476L

logistics
transport
support
system

SUPER HERCULES · GL207-45

VOLUME 3 *operational data*

LOCKHEED AIRCRAFT CORPORATION

476L


MATS
U.S. AIR FORCE
USAF

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FIGURE INDEX (Cont'd.)

FIGURE INDEX (Cont'd.)

SUPER HERCULES · GL207-45

section 1

INTRODUCTION

GENERAL

This is one of seven books being submitted to describe Lockheed's proposal for Support System 476L. The complete set, prepared in accordance with the Statement of Work and augmented by guidance resulting from queries to the Air Force, is as follows:

Volume	
1	Basic Proposal
2	Substantiating and Trade-Off Data
3	Operational Data
4	Special Technical and Cost Data
5	Model Specification
6	Large Scale Drawings
7	PEP Networks

The formats of all volumes containing significant amounts of text are the same except for Volume 5, which is laid out to the customary format for Model Specifications in order that it could serve in future negotiations.

Volume 1 thru 4 are organized in absolute conformity with the sequence and breakdown of subject headings in the Work Statement. Every decimally numbered paragraph of that document is identified by the same decimal number in this submittal and the sequencing is identical. Thus, Volumes 1 and 2 cover Work Statement Paragraphs 5.1 and 5.2. Volume 3 covers Paragraph 5.3, and Volume 4 covers Paragraph 5.4. It is hoped that this parallelism in detail and in general will facilitate review by the Air Force Evaluation Team.

Volume 1, though employing references to other volumes on occasion, is intended to be substantially self-sufficient. Volume 2, on the other hand depends upon Volume 1 for basic subject descriptions and is intended principally to substantiate and/or expand on subjects which require more discussion than the page limit of Volume 1 would permit. Volumes 3 and 4 are reasonably independent, but do rely to a degree on familiarity with Volume 1. Volume 5 is, of course, self-sufficient, and Volumes 6 and 7 are basically repositories for certain loose data requested so that it will be easier to handle.

AIRPLANE DESCRIPTION

For the reader not familiar with the other volumes of this proposal, the following brief description of the air vehicle is provided.

The GL 207-45 Super Hercules is of conventional configuration utilizing four pylon mounted Pratt & Whitney, P&W turbo-fan engines. A general arrangement of the aircraft is presented in Figure 1-1. In its initial version, the P&W JT3D-4 engines are utilized; the growth version of the JT3D-4, the JT3D-8A, is readily substituted in the original nacelles when it is available. The engines are equipped with simple, in-flight operable, target thrust reversers.

The cargo compartment of 70 ft. length is equivalent in cross-sectional size to that of the C-130 and contains an aft loading ramp which also forms the aft end of the pressure compartment. The fin is swept back with a trimmable horizontal tail mounted at its top. The forward fuselage contains a cockpit designed along the same principles as that of the C-130 but modified to meet the additional requirements of System 476L and FAA regulations. A normal tricycle landing gear is provided with the main gear retracting into wheel-well pods on the sides of the fuselage.

Principal dimensional data are summarized as follows:

Wing area	3228 sq. ft.
Wing span	160 ft. 8 in.
Overall length	150 ft.
Overall height	39 ft. 10 in.

The equipped weight empty, which includes the weight of a complete 463L loading system, is 127,000 lbs. The take-off weight at which the airplane will meet or better all requirements of the Work Statement (airport performance, basic and alternate mission range/payload, etc.) is 287,200 lbs. with the JT3D-4 engines. The design take-off weight, however, is 315,000 lbs., which is the weight at which all of the requirements are met or bettered with the growth JT3D-8 engine.

Because the airplane is completely compatible with no modification (except a longer nacelle inlet) with the JT3D-8A, limited data on the effect of changing to -8A engines when available is included. Because the airplane performance, even with -4 engines, is attractive at 315,000 lbs., it is included as well.

	WING	HORIZ.	VERT.
AREA SQ. FT.	3228.13	521.14	413.66
ASPECT RATIO	7.897	5.21	1.23
TAPER RATIO	0.374	0.37	0.6117
SWEEP AT 0.25c̄	25.0°	25.0°	35.0°
ROOT CHORD INCHES	398.00	175.20	273.096
TIP CHORD INCHES	132.41	64.83	167.07
MAC INCHES	266.51	128.47	224.34

WING
DIHEDRAL AT 0.25c̄ — — — — — — — — — — -1.25°
INCIDENCE - ROOT, 4.5° - TIP 0.0°
AIRFOIL SECTION-ROOT — — — — — — — — NACA0012.50M
AIRFOIL SECTION-0.43 B/2 — — — — — — — NACA0011.00M
AIRFOIL SECTION TIP — — — — — — — — — NACA0010.00M
AVERAGE AIRFOIL SECTION — — — — NACA0011.15M

FLAPS INBD — CENTER — OUTBD
AREA SQ.FT. TOTAL — — — — — — 175.9 — — 153.9 — — — 195.8
DEFLECTION TAKE OFF — — — — 35° — — 35° — — — 35°
DEFLECTION LANDING — — — — — 50° — — — 50° — — — 50°
MAX DEFLECTION — — — — — — 55° — — 55° — — — 55°
PERCENT OF WING CHORD — — — — — — — — — — 26%
PERCENT WING AREA AFFECTED — — — — — — — 66.8%
TYPE — — — — — — — — — — — — LOCKHEED FOWLER

AILERON
AREA SQ.FT. — — — — — — — — — — — — — 190.44
DEFLECTION DEGREES — — — — — — — — DN 15°-UP 25°
TYPE — — — — — SEMI-AERODYNAMICALLY BALANCED

VERTICAL TAIL
RUDDER AREA SQ.FT. — — — — — — — — — — — — 90.54
RUDDER DEFLECTION DEGREES — — — — — — — — ±35.0
AIRFOIL SECTION — — — — — — — — — — — — NACA64A012

HORIZONTAL TAIL
AERODYNAMIC INCIDENCE DEGREES — — — UP 4.0 DN 14.0
ELEVATOR AREA AFT OF HINGE SQ.FT. — — — — — — — 120.12
ELEVATOR DEFLECTION DEGREES — — — — UP 25.0 DN 15.0
AIRFOIL SECTION — — — — — — — — — — — NACA64A010
DIHEDRAL — — — — — — — — — — — — — — — — — 0°

POWER PLANT
FOUR P&W JT3D-4

NOSE GEAR
TWO-SIZE 32 X 11.5-15—PLY 24 -TYPE VIII
FULLY COMPRESSED — 5.25 FROM STATIC
FULLY EXTENDED — 11.00 FROM STATIC

MAIN GEAR
EIGHT-SIZE 44 X 16—PLY 28 -TYPE VIII
FULLY COMPRESSED — 5.875 FROM STATIC
FULLY EXTENDED-31.725 FROM STATIC

SPOILERS
AREA SQ.FT. — — — — — — 266.8
TYPE — — — — — TRAILING EDGE

WETTED AREA (SQ.FT.)

FUSELAGE	4036
NACELLE	243
WING	6123
TAIL	1912
MISC	1394
TOTAL	14,437

GROUND CLEARANCE OF FUS. WITH
FULLY COMPRESSED GEAR — 24.125 IN.

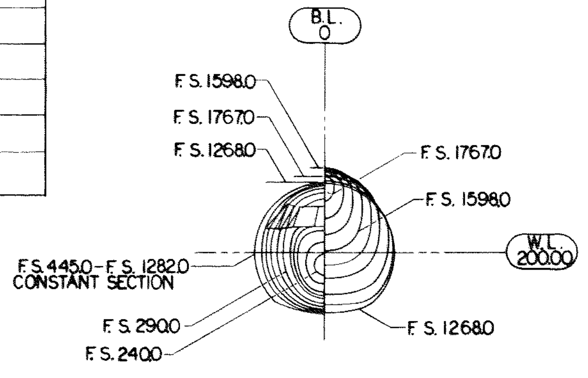
CONDITION	WEIGHT LB.	CENTER OF GRAVITY LOCATIONS FUS. STA.	% MAC	WATER LINE	VERT DIST FROM L.E. OF ROOT CHORD
BASIC MISSION DSGN GROSS WT.	288,000	916.0	21.3	236.8	48.9
LAND PLANE LDG DSGN GROSS WT.	257,500	904.5	17.0	228.0	57.7
MIN FLYING GROSS WT.	128,082	917.6	21.9	230.9	54.8
MAX DSGN GROSS WT. WITH MAX FUEL	315,000	913.9	20.5	241.9	43.8
MAX DSGN GROSS WT. WITH DSGN PAYLOAD (70,000 LB.)	315,000	913.9	20.5	235.1	50.6
DSGN GROSS WT (GEAR EXTENDED)	315,000	913.9	20.5	241.9 TO 235.1	43.8 TO 50.6
DSGN GROSS WT. (GEAR RETRACTED)	315,000	912.9	20.1	242.9 TO 236.1	42.8 TO 49.6
MOST FWD C. G. AT ANY POSSIBLE WEIGHT	210,000 MAX	893.8	13.0	242.5 TO 219.2	43.2 TO 66.5
MOST AFT C. G. AT ANY POSSIBLE GROSS WEIGHT	315,000 MAX	939.2	30.0	242.9 TO 235.1	42.8 TO 50.6

MAX CENTER OF GRAVITY SHIFT DUE TO FUEL FLOW

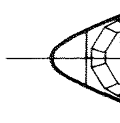
CONDITION	WEIGHT	C. G. BEFORE MOVEMENT		MOVEMENT % MAC	
		FUS STA	% MAC	FWD	AFT
NOSE UP ATTITUDE	213,000	922.2	23.6	—	2.8
NOSE DOWN ATTITUDE	283,000	909.1	18.7	1.5	—

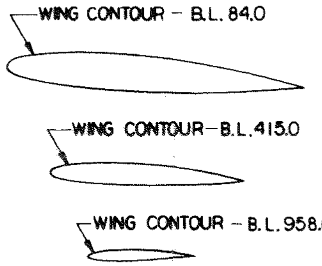
WEIGHTS

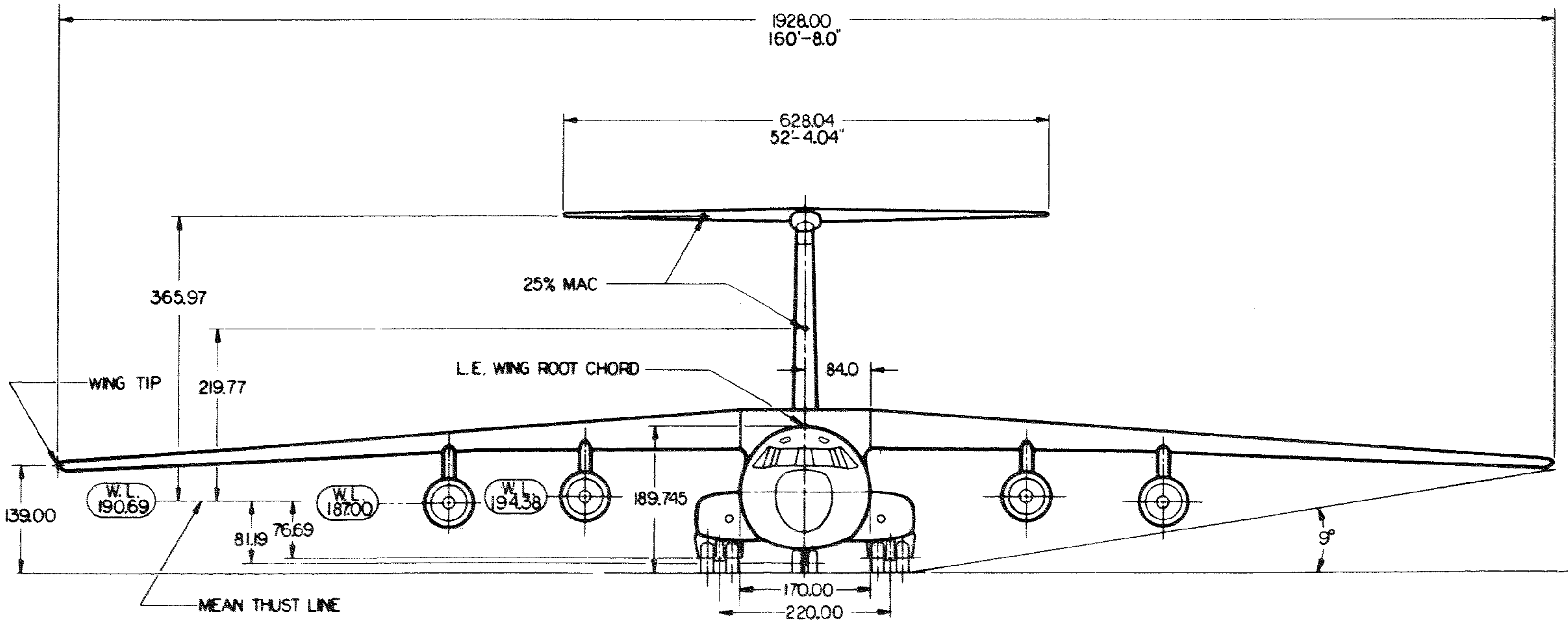
AIRCRAFT WEIGHT EMPTY (LB)	118,076
DESIGN USEFUL LOAD (LB)	196,924
DESIGN MAX GROSS WT. (LB)	315,000
MAX ALTERNATE GROSS WT. (LB)	315,000

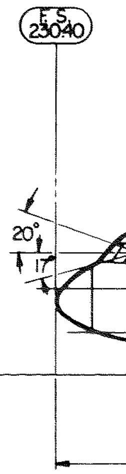


FUS. STA. CONTOUR LINES









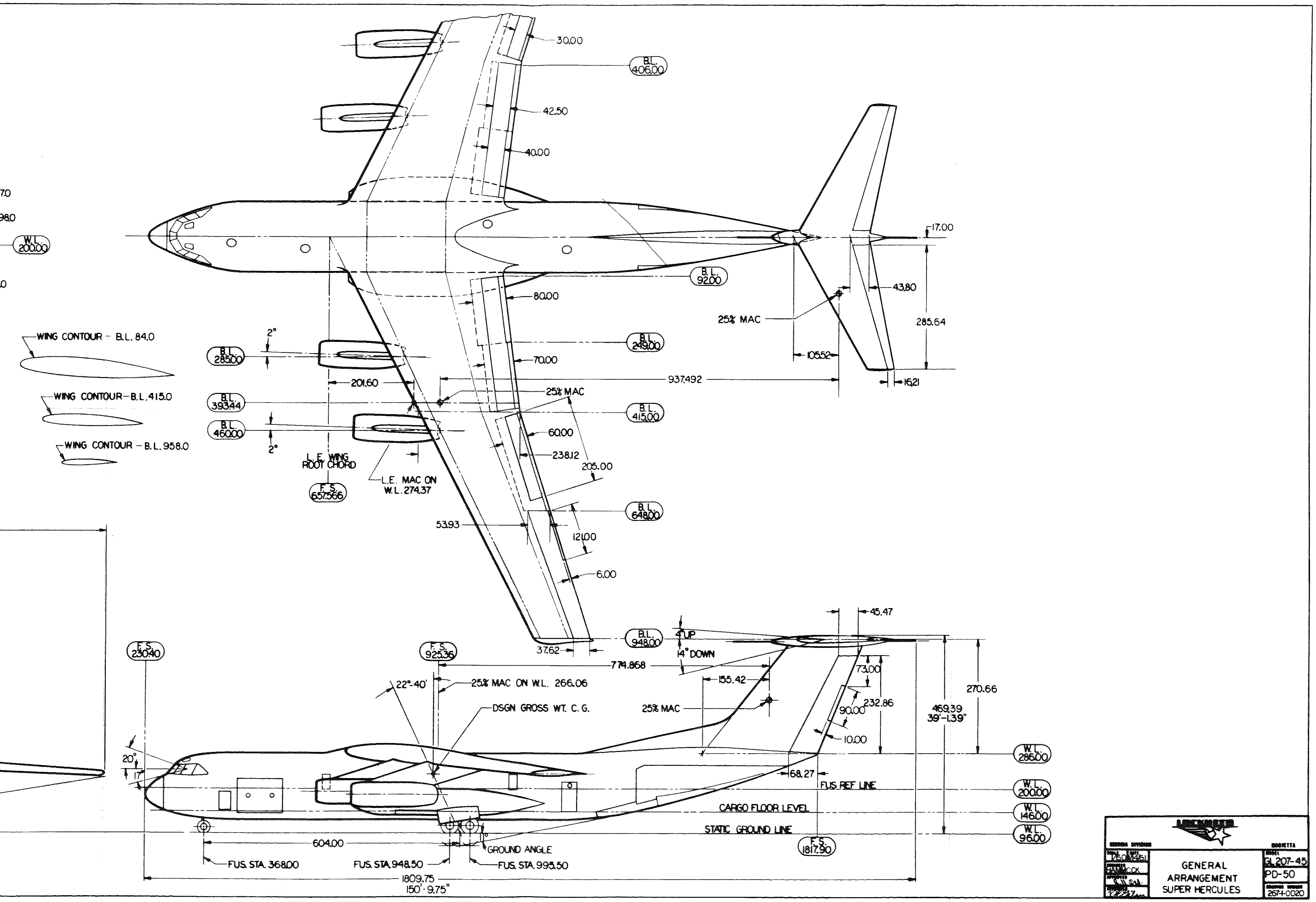

7.0
980
W.L. 200.00
0
30.00
B.L. 406.00
42.50
40.00
17.00
B.L. 92.00
80.00
43.80
25% MAC
285.64
WING CONTOUR – B.L. 84.0
2°
B.L. 285.00
B.L. 249.00
70.00
105.52
201.60
937.492
B.L. 393.44
25% MAC
16.21
WING CONTOUR–B.L. 415.0
B.L. 415.00
B.L. 460.00
60.00
2°
238.12
WING CONTOUR – B.L. 958.0
L.E. WING ROOT CHORD
L.E. MAC ON W.L. 274.37
205.00
F.S. 657.566
B.L. 648.00
53.93
121.00
6.00
45.47
B.L. 948.00
4° UP
14° DOWN
37.62
F.S. 230.40
F.S. 925.36
774.868
73.00
155.42
270.66
22°-40'
25% MAC ON W.L. 266.06
DSGN GROSS WT. C.G.
25% MAC
232.86
469.39
39'-1.39"
90.00
10.00
20°
17°
W.L. 286.00
68.27
FUS REF LINE
W.L. 200.00
CARGO FLOOR LEVEL
W.L. 146.00
STATIC GROUND LINE
W.L. 96.00
F.S. 1817.90
604.00
11°
GROUND ANGLE
FUS. STA. 368.00
FUS. STA. 948.50
FUS. STA. 995.50
1809.75
150'-9.75"
MARIETTA
1/60 7/4/61
HAMMOCK
GENERAL
ARRANGEMENT
SUPER HERCULES
GL 207-45
PD-50
2674-0020

figure 1-1

SUPER HERCULES · GL207-45

section 2

AIRFIELD CRITERIA (5.3.1)

The GL 207-45 airplane capabilities related to airfield runway length, UCI bearing strength and turning radius requirements are presented in this section.

Take-off and landing performance of the airplane are analyzed on the basis of both military specification MIL-C-5011A and Civil Air Regulation SR422B requirements. Data are presented for sea level and for 5000-ft. altitudes and for standard and hot day temperature conditions.

TAKE-OFF (5.3.1.1)

The maximum weight at which the GL 207-45 powered with P&W JT3D-4 engines, meets the System 476L Statement of Work requirement 2.4.4 for take-off from a 6000-ft. runway, using CAR transport category rules, is 288,000 lbs. The maximum weight required to meet or exceed all of the specified military missions is 287,200 lbs. as shown below.

Payload (lbs.)	Range (N.M.)	Take-Off Gross Weight (lbs.)	CAR Take-Off Field Length (ft.)
20,000	5500	283,100	5780
50,000	4000	287,200	5960
60,000	3000	280,484	5700
70,000	1000	237,905	4080

Take-off data are based on a 35-degree wing flap setting, take-off dry power ratings, sea level, standard day, and no wind conditions.

CAR take-off field lengths for sea level and for 5000-ft. altitude and for standard and hot day are shown in Figure 2-1. Military take-off distances for sea level and for 5000-ft. altitude and for standard and Air Force hot day are shown in Figures 2-2 and 2-3.

The take-off climb-out performance requirements of CAR are shown for both standard and hot-day conditions. At the maximum design gross weight of 315,000 lbs. the GL 207-45 is not limited by CAR 1st, 2nd or final segment climb as shown on Figure 2-4. On a hot day the maximum gross weight is limited by 2nd segment climb performance as shown on Figure 2-5.

When runway lengths greater than 6000 ft. are available take-off gross weight varies up to the 315,000-pound design gross weight and payload increases for a given range as shown in Figure 2-6. At the maximum design gross weight with a CAR field length of 7720 ft., a 67,300 lb. payload can be carried 4000 N. M.

Effect of JT3D-8A Engines

The GL 207-45 powered with four P&W JT3D-4 turbofan engines, meets or betters every requirement of System 476L. Its design and initial performance are based on the JT3D-4 powerplant; however, provisions are made in every airframe for fully exploiting, at any time, the full potential of the JT3D-8A, the growth version of the JT3D-4, when it becomes available.

In addition to the JT3D-4 performance data, basic mission performance has been computed for the GL 207-45 powered with the JT3D-8A engine. Take-off and landing field lengths for both civil and military operation with the JT3D-8A engine is shown in Figures 2-7 and 2-8. Other JT3D-8A performance data is shown in the appropriate sections of this volume.

At the design gross weight of 315,000 lbs., the GL 207-45 powered with JT3D-8A engines can take-off from a 6000-ft. runway using CAR transport category rules and fly the 4000-N. M. range with a 69,000-lb. payload as shown in Figure 2-9.

LANDING (5.3.1.2)

Maximum design landing weight for the GL 207-45 is 257,500 lbs. The maximum weight at which all System 476L requirements are met for landing on a 6000-ft. runway, using CAR transport category rules, is 241,000 lbs. This weight exceeds that required to meet all of the specified military missions as shown below.

Payload (lbs.)	Range (N.M.)	Landing Gross Weight (lbs.)	CAR Landing Field Length (ft.)
20,000	5500	158,305	4330
50,000	4000	187,530	4910
60,000	3000	204,700	5270
70,000	1000	212,030	5400

These landing distances are based on four engines in idle thrust without use of reverse thrust, sea level, standard day, and no wind conditions.

The CAR landing field lengths for sea level and for 5000 ft. altitude and for standard and hot-day conditions are shown in Figure 2-10. Military landing distances for sea level and for 5000 ft. altitude and for standard and hot-day conditions are shown in Figures 2-11 and 2-12.

The approach and landing climbout performance requirements of the CAR are shown for both standard and hot-day conditions at various altitudes in

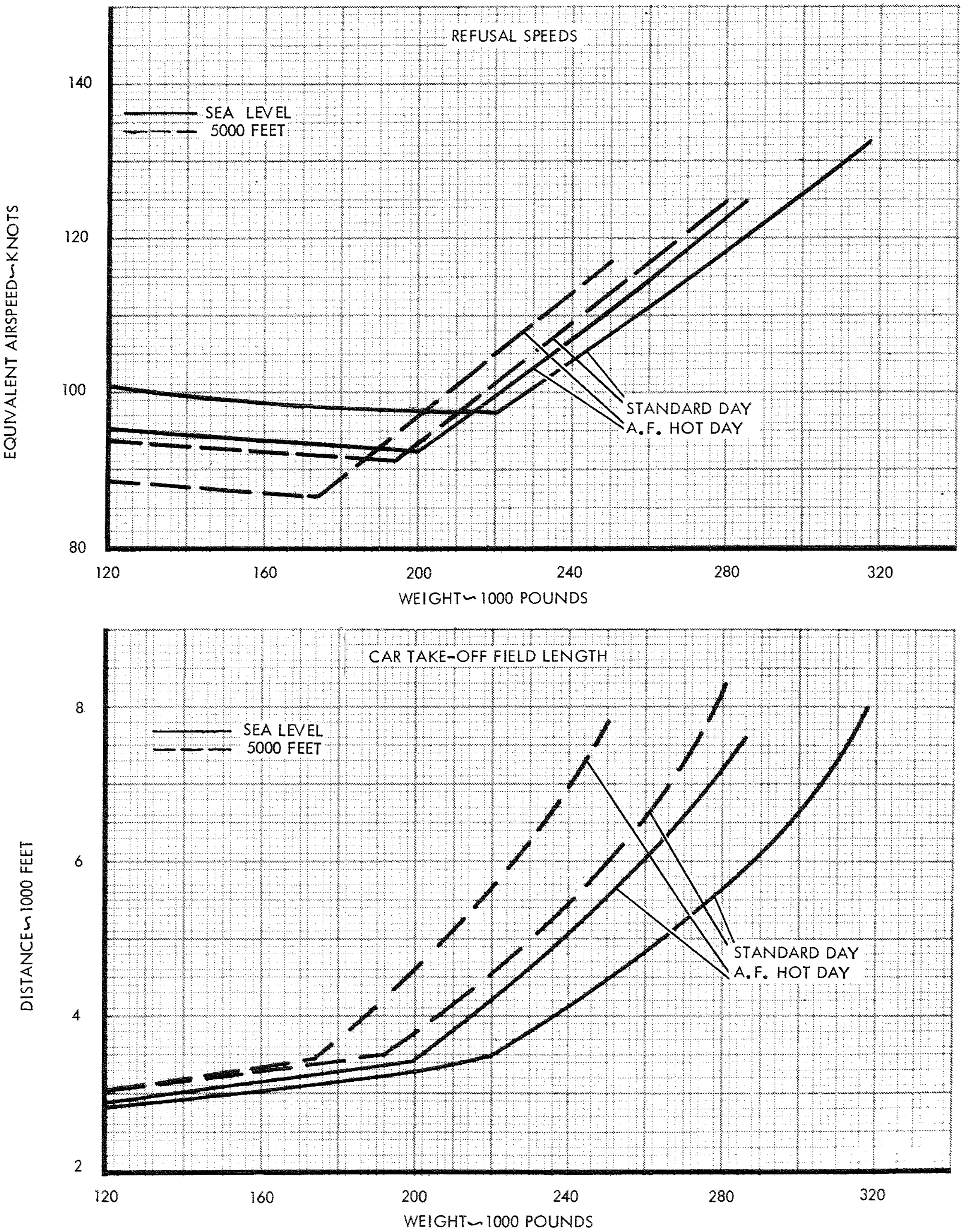


Figure 2-1—CAR TAKE-OFF FIELD LENGTHS, 35 DEGREE FLAP SETTING, TAKE-OFF POWER, NO WIND, P & W JT3D-4 ENGINE.

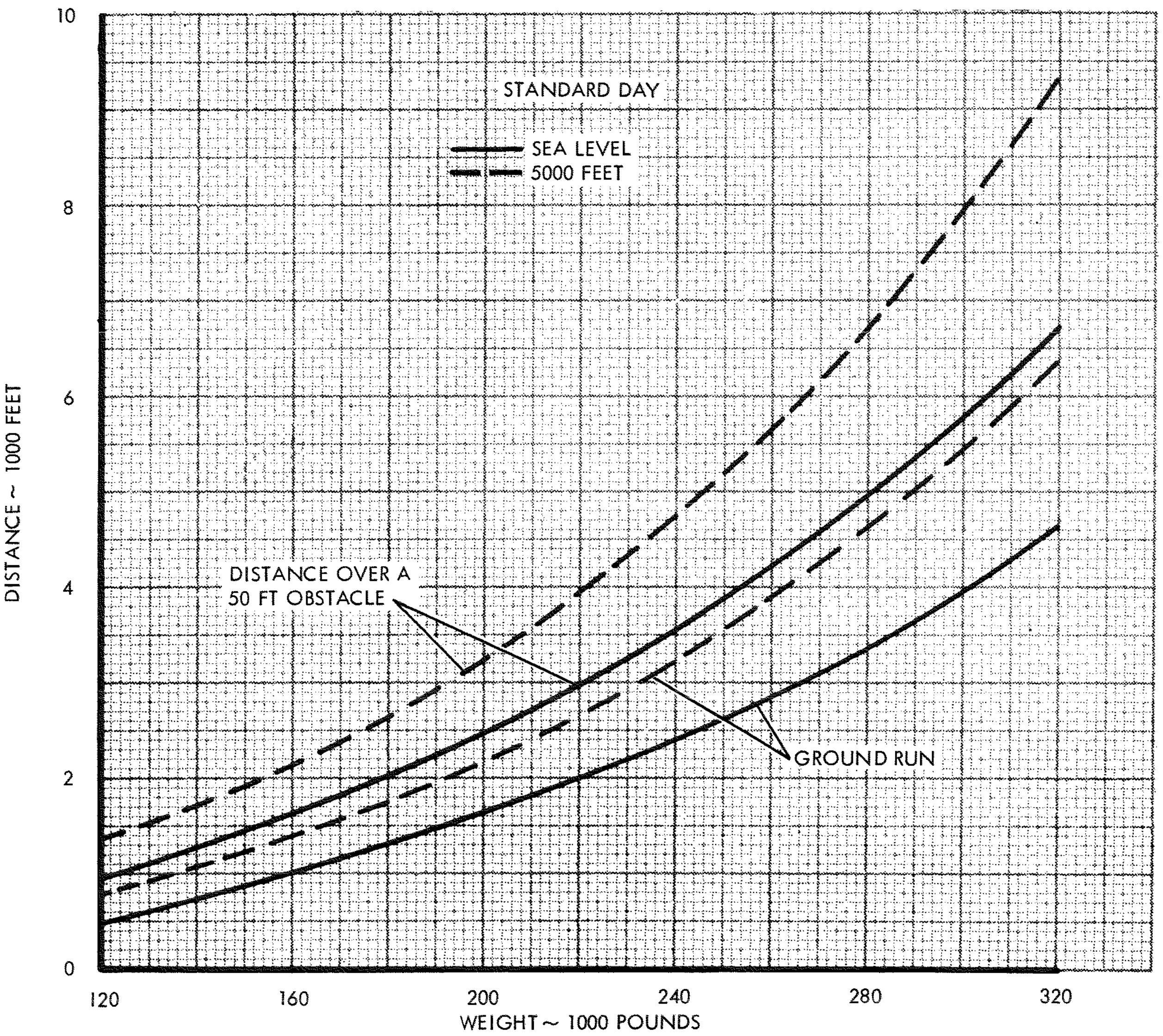


Figure 2-2—MILITARY TAKE-OFF POWER, NO WIND, P & W JT3D-4 ENGINE.

Figure 2-13. For normal operation the climb-out performance in the approach and landing configuration is not limiting and far exceeds CAR requirements. At the normal design landing gross weight of 257,500 lbs., the CAR requirements can be met on a hot day at an airport at 4750 ft. elevation.

All landing data are based on a 50-degree flap setting. The military landing distances are based on approach at 120% of stall speed and touchdown at 110%of stall speed. The corresponding CAR speeds are 130% and 120%. The military landing data, Figures 2-11 and 2-12, shows landing distances with (1) four engines in idle thrust, (2) two engines in reverse, one engine in idle, and one engine windmilling, and (3) four engines in reverse thrust. The civil landing distance, Figure 2-10, gives data for (1) all engines in idle, and (2) two engines in reverse, one engine in idle, and one engine windmilling.

The effect of the JT3D-8A engine on landing runway length is negligible when compared to the JT3D-4 performance. Civil and military landing runway length data are shown in Figures 2-7 and 2-8 for the JT3D-8A engine.

UNIT CONSTRUCTION INDEX (5.3.1.3)

The landing gear geometry of the GL 207-45 is a typical tricycle arrangement with dual wheel nose gear and dual tandem main gears. The resultant ground flotation characteristics of the airplane related to airfield runway bearing strength requirements are presented as UCI for various gross weights in Figure 2-14.

At the design gross weight of 315,000 lbs. the UCI of the GL 207-45 landing gear is 80 which allows the use of normal operational runways per USAF HIAD. For short ranges and medium gross weights, the UCI is low enough to permit operation into ad-

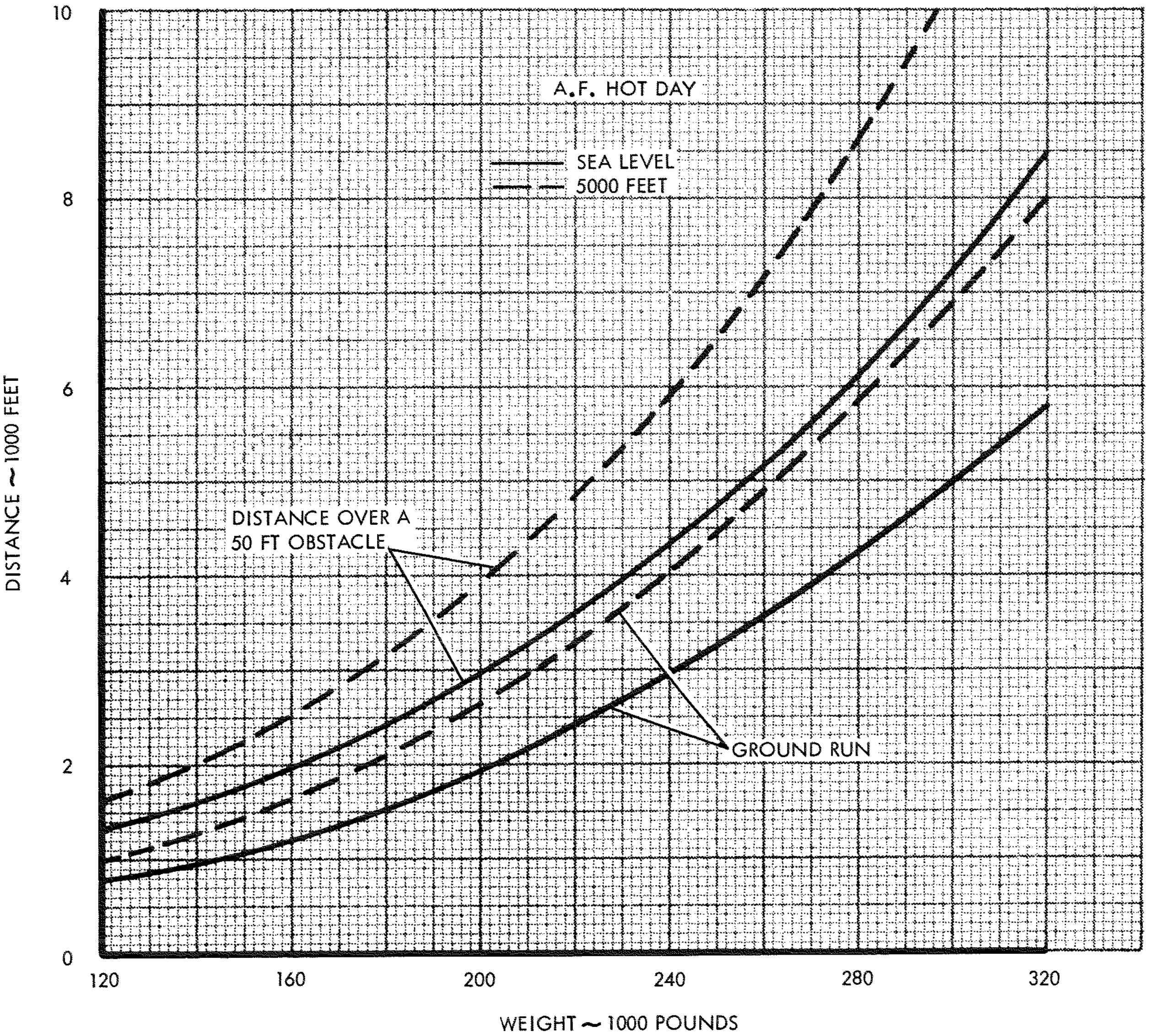


Figure 2-3—MILITARY TAKE-OFF DISTANCES, HOT DAY, 35 DEGREE FLAP SETTING, TAKE-OFF POWER, NO WIND P & W JT3D-4 ENGINE.

vance bases with flexible pavement and landing mats per HIAD definition. The UCI for the gear at the required landing weight of 193,640 lbs. for a 60,000-lb, 1000-N. M. mission is 38 for the main gear and 34 for the nose gear. For a mission to carry 25,000 lbs. 1,500 N. M., a take-off weight of 191,400 lbs. results in a take-off UCI of only 38. Landing weight is 158,480 lbs. which results in a landing UCI of only 32. Landing ground roll is 900 ft.

TURNING RADIUS (MAXIMUM GROSS WEIGHT) (5.3.1.4)

The GL 207-45 can be turned 180 degrees on a 73-ft.-wide runway, as shown in Figure 2-15. Turning about the inside truck can be accomplished with normal pivot turn tire wear. For minimum wear during turns accomplished in the rquired 150-ft.-wide runway, the nose gear steering angle need be only 41 degrees and the inside truck will rotate about a 49 ft. 8 in. radius resulting in minimum tire scrubbing.

The nose landing gear is fitted with hydraulically powered rack and gear steering controlled by the standard steering wheel on the pilot's side of the crew station. Provisions for initiating nose wheel steering by rudder pedal action may be included in addition, if desired.

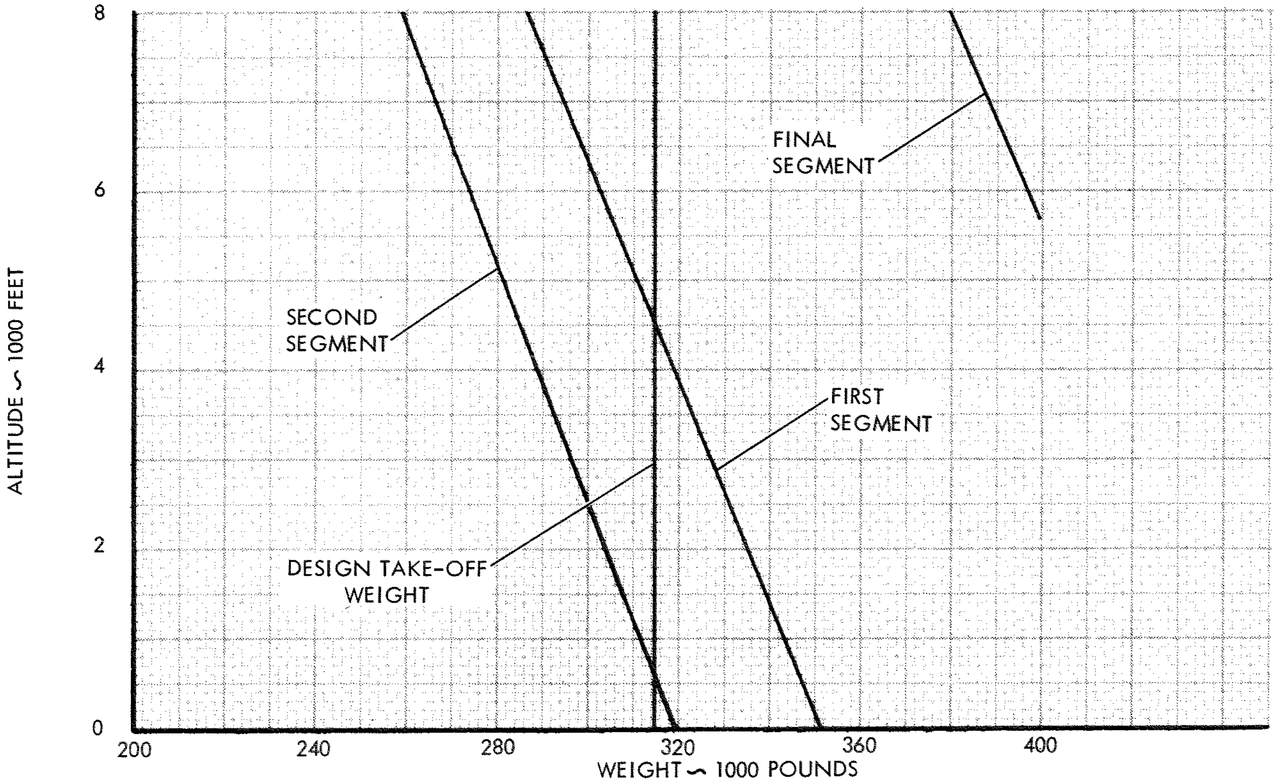


Figure 2-4—CAR WEIGHT LIMITATIONS, STANDARD DAY, FIRST, SECOND, AND FINAL CLIMB SEGMENTS, P & W JT3D-4 ENGINE.

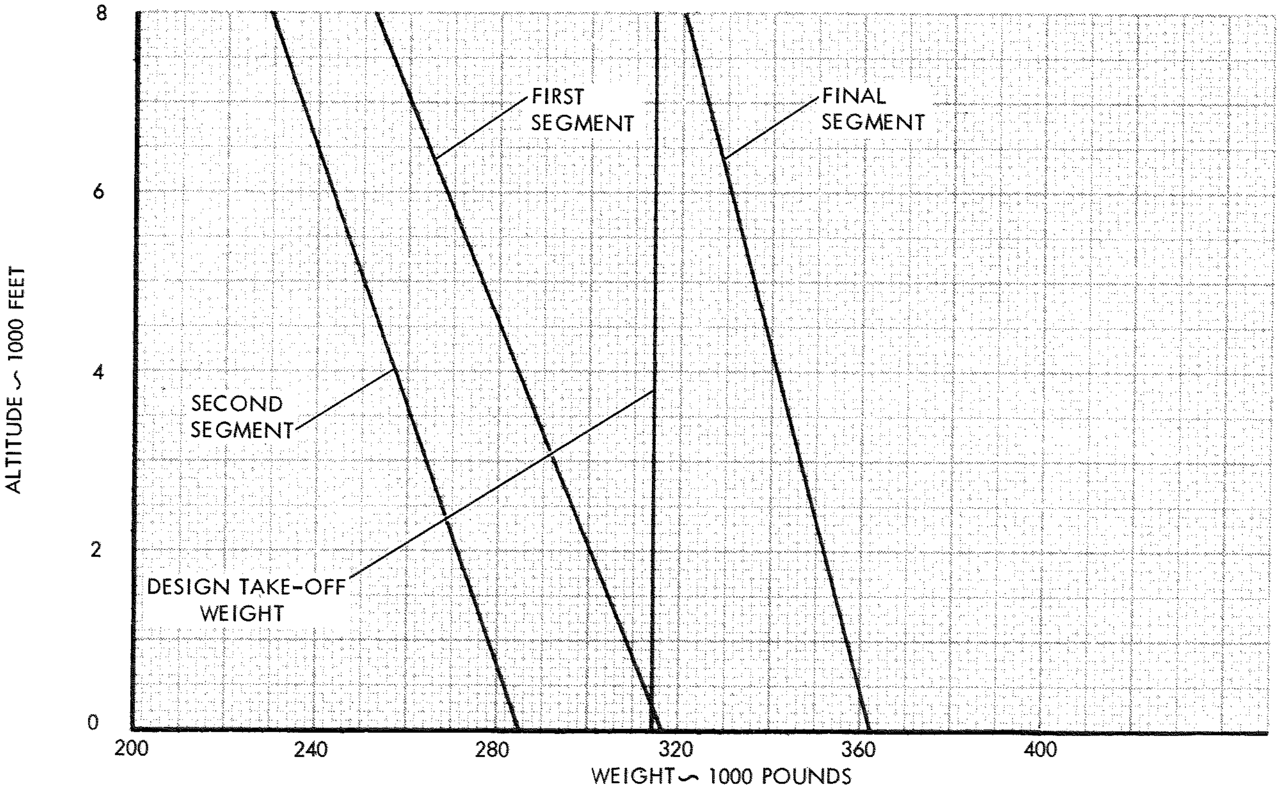


Figure 2-5—CAR WEIGHT LIMITATIONS, AF HOT DAY, FIRST, SECOND, AND FINAL CLIMB SEGMENTS, P & W JT3D-4 ENGINE.

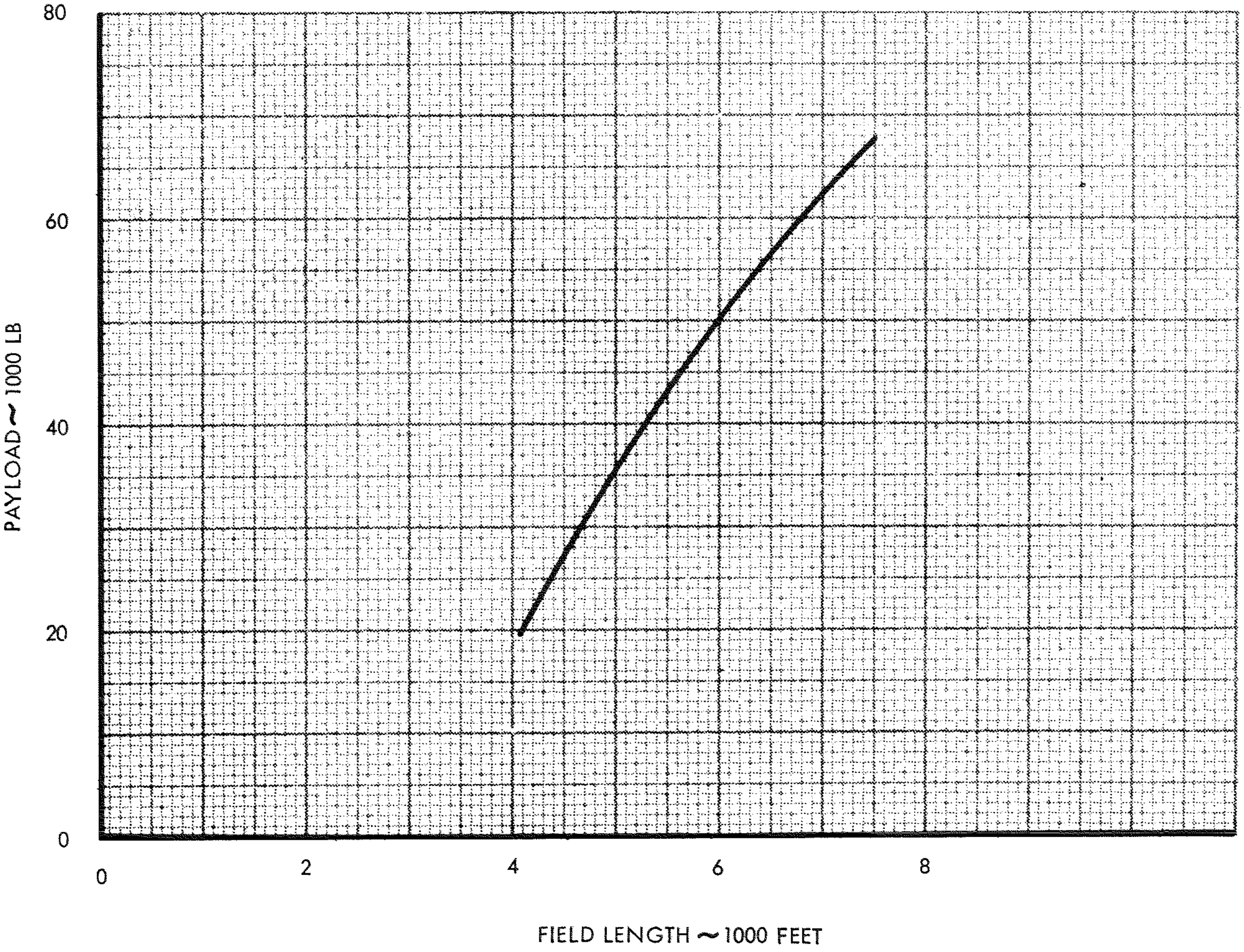


Figure 2-6—PAYLOAD VERSUS FIELD LENGTH, 4000 NAUTICAL MILE RANGE, P & W JT3D-4 ENGINE.

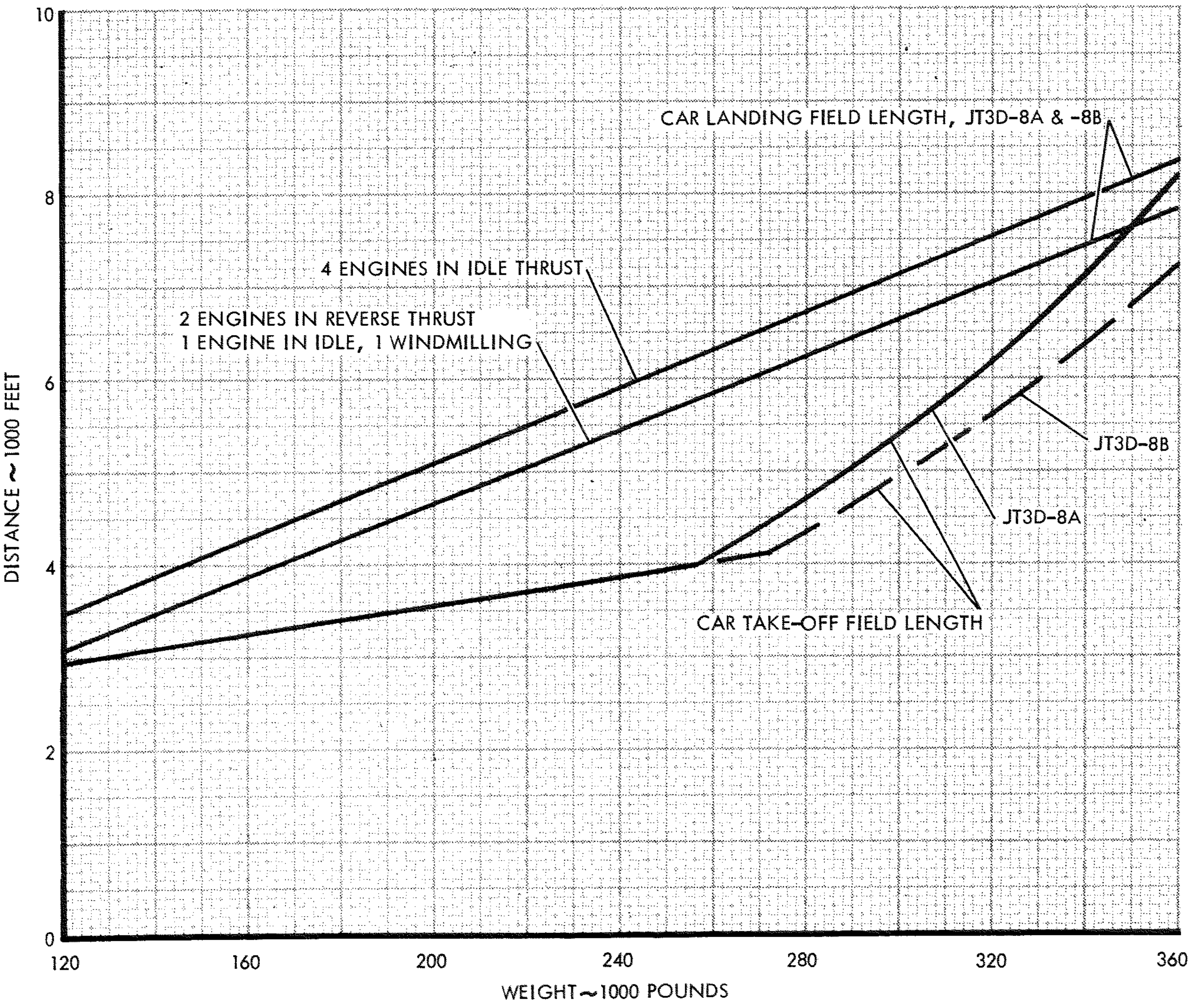


Figure 2-7—CAR TAKE-OFF AND LANDING FIELD LENGTHS, SEA LEVEL, STANDARD DAY, NO WIND, TAKE-OFF BASED ON 35 DEGREE FLAP SETTING, LANDING BASED ON 50 DEGREE FLAP SETTING, P & W JT3D-8A AND -8B ENGINES.

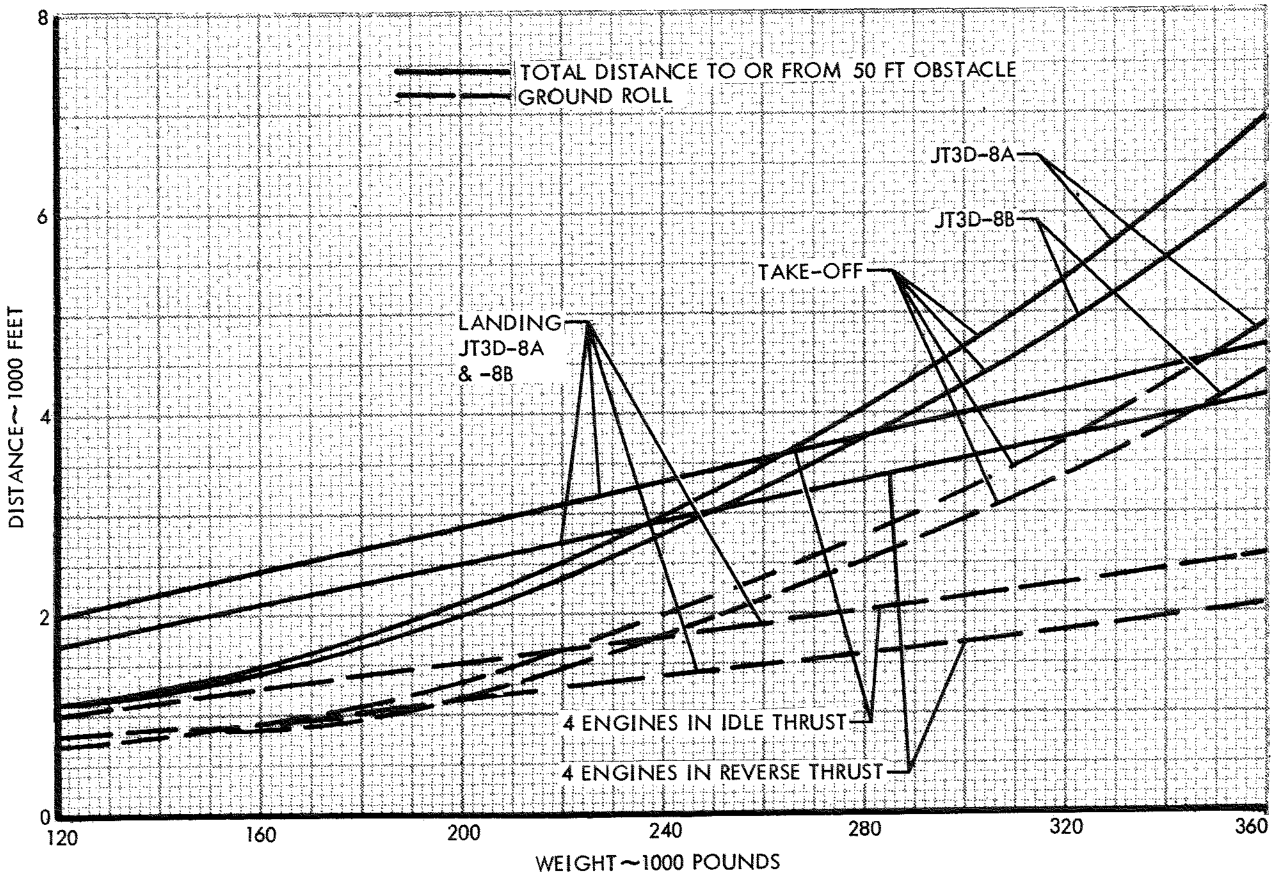


Figure 2-8—MILITARY TAKE-OFF AND LANDING FIELD LENGTHS, SEA LEVEL, STANDARD DAY, NO WIND, TAKE-OFF BASED ON 35 DEGREE FLAP SETTING, LANDING BASED ON 50 DEGREE FLAP SETTING, P & W JT3D-8A AND -8B ENGINE.

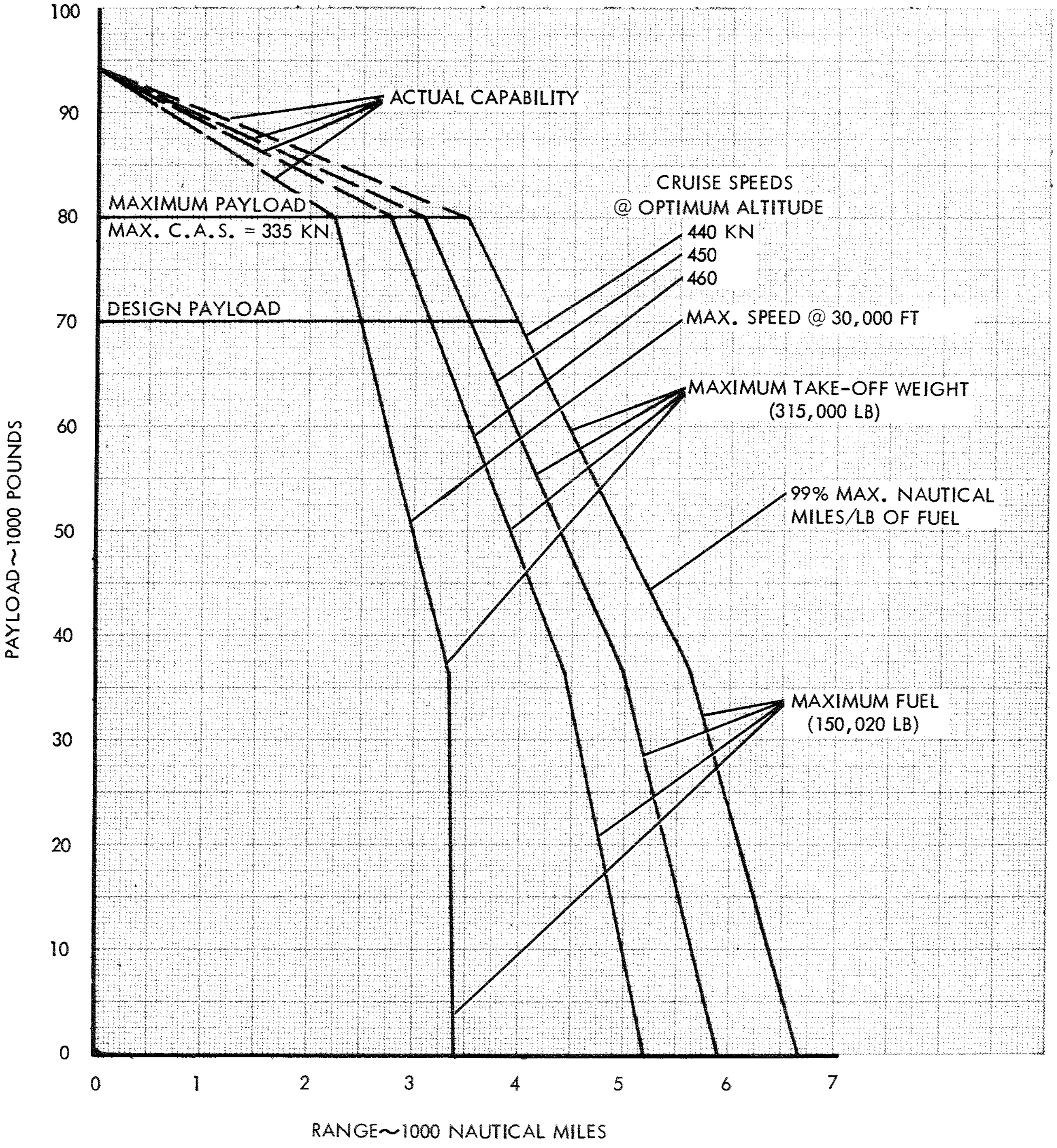


Figure 2-9—PAYLOAD RANGE, INSTALLED FUEL FLOWS FIVE PER CENT CONSERVATIVE, TAKE-OFF FUEL ALLOWANCES AND FUEL RESERVES—MIL-C-5011A, P & W JT3D-8A AND -8B ENGINE.

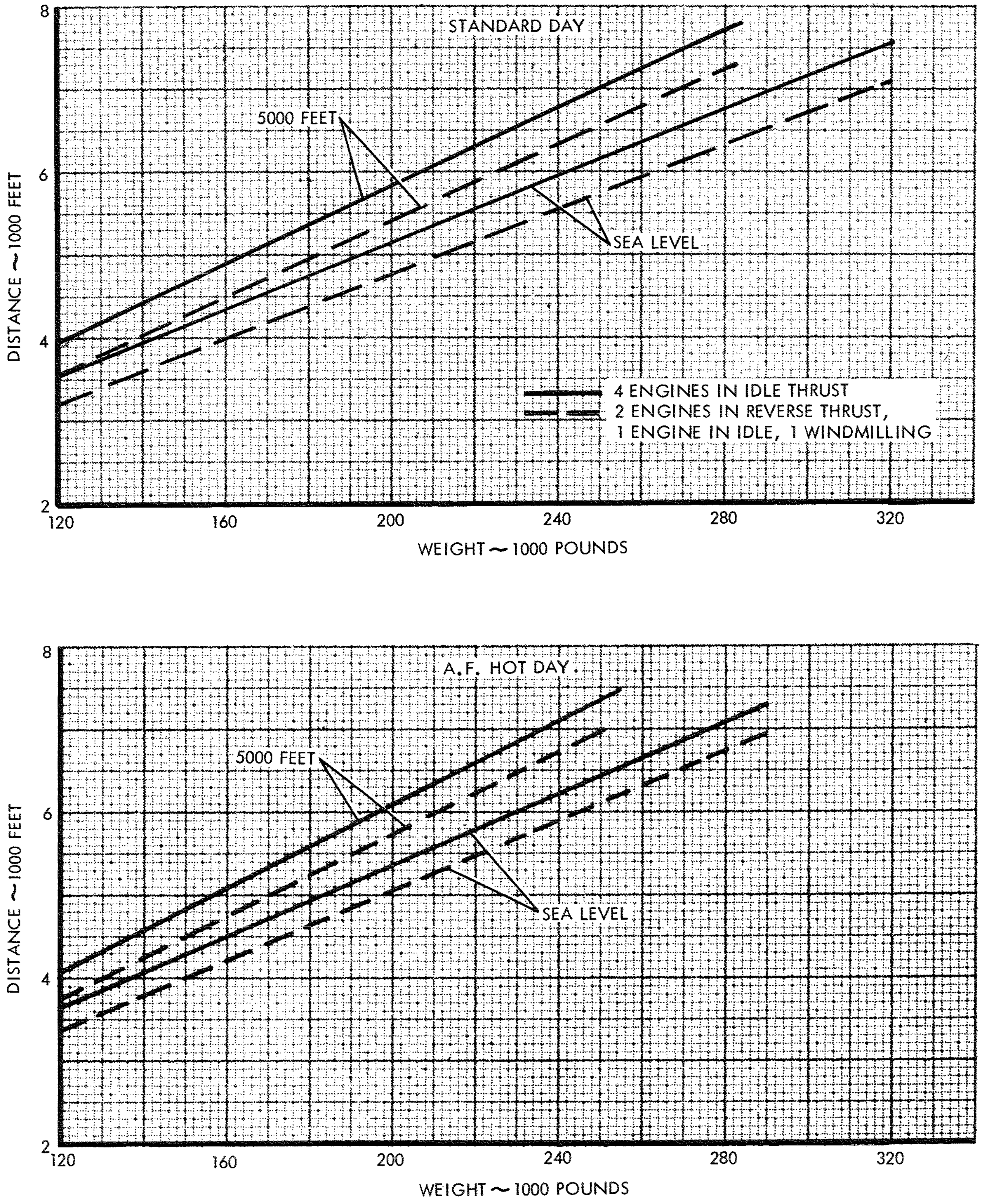
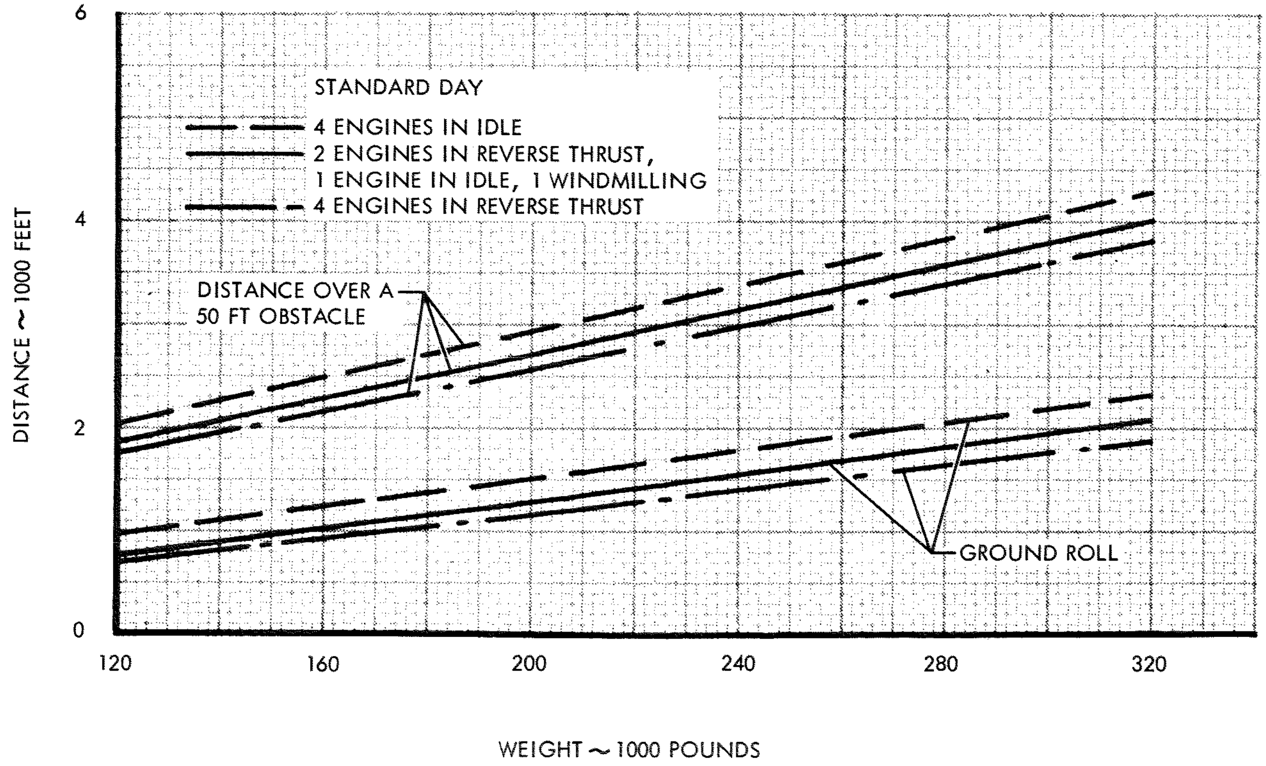


Figure 2-10—CAR LANDING FIELD LENGTHS, 50 DEGREE FLAP SETTING, NO WIND, P & W JT3D-4 ENGINE.



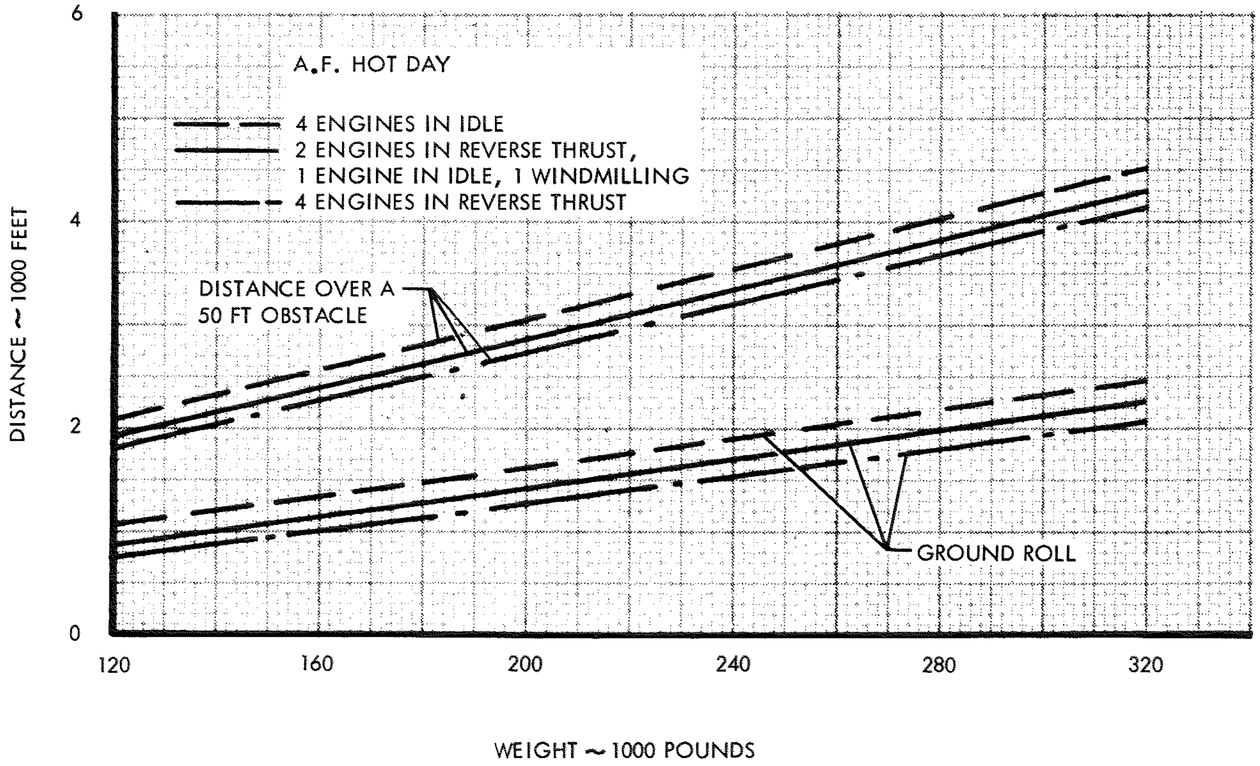
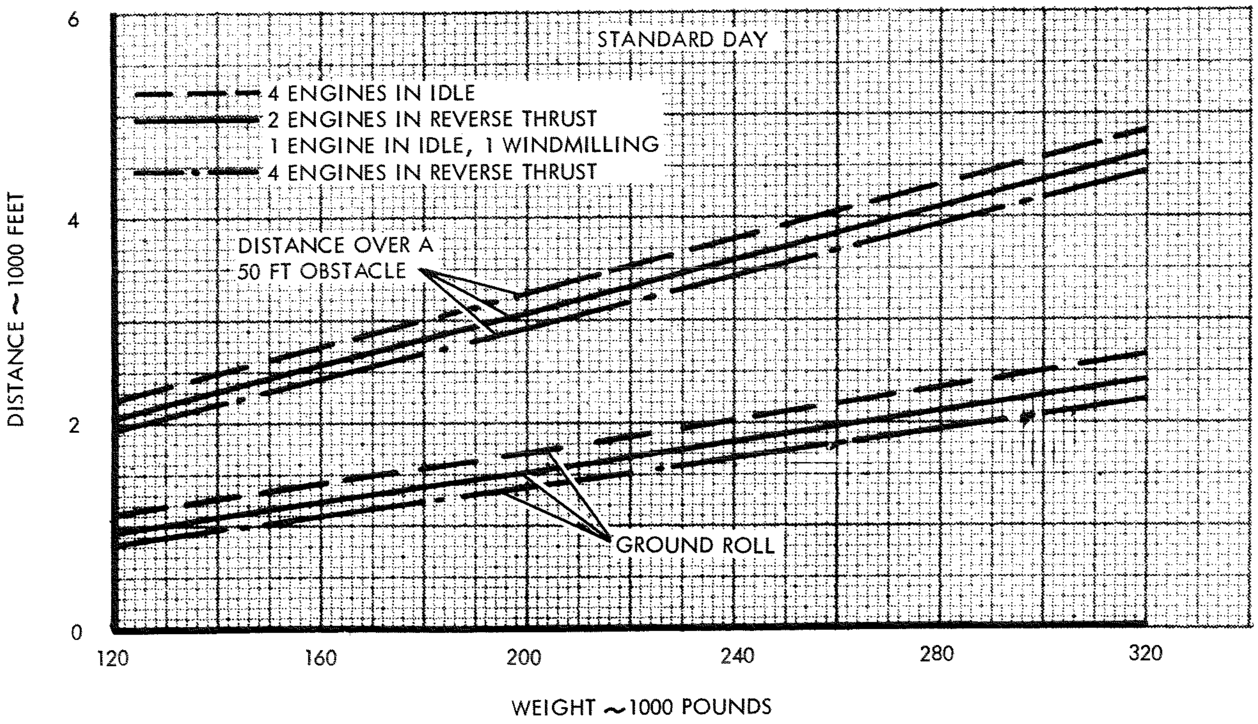


Figure 2-11—MILITARY LANDING DISTANCES SEA LEVEL, 50 DEGREES FLAP SETTING, NO WIND, P & W JT3D-4 ENGINE.



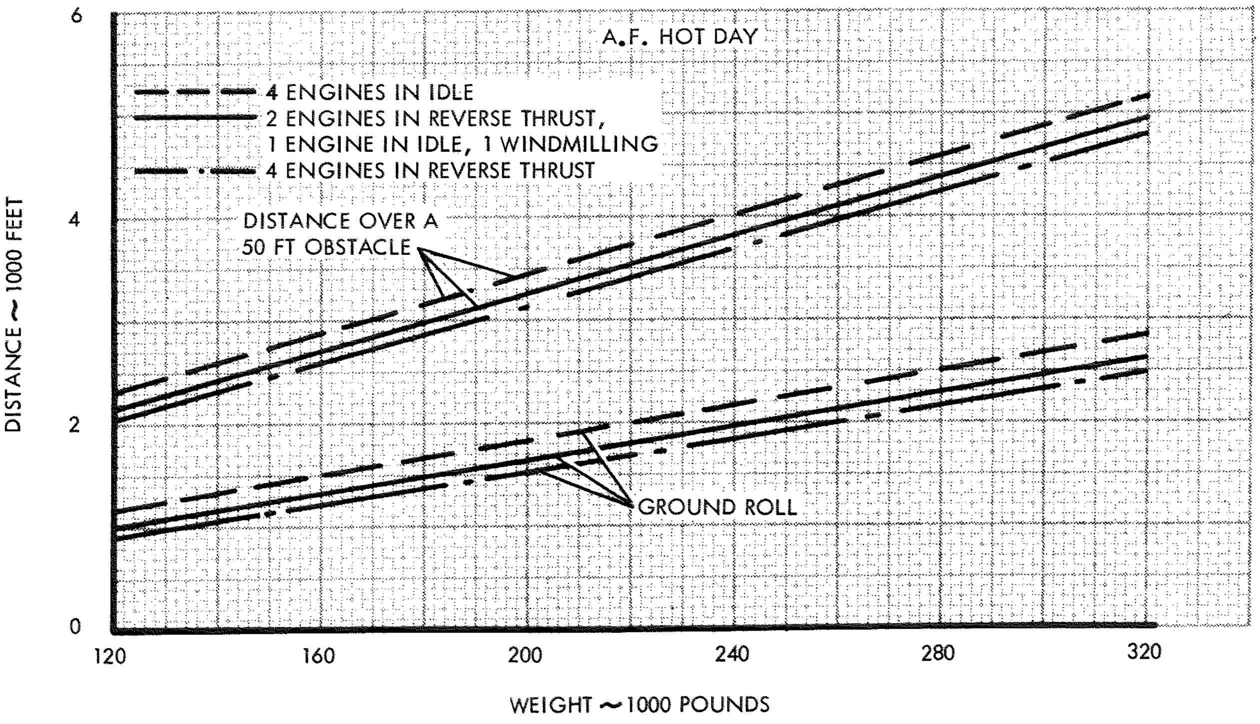
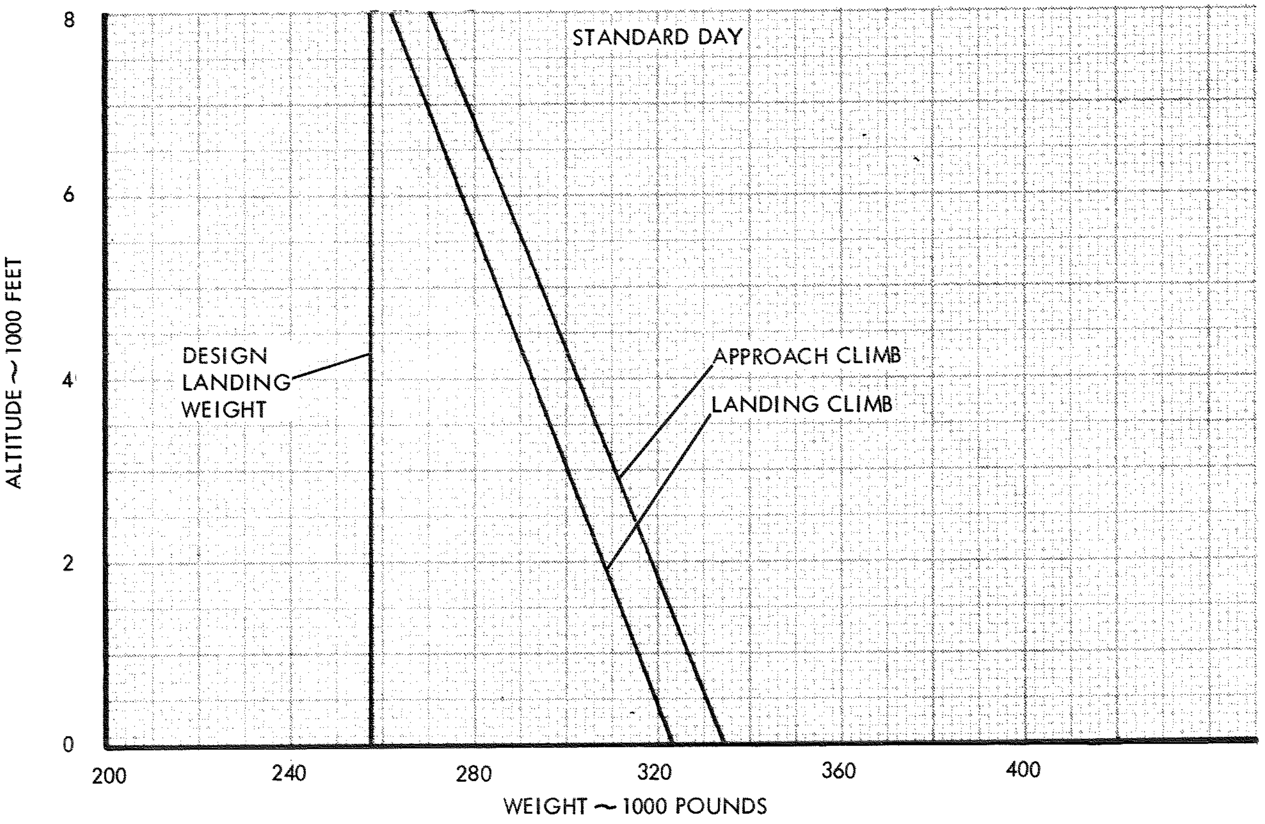


Figure 2-12—MILITARY LANDING DISTANCES 5000 FEET, 50 DEGREE FLAP SETTING, NO WIND, P & W JT3D-4 ENGINE.



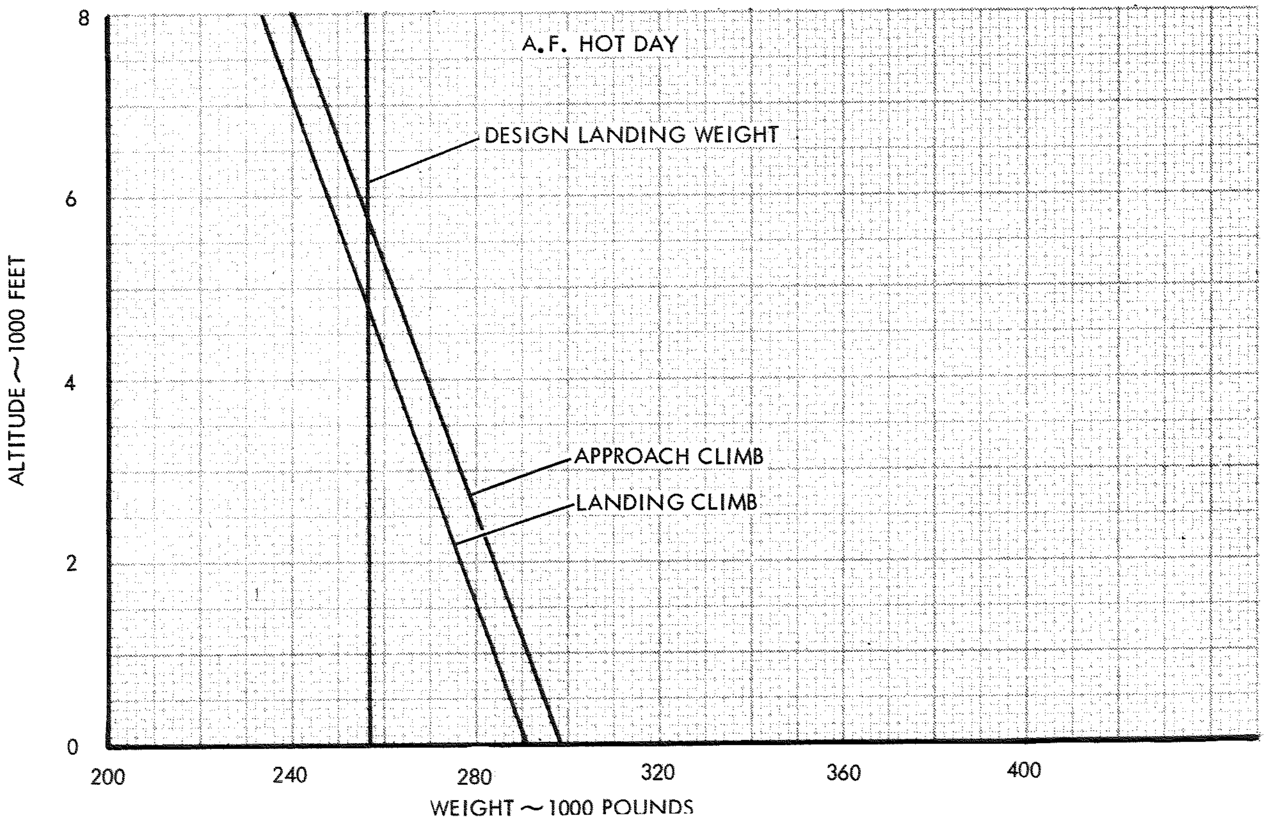


Figure 2-13—CAR WEIGHT LIMITATIONS, APPROACH AND LANDING CLIMB SEGMENTS, TAKE-OFF POWER, P & W JT3D-4 ENGINE.

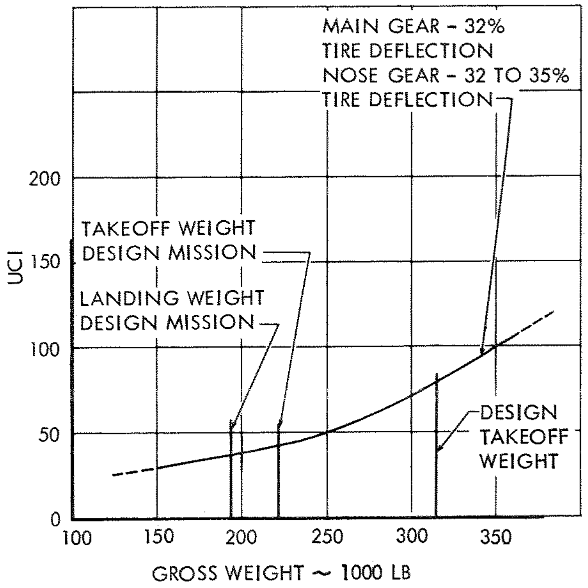


Figure 2-14—UNIT CONSTRUCTION INDEX.

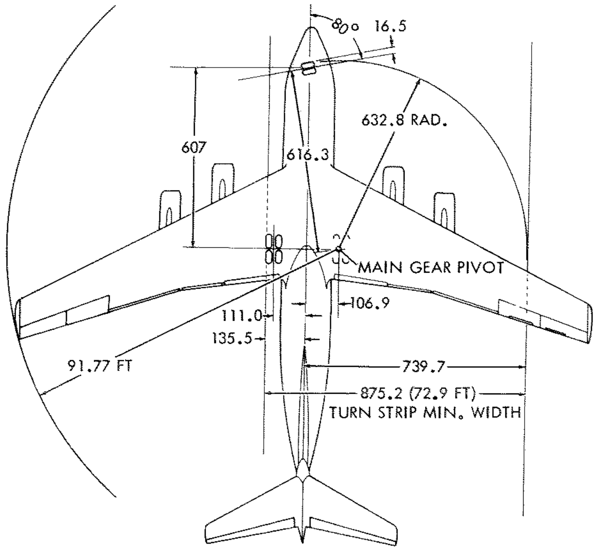
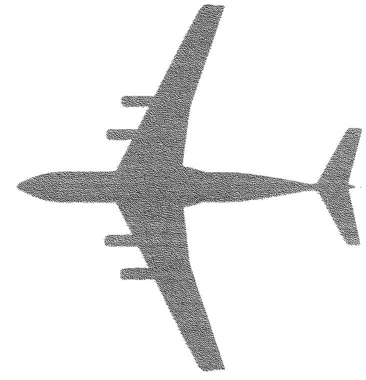


Figure 2-15—AIRPLANE TURNING RADIUS.

section 3



RESPONSE (5.3.2)

Upon initial receipt of deployment orders, the aircraft response is the result of aircraft preflight inspection, flight planning, loading, fueling, start, taxi, run-up, take-off, climb, and cruise to destination plus transit times if enroute stops are required. The ground preparation of the aircraft for flight is covered in Sections 7 and 8, and the time will vary depending upon the type of ground support equipment and facilities available.

SPEEDS (AVERAGE CRUISE AND MAXIMUM CRUISE) (5.3.2.1)

Climb and cruise speed data for various altitudes, powers, and gross weights are presented in this section so that flight speed and time for any regime may be determined. Figure 3-1 presents a speed summary of the GL 207-45 airplane and shows that maximum allowable cruise speed is obtained at 25,000 ft. altitude which is the lowest normal cruise altitude meeting the requirements of system 476L. The maximum level flight speed at 25,000 ft. altitude is 488 knots TAS at a weight of 280,000 lbs. and 492 knots at a weight of 240,000 lbs.

Best range is achieved with cruise climb, at 440 knots TAS and 80% normal power, as shown in Figures 3-2 and 3-3. The optimum cruise altitude varies from 31,700 ft. at a weight of 310,000 lbs. to

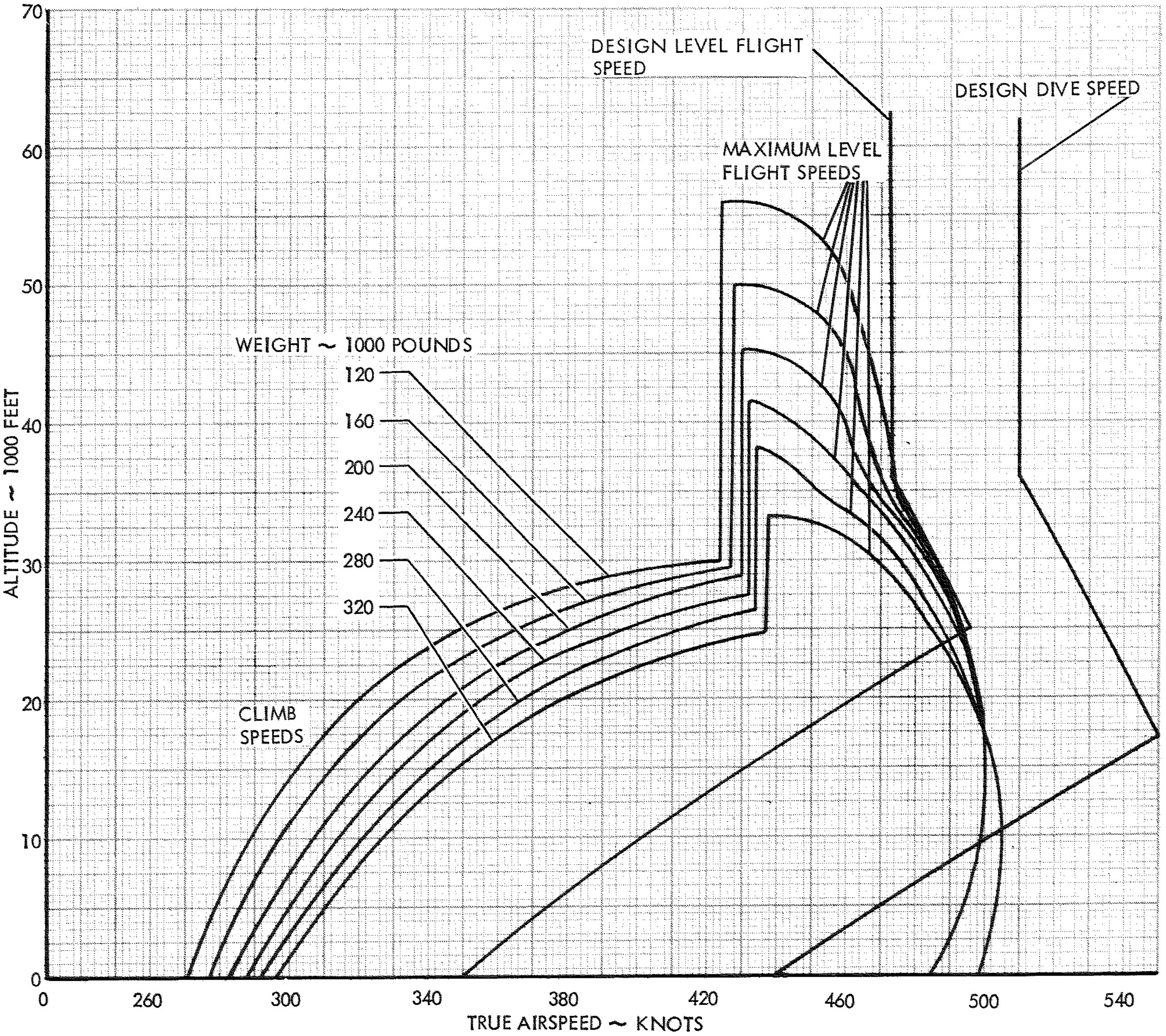


Figure 3-1—ALTITUDE PERFORMANCE SUMMARY—SPEED ALTITUDE, STANDARD DAY, NORMAL POWER, P & W JT3D-4 ENGINE.

47,800 ft. at a weight of 140,000 lbs. At these same weights, the three-engine, normal-power service ceilings are 26,500 ft. and 45,000 ft. respectively. Higher cruising speeds of 450 knots and 460 knots TAS are optional at some reduction in range as shown in Figure 3-2.

Also included in this section are a rate of climb summary; a time, distance, and fuel to climb chart; and charts showing enroute climb performance for both one and two engines inoperative. These data permit specific analysis of various type cruise missions and are shown in Figures 3-4, 3-5, 3-6 and 3-7. A rate of climb summary and speed altitude summary for the JT3D-8A engine is shown in Figures 3-8 and 3-9.

DISPATCH TIME (5.3.2.2)

The requirement for this discussion was deleted at the Query Meeting.

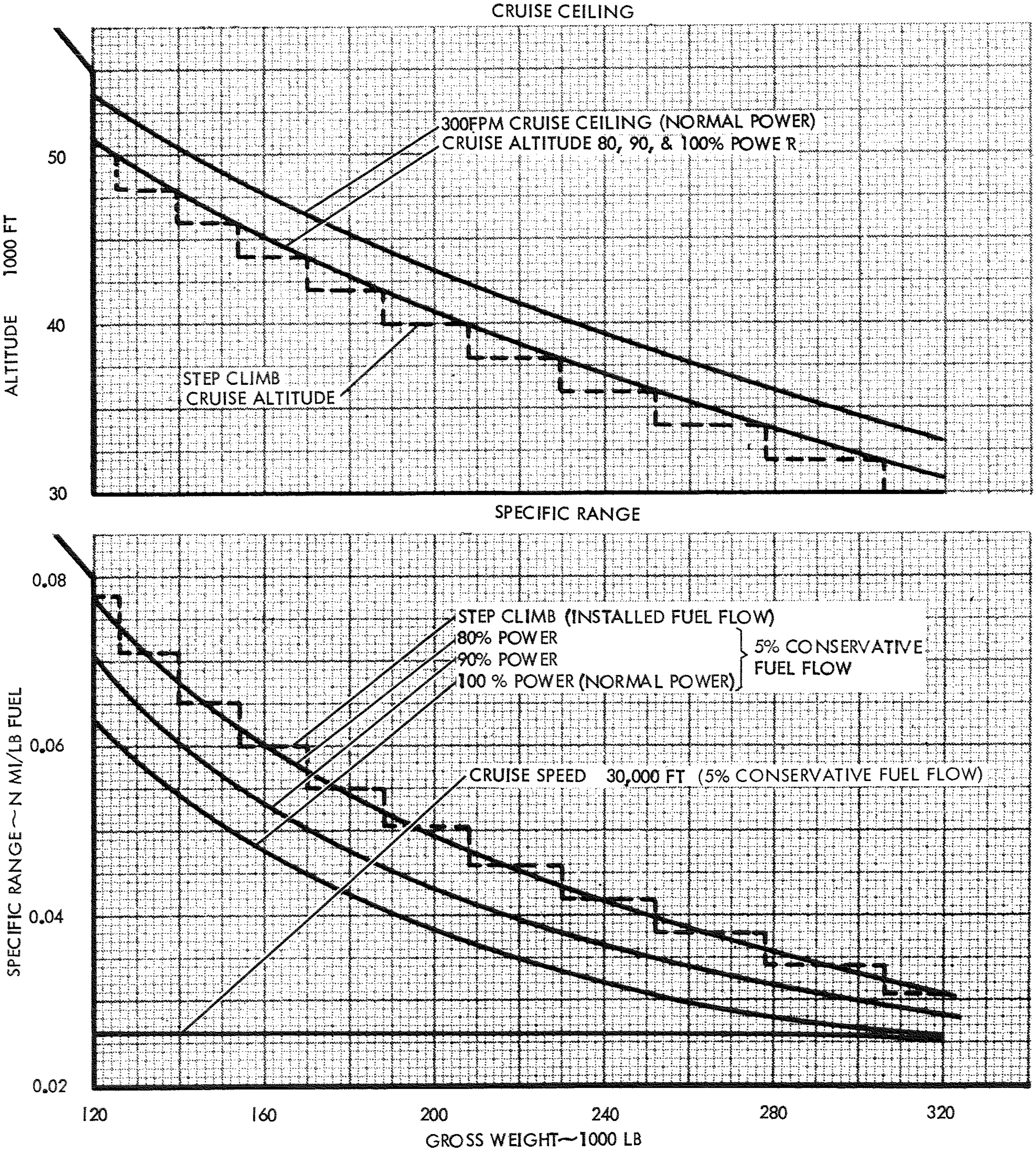
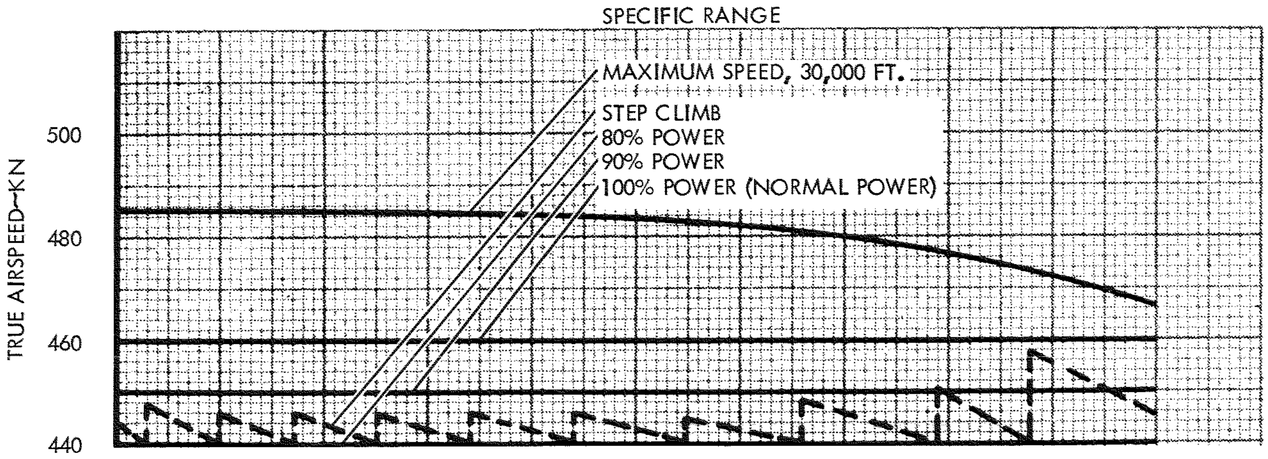


Figure 3-2—CRUISE PERFORMANCE SUMMARY, CRUISE CEILING, SPECIFIC RANGE.



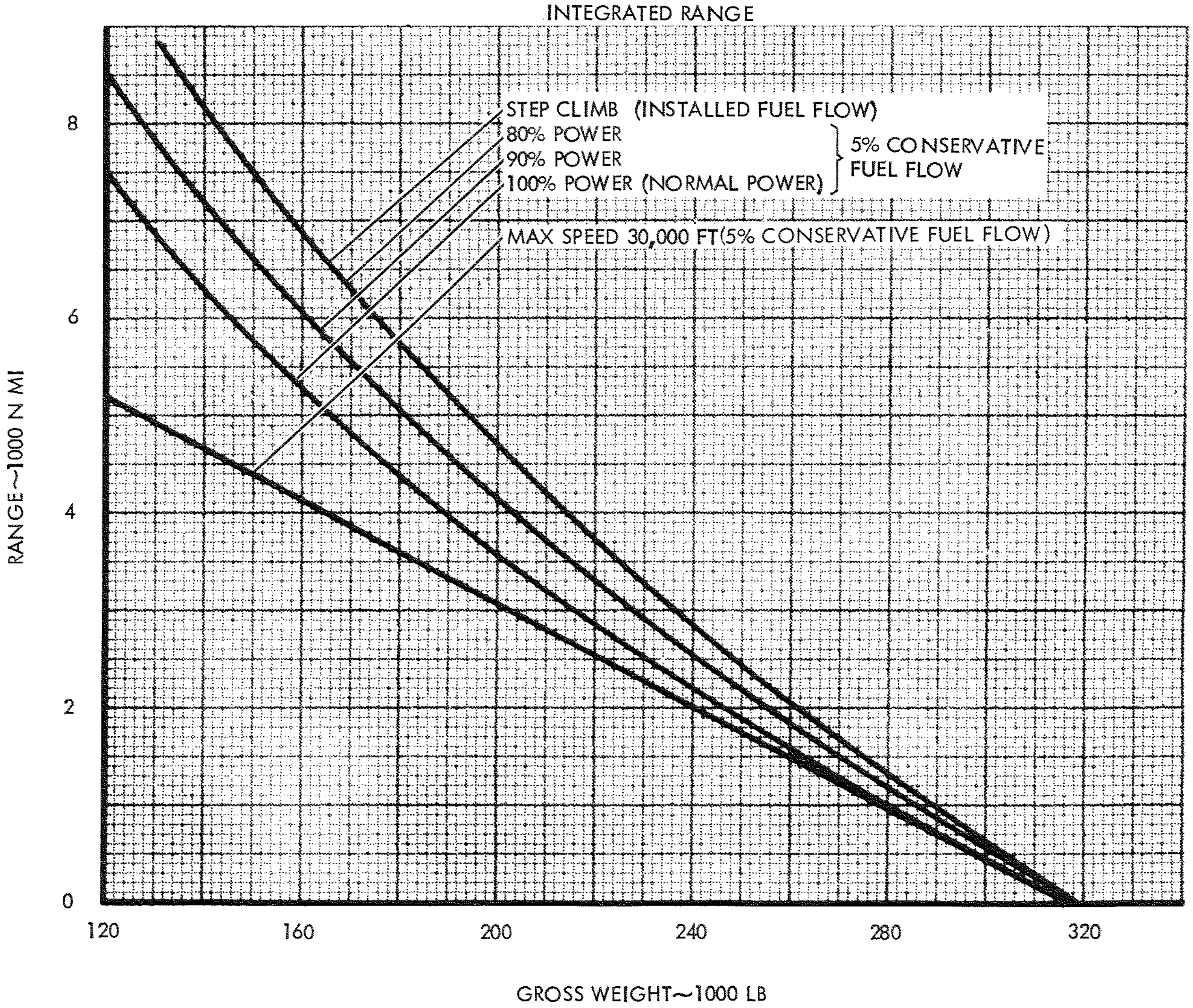


Figure 3-3—CRUISE PERFORMANCE SUMMARY, CRUISE SPEED, INTEGRATED RANGE.

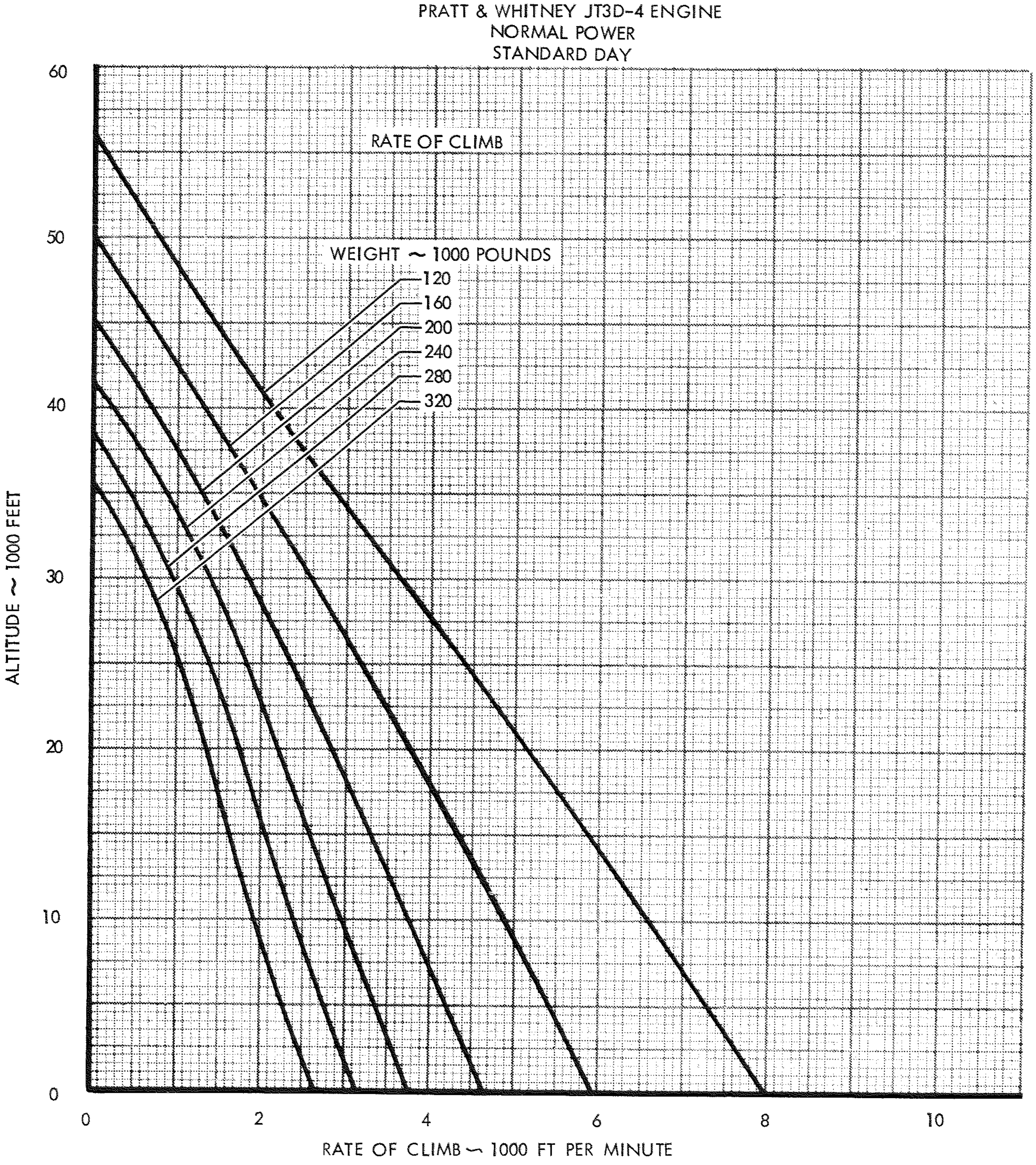


Figure 3-4—ALTITUDE PERFORMANCE SUMMARY—RATE OF CLIMB, STANDARD DAY, NORMAL POWER, P & W JT3D-4 ENGINE.

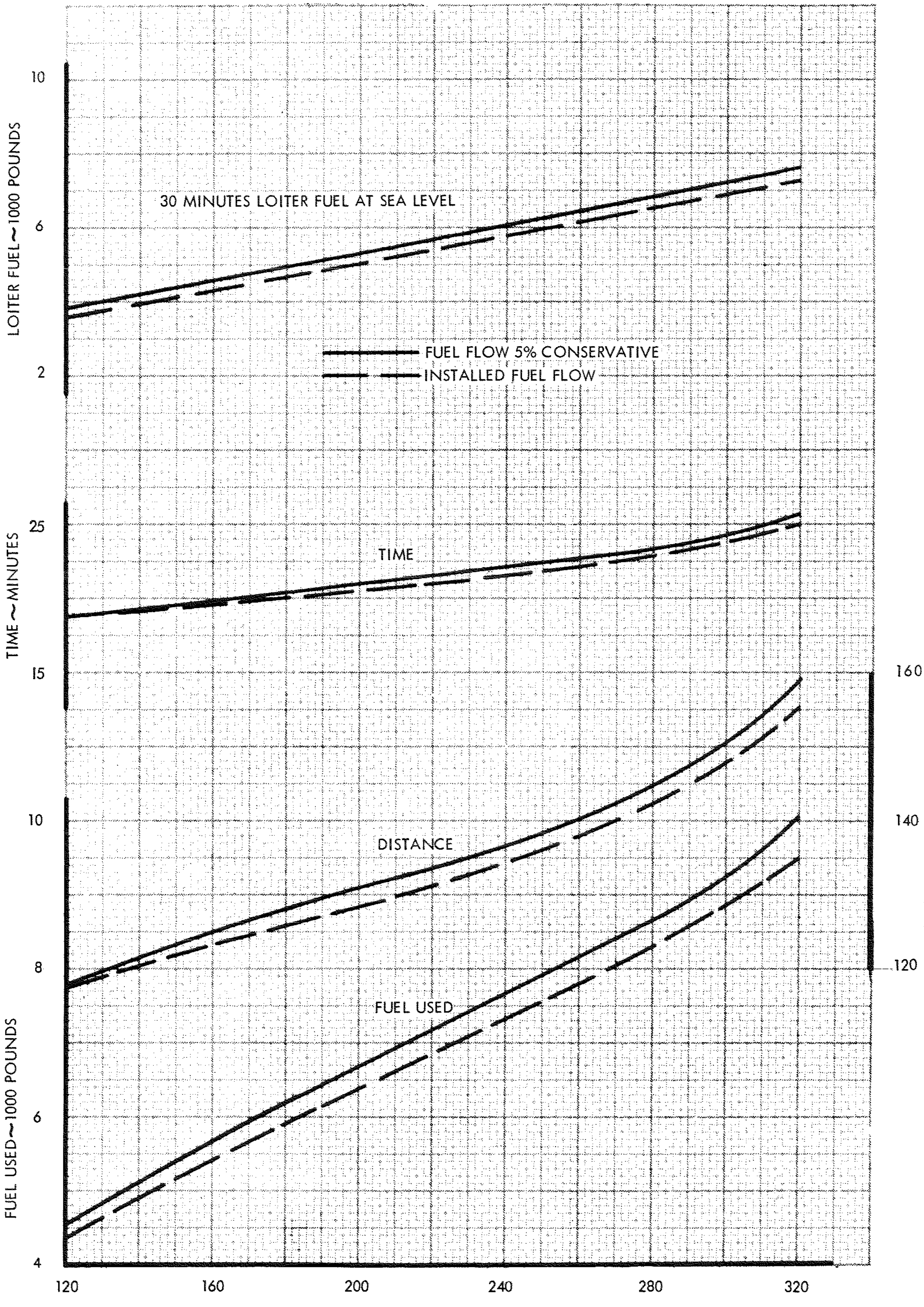


Figure 3-5—TIME, DISTANCE AND FUEL TO CLIMB—LOITER FUEL, P & W JT3D-4 ENGINE.

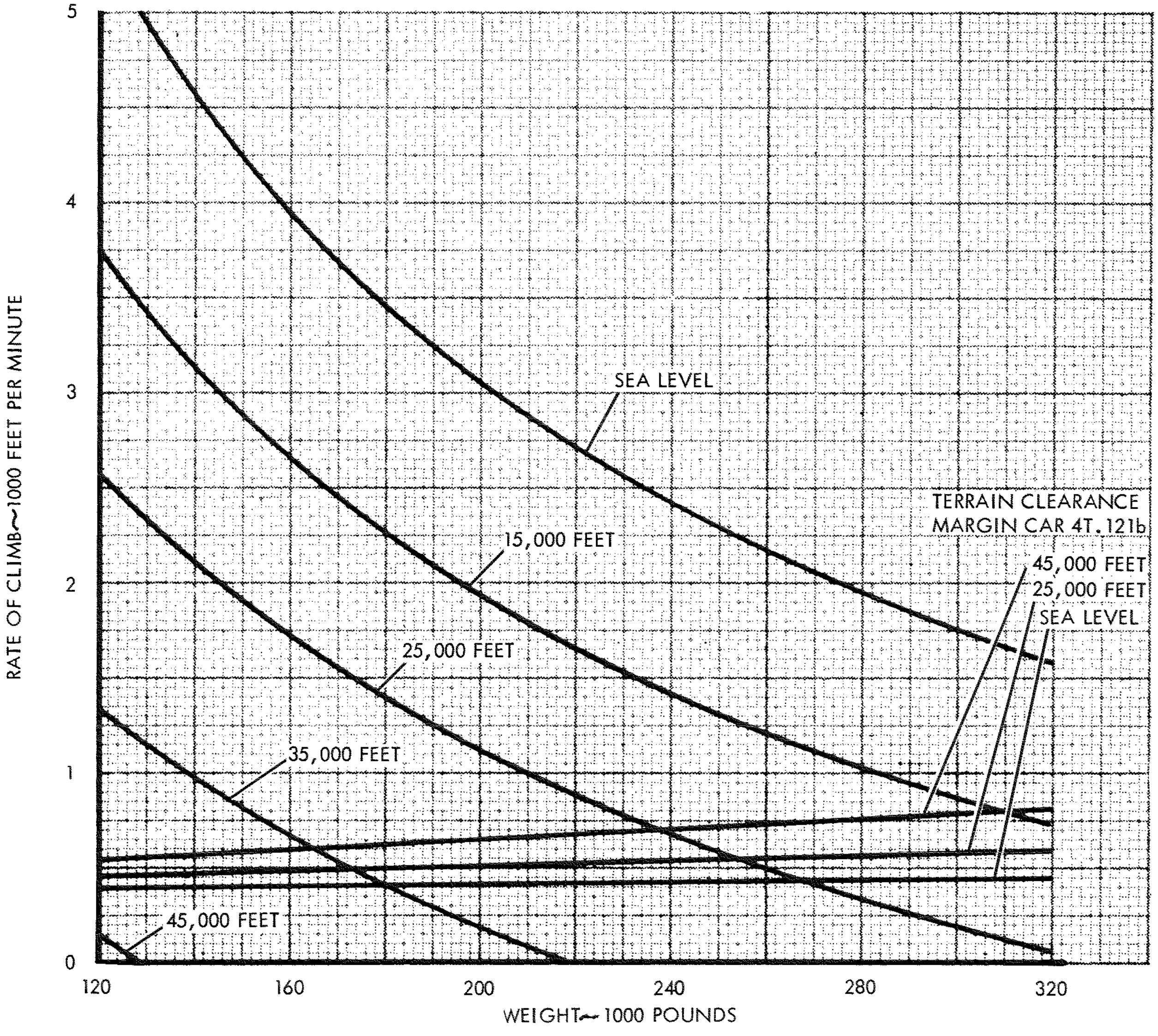


Figure 3-6—ENROUTE CLIMB PERFORMANCE, ONE ENGINE INOPERATIVE, NORMAL POWER, OPTIMUM CLIMB SPEED, P & W JT3D-4 ENGINE.

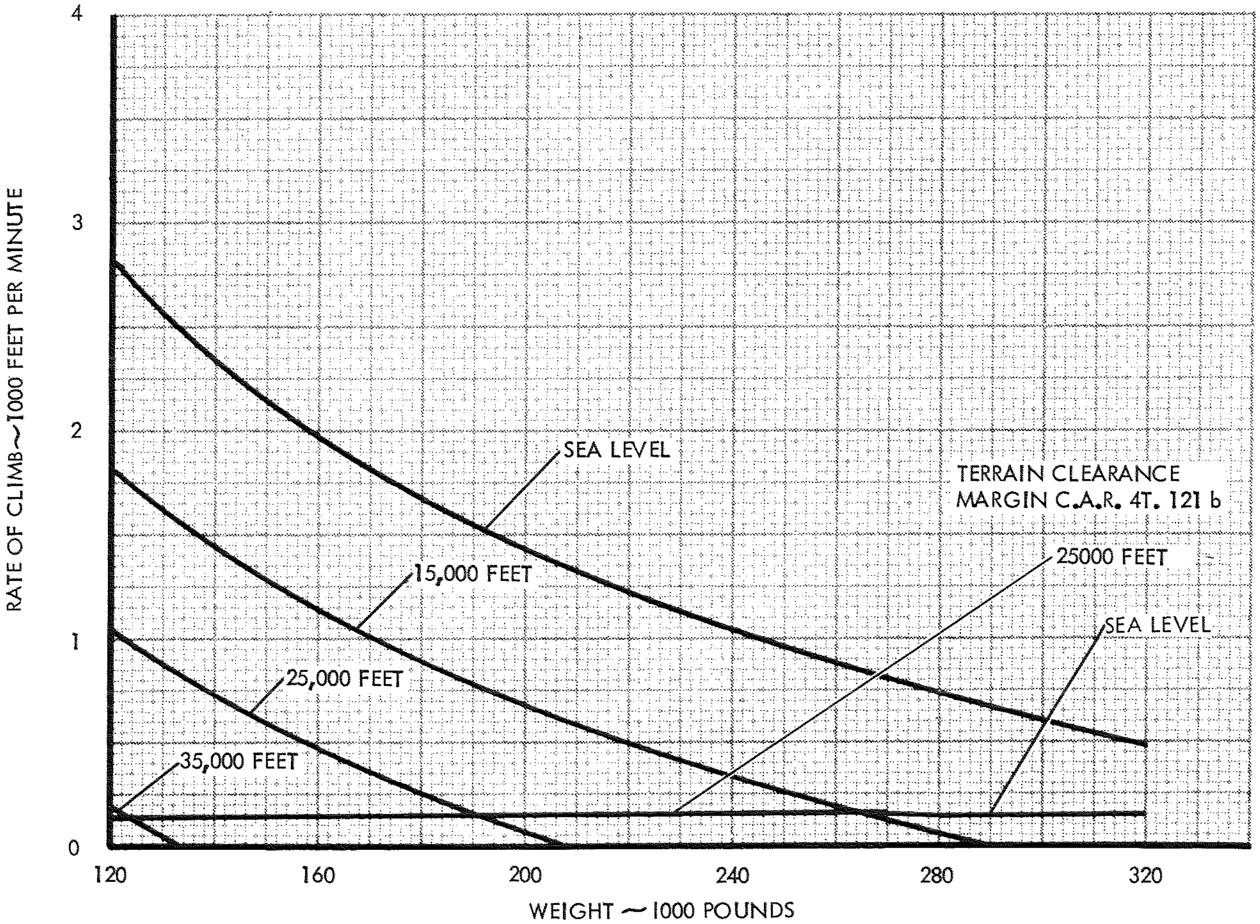


Figure 3-7—ENROUTE CLIMB PERFORMANCE, TWO ENGINES INOPERATIVE, ASYMMETRIC THRUST, OPTIMUM CLIMB SPEED, P & W JT3D-4 ENGINE.

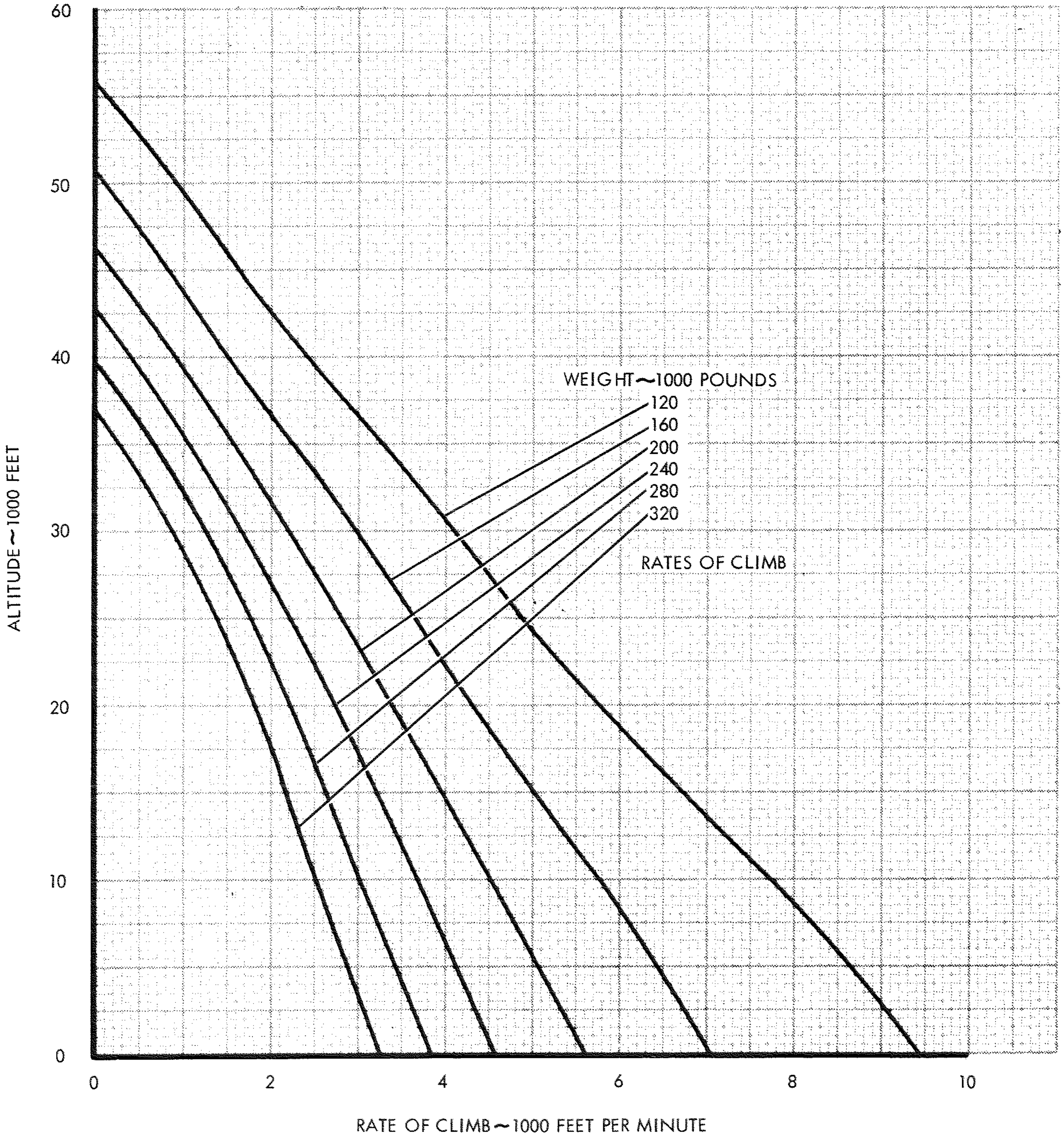


Figure 3-8—ALTITUDE PERFORMANCE SUMMARY, RATE OF CLIMB, NORMAL POWER, P & W JT3D-8A ENGINE.

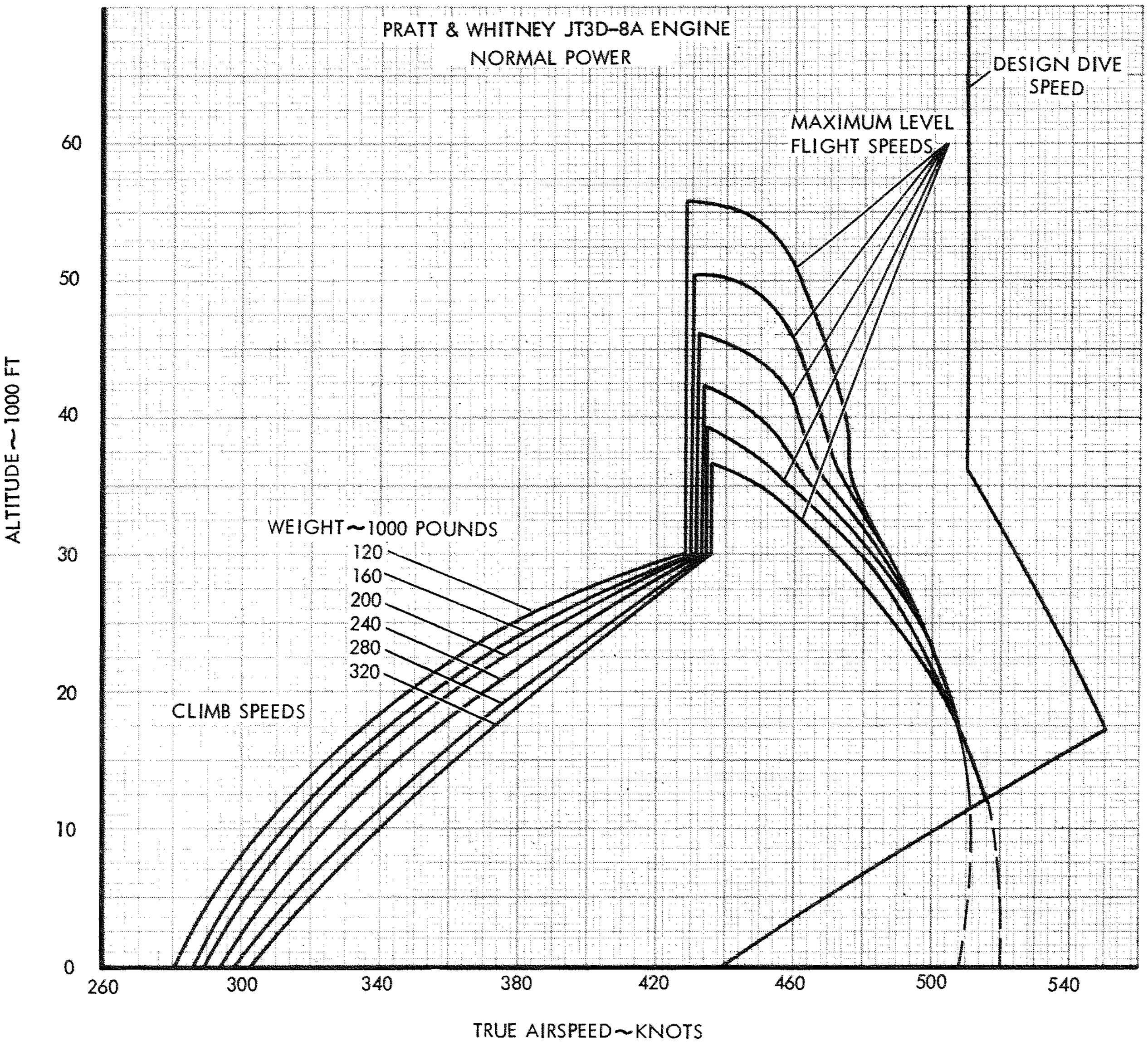


Figure 3-9—ALTITUDE PERFORMANCE SUMMARY, SPEED VERSUS ALTITUDE, NORMAL POWER, P & W JT3D-8A ENGINE.

SUPER HERCULES · GL207-45

section 4

PERFORMANCE (5.3.3)

The Standard Aircraft Characteristics charts for the GL 207-45 are shown in Figures 4-1 thru 4-12. The structural capability, available and useable cube, troop seating, payload range and N. M./lb. of fuel at 35,000 ft. altitude follow.

STRUCTURAL PAYLOAD (5.3.3.1)

The GL 207-45 basic design and aerodynamic characteristics provides a capability for increased payload with a trade-off in speed limits at lower altitudes and/or maneuver load factor limits. Such estimated information can be used to establish the adaptability of the design to something other than the basic mission requirements. Figure 4-13 shows the payload capability for maneuver and the necessary speed limitations associated with 50 ft./sec. gust encounters. The speed values shown represent the most critical speed-Mach number combination. These data indicate that FAA certification of 80,000 lbs. of payload and above is possible with a 2.5 "g" maneuver load factor and a design cruise speed of Mach 0.825 with limited airspeed below Mach critical altitude.

Payloads and fuel combinations outside the solid lines of Figure 4-13 are for emergency use. The 2.25 "g" maneuver load factor of the Work Statement, Paragraph 3.1.2, are reached with capacity fuel and a take-off gross weight of 353,200 lbs. This weight is within the 6 ft./second landing capability. The wing can withstand a 2.0 "g" taxi condition at all fuel weights and the gear and attachment structure are good for a 1.7 "g" limit or 2.5 "g" ultimate taxi factor. The flight speed limits for a 50 ft./sec. gust and the 2.25 "g" line result in gross weight limits when the relieving wing fuel reaches its capacity and the bladder cells above the cargo compartment start to act as cargo weight.

Permissible cargo distributions throughout the cargo compartment are shown in Figure 4-14. Areas of maximum local load carrying capability are illustrated in detail. Figures 4-15 and 4-16 show the cargo capabilities by zone.

Available Cube (5.3.3.2)

Gross cube within the cargo cavity is 8,426 cu. ft. Clear cube volume over the floor is 6,531 cu. ft. Additionally, 625 cu. ft. of volume are available over the cargo ramp. Clear cargo cube available over the floor and ramp together is 7,156 cu. ft., as shown in Figure 4-17.

Usable Cube (5.3.3.3)

Since safety-scanning aisles are provided down each side of the cargo cavity, the entire volume above the floor and ramp are available as usable cube. These volumes total 7,156 cu. ft. When system 463L pallets are utilized, nine pallets may be positioned over the flat cargo floor, with 561 cu. ft. on each pallet, for a total of 5,049 cu. ft. An additional System 463L pallet can be positioned on the loading ramp with 435 cu. ft. of volume available. Total palletized payload volume utilizing nine pallets on the floor and a tenth on the ramp is 5,484 cu. ft., as shown in Figure 4-18.

Total palletized volume shown in Figure 4-18 is based on stacking cargo to 9 ft. height on a 108 in. wide system 463L pallet. Useable volume as defined in the answer to the query question, paragraph 5.3.3.3, is 5711 cubic ft. using the level cargo floor area and 6227 cubic feet using the level cargo floor area and the ramp area. These volumes are based on an 8 ft. stacking height.

TROOP SEATING AT 38-INCH CENTERS (5.3.3.4)

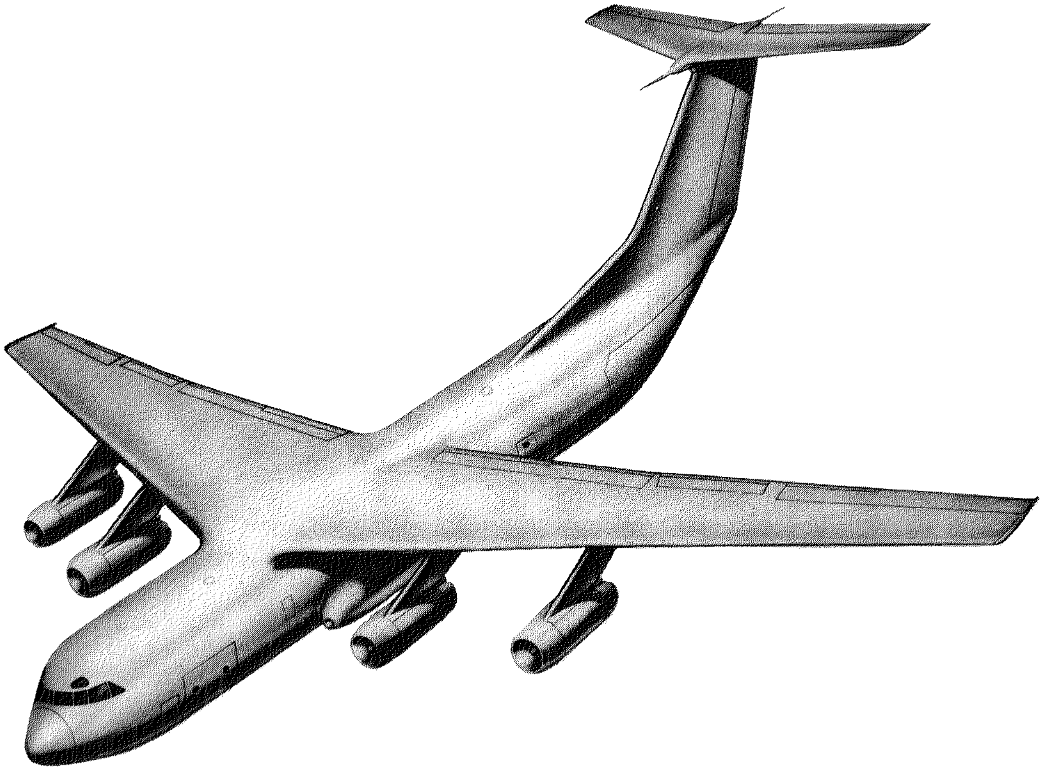
In complete compliance with System 476L, the cargo compartment of the GL 207-45 is fitted with a universal cargo floor incorporating a 20-in. grid tie-down pattern and integral provisions for the System 463L pallets. This floor, shown in Figure 4-19, is unique in that the rails and rollers for the System 463L pallets are installed so that, when not required, the rails retract into cavities provided beneath the walkway of the safety-scanning aisle on each side of the cargo compartment and the channel sections containing the rollers may be lifted and turned over and re-inserted into the same space to provide a flat cargo floor.

The seating arrangements discussed in Paragraph 5.3.3.4.1 are readily adaptable to the 20-in. tie-down grid if troop seating is made at 40-in. centers in place of the minimum 38 in. permitted.

As described in Paragraph 5.3.3.4.2 seating arrangements mounted on pallets are completely compatible with the retractable rails and rollers provided by the universal floor.

Based on Universal Floor (5.3.3.4.1)

The GL 207-45, designed primarily as a cargo carrier with provisions for rapid conversion to troop carrying missions, is equipped with a 20-in. grid of cargo tie-down fittings. Aft facing 16 "g" troop seats per MIL-S-26688, equipped with brownline seat fittings, drawing number 21309, are readily installed on the 20-in. grid of tie-down fittings. As shown in Figure 4-20, maximum troop carrying capacity is achieved with the required 19-in.-wide seats when five rows of seats are installed, three on one side and two on the other, of a 20-in. aisle, at 40-



Standard Aircraft Characteristics

FOUR JT3D-4
PRATT AND WHITNEY

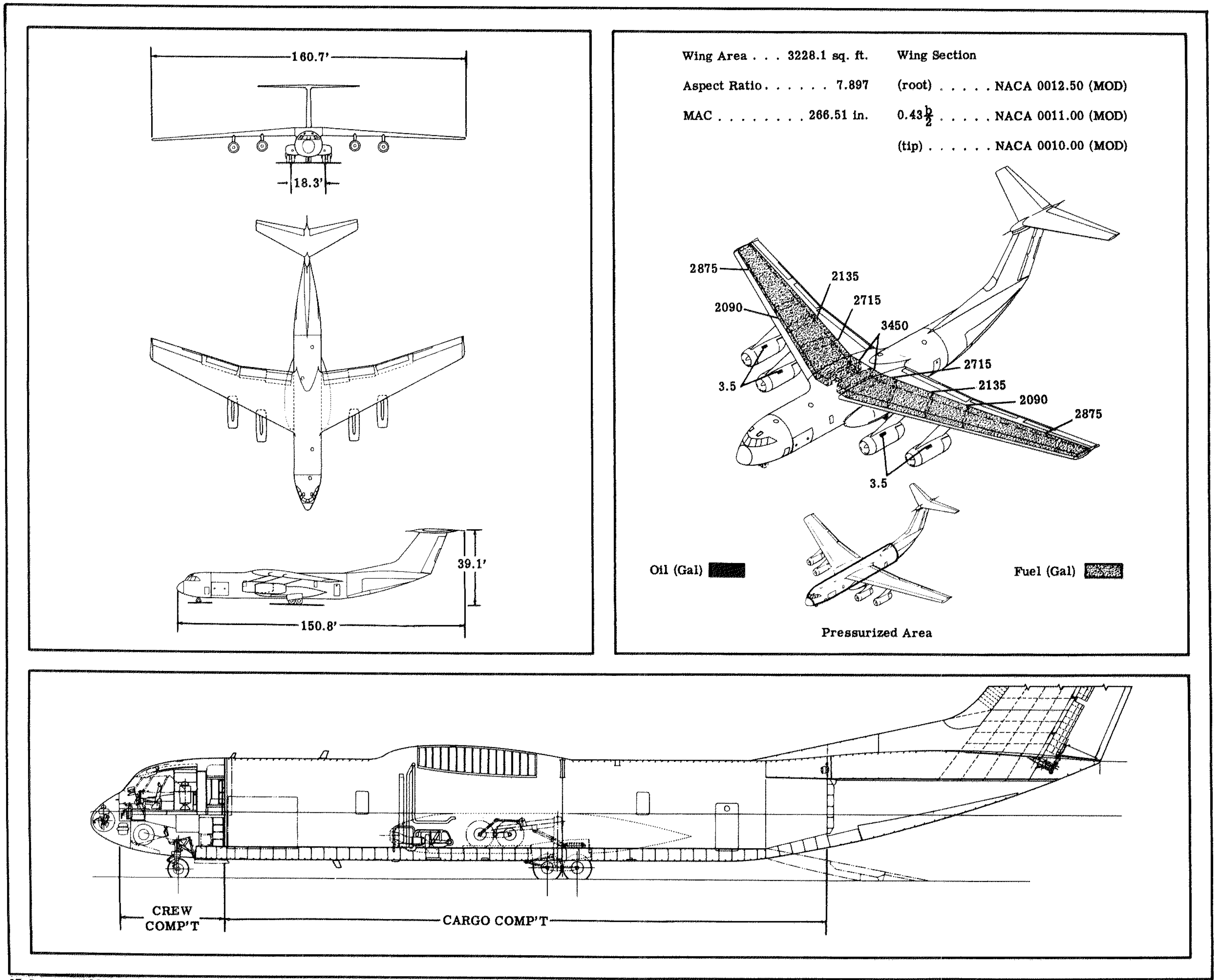
GL 207-45

LOCKHEED

27 January 1961

Figure 4-1—STANDARD AIRCRAFT CHARACTERISTICS—ILLUSTRATION.

GL 207-45



Wing Area . . . 3228.1 sq. ft.

Aspect Ratio 7.897

MAC . . . . 266.51 in.

Wing Section

(root) . . . . . NACA 0012.50 (MOD)

$0.43\frac{b}{2}$ . . . . . NACA 0011.00 (MOD)

(tip) . . . . . . NACA 0010.00 (MOD)

27 January 1961

Figure 4-2—SAC—THREE VIEW.

2 GL 207-45

POWER PLANT

No. & Model	(4) JT3D-4
Mfr	Pratt & Whitney
Engine Spec No.	1761 Date 8-25-60
Type	Axial Flow Turbofan
Length	136.32"
Diameter	53.14"
Weight (dry)	4170 lb
Tail Pipe	Fixed Area

ENGINE RATINGS

S.L. STATIC		RPM	MIN
T.O.	18,000	---	5
Mil:	17,000	---	30
Nor:	16,400	---	Cont

DIMENSIONS

Wing	
Span	160.67'
Incidence (root)	4.5°
(tip)	0°
Dihedral (.25c)	-1° 15'
Sweepback (.25c)	25°
Length	150.813'
Height	39.115'
Tread	18.34'

Mission and Description

Navy Equivalent: None   Mfr's Model: GL-207-45

The principal mission of the GL-207-45 is to provide a rapid, reliable, and efficient means of airlifting combat or support units of all services under general or limited emergency conditions, military logistics supplies or commercial cargo, and mail.

The normal crew consists of pilot, co-pilot, navigator and systems engineer.

Features include integral ramp-pressure bulkhead and cargo door, crew and cargo compartment pressurization, ground and in-flight air conditioning, thermal de-icing for wing and empennage leading edges, single point refueling, palletized cargo loading, and provisions for air-dropping personnel and cargo.

Development

Date of Contract	NA
First Flight	NA
First Acceptance	NA
First Service	NA

GENERAL

CARGO

Max Cargo - See "Payload - Distance" graph, page 5.

CLEARANCES

Main Compartment:	
Length	70.0'
Width	10.27'
Height	9.1'
Main Loading Door:	
Width	10.27'
Height	9.10'
Height from Ground	4.16'
Side Cargo Door:	
Width	9.10'
Height	6.5'
Height from Ground	4.16'
Paratroop Door:	
Width	3.0'
Height	6.0'
Height from Ground	4.16'

CAPACITIES

Main Compartment	6531 cu ft
Cargo Floor:	
Single Axle Load	20,000 lb
Capacity	300 lb/sq ft
Ramp:	
Single Axle Load.	20,000 lb
Capacity	300 lb/sq ft

MISCELLANEOUS

Ramp (type)	Integral
Ramp Incline	11°

PERSONNEL

Crew (normal)	4
Troops (max)	95
or	
Paratroops (max)	74
or	
Litters (max).	72
plus	
Attendants	8

WEIGHTS

Loading	LB	L. F.
Empty	118,076 (E)	
Basic	126,070 (E)	
Design	315,000	2.5
Combat	*155,100	
Max T. O. (nor)	315,000	2.5
Max Land	+315,000	2.5

(E) Estimated

* For Basic Mission

\+ Limited by gear strength 6 fps sinking speed.

FUEL

Location	No. Tanks	Gal
Wing, inbd	2	4270
Wing, outbd	2	4180
Wing, inbd aux.	2	5430
Wing, outbd aux	2	5750
Wing, center	1	3450
		Total ± 23,080

Grade	JP-4
Specification	MIL-F-5624E

OIL

Nacelles	4	(tot) 14
Specification		MIL-L-7808D

± Limited by structure to weight and disposition shown.

ELECTRONICS

UHF Communication (2)	AN/ARC-50
VHF Communication (2)	VHF-101
H.F. Communication (2)	HF-102
AGA SC/SELCAL	
Radio Set (Tacan) (2).	AN/ARN-52
Astro-Navigation Set.	AN/APN-1
Radio Compass (2)	DF-202
Weather-Navigation Radar.	RDR/1D
Doppler Radar	AN/APN-501
Altimeter	AN/APN-141
IFF	AN/APX-46
Gyro-Stabilized Compass (2)	Sperry C-11
Inertial Platform	Litton LN 2C
Digital Computer	AN/ASN-24

27 January 1961

Figure 4-3—SAC—INFORMATION BLOCKS

Loading and Performance—Typical Mission

CONDITIONS			BASIC MISSION	DESIGN CARGO	MAX FUEL	MAX CARGO	ASSAULT MISSION	FERRY RANGE
TAKE-OFF WEIGHT		(lb)	I 267,100	II 315,000	III 315,000	IV 315,000	V 191,400	VI 277,020
Fuel at 6.5 lb. gal. (grade JP-4)		(lb)	60,100	118,000	150,020	108,000	39,400	150,020
Payload (outbound)		(lb)	80,000	70,000	37,980	80,000	25,000	0
Wing loading		(lb./sq. ft)	82.74	97.58	97.58	97.58	59.3	85.82
Stall speed (power off)		(kn)	101.3	110.4	110.4	110.4	86.1	103.6
Take-off ground run at SL	1	(ft)	3020	4430	4430	4430	1460	3300
Take-off to clear 50 ft.	1	(ft)	4430	6430	6430	6430	2290	4820
Rate of climb at SL	2	(fpm)	3340	2710	2710	2710	4960	3185
Rate of climb at SL (one engine out)	1	(fpm)	2250	1730	1730	1730	3460	2130
Time: SL to 25,000 ft.	2	(min)	12.00	16.20	16.20	16.20	7.60	12.80
Time: SL to cruise ceiling	2	(min)	21.55	23.55	23.55	23.55	19.40	21.90
Service ceiling (100 fpm)	2	(ft)	38,600	35,100	35,100	35,100	45,600	37,850
Service ceiling (one engine out)	1	(ft)	31,850	27,000	27,000	27,000	39,800	30,850
COMBAT RANGE	3	(n. mi.)	1879	3897	5496	3446	1500	6536
Average cruising speed		(kn)	440	440	440	440	440	440
Initial cruising altitude		(ft)	35,700	32,250	32,250	32,250	42,650	35,000
Final cruising altitude		(ft)	39,300	40,000	43,200	39,100	45,500	48,200
Total mission time		(hr)	4.33	8.91	12.54	7.89	3.44	14.92
COMBAT RADIUS	3	(n. mi.)	1000	2147	2854	1925	----	----
Average cruising speed		(kn)	440	440	440	440	----	----
Initial cruising altitude		(ft)	35,700	32,250	32,250	32,250	----	----
Final cruising altitude		(ft)	48,700	48,300	48,100	48,400	----	----
Total mission time		(hr)	4.66	9.86	13.08	8.86	----	----
FIRST LANDING WEIGHT	4	(lb)	235,100	248,000	231,300	253,500	----	----
Ground roll at SL/aux. brake		(ft)	1365	1450	1360	1480	----	----
Total from 50 ft/aux. brake		(ft)	2935	3070	2900	3110	----	----
COMBAT WEIGHT	4	(lb)	155,100	178,000	193,320	173,500	158,480	138,651
Combat altitude		(ft)	45,850	43,200	41,500	43,650	45,500	48,200
Combat speed	1	(kn)	460	460	460	460	460	460
Combat climb	1	(fpm)	710	660	660	680	690	710
Combat ceiling (500 fpm)	1	(ft)	47,550	44,750	43,000	45,300	47,050	49,900
Service ceiling (100 fpm)	2	(ft)	50,000	47,100	45,400	47,600	49,500	52,400
Service ceiling (one engine out)	2	(ft)	43,350	40,800	39,100	41,200	42,900	45,100
Take-off ground run at SL	1	(ft)	915	1250	1490	1180	960	730
Take-off to clear 50 ft	1	(ft)	1580	2000	2325	1920	1630	1330
Max rate of climb at SL	1	(fpm)	6580	5700	5230	5850	6440	7380
Max speed at optimum alt.	1	(kn/ft)	496/25,000	496/25,000	496/25,000	496/25,000	496/25,000	496/25,000
Basic speed at 25,000 ft.	1	(kn)	496	496	496	496	496	496
LANDING WEIGHT	4	(lb)	134,070	137,020	138,661	136,520	158,480	138,651
Ground roll at SL/aux. brake		(ft)	780	795	800	795	900	800
Total from 50 ft/aux. brake		(ft)	1900	1910	1930	1910	2130	1930

NOTES

1 Military power
2 Normal power
3 Detailed descriptions of Radius and Range missions are given on page 6.
4 For Radius Missions if radius is shown

Performance Basis:

(a) Data source: Estimated

(b) Performance is based on power shown on page 3

Figure 4-4—SAC—TABULATED DATA

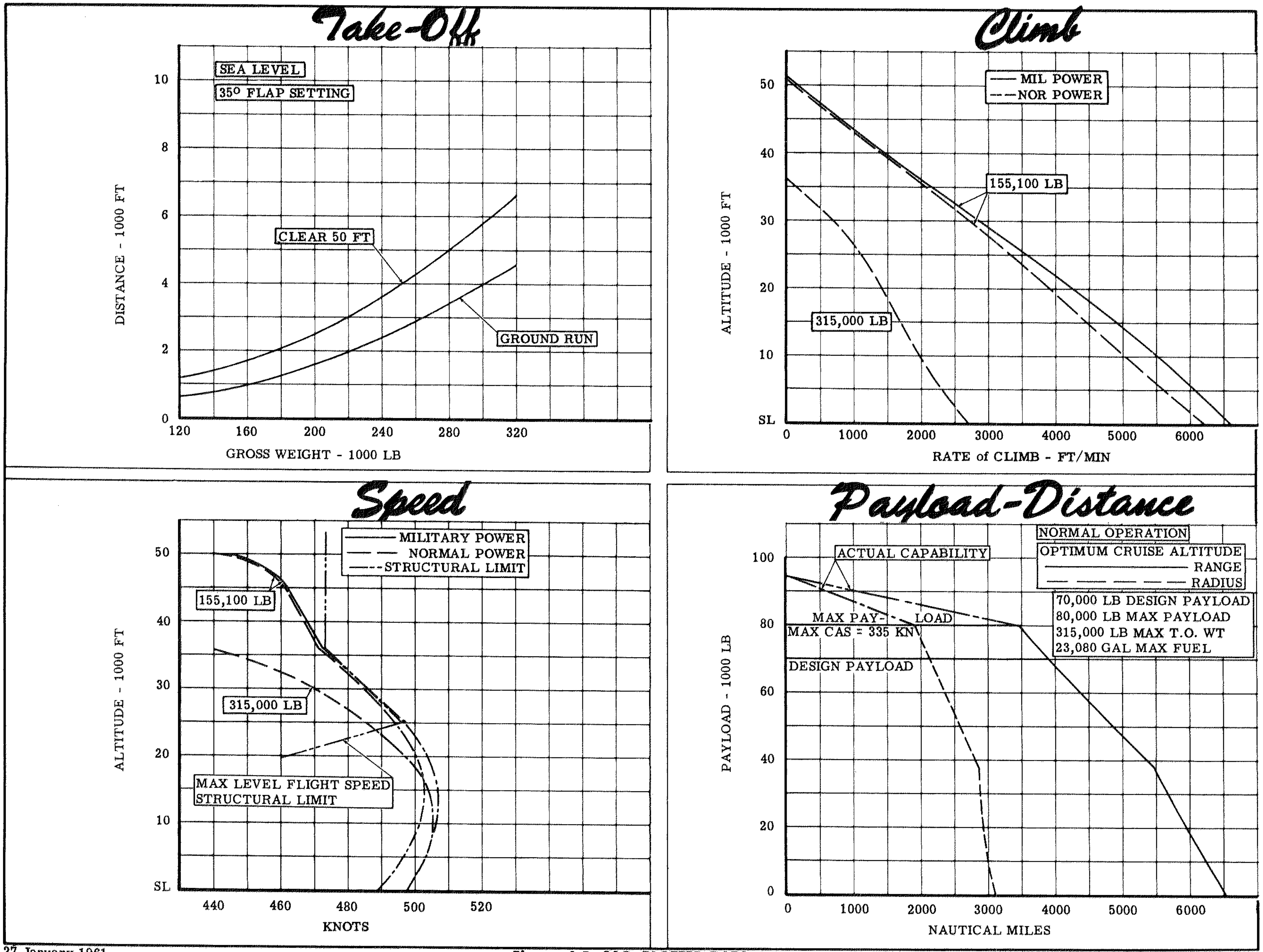


Figure 4-5—SAC—PLOTTED DATA

NOTES

FORMULA: RADIUS MISSIONS I, II, III & IV

Takeoff, climb on course to cruise ceiling at normal power, cruise out at cruise ceiling at long range speeds to remote base, land and unload cargo. Without refueling, takeoff and return home to base at cruise ceiling at long range speeds. Range free allowances are 10 minutes at normal power for warm-ups and takeoffs, plus fuel for 30 minutes at speeds for maximum endurance at sea level and 5 percent of initial fuel reserve.

FORMULA: RANGE MISSIONS I, II, III, IV, V & VI

Takeoff, climb on course to cruise ceiling at normal power until only reserve fuel remains. Range free allowances are 5 minutes at normal power plus fuel for 30 minutes at speeds for maximum endurance at sea level and 5 percent of initial fuel reserve.

GENERAL NOTES:

Engine ratings shown on Page 3 are engine manufacturers guaranteed ratings and are the same ratings used in the performance calculations.

REVISION BASIS: Initial Issue

Figure 4-6—SAC—NOTES

SUPPLEMENTAL

Loading and Performance—Typical Mission

CONDITIONS			*SPECIAL MISSION	*SPECIAL MISSION
			I	II
TAKE-OFF WEIGHT		(lb)	287,200	283,100
Fuel at 6.5 lb. gal. (grade JP-4)		(lb)	110,200	136,100
Payload (outbound)		(lb)	50,000	20,000
Wing Loading		(lb./sq. ft.)	88.97	87.70
Stall Speed (power off)		(kn)	105.5	104.7
Take-off ground run at SL	①	(ft)	3620	3505
Take-off to clear 50 ft.	①	(ft)	5260	5050
Rate of climb at SL	②	(fpm)	3050	3100
Rate of climb at SL (one engine out)	①	(fpm)	2015	2070
Time: SL to 25,000 ft.	②	(min)	13.60	13.20
Time: SL to cruise ceiling	②	(min)	22.30	22.10
Service ceiling (100 fpm)	②	(ft)	37,000	37,350
Service ceiling (one engine out)	①	(ft)	29,800	30,250
COMBAT RANGE	③	(n. mi.)	4000	5500
Average cruising speed		(kn)	440	440
Initial cruising altitude		(ft)	34,200	34,500
Final cruising altitude		(ft)	42,200	45,500
Total mission time		(hr)	9.14	12.52
COMBAT RADIUS	③	(n. mi.)	2105	2728
Average cruising speed		(kn)	440	440
Initial cruising altitude		(ft)	34,200	34,500
Final cruising altitude		(ft)	48,350	48,150
Total mission time		(hr)	9.67	12.45
FIRST LANDING WEIGHT	④	(lb)	226,730	209,920
Ground roll at SL/aux. brake		(ft)	1310	1200
Total from 50 ft/aux. brake		(ft)	2840	2670
COMBAT WEIGHT	④	(lb)	176,730	189,920
Combat altitude		(ft)	43,550	41,800
Combat speed	①	(kn)	460	460
Combat climb	①	(fpm)	650	640
Combat ceiling (500 fpm)	①	(ft)	44,900	43,400
Service ceiling (100 fpm)	②	(ft)	47,250	45,700
Service ceiling (one engine out)	②	(ft)	40,900	39,400
Take-off ground run at SL	①	(ft)	1230	1430
Take-off to clear 50 ft.	①	(ft)	1995	2260
Max rate of climb at SL	①	(fpm)	5740	5320
Max speed at optimum alt.	①	(kn/ft)	496/25,000	496/25,000
Basic speed at 25,000 ft.	①	(kn)	496	496
LANDING WEIGHT	④	(lb)	136,630	137,945
Ground roll at SL/aux. brake		(ft)	795	800
Total from 50 ft/aux. brake		(ft)	1910	1930

NOTES

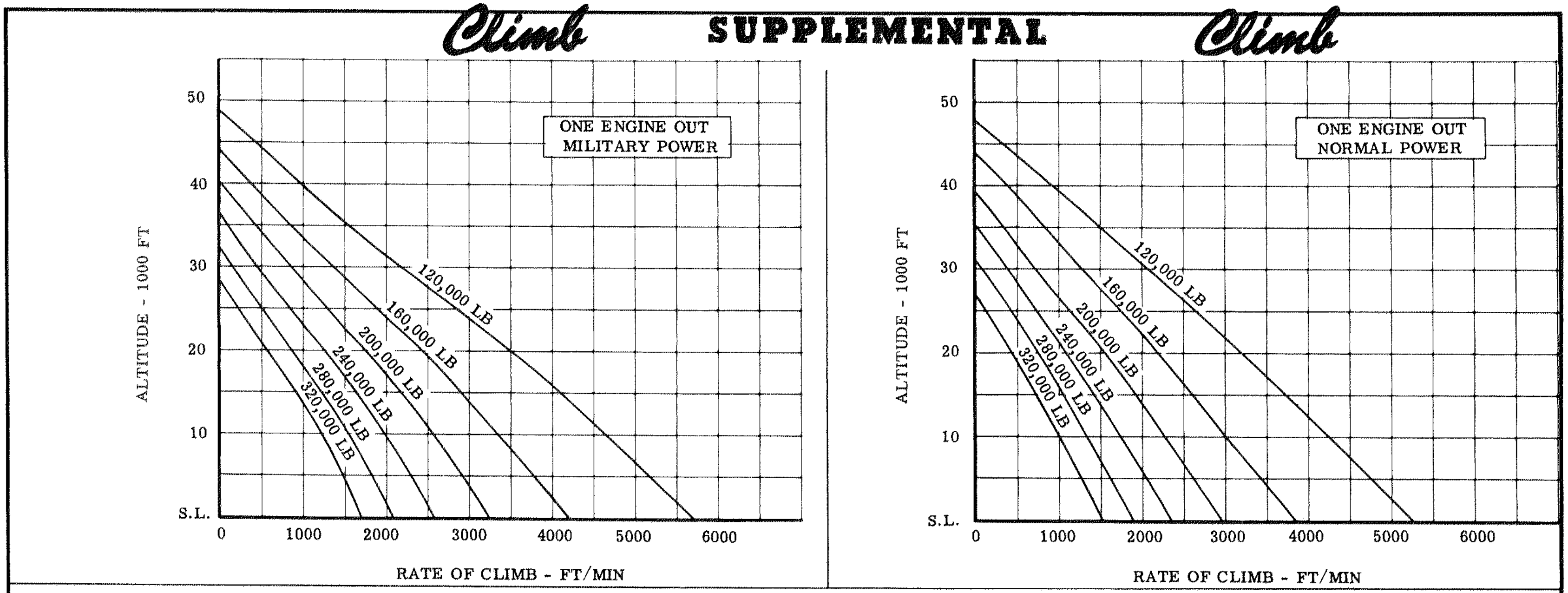
① Military power
② Normal power
③ Detailed descriptions of Radius and Range missions are given on page 9.
④ For Radius Missions if radius is shown

Performance Basis:
(a) Data source : Estimated
(b) Performance is based on powers shown on page 3

*Support system 476L

Figure 4-7—SAC—SUPPLEMENTAL TABULATED DATA (MIL)

Climb SUPPLEMENTAL *Climb*



Payload-Distance

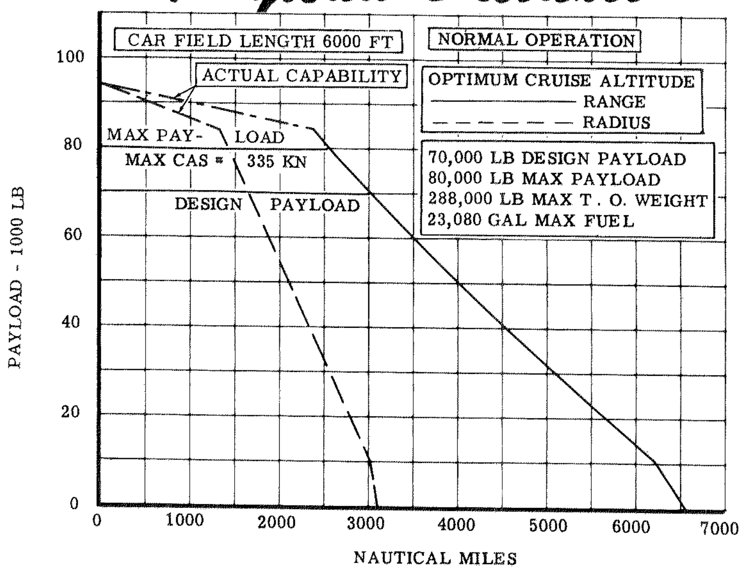


Figure 4-8—SAC—SUPPLEMENTAL PLOTTED DATA (MIL)

SUPPLEMENTAL NOTES

FORMULA: RADIUS MISSION I & II

Same as radius mission on Page 6.

FORMULA: RANGE MISSION I & II

Same as range mission on Page 6.

FORMULA: PAYLOAD DISTANCE DIAGRAM

Same as range and radius missions on Page 6.

27 January 1961

Figure 4-9—SAC—SUPPLEMENTAL NOTES (MIL)

9 GL 207-45

SUPPLEMENTAL
Loading and Performance—Typical Mission

CONDITIONS			INTERNATIONAL FLIGHT	DOMESTIC FLIGHT				
RAMP WEIGHT		(lb)	I 282,200	II 239,470				
TAKE-OFF WEIGHT		(lb)	280,484	237,905				
Fuel at 6.5 lb. gal. (grade Aviation osene)		(lb)	95,200	42,470				
Payload		(lb)	60,000	70,000				
Wing loading		(lb./sq. ft)	86.9	73.7				
Stall speed (power off)		(kn)	104.2	96.0				
CAR take-off field length	①	(ft)	5700	4080				
Limiting weight, critical gradient second segment S.L.		(lb)	318,000	318,000				
Rate of climb at S.L.	②	(fpm)	3140	3835				
Rate of climb at S.L. (one engine out)	①	(fpm)	2060	2520				
Time: SL to 25,000 ft	②	(min)	13.20	10.25				
Time: SL to cruise ceiling	②	(min)	22.15	20.73				
En route terrain clearance (one engine out)	②	(fpm)	1955	2440				
En route terrain clearance (two engine out)	②	(fpm)	740	1060				
En route terrain clearance margin SL (one engine out)	②	(fpm)	1085	1615				
En route terrain clearance margin SL (two engines out)	②	(fpm)	400	790				
RANGE		(n.mi.)	3000	1000				
Average cruising speed		(kn)	445	445				
Initial cruising altitude		(ft)	34,400	37,900				
Final crusing altitude		(ft)	40,200	39,500				
Total flight time		(hr)	6.80	2.32				
LANDING WEIGHT		(lb)	204,700	212,030				
CAR landing field length		(ft)	5270	5400				
Limiting weight critical gradient landing climb S.L.		(lb)	323,000	323,000				

NOTES

1 Military power
2 Normal power
3 Detailed Description of Range Missions are given on page 12.

Performance Basis:
(a) Data Source: Estimated
(b) Performance is based on powers shown on page 3.

27 January 1961

Figure 4-10—SAC—SUPPLEMENTAL NOTES (CIVIL)

10 GL207-45

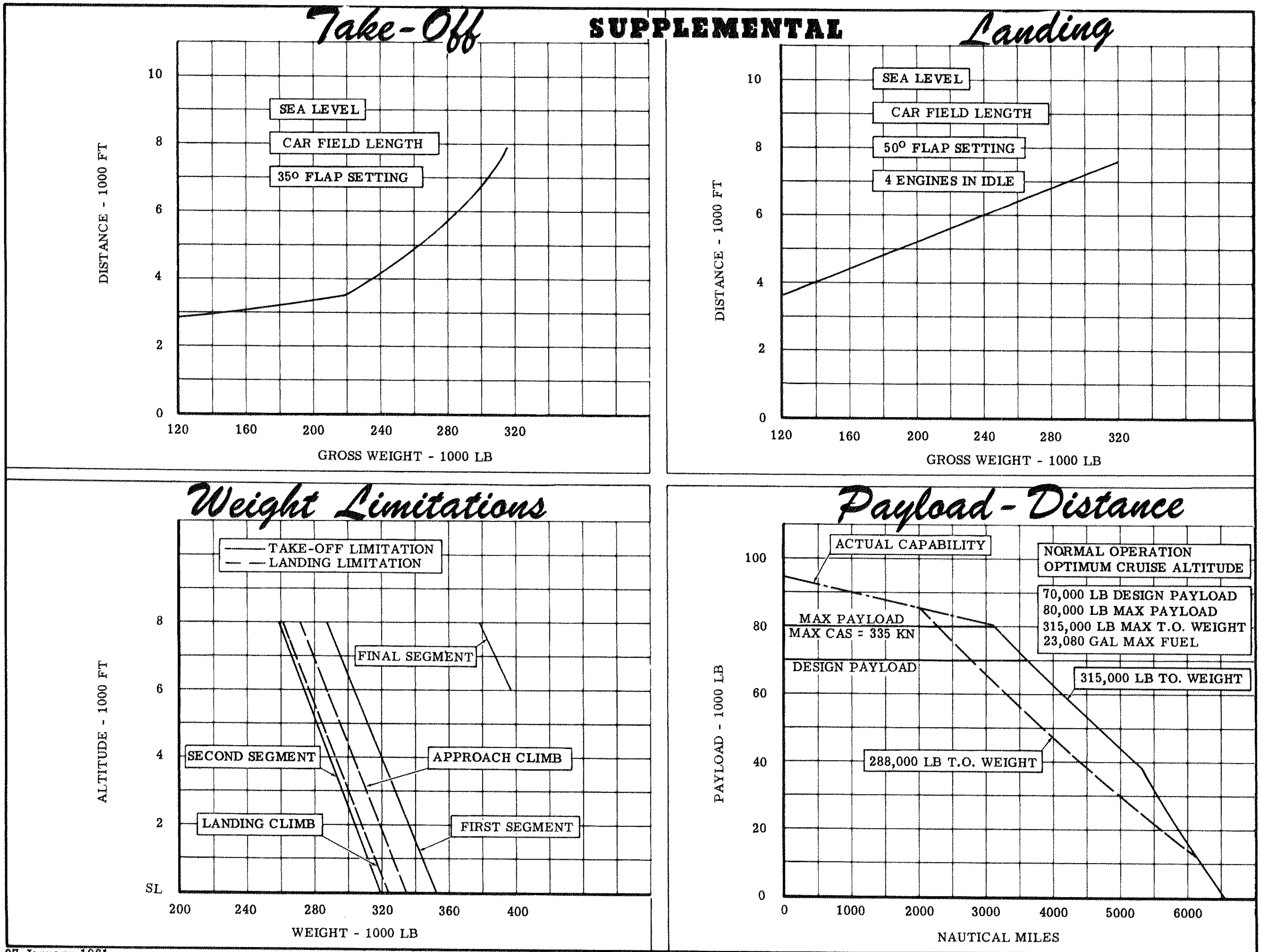


Figure 4-11—SAC—SUPPLEMENTAL PLOTTED DATA (CIVIL)

SUPPLEMENTAL
NOTES

FORMULA: RANGE MISSION I

Takeoff, climb on course to cruise ceiling at normal power, cruise out on a step cruise basis at long range speeds until only reserve fuel remains. Range free allowances are fuel for warm-up and takeoff computed by ATA 1960 rules, fuel to accelerate to climb speed given by SR 422B, plus fuel for 2 hours at normal cruise consumption and 15 nautical miles air maneuver.

FORMULA: RANGE MISSION II

Takeoff, climb on course to cruise ceiling at normal power, cruise out on a step cruise basis at long range speeds until only reserve fuel remains. Range free allowances are fuel for warm-up and takeoff computed by ATA 1960 rules, fuel to accelerate to climb speed given by SR 422B, plus sufficient fuel to fly to an alternate airport 200 nautical miles distant and fuel for 45 minutes flight at normal cruise consumption.

FORMULA: RANGE MISSIONS I & II

Installed fuel flows are non-conservative.

27 January 1961

Figure 4-12—SAC—SUPPLEMENTAL TABULATED DATA (CIVIL)

12 GL 207-45

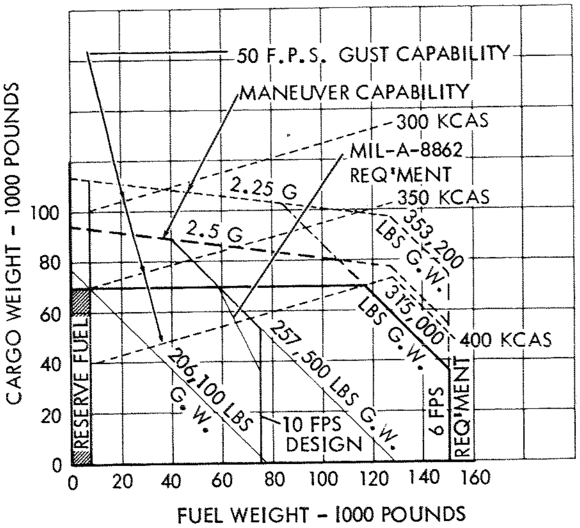


Figure 4-13—PAYLOAD CAPABILITY

in. spacing for the entire length of the cargo floor. With this arrangement, 95 troops can be carried.

When paratroopers are carried, one row of seats is removed to provide two 20-in. aisles the length of the cargo compartment, as shown in Figure 4-2. With this arrangement, 74 paratroopers can be carried.

Based on 463L Pallets (5.3.3.4.2)

As shown in Figure 4-22, the five-abreast arrangement can be installed upon pallets fitting the System 463L rails and rollers. With this arrangement, a total of 82 troops can be carried. Required latrine facilities and oxygen for emergencies are provided.

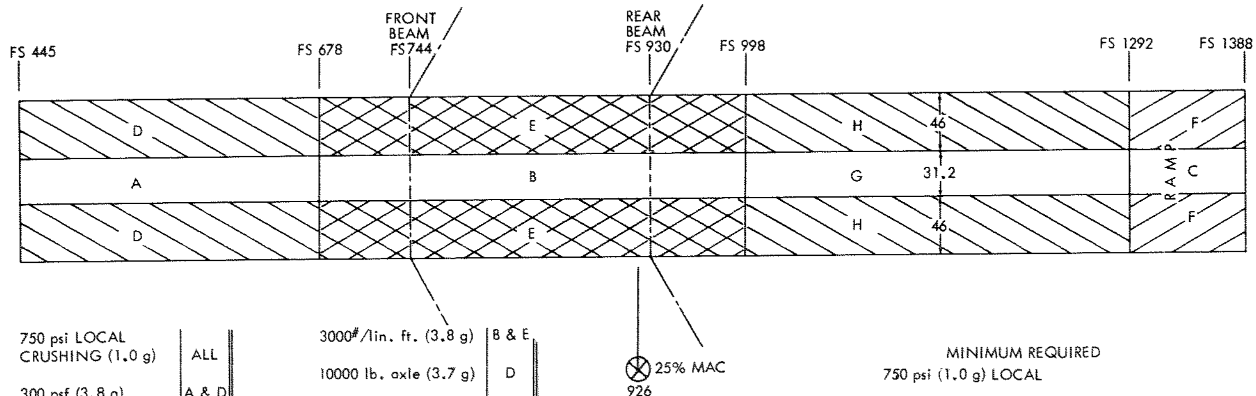
Payload/Range (5.3.3.5)

All of the payload/range requirements of system 476L are met or exceeded when operating from the specified 6000 ft. runway and using CAR Transport category rules. The extra margins available can be traded off for either additional payload or range. Holding the range and runway length requirement constant, the payload capability is as follows:

Payload (lbs.)	Range (N.M.)	Take-Off Gross Weight (lbs.)	CAR Take-Off Field Length (ft.)
22,700	5500	288,000	6000
50,800	4000	288,000	6000
65,700	3000	288,000	6000
89,700	1000	253,650	4650

Payload increases as available runway length increases beyond 6000 ft. as previously shown in Figure 2-6 in Paragraph 5.3.1.1 of Section 2. At the maximum design gross weight of 315,000 lbs., a CAR take-off field length of 7720 ft. is required. The payload range for the system 476L basic mission at this weight is 67,300 lb. payload—4000 N. M.

The effect of the JT3D-8A engine is to permit operation at 315,000 lbs. from the required CAR run-



750 psi LOCAL CRUSHING (1.0 g)	ALL
300 psf (3.8 g)	A & D
300 psf (4.9 g)	G & H
400 psf (3.8 g)	B & E
2000#/lin. ft. (3.8 g)	A & D
2000#/lin. ft. (4.8 g)	G & H

3000#/lin. ft. (3.8 g)	B & E
10000 lb. axle (3.7 g)	D
10000 lb. axle (4.8 g)	H
20000 lb. axle (2.0 g)	F & H
20000 lb. axle (3.6 g)	E
9000 lb. total (5.4 g)	RAMP (F, C)

MINIMUM REQUIRED
750 psi (1.0 g) LOCAL
200 psf (2.5 g) EVERYWHERE
20000 lb. axle (2.0 g) PATH TO LOCATION
20000 lb. axle (FLIGHT LD. F.) CHOSEN AREA

Figure 4-14—PERMISSIBLE CARGO DISTRIBUTIONS

	COMPARTMENTS	UNIT	C	D	E	F	G	H	I	J	K	L	M	N
			MAIN COMPARTMENT											RAMP
1	FLOOR AREA (APPROXIMATE)	SQ FT	62	68	68	68	68	68	68	68	68	68	46	82
2	VOLUME	CU FT.	670	735	735	735	735	735	735	735	735	735	497	820
3	MAX. CAPACITY (DISTR. SINGLE COMP'T LOADS)	LB	12,000	13,300	13,300	20,000	20,000	20,000	20,000	13,300	13,300	13,300	9,000	9,000
* 4	MAX. AXLE LOAD (TREAD WAY ONLY)	LB	10,000	10,000	10,000	20,000	20,000	20,000	20,000	10,000	10,000	10,000	10,000	
* 5	MAX. WHEEL OR TONGUE LOAD (BETWEEN TREADWAYS)	LB	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,0000	2,000	
6	MAX. RUNNING LOAD	LB PER LINEAR FT	2,000	2,000	2,000	3,000	3,000	3,000	3,000	2,000	2,000	2,000	2,000	1,125
7	MAX. EVENLY DISTRIBUTED	LB. PER SQ FT	2,880	2,880	2,880	2,880	2,880	2,880	2,880	2,880	2,880	2,880	2,880	110
** 8	MAX. LOCAL LOADING (TREADWAYS ONLY)	LB PER LINEAR FT	4,600	4,600	4,600	9,200	9,200	9,200	9,200	4,600	4,600	4.600	4,600	1,125
	MAX. LOCAL LOADING (BETWEEN TREADWAYS)	LB PER LINEAR FT	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,2000	1,200	1,200	1,200	1,125

445 518 598 678 758 838 918 998 1,078 1,158 1,238 1,292 1,388

NOTES:
1. MINIMUM DISTANCE BETWEEN AXLES IS 5 FEET.
*2. BASED ON MAXIMUM TIRE INFLATION PRESSURE OF 100 PSI OR TONGUE LOAD OF 20 PSI.
**3. THESE LOADINGS NOT TO OCCUR SIMULTANEOUSLY. TREADWAY LOADING TO BE APPLIED SYMMETRICALLY ABOUT AIRCRAFT CENTERLINE.
4. FOR COMBINED AXLE AND DISTRIBUTED LOADS, IN THE MAIN CABIN AREA, THE DIFFERENCE BETWEEN AXLE LOAD AND THE ALLOWABLE TOTAL LOAD MUST BE DISTRIBUTED IN THE SAME COMPARTMENT AS THE AXLE LOAD OR IN A COMPARTMENT BETWEEN THE AXLE LOAD AND THE WING BEAM.

Figure 4-15—CARGO CAPACITY

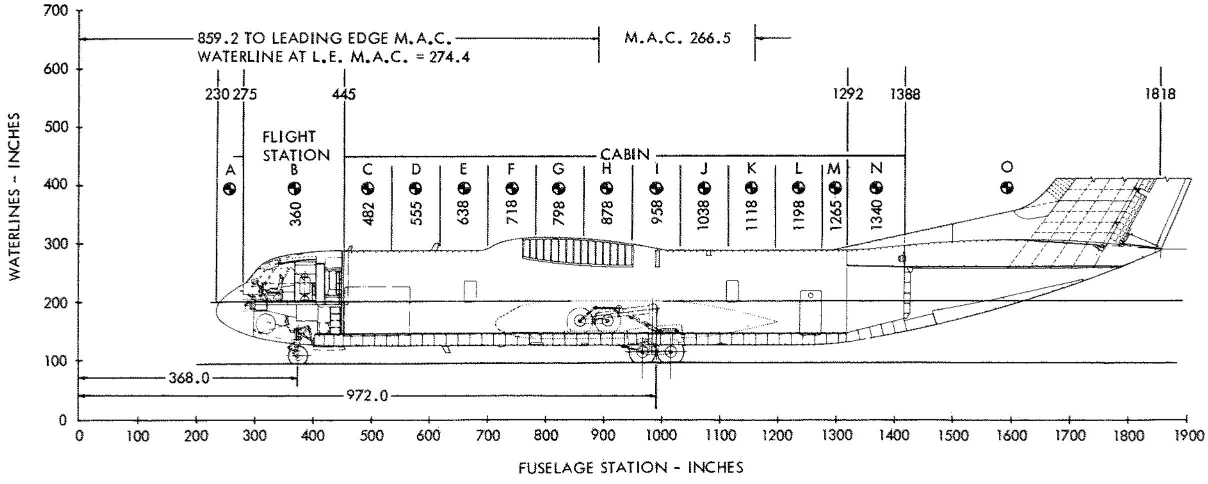
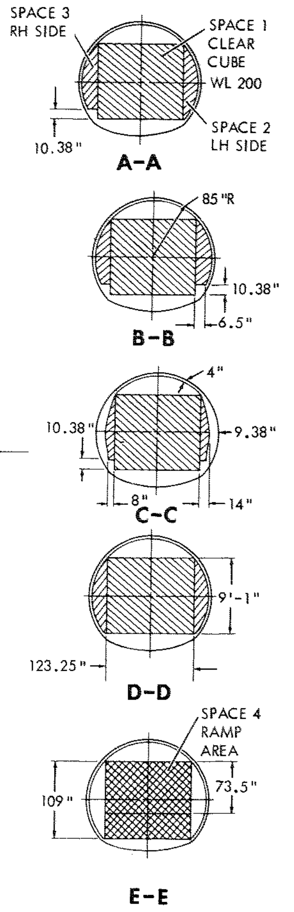


Figure 4-16—BALANCE DIAGRAM

VOLUMES AND DENSITIES

SPACE	VOLUME CU. FT.	50,000 LB PAYLOAD DENSITY CU FT	60,000 LB PAYLOAD DENSITY CU FT	70,000 LB PAYLOAD DENSITY CU FT
1 (CLEAR CUBE)	6531.0	7.66	9.19	10.72
2 LH (CHEEK)	662.0	—	—	—
3 RH (CHEEK)	658.0	—	—	—
4 (RAMP)	625.0	—	—	—
TOTAL (GROSS)	8476.0	5.90	7.08	8.26
1 + 2 + 3	7851.0	6.37	7.64	8.92
1 + 4	7156.0	6.99	8.38	9.78



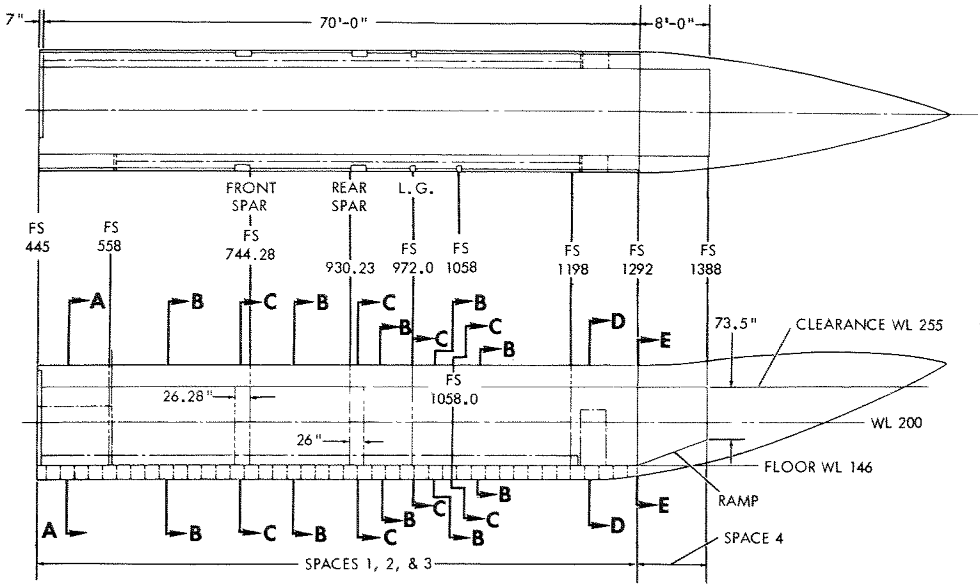
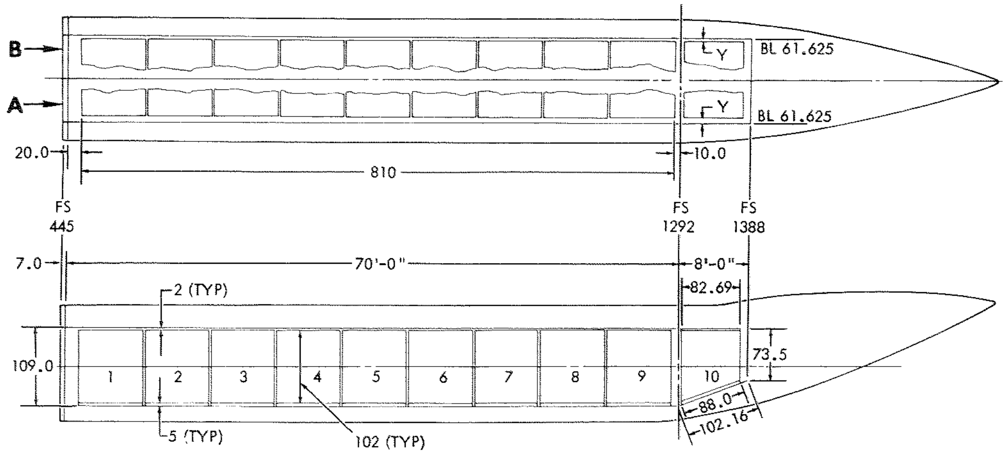
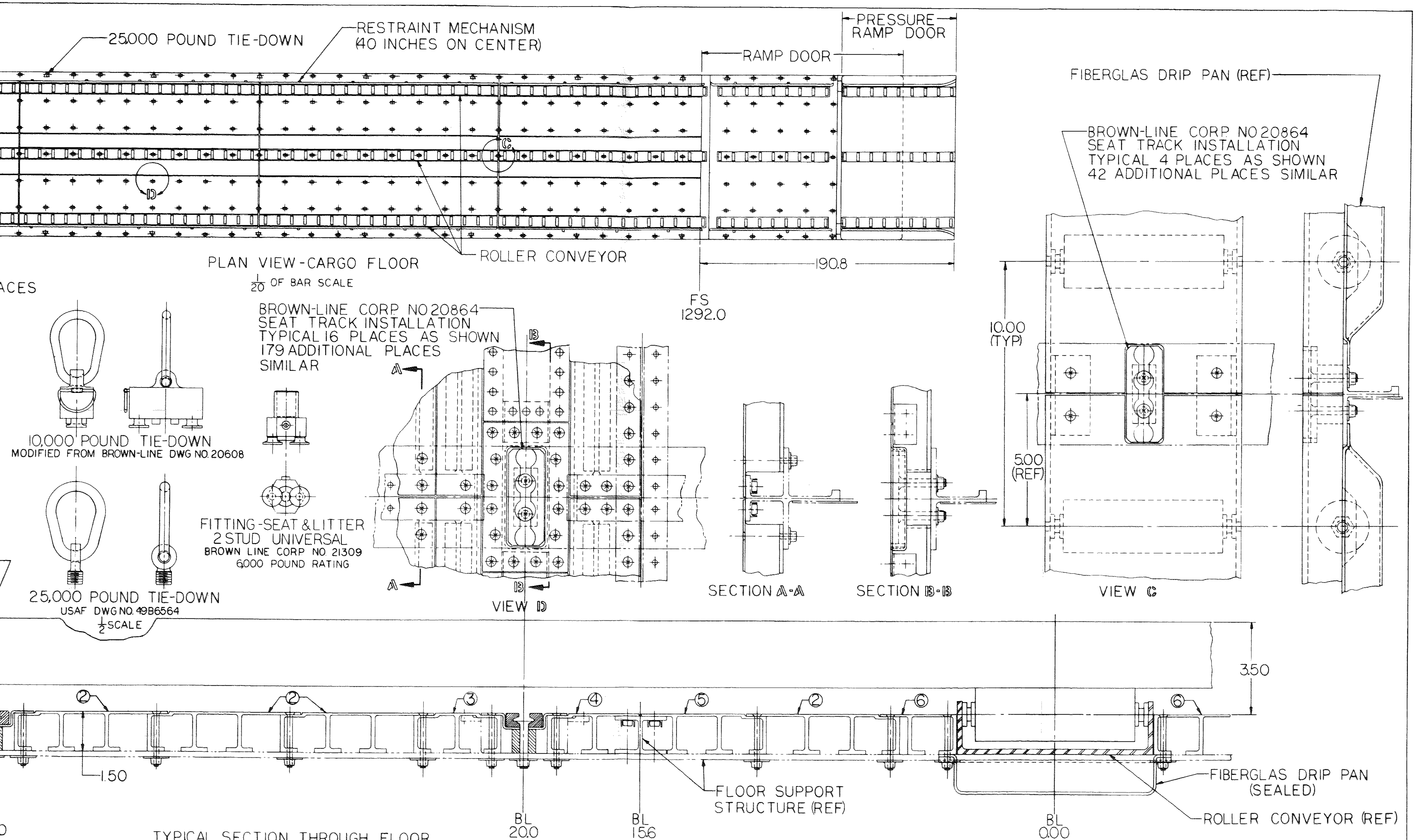


Figure 4-17—CARGO COMPARTMENT SIZES, DENSITIES AND VOLUME — GROSS



	PALLETS	Y	OVERALL DIMENSIONS	MAIN CABIN ONLY - NO RAMP NO. OF PALLETS IN 70' LGTH.	VOL PER PALLET - CU. FT.	TOTAL VOL CU. FT.	WITH RAMP RAMP PAL. VOL. CU. FT.	TOTAL VOL CU. FT.	DENSITY LB/CU FT 70,000 LB P.L. NO RAMP	WITH RAMP	50,000 LB P.L. NO RAMP	WITH RAMP
A	88 X 108 (WS-463L)	7.63	90 X 110	9	561.0	5049	435	5484	13.86	12.76	9.90	9.12
B	88 X 118 MAX CAPACITY	2.63	90 X 120	9	612.9	5516	480	5996	12.69	11.67	9.06	8.33

Figure 4-18—CARGO COMPARTMENT SIZES AND VOLUMES — PALLETIZED.

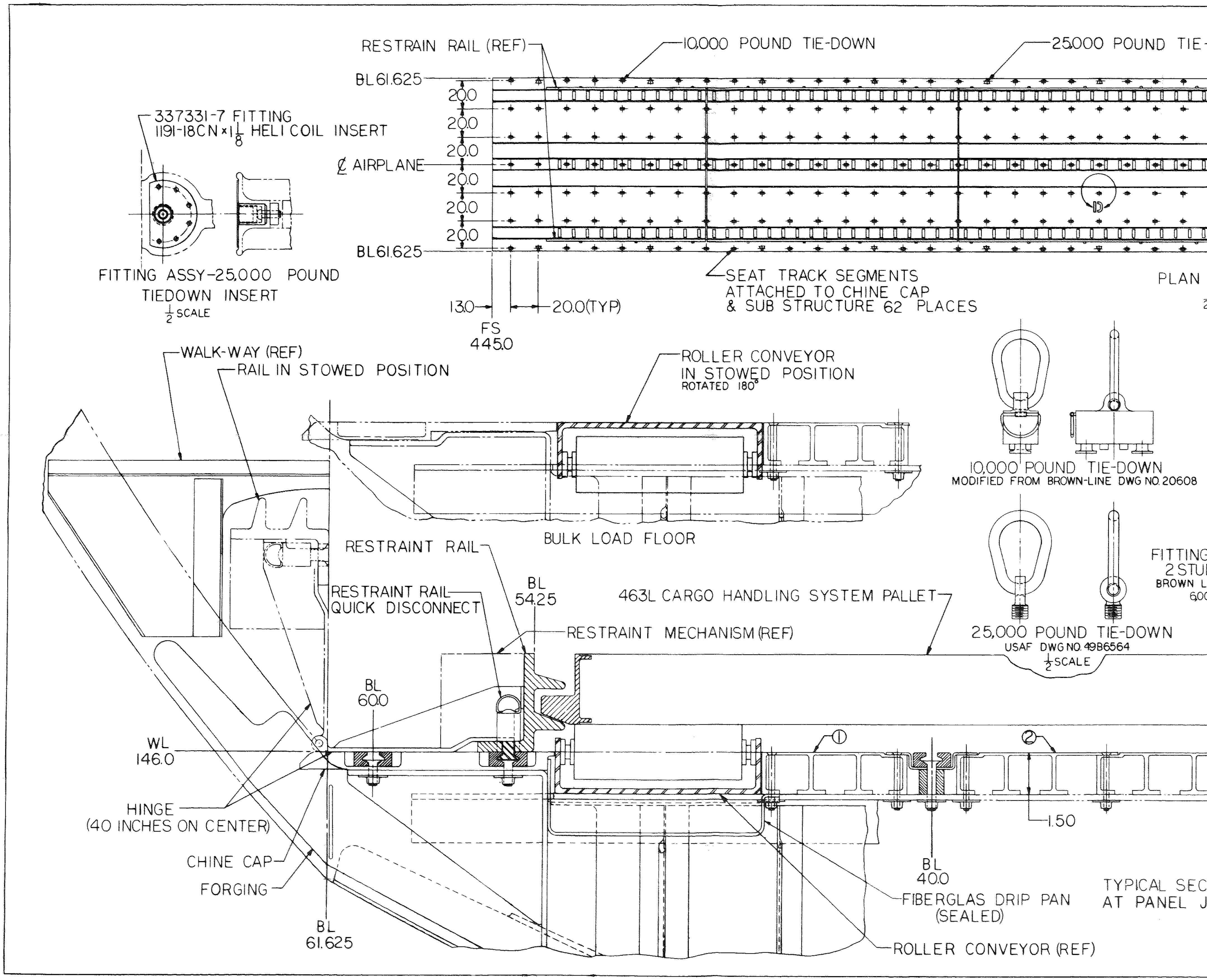


NOTES:
SEAL ALL FAYING SURFACES OF SPLICES AND JOINTS WITH .010 THICKNESS OF THIOKOL SEALING TAPE, SF-50

MAXIMUM CLEARANCE BETWEEN TOP OF PALLET AND TOP OF CARGO COMPARTMENT 105.50 INCHES.

LOCKHEED
GEORGIA DIVISION MARIETTA
SCALE 1/2 & NOTED DATE 11-1-61
ENGINEER RE DAETWYLER
CARGO COMPT
FLOOR-UNIVERSAL
EXTRUDED
MODEL GL207-45
PD-132
DRAWING NUMBER 2674030

figure 4-19



RESTRAIN RAIL (REF)
10,000 POUND TIE-DOWN
25,000 POUND TIE-
BL 61.625
20.0
20.0
20.0
℄ AIRPLANE
20.0
20.0
20.0
BL 61.625
13.0
20.0(TYP)
FS
445.0
SEAT TRACK SEGMENTS
ATTACHED TO CHINE CAP
& SUB STRUCTURE 62 PLACES
PLAN
337331-7 FITTING
1191-18CN×1$\frac{1}{8}$ HELI COIL INSERT
FITTING ASSY-25,000 POUND
TIEDOWN INSERT
$\frac{1}{2}$ SCALE
WALK-WAY (REF)
RAIL IN STOWED POSITION
ROLLER CONVEYOR
IN STOWED POSITION
ROTATED 180°
BULK LOAD FLOOR
10,000 POUND TIE-DOWN
MODIFIED FROM BROWN-LINE DWG NO. 20608
FITTING
2 STU
BROWN L
6.00
RESTRAINT RAIL
RESTRAINT RAIL
QUICK DISCONNECT
BL
54.25
463L CARGO HANDLING SYSTEM PALLET
RESTRAINT MECHANISM (REF)
25,000 POUND TIE-DOWN
USAF DWG NO. 49B6564
$\frac{1}{2}$ SCALE
BL
60.0
WL
146.0
①
②
1.50
HINGE
(40 INCHES ON CENTER)
CHINE CAP
FORGING
BL
61.625
BL
40.0
FIBERGLAS DRIP PAN
(SEALED)
ROLLER CONVEYOR (REF)
TYPICAL SEC
AT PANEL J

way length of 6000 ft. With the JT3D-8A, the higher cruise altitude and improve engine specific fuel consumption gives increased payload/range capability of 69,300 lb. payload—4000 N. M.

Payload/range data based on MIL-C-5011A is shown in Figure 4-23, and data based on MATS reserves is shown in Figure 4-24. Payload/range data for the JT3D-8A engine is shown in Figure 4-25. The MIL-C-5011A data is based on 5% conservative fuel flows while the MATS payload/range data is based on installed fuel flows. These charts present data for best range which is achieved in cruise climb at 440 knots true airspeed and 80% normal power. Additional data is also shown for higher cruise speeds.

A payload/range comparison of the JT3D-4 powered airplane with the JT3D-8A powered airplane is shown in Figure 4-26. This shows that the payload range advantage of the JT3D-8A is small. The only real difference is that with the System 476L 6000 ft., CAR runway length requirement, the JT3D-4 powered airplane has a take-off gross weight of 288,000 lbs. while the JT3D-8A powered airplane has a take-off gross weight of 315,000 lbs.

Analysis of several trans-Atlantic and trans-Pacific routes, with the JT3D-4 powered airplane, is shown in Figures 4-27 and 4-28. These data show operational capability based on average annual enroute winds, MATS alternates per MM 55-1, and MATS fuel reserves. Times shown are total flight times from flight origin to final destination.

Fuel allowances include 2640 lbs. for taxi, run-up and take-off, and fuel for approach and landing time of 15 minutes based on four engine maximum endurance at 10,000 ft. altitude.

Fuel reserve includes fuel for 10% of flight time or one hour, whichever is less, plus fuel to MATS alternate I, plus 45 minutes holding fuel based on four-engine maximum endurance at 10,000 ft. altitude.

NAUTICAL MILES PER POUND OF FUEL VS. TRUE AIRSPEED AT 35,000 FT. STANDARD ARDC DAY. (5.3.3.6)

Specific range data at 35,000 ft. altitude is shown in Figure 4-29. The data is presented for the airplane at two weights and under no-wind conditions four hours after a maximum gross weight take-off on a 4,000 N. M. mission using MIL-C-5011A fuel reserves.

For the basic 4000 N. M. mission requirement of System 476L, four hours after take-off with a 6000 ft. CAR field length, the weight is 236,400 lbs. and specific range at 35,000 feet at best range cruise is 0.0414 N. M./lb. Figure 4-29 also shows the specific range at 258,600 lbs. which is four hours after take-off at 315,000 lbs. design gross weight.

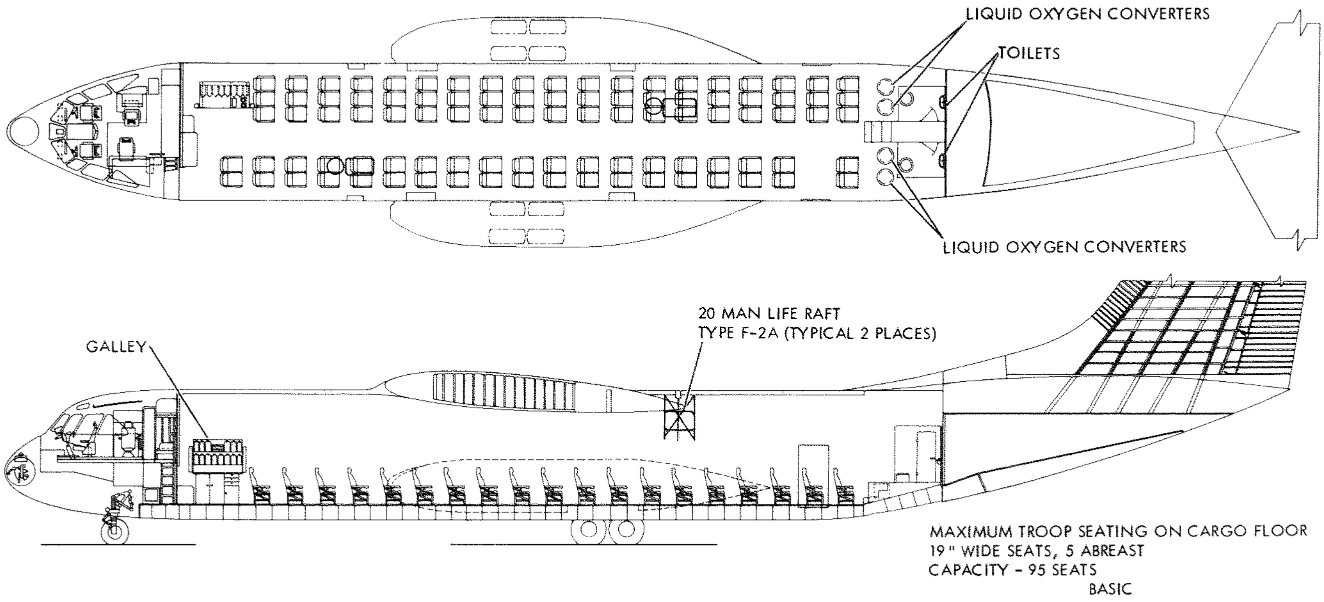
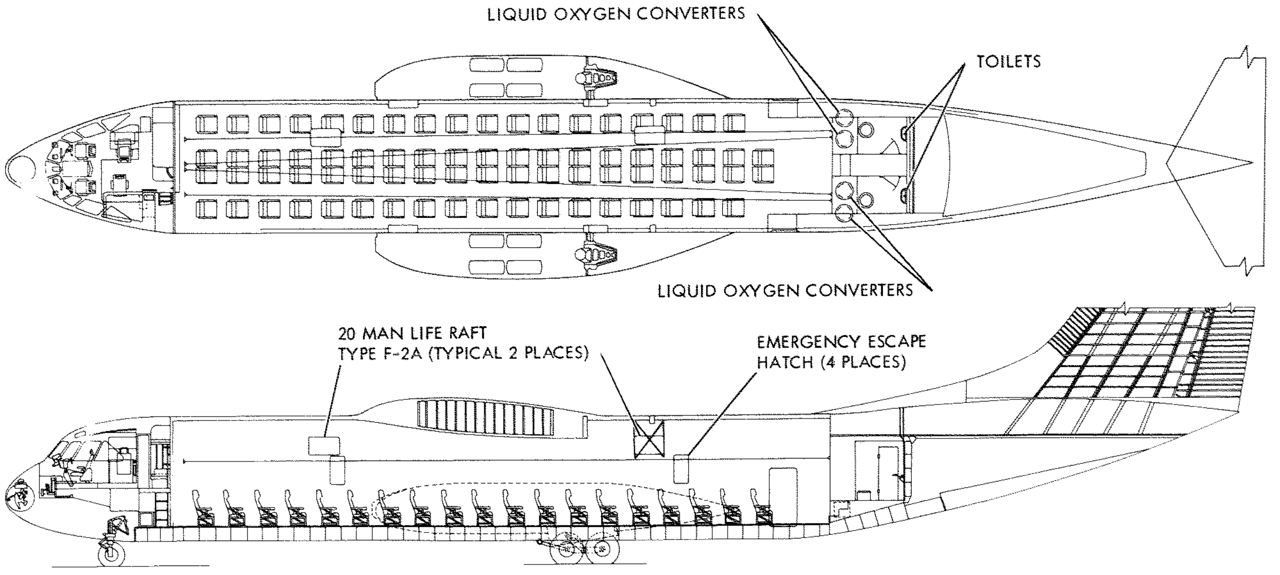
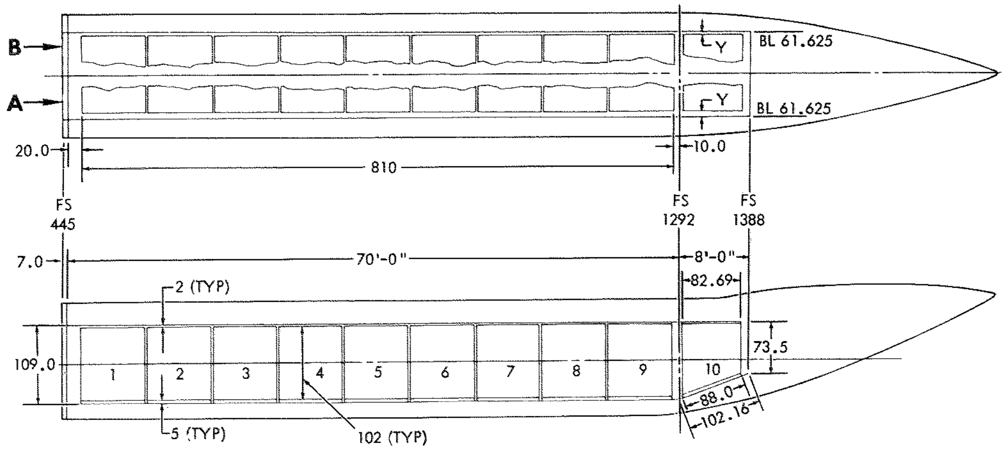


Figure 4-20—INBOARD PROFILE — MAXIMUM SEATING AREA ON CARGO FLOOR, FIVE ABREAST.



MAXIMUM PARATROOP SEATING ARRANGEMENT ON CARGO FLOOR
19" WIDE SEATS, 4 ABREAST
CAPACITY - 74

Figure 4-21—INBOARD PROFILE — MAXIMUM PARATROOP SEATING ON CARGO FLOOR.



				MAIN CABIN ONLY - NO RAMP			WITH RAMP		DENSITY LB/CU FT			
									70,000 LB P.L.		50,000 LB P.L.	
	PALLETS	Y	OVERALL DIMENSIONS	NO. OF PALLETS IN 70' LGTH.	VOL PER PALLET - CU. FT.	TOTAL VOL CU. FT.	RAMP PAL. VOL. CU. FT.	TOTAL VOL CU. FT.	NO RAMP	WITH RAMP	NO RAMP	WITH RAMP
A	88 X 108 (WS-463L)	7.63	90 X 110	9	561.0	5049	435	5484	13.86	12.76	9.90	9.12
B	88 X 118 MAX CAPACITY	2.63	90 X 120	9	612.9	5516	480	5996	12.69	11.67	9.06	8.33

Figure 4-22—INBOARD PROFILE — MAXIMUM SEATING ON PALLETS.

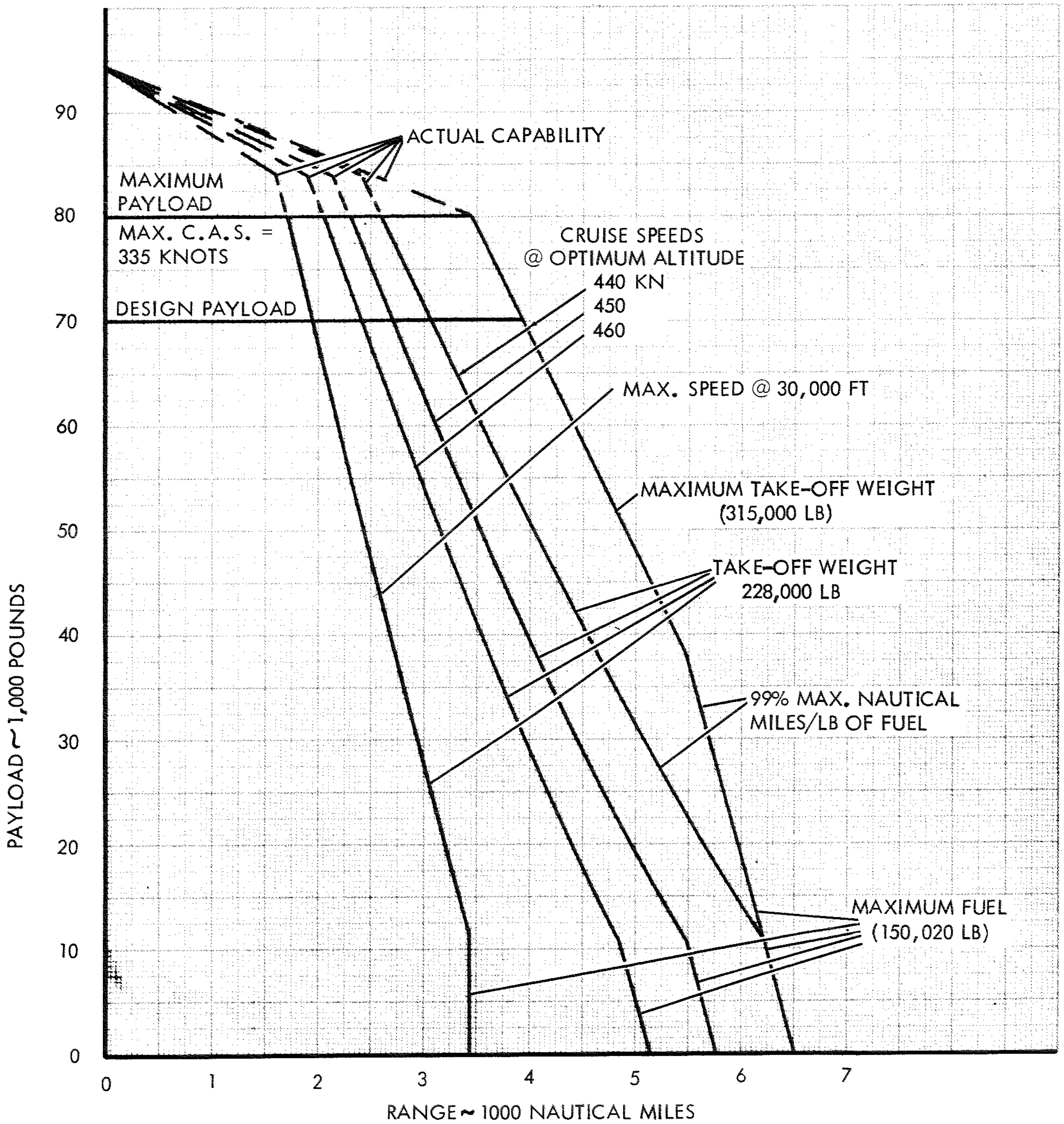


Figure 4-23—PAYLOAD RANGE, INSTALLED FUEL FLOWS FIVE PER CENT CONSERVATIVE, TAKE-OFF FUEL ALLOWANCES AND FUEL RESERVES — MIL-C-5011A, P & W JT3D-4 ENGINE.

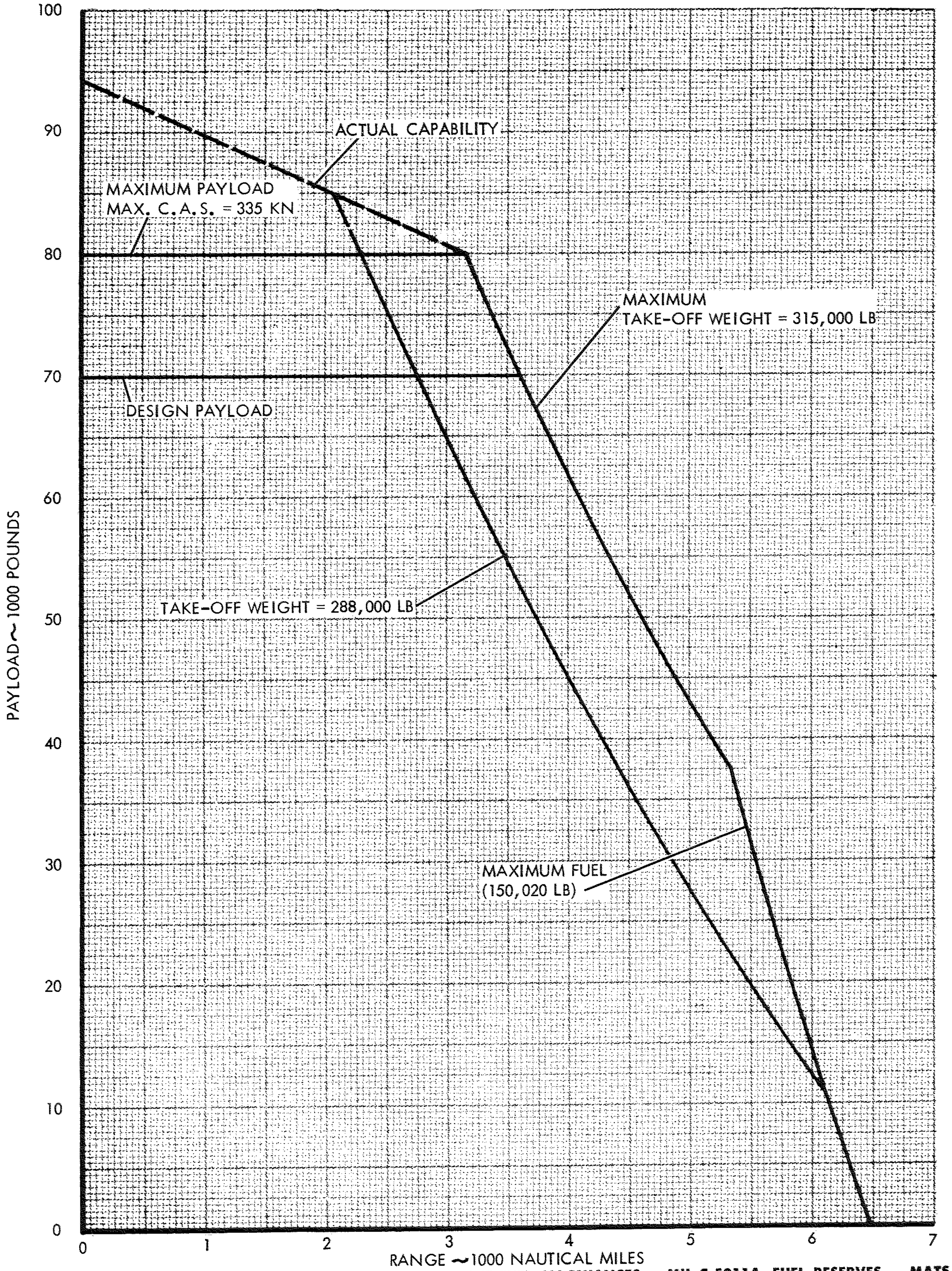


Figure 4-24—PAYLOAD RANGE, INSTALLED FUEL FLOWS, TAKE-OFF FUEL ALLOWANCES — MIL-C-5011A, FUEL RESERVES — MATS, CRUISE SPEED — 440 KNOTS, P & W JT3D-4 ENGINE.

PAYLOAD — RANGE

PRATT & WHITNEY JT3D-8A ENGINES
INSTALLED FUEL FLOW 5% CONSERVATIVE
TAKE-OFF FUEL ALLOWANCES AND FUEL RESERVES - MIL-C-5011A

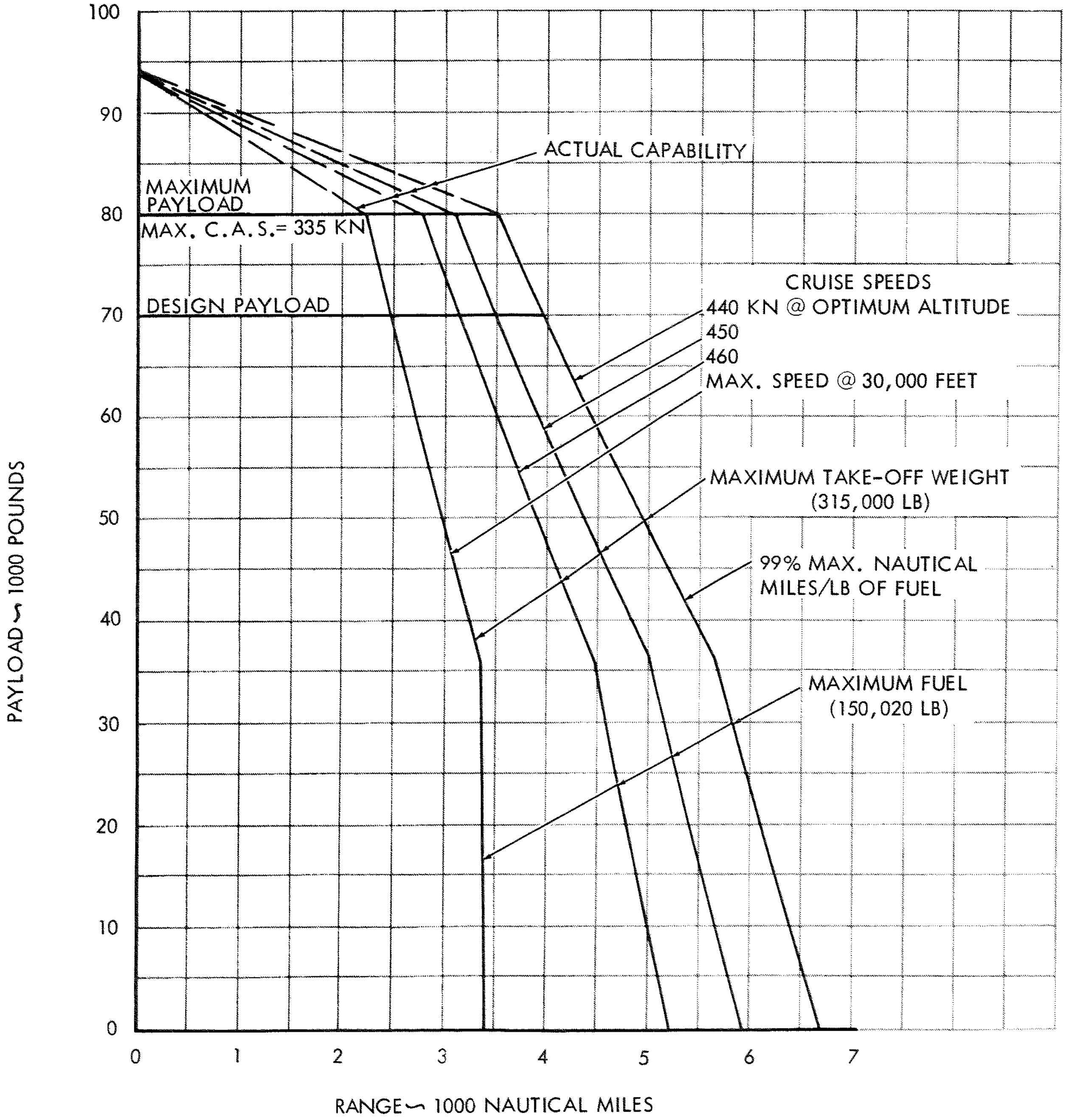


Figure 4-25—PAYLOAD RANGE, INSTALLED FUEL FLOWS FIVE PERCENT CONSERVATIVE, TAKE-OFF ALLOWANCES AND FUEL RESERVES — MIL-C-5011A, P & W JT3D-8 AND -8B ENGINES.

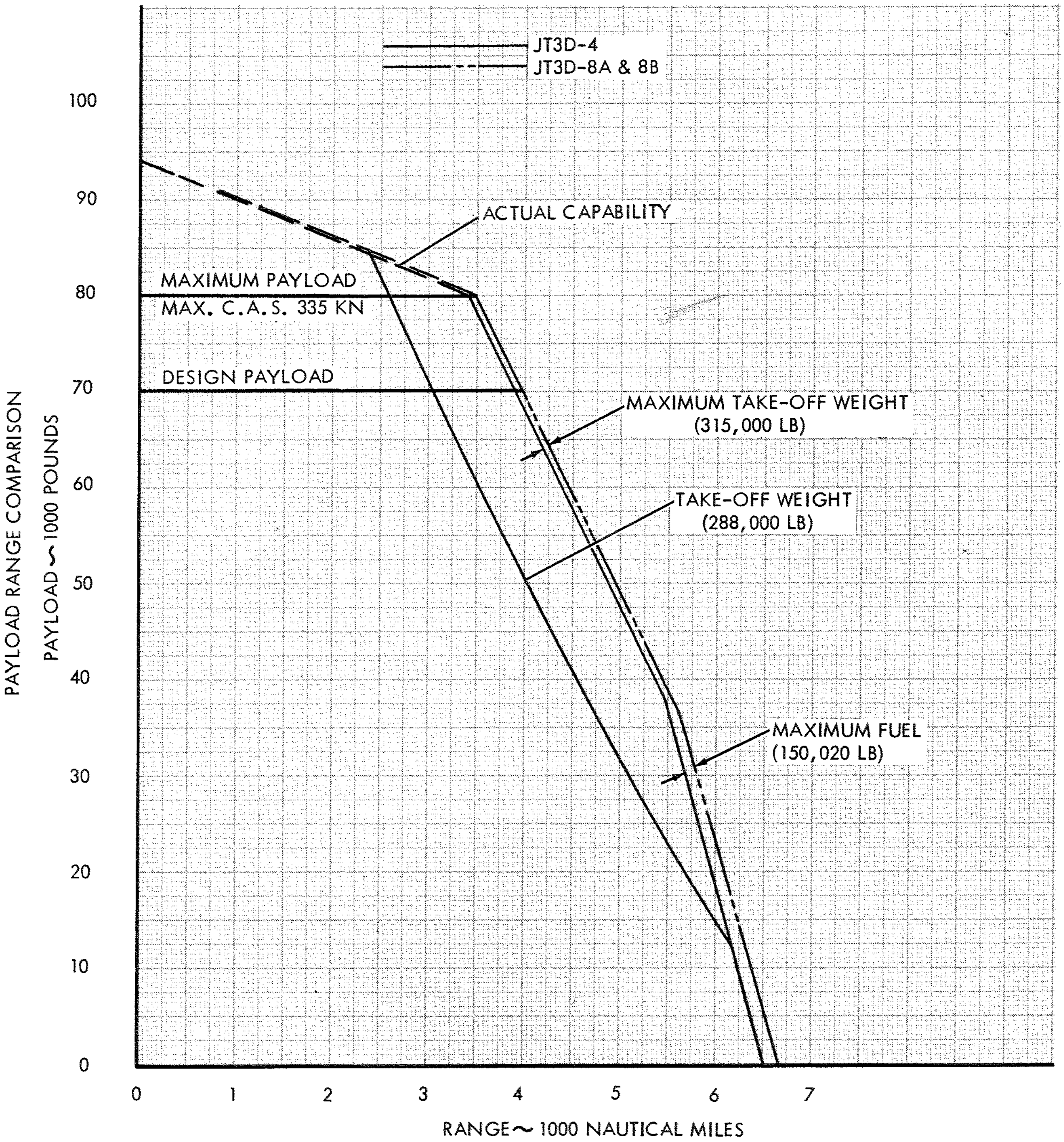


Figure 4-26—PAYLOAD RANGE COMPARISON JT3D-4 AND JT3D-8A AND -8B, INSTALLED FUEL FLOWS FIVE PERCENT CONSERVATIVE, TAKE-OFF FUEL ALLOWANCES AND FUEL RESERVES — MIL-C-5011A, 440 KNOTS CRUISE SPEED AT OPTIMUM ALTITUDE.

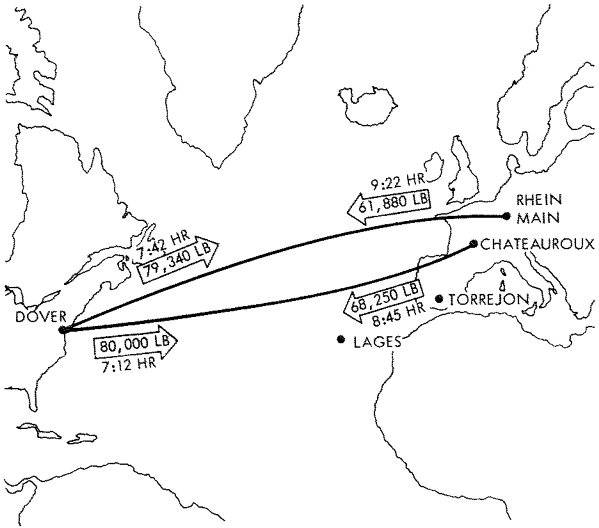


Figure 4-27—TRANS-ATLANTIC PAYLOADS.

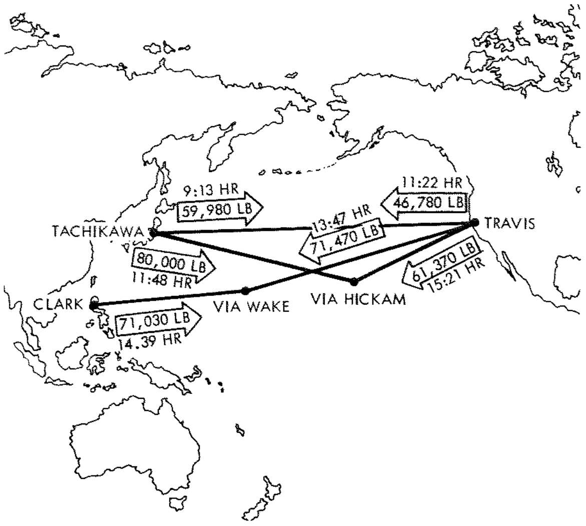


Figure 4-28—TRANS-PACIFIC PAYLOADS.

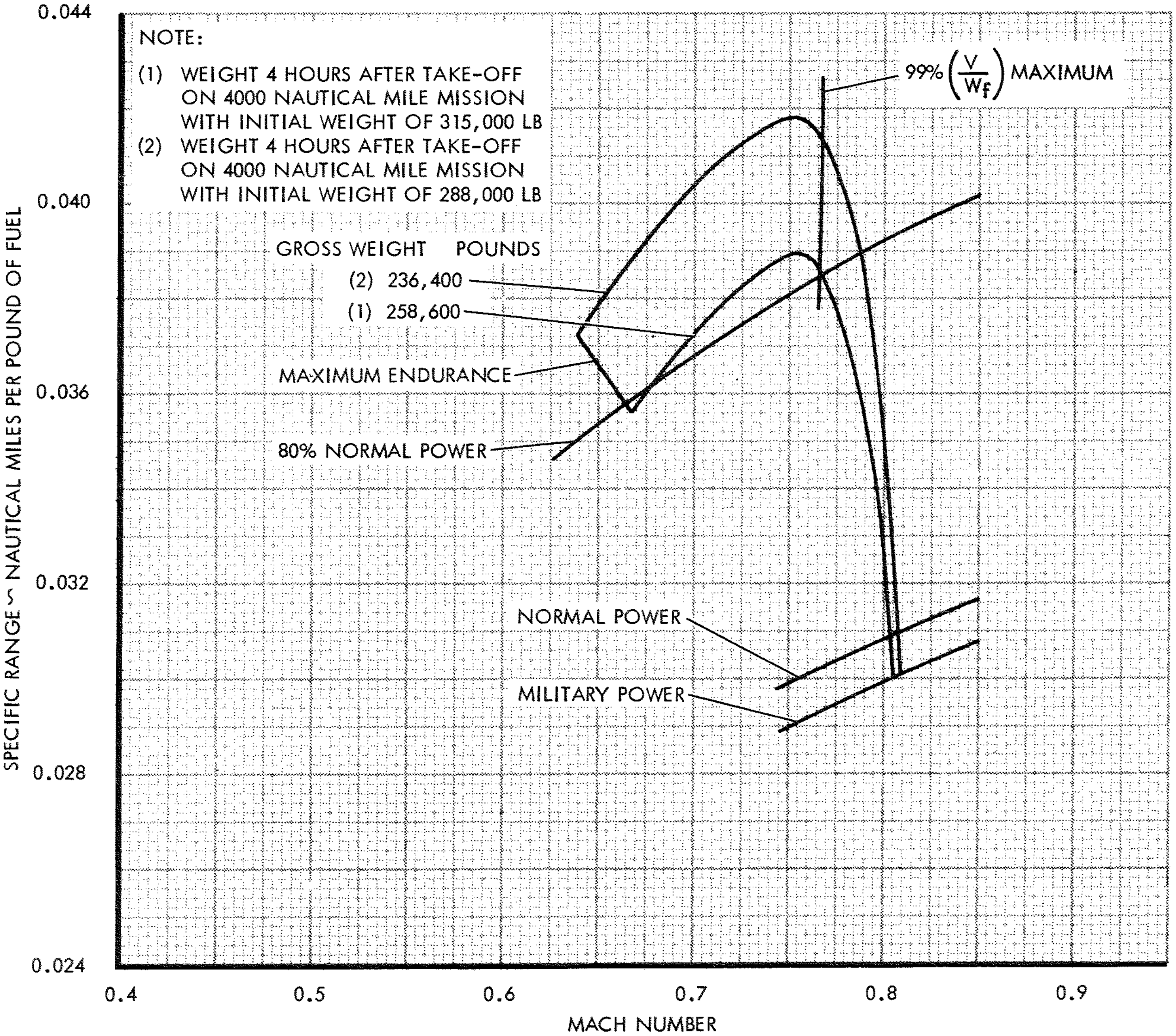


Figure 4-29—SPECIFIC RANGE, 35,000 FEET, STANDARD ARDC DAY, FUEL FLOWS FIVE PER CENT CONSERVATIVE, P & W JT3D-4 ENGINE.

SUPER HERCULES · GL207-45

section 5

AIR DROP CAPABILITY (5.3.4)

The GL 207-45 is designed for easy and rapid aerial delivery of both cargo and personnel. A minimum speed of 1.3 times stall speed gives excellent characteristics for cargo ejection. Positive nose-up deck angles exist which provide desirable qualities for cargo jettisoning as well as for parachute or gravity ejections.

Drop equipment developed for and compatible with the C-130 can be employed with no changes since the cargo compartment cross sections are identical.

Aerodynamic Considerations

Positive speed stability exists for the full range of drop speeds and provides the desirable characteristics for satisfactory formation airdrops. The operator has a choice of floor angles depending upon his selection of flap setting and speed, appropriate to mission requirements for payload and circumstances of drop.

Experience with the C-130 has shown that the handling qualities at drop speeds of about 1.3 stall speed or above are quite satisfactory. The GL 207-45 with twice the weight and three times the pitching moment of inertia of the C-130 should have the same satisfactory characteristics when dropping a payload of 40,000 to 60,000 lbs. as the C-130 has when dropping 15,000 to 35,000 lbs. Figures 5-1, 5-2 and 5-3 give air drop operating limits.

Structural Considerations

Two operating flight regimes are of importance. The first is when cargo or personnel are in the fuselage and covers the time span prior to drop and governs the strength of the fuselage above the doors. The second regime is during the actual drop or extraction which covers a nominal time span of less than two seconds and governs the strength of the aft cargo door ramp structure. A 2.0 "g" maneuver load as well as reduced equivalent gust intensities of 25 ft./sec. prior to drop and 10 ft./sec. during drop is utilized and is considered satisfactory for both regimes. This is the same criterion which has proven satisfactory during the airdropping of unit pallets slightly in excess of 40,000 lbs. with the C-130 airplane.

PERSONNEL (5.3.4.1)

A paratroop seating arrangement installed on the cargo floor is shown in Figure 4-21. This arrangement utilizes 19-in.-wide, aft-facing, 16-g seats with single seats along the sides and two clustered seats down the center. This arrangement accommodates 76 airborne troops with no galley, but includes two removable toilets on the ramp and an oxygen system installed by kit. Paratroop spoilers are also installed by kit for this arrangement. The spoilers are attached within the fuselage forward of the paratroop doors. The spoilers are actuated to the desired position for protection during bailout of paratroops by a hydraulic actuator.

An alternate possibility for a paratroop arrangement is shown in Figure 5-4. This arrangement shows the usual side-facing seats required for airborne troops. This version has a capacity for 151 troops at 20-in. spacing and approximately 128 paratroops at 24-in. spacing. This version also includes two toilets, and an emergency oxygen system installed by kit. No galley is installed.

The aft-entry/paratrooper doors are located at F. S. 1213.0 on both the right and left sides of the fuselage. The doors provide a clear opening 36 in. wide and 72 in. high.

The doors are inward opening plug-type equipped with four locks. The locks are operable from either inside or outside the airplane by rotating handles. A spring loaded device raises the door inboard and up through a system of arms and tracks which allows it to be rolled to a stowed area aft of the door opening and about five in. above the floor. A typical jump is shown in Figure 5-5.

CARGO (5.3.4.2)

The aircraft can deliver 463L palletized loads 108 in. wide and in variable lengths as shown in Figure 5-6. Palletized loads as wide as 120 in. in variable lengths may also be delivered.

The single drop load capacity exceeds 35,000 lbs., including the armored reconnaissance airborne assault vehicle referred to in Paragraph 3.1.10 of the Statement of Work. The structural integrity of the ramp doors provides for teeters loads imposed by emergency gravity ejection of loads to 35,000 lbs. The aircraft will accommodate known cargo delivery systems such as the interim conveyer system and rail system for skid boards, metal platforms, combat expendable platforms and others. Gravity ejection of A-22 containers can be accomplished using existing techniques.

The extraction parachute ejection system is the overhead pendulum type proven thoroughly reliable by engineering flight test and operational service on the C-130 series aircraft. The system consists of attach points for two-ring pickup of the extraction parachute bag, a release mechanism operable by electrical or mechanical means, a pivot arm, cocking device, and positive locking during the door opening cycle. The ejection device is located in the overhead

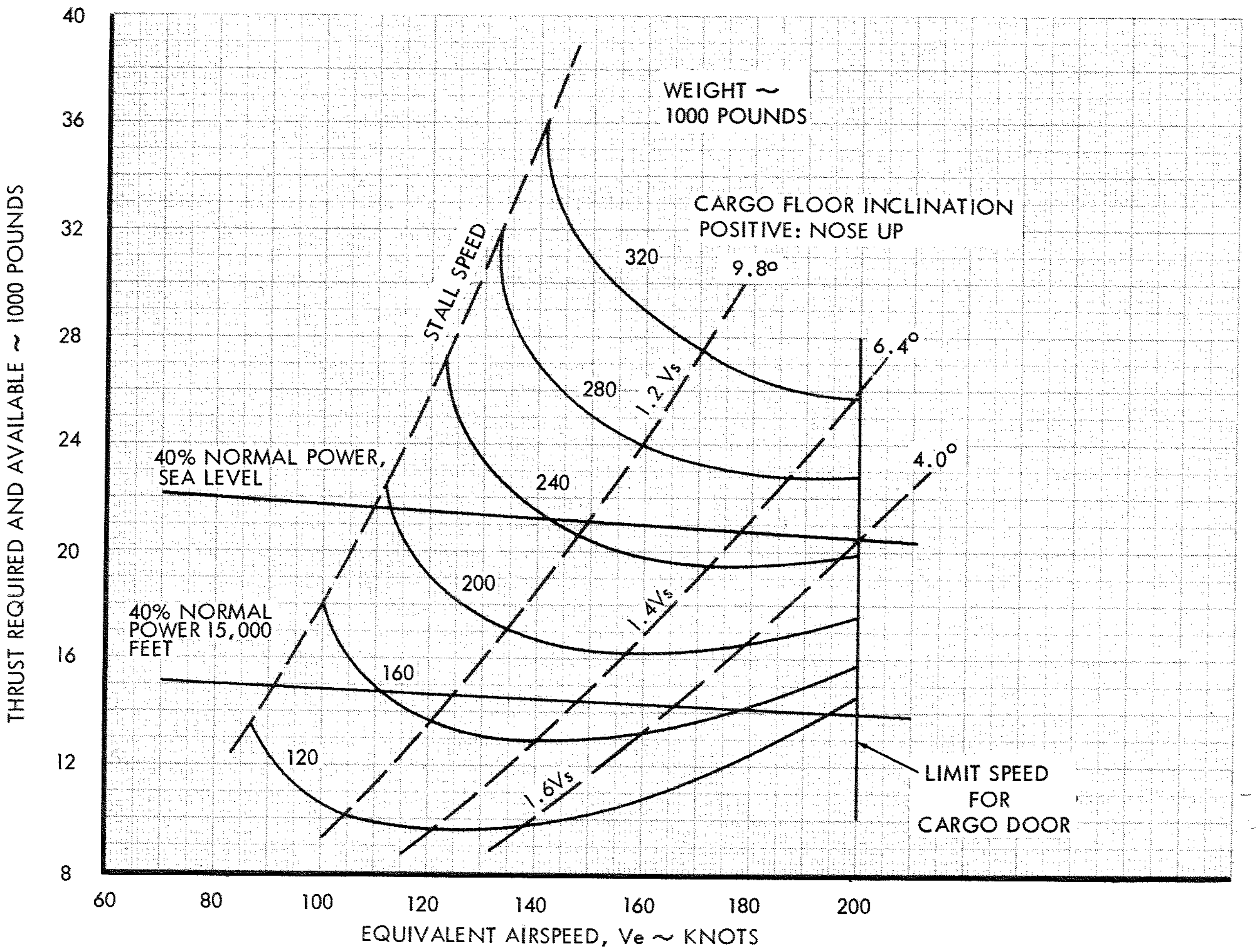


Figure 5-1—THRUST REQUIRED AND AVAILABLE, AIRDROP CONFIGURATION, GEAR UP, FLAPS UP, CARGO DROP DOOR OPEN, P & W JT3D-4 ENGINES.

structure just forward of the aft edge of the ramp door in the airdrop position. When the system is energized, the parachute swings down and out and into the slipstream where the wind blast strips the bag pack away.

Extraction parachutes planned for use with this aircraft are the existing standard parachutes. The cargo delivery rail system and release mechanism is compatible with the 463L palletized cargo loading system.

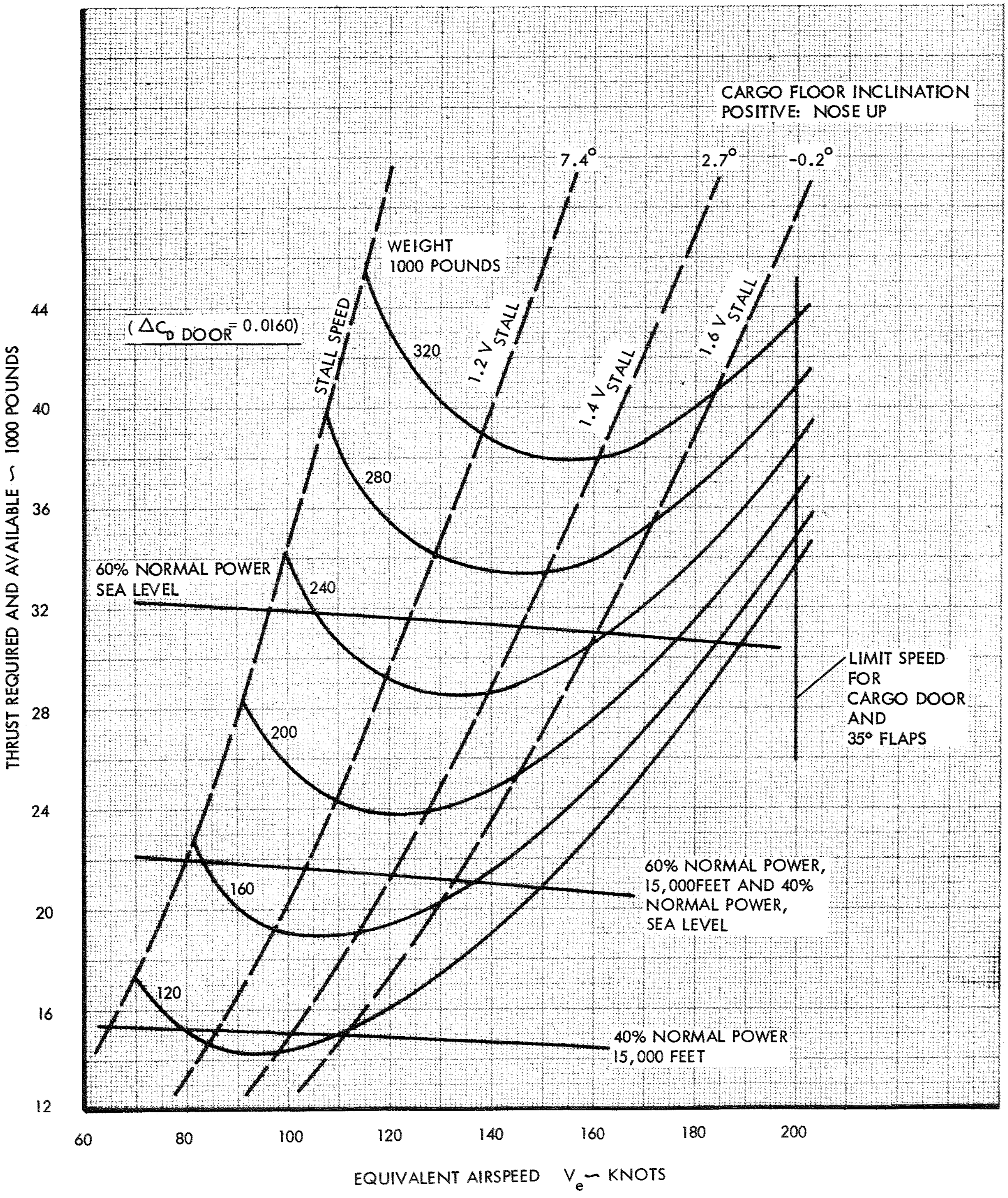


Figure 5-2—THRUST REQUIRED AND AVAILABLE, AIRDROP CONFIGURATION, GEAR UP, FLAP DEFLECTED 35 DEGREES, CARGO DOOR OPEN, P & W JT3D-4 ENGINE.

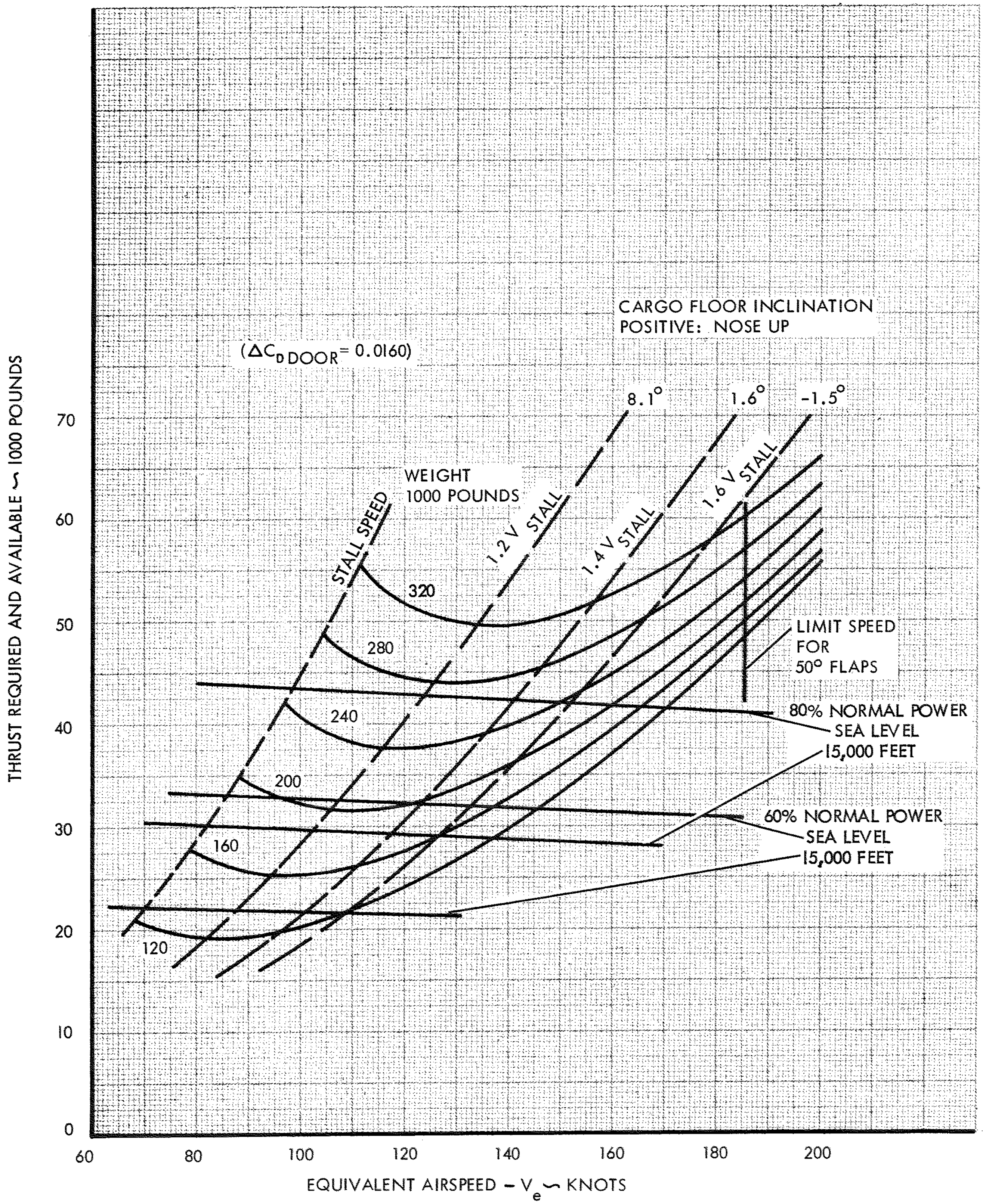
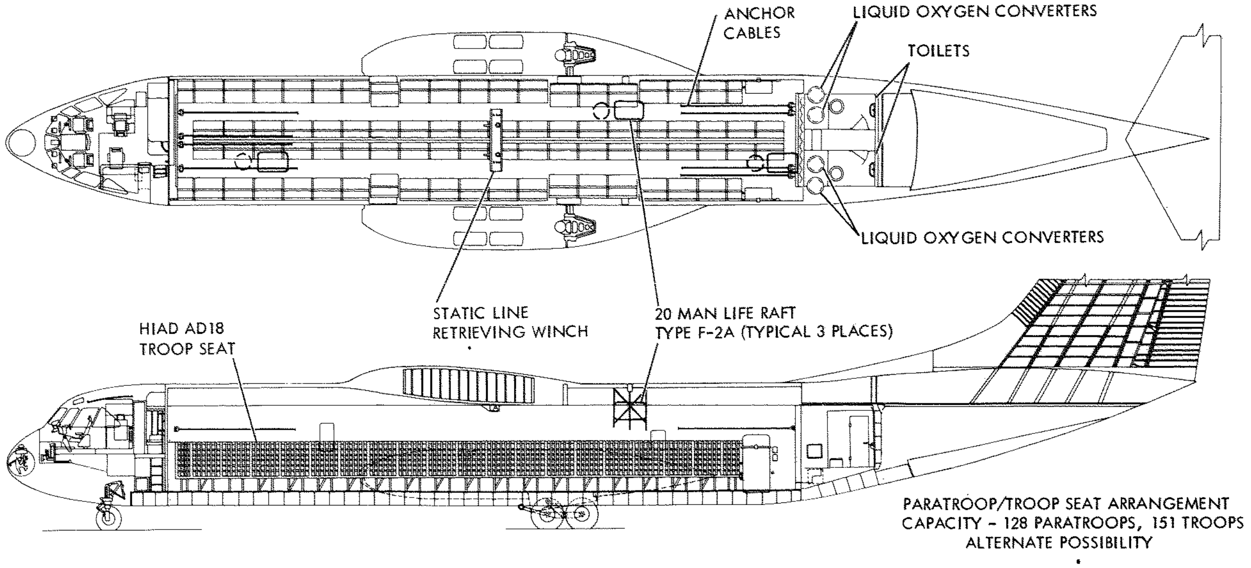


Figure 5-3—THRUST REQUIRED AND AVAILABLE, AIRDROP CONFIGURATION, GEAR UP, FLAP DEFLECTED 50 DEGREES, CARGO DOOR OPEN, P & W JT3D-4 ENGINE.



PARATROOP/TROOP SEAT ARRANGEMENT
CAPACITY - 128 PARATROOPS, 151 TROOPS
ALTERNATE POSSIBILITY

Figure 5-4—INBOARD PROFILE — TROOP ARRANGEMENT.

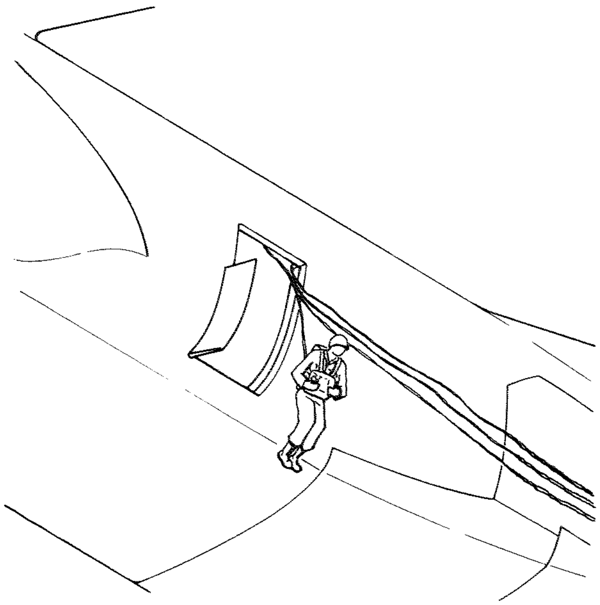


Figure 5-5—AIRDROP — PERSONNEL.

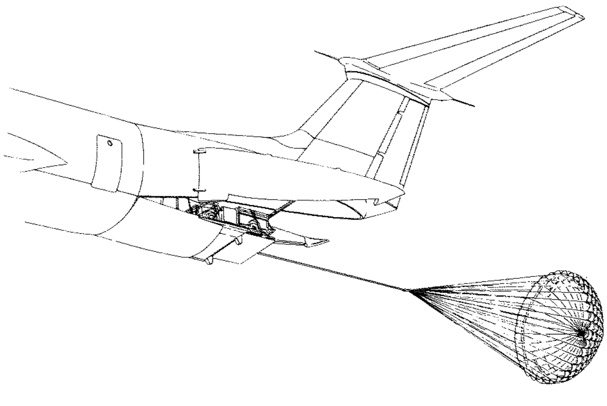


Figure 5-6—AIRDROP — CARGO.

SUPER HERCULES · GL207-45

section 6

ALL WEATHER OPERATION (5.3.5)

The GL 207-45 has all-weather operational capability as described in the following paragraphs.

ANTI-ICING OR DE-ICING (5.3.5.1)

Wing leading edge, air conditioning ram air scoops and engine inlets are anti-iced with engine bleed air, as shown in Figure 6-1. The ejector method of diluting the hot bleed air with recirculated air from the leading edge double-skin passages is identical to that used in proven operational airplanes, including the C-130. The airflow to the six wing sections is regulated by thermostatically controlled, motor-actuated valves. Three switches turn the wing sections on or off in pairs. The double-skin exit temperature is maintained at a constant value by the control thermostats which vary the valve opening in accordance with the thermal load. Temperature sensors are installed to monitor system operation and to provide overheat warning. Pressure relief doors are installed to protect the leading edge structure in case of duct rupture. The wing anti-icing system is designed to be 100% evaporative under all climb and level flight conditions, using the meteorological requirements outlined in Specification MIL-A-9482, and will meet the requirements of CAR Part 4b. The lip area of each air conditioning ram air scoop located in the forward end of the main landing gear wheel enclosures is anti-iced by heating the inner and outer surfaces to a point three inches aft of the leading edge. Bleed air at a maximum temperature of 450°F is used as the heating medium. A running-wet surface is maintained.

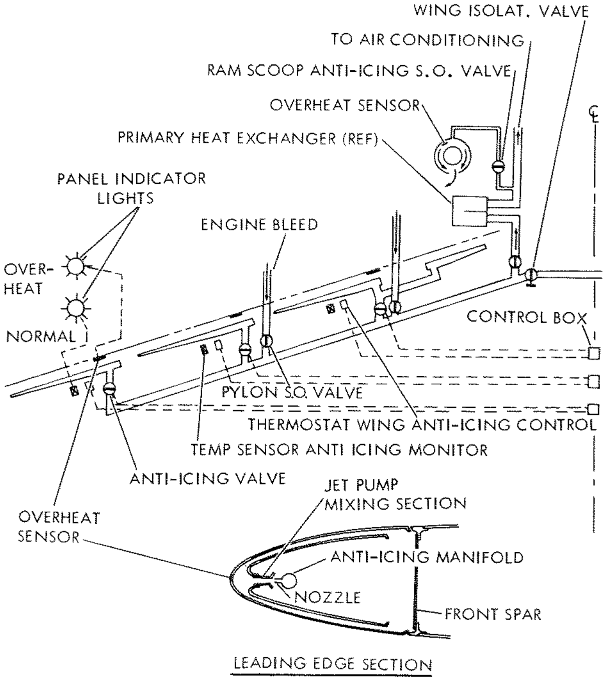


Figure 6-1—WING AND RAM AIR SCOOP ANTI-ICING SYSTEM SCHEMATIC.

The front windshield panels are anti-iced electrically through a conductive film. All other windshield panels are defogged with electrical energy. These systems are designed to meet the requirements of MIL-A-9482 and MIL-T-5842. The pilot's and co-pilot's side panels are cleared with a jet blast rain removal system and forward visibility under heavy rain conditions during taxi, take-off, and landing.

The empennage is protected as shown in Figure 6-1 by metal-clad electrical heating elements recessed and bonded to form an integral part of the leading edge structure. Electrical de-icing has been selected because it is lighter and more efficient than a bleed air system, and eliminates the hazards involved in locating a long run of high-pressure ducting inside the cargo compartment. The combination of bleed air anti-icing for the wing and cyclic electrical de-icing for the empennage is also used on the P3V and other large modern aircraft. The bonded laminate type of construction affords maximum protection for the heater element and the steel cladding prevents damage from abrasion and hail. Continuously heated chordwise parting strips are located at the ends of each 8–second-cycled section to insure positive ice shedding. The total power requirement is 18.7 kw. A safety relay prevents normal cycling operation when the airplane is on the ground. Overload protection is incorporated in all AC and DC circuits and overheat protection is provided by temperature sensors. Fail-safe features include power shut-off to all heater elements in case of a loss of DC control power and power removal in the event of a timer failure. The electrical de-icing system has a high degree of reliability through the use of qualified components.

Engine Inlet Duct Anti-Icing

The anti-icing system selected for the engine after evaluation of all possible methods of anti-icing, including an optimization study of hot-air vs. electrically heated blankets, is of the hot-air, fully evaporative, recirculating double-skinned type. The aircraft is estimated to be in icing condition only 2% of the time. The anti-icing system selected for the engine inlet duct is of sufficient capacity to assure all-weather capability.

On the basis of this design study, the engine compressor bleed system is selected to provide an adequate supply of hot air to use as the anti-icing medium. This source of hot air provides the most reliable, lightest installed weight, lowest cost, least complex, and easiest maintained of all the many types studied by Lockheed. Furthermore engine performance is not affected when the system is inoperative.

Figure 6-2 shows the arrangement of the inlet anti-icing air passages, three-barrel ejector, inlet and outlet plenums, and air flow routes. Since the compressor bleed air may reach temperatures in excess of 800°F in certain flight regions, a recirculating system is provided to yield a mixed, tempered air temperature which is compatible with the aluminum structure of the inlet duct.

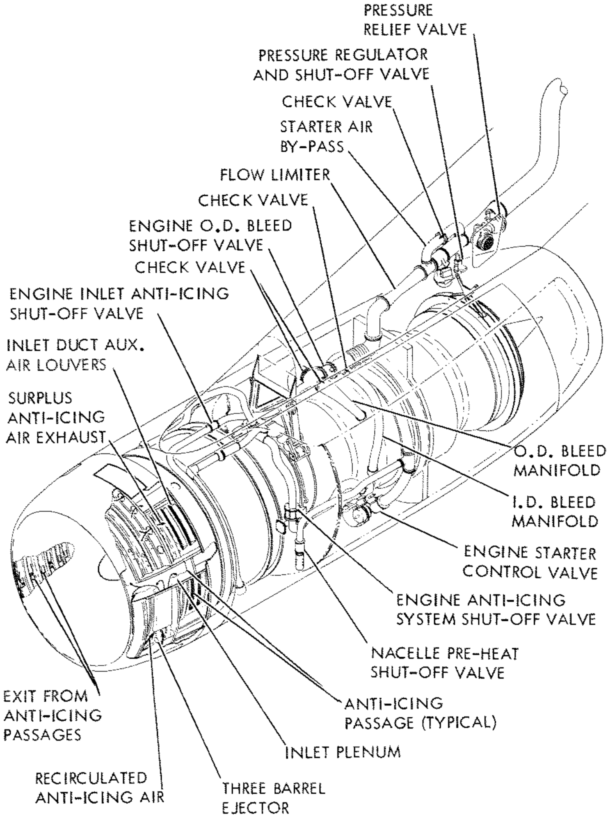


Figure 6-2—COMPRESSOR BLEED DUCTING — NACELLE.

Bleed air flows from the shut-off valve to a three-barrel ejector which induces recirculated secondary air from the immediate surroundings to flow into a mixing chamber, then into the inlet plenums. Air flows out of the plenum axially toward the inlet lip and circumferentially in two directions around the inlet duct. Air exits from the anti-icing air passages 180 degrees from the inlet and then flows through flow restricting ports to be discharged into the inlet duct through louvers. Axial coverage of the inlet duct extends aft 24 in. from the lip.

Operation may be either manual or automatic. Automatic on-off operation is initiated by an ice-detector located on the fuselage. Manual operation of the system whenever icing conditions are known or predicted is recommended by most of the commercial airlines. The system is designed with fail-safe features; e.g., a dead engine does not penalize other engine bleed systems. Valves fail in the safe direction, and an engine isolated from the main aircraft bleed system continues to furnish its own anti-icing.

The system is designed to be fully evaporative with respect to catch inside the inlet duct at all climb level flight conditions, including loiter, as discussed in Volume 2. Exterior icing has little effect and is not removed. The use of loiter as a design condition poses a difficult problem because of the very low-bleed temperature, but it has nevertheless been adhered to because of the operational importance of the ability to hold for extended periods, especially in the bad weather associated with icing conditions.

PREHEAT REQUIREMENTS (5.3.5.2)

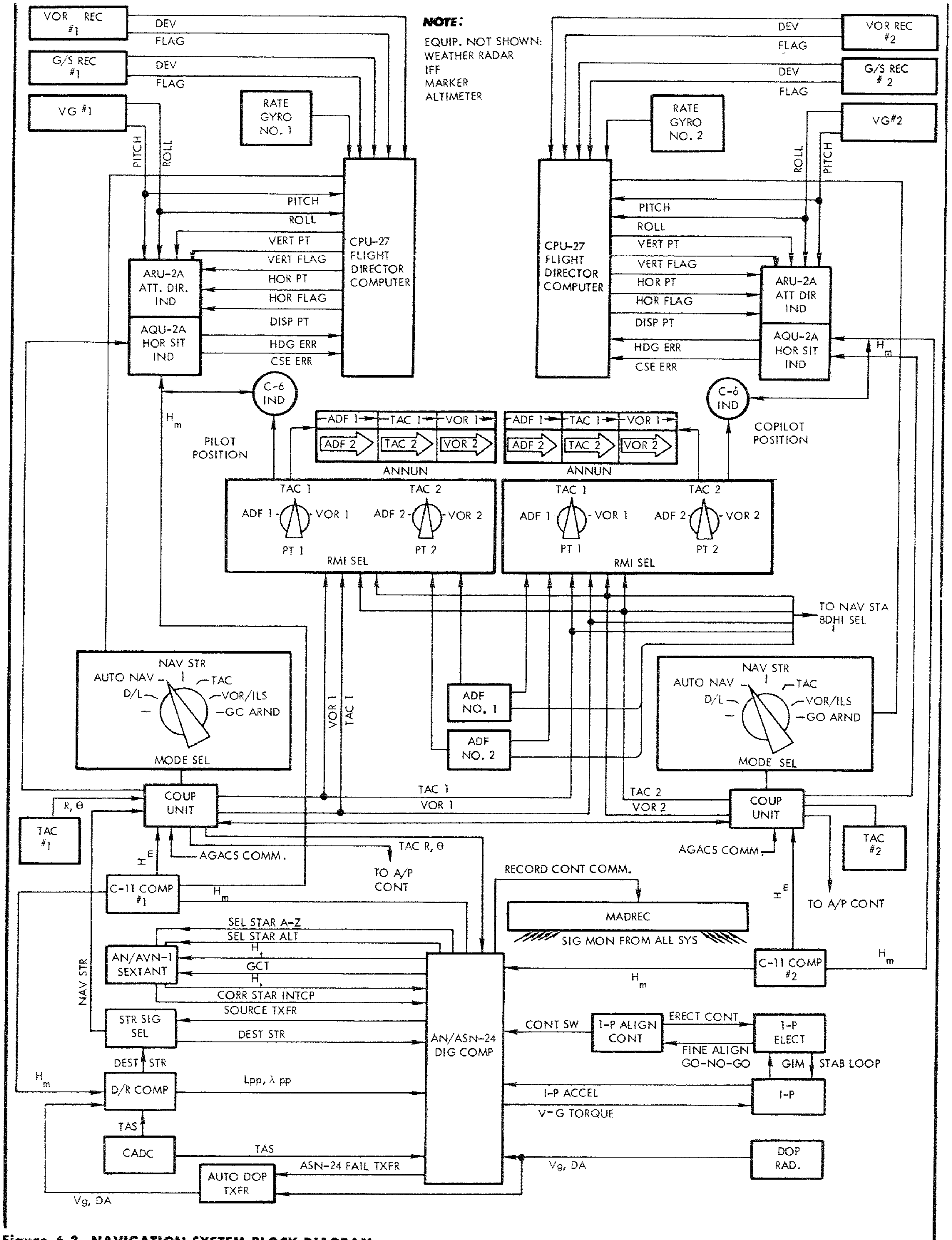
Each engine nacelle has provisions for preheat of the engine starter and other engine accessories. The preheat takes off from the compressor bleed manifold within the nacelle. Preheat air may also be obtained from the aircraft gas turbine compressor or a running engine.

NAVIGATION EQUIPMENT (5.3.5.3)

Navigation equipment installed in the GL 207-45 provides an all-weather navigation capability through the use of a self-contained navigation system plus a complete assemblage of dual navigation aids, as shown in Figure 6-3. The global system consists of a doppler-damped inertial platform, a general purpose digital computer, an analog dead-reckoning computer, a semi-automatic sextant, two C-11 compasses, the central air data computer, and the TACAN.

Under zero visibility conditions, with all electronics operating and the inertial navigation system aligned to the airplane's position, a localizer beam can be used for lateral control on take-off in the same manner as is used for QB-47 drone take-offs.

Airborne steering information is furnished by the global navigation system. Besides its normal navigation computation function, the computer is utilized to manage the navigation system by cross-comparing the credibility of the sensors and rejecting information which is out of tolerance with notification to the navigator of such a condition. Sufficient redundancy is incorporated in the navigation system so that multiple failure of components will not create a hazardous condition. For example, a few of the parallel-path computations which operate within the computer illustrate the position keeping accuracies



NOTE:
EQUIP. NOT SHOWN:
WEATHER RADAR
IFF
MARKER
ALTIMETER

Figure 6-3—NAVIGATION SYSTEM BLOCK DIAGRAM.

to be expected with various combinations of available equipment:

(1) The doppler-inertial combination using the AN/ASN-24 for digital solution of the navigation computation would result in a position error of approximately 1 N. M./H. (2) The doppler radar with the astro-sextant for heading and the AN/ASN-24 computing would have an error of approximately 1-½ N. M./H. (3) The doppler-astro combination, using the analog computer would result in a position error of approximately 3.5 N. M./H. (4) A navigation solution using TAS, wind from two fixes, a gyrocompass, and an analog computation would have a position error of approximately 7.5 N. M./H.

The cruise altitude of the airplane will permit fix-taking by means of the semi-automatic sextant as often as desired, with a high probability of no cloud cover. A position accuracy of 3 to 4 miles can be expected, and 7 minutes are required for a fix. The AN/ASN-24 computer contains data on 57 navigation stars, and the star data is continuously updated and available for use at any time in the sextant.

The dual navigation aids: TACAN, VOR, Glide slope, and localizer, together with a single marker beacon receiver, provide enroute and terminal guidance and position-fixing information from ground facilities. It is anticipated that automatic landing systems such as the Bell Aircraft unit will be available during the operational period of this airplane. The Bell system works through the ILS system for airplane control during descent and touchdown. Safety information as to altitude is presented to the pilot on the low-altitude altimeter indicator.

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section 7

CONFIGURATION SUITABILITY (5.3.6)

The data presented in this section shows the configuration suitability of the GL 207-45 and its complete compatibility with the System 476L Statement of Work. The basic configuration is conventional in every respect. The overall dimensions of the airplane permit its ready entry into normal MATS hangers. The structure is completely conventional and uses design features and manufacturing techniques now in use on the C-130.

The minimum wing sweep, moderate airfoil thickness, large outboard leading edge radius, and carefully selected camber and twist distribution, thoroughly tested on wind tunnel models, provide excellent stall characteristics without requiring use of wing leading edge devices. Low-speed wind tunnel tests have shown that excellent roll control is provided throughout the flight speed range through use of conventional ailerons.

The wing has an area of 3,228 sq. ft. and is swept 25 degrees. Sufficient fuel volume is provided within the wing for all fuel required for all proposed missions. Sixty per cent span Fowler flaps are used, and lateral control is by conventional outboard ailerons. Spoilers, located in the wing trailing edge above the flaps, are used only on the ground to reduce wing lift and thereby achieve maximum braking effectiveness.

The T-empennage incorporates a movable horizontal stabilizer for normal airplane trim. This arrangement provides excellent pitch and directional control and stability with approximately 30% less surface area than possible with other arrangements.

The alighting gear is a modified tricycle type. The nose gear has two free-rotating wheels and rack-and-gear hydraulically-powered steering through 160 degrees. The main gears each have four bogie-mounted wheel and brake assemblies. All gears retract forward and will extend and lock by gravity free-fall in emergency. All gears are hydraulically retracted and extended. All doors are mechanically operated by gear motion. Maximum turnover angle is 51 degrees, 54 minutes. The advantages of this conventional, well-proven configuration include the fact that it puts the landing gear where it belongs, beneath the primary load. This arrangement provides added safety in the event of a gear-up belly-landing, and exceeds all Air Force tip-over requirements. The main landing gear geometry has been compared with similar gears on the C-123, C-130, and C-133. The anti-tip capability for the GL 207-45 is much better than that for the other airplanes; even better than that of the C-130 which has proven itself completely adequate.

The primary flight controls are conventional, utilizing elevators, ailerons and rudder without employing supplementary spoilers. Crew station controls operate the surfaces through cables, and utilize Lockheed-developed force-modulating boosters powered by 2 separate hydraulic systems. Manually-operated ratio shifters in the booster assemblies are utilized to increase the pilot's mechanical advantage when boost power is off, thus allowing the airplane to be flown and landed using only manual pilot effort.

The fuel system has nine internal wing tanks with a total fuel capacity of 23,080 U. S. gal. A single common line routed through the fuel tanks from wing tip to wing tip is utilized for crossfeed, refueling, defueling and fuel jettisoning.

CREW STATION (5.3.6.1)

The flight station arrangement as show in Figure 7-1 is designed in compliance with all military and FAA requirements, including vision requirements which have been met or bettered. Four permanent crew positions for the normal crew of pilot, co-pilot, systems engineer, and navigator are designed in complete recognition of all human factors parameters. A flight check seat, mounted on tracks and stowed beneath the forward end of the navigator's table when not in use, provides a fifth position on the centerline of the flight deck aft of the center console. The lower of two bunks at the rear of the flight deck can be used for seating. Complete galley provisions are made for 2 meals, for 4 men. While the crew station is optimized for division of work assignments, control equipment arrangement is such that flight can be safely accomplished with as few as 2 crew members.

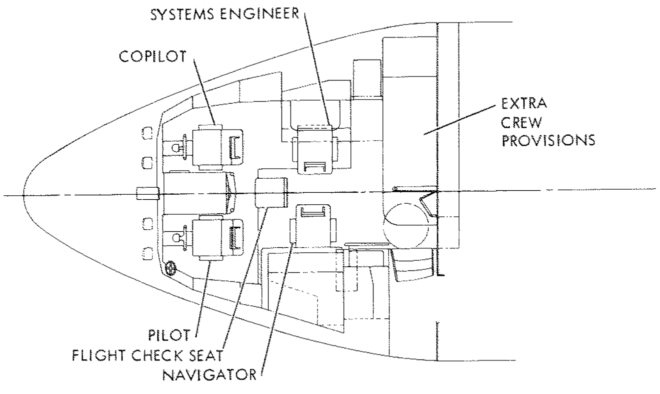


Figure 7-1—CREW STATION ARRANGEMENT.

Seating (5.3.6.1.1)

The pilot and co-pilot seats comply with MIL-S-25073, and the navigator and systems engineer seats meet MIL-S-7852 requirements. The flight check seat is a special fold-away unit designed for in-flight load factors. During take-off and landing, the observer, when aboard, uses the navigator's seat which can be positioned behind the pilot and co-pilot, and the navigator sits on the lower bunk located on the aft bulkhead.

Heating, Cooling and Noise Levels (5.3.6.1.2)

Heating and cooling are provided by a bleed-air air conditioning system which is designed to meet MIL-A-9482 and MIL-T-5842. The bleed air for this system is taken from the inner diameter of the engine compressor. Refrigeration is furnished by an air cycle unit with automatic temperature and flow control. The basic aircraft system schematic and temperature control schematic is discussed subsequently.

The crew station has a circulation rate of 35 cfm per man with a design cooling temperature of 75 degrees and a design heating temperature of 80 degrees F. Cabin pressure is controlled by 2 combination outflow-safety valves which maintain sea level cabin pressure up to 25,000 ft. altitude and 8000 ft. cabin pressure up to 50,000 ft. altitude. Each of the valves provide pressure relief, emergency depressurization, and cabin altitude limiting.

Noise levels in all occupied areas of the aircraft are within the limits imposed by MIL-A-8860, including those of Table A. Ear defenders are not required in any area of the aircraft for a 10-hour flight, according to the analysis techniques of Air Force Regulation 160-3.

Initial estimates of the noise levels on the flight deck are shown in Figure 7-2. Equivalent noise exposure for a 10-hour mission is shown in Figure 7-3.

Instrumentation (5.3.6.1.3)

Every effort has been made to develop an aircrew station conforming to all applicable standards, including all requirements of system 476L. Controls and displays have been designed to standard and conventional locations. Control movements are conventional, thus minimizing transition times and possibility of pilot error. Specific attention is given to the delineation of general and specific work area displays.

Displays are arranged to minimize operator head movements on overall view of the instrumentation layout of the aircraft. The instrumentation layout is shown in Figure 7-4.

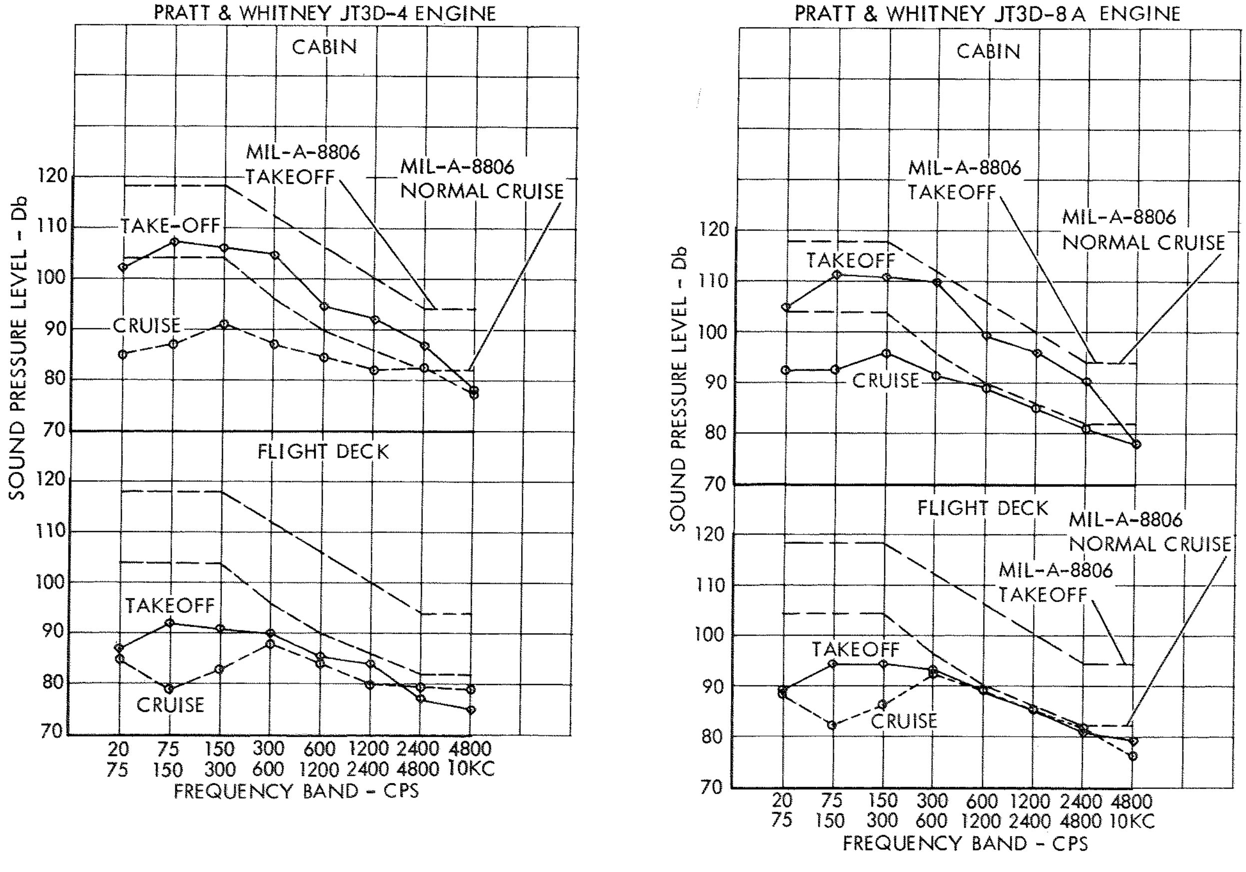


Figure 7-2—ESTIMATED AVERAGES — INTERIOR NOISE LEVELS.

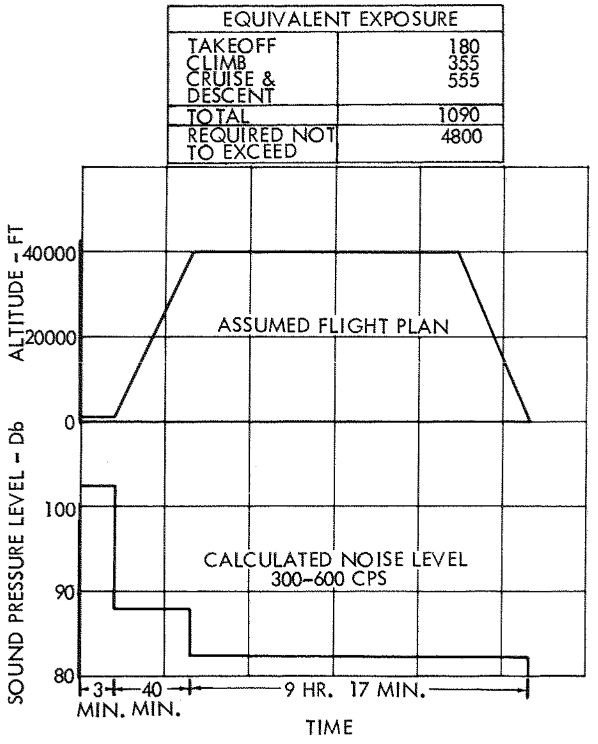


Figure 7-3—EQUIVALENT NOISE EXPOSURE FOR TEN HOUR MISSION.

The standard flight instruments are located in a basic T-configuration as specified by HIAD and CAR 4b. A discussion of the flight instrumentation in detail appears in paragraph 5.1.5.8.3, Volumes 1 and 2.

The navigator's panel layout is shown in Figure 7-5 and the systems engineer panel is shown in Figure 7-6.

The selected arrangement and details have been demonstrated in a full-scale mockup of the entire GL 207-45 fuselage.

Communications-Electronics (5.3.6.1.4)

The communications and navigation systems proposed for the GL 207-45 fully comply with the Work Statement. The communication system includes dual installation of UHF, VHF, and HF transmitter-receiver units which are controlled by the pilot and co-pilot from control units on the center control console. The system features a digital data link for automatic ground-to-air communication for air traffic control and management, advisory, and command/control traffic. The system also meets the requirements for selective calling and variable length messages. The entire system is compatible with present and planned FAA and 480L ground environments. (480L is the USAF global communications system being developed primarily for SAC).

Figure 7-7 is a listing of all CN I equipment. Figure 7-8 is a simplified block diagram showing the communications complement. Radio communications is provided by the AN/ARC-50 UHF set with 3500 channels and 25 watts output power, the VHF-101 VHF set with 680 channels and 25 watts output power, and the HF-102 HF set with 28,000 frequencies and 400 watts PEP single sideband, or

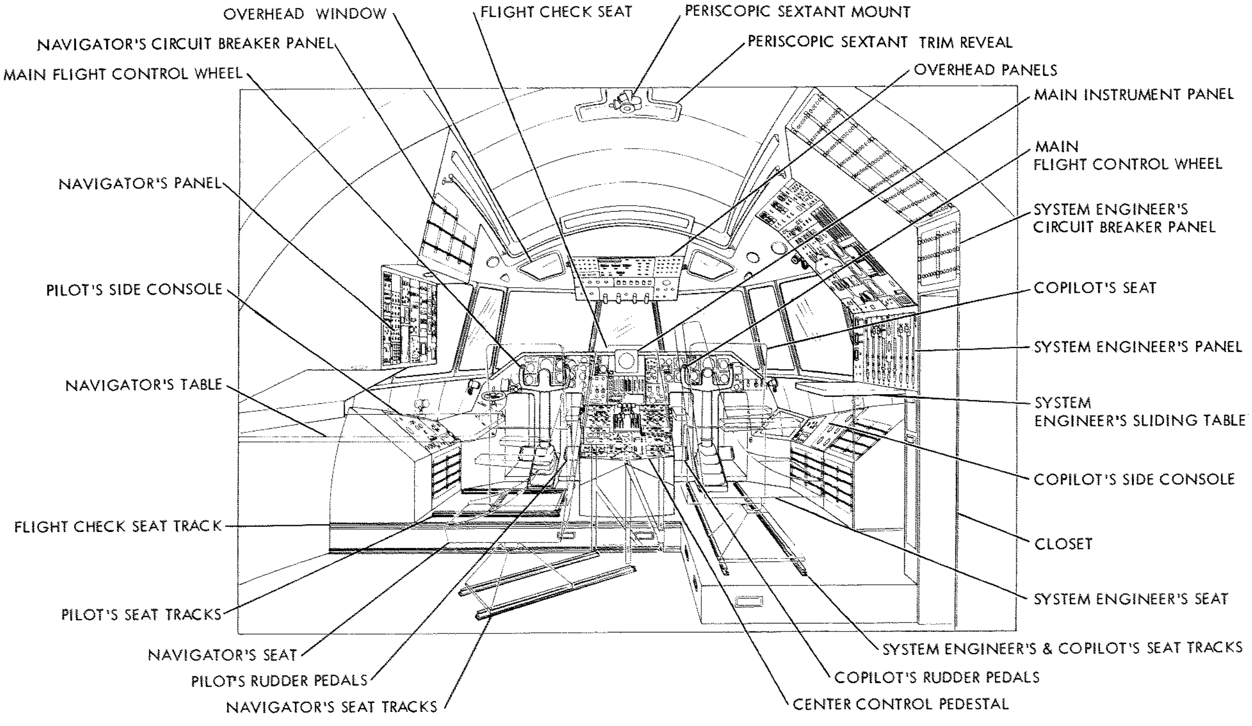


Figure 7-4—FLIGHT STATION — LOOKING FORWARD.

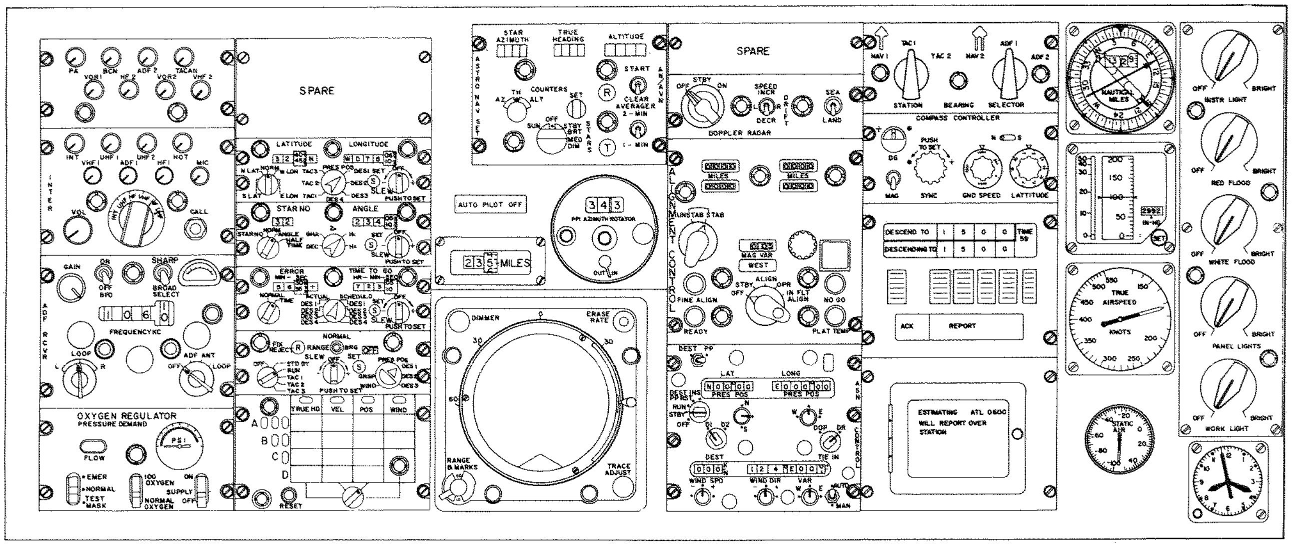


Figure 7-5—NAVIGATOR'S PANEL.

100 watt amplitude modulated power output. All frequency and on-off controls are located between the pilot and co-pilot on the pedestal in an aft location which is also within reach of the navigator. AN/AIC-18 intercommunications sets are installed at each of the crew stations. Appropriate radio monitoring facilities are provided at each position and audio access to the communications transmitters is given to the pilot, co-pilot, and navigator. The control of the public address system is located on the pedestal. Additional audio equipment is provided by a simple, independent, interphone system for use during ground servicing and maintenance as shown in Figure 7-9. Headset-microphone jacks are installed throughout the aircraft in convenient locations which operate through a central amplifier. One of the jacks is located in the cockpit for ground communications use.

The navigation system functionally divides into two parts: the radio aids to navigation equipment, and the global navigation equipment. The radio aids to navigation include the VHF navigation, glide slope, automatic direction finder, marker beacon, and radar systems. Remote control units for this equipment are installed on the center control console. The global navigation equipment, which includes the inertial platform, doppler radar, digital and dead-reckoning computers, and photo-electric sextant, are controlled by the navigator.

The control for the RDR-1D weather radar control is installed on the pedestal with the pilot's and co-pilot's indicators located as shown in Figure 7-10 and the navigator's indicator as shown in Figure 7-5. The navigator also has the azimuth rotator for full range viewing abeam of the airplane. The AN/APX-46 IFF control is also installed on the pedestal for convenience during operation in controlled areas.

Dual DF-202 automatic direction-finder controls are located on the pedestal. Control of ADF No. 1 may be transferred from the No. 1 control panel on the pedestal to a 3rd panel on the navigators panel upon demand.

The indicator-control for the low-altitude altimeter is installed on the pilot's instrument panel.

Oxygen System (5.3.6.1.5)

A permanent oxygen system is installed in the crew station. The system, shown in Figure 7-11, is provided with a suitable fill-valve external to the aircraft, and pressure build-up in the converter is automatic. It is capable of serving 10 men from a 25-liter liquid oxygen converter. This system is sufficient to supply 113 manhours of oxygen at 30,000 ft. Operation of the oxygen system involves only the setting of the MD-1S automatic pressure breathing diluter demand regulator control as desired, and coupling of the mask hose to the mask-to-regulator tubing. The flight station oxygen regulators are located as follows; pilot, co-pilot, navigator, systems engineer, flight check seat, upper bunk and two at the lower bunk.

Two additional regulators are located in the aft cargo compartments at the loadmaster/jumpmaster stations. Four rechargers and type MA-1 portable cylinders are located at the pilot and co-pilot stations and two are located in the aft cargo compartment at the loadmaster/jumpmaster stations. All oxygen system outlets permit the use of personal-issue USAF masks. Normally, oxygen is supplied approximately 15 degrees below ambient temperature. The in-flight oxygen supply quantity is checked by observing the flight station oxygen quantity indicator. All system components are in USAF inventory.

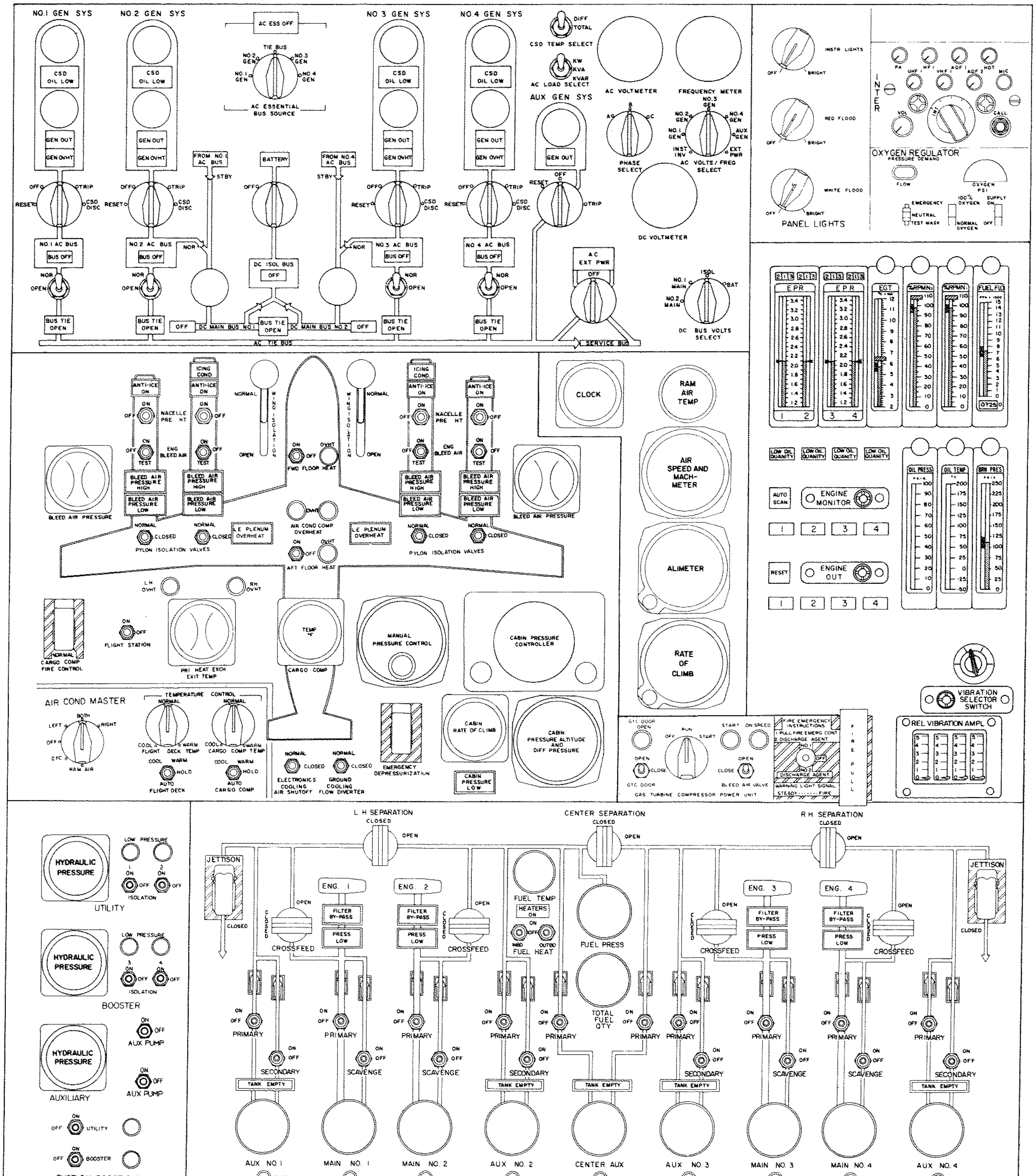


Figure 7-6—SYSTEMS ENGINEER'S PANEL.

Quantity	System	Type	Manufacturer
2	VHF Communications	VHF-101	Collins
2	UHF Communications	AN/ARC-50	Magnavox
2	HF Communications	HF-102	Collins
1	Intercommunications	AN/AIC-18	Andrea
1	Service Interphone	—	Lockheed
1	Public Address	AN/AIC-13	RCA
1	Radar Altimeter	AN/APN-141	Bendix
1	Doppler Radar	AN/APN-501*	Marconi
1	DR Computer	AN/ASN-15* (Simplified)	Waldorf
1	Digital Computer	AN/ASN-24	Libroscope
2	Glide Slope Receiver	51V-3	Collins
2	Gyro-Magnetic Compass	C-11	Sperry
2	VHF Navigation	VOR-101	Collins
1	IFF Transponder	AN/APX-46	Hazeltine
2	Radio Compass, ADF	DF-202	Collins
2	Tacan	AN/ARN-52	ITT
1	Marker Beacon Receiver	51Z-2	Collins
1	Weather-Navigation Radar	RDR-1D	Bendix
1	Inertial Platform	LN-2C*	Litton
1	Astro-Navigation	AN/AVN-1	Kollsman
1	VGH Recorder	A/A24U-3	Emerson
1	AGACS/SELCAL	—	RCA
1	Malfunction Detection and Recording	Madrec	Lockheed

* Or Equivalent

Figure 7-7—ELECTRONIC EQUIPMENT.

A 10-liter liquid oxygen system is supplied in the portable extra crew compartment. Its capacity is 45 manhours of oxygen at 30,000 ft. The portable oxygen system for troops and litter patients may be installed in the cargo compartment. This installation is supplied with four 25-liter liquid oxygen converters capable of supplying 95 troops for over 4 hours at 30,000 ft. All oxygen systems on the airplane are logistically compatible and employ components readily available in Air Force inventory.

Extra Crew Provisions (5.3.6.1.6)

Permanent extra crew provisions include two bunks, a galley, a latrine, and storage space as shown in Figure 7-12. The bunks are located on the bulkhead at the aft end of the crew station, the lower one being so constructed as to allow it to be readily converted into a seat with a back. At the outboard end of the bunks there is storage space, and the inboard end provides a magazine rack. The galley is complete with refrigerator-freezer, oven, hot cups, etc., and is located to the left of the navigator station. A latrine is provided beneath the crew compartment on the level of the crew entry door which has a chemical toilet, urinal, and lavatory.

AUGMENTED CREW COMPARTMENT (5.3.6.2)

A portable extra crew rest area capsule, mounted on a standard 88-inch x 108-inch pallet, and compatible with the system 463L loading system, may be located in the forward end of the cargo compartment and may be loaded from the aft end of the cargo compartment.

Crew Necessities (5.3.6.2.1)

The portable extra crew rest area, shown in Figure 7-13, contains three bunks, the lower of which can be made into a seat with a back rest; four seats with a table for writing; reading lights; a large storage area; and a galley equipped with refrigerator-freezer, oven, and hot cups.

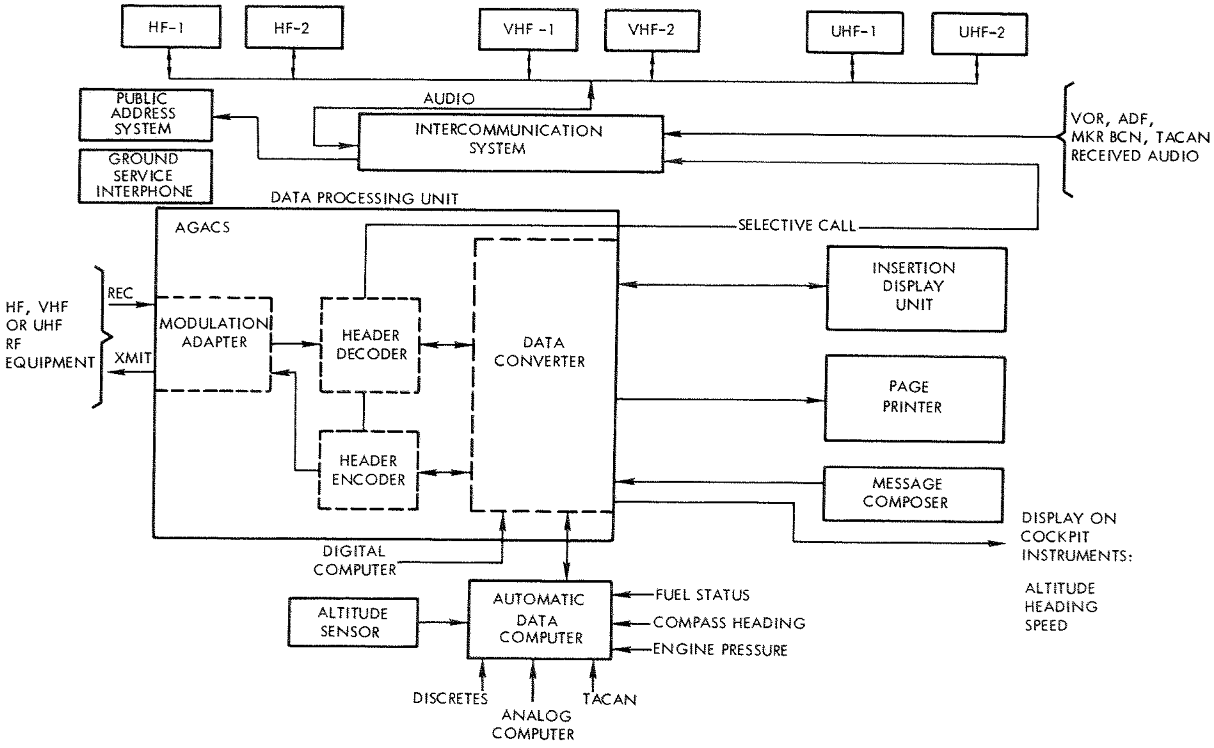
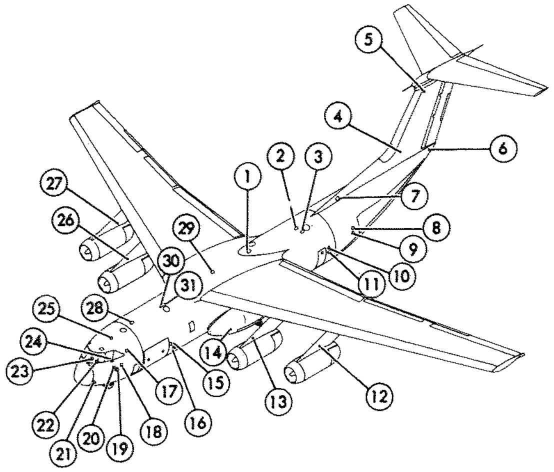


Figure 7-8—COMMUNICATION SYSTEMS BLOCK DIAGRAM.



1. NO. 4 LOUDSPEAKER
2. RH PARATROOP DOOR LOUDSPEAKER
3. LH PARATROOP DOOR LOUDSPEAKER
4. LOWER VERTICAL STABILIZER JACKBOX
5. UPPER VERTICAL STABILIZER JACKBOX
6. TAIL CONE JACKBOX
7. AFT LOUDSPEAKER
8. AFT CARGO DOOR ICS
9. AFT CARGO DOOR PA AUXILIARY CONTROL PANEL
10. LH PARATROOP DOOR PA AUXILIARY CONTROL PANEL
11. LH PARATROOP DOOR ICS
12. LH OUTBOARD PYLON JACKBOX
13. LH INBOARD PYLON JACKBOX
14. LH WHEEL WELL JACKBOX
15. FWD CARGO DOOR ICS
16. FORWARD CARGO DOOR PA AUXILIARY CONTROL
17. NAVIGATOR'S ICS CONTROL PANELS
18. ELECTRONICS COMPARTMENT AND EXTRA CREW COMPARTMENT ICS
19. SERVICE INTERPHONE AMPLIFIER
20. PA AMPLIFIERS
21. NOSE WHEEL WELL ICS
22. PILOT'S ICS CONTROL PANELS
23. COPILOT'S ICS CONTROL PANELS
24. PILOT'S SIDE SHELF PA MAIN CONTROL
25. SYSTEM ENGINEER'S ICS CONTROL PANELS
26. RH INBOARD PYLON JACKBOX
27. RH OUTBOARD PYLON JACKBOX
28. NO. 1 LOUDSPEAKER
29. NO. 3 LOUDSPEAKER
30. RH WHEEL WELL JACKBOX
31. NO. 2 LOUDSPEAKER

Figure 7-9—INTERCOMMUNICATION AND PUBLIC ADDRESS SYSTEM.

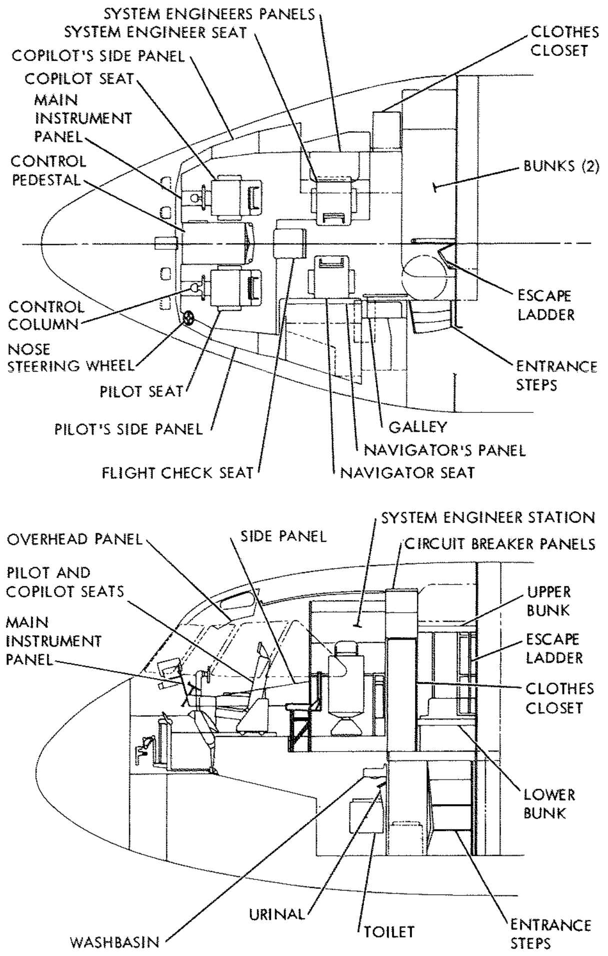


Figure 7-10—FLIGHT STATION ARRANGEMENT.

A 10-liter liquid oxygen converter, separate from the permanent airplane oxygen system, may be filled prior to being installed. Refilling is accomplished on a replacement basis. The system will provide approximately 45 manhours of oxygen. Pressure build-up in the system is automatic. Further operation of the system requires only the setting of the MD-1 automatic pressure breathing diluter demand regulator control as desired, and coupling of the mask hose to the mask-to-regulator tubing. A regulator is located at each of the three bunks and four seats within the compartment. The portable cylinder discussed in paragraph 5.3.6.1.5 may also be used by personnel from this compartment. These oxygen outlets will also accept the personal-issue USAF masks. The oxygen quantity is monitored from the flight station quantity indicator. Oxygen will be supplied to the masks approximately 15 degrees below ambient temperature.

Heating, Cooling, and Noise Level (5.3.6.2.2)

The heating and cooling for this compartment is supplied by the aircraft's air conditioning system. The cargo compartment design temperature for heating and cooling is 80 degrees F. The floor design temperature is 60 degrees F. The circulation or ventilation rate is unlimited since the cargo compartment ventilation rate is designed for 17 cfm per person based on 114 troops or passengers. Blowers and louvers are provided in the augmented crew area to insure adequate ventilation. Since the augmented crew area is an enclosure within an enclosure, noise levels therein are well below those shown in Figure 7-2.

CARGO COMPARTMENT (5.3.6.3)

The cargo compartment of the GL 207-45 is shown in Figure 7-14. The configuration presented meets or betters all requirements for System 476L. Additionally, it contains many features which contribute

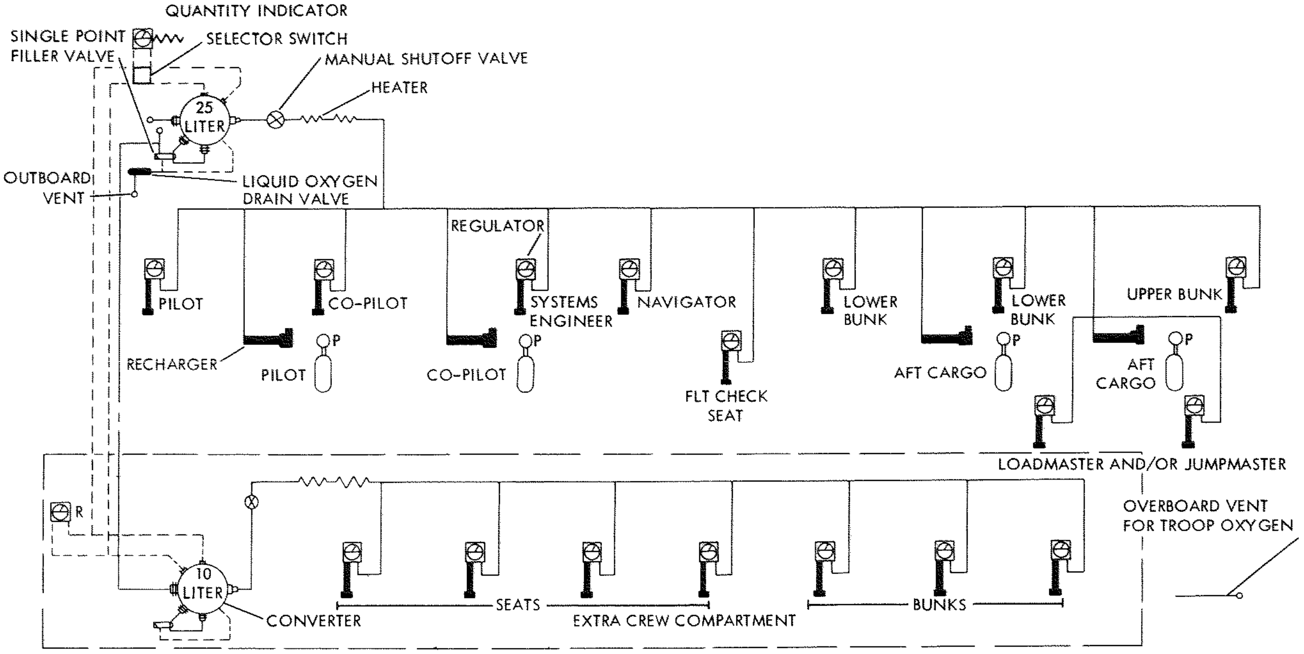


Figure 7-11—AIRCRAFT OXYGEN SYSTEMS SCHEMATIC.

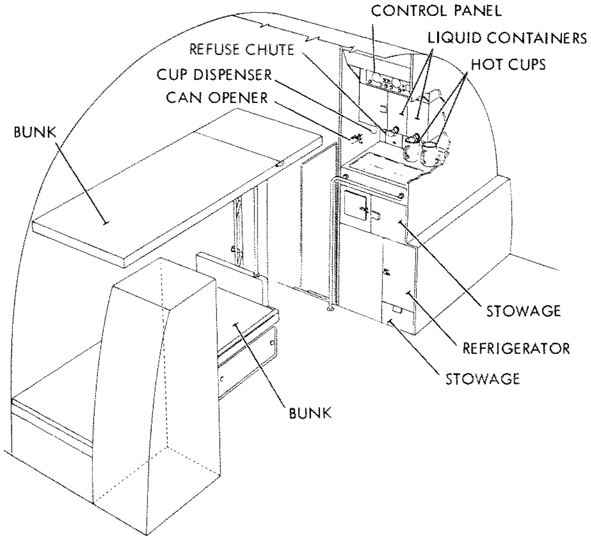


Figure 7-12—GALLEY AND REST AREA.

to increased versatility, flexibility, and utilization of the cargo compartment.

The cargo compartment cube envelope is 109.0 in. high, 123.25 in. wide and 70 ft. long. Eight feet of additional cargo cavity is included on the ramp, which is also 123.25 in. wide, but varying in height from 109.0 in. to 73.5 in. This envelope allows a clear-cube volume of 6531.0 cu. ft. in the constant area and 625.0 cu. ft. on the ramp. Cargo compartment volumes are given in Section 4.

With the landing gear in normal static position, the cargo floor is 50 in. above, and is parallel with, the ground. The cargo floor meets every requirement of System 476L and provides for loading of all desired military cargos since its detailed design is based on experience gained in the development of the C-130. The rollers and restraining rails for the System 463L pallets are provided as an integral part of the floor design. When the pallet is not in use, the rails and rollers retract into recesses to provide a flat cargo floor. In addition to the cargo floor, a space 90-in. long is available for an additional pallet on the cargo loading ramp forward of the pressure door. Nine pallets are normally car-

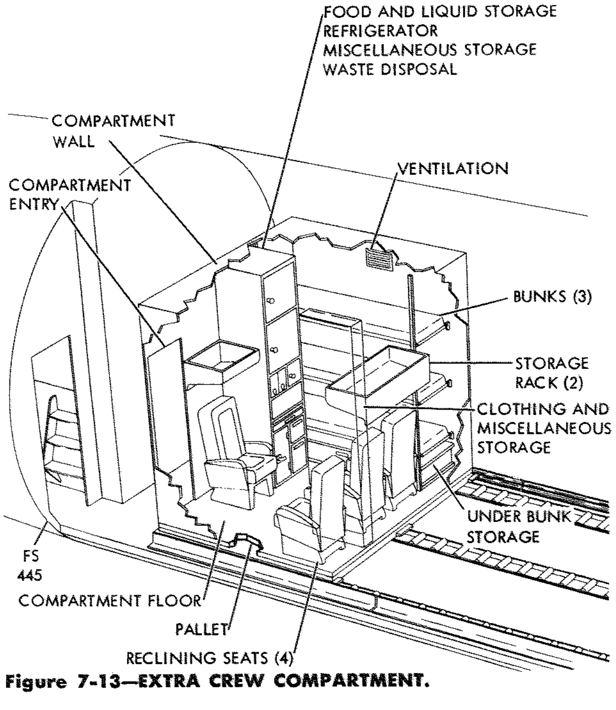


Figure 7-13—EXTRA CREW COMPARTMENT.

INBOARD PROFILE BASIC

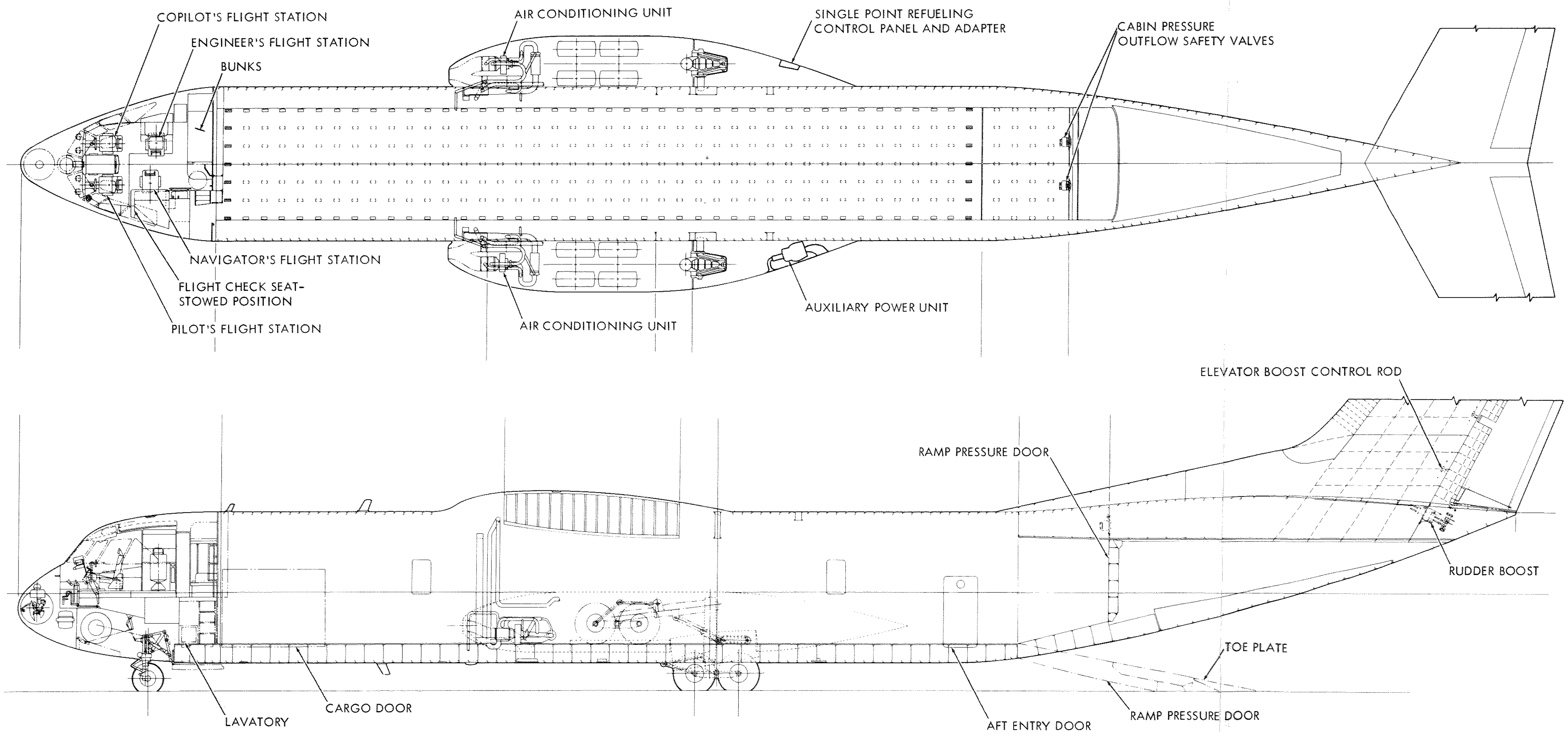


Figure 7-14—INBOARD PROFILE — BASIC.

ried on the main cargo floor and one on the ramp. Palletized volumes are 5,484 cu. ft. when a pallet is carried on the ramp and 5,049 cu. ft. excluding a pallet on the ramp.

A forward cargo loading door with a clear opening 78 in. high and 109 in. long is provided on the left side of the airplane. Except for the longer length required, the door installation is identical to the military door used on the C-130 Hercules. The door is hinged at its top and powered by an independent hydraulic system actuated by a hand pump. The door moves outward and up to a position that will give access to the clear opening dimensions.

The aft cargo door arrangement provides straight-intail loading. A combination ramp and pressure door, when in the closed position, provides a pressure bulkhead at the aft end of the cargo compartment , thus eliminating pressure loads from the aft fuselage doors which greatly reduces the structural design and sealing problems. The ramp/pressure door, when lowered, forms an extension to the cargo ramp and both act as a loading platform either at a 50 in. truckbed height for horizontal loading or as an inclined ramp of 11 degrees for vehicular loading operations.

Stabilizing jacks are incorporated as an integral part of the airframe to ensure stability of the cargo compartment during loading and unloading operations. When retracted, the jacks are positioned within fuselage compartments located on the L/H and R/H sides or bottom of the fuselage at F. S. 1268.0. The jacks are hinged at their trunnion points which allows them to be extended and locked by hand to approximate ground-level position. The jacks are manifolded and are actuated to ground level by a hand-operated wobble pump. The design includes a feature which will not allow the aft ramp pressure doors to be actuated until the jacks are retracted and locked within the fuselage.

Aft facing, 16-g troop seats per MIL-S-26688, equipped with brownline seat fittings, Drawing No. 21309, are readily installed on the 20-in. grid of the cargo floor tie-down fittings as discussed in Paragraph 5.3.3.4.

Ground emergency escape hatches are located on the left and right sides of the fuselage at F. S. 658.0 and F. S. 1098.0. These hatches are plug-in type and are operable from either inside or outside of the airplane. The hatches afford a clear opening of 36 in. high by 20 in. wide. Except for their larger size, the hatches are the same design as those used successfully on the C-130 airplane.

Four additional emergency escape hatches are provided along the top of the fuselage for ditching. One is located at the aft end of the crew compartment at F. S. 424.0.

Additional escape hatches are located at both F. S. 598.0 and F. S. 1218.0. A 4th is located at F. S. 1018, has a T-handle, cable bell crank release mechanism operable from the crew compartment, and may also be used for emergency depressurization of the aircraft. This arrangement is the same as the C-130 aircraft.

Compatible with 463L (5.3.6.3.1)

Materiel handling provisions, including load restraining, are an integral part of the aircraft and are designed to receive 463L pallets and to meet airdrop requirements. This system, shown in Figures 7-15 and 7-16, can be quickly converted to form a flat, smooth cargo floor to receive bulk loading, rolling stock, or the troop seating and litter arrangements required.

The WS 463L handling provisions can accommodate nine 88x108-in. 463L cargo pallets in the main cargo compartment. The cargo ramp can accept a 10th pallet. The system is also designed for cargo jettison/airdrop capability and can accommodate the armored reconnaissance airborne assault vehicle, having a delivery weight of 35,000 pounds, as a unit load.

When the cargo floor is converted to a flat floor it will accept the rolling loads imposed by the 31,750 lb. type MB-2 aircraft tow tractor. Permissible cargo floor loading is shown in Figure 7-17.

Provides Walkway (14 inch aisle) (5.3.6.3.2)

A 19 inch wide safety/scanning aisle is provided down each side of the cargo compartment to enable a crew member to walk the entire length of both sides of the compartment and to inspect restraint fittings when carrying a full load of cargo. In three areas, the width of this aisle reduces to 15 in. due to wing and landing gear support bulkheads. This walkway is outside the 9 x 10 ft. cargo envelope, as shown in Figure 7-18.

Cargo Restraint Devices (5.3.6.3.3)

The cargo floor is a completely flush, liquid-sealed, extruded aluminum floor which incorporates a 20-in. grid pattern of 10,000-lb. tie-down points, with the exception of 25,000-lb. fittings located at every 4th grid point on the extreme sides of the floor. The 10,000-lb. tie-down points are designed to receive quick-disconnect cargo tie-down rings, shown in Figure 7-19, seat studs, and litter stanchion fittings. The 25,000-lb. tie-down points are designed to receive the standard 25,000-lb. eyebolt rings defined by USAF Drawing No. 49B6564 and shown in Figure 7-20.

In all, 303 of the 10,000-lb. tie-down points and 26 of the 25,000-lb. tie-down points are installed over the entire cargo floor and ramp.

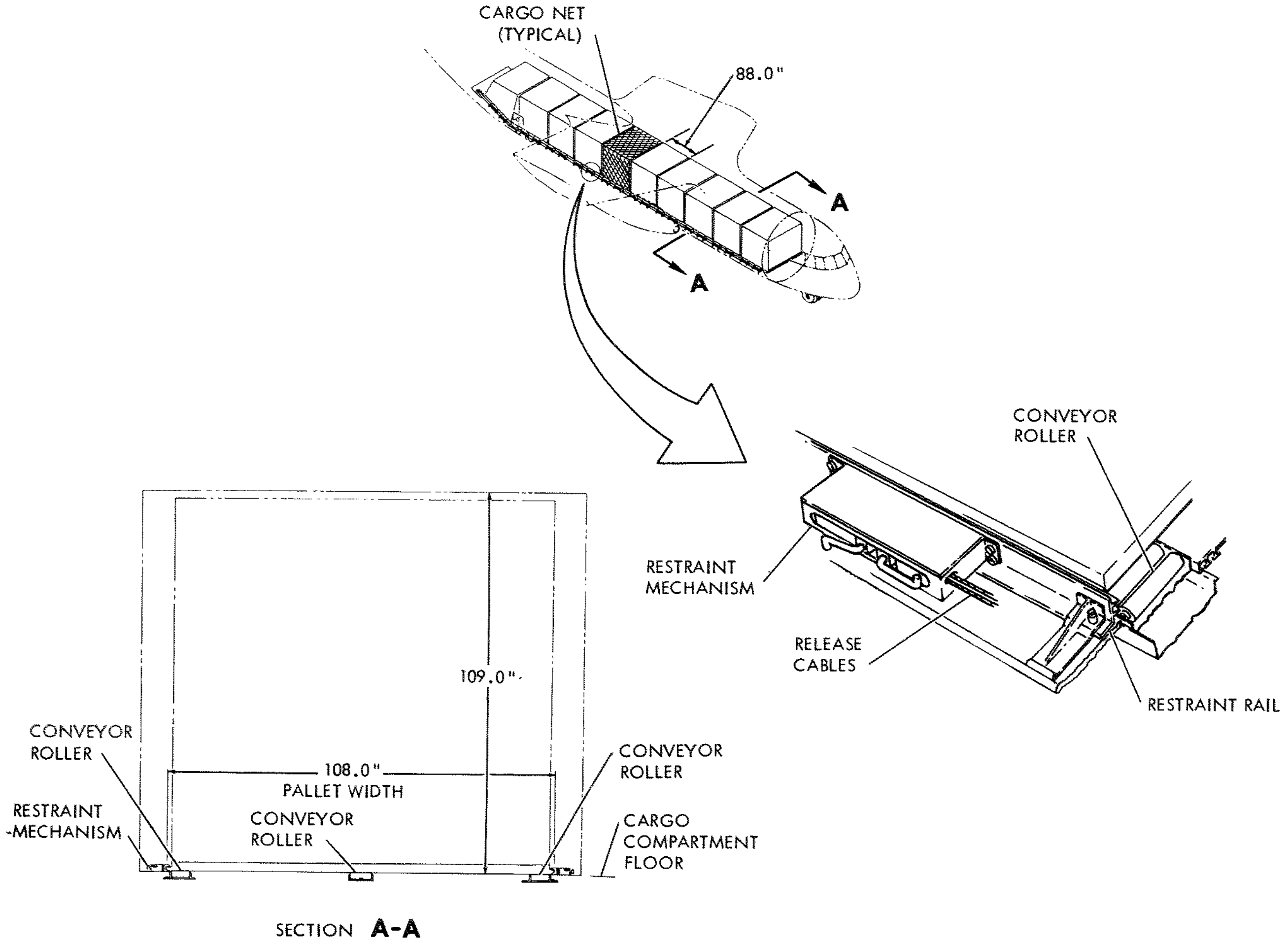


Figure 7-15—INBOARD PROFILE — 463L LOADING SYSTEM.

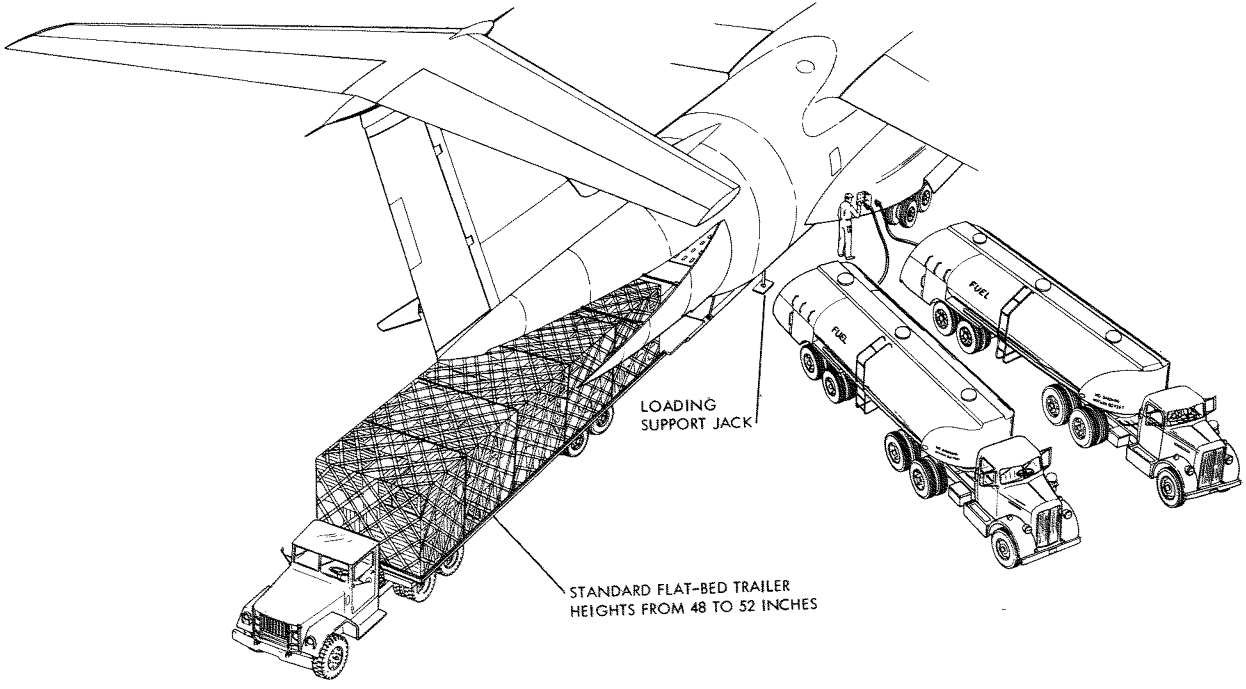
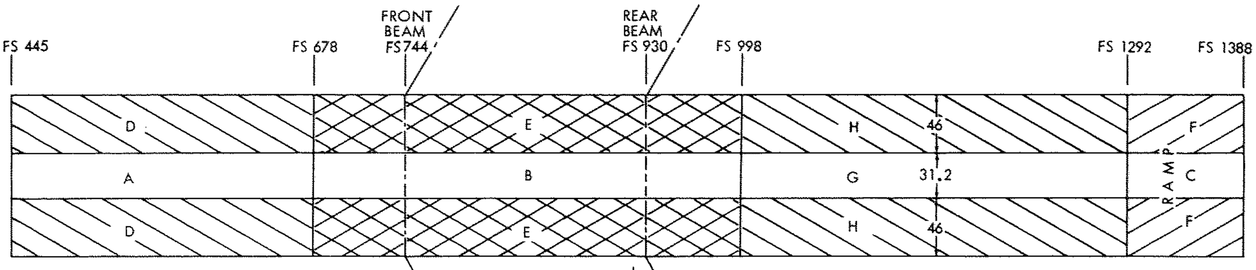


Figure 7-16—CARGO LOADING — TRUCK TO AIRCRAFT.



750 psi LOCAL CRUSHING (1.0 g)	ALL
300 psf (3.8 g)	A & D
300 psf (4.9 g)	G & H
400 psf (3.8 g)	B & E
2000#/lin. ft. (3.8 g)	A & D
2000#/lin. ft. (4.8 g)	G & H

3000#/lin. ft. (3.8 g)	B & E
10000 lb. axle (3.7 g)	D
10000 lb. axle (4.8 g)	H
20000 lb. axle (2.0 g)	F & H
20000 lb. axle (3.6 g)	E
9000 lb. total (5.4 g)	RAMP (F, C)

MINIMUM REQUIRED
750 psi (1.0 g) LOCAL
200 psf (2.5 g) EVERYWHERE
20000 lb. axle (2.0 g) PATH TO LOCATION
20000 lb. axle (FLIGHT LD. F.) CHOSEN AREA

Figure 7-17—PERMISSABLE CARGO DISTRIBUTION.

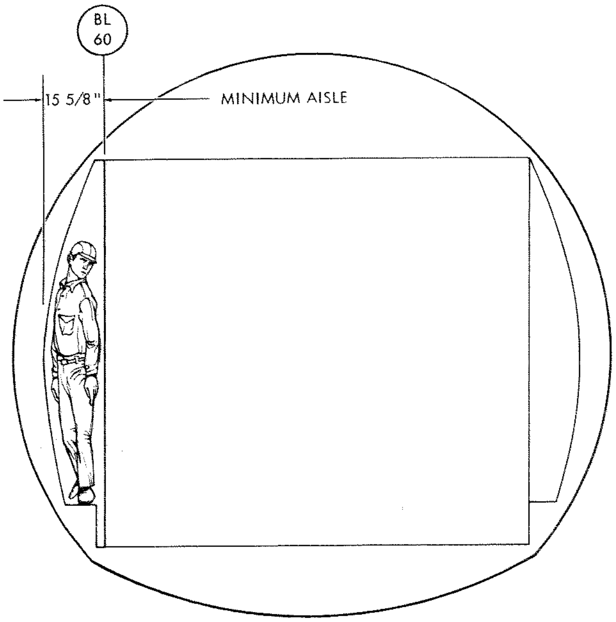


Figure 7-18—WALK WAY.

The floor is stressed for 300 psf and a crushing strength of 750 psi. In addition, it is designed to receive 20,000-lb., single axle loads over 46-in. treadways located on both the L/H and R/H sides of the floor.

The GL 207-45 is designed as a cargo airplane but can be quickly and readily converted to carry troops, paratroops, or litter patients for emergency requirements and peacetime training considerations. These alternate modes of operation do not compromise the design of the airplane as a basic cargo carrier.

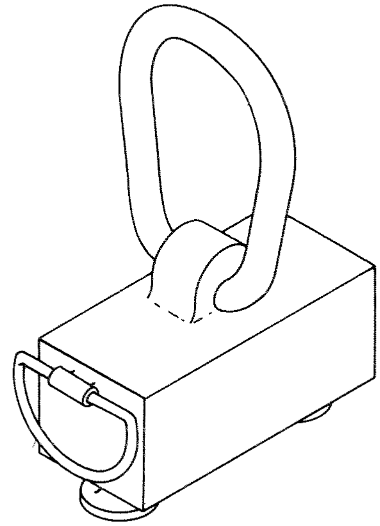


Figure 7-19—10,000 POUND TIE DOWN FITTING.

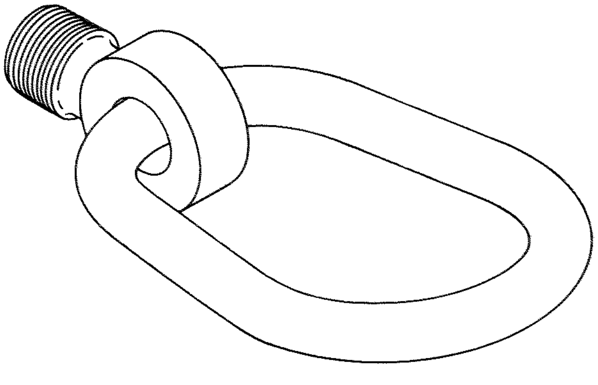


Figure 7-20—25,000 POUND TIE DOWN FITTING.

Emergency Oxygen (5.3.6.3.4)

When troops are carried, oxygen is supplied from four 25-liter liquid oxygen converters, as shown in Figure 7-21. These are filled prior to installation on the ramp. Operation of the system requires only the connection of the mask hose to the portable fitting tube assembly. USAF mask type A-13A with mask-mounted regulators of MIL-R-19121 type are for troop use. The liquid oxygen quantity for the system may be monitored from the flight station by an additional quantity indicator. The portable troop oxygen system will supply a full compliment of 95 troops for over four hours.

Heating, Cooling, and Noise (5.3.6.3.5)

The air conditioning system is designed per HIAD, Volume 1, Part C, Chapter 6. The heating and cooling design temperature for the cargo compartment is 80 degrees F which exceeds the ANA 421 Cold Day requirements. The cargo floor design temperature is 60 degrees F, and the ventilation rate in the cargo compartment is 17 cfm based upon 114 passengers. A schematic of the air conditioning system is shown in Figure 7-22 and a schematic of the temerature control system in Figure 7-23.

The air conditioning system provides two independent condition packages, each utilizing a separate engine bleed air supply. The two packages normally function in parallel, but either package can operate independently in the event of a failure, thus preventing loss of cabin pressure. Temperature regulation and airflow regulation are automatic. Compatibility between ground and flight refrigeration and minimum system weight are achieved by regulating the bleed air pressure at each engine manifold. Capacity is provided to maintain temperatures of 75 degrees F in the crew compartment, 80 degrees F in the cargo compartment, and 60 degrees F on the floor in flight. Ground refrigeration is maximized by careful matching of equipment with the system characteristics.

Noise levels in the cargo compartment are well within the limits imposed by MIL-A-8806, including those of Table 4. Ear plugs will not be required during a 10-hour flight, according to the analyses of AF Regulation 160-3. Representative noise levels are shown in Figure 7-2.

LATRINE FACILITIES (5.3.6.4)

Latrine facilities are provided for the crew (permanent) and troops (removable) as explained in the following paragraphs.

Troop Type (5.3.6.4.1)

Latrines for troop personnel consist of two portable units installed in the aft end of the cargo compartment against the ramp pressure door. Each of these has a chemical toilet and wash basin as shown in Figure 7-24.

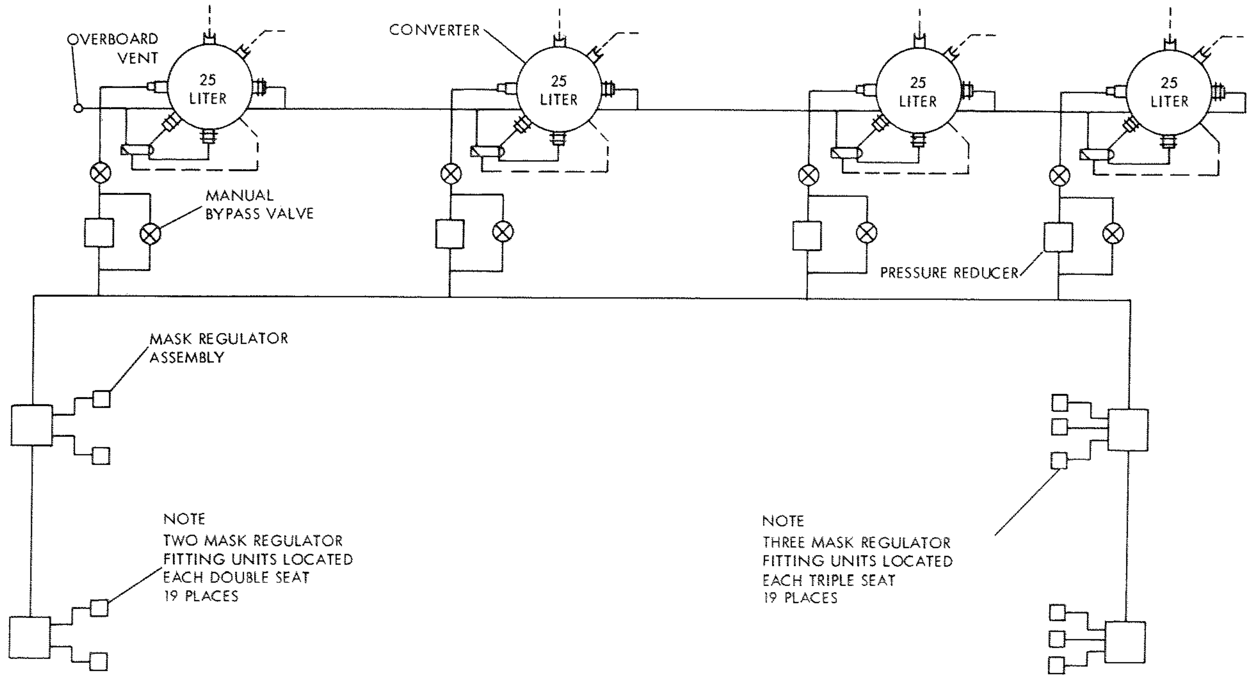


Figure 7-21—TROOP OXYGEN SUPPLY SCHEMATIC.

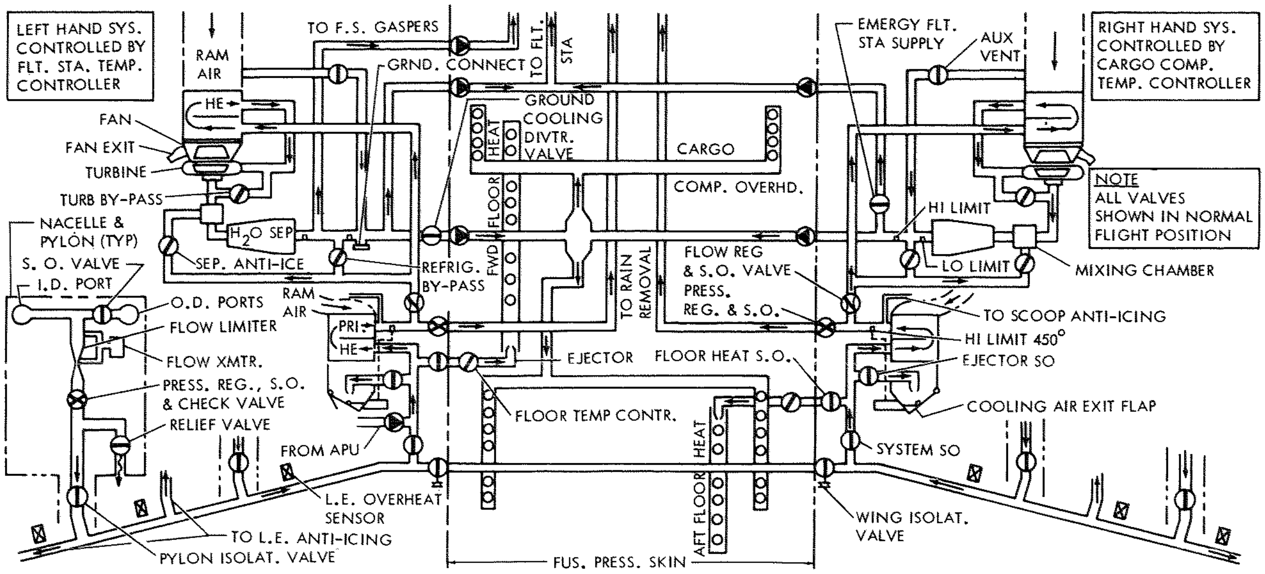


Figure 7-22—AIR CONDITIONING SYSTEM SCHEMATIC.

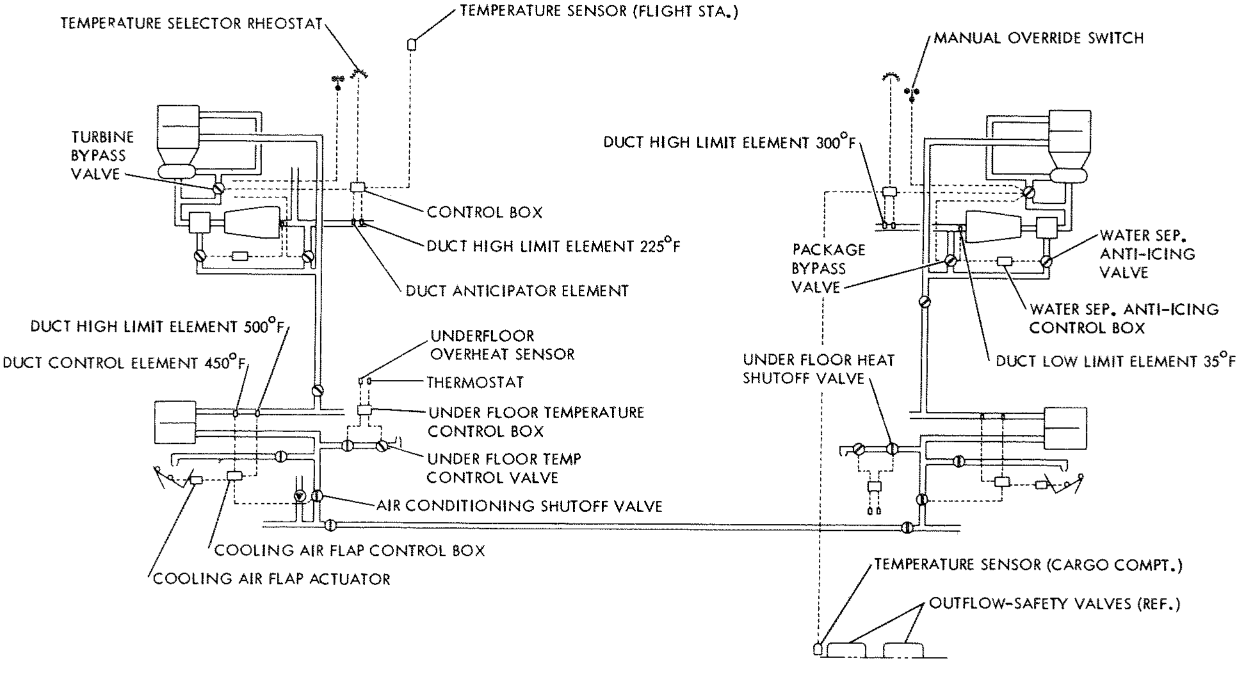


Figure 7-23—TEMPERATURE CONTROL SYSTEM SCHEMATIC.

Crew Type (5.3.6.4.2)

The crew latrine is located on the left inside the crew door beneath the crew station. A fold-away installation which is completely concealed, except when in use, is utilized. This consists of a chemical toilet, wash basin, and urinal, as shown in Figure 7-25.

Type of Servicing (5.3.6.4.3)

All latrines are easily removable from within the airplane for service.

CONVERTIBILITY FROM CARGO CONFIGURATION (5.3.6.5)

The cargo compartment is convertible to air evacuation, to troop carrier, and to air drop capability.

To Air Evacuation (5.3.6.5.1)

The air evacuation arrangement on the cargo floor is shown on Figure 7-26. An arrangement of 72 litters in tiers of 3 and accommodations for 8 attendants is provided. Litter stanchions are compatible with the cargo floor 20-in. grid pattern. The two remov-

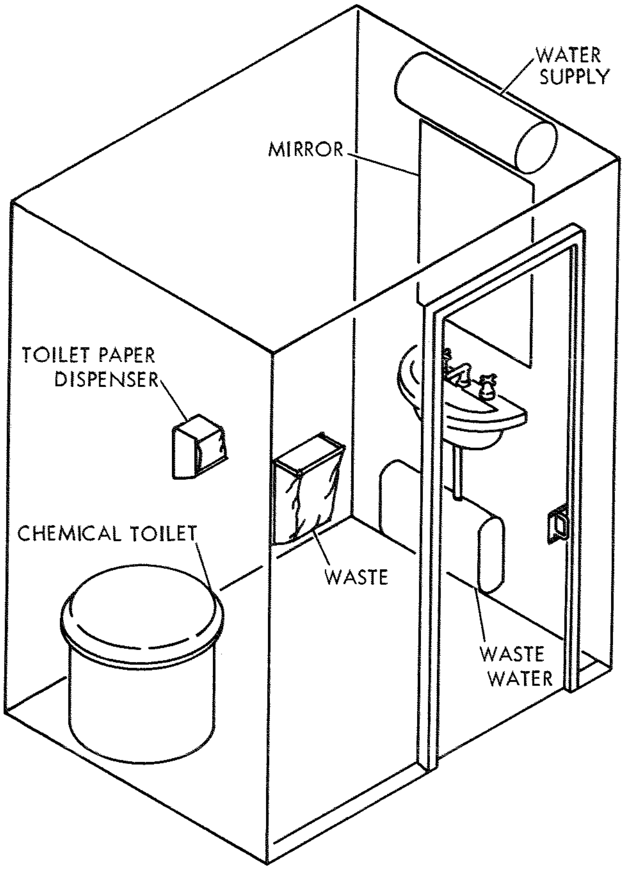


Figure 7-24—LATRINE — TROOP TYPE.

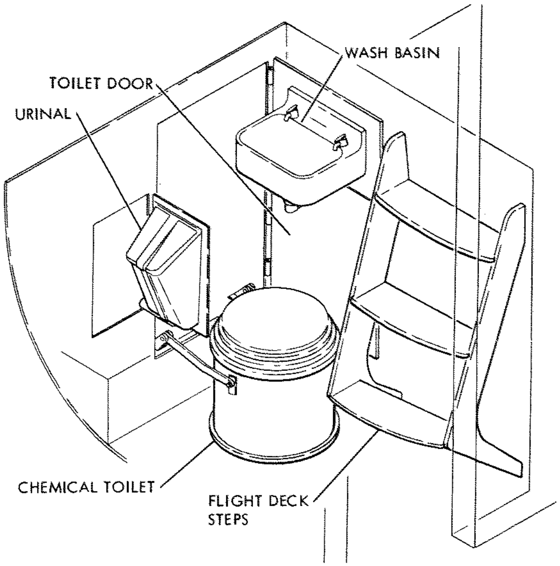


Figure 7-25—LATRINE — CREW TYPE.

able toilets and oxygen provisions are installed by a kit.

Oxygen for litter patients is supplied from a portable system with tubing and associated equipment being installed with the litter stanchions. Four 25-liter liquid oxygen converters, mounted on the ramp, supply the necessary oxygen. Provisons are made for supporting outlet fittings at each of the 72 litters and for the required medical flight attendants. Total fitting capacity is 95, the same as for troops.

To Troop Carrier (5.3.6.5.2)

The maximum troop seating arrangement on the cargo floor is shown in Figure 4-20. Aft-facing 19-in. wide troop seats are arranged with a 2-seat cluster on the L/H side and a 3-seat cluster on the R/H side. A 20-in. aisleway separates the two clusters which seat a total of 95 troops. A removable galley is located at the forward R/H side of the compartment and two removable toilets are installed on the ramp. Oxygen provisions are installed by a kit.

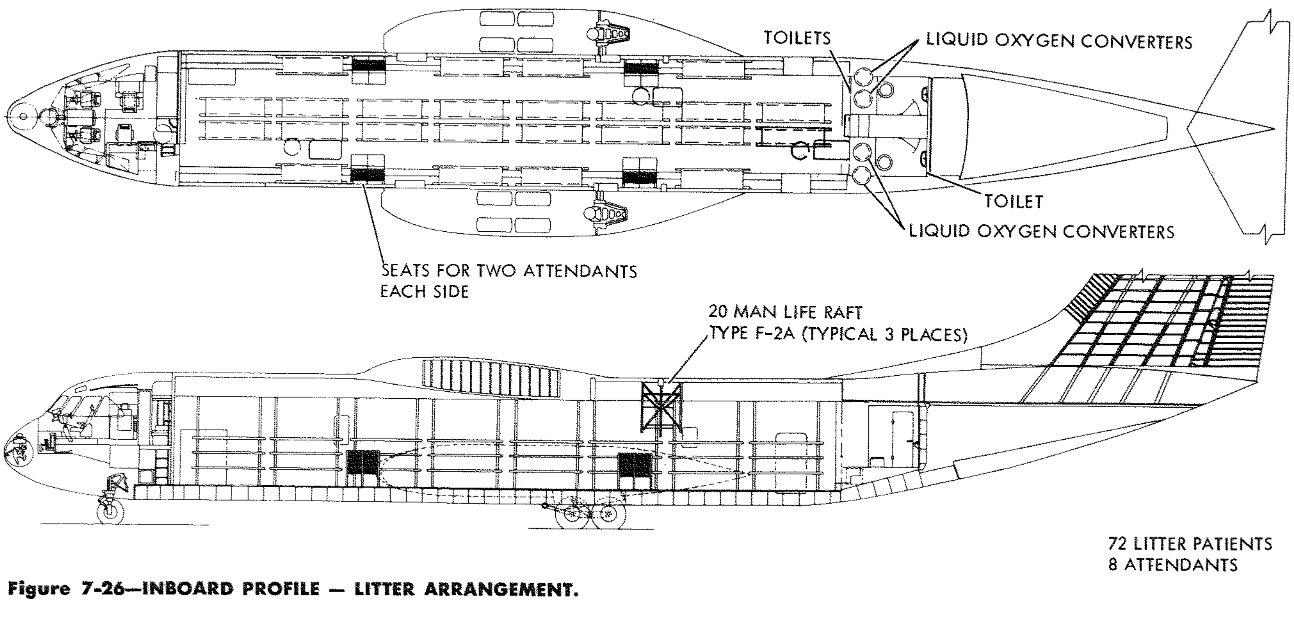


Figure 7-26—INBOARD PROFILE — LITTER ARRANGEMENT.

The troop carrier oxygen system is installed along with the troop seats, and its flexible lines are attached to the fuselage frames with suitable clips. Four 25-liter liquid oxygen converters for this installation are filled prior to being placed in the airplane and are connected to an overboard vent with flexible lines. Connection to the quantity indicator in the aircraft completes the installation.

As an alternate, the same arrangement on WS 463L pallets is shown in Figure 7-27. Eighty-two troops can be carried in this version, which also has removable galley, toilets, and oxygen provisions.

To Air Drop (5.3.6.5.3)

The paratroop seating arrangement shown in Figure 4-21 utilizes 19-in.-wide aft-facing 16 "g" seats with single seats along the sides and two clustered seats down the center. This arrangement accommodates 74 airborne troops. No galley is provided, but the 2 removable toilets on the ramp are retained, as is the oxygen system installed by kit.

Aft entry paratroop doors are located at F. S. 1213.0 on both the right and left sides of the fuselage. The doors provide a clear opening of 36 in. wide and 72 in. high.

The doors are inward-opening plug-type, equipped with four locks. The locks are operable from either inside or outside the airplane by rotating handles. When opened, the door is counterbalanced by a spring which allows it to be rolled to a stowed area aft of the door opening and about 5 inches above the floor.

Paratroop spoilers are also installed by kit for this arrangement. The spoilers shown in Figure 7-28 are attached within the fuselage forward of the paratroop doors. The spoilers are actuated to the desired position for protection during bailout of paratroops. The spoiler is powered into the air stream by a hydraulic actuator.

An alternate possibility for a paratroop arrangement is shown in Figure 5-4. This arrangement shows the usual side-facing seats required for airborne troops. This version has a capacity for 151 troops with 20 in. spacing and approximately 128 troops with 24 in. spacing. This version also includes two toilets and an emergency oxygen system installed by kit. No galley is installed.

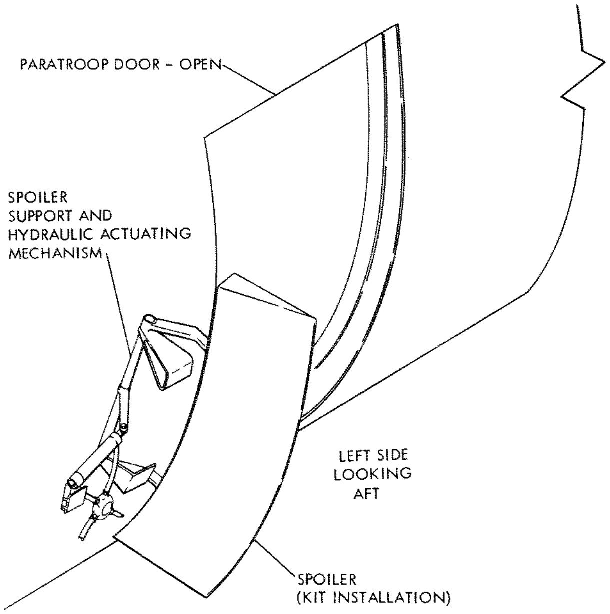


Figure 7-28—PARATROOP DOOR SPOILER.

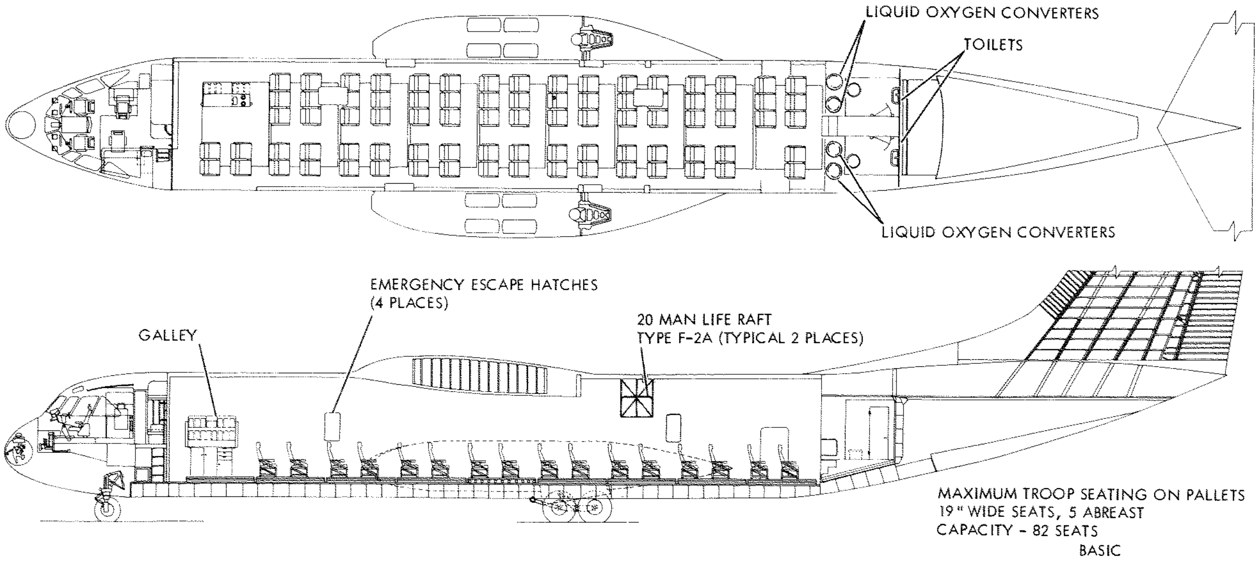
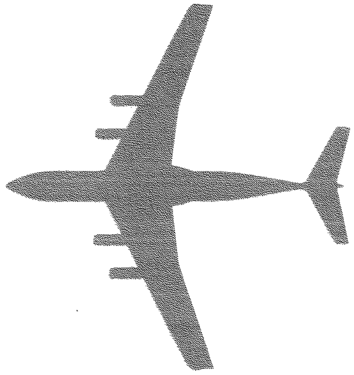


Figure 7-27—INBOARD PROFILE — MAXIMUM SEATING ON PALLETS.

SUPER HERCULES · GL207-45

section 8



MAINTAINABILITY AND SUPPORTABILITY (5.3.7)

The various aspects of the individual phases of maintainability and supportability are covered in detail by coverage of the various phases of maintainability and supportability as they apply to the model GL 207-45 in the following paragraphs.

PERSONNEL REQUIREMENTS (5.3.7.1)

The preflight, thru-flight, hourly postflight and periodic inspections accomplished on the GL 207-45 airplane are scheduled so as to be compatible with Air Force and commercial operator practices for maximum utilization of the aircraft. The manpower, skill levels, and elapsed time to perform these inspections is minimized by the maintainability designed into the aircraft system and subsystems.

The inspection and maintenance of the airframe and subsystems are accomplished by personnel with skill levels of "skilled" (5 level) and "semi-skilled" (3 level). Maintenance supervision require a minimum number of "advanced skilled" (7 level) technicians. The skilled (5 level) mechanic has 1 to 3 years of experience in his specialty field. He has completed a training course related to his specialty and has average mechanical ability and knowledge. He can interpret simple blueprints, diagrams and applicable technical publications. High school level of education is desirable.

The semi-skilled (3 level) mechanic should have completed a technical training course pertaining to the aircraft. He does not require job experience, as his duties are to assist skilled and advanced skilled personnel as an on-the-job trainee.

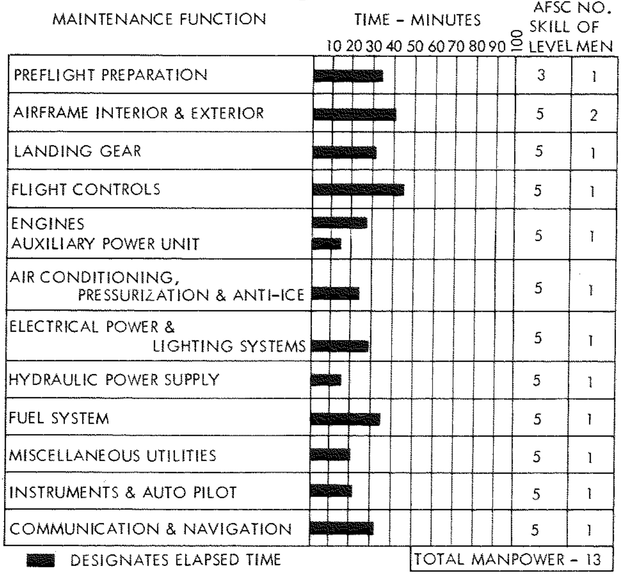
The advanced skilled (7 level) technician has completed one and preferably two enlistments and has a minimum of four years experience in his specialty field. He should be able to interpret and use technical prints and publications and have a thorough knowledge of electrical and mechanical principles as applied to aircraft and their components. He should be proficient in supervising skilled and semi-skilled personnel in installation, inspection, repair and overhaul of aircraft and aircraft systems. Completion of the advanced training course in his specialty is required.

The ready accessability for maintenance and maximum self-sufficiency of the GL 207-45 for both routine operational and emergency deployment purposes reduces the number of maintenance, inspection and servicing personnel necessary.

Skill Levels Required (5.3.7.1.1)

Maintenance personnel of various skill levels, commensurate with skill levels presently available in the Air Force and at commercial operator maintenance bases, should be permanently assigned to the scheduled maintenance operation for maximum efficiency. The GL 207-45 contains no complex systems requiring skills or training beyond a level to which existing personnel are capable of being trained.

Inspection and maintenance of the airframe and subsystems can be accomplished by personnel with skill levels of "skilled" (5 level) and "semi-skilled" (3 level). A minimum of supervisory personnel with "advanced skill" (7 level) skill levels are required. Figures 8-1 and 8-2 indicate the skill levels required to perform the individual phases and areas of maintenance and inspection.



MAINTENANCE FUNCTION	AFSC SKILL LEVEL	NO. OF MEN
PREFLIGHT PREPARATION	3	1
AIRFRAME INTERIOR & EXTERIOR	5	2
LANDING GEAR	5	1
FLIGHT CONTROLS	5	1
ENGINES AUXILIARY POWER UNIT	5	1
AIR CONDITIONING, PRESSURIZATION & ANTI-ICE	5	1
ELECTRICAL POWER & LIGHTING SYSTEMS	5	1
HYDRAULIC POWER SUPPLY	5	1
FUEL SYSTEM	5	1
MISCELLANEOUS UTILITIES	5	1
INSTRUMENTS & AUTO PILOT	5	1
COMMUNICATION & NAVIGATION	5	1
	TOTAL MANPOWER - 13	

Figure 8-1—PRE-FLIGHT INSPECTION TIME CHART.

Manhours Per Flying Hour (5.3.7.1.2)

In establishing ground rules on which an evaluation may be made, inspection intervals compatible with those presently scheduled by the Air Force and commercial air carriers were assumed. An interval of 300 flying hours between periodic inspections was selected. In deriving realistic maintenance manhours during this 300-hour period, all scheduled maintenance manhours required in the performance of preflight, thru-flight, hourly postflight and periodic inspections were calculated. Unscheduled maintenance manhours based on current statistical operational data required by organizational and field maintenance were included.

The GL 207-45 is a derivative of the proven and reliable C-130 family of aircraft. Consequently, the utilization of valuable operational and maintenance records of the C-130 provided a sound basis for

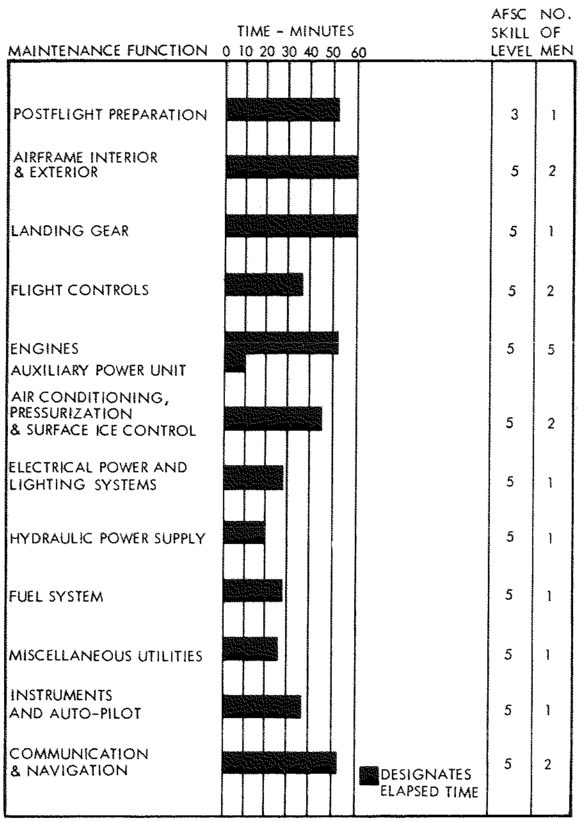


Figure 8-2—POST FLIGHT INSPECTION TIME CHART.

establishing a reasonable and practical maintenance-manhour per flying-hour value for the aircraft.

From this analysis of the maintenance manhours expended on the C-130 Hercules over an extended period of time, the following ratios of unscheduled to scheduled maintenance manhours was obtained.

1 One and one-half unscheduled manhours are expended during preflight, hourly postflight and periodic inspections for each scheduled manhour.
2 One unscheduled manhour is expended for the thru-flight and turn-around inspection for each scheduled manhour.
3 One manhour of field maintenance is expended for each manhour of organizational maintenance.

With the above ratios established for long term C-130 records and the scheduled maintenance manhours for the GL 207-45 calculated, the maintenance manhour per flying hour may be derived.

With a normal military utilization of 5 flying hours per day, 60 days are required to accumulate 300 flying hours The maintenance manhours of this 60 day period are as follows:

Preflight Inspection

Number of inspections per day	1
Number of inspections in 300 flying hours (60 days)	60
Scheduled maintenance manhours per inspection	6.9
Unscheduled maintenance manhours per inspection (1.5 x 6.9)	10.35
Total maintenance manhours per inspection	17.25
Maintenance manhours for 60 inspections (300 flying hours)	1035

Thru-Flight/Turnaround Inspection

Number of inspections per day (estimated)	2
Number of inspections in 300 flying hours (60 days)	120
Scheduled maintenance manhours per inspection	1.3
Unscheduled maintenance manhours per inspection (1 x 1.3)	1.3
Total maintenance manhours per inspection	2.6
Maintenance manhours for 120 inspections (300 flying hours)	312

Hourly Postflight Inspection

Number of inspections in 300 flying hours (60 days)	3
Scheduled maintenance manhours per inspection	14.6
Unscheduled maintenance manhours per inspection (1.5 x 14.6)	21.9
Total maintenance manhours/inspection	36.5
Maintenance manhours for 3 inspections (300 flying hours)	109.5

Periodic Inspection

Number of inspections in 300 flying hours (60 days)	1
Scheduled maintenance manhours per inspection	106
Unscheduled maintenance manhours per inspection (1.5 x 106)	159
Total maintenance manhours (300 flying hours)	265

The total manhours expended for maintaining the airplane in a 300 flying hour period and the maintenance manhours per flying hour is summarized below.

Maintenance Function	Total Manhours per 300 Flying Hours	Maintenance Manhour per Flying Hour
Preflight Inspections	1035	3.5
Thru-Flight/Turnaround Inspections	312	1.1
Hourly Postflight Inspections	109.5	0.3
Periodic Inspection	265	0.9
Total: Organizational Maintenance	1721.5	5.8
Field Maintenance Manhours (Approximately equal to		

the total organizational maintenance manhours)	2000	6.7
Total organization and field maintenance manhours required to support 300 flying hours	3721.5	
Maintenance manhours per flying hour for GL 207-45		12.5

The 12.5 maintenance manhours per flying hour is considered to be conservative. It is anticipated that it will be reduced as maintenance personnel become thoroughly familiar with the airplane. This figure compares quite favorably with currently operating aircraft and is an indication of the effort expended in designing the GL 207-45 for easy maintenance.

Any New Skill Fields Peculiar to Air Force (5.3.7.1.3)

No new skill fields will be required to maintain the GL 207-45 airplane, due to maximum utilization of proven components and concepts.

HANDLING AND SERVICING (5.3.7.2)

The GL 207-45 is designed to realize a high degree of availability through minimum servicing and handling while requiring a minimum of ground equipment. Every effort has been made to assure an efficient operation during all activities whether at established ZI or foreign bases or, in event of emergency support missions, at an austere forward location.

The GL 207-45 may be quickly fueled by use of the single-point refueling system or may be refueled at a slower rate through the overwing filler openings. Towing is accomplished by use of a standard towbar with an Air Force inventory tow vehicle. No unique jacking procedures are necessary. An AUXILIARY Power Unit (APU) eliminates the need for most maintenance support equipment other than standard hand tools. Turn-around time in this design is greatly reduced through incorporation of all known and proven handling and servicing experience obtained from in-plant, military and commercial operators. Figure 8-3 illustrates maintenance-access provisions on the airplane.

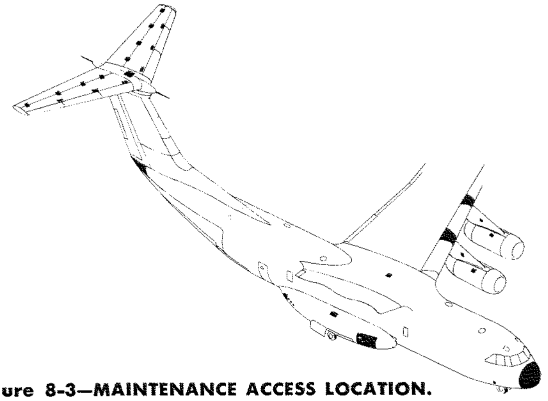


Figure 8-3—MAINTENANCE ACCESS LOCATION.

Propulsion System

In each power plant the engine oil tank, starter, constant-speed drive and thrust reverser system is serviced with MIL-L-7808 oil. The Auxiliary Power Unit, accessible from ground level, is also serviced with MIL-L-7808 oil. The use of the same type oil in these units simplifies the servicing and minimizes the possibility of servicing with an incorrect oil.

Hydraulics

Reservoirs and filling provisions are located in the cargo compartment, thereby providing ready accessibility for servicing both on the ground and inflight. The accumulators are located in the nose wheel well and in the cargo compartment to permit rapid servicing.

Liquid Oxygen System

An adapter located on the lower right side of the nose section provides ground-level access for filling the system.

Battery

The battery, located at the forward left side of the fuselage, is accessible from ground level for servicing.

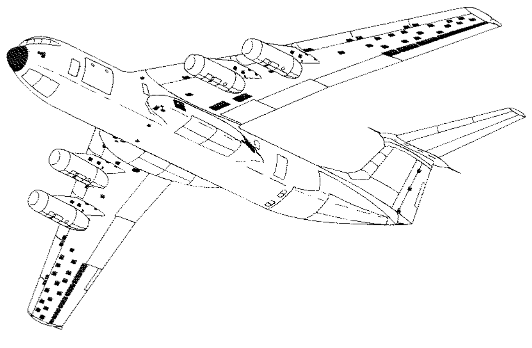
Landing Gear

Fluid and dry-air servicing of the landing gear shock struts is accomplished by means of a filler valve provided on each strut. Filling procedure is compatible with the shock-strut servicing on contemporary aircraft.

Galley and Toilets

The drinking and wash water containers are readily removable for servicing. The chemical toilet has a removable inner liner to facilitate rapid servicing.

The servicing areas are dispersed throughout the airframe to prevent interference of personnel when servicing different systems, as illustrated by Figure 8-4.



Single-Point Refueling (5.3.7.2.1)

Provision for single-point refueling is made in the R/H main landing gear fairing where 2 flush-mounted MS29515-2 refueling adapters and a refueling panel are located. The adapters are located forward of the control panel, approximately 4 ft. above ground level for ease of attachment of fuel hoses. The control panel is readily accessible through a quick-opening hinged door, and contains fuel-quantity repeater gauges, preset-quantity selectors, precheck/shut-off controls and a service light. An interphone connection is provided for communication during maintenance and/or refueling activities. Refueling rates may be found in paragraph 5.3.7.6.1 of this section.

DESCRIPTION	SERVICE LOCATIONS AND COMMENTS	SPEC AND GRADE
1. FUEL SYSTEM	SINGLE POINT REFUELING PANEL AFT ON RIGHT MLG FAIRING. SINGLE POINT REFUELING AT RATE OF 900 GPM. CONVENTIONAL FILLER POINTS ALSO PROVIDED ON TOP OF WING FOR EACH TANK. TOTAL FUEL CAPACITY - 23,080 GALLONS.	MIL-J-5624D GRADE JP 4 AND JP5 ONLY OR AVIATION KEROSENE
2. ENGINE LUBRICATION SYSTEM	ACCESS DOORS PROVIDED IN EACH NACELLE FOR: (a) ENGINE OIL TANK (b) CSD RESERVOIR (c) THRUST REVERSER RESERVOIR (d) STARTER RESERVOIR	MIL-L-7808C
3. AUXILIARY POWER UNIT LUBRICATION SYSTEM	AFT END OF LEFT MLG FAIRING. OIL CAPACITY - 1.88 GALLONS	MIL-L-7808C
4. HYDRAULIC SYSTEM	RESERVOIRS IN CARGO COMPARTMENT: (a) FORWARD CARGO DOOR SYSTEM (b) UTILITY & BOOSTER SYSTEM (c) AUXILIARY SYSTEM ACCUMULATORS WITH MS28889 AIR CHARGING VALVE: (a) TWO IN NOSE WHEEL WELL - NORMAL AND EMERGENCY BRAKE SYSTEMS (b) THREE IN CARGO COMPARTMENT FOR UTILITY, BOOSTER AND AUXILIARY SYSTEMS.	SKYDROL 500A
5. FIRE EXTINGUISHER SYSTEM	ACCESS DOOR IN FORWARD LEFT MLG FAIRING. 19.5 LB MINIMUM BOTTLE WEIGHT 600 PSI	MIL-B-4394A BROMOCHLOROMETHANE
6. OXYGEN SYSTEM (CREW)	FILLER ACCESS DOOR, LOWER RIGHT SIDE OF THE NOSE SECTION. PROVISIONS FOR ONE (1) TWENTY-FIVE (25) LITER LIQUID OXYGEN CONVERTER.	MIL-I-9475A
7. OXYGEN SYSTEM (TROOP)	PROVISIONS FOR FOUR (4) PORTABLE TWENTY-FIVE (25) LITER LIQUID OXYGEN CONVERTERS LOCATED ON FLOOR OF RAMP.	MIL-I-9475A
8. LANDING GEAR SYSTEM	MS28889 CHARGING VALVE PROVIDED ON EACH STRUT FOR FLUID AND AIR SERVICING. A STANDARD AIR INFLATION VALVE IS PROVIDED FOR EACH TIRE.	

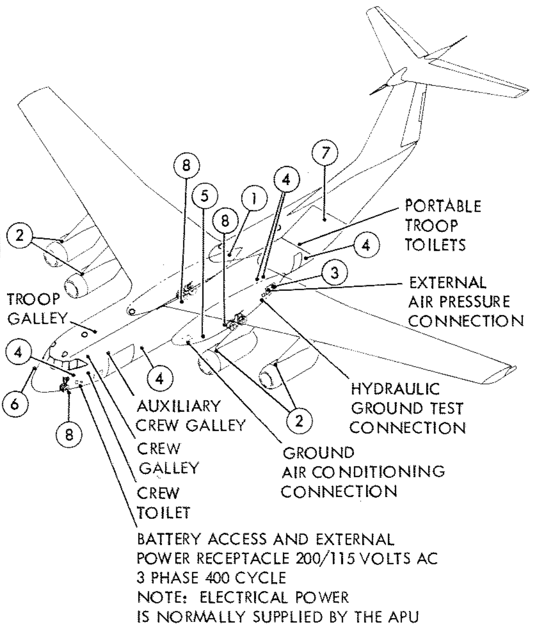


Figure 8-4—REPLENISHING AND SERVICE POINTS.

Individual Tank Refueling (5.3.7.2.2)

Each wing tank is equipped with a filler receptacle sized to receive a 2 in. diameter standard fuel nozzle, and fitted with grounding provisions. Gabb RC-3500 filler caps, qualified to MIL-C-7244B Type II, are utilized. Provisions are made for assuring adequate expansion space at overflow and overflow spillage is drained to the lower surface of the wing. See Paragraph 5.3.7.6.1 for refueling rates.

Towing (5.3.7.2.3)

Routine towing over prepared surfaces is accomplished through the use of a Universal Type MD-1 Tow bar (AC drawing 55J22139). The tow bar is readily attached by one man and contains shear-out provisions to conserve the integrity of the aircraft structure. For emergency or abnormal conditions, where heavy loads, steep inclines, soft surfaces, etc., increase drag, each main landing gear is provided with towing rings to accommodate cables for either fore or aft towing. Figure 8-5 illustrates the towing provisions. A type MB-2 or equivalent aircraft towing tractor may be used for towing. The turning radius of the GL 207-45 is shown in Figure 2-15.

Aircraft Jacking (5.3.7.2.4)

Aircraft jacking is accomplished through the use of the following types of jacks at the following locations:

1 Type B3C on each side of the forward fuselage at F. S. 365. Bolt-on pads utilize attaching-bolts

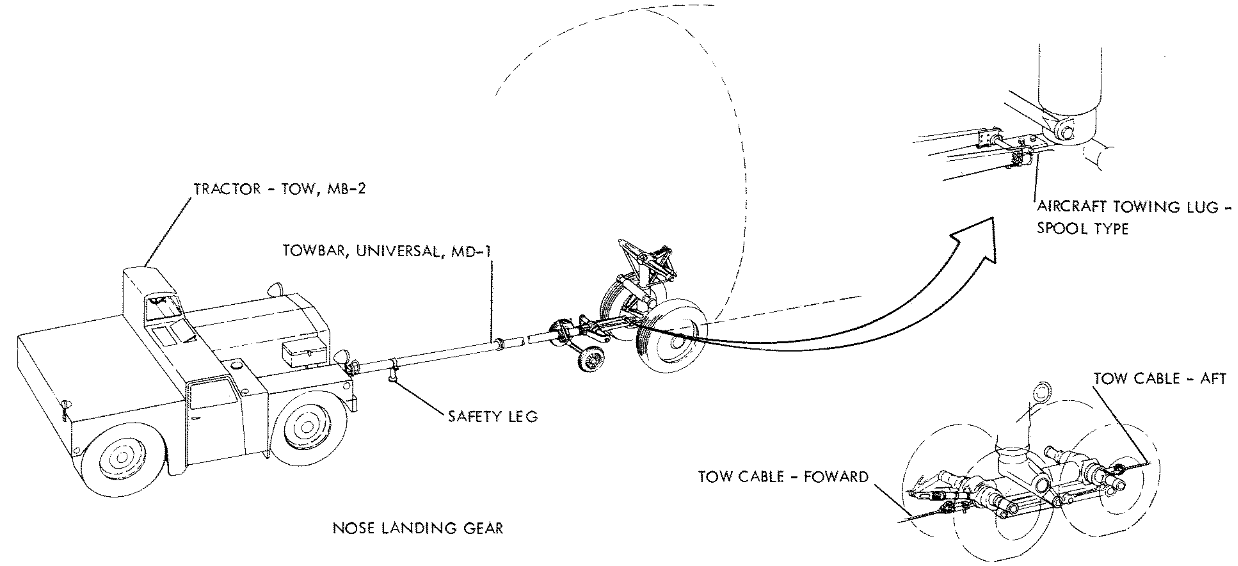


Figure 8-5—TOWING PROVISIONS.

of equal size and length to prevent incorrect installations.

2 Type equivalent to Regent Model 3934 modified to 75-ton capacity) on each main landing gear supporting structure at F. S. 973, B. L. 245.

3 Type B4A on each wing rear beam at B. L. 245.

4 Type F2 on the main landing gear forward and aft axles, and the bottom of the nose landing gear shock strut assembly.

Two jacks, integral in the aircraft structure, are provided on the fuselage near the cargo ramp hinge line (F. S. 1090). These jacks are basically provided to stabilize the aircraft during cargo loading conditions but may, if necessary, be utilized during any maintenance or overhaul operation. Jacking and mooring provisions are shown in Figures 8-6 and 8-7.

A means of determining the level attitude of the GL 207-45 airplane has been provided by which leveling of the aircraft, both laterally and longitudinally, is verified by use of a plumb bob and scale installation. The scale is attached to permanent primary structure to preserve integrity to the greatest practical extent. The plumb bob attach-point and scale are located within the cargo compartment and are readily accessible. Figure 8-8 illustrates installation details.

Ground Power Requirements (5.3.7.2.5)

Electrical power from an Auxiliary Power Unit (APU), integral but easily and quickly removable from the airplane, permits maintenance checkout of the electrical, hydraulic, pneumatic and air conditioning systems without the need for external auxiliary

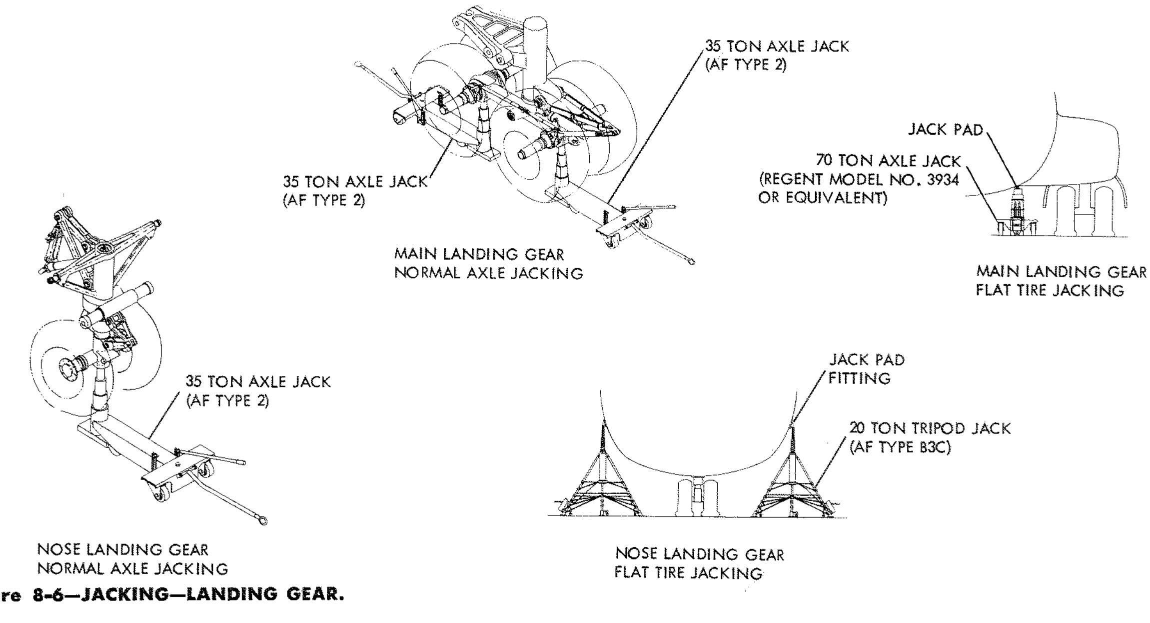


Figure 8-6—JACKING—LANDING GEAR.

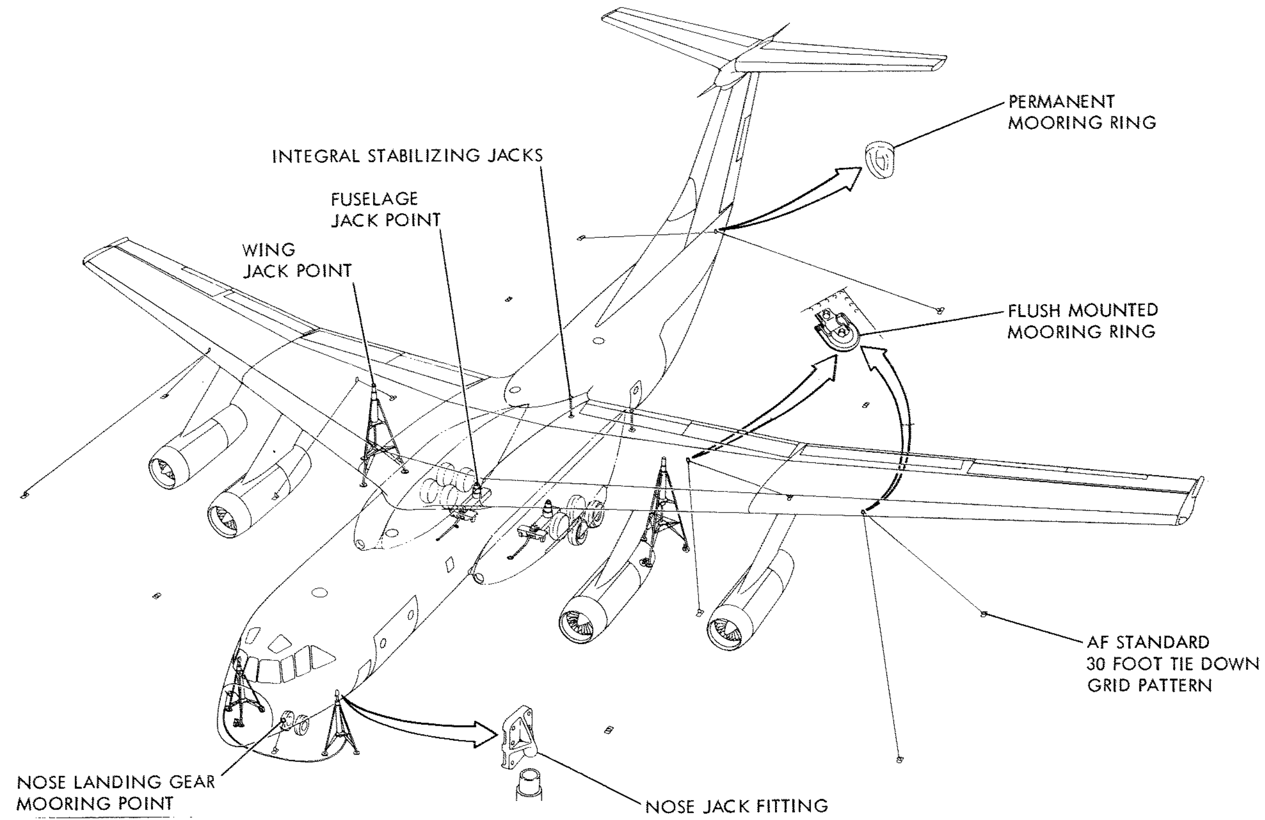


Figure 8-7—JACKING AND MOORING ARRANGEMENT.

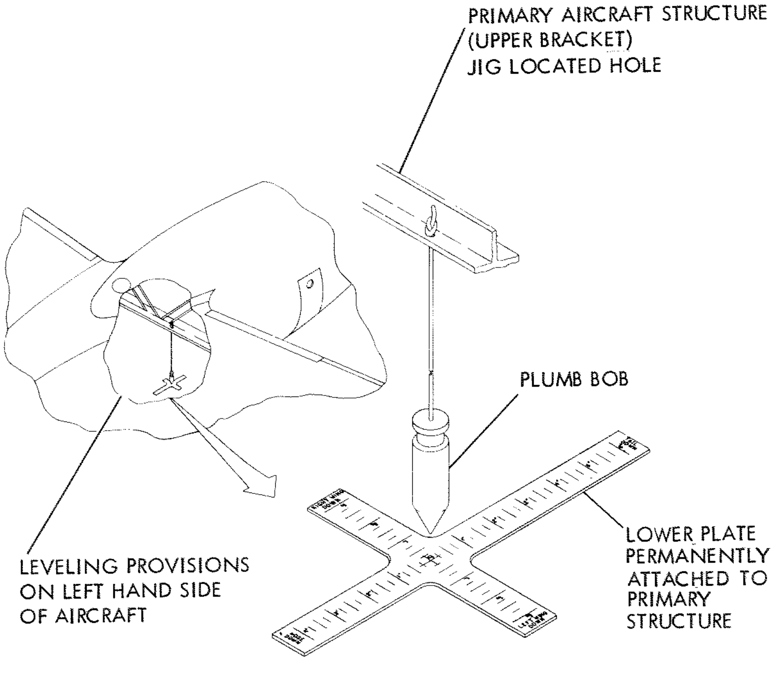


Figure 8-8—LEVELING.

equipment, providing an aid to maintenance personnel when ground service facilities are limited. However, provisions have been made to utilize, when necessary, the following units for system checkout:

a. Type MD-4 Generator Set capable of 120-Volt, 40-KVA, 400-cycle AC output and 28-Volt DC, 500-ampere DC output

b. Hydraulic cart, such as a Type MJ-1, model HST-1, modified for Skydrol, capable of 30 GPM flow at 3000 psi

c. Type MA1A Trailer Mounted Gas Turbine Compressor capable of a nominal air weight flow of 110 lbs./min. at 350 degrees F and 40 psig with an ambient temperature of 70 degrees F.

Figure 8-9 illustrates a typical arrangement of the ground power units in use.

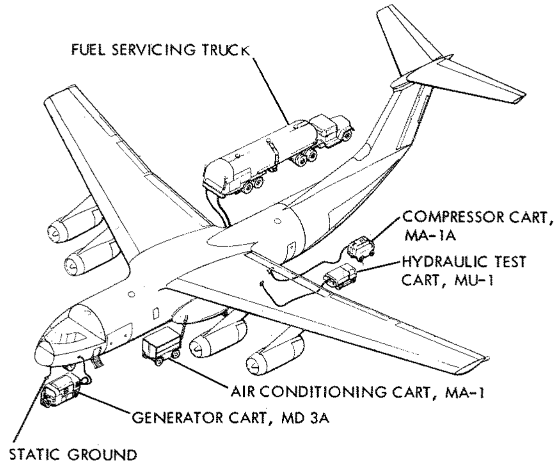


Figure 8-9—MAINTENANCE SUPPORT EQUIPMENT.

Ground Support Vehicles Necessary to Support The Aircraft (5.3.7.2.6)

The following vehicles, listed by name, identification and function, will be necessary for ground support of the GL 207-45 airplane. For purposes of this listing, a vehicle is assumed to be any self-propelled conveyance.

Name and Identification	Functional Description
Tractor-Aircraft Towing Type MB-1 FSN 2420-287-6967	Aircraft towing
Truck-Firefighting, Aircraft Type 0-12	Extinguish aircraft fires
Truck-Ambulance Type M-43 FSN 2310-289-8367	Transport sick and injured
Crane-Truck, Mobile 20-Foot Maximum Hook Height N. S. L.	Remove and install ailerons and flaps and perform general lifting requirements.
Truck-Tank Type AF/S32R-2 (5000 gal. capacity) FSN 2320-555-1509	Refuel aircraft
Crane-Semi-Tractor Type MB-1A FSN 3810-580-6535	Remove damaged aircraft from runway of airfield.

In the development of ground support concept for the GL 207-45 a design philosophy of elimination of GSE, where possible, was applied to provide the USAF with an airplane with maximum self-sufficiency. Through very close coordination between the GSE staff and aircraft design organizations, an aircraft system has been developed which requires a minimum of GSE for normal, fixed-base operation. For operation from advanced bases with virtually no ground support capability, the self-sufficiency features of the aircraft permit routing maintenance to be accomplished with only a few light-weight GSE items to handle such operations as engine and control surface and wheel replacements. In addition, requirements for engine starting, air conditioning, electrical power and hydraulic power from external auxiliary power sources have been eliminated. The APU installed in the L/H main landing gear fairing provides the basic source for supplying pneumatic and electrical power, which can then be used to operate the emergency hydraulic pumps for ground checks.

To establish the GSE requirements to support the GL 207-45, an analysis of the systems and subsystems of the aircraft was made to define the conditions to be satisfied. This analysis takes into account maintenance personnel capabilities, operational requirements, and logistics and facilities considerations. The resulting GSE concept provides for full support of the GL 207-45 from factory flight check and acceptance through its expected useful life. The GSE items selected will meet specifications derived for the individual GSE items and will provide performance necessary to assure maximum utilization of the aircraft.

To assure a high degree of standardization with GSE in the USAF inventory, the selection of GSE items for this aircraft is based on the following criteria in order of preference:

1 Use of existing military inventory GSE
2 Use of proposed or development military GSE
3 Modification of existing or proposed military GSE
4 Off-the-shelf commercial items in military inventory or modified off-the-shelf commercial items in military inventory
5 Use off-the-shelf commercial items or modified off-the-shelf commercial items
6 New items developed to fulfill requirements

All GSE items necessary to support the GL 207-45 in performing its operational mission are defined and will be selected, developed, and procured in sufficient time to assure the compatibility of the GSE and the aircraft prior to operational deployment.

The self-sufficiency features of the GL 207-45 provide an airplane which requires a minimum of ground support equipment for organizational and field-level maintenance. The GSE established to sup-

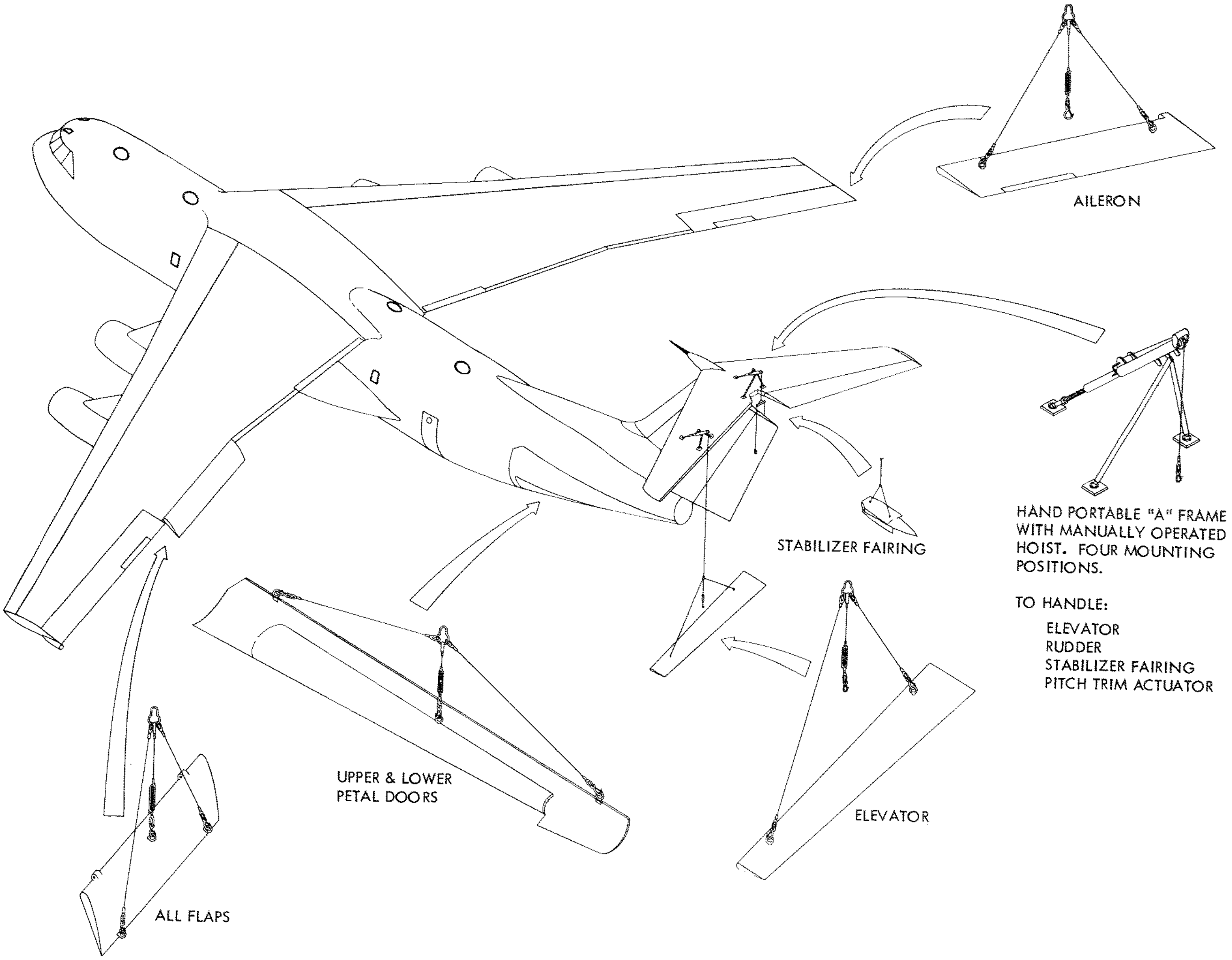


Figure 8-10—HOISTING PROVISIONS.

port the maintenance operations at overhaul base level are held to a minimum by the use of aircraft components and assemblies which are the same as, or have similar counterparts in, the USAF inventory. The selection of like or similar components permits use of many currently available overhaul ground support equipment items.

To indicate the depth of study in this area, the GSE requirements for the empennage of the GL 207-45 airplane have received careful consideration. The basic internal structure of the vertical stabilizer is designed to be used as a ladder, and access doors are provided through to the upper surface of the horizontal stabilizer. A portable A-frame hoist with a hand-operated winch can be carried up this internal ladder and secured to the horizontal stabilizer as illustrated in Figure 8-10. This hoist can be used to position the elevator or empennage fairings for installation.

The GSE required for installing the rudder is also illustrated in Figure 8-10. A B-3 maintenance stand or Lockheed Verti-stand is used to attach the handling equipment to the lower surface of the horizontal stabilizer and to the rudder. The equipment consists basically of a block-and-tackle suspended from a trolley mounted to the underside of the horizontal stabilizer, and a counterweighted sling attached to the rudder. With the hinge pins removed, the rudder can be backed-out of the hinge joint with the trolley arrangement and lowered to the ground with the block and tackle. The counterweighted sling assembly maintains the proper attitude of the rudder during this operation. The remainder of the operational ground support equipment items are also designed to be as simple and versatile as possible.

Simultaneous Refuel Loading (5.3.7.2.7)

Simultaneous refueling, loading, and through-flight inspection operations are necessary in order to ensure that turn-around times are held to a minimum.

The GL 207-45 has been designed to provide such capabilities through the use of single-point refuel adapters, forward and aft cargo doors, crew and

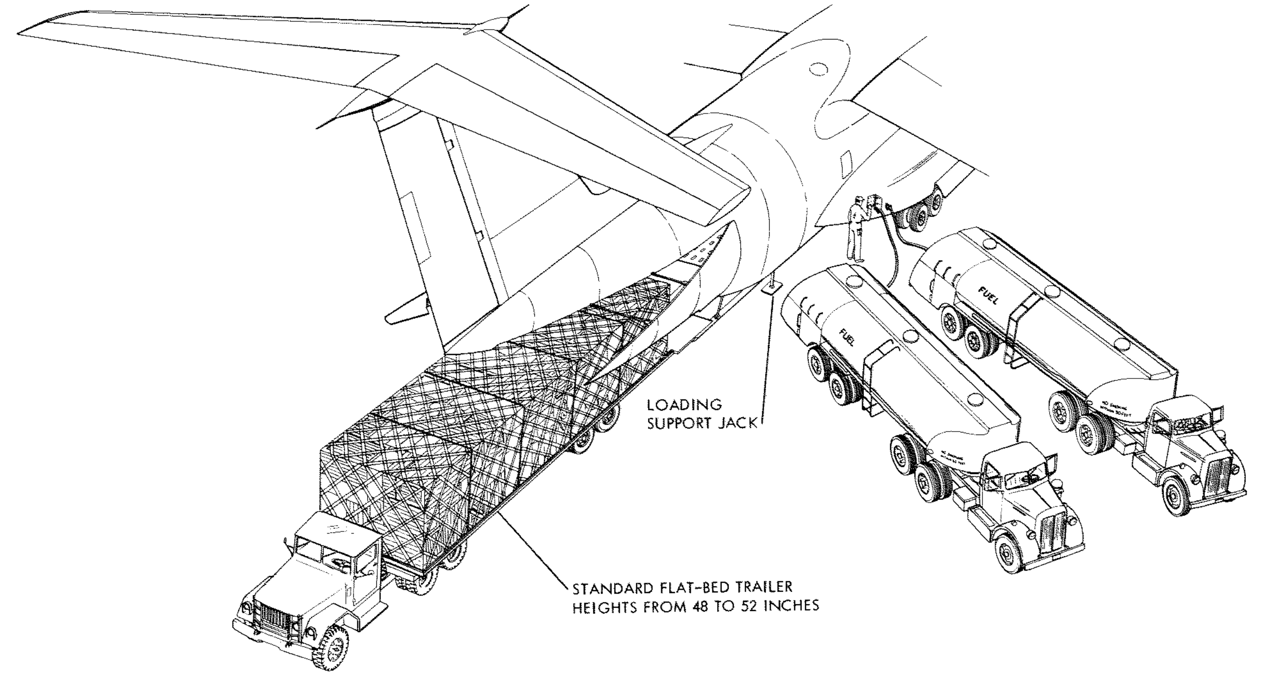


Figure 8-11—CARGO LOADING—TRUCK TO AIRCRAFT.

passenger entrance doors, and ready accessibility to those maintenance points that will require check during turn-around.

It should be noted, however, that certain provisions should be waived in T.O. 00-25-172 in order to retain, discharge, load, or unload passengers, load or off-load cargo, and perform through-flight maintenance operations which may require operation of electrically-powered equipment while refueling operations are in process, in order to accomplish turn-around in a minimum amount of time.

Figure 8-11 presents a view of a typical simultaneous refueling/loading operation being performed on the GL 207-45 airplane.

GROUND TEST EQUIPMENT NECESSARY (5.3.7.3)

Ground test equipments necessary for the support of the GL 207-45 airplane are listed below by name, identification, and function or requirement. This listing is separated into the following groups: Propulsion, Hydraulics, Fuel, Flight Controls, Electrical and Electronics, and Miscellaneous.

Propulsion

Name & Identification No.	Functional Description
Mobile Jet Engine Run-Up and Test System Air Logistics Corp. Model 12,000A (modified) Federal Stock No. 4920-592-4745	Run-up and Check-out Engine
Remote Trimmer System (Lear) FSN 5920-589-9624-4728B	Remotely Trim Engine Fuel Control From Cockpit
Jet Cal Analyzer B&H Instrument Co. (as modified)	Check Engine Exhaust Gas Thermocouples

Hydraulics

Stand, Hydraulic Type MJ-1, Model HST-1 FSN4920-204-0318	Perform ground-checks on hydraulic system.
Brake Pressure Gauge & Bleed Unit P/N 5079-TCA FSN 4920-626-9305	Ground-check brake system.

Fuel

Fuel Quantity System Tested MD-2A	To troubleshoot and calibrate fuel quantity indicating system.

Flight Controls

Test Jig-Aileron Boster Assy.	Bench-test of aircraft aileron booster.
Test Jig-Elevator Booster Assy.	Bench-test of aircraft elevator booster.
Test Jig-Rudder Booster Assy.	Bench-test of aircraft rudder booster.
Line Analyzer, Auto Pilot	Test auto-pilot system in aircraft.

Pneumatics

Compressor, Type MA1A FSN 1730-550-5691	Supply air for ground-check of aircraft pneumatic system.
Tester-Cabin Pressure FSN 4920-564-9808	Check fuselage pressure leakage

Electrical and Electronics

Name & Identification No.	Required For
Cable Assy. FSN 6625-220-9668	VHF-101, AN/ARC-50

Name & Identification No.	Required For
Dummy Load URM-13 P/N 274350	VHF-101, AN/ARC-50
Signal Generator AN/USM-44a FSN 5625-553-1572	HF-102 (168-T) VHF-101, AN/ARC-50, AGACS, 51Z-2
Signal Generator FSN 6625-539-9922	General testing of various electronic components, as required
Oscillator TS-382F/U FSN 6625-519-3815	VHF-101, AN/ARC-50, AN/AIC-13, AN/APN-141
Frequency Meter AN/URM FSN 6625-668-9749	Check of various electronic components, as required
Multimeter Test Set 297 P/N 587845	VHF-101, AN/ARC-50, AN/AIC-18, AMA-11A, VOR-101, AN/APX-46, 51Z-2.
Multimeter TS 585C/U	HF-102(618-T), VHF-101, AN/ARC-50, AN/AIC-13, VOR-101
Multimeter, Electronic TS 505/U FSN 6625-376-4937	HF-102(618-T), VHF-101, AN/ARC-50, AGACS, VOR-101, AN/ASN-24
Multimeter AN/PSM-6 FSN 6625-643-1686	HF-102(618-T), VHF-101, AN/ARC-50, AGACS, AN/APX-46, AN/ARN-52, AN/ASN-24, 51Z-2, AN/APN-141
Oscilloscope OS-8B/U FSN 6625-553-7696	HF-102(618-T), VHF-101, AN/ARC-50, AN/AIC-18, AMA-11A, AN/AIC-13, VOR-101, AN/APN-141
Microphone SIM AN/URM-14 FSN 6940-515-2450	Communication during testing, as required
Test Set, Electron Tube TU 7/U FSN 6625-376-4939	VHF-101, AN/ARC-50, VOR-101, AN/APX-46, AN/ARN-52, 51Z-2, AN/APN-141
Test Set, Radio AN/URM-76 FSN 6625-553-8009	General radio tests
Test Set AN/ARM-11 FSN 6625-649-3150	General testing
Wattmeter Bird-Model 43	VHF-101, AN/ARC-50
Wattmeter RE AN/URM-43 FSN 6625-635-9186	VHF-101, AN/ARC-50
Radar Test Set AN/UPM-10B	RDR-1D
Radar Test Set AN/UPM-12A FSN 6625-539-9915	RDR-1D
Electronic Multimeter TS-505 D/U FSN 6625-620-6366	DF-202, RDR-1D, AN/APN-141
Echo Box TS-488A/UP	RDR-1D
Oscilloscope Tektronix 545 FSN 6625-553-7931	AGACS, AN/ARN-52, RDR-1D
Test Set Crystal AN/UPM-33A FSN 6625-539-8587	RDR-1D
Shield, Antenna CW-224/U	AN/APX-46
Test Set Crystal TS-268D/U	RDR-1D, AN/APN-141
Test Set Radar AN/UPM-8 FSN 6625-542-1115	AN/APX-46
Signal Generator TS-47/APR	AN/APX-46
Dummy Load	RDR-1D
Signal Generator BC-376-H	51Z-2
Signal Generator TS-497( )/URR	51Z-2
Signal Generator URM-25D FSN 6625-643-1548	HF-102(618-T), VOR-101, 51Z-2
Signal Generator SG-13	VOR-101
Wattmeter Model 43 FSN 6625-649-5070	AN/ARC-50
Test Set, Radio AN/ARM-7 FSN 6625-539-8706	HF-102 (618-T)
Signal Generator AN/GRM-4 FSN 6625-536-9223	51V-3
Modulator MD-83A/ARN FSN 6625-539-8563	VOR-101
Spirit Level	C-11 Gyro Compass
Stop Watch	C-11 Gyro Compass
C-11 Cable Assembly	C-11 Gyro Compass
Generator, Interphone SG-23/U FSN 6625-519-9808	HF-102 (618-T)
Test Set Radio AN/ARM-34 FSN 6625-523-4291	HF-102 (618-T), AN/ARN-52
Test Set-Radio AMEAS FSN 6625-649-4647	HF-102, AN/ARN-52
Wave Meter 10-263/U FSN 6625-500-4495	HF-102
Test Set, Electron Tube TV-2/U FSN 6625-392-6997	HF-102, AN/AIC-18, AMA-11A, AGACS
Signal Generator AN/USM - P/N 363916-6	AN/AIC-18, AMA-11A
Multimeter ME-6D/U FSN 6625-643-1663	AN/AIC-18, AMA-11A, AN/AIC-13, AN/APN-141
Test Set Dyn. TS 414/U FSN 6625-553-7691	AN/AIC-18, AMA-11A

Name & Identification No.	Required For
Generator, Signal SG-1 ( ) ARM FSN 6625-649-4636	VOR-101
Generator, Signal MD-8/ARM FSN 6625-093-6739	VOR-101
Generator, Signal AN/USM-16 FSN 6625-692-4549	VOR-101, AN/ARN-52
Oscilloscope AN/USM-25A FSN 6625-649-2870	AN/ARN-52
Frequency Meter AN/USM-26 FSN 6625-649-4356	AN/ARN-52
Oscilloscope AN/USM-24 P/N 612175	AN/ARN-52
Oscilloscope AN/USM-50 FSN 6625-553-0264	AN/ARN-52
Signal Generator HP 105-AG FSN 6625-643-1586	51Z-2
Output Meter, General Radio 583-A No FSN, But std. stock	51Z-2
Generator Collins 477V-1 No FSN, but std stock	DF-202 (Low Frequency ADF)
Simulator, Loop Collins 477 U-1 No FSN, but std. stock	DF-202
Line Tester-go, no-go (new)	AN/APN-501 (Doppler)
Test Set, Doppler, Radar (New)	AN/APN-501
Test Set, Radar (New)	AN/APN-141
Delay Line (New)	AN/APN-141
Bridge, Summation USM-68 P/N 801319-254195	AN/APN-141
Square Wave, Generator (New)	AGACS
Compass Calibrator FSN 4920-659-6349	C-11 Gyro Compass
Cable Assembly Doppler Radar (New)	AN/APN-501
Cable Assembly, Computer (New)	AN/ASN-24
Cable Assy IFF (New)	AN/APX-46
Cable Assy Low Altitude Altimeter (New)	AN/APN-141
Cable Assembly Weather Radar (New)	RDR-1D
Cable Assy HF Comm. (New)	HF-102

Name & Identification No.	Required For
Cable Assy AN/ARC-50 (New)	VHF 101, AN/ARC-50
Cable Assy AIC-18 (New)	AN/AIC-18
Cable Assy VOR-101 (New)	VOR-101
Cable Assy TACAN (New)	AN/ARN-52
Cable Assy Glide Slope (New)	5IV-3
Cable Assy ADF (New)	DF-202
Auto Pilot Test Bench (New)	Ground Test of Auto-pilot
SIMI/ACRUM and Power Supply (New)	AN/AVN-1
Chopper Tester (New)	AN/AVN-1
Line Test Analyzer (New)	Inertia Navigator
Bench Test Analyzer (New)	Inertia Navigator
Automatic Test Console (New)	Inertia Navigator
Precision Tilting Rotary Table (New)	Inertia Navigator
Fill & Test Unit (New)	AN/ASN-24
Tape Reader (New)	AN/ASN-24
Card Checker (New)	AN/ASN-24
Automatic Test Console (New)	AN/ASN-24
Test Pattern Generator (New)	AN/ASN-24
G/A Message Generator (New)	AGACS
Logic Board Tester (New)	AGACS
Automatic Test Console (New)	AGACS
Generator Set Model MD-4 FSN 6115-557-0316	Aircraft Electrical Power During Tests
Miscellaneous	
Tester	Check Out of Fire Warning System

MAINTENANCE AND STORAGE FACILITIES (5.3.7.4)

The GL 207-45 will normally be operated from MATS bases where maintenance facilities are now established for 4 engine transport aircraft of comparable size. Most existing facilities will be compatible with the GL 207-45 maintenance requirements.

Hangars presently used in the support of the C-124 and C-133 aircraft will be adequate, since the GL 207-45 is dimensionally smaller both in height and span. Also, MB-48 nose docks used for C-124 maintenance are usable.

Maintenance facility requirements may generally be categorized into three general areas; (1) flight line maintenance, (2) periodic maintenance, and (3) field maintenance shop operations.

Flight line maintenance will be affected by the considerations necessary for jet engine facilities for noise suppression, personnel protection, and exhaust stream deflection. These must be resolved at the individual facilities because of varied circumstances and location of flight line areas. Flight line stands, towing equipment and servicing equipment presently being used will provide ample support for the GL 207-45.

Where small numbers of aircraft are based at certain facilities, the use of standard Air Force work stands and ladders will provide ample coverage for inspection and maintenance functions. Where continual maintenance is established to handle a production-type of maintenance, fixed docks supplemented by portable equipment will be more desirable.

Tools and equipment presently in use will generally suffice in fulfilling the requirements of any structural maintenance. Hydraulic equipment and test stands must be compatible with Skydrol 500A. Test stands using MIL-0-5606 may be modified for use of Skydrol by replacing seals, packing, and gaskets.

The use of existing shop and test facilities with possible minor alterations and additions should be adequate for the maintenance of communications and navigational equipment.

Docks and Hanger Facilities (5.3.7.4.1)

If the operator desires to follow a semi-permanent hangar dock maintenance-concept for performance inspections, procurement of maintenance platform seats, FS 1730-593-9942, used for the B-52, or equal, is advisable. Although the type B-52 platform will not be usable as received, principally because of length, certain sections may be omitted and slight alterations made to adapt it for use on the GL 207-45.

Standard Air Force maintenance work stands, such as B-1, B-3, B-4, and B-5, are considered adequate for general maintenance work.

Existing Air Force Hangars, such as the B-36-type standard field maintenance hangar that will accept the C-124 or C-133 airplanes, will accept the GL 207-45 which has a span of 161 ft., a length of 150 ft., and height of 40 ft.

Engine Test Stands, Blast Wall or Silencer (5.3.7.4.2)

A simple installation for engine testing is considered essential to the satisfactory maintenance of the GL 207-45. In the interests of economy and simplicity, it is recommended that an engine test installation similar to the Air Logistics Corporation Model 12,000A, FSN 4920-572-4745, be used. Basic elements of this installation such as the control booth, fuel tank, and tiedown assemblies are packaged on the module principle, thus the test installation may be varied to conform to the particular application. Some modifications would be required for testing thrust reverser operation and an engine run-up adapter kit will be required. An AF Type MA1A trailer-mounted GTC will also be required for engine starting. Optional items such as the hydraulic and electrical load banks, oil system, and air conditioning may be added as the particular application requires.

Blast wall and silencer requirements may be satisfied by utilizing a silencer assembly similar to Air Logistics Corporation P/N 11,020. This type silencer eliminates the requirements for a blast wall, since it deflects the jet blast to a vertical direction at exit. Provisions will be required in the silencer to accommodate thrust reverser operation testing. Geographic location of the test stand installation at the base site can alleviate the requirement for a silencer; with sufficient separation (distance) the silencer could be eliminated.

A typical engine testing installation is illustrated in Figure 8-12 and overall sound pressure levels for a 150-ft. radius is given in Figure 8-13.

MAINTAINABILITY (5.3.7.5)

The maintenance and inspection features designed into the GL 207-45 enable the operator to perform all required functions with a minimum of special tools, test facilities and other support equipment. Aircraft down time and the special skills required are reduced to a minimum. Special attention and effort was given the fact that this aircraft, under emergency conditions, may be expected to operate in areas where virtually no support facilities are available.

The basic simplicity and attention to detail design in the GL 207-45 makes it adaptable to almost any maintenance program. Further maintenance requirements fall well within the capabilities and skill levels of the organizational and field maintenance personnel presently available to the USAF. This characteristic is enhanced by the use of a large number of items already under procurement by the USAF (AERNO and AN) with which maintenance personnel are already generally familiar.

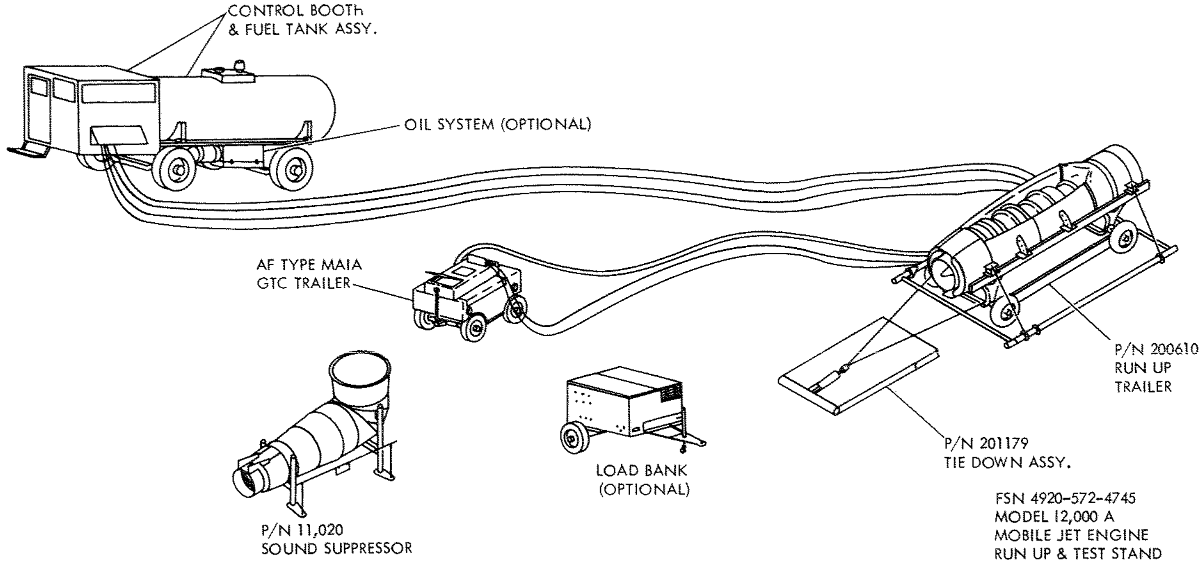


Figure 8-12—ENGINE TEST EQUIPMENT.

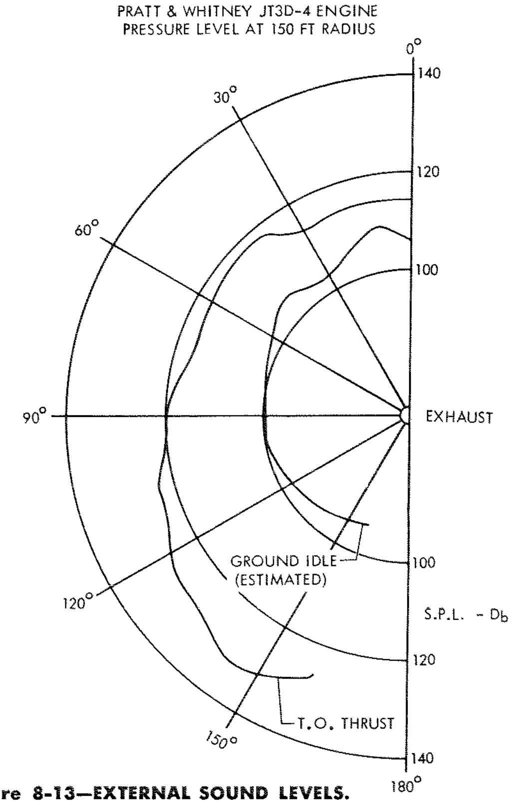


Figure 8-13—EXTERNAL SOUND LEVELS.

As a basic design concept, it is recognized that periodically during the life of the airplane, every area and structural component must be carefully examined and inspected. As a design goal, blind or inaccessible areas are held to an absolute minimum. The following paragraphs present specific examples of the maintainability features of this aircraft.

Fuselage

Numerous access doors and openings are strategically located throughout the fuselage, as shown in Figure 8-3, to provide the accessibility required to inspect, service and maintain the structure and all installed components. Access doors are all placarded or identified to denote the equipment or component located in the respective areas.

Each area of the fuselage has been subjected to careful analysis to determine the size of openings required to properly perform the maintenance functions normally anticipated. It is not necessary to disassemble any component in order for it to pass through its identified access opening.

The radome nose, at the forward extremity of the fuselage, is hinged at the upper edge and is readily opened for radar installation access. A jury strut with safety-pin is provided to hold the radome in its open position during maintenance activities. Lifting hand holes are incorporated in the radome to facilitate removal.

The forward nose-wheel door is quickly detachable from its actuating linkage to provide easy access to the well area.

The doorway into the flight station is sized to permit removal of any crew seat without disassembly of the seat.

Unstressed, readily removable flight station floor panels provide access to controls mechanisms and other equipment installed in the area.

The crew entrance door, with integral steps, is manually opened, closed and latched to eliminate complex mechanisms. This simplicity significantly reduces the maintenance required.

Fuselage cargo-compartment personnel-escape hatches, two located on each side of fuselage, are identical in design and are interchangeable, thereby effecting a reduction in spares inventory. The two windows for viewing engines, located in the forward side cargo door and the one window in the fuselage right side are also designed to be interchangeable between positions. The overhead escape hatches, one in the flight station and one aft of the wing, are designed for individual interchangeability only, due to contour differences; however, each design is identical with the C-130 installation, trouble-free units proven by thousands of flight hours. The small windows in each paratroop door are completely interchangeable.

Cargo compartment floor panels, of conventional all-metal construction, are interchangeable to facilitate quick replacement if required.

The aft cargo ramp pressure door assembly is readily accessible for inspection, and the locking mechanism, located on the forward side of the door, is readily visible in-flight from the cargo compartment for latch security verification. The door pressure seal is installed on the door frame rather than the door, to minimize service damage.

Fuselage main structural joints such as production breaks, wing-to-fuselage attachments, and fuselage-to-empennage connection are located in open areas, offering ready access for inspection.

The top of the fuselage, along the center line, is provided with added auxiliary ribs to permit use by maintenance personnel as a walkway.

Wing

The basic wing design details are straightforward, and follow tried and proven C-130 concepts. Simplicity is emphasized to facilitate repairs and inspections and to minimize the time and manhour expenditures required to perform fuel tank maintenance functions. Removable doors, located in the wing lower surface, provide complete access to the integral fuel tanks for maintenance of tank sealants and for structural inspections or repairs. These doors provide a distinct maintenance advantage, in that personnel may stand and work in an upright position while the unopened wing upper surface provides protection against inclement weather with no need for auxiliary protective covers or shelters.

Wing fillets are attached with screws and nut plates to facilitate removal. Access to components in fillet areas is provided by appropriately-sized doors secured with quick-opening fasteners.

Small access doors, screw-attached, are located in the wing upper surface to facilitate service replacements of fuel pumps and fuel-level probes without the need for completely draining fuel. Additionally, fuel system control valves, located on the wing rear beam, are designed to permit actuator motor replacement without draining fuel. Access to wing leading edge structure and system installations is provided through hinged leading edge assemblies. Also, small access doors are located adjacent to principal system components in the area for routine inspection, servicing or component replacement.

Structure, components, and systems installed on the wing rear beam are accessible when flaps are lowered; strategically located doors to components and structure provide access not available with lowered flaps.

Wing jack-pad locations are arranged to eliminate possible interference between jacks and other essential maintenance activities, including removal of fairing, doors or components.

Empennage

The empennage structural arrangement is shown in Figure 8-14. Simplicity, accessibility and interchangeability were emphasized in the design to minimize maintenance operations required to inspect, test and replace the structure and related control components.

The empennage design incorporates a unique feature that enhances the maintainability of this portion of the aircraft. Size and overall configuration allow the use of the basic internal structure of the vertical fin as a maintenance access ladder. Figure 8-15 illustrates the conveniencies and utilization of this design. Use of this ladder provides ready access for the entire interior of the vertical fin structure as well as systems and components located therein. Additionally, access to the area between the vertical fin and the horizontal stabilizer, and components therein, is provided. Quickly-removable doors provide egress from the interior to the top surface of the horizontal stabilizer, thereby enabling inspections and component replacements without the need for large work stands or ladders. This entire arrangement provides a valuable facility during maintenance activities, especially at advanced bases where minimum support equipment may be anticipated. Provisions for the use of safety belts and personnel-restraining safety cables or straps are included. Simple, light, handling and lifting devices are designed to enable the maximum maintenance activity without the need for large complex support equipment.

Operable control surfaces of the empennage are designed for interchangeability. Properly located access doors enable routine inspections, adjustments and replacement of control components.

Fairing, fillets and radome bullet are designed for ready removal and, where size is a factor, provisions are made for hoist attachments.

Electrically-heated empennage leading edges are sectionalized to facilitate ease of handling. Electrical connections to heating elements are acces-

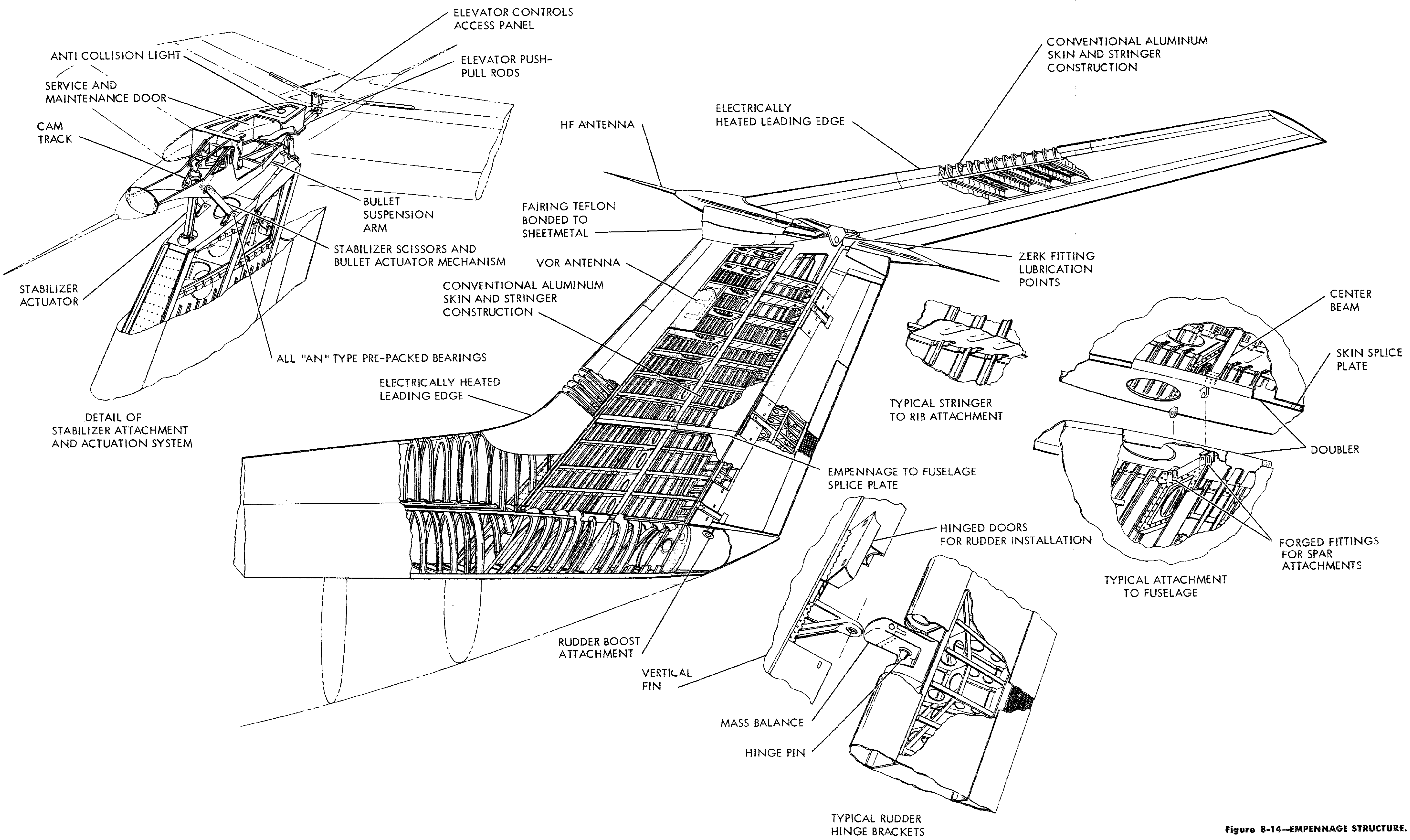


Figure 8-14—EMPENNAGE STRUCTURE.

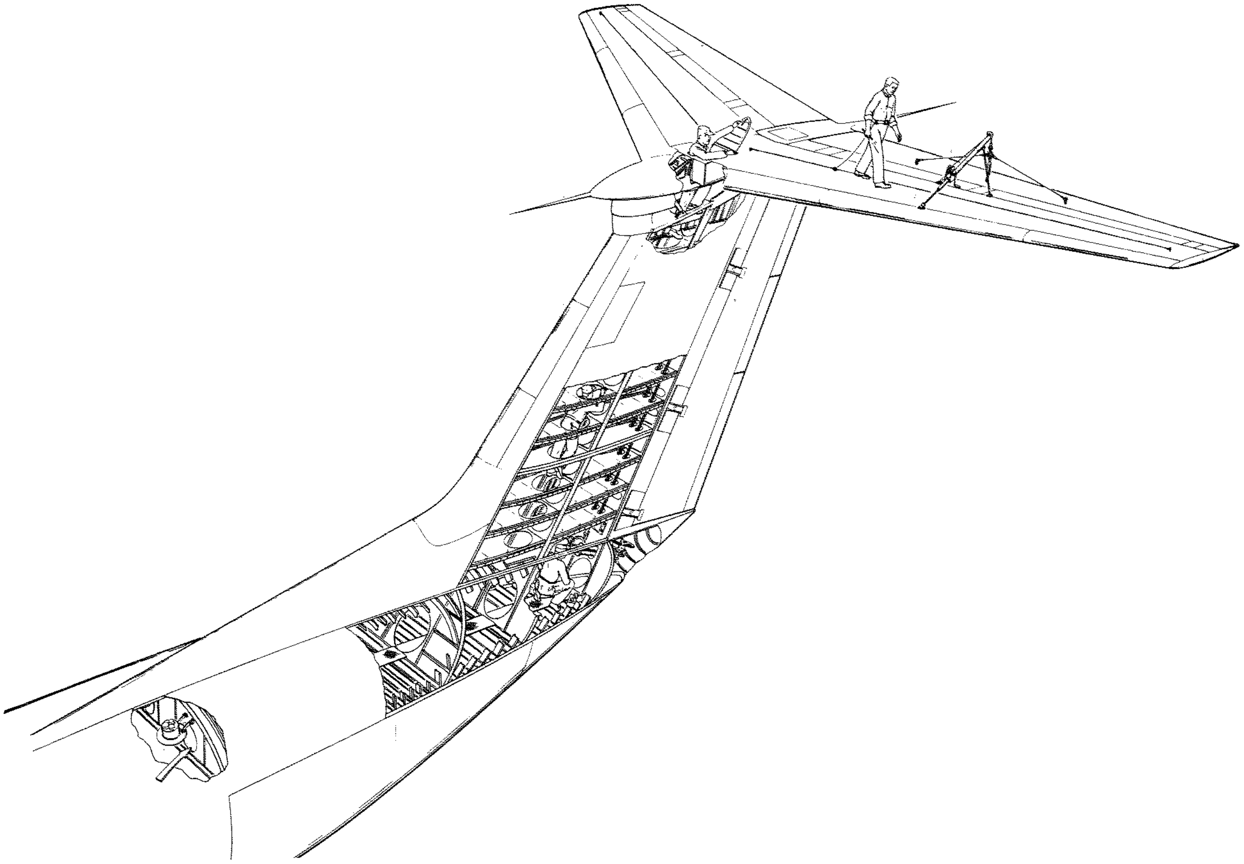


Figure 8-15—MAINTENANCE SUPPORT EQUIPMENT.

sible from the interior of the vertical fin or through small doors on the upper surface of the leading edge of the horizontal stabilizer.

Rudder hinge fittings, elevator control rods and related mechanisms are arranged for inspection-access from within vertical fin. Elevator and rudder boost assemblies, located at the lower extremity of the vertical fin, are readily accessible for inspection service and adjustment.

Structural connection between the vertical fin and the fusealge is open and readily accessible for inspection.

Landing Gear System

The nose and main landing gear are of conventional design and incorporate many features which simplify and minimize the maintenance and support requirements. The landing gear can be manually released from the up position and will free-fall to the down and locked position. This eliminates the need for an emergency extension system with the attendant maintenance requirements.

The inspection and servicing requirements of the landing gear can be accomplished in a minimum of time. The interior of the wheel well areas are painted white, and lights are provided to facilitate maintenance operations. Single, pin-type ground locks are provided for each gear and can be installed from ground level. Placards on the oleo struts provide immediate reference to strut servicing information ("O" rings, pressure, type fluid, etc.).

The four-wheel truck-type main landing gear incorporates wheels and brakes that are interchangeable in all positions. Brake and truck stabilizer links are above the main truck beam to minimize damage during ground maneuvering and to provide maximum clearance and accessibility to the jack pads. Jack points are provided at the fore and aft ends of the truck beam which permit individual wheel and brake changes without jacking the complete airplane. The main wheel axles, which are replaceable and interchangeable between all positions, incorporate internal threads for wheel retention which minimizes possible thread damage during wheel changes. The main landing gear doors, as shown in Figure 8-16, are mechanically actuated by gear movement, and have quick-release and hold-open provisions to provide optimum maintenance access and facilitate wheel and brake changes. The main landing gear incorporates a positive mechanical down-lock indicator which can be seen in flight through

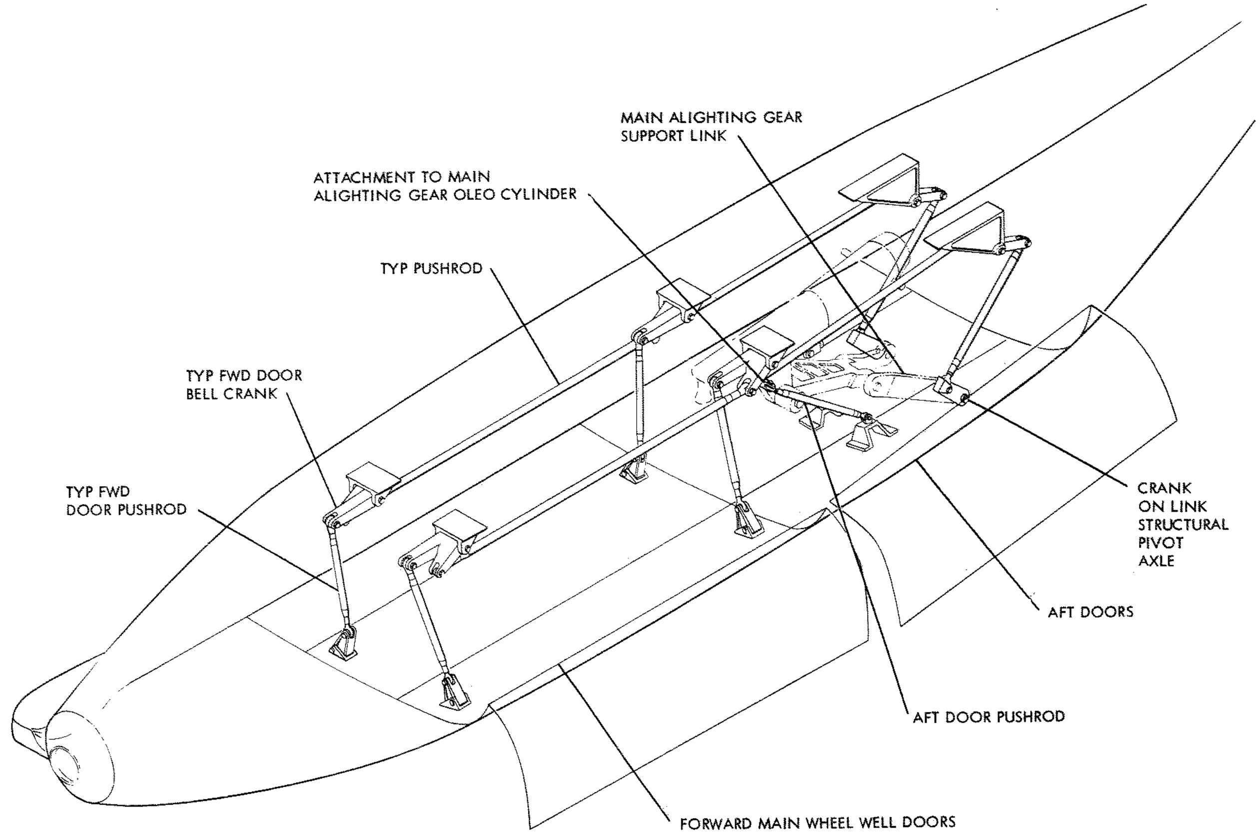


Figure 8-16—MAIN LANDING GEAR DOOR MECHANISM.

small windows provided in the cargo compartment. This mechanical indication also provides an additional safeguard to maintenance presonnel prior to installing the ground locks. In addition to the squat switch, which electrically prevents actuation of the landing gear selector valve to the up position when the weight of the airplane is on the gear. The principal component parts of the main landing gear (oleo struts, actuators, links, etc.) are interchangeable left to right

The nose landing gear also incorporates a positive mechanical downlock indicator which can be seen in flight from the cockpit. This provides a visual indication to maintenance personnel that the gear is down and locked before they enter the wheel well area. The nose landing gear wheel well doors are mechanically actuated by landing gear movement. Quick-releases and hold-open provisions on the forward door provide optimum maintenance access. The nose landing gear torque arms have quick-disconnect attachments to allow free swivel when towing the airplane from the nose landing gear. When disconnected, the torque arms are positioned to preclude dragging or interference. Shear provisions, to prevent excessive loads on the nose landing gear installation during towing operations, are incorporated in the towbar and not on the gear itself. A jack pad is incorporated on the nose strut. The nose landing gear axle is replaceable and incorporates internal threads to minimize thread damage during wheel changes.

Both the main and nose landing gear struts have drain provisions. This allows draining the strut, removing the piston assembly, and replacing O-rings and back-up rings with minimum fluid spillage. O-rings and back-up rings may be replaced without removing the entire landing gear assembly. Isolation valves in the hydraulic system prevent inadvertent landing gear operation when maintenance personnel are working on these units. These isolation valves also permit individual gear retraction checks without interrupting maintenance operations in the other wheel well areas.

To simplify lubrication of the landing gear, the MS15001 fitting is used exclusively, and only one lubricant type is specified. This eliminates the need for different adapters and lubricants and minimizes the possibility of overlooking a lubrication point.

Routine service of the landing gear and removal and installation of the individual gears can be accomplished with standard hand tools. Combination storage, transport, and installation carts for the nose and main landing gear assemblies, and wheel transport and change dollies are the only special support equipment required.

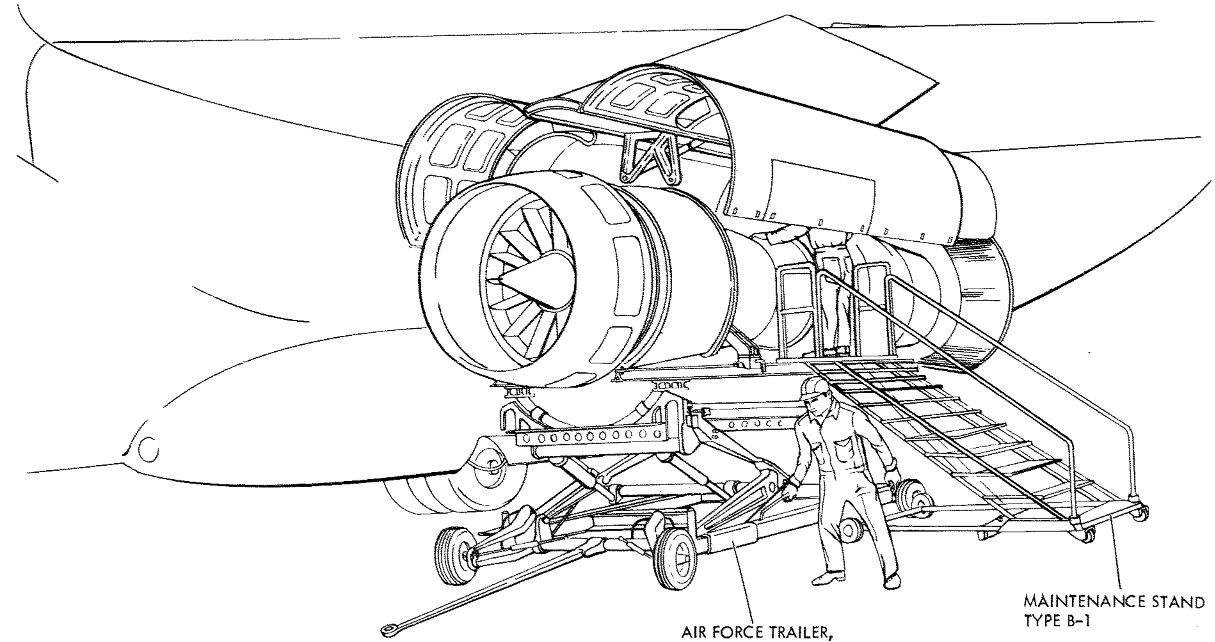


Figure 8-17—ENGINE REPLACEMENT—FIXED BASE EQUIPMENT.

Propulsion System

Power Plant

The power plant installation reflects the extensive considerations given to maintainability. Ease in performance of routine inspections and the repairability of the power plant assembly is assured by 3 adequate access and inspection provisions. The serviceability requirements, essential to engine replacement capability by 2 technicians in 1 hour, are provided in the detail design of the installation.

As shown in Figure 8-17, only standard ground support equipment normally found at base level maintenance organizations is required for engine changes. To facilitate engine changes at advanced bases, where only minimum support equipment may be available, a portable, electrically-powered hoist, shown in Figure 8-18, has been developed. Electric power for this hoist is obtained from the aircraft AC electrical system which is energized by the aircraft Auxiliary Power Unit.

Each engine assembly, including accessories, equipment, plumbing and electrical harnesses, is completely interchangeable from one position to another. Mounting pads and lugs are located on the engine to accommodate attachment to ground support equipment during engine changes. Engine installation disconnect points and engine attachment torque values are placarded to facilitate rapid engine replacement. Engine mounts are designed with alignment provisions to assist in engine installation.

Clam shell cowling doors, shown in Figure 8-19, provide full accessibility to the engine during maintenance activities. These doors are hinged from the pylon structure and includes quick-opening hook-tension latches that secure the doors to each other in the closed position. All latches are so arranged that a visual inspection from the ground can readily determine their security.

Fore and aft support rods hold the clam shell doors open during engine maintenance and are securely stowed when the doors are closed. Fire fighting, push-in access doors, held in place with spring clips, are located in each L/H side door, fore and aft of the engine firewall. Hinged, quick-opening doors are provided to the engine oil tank filler and the fuel filter drain valve. Means are provided on the oil tank cap access door to assure proper installation of the cap. A small door is provided through which a fuel control remote-trimming adapter may be attached. An adequate number of access doors are provided on the pylon for inspection of, and access to, internal structure, attachment fittings, ducts, fluid lines and electrical harnesses.

The oil system is comprised of the following components: oil tank, fuel-oil cooler, air-oil cooler, pressure transmitter, temperature bulb and oil tank low-level warning switch. All components are installed to provide ease of replacement. The oil tank dipstick is an integral part of the filler cap. The engine oil filter incorporates a drain port to facilitate draining prior to filter element removal for cleaning or replacement.

Anti-icing for the nose cowling inlet lip and throat is supplied from the engine compressor bleed pneumatic supply duct, through a motor-operated

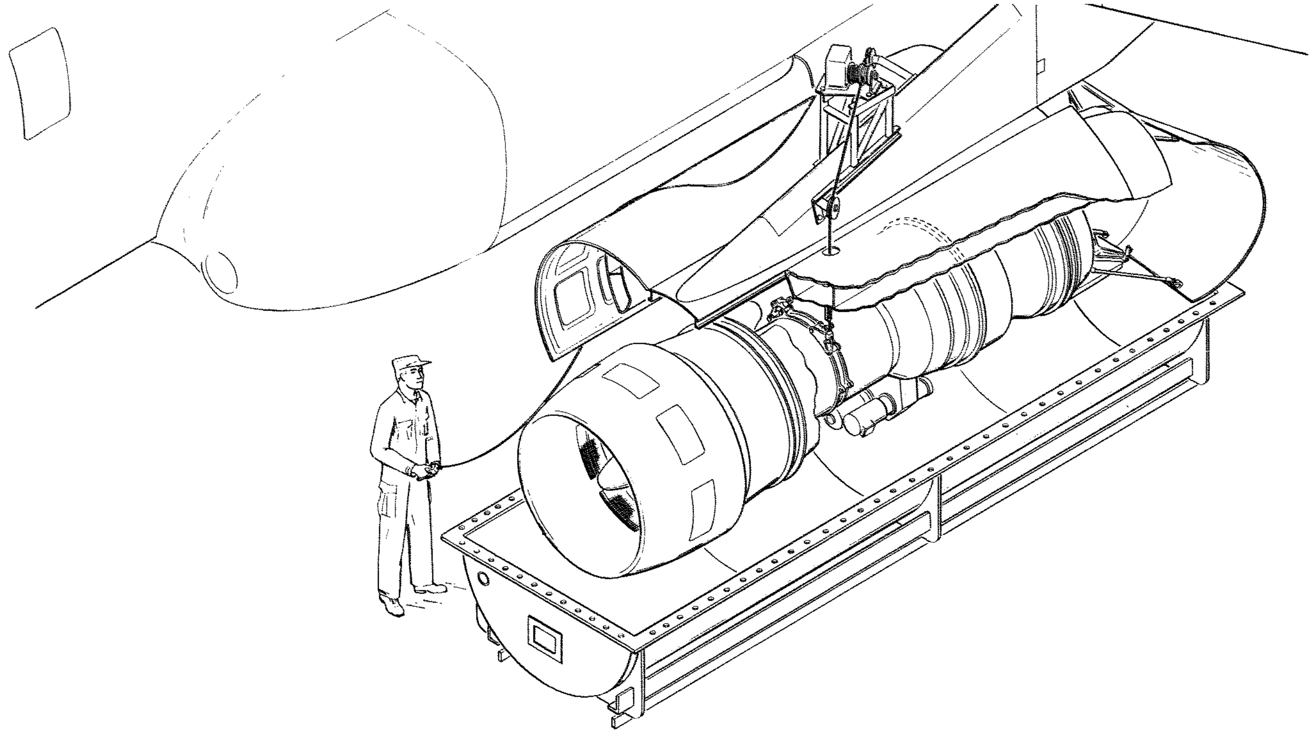


Figure 8-18—ENGINE REPLACEMENT—ADVANCED BASE EQUIPMENT.

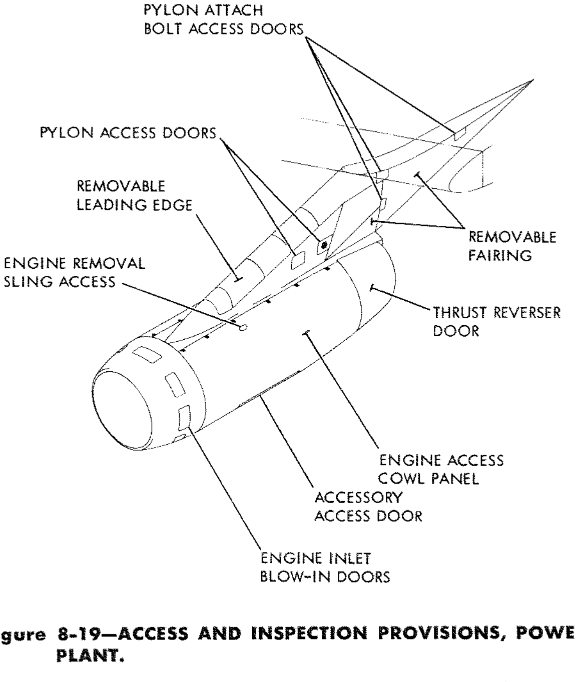


Figure 8-19—ACCESS AND INSPECTION PROVISIONS, POWER PLANT.

shut-off valve. This valve is located in the forward top section of the engine compartment and is accessible through the clam shell doors. An anti-icing system for the engine inlet bullet and guide vanes is provided as a part of the basic engine; components are accessible for easy replacement.

Fluid lines and electrical leads which must be disconnected for engine replacement are grouped and terminated at disconnect panels attached to the fixed pylon. Access to these disconnects is through quick-opening panels. Fluid connections are isolated from electrical disconnects. Quick-disconnect, self-sealing couplings are mounted in the hydraulic pump lines and are located on the engine disconnect panel.

All engine accessories are replaceable with the engine installed as shown in Figure 8-20. Quick-attach-detach couplings are furnished on the constant speed drive (CSD) and starter mounting flanges for rapid replacement capability. Both the CSD unit and the starter have self-contained oil reserviors and require the same type oil (MIL-L-7808) as the engine lubrication system.

Removal of the engine assembly from the pod does not disturb the engine control rigging in the aircraft. To expedite rigging procedure, rig pin holes are located in the engine control mechanism.

Thrust reverser doors, actuating linkage and actuators are replaceable as individual units with the engine installed. Two ground service connections, mounted in the thrust reverser hydraulic system, provide a means of checking the actuation of the thrust reverser with a hydraulic test stand without running the engines. A magnetic chip detector is mounted in the thrust reverser oil system filter. Contamination of the system by ferrous material may be detected by checking continuity across the poles of the detector.

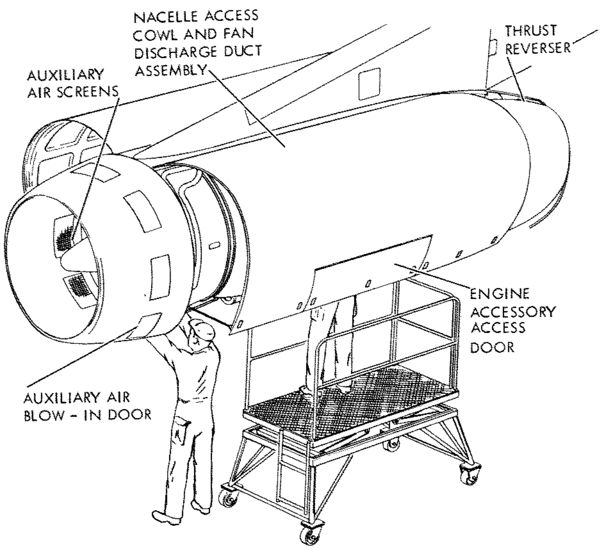


Figure 8-20—ENGINE ACCESSIBILITY.

Auxiliary Power Unit

The Auxiliary Power Unit, which supplies electrical and pneumatic power to the aircraft systems, is mounted in the aft section of the left main landing gear fairing. This installation is illustrated in Figure 8-21. Two clam shell doors provide complete access for inspection, service and replacement of the assembly. Removal is accomplished by lowering the assembly straight down through the opening provided by the clam shell doors. Either a single point cable hoist with its cable passing through an access door on top of the fairing, or a simple adjustable dolly may be used for unit replacement. A small access door has been provided for checking and servicing the oil reservoir.

Fuel System

Basic maintenance considerations in the design and installation of the fuel system provide for the replaceability and serviceability of components without draining fuel or entering fuel tanks. As illustrated in Figure 8-22, system simplicity is provided by using a common fuel line for the crossfeed, jettisioning and refueling system. With the exception of a short section of refueling line, all plumbing is contained within the tanks.

Access doors into the fuel tanks on the lower surface of the wing are sized for adequate access with a minimum number of fasteners, and provide complete accessibility to sealed areas for inspection and repair. Both the door seal and dome nuts are installed on the door to facilitate bench replacement of seals and sealant. Each access door is installed with screws of equal length to preclude damage to dome nuts by improperly locating screws of different lengths.

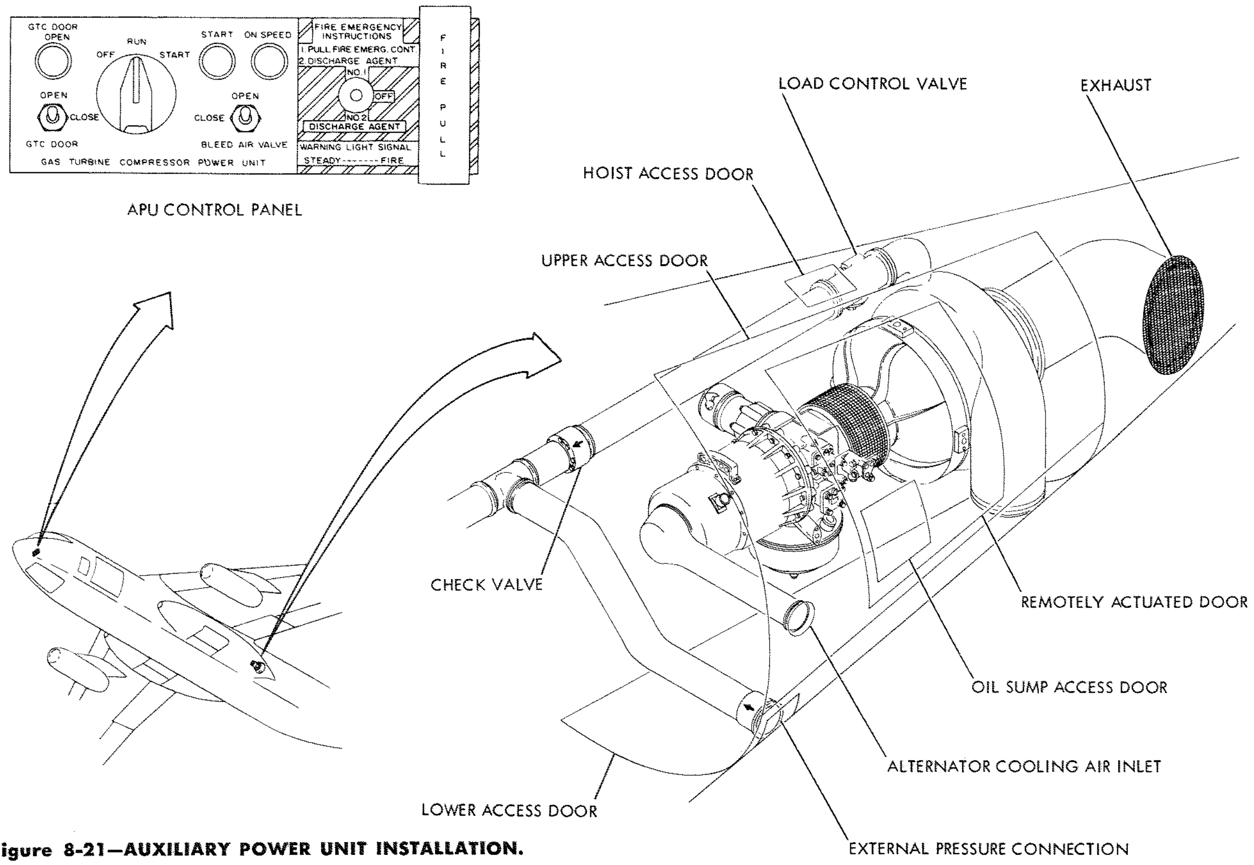


Figure 8-21—AUXILIARY POWER UNIT INSTALLATION.

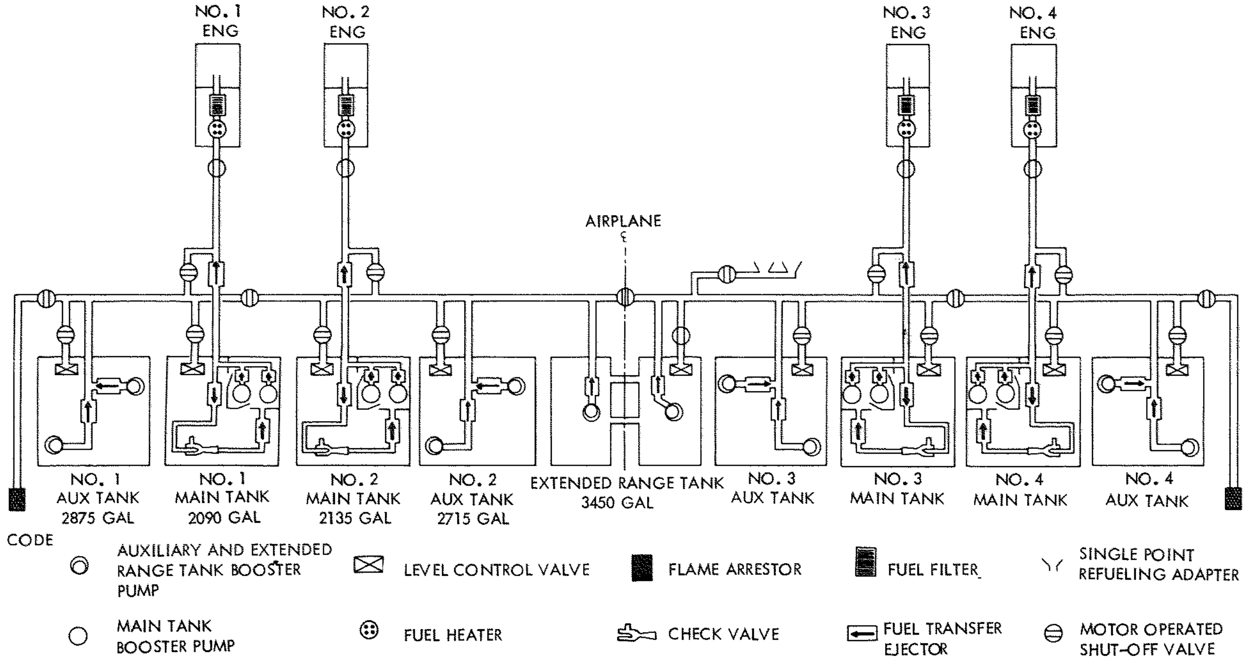


Figure 8-22—FUEL SYSTEM DIAGRAM.

Over-wing filler caps are provided for each tank and are sized to accept a standard two-inch refueling nozzle. The cap and flange assembly, retained by screws, is easily replaceable. Static ground receptacles are provided at each filler cap for grounding the refueling hose and nozzle.

Fuel system crossfeed valves, fuel level control valves and jettison valves are mounted through the wing aft beam with access gained by simply lowering the flaps; no access panels require removal. The motor and gate assembly of the crossfeed and jettison valves may be replaced as a unit, or separately, without draining the tanks. A position indicator is provided on each valve as an aid in troubleshooting; this indicator may also be used to manually operate the valve during maintenance activities. All fuel system components are placarded with name and function to aid maintenance personnel.

Access to the fuel booster pumps and scavenger pumps is gained through access plates in the wing top surface. The pump scroll case is mounted to the tank lower surface structure; the motor and pump assembly being connected thereto by a bayonet-type receptacle. To replace a motor and pump assembly, the access plate is removed, the electrical leads disconnected, and the assembly removed with the use of a simple hand tool without the need for draining fuel.

The fuel gaging system is a capacitance-type using characterized probes in the tanks. Provisions are made for adjusting the electrical circuit for range and calibration of the indicators. The adjustments are of sufficient range to compensate for manufacturing tolerance in the system and in the fuel tanks, and provide a sensitivity such that adjustments can be easily accomplished under service conditions. The tank probes, which are screw-mounted through the top surface of the wing, have disconnect plugs and receptacles and may be replaced without special tools or fuel drainage.

All fuel-carrying lines that are contained within the fuel tanks are fabricated from aluminum alloy. Fuel lines within the pylon and nacelles are either corrosion-resistant steel tubing or fireproof, flexible hose assemblies. There are no quick-disconnect fittings associated with the fuel system.

Mechanically-operated drain valves are mounted in the wing lower skin. These valves will drain all fluid from the lowest parts of the tanks. The primary seal of the drain valves is replaceable without draining fuel from the tank.

A refueling control panel is located in the aft section of the R/H landing gear fairing, permitting tanks to be filled individually or simultaneously. This panel, accessible through a quick opening hinged door, contains fuel quantity repeater gauges, preset quantity selectors and precheck show-off controls. A service light is installed on the refueling panel. Two flush-mounted refueling adapters are located forward of the refueling panel. Interphone connections are provided for communication during maintenance activities.

Defueling is accomplished through one or both of the pressure refueling adapters. The defueling operation is controlled from both the systems engineer's fuel management panel and the ground refueling control panel.

The design of the vent system does not utilize components requiring moving parts. The system consists of tubing, sump boxes and sump box ejectors. The ejectors are operated by fuel flow bypassed from the main tank booster pumps. By the use of this vent system arrangement, minimum maintenance is required and maximum reliability is obtained.

All identification and instruction placards are of a permanent type and mechanically attached wherever possible.

Fire Extinguishing, Fire Detection and Overheat Systems

The fire extinguishing system utilizes bromochloromethane (CB) as the extinguishing agent. The fire extinguishing agent containers are located in the forward section of the left main landing gear fairing. Access for replacement of containers and inspection of the installation is made through a large quick-opening access panel. A small, hand-opened door, at eye level, is provided for checking container pressure gages. All operating components are located in areas where ready-access if provided.

All lines, fittings, check valves and directional control valves are fabricated from corrosion-resistant steel. Directional control valves are provided with external position indicators to aid in system checks. Distribution lines in the engine pods are attached to nacelle structure and do not require disconnection during engine replacement.

A Pyrotector fire detector system is provided in Zone II of the powerplant installation. This system consists of 4 detectors in each nacelle, 1 control amplifier in each pylon, and related circuits for indication and testing. The detectors are mounted on the pylon structure to minimize engine build-up requirements. Access to the control amplifier is gained through a quick-opening access-panel in the forward section of the pylon. A complete functional test of the fire detection capabilities, as well as a continuity test of the detection system, is accomplished through a single cockpit test switch.

The combustion and turbine section (Zone II) of each nacelle is provided with a thermal-switch-detector type of overheat warning system. Eight detectors and associated wiring in each nacelle are mounted to structure to minimize engine build-up requirements. A test switch on the nacelle overheat warning panel provides an operational check at the warning lights and a continuity check of all four warning circuits.

Wiring, vulnerable to damage during normal service, is routed through corrosion-resistant steel conduits. Fire detection and overheat electrical circuits are isolated at disconnect points to facilitate system checkout.

Control System

Primary Flight Controls

The arrangement of the primary flight controls is shown in Figure 8-23. The floor panels, center console side panels and side trim panels in the flight station are readily removable for maintenance, inspection and rigging of the control system cables and components. A door at the top of the nose wheel well area provides additional access to the control mechanism beneath the flight station floor.

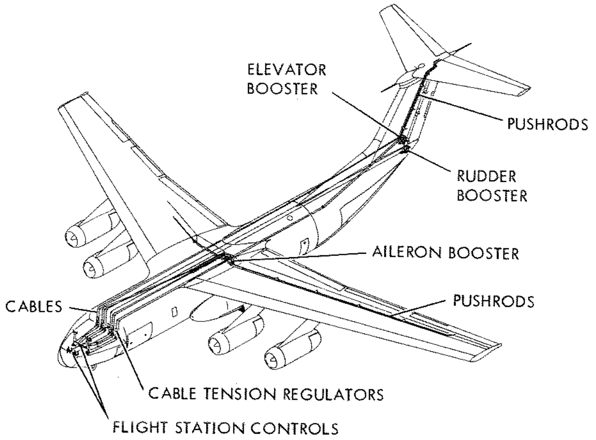


Figure 8-23—FLIGHT CONTROLS—PRIMARY.

Cable turnbuckles and cable-tension regulators are located on the FS 445 bulkhead, and are accessible through access panels on the aft side of the bulkhead.

The use of cable tension regulators makes possible the utilization of lower cable tension values, resulting in reduced cable friction, wear, and maintenance.

Rigging of the control systems is simplified by provisions for the use of rig pins. The cables in each control loop vary in length to preclude the possibility of crossing cables during maintenance operations. All fairleads, turnbuckles, pulley brackets and quadrants are accessible for inspection and maintenance.

The dual elevator boost unit is located in the torque box section of the extreme aft end of the fuselage. Access for maintenance or replacement is provided through the fuselage torque box. This access is readily available on the ground and may be used in the air during unpressurized flight.

The dual rudder booster assembly is attached by bolted flanges directly to the base of the rudder torque tube and is located aft of and below the level of the elevator booster. With this installation arrangement the access available for the elevator booster may also be utilized for the rudder booster. Additionally, rudder-boost access is available by removing the fuselage tail cone or through a large removable door in the tail cone. Any service, maintenance or unit replacements may readily be performed by utilizing the selective access provided, depending on support facilities available.

The tandem aileron booster unit, installed on the aft side of the rear beam of the wing center section, is completely visible and maintainable from the cargo compartment.

The aileron control rods and linkeage from the boost control unit to the ailerons are readily accessible through doors provided in the wing trailing edge lower surface.

The booster filters, actuators and shut-off and control valves are interconnected through a manifold, thereby greatly reducing the number of seals required, and the possibility of leaks. Ported trunnions are utilized to connect the actuators to the manifold, thereby eliminating the need for flexible hose connections. The use of trunnions in this configuration has proven very satisfactory in the C-130B aircraft with thousands of operating hours. Snubbing devices provided in the booster cylinders reduce shock loads from wind gusts on the control surfaces, thereby eliminating the need for a separate gust-lock system with its additional maintenance problems.

The push-pull rods from the booster to the elevator bellcrank are of one-piece construction, supported at idler arms by trunnion fittings, thereby reducing the number of bearings and enhancing the maintainability. The push rods are easily removable through the opening provided by the aft cargo door. Access to the elevator push rods and components is provided by a ladder incorporated inside the vertical stabilizer.

This built-in ladder also provides ready access to the pitch trim actuator and other components in the vertical fin, and access to the top of the horizontal stabilizer for routine maintenance inspection and component replacement, thereby reducing the need for large work stands.

Secondary Flight Controls

Cable-operated trim tab controls, designed for the aileron and rudder, are similar to those utilized on other Lockheed aircraft which are currently providing long and trouble-free service. A minimum of maintenance is required for these proven components. Access doors are provided for inspection and replacement of the tab mechanisms.

The pitch trim actuator is accessible through doors provided in the vertical stabilizer, and from the ladder installed inside the vertical stabilizer. An adjustable support is provided to retain the horizontal stabilizer when removing or installing the pitch trim actuator.

Wing flaps, 3 on each wing trailing edge, are designed for ready repair or replacement. The flap motor and gear box mounted on the aft side of the wing center section rear beam is readily accessible from the cargo compartment. Flap actuators are ball-screw type, similar to the proven C-130B actuators, and are readily accessible for rigging and maintenance. The emergency manual flap extension system utilizes a majority of the components installed in the C-130B aircraft system. The use of these flight-tested and proven systems and components enhances the maintainability. Wing flap asymmetry switches are accessible for rigging and maintenance with the flaps retracted or extended.

The spoilers on the top trailing edge of the wing are two position, full open or full closed. The actuating mechanism is accessible when the flaps are in the down position.

Hoisting provisions for the primary and secondary control surfaces are shown in Figure 8-10. Simple, conventional-type cable slings are utilized. A hand-portable "A"-frame with manually-operated hoist is provided for removing and installing the elevators, the pitch trim actuator and the forward and aft bullet fairing at horizontal-vertical stabilizer intersection. The hoist, consisting of three basic parts, can be readily disassembled; the heaviest part weighs approximately 30 pounds and may easily be carried up the access ladder in the vertical fin. Mounting points are provided for attaching the hoist at various places on the top of the horizontal stabilizer.

The rudder hoist assembly is designed for utilization when minimum ground support facilities are available.

Automatic Flight Control System (AFCS)

The majority of the components utilized in the AFCS are similar or identical to components presently installed on contemporary aircraft. This feature enhances maintenance and overhaul of system components since developed skills of maintenance personnel can be directly applied.

The AFCS controller installed in the crew compartment utilizes electrical quick-disconnect plugs and quick-disconnect fasteners for ease of removal and replacement.

The AFCS servo units are identical and interchangeable, thereby simplifying maintenance and reducing the spares requirements. Ground test connections are provided in readily accessible areas for complete testing of the installed system and immediate detection of any malfunctioning components.

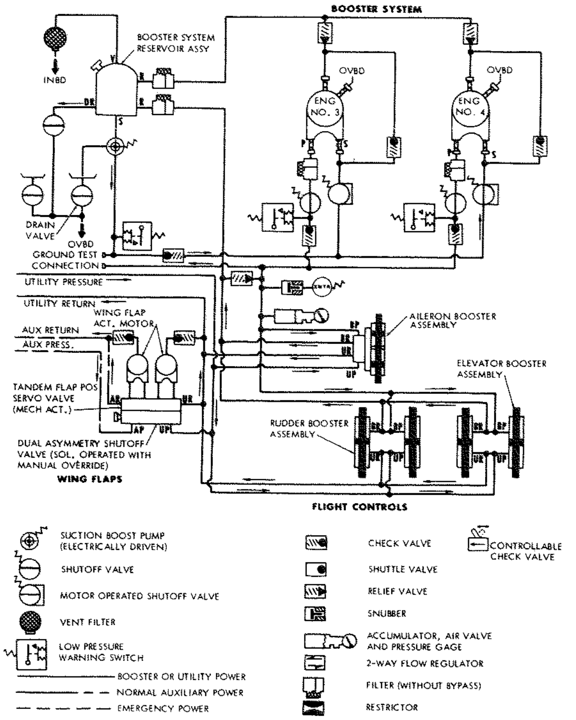
Any component of the AFCS system can be replaced without affecting auto-pilot operation or stability, providing the replacement unit is of identical part number.

Hydraulic System

The hydraulic system is designed for simplicity, versatility and ease of maintenance. As shown schematically in Figure 8-24, the booster and utility systems, powered by engine-driven hydraulic pumps, are completely isolated, eliminating the possibility of one system contaminating the other. The booster system's sole function is to provide power to the primary flight controls, and isolation from the utility system is accomplished by system and component design. The utility system supplies power for landing gear actuation, nose landing gear steering, main landing gear wheel brakes, and wing flap and spoiler actuation. In addition, the utility system supplies another source of power for the primary flight control system. The auxiliary system, powered by two electrically-driven hydraulic pumps, supplies power for the aft ramp and cargo door operation, wing flap and spoiler actuation and emergency brakes. A hand pump is provided for emergency or power-off operation of the auxiliary system. The forward cargo door hydraulic system is completely hand-pump-operated and supplies power solely for actuation of the forward cargo door.

All reservoirs are located in the cargo compartment on the L/H side of the fuselage and are accessible in flight for inspection and servicing. Each reservoir has a sight gage and is permanently placarded as to type fluid and filling instructions. The utility, booster, and auxiliary system reservoirs are interchangeable in any of the three locations.

Non-bypass type filters are installed in the reservoir return lines and in the hydraulic pump pressure lines. These filters incorporate external indicators which means the filter elements can be changed on an as-required basis. This eliminates needless changes on a time basis and provides early warning of impending discrepancies. These filters are installed so that the elements can be changed with a minimum amount of fluid spillage.



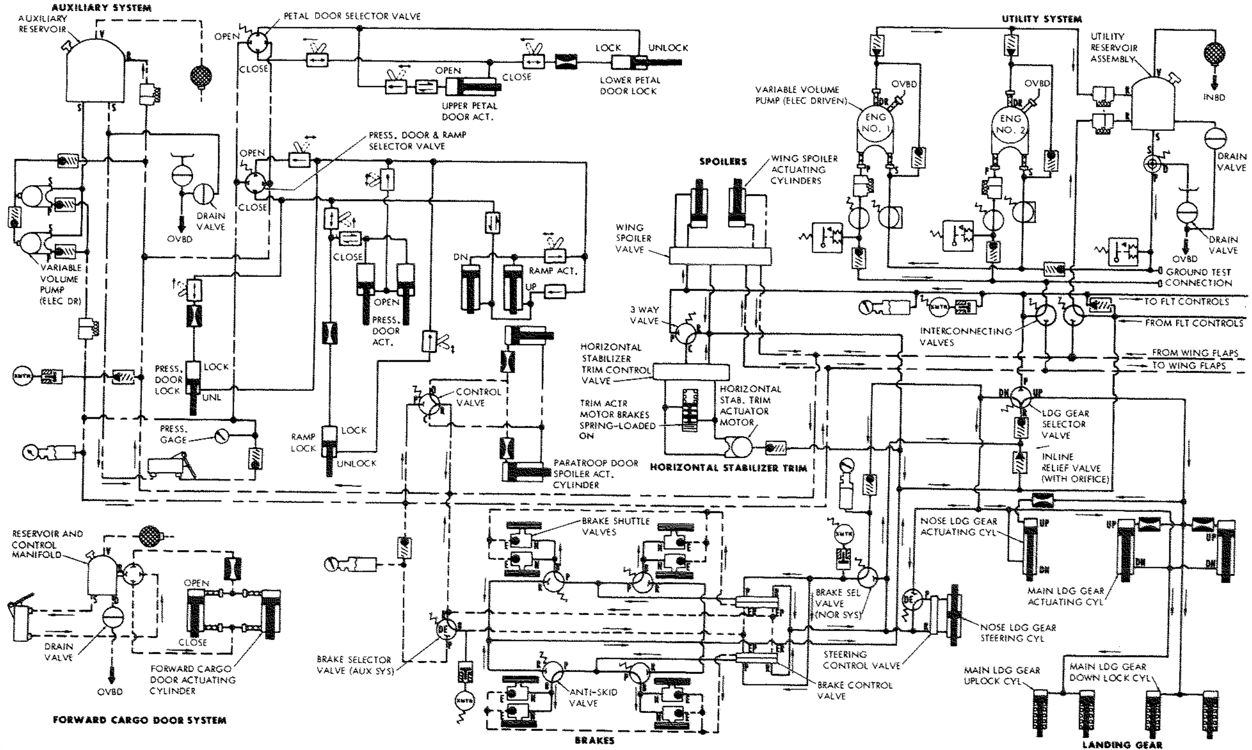


Figure 8-24—HYDRAULIC POWER SYSTEM—SCHEMATIC.

All components are installed to be readily accessible for inspection and replacement without disturbing other components. Bleeding of the system after a component change can be accomplished by actuation of the subsystem involved, except for the main landing gear brakes which incorporate bleed ports. However, self-sealing couplings are provided at the hydraulic line connections to the brakes which minimizes the required bleeding.

The hydraulic system incorporates a ground-operated interconnect valve which provides the electric driven pumps of the auxiliary system as a power source for ground operation and checkout of the utility system. With electrical power available from the aircraft's auxiliary power unit, the need is eliminated for any hydraulic or electrical ground carts for checking the utility and auxiliary system operation. External ground connections are also provided in the left main landing gear fairing for both the utility and booster systems.

The engine-driven pump installation incorporates a unique run-around system which provides a flow of oil through the pump when the pump supply and pressure line shut-off valves have been closed. This system allows continued operation of the engine without damage to the pump. The electrically-driven suction boost pump installed in the supply line below the utility and booster reservoirs provide a positive pressure to the engine-driven pumps on starting to prevent pump cavitation. The suction boost pumps are readily accessible for inspection and replacement and are interchangeable between utility and booster systems.

Accumulators are installed in the utility system, booster system, auxiliary system, normal brake system and emergency brake system. These accumulators are readily accessible for inspection and servicing and incorporate pressure gages and recharging valves. Permanent placards are installed at the accumulator locations to denote pressure requirements and recharging procedures.

Flareless (MS type) hydraulic fittings are used throughout the hydraulic system. Flareless fittings are used on the C-130B aircraft and have resulted in a noticeable decrease in leaks at fittings and connections when compared to the flared (AN type) hydraulic fittings as used on the C-130A aircraft.

There are no special service or support equipment requirements for the hydraulic system.

Electrical System

The electrical power system consists of 4 constant-speed AC generators, each supplying power to its load bus, with the 4 load buses connected through a tie bus for parallel operation. See Figure 8-25 for a perspective diagram of component location. The AC generators and constant-speed drive units (CSD) are mounted on each engine and are readily accessible through the engine clam shell doors. The electrical load and distribution center is located in the compartment bulkhead between the flight station and cargo compartment. Access to this junction box is provided from both the flight and cargo compartments through sliding access doors. Electrical control and transformer-rectifier units are mounted in racks beneath the flight compartment floor. The size and arrangement of this lighted area permits replacement of any component from aisles provided within the compartment.

1. WING TIP NAVIGATION LIGHT
2. FORMATION LIGHTS
3. LANDING LIGHT (NARROW BEAM)
4. RIGHT-TAXI LIGHT (NARROW BEAM)
5. ANTI COLLISION LIGHT (BOTTOM)
6. ANTI COLLISION LIGHT (TOP)
7. TAIL NAVIGATION LIGHT
8. AUXILIARY AC GENERATOR
9. TOP FUSELAGE LIGHT
10. CONSTANT SPEED DRIVE
11. AC GENERATOR
12. INBOARD LEADING EDGE LIGHTS (WIDE BEAM)
13. OUTBOARD LEADING EDGE LIGHTS (WIDE BEAM)
14. MAIN POWER JUNCTION BOX
15. LEFT-TAXI LIGHT (NARROW BEAM)
16. ELECTRICAL CONTROL PANEL (PART OF SYSTEM'S ENGINEER'S PANEL)
17. WING TIP AREA TAXI LIGHTS (WIDE BEAM)
18. BATTERY
19. BOTTOM FUSELAGE LIGHT
20. EXTERNAL ELECTRICAL POWER RECEPTACLE
21. GENERATOR VOLTAGE REGULATORS; GENERATOR CONTROL PANELS; TRANSFORMER RECTIFIERS

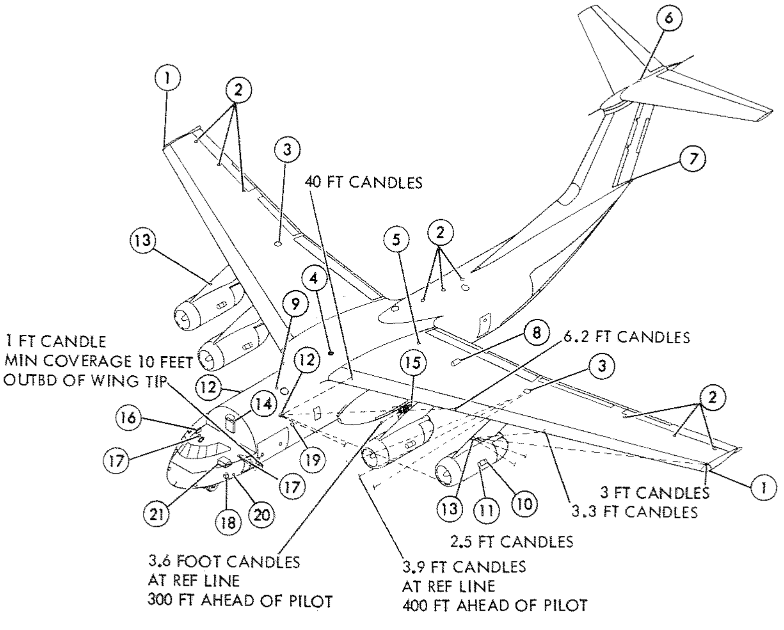


Figure 8-25—EXTERIOR LIGHTING AND ELECTRICAL COMPONENT LAYOUT.

An AC generator, interchangeable with the engine-mounted generators, is driven from a pad on the auxiliary power unit. This installation provides electrical power for ground-checkout of electrical systems and components without the use of an external power source. The auxiliary power unit starter draws its power from the 24-volt bus. This provides the capability of starting this unit using the battery.

The battery, mounted on sliding tracks, is located in a compartment on the lower left side of the nose section. This installation, accessible from the exterior of the aircraft, permits servicing from ground level without the need of stands or ladders. The external power receptacle is located on the left side of the nose section, just forward of the crew entrance door. Both the battery and the power receptacle are recessed and covered by quick-opening, hinged access doors.

An external power unit connected to the aircraft's external power receptable provides all necessary electrical power to check the aircraft systems.

Flow diagram control panels are utilized as an aid to flight and maintenance personnel in properly operating the electrical system. Circuit breakers, mounted in consoles in the flight compartment, are readily accessible to the flight crew and systems engineer. Circuit breaker consoles are provided with easily removable side panels.

Wire harnesses, to the degree possible, are designed to contain wires providing current for similar functions to facilitate troubleshooting. Electrical components and circuitry have single adjustments, wherever possible, avoiding the necessity for multiple-sequenced adjustment. All wiring and components of the electrical system are located to minimize malfunction and deterioration due to moisture. Sealing or draining of junction boxes and other equipment is provided as required.

Electrical connectors are held to a minimum and are generally used only in applications where frequent installations and removals are contemplated. Removable crimp-pin and socket-type electrical connectors are used wherever possible. These environmental connectors do not require potting or soldering. These connectors are basically an improved "E" type connector and will mate with an "E" type receptacle. This connector greatly facilitates maintenance rework or modification of the aircraft.

To facilitate inspection and maintenance activities, lights are provided in the following areas: wheel wells, junction boxes, air-conditioning, electronic and auxiliary power unit compartments.

Air Conditioning and Pressurization System

Air conditioning and pressurization in flight is accomplished with air extracted from the final compressor stage of all four power plants. Conditioned air is supplied from dual "simple" air cycle refrigeration units. Each air conditioning system also contains a primary heat exchanger to reduce the bleed-air temperature to 450 degrees F. The two air conditioning systems normally function in parallel, however, each system is capable of independent operation. Existing air cycle refrigeration units, temperature controls, valves and miscellaneous components can be used in the proposed system. Ground air conditioning is provided through this system by utilizing high-pressure air from the on-board auxiliary power unit. A ground-cart connection, in accordance with MS33562, is installed in the left main landing gear fairing if a ground source of conditioned air is required for extended time periods.

As shown on the schematic diagram, Figure 8-26, the L/H (flight station) and R/H (cargo com-

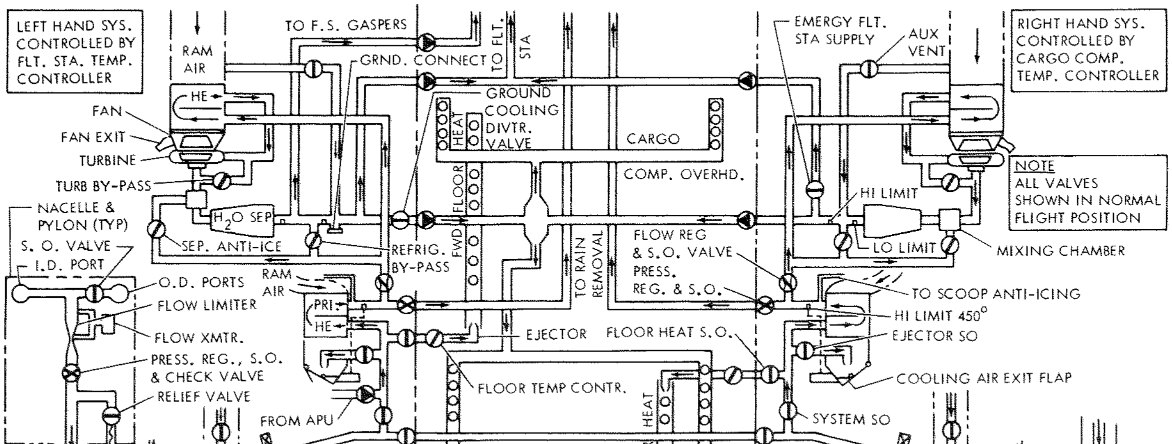


Figure 8-26—AIR CONDITIONING SYSTEM SCHEMATIC.

partment) air conditioning systems are practically mirror images. Interchangeability between left hand and right hand system components is accomplished through installation and equipment design. All major components such as heat exchangers, refrigeration packages, water separators, flow regulators, and control valves are interchangeable in their respective installations and between L/H and R/H installations. This interchangeability factor is applied to left and right hand duct assemblies in the forward section of the main landing gear fairing to the maximum extent possible. The bleed air system in the nacelle/pylon installations is designed to provide for interchangeability of the control components in any engine position. The bleed air pressure is limited to 70 psig immediately downstream of the compressor bleed ports. This low-pressure duct system is sectionalized to allow replacement of any individual duct section without interference from structure or components.

The air conditioning system service centers are located in the forward portion of the main landing gear fairings. The L/H system is controlled by the flight station temperature controller and the R/H system is controlled by the cargo compartment temperature controller. The longitudinal center line of the refrigeration package is approximately 5 ft. above the ground, which allows normal servicing and inspection of this area without the use of work stands. The location of these service areas allows concurrent maintenance of both the flight station and cargo compartment systems. The interiors of these service areas are painted white, and lights are provided.

The installation provides for replacement of any individual component of the air conditioning system without disturbing other components or ducts and conduits not connected to the unit being changed. The duct connections to components are readily accessible. To facilitate system checkout and troubleshooting, all directional control valves incorporate external position indicators. Adequate instrumentation is provided for detection of equipment malfunction and hot air duct leakage. The oil supply of the refrigeration package is the only item that will require routine servicing. Ground support equipment requirements are negligible.

Anti-icing of the ram air scoops and rain removal from flight deck windshields is accomplished with air taken downstream of the primary heat exchanger. The control valves for these subsystems are located in the air conditioning service areas and are readily accessible.

Access is provided for the temperature sensors of the underfloor heating system. These sensors and the distribution ducts are the only items of the air conditioning system located under the cargo compartment floor.

The electronic equipment cooling subsystem is shown schematically in Figure 8-27. The ground cooling fan, blow control venturi and shut-off valves, associated with the ARINC type cooling, are readily accessible in the electronics compartment. The cooling air fan, for the electronic equipment designed in accordance with Air Force Exhibit WCLN 58-18, is also readily accessible in the electronics compartment. The units of the electronic cooling subsystem are service proved-items, well within the state-of-the-art.

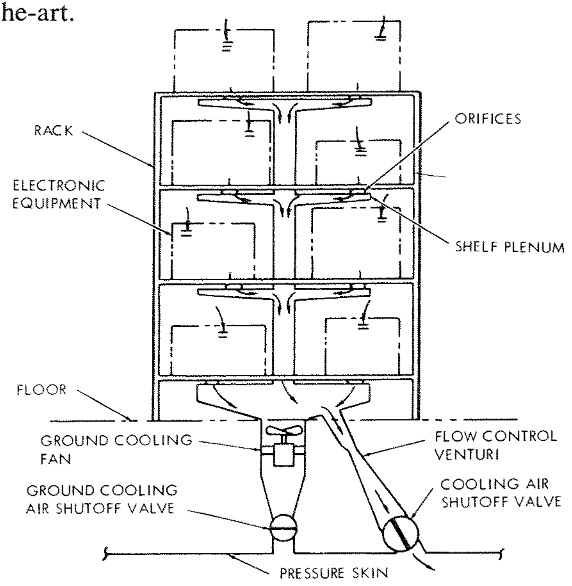


Figure 8-27—ELECTRIC EQUIPMENT COOLING SCHEMATIC.

The cabin pressure control system is shown schematically in Figure 8-28. This is a pneumatic control system comprised of valves and controls proven in service on both military and commercial airplanes. The number of items in the pressurization control system are held to a minimum and all units are readily accessible. The outflow-safety valves and two emergency-depressurization solenoid valves, in conjunction with the integral auxiliary the other control items are located at the systems engineer's station. Inspection of the filters in the outflow-safety valves and the manual controller is the only routine service requirement of the pressurization control system. Four manual shut-off valves are provided for ground testing the system. These valves, in conjunction with the integral auxiliary power unit, eliminate the requirements for extensive ground support equipment.

Anti-Icing—Wing

The wing anti-icing system for the GL 207-45 is illustrated in Figure 6-1. The system in each wing is divided into three sections; namely, inboard, midwing, and outboard. Controls are provided to simultaneously control the corresponding L/H and

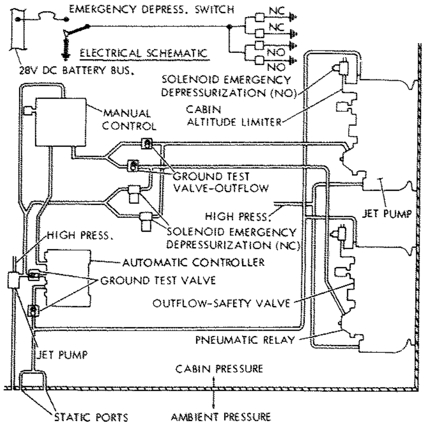


Figure 8-28—CABIN PRESSURE CONTROL SYSTEM SCHEMATIC.

R/H sections, thereby providing a valuable aid during troubleshooting activities. Indicator lights in the flight station show condition, by sections, when system is operating; indications include (1) cold section, (2) heat reaching section and (3) overheat condition exists in section. This design concept also provides a valuable maintenance aid.

A modulating valve controls the heat to each individual leading-edge section. An external indicator of valve position is incorporated in each valve as a further assistance in maintenance troubleshooting. Valves are attached to adjacent duct sections by means of V-band type clamps to facilitate quick removal. Quick detachments at modulating valves permit lowering of hinged leading-edge sections for ease of inspection of anti-icing manifolds, ducts, wiring and related leading edge and wing structure.

Wing isolation valves permit sectionalizing of distribution ducting for testing and troubleshooting. A supply duct, equipped with line check valve, enables use of APU air in the wing anti-icing system for monitored ground testing of the system.

Temperature sensors, thermostats and related wiring are accessible by lowering of the respective hinged sections; the overheat-warning sensor installation is designed to facilitate replacement of the sensor without lowering the leading edge.

Anti-Icing—Empennage

The empennage leading edges are equipped with an electric heat anti-icing system as illustrated in Figure 8-29. The heating elements, affixed to removable leading edge structure, utilize a metal exterior covering to resist the effects of rain, hail and normal service abuse. Basic design criteria for the elements follows an in-service concept and minimum maintenance is anticipated; small localized damaged areas may be repaired on the aircraft without removing leading edge sections.

Empennage leading edges, including heating elements, are sectionalized to provide single units of reasonable size which may be readily handled by two men. Respective sections are interchangeable to facilitate easy service replacements.

Grouped indicator lights are provided in the cockpit to assure element power application. A readily accessible cycling control unit is designed to accommodate ammeter test connections which verify continuity and heating element integrity (resistance).

Routine condition inspections of the anti-icing elements are conducted by external visual examination. Electrical connections to the heating elements on the vertical fin are accessible through openings in the fin forward beam which are reached from the unique vertical ladder provided as an integral part of the fin center beam. Electrical connection access for horizontal stabilizer elements is provided by small doors adjacent to the forward beam.

Oxygen System

A 25 liter liquid oxygen converter supply system is utilized for the flight crew. This system is shown schematically in Figure 7-11. The liquid oxygen converter is located in an unpressurized area on the right side of the nose wheel well.

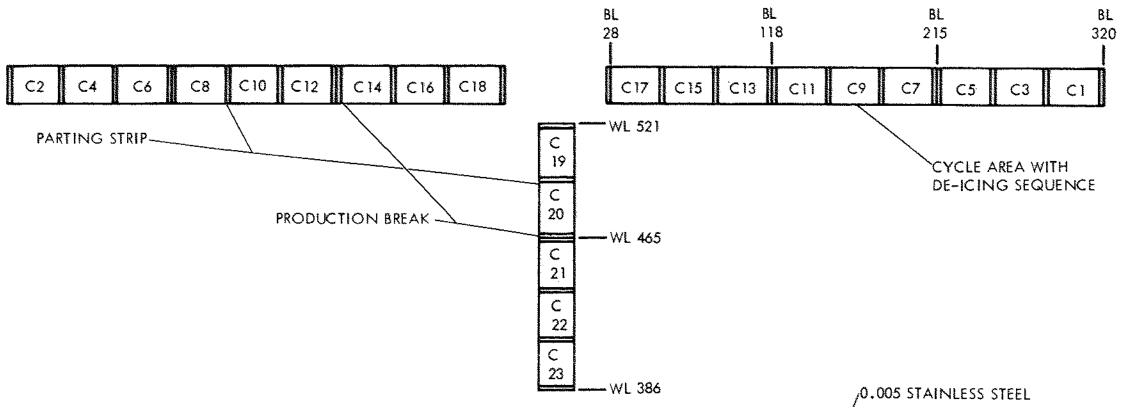
An externally accessible filler valve, recessed behind a quick-opening access door, is located on the lower right side of the nose section. A system drain valve is located on the panel with the filler valve. An overboard vent line is located approximately 30 in. aft of the filler valve. Double-check, quick-disconnect fittings are used on the converter and connecting flexible hose assemblies for ease and convenience of unit replacement. The warming coils, mounted in the electrical and electronics compartment, are readily accessible. Regulators and masks are located at each crew station. Four portable unit rechargers are located in the flight compartment.

The system is serviced by attaching a portable liquid oxygen dispenser to the filler valve and filling until liquid oxygen flows from the vent. An oxygen quantity indicator, visible to the flight crew, is mounted in the flight compartment.

All system components are USAF approved and qualified and are covered by existing technical orders and tool complements for USAF field-level maintenance.

Aluminum tubing, AN fittings and MS double-flared tubing ends are used in the oxygen system plumbing. The proven reliability of these fittings offers the advantage of maintaining this low pressure system in a leak-free condition.

A removable liquid oxygen converter supply system is provided for the troop and litter configurations. Liquid oxygen converters are easily installed in portable racks attached to the aft cargo ramp. Tubing, fittings and masks are readily installed by means of quick-attach fittings.



ELECTRICAL POWER REQUIRED FOR PARTING STRIPS AND CYCLED SECTIONS

LEADING EDGE SECTION	PROTECTED SPAN (IN)	TOTAL PROTECTED AREA (FT^2)	PARTING STRIPS AREA (IN^2)	PARTING STRIPS POWER (KW)	CYCLED AREAS AVERAGE AREA (IN^2)	CYCLED AREAS AVERAGE POWER (KW)	TOTAL POWER (KW)
INBOARD HORIZ.	90	12.6	80.7	0.97	557	11.15	
CENTER HORIZ.	97	12.4	73.5	0.88	570	11.40	
OUTBOARD HORIZ.	105	12.1	66.3	0.80	577	11.55	
TOTAL HORIZ. (PER SIDE)	292	37.1	220.5	2.65	568	11.36	
LOWER VERTICAL	79	13.0	95.0	1.15	592	11.85	
UPPER VERTICAL	56	8.7	66.5	0.80	587	11.75	
TOTAL VERTICAL	135	21.7	161.5	1.95	590	11.80	
AIRPLANE TOTAL	719	95.9	602.5	7.25	573	11.45	18.7

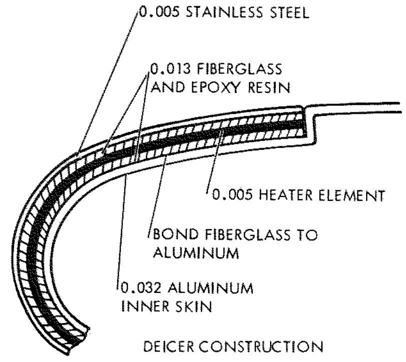


Figure 8-29—EMPENNAGE ELECTRICAL DE-ICER DIAGRAM.

Black Box Concept (5.3.7.5.1)

The electronic system design provides the capability of routine maintenance, troubleshooting and component replacement by the average electronic specialist. The specialist is assumed to have the skill of isolating the trouble in the system and correcting it by replacing a "black box".

The ARINC type of "black box" concept is utilized to permit rapid replacement of a complete package. System malfunction detection is accomplished, in some systems, by normal cockpit instrument indication. This reduces the extensive troubleshooting and expensive portable test equipment to locate the malfunctioning unit while installed in the aircraft. Electronic components in general are designed as modular units to facilitate replacement of a complete package or subassembly module. This arrangement benefits the maintenance function and enables more rapid overhaul. Unit installations are designed for rapid replacement. Dual systems are incorporated to increase reliability. See Figure 8-30 for equipment location.

Standard off-the-shelf equipment, which has been proven in service on contemporary aircraft, is selected in every possible application to increase system realiability.

Controls for the electronic systems are located in the flight compartment on the pilot's pedestal and at the navigator's station. These units are secured with a minimum number of quick-release fasteners and are provided with easily detachable electrical connectors. Radio receivers and transmitters, amplifiers, etc., are installed on shock-mounted shelves in racks located in a pressurized area beneath the flight deck. This electronic compartment is accessible through a door forward of the flight deck stairs or through an access door on the R/H side of the cargo compartment forward bulkhead. This area is readily accessible both in flight and on the ground. An aisle between the electronics rack and the electrical component racks provides ample space to comfortably accommodate two technicians simultaneously. Shelves allow access from both the front and rear; therefore, wiring and connectors can be inspected or repaired without component removal. The electronic compart-

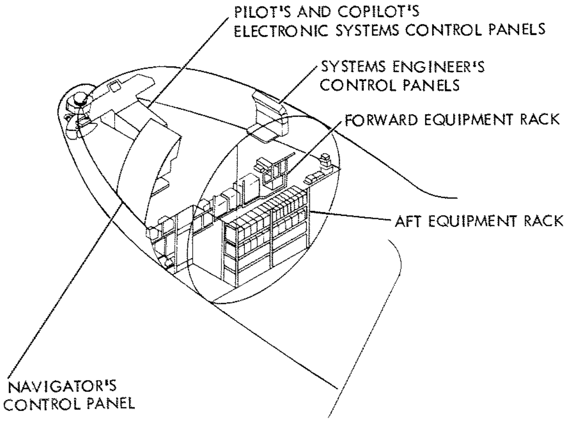


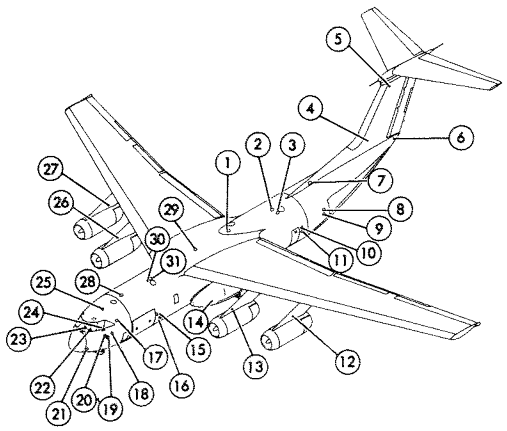
Figure 8-30—ELECTRONIC EQUIPMENT LOCATION.

ment is well lighted and all components are clearly labeled as to system and function with engraved or etched metal placards.

To ensure maximum serviceability of electronic equipment, the ARINC type cooling system was selected. During pressurized flight when a pressure differential exists, air circulates through the electronic units into plenum chambers mounted beneath the units and is ducted overboard through a flow controlling venturi and shut-off valve. During operation of the equipment on the ground and during unpressurized flight, cooling is provided by means of fans.

Antennas are removed and installed from the exterior of the aircraft. Wherever necessary, access doors adjoining the antenna are provided to assist in replacement.

An interphone system provides inter-communications between ground service personnel from service areas of the aircraft, as shown in Figure 8-31. These service areas include: refueling control panel, vertical stabilizer, tail cone, each power plant, forward fuselage, main landing gear wells, fore and aft cargo doors, and flight compartment.



1.	NO. 4 LOUDSPEAKER
2.	RH PARATROOP DOOR LOUDSPEAKER
3.	LH PARATROOP DOOR LOUDSPEAKER
4.	LOWER VERTICAL STABILIZER JACKBOX
5.	UPPER VERTICAL STABILIZER JACKBOX
6.	TAIL CONE JACKBOX
7.	AFT LOUDSPEAKER
8.	AFT CARGO DOOR ICS
9.	AFT CARGO DOOR PA AUXILIARY CONTROL PANEL
10.	LH PARATROOP DOOR PA AUXILIARY CONTROL PANEL
11.	LH PARATROOP DOOR ICS
12.	LH OUTBOARD PYLON JACKBOX
13.	LH INBOARD PYLON JACKBOX
14.	LH WHEEL WELL JACKBOX
15.	FWD CARGO DOOR ICS
16.	FORWARD CARGO DOOR PA AUXILIARY CONTROL
17.	NAVIGATOR'S ICS CONTROL PANELS
18.	ELECTRONICS COMPARTMENT AND EXTRA CREW COMPARTMENT ICS
19.	SERVICE INTERPHONE AMPLIFIER
20.	PA AMPLIFIERS
21.	NOSE WHEEL WELL ICS
22.	PILOT'S ICS CONTROL PANELS
23.	COPILOT'S ICS CONTROL PANELS
24.	PILOT'S SIDE SHELF PA MAIN CONTROL
25.	SYSTEM ENGINEER'S ICS CONTROL PANELS
26.	RH INBOARD PYLON JACKBOX
27.	RH OUTBOARD PYLON JACKBOX
28.	NO. 1 LOUDSPEAKER
29.	NO. 3 LOUDSPEAKER
30.	RH WHEEL WELL JACKBOX
31.	NO. 2 LOUDSPEAKER

Figure 8-31—INTERCOMMUNICATION AND PUBLIC ADDRESS SYSTEM.

Receptacles are located at convenient points in the fuselage for connecting electronic test equipment.

Metal stranded, braided wire covered, static discharge wicks with proven and reliable service on high speed jet aircraft are installed on the trailing edge of control surfaces.

Ease of Engine Removal for Trouble Shooting (5.3.7.5.2)

The power plant installations on the GL 207-45 are developed to provide the maximum possible features of accessibility and interchangeability, a minimum requirement of special tools and ground support equipment, and rapid engine replacement capabilities.

Engine removal for troubleshooting can be accomplished by two men in one hour of elapsed time. Features that allow rapid removal and replacement are:

1 Large, clam-shell type doors are provided on each side of the engine nacelle which permit maximum access to the engine and its accessories. These doors are removable if desired. These large opening doors are shown in Figure 8-17.

2 Fluid lines and electrical leads are grouped and terminated at disconnect panels attached to the fixed pylon. Access to these disconnects is provided through quick-opening panels.

3 Fire extinguishing lines and detector elements in the nacelles are attached to nacelle structure and do not require disconnection during engine replacement.

4 Engine control rigging in the aircraft is not affected by engine removal.

To facilitate ease of engine removal and replacement, a requirement exists for an efficient means to provide the following operation on Q.E.C.'s:

1 Ground Transport

2 Air Transport

3 Bare Engine Handling

4 Q.E.C. Build-up

5 Installation on and removal from Aircraft.

The existing dual rail system meets these requirements for current jet engines and is capable of handling the engines for the GL 207-45 airplane. The Air Logistics Corp. installation and removal trailer, or equivalent, is recommended for this application. Figure 8-17 illustrates a typical installation and removal trailer being used to remove an engine from the aircraft. This trailer, which is part of the dual rail system, permits rapid transfer of the engine to a work stand for maintenance, or serves as a storage or transportation trailer with no additional equipment required. This system will operate most efficiently at a fixed base where the dual rail system is standard equipment.

Engine changes will be made at outstations and advanced bases where the dual rail equipment is not available. A manually-operated hoist or chain-fall would require an excessive length of time to raise an engine of this weight and a portable bomb hoist or like device with the necessary lift capacity is not available. Figure 107 illustrates an electrically-powered portable hoist which could be bolted to the pylon structure to remove or install an engine at an advanced base. The hoist would consist of a frame and pulley assembly bolted to the pylon and gear motor. with cable drums bolted to the frame. The pulleys would be located so that one cable would attach to a point forward and to the left of the engine c.g. while the other cable attaches to a point aft and to the right of the engine c.g. Preliminary studies indicate that the hoist would weigh less than 100 lbs. The gear motor would utilize electrical power from the aircraft's APU, and an engine could be raised from the ground to its installed position in approximately 6 minutes.

Simplicity of Design (5.3.7.5.3)

Lockheed's extensive experience in the design and development of transport aircraft for both military and commercial operations has been coupled with the feedback of technical information from on-the-scene field service personnel and careful design analysis to assure maximum recognition of field usage and maintenance problems. Based on this background and design philosophy which dictates maximum carry-over of proven C-130 features and design details, the design encompasses detail structural configurations of proven concepts, utilization of commercially available and service proven equipments and components wherever possible, and maximum accessibility and interchangeability for ease of maintenance. As a result, the detail design of the GL 207-45 is very simple and completely conventional. It is held within the state-of-the-art in all areas in order to minimize development time and costs and to maximize initial reliability and utilization.

Accessibility (5.3.7.5.4)

Excellent accessibility is provided in all areas to permit inspection, servicing and maintenance of all equipment and critical structure. Refer to paragraph 5.3.7.5 on maintainability in this section for specific accessibility data.

Reliability (5.3.7.5.5)

Reliability is a major factor in the total effectiveness of System 476L. To this end, reliability has received primary attention throughout planning and design.

The highest degree of system reliability is established by the inherent reliability of design. Careful attention has therefore been given to all design details of systems, to the selection of proven, reliabile, components, and to the application of accepted reliability principles and practices.

Utilizing service data collected in the Lockheed Reliability Data Center from Air Force operations of the model C-130 transport, from test and operation of the Lockheed JetStar jet transport, and from service and failure reports supplied by major airlines, possible problem areas were defined and action taken to eliminate or alleviate those factors which might degrade inherent reliability.

Methods and procedures to realize the highest practical achieved reliability through proper control of possible degrading functions during production, storage, maintenance, and operation have been formulated for direct application to the GL 207-45 program.

Lockheed's ability to design and produce an effecttive and reliable transport airplane is exemplified by the service record of the model C-130.

TURNAROUND TIME (5.3.7.6)

Turnaround may be accomplished in a total elapsed time of 30 minutes where throughflight inspections, cargo loading, and refueling operations are performed concurrently. Note, however, that certain changes will be required in T.O. 00-25-172, "Ground Servicing of Aircraft and Repositioning of Equipment".

Refueling (5.3.7.6.1)

The GL 207-45 is provided with two flush-mounted MS-29515-2 refueling adapters to reduce refueling time requirements to a minimum.

Employing a fixed ground pump, pit equipment, and the single-point refuel adapters, the GL 207-45 may be refueled from a zero fuel load to 4,000 NMR capability in 25 minutes and to 5500 NMR capability in 29 minutes.

Where only refueling units, such as the Type AF/S32R-2 truck, the Type F-6 trailer, or similar equipment are available, it is possible through multiple and simultaneous use of these type units and the single-point refuel adapters, to refuel the GL 207-45 from a zero fuel load to 4000 NMR capability in a total of 28 minutes, and to 5500 NMR capability in 35 minutes.

It is possible to refuel over the wing from zero fuel load to 4000 NMR capability in a total of 42 minutes through the use of multiple fuel units simultaneously. If refueling of the 5500 NMR range is desired, this can be accomplished with an additional unit in another 27 minutes for a total elapsed time of 69 minutes from zero fuel load to 5500 NMR capacity.

These computations are based on zero fuel load existing at the beginning of refueling operations, nominal refueling pump outputs, and refueling

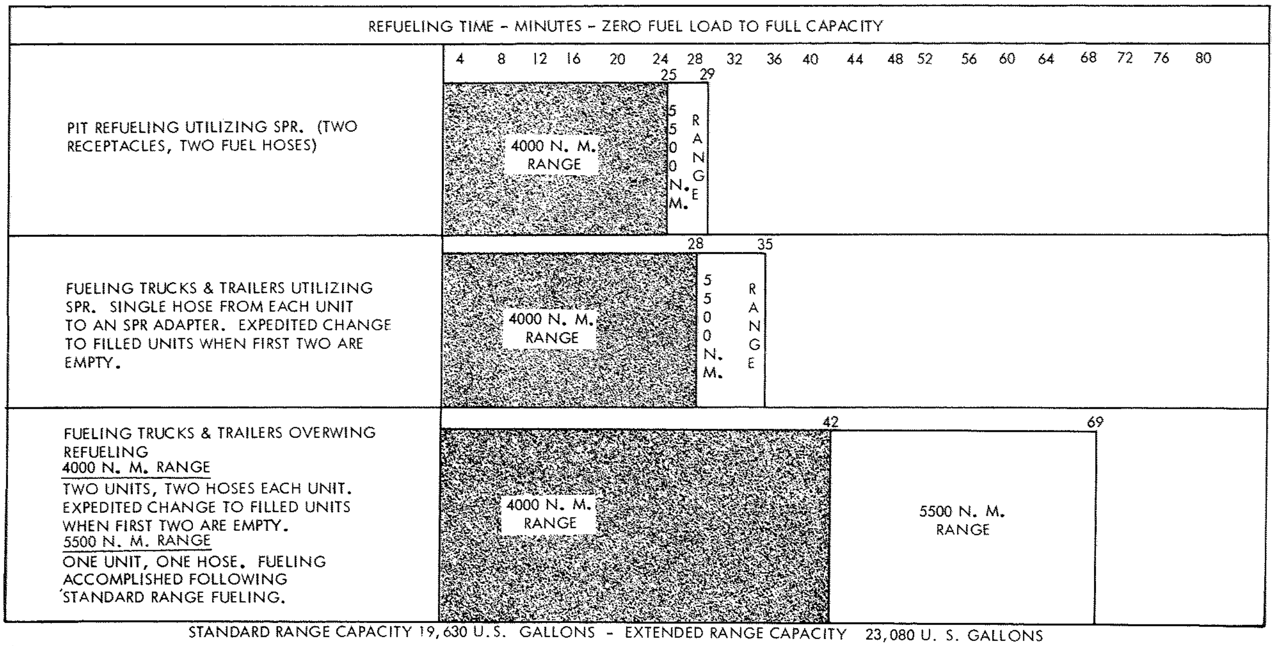


Figure 8-32—REFUELING TIME.

from empty to required full. The elapsed time factors given can be lowered approximately 25% during normal operations, when normal reserve fuel is present.

Figure 8-32 presents a quick visual reference to the time factor relationship of the various refueling methods that can be used with the GL 207-45 airplane.

Enroute Maintenance (Post Flight) (5.3.7.6.2)

Required turnaround inspection and maintenance time totals 26 minutes, based on refueling time required. The required inspection can be accomplished within this period by three mechanics, concurrently with refueling and cargo loading.

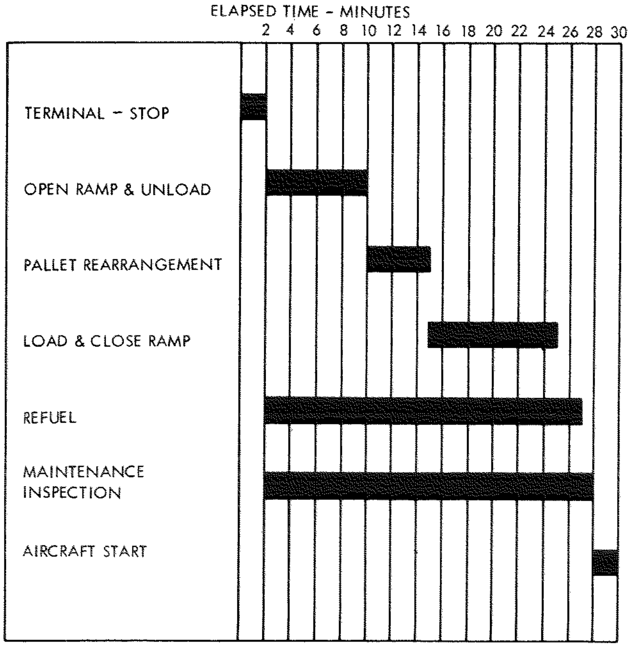


Figure 8-33—TURNAROUND TIME CHART.

A breakdown of the various turnaround operation time factors is shown in Figure 8-33.

RUGGEDNESS AND ADAPTABILITY TO ENVIRONMENT (5.3.7.7)

The extensive experience gained in the design and development of C-130 cargo aircraft, as proven by the service record of these airplanes and their ability to be adapted to any type of environment, has been incorporated into the design of the GL 207-45. Fulfillment of the requirements for operation from advanced bases, minimum dependence on ground support facilities, and the capability of flexible mission adaptability has been achieved. The use of C-130's in the Congo airlift, operation Deep Freeze, and in Lebanon, reveal the strength built into the fore-runner of the GL 207-45.

Operating from Fixed or Emergency Bases Incorporating Runway and Taxi Provisions (5.3.7.7.1)

As previously discussed, the GL 207-45 auxiliary power unit supplies power on the ground to operate the hydraulic, pneumatic and electrical systems, thereby achieving self sufficiency and eliminating the need for external ground power units for these systems. A power transfer cable, connected to a standard four-prong electrical plug located adjacent to the normal ground power connection, may be used to transfer electrical power from an adjacent airplane in the event of a battery or APU failure.

Noise Levels (5.3.7.7.2)

For internal noise levels, see Section 7, presented earlier in this volume.

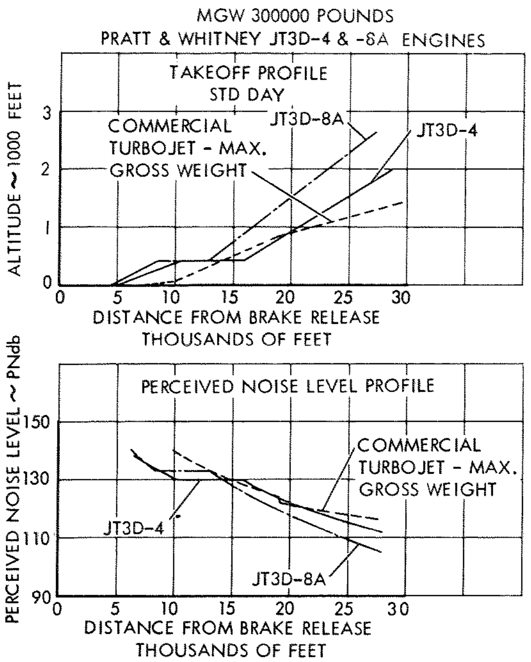


Figure 8-34—TAKE-OFF NOISE CONSIDERATIONS.

The perceived noise level profile for the GL 207-45 airplane during take-off is compared with current commercial jet aircraft in Figure 8-34.

Door Operations in Weather Extremes (5.3.7.7.3)

Door operations in weather extremes are described in the following paragraphs.

Crew Door (5.3.7.7.3.1)

The crew entrance door, shown in Figure 8-35, installed on the L/H side of the fuselage just forward of the side cargo loading door, is a combination door and built-in steps. It is hinged at its lower edge and swings out and down when opened. It can be unlatched by either an inside or outside release handle. A counterbalance assembly, working with a telescoping arm assembly, restrains door movement and degree of opening. A hand-lanyard attached to the door is used to close the door from inside the airplane. This unit is identical with that on the C-130 which has proven to be openable and completely reliable under all weather conditions.

Paratroop Door (5.3.7.7.3.2)

The paratroop doors are located at the aft end of the cargo compartment on both the left and right sides of the fuselage. The doors are inward-opening, plug-type equipped with four locks, and are operable from either inside or outside the airplane manually by rotating handles. Figure 8-36 illustrates the door arrangement.

The doors are patterned after doors used on the Lockheed Constellation and JetStar. They utilize internal tracks which have proven completely reliable and adequate under all weather conditions.

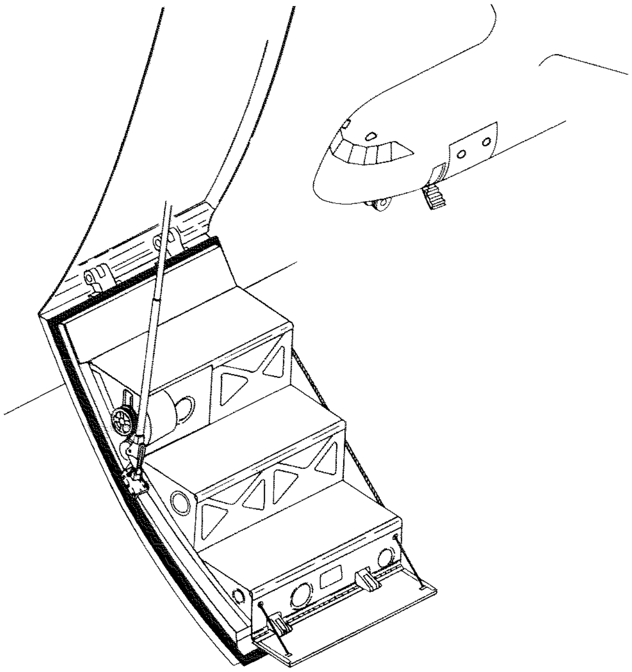


Figure 8-35—CREW ENTRY DOOR.

Cargo Ramp (5.3.7.7.3.3)

The most important feature of the GL 207-45 fuselage is the straight-in tail loading arrangement shown in Figure 8-37. This important feature eliminates the drag normally associated with straight-in aft loading with air drop capability.

The lower segments of each door are hinged along the top edge to the bottom edge of the upper segments. The upper segments are hinged at the forward edge to the fuselage structure. Hydraulic operation places both segments of each door in a position approximately parallel to the fuselage centerline when open. The combination ramp and presure door is then hydraulically actuated to the desired position. A simple, straight-forward mechanically-sequenced hydraulic actuation system controls and limits all door motions to prevent inadvertent damage.

The doors are operated from the pilot's center control console or from the ramp area in the cargo compartment. The ramp actuation system receives power from the utility hydraulic system and the DC electrical system. Both systems are designed for a temperature range from -65°F to + 160°F and will operate in all weather conditions.

Side Cargo Door (5.3.7.7.3.4)

The forward cargo door, located at the forward left side of the cargo compartment, is 78 in. high and 109 in. wide. Except for its greater width, it is identical to the door on the C-130B.

The door, shown in Figure 8-38, is powered by an independent hydraulic system operated by a hand

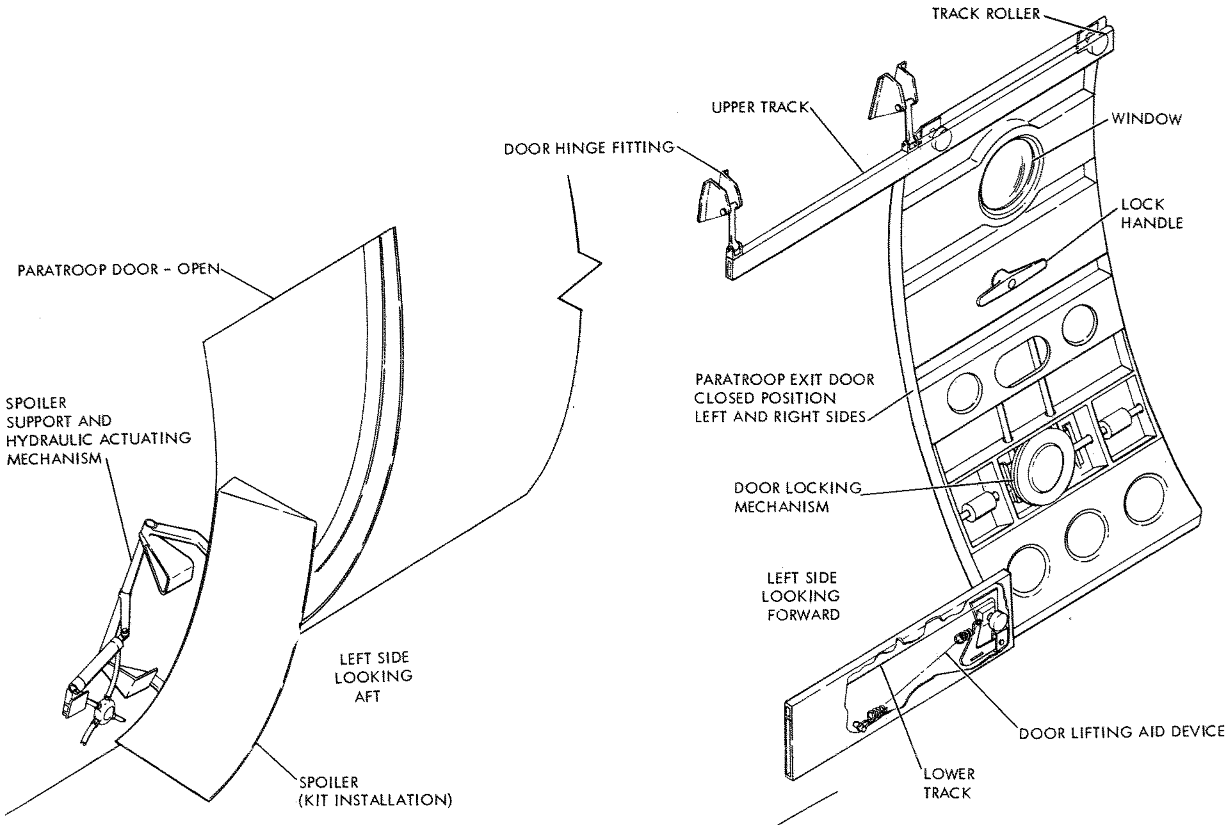


Figure 8-36—AFT ENTRY/PARATROOP DOOR.

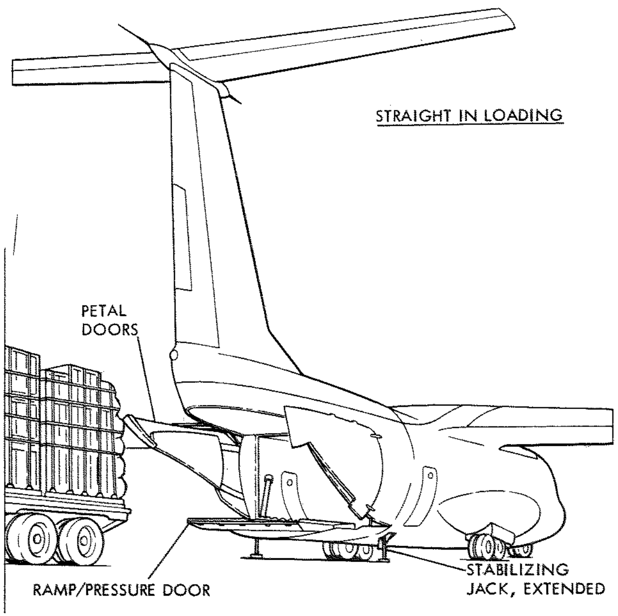


Figure 8-37—CARGO LOADING DOORS—AFT.

pump. The hydraulic system is designed for a temperature range from -65°F to + 160°F. This door and system on the C-130 has proven to be completely reliable under all weather conditions.

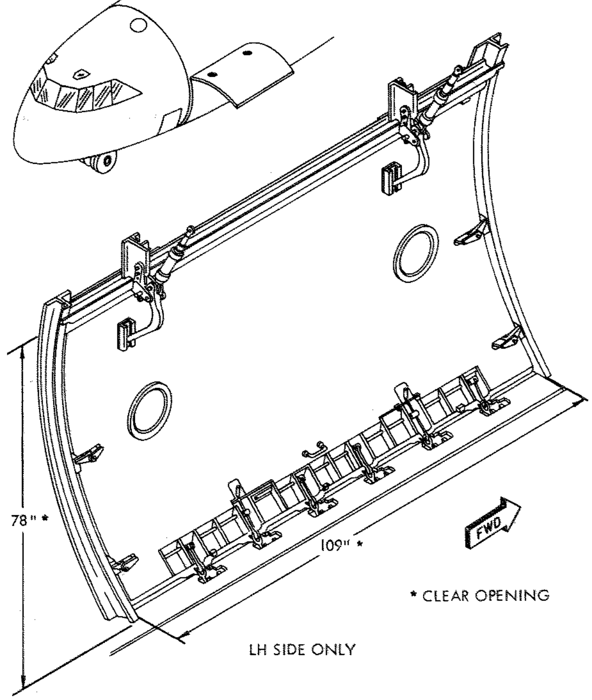


Figure 8-38—CARGO LOADING DOOR—FORWARD.

IMPACT ON LOGISTICS SUPPORT REQUIREMENTS AND EFFECT ON EXISTING SUPPORT (5.3.7.8)

The C-130 series cargo aircraft are now considered relatively simple to support logistically.

It is not anticipated that logistic support of the GL 207-45 will create any greater problems over its development and operational spans than those encountered in supporting the C-130, due in part to the carryover of proven design features. It will be necessary for the Air Force to inventory those items of common and standard equipment specified for this System to determine that an adequate supply exists as needed.

Compatibility with Existing Support Equipment (5.3.7.8.1)

Aerospace Ground Equipment

The GL 207-45 airplane system and subsystems are designed to permit the use of standard, existing Air Force and Commercial Aerospace Ground Equipment to the maximum extent possible. The utilization of existing on-base equipment simplifies the maintenance task as maintenance personnel are familiar with its operation, therefore additional, training and skills are not required. For example, an MA-1 Liquid Oxygen Cart, MD-4 electrical cart, MA-1A compressed air cart and MA-1 air conditioning cart can be used for servicing and testing the aircraft subsystems. An MJ-1 hydraulic test stand can be modified for use of Skydrol 500A, thereby eliminating the need for a new and costly design. Some commercial operators are concurrently equipped with Skydrol usable test equipment.

Wherever possible the aircraft is designed to eliminate the need for support equipment. A ladder permanently installed inside the vertical stabilizer provides accessibility to all areas of the empennage for routine inspection and maintenance of the empennage structure and installed components without the need for large work stands or ladders.

Standard jacks are generally utilized for aircraft and landing gear jacking. Aft fuselage support jacks are integral with the airframe, thereby eliminating the requirement for special ground equipment during cargo loading or unloading.

Unusual Supply Support Occasioned by Peculiar Equipment and/or Inspections, Such as Skydrol, etc. (5.3.7.8.2)

No unusual supply problems are occasioned by peculiar equipment required for support of the System 476L. The aircraft hydraulic system is designed for use of Skydrol. Therefore, electrical wiring insulation and other materials used in areas subject to Skydrol contact will be of a type selected for use with this fluid. If the operator plans to use Skydrol, seals and flexible lines in support equipments. Accordingly, the use of Skydrol 500A vs. the use of MIL-H-5606 fluid does not create a cost problem of any magnitude in the areas of logistics and ground support equipment, although the present commercial cost of "red oil" as against Skydrol is on the order of 1 to 12 or 15.

SUPER HERCULES · GL207-45

section 9

OPERATING COSTS (5.3.8)

The operating costs data presented have been computed in accordance with the 1960 ATA "Standard Method of Estimating Comparative Direct Operating Costs" except as modified by the USAF in the various documents relating to System 476L. Since the ATA method is developed from CAB statistics compiled for the early jet transports now in operation, the actual operating costs of an aircraft with a conventional configuration reflecting normal state-of-the-art advances, such as the GL 207-45, should be equal to, or even less, than the costs obtained from the ATA method.

OPERATING COSTS PER BLOCK HOUR (5.3.8.1)

The operating costs of the GL 207-45, as operated in accordance with MATS rules and MIL-C-5011A rules, are presented in Figures 9-1 and 9-2. The maximum average operating-cost-per-block-hour for ranges between 1000 and 4000 NM is $855. This decreases for the longer ranges until a value of $812-per-hour is reached for a maximum distance ferry-range mission using MATS cruise procedures. A minimum value of $793-per-hour is obtained at a range of 2000 N.M. when no payload is carried. This variation of cost-per-block-hour with range is presented in Figures 9-1 and 9-2. Figure 9-2 is a tabular presentation of airplane operating costs in both dollars-per-flying-hour and cents-per-TNM for the maximum capability of the airplane at the specific distances requested in the System 476L Statement of Work. This figure shows the detailed build-up of the operating cost computations.

The block performance data, presented in Figure 9-3, are based upon military procedures, either as specified in MIL-C-5011A or in MATS Manual 55-1. Ground and air maneuver time allowances and block speeds have been computed in accordance with the 1960 ATA costing method. Ground and air maneuver fuel allowances for the MIL-C-5011A missions were also computed in accordance with the 1960 ATA method; while for MATS missions the maneuver fuel allowances were the sum of 5 minutes at normal rated power at sea-level static conditions plus 15 minutes at holding speed at 10,000 ft. altitude. MATS reserves are herein defined as fuel for 1¼ hour holding at 10,000 ft. plus fuel for 10% of flight time to destination of 1 hour, whichever is less. The increasing payload capability as range decreases from the full-load maximum-range point shown in this figure is made possible by the structural design capability discussed in Section 4. This concept permits the aircraft to carry higher payloads at shorter ranges.

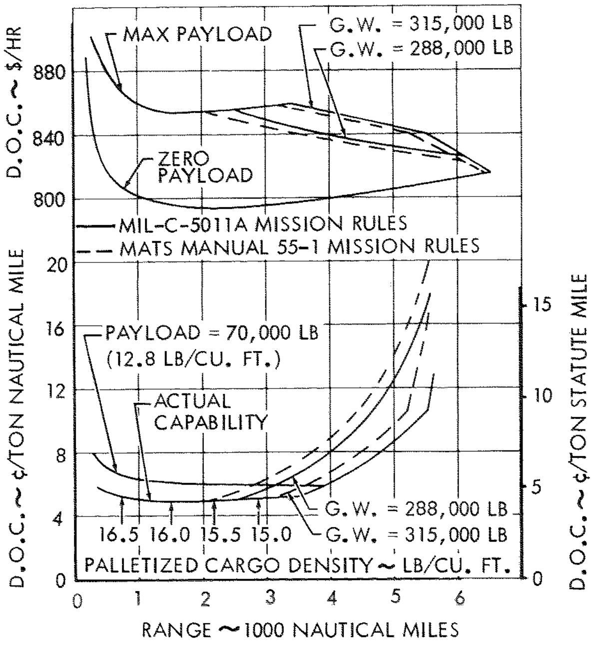


Figure 9-1—DIRECT OPERATING COSTS.

	Distance	Block Time	Block Fuel	Fuel Cost	Other Costs	Total Cost	Block Speed	Payload	Total Cost
	(n.m.)	(hr)	(lb)	($/hr)	($/hr)	($/hr)	(knots)	(tons)	(¢/tnm)
MIL-C-5011A	1000	2.60	30,500	182	675	857	385	44.75	4.96
	2000	4.93	57,000	179	675	854	406	42.75	4.90
	3000	7.23	84,500	181	675	856	415	41.0	5.04
	3440	8.24	97,000	183	675	858	417	40.0	5.15
	4000	9.52	109,000	178	675	853	420	34.0	5.97
	5500	12.90	138,000	166	675	841	426	19.0	10.40
MM55-1	1000	2.60	30,000	182	675	857	385	44.75	4.96
	2000	4.93	57,000	179	675	854	406	42.75	4.90
	3000	7.23	84,500	181	675	856	415	41.0	5.04
	3130	7.55	89,000	183	675	858	415	40.75	5.08
	4000	9.52	107,200	175	675	850	420	30.75	6.60
	5300	12.49	131,800	163	675	838	425	19.0	10.40
	5500	12.90	132,300	159	675	834	426	11.5	17.00

Figure 9-2—TYPICAL OPERATION COSTS COMPUTATION.

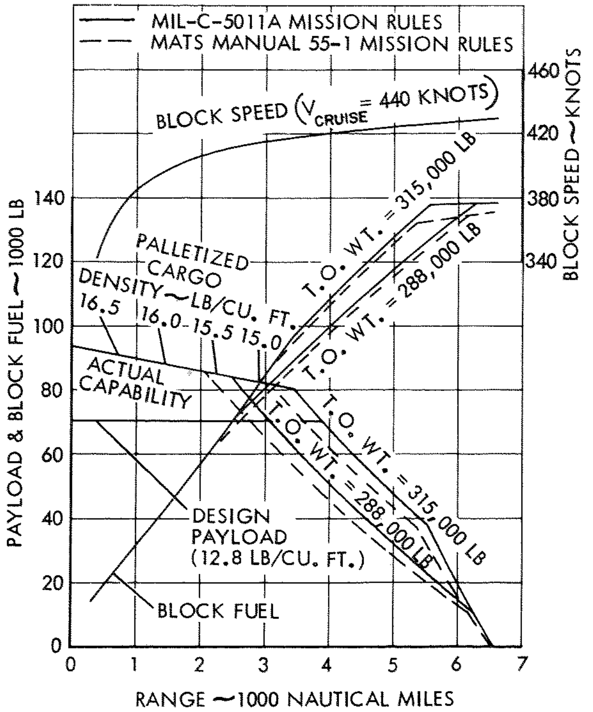


Figure 9-3—BLOCK PERFORMANCE SUMMARY, P & W JT3D-4 ENGINE.

The basic values used and the breakdown of the costing equation are presented in Figure 9-4.

BASIC VALUES FOR COST EQUATION			GL207-45 (JT3D-4)
Weight			
Manufacturer's empty		lb	118,075
One engine (dry)	(W_e)	lb	4,170
Airplane less engines	(W_a)	lb	101,395
Cost			
Total airplane	(C_t)	$	5,655,000
One engine	(C_e)	$	250,000
Airplane less engines	(C_{spa})	$	4,655,000
Radio	(C_r)	$	300,000
Airplane less eng. and radio	(C_a)	$	4,355,000
Fuel	(A)	$/gal.	.098
Oil	(B)	$/gal.	3.90
Engine Thrust Rating	(T)	lb	18,000
Utilization	(U)	hr/yr	1825

BREAKDOWN OF COST EQUATION		
Flying Operations		
Crew	$/hr	59.50
Fuel	$/lb	.01553
Oil	$/hr	1.29
Insurance—airframe	$/hr	. . .
Insurance—liability	$/N.M.	. . .
Maintenance		
Labor—aircraft and other	$/hr	30.26
Labor—engines	$/hr	17.18
Material—aircraft and other	$/hr	40.47
Material—engines	$/hr	81.94
Applied burden	$/hr	70.74
Depreciation		
Airframe	$/hr	202.86
Engine	$/hr	66.54
Radio	$/hr	32.88
Airframe spares	$/hr	21.86
Engine spares	$/hr	49.92

COST EQUATION — $\$/\text{hr} = \$675 + (\$.0155)\,(F_B/T_B)$

NOTE: 1) F_B=Block Fuel (lb)

2) T_B=Block Time (hr)

3) V_B=Block Speed (knots)

Figure 9-4—SUMMARY OF OPERATING COST DERIVATION.

COST PER TON MILE (5.3.8.2)

The versatile nature of the GL 207-45 is shown in Figure 9-1 which shows that this aircraft can be operated over any range between 500 and 3700 NM at operating costs of less than 5.5¢/TNM, reaching a minimum value of 4.9 ¢/TNM at a range of 2000 NM. These values are based on the actual structural capability of the airplane. Operating costs of the aircraft when the payload is arbitrarily limited to 70,000 lbs. and when the take-off weight is limited to 288,000 lbs. (the maximum weight for an FAA take-off from a 6000 ft. runway) are also shown in the figure. The differences in cruise procedures have no noticeable effect on direct operating costs in ¢/TNM per ton nautical mile except where payload is affected. Since MATS reserves are larger than MIL-C-5011A reserves, there is with MATS reserves, a payload reduction for the longer flights with a resulting small increase in cents-per-ton-mile-cost.

Basic values and details of the costing equation for each version of the airplane are presented in Figure 9-4. Block performance data for the airplane, presented in Figure 9-3 are based on military operation as defined in this Section.