SECTION V—OPERATING LIMITATIONS

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INTRODUCTION.

The limitations imposed on the aircraft must be observed during normal operation. Cognizance must be taken of the instrument markings since they represent limitations that are not necessarily repeated in the text. Further explanation of the instrument markings is covered in the text under pertinent headings.

MINIMUM CREW REQUIREMENTS.

The minimum crew for this aircraft consists of the pilot, copilot, and flight engineer. Additional crew members may be added at the discretion of the pilot in command.

INSTRUMENT MARKINGS.

The limits and interpretation of the markings on the aircraft instruments are shown in figure 5-1.

ENGINE LIMITATIONS.

In addition to the instrument marking limitations indicated on figure 5-1 and Engine Operating Curves, figure 5-4, the following limitations must be observed.

1. Do not make more than one blower shift into high ratio within a 5-minute interval. Reduce engine speed to 1600 rpm and MAP to 20 in. Hg before shifting from low to high blower.

2. An overspeed in takeoff rpm between 2900 and 3050 is considered within safe operational limits. However, all cases of deviation from 2900-3050 rpm except minor surges will be recorded in Form 781. Operation in the 3050 to 3300 rpm range requires an entry in Form 781 and inspection. A second overspeed in excess of 3120 rpm, or any overspeed over 3300 rpm, requires an engine change.

OVERBOOST LIMITATIONS.

Blower Position	MAP In. Hg	Duration in seconds	RPM Range at Which Limits Apply
Low	1	60	Above 2600 rpm
	5	15	2401 to 2600 rpm
	No Limits		2400 rpm and below
High	2	15	At 2600 rpm
	3	15	Below 2600 rpm

1. When the maximum allowable manifold pressure for any applicable power is exceeded by more than the above listed MAP values, an engine overboost inspection is required, regardless of overboost duration.

2. When the maximum allowable manifold pressure for any applicable power is exceeded for a time period in excess of the above listed durations, an engine overboost inspection is required.

3. All overboosts in excess of the above limits should be recorded in Form 781.

4. Engines overboosted beyond the above limits need not be rejected to overhaul unless the required inspection reveals sufficient overboost damage.

INSTRUMENT MARKINGS

BASED ON MIL-G-5572
FUEL GRADE 115/145

NOTE MAXIMUM CONTINUOUS LIMIT FOR SEA LEVEL-LOW BLOWER-AUTO RICH IS 52 IN. HG
MAXIMUM LIMIT FOR 10,000 FT HIGH BLOWER IS 49.5 IN. HG

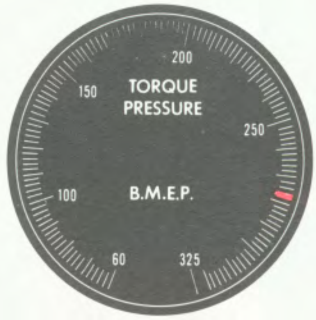
TACHOMETER

- (Blue) 1600-2500 RPM AUTO/MANUAL LEAN PERMITTED (LOW BLOWER)
- (Blue) 1800-2500 RPM AUTO/MANUAL LEAN PERMITTED (HIGH BLOWER)
- (Green) 2500-2650 RPM AUTO RICH REQUIRED
- (Red) 2900 RPM MAXIMUM

MANIFOLD PRESSURE

- (Blue) 20-43 IN. HG AUTO/MANUAL LEAN PERMITTED (LO BLO) (MAX OF 45 IN. HG PERMITTED IN HIGH BLOWER AT 15% MANUAL LEAN)
- (Green) 43-52 IN. HG AUTO RICH REQUIRED
- (Red) 59.5 IN. HG MAXIMUM

BMEP



- (Red) 277 BMEP MAXIMUM

CYLINDER HEAD

- (Blue) 145° - 215° C AUTO/MANUAL LEAN PERMITTED
- (Green) 215° - 245° C AUTO RICH REQUIRED
- (Red) 260° C MAXIMUM

CARBURETOR AIR

- (Red) 30° C MAXIMUM - LOW BLOWER (WITH HEAT APPLIED)
- (Red) 22° C MAXIMUM - HIGH BLOWER (WITH HEAT APPLIED)
- (Green) +15° TO +30° C NORMAL OPERATION
- (Yellow) -10° TO +15° C DANGER OF ICE

OIL INLET

- (Green) 70°-85°C CONTINUOUS OPERATION
- (Red) 40° C MINIMUM
- (Red) 104° C MAXIMUM

ENGINE OIL PRESSURE (REAR PUMPS)

- (Green) 65-90 PSI CONTINUOUS OPERATION
- (Red) 65 PSI MINIMUM FOR FLIGHT
- (Red) 100 PSI MAXIMUM

FUEL PRESSURE

- (Green) 24-28 PSI NORMAL
- (Red) 19 PSI MINIMUM FOR FLIGHT
- (Red) 35 PSI MAXIMUM

AC GENERATOR TEMPERATURE

- (Red) 150° C MAXIMUM DRIVESHAFT BEARING TEMP
- (Red) 150° C MAXIMUM GEARBOX BEARING TEMP
- (Red) 50° C MAXIMUM COOLING AIR RISE

F66-0-5-1

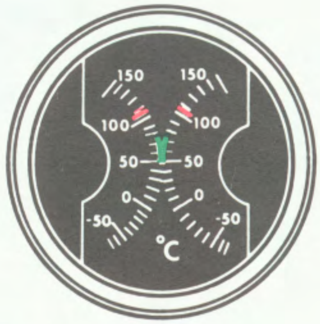
Figure 5-1 (Sheet 1 of 3)

INSTRUMENT MARKINGS

CABIN SUPERCHARGER
OIL PRESSURE

70-80 PSI NORMAL 1000 RPM
60 PSI MINIMUM
125 PSI MAXIMUM

CABIN SUPERCHARGER
OIL TEMP



49° - 77° C NORMAL
107° C MAXIMUM (LIGHT ON)

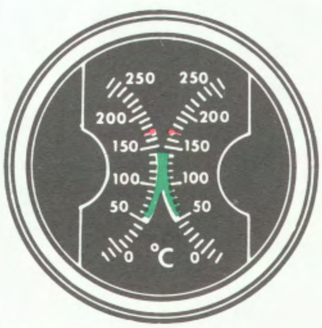
CABIN SUPERCHARGER
DRIVE SHAFT

150° C MAXIMUM

CABIN DIFFERENTIAL
PRESSURE

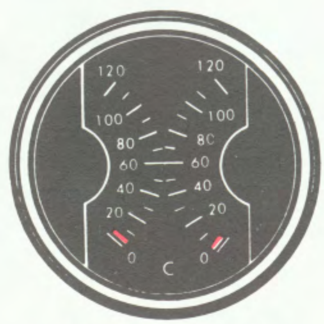
10.92 IN. HG MAXIMUM FOR NORMAL OPERATION
11.4 IN. HG SAFETY RELIEF AND DUMP VALVE CRACKING PRESSURE

CABIN HEATER
TEMP



50° - 140° C NORMAL CYCLING
170° C MAXIMUM CYCLING AND OVERRIDE CYCLING TEMP
180° C LOCKOUT AND OVERHEAT LIGHT ON

REFRIGERATOR DISCHARGE
DUCT TEMPERATURE



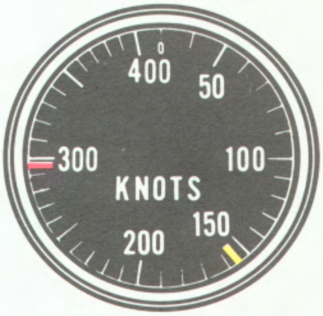
2° C MINIMUM

F66-0-5-1(A)

Figure 5-1 (Sheet 2 of 3)

INSTRUMENT MARKINGS

AIR SPEED



- 295 KNOTS MAXIMUM PERMISSIBLE AIRSPEED
- 155 KNOTS MAXIMUM-WING FLAPS 100% EXTENDED (LANDING GEAR - 165 KNOTS)

HYDRAULIC QUANTITY

FULL	7.1 GALS
RESERVICE	1/2 FULL
MINIMUM	1/4 FULL

(EQUALIZER HOLE IN BAFFLE AT 7/8 FULL)

HYDRAULIC PRESSURE

- 1650-1800 PSI NORMAL
- 1850 PSI MAXIMUM

EMERGENCY BRAKE

1100 PSI MINIMUM
- 1650-1800 PSI NORMAL
- 1850 PSI MAXIMUM

VACUUM

- 7–7.5 IN. HG NORMAL
- 4.0 IN. HG WARNING LIGHT ON

DEICING PRESSURE

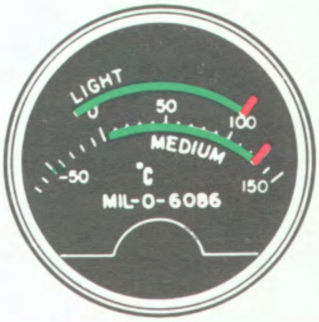
- 20-24 PSI NORMAL
- 26 PSI MAXIMUM

F66-0-5-1(B)

Figure 5-1 (Sheet 3 of 3)

INSTRUMENT MARKINGS LIMITATIONS

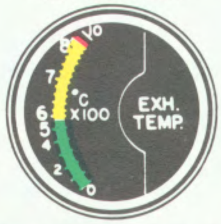
C-121G
GTPU OIL
TEMPERATURE



LIGHT
- -10-100° NORMAL
- 100° MAXIMUM

MEDIUM
- 5-125° NORMAL
- 125° MAXIMUM

C-121G
GTPU EXHAUST
TEMPERATURE
AF 54-4071
and Subsequent

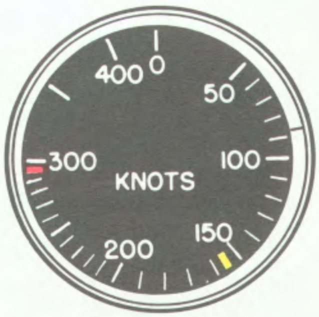


- 0-540° NORMAL RUN
- 540-815° CAUTION
- 815° MAXIMUM

GTPU
TACHOMETER

- 94-106% NORMAL
- 106-110% CAUTION
- 110% MAXIMUM

AIRSPEED



- 295 MAXIMUM PERMISSIBLE AIRSPEED
- 155 KN MAXIMUM — WING FLAPS 100% EXTENDED (LANDING GEAR - 165 KN)

DE-ICER PRESSURE

- 20 - 24 PSI NORMAL
- 26 PSI MAXIMUM

CARBURETOR AIR

- 30°C MAXIMUM — LOW BLOWER (WITH HEAT APPLIED)
- 22°C MAXIMUM — HIGH BLOWER (WITH HEAT APPLIED)
- +15° TO 30° C CONTINUOUS OPERATION
- -25° TO +10°C DANGER OF ICE

HYDRAULIC PRESSURE

- 1650-1800 psi NORMAL
- 1850 psi MAXIMUM

CABIN SUPERCHARGER
DRIVE SHAFT REAR BEARING OIL TEMP.

- 150°C MAXIMUM

VACUUM GAUGE

- 4.0" Hg MINIMUM
- 4.0"-7.5" Hg NORMAL
- 7.5" Hg MAXIMUM

F85(A)-D-5-122(2)

Figure 5-2

5. The statement, no limit – 2400 rpm and below, means that full throttle will normally be reached before cylinder pressures become sufficiently high to cause damage to the average engine in this rpm range. Therefore, overboost limits are not applicable.

6. Reverse pitch operation for taxi purposes is to be avoided if possible. If such operation is required, it must be limited to a maximum period of 30 seconds. Maximum rpm in reverse pitch is 2600.

PROPELLER LIMITATIONS.

There are no restricted operating speeds within the normal operating region for aircraft equipped with the Hamilton Standard 43H60/6959B-O propellers. However, the aircraft must be headed into the wind during static runup tests when engine speed exceeds 2600 rpm. The propellers must not be unfeathered at flight speeds in excess of 155 knots. Do not reverse the propellers in flight. Engine speeds above 3480 rpm require removal of the propeller.

CARBURETOR TEMPERATURE LIMITATIONS.

When the carburetor air temperature gage reads 30°C the air intake temperature at the carburetor deck may be as high as 38°C. Therefore, it is recommended that the carburetor air temperature not exceed 30°C as read on the carburetor air temperature gage in low blower.

CAUTION

During HIGH blower operation, CAT must not exceed 22°C and spark must be in RETARD above 2400 rpm.

AIRSPEED LIMITATIONS.

For turbulent air penetration speeds, refer to Section VI.

PROHIBITED MANEUVERS.

The aircraft is restricted to normal flight maneuvers. No aerobatics are permitted.

FLIGHT CONTROL PRECAUTIONS.

Although the control forces for patrol and transport aircraft are heavier than in some other types, it is still possible to apply severe structural loads to the aircraft by rapid and violent application, sudden release, or reversal of forces on any of the three control systems. It is within the pilot's physical power to cause failure of some components of the airframe structure, particularly when flying at high speeds. Rapid release or reversal of rudder force can result in heavy loads on the vertical fins and aft fuselage and must be avoided.

CENTER-OF-GRAVITY LIMITATIONS.

The forward center-of-gravity (cg) limit is variable, depending upon the aircraft gross weight. The aft cg limit is a constant 32 percent with gear down at all gross weights. Raising the landing gear will move the cg forward approximately 1 percent. Refer to Handbook of Weight Limitations, T.O. 1-1B-40.

CABIN PRESSURIZATION LIMITATIONS.

Cabin pressurization is not permitted during takeoff and landing. In the event of emergency during takeoff or landing, cabin pressurization would interfere with opening of doors and emergency exits.

FUEL LOADING AND USAGE LIMITATIONS.

Main tanks (1, 2, 3, and 4), tank-to-engine, with auxiliary fuel boost pumps for these tanks on HIGH, normally will be used for takeoff. During flight, lateral balance must be maintained within limits set forth in this section. Minimum fuel quantity restrictions applicable because of structural limitations are shown on figure 5-5. Use of the normal fuel loading and fuel management procedures given in Section VII will result in compliance with the minimum fuel quantity restrictions. Under some circumstances, such as during training operations, it may be desirable to deviate from normal fuel loadings. Optional fuel loading and usage procedures suited to the particular situation are permitted in such cases, provided structural minimum fuel restrictions for individual tanks shown in figure 5-5 are observed. If circumstances, such as during training operations, require deviations from normal fuel loading, and tanks 2 and 3 do not contain the minimum of 150 gallons each, then tanks 2A and 3A may be used for takeoff. In either event, tanks used for takeoff must contain a minimum of 150 gallons each. Because of structural wing strain during landing, the maximum permissible fuel in tip tanks 2B and 3B is as follows:

- At landing gross weight of 122,000 lb – 300 gal ea. (Reduced limit sinking speed – 420 fpm)
- At landing gross weight of 110,000 lb – 200 gal ea. (Design limit sinking speed – 600 fpm)

CONSOLIDATED LIMITATIONS LIST

TAKEOFF WEIGHT—G-LOAD CAPABILITY*

Takeoff Weight (Pounds)	Max Safe G-Load
145,000 gross or 99,000 zero fuel	2.50
152,500 gross or 105,000 zero fuel	2.25

LANDING WEIGHT–SINKING SPEED

110,000 lb .... 600 fpm

122,000 lb .... 420 fpm

MAC Limitations

Basic .... 18-32 percent

Boost-out landing .... 23-30 percent desired

AIRSPEED LIMITATIONS (IAS)

Below 15,000 ft .... 295 knots max

At 20,000 ft .... 270 knots max

At 25,000 ft .... 240 knots max

Gear extension .... 165 knots max

60 percent flaps .... 190 knots max

66 percent flaps .... 175 knots max

80 percent flaps .... 175 knots max

100 percent flaps .... 155 knots max

Landing light extension .... 165 knots max

Unfeathering .... 155 knots max

Engaging control boosters .... 155 knots max

Opening escape hatches .... 175 knots max

Flight with hydraulic access door unlatched

- 80,000 lb gross weight .... 150-160 knots
- 100,000 lb gross weight .... 165-180 knots
- 120,000 lb gross weight .... 180-200 knots

Fuel dumping .... 140-190 knots (155-165 desired)

Turbulence penetration (clean configuration) .... 60 knots above stall speed

Maneuvering speed (60 percent flaps) .... 140 knots min

*See figure 5-5 for other loadings.

TANK QUANTITIES

Engine oil tanks .... Vol 54 gal; fill to 42.5 gal each

Engine reserve oil tank .... 67 gal

Cabin supercharger oil system .... 2 gal each

Hydraulic system .... 54 gal

Hydraulic reservoir .... Capacity 10.1; fill to 7.1 gal

Emergency extension tank .... 3.2 gal

Alcohol tanks .... 20 gal each

Wash water, forward .... 40 gal

Wash water, aft .... 15 gal

Oxygen system pressure—1800 psi

ELECTRICAL

Battery .... 24 volts, 34 amp hr each

DC system .... 28 (±0.5) volts

DC generators .... 28 volts; 300 amp/each; overload 400 amp/each for 15 min

Inverter .... 115 volts (±3), 400±10 cps

HYDRAULIC

Hydraulic system pressure .... 1650-1800 psi normal

Aux boost system pressure .... 700-825 psi normal

Hydraulic pump capacity .... 22 gpm at 1650 psi

Hydraulic warning light limit .... 1325 (±50) psi

Minimum pressure for setting parking brake .... 1100 psi

Air charge in brake accumulator .... 1000 psi/each

ENGINE OIL

Engine oil system pressure .... normal 65-90 psi, min 65 psi, max 100 psi

Engine oil temperature .... normal 70°—85°C, max 104°C

Engine oil warning light limit .... 55 (±5) psi

Figure 5-3 (Sheet 1 of 2)

CONSOLIDATED LIMITATIONS LIST

FUEL

Fuel system pressure .... normal 24-28 psi, min 19 psi, max 35 psi

Aux fuel pumps (static) .... high boost 27-29 psi, low boost 12 psi min

Fuel system low pressure warning lights..... 20 ±.5 psi

ANTI-ICING

Propeller system pump capacity (full increase setting) .... 5 gal/hr/pump min

Propeller anti-icer rate of flow (full increase setting) .... 2.5 gal/hr/prop min

Carburetor anti-icer rate of flow....... 26 gal/hr/pump

CABIN SUPERCHARGER

Capacity .... 70 lb/min/supercharger/SL

Oil pressure .... normal 70-80 psi, min 60 psi, max 125 psi

Oil pressure warning lights .... on 30-35 psi, off 35-40 psi

Oil temperature .... 107°C max

Oil temperature warning lights .... on 107°C

Maximum cabin regulated differential..... 10.92 in. Hg

Cabin altitude warning lights ...... 10,000 (±500) feet

ELEVATOR CONTROL SURFACE TRAVEL

Boost on 40° up, 20° down; boost off 16° up, 6° down

Figure 5-3 (Sheet 2 of 2)

LATERAL UNBALANCE OF FUEL LOAD.

The following table presents the maximum safe fuel differential between opposite tanks. Lateral unbalance may cause abnormal control deflection, therefore producing asymmetrical airload conditions.

TANK	MAXIMUM DIFFERENTIAL	
	Flight or Landing	Takeoff
2A & 3A	3390 lb (565 gal)	1200 lb (200 gal)
or		
1 & 4	5400 lb (900 gal)	1800 lb (300 gal)
or		
2 & 3	4740 lb (790 gal)	4740 lb (790 gal)
2B & 3B	2700 lb (450 gal) for flight only 300 lb (50 gal) for landing	1200 lb (200 gal)

WEIGHT LIMITATIONS.

Weight limits have been provided here to show operational capabilities and restrictions which must be observed due to structural and performance considerations. Their proper use will ensure maximum utilization of the aircraft as well as extending the life of its structural components. Overloading or improper weight distribution results in penalties in performance and can result in structural damage or failure. Factors which govern weight limitations, as applied to this aircraft, are discussed in the succeeding paragraphs.

NOTE

- Maximum zero fuel weight is defined as the maximum airplane gross weight with zero usable fuel in the wing tanks. (See Minimum Permissible Fuel Restrictions for Individual Tanks During Flight, figure 5-5.)
- The most critical wing loading condition occurs with maximum weight in the fuselage and minimum fuel in the wing. By proper fuel management the fuselage fuel, except for takeoff and climb, is burned before the wing fuel has been reduced to the most critical combination of gross weight and inertia relief. Therefore, fuel in tanks 5 and 6 is not the same as payload since it should be consumed before the critical weight condition is reached.

WEIGHTS AND LOADS.

The total weight an aircraft must sustain is composed of the basic operating weight of the aircraft plus the crew, fuel, oil, cargo, and any additional equipment. Additional loads are frequently imposed on the structure during flight which result from operation in turbulent air or from maneuvering the aircraft. These loads have

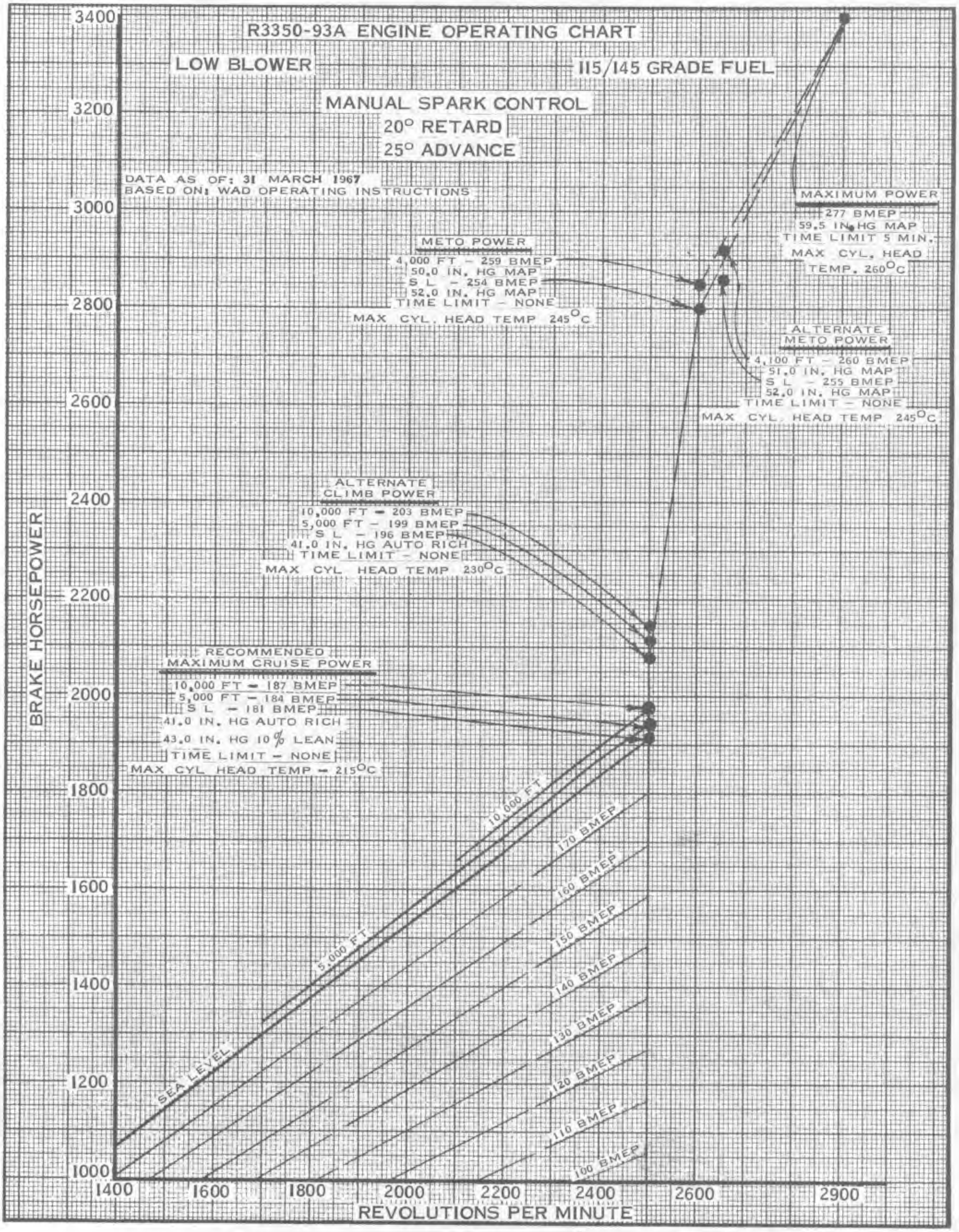


Figure 5-4 (Sheet 1 of 3)

ENGINE OPERATING CURVES

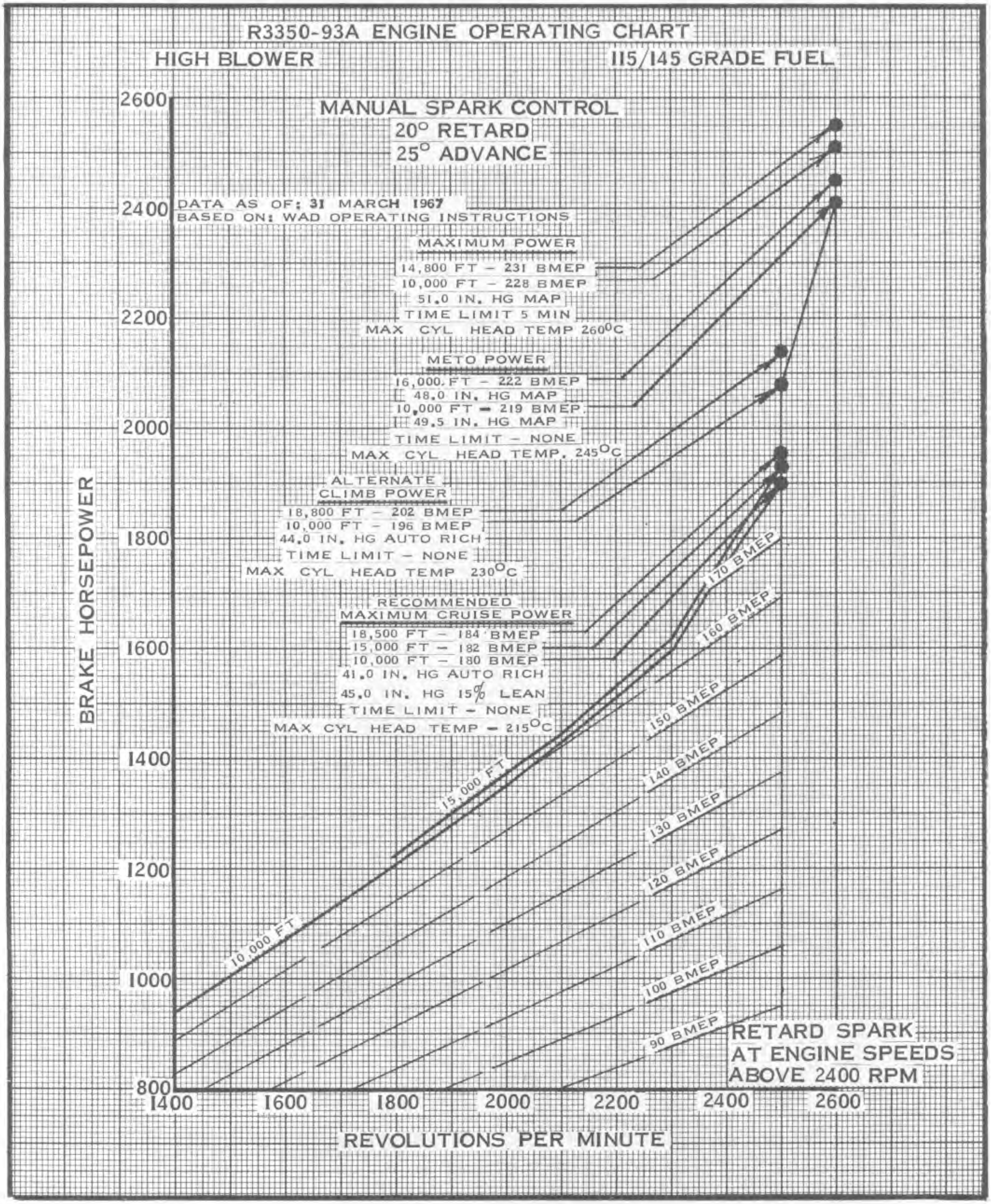


Figure 5-4 (Sheet 2 of 3)

ENGINE OPERATING CURVES

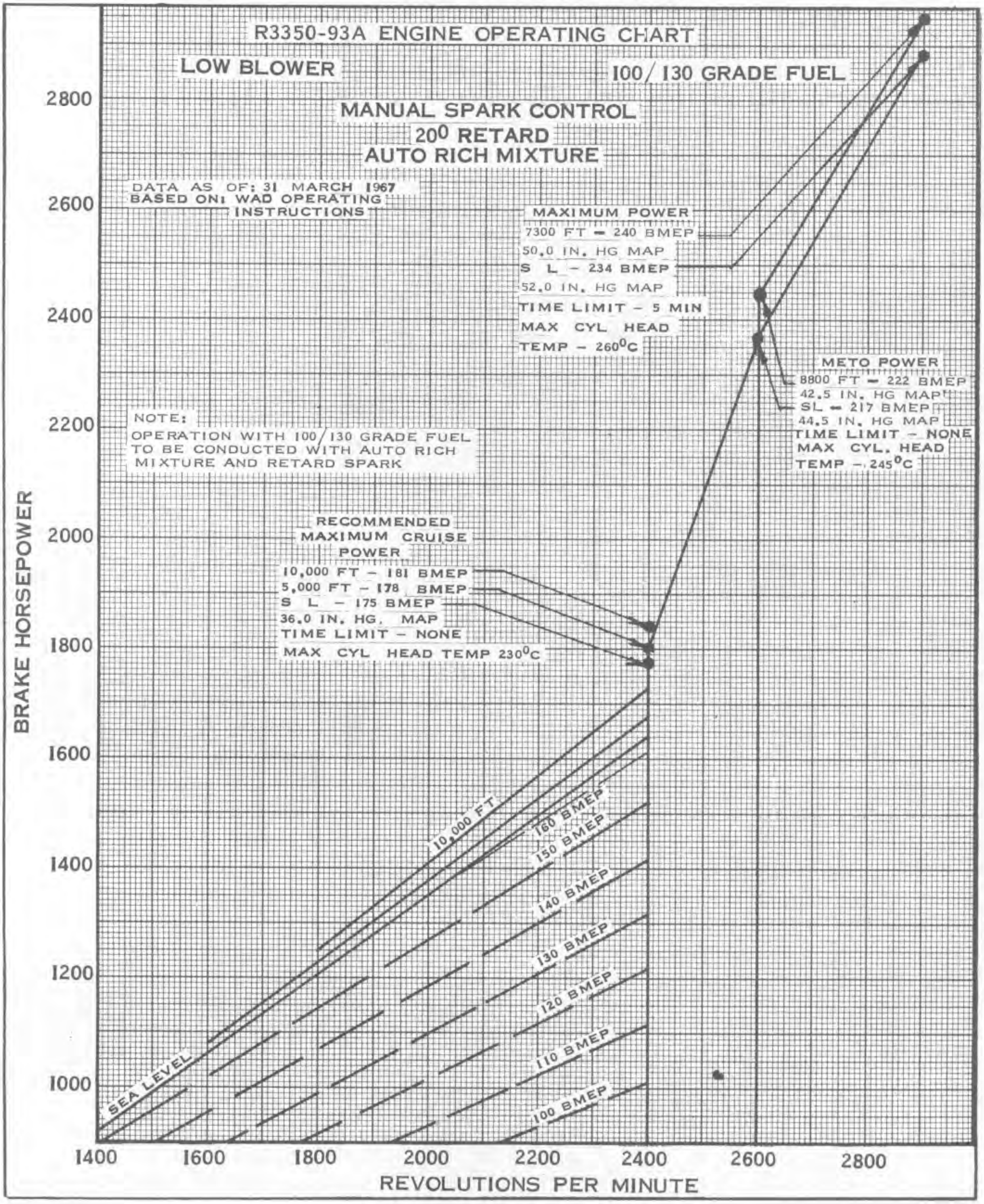


Figure 5-4 (Sheet 3 of 3)

been considered in the design of the aircraft and will not exceed the limit strength of the structure in normal operation. However, if these loads were imposed with the aircraft in an overweight condition, the limit strength of the supporting structure might be exceeded and damage or failure result. The maximum weight which the aircraft can safely carry is dependent upon distribution of the weight throughout the aircraft, its capacity to sustain airloads in accelerated flight, and its available performance under the existing flight conditions. Fuel and cargo must be carried in accordance with recommended procedures if maximum structural capability is to be maintained.

LOAD FACTORS.

A load factor is the ratio of the load imposed on the aircraft (when accelerated in any direction) relative to the weight of the aircraft. The load factor is indicative of the magnitude of the forces acting on the aircraft due to such accelerations, and may occur because of sudden changes in air currents or by manipulation of the controls or due to loads imposed during ground handling. The load resulting from these forces is expressed in terms of "g" and is the ratio of forces acting on the structure of the aircraft weight. For example, if a 110,000 pound aircraft underwent an acceleration of 3.0g at some given moment, the wings would have to sustain approximately three times the load on the wings in 1g level flight, or 330,000 pounds.

MARGIN OF SAFETY.

The margin of safety of an aircraft part in a given design condition is defined as the amount by which its strength exceeds its design loading in that condition. In actual operation of the aircraft, the margin of safety becomes the difference between the load carried by the airplane structure at a particular instant and the load at which structural damage would occur.

EXPLANATION OF WEIGHT LIMITATIONS CHART.

The Gross Weight Limitations chart, figure 5-6, is intended to represent graphically the weight-carrying capabilities of all aircraft. Through the use of the chart, flight planning is aided by recognizing the weight limitations within which the aircraft can conduct a specific mission.

NOTE

Although the chart indicates the limitations applicable to a specific loading of the aircraft, the authority for operating the aircraft at a given gross weight remains the responsibility of the commander.

GROSS WEIGHTS.

The data in the weight limitations chart is referenced to a basic operating weight, exclusive of fuel and cargo, of 85,000 pounds. This value is an arbitrary weight which approximates the aircraft basic weight shown on Chart "C" of T.O. 1-1B-40, Handbook of Weight and Balance Data, plus standard crew and full oil load. Individual aircraft weights vary because of differences in equipment weights. Therefore, it may be necessary to adjust the chart for variations in basic operating weight before use for a specific aircraft.

The basic operating weight is represented on the chart by the intersection of the vertical and horizontal axes where the fuel load and cargo load are zero (the term cargo, or payload, is used to indicate extra crew members, baggage, or other removable items). The diagonal gross weight lines show combinations of fuel load and cargo that can be used to make up a given permissible gross weight. The allowable design load factor varies along these weight lines. Constant load factor lines appear as horizontal lines in the chart. They are valid only when the recommended procedure for fuel and cargo loading is followed.

DESIGN LOAD FACTORS.

The design load factor is 2.5g for the design zero fuel weight. The aircraft normally will be loaded and flown so that maneuvering loads, gust loads, or a combination of both will not cause load factors in excess of 2.5g to be experienced. The aircraft has strength capabilities in flight such that it can support limit loads due to a 2.5g maneuver without detrimental deformation, and such that any deformation which might occur will not interfere with safe operation of the airplane. The structure is also designed to ultimate loads obtained by applying a 1.5 factor of safety to limit loads, and is capable of supporting ultimate loads without failure of the primary structure.

WING FUEL LOAD.

The ability of the wing to safely withstand the imposed airloads is dependent on the weight of the fuel present in the wings, and with the distribution of the fuel in the wings along the span. Therefore, it is important to adhere to fuel loading and consumption schedules recommended in Section VII.

WING LIMITATIONS.

Lines showing wing strength in terms of aircraft flight load factors for combinations of fuel and payload are shown for 2.25 and 2.5g. If the aircraft utilizes combinations of payload and fuel which reduce the allowable load factor to less than 2.5g, it should be flown with caution, especially when making turns and pullouts and when operating in turbulent air.

LANDING GEAR AND BRAKING LIMITATIONS.

The aircraft design landing weight is 110,000 pounds for a sinking speed of 600 feet per minute. The overload design

MINIMUM PERMISSIBLE FUEL RESTRICTIONS FOR INDIVIDUAL TANKS DURING FLIGHT WITH TIP TANKS INSTALLED

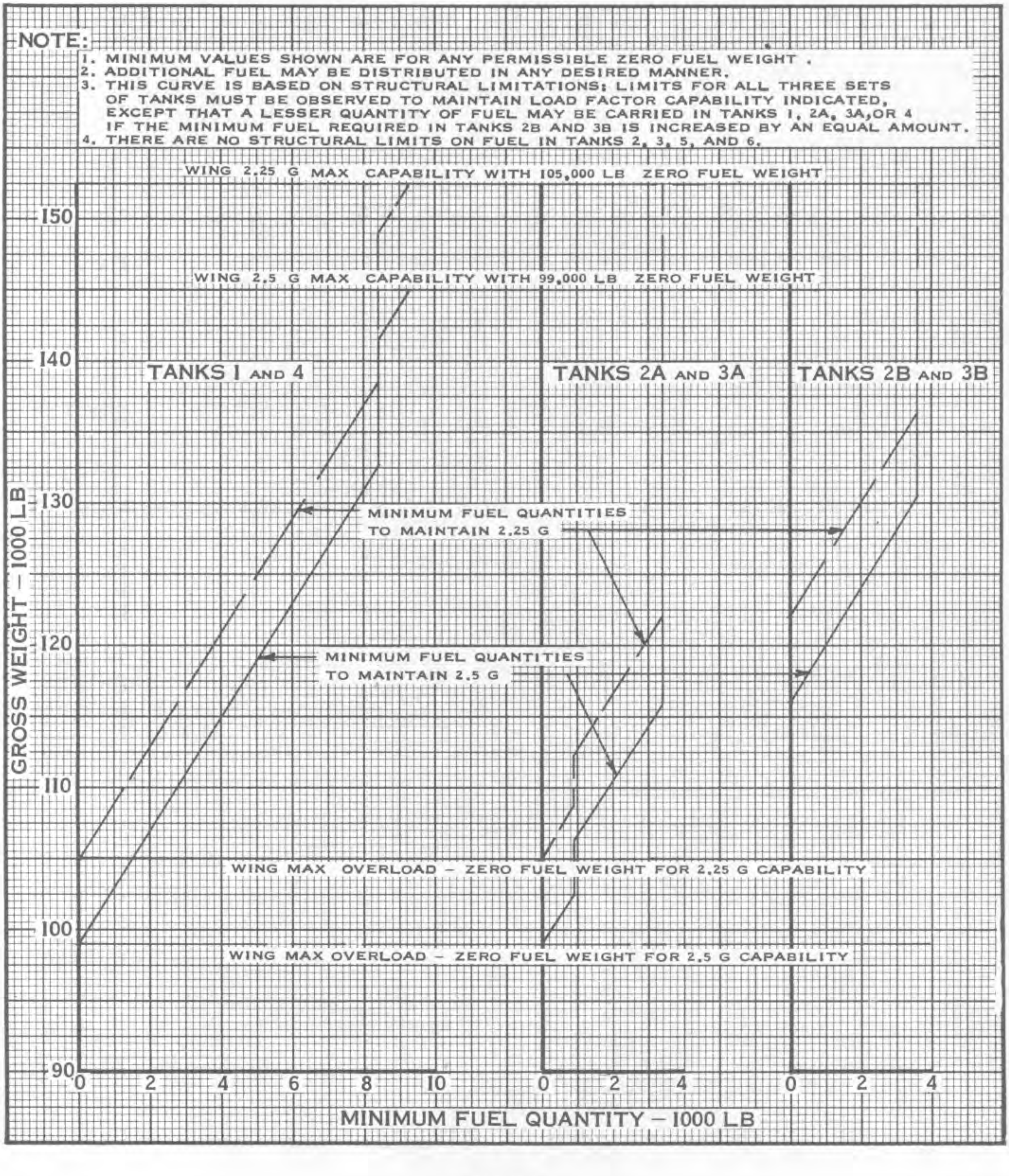


Figure 5-5

landing weight is 122,000 pounds with a limit sinking speed of 420 feet per minute at touchdown. The landing gear and associated structure are of required strength for normal taxiing and ground handling at takeoff weights up to 130,000 pounds. Increased care should be exercised in taxiing, braking, turning, and other ground-handling operations at heavier weights. The brakes are capable of bringing the aircraft to an emergency stop from normal takeoff speed at operating weights up to 152,500 pounds. However, full reverse thrust should be used during such a stop, especially at altitudes above sea level, to reduce the energy which would otherwise be absorbed by the brakes. Full application of brakes should be delayed, if possible, until speed has been reduced to that for design takeoff weight. The critical braking condition for takeoff would be reached at about 155,000 pounds using full reverse thrust on two engines or partial reverse thrust on three engines.

PERFORMANCE LIMITATIONS.

Structural limitations rather than performance requirements generally limit the weight-carrying capabilities of a four-engine aircraft. The most severe of the normal performance requirements is met at a weight of 150,200 pounds. The aircraft will take off and climb 50 feet within a distance of 10,000 feet at sea level on a hot day at that weight. Higher weights are listed on the Gross Weight Limitations chart, figure 5-6, for less severe performance requirements. However, this chart is to be used only as a guide with respect to performance available. Refer to the Appendix for detailed performance information. Local operating conditions may limit allowable weights more severely than is indicated by the weight limitations chart.

CONFIGURATION AND PERFORMANCE.

The configuration of the aircraft may impose a penalty on performance. An increase in drag from that for the cruise configuration results in a decrease in the rate of climb available, increases power required, and may require a readjustment of the permissible operating gross weight. As with power losses, increases in drag are most critical at takeoff when the landing gear is extended, the cowl flaps are open, and the wing flaps are extended 60 percent.

RECOMMENDED LOADING AREA.

The green area below the 2.5g line represents loading conditions that present no particular problem in regard to strength or performance of the aircraft. Operation of the aircraft at weights outside this recommended loading area should be avoided.

CAUTIONARY LOADING AREA

The yellow area represents loading of progressively decreasing margin of safety as payload or zero fuel weight is increased. An aircraft may reasonably be expected to encounter a load factor of 2.5g at times because of either maneuvering or turbulence. Also, depending upon aircraft configuration and atmospheric condition, performance may become critical in the upper region of this area. Careful adherence to rough air penetration speeds is recommended when operating at weights in the cautionary range. In a particular emergency, landing at weights in excess of normal landing weights are practicable if the pilot exercises ordinary care and precaution during the approach and landing. The glide path should be planned for decremental power changes from the start of the final approach to the landing. Rapid power changes should be held to a minimum during the approach and a small amount of engine power should be kept in reserve until after the landing flare. Every effort should be made to achieve minimum rate of descent on landing.

SAMPLE USE OF WEIGHT LIMITATIONS CHART.

Example 1

Assume a mission requires a 4000-pound payload and a 39,000-pound fuel load (including the reserve allowance). Calculate the gross weight to be:

Basic operating weight	85,750 lb
Payload	4000 lb
Fuel load	39,000 lb
	128,760 lb

The Gross Weight Limitations chart can only be used directly for a basic operating weight of 85,000 pounds since its construction is based on this value. Any other value (as in this example) must be adjusted to 85,000 pounds before entering the curve. This step can be accomplished by subtracting 85,000 pounds from the basic operating weight of the problem and adding this difference to the problem payload value. The solution then would be as follows:

Example 1 Basic Operating Weight	85,760 lb
Curve Basic Operating Weight	85,000 lb
Difference	760 lb

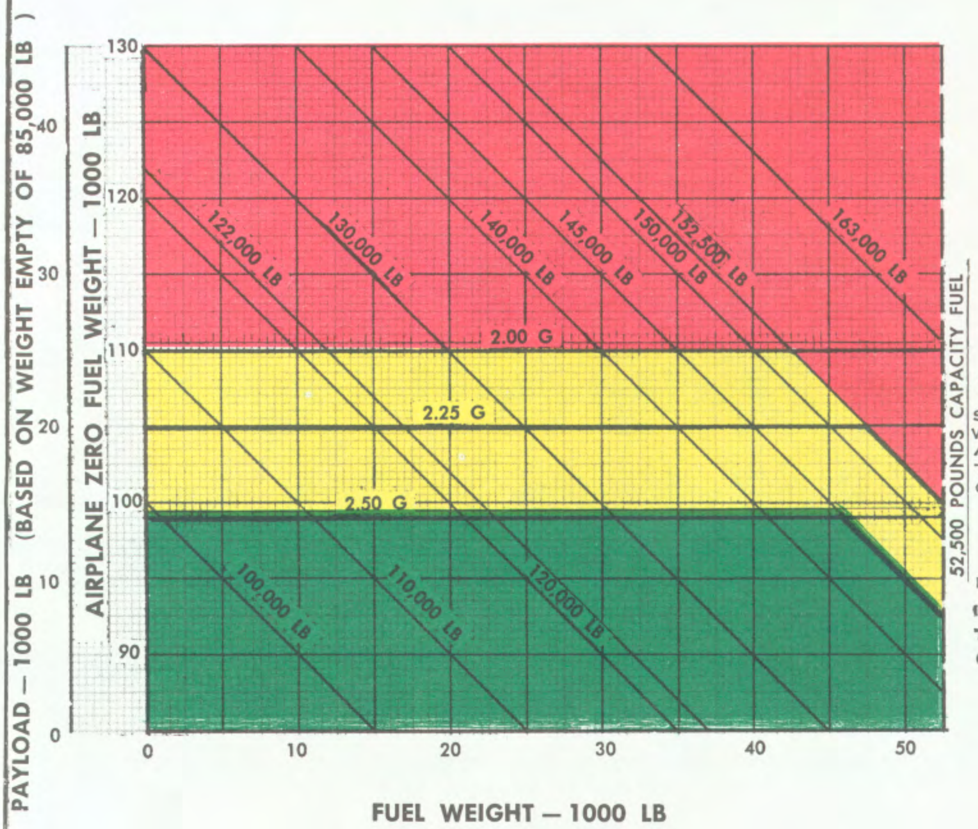
The problem payload now becomes 4000 plus 760 or 4760 pounds.

Recalculate the loaded gross weight:

Adjusted Operating Weight	85,000 lb
Payload and Weight Adjustment	4760 lb
Fuel Load	39,000 lb
	128,760 lb

EC-121R. GROSS WEIGHT LIMITATIONS

TIP TANKS INSTALLED



85,000 POUNDS
BASIC OPERATING WEIGHT

110,000 POUNDS
DESIGN LANDING WEIGHT WITH 600 FPM LIMIT CONTACT SINKING SPEED.

122,000 POUNDS
OVERLOAD LANDING WEIGHT WITH 420 FPM LIMIT CONTACT SINKING SPEED.

149,900 POUNDS
LIMITING GROSS WEIGHT FOR 100 FPM RATE OF CLIMB AT SEA LEVEL ON A HOT DAY WITH ONE ENGINE INOPERATIVE AND PROPELLER FEATHERED, TAKE – OFF (60%) FLAPS AND GEAR UP.

150,200 POUNDS
LIMITING GROSS WEIGHT FOR 10,000 FT DISTANCE TO TAKE OFF AND CLIMB 50 FT ON A HOT DAY AT S L.

152,500 POUNDS
MAXIMUM OVERLOAD GROSS WEIGHT

NOTE:

1. CAREFUL ADHERENCE TO ROUGH AIR PENETRATION SPEEDS IS RECOMMENDED WHEN OPERATING AIRPLANE AT WEIGHTS IN THE CAUTIONARY RANGE.
2. SINKING SPEEDS LESS THAN 420 FEET PER MINUTE ARE REQUIRED IN THE UPPER PART OF THE CAUTIONARY RANGE WHERE ZERO FUEL WEIGHTS SHOWN WILL LEAD TO LANDING WEIGHTS IN EXCESS OF 122,000 POUNDS.
3. INCREASED CARE SHOULD BE EXERCISED IN TAXIING, BRAKING, TURNING AND OTHER GROUND HANDLING OPERATIONS AT GROSS WEIGHTS IN EXCESS OF 130,000 POUNDS.
4. REFER TO APPENDIX FOR DETAILED PERFORMANCE INFORMATION.

Figure 5-6

Enter the weight limitations curve at "0", which now represents the basic operating weight of 85,000 pounds, and proceed horizontally to the fuel load line 39,000 pounds. Move vertically along this line to 4760 pounds payload. Find the loaded gross weight on the diagonal lines by interpolation to be 128,760 pounds; which checks the initial calculation. This initial operating point falls in the green area and the planned landing weight (with reserve fuel included) is less than 110,000 pounds.

Example 2

Using a fuel load of 52,500 pounds, assume that the basic operating weight was found to be 90,500 pounds due to the addition of equipment. Also assume that mission requirements increase the payload to 9000 pounds.

The following condition are now present:

Basic Operating Weight	90,500 lb
Payload	9000 lb
Fuel Load	52,500 lb
Total	152,000 lb

As in Example 1, the basic operating weight for the problem must be adjusted to 85,000 pounds before entering the weight limitations curve. This adjustment is made, as before, by adding the difference of the two basic operating weights to the payload value.

Example 2 Basic Operating Weight	90,500 lb
Adjusted Basic Operating Weight	85,000 lb
Difference	5500 lb
Actual Payload	9000 lb
Difference Between Basic Operating Weights	5500 lb
New Payload Value	14,500 lb

Enter the curve as in the previous example with the fuel load, 52,500 pounds, and the new payload value, 14,500 pounds. Read the loaded gross weight to be 152,000 pounds which checks the initial calculation. The point falls 7000 pounds above the 2.5g line. If overweight operation is not permissible, the mission requirements must be reexamined or 7000 pounds of payload must be removed.

The Appendix should be checked for detailed performance data to determine whether further limitations should be imposed.