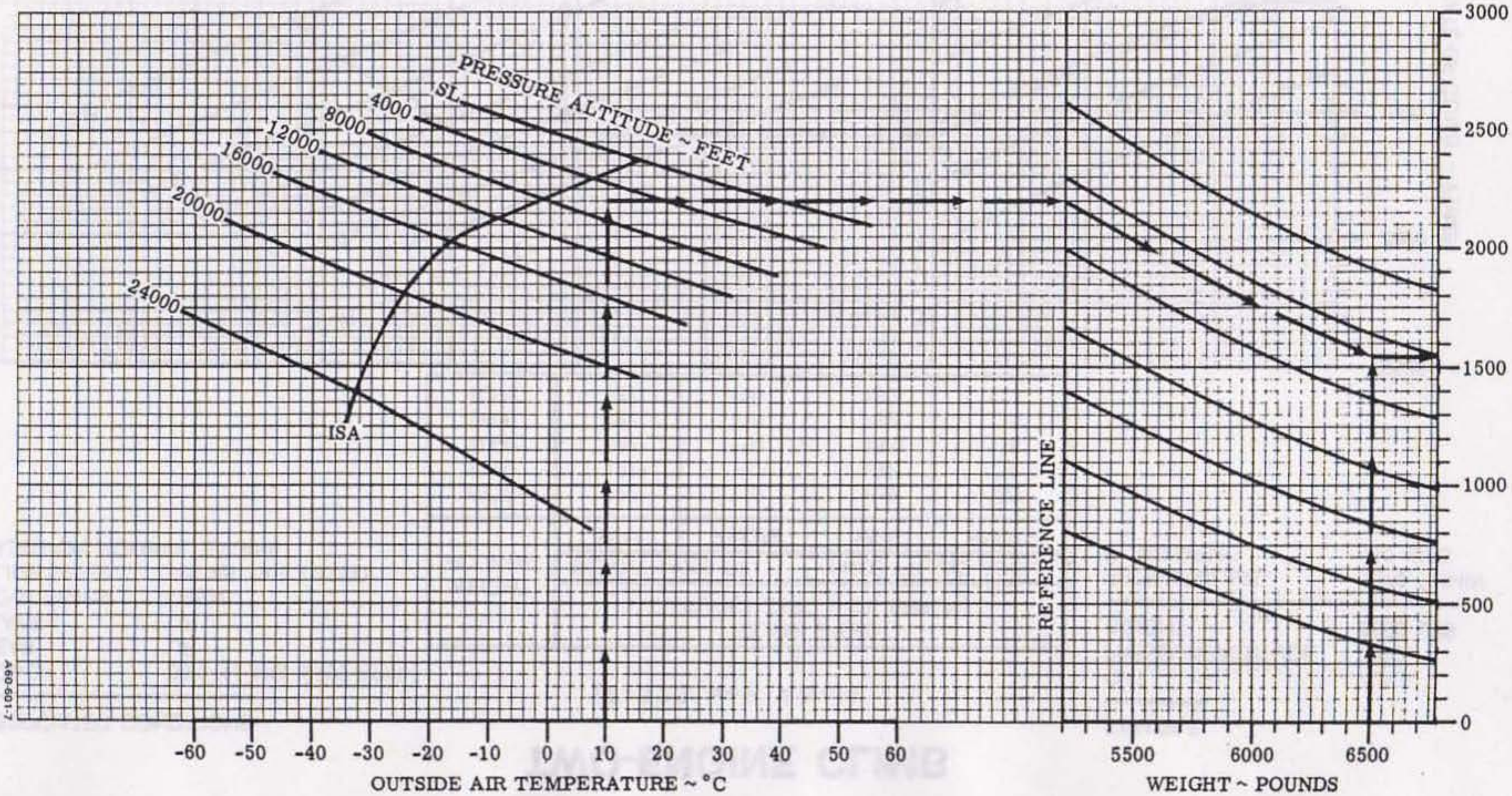
ASSOCIATED CONDITIONS:

POWER	MAXIMUM CONTINUOUS
GEAR	UP
FLAPS	UP
COWL FLAPS	OPEN
CLIMB SPEED	IAS AS TABULATED

WEIGHT POUNDS	CLIMB SPEED (ASSUMES ZERO INST. ERROR)	
	MPH	KNOTS
6775	138	120
6400	137	119
6000	133	116
5600	132	115
5200	130	113

EXAMPLE:

OAT	10°C
PRESSURE ALTITUDE	6000 FT
WEIGHT	6500 LBS
RATE OF CLIMB	1550 FT/MIN
CLIMB SPEED	119 KIAS



TWO-ENGINE CLIMB

(P-523 and After)

ASSOCIATED CONDITIONS:

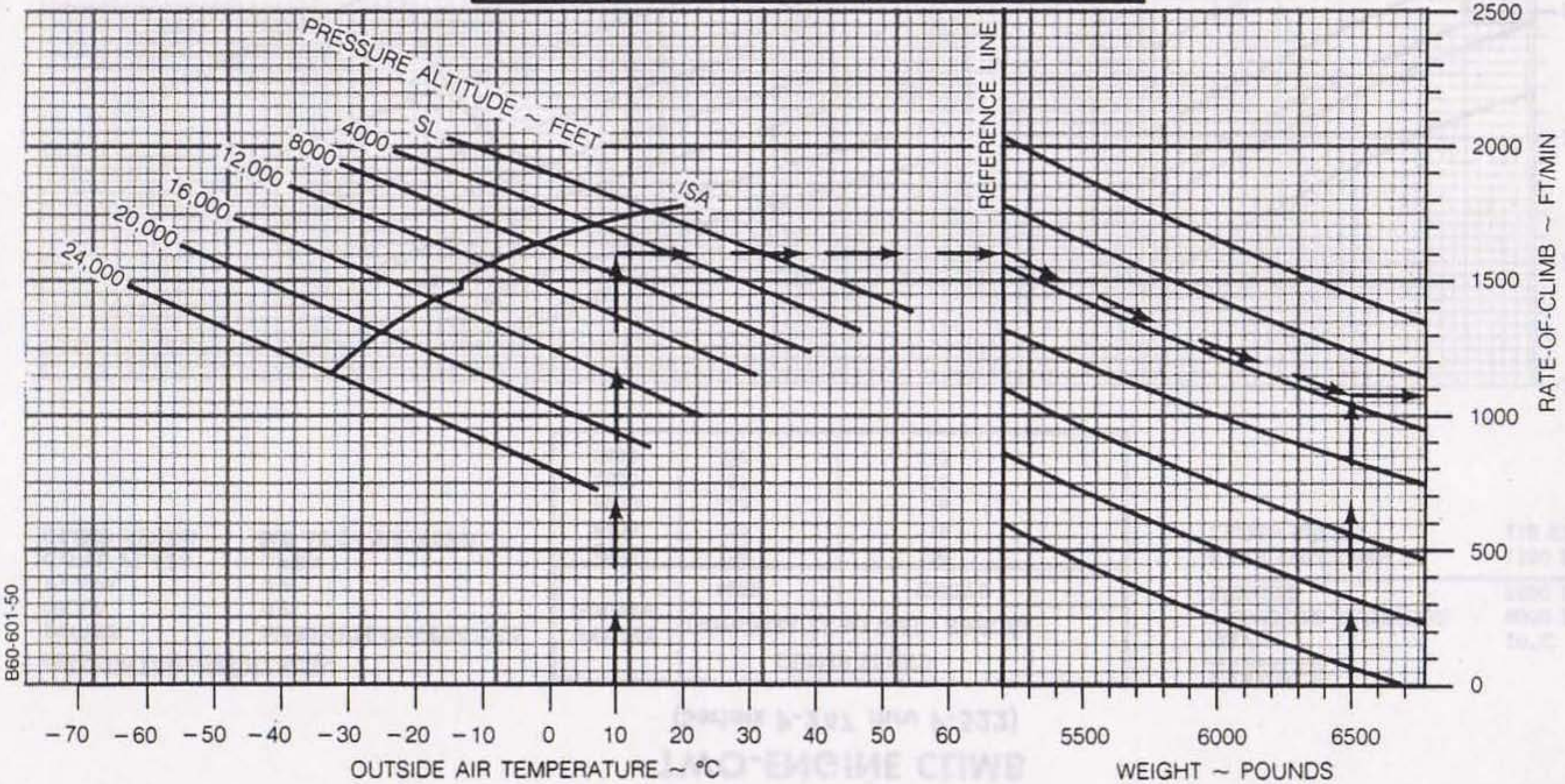
POWER .... 36.5 IN. HG 2750 RPM
GEAR .... UP
FLAPS.......... UP
COWL FLAPS ... OPEN
CLIMB SPEED... IAS AS TABULATED
BASED ON NOMINAL ENGINE

WEIGHT POUNDS	CLIMB SPEED (ASSUMES ZERO INST. ERROR)			
	BELOW 14000 FT		14000 FT AND ABOVE	
	MPH	KNOTS	MPH	KNOTS
6775	127	110	138	120
6400	127	110	137	119
6000	127	110	133	116
5600	127	110	132	115
5200	127	110	130	113

EXAMPLE:

OAT.................. 10°C
PRESSURE ALTITUDE.. 6000 FT
WEIGHT .... 6500 LBS

RATE OF CLIMB .... 1070 FT/MIN
CLIMB SPEED......... 110 KIAS



SINGLE-ENGINE CLIMB

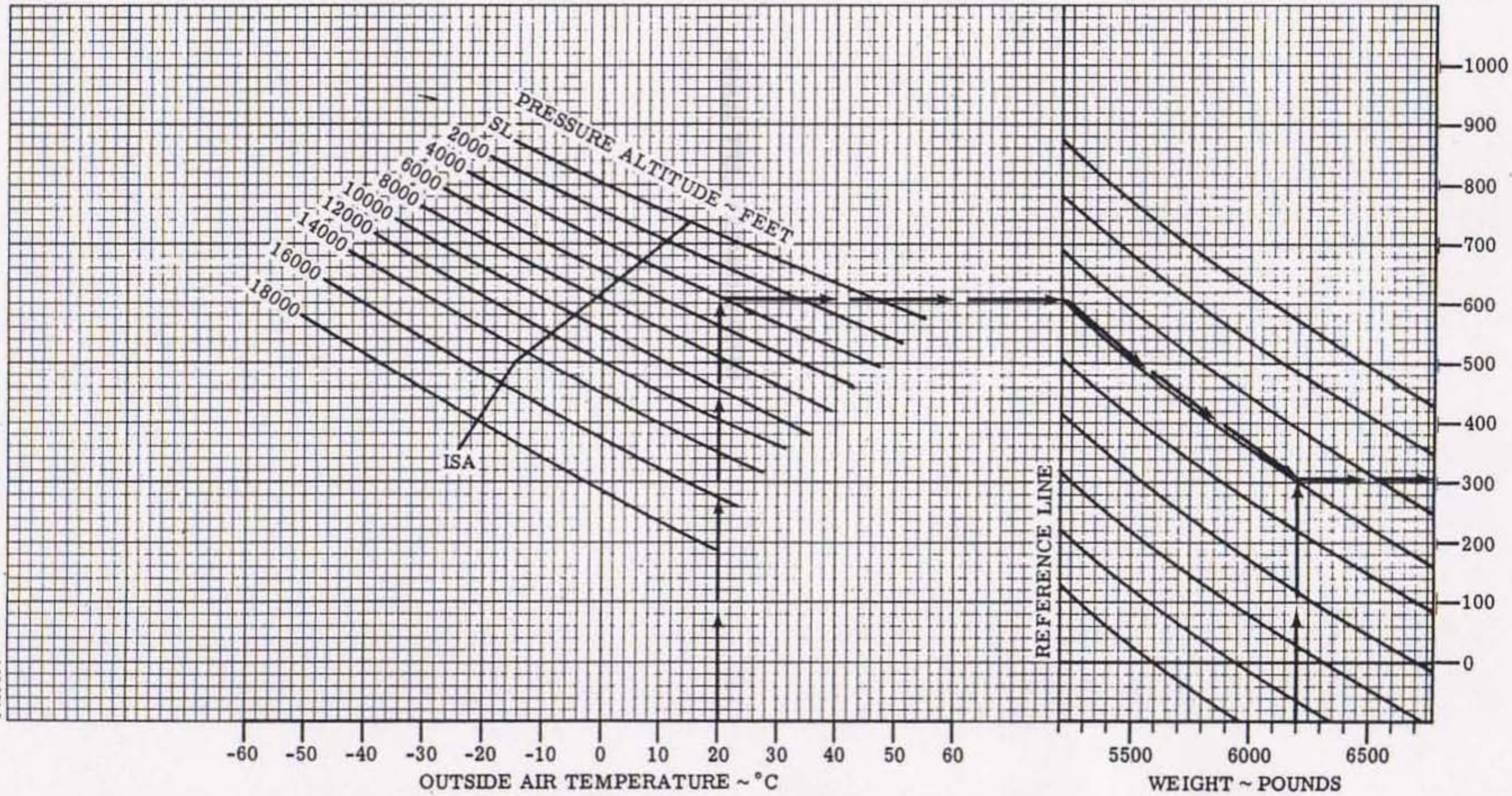
ASSOCIATED CONDITIONS:

POWER	MAXIMUM CONTINUOUS
GEAR	UP
FLAPS	UP
COWL FLAPS	OPEN
INOPERATIVE PROPELLER	FEATHERED
CLIMB SPEED	IAS AS TABULATED

WEIGHT POUNDS	CLIMB SPEED ~ KNOTS (ASSUMES ZERO INST. ERROR)	
	MPH	KNOTS
6775	127	110
6400	124	108
6000	122	106
5600	120	104
5200	119	103

EXAMPLE:

OAT	20°C
PRESSURE ALTITUDE	4000 FT
WEIGHT	6200 LBS
RATE OF CLIMB	305 FT/MIN
CLIMB SPEED	107 KIAS



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BALKED LANDING CLIMB

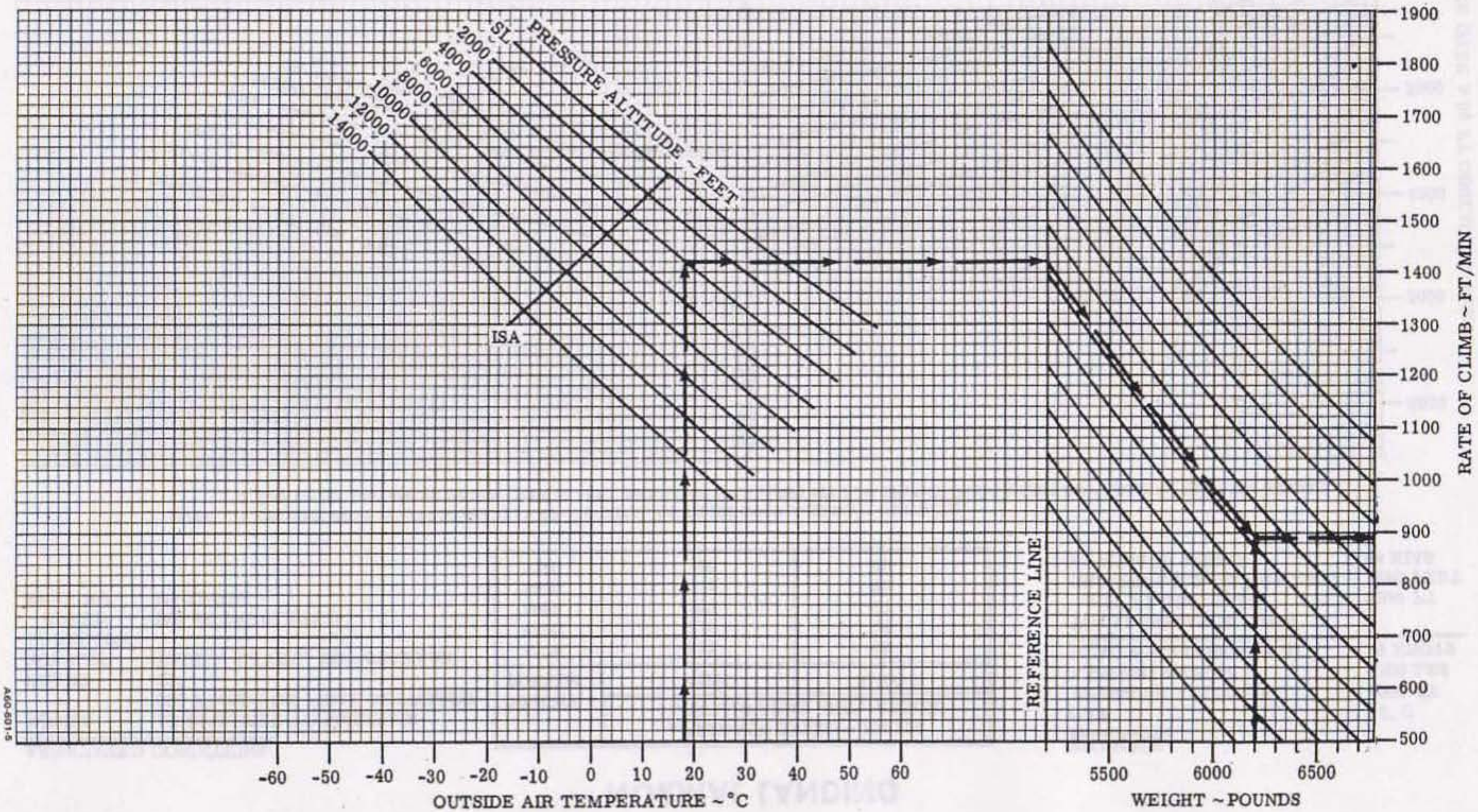
ASSOCIATED CONDITIONS:

POWER	TAKE-OFF
GEAR	DOWN
FLAPS	30°
CLIMB SPEED	IAS AS TABULATED

WEIGHT POUNDS	CLIMB SPEED ~ KNOTS (ASSUMES ZERO INST. ERROR)	
	MPH	KNOTS
6775	115	100
6400	114	99
6000	112	97
5600	110	96
5200	108	94

EXAMPLE:

OAT	18°C
PRESSURE ALTITUDE	4000 FT
WEIGHT	6200 LBS
RATE OF CLIMB	890 FT/MIN
CLIMB SPEED	98 KIAS



NORMAL LANDING

ASSOCIATED CONDITIONS:

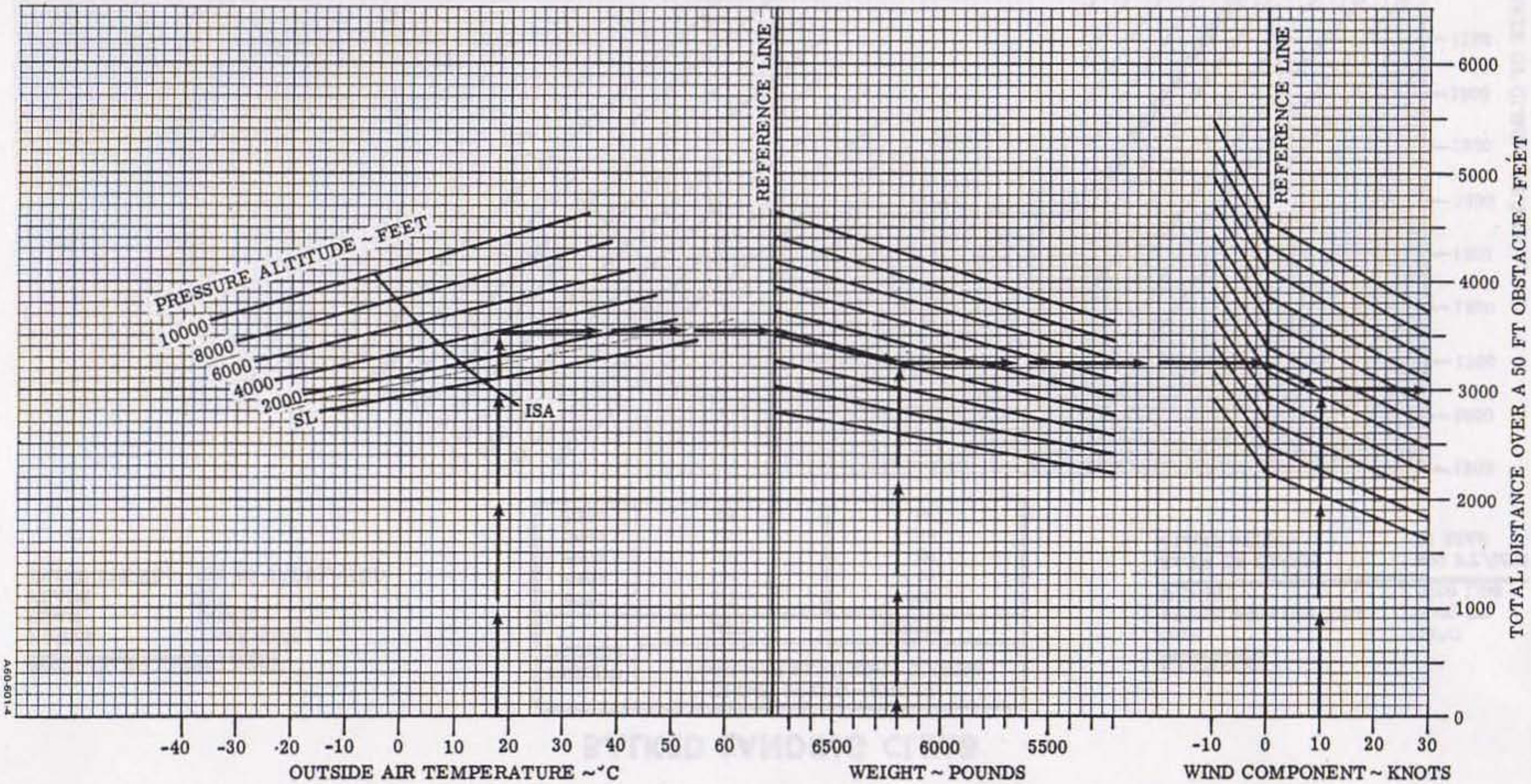
POWER	AS REQUIRED TO MAINTAIN 800 FT/MIN ON FINAL APPROACH
FLAPS	30°
RUNWAY	PAVED, LEVEL, DRY SURFACE
APPROACH SPEED	IAS AS TABULATED
BRAKING	MAXIMUM

WEIGHT POUNDS	APPROACH SPEED ~ KNOTS (ASSUMES ZERO INST. ERROR)	
	MPH	KNOTS
6775	113	98
6400	110	96
6000	107	93
5600	104	90
5200	98	85

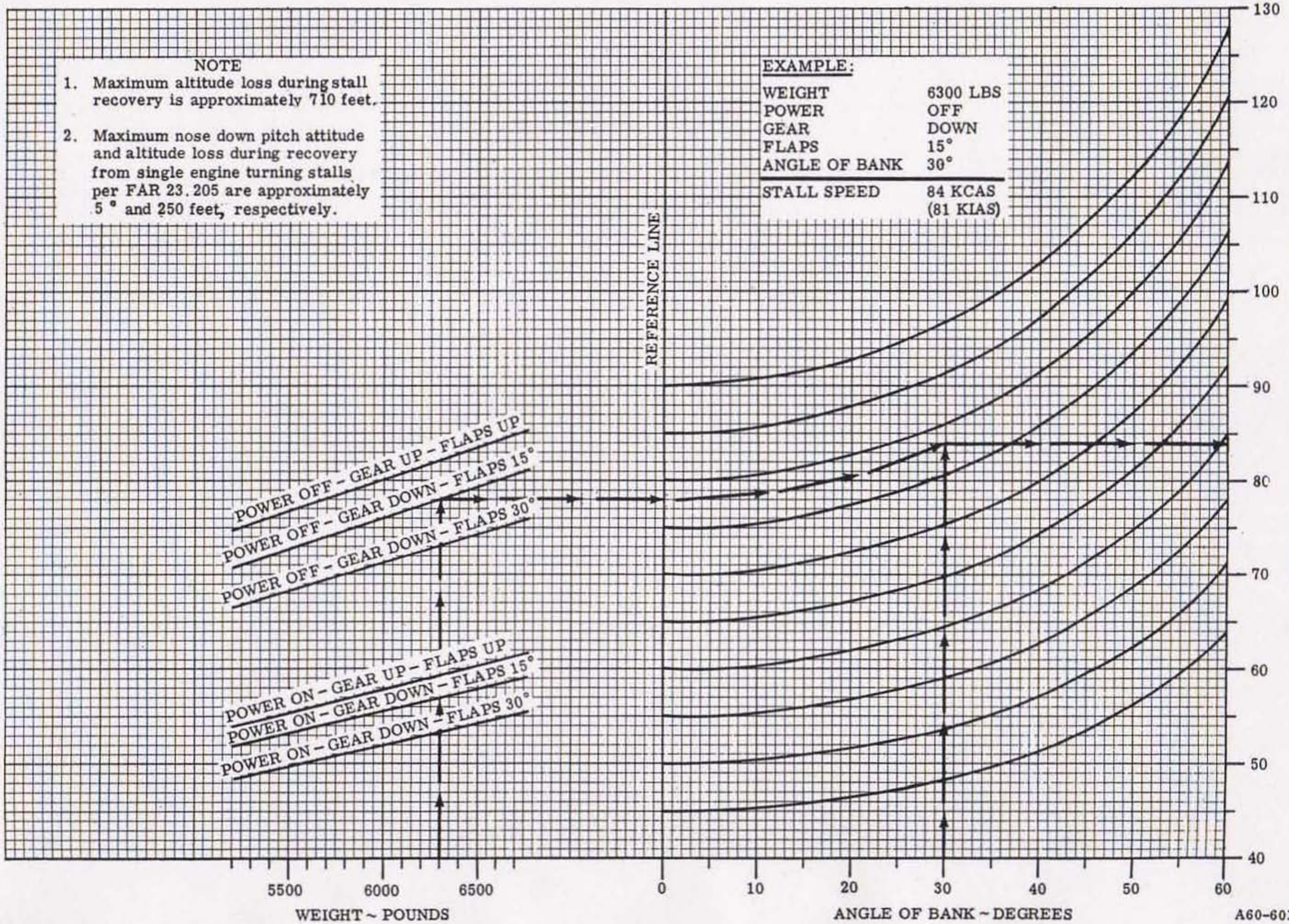
EXAMPLE:

OAT	18° C
PRESSURE ALTITUDE	4000 FT
LANDING WEIGHT	6200 LBS
HEAD WIND COMPONENT	10 KNOTS
TOTAL DISTANCE OVER A 50 FT OBSTACLE	3000 FT
GROUND ROLL (43% OF 3000)	1290 FEET
APPROACH SPEED	95 KIAS

NOTE: 1. GROUND ROLL IS APPROXIMATELY 43% OF TOTAL DISTANCE OVER A 50 FOOT OBSTACLE.
2. THE TOTAL DISTANCES SHOWN OVER 50 FEET SHOULD BE INCREASED 18% FOR OPERATION ON SHORT DRY GRASS WITH A FIRM SUBSOIL.



STALL SPEEDS



SECTION VI

PERFORMANCE

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DISTANCE TO ACCELERATE TO DECISION SPEED AND STOP

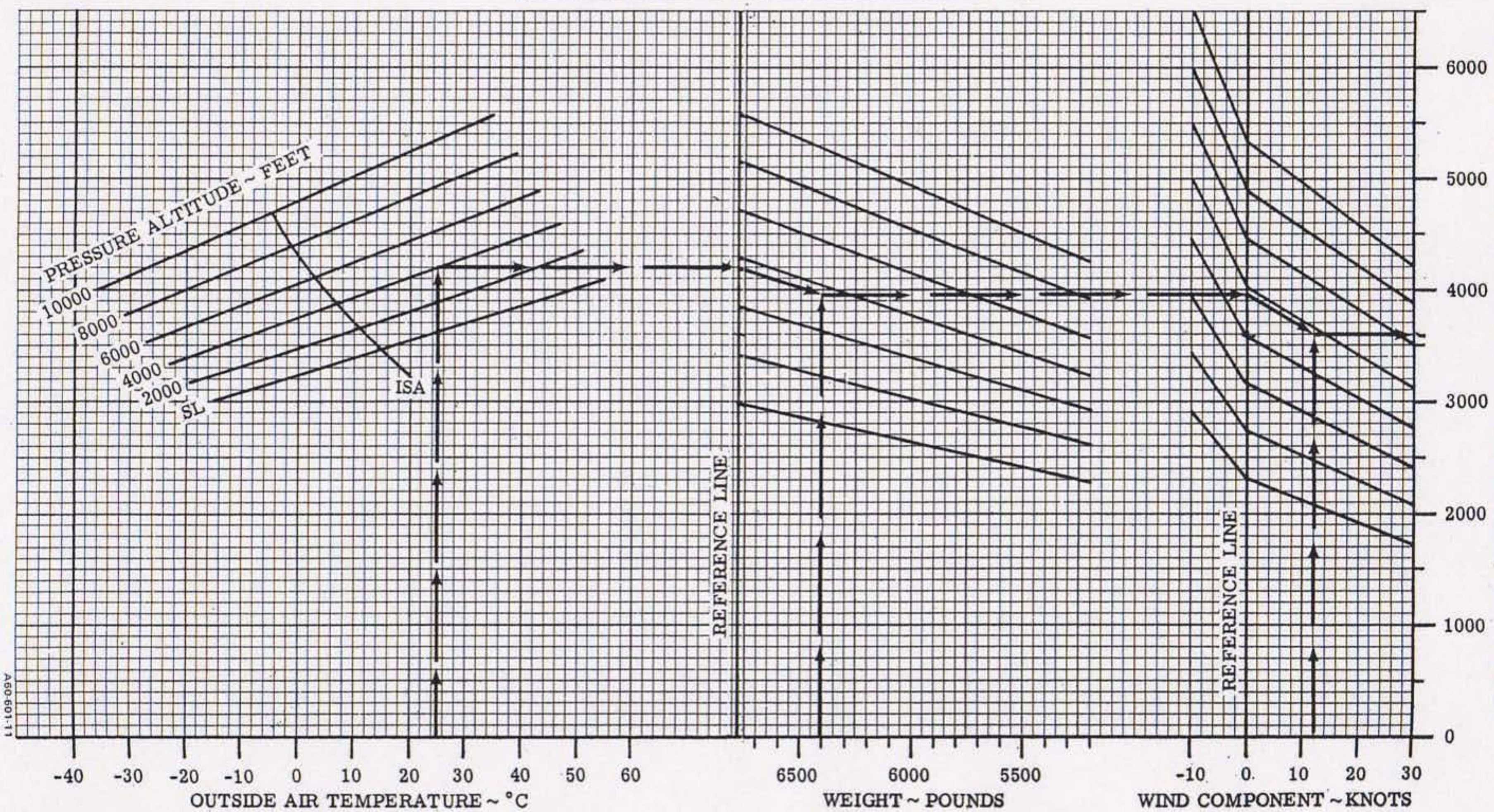
ASSOCIATED CONDITIONS:

POWER	1. TAKE-OFF POWER SET BEFORE BRAKE RELEASE 2. BOTH ENGINES IDLE AT DECISION SPEED
FLAPS	UP
COWL FLAPS	OPEN
RUNWAY	PAVED, LEVEL, DRY SURFACE
BRAKING	MAXIMUM

WEIGHT POUNDS	DECISION SPEED ~ KNOTS (ASSUME ZERO INST. ERROR)	
	MPH	KNOTS
6775	108	94
6400	107	93
6000	106	92
5600	104	90
5200	102	89

EXAMPLE:

OAT	25°C
PRESSURE ALTITUDE	4000 FT
WEIGHT	6400 LBS
HEAD WIND COMPONENT	12 KNOTS
ACCELERATE AND STOP DISTANCE	3600 FT
DECISION SPEED	93 KIAS



SECTION VII

CRUISE CONTROL

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INTRODUCTION TO CRUISE CONTROL

The graphs and tables in this section present performance information for flight planning at various parameters of power, altitude and temperature. The calculations for flight time, block speed, and fuel required for a proposed flight are presented using the condition below:

CONDITIONS

At Billings:
Outside Air Temperature .... 25°C (77°F)
Field Elevation .... 3606 feet

Route of Trip:
BIL-V19-CZI-V247-DGW-V19E-CYS-V19-DEN

Weather Conditions: IFR for cruise altitude of 17,000 feet

ROUTE SEGMENT	DISTANCE NM	MEA FT	WIND AT 1700 FT DIR/KTS	OAT AT CRUISE ALT °C	OAT AT MEA °C	ALT SET. IN. HG
BIL-SHR	88	8000	010/30	-10	0	29.56
SHR-CZI	57	9000	350/40	-10	-4	29.60
CZI-DGW	95	8000	040/45	-10	0	29.60
DGW-CYS	47	8000	040/45	-10	0	29.60
	46	8000	040/45	-10	0	29.60
CYS-DEN	81	8000	040/45	-10	0	29.60

REFERENCE: Enroute Low Altitude charts L-8 and L-9

At Denver:
Outside Air Temperature .... 15°C (59°F)
Field Elevation .... 5331 feet

To determine pressure altitude at origin and destination airports, add 100 feet to field elevation for each .1 in. Hg below 29.92 and subtract 100 feet from field elevation for each .1 in. Hg above 29.92.

Pressure Altitude at BIL:
29.92 - 29.56 = .36 in. Hg
The pressure altitude at BIL is 360 feet above the field elevation.
3606 + 360 = 3966 feet

Pressure Altitude at DEN:
29.92 - 29.60 = .32 in. Hg
The pressure altitude at DEN is 320 feet above the field elevation.
5331 + 320 = 5651 feet

For enroute altitudes and MEA's this pressure correction has been ignored.

Enter the graph for ISA Conversion at the condition indicated:

ENROUTE:	Pressure Altitude (approx)	=	17,000 feet
	OAT	=	-10°C
	ISA Condition	=	ISA + 9°C

Enter the graph for Time, Fuel and Distance to Climb at 25°C and 3966 feet, and -10°C and 17,000 feet, with an initial weight of 6775 lbs.

Time to Climb	=	21	-5	=	16 min
Fuel Used to Climb	=	140	-35	=	105 lbs
Distance Traveled	=	56	-12	=	44 NM

Enter the tables for Recommended Cruise Power 32 in. Hg 2500 RPM at ISA and ISA + 20°C.

Interpolate to obtain cruise speeds and fuel flows at 17,000 feet.

CRUISE TRUE AIRSPEED - KNOTS		CRUISE FUEL FLOWS - GAL/HR/ENG	
ISA	ISA + 20°C	ISA	ISA + 20°C
209	202	19.55	16.95

Interpolate between these speeds for ISA + 9°C

Cruise True Airspeed	=	206 knots

Interpolate between these fuel flows for ISA + 9°C

Fuel Flow Per Engine	=	16.3 gal/hr
Total Fuel Flow	=	32.6 gal/hr (221 lbs/hr)

Enter the graph for Time, Fuel and Distance to Descend at 17,000 feet and at 5651 feet.

Time to Descend	=	17-5.6	=	11.9 min
Fuel to Descend	=	50-16	=	34 lbs
Distance to Descend	=	59-19	=	40 NM

Time and fuel used were calculated at Recommended Cruise Power of 32 in. Hg and 2500 RPM as follows:

Time	=	Distance ÷ Ground Speed
Fuel Used	=	(Time) (Total Fuel Flow)

Results are as follows:

Route	Distance	Estimated Ground Speed	Time At Cruise Altitude	Fuel Used For Cruise
	NM	KTS	HRS:MIN	LBS
BIL - SHR	44*	221	0:12	44
SHR - CZI	57	243	0:14	52
CZI - DGW	95	218	0:26	96
DGW - CYS	47	223	0:13	48
	46	242	0:11	40
CYS - DEN	41*	240	0:10	37

*Distance to Climb or Descend subtracted from Segment Distance.

DETERMINATION OF FLIGHT TIME, BLOCK SPEED, AND FUEL REQUIREMENTS

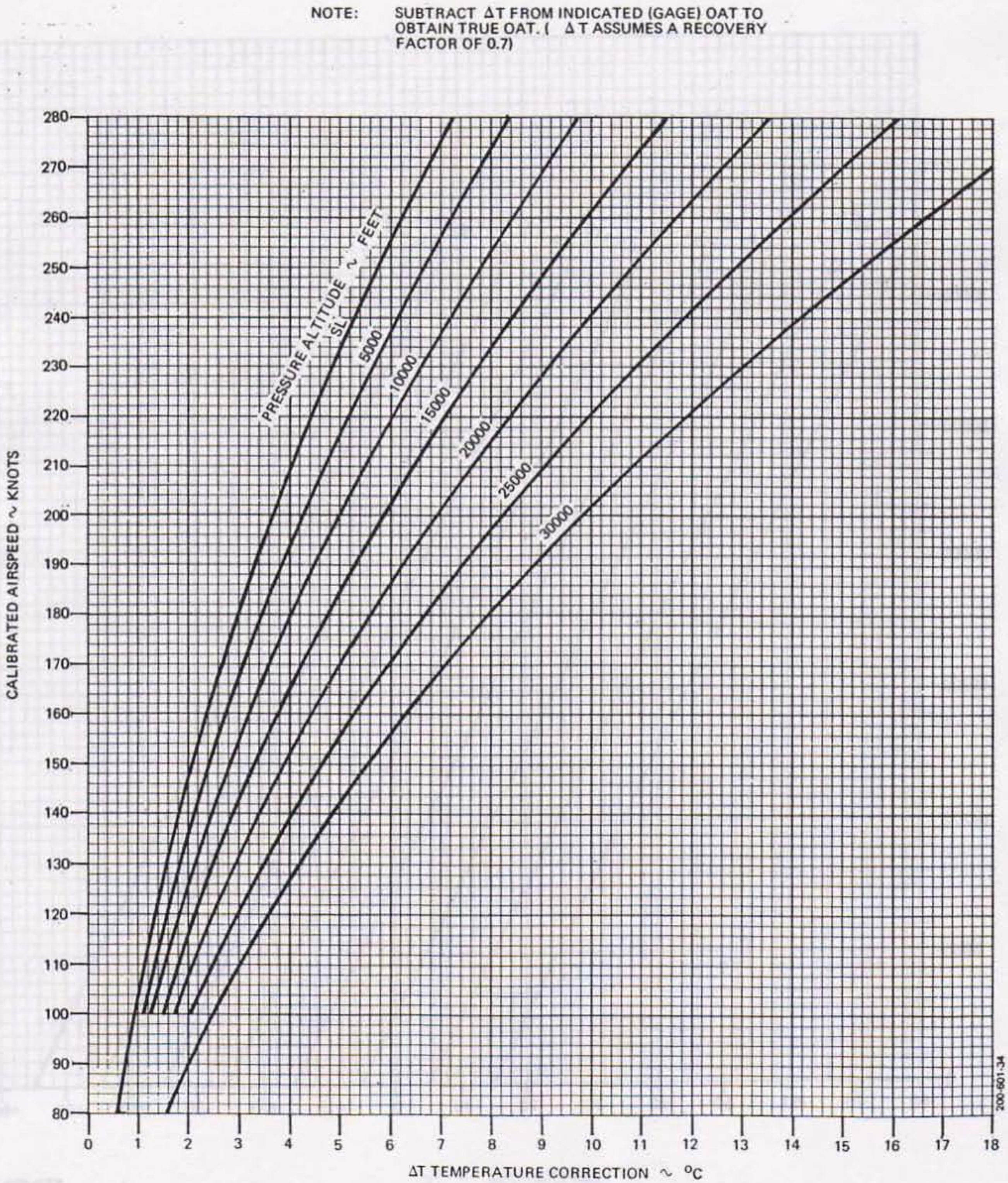
ITEM	TIME HRS:MIN	FUEL POUNDS	DISTANCE NAUTICAL MILES
Start, Runup, Taxi and Take-off Acceleration	0:00	42	0
Climb	0:16	105	44
Cruise	1:26	317	330
Descent	0:11	34	40
Total	1:53	498	414

Total Flight Time: 1 hour, 53 minutes

Block Speed: 414 NM ÷ 1:53 = 218 knots

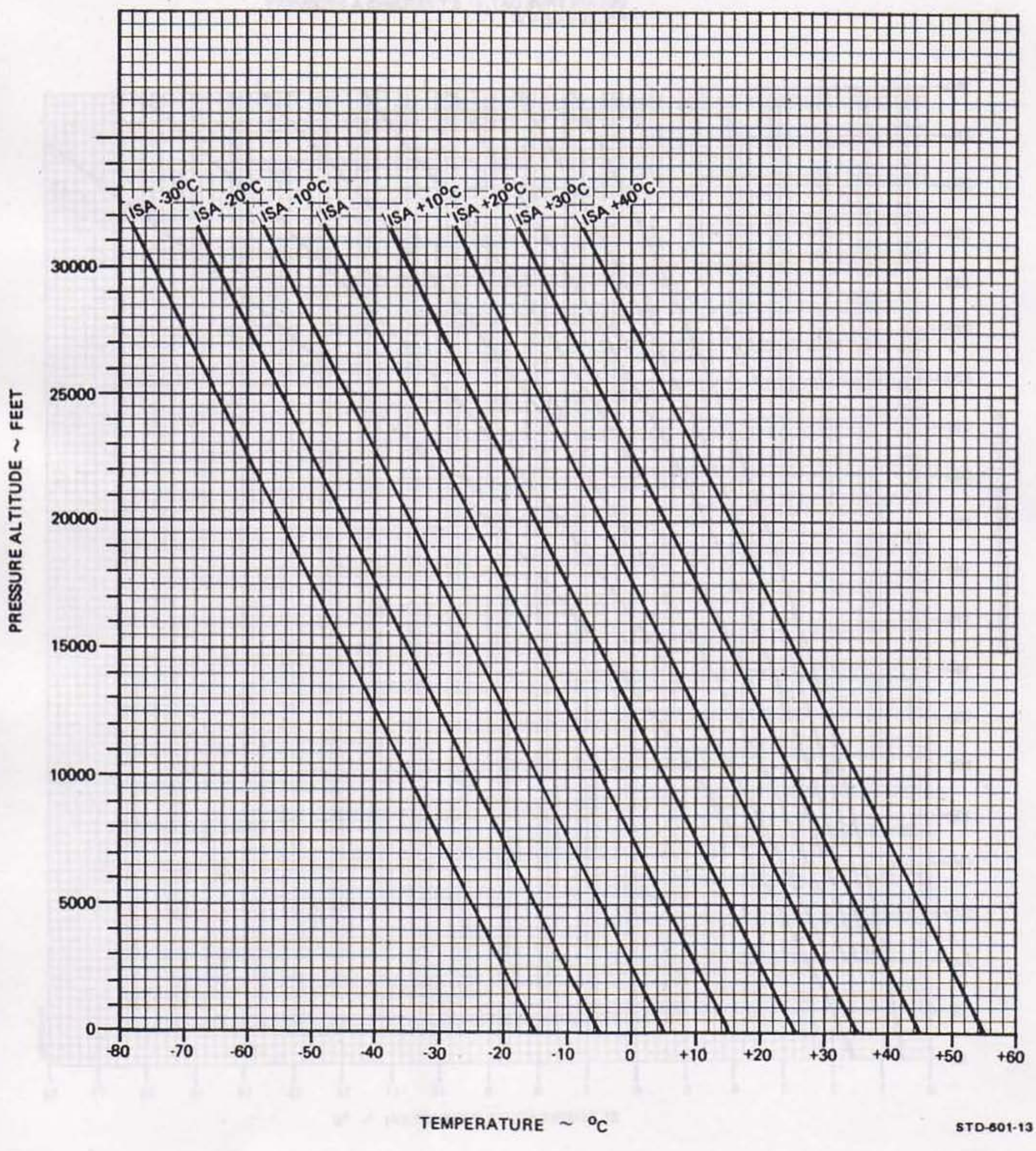
INDICATED OUTSIDE AIR TEMPERATURE CORRECTION

STANDARD DAY (ISA)

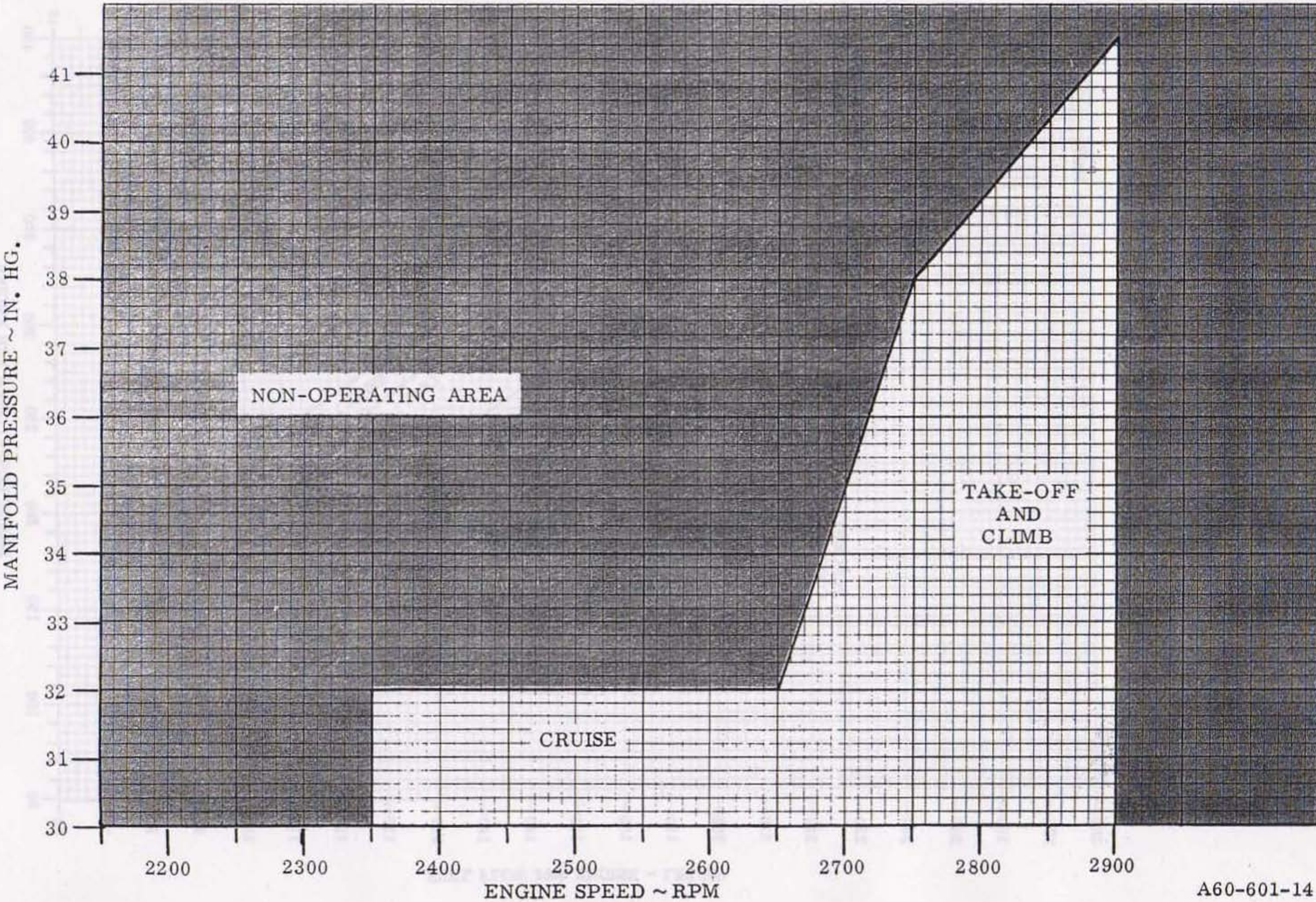


ISA CONVERSION

PRESSURE ALTITUDE VS OUTSIDE AIR TEMPERATURE



LIMITING MANIFOLD PRESSURE
FOR CONTINUOUS OPERATION



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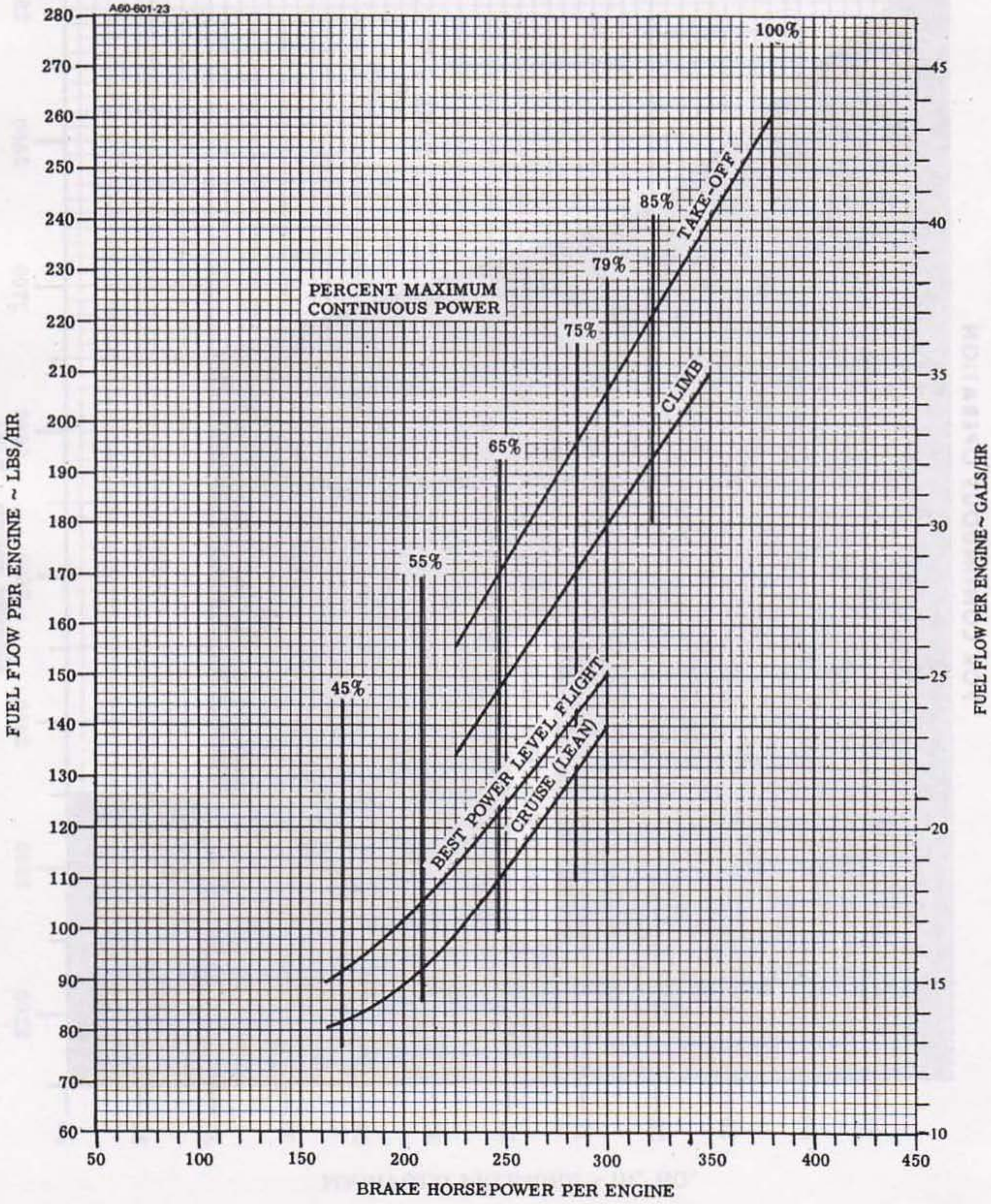
FUEL FLOW vs BRAKE HORSEPOWER



TIME FUEL AND DISTANCE TO CLIMB

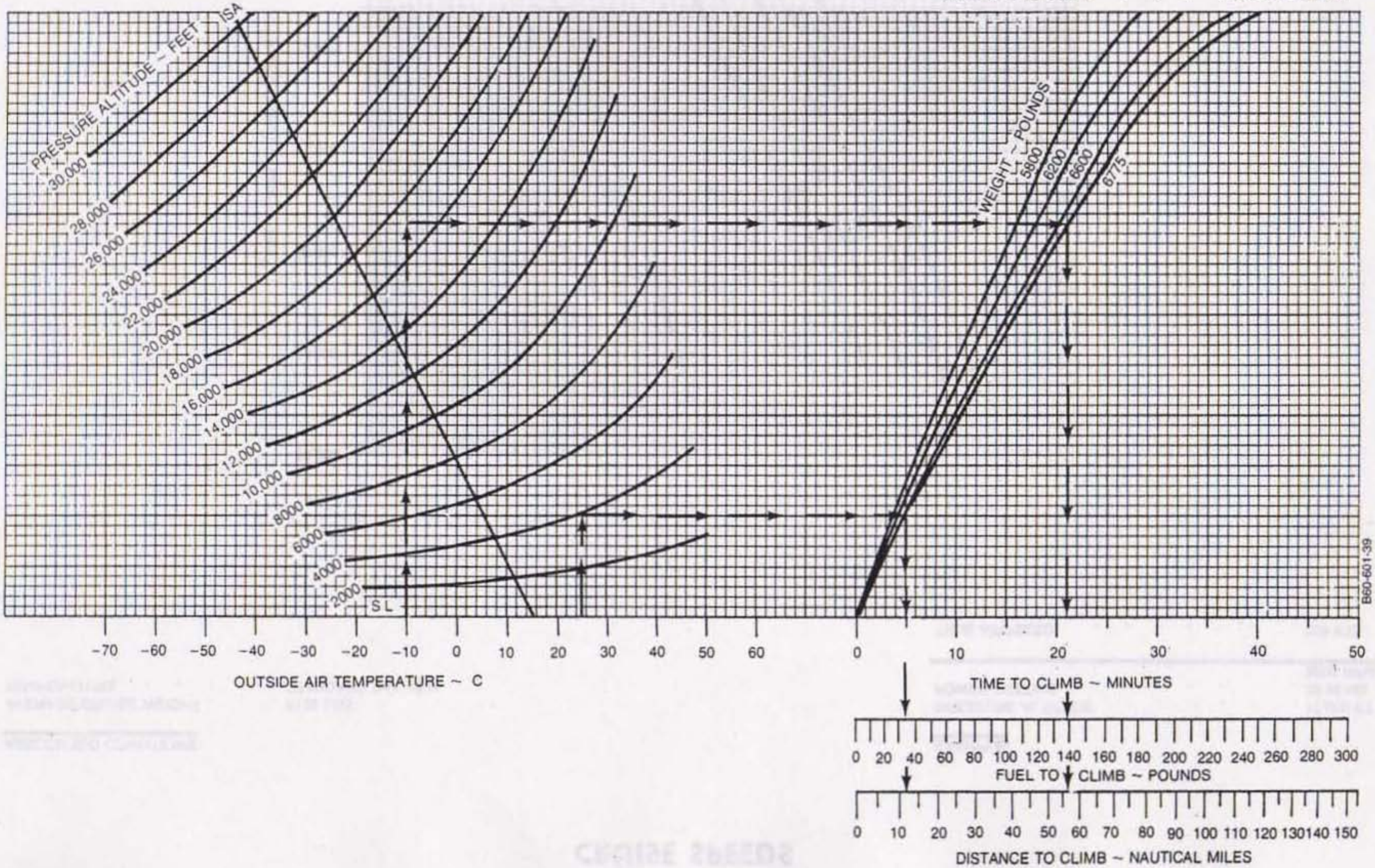
ASSOCIATED CONDITIONS:

PROPELLER SPEED	2750 RPM
MANIFOLD PRESSURE	36.5 IN.HG
FUEL DENSITY	6.0 LBS/GAL
FUEL FLOW	198 LBS/HR/ENG
COWL FLAPS	OPEN

ALTITUDE FEET	CLIMB SPEED KNOTS
SL - 20,000	139
20,000 - 25,000	129
25,000 - 30,000	119

EXAMPLE:

OAT AT TAKE-OFF	25 °C
OAT AT CRUISE	− 10°C
AIRPORT PRESSURE ALTITUDE	3966 FT
CRUISE PRESSURE ALTITUDE	17,000 FT
INITIAL CLIMB WEIGHT	6775 LBS
TIME TO CLIMB	21 - 5 = 16 MIN
FUEL TO CLIMB	140 - 35 = 105 LBS
DISTANCE TO CLIMB	56 - 12 = 44 NM



CRUISE SPEEDS

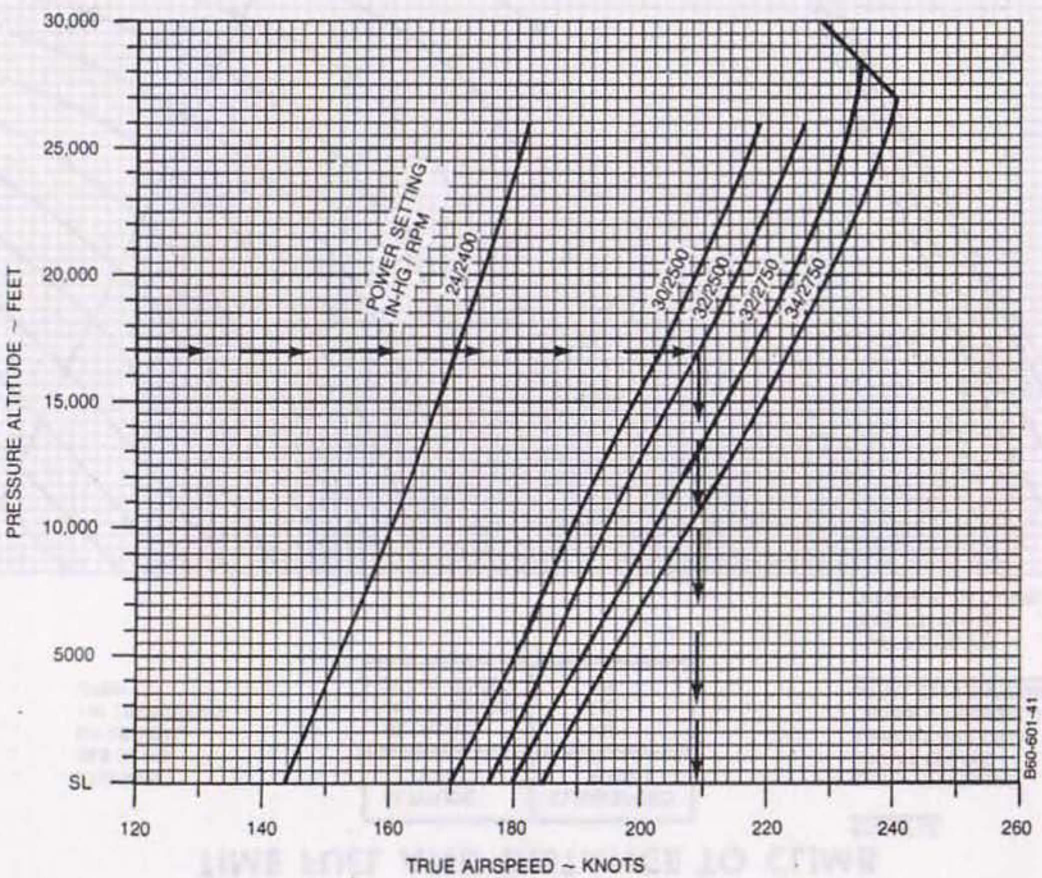
ASSOCIATED CONDITIONS:

AVERAGE CRUISE WEIGHT . . . 6125 LBS
TEMPERATURE . . . . . STANDARD DAY (ISA)

EXAMPLE:

PRESSURE ALTITUDE . . . . 17,000 FT
POWER SETTING . . . . 32 IN.HG
2500 RPM

TRUE AIRPSEED . . . . 209 KTS



MAXIMUM CRUISE POWER

MANIFOLD PRESSURE 34.0 IN. HG-PROPELLER SPEED 2750 RPM

PRESS ALT	ISA -20°C (-36°F) IOAT		FUEL FL. PER ENG.	IAS	TAS	STANDARD DAY (ISA) IOAT		FUEL FL. PER ENG.	IAS	TAS	ISA +20°C (+36°F) IOAT		FUEL FL. PER ENG.	IAS	TAS
FEET	°C	°F	LBS/HR	KTS	KTS	°C	°F	LBS/HR	KTS	KTS	°C	°F	LBS/HR	KTS	KTS
SL	-2	28	164.4	196	190	18	64	143.0	184	185	38	100	122.9	173	180
2000	-6	21	164.4	194	194	14	57	143.0	183	190	34	93	122.9	172	184
4000	-9	16	164.4	193	198	11	52	143.0	182	194	30	86	122.9	171	188
6000	-13	9	164.4	192	203	7	45	143.0	181	199	27	81	122.9	169	193
8000	-17	1	164.4	191	207	3	37	143.0	180	203	23	73	122.9	168	197
10000	-21	-6	164.4	189	212	-1	30	143.0	178	208	19	66	122.9	167	202
12000	-24	-11	164.4	188	217	-5	23	143.0	177	213	15	59	122.9	165	206
14000	-28	-18	164.4	186	222	-8	18	143.0	175	217	11	52	122.9	164	211
16000	-32	-26	163.5	184	226	-12	10	142.3	173	222	8	46	122.3	162	215
18000	-36	-33	162.6	182	230	-16	3	141.5	171	226	4	39	121.6	160	219
20000	-40	-40	161.7	180	235	-20	-4	140.7	169	231	0	32	121.0	157	224
22000	-43	-45	158.1	177	238	-24	-11	137.6	166	234	-4	25	118.3	154	227
24000	-47	-53	154.5	173	242	-27	-17	134.6	162	237	-8	18	115.6	151	229
26000	-51	-60	149.2	170	245	-31	-24	130.2	159	240	-12	10	111.8	147	231
28000	-55	-67	135.7	163	243	-35	-31	118.6	151	237	-16	3	102.6	139	228
30000	59	-74	116.6	152	236	-40	-40	102.6	140	228	-20	-4	90.7	127	216

NOTES:
1. Extend cowl flaps as required to maintain cylinder head temperature at 246°C or less.
2. Cowl flaps full open reduce true airspeed by approximately 10 knots.
3. Cruise speeds are presented at an average weight of 6125 lbs.
4. Shaded area represents operation with full throttle.

RECOMMENDED CRUISE POWER

MANIFOLD PRESSURE 32.0 IN. HG-PROPELLER SPEED 2750 RPM

	ISA -20°C (-36°F)					STANDARD DAY (ISA)					ISA +20°C (+36°F)				
PRESS ALT	IOAT		FUEL FL. PER ENG.	IAS	TAS	IOAT		FUEL FL. PER ENG.	IAS	TAS	IOAT		FUEL FL. PER ENG.	IAS	TAS
FEET	°C	°F	LBS/HR	KTS	KTS	°C	°F	LBS/HR	KTS	KTS	°C	°F	LBS/HR	KTS	KTS
SL	-2	28	151.2	190	185	18	64	131.8	179	180	38	100	113.2	168	175
2000	-6	21	151.2	189	188	14	57	131.8	178	184	34	93	113.2	167	179
4000	-10	14	151.2	187	192	10	50	131.8	177	189	30	86	113.2	166	183
6000	-13	9	151.2	186	197	7	45	131.8	176	193	26	79	113.2	164	187
8000	-17	1	151.2	185	202	3	37	131.8	175	198	23	73	113.2	163	191
10000	-21	-6	151.2	184	206	-1	30	131.8	173	202	19	66	113.2	162	196
12000	-25	-13	151.2	183	211	-5	23	131.8	172	207	15	59	113.2	160	200
14000	-28	-18	151.2	181	216	-9	16	131.8	170	211	11	52	113.2	159	205
16000	-32	-26	151.2	179	220	-12	10	131.8	169	216	7	45	113.2	157	209
18000	-36	-33	151.2	178	225	-16	3	131.8	167	221	4	39	113.2	155	214
20000	-40	-40	151.2	176	230	-20	-4	131.8	165	225	0	32	113.2	154	218
22000	-44	-47	147.6	173	233	-24	-11	128.8	162	228	-4	25	110.7	150	221
24000	-47	-53	143.9	169	237	-28	-18	125.8	158	232	-8	18	108.3	147	223
26000	-51	-60	138.1	165	239	-31	-24	120.8	154	233	-12	10	104.4	142	224
28000	-55	-67	132.6	161	241	-35	-31	115.8	150	235	-16	3	100.5	138	225
30000	-59	-74	116.6	152	236	-40	-40	102.6	140	228	-20	-4	90.7	127	216

NOTES:
1. Extend cowl flaps as required to maintain cylinder head temperature at 246°C or less.
2. Cowl flaps full open reduce true airspeed by approximately 10 knots.
3. Cruise speeds are presented at an average weight of 6125 lbs.
4. Shaded area represents operation with full throttle.

RECOMMENDED CRUISE POWER

MANIFOLD PRESSURE 32.0 IN. HG-PROPELLER SPEED 2500 RPM

	ISA -20°C (-36°F)					STANDARD DAY (ISA)					ISA +20°C (+36°F)				
PRESS ALT	IOAT		FUEL FL. PER ENG.	IAS	TAS	IOAT		FUEL FL. PER ENG.	IAS	TAS	IOAT		FUEL FL. PER ENG.	IAS	TAS
FEET	°C	°F	LBS/HR	KTS	KTS	°C	°F	LBS/HR	KTS	KTS	°C	°F	LBS/HR	KTS	KTS
SL	-2	28	138.1	186	181	18	64	120.8	175	176	38	100	104.4	164	171
2000	-6	21	138.1	185	184	14	57	120.8	174	180	34	93	104.4	163	175
4000	-10	14	137.5	183	188	10	50	120.2	172	184	30	86	103.9	161	178
6000	-14	7	136.3	181	191	6	43	119.1	170	187	26	79	103.1	159	181
8000	-17	1	135.7	179	195	3	37	118.6	169	191	22	72	102.6	158	185
10000	-21	-6	135.7	178	199	-1	30	118.6	167	195	19	66	102.6	156	189
12000	-25	-13	135.1	176	203	-5	23	118.0	166	199	15	59	102.2	154	193
14000	-29	-20	135.1	174	208	-9	16	118.0	164	203	11	52	102.2	152	197
16000	-33	-27	134.4	172	212	-13	9	117.5	162	207	7	45	101.8	150	200
18000	-36	-33	133.8	170	216	-17	1	116.9	160	211	3	37	101.3	148	204
20000	-40	-40	133.2	168	220	-20	-4	116.4	157	215	-1	30	100.9	146	208
22000	-44	-47	132.0	166	224	-25	-11	115.3	155	219	-4	25	100.0	143	211
24000	-48	-54	130.7	163	228	-28	-18	114.2	152	223	-8	18	99.2	140	214
26000	-52	-62	128.9	160	232	-32	-26	112.5	149	226	-12	10	97.9	137	217

NOTES:
1. Extend cowl flaps as required to maintain cylinder head temperature at 246°C or less.
2. Cowl flaps full open reduce true airspeed by approximately 10 knots.
3. Cruise speeds are presented at an average weight of 6125 lbs.

RECOMMENDED CRUISE POWER

MANIFOLD PRESSURE 30.0 IN. HG-PROPELLER SPEED 2500 RPM

	ISA -20°C (-36°F)					STANDARD DAY (ISA)					ISA +20°C (+36°F)				
PRESS ALT	IOAT		FUEL FL. PER ENG.	IAS	TAS	IOAT		FUEL FL. PER ENG.	IAS	TAS	IOAT		FUEL FL. PER ENG.	IAS	TAS
FEET	°C	°F	LBS/HR	KTS	KTS	°C	°F	LBS/HR	KTS	KTS	°C	°F	LBS/HR	KTS	KTS
SL	-2	28	125.8	180	175	18	64	110.0	169	170	38	100	95.9	158	165
2000	-6	21	125.8	179	178	14	57	110.0	168	174	34	93	95.9	157	168
4000	-10	14	125.8	177	182	10	50	110.0	167	178	30	86	95.9	156	172
6000	-14	7	125.2	176	186	6	43	109.5	165	182	26	79	95.6	154	176
8000	-18	0	125.2	174	190	2	36	109.5	164	186	22	72	95.6	153	179
10000	-21	-6	124.6	173	194	-2	28	109.0	162	189	18	64	95.3	151	183
12000	-25	-13	123.4	171	197	-5	23	108.0	160	193	14	57	94.6	149	186
14000	-29	-20	123.4	169	201	-9	16	108.0	159	197	11	52	94.6	147	190
16000	-33	-27	123.2	167	206	-13	9	107.9	157	201	7	45	94.4	145	193
18000	-37	-35	122.9	165	210	-17	1	107.7	155	205	3	37	94.3	143	197
20000	-40	-40	122.7	163	214	-21	-6	107.6	153	209	-1	30	94.2	141	201
22000	-44	-47	121.5	161	218	-24	-11	106.6	150	212	-5	23	93.5	138	204
24000	-48	-54	120.3	158	222	-28	-18	105.6	147	216	-9	16	92.8	135	206
26000	-52	-62	119.1	156	225	-32	-26	104.6	145	219	-12	10	92.1	132	209

NOTES:
1. Extend cowl flaps as required to maintain cylinder head temperature at 246°C or less.
2. Cowl flaps full open reduce true airspeed by approximately 10 knots.
3. Cruise speeds are presented at an average weight of 6125 lbs.

ECONOMY CRUISE POWER

MANIFOLD PRESSURE 24.0 IN. HG-PROPELLER SPEED 2400 RPM

	ISA -20°C (-36°F)					STANDARD DAY (ISA)					ISA +20°C (+36°F)				
PRESS ALT	IOAT		FUEL FL. PER ENG.	IAS	TAS	IOAT		FUEL FL. PER ENG.	IAS	TAS	IOAT		FUEL FL. PER ENG.	IAS	TAS
FEET	°C	°F	LBS/HR	KTS	KTS	°C	°F	LBS/HR	KTS	KTS	°C	°F	LBS/HR	KTS	KTS
SL	-3	27	87.5	154	149	17	63	83.5	143	144	37	99	80.5	131	137
2000	-7	19	87.5	153	153	13	55	83.5	142	148	33	91	80.5	130	140
4000	-11	12	87.5	151	156	9	48	83.5	141	151	29	84	80.5	129	143
6000	-15	5	87.5	150	159	5	41	83.5	140	154	25	77	80.5	127	146
8000	-18	0	87.5	149	163	1	34	83.5	138	157	21	70	80.5	126	148
10000	-22	-8	87.5	148	166	-2	28	83.5	137	160	17	63	80.5	124	151
12000	-26	-15	87.5	146	169	-6	21	83.5	135	163	13	55	80.5	122	153
14000	-30	-22	87.5	144	173	-10	14	83.5	133	166	10	50	80.5	120	156
16000	-34	-29	87.5	143	176	-14	7	83.5	131	169	6	43	80.5	118	158
18000	-38	-36	87.5	141	180	-18	0	83.5	129	172	2	36	80.5	115	160
20000	-42	-44	87.5	139	183	-22	-8	83.5	127	175	-2	28	80.5	112	161
22000	-45	-49	87.5	137	187	-26	-15	83.5	125	178	-6	21	80.5	108	161
24000	-49	-56	87.5	135	190	-30	-22	83.5	122	180	-10	14	80.5	104	160
26000	-53	-63	87.5	133	194	-33	-27	83.5	120	182	-14	7	80.5	98	156

NOTES:
1. Extend cowl flaps as required to maintain cylinder head temperature at 246°C or less.
2. Cowl flaps full open reduce true airspeed by approximately 10 knots.
3. Cruise speeds are presented at an average weight of 6125 lbs.

RANGE PROFILE-232 GALLONS

STANDARD DAY (ISA)

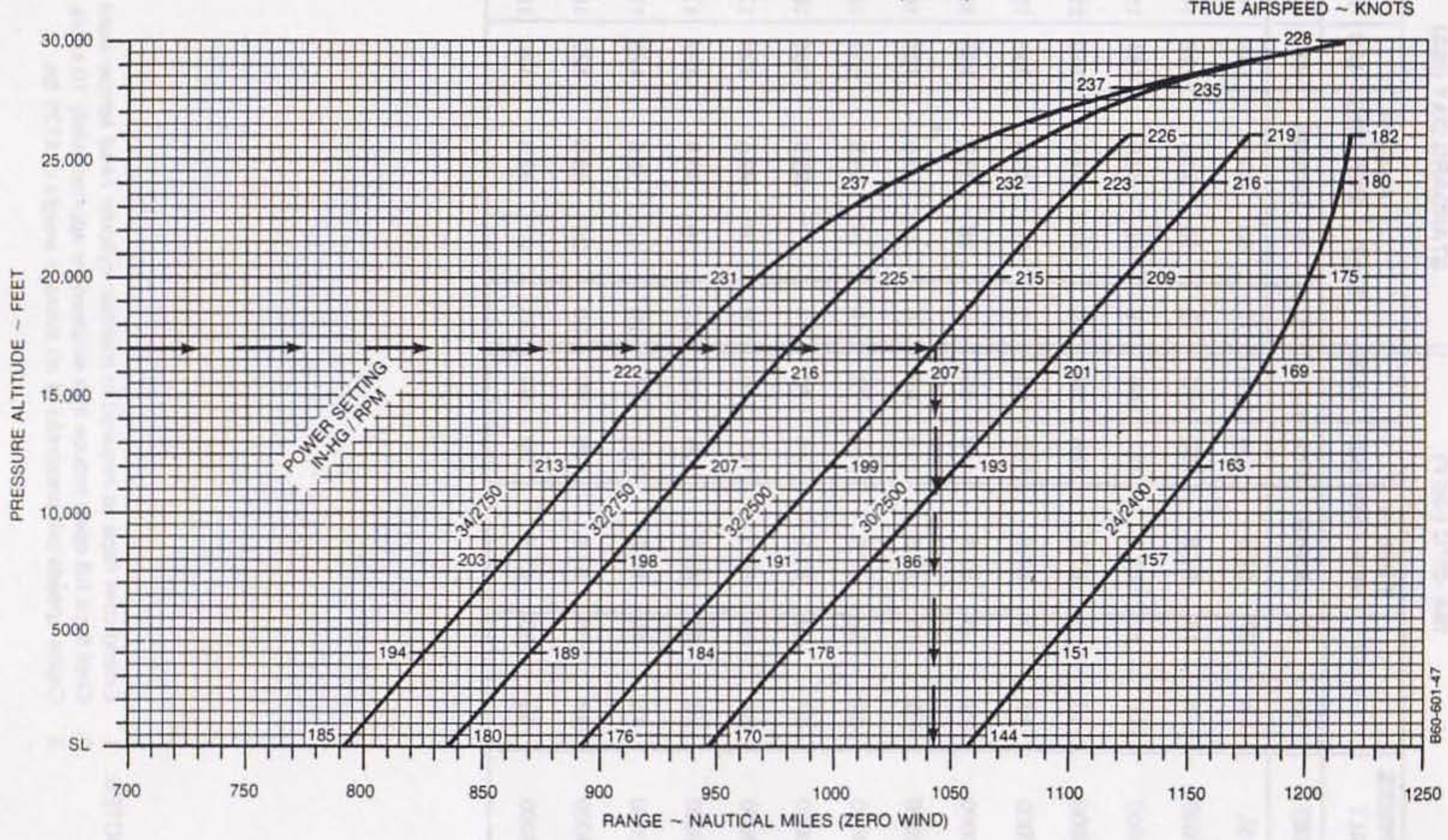
ASSOCIATED CONDITIONS:

WEIGHT	6819 LBS BEFORE ENGINE START
FUEL	AVIATION GASOLINE
FUEL DENSITY	6.0 LBS/GAL
INITIAL FUEL LOADING	232 U.S. GAL (1392 LBS)
COWL FLAPS	CLOSED
FUEL FLOW	SET PER POWER SETTING TABLES

EXAMPLE:

PRESSURE ALTITUDE	17,000 FT
POWER SETTING	32 IN-HG 2500 RPM
RANGE	1043 NM

NOTE:
RANGE INCLUDES START, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT ECONOMY CRUISE (24/2400)



RANGE PROFILE-202 GALLONS

STANDARD DAY (ISA)

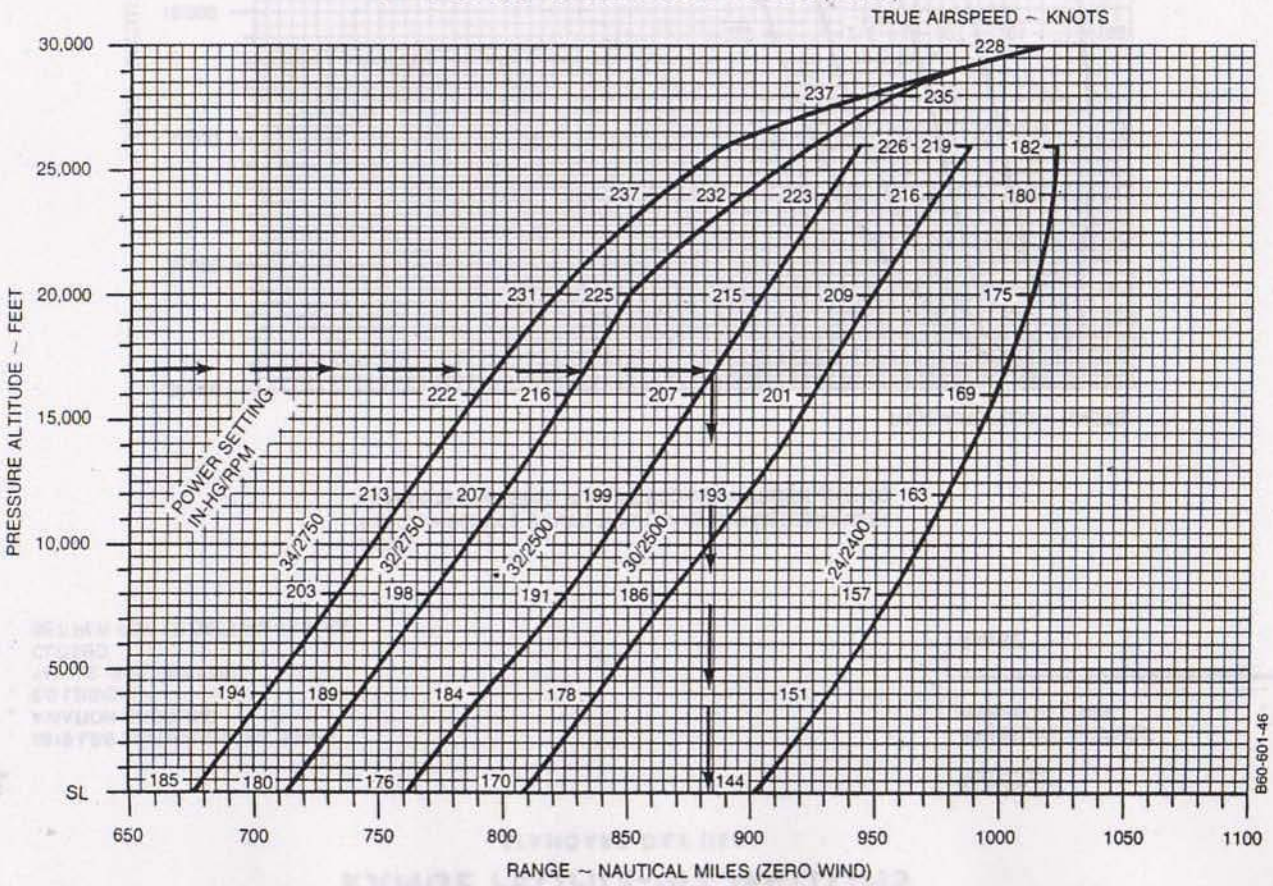
ASSOCIATED CONDITIONS:

WEIGHT	6819 LBS BEFORE ENGINE START
FUEL	AVIATION GASOLINE
FUEL DENSITY	6.0 LBS/GAL
INITIAL FUEL LOADING	202 U.S. GAL (1212 LBS)
COWL FLAPS	CLOSED
FUEL FLOW	SET PER POWER SETTING TABLES

EXAMPLE:

PRESSURE ALTITUDE	17,000 FT
POWER SETTING	32 IN.HG (2500 RPM)
RANGE	885 NM

NOTE:
RANGE INCLUDES START, TAXI, CLIMB, AND DESCENT WITH 45 MINUTES RESERVE FUEL AT ECONOMY CRUISE (24/2400)



RANGE PROFILE-142 GALLONS

STANDARD DAY (ISA)

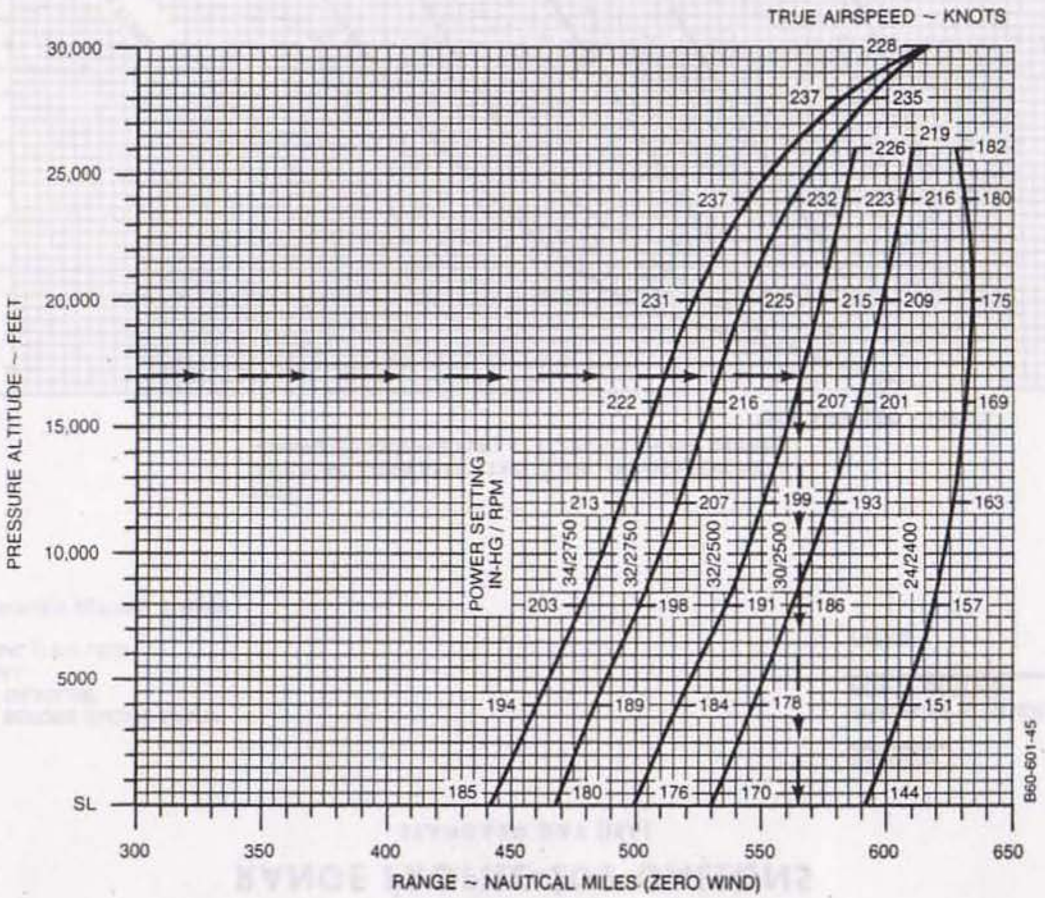
ASSOCIATED CONDITIONS:

WEIGHT	6819 LBS BEFORE ENGINE START
FUEL	AVIATION GASOLINE
FUEL DENSITY	6.0 LBS/GAL
INITIAL FUEL LOADING	142 U.S. GAL (852 LBS)
COWL FLAPS	CLOSED
FUEL FLOW	SET PER POWER SETTING TABLES

EXAMPLE:

PRESSURE ALTITUDE	17,000 FT
POWER SETTING	32 IN.HG 2500 RPM
RANGE	565 NM

NOTE:
RANGE INCLUDES START, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT ECONOMY CRUISE (24/2400)



ENDURANCE PROFILE-232 GALLONS

STANDARD DAY (ISA)

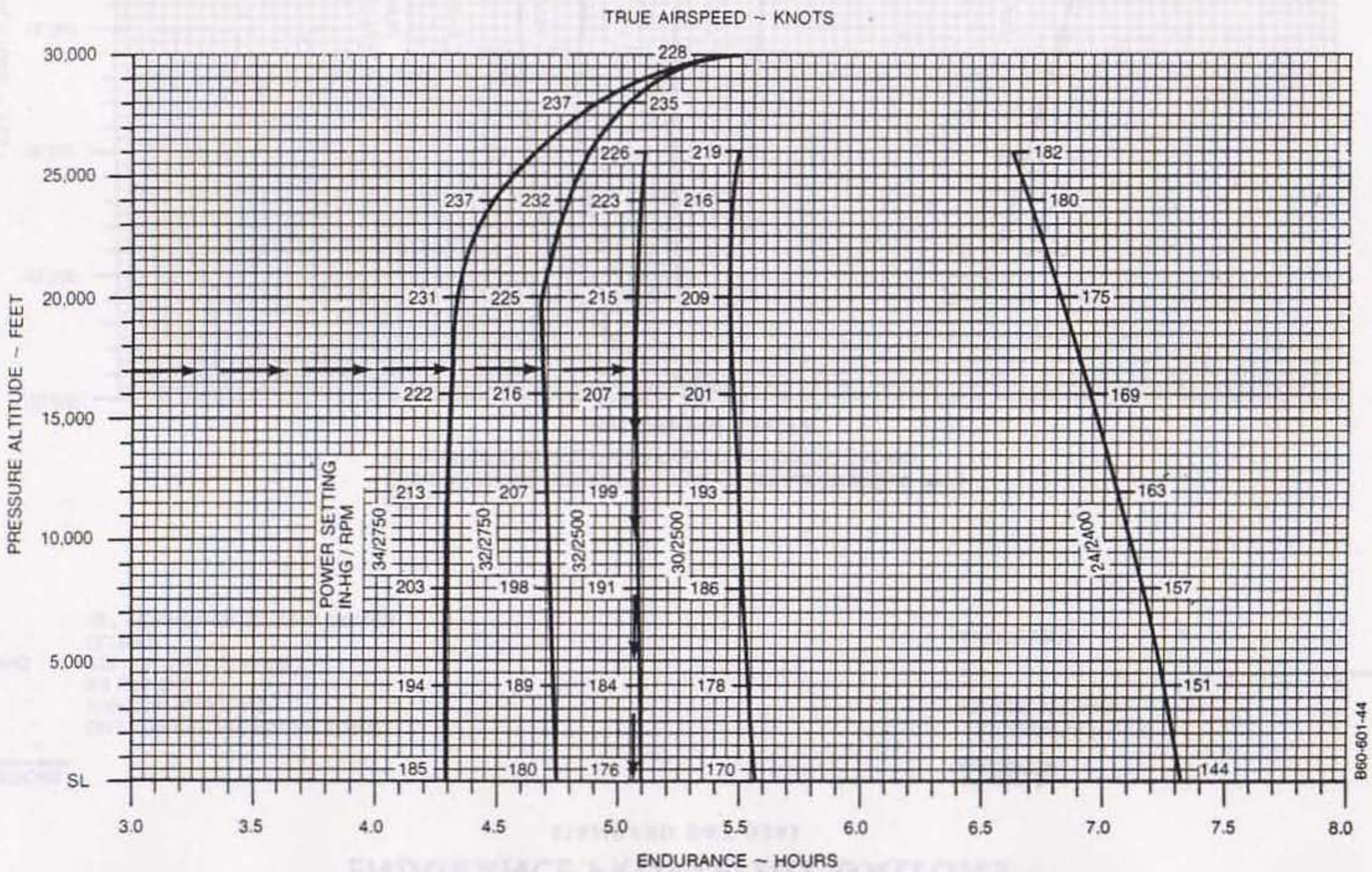
ASSOCIATED CONDITIONS:

WEIGHT	6819 LBS BEFORE ENGINE START
FUEL	AVIATION GASOLINE
FUEL DENSITY . . .	6.0 LBS/GAL
INITIAL FUEL LOADING .	232 U.S. GAL (1392 LBS)
COWL FLAPS	CLOSED
FUEL FLOW	SET PER POWER SETTING TABLES

EXAMPLE:

PRESSURE ALTITUDE	17,000 FT
POWER SETTING	32 IN.HG 2500 RPM
ENDURANCE	5.06 HRS (5 HRS 3 MIN)

NOTE:
ENDURANCE INCLUDES START, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT ECONOMY CRUISE (24/2400)



ENDURANCE PROFILE-202 GALLONS

STANDARD DAY (ISA)

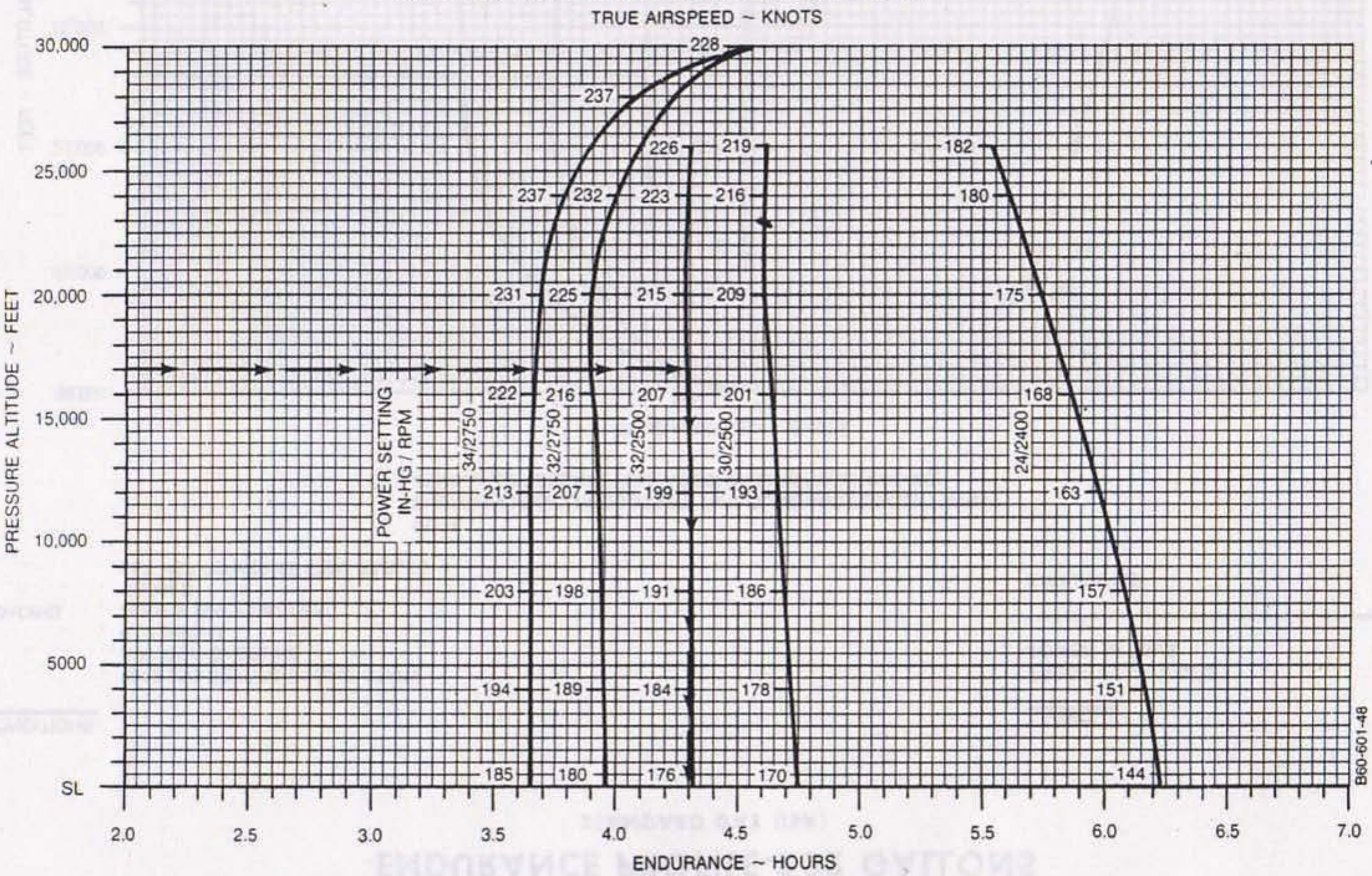
ASSOCIATED CONDITIONS:

WEIGHT	6819 LBS BEFORE ENGINE START
FUEL	AVIATION GASOLINE
FUEL DENSITY	6.0 LBS/GAL
INITIAL FUEL LOADING	202 U.S. GAL (1212 LBS)
COWL FLAPS	CLOSED
FUEL FLOW	SET PER POWER SETTING TABLES

EXAMPLE:

PRESSURE ALTITUDE	17,000 FT
POWER SETTING	32 IN.HG 2500 RPM
ENDURANCE	4.3 HRS (4 HRS 18 MIN)

NOTE:
ENDURANCE INCLUDES START, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT ECONOMY CRUISE (24/2400)



ENDURANCE PROFILE-142 GALLONS

STANDARD DAY (ISA)

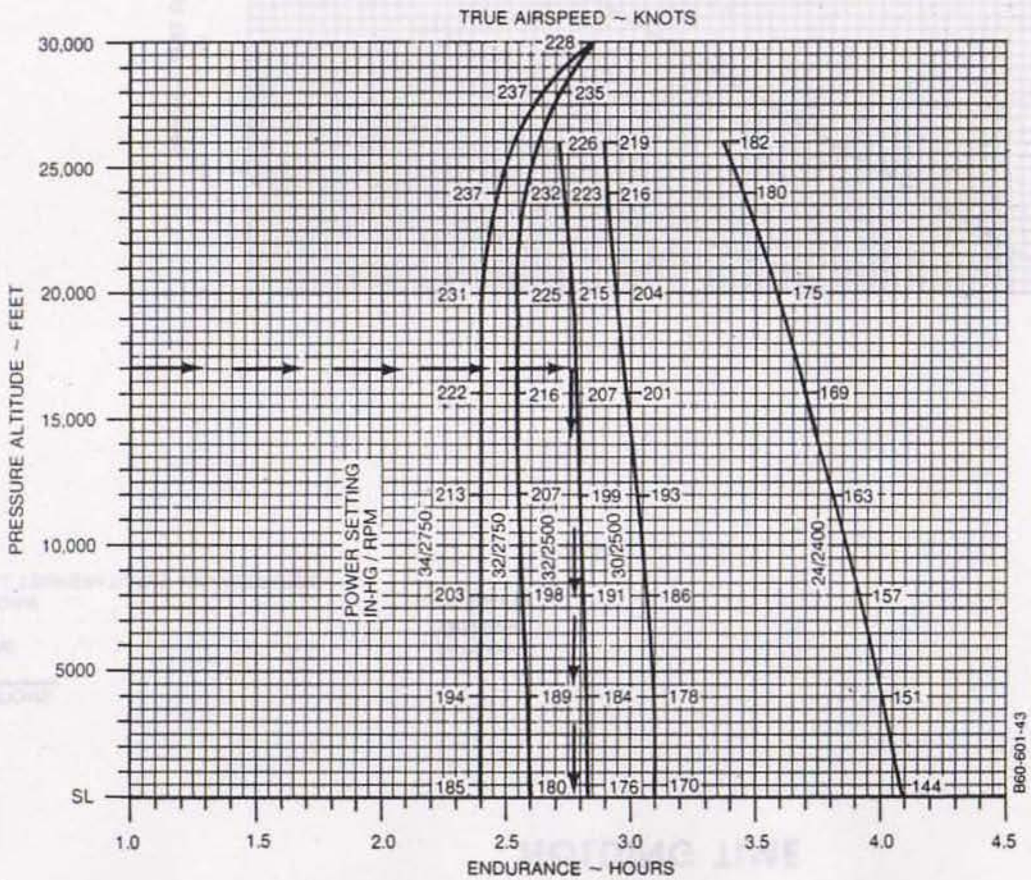
ASSOCIATED CONDITIONS:

WEIGHT	6819 LBS BEFORE ENGINE START
FUEL	AVIATION GASOLINE
FUEL DENSITY	6.0 LBS/GAL
INITIAL FUEL LOADING	142 U.S. GAL (852 LBS)
COWL FLAPS	CLOSED
FUEL FLOW	SET PER POWER SETTING TABLES

EXAMPLE:

PRESSURE ALTITUDE	17,000 FT
POWER SETTING	32 IN-HG 2500 RPM
ENDURANCE	2.77 HRS (2 HRS 46 MIN)

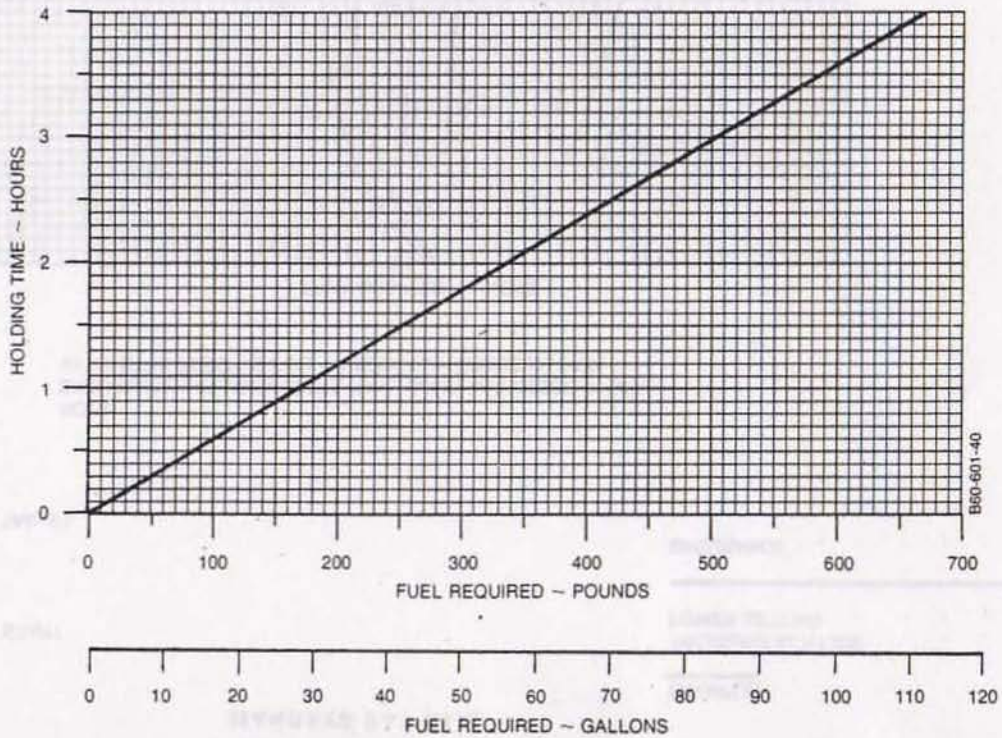
NOTE:
ENDURANCE INCLUDES START, TAXI, CLIMB AND DESCENT WITH 45 MINUTES RESERVE FUEL AT ECONOMY CRUISE (24/2400)



HOLDING TIME

ASSOCIATED CONDITIONS:

MANIFOLD PRESSURE . . . . 24 IN.HG
PROPELLER SPEED . . . . 2400 RPM
FUEL FLOW PER ENGINE . . . . 14 GAL/HR
APPLICABLE FOR ALL TEMPERATURES AND ALTITUDES



DESCENT

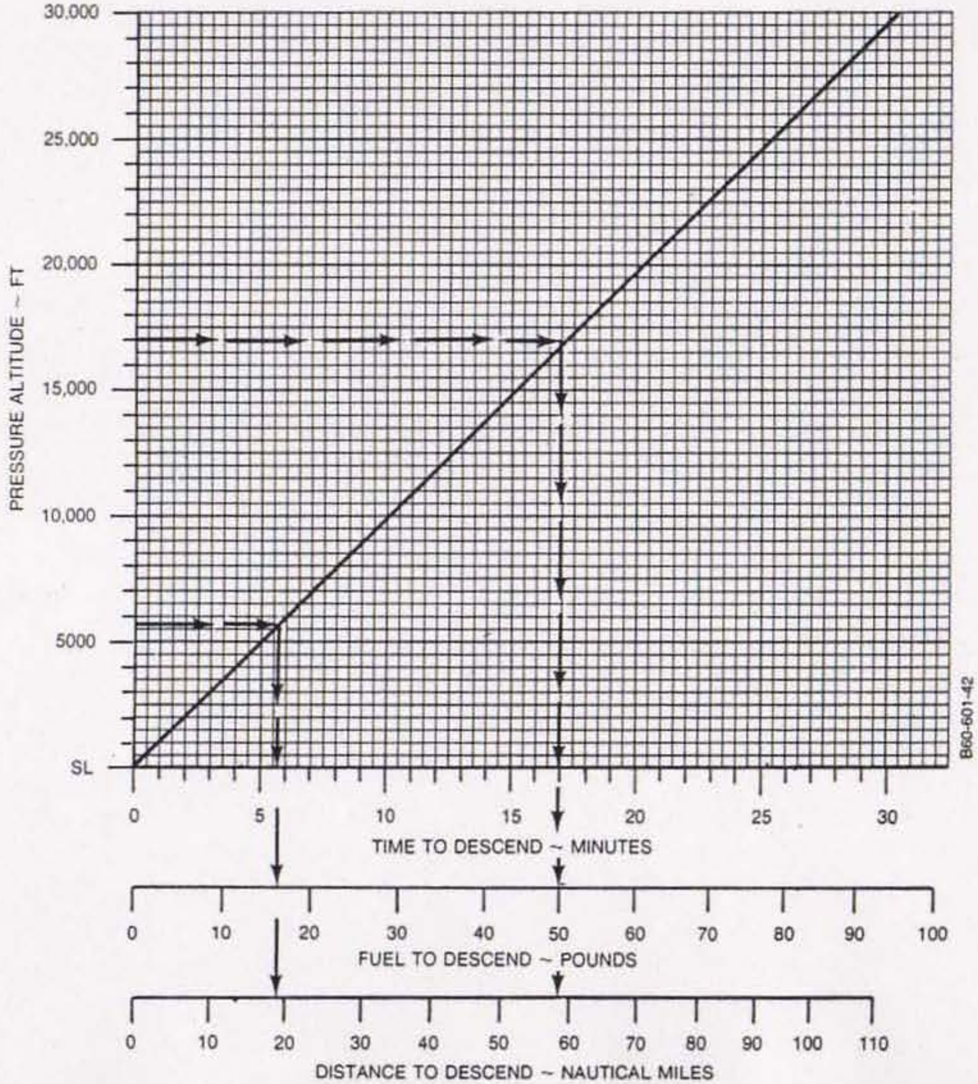
DESCENT SPEED 180 KNOTS

ASSOCIATED CONDITIONS:

POWER	30 IN.HG AND 2500 RPM OR AS REQUIRED FOR 1000 FT/MIN
FLAPS	UP (0°)
LANDING GEAR	UP

EXAMPLE:

INITIAL ALTITUDE	17,000 FT
FINAL ALTITUDE	5650 FT
TIME TO DESCEND	17 - 5.6 = 11.4 MIN
FUEL TO DESCEND	50 - 16 = 34.0 LBS
DISTANCE TO DESCEND	59 - 19 = 40 NM



SECTION VIII

WEIGHT AND BALANCE

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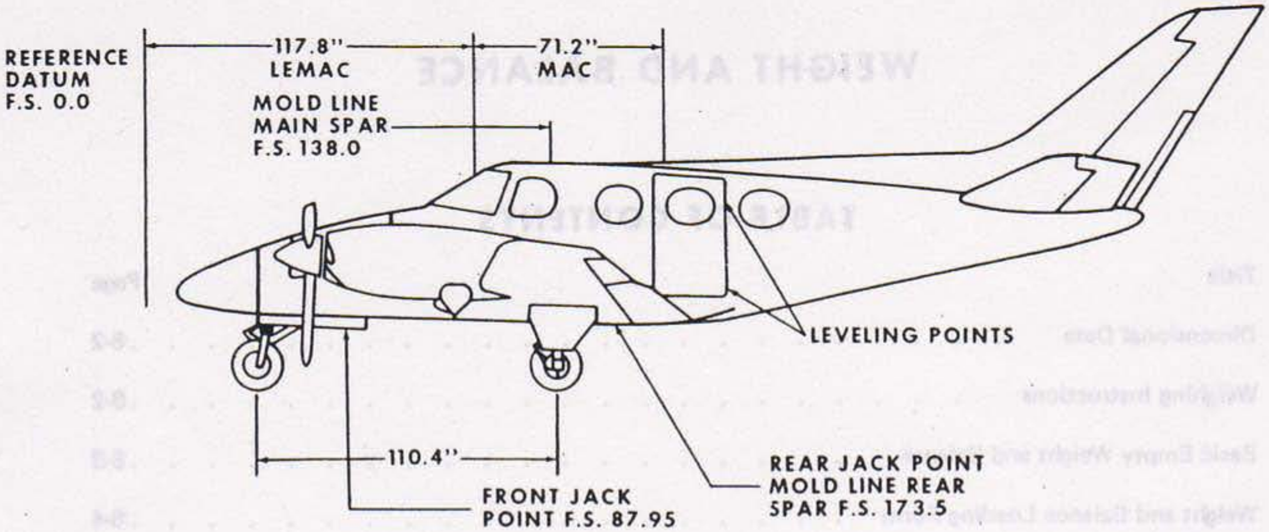
DIMENSIONAL DATA



WEIGHING INSTRUCTIONS

Periodic weighing of the Duke B60 may be necessary to keep the Basic Empty Weight current. Frequency of weighing is to be determined by the operator. All changes to the airplane affecting weight and balance are the responsibility of the airplane operator.

1. Airplane may be weighed on wheels or jack points. Jack point locations are on the forward fuselage station 87.95 and on the wing center section rear spar fuselage station 173.5. Wheel reaction locations must be measured as described in Paragraph 6, below.
2. Fuel should be drained preparatory to weighing. Tanks are drained from the regular drain ports with the airplane in static ground attitude. When tanks are drained, 11 pounds of undrainable fuel remains in the airplane at an arm of 135 inches. The remainder of the unusable fuel to be added to a drained system is 19 pounds at fuselage station 133.4. When the airplane is weighed with full fuel, the fuel specific weight (pounds/gallons) should be determined by using a hydrometer. Full usable fuel of 202 gallons has a center of gravity at fuselage station 139.0.Full usable fuel of 232 gallons has a center of gravity at fuselage station 139.7.
3. Engine oil must be at the full level in each tank. Total engine oil aboard when tanks are full is 49 pounds at an arm of 88.0 inches.
4. Installed equipment is checked against the airplane equipment list or superseding forms. All equipment must be in its proper place during weighing.
5. Airplane is placed on scales in a level attitude. Leveling screws are located on the fuselage entrance door frame. Leveling is accomplished with a plumb bob. Jack pad leveling may require the nose gear shock to be secured in the static position to prevent its extension. Wheel weighings can be leveled by varying the amounts of air in shocks and tires.
6. Measurement of the reaction locations for a wheel weighing is made using the nose jacking point for a reference. Using a steel measuring tape, measurements are taken from the reference (a plumb bob hung from the center of the nose jacking point) to the axle center line of the nose gear and then from the nose gear axle center line to the main wheel axle center line. The main wheel axle center line is best located by stretching a string across from one main wheel to the other. All measurements are to be taken in a plane level with the floor and parallel to the fuselage center line. The locations of the wheel reactions will be approximately at an arm of 152 inches for main wheels and 42 inches for the nose wheel.
7. The basic empty weight and corresponding moment is determined from the scale readings. Items weighed which are not part of the empty airplane are subtracted, e.g., usable fuel. Unusable fuel and engine oil are added if not already in the airplane.
8. Weighing should always be performed in an enclosed area which is free of air currents. The scales used should be properly calibrated and certified.

BASIC EMPTY WEIGHT AND BALANCE

DATE:

SERIAL NO:

REGISTRATION NO:

PREPARED BY:

STRUT POSITION -	NOSE	MAIN
EXTENDED	40.3	151.0
COMPRESSED	41.9	152.0

JACK POINT LOCATION

FORWARD	87.95
AFT	173.5

REACTION WHEEL - JACK POINTS	SCALE READING	TARE	NET WEIGHT	ARM	MOMENT
LEFT MAIN					
RIGHT MAIN					
SUB TOTAL					
NOSE					
TOTAL (AS WEIGHED)					

SPACE BELOW PROVIDED FOR ADDITIONS AND SUBTRACTIONS TO AS WEIGHED CONDITION

EMPTY WEIGHT			
ENGINE OIL	49	88	4312
UNUSABLE FUEL	30	134	4020
BASIC EMPTY WEIGHT			

Beechcraft® DUKE B60

WEIGHT AND BALANCE LOADING FORM

SERIAL NO:	REGISTRATION NO:	DATE:

PAYLOAD COMPUTATIONS				ITEM	WEIGHT	MOM/100
ITEM		WEIGHT	MOM/100	BASIC EMPTY COND.		
PASSENGER (OR CARGO)				PILOT		
NO.	LOCATION (ROW, F.S., ETC)			PILOT'S BAGGAGE		
				TOTAL PAYLOAD		
				SUB TOTAL		
				FUEL LOADING		
				SUB TOTAL RAMP CONDITION		
				*LESS FUEL FOR START TAXI, AND TAKEOFF		
BAGGAGE				SUB TOTAL TAKE-OFF CONDITION		
CABINET CONTENTS				LESS FUEL TO DESTINATION		
TOTAL PAYLOAD				LANDING CONDITION		

*Fuel for start, taxi and takeoff is normally 19 lbs at an average moment/100 of 26.

LOADING INSTRUCTIONS

It is the responsibility of the airplane operator to insure that the airplane is properly loaded. At the time of delivery, Beech Aircraft Corporation provides the necessary weight and balance data to compute individual loadings. All subsequent changes in airplane weight and balance are the responsibility of the airplane owner and/or operator.

The basic empty weight and moment of the airplane at the time of delivery are shown on the Basic Empty Weight and Balance form. Useful load items which may be loaded into the airplane are shown on the Useful Load Weights and Moments tables. The minimum and maximum moments approved by the FAA are shown on the Moment Limits vs Weight Graph. These moments correspond to the forward and aft center of gravity flight limits (landing gear down) for a particular weight. All moments are divided by 100 to simplify computations.

COMPUTING PROCEDURE

1. Record the Basic Empty Weight and Moment from the Basic Empty Weight and Balance form (or from the latest superseding form) under the Basic Empty Condition block. The moment must be divided by 100 to correspond to Useful Load Weights and Moments tables.
2. Record the weight and corresponding moment from the appropriate table of each of the useful load items (except fuel) to be carried in the airplane.
3. Total the weight column and moment column. The SUB TOTAL is the Zero Fuel Condition.
4. Determine the weight and corresponding moment for the fuel loading to be used. This fuel loading should include fuel for the flight (with required reserves), plus that required for start, taxi, and takeoff. Add the Fuel Loading to Zero Fuel Condition to obtain the SUB TOTAL RAMP CONDITION.
5. Subtract the fuel to be used for start, taxi, and takeoff to arrive at the SUB TOTAL TAKE-OFF CONDITION.
6. Subtract the weight and moment of the FUEL TO DESTINATION from the take-off weight and moment. (Determine the weight and moment of this fuel by subtracting the amount on board at landing from the amount on board at takeoff.) The SUB TOTAL Condition No. 3 and No. 5 as well as LANDING CONDITION moment must be within the minimum and maximum moments shown on the Moment Limits vs Weight Graph for that weight. If the total moment is less than the minimum moment allowed, useful load items must be shifted aft, or forward load items reduced. If the total moment is greater than the maximum moment allowed, useful load items must be shifted forward, or aft load items reduced. If the quantity or location of load items is changed, the calculations must be revised and the moments rechecked.

USEFUL LOAD WEIGHTS AND MOMENTS

OCCUPANTS				
WEIGHT	PILOT OR COPILOT ARM 141	CENTER SEATS ARM 178	5TH & 6TH SEATS* ARM 218	5TH & 6TH SEAT** ARM 222
	MOMENT/100			
100	141	178	218	222
110	155	196	240	244
120	169	214	262	266
130	183	231	283	289
140	197	249	305	311
150	212	267	327	333
160	226	285	349	355
170	240	303	371	377
180	254	320	392	400
190	268	338	414	422
200	282	356	436	444

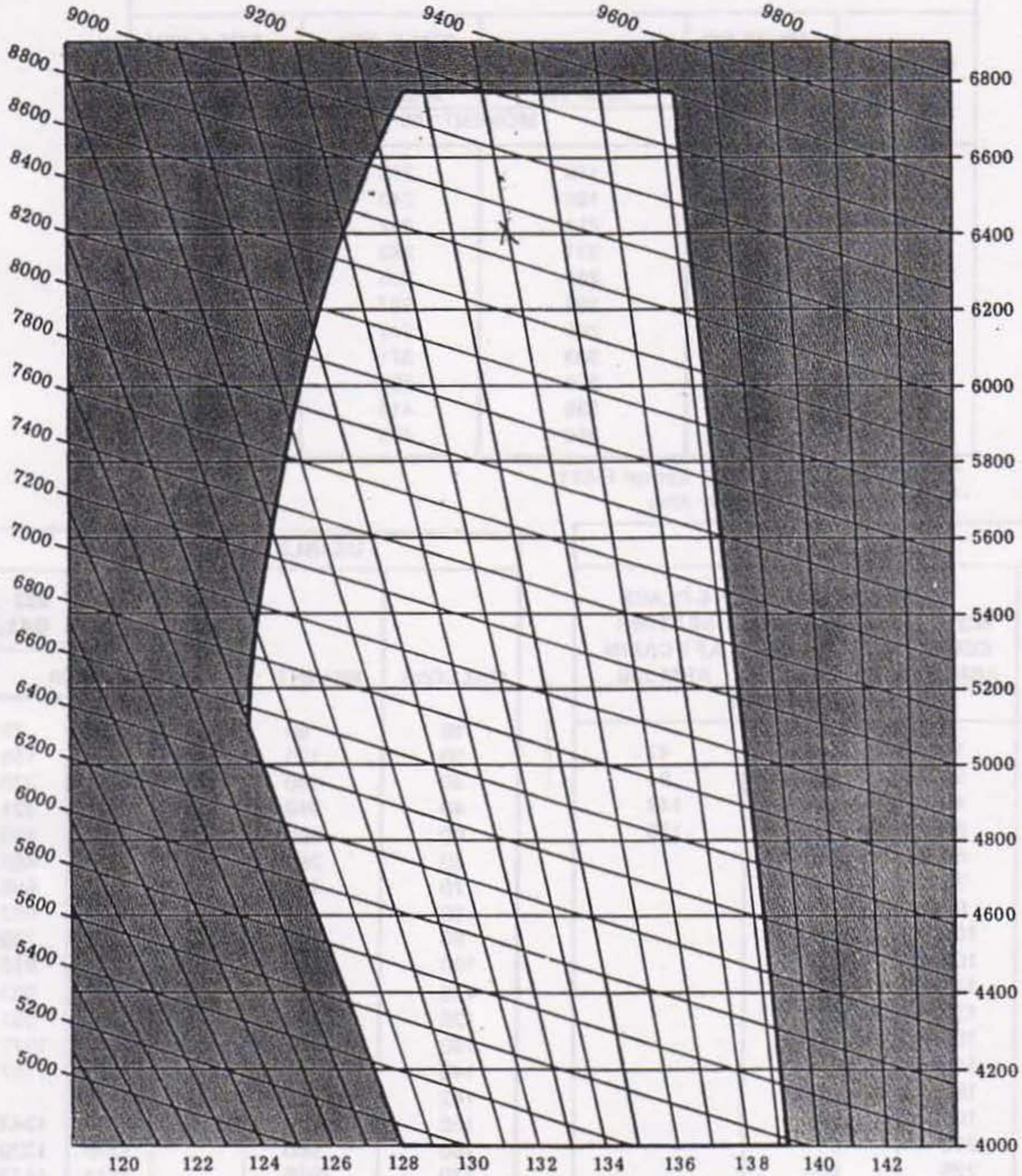
*Serials P-247 thru P-519, Except P-511
**Serials P-511, P-520 and After

BAGGAGE			
WEIGHT	NOSE COMP ARM 75	4-PLACE SEATING AFT CABIN ARM 230	6-PLACE SEATING AFT CABIN ARM 236
	MOMENT/100		
20	15	46	47
40	30	92	94
60	45	138	142
70	53	161	165
80	60	184	
100	75	230	
120	90	276	
135	101	311	
140	105	322	
160	120	368	
180	135	414	
200	150	460	
220	165	506	
240	180	552	
260	195	598	
280	210	644	
300	225	690	
315	236	725	
320	240		
340	255		
360	270		
380	285		
400	300		
420	315		
440	330		
460	345		
480	360		
500	375		

USABLE FUEL				
GALLONS	WEIGHT	142 GAL.	202 GAL.	232 GAL.
		MOMENT/100		
10	60	78	78	78
20	120	158	158	158
30	180	239	239	239
40	240	321	321	321
50	300	403	403	403
60	360	485	485	485
70	420	568	568	568
80	480	652	652	652
90	540	735	735	735
100	600	819	819	819
110	660	903	903	903
120	720	987	987	987
130	780	1073	1072	1072
140	840	1158	1157	1157
142	852	1175	---	---
150	900		1243	1243
160	960		1328	1328
170	1020		1413	1413
180	1080		1499	1499
190	1140		1584	1584
200	1200		1668	1668
202	1212		1685	---
210	1260			1754
220	1320			1841
230	1380			1927
232	1392			1945

Beechcraft

DUKE B60
MOMENT LIMITS vs WEIGHT



4965

ENVELOPE BASED ON THE FOLLOWING WEIGHT AND CENTER OF GRAVITY LIMIT DATA (LANDING GEAR DOWN)

WEIGHT CONDITION	FORWARD C. G. LIMIT	AFT C. G. LIMIT
6775 LB. MAXIMUM TAKE-OFF	134.6	139.2
6775 LB. LANDING	134.6	139.2
5100 LB. OR LESS	128.0	139.2

NOTE: SEE LIMITATIONS SECTION FOR LANDING WEIGHT RESTRICTIONS.

B60-601-38

Beechcraft®

EQUIPMENT LIST

AIRCRAFT SERIAL NO.

DATE

REGISTRATION NO.

I.D.	DESCRIPTION	WEIGHT	ARM

SECTION IX
SYSTEMS
TABLE OF CONTENTS

AIRFRAME

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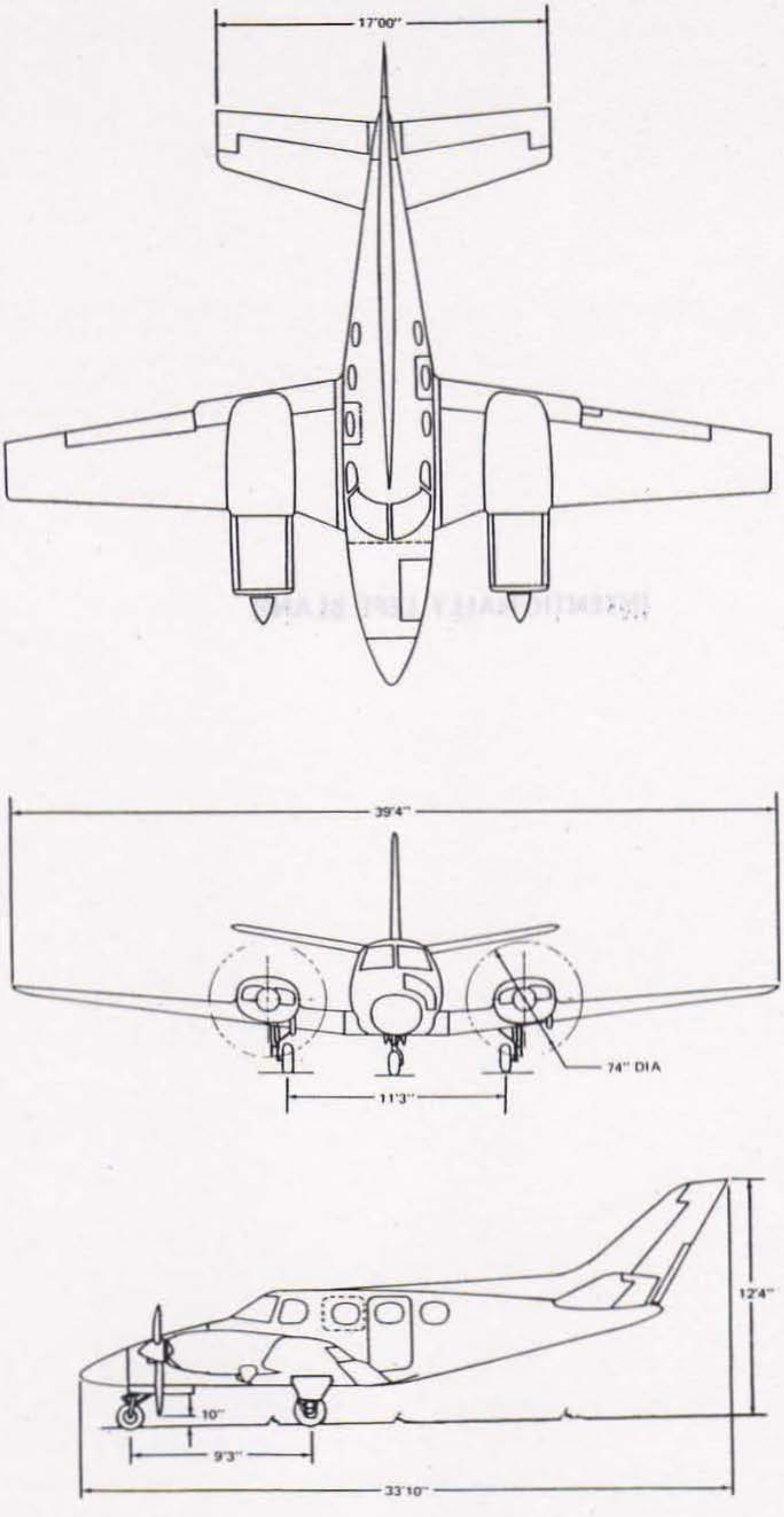

A60-607-1

THREE VIEW

GENERAL SPECIFICATIONS

WEIGHTS

Maximum take-off and landing	6775 lbs
Maximum ramp weight	6819 lbs

WING AREA AND LOADING

Wing Area	212.9 sq ft
Wing Loading at 6775 lbs	31.8 lbs/sq ft
Power Loading at 6775 lbs	8.91 lbs/hp

DIMENSIONS

Wing Span	39 ft 4 in.
Length	33 ft 10 in.
Height to top of fin	12 ft 4 in.

CABIN DIMENSIONS

Length	142 in.
Height	52 in.
Width	50 in.
Entrance Door	47-1/2 in. x 26-1/2 in.

FUEL

100/130 (Green) Aviation Gasoline. If not available 115/145 (Purple) Aviation Gasoline.

Standard System	147 Gallons Capacity	142 Gallons Usable
Optional System	207 Gallons Capacity	202 Gallons Usable
Optional System	237 Gallons Capacity	232 Gallons Usable

OIL

Oil capacity per engine	13 qts

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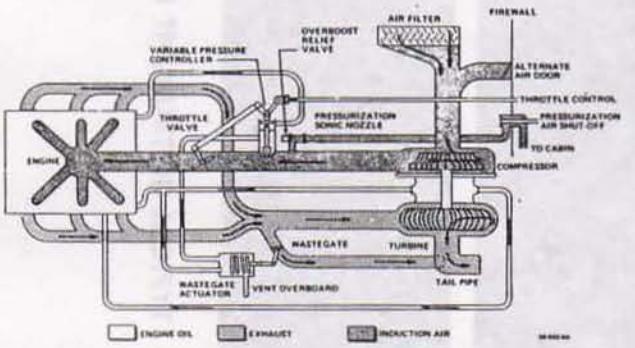
PROPULSION SYSTEM

ENGINES

The BEECHCRAFT Duke is equipped with Lycoming TIO-541-E1A4 and/or TIO-541-E1C4 engines. They are rated at 380 horsepower at 2900 rpm and 41.5 in. Hg, and are turbocharged for high performance at altitudes to 30,000 feet. The engines drive three-bladed, 74 in. diameter, constant speed, full feathering, hydraulically controlled propellers.

TURBOCHARGER

The turbocharger consists of two separate components: a compressor and a turbine connected by a common shaft.



The compressor supplies pressurized air to the engines for high altitude operation, and to the cabin for pressurization. The compressor and its housing are located between the ambient air intake and the induction air manifold. The turbine and its housing are part of the exhaust system and utilize the flow of exhaust gases to drive the compressor.

WASTE GATE AND EXHAUST BYPASS

The waste gate actuator, operated by engine oil pressure, activates a waste gate valve located in the exhaust bypass. Oil pressure closes the waste gate and all the exhaust gas is routed into the turbine side of the turbocharger, giving maximum compression to induction air. When the actuator opens the waste gate a minimum of exhaust gas drives the turbocharger. The balance of the exhaust is dumped directly overboard. Thus, the waste gate position regulates the supercharger air available to the engine.

The following steps illustrate the operation of the system:

1. Induction air is taken in through the air filter and ducted to the compressor.
2. The induction air is then compressed and ducted to the engine.
3. A portion of the compressed air is bled off for cabin pressurization.
4. As the waste gate opens, some of the exhaust gases are routed around the turbine, through the exhaust bypass and overboard.
5. When the waste gate is closed, all of the exhaust gases pass through and drive the turbine, which, in turn, drives the compressor.
6. The exhaust gases are dumped overboard.

VARIABLE ABSOLUTE PRESSURE CONTROLLER

The control center of the turbocharger system is the variable absolute pressure controller. This device simplifies turbocharging to one control - the throttle. Once the pilot has set the desired manifold pressure, virtually no throttle adjustment is required with changes in altitude. The controller senses manifold pressure requirements for various altitudes and regulates the oil pressure to adjust the waste gate. Thus, the turbocharger maintains only the manifold pressure called for by the throttle setting except for operation above the "critical altitude" or that altitude where the waste gate reaches the fully closed position. For example, at 2900 rpm, the critical altitude is that altitude above which 41.5 in. Hg manifold pressure cannot be obtained at full throttle.

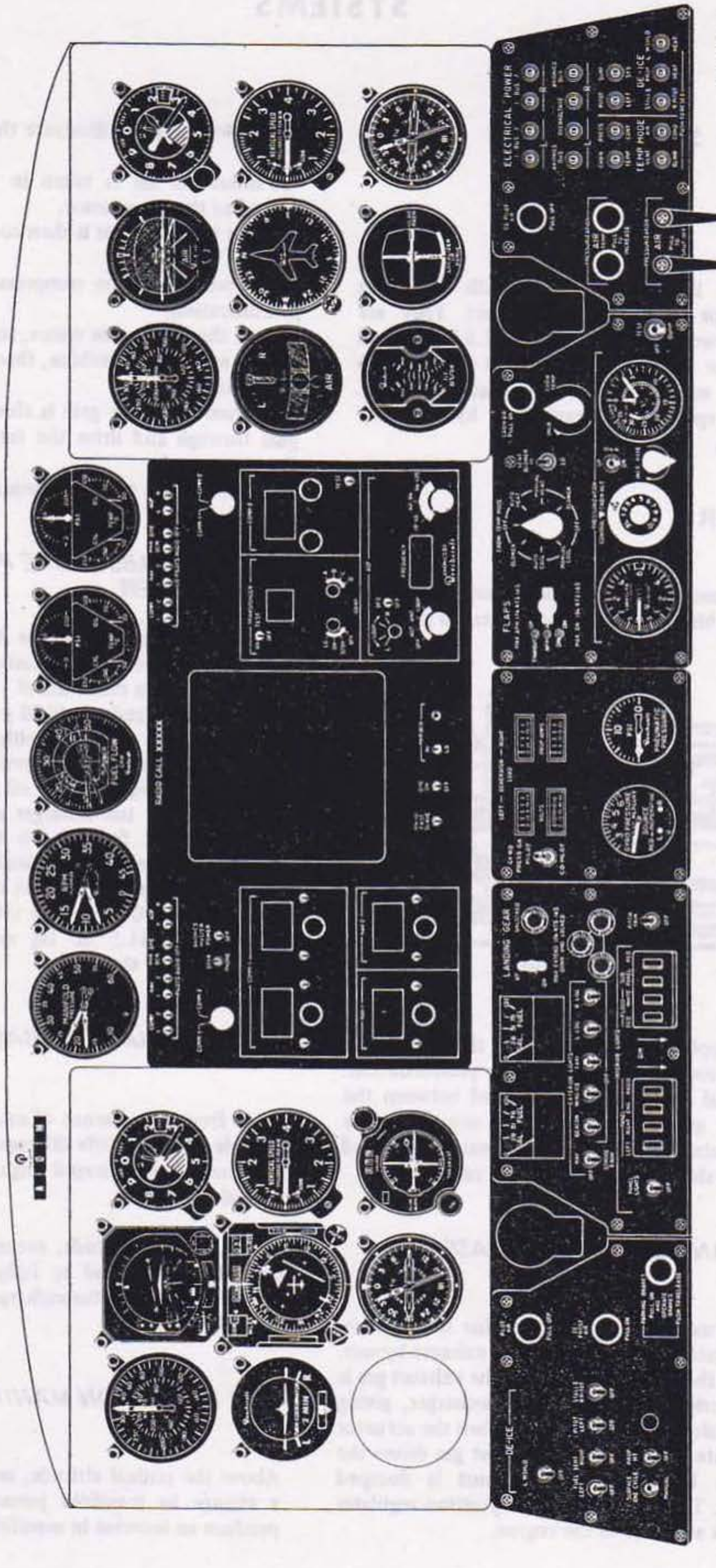
OPERATIONAL CHARACTERISTICS

Aside from the absence of manifold pressure variation with altitude, there is little difference between the turbocharged and the unturbocharged engine when operated below the critical altitude.

Above critical altitude, certain operational characteristics must be understood to fully realize the advantages and capabilities of this turbocharger engine combination. These are as follows:

RPM EFFECT ON MANIFOLD PRESSURE

Above the critical altitude, any change in rpm will result in a change in manifold pressure. A decrease in rpm will produce an increase in manifold pressure.



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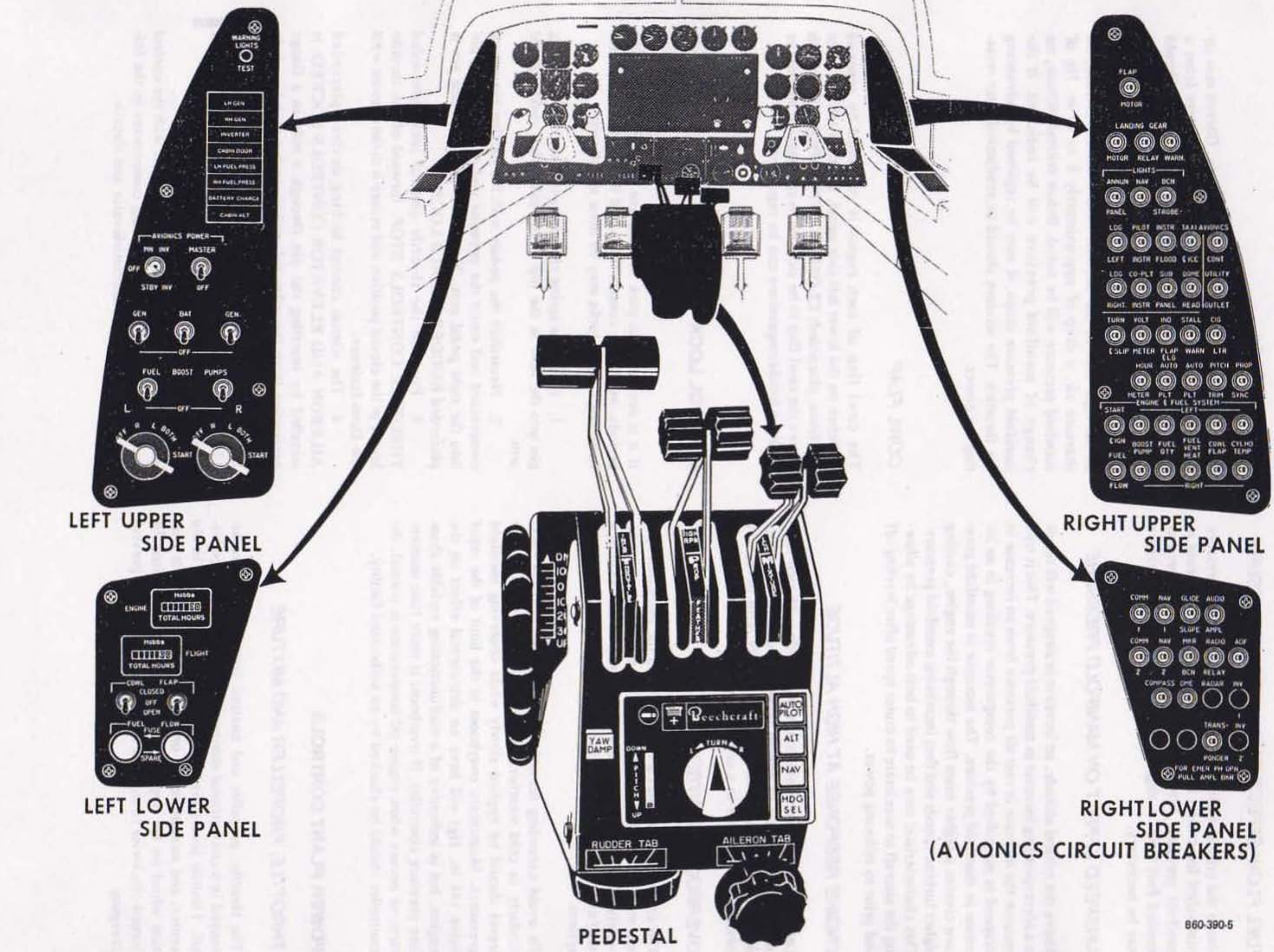
TYPICAL INSTRUMENT PANEL



WARNING LIGHTS
TEST
LH GEN
RH GEN
INVERTER
CABIN DOOR
LH FUEL PRESS
RH FUEL PRESS
BATTERY CHARGE
CABIN ALT
AVIONICS POWER
MN INV
MASTER
OFF
STBY INV
OFF
GEN
BAT
GEN
OFF
FUEL BOOST PUMPS
L
OFF
R
START
START
LEFT UPPER SIDE PANEL
Hobbs
ENGINE
TOTAL HOURS
Hobbs
FLIGHT
TOTAL HOURS
COWL FLAP
CLOSED
OFF
OPEN
FUEL FLOW
FUSE
SPARE
LEFT LOWER SIDE PANEL
FLAP
MOTOR
LANDING GEAR
MOTOR RELAY WARN.
LIGHTS
ANNUN NAV BCN
PANEL STROBE
LDG PILOT INSTR TAXI AVIONICS
LEFT INSTR FLOOD ICE CONT
LDG CO-PLT SUB DOME UTILITY
RIGHT INSTR PANEL READ OUTLET
TURN VOLT IND STALL CIG
SLIP METER FLAP WARN LTR
HOUR AUTO AUTO PITCH PROP
METER PLT PLT TRIM SYNC
ENGINE & FUEL SYSTEM
START
LEFT
IGN
BOOST PUMP
FUEL QTY
FUEL VENT HEAT
COWL FLAP
CYL HD TEMP
FUEL FLOW
RIGHT
RIGHT UPPER SIDE PANEL
COMM NAV GLIDE AUDIO
1 1 SLOPE AMPL
COMM NAV MKR RADIO ADF
2 2 BCN RELAY
COMPASS DME RADAR INV
1
TRANS- INV
PONDER 2
FOR EMER PH OPN PULL AMPL BAR
RIGHT LOWER SIDE PANEL (AVIONICS CIRCUIT BREAKERS)
Beechcraft
AUTO PILOT
ALT
NAV
HDG SEL
YAW DAMP
DOWN
PITCH
UP
TURN
L
R
RUDDER TAB
AILERON TAB
PEDESTAL
B60-390-5

FUEL FLOW EFFECT ON MANIFOLD PRESSURE

Above the critical altitude, with rpm and manifold pressure established for cruise, leaning will cause a slight increase in manifold pressure. When the mixture reaches the recommended fuel flow, a slight reduction in manifold pressure may be necessary.

AIRSPEED EFFECT ON MANIFOLD PRESSURE

Above the critical altitude, an increase in airspeed will result in a corresponding increase in manifold pressure. This is true because the increase in ram air pressure from an increase in airspeed is magnified by the compressor resulting in an increase in manifold pressure. The increase in manifold pressure creates a higher mass flow through the engine, causing higher turbine speeds and thus increasing manifold pressure. This characteristic may be used to best advantage by allowing the aircraft to accelerate to cruise speed after leveling off and prior to reducing power.

ENGINE RESPONSE AT HIGH ALTITUDE

Large, sudden power reductions at altitude with rich mixtures can cause loss of engine power. These power reductions or increases should be made slowly with necessary mixture adjustments in a series of two or three steps.

OVERBOOST CONTROL

The engine incorporates a relief valve in the induction system which is set to relieve the manifold pressure at approximately 44 in. Hg. This valve will open only in the event of a malfunction in the variable absolute pressure control system.

To avoid exceeding normal manifold pressure limits, particularly in cold weather, the last 11/2 inches of throttle travel should be applied slowly while observing manifold pressures. Momentary overboost to the limit of the relief valve (44 in. Hg) will have no detrimental effect on the engine, but is indicative of a malfunctioning variable absolute pressure controller. If overboost is more than momentary, or occurs when engine oil temperature is normal, the controller should be checked by an authorized facility.

POWER PLANT CONTROLS

THROTTLE, PROPELLER AND MIXTURE

The throttle, propeller and mixture control levers are arranged in a conventional manner along the top of the pedestal. Throttle levers are on the left, propeller levers in the center, and mixture levers on the right. An adjustable friction wheel on the upper right side of the console may be turned clockwise to increase friction of the levers to prevent creeping.

INDUCTION AIR

Induction air is available from two sources, filtered ram air or automatic alternate air. Filtered ram air enters from a flush inlet air scoop on the right side of each cowl. Should the filter become obstructed, a spring-loaded door on the firewall will open automatically and the induction system will operate on alternate air taken from a louvered opening on the right side of the nacelle. Above critical altitude, on alternate air, a drop of approximately 8 to 10 in. Hg of manifold pressure will be noted. Below critical altitude, no change of manifold pressure will be indicated. If the manifold pressure drops, it may be regained by advancing the throttles. The mixture should be readjusted after resetting the power.

COWL FLAP

The cowl flap of each engine is controlled by separate switches on the lower left side panel. Each switch has three positions, placarded: CLOSED - OFF - OPEN. The switch allows the cowl flap to be stopped in any position so that the cylinder head temperature can be regulated.

CONTROL LOCK

If it is necessary to park the airplane outside for extended periods, install the control locks and tie down the airplane. Installing control locks may be done as follows:

1. Insert the spring end of the rudder control locking pin into the hole at the top of the pilot's left rudder pedal arm.
2. Neutralize the pedals with the locking pin spring compressed and insert the opposite end of the locking pin into the right pedal arm. The rudder pedals locking pin is placarded RUDDER PEDALS LOCKED.
3. Position the throttle control lock, placarded THROTTLE CONTROLS STOP, forward of the throttle levers in the closed position and secure it to the console with the Dzus fastener.
4. The aileron control locking device, placarded AILERON AND ELEVATOR CONTROLS LOCKED, is installed by inserting the pin through a hole in a flange protruding from the subpanel, and through a matching hole in the lower side of the control column tube. On airplanes P-438 and after, the control wheel is rotated approximately 12 degrees to the right in order to insert the pin. The flag is then rotated over the top of the control column tube.

To lessen the possibility of taxi or take-off with the control locks installed, remove the locking components in the following order: rudder, aileron/elevator and throttle.

ENGINE INSTRUMENTATION

Most of the engine instruments are located in the upper center of the instrument panel above the avionics controls. The standard grouping is the dual manifold pressure, dual tachometer, a dual fuel flow indicator, and a left and right multiple readout indicator for oil pressure, oil temperature, and cylinder head temperature. The left and right loadmeter with the volt meter and propeller ammeter directly below are located in the center subpanel. The fuel quantity indicators are located on the pilot's subpanel and the turbine inlet temperature (TIT) indicator is located on the right floating panel.

ENGINE LUBRICATION

The engines are equipped with a wet sump, pressure type oil system. Each engine sump has a capacity of 13 quarts. The oil system may be checked through access doors in the engine cowling. A calibrated dip stick attached to the filler cap indicates the oil level. Due to the canted position of the engines, the dip sticks are calibrated for either right or left engines, and are not interchangeable.

The oil grades listed in the Approved Oil are general recommendations only, and will vary with individual circumstances. The determining factor for choosing the correct grade of oil is the oil inlet temperature observed during flight; however, inlet temperatures consistently near the maximum allowable indicate a heavier oil is needed.

NOTE

> The turbocharged engines are to be operated with ashless dispersant oil conforming to MIL-L-22851 or a Lycoming approved synthetic oil.

PROPELLERS

The engines are equipped with 74 inch Hartzell, three bladed, full feathering, constant speed, air dome propellers. Centrifugal force from the propeller counterweights, assisted by air pressure and a spring in the propeller dome, moves the blades to high pitch. Engine oil under governor-boosted pressure moves the blades to low pitch. Propeller dome air pressure settings are listed in the Servicing Section.

The propellers should be cycled occasionally during high altitude flight and during cold weather operation. This will help maintain warm oil in the propeller hubs so that the oil will not congeal.

PROPELLER SYNCHRONIZER

The propeller synchronizer automatically matches the left "slave" propeller rpm to that of the right "master" propeller. To prevent the left propeller from losing excessive rpm if the right propeller is feathered while the synchronizer is on, the synchronizer operation is limited to approximately ± 30 rpm from the manual governor setting. Normal governor operation is unchanged but the synchronizer will continuously monitor propeller rpm and reset the governor as required.

A magnetic pickup mounted in each propeller governor transmits electric pulses to a transistorized control box installed behind the pedestal. The control box converts any pulse rate differences into correction commands, which are transmitted to a stepping type actuator motor mounted on the left engine compressor mounting bracket. The motor then trims the left propeller governor through a flexible shaft and trimmer assembly to exactly match the right propeller rpm. The trimmer, installed between the governor control arm and the control cable, screws in or out to adjust the governor while leaving the control lever setting constant.

A toggle switch installed on the pedestal turns the system on. With the switch off, the actuator automatically runs to the center of its range of travel before stopping to assure that when next turned on, the control will function normally.

To operate the system, synchronize the propellers in the normal manner and turn the synchronizer on. The left propeller rpm will automatically be adjusted to correspond with the right. To change rpm, adjust both propeller controls at the same time. This will keep the left governor setting within the limiting range of the right propeller. If the synchronizer is on but is unable to adjust the left propeller rpm to match the right, the actuator has reached the end of its travel. Turn the synchronizer switch off (allowing the actuator to run to the center of its range and the left propeller to be governed by the propeller lever), synchronize the propellers manually, and turn the synchronizer switch on.

PROPELLER SYNCHROSCOPE

A propeller synchroscope, located in the tachometer case, operates to give an indication of synchronization of propellers. If the right propeller is operating at a higher rpm than the left, the face of the synchroscope, a black and white cross pattern, spins in a clockwise rotation. Left or counterclockwise, rotation indicates a higher rpm of the left propeller. This instrument aids the pilot in obtaining complete manual synchronization of propellers.

ENGINE ICE PROTECTION

Engine ice protection consists of electrothermal fuel vent heaters controlled by a switch on the left side panel, and an automatic alternate air induction system.

The possibility of induction system icing is reduced by the non-icing characteristics of fuel injection engines and the Duke's automatic alternate air source. The only possible ice accumulation is impact ice at the ram air scoop and filter. Should the ram air scoop or filter become clogged with ice, a spring-loaded door on the firewall will open automatically, and the induction system will operate on alternate air. When operating on alternate air above the critical altitude, approximately 8 to 10 inches of manifold pressure will be lost.

ANNUNCIATOR SYSTEM

The annunciator warning lights system consists of several single channel circuits which are divided into fault warning and indicating channels. When a fault warning signal is sent to an annunciator circuit, it is used to illuminate its respective readout in the annunciator panel, located in the upper left side panel. Illumination of an annunciator light indicates a fault in its respective system. A dimming circuit for the annunciator lights is connected to the navigation light switch. Should an annunciator light illuminate with the NAV light switch in the ON position, the dimming circuit prevents a distracting glare. All warning lights in the annunciator panel can be tested for illumination by pressing the WARNING LIGHTS TEST switch on the annunciator panel above the warning lights.

FUEL SYSTEM

The fuel system is a simple OFF-ON-CROSSFEED arrangement.

FUEL CELLS

A typical wing fuel system installation (see Fuel System Schematics) consists of an inboard leading edge fuel cell, box section fuel cell, nacelle fuel cell, and an optional outboard leading edge fuel cell. Optional wing tip tanks are available, as shown. All fuel cells in each wing plus the tip tanks are interconnected so that all usable fuel in each wing is available to the respective engine when the fuel selector valve is turned ON. All fuel cells are serviced through a single filler in the respective wing; however, the tip tanks have individual filler caps.

FUEL QUANTITY INDICATORS

Fuel quantity is measured by float type transmitter units which transmit the common level indication to a single indicator for each respective wing.

FUEL FLOW INDICATOR

The dual fuel flow indicator on the instrument panel is calibrated in pounds per hour, the green arc indicating fuel flow for normal operating limits. In the cruise power range the green sectors cover power settings of 55%, 65% and 75%.

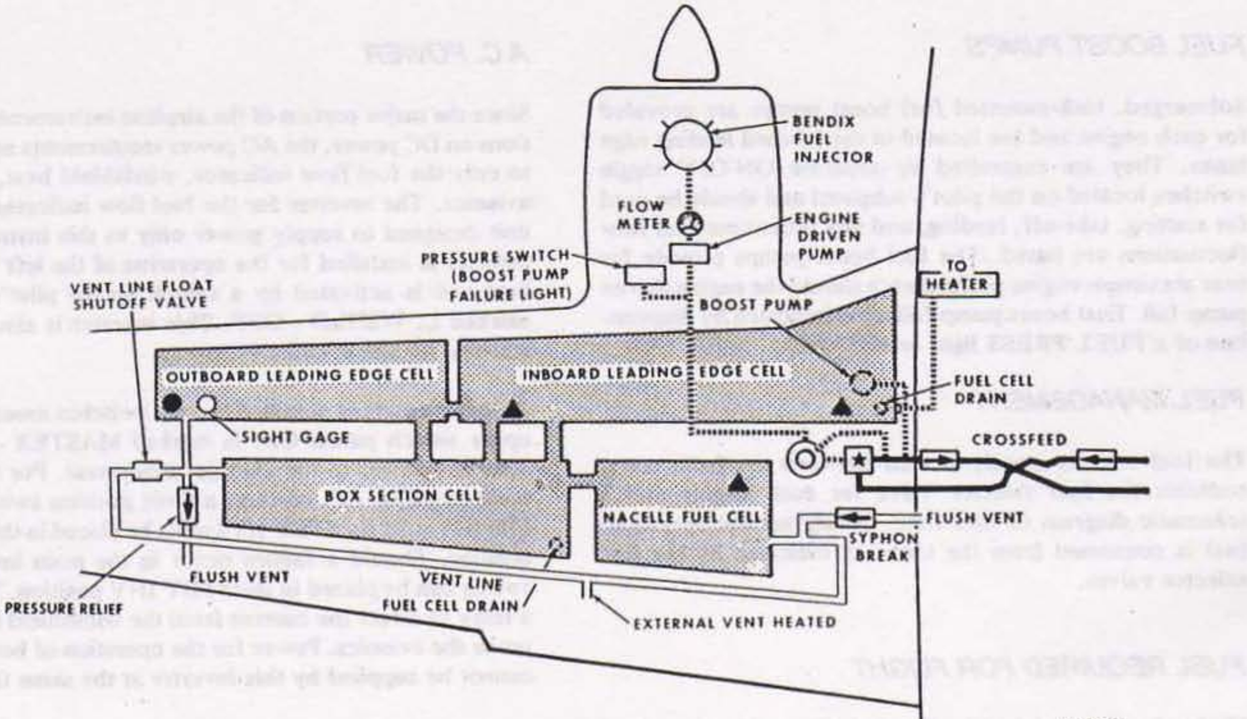
FUEL CROSSFEED

The separate identical fuel supplies for each engine are interconnected by crossfeed lines. During normal operation, each engine uses its own fuel pumps to draw fuel from its respective fuel tank arrangement. However, on crossfeed operations, the entire usable fuel supply of both wings can be consumed by either engine. The procedure for using the crossfeed system is described in the Emergency Procedures Section.

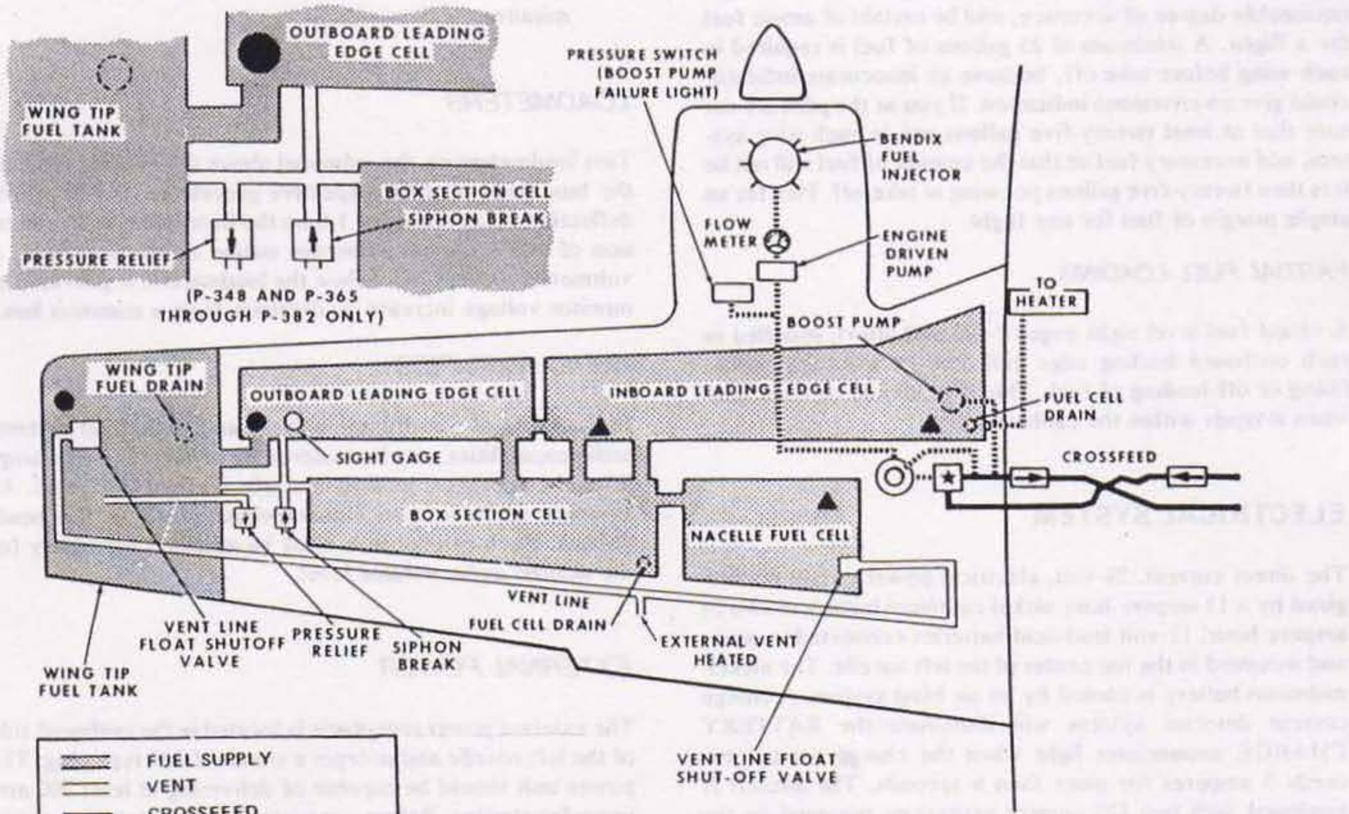
The fuel crossfeed system cannot be employed to transfer fuel from one wing to another during flight.

ANNUNCIATOR PANEL

NOMENCLATURE	*COLOR*	*PROBABLE CAUSE FOR ILLUMINATION*
L.H. GEN	RED	Left generator failure
R.H. GEN	RED	Right generator failure
INVERTER	RED	Loss of Avionics AC power
CABIN DOOR	RED	Cabin door not fully secure
L.H. FUEL PRESS	RED	Left Fuel Boost Pump failure
R.H. FUEL PRESS	RED	Right Fuel Boost Pump failure
BATTERY CHARGE	YELLOW	Excessive battery charge current
CABIN ALT	YELLOW	Cabin is above 10,000 ft.



207 GALLON SYSTEM



237 GALLON SYSTEM

FUEL SYSTEM SCHEMATICS

FUEL BOOST PUMPS

Submerged, tank-mounted fuel boost pumps are provided for each engine and are located in the inboard leading edge tanks. They are controlled by separate ON-OFF toggle switches located on the pilot's subpanel and should be used for starting, take-off, landing, and any other time fuel flow fluctuations are noted. The fuel boost pumps provide for near maximum engine performance should the engine-driven pump fail. Fuel boost pump failure is indicated by illumination of a FUEL PRESS light on the panel.

FUEL MANAGEMENT

The fuel selector panel, located between the front seats, contains the fuel selector valve for each engine and a schematic diagram of fuel flow. During normal operation, fuel is consumed from the tanks as indicated by the fuel selector valves.

FUEL REQUIRED FOR FLIGHT

Flight planning and fuel loading is facilitated by the use of fuel quantity indicators that have been coordinated with the fuel supply. It is the pilot's responsibility to ascertain that the fuel quantity indicators are functioning and maintaining a reasonable degree of accuracy, and be certain of ample fuel for a flight. A minimum of 25 gallons of fuel is required in each wing before take-off, because an inaccurate indicator could give an erroneous indication. If you as the pilot are not sure that at least twenty-five gallons are in each wing system, add necessary fuel so that the amount of fuel will not be less than twenty-five gallons per wing at take-off. Plan for an ample margin of fuel for any flight.

PARTIAL FUEL LOADING

A visual fuel level sight gage (P-402 and after), installed in each outboard leading edge cell, can be used for partial filling or off-loading of fuel. This gage should be used only when it reads within the calibrated area.

ELECTRICAL SYSTEM

The direct current, 28-volt, electrical power circuit is energized by a 13 ampere-hour nickel-cadmium battery or two 24 ampere-hour, 12-volt lead-acid batteries connected in series and mounted in the top center of the left nacelle. The nickel-cadmium battery is cooled by an air blast system. A charge current detector system will illuminate the BATTERY CHARGE annunciator light when the charge current exceeds 3 amperes for more than 6 seconds. The aircraft is equipped with two 125 ampere generators mounted on the lower left side of the engine and are belt driven. An air duct from the upper portion of the nacelle directs a supply of ram air to the generator for cooling. If a generator failure indication appears on the annunciator panel, turn the affected generator switch OFF then ON. If the condition persists, turn the affected generator off and reduce electrical power consumption as necessary.

A.C. POWER

Since the major portion of the airplane instrumentation functions on DC power, the AC power requirements are confined to only the fuel flow indicator, windshield heat, and some avionics. The inverter for the fuel flow indicator is a small unit designed to supply power only to this instrument. An inverter is installed for the operation of the left windshield heat and is activated by a switch on the pilot's subpanel marked L. WSHLD - OFF. This inverter is also used as a standby for the avionics inverter.

Avionics power is obtained by two switches mounted on the upper switch panel. One is marked MASTER - OFF and activates power to the avionics equipment. For that equipment requiring AC, current, a three position switch marked MN INV - OFF - STBY INV must be placed in the MN INV position. Should a failure occur in the main inverter, the switch can be placed in the STBY INV position. This opens a relay to direct the current from the windshield heat inverter to the avionics. Power for the operation of both systems cannot be supplied by this inverter at the same time.

CAUTION

> Ground use of windshield heat is limited to 10 minutes.

LOADMETERS

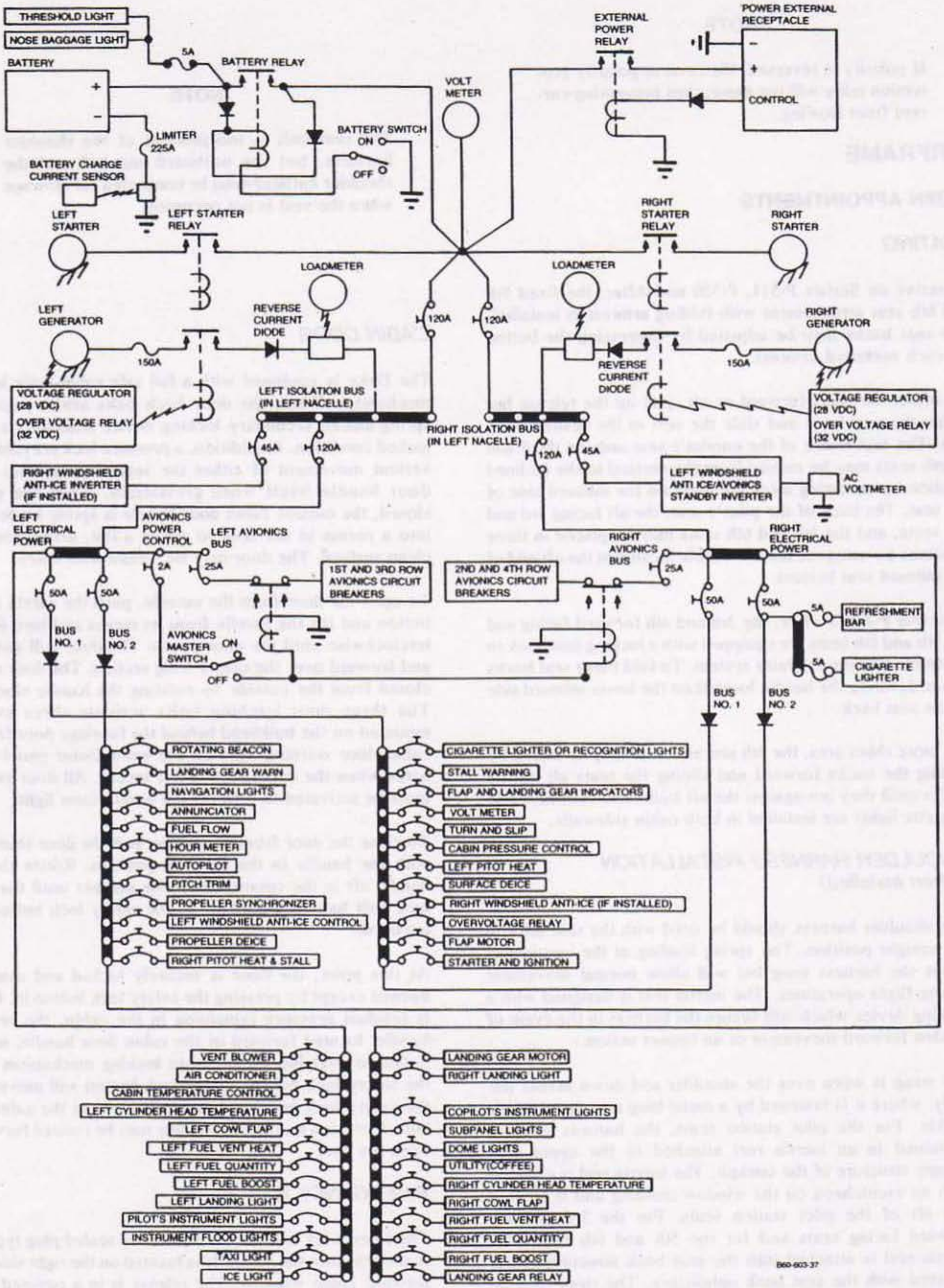
Two loadmeters on the subpanel above the console indicate the bus loads of their respective generators. A full needle deflection on a reading of 1.0 on the instrument is an indication of 100% normal amperage output of the generator. A voltmeter, located just below the loadmeters, is provided to monitor voltage increase or decrease from a common bus.

AUDIO AMPLIFIER

In the event of a malfunction in the audio amplifier system, audio capabilities may be restored by pulling the audio amplifier circuit breaker located on the lower right side panel. All avionics audio is then simultaneously feed to the headphones. Each avionic unit must be adjusted separately for the desired audio volume level.

EXTERNAL POWER

The external power receptacle is located in the outboard side of the left nacelle and accepts a standard AN type plug. The power unit should be capable of delivering at least 300 amperes for starting. Before connecting an external power unit, turn the electrical systems and avionics off to avoid damage due to electrical surges. If the unit does not have a standard AN type plug, check the polarity (negative ground) and connect the positive lead from the external power unit to the center and aft posts of the aircraft receptacle. The negative lead connects to the front post. When external power is connected, the battery switch should be turned on.



TYPICAL POWER DISTRIBUTION SCHEMATIC

NOTE

If polarity is reversed, the reverse polarity protection relay will not close, thus preventing current from flowing.

AIRFRAME

CABIN APPOINTMENTS

SEATING

Effective on Serials P-511, P-520 and After, the fixed 5th and 6th seat arrangement with folding armrest is installed. The seat backs may be adjusted by depressing the button on each outboard armrest.

To adjust the seats forward or aft, pull up the release bar below the seat front and slide the seat to the desired position. The seat backs of the copilot's seat and the third and fourth seats may be moved from the vertical to the reclined position by actuating a release lever on the inboard side of the seat. The back of the pilot's seat, the aft facing 3rd and 4th seats, and the 5th and 6th seats may be placed in three positions by using the release handle located at the aft end of the inboard seat bottom.

Effective P-388 & after, the 3rd and 4th forward facing and the 5th and 6th seats are equipped with a locking seat back to accommodate the restraint system. To fold these seat backs forward, rotate the handle located on the lower inboard side of the seat back.

For more cabin area, the 5th and 6th seats may be stored by folding the backs forward and sliding the seats aft on the tracks until they are against the aft bulkhead. Ashtrays and cigarette lights are installed in both cabin sidewalls.

SHOULDER HARNESS INSTALLATION (When Installed)

The shoulder harness should be used with the seat back in the upright position. The spring loading at the inertia reel keeps the harness snug but will allow normal movement during flight operations. The inertia reel is designed with a locking device which will secure the harness in the event of sudden forward movement or an impact action.

The strap is worn over the shoulder and down across the body, where it is fastened by a metal loop into the seat belt buckle. For the pilot station seats, the harness strap is contained in an inertia reel attached to the upper side canopy structure of the cockpit. The inertia reel is covered with an escutcheon on the window molding and is located just aft of the pilot station seats. For the 3rd and 4th forward facing seats and for the 5th and 6th seats, the inertia reel is attached into the seat back structure and is covered with the seat back upholstery. The strap runs up the seat back and over the outboard corner of the seat back. When the fixed 5th and 6th seat arrangement with folding armrest is installed, the inertia reel is attached to the fuselage structure.

NOTE

The seat belt is independent of the shoulder harness, but the outboard seat belt and the shoulder harness must be connected for stowage when the seat is not occupied.

CABIN DOOR

The Duke is equipped with a fail safe cabin door latching mechanism. When the door latch bolts are in position, a spring-loaded secondary locking device maintains a safety locked condition. In addition, a pressure lock prevents inadvertent movement of either the secondary system of the door handle itself when pressurized. When the door is closed, the outside cabin door handle is spring loaded to fit into a recess in the door to create a flat, aerodynamically clean surface. The door may be locked with a key.

To open the door from the outside, push the safety release button and lift the handle from its recess and turn it counterclockwise until the door opens. The door will swing out and forward over the center wing section. The door may be closed from the outside by rotating the handle clockwise. The three door latching bolts activate three switches mounted on the bulkhead behind the fuselage door frame. a cabin door warning light on the annunciator panel illuminates when the cabin door is not secure. All door switches must be activated to turn off the annunciator light.

To close the door from the inside, pull the door shut firmly with the handle in the forward position. Rotate the door handle aft in the counterclockwise manner until the safety lock bolt handle moves aft or the safety lock button pops outward.

At this point, the door is securely locked and cannot be opened except by pressing the safety lock button in. If there is residual pressure remaining in the cabin, the red "T" handle, located forward of the cabin door handle, must be pulled to override the pressure locking mechanism before the safety lock bolt or safety lock button will move. Once the safety lock bolt has been pulled aft, or the safety lock button pressed in, the door handle may be rotated forward to open the door.

EMERGENCY EXIT

The emergency exit door is a pressure sealed plug type door that opens into the cabin. It is located on the right side at the forward cabin window. The release is in a covered recess behind the window curtain. To open the door, lift the cover, release the catch and pull the handle down fully. There is no provision made for opening the door from outside the airplane.

NOSE BAGGAGE COMPARTMENT

The forward baggage compartment is easily accessible through a large door on the left side of the nose. The door, hinged at the top, swings upward, clear of the loading area. This compartment affords accessibility to some of the aircraft avionics as well as storage space for the larger, heavier items, but loading within this area will fall within the limitations according to the WEIGHT AND BALANCE SECTION. The nose baggage compartment incorporates the full width of the fuselage as usable space.

FLIGHT CONTROLS

CONTROLS AND SURFACES

The Duke is equipped with conventional dual controls. Primary flight surfaces are operated through push-pull rods and conventional cable systems, terminating at bell cranks.

Control of the rudder and nose wheel steering is provided by rudder pedals. To adjust the rudder pedals, press the spring-loaded lever on the side of each pedal and move the pedal to its forward or aft position. The adjustment lever can also be used to place the right set of rudder pedals against the floor when not in use.

ELEVATOR TRIM TAB

An elevator trim tab control wheel on the left side of the console, operates in the conventional manner. An indicator placarded DN and UP, is calibrated in 10° increments. Nose-down trimming of the aircraft from 0° to 10° may be effected by rotating the top of the wheel forward. Nose-up trimming, from 0° to 30°, requires the top of the wheel to be moved aft. Make necessary compensations for loading conditions before take-off.

RUDDER TRIM TAB

A wheel, placarded RUDDER TAB, positioned horizontally on the lower aft side of the console, trims the aircraft with the rudder tab. Vertical reference marks to the left and right of the center mark indicate the amount of rudder tab being used. To move the nose of the aircraft to the right, move the protruding edge of the wheel to the right.

AILERON TRIM TAB

To the right of the rudder trim wheel is the aileron trim tab control. It is a vertically mounted knob that may be turned clockwise to lower the right wing and counterclockwise to lower the left wing. The indicator above the knob, placarded AILERON TAB, is identical to that used on the rudder tab installation.

ELECTRICAL ELEVATOR TRIM

A switch on the control wheel actuates the electric elevator trim control. The switch is moved forward for nose down, aft for nose up. When released the switch centers in the OFF position. When the system is not being electrically actuated, the manual trim control wheel may be used. An ON-OFF switch is located on the left subpanel.

WING FLAPS

The wing flaps are controlled by a three position switch located to the right of the control console on the subpanel. The flaps have three positions which are identified by three separate lights located to the left of the flap position switch. All lights are extinguished when the flaps are in the full up position. The top light is placarded TRANSIT and illuminates red when the flaps are in motion to a selected position. The middle (blue) light placarded APH (approach) illuminates when the flaps are stopped in the approach position. The lower light is amber and illuminates when the flaps are in the DN (down) position. To move the flaps from UP to APH, move the switch to the middle detent position. From APH to DN, the switch must be pulled out of the detent and moved downward to the last position.

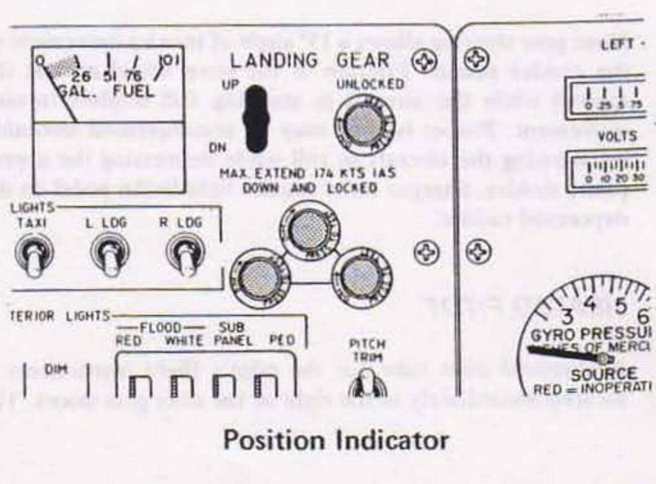
LANDING GEAR SYSTEM

CONTROL SWITCH

A two-position switch on the subpanel to the left of the console controls the landing gear. The switch is operated by moving it upward to retract and downward to extend the gear. From one position to the other, the switch handle must be lifted across a center detent.

POSITION INDICATORS

Landing gear position lights are located on the subpanel adjacent to the control switch. To the right of the switch is a single red light placarded UNLOCKED. This light indicates that the gear is in transit, neither full up or full down. Below the switch are three green lights arranged in a triangle. Each light represents a landing gear, and, when illuminated, indicates that the gear is locked in the extended position. These are placarded DOWN AND LOCKED.



Position Indicator

SAFETY SWITCH

A safety switch incorporated in the left main gear strut prevents inadvertent retraction of the landing gear. When the strut is compressed, the control circuit is open and the gear cannot retract. However, maneuvering over rough ground may allow the gear strut to extend momentarily, closing the circuit long enough to begin retraction. NEVER RELY ON THE SAFETY SWITCH TO KEEP THE GEAR DOWN DURING GROUND MANEUVERING. CHECK TO SEE THAT THE LANDING GEAR SWITCH IS DOWN.

WARNING HORN

A gear-up warning horn is located behind the panel. Any time either or both throttles are retarded to approximately 12 in. Hg. the horn will sound intermittently if the landing gear is in the retracted position. During single-engine operation, the horn can be silenced by advancing the throttle of the inoperative engine until the throttle warning horn switch opens the circuit.

MANUAL EXTENSION

The landing gear can be manually extended, but not retracted, by operating the handcrank on the rear of the pilot's seat. This procedure is described in the FAA APPROVED EMERGENCY PROCEDURES section of this book. Do not operate the landing gear electrically with the handcrank engaged.

BRAKES

A toe brake is incorporated in each rudder pedal. Either set of pedals will actuate the brakes. The parking brake system, operated from the pilot's controls only, utilizes a parking brake valve to allow buildup of pressure in the landing gear cylinders. To operate, pull out the parking brake knob, placarded PARKING BRAKES, on the subpanel below the pilot's control column and pump the toe pedals. Apply pressure to the pedals then push the control in to release the brakes. This will allow the pressure in the brake system to gradually bleed back into the reservoir.

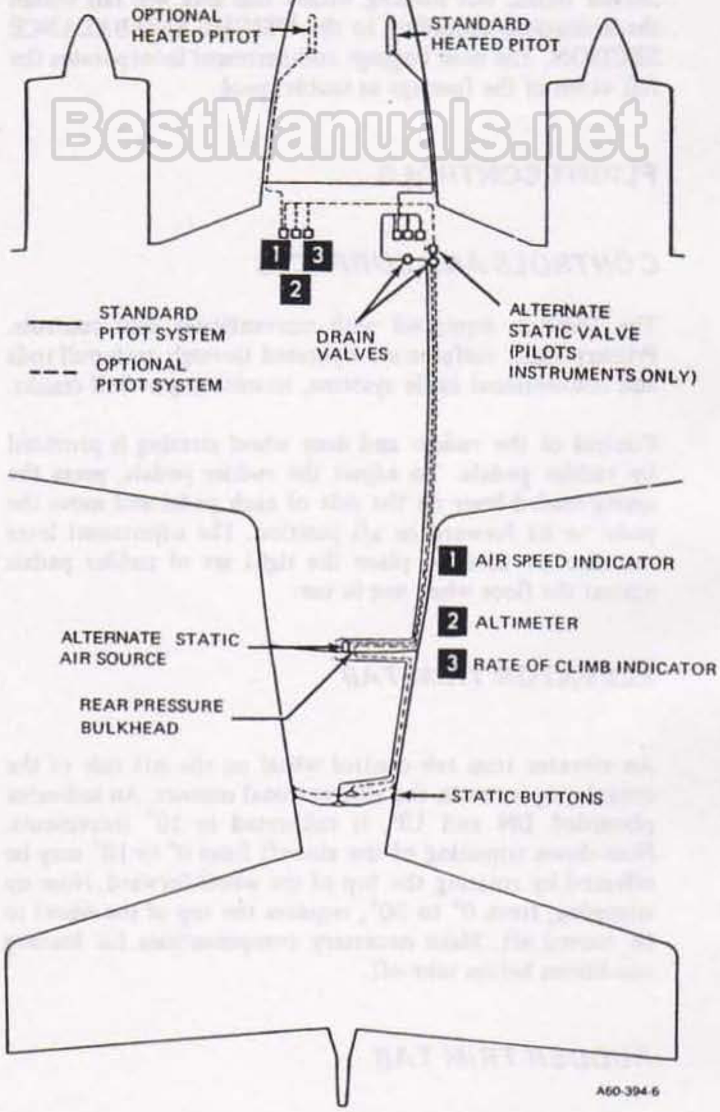
NOSE GEAR STEERING

Nose gear steering allows a 15° angle of turn by movement of the rudder pedals. Friction of the nose wheel against the ground while the aircraft is standing still inhibits turning movement. Proper turning may be accomplished smoothly by allowing the aircraft to roll while depressing the appropriate rudder. Sharper turns require light brake pedal on the depressed rudder.

HEATED PITOT

A standard pitot tube for the pilot's flight instruments is located immediately to the right of the nose gear doors. The

PITOT - STATIC SYSTEM



optional pitot tube for the copilot's instruments is located to the left of the nose gear doors. Left and right pitot heat switches, supplying heat to the left and right pitot masts respectively, and are located on the pilot's left subpanel.

STATIC AIR

Static buttons on aft fuselage provide static pressure source to the rate of climb indicator, altimeter and airspeed indicator.

The emergency or alternate static air source is located inside the tail cone aft of the pressure bulkhead. It is selected by a valve located in the right side wall adjacent to the copilot's seat.

Refer to FAA Performance Section for calibration and Emergency Procedures for advice on when to use it.

STATIC DRAIN

The pitot system needs no drain because of the location of the components. Static air plumbing is drained by removing the side panel, placarded STATIC AIR LINE DRAIN, on the lower right cockpit wall forward of the copilot's seat and opening the valves provided.

INSTRUMENT PRESSURE SYSTEM

Pressure for the pressure-operated flight instruments is supplied by two engine-driven, dry, pressure pumps, interconnected to form a single system. If either pump fails, check valves automatically close. The remaining pump will continue to operate the gyro instruments. With both engines operating at a minimum of 2200 rpm, the pressure gage on the instrument panel should indicate between 3.5 and 5.5 in. Hg. A pressure pump failure is indicated by the protrusion of a red button on the pressure gage placarded "L" or "R" adjacent to each button indicating which pump has failed.

Some aircraft may be equipped with dual regulators installed in the instrument pressure system. A regulator is located in each pressure line ahead of the pilot's and copilot's instruments to facilitate a check of the pressure to either of the instrument systems. A two-position switch, placarded PILOT - COPILOT, located adjacent to the Gyro Pressure gage on the center subpanel, gives a constant reading of the pressure of the instrument system selected with the switch. An abnormal reading is an indication of probable malfunction of one regulator. Select the other regulator and check the system pressure. If it is normal, operate with the instrument system that is functioning from that regulator.

STALL WARNING INDICATOR

The stall warning system consists of a stall warning horn mounted forward of the instrument panel, a lift transducer on the leading edge of the left wing, a lift transducer vane heater element, a face plate heater element, a landing gear switch, a circuit breaker, and a switch located on the pilot's subpanel marked STALL & R PITOT.

When aerodynamic pressure on the lift transducer vane indicates that a stall is imminent, the transistor switch is actuated to complete the circuit to the stall warning horn. The lift transducer senses the angle of attack and is triggered by reverse air flow.

CAUTION

The heater element protects the lift transducer from ice; however, a buildup of ice on the wing may disrupt the airflow and prevent the system from accurately indicating an incipient stall.

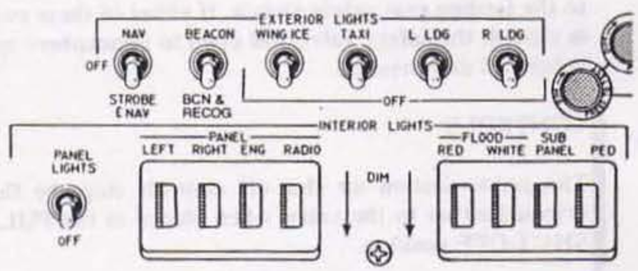
LIGHTING

INTERIOR LIGHTING

The cockpit dome light is operated by a push button switch, adjacent to the light. The switches for the individual reading lights above the rear seats are located adjacent to the lights. All other interior lights are controlled from the interior light switch group on the pilot's right subpanel. A master PANEL LIGHTS switch activates the group and the individual lights are regulated by thumb wheel switches.

A courtesy light illuminates the doorway and will be turned off by closing the door. If the door is to remain open for extended periods, the light may be turned off with a pushbutton switch inside the cabin just forward of the light.

A baggage compartment light and light switch are located just inside at the top of the nose compartment door for illumination of baggage and avionics space. The courtesy light and the baggage compartment light receive power directly from the battery.



Light Switches

EXTERIOR LIGHTING

The switches for the navigation lights, landing lights, and rotating beacons, plus the switches for the nose taxi light and wing ice lights, are grouped on the left subpanel. On airplanes P-386, P-401 and after the beacon light switch also operates the wing tip recognition lights. The landing lights in the leading edge of each wing tip or on each main landing gear strut are operated by separate switches. For longer battery and lamp service life, use the landing lights only when necessary. Avoid prolonged operation during ground maneuvering to prevent overheating.

ENVIRONMENTAL SYSTEM

An environmental control section on the right subpanel provides for automatic or manual control of the system. This section, just to the right of the flap control lever, contains all the major controls of the environmental function: the mode selector switch for selecting manual or automatic heating or cooling, a vent blower control switch, and a cabin temperature level control. Directly below these controls are the pressurization controls. To the right of the copilot's control column, are the pressurization Air Temp controls and pressurization Air Shut-Off controls.

PRESSURIZATION

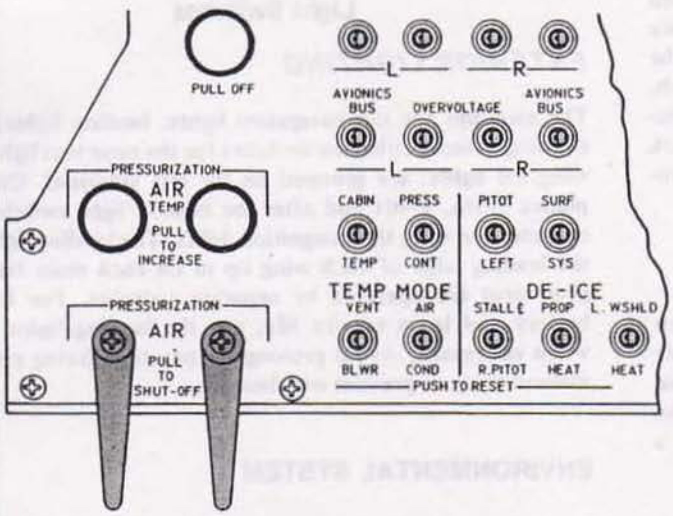
DESCRIPTION

The pressurization system consists of a cabin altitude controller, a combination test/dump switch, a cabin vertical speed indicator, a combination pressure differential and cabin altitude indicator, and a pressurization air shut-off valve for each engine.

Pressurized air for the cabin is taken from the turbocharger compressor of each engine and reduced to a usable flow by sonic nozzles located in-line, forward of the turbocharger compressor. The air then passes through a firewall shut-off and through an intercooler. The intercooler reduces the heat acquired by the air during pressurization with a flow of ram air from a scoop at the leading edge wing root. The air is then routed into the cabin through oneway check valves beneath the pilot and copilot floorboards. After entering the pressure vessel, the air is drawn into the conditioning plenums where it is either heated or cooled, according to the selected mode, and distributed throughout the cabin. Located on the aft cabin bulkhead are two valves: the outflow control valve and the safety valve. The controller pneumatically regulates the outflow control valve to maintain the selected altitude. The safety valve is connected to the test/dump switch, and to the landing gear safety switch. If either of these switches is closed, the safety valve will open to atmosphere and the cabin will depressurize.

CONTROLS

The pressurization air shut-off controls stop the flow of pressurized air to the cabin when placed in the PULL TO SHUT-OFF position.



Pressurization Controls

MANUAL CABIN ALTITUDE CONTROLLER (P-247 through P-307)

The manual cabin altitude controller is located on the right subpanel between the cabin climb indicator and the cabin differential pressure gage. The cabin altitude is maintained with the control anywhere from zero pressure to the maximum differential pressure.

Manual Cabin Altitude Controller

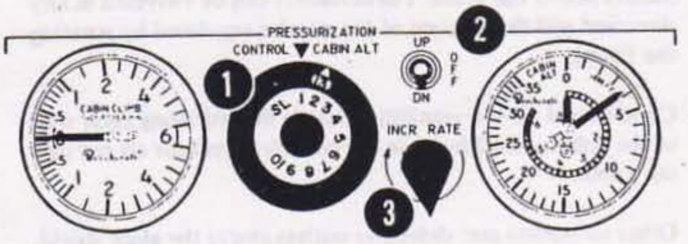
The controller is rotated until the desired cabin altitude for flight is at the 12 o'clock position under the index mark. Any selected cabin altitude will be maintained during the flight, provided the cabin pressure is at or below the maximum differential pressure. If the cabin reaches the maximum differential and the airplane is still climbing, the cabin altitude will climb with the airplane.

If a cabin altitude change is required in flight it can be accomplished with a minimum of abrupt cabin pressure change by turning the selector dial very slowly and monitoring the rate of change on the cabin pressure indicator. A time lapse of approximately two minutes for each thousand-foot increment change on the dial will effect a comfortable change of pressure. Rapid cabin pressure changes will be experienced if the altitude selector is moved quickly before reaching the maximum differential pressure.

MOTORIZED CABIN ALTITUDE CONTROLLER (P-247 through P-307)

The motorized controller is similar to the manual controller except in the method of changing cabin altitude up or down. The unit is best described as an adjustable isobaric controller incorporating a variable speed drive motor with automatic shut-off. The additional controls for the unit are the Red Altitude Selector Ring, the Motor Rate Rheostat and the Directional Toggle Switch. The inner cabin altitude selector is normally operated with the directional toggle switch. The control can be moved to override the motor drive, but under normal operation all movement should be made with the toggle switch. The inner scale shows the cabin altitude when read at the index mark (12 o'clock position). The outer scale under the window shows the selected airplane altitude. The inner scale adjacent to the window shows what the cabin altitude will be when maximum differential pressure is reached.

To ready the unit for operation, place the rate rheostat knob in the midrange and insure that the directional toggle switch is in the OFF position. Manually set the cabin altitude controller (inner scale) to approximately 1000 feet above the take-off field elevation. (The red altitude selector ring will turn with the inner scale when this adjustment is made.) Now set the window on the red altitude selector ring to 500 feet above the planned airplane cruise altitude. This will avoid reaching maximum differential pressure in the cabin prior to achieving cruise altitude.



1 Red Altitude Selector Ring.

2 Directional Toggle Switch.

3 Drive Motor Rate Rheostat.

Motorized Cabin Altitude Controller

After take-off and during the climb when the cabin rate of climb has returned to zero, move the directional toggle switch to the UP position. This gradually climbs the cabin to the altitude which is opposite the altitude in the window on the red selector ring. The controller should be driven at a rate to arrive at the cabin altitude shortly before the airplane arrives at the cruise altitude. This can be accomplished by increasing or decreasing the rate rheostat knob. A few seconds lag time must be allowed for the pressurization controls to respond and stabilize before reading the cabin altitude rate of climb indicator. The controller will automatically turn off when the window in the red selector ring reaches the 12 o'clock position. However, the directional toggle switch should be placed in the OFF position.

NOTE

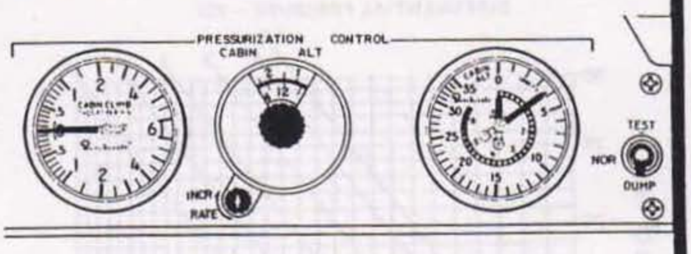
In the event the directional toggle switch is positioned improperly, the controller will drive to the end of the scale, and damage to the slip clutch may result.

For normal descent turn the red selector ring until the window is opposite the altitude which is 1000 feet above the landing altitude. After departing the original altitude, place the directional toggle switch in the DN position. If a rapid descent rate is required, set the rate rheostat for an increased rate of descent to maintain a higher airplane altitude than cabin altitude throughout the descent.

If the cruise altitude selected is less than 11,000 feet or corresponding cabin altitude (below the window) is less than the take-off altitude, then the controller need not be moved. However, if the landing altitude is less than the field elevation, then the controller can be driven down to the selected cruise altitude.

CABIN ALTITUDE CONTROLLER (P-308 and after)

The controller contains a visual display of the selected altitude, an altitude selector, and a rate control. The altitude outer scale indicates the selected cabin altitude and the inner scale indicates the corresponding airplane altitude where the maximum differential pressure would occur.



1 Altitude Selector

2 Rate Control

3 TEST/NOR/DUMP Switch

Cabin Altitude Controller

Before take-off, the altitude may be set either to the desired cabin altitude (outer scale) or to the planned cruising altitude (inner scale) plus 500 feet. Before descent to landing, the outer scale should be set to the field elevation plus 500 feet.

The rate control regulates the rate at which cabin pressure ascends or descends to the selected altitude. The pointer set to the vertical position results in a rate of approximatly 500 ft/min.

If the cabin differential pressure reaches the maximum and the airplane is still climbing, the cabin altitude will climb with the airplane altitude.

CABIN ALTITUDE WARNING SYSTEM

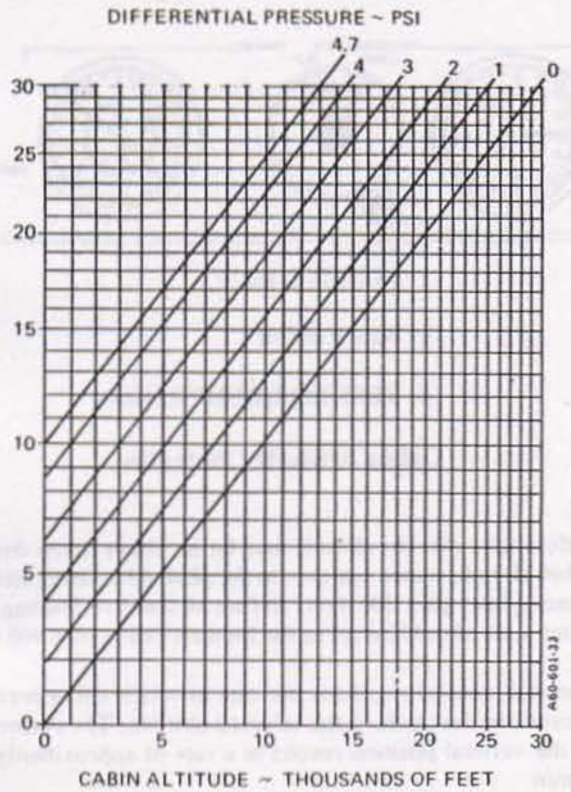
The cabin altitude warning system consists of an annunciator placarded CABIN ALT mounted on the left upper side panel and a preset barometric pressure switch mounted on the pressure bulkhead.

The system is designed to function while the cabin is either pressurized or unpressurized. In the unpressurized mode any time the cabin altitude reaches 10,000 feet, the barometric pressure switch completes a circuit and illuminates the CABIN ALT annunciator. When operating in the pressurized mode at cabin altitudes below 10,000 feet, a loss of pressurization is indicated by the illumination of the CABIN

ALT annunciator light. When operating at cabin altitudes between 10,000 feet and 12,500 feet, the annunciator will be illuminated. Loss of pressurization can then be detected by monitoring the cabin altitude indicator for an increase in cabin altitude. When pressurization is lost the use of oxygen is recommended to be in accordance with current FAA operating rules, or descent should be made to a lower cabin altitude.

DIFFERENTIAL PRESSURE

The following graph provides information to determine the



relationship between cruise altitude, cabin altitude, and differential pressure. The zero differential pressure line indicates that the cruise altitude and the cabin altitude are identical (unpressurized). The 4.7 psi line indicates the maximum differential pressure obtainable in the cabin. To determine the lowest cabin altitude which can be maintained for a given cruise altitude enter the graph at the desired cruise altitude and read right to the 4.7 psi differential pressure line, then read down the graph to the altitude which can be maintained in the cabin.

AIR CONDITIONING SYSTEM

DESCRIPTION

A 45,000 BTU combustion heater and a 14,000 BTU, refrigerative air cooler work through a cabin temperature control system to maintain cabin comfort. The air conditioning is selected on the TEMP MODE selector on the right subpanel. Fresh air is taken into the system at the nose ram air vent opening for unpressurized flight, and from the pressurization air inlets beneath the cockpit floor for pressurized flight. From either source, the air is collected in a plenum ahead of the cockpit, heated or cooled according to the selected mode, and forced through ducts for distribution throughout the cabin. Air is ducted to individual overhead outlets above the seats. These outlets can be swiveled in any direction and the volume of air may be regulated by rotating the fitting.

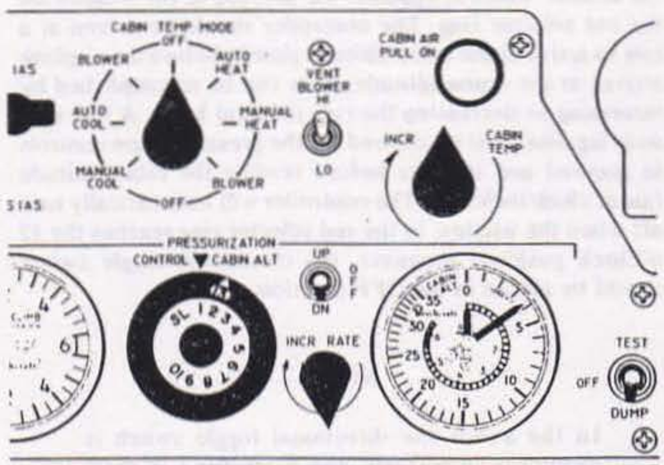
Conditioned air (or ventilation air) is ducted along each wall of the cabin. Small holes in the console direct the air out into the cabin.

Other air outlets are: defroster outlets above the glare shield, individual pilot and copilot air outlets.

Exchanging the cabin air is accomplished by exhausting a controlled amount of air through the isobaric control valve on the aft pressure bulkhead.

VENT BLOWER

Velocity of the air from the cabin air outlets may be controlled by the VENT BLOWER switch, located on the right subpanel. Either the HI or LO position may be selected.

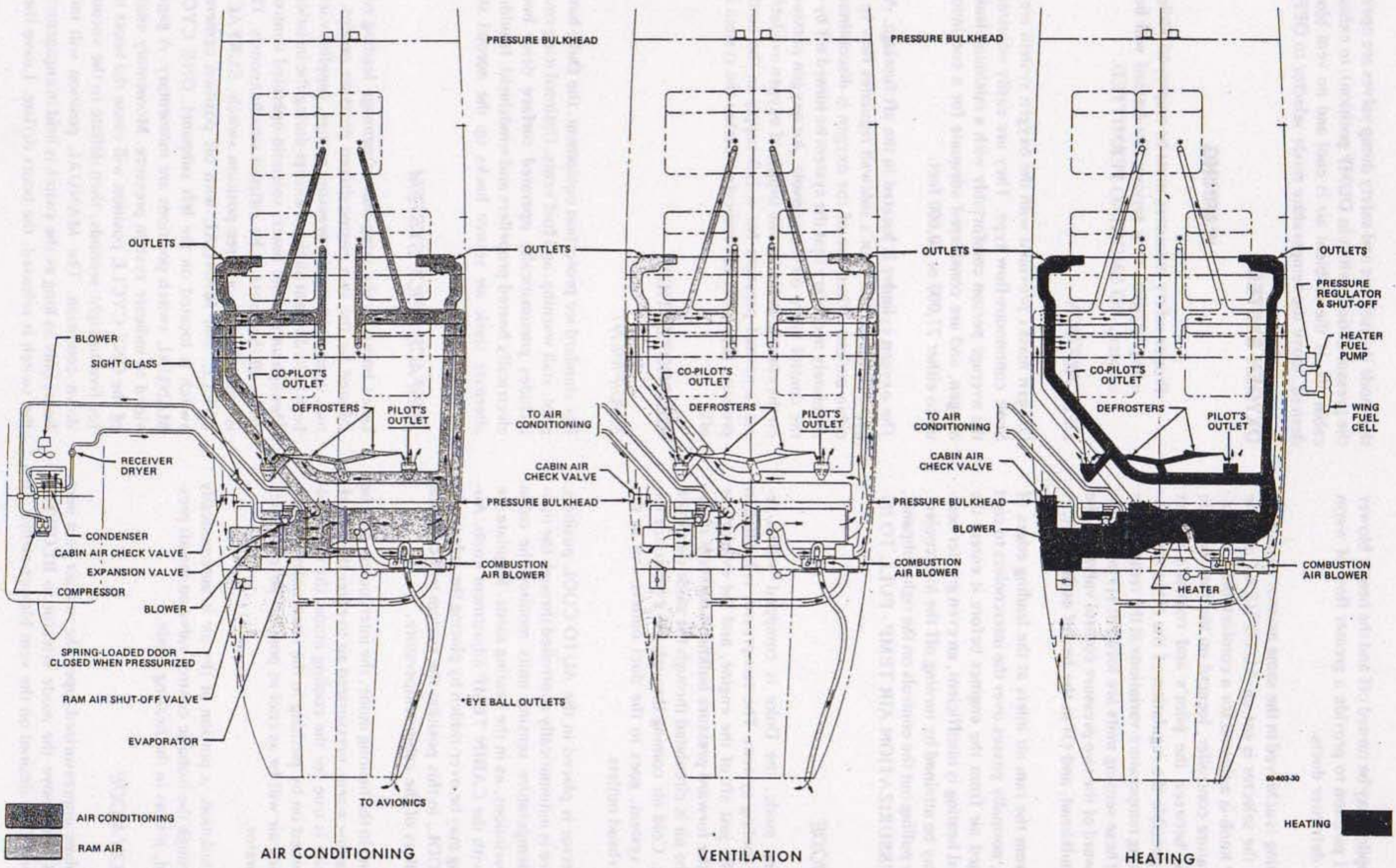


Vent Control

HEATING MODE

PRESSURIZED OPERATION

Heating may be accomplished in either the manual or automatic position. For manual heating, select MANUAL HEAT using the CABIN TEMP MODE selector on the right subpanel. The heater will then operate continuously. For faster heating at the pilot and the copilot positions, place the vent controls (placarded PILOT AIR - PULL OFF and COPILOT AIR - PULL OFF) in the "on" position by pushing them in. For maximum windshield defrosting (in addition to the electrically heated windshield) the individual vents for



ENVIRONMENTAL SCHEMATIC

the pilot and copilot may be turned off and the heater blower placed inthe HI position to provide a greater flow of warm air through the defroster ducts.

Automatic heating is achieved in the same manner as manual heating except the selector is set on AUTO HEAT and the CABIN TEMP knob is adjusted for a comfortable temperature. A temperature controller, located on the forward side of the pedestal between the pilot's and copilot's rudder pedals, makes possible the regulation of the cabin temperature by monitoring temperature variations at the temperature sensing units. These sensing units are located: (1) in the ram air inlet (2) forward of the two pressure control valves on the rear pressure bulkhead, and (3) in the heater outlet duct.

Ambient air, from the ram air inlets at the leading edges of the wing roots, normally passes over the intercoolers to cool the turbocharged air from the engines before it enters the cabin. If normal heating is insufficient, an even greater heating capacity may be attained by turning off the intercoolers. This is done by pulling out the controls on the right subpanel, placarded PRESSURIZATION AIR TEMP - PULL TO INCREASE.

COOLING MODE

For the cooling mode, the Duke is equipped with a refrigerant-type cooling system. The compressor is located in the right nacelle just aft of the engine, and the evaporator just ahead of the forward pressure bulkhead adjacent to the heater unit. The air is circulated through the same ductwork as for heating. Cold air coming through the evaporator enters the duct system, goes to the duct outlets and to the individual overhead outlets.

When the selector is placed in the AUTO COOL position, the temperature is automatically controlled through the thermostat. The temperature sensing units monitor the cabin temperature variations, as in the heating mode. Regulate the temperature with the CABIN TEMP adjustment knob. Automatic cooling may be over-ridden by placing the selector in MANUAL COOL; in this position the system will continue to cool regardless of the cabin temperature.

While operating in the heating mode, the intercoolers may be turned off to allow warm, pressurized air to enter the vessel, but the opposite is true for the cooling mode; the intercoolers may be turned on by pushing in the intercooler controls so the incoming air will be as cool as possible before reaching the evaporator.

For cabin ventilation, a portion of the air is automatically exhausted through the isobaric control valve on the aft pressure bulkhead, just as in the heating mode.

VENTILATION MODE

With the airplane unpressurized, open the ram air vent inlet (CABIN AIR) and move the mode selector to BLOWER. Choose HI or LO as desired on the vent blower switch. In this mode the isobaric and safety dump valves are open (with the pressurization switch in DUMP position), to exhaust the cabin air. If the ambient air is cool and no vent blower is desired, move the temperature mode selector to OFF.

OXYGEN SYSTEM

WARNING

> Proper safety measures must be employed while using oxygen, or a serious fire hazard will be created. NO SMOKING PERMITTED.

DESCRIPTION

Oxygen masks provided with the oxygen system are of the Scott continuous-flow type. They are easily adjusted to fit the average person comfortably with a minimum leakage of oxygen, and are considered adequate for a continuous use up to either 27,000 or 30,000 feet.

The oxygen cylinder is located in the aft fuselage. An oxygen console on the pilot's sidewall regulates flow to the six cabin outlets. When use of the oxygen is discontinued, it is absolutely necessary that the system be turned off by closing the control valve on the console. An oxygen pressure gage on the console indicates the supply of oxygen available. 1850 psi is normal pressure for a full supply in the bottle. The pressure gage does not indicate whether the system is on or off.

ICE PROTECTION

EQUIPMENT

For standard ice protection equipment, the Duke has heated pitot, stall warning, and fuel vents. Optional icing equipment includes pneumatically operated surface deice boots and electrically heated propellers and windshield. In addition, an alternate static air source backs up the normal static air source buttons.

SURFACE DEICE SYSTEM

Deice boots on the wing and empennage leading edges are inflated by the two engine-driven pressure pumps. A venturi, operated from the pressure pumps, supplies vacuum for boot hold-down at all times except during the inflation mode. Through an electric timer, solenoid-operated control valves cause all the boots to be inflated simultaneously. The timer is controlled by a three-position switch: SURFACE ONE CYCLE, and MANUAL with off position centered. This switch is located on the left subpanel. ONE CYCLE and MANUAL switch positions are momentary. A gage is provided to indicate system pressure. Momentary engagement of the ONE CYCLE position will cause the boots to inflate for five to eight seconds, then deflate to the vacuum hold-down condition. The MANUAL position will inflate the boots only as long as the switch is held in engagement; when the switch is released, the boots deflate. Leave the deicing system off until 1/2 to 1 inch of ice is accumulated. During inflation, the deice system pressure gage should register approximately 15 to 18 psi. Sufficient pressure for proper operation of the system is available with one engine inoperative.

When the surface deice system is operated with the cabin pressure switch in the DUMP position, cabin pressure oscillations will occur. This is caused by a momentary loss of vacuum to the outlfow valve while the boots are pressurizing. This vacuum loss allows the outflow valve to close and create a small residual cabin pressure. After a small increase, this pressure is then dumped by the safety valve.

The cabin pressurization shut off controls should be pulled during this mode to divert cabin pressurizing air overboard and prevent excessive cabin pressure oscillations. Cabin ventilation may be obtained by pulling out the cabin air control. In this mode pressure oscillations will be small.

For night operation, a wing ice light is provided on the outboard side of the left nacelle. The switch, placarded WING ICE, is on the left subpanel.

PROPELLER ELECTROTHERMAL DEICE

Electrothermal deice boots, cemented to the propeller blades, remove ice from the propellers. Each boot, consisting of one outboard and one inboard heating element, receives its electrical power through a deice timer. The timer directs current to the propeller boots alternately, in a 30-second cycle. The PROP HT switch is located on the left subpanel. The propeller deice ammeter (prop amp) will indicate 14 to 18 amperes with minor fluctuations about every 30 seconds during normal operation. For deviations from the normal indications, and the procedures to be followed, see the Surface Deice Supplement in the FAA FLIGHT MANUAL SUPPLEMENTS Section.

WINDSHIELD ANTI-ICE

The pilot's electrically-heated windishield is controlled by a switch, placarded WSHLD HT, located on the left subpanel. Windshield heat, designed for continuous use, should be applied prior to, or upon first encountering, icing conditions. This system is also beneficial as an aid in preventing frost and fogging due to rapid descents from higher altitudes into warm, moist air.

Operation of the windshield heat will cause the standby compass to become erratic; therefore, windshield heat should be turned off for a period of 15 seconds to allow a stable reading of the standby compass.

CAUTION

Ground use of windshield heat is limited to 10 minutes.

ADDITIONAL ICE PROTECTION

The right pitot heat element (and the left pitot heat element if installed) is turned on by moving the respective PITOT HEAT switch to the ON position. Stall warning heat is installed in conjunction with right pitot heat, and is controlled by the STALL & R. PITOT HEAT switch. Fuel vent heat is controlled by two switches, placarded FUEL VENT - LEFT - RIGHT.

SECTION X
SERVICING
TABLE OF CONTENTS

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INTRODUCTION TO SERVICING

The purpose of this section is to outline the requirements for maintaining the airplane in a condition equal to that of its original manufacture. This information sets the time frequency intervals at which the airplane should be taken to the BEECHCRAFT Parts and Service Outlet for periodic servicing or preventive maintenance.

The Federal Aviation Regulations place the responsibility for the maintenance of this airplane on the owner and operator of the airplane who must ensure that all maintenance is done by qualified mechanics in conformity with all airworthiness requirements established for this airplane.

All limits, procedures, safety practices, time limits, servicing and maintenance requirements contained in this handbook are considered mandatory.

Authorized BEECHCRAFT Parts and Service Outlets will have recommended modification, service, and operating procedures issued by both FAA and Beech Aircraft Corporation, designed to get maximum utility and safety from the airplane.

If there is a question concerning the care of the airplane, it is important to include the airplane serial number in any correspondence. The serial number may be found on the Manufacturer's Identification Plaque attached to the left wing stub root rib adjacent to the inboard end of the flap. The placard is not visible unless the flaps are lowered.

WARNING

The BEECHCRAFT Duke B60 is a pressurized airplane. Drilling, modification, or any type of work which creates a break in the pressure vessel, is considered the responsibility of the owner or facility performing the work. Obtaining approval of the work is, therefore, their responsibility.

GROUND HANDLING

The three-view drawing shows the minimum hangar clearance for the airplane of standard configuration. Allowances have not been made for any special radio antennas. When this equipment is installed on the airplane, the dimensions should be noted on the drawing for quick reference.

TOWING BY HAND

The Duke can be moved easily on a smooth, level surface with the hand tow bar. Attach the tow bar to the tow lugs on the nose gear lower torque knee. Someone should be present at the controls of the airplane to operate the toe brakes if there is any danger of rolling down a slope. Do not apply excessive side pressure against the tow bar while turning sharply. The leverage of the bar could damage the steering mechanism.

CAUTION

Do not exert force on propellers, control surfaces, or horizontal stabilizer.

When the airplane has been moved to the desired position, chock the main gears fore and aft to prevent rolling. If outside, tie down the airplane and install the control locks.

Tow Limits

TOWING WITH A TUG

For maneuvering the airplane on rough ground or slopes, it is advisable to use a tug for greater security. Again, an assistant should remain at the controls to operate the brakes when necessary.

CAUTION

Always ascertain that the control locks are removed before towing the airplane. Serious damage can result to the steering linkage if towed with a tug with the rudder locks installed.

While turning the airplane with a tug, exercise care to prevent exceeding the turn limits placarded on the nose gear. The Duke's low fuselage results in the nose sitting very close to the ground and, normally, a tug operator is unable to see the limit marks. If the airplane is being maneuvered sharply, an assistant should monitor the turning of the nose gear.

TIE-DOWN

Tie the airplane down when it is not being used. Tie-down may be performed as follows:

1. Install the control locks.
2. Chock the main wheels, fore and aft.
3. Using chain or nylon line of sufficient strength, secure the airplane at the tie-down lugs; one under each wing and one under the aft fuselage. Tie-down lines should have no slack, but you should avoid raising the nose by pulling the aft line too tight. A high nose will produce lift by increasing the angle of attack of the wings.

SERVICING

BATTERY (NICKEL-CADMIUM)

The 13-ampere-hour, 24-volt nickel-cadmium battery is installed in a battery box in the left nacelle and is accessible through the top door of the nacelle. When service is required for the battery, it is recommended it be serviced by a qualified nickel-cadmium battery service facility.

BATTERY (LEAD-ACID)

The two 25-ampere-hour, 12-volt lead-acid batteries are connected in series and accessible through a door on top of the left engine nacelle. When servicing the lead-acid battery, check the battery electrolyte level after each 25 hours of operation; maintain the electrolyte level to cover the plates by adding distilled battery water. Avoid filling over the baffles and never fill more than one-quarter inch over the separator tops. Excessive water consumption may be an indication that the voltage regulators require resetting. The specific gravity of the electrolyte should be checked periodically and maintained within the limits placarded on the battery.

The battery box (for lead-acid batteries) is vented overboard to dispose of electrolyte and hydrogen gas fumes discharged during the normal charging operation. To insure the disposal of these fumes, the vent hose connections at the battery box should be checked frequently for obstructions.

EXTERNAL POWER

When using external power, it is very important that the following precautions be observed.

1. The airplane has a negative ground system. Exercise care to avoid reversed polarity. Be sure to connect the positive lead of the auxiliary power unit to the positive terminal of the airplane's external power receptacle and the negative lead to the negative terminal of the external power receptacle. A positive voltage must also be applied to the small guide pin.
2. To prevent arcing, make certain no power is being supplied when the connection is made.
3. Make certain that the battery switch is ON, all avoinics and electrical switches OFF, and a battery is in the system before connecting an external power unit. This protects the electronic voltage regulators and associated electrical equipment from voltage transients (power fluctuations).

RECHARGING BATTERY USING AUXILIARY POWER

1. Battery switch - ON.
2. Connect an auxiliary power unit to the airplane's xternal power receptacle as described in the NORMAL PROCEDURES section.

If the battery relay will not close, the battery must be removed from the aircraft for recharging. Check the battery relay control circuit for a malfunction.

CHECKING ELECTRICAL EQUIPMENT

Connect an auxiliary power unit as outlined in NORMAL PROCEDURES. Ensure that the current is stabilized prior to making any electrical equipment or avionics check.

NOTE

If the external power unit has poor voltage regulation or produces voltage transients the equipment connected to the unit may be damaged.

MAGNETOS

Magnetos ordinarily require only occasional adjustment, lubrication and breaker point replacement. This work should be performed by your BEECHCRAFT Parts and Service Outlet.

WARNING

To be safe, treat the magnetos as hot whenever a switch lead is disconnected at any point; there is not an internal automatic grounding device. The magnetos can be grounded by replacing the switch lead at the noise filter capacitor with a wire which is grounded to the engine case. Otherwise, all spark plug leads should be disconnected or the cable outlet plate on the rear of the magneto should be removed.

PROPELLERS

Propeller operation, servicing and maintenance instructions are contained in the propeller owner's manual furnished with your airplane.

WARNING

When servicing a propeller, always make certain the ignition switch is off and that the engine has cooled completely. STAND IN THE CLEAR WHEN MOVING A PROPELLER. THERE IS ALWAYS SOME DANGER OF A CYLINDER FIRING WHEN A PROPELLER IS MOVED.

PROPELLER DOME AIR PRESSURE SETTING

The propeller spinner dome air pressure should be checked for sufficient pressure each 100 hours as follows:

1. Remove the cap on the propeller spinner.

2. Connect a dry air or nitrogen supply line to the air valve and fill to 80 PSI for HC-F3YR-2/C7479-2R or HC-F3YR-2/C7479B-2R or HC-F3YR-2F/FC7479-2R or HC-F3YR-2F/FC7479B-2R propellers. This should be done at 70°F.

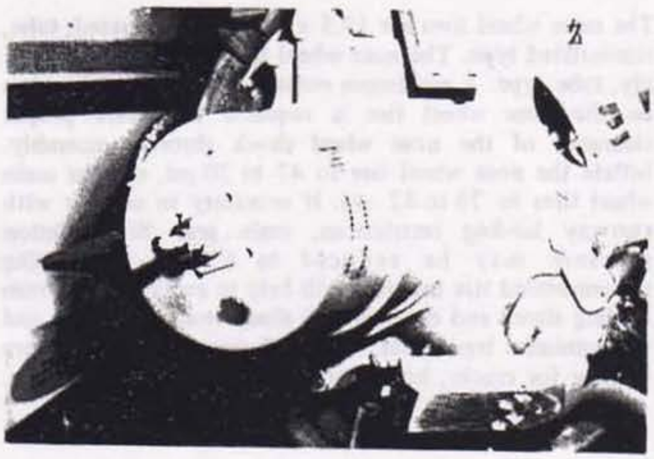
NOTE

Increase 2 PSI for every 10 degrees of temperature increase. Decrease 2 PSI for every 10 degrees of temperature decrease.

3. Fill to 41 PSI for HC-F3YR-2UF/FC7479-2R or HC-F3YR-2UF/FC7479B-2R propellers. This should be done at 70° - 100°F.

NOTE

70° to 100°F - 41 PSI
40° to 70°F - 38 PSI
0° to 40°F - 36 PSI
-30° to 0°F - 33 PSI



Propeller Dome

PROPELLER BLADE BEARING LUBRICATION

1. Remove the propeller spinner.
2. Remove the safety wire and covers from the four grease zerks.
3. Lubricate by placing the grease gun fitting on one zerk of each blade and filling until the grease is visible from the zerk opening on the opposite side of the blade. The zerk on the opposite side must be removed.
4. Clean the excess grease from the propeller, reinstall the grease zerk covers and safety.
5. Reinstall the spinner.

INDUCTION AIR FILTERS

The induction air filters should be cleaned every 50 hours of operation and replaced every 500 hours. In extremely dusty conditions the filter should be inspected frequently for cleaning if needed.

To remove and clean the filters:

1. Open the access door on the right side of each nacelle.
2. Slide out the filters.
3. Clean the filter per manufacturer's instructions printed on the edge of the filter, and replace.

LANDING GEAR

MAIN WHEEL JACKING

Individual main wheels may be jacked by placing a floor jack under the jacking point located under each axle.

CAUTION

Prior to jacking the airplane, ensure that an unbalanced condition does not exist. Fuel should be distributed evenly in both wings to prevent an unbalanced condition which could cause the airplane to be unstable while on jacks.

SHOCK STRUTS

CAUTION

Never taxi with a flat shock strut.

The shock struts are filled with compressed air and hydraulic fluid. The same procedure is used for servicing both the main and nose gear shock struts. To service a strut, proceed as follows:

1. Remove the air valve cap and depress the valve core to release the air pressure.

WARNING

Do not unscrew the air valve assembly until the air pressure has been released or it may be blown off with considerable force, causing injury to personnel or property damage.

2. Remove the air valve assembly.
3. Compress the strut and fill through the air valve assembly hole with hydraulic fluid until the fluid overflows (approximately one pint).
4. Cycle the strut from full extension to compressed and refill. Repeat until no more fluid can be added to the strut in the compressed position.

NOTE

Cycling of the shock strut is necessary to expel any trapped air within the strut housing.

5. Install the air valve assembly.
6. With the aircraft resting on the ground and the fuel cells full, inflate the nose gear strut until 4-1/16 to 4-5/16 inches of the piston are exposed and inflate the main gear until 3 inches of the piston are exposed. Rock the aircraft gently to prevent possible binding of the piston in the barrel while inflating.

NOTE

It is recommended that the nose strut inflation dimension and the tire inflation pressure be carefully adhered to. Properly inflated tires and struts reduce the possibility of ground damage occurring to the propellers. Exercise caution when taxiing over rough surfaces.

The shock strut piston must be clean. Remove foreign material by wiping the strut with a cloth containing hydraulic fluid.

CAUTION

If a compressed air bottle containing air under extremely high pressure is used, exercise care to avoid over-inflation of the strut.

WARNING

NEVER FILL SHOCK STRUTS WITH OXYGEN.

BRAKES

The brake fluid reservoir, accessible through the forward baggage compartment door, is hinged on the aft frame of the door. Loosening the screw securing the reservoir to the

Brake Fluid Reservoir

airplane structure allows the reservoir to swing out for easy servicing. Fill the reservoir with hydraulic fluid to the full mark on the dipstick. Maintain the fluid level between the "add" and "full" marks.

CAUTION

Do not overfill.

On multi-disc brakes, a brake wear indicator pin is attached the pressure plate on each brake. The pin moves with the pressure plate as the brakes are applied. When the brakes are applied and the indicator pin is flush with its bushing, the lining has reached its wear limit.

On single-disc brakes, the lining should be replaced when the distance between the brake lining and the brake housing measures .250 inch with the brakes applied.

PARKING BRAKE

The brakes are set for parking by pulling out the parking brake control and depressing the pilot's brake pedals to pressurize the system. Do not attempt to lock the parking brake by applying force to the parking brake handle; it controls a valve only and cannot apply pressure to the brake master cylinders.

CAUTION

Do not set the parking brake control when the brakes are hot from severe use or during low temperatures when an accumulation of moisture may cause the brakes to freeze.

TIRES

The main wheel tires are 19.5 x 6.75-8, 10 ply rated, tube, rim-inflated type. The nose wheel tire is a 15 x 6.00 x 6, 4 ply, tube type. A maximum outside diameter of 15 inches on the nose wheel tire is required to ensure proper clearance of the nose wheel shock absorber assembly. Inflate the nose wheel tire to 47 to 50 psi, and the main wheel tires to 76 to 82 psi. If necessary to comply with runway landing restrictions, main gear tire inflation pressure may be reduced to 65 psi. Maintaining recommended tire inflation will help to avoid damage from landing shock and contact with sharp stones and ruts, and will minimize tread wear. When inflating tires, inspect them visually for cracks, breaks or evidence of internal damage.

NOTE

Beech Aircraft Corporation cannot recommend the use of recapped tires. Recapped tires have a tendency to swell as a result of the increased temperature generated during take-off. Increased tire size can jeopardize proper function of the landing gear retract system, with the possibility of damage to the landing gear doors and retract mechanism.

FUEL SYSTEM

All fuel cells in each wing plus the optional tip tanks are interconnected and serviced through a filler cap in the wing tip and/or outboard wing section. To obtain maximum capacity with the tip tank installation, use the tip filler caps.

CAUTION

To prevent fuel spillage, do not open the outboard wing section filler caps with the tip tanks filled. Should spillover occur, wash all fuel from the wing surface to preclude possible damage.

When filling the airplane fuel cells, always observe the following:

1. Service the fuel cells with 100/130 (Green) octane fuel or, if not available, use 115/145 (Purple) octane fuel.
2. Make certain the airplane is statically grounded to the servicing unit.
3. Do not fill fuel cells near open flame or within 100 feet of any open, energized electrical equipment capable of producing sparks.
4. Do not insert the fuel nozzle more than 3 inches into the filler neck; to do so may cause damage to the rubber fuel cell.

Most fuel injection system malfunctions can be attributed to contaminated fuel. Inspecting and cleaning the fuel strainers should be considered to be of the utmost importance as a regular part of preventive maintenance.

Normally the fuel strainers should be inspected and cleaned every 100 hours. However, the strainers should be inspected and cleaned at more frequent intervals depending on service conditions, fuel handling equipment, and operation in localities where there is excessive sand or dust.

Snap-type fuel drains, on airplanes P-247 through P-434 or flush-type fuel drains on airplanes P-435 and after and on tip tanks (if installed), are located on the lower surface of each wing. Open the fuel drains daily to allow condensed moisture to drain from the fuel system. Open the flush-type drains with the wrench provided in the loose tools and accessories.

NOTE

If the cells are to remain unfilled for 10 days or more, apply a thin coating of light engine oil to the inside surface of the cell to prevent deterioration and cracking.

OIL SYSTEM

The engines are equipped with a wet sump, pressure type oil system. Each engine sump has a capacity of 13 quarts. The oil system may be checked through access doors in the engine cowling. A calibrated dip stick attached to the filler cap indicates the oil level. Due to the canted position of the engines, the dip sticks are calibrated for either right or left engines and are not interchangeable.

The oil should be changed every 100 hours under normal operating conditions and the oil filter changed every 50 hours. Lycoming specifies that only ashless dispersant oil be used in the engines. The oil drain is accessible through the cowl flap opening. The engines should be warmed to operating temperature to assure complete draining of the oil. Moisture that may have condensed and settled in the oil sump should be drained occasionally by opening the oil drain plug and allowing a small amount of oil to escape. This is particularly important in winter, when the moisture will collect rapidly and may freeze.

The oil grades listed in the Approved Oil Grades Chart are general recommendations only, and will vary with individual circumstances. Lycoming Service Instruction 1014E specifies only ashless dispersant multi-grade lubricants are to be used in the Duke's TIO-541 series engines. At operating temperatures above 60°F (15°C), multi-grade lubricants equivalent to SAE 50 or SAE 60 should be used. At temperatures below 30°F (-1°C), multi-grade lubricants equivalent to SAE 40 are recommended.

OXYGEN SYSTEM

To service the oxygen system, remove the protective cap from the filler valve located in the aft fuselage.

WARNING

Keep fires, cigarettes and sparks away when outlets are in use. Open and close all oxygen valves slowly. Make certain the oxygen shutoff valve is in the closed position. Inspect the filler connection for cleanliness before attaching it to the filler valve. Keep tools, hands and components clean, as fire or explosion may occur when pure oxygen under pressure comes in contact with organic material such as grease or oil.

Attach a hose from an oxygen recharging cart to the filler valve. To prevent overheating, fill the oxygen system slowly by adjusting the recharging rate with the pressure regulating valve on the cart. The oxygen cylinder should be filled to a pressure of 1800 ± 50 psi at a temperature of 70°F. This pressure may be increased an additional 3.5 psi for each degree of increase in temperature. Similarly, for each degree of drop in temperature, reduce the pressure by 3.5 psi. When the oxygen system is properly charged, disconnect the filler hose from the filler valve and replace the protective cap.

OXYGEN CYLINDER RETESTING

Oxygen cylinders used in the airplane are of two types. Light weight cylinders, stamped "3HT" on the plate on the side, must be hydrostatically tested every three years and the test date stamped on the cylinder. This bottle has service life of 4,380 pressurizations or fifteen years, whichever occurs first, and then must be discarded. Regular weight cylinders, stamped "3A", or "3AA", must be hydrostatically tested every five years and stamped with the retest date. Service life on these cylinders is not limited.

MINOR MAINTENANCE

CLEANING

CLEANING DEICE BOOTS

Keep the boots free of engine oil with a solution of neutral soap and water. Avoid scuffing the surface of the boot to protect the special conductive surface.

CAUTION

Deice boots may be damaged by dragging gasoline hoses over them or resting ladders or platforms against them. Protect these surfaces while working around them.

INTERIOR

The seats, rugs, upholstery panels, and headlining should be vacuum-cleaned regularly. Commercial foam-type cleaners or shampoos can be used to clean rugs, fabrics, and upholstery; the instructions on the containers should be followed carefully.

ENGINES

Clean the engines with kerosene, solvent, or any standard engine cleaning solvent. Spray or brush the fluid over the engine, then wash it off with water and allow to dry.

CLEANING AND CARE OF AIRCRAFT FINISH

Do not apply wax or polish for a period of 90 days after delivery to allow the paint to cure. Waxes and polish seal the paint from the air and prevent curing. For uncured painted surfaces, wash only with cold or lukewarm (never hot) water and a mild nondetergent soap. Any rubbing of the painted surface should be done gently and held to a minimum to avoid scratching the paint film.

After the paint cures, wash the airplane with a mild soap and water. Flush loose dirt away first with clear water. Harsh, abrasive, or alkaline soap or detergents which could cause corrosion or make scratches should never be used. Use soft cleaning cloths or chamois to prevent scratches when cleaning and polishing. Any good grade automobile wax may be used to preserve painted surfaces. To remove stubborn oil and grease, use a soft cloth dampened with naphtha. However, after cleaning with naphtha, the surface should be rewaxed, and polished.

CLEANING PLASTIC WINDOWS

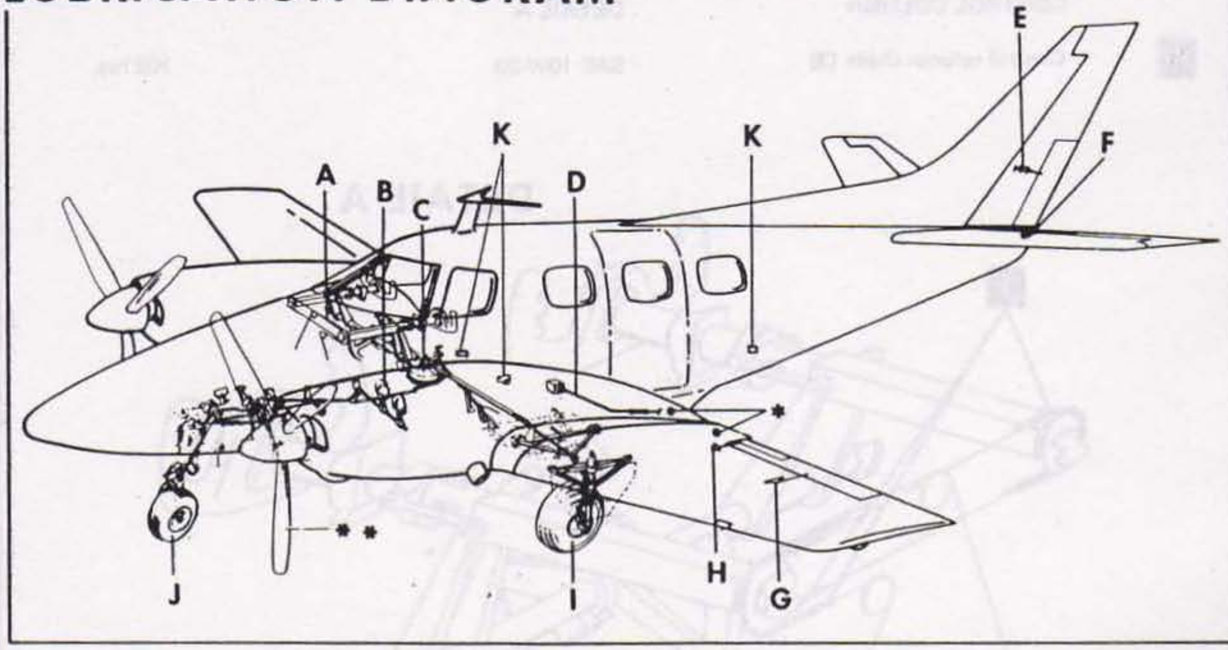
If a commercial cleaning compound for cleaning acrylic plastic windows is used, follow the instructions on the container. If a commercial cleaner is not available, clean as follows:

Cleaning of the acrylic plastic windows should never be attempted when dry. Flush the window with water or a mild soap solution and rub lightly with a grit-free soft cloth, chamois or sponge. Stubborn grease or oil deposits are readily removed with aliphatic naphtha or hexane. Rinse with clear water.

CAUTION

Do not use thinner or aromatic abrasive cleaners to clean the windows since the surface of the plastic may be damaged. Also, aliphatic naphtha and similar solvents are highly flammable, and extreme care must be taken when using them.

LUBRICATION DIAGRAM



NOTE

Apply MIL-G-81322 lubricating grease at all points of friction in the cabin door except where Oilite bearings are installed. The time interval for lubrication is as required.

Precaution should be taken when using MIL-G-23827 and MIL-G-81322, since these greases contain chemicals harmful to painted surfaces.

* Flaps track rollers (pre-lubed sealed bearings). Pressure lubricate at 1000 hours inspection using MIL-G-23827 lubricating grease.

** MIL-G-23827 grease is recommended for use in lubricating the blade bearings in the Hartzell Propeller. This grease will insure against a possible freeze up of the pitch change mechanism when prolonged flights are made at altitudes where the ambient temperature is below -20°C. Lubricate at 100 hours inspection. (6)

( ) Indicates the number of points to be lubricated.

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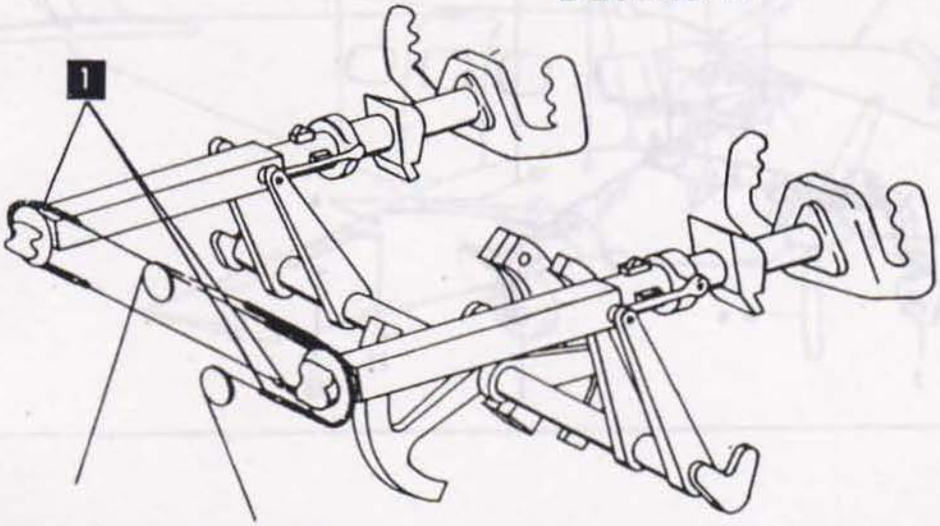
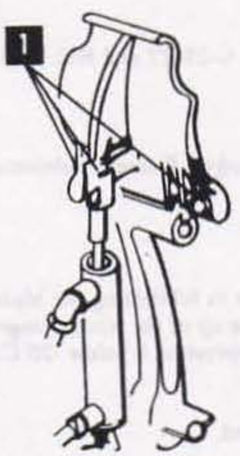
LUBRICATION POINTS

INDEX	LOCATION	LUBRICANT	INTERVAL
	CONTROL COLUMN	DETAIL A	
1	Control column chain (3)	SAE 10W-30	100 hrs.

DETAIL A



DETAIL B



INDEX	LOCATION	LUBRICANT	INTERVAL
	RUDDER PEDALS	DETAIL B	
1	Pedals linkage (6)	SAE 10W-30	100 hrs.

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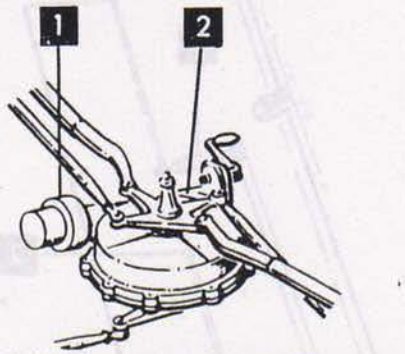
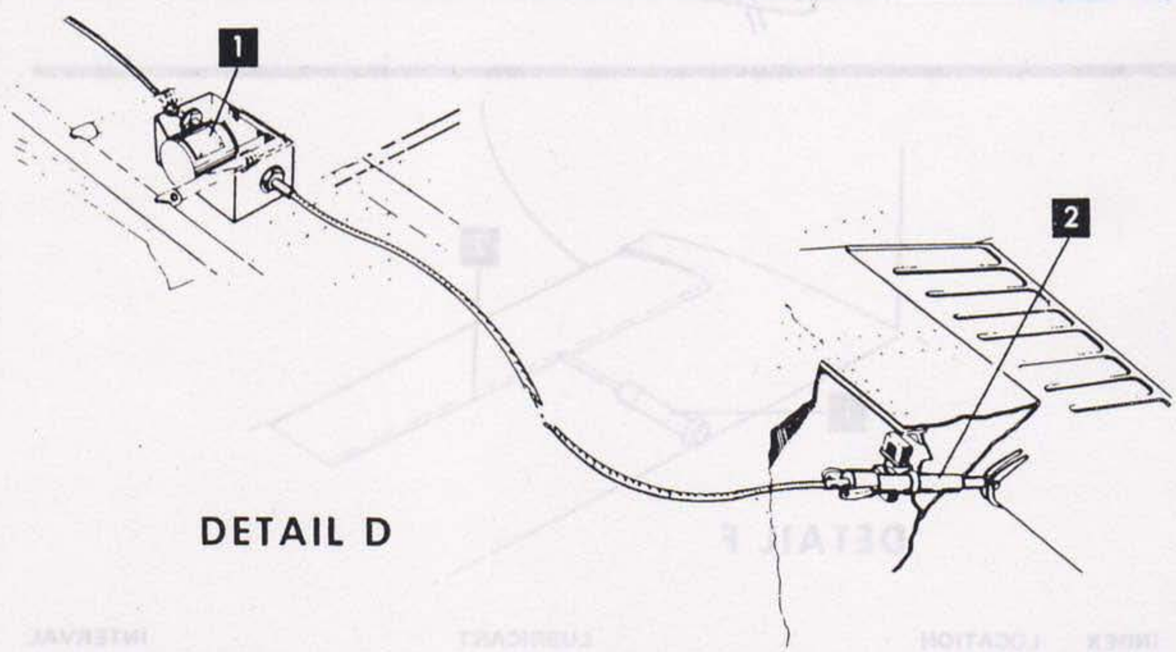
LUBRICATION POINTS

INDEX	LOCATION	LUBRICANT	INTERVAL
	LANDING GEAR ACTUATOR	DETAIL C	
1	Landing gear motor gear box (1)	MIL-G-81322	300 hrs.
2	† Landing gear actuator gear box (1)	MIL-L-10324	300 hrs.

DETAIL C



† When properly filled, the oil level on a dip stick inserted through the filler hole will be approximately ¼ inch.



DETAIL D

INDEX	LOCATION	LUBRICANT	INTERVAL
	FLAP ACTUATOR	DETAIL D	
1	Flap motor gear box (1)	MIL-G-23827	300 hrs.
2	Flap actuator (2)	MIL-L-6086 Grade M	1000 hrs.

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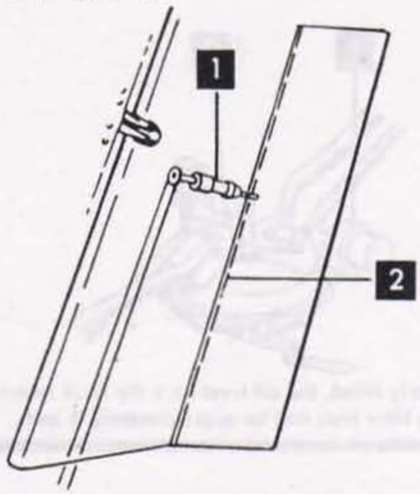
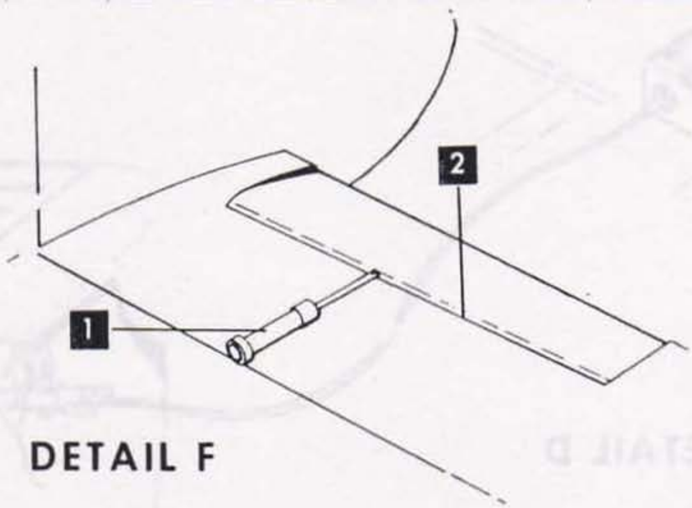
LUBRICATION POINTS

INDEX	LOCATION	LUBRICANT	INTERVAL
	RUDDER TRIM	DETAIL E	
1	Rudder trim tab actuator (1)	MIL-G-23827	AR
2	†Rudder trim tab hinge (1)	MIL-M-7866B	100 hrs.

† Mix MIL-M-7866B with naphtha and apply with a brush.

DETAIL E





DETAIL F

INDEX	LOCATION	LUBRICANT	INTERVAL
	ELEVATOR TRIM	DETAIL F	
1	Elevator trim tab actuator (1)	MIL-G-23827	AR
2	†Elevator trim tab hinge (1)	MIL-M-7866B	100 hrs.

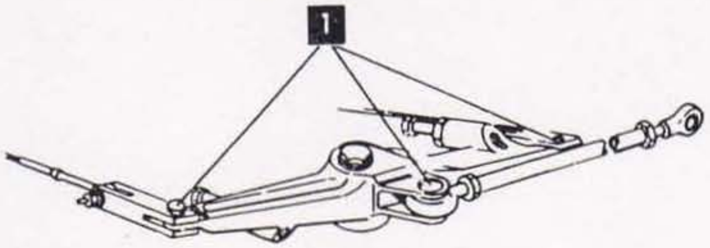
†Mix MIL-M-7866B with naphtha and apply with a brush.

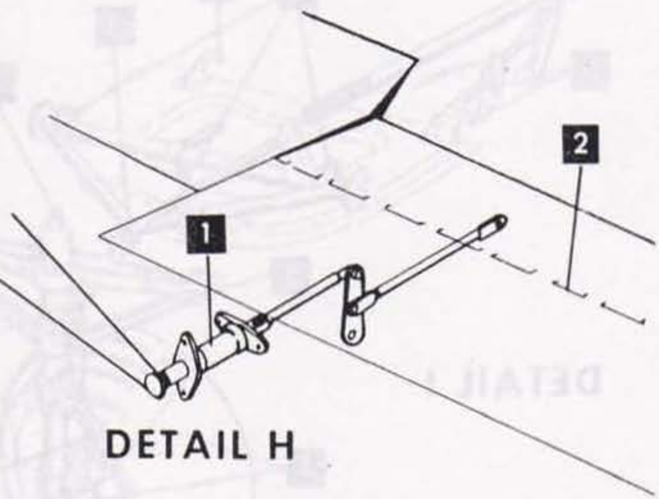
A60-604-10B

LUBRICATION POINTS

INDEX	LOCATION	LUBRICANT	INTERVAL
	AILERON BELL CRANK	DETAIL G	
1	Aileron bell crank (6)	SAE 10W-30	100 hrs.

DETAIL G





DETAIL H

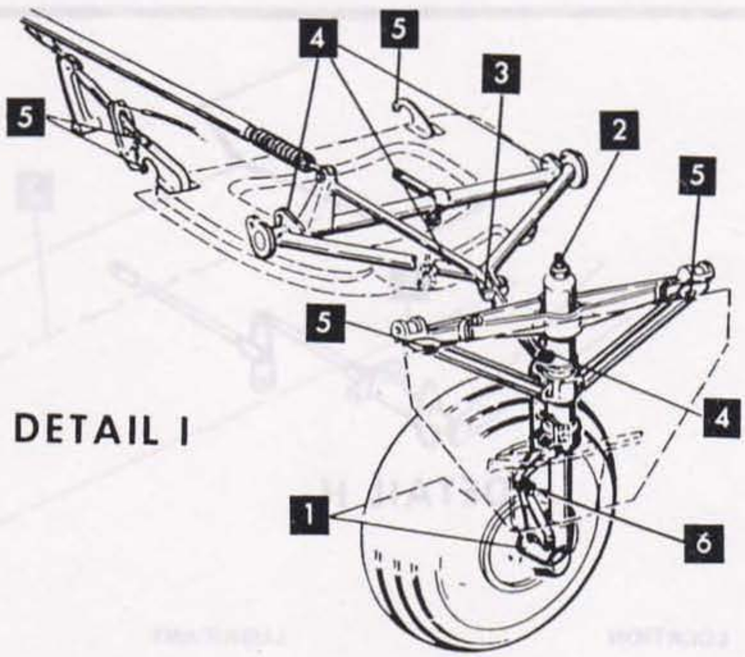
INDEX	LOCATION	LUBRICANT	INTERVAL
	AILERON TRIM TAB	DETAIL H	
1	Aileron trim tab actuator (1)	MIL-G-23827	AR
2	†Aileron trim tab hinge (1)	MIL-M-7866B	100 hrs.

†Mix MIL-M-7866B with naphtha and apply with a brush

A60-604-11B

LUBRICATION POINTS

INDEX	LOCATION	LUBRICATION	INTERVAL
	MAIN LANDING GEAR	DETAIL I	
1	Main wheel bearings (4)	MIL-G-3545	100 hrs.
2	Main shock struts (2)	MIL-H-5606 or MIL-H-83282	100 hrs.
3	Uplock rollers (2)	MIL-G-23827	100 hrs



DETAIL I

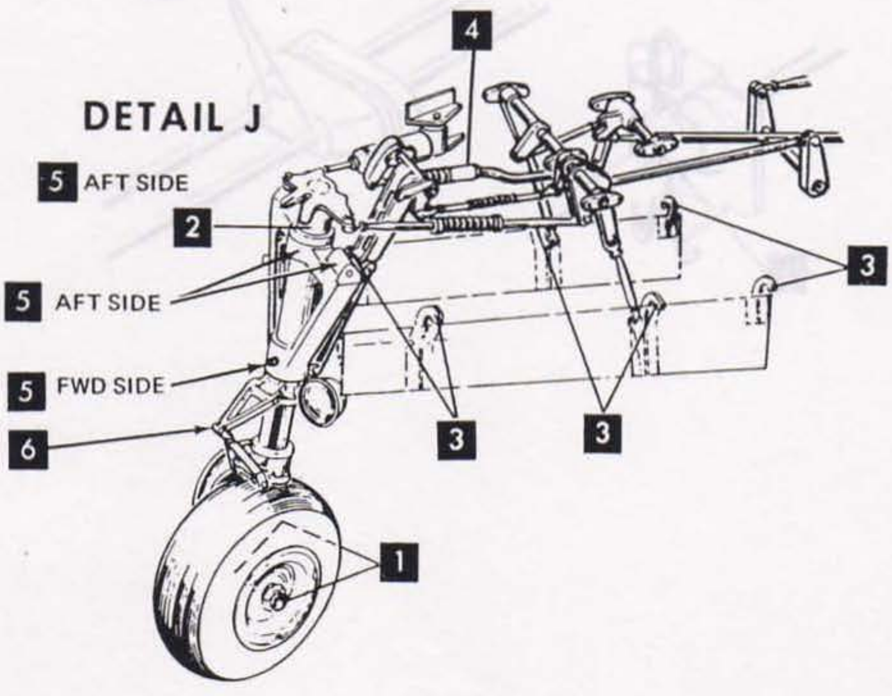
INDEX	LOCATION	LUBRICANT	INTERVAL
4	Main retract fittings (8)	MIL-G-81322	100 hrs.
5	Main gear door hinges (10)	SAE 10W-30	100 hrs.
6	Main Gear Torque Knee Hinge Point	SAE 30 or SAE 10W-30	100 hrs.

A60-604-12 B

LUBRICATION POINTS

INDEX	LOCATION	LUBRICANT	INTERVAL
	NOSE LANDING GEAR	DETAIL J	
1	Nose wheel bearings (2)	MIL-G-3545	100 hrs.
2	Nose shock strut (1)	MIL-H-5606 or MIL-H-83282	100 hrs.
3	Nose gear door hinges (6)	SAE 10W-30	100 hrs.
4	Nose gear forward retract rod (1)	MIL-G-7118	600 hrs.
*5	Nose gear brace bushings (4)	MIL-G-81322	100 hrs.
6	Nose Gear Torque Knee Hinge Point	SAE 30 or SAE 10W-30	100 hrs.

*P-297 and after



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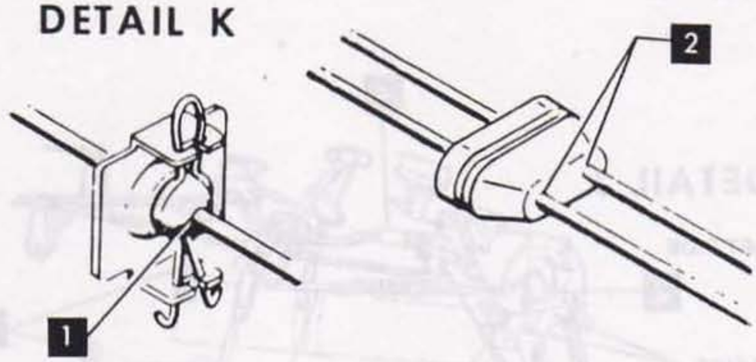
LUBRICATION POINTS

INDEX	LOCATION	LUBRICANT	INTERVAL
	CABLE PRESSURE SEALS	DETAIL K	
1	Control cable pressure seals (8)	MIL-G-23827	1000 hrs.
2	Trim tab cable pressure seals (3)	MIL-G-23827	1000 hrs.

DETAIL K



A60-604-14A

RECOMMENDED SERVICING SCHEDULE

INTERVAL	ITEM	LOCATION (Letters refer to Lubrication Diagram)	SERVICE AND MATERIAL (Numbers Refer to Item in Consumable Materials)
Preflight	Drain Fuel Sump	Lower wing surface	
	Drain Fuel Strainer	Lower wing surface	
	Drain Fuel Tank	Lower wing surface	
	Drain Heater Fuel	Aft bulkhead of nose wheel well	
	Check Engine Oil Level	Access door on upper cowling	(2)
50 hrs.	Replace Engine Oil Filter	Right side of engine	
	Clean Induction Air Filter	Right rear side of engine	Clean per instructions on filter.
	Lubricate Uplock Rollers	Each main landing gear (I)	SAE 10W-30
100 hrs.	Change Engine Oil	Accessible through cowl flap opening	(2)
	Clean Engine Oil Screen	Engine oil sump	Clean with solvent and blow dry with air pressure at oil change.
	Check Battery Electrolyte	Access plate on rear of left nacelle	See Maintenance Manual
	Check Propeller Air Dome	Access cap on propeller spinner	Dry air or nitrogen
	Check Propeller Accumulator	Lower rear of engine	Dry air or nitrogen
	Clean Pressure System Inlet Air Filter	Forward side of aft engine baffle	Wash with soap and water, rinse and dry.
	Clean Servo Fuel Filter	Fuel injection	Clean with solvent and blow dry with air pressure (8)
	Clean Static Air Button	Aft fuselage skin	Clean with solvent and wipe dry with clean rag (8)
	Clean Heater Fuel Pump Screen	Left wing stub	Clean with solvent and blow dry with air pressure (8)
	Clean Cabin Altitude Control Filter	Right subpanel	P-247 thru P-307: Clean or replace. P-308 and after: Clean with solvent and blow dry with air pressure.

RECOMMENDED SERVICING SCHEDULE (Continued)

INTERVAL	ITEM	LOCATION (Letters refer to Lubrication Diagram)	SERVICE AND MATERIAL (Numbers Refer to Item in Consumable Materials)
	Clean Cabin Pressurization System Outflow Valve Filter (P-247 through P-307)	Aft pressure bulkhead	Clean or replace.
	Clean Cabin Pressurization System Safety Valve Filter (P-308 and after)	Aft pressure bulkhead	Clean with solvent and blow dry with air pressure.
100 hrs.	Drain Static Air Line	On upholstery panel below copilot's subpanel	
	Lub Control Column Chain	In cockpit (A)	SAE 10W-30
	Lub Rudder pedals	In cockpit (B)	SAE 10W-30
	Lub Elevator Trim Tab Hinge	On elevator (F)	MIL-M-7866(5)
	Lub Rudder Trim Tab Hinge	On rudder (E)	MIL-M-7866(5)
	Lub Aileron Trim Tab Hinge	On aileron (H)	MIL-M-7866(5)
	Lub Aileron Bell Crank	Under cockpit floorboards (G)	SAE 10W-30
	Lub Main Wheel Bearings	Main landing gear (I)	MIL-G-81322 (3)
	Lub Main Retract Fittings	Main landing gear	MIL-G-81322
	Lub Main Gear Door Hinges	Main landing gear wheel well (I)	SAE 10W-30
	Lub Nose Wheel Bearings	Nose landing gear (J)	MIL-G-81322 (3)
	Lub Nose Gear Door Hinges	Nose landing gear wheel well (J)	SAE 10W-30
	Lub Turbocharger Wastegate butterfly valve	Exhaust manifold forward at turbocharger	MOUSE MILK or KANO KROIL
300 hrs.	Lub Landing Gear Motor Gear Box	Under floorboards of cockpit (C)	MIL-G-81322 (3)
500 hrs.	Replace Pressure System Inline Air Filter	Right rear side of nacelle	
	Replace Induction Air Filter	Right rear side of nacelle	

RECOMMENDED SERVICING SCHEDULE (Continued)

INTERVAL	ITEM	LOCATION (Letters refer to Lubrication Diagram)	SERVICE AND MATERIAL (Numbers Refer to Item in Consumable Materials)
1000 hrs	Lub Landing Gear Actuator gear box	Under floorboards of cockpit (C)	MIL-L-10324
	Lub Flap Actuator	Under floorboards of cabin (D)	MIL-L-6086 Grade M [illegible]
	Lub Flap Motor Gear Box	Under floorboards of cabin (D)	MIL-G-23827 (4)
As Required	Lub Rudder Trim Tab Actuator	On rudder (E)	MIL-G-23827 (4)
	Lub Elevator Trim Tab Actuator	On elevator (F)	MIL-G-23827 (4)
	Lub Aileron Trim Tab Actuator	On aileron (H)	MIL-G-23827 (4)
	Brake Fluid Reservoir	Forward baggage compartment	MIL-H-5606 or MIL-H-83282 hydraulic fluid (7)
	Oxygen Cylinder	Aft fuselage	MIL-O-27210, aviator's breathing oxygen (13)
	Air Conditioner Compressor Oil Level	See Maintenance Manual	Suniso No. 5 or Texaco Capella E, 500 Viscosity oil (17)
	Air Conditioner Refrigerant	See Maintenance Manual	Refrigerant No. 12 (18)
	Service Main and Nose Landing Gear Struts	Top of each strut	Compressed air and (5)
One Year from battery Installation	Emergency Locator Transmitter (ELT) Battery (Replace)	Aft fuselage, right side	

NOTES: 1. Any time the control surfaces are altered, repaired, or repainted, they must be rebalanced per Maintenance Manual.

2. Check the wing bolts for proper torque at the first 100 hour inspection and at the first 100 hour inspection after each reinstallation of the wing attach bolts.

Rechargeable Batteries: Recharge after one cumulative hour of use or after 50% of the useful charge life.
Non-Rechargeable Batteries: Replace after one cumulative hour or after 50% of the useful life.

CONSUMABLE MATERIALS

The vendor products appearing in this table have been selected at random to help field personnel determine products conforming to the military specifications in this publication. The brand names are listed for ready reference and are not specifically recommended by Beech Aircraft Corporation. Any product which conforms to the referenced specification may be used.

ITEM	MATERIAL	SPECIFICATIONS	VENDOR PRODUCTS
1.	Fuel, Engine	100/130 (Green) Octane; if not available, use 115/145 (Purple).	
2.	Oil, Engine	MIL-L-22851	Ashless Dispersant Only
3.	Lubricating Grease, General Purpose, Wide Temperature Range	MIL-G-81322	Regal AFB 2, Texaco Inc., 135 East 42nd Street, New York, 17, N.Y.
			Aeroshell Grease 5, 6, Shell Oil Co., 50 West 50th Street, New York 20, N.Y.
			International Lubricants Co., New Orleans, La. 22442
			Mobil Grease 28, Mobil Oil Corp., Shoreham Bldg., Washington D.C. 20005
4.	Lubricating Grease, Aircraft and Instruments,	MIL-G-23827	Supermil Grease No. A72832, American Oil Co., 910 South Michigan Avenue, Chicago, Ill.
			Royco 27A, Royal Lubricants Co., River Road, Hanover, N.J.
			Aeroshell Grease 7, Shell Oil Co., 50 West 50th St., New York 20, N.Y.
5.	Lubricant, Powdered, Graphite	MIL-M-7866 or "Petrochem Chain Life"	GP-38, National Carbon Co., New York, N.Y.
			Ashland Chemical Co., P.O. Box 2260 Santa Fe Springs, California 90670
6.	Hydraulic Fluid	MIL-H-5606 or MIL-H-83282	Brayco 756D, Bray Oil Co., 3344 Medford Street, Los Angeles 63, California
			PED 3565, Standard Oil Co., of California, 225 Bush Street, San Francisco 20, California

CONSUMABLE MATERIALS (Continued)

ITEM	MATERIAL	SPECIFICATIONS	VENDOR PRODUCTS
7.	Anti-Ice Fluid	TT-I-735	Sherwood & Co., Wichita, Kansas
8.	Solvent	PD680	
9.	Soap Solution, Oxygen System, Leak-Testing	MIL-L-25567	
10.	Lubricant, Molybdenum Disulfide	MIL-M-7866	Molykote Z, Wilco Inc., Wichita, Kansas
			Molykote Z, Standard Oil of Kentucky
			Molykote Z, Hasker Seals, Glendale, California
			Molykote Z, Alpha Molykote Corp., Stanford, Conn.
			Moly-Paul Number 4, K.S. Paul Products Ltd., London, England
11.	Tape, Antiseize Tetrafluorethylene	MIL-T-27730	
			Dag 217, Acheson Colloies Co., Port Huron, Michigan
			Key Abso-Lute, Type B, Key Co., East St. Louis, Illinois
12.	Aviator's Breathing Oxygen	MIL-0-27210	
13.	Naphtha	TT-N-95	
14.	Methyl Ethyl Ketone	MIL-M-13999	
15.	Thread Locking Compound		Stud Loc, Loctite Corp., Newington, Conn.
16.	Lubricating Oil, Gear	MIL-L-10324A or MIL-L-6086 Grade M	Trojan Gear Oil 6086M, Cities Service Oil Co., New York, New York
			Aeroshell Fluid 5M, Shell Oil Co., 50 West 50th Street, New York, N.Y.
			L-1195, Sinclair Refining Co., 600 Fifth Avenue, New York, N.Y.

CONSUMABLE MATERIALS (Continued)

ITEM	MATERIAL	SPECIFICATIONS	VENDOR PRODUCTS
17.	Oil (Air Conditioner Compressor)	Suniso No. 5	Virginia Chemical & Smelting Co., West Norfolk, Virginia
		Texaco Capella E (500 viscosity)	Texaco Inc., 135 East 42nd St., New York, N.Y.
18.	Air Conditioning Refrigerant	Dichlorodifluoro-methane	
		Racon 12 Racon Inc.,	Wichita, Kansas
		Genetron 12	Allied Chemical Speciality Chemicals Division, Morristown, New Jersey
		Freon 12	DuPont Inc., Freon Products Division, Wilmington Delaware 19898

NOTES

1. If 100/130 (Green octane fuel is not available, 115/145 (Purple) octane fuel may be used as an alternate. Never use a lower octane fuel.
2. Mix item 5 with naphtha and apply with a brush.
3. Precautions should be taken when using MIL-G-23827 and MIL-G-81322, since these greases contain chemicals harmful to painted surfaces.

APPROVED ENGINE OILS

(ASHLESS DISPERSANT OILS)

COMPANY	BRAND IDENTIFICATION
Delta Petroleum Company Incorporated	Global Concentrate A
Enjay Chemical Company	Paranox 160 and 165
Mobil Oil Corporation	RT-451, RM-178E, RM-180E
Shell Oil Company	Shell Concentrate A Code 60068 Aeroshell W120 Aeroshell W80
Texaco Incorporated	TX-6309 Aircraft Engine Oil Premium AD120 Aircraft Engine Oil Premium AD80
American Oil and Supply Company	PQ Aviation Lubricant 753
Chevron Oil Company	Chevron Aero Oil Grade 120
Humble Oil and Refining Company	Esso Aviation Oil E-120 Enco Aviation Oil E-120 Esso Aviation Oil A-100 Enco Aviation Oil A-100 Esso Aviation Oil E-80 Enco Aviation Oil E-80
Standard Oil Company of California	Chevron Aero Oil Grade 120

The vendor products appearing in this table have been selected at random to help field personnel determine products conforming to the specifications in this publication. The brand names are listed for ready reference and are not specifically recommended by Beech Aircraft Corporation. Any product which conforms to the referenced specification may be used.

LAMP REPLACEMENT GUIDE

LOCATION	PART NUMBER
Annunciator Panel Lights	327
Edge Lights	D158-100-5T 1
Post Lights	327
Compass Light	327
Instrument Flood Lights (Red)	1846R
Instrument Flood Lights (White)	1846
Map Light	1495
Landing Gear Position Lights	327
Reading Lights	1495
Nose Baggage Compartment Light	303
Navigation Lights (Wing)	1524
Navigation Light (Tail)	1683
Rotating Beacon (Upper And Lower)	A7079B24
Ice Light	A7796A24
Landing Lights	4596
Taxi Light (Nose Landing Gear)	4587
Flap Position Indicator Lights	FB-59
Recognition Lights	DN25-3
Wing Tip Strobe Light	30-1131-3 or 701148-7-2

SECTION XI
SAFETY INFORMATION
TABLE OF CONTENTS

INTRODUCTION

Beech Aircraft Corporation has developed this special summary publication of safety information to refresh pilots' and owners' knowledge of safety related subjects. Topics in this publication are dealt with in more detail in FAA Advisory Circulars and other publications pertaining to the subject of safe flying.

The skilled pilot recognizes that safety consciousness is an integral - and never-ending - part of his or her job. Be thoroughly familiar with your airplane. Know its limitations and your own. Maintain your currency, or fly with a qualified instructor until you are current and proficient. Practice emergency procedures at safe altitudes and airspeeds, preferably with a qualified instructor pilot, until the required action can be accomplished without reference to the manual. Periodically review this safety information as part of your recurrency training regimen.

BEECHCRAFT airplanes are designed and built to provide you with many years of safe and efficient transportation. By maintaining your BEECHCRAFT properly and flying it prudently you will realize its full potential.

. . . . Beech Aircraft Corporation

WARNING

Because your aircraft is a high performance, high speed transportation vehicle, designed for operation in a three-dimensional environment, special safety precautions must be observed to reduce the risk of fatal or serious injuries to the pilot(s) and occupant(s).

It is mandatory that you fully understand the contents of this manual and the other manuals which accompany the aircraft; that FAA requirements for ratings, certifications and review be scrupulously complied with; and that you allow only persons who are properly licensed and rated, and thoroughly familiar with the contents of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual to operate the aircraft. IMPROPER OPERATION OR MAINTENANCE OF AN AIRCRAFT, NO MATTER HOW WELL BUILT INITIALLY, CAN RESULT IN CONSIDERABLE DAMAGE OR TOTAL DESTRUCTION OF THE AIRCRAFT ALONG WITH SERIOUS OR FATAL INJURIES TO ALL OCCUPANTS.

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GENERAL

As a pilot, you are responsible to yourself and to those who fly with you, to other pilots and their passengers and to people on the ground, to fly wisely and safely.

The following material in this Safety Section covers several subjects in limited detail. Here are some condensed Do's and Don'ts.

DO'S

Be thoroughly familiar with your airplane, know its limitations and your own.

Be current in your airplane, or fly with a qualified instructor until you are current. Practice until you are proficient.

Preplan all aspects of your flight - including a proper weather briefing and adequate fuel reserves.

Use services available - weather briefing, inflight weather and Flight Service Station.

Carefully preflight your airplane.

Use the approved checklist.

Have more than enough fuel for takeoff, plus the trip, and an adequate reserve.

Be sure your weight loading and C.G. are within limits.

Use seatbelts and shoulder harnesses at all times.

Be sure all loose articles and baggage are secured.

Check freedom and proper direction of operation of all controls during preflight.

Maintain the prescribed airspeeds in takeoff, climb, descent, and landing.

Avoid wake turbulence (Vortices).

Preplan fuel and fuel tank management before the actual flight. Utilize auxiliary tanks only in level cruise flight. Take off and land on the fullest main tank, NEVER use auxiliary fuel tanks for take off or landing.

Practice emergency procedures at safe altitudes and airspeeds, preferably with a qualified instructor pilot, until the required action is instinctive.

Keep your airplane in good mechanical condition.

Stay informed and alert; fly in a sensible manner.

DON'TS

Don't take off with frost, ice or snow on the airplane.

Don't take off with less than minimum recommended fuel, plus adequate reserves, and don't run the tank dry before switching.

Don't fly in a reckless, show-off, or careless manner.

Don't fly into thunderstorms or severe weather.

Don't fly in possible icing conditions unless the airplane is approved, properly equipped, and all required equipment is operational for flight in icing conditions.

Don't fly close to mountainous terrain.

Don't apply controls abruptly or with high forces that could exceed design loads of the airplane.

Don't fly into weather conditions that are beyond your ratings or current proficiency.

Don't fly when physically or mentally exhausted or below par.

Don't trust to luck.

SOURCES OF INFORMATION

There is a wealth of information available to the pilot created for the sole purpose of making your flying safer, easier and more efficient. Take advantage of this knowledge and be prepared for an emergency in the event that one should occur.

PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL

You must be thoroughly familiar with the contents of your operating manuals, placards, and check lists to ensure safe utilization of your airplane. When the airplane was manufactured, it was equipped with one or more of the following: placards, Owner's Manual, FAA Flight Manual, Approved Airplane Flight Manual Supplements, Pilot's Operating Handbook and FAA Approved Airplane Flight Manual. Beech has revised and reissued many of the early manuals for certain models of airplanes in GAMA Standard Format as Pilot's Operating Handbooks and FAA Approved Airplane Flight Manuals. For simplicity and convenience, all official manuals in various models are referred to as the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual. If the airplane has changed ownership, the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual may have been misplaced or may not be current. Replacement handbooks may be obtained from any BEECHCRAFT Aviation Center.

BEECHCRAFT SERVICE PUBLICATIONS

Beech Aircraft Corporation publishes a wide variety of manuals, service letters, service instructions, service bulletins, safety communiques and other publications for the various models of BEECHCRAFT airplanes. Information on how to obtain publications relating to your airplane is contained in BEECHCRAFT Service Bulletin number 2001, entitled "General - BEECHCRAFT Service Publications -What is Available and How to Obtain It."

Beech Aircraft Corporation automatically mails original issues and revisions of BEECHCRAFT Mandatory and Optional Service Bulletins, FAA Approved Airplane Flight Manual Supplements, reissues and revisions of FAA Approved Airplane Flight Manuals, Flight Handbooks, Owners Manuals, Pilot's Operating Manuals and Pilot's Operating Handbooks, and original issues and revisions of BEECHCRAFT Safety Communiques to BEECHCRAFT Owners addresses as listed by the FAA Aircraft Registration Branch List and the BEECHCRAFT International Owner Notification Service List. While this information is distributed by Beech Aircraft Corporation, Beech can not make changes in the name or address furnished by the FAA. The owner must contact the FAA regarding any changes to name or address. Their address is: FAA Aircraft Registration Branch (AAC250) P.O. Box 25082, Oklahoma City, OK 73125, Phone (405) 680-2131.

It is the responsibility of the FAA owner of record to ensure that any mailings from Beech are forwarded to the proper persons. Often the FAA registered owner is a bank or financing company or an individual not in possession of the airplane. Also, when an airplane is sold, there is a lag in processing the change in registration with the FAA. If you are a new owner, contact your BEECHCRAFT dealer and ensure your manuals are up to date.

Beech Aircraft Corporation provides a subscription service which provides for direct factory mailing of BEECHCRAFT publications applicable to a specific serial number airplane. Details concerning the fees and ordering information for this owner subscription service are contained in Service Bulletin number 2001.

For owners who choose not to apply for a Publications Revision Subscription Service, Beech provides a free Owner Notification Service by which owners are notified by post card of BEECHCRAFT manual reissues, revisions and supplements which are being issued applicable to the airplane owned. On receipt of such notification, the owner may obtain the publication through a BEECHCRAFT Aviation Center, Aero Center or International Distributor. This notification service is available when requested by the owner. This request may be made by using the owner notification request card furnished with the loose equipment of each airplane at the time of delivery, or by a letter requesting this service, referencing the specific airplane serial number owned. Write to :

Supervisor, Special Services
Dept. 52
Beech Aircraft Corporation
P.O. Box 85
Wichita, Kansas 67201-0085

From time to time Beech Aircraft Corporation issues BEECHCRAFT Safety Communiques dealing with the safe operation of a specific series of airplanes, or airplanes in general. It is recommended that each owner/operator maintain a current file of these publications. Back issues of BEECHCRAFT Safety Communiques may be obtained without charge by sending a request, including airplane model and serial number, to the Supervisor, Special Services, at the address listed above.

Airworthiness directives (AD's) are not issued by the manufacturer. They are issued and available from the FAA.

FEDERAL AVIATION REGULATIONS

FAR Part 91, General Operating and Flight Rules, is a document of law governing operation of aircraft and the owner's and pilot's responsibilities. Some of the subjects covered are:

Responsibilities and authority of the pilot-in-command

Certificates required

Liquor and Drugs

Flight plans

Preflight action

Fuel requirements

Flight Rules

Maintenance, preventive maintenance, alterations, inspection and maintenance records

You, as a pilot, have responsibilities under government regulations. The regulations are designed for your protection and the protection of your passengers and the public. Compliance is mandatory.

AIRWORTHINESS DIRECTIVES

FAR Part 39 specifies that no person may operate a product to which an airworthiness directive issued by the FAA applies, except in accordance with the requirements of that airworthiness directive.

AIRMAN'S INFORMATION MANUAL

The Airman's Information Manual (AIM) is designed to provide airmen with basic flight information and ATC procedures for use in the national airspace system of the United States. It also contains items of interest to pilots concerning health and medical facts, factors affecting flight safety, a pilot/controller glossary of terms in the Air Traffic Control system, information on safety, and accident/hazard reporting. It is revised at six-month intervals and can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

This document contains a wealth of pilot information. Among the subjects are:

Controlled Airspace

Emergency Procedures

Services Available to Pilots
Weather and Icing
Radio Phraseology and Technique
Mountain Flying
Airport Operations
Wake Turbulence - Vortices
Clearances and Separations
Medical Facts for Pilots
Preflight
Bird Hazards
Departures - IFR
Good Operating Practices
En route - IFR
Airport Location Director
Arrival - IFR

All pilots must be thoroughly familiar with and use the information in the AIM.

ADVISORY INFORMATION

NOTAMS (Notices to Airmen) are documents that have information of a time-critical nature that would affect a pilot's decision to make a flight; for example, an airport closed, terminal radar out of service, or enroute navigational aids out of service.

FAA ADVISORY CIRCULARS

The FAA issues Advisory Circulars to inform the aviation public in a systematic way of nonregulatory material of interest. Advisory Circulars contain a wealth of information with which the prudent pilot should be familiar. A complete list of current FAA Advisory Circulars is published in AC 00-2, which lists Advisory Circulars that are for sale, as well as those distributed free of charge by the FAA, and provides ordering information. Many Advisory Circulars which are for sale can be purchased locally in aviation bookstores or at FBO's. These documents are subject to periodic revision. Be certain the Advisory Circular you are using is the latest revision available. Some of the Advisory Circulars of interest to pilots are:

*00-6	Aviation Weather
00-24	Thunderstorms
00-30	Rules of Thumb for Avoiding or Minimizing Encounters with Clear Air Turbulence
*00-45	Aviation Weather Services
00-46	Aviation Safety Reporting Program
20-5	Plane Sense
20-32	Carbon Monoxide (CO) Contamination in Aircraft - Detection and Prevention
20-35	Tie-Down Sense
20-43	Aircraft Fuel Control
20-105	Engine-Power Loss Accident Prevention
20-113	Pilot Precautions and Procedures to be Taken in Preventing Aircraft Reciprocating Engine Induction System and Fuel System Icing Problems
20-125	Water in Aviation Fuels
21-4	Special Flight Permits for Operation of Overweight Aircraft
43-9	Maintenance Records: General Aviation Aircraft
43-12	Preventive Maintenance
60-4	Pilot's Spatial Disorientation
60-6	Airplane Flight Manuals (AFM), Approved Manual Materials, Markings and Placards - Airplanes
60-12	Availability of Industry-Developed Guidelines for the Conduct of the Biennial Flight Review
60-13	The Accident Prevention Counselor Program
*61-9	Pilot Transition Courses for Complex Single-Engine and Light Twin-Engine Airplanes
*61-21	Flight Training Handbook
*61-23	Pilot's Handbook of Aeronautical Knowledge
*61-27	Instrument Flying Handbook
61-67	Hazards Associated with Spins in Airplanes Prohibited from Intentional Spinning.
61-84	Role of Preflight Preparation
*67-2	Medical Handbook for Pilots
90-23	Aircraft Wake Turbulence
90-42	Traffic Advisory Practices at Nontower Airports
90-48	Pilot's Role in Collision Avoidance
90-66	Recommended Standard Traffic Patterns for Airplane Operations at Uncontrolled Airports
90-85	Severe Weather Avoidance Plan (SWAP)
91-6	Water, Slush and Snow on the Runway
91-13	Cold Weather Operation of Aircraft

*91-23	Pilot's Weight and Balance Handbook
91-26	Maintenance and Handling of Air Driven Gyroscopic Instruments
91-33	Use of Alternate Grades of Aviation Gasoline for Grade 80/.87
91-35	Noise, Hearing Damage, and Fatigue in General Aviation Pilots
91-43	Unreliable Airspeed Indications
91-44	Operational and Maintenance Practices for Emergency Locator Transmitters and Receivers
91-46	Gyroscopic Instruments - Good Operating Practices
91-50	Importance of Transponder Operations and Altitude Reporting
91-51	Airplane Deice and Anti-ice Systems
91-59	Inspection and Care of General Aviation Aircraft Exhaust Systems
91-65	Use of Shoulder Harness in Passenger Seats
103-4	Hazards Associated with Sublimation of Solid Carbon Dioxide (Dry Ice) Aboard Aircraft
135-9	FAR Part 135 Icing Limitations
210-5A	Military Flying Activities

NOTE:

*** For Sale**

FAA GENERAL AVIATION NEWS

FAA General Aviation News is published by the FAA in the interest of flight safety. The magazine is designed to promote safety in the air by calling the attention of general aviation airmen to current technical, regulatory and procedural matters affecting the safe operation of aircraft. FAA General Aviation News is sold on subscription by the Superintendent of Documents, Government Printing Office, Washington D.C., 20402.

FAA ACCIDENT PREVENTION PROGRAM

The FAA assigns accident prevention specialists to each Flight Standards and General Aviation District Office to organize accident prevention program activities. In addition, there are over 3,000 volunteer airmen serving as accident prevention counselors, sharing their technical expertise and professional knowledge with the general aviation community. The FAA conducts seminars and workshops, and distributes invaluable safety information under this program.

Usually the airport manager, the FAA Flight Service Station (FSS), or Fixed Base Operator (FBO), will have a list of accident prevention counselors and their phone numbers available. All Flight Standards and General Aviation District Offices have a list of the counselors serving the District.

Before flying over unfamiliar territory, such as mountainous terrain or desert areas, it is advisable for transient pilots to consult with local counselors. They will be familiar with the more desirable routes, the wind and weather conditions, and the service and emergency landing areas that are available along the way. They can also offer advice on the type of emergency equipment you should be carrying.

ADDITIONAL INFORMATION

The National Transportation Safety Board and the Federal Aviation Administration periodically issue, in greater detail, general aviation pamphlets concerning aviation safety. FAA Regional Offices also publish material under the FAA General Aviation Accident Prevention Program. These can be obtained at FAA Offices, Weather Stations, Flight Service Stations or Airport Facilities. Some of these are titled:

12 Golden Rules for Pilots
Weather or Not
Disorientation
Plane Sense
Weather Info Guide for Pilots
Wake Turbulence
Don't Trust to Luck, Trust to Safety
Rain, Fog, Snow
Thunderstorm - TRW
Icing
Pilot's Weather Briefing Guide
Thunderstorms Don't Flirt ... Skirt 'em
IFR-VFR - Either Way Disorientation Can Be Fatal
IFR Pilot Exam-O-Grams
VFR Pilot Exam-O-Grams
Flying Light Twins Safely
Tips on Engine Operation in Small General Aviation Aircraft
Estimating Inflight Visibility
Is the Aircraft Ready for Flight
Tips on Mountain Flying
Tips on Desert Flying
Always Leave Yourself An Out
Safety Guide for Private Aircraft Owners
Tips on How to Use the Flight Planner

GENERAL INFORMATION ON SPECIFIC TOPICS

MAINTENANCE

Safety of flight begins with a well maintained airplane. Make it a habit to keep your aircraft and all of its equipment in airworthy condition. Keep a "squawk list" on board, and see that all discrepancies, however minor, are noted and promptly corrected.

Schedule your maintenance regularly, and have your aircraft serviced by a reputable organization. Be suspicious of bargain prices for maintenance, repair and inspections.

It is the responsibility of the owner and the operator to assure that the airplane is maintained in an airworthy condition and that proper maintenance records are kept.

Use only genuine BEECHCRAFT or BEECHCRAFT approved parts obtained from BEECHCRAFT approved sources, in connection with the maintenance and repair of Beech airplanes.

Genuine BEECHCRAFT parts are produced and inspected under rigorous procedures to insure airworthiness and suitability for use in Beech airplane applications. Parts purchased from sources other than BEECHCRAFT, even though outwardly identical in appearance, may not have had the required tests and inspections performed, may be different in fabrication techniques and materials, and may be dangerous when installed in an airplane.

Salvaged airplane parts, reworked parts obtained from non-BEECHCRAFT approved sources or parts, components, or structural assemblies, the service history of which is unknown or cannot be authenticated, may have been subjected to unacceptable stresses or temperatures or have other hidden damage not discernible through routine visual or usual nondestructive testing techniques. This may render the part, component or structural assembly, even though originally manufactured by BEECHCRAFT, unsuitable and unsafe for airplane use.

BEECHCRAFT expressly disclaims any responsibility for malfunctions, failures, damage or injury caused by use of non-BEECHCRAFT parts.

Airplanes operated for Air Taxi or other than normal operation, and airplanes operated in humid tropics, or cold and damp climates, etc., may need more frequent inspections for wear, corrosion and/or lack of lubrication. In these areas, periodic inspections should be performed until the operator can set his own inspection periods based on experience.

NOTE

The required periods do not constitute a guarantee that the item will reach the period without malfunction, as the aforementioned factors cannot be controlled by the manufacturer.

Corrosion and its effects must be treated at the earliest possible opportunity. A clean, dry surface is virtually immune to corrosion. Make sure that all drain holes remain unobstructed. Protective films and sealants help to keep corrosive agents from contacting metallic surfaces. Corrosion inspections should be made most frequently under high-corrosion-risk operating conditions, such as in areas of excessive airborne salt concentrations (e.g., near the sea) and in high-humidity areas (e.g., tropical regions).

If you have purchased a used aircraft, have your mechanic inspect the aircraft registration records, logbooks and maintenance records carefully. An unexplained period of time for which the aircraft has been out of service, or unexplained significant repairs may well indicate the aircraft has been seriously damaged in a prior accident. Have your mechanics inspect a used aircraft carefully. Take the time to ensure that you really know what you are buying when you buy a used aircraft.

HAZARDS OF UNAPPROVED MODIFICATIONS

Many aircraft modifications are approved under Supplemental Type Certificates (STC's). Before installing an STC on your airplane, check to make sure that the STC does not conflict with other STC's that have already been installed. Because approval of an STC is obtained by the individual STC holder based upon modification of the original type design, it is possible for STC's to interfere with each other when both are installed. Never install an unapproved modification of any type, however innocent the apparent modification may seem. Always obtain proper FAA approval.

Aircraft owners and maintenance personnel are particularly cautioned not to make attachments to, or otherwise modify, seats from original certification without approval from the FAA Engineering and Manufacturing District Office having original certification responsibility for that make and model.

Any unapproved attachment or modification to seat structure may increase load factors and metal stress which could cause failure of seat structure at a lesser "G" force than exhibited for original certification.

Examples of unauthorized attachments found are drilling holes in seat tubing to attach fire extinguishers and drilling holes to attach approach plate book bins to seats.

FLIGHT PLANNING

FAR Part 91 requires that each pilot in command, before beginning a flight, familiarize himself with all available information concerning that flight.

Obtain a current and complete preflight briefing. This should consist of local, enroute and destination weather and enroute navaid information. Enroute terrain and obstructions, alternate airports, airport runways active, length of runways, and takeoff and landing distances for the airplane for conditions expected should be known.

The prudent pilot will review his planned en route track and stations and make a list for quick reference. It is strongly recommended a flight plan be filed with Flight Service Stations, even though the flight may be VFR. Also, advise Flight Service Stations of changes or delays of one hour or more and remember to close the flight plan at destination.

The pilot must be completely familiar with the performance of the airplane and performance data in the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual. The resultant effect of temperature and pressure altitude must be taken into account in performance if not accounted for on the charts. An applicable FAA Approved Flight Manual must be aboard the airplane at all times and include the weight and balance forms and equipment list.

PASSENGER INFORMATION CARDS

Beech has available, for most current production airplanes, passenger information cards which contain important information on the proper use of restraint systems, oxygen masks, emergency exits and emergency bracing procedures. Passenger information cards may be obtained at any BEECHCRAFT Aviation or Aero Center. A pilot should not only be familiar with the information contained in the cards, but should always, prior to flight, inform the passengers of the information contained in the information cards. The pilot should orally brief the passengers on the proper use of restraint systems, doors and emergency exits, and other emergency procedures, as required by Part 91 of the FAR's.

STOWAGE OF ARTICLES

The space between the seat pan and the floor is utilized to provide space for seat displacement. If hard, solid objects are stored beneath seats, the energy absorbing feature is lost and severe spinal injuries can occur to occupants.

Prior to flight, pilots should insure that articles are not stowed beneath seats that would restrict seat pan energy absorption or penetrate the seat in event of a high vertical velocity accident.

FLIGHT OPERATIONS

GENERAL

The pilot MUST be thoroughly familiar with ALL INFORMATION published by the manufacturer concerning the airplane, and is required by law to operate the airplane in accordance with the FAA Approved Airplane Flight Manual and placards installed.

PREFLIGHT INSPECTION

In addition to maintenance inspections and preflight information required by FAR Part 91, a complete, careful preflight inspection is imperative.

Each airplane has a checklist for the preflight inspection which must be followed. USE THE CHECKLIST!

WEIGHT AND BALANCE

Maintaining center of gravity within the approved envelope throughout the planned flight is an important safety consideration.

The airplane must be loaded so as not to exceed the weight and center of gravity (C.G.) limitations. Airplanes that are loaded above the maximum takeoff or landing weight limitations will have an overall lower level of performance compared to that shown in the Performance section of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual. If loaded above maximum takeoff weight, takeoff distance and the landing distance will be longer than that shown in the Performance section; the stalling speed will be higher, rate of climb, the cruising speed, and the range of the airplane at any level of fuel will all be lower than shown in the Performance section.

If an airplane is loaded so that the C.G. is forward of the forward limit it will require additional control movements for maneuvering the airplane with correspondingly higher control forces. The pilot may have difficulty during takeoff and landing because of the elevator control limits.

If an airplane is loaded aft of the aft C.G. limitation, the pilot will experience a lower level of stability. Airplane characteristics that indicate a lower stability level are; lower control forces, difficulty in trimming the airplane, lower control forces for maneuvering with attendant danger of structural overload, decayed stall characteristics, and a lower level of lateral-directional damping.

Ensure that all cargo and baggage is properly secured before takeoff. A sudden shift in balance at rotation can cause controllability problems.

AUTOPILOTS AND ELECTRIC TRIM SYSTEMS

Because there are several different models of autopilots and electric trim systems installed in Beech airplanes and different installations and switch positions are possible from airplane to airplane, it is essential that every owner/operator review his Airplane Flight Manual (AFM) Supplements and ensure that the supplements properly describe the autopilot and trim installations on his specific airplane. Each pilot, prior to flight, must be fully aware of the proper procedures for operation, and particularly disengagement, for the system as installed.

In addition to ensuring compliance with the autopilot manufacturer's maintenance requirements, all owners/operators should thoroughly familiarize themselves with the operation, function and procedures described in the Airplane Flight Manual Supplements. Ensure a full understanding of the methods of engagement and disengagement of the autopilot and trim systems.

Compare the descriptions and procedures contained in the Supplements to the actual installation in the airplane to ensure that the supplement accurately describes your installation. Test that all buttons, switches and circuit breakers function as described in the Supplements. If they do not function as described, have the system repaired by a qualified service agency. If field service advice or assistance is necessary, contact Beech Aircraft Corporation, Customer Support Department.

As stated in all AFM Supplements for autopilot systems and trim systems installed on Beech airplanes, the preflight check must be conducted before every flight. The preflight check assures not only that the systems and all of their features are operating properly, but also that the pilot, before flight, is familiar with the proper means of engagement and disengagement of the autopilot and trim system.

Autopilot Airplane Flight Manual Supplements caution against trying to override the autopilot system during flight without disengaging the autopilot because the autopilot will continue to trim the airplane and oppose the pilot's actions. This could result in a severely out of trim condition. This is a basic feature of all autopilots with electric trim follow-up.

Do not try to manually override the autopilot during flight.

IN CASE OF EMERGENCY, YOU CAN OVERPOWER THE AUTOPILOT TO CORRECT THE ATTITUDE, BUT THE AUTOPILOT AND ELECTRIC TRIM MUST THEN IMMEDIATELY BE DISENGAGED.

It is often difficult to distinguish an autopilot malfunction from an electric trim system malfunction. The safest course is to deactivate both. Do not re-engage either system until after you have safely landed. Then have the systems checked by a qualified service facility prior to further flight.

Depending upon the installation on your airplane, the following additional methods may be available to disengage the autopilot or electric trim in the event that the autopilot or electric trim does not disengage utilizing the disengage methods specified in the Supplements.

CAUTION

Transient control forces may occur when the autopilot is disengaged.

1. Turn off the autopilot master switch, if installed.
2. Pull the autopilot and trim circuit breaker(s) or turn off the autopilot switch breaker, if installed.
3. Turn off the RADIO MASTER SWITCH, if installed, and if the autopilot system and the trim system are wired through this switch.

CAUTION

Radios, including VHF COMM are also disconnected when the radio master switch is off.

4. Turn off the ELECTRIC MASTER SWITCH.

WARNING

Most electrically powered systems will be inoperative. Consult the AFM for further information.

5. Push the GA switch on throttle grip, if installed, depending upon the autopilot system.
6. Push TEST EACH FLT switch on the autopilot controller, if installed.

NOTE

After the autopilot is positively disengaged, it may be necessary to restore other electrical functions. Be sure when the master switches are turned on that the autopilot does not re-engage.

The above ways may or may not be available on your autopilot. It is essential that you read your airplane's AFM SUPPLEMENT for your autopilot system and check such function and operation on your system.

The engagement of the autopilot must be done in accordance with the instructions and procedures contained in the AFM SUPPLEMENT.

Particular attention must be paid to the autopilot settings prior to engagement. If you attempt to engage the autopilot when the airplane is out of trim, a large attitude change may occur.

IT IS ESSENTIAL THAT THE PROCEDURES SET FORTH IN THE APPROVED AFM SUPPLEMENTS FOR YOUR SPECIFIC INSTALLATION BE FOLLOWED BEFORE ENGAGING THE AUTOPILOT.

TURBULENT WEATHER

A complete and current weather briefing is a requirement for a safe trip.

Updating of weather information en route is also essential. The wise pilot knows that weather conditions can change quickly, and treats weather forecasting as professional advice, rather than an absolute fact. He obtains all the advice he can, but stays alert to any sign or report of changing conditions.

Plan the flight to avoid areas of reported severe turbulence. It is not always possible to detect individual storm areas or find the in-between clear areas.

The National Weather Service classifies turbulence as follows:

Class of Turbulence	Effect
Extreme	Aircraft is violently tossed about and is practically impossible to control. May cause structural damage.
Severe	Aircraft may be momentarily out of control. Occupants are thrown violently against the belts and back into the seat. Unsecured objects are tossed about.
Moderate	Occupants require seat belts and occasionally are thrown against the belt. Unsecured objects move about.
Light	Occupants may be required to use seat belts, but objects in the aircraft remain at rest.

Thunderstorms, squall lines and violent turbulence should be regarded as extremely dangerous and must be avoided. Hail and tornadic wind velocities can be encountered in thunderstorms that can destroy any airplane, just as tornadoes destroy nearly everything in their path on the ground.

Thunderstorms also pose the possibility of a lightning strike on an aircraft. Any structure or equipment which shows evidence of a lightning strike, or of being subjected to a high current flow due to a strike, or is a suspected part of a lightning strike path through the aircraft should be thoroughly inspected and any damage repaired prior to additional flight.

A roll cloud ahead of a squall line or thunderstorm is visible evidence of extreme turbulence; however, the absence of a roll cloud should not be interpreted as denoting that severe turbulence is not present.

Even though flight in severe turbulence must be avoided, flight in turbulent air may be encountered unexpectedly under certain conditions.

The following recommendations should be observed for airplane operation in turbulent air:

Flying through turbulent air presents two basic problems, the answer to both of which is proper airspeed. On one hand, if you maintain an excessive airspeed, you run the risk of structural damage or failure; on the other hand, if your airspeed is too low, you may stall.

If turbulence is encountered, reduce speed to the turbulent air penetration speed, if given, or to the maneuvering speed, which is listed in the Limitations section of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual. These speeds give the best assurance of avoiding excessive stress loads, and at the same time providing the proper margin against inadvertent stalls due to gusts.

Beware of overcontrolling in an attempt to correct for changes in attitude; applying control pressure abruptly will build up G-forces rapidly and could cause structural damage or even failure. You should watch particularly your angle of bank, making turns as wide and shallow as possible. Be equally cautious in applying forward or back pressure to keep the airplane level. Maintain straight and level attitude in either up or down drafts. Use trim sparingly to avoid being grossly out of trim as the vertical air columns change velocity and direction. If necessary to avoid excessive airspeeds, lower the landing gear.

WIND SHEAR

Wind shears are rapid, localized changes in wind direction, which can occur vertically as well as horizontally. Wind shear can be very dangerous to all aircraft, large and small, particularly on approach to landing when airspeeds are slow.

A horizontal wind shear is a sudden change in wind direction or speed that can, for example, transform a headwind into a tailwind, producing a sudden decrease in indicated airspeed because of the inertia of the aircraft. A vertical wind shear, is a sudden updraft or downdraft. Microbursts are intense, highly localized severe downdrafts.

The prediction of wind shears is far from an exact science. Monitor your airspeed carefully when flying near storms, particularly on approach. Be mentally prepared to add power and go around at the first indication that a wind shear is being encountered.

FLIGHT IN ICING CONDITIONS

Every pilot should be intimately acquainted with the FAA Approved National Weather Service definitions for ice intensity and accumulation which we have reprinted below:

INTENSITY	ICE ACCUMULATION
Trace	Ice becomes perceptible. Rate of accumulation slightly greater

	than rate of sublimation. It is not hazardous even though deicing/anti-icing equipment is not utilized, unless encountered for an extended period of time (over 1 hour).
Light	The rate of accumulation may create a problem if flight is prolonged in this environment (over 1 hour). Occasional use of deicing/anti-icing equipment removes/prevents accumulation. It does not present a problem if the deicing/anti-icing equipment is used.
Moderate	The rate of accumulation is such that even short encounters become potentially hazardous and use of deicing/anti-icing equipment or diversion is necessary.
Severe	The rate of accumulation is such that deicing/anti-icing equipment fails to reduce or control the hazard. Immediate diversion is necessary.

It is no longer unusual to find deicing and anti-icing equipment on a wide range of airplane sizes and types. Since the capability of this equipment varies, it becomes the pilot's primary responsibility to understand limitations which restrict the use of his airplane in icing conditions and the conditions which may exceed the systems capacity.

Pilots and airplane owners must carefully review the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual in order to ascertain the required operable equipment needed for flight in icing conditions. In addition, they must ascertain from the same sources the limits of approval or certification of their airplane for flight in icing conditions, and plan the flight accordingly, if icing conditions are known or forecast along the route.

Every owner and pilot of an airplane should understand that it is not uncommon to find aircraft equipped with less than the full complement of available systems and equipment. For example, propellers and pitot tube may be protected, but the aircraft may not have wing boots or tail boots. The reverse might be true. Windshield, pitot and airfoil surfaces might be protected, but the propellers might not be. Before undertaking any flight into areas where icing conditions might be suspected, inspect the aircraft and review the Pilot's Operating Handbook and FAA Approved Flight Manual to be certain that you are supported by the full complement of required IFR and deicing/anti-icing equipment.

Remember that regardless of its combination of deicing/anti-icing equipment, any aircraft not fully equipped and functional for IFR flight is not properly equipped for flight in icing conditions. An airplane which is not approved or certificated for flight in icing conditions, or which does not have all critical areas protected in the required manner by fully operational anti-icing equipment must not be exposed to icing encounters of any intensity. When icing is detected, the pilot of such an aircraft must make an immediate diversion by flying out of the area of visible moisture or going to an altitude where icing is not encountered.

Some models of Beech airplanes were approved for flight in certain limited icing conditions under the FAA's Bureau of Flight Standards Release No. 434. Under this release, properly equipped airplanes are approved for flight in light to moderate icing conditions only. See Sections 2 and 4 of this manual for icing limitations. These aircraft are not approved for extended flight in moderate icing conditions or flights in any severe icing conditions. Flight in these conditions must be avoided.

Even airplanes fully equipped and certified for flight in the icing conditions described in Appendix C to FAR Part 25 must avoid flights into those conditions defined by the National Weather Service as "Severe". The National Weather Service definition of "Severe Icing" describes that conditions as: "the rate of accumulation is such that deicing/anti-icing equipment fails to reduce or control the hazard." No airplane equipped with any combination of deicing/anti-icing equipment can be expected to cope with such conditions. As competent pilots know, there appears to be no predictable limits for the severest weather conditions. For essentially the same reasons that airplanes, however designed or equipped for IFR flight, cannot be flown safely into conditions such as thunderstorms, tornadoes, hurricanes or other phenomena likely to produce severe turbulence, airplanes equipped for flight in icing conditions cannot be expected to cope with "Severe" icing conditions as defined by the National Weather Service. The prudent pilot must remain alert to the possibility that icing conditions may become "severe" and that his equipment will not cope with them. At the first indication that such condition may have been encountered or may lie ahead, he should immediately react by selecting the most expeditious and safe course for diversion.

Every pilot of a properly fully-equipped Beech airplane who ventures into icing conditions must maintain the minimum speed (KIAS) for operation in icing conditions, which is set forth in the Normal Procedures section, and in the Limitations section, of his Pilot's Operating Handbook and FAA Approved Airplane Flight Manual. a minimum speed for flight in icing conditions is not specified in the manual, the following minimum indicated airspeeds must be maintained:

All Baron and Travel Air Models - 130 KIAS

All other BEECHCRAFT twin-engine models - 140 KIAS

The pilot must remain aware of the fact that if he allows his airspeed to deteriorate below this minimum speed, he will increase the angle of attack of his airplane to the point where ice may build up on the under side of the wings aft of the area protected by the boots.

The fact or extent of ice build-up in unprotected areas will not be directly observable from the cockpit. Due to distortion of the wing airfoil, increased drag and reduced lift, stalling speeds will increase as ice accumulates on the airplane. For the same reasons, stall warning devices are not accurate and cannot be relied upon in icing conditions.

Even though the pilot maintains the prescribed minimum speeds for operating in icing conditions, ice is still likely to build up on the unprotected areas (the fuselage and unprotected wing leading edge inboard of the engine nacelle). Under some atmospheric conditions, it may even build up aft of the boots despite the maintenance of the prescribed minimum speed. The effect of ice accumulation on any unprotected surface is aggravated by length of exposure to the icing conditions. Ice buildup on unprotected surfaces will increase drag, add weight, reduce lift, and generally, adversely affect the aerodynamic characteristics and performance of the airplane. It can progress to the point where the airplane is no longer capable of flying. Therefore, the pilot operating even a fully-equipped airplane in sustained icing conditions must remain sensitive to any indication, such as observed ice accumulation, loss of airspeed, the need for increased power, reduced rate of climb, or sluggish response, that ice is accumulating on unprotected surfaces and that continued flight in these conditions is extremely hazardous, regardless of the performance of the deicing/anti-icing equipment.

Since flight in icing conditions is not an everyday occurrence, it is important that pilots maintain a proper proficiency and awareness of the operating procedures necessary for safe operation of the airplane and that the airplane is in a condition for safe operation.

Ensure moisture drains in the aircraft structure are maintained open as specified in the Aircraft Maintenance Manual, so that moisture will not collect and cause freezing in the control cable area. Also, control surfaces tab hinges should be maintained and lubricated as specified in the Aircraft Maintenance Manual.

In icing conditions the autopilot should be disengaged at an altitude sufficient to permit the pilot to gain the feel of the aircraft prior to landing. In no case should this be less than the minimum altitude specified in the Autopilot Airplane Flight Manual Supplement.

Observe the procedures set forth in your Pilot's Operating Handbook and FAA Approved Airplane Flight Manual during operation in icing conditions.

Activate your deice and anti-icing systems before entering an area of moisture where you are likely to go through a freezing level, to make sure all necessary equipment is operative.

Rapid cycling of deice boots or cycling before at least one-half inch (1/2") of ice has accumulated (measured in the chordwise direction or forward from the leading edge), may cause the ice to grow outside the contour of the inflated boots and prevent ice removal.

For any owner or pilot whose use pattern for an aircraft exposes it to icing encounters, the following references are required reading for safe flying:

> The aircraft's Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, especially the sections on Normal Procedures, Emergency Procedures, Abnormal Procedures, Systems, and Safety Information.
>
> FAA Advisory Circulars 91-51 Airplane Deice and Anti-ice Systems
>
> FAA Advisory Circulars 135-9 - Icing Limitations
>
> Weather Flying by Robert N. Buck.

Finally, the most important ingredients to safe flight in icing conditions - regardless of the aircraft or the combination of deicing/anti-icing equipment - are a complete and current weather briefing, sound pilot judgement, close attention to the rate and type of ice accumulations, and the knowledge that "severe icing" as defined by the National Weather Service is beyond the capability of modern aircraft and immediate diversion must be made. It is the inexperienced or uneducated pilot who presses on "regardless", hoping that steadily worsening conditions will improve, only to find himself flying an airplane which has become so loaded with ice that he can no longer maintain altitude. At this point he has lost most, if not all, of his safety options, including perhaps a 180 degree turn to return along the course already traveled.

The responsible and well-informed pilot recognizes the limitations of weather conditions, his airplane and its systems and reacts promptly.

WEATHER RADAR

Airborne weather avoidance radar is, as its name implies, for avoiding severe weather--not for penetrating it. Whether to fly into an area of radar echoes depends on echo intensity and shape, spacing between the echoes, and the capabilities of you and your aircraft. Remember that weather radar detects only precipitation drops. Therefore, the radar scope provides no assurance of avoiding turbulence. The radar scope also does not provide assurance of avoiding instrument weather from clouds and fog. Your scope may be clear between intense echoes; this clear area does not necessarily mean you can fly between the storms and maintain visual sighting of them.

Thunderstorms build and dissipate rapidly. Therefore, do not attempt to plan a course between echoes using ground based radar. The best use of ground radar information is to isolate general areas and coverage of echoes. You must avoid individual storms from in-flight observations either by visual sighting or by airborne radar. It is better to avoid the whole thunderstorm area than to detour around individual storms unless they are scattered.

Remember that while hail always gives a radar echo, it may fall several miles from the nearest visible cloud and hazardous turbulence may extend to as much as 20 miles from the echo edge. The intensity of the radar echo from hail varies with the size and nature of the hailstone. A hailstone with a wet surface gives a strong radar return while a dry hailstone gives a relatively weak return. Avoid intense or extreme level echoes by at least 20 miles; that is, such echoes should be separated by at least 40 miles before you fly between them. With weaker echoes you can reduce the distance by which you avoid them.

Above all, remember this: never regard any thunderstorm lightly. Even when radar observers report the echoes are of light intensity, avoiding thunderstorms is the best policy. The following are some do's and don'ts of thunderstorm avoidance:

1. Don't land or take off in the face of an approaching thunderstorm. A sudden gust front of low level turbulence could cause loss of control.
2. Don't attempt to fly under a thunderstorm even if you can see through to the other side. Turbulence and wind shear under the storm could be disastrous.
3. Don't fly without airborne radar into a cloud mass containing scattered embedded thunderstorms. Embedded thunderstorms usually can not be visually circumnavigated.
4. Don't trust visual appearance to be a reliable indicator of the turbulence inside a thunderstorm.
5. Do avoid by at least 20 miles any thunderstorm identified as severe or giving an intense radar echo. This is especially true under the anvil of a large cumulonimbus.
6. Do circumnavigate the entire area if the area has 6/10 or greater thunderstorm coverage.
7. Do remember that vivid and frequent lightning indicates the probability of a severe thunderstorm.
8. Do regard as extremely hazardous any thunderstorm with tops 35,000 feet or higher, whether the top is visually sighted or determined by radar.

If you cannot avoid penetrating a thunderstorm, the following are some do's BEFORE entering the storm:

9. Tighten your safety belt, put on your shoulder harness, and secure all loose objects.
10. Plan and hold your course to take you through the storm in minimum time.
11. To avoid the most critical icing, establish a penetration altitude below the freezing level or above the level of -15°C.
12. Verify that pitot heat is on and turn on carburetor heat or engine anti-ice. Icing can be rapid at any altitude and cause almost instantaneous power failure and/or loss of airspeed indication.

MOUNTAIN FLYING

Pilots flying in mountainous areas should inform themselves of all aspects of mountain flying, including the effects of topographic features on weather conditions. Many good articles have been published, and a synopsis of mountain flying operations is included in the FAA Airman's Information Manual, Part 1.

Avoid flight at low altitudes over mountainous terrain, particularly near the lee slopes. If the wind velocity near the level of the ridge is in excess of 25 knots and approximately perpendicular to the ridge, mountain wave conditions are likely over and near the lee slopes. If the wind velocity at the level of the ridge exceeds 50 knots, a strong mountain wave is probable with extreme up and down drafts and severe turbulence. The worst turbulence will be encountered in and below the rotor zone, which is usually 8 to 10 miles downwind from the ridge. This zone is sometimes characterized by the presence of "roll clouds" if sufficient moisture is present; altocumulus standing lenticular clouds are also visible signs that a mountain wave exists, but their presence is likewise dependent on moisture. Mountain wave turbulence can, of course, occur in dry air and the absence of such clouds should not be taken as assurance that mountain wave turbulence will not be encountered. A mountain wave downdraft may exceed the climb capability of your airplane. Avoid mountain wave downdrafts.

VFR - LOW CEILINGS

If you are not instrument rated, do not attempt "VFR on Top" or "Special VFR" flight or clearances. Being caught above a solid cloud layer when an emergency descent is required (or at destination) is an extremely hazardous position for the VFR pilot. Accepting a clearance out of airport control zones with no minimum ceiling and one-mile visibility as permitted with "Special VFR" is a foolish practice for the VFR pilot.

Avoid areas of low ceilings and restricted visibility unless you are instrument rated and proficient and have an instrument equipped airplane. Then proceed with caution and with planned alternates.

VFR AT NIGHT

When flying VFR at night, in addition to the altitude appropriate for the direction of flight, pilots should maintain a safe minimum altitude as dictated by terrain, obstacles such as TV towers, or communities in the area flown. This is especially true in mountainous terrain, where there is usually very little ground reference. Minimum clearance is 2,000 feet above the highest obstacle en route. Do not depend on your ability to see obstacles in time to miss them. Flight on dark nights over sparsely populated country can be the same as IFR, and must be avoided by inexperienced or non-IFR rated pilots.

VERTIGO - DISORIENTATION

Disorientation can occur in a variety of ways. During flight, inner ear balancing mechanisms are subjected to varied forces not normally experienced on the ground. This, combined with loss of outside visual reference, can cause vertigo. False interpretations (illusions) result, and may confuse the pilot's conception of the attitude and position of his airplane.

Under VFR conditions, the visual sense, using the horizon as a reference, can override the illusions. Under low visibility conditions (night, fog, clouds, haze, etc.) the illusions predominate. Only through awareness of these illusions, and proficiency in instrument flight procedures, can an airplane be operated safely in a low visibility environment.

Flying in fog, dense haze or dust, cloud banks, or very low visibility, with strobe lights or rotating beacons turned on can contribute to vertigo. They should be turned off in these conditions, particularly at night.

All pilot's should check the weather and use good judgment in planning flights. The VFR pilot should use extra caution in avoiding low visibility conditions.

Motion sickness often precedes or accompanies disorientation and may further jeopardize the flight.

Disorientation in low visibility conditions is not limited to VFR pilots. Although IFR pilots are trained to look at their instruments to gain an artificial visual reference as a replacement for the loss of a visual horizon, they do not always do so. This can happen when the pilot's physical condition will not permit him to concentrate on his instruments; when the pilot is not proficient in flying instrument conditions in the airplane he is flying; or, when the pilot's work load of flying by reference to his instruments is augmented by such factors as turbulence. Even an instrument rated pilot encountering instrument conditions, intentional or unintentional, should ask himself whether or not he is sufficiently alert and proficient in the airplane he is flying, to fly under low visibility conditions and the turbulence anticipated or encountered.

If any doubt exists, the flight should not be made or it should be discontinued as soon as possible.

The result of vertigo is loss of control of the airplane. If the loss of control is sustained, it will result in an excessive speed accident. Excessive speed accidents occur in one of two manners, either as an inflight airframe separation or as a high speed ground impact; and they are fatal accidents in either case. All airplanes are subject to this form of accident.

For years, Beech Pilot's Operating Handbooks and FAA Approved Flight Manuals have contained instructions that the landing gear should be extended in any circumstance in which the pilot encounters IFR conditions which approach the limits of his capability or his ratings. Lowering the gear in IFR conditions or flight into heavy or severe turbulence, tends to stabilize the aircraft, assists in maintaining proper airspeed, and will substantially reduce the possibility of reaching excessive airspeeds with catastrophic consequences, even where loss of control is experienced.

Excessive speed accidents occur at airspeeds greatly in excess of two operating limitations which are specified in the manuals: Maximum maneuvering speed and the "red line" or maximum operating speed. Such speed limits are set to protect the structure of an airplane. For example, flight controls are designed to be used to their fullest extent only below the airplane's maximum maneuvering speed. As a result, the control surfaces should never be suddenly or fully deflected above maximum maneuvering speed. Turbulence penetration should not be performed above that speed. The accidents we are discussing here occur at airspeeds greatly in excess of these limitations. No airplane should ever be flown beyond its FAA approved operating limitations.

FLIGHT OF MULTI-ENGINE AIRPLANES WITH ONE ENGINE INOPERATIVE

The major difference between flying a twin-engine and single-engine airplane is knowing how to manage the flight if one engine loses power for any reason. Safe flight with one engine inoperative requires an understanding of the basic aerodynamics involved - as well as proficiency in engine out procedures.

Loss of power from one engine affects both climb performance and controllability of twin-engine airplanes. Climb performance depends on an excess of power over that required for level flight. Loss of power from one engine obviously represents a 50% loss of horsepower but, in virtually all twin-engine airplanes, climb performance is reduced by at least 80%. A study of the charts in your Pilot's Operating Handbook and FAA Approved Airplane Flight Manual will confirm this fact. Single-engine climb performance depends on four factors:

Airspeed	too little, or too much, will decrease climb performance
Drag	gear, flaps, cowl flaps, prop, and speed
Power	amount available in excess of that needed for level flight
Weight	passengers, baggage, and fuel load greatly affect climb performance

Loss of power on one engine creates yaw due to asymmetric thrust. Yaw forces must be balanced with the rudder. Loss of power on one engine also reduces airflow over the wing causing a roll toward the "dead" engine which must be balanced with the aileron. The net result of these forces cause the airplane to sideslip slightly toward the dead engine. This sideslip may be balanced by banking slightly (up to 5°) into the operating engine.

CAUTION

In the event of an engine failure with the main tanks less than one-quarter full, corrective action must be taken immediately to prevent large yaw angles from developing and causing stoppage of the remaining engine.

Airspeed is the key to safe single engine operations. For most twin-engine airplanes there is:

Symbol	Description
V_{MCA}	Airspeed below which directional control cannot be maintained
V_{SSE}	Airspeed below which an intentional engine cut should never be made
V_{YSE}	Airspeed that will give the best single engine rate-of-climb (or the slowest loss of altitude)
V_{XSE}	Airspeed that will give the steepest angle-of-climb with one engine out

MINIMUM CONTROL SPEED AIRBORNE (V_{MCA})

V_{MCA} is designated by the red radial on the airspeed indicator and indicates the minimum control speed, airborne at sea level. V_{MCA} is determined by FAA regulations as the minimum airspeed at which it is possible to recover directional control of the airplane within 20 degrees heading change, and thereafter maintain straight flight, with not more than 5 degrees of bank if one engine fails suddenly with:

Takeoff power on both engines

Rearmost allowable center of gravity

Flaps in takeoff position

Propeller windmilling in takeoff pitch configuration

However, sudden engine failures rarely occur with all factors listed above, and therefore, the actual V_{MCA} under any particular situation may be a little slower than the red radial on the airspeed indicator. Most airplanes with an inoperative engine will not maintain level flight at maximum power at speeds at or near V_{MCA}. Consequently, it is not advisable to fly at speeds approaching V_{MCA}, except in training situations or during flight tests. Adhering to the practice of never flying at or below the published V_{MCA} speed for your aircraft does not eliminate loss of directional control as a problem in the event of an engine failure. The pilot must be prepared to to use assertive control input to maintain aircraft control following an engine failure.

INTENTIONAL ONE-ENGINE INOPERATIVE SPEED (V_{SSE})

V_{SSE} is specified by the airplane manufacturer and is the minimum speed at which to perform intentional engine cuts. Use of V_{SSE} is intended to reduce the accident potential from loss of control after engine cuts at or near minimum control speed. V_{MCA} demonstrations are necessary in training but should only be made at safe altitude above the terrain and with power reduction on one engine made at or above V_{SSE}.

BEST SINGLE ENGINE RATE-OF-CLIMB SPEED (V_{YSE})

V_{YSE} is designated by the blue radial on the airspeed indicator. V_{YSE} delivers the greatest gain in altitude in the shortest possible time, and is based on the following criteria:

Critical engine inoperative, and its propeller in the minimum drag position.

Operating engine set at not more than the maximum continuous power.

Landing gear retracted.

Wing flaps up.

Cowl flaps as required for engine cooling.

Aircraft flown at recommended bank angle (up to 5° into operating engine).

Drag caused by a windmilling propeller, extending landing gear, or flaps in the landing position, will severely degrade or destroy single engine climb performance. Since climb performance varies widely with type of airplane, weight, temperature, altitude, and airplane configuration, the climb gradient (altitude gain or loss per mile) may be marginal - or even negative - under some conditions. Study the Pilot's Operating Handbook and FAA Approved Flight Manual for your airplane and know what performance to expect with one engine out.

BEST SINGLE ENGINE ANGLE-OF-CLIMB SPEED (V_{XSE})

V_{XSE} is used only to clear obstructions during initial climb-out as it gives the greatest altitude gain per unit of horizontal distance. It provides less engine cooling and requires more rudder control input than V_{YSE}.

SINGLE ENGINE SERVICE CEILING

The single engine service ceiling is the maximum altitude at which an airplane will climb at a rate of at least 50 feet per minute in smooth air, with one engine inoperative.

The single engine service ceiling chart should be used during flight planning to determine whether the airplane, as loaded, can maintain the Minimum En Route Altitude (MEA) if IFR, or terrain clearance if VFR, following an engine failure.

BASIC SINGLE ENGINE PROCEDURES

Know and follow, to the letter, the single-engine emergency procedures specified in your Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for your specific make and model airplane. However, the basic fundamentals of all the procedures are as follows:

Maintain aircraft control and airspeed at all times. **This is cardinal rule No. 1.**

Usually, apply maximum power to the operating engine. However, if the engine failure occurs at a speed below V_{MCA}, during cruise or in a steep turn, you may elect to use only enough power to maintain a safe speed and altitude. If the failure occurs on final approach, use power only as necessary to complete the landing.

Reduce drag to an absolute minimum.

Secure the failed engine and related sub-systems.

The first three steps should be done promptly and from memory. The check list should then be consulted to be sure that the inoperative engine is secured properly and that the appropriate switches are placed in the correct position. The airplane must be banked about 5° into the operating engine, with the "slip/skid" ball slightly out of center toward the operating engine, to achieve rated performance.

Another note of caution: Be sure to identify the dead engine, positively, before securing it. Remember: First identify the suspected engine (i.e., "Dead foot means dead engine"), second, verify with cautious throttle movement, then secure.

ENGINE FAILURE ON TAKEOFF

If an engine fails before attaining lift-off speed or below V_{MCA}, the only proper action is to discontinue the takeoff. If the engine fails after lift-off with the landing gear still down, the takeoff should still be discontinued if touchdown and roll-out on the remaining runway is still possible.

If you do find yourself in a position of not being able to climb, it is much better to reduce the power on the good engine and land straight ahead than try to force a climb and lose control.

Your Pilot's Operating Handbook and FAA Approved Airplane Flight Manual contains charts that are used in calculating the runway length required to stop if the engine fails before reaching lift-off speed and also has charts showing the single-engine performance after lift-off.

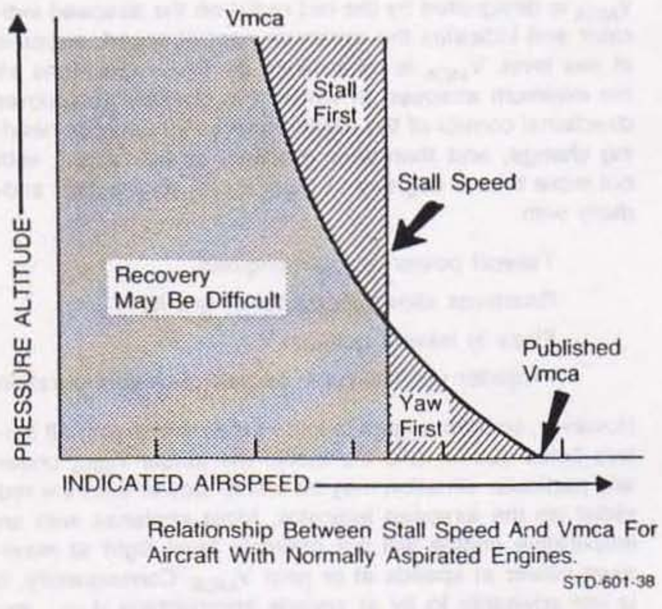
Study your charts carefully. No airplane is capable of climbing out on one engine under all weight, pressure altitude, and temperature conditions. Know, before you take the actual runway, whether you can maintain control and climb out if you lose an engine while the gear is still down. It may be necessary to off-load some weight, or wait for more favorable temperatures.

WHEN TO FLY V_X, V_Y, V_{XSE} AND V_{YSE}

During normal two-engine operations, always fly V_Y (V_X if necessary for obstacle clearance) on initial climb out. Then, accelerate to your cruise climb airspeed, which may be V_Y plus 10 or 15 knots after you have obtained a safe altitude. Use of cruise climb airspeed will give you better engine cooling, increased inflight visibility and better fuel economy. However, at first indication of an engine failure during climb out, or while on approach, establish V_{YSE} or V_{XSE}, whichever is appropriate. (Consult your Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for specifics.)

STALLS, SLOW FLIGHT AND TRAINING

The stall warning system must be kept operational at all times and must not be deactivated by interruption of circuits, circuit breakers, or fuses. Compliance with this requirement is especially important in all high performance multi-engine airplanes during engine-out practice or stall demonstrations, because the stall speed is critical in all low speed operations of high-performance airplanes.



Relationship Between Stall Speed and V_{MCA} for Aircraft with Normally Aspirated Engines

Training should be accomplished under the supervision of a qualified instructor-pilot, with careful reference to the applicable sections of the FAA Practical Test Standards and FAA Pilot Transition Courses for Complex Single Engine and Light Twin Engine Airplanes (AC61-9B). In particular, observe carefully the warnings in the Practical Test Standards.

The single-engine stall speed of a twin-engine aircraft is generally slightly below the power off (engines idle) stall speed, for a given weight condition. Single-engine stalls should not be conducted in multi-engine airplanes by other than qualified engineering test pilots.

Engine-out minimum control speed generally decreases with altitude, while the single engine stall speed remains approximately constant for normally aspirated engines. No such demonstration should be attempted when the altitude and temperature are such that the engine-out minimum control speed is known, or discovered to be, close to the stalling speed. Loss of directional or lateral control, just as a stall occurs, is potentially hazardous.

V_{SSE}, the airspeed below which an engine should not be intentionally rendered inoperative for practice purposes, was established because of the apparent practice of some pilots, instructors, and examiners, of intentionally rendering an engine inoperative at a time when the airplane is being operated at a speed close to, or below the power-idle stall speed. Unless the pilot takes immediate and proper corrective action under such circumstances, it is possible to enter an inadvertent spin.

It is recognized that flight below V_{SSE} with one engine inoperative, or simulated inoperative, may be required for conditions such as practice demonstration of V_{MCA} for multi-engine pilot certification. Refer to the procedure set forth in the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for your aircraft. This procedure calls for simulating one engine inoperative by reducing the power level (throttle) on one engine to idle while operating at an airspeed above V_{SSE}. Power on the other engine is set at maximum, then airspeed is reduced at approximately one knot per second until either V_{MCA} or stall warning is obtained. During this transition, rudder should be used to maintain directional control, and ailerons should be used to maintain a 5° bank toward the operative engine. At the first sign of either V_{MCA} or stall warning (which may be evidenced by inability to maintain longitudinal, lateral or directional control, aerodynamic stall buffet, or stall warning horn sound), recovery must be initiated immediately by reducing power to idle on operative engine and lowering the nose to regain V_{SSE}. Resume normal flight. This entire procedure should be used at a safe altitude of at least 5,000 feet above the ground in clear air only.

If stall warning is detected prior to the first sign of V_{MCA}, an engine-out minimum control speed demonstration cannot be accomplished under the existing gross weight conditions and should not be attempted.

SPINS

A major cause of fatal accidents in general aviation aircraft is a spin. Stall demonstrations and practice are a means for a pilot to acquire the skills to recognize when a stall is about to occur and to recover as soon as the first signs of a stall are evident. **If a stall does not occur - A spin cannot occur.** It is important to remember however, that a stall can occur in any flight attitude, at any airspeed, if controls are misused.

Unless your aircraft has been specifically certificated in the aerobatic category and specifically tested for spin recovery characteristics, it is placarded against intentional spins. The pilot of an airplane placarded against intentional spins should assume that the airplane may become uncontrollable in a spin, since its performance characteristics beyond certain limits specified in the FAA regulations may not have been tested and are unknown. This is why aircraft are placarded against intentional spins, and this is why stall avoidance is your protection against an inadvertent spin.

Pilots are taught that intentional spins are entered by deliberately inducing a yawing moment with the controls as the aircraft is stalled. Inadvertent spins result from the same combination - stall plus yaw. That is why it is important to use coordinated controls and to recover at the first indication of a stall when practicing stalls.

In any twin engine airplane, fundamental aerodynamics dictate that if the airplane is allowed to become fully stalled while one engine is providing lift-producing thrust, the yawing moment which can induce a spin will be present. Consequently, it is important to immediately reduce power on the operating engine, lower the nose to reduce the angle of attack, and increase the airspeed to recover from the stall. In any twin engine aircraft, if application of stall recovery controls is delayed, a rapid rolling and yawing motion may develop, even against full aileron and rudder, resulting in the airplane becoming inverted during the onset of a spinning motion. Once the airplane has been permitted to progress beyond the stall and is allowed to reach the rapid rolling and yawing condition, the pilot must then immediately initiate the generally accepted spin recovery procedure for multi-engine airplanes, which is as follows:

Immediately move the control column full forward, apply full rudder opposite to the direction of the spin and reduce power on both engines to idle. These three actions should be done as near simultaneously as possible; then continue to hold this control position until rotation stops, then neutralize all controls and execute a smooth pullout. Ailerons should be neutral during recovery. THE LONGER THE PILOT DELAYS BEFORE TAKING CORRECTIVE ACTION, THE MORE DIFFICULT RECOVERY WILL BECOME.

Always remember that extra alertness and pilot techniques are required for slow flight maneuvers, including the practice or demonstration of stalls or V_{MCA}. In addition to the foregoing mandatory procedure, always:

Be certain that the center of gravity of the airplane is as far forward as possible. Forward C.G. aids stall recovery, spin avoidance and spin recovery. An aft C.G. can create a tendency for a spin to stabilize, which delays recovery.

Whenever a student pilot will be required to practice slow flight or single-engine maneuvers, be certain that the qualified instructor pilot has a full set of operable controls available. FAA regulations prohibit flight instruction without full dual controls.

Conduct any maneuvers which could possibly result in a spin at altitudes in excess of five thousand (5,000) feet above ground level in clear air only.

Remember that an airplane, at or near traffic pattern and approach altitudes, cannot recover from a spin, or perhaps even a stall, before impact with the ground. For twin engine aircraft, when descending to traffic altitude and during pattern entry and all other flight operations, maintain speed no lower than V_{SSE}. On final final approach maintain at least the airspeed shown in the flight manual. Should a go-around be required, do not apply more power than necessary until the airplane has accelerated to V_{SSE}. Recognize that under some conditions of weight, density altitude, and aircraft configuration, a twin engine aircraft cannot climb or accelerate on a single engine. Hence a single engine go-around is impossible and the aircraft is committed to a landing. Plan your approach accordingly.

Remember that if an airplane flown under instrument conditions is permitted to stall or enter a spin, the pilot, without reference to the horizon, is certain to become disoriented. He may be unable to recognize a stall, spin entry, or the spin condition and he may be unable to determine even the direction of the rotation.

Finally, never forget that stall avoidance is your best protection against an inadvertent spin. MAINTAIN YOUR AIRSPEED.

DESCENT

In twin engine piston-powered airplanes, supercharged or normally aspirated, it is necessary to avoid prolonged descents with low power, as this produces two problems: (1) excessively cool cylinder head temperatures which cause premature engine wear, and (2) excessively rich mixtures due to idle enrichment (and altitude) which causes soot and lead deposits on the spark plugs (fouling). The second of these is the more serious consideration; the engine may not respond to the throttle when it is desired to discontinue the descent. Both problems are amenable to one solution: maintain adequate power to keep cylinder head temperatures in the "green" range during descent, and lean to best power mixture (that is, progressively enrich the mixture from cruise only slightly as altitude decreases). This procedure will lengthen the descent, of course, and requires some advance planning. If it is necessary to make a prolonged descent at or near idle, as in practicing forced landings, at least avoid the problem of fouled spark plugs by frequently advancing the throttle until the engine runs smoothly, and maintain an appropriate mixture setting with altitude. (Refer to prelanding check list.)

VORTICES - WAKE TURBULENCE

Every airplane generates wakes of turbulence while in flight. Part of this is from the propeller or jet engine, and part from the wing tip vortices. The larger and heavier the airplane, the more pronounced and turbulent the wakes will be. Wing tip vortices from large, heavy airplanes are very severe at close range, degenerating with time, wind and distance. These are rolling in nature, from each wing tip. In tests, vortex velocities of 133 knots have been recorded. Encountering the rolling effect of wing tip vortices within two minutes after passage of large airplanes is most hazardous to light airplanes. This roll effect can exceed the maximum counter-roll obtainable in a light airplane. The turbulent areas may remain for as long as three minutes or more, depending on wind conditions, and may extend several miles behind the airplane. Plan to fly slightly above and to the windward side of the other airplanes. Because of the wide variety of conditions that can be encountered, there is no set rule to follow to avoid wake turbulence in all situations. However, the Airman's Information Manual, and to a greater extent Advisory Circular 90-23, Aircraft Wake Turbulence, provide a thorough discussion of the factors you should be aware of when wake turbulence may be encountered.

TAKEOFF AND LANDING CONDITIONS

When taking off on runways covered with water or freezing slush, the landing gear should remain extended for approximately ten seconds longer than normal, allowing the wheels to spin and dissipate the freezing moisture. The landing gear should then be cycled up, then down, wait approximately five seconds and then retracted again. Caution must be exercised to insure that the entire operation is performed below Maximum Landing Gear Operating Airspeed.

Use caution when landing on runways that are covered by water or slush which cause hydroplaning (aquaplaning), a phenomenon that renders braking and steering ineffective because of the lack of sufficient surface friction. Snow and ice covered runways are also hazardous. The pilot should also be alert to the possibility of the brakes freezing.

Use caution when taking off or landing during gusty wind conditions. Also be aware of the special wind conditions caused by buildings or other obstructions located near the runway.

MEDICAL FACTS FOR PILOTS

GENERAL

When the pilot enters the airplane, he becomes an integral part of the man-machine system. He is just as essential to a successful flight as the control surfaces. To ignore the pilot in preflight planning would be as senseless as failing to inspect the integrity of the control surfaces or any other vital part of the machine. The pilot has the responsibility for determining his reliability prior to entering the airplane for flight. When piloting an airplane, an individual should be free of conditions which are harmful to alertness, ability to make correct decisions, and rapid reaction time.

FATIGUE

Fatigue generally slows reaction time and causes errors due to inattention. In addition to the most common cause of fatigue; insufficient rest and loss of sleep, the pressures of business, financial worries, and family problems can be important contributing factors. If you are tired, don't fly.

HYPOXIA

Hypoxia, in simple terms, is a lack of sufficient oxygen to keep the brain and other body tissues functioning properly. There is a wide individual variation in susceptibility to hypoxia. In addition to progressively insufficient oxygen at higher altitudes, anything interfering with the blood's ability to carry oxygen can contribute to hypoxia (anemias, carbon monoxide, and certain drugs). Also, alcohol and various drugs decrease the brain's tolerance to hypoxia.

Your body has no built-in alarm system to let you know when you are not getting enough oxygen. It is impossible to predict when or where hypoxia will occur during a given flight, or how it will manifest itself. Some of the common symptoms of hypoxia are increased breathing rate, a light-headed or dizzy sensation, tingling or warm sensation, sweating, reduced visual field, sleepiness, blue coloring of skin, fingernails, and lips, and behavior changes. A particularly dangerous feature of hypoxia is an increased sense of well-being, called euphoria. It obscures a person's ability and desire to be critical of himself, slows reaction time, and impairs thinking ability. Consequently, an hypoxic individual commonly believes things are getting progressively better while he nears total collapse.

The symptoms are slow but progressive, insidious in onset, and are most marked at altitudes starting above ten thousand feet. Night vision, however, can be impaired starting at an altitude of 5,000 feet. Persons who have recently overindulged in alcohol, who are moderate to heavy smokers, or who take certain drugs, may be more susceptible to hypoxia. Susceptibility may also vary in the same individual from day to day or even morning to evening. Use oxygen on flights above 10,000 feet and at any time when symptoms appear.

Depending upon altitude, an hypoxic individual has a limited time to make decisions and perform useful acts, even though he may remain conscious for a longer period. If pressurization equipment fails at certain altitudes the pilot and passengers have only a certain amount of time to get an oxygen mask on before they exceed their time of useful consciousness. The time of useful consciousness is approximately 3-5 minutes at 25,000 feet of altitude for the average individual and diminishes markedly as altitude increases. At 30,000 feet altitude, for example, the time of useful consciousness is approximately 1 to 2 minutes. Therefore, in the event of depressurization, oxygen masks should be used immediately.

Should symptoms occur that cannot definitely be identified as either hypoxia or hyperventilation, try three or four deep breaths of oxygen. The symptoms should improve markedly if the condition was hypoxia (recovery from hypoxia is rapid).

Pilots who fly to altitudes that require or may require the use of supplemental oxygen should be thoroughly familiar with the operation of the aircraft oxygen systems. A preflight inspection of the system should be performed, including proper fit of the mask. The passengers should be briefed on the proper use of their oxygen system before flight.

Pilots who wear beards should be careful to ensure that their beard is carefully trimmed so that it will not interfere with proper sealing of the oxygen masks. If you wear a beard or moustache, test the fit of your oxygen mask on the ground for proper sealing. Studies conducted by the military and oxygen equipment manufacturers conclude that oxygen masks do not seal over beards or heavy facial hair.

Federal Aviation Regulations related to the use of supplemental oxygen by flight crew and passengers must be adhered to if flight to higher altitudes is to be accomplished safely. Passengers with significant circulatory or lung disease may need to use supplemental oxygen at lower altitudes than specified by these regulations.

Pilots of pressurized aircraft should receive physiological training with emphasis on hypoxia and the use of oxygen and oxygen systems. Pilots of aircraft with pressure demand oxygen systems should undergo training, experience altitude chamber decompression, and be familiar with pressure breathing before flying at high altitude. This training is available throughout the United States at nominal cost. Information regarding this training may be obtained by request from the Chief, Civil Aeromedical Institute, Attention: Aeromedical Education Branch, AAC-140, Mike Monroney Aeronautical Center, P. O. Box 25082, Oklahoma City, Oklahoma 73125

HYPERVENTILATION

Hyperventilation, or overbreathing, is a disturbance of respiration that may occur in individuals as a result of emotional tension or anxiety. Under conditions of emotional stress, fright, or pain, breathing rate may increase, causing increased lung ventilation, although the carbon dioxide output of the body cells does not increase. As a result, carbon dioxide is "washed out" of the blood. The most common symptoms of hyperventilation are: dizziness, nausea, sleepiness, and finally, unconsciousness. If the symptoms persist discontinue use of oxygen and consciously slow your breathing rate until symptoms clear, and then resume normal breathing rate. Normal breathing can be aided by talking aloud.

ALCOHOL

Common sense and scientific evidence dictate that you must not fly as a crew member while under the influence of alcohol. Alcohol, even in small amounts, produces, among other things, a dulling of critical judgment; a decreased sense of responsibility; diminished skill reactions and coordination; decreased speed and strength of muscular reflexes (even after one ounce of alcohol); decreases in efficiency of eye movements during reading (after one ounce of alcohol); increased frequency of errors (after one ounce of alcohol); constriction of visual fields; decreased ability to see under dim illuminations; loss of efficiency of sense of touch; decrease of memory and reasoning ability; increased susceptibility to fatigue and decreased attention span; decreased relevance of response; increased self confidence with increased insight into immediate capabilities.

Tests have shown that pilots commit major errors of judgment and procedure at blood alcohol levels substantially less than the minimum legal levels of intoxication for most states. These tests further show a continuation of impairment from alcohol up to as many as 14 hours after consumption, with no appreciable diminution of impairment. The body metabolizes ingested alcohol at a rate of about one-third of an ounce per hour. Even after the body completely destroys a moderate amount of alcohol, a pilot can still be severely impaired for many hours by hangover. The effects of alcohol on the body are magnified at altitudes, as 2 oz. of alcohol at 18,000 feet produce the same adverse effects as 6 oz. at sea level.

Federal Aviation Regulations have been amended to reflect the FAA's growing concern with the effects of alcohol impairment. FAR 91 states:

"(a) No person may act or attempt to act as a crewmember of a civil aircraft:

> Within 8 hours after the consumption of any alcoholic beverage;
>
> While under the influence of alcohol;
>
> While using any drug that affects the person's faculties in any way contrary to safety; or
>
> While having .04 percent by weight or more alcohol in the blood.

(b) Except in an emergency, no pilot of a civil aircraft may allow a person who appears to be intoxicated or who demonstrates by manner or physical indications that the individual is under the influence of drugs (except a medical patient under proper care) to be carried in that aircraft."

Because of the slow destruction of alcohol by the body, a pilot may still be under influence eight hours after drinking a moderate amount of alcohol. Therefore, an excellent rule is to allow at least 12 to 24 hours between "bottle and throttle," depending on the amount of alcoholic beverage consumed.

DRUGS

Self-medication or taking medicine in any form when you are flying can be extremely hazardous. Even simple home or over-the-counter remedies and drugs such as aspirin, antihistamines, cold tablets, cough mixtures, laxatives, tranquilizers, and appetite suppressors, may seriously impair the judgment and coordination needed while flying. The safest rule is to take no medicine before or while flying, except after consultation with your Aviation Medical Examiner.

SCUBA DIVING

Flying shortly after any prolonged scuba diving could be dangerous. Under the increased pressure of the water, excess nitrogen is absorbed into your system. If sufficient time has not elapsed prior to takeoff for your system to rid itself of this excess gas, you may experience the bends at altitudes even under 10,000 feet, where most light planes fly.

CARBON MONOXIDE AND NIGHT VISION

The presence of carbon monoxide results in hypoxia which will affect night vision in the same manner and extent as hypoxia from high altitudes. Even small levels of carbon monoxide have the same effect as an altitude increase of 8,000 to 10,000 feet. Smoking several cigarettes can result in a carbon monoxide saturation sufficient to affect visual sensitivity equal to an increase of 8, 000 feet altitude.

A FINAL WORD

Airplanes are truly remarkable machines. They enable us to shrink distance and time, and to expand our business and personal horizons in ways that, not too many years ago, were virtually inconceivable. For many businesses, the general aviation airplane has become the indispensable tool of efficiency.

Advances in the mechanical reliability of the airplane we fly have been equally impressive, as attested by the steadily declining statistics of accidents attributed to mechanical causes, at a time when the airframe, systems and power plants have grown infinitely more complex. The explosion in capability of avionics systems is even more remarkable. Radar, RNAV, LORAN, sophisticated autopilots and other devices which, just a few years ago, were too large and prohibitively expensive for general aviation size airplanes, are becoming increasingly commonplace in even the smallest airplanes.

It is thus that this Safety Information is directed to the pilot, for it is in the area of the skill and proficiency of you, the pilot, that the greatest gains in safe flying are to be made over the years to come. Intimate knowledge of your aircraft, its capabilities and its limitations, and disciplined adherence to the procedures for your aircraft's operation, will enable you to transform potential tragedy into an interesting hangar story when - as it inevitably will - the abnormal situation is presented.

Know your aircraft's limitations, and your own. Never exceed either.

Safe flying,

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PILOT'S OPERATING MANUAL

This book is incomplete without a current FAA Airplane Flight Manual, P/N 60-590000-11, consisting of FAA Data, FAA Revision Log, FAA Limitations, FAA Normal Procedures, FAA Emergency Procedures, FAA Performance, and FAA Flight Manual Supplements.

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