4.3 AERODYNAMICS

(U) For the small single-engine airplane (Configuration 403), the overall configuration planform, as well as the wing itself, it geometrically similar to the large single-engine airplane (401B) of Section 3. Furthermore, the wing airfoil section, t/c = .04 biconvex, and leading-edge-flap geometry are identical to that for the large single-engine airplane. It is therefore assumed that the aerodynamic characteristics of the two are also identical, except for the minimum drag.

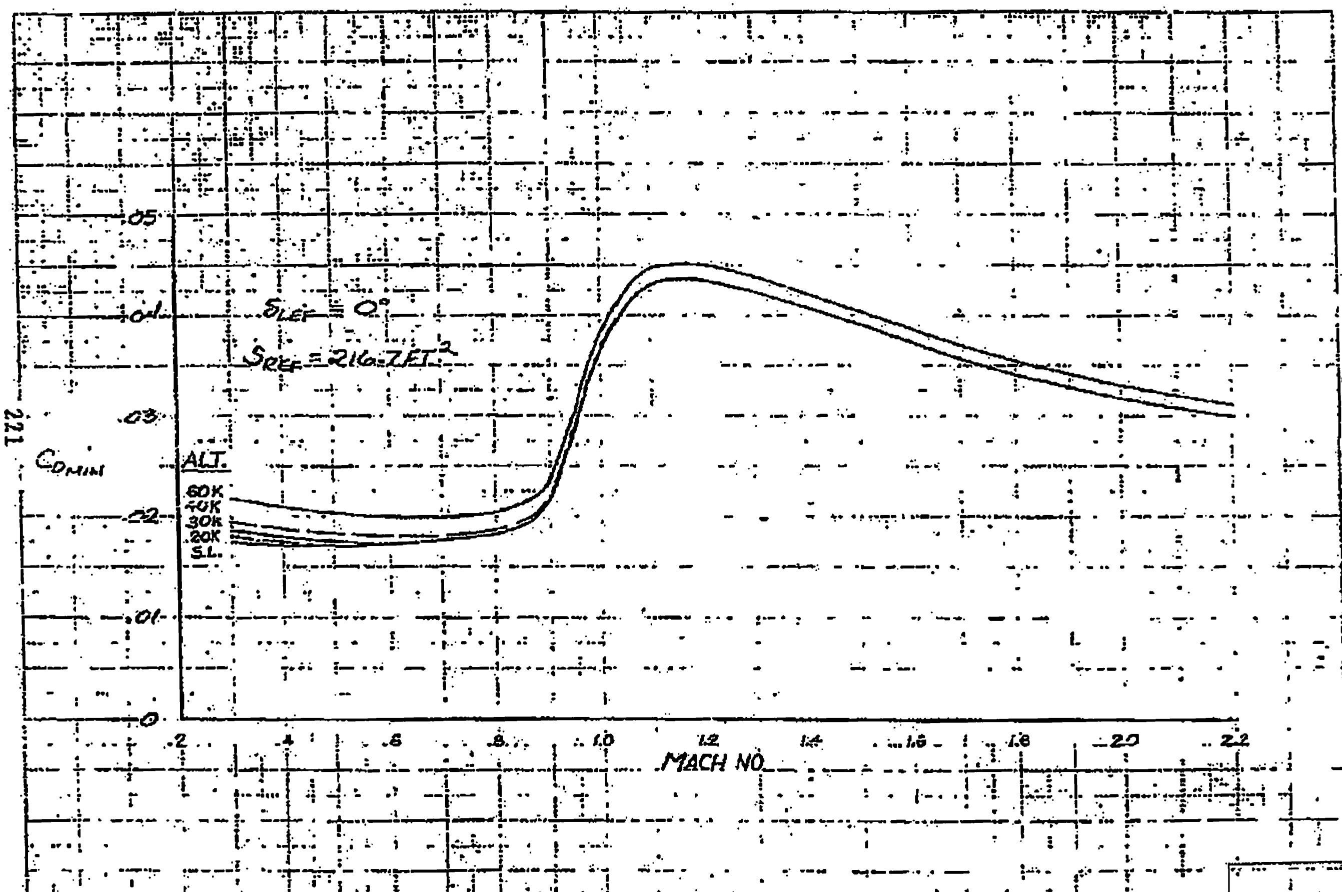
(U) The minimum drag for Configuration 403 is predicted by use of the same methodology as was used on Configuration 401B (Section 3.3).

(U) The total minimum drag is presented in Figure 4.3-1 for various altitudes. The D/q's for the canopy, missile pylons, and protuberances are the same as those for 401B. However, there are small differences in the nozzle, cowl, and diverter drags. These drag components are shown in Figure 4.3-2. The effect of airplane size on minimum drag is shown in Figure 4.3-3 for this concept.

(U) The trimmed drag polars and trimmed configuration polars are presented in Figures 4.3-4 through 4.3-9. The drag due to lift, leading-edge-flap drag, and trim drag are the same as those for the 403 Configuration, given in Figures 3.3-6 through 3.3-13 of Section 3.3

(U) The trimmed (L/D) data for this configuration are plotted in Figure 4.3-10. A comparison of these max data with those of Figure 3.3-25 shows that the 403 configuration has 5 percent less (L/D) max than the 401B configuration.

(U) Since the planform and wing loading are the same as for the 401B configuration, the lift curves, buffet boundaries, and control-limit C_L's shown in Figure 3.3-26 through 3.3-31 of Section 3.3 also apply to the 403 configuration.



(S)Figure 4.3-1 Minimum Drag vs Mach Number, Configuration 403(U)

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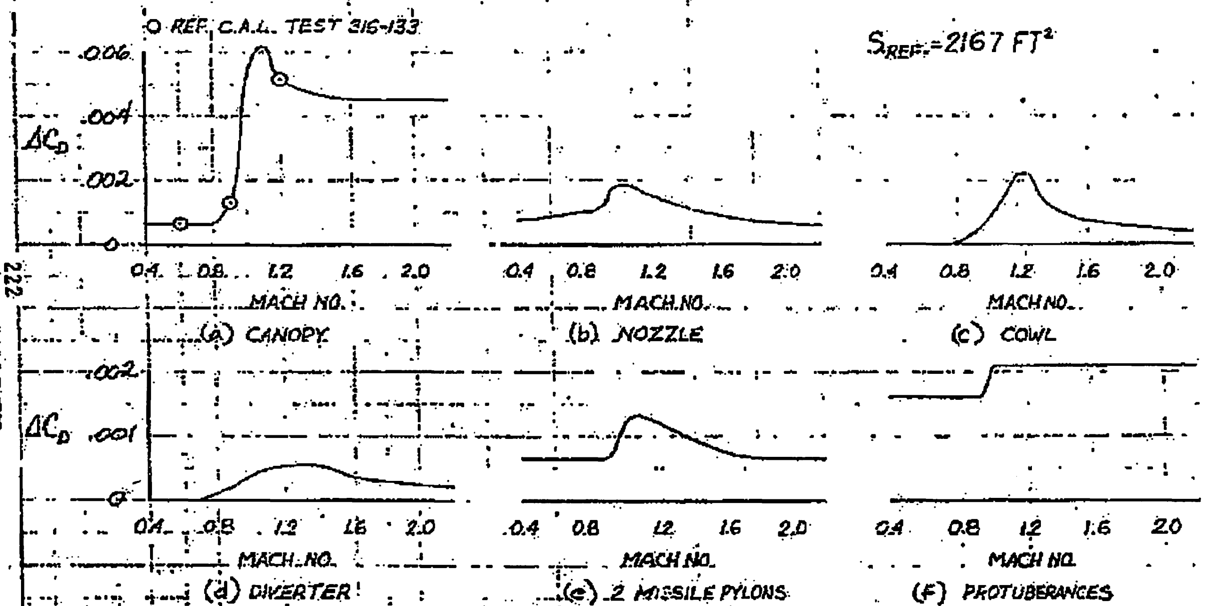

Figure 4.3-2 Components Used in Minimum Drag Buildup, Configuration 403

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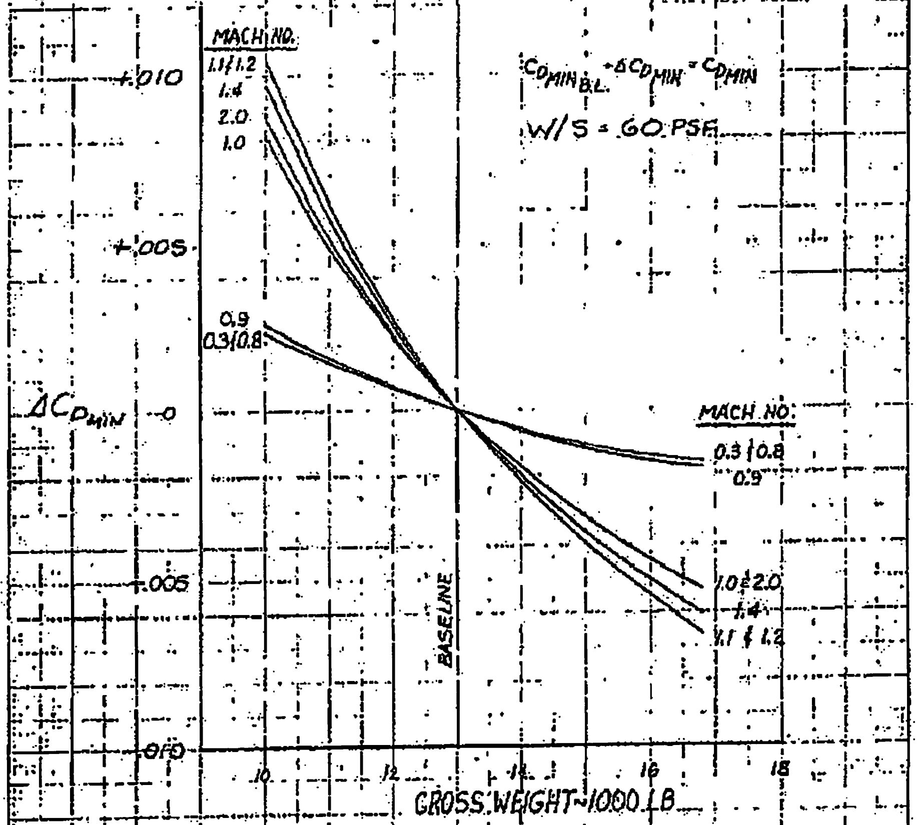
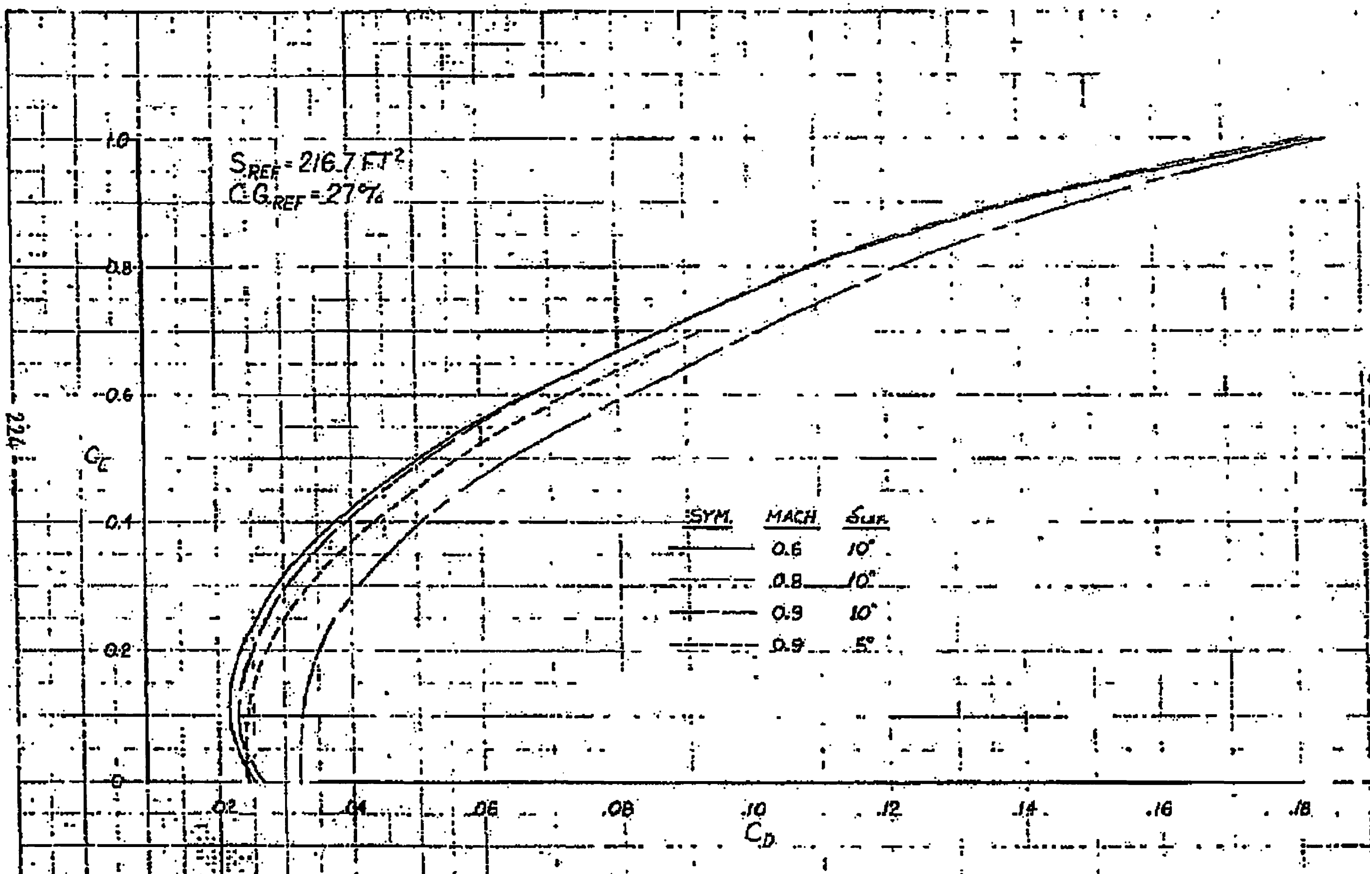


(S) Figure 4.3-3 Effect of Aircraft Size on Minimum Drag Coefficient, Configuration 403 (U)



(S) Figure 4.3-4 Trimmed Drag Polars at M=0.6, 0.8, and 0.9, Configuration 403 (U)

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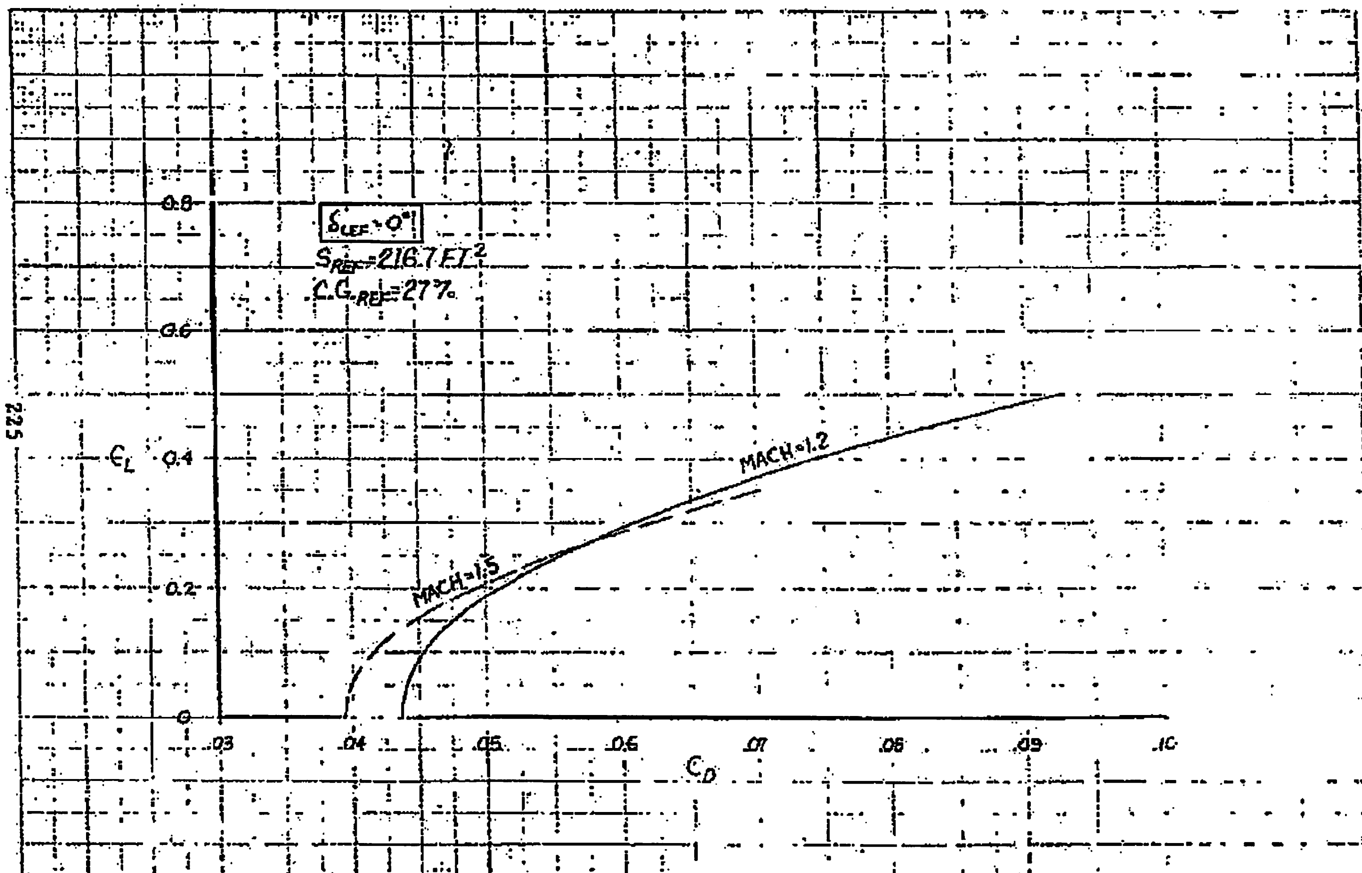

(S) Figure 4.3-5 Trimmed Drag Polars at M=1.2 and 1.5, Configuration 403(U)

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88th ABW/IPI
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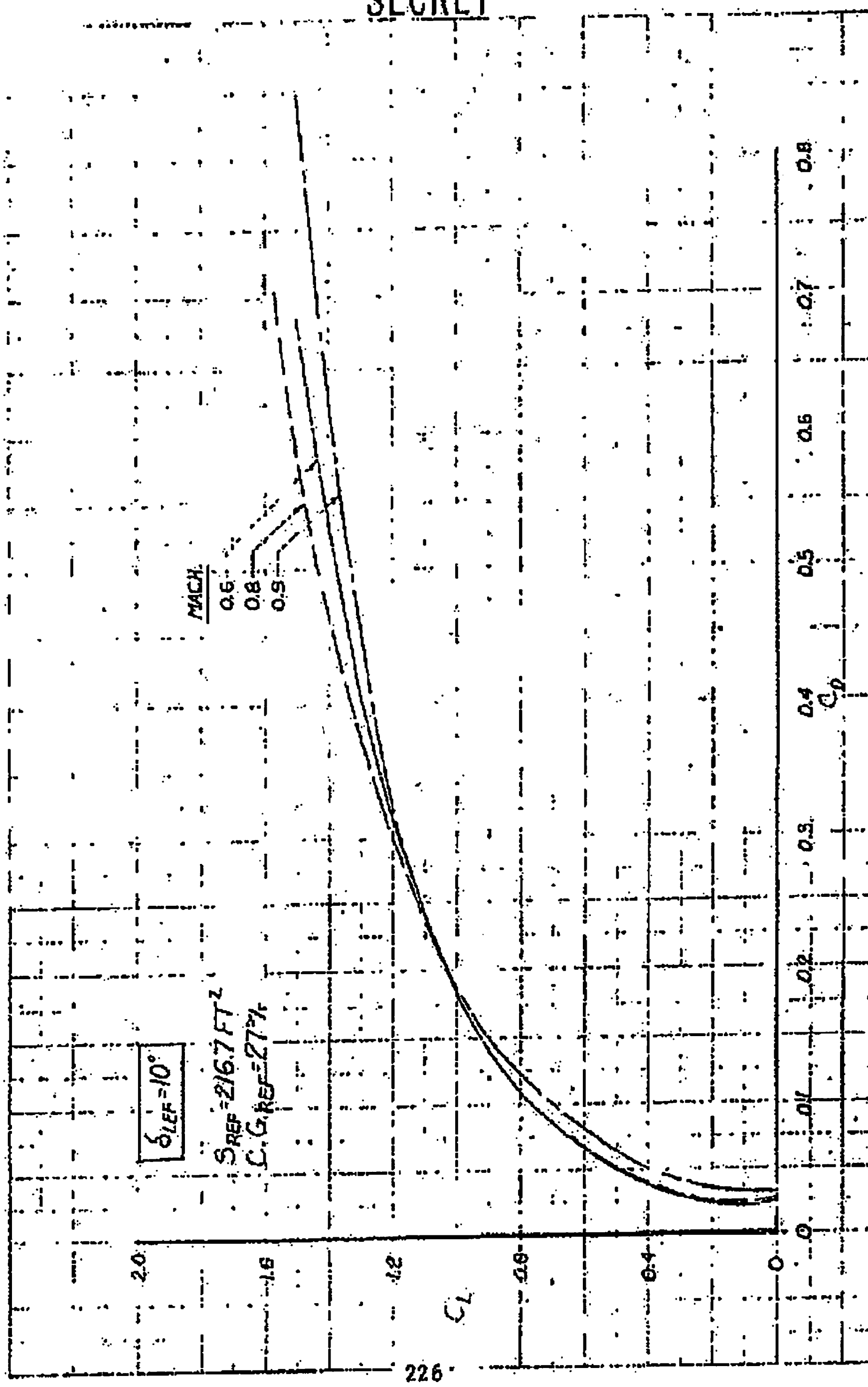
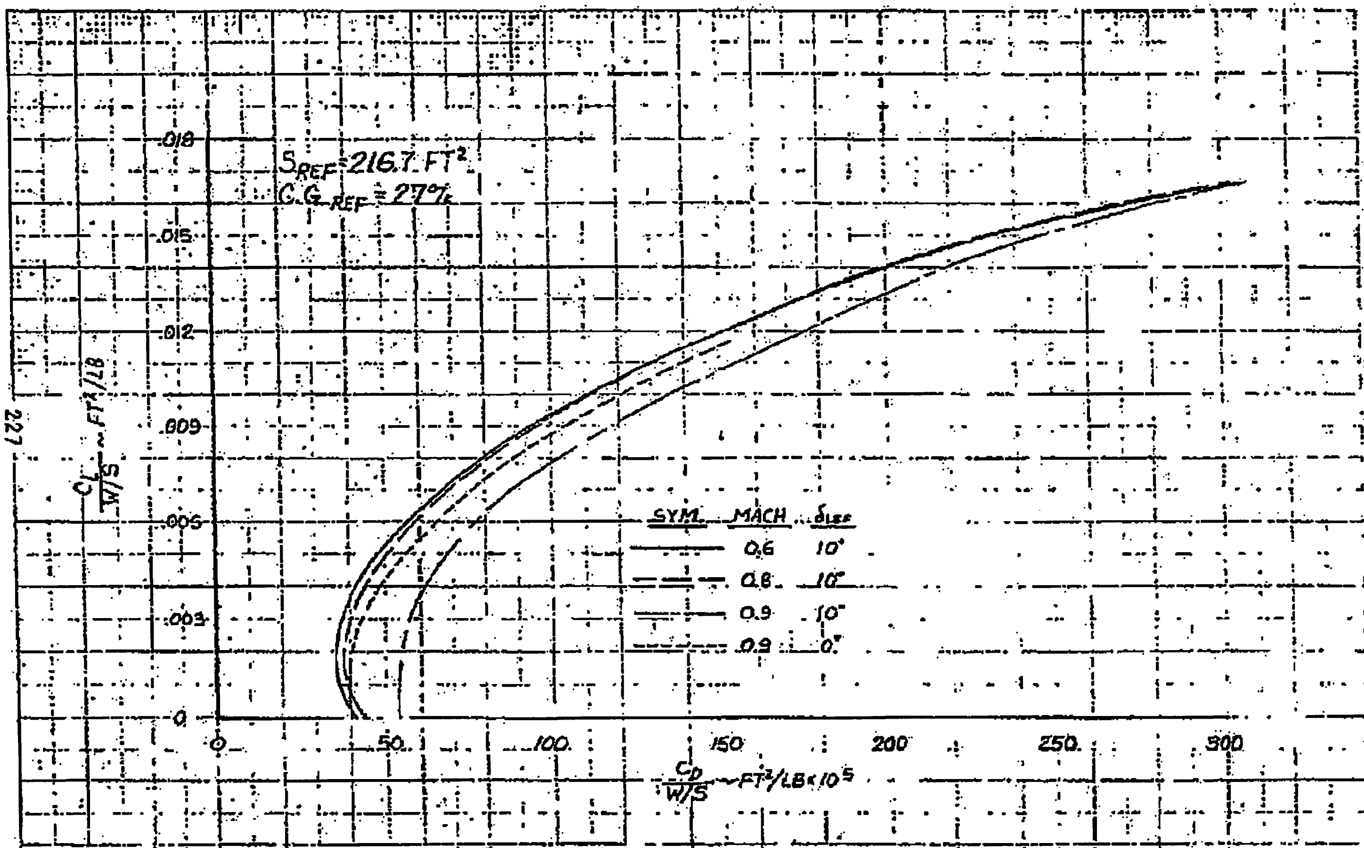
E.O. 13526
SEC. 3.3.(b)
(4)
1.4. (a)(g)



(S) Figure 4.3-6 Trimmed Drag Polars at High C_L's, Configuration 403(U)



(S) Figure 4.3-7 Trimmed Configuration Polars at M=0.6, 0.8, and 0.9, Configuration 403(U)

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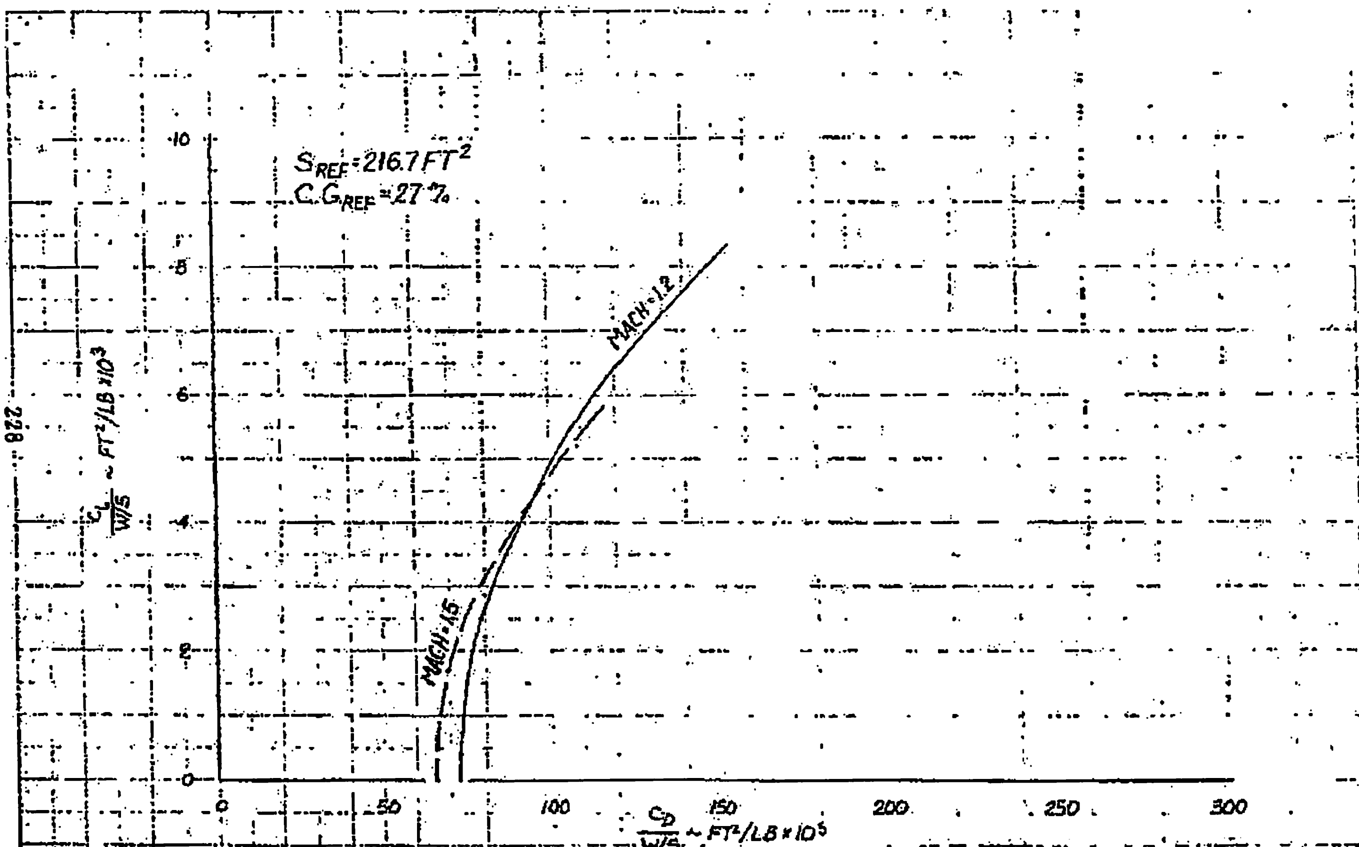

(U) Figure 4.3-8 Trimmed Configuration Polars at M=1.2 and 1.5, Configuration 403 (U)

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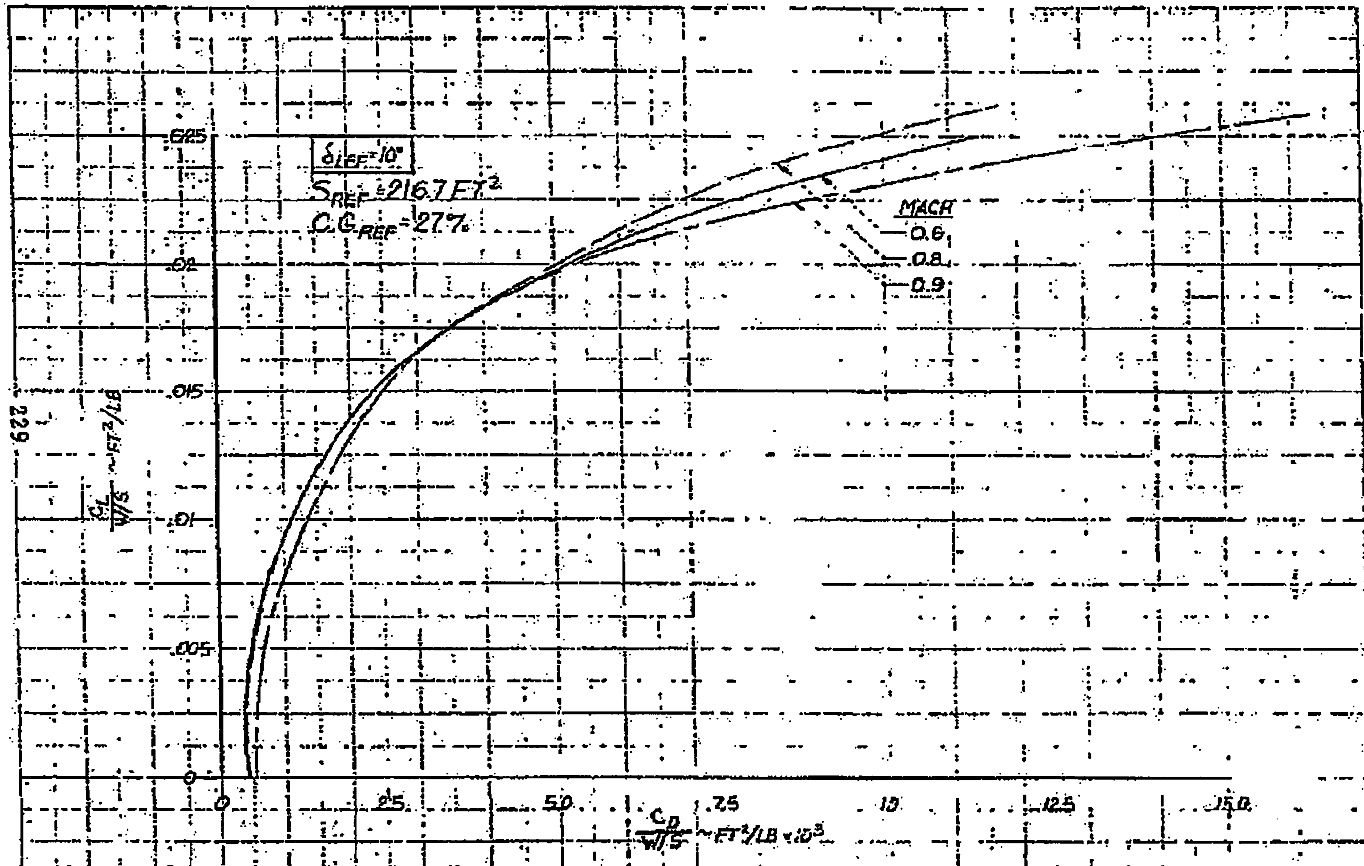

(S) Figure 4.3-9 Trimmed Configuration Polars at High C_L's, Configuration 403(U)

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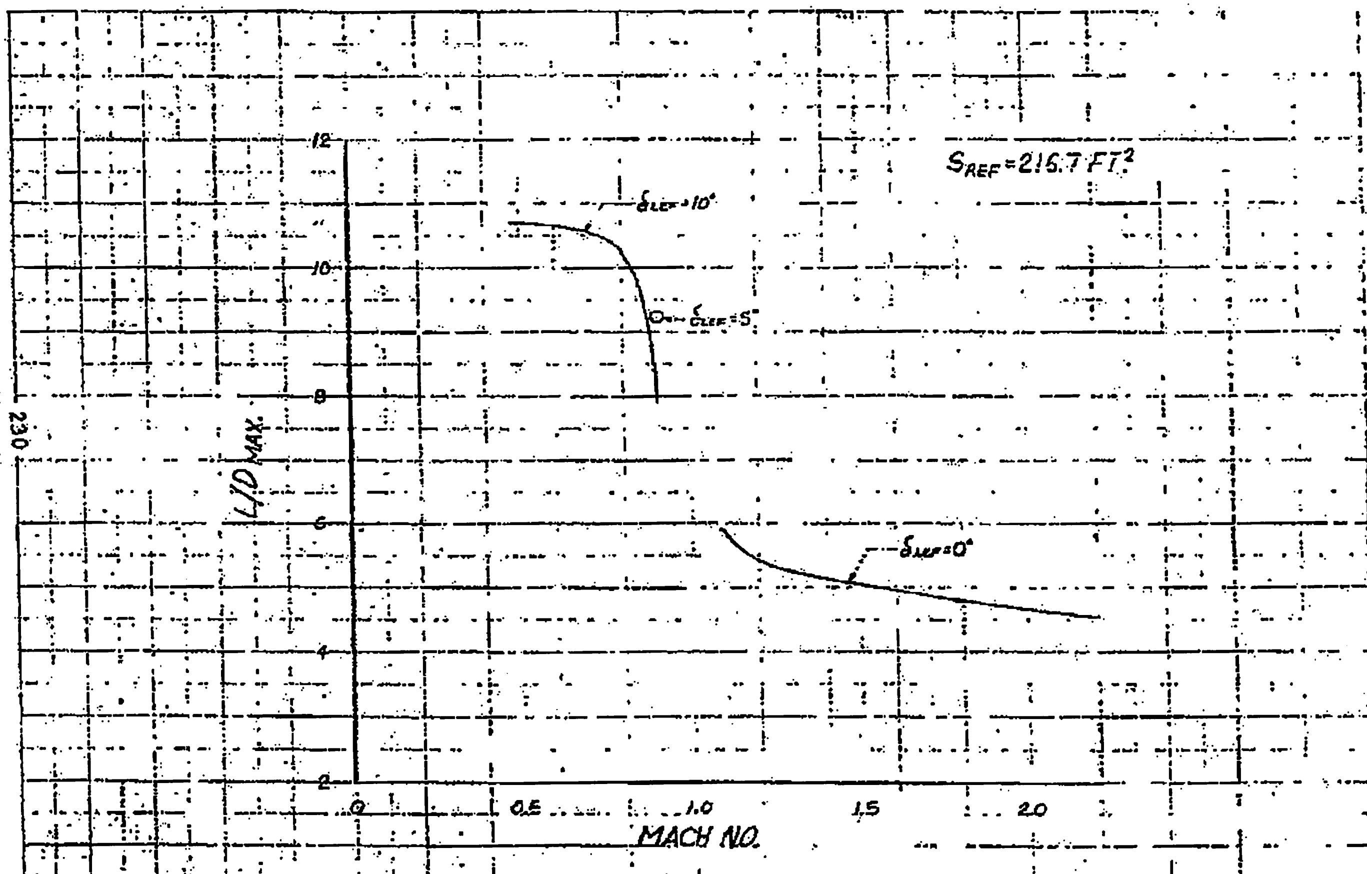

(S) Figure 4.3-10 Trimmed (L/D) Max vs Mach Number, Configuration 403(U)

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4.4 STABILITY, CONTROL, AND HANDLING QUALITIES

(U) In the case of the small single-engine design concept (Configuration 403), the same basis for handling qualities design aspects as previously presented in Section 3.4 for the 401B configuration has been followed. The overall configurations of the 401B and the 403 concepts are very similar. In these design studies, the respective volume coefficients of the horizontal and vertical tails have been maintained equal for the configuration layouts. Consequently, the stability and control characteristics of the small design will be basically the same as those presented in Subsection 3.4.3. A small difference may exist in the handling qualities of the two designs with the advantage in favor of the smaller design because of its correspondingly lower moments of inertia.

4.5 STRUCTURES AND WEIGHTS

~~(S)~~ Weight analysis for the Configuration 403 growth curve was performed in the same manner as for the Configuration 401B growth curve. Three airplanes were selected for analysis at design gross weights (in pounds) as shown below.

TOGW	(80% Fuel) Struct DGW	Ferry Mission Overload GW
10,000	9,460	20,200
13,000	12,300	23,200
16,800	15,800	27,000

(U) Input data for weight equations were derived from the scaling data presented in Section 4.1 together with layouts as required to develop specific area and dimensional data.

~~(S)~~ A weight summary for each of the three selected airplanes is presented in Table 4.5-1. A plot of weight variation versus gross weight is shown in Figure 4.5-1. A summary of the center-of-gravity conditions for the 13,000-pound-gross-weight configuration is shown below.

Item	Weight (lb)	C.G. (% MAC)
Basic Operating Weight	9,671	25.5
Zero Fuel Weight	10,304	25.3
Gross Weight	13,000	25.1

~~(S)~~ Table 4.5-1 WEIGHT SUMMARY: CONFIGURATION 403 GROWTH STUDY (pounds) (U)

Item	Airplane Size (Gross Weight)		
	10,000	13,000	16,800
Structure	(3662)	(4332)	(5263)
Wing	886	1193	1595
Fuselage	2006	2145	2376
Horizontal Tail	176	250	362
Vertical Tail	186	242	316
Landing Gear	408	502	614
Propulsion System	(2333)	(2422)	(2522)
Engine (G.E. 15-1/JIA5)	1790	1790	1790
Air Induction	223	231	244
Fuel System	283	364	449
Engine Controls	17	17	19
Starting System	20	20	20
Systems and Equipment	(2412)	(2536)	(2703)
Surface Controls	412	475	563
Landing Gear Controls	81	97	115
Instruments	94	94	94
Hydraulics and Pneumatics	185	218	267
Electrical	347	359	371
Avionics	460	460	460
Furnishings	238	238	238
Air Conditioning	142	142	142
Armament	453	453	453
Weight Empty	8407	9290	10,488
Useful Load	(375)	(381)	(387)
Crew	200	200	200
Unusable Fuel	11	17	23
Engine Oil	10	10	10
Missile Racks and Pylon	124	124	124
Starter Cartridge (2)	20	20	20
Miscellaneous	10	10	10
Basic Operating Weight	8782	9671	10,875
Payload	(633)	(633)	(633)
Ammo (500 rounds)	285	285	285
Missiles (2)	348	348	348
Zero Fuel Weight	9415	10,304	11,508
Fuel	585	2696	5292
Gross Weight	10,000	13,000	16,800

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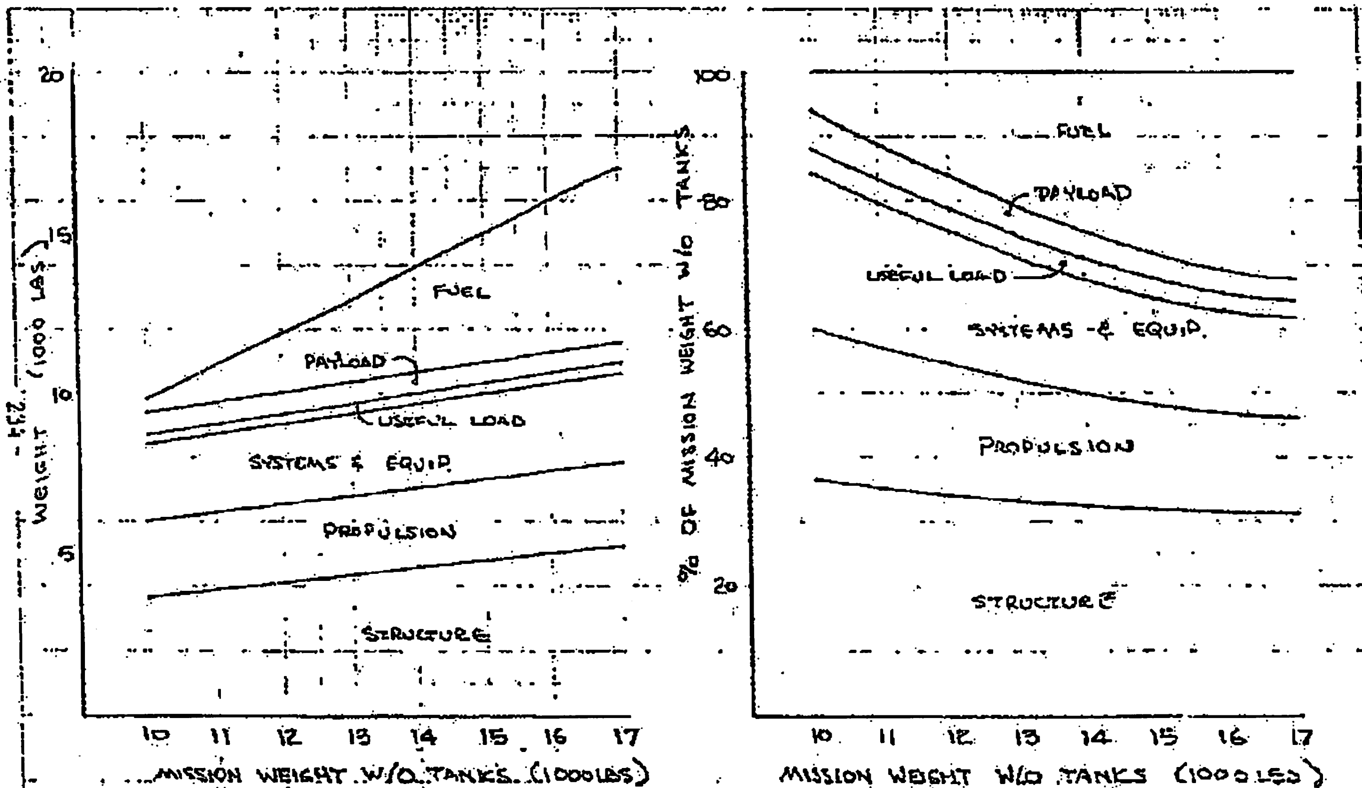

~~(S)~~ Figure 4.5-1 Weight Variation with Aircraft Size: Configuration 403 (U)

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4.6 PROPULSION (403/J101-GE-100)

(U) A single General Electric continuous-bleed turbojet, J101-GE-100, is installed in the Configuration 403 airplane. The General Electric designation for this engine is GE15/J1A5 (Reference 25). In this report the engine will be referred to as the J101-GE-100. Performance data were furnished by General Electric (Reference 26) accounting for Convair estimates of inlet pressure recovery, engine bleed and shaft power extraction.

(U) In this section, the J101-GE-100 propulsion system performance data are presented for the engine installed in a manner similar to that of the Configuration 401B engine installation described in Section 3.6. The same amounts of high-pressure air bleed and shaft power are extracted.

(U) The exhaust nozzle is a contoured translating-flap convergent-divergent (TFCD) configuration. The nozzle exhaust area is fully modulated during afterburning operation and varies to a lesser extent when the engine is operating in non-afterburning power settings.

4.6.1 Propulsion System Performance

(U) The installed thrust specific fuel consumption, TSFCS, and propulsion system net thrust, F_{NS}, of the J101-GE-100 are presented in Table 4.6-1 and Figure 4.6-1 through 4.6-7. The data shown comprise a minimum package needed for the Configuration 403 airplane design and mission analysis.

(U) The definition of the installed propulsion system net thrust, F_{NS}, is similar to that given in Subsection 3.6.1

(U) It should be noted that some differences exist between the propulsion system performance data contained in this section of the report and those shown in Subsection 5.6.1 for the twin-engine airplane. Subsection 5.6.1 contains later engine data from General Electric. The data contained in this section are the same as those reported in the Convair interim report (FZM-5726). A change in the propulsion system performance data to the later set of data will not affect the conclusions made on the single-engine airplane. Therefore no effort was made to update the single-engine propulsion performance.

(U) Table 4.6-1 403/J101-GE-100 MAXIMUM AFTERBURNING AND INTERMEDIATE POWER PROPULSION SYSTEM PERFORMANCE DATA (U)

Altitude (ft)	Mach Number	FNS (lbf)	TSFCS (lbm/hr/lbf)
Power Setting - Maximum Afterburning			
0	0	11295.	2.047
0	.5	13254.	2.202
10000.	.6	11130.	2.088
10000.	.9	12611.	2.229
30000.	.8	6442.	2.053
	.9	7018.	2.051
	1.0	7688.	2.053
	1.1	8315.	2.063
	1.2	8813.	2.093
	1.3	9212.	2.147
	1.4	9509.	2.219
	1.5	9953.	2.273
35000.	1.6	8787.	2.275
	1.8	8447.	2.467
	2.0	7440.	2.821
40000.	1.6	7013.	2.275
	1.8	6776.	2.457
	2.0	6060.	2.791
Power Setting - Intermediate Power			
0	0	7669.	.893
0	.5	8093.	1.021
10000.	.6	6651.	1.036
10000.	.9	7037.	1.090
20000.	.713	5258.	1.032
25000.	.783	4538.	1.035

4.6.2 Inlet

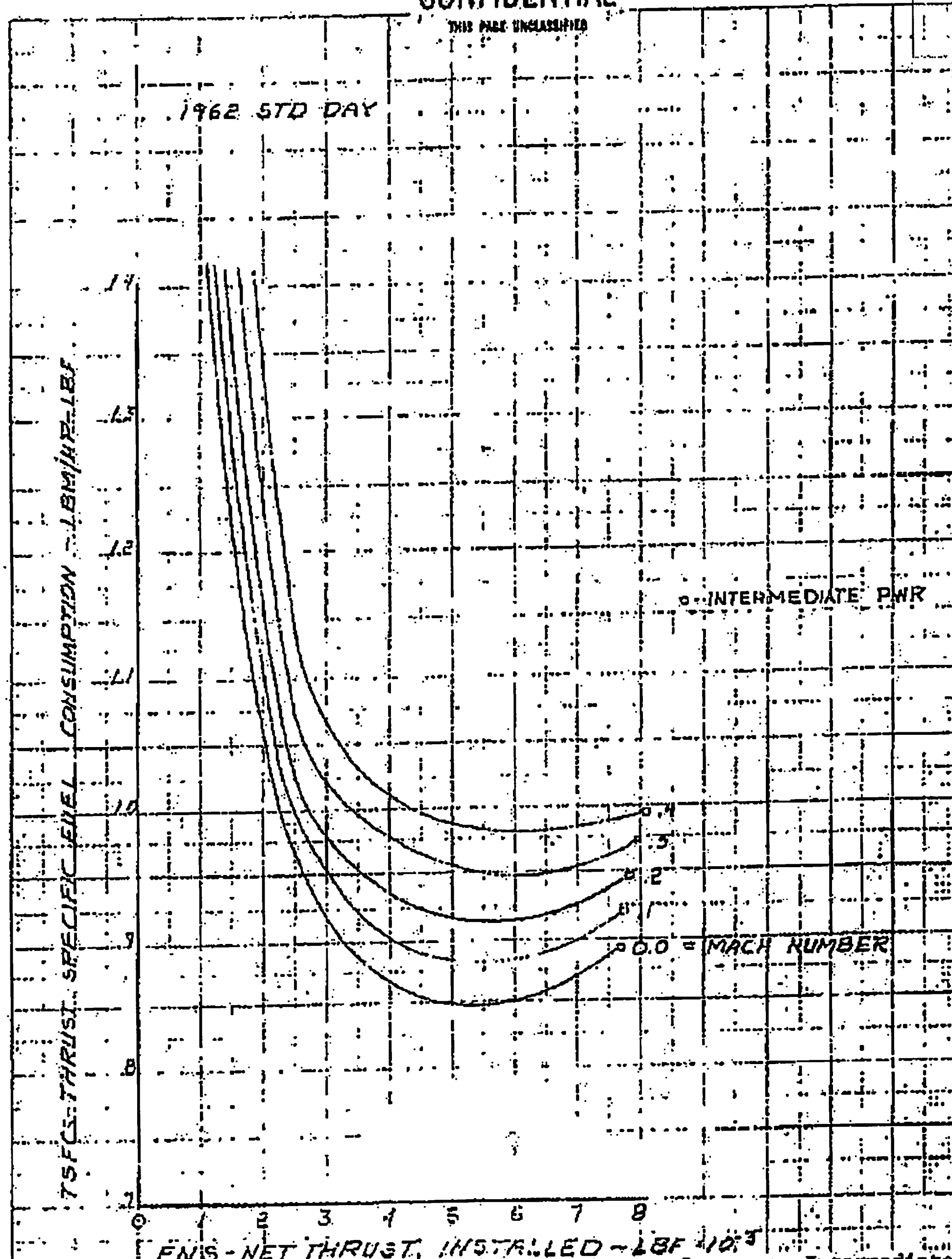
~~(C)~~ The inlet system for configuration 403/J101-GE-100 is essentially the same as that described in Subsection 3.6.2, but scaled to match the airflow requirements of the J101-GE-100 engine. The resulting inlet capture area, 423 sq in. is based on a maximum engine corrected airflow of 129.8 lbm/sec. The inlet performance data presented in Subsection 3.6.2 is made applicable to the J101-GE-100 engine by multiplying the engine corrected airflow scale by the ratio of maximum standard-day engine corrected airflows:

$$\frac{129.8}{227} = 0.572$$

4.6.3 Nozzle

(U) The nozzle employed for this engine is a translating-flap-type convergent/divergent, non-ejector nozzle as depicted in the Figure 4.6-8 sketch. A pressure-drag analysis was made, and the data are shown in Figures 4.6-9 and 4.6-10.

(U) The drag bookkeeping system employed is the same as that defined in Subsection 3.6.1. The maximum augmentation drag given in Figure 4.6-9 is the baseline, and the dry-power drag given in Figure 4.6-10 is the increment included in the propulsion data. Also, nozzle/aft-fuselage flow-field interactions are accounted for as defined in Subsection 3.6.3. The baseline nozzle pressure ratio is shown in Figure 4.6-11.



(U) Figure 4.6-1 403/J101-GE-100 Propulsion System Performance, Intermediate and Reduced Powers, Sea Level

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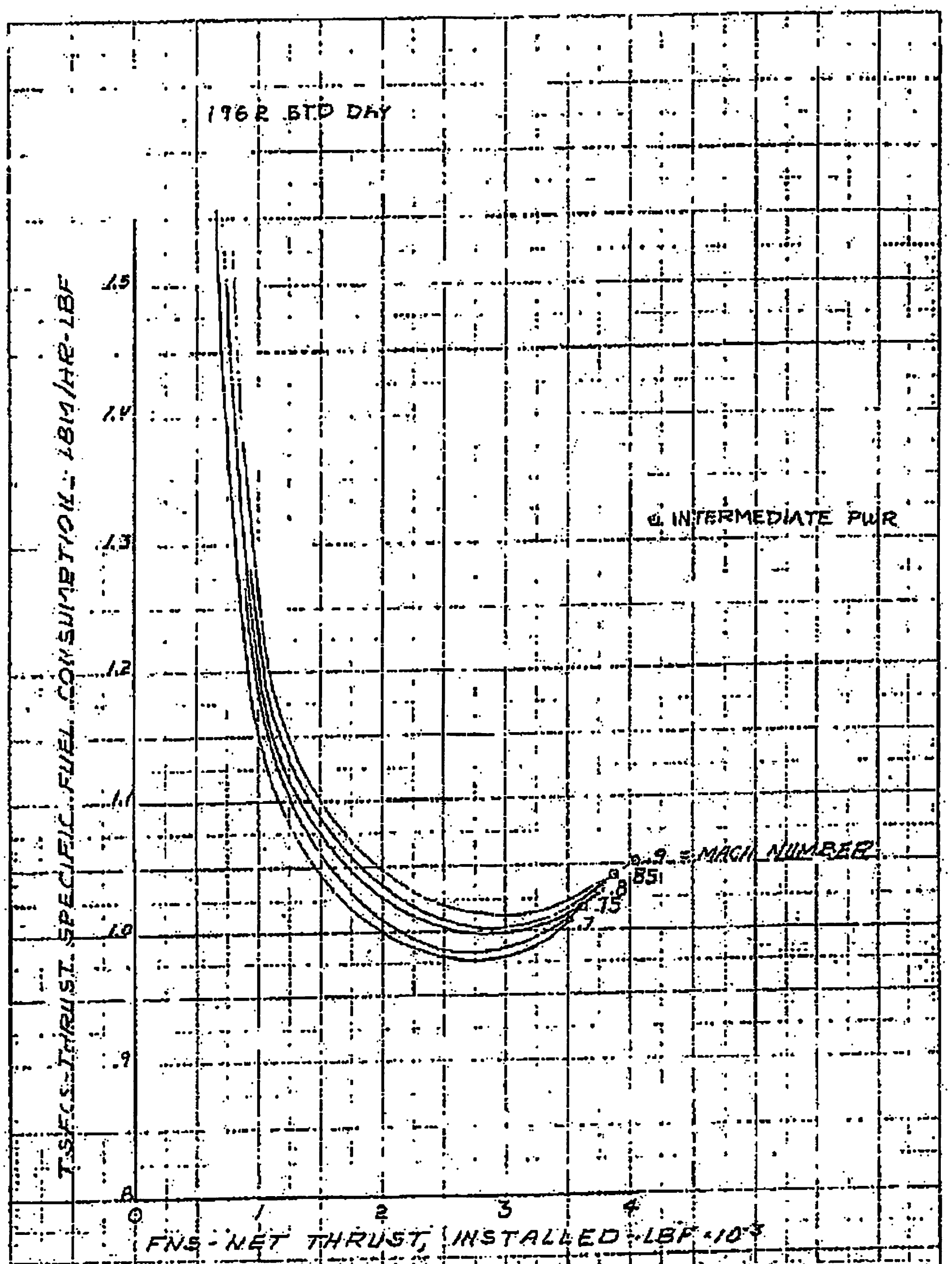
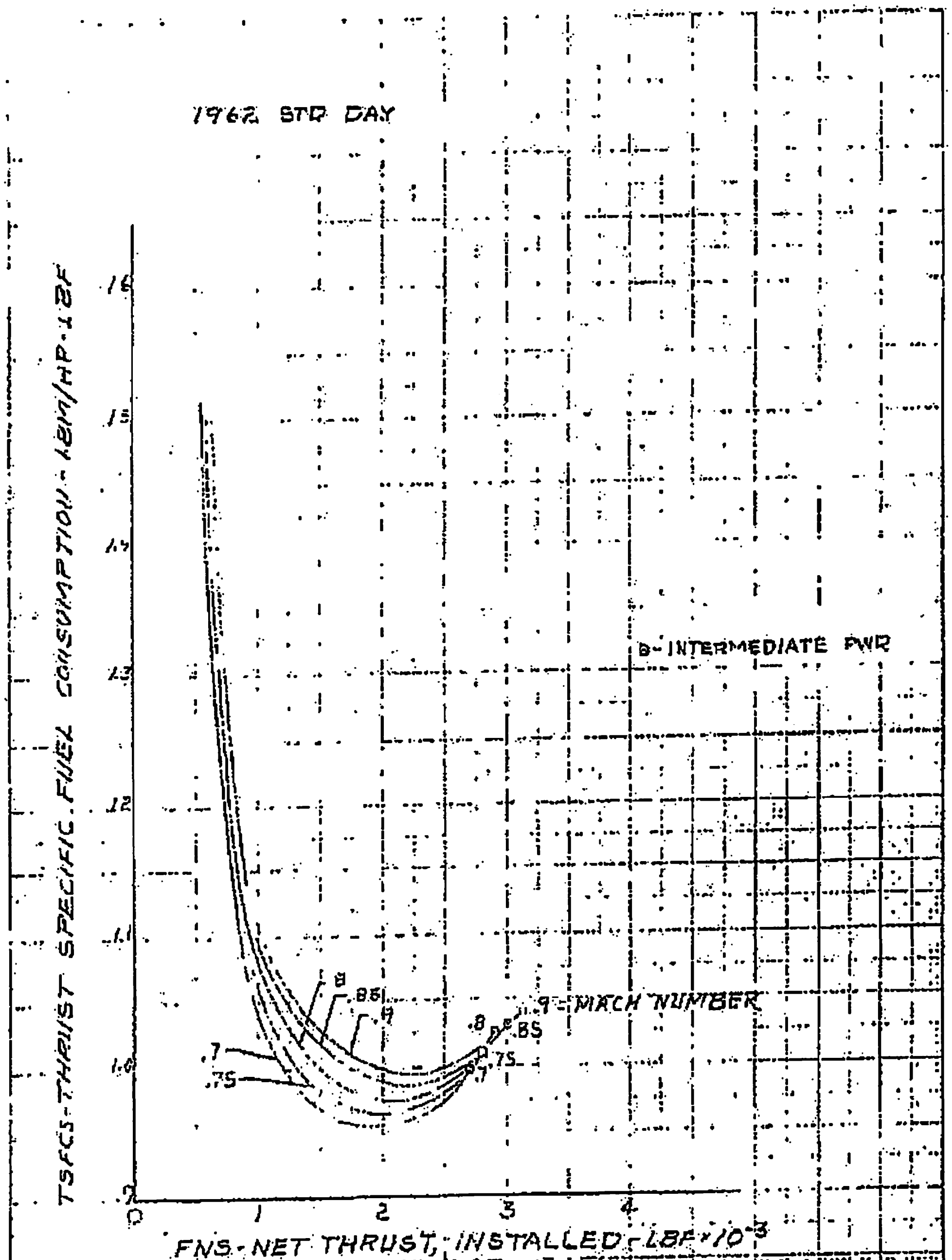


(U) Figure 4.6-2 403/J101-GE-100 Propulsion System Performance, Intermediate and Reduced Powers, 30,000 Feet



(U) Figure 4.6-3 403/J101-GE-100 Propulsion System Performance, Intermediate and Reduced Powers, 36,089 Feet

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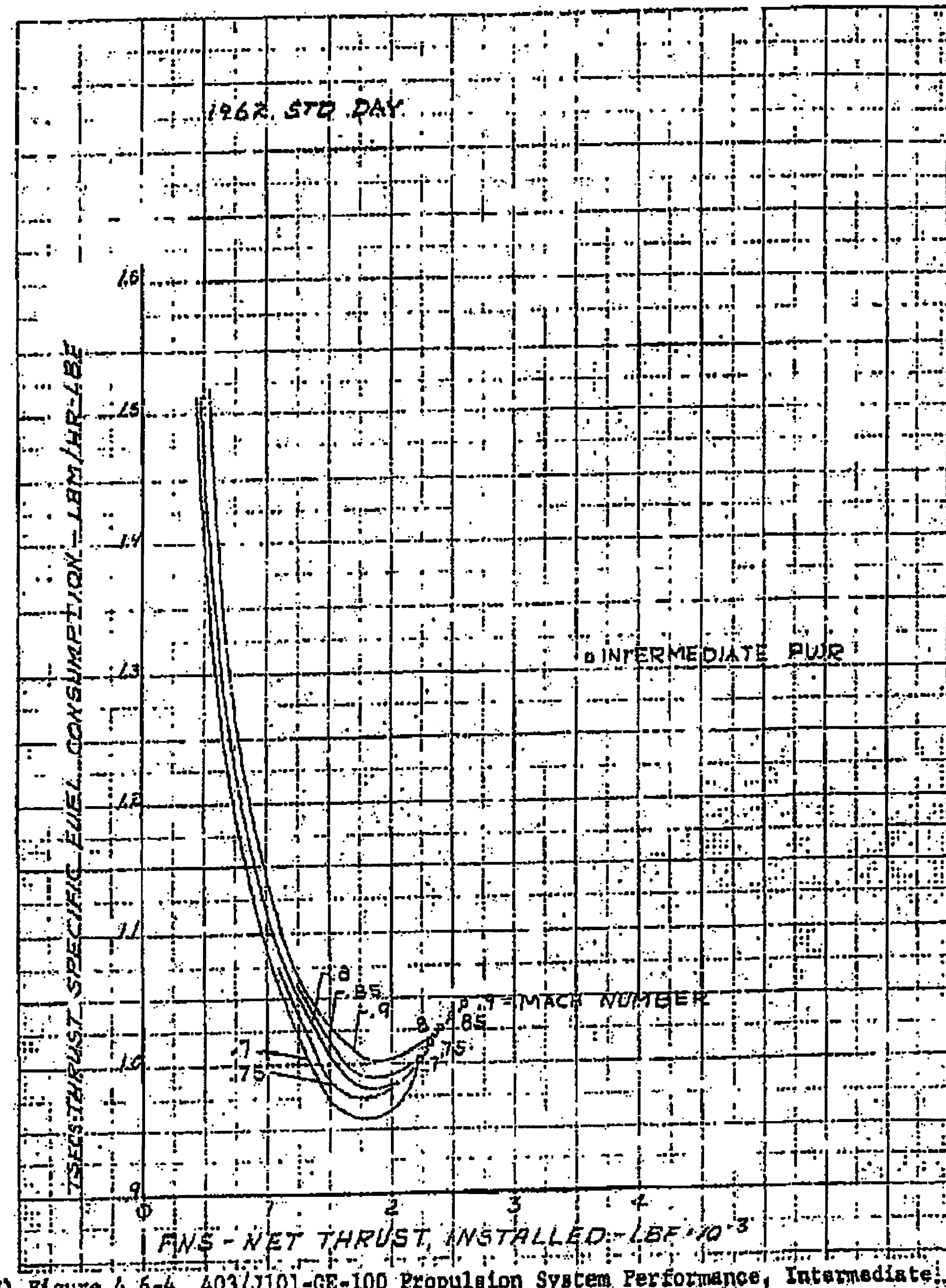
SEC. 3.3.(b)(4)
1.4. (a)(g)



(U) Figure 4.6-4 403/J101-GE-100 Propulsion System Performance, Intermediate and Reduced Powers, 40,000 Feet

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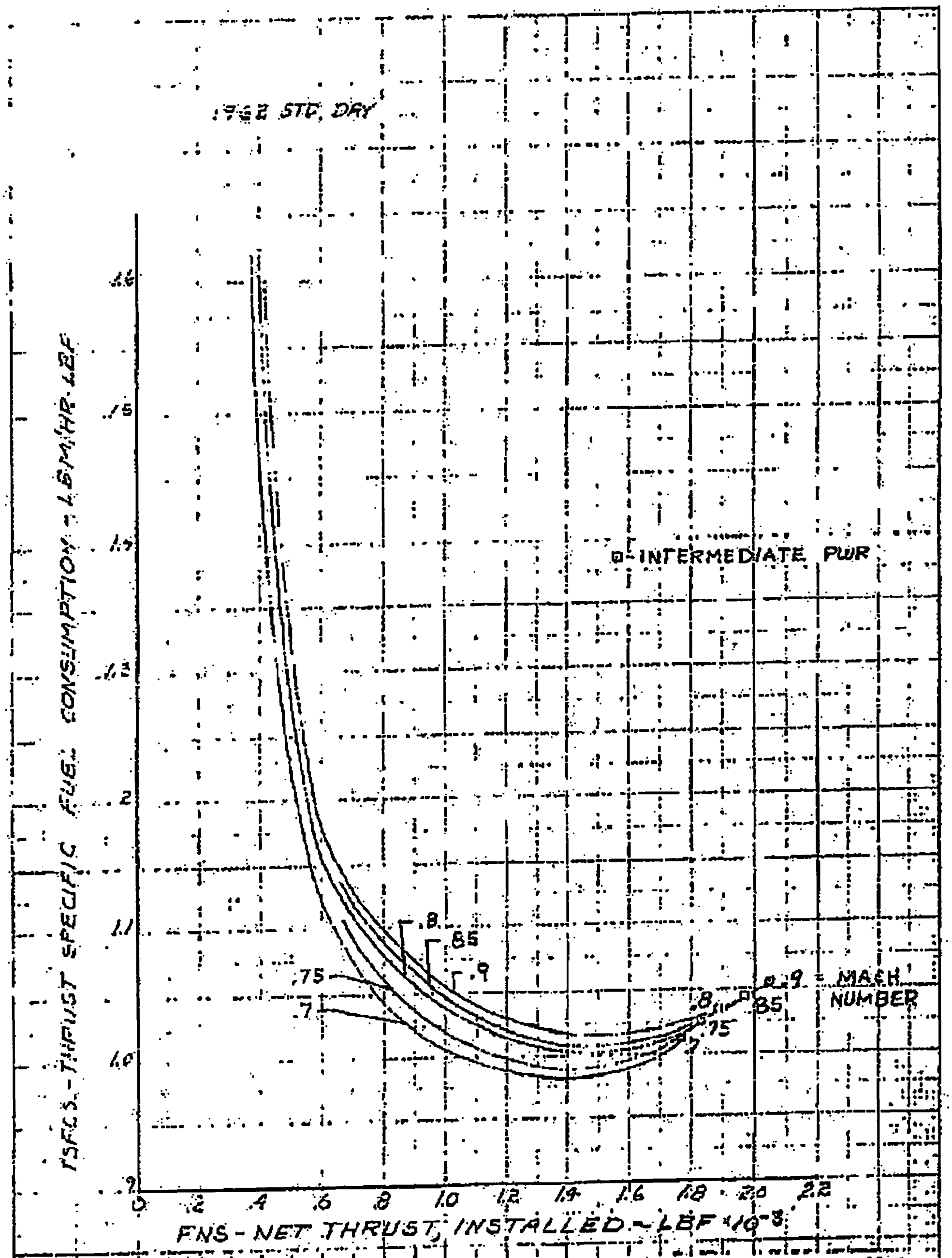
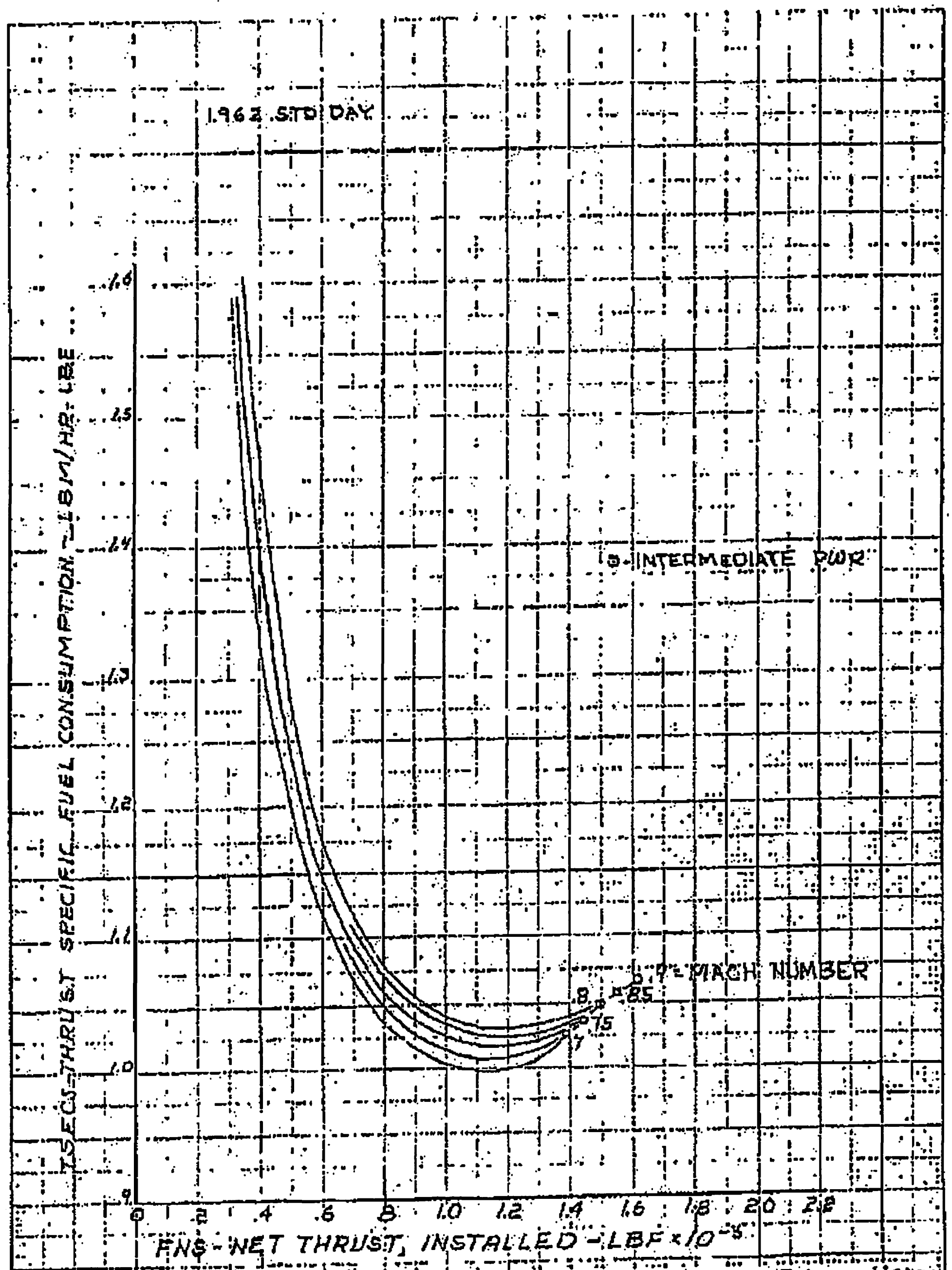
FOIA (b)(1)
E.O. 13526 SEC. 3.3.(b)(4)
1.4. (a)(g)

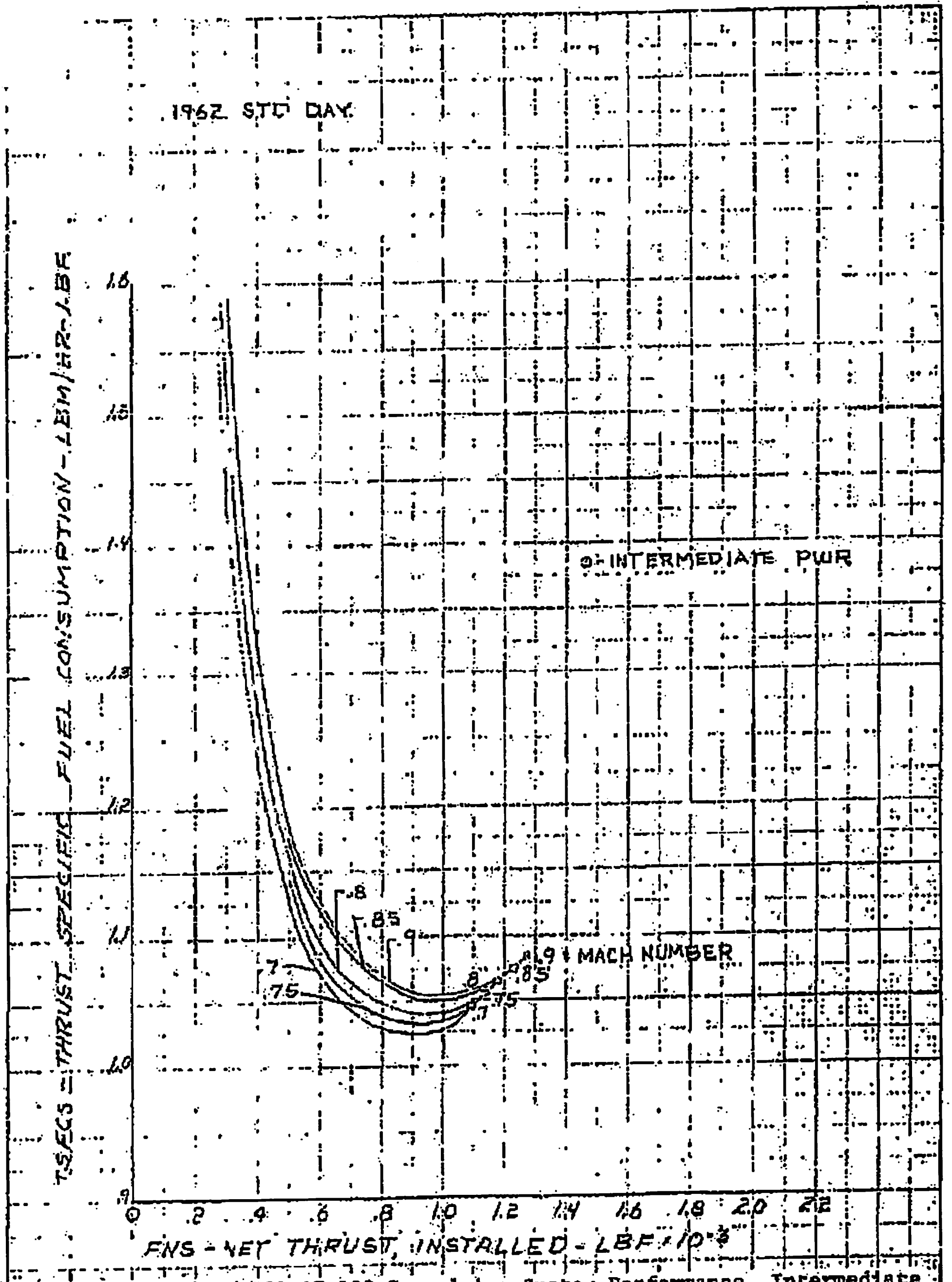


(U) Figure 4.6-5 403/J101-GE-100 Propulsion System Performance, Intermediate and Reduced Powers, 45,000 Feet

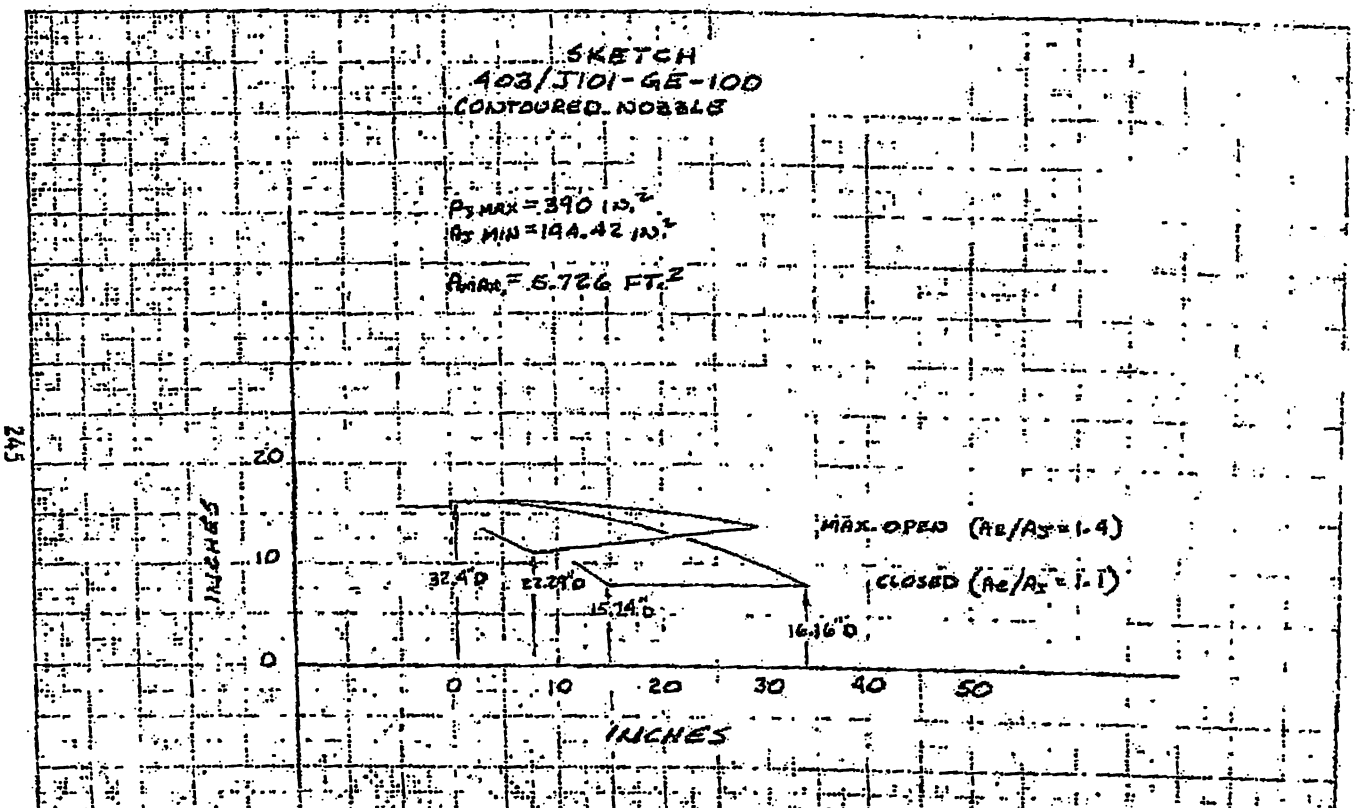
88th ABW/IPI
FOIA (b)(1)
E.O.13526 SEC.
3.3.(b)(4)
1.4. (a)(g)



(U) Figure 4.6-6 403/J101-GE-100 Propulsion System Performance, Intermediate and Reduced Powers, 50,000 Feet



(U) Figure 4.6-7 403/J101-GE-100 Propulsion System Performance, Intermediate and Reduced Powers, 55,000 Feet



(U) Figure 4.6-8 Sketch of the J101-GE-100 Contoured Nozzle Configuration

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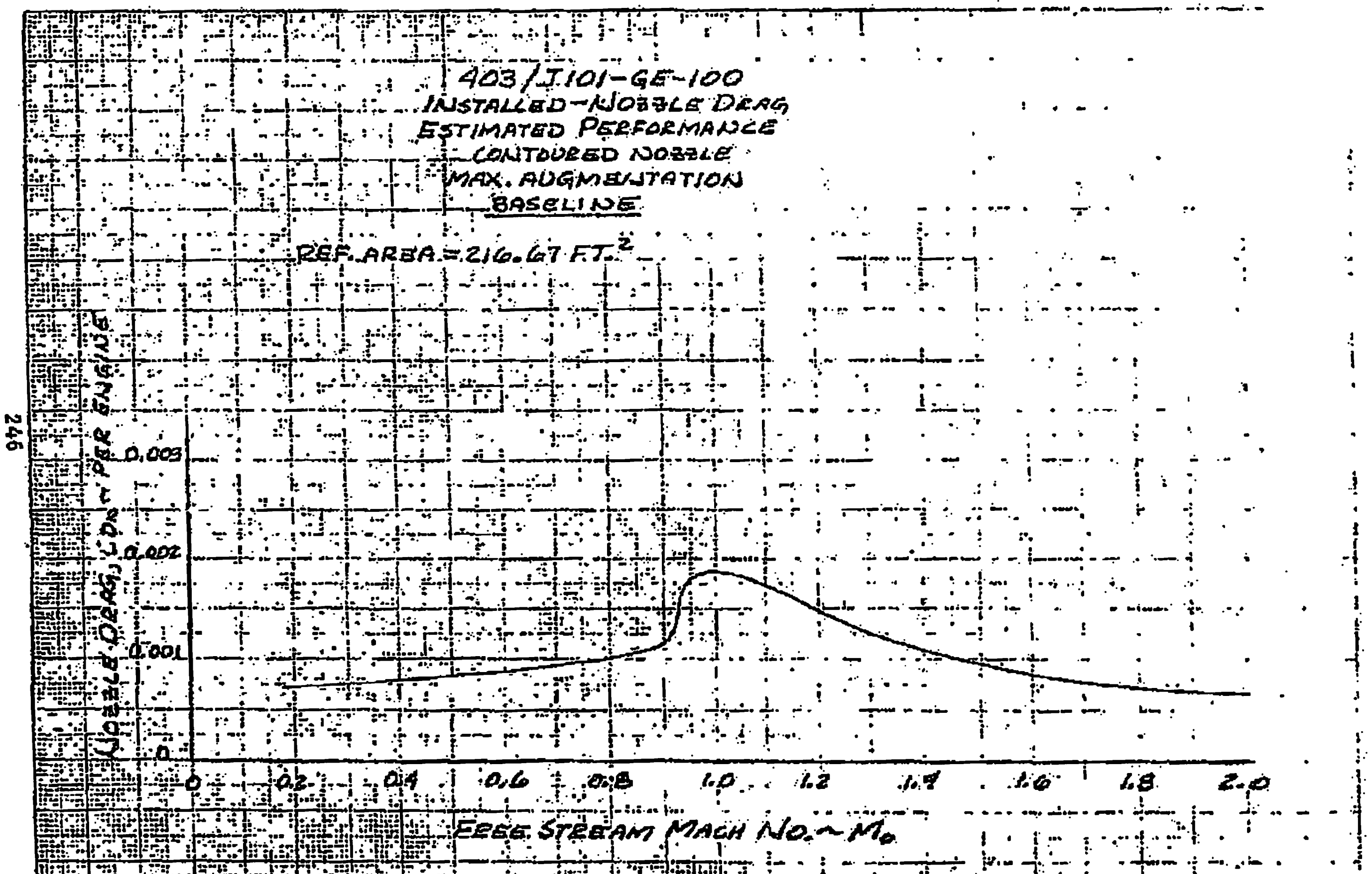
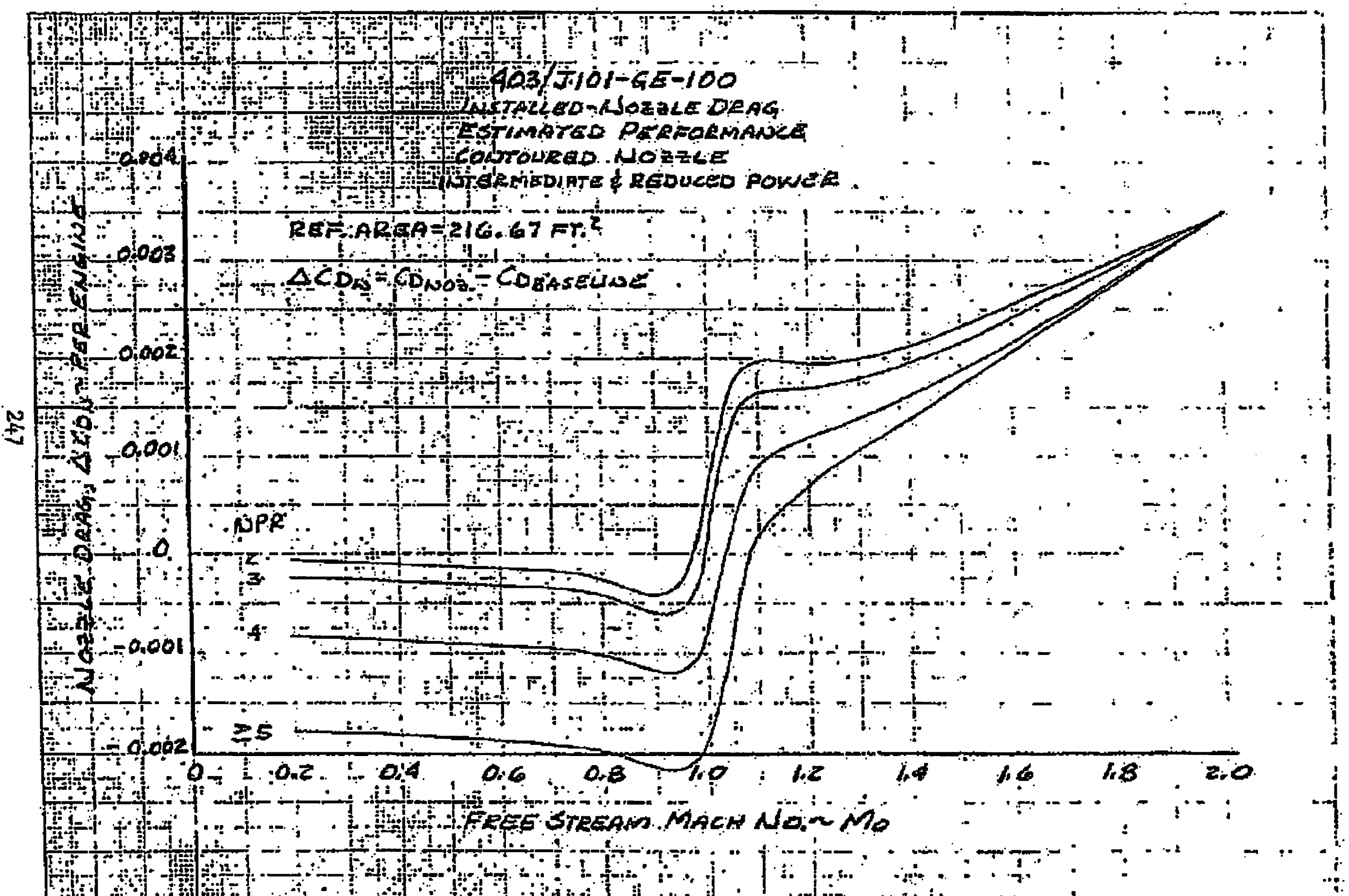
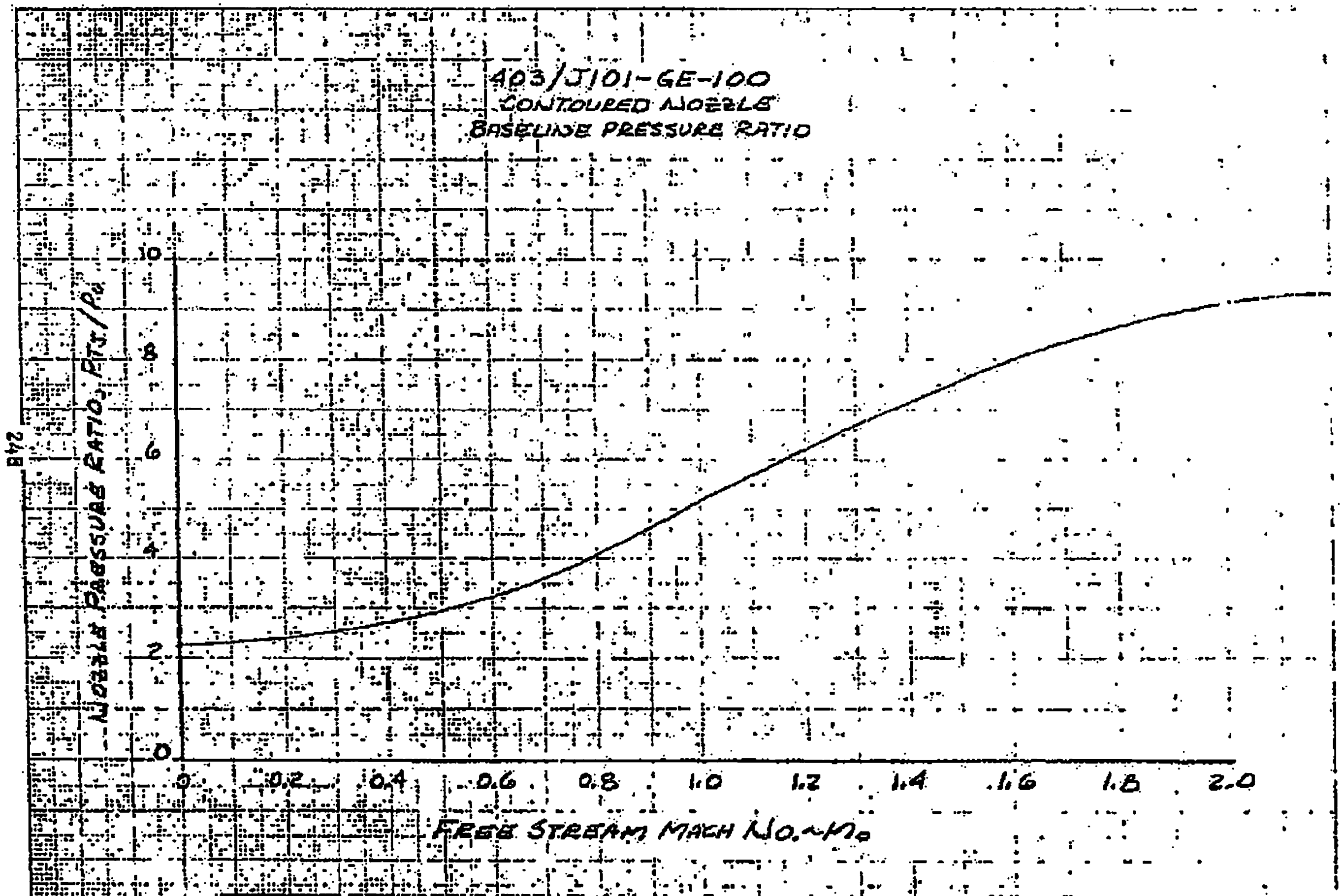


(U) Figure 4.6-9 403/J101-GE-100 Installed Nozzle Drag, Maximum Afterburning



(U) Figure 4.6-10 403/J101-GE-100 Installed Nozzle Drag, Intermediate and Reduced Powers



(U) Figure 4.6-11 403/J101-GE-100 Baseline Nozzle Pressure Ratio

SECTION 5

LARGE TWIN - ENGINE CONCEPT

(501A/J101-GE-100)

5.1 VEHICLE DESIGN

(U) In this subsection a description is presented of the large twin-engine concept, a brief explanation is given of the configuration rationale, and the configuration growth data that were generated for sizing the point-design vehicle are summarized.

5.1.1 Vehicle Description

~~(S)~~ The large twin-engine fighter concept (Concept 3) designated Configuration 501A, is presented in Figure 5.1-1, which shows the general arrangement of the point-design airplane (22,680-lb mission weight). An inboard profile and basic lines arrangement of a 501A-type airplane are shown in Figures 5.1-2 and 5.1-3 at a mission weight of 19,000 pounds. The airplane depicted in these two figures was designed for a gross weight of 19,000 pounds and was used as a basis for development of the growth data generated to determine the sized airplane of Figure 5.1-1.

~~(S)~~ Configuration 501A is a high-performance fighter with a gross weight of 22,680 pounds, a wing loading of 60 psf and a thrust-to-weight ratio of 1.26 (uninstalled).

(U) Configuration 501A is basically very similar to Configurations 401B and 403. Overall characteristics such as wing and control surface planform and arrangement geometry, crew station, fuel tankage, and equipment arrangement are essentially the same. The major differences occur in the engine/inlet system, the landing gear, and the gun installation. These differences are described briefly in the following subsections.

5.1.1.1 Engine/Inlet

(U) In Configuration 501A, the two J101-GE-100 engines are clustered closely together in the aft fuselage section of the airplane. Primary air is supplied to each engine by a separate duct which incorporates a semi-D-shaped, fixed, normal-shock inlet. The inlets are located just forward of the nose gear on either side of the fuselage centerline and spaced approximately one engine diameter apart. The fuselage is contoured forward of the inlets in a manner designed to provide an integrated forebody/inlet geometry that will allow good air inlet characteristics throughout the maneuver envelope.

5.1.1.2 Landing Gear

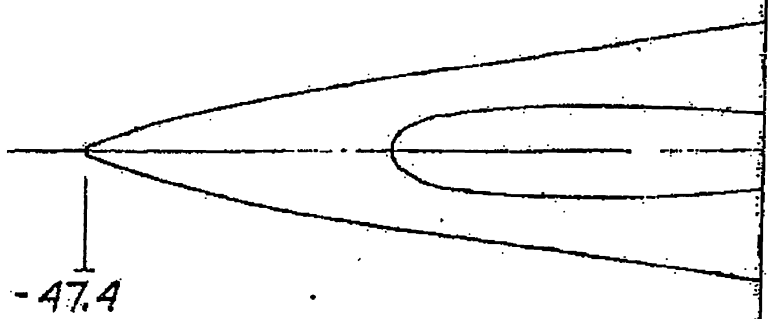
(U) A conventional tricycle landing gear arrangement is employed on Configuration 501A. The main gear is located in the fuselage in the region just ahead of the engine compartment and retracts forward into a bay on either side beneath the engine inlet ducts. The nose gear is a semi-articulated design with a free-castering, single-wheel arrangement. It is located just aft and between the engine inlets and retracts forward int. a bay in the lower center fuselage.

5.1.1.3 Gun Installation

~~(S)~~ The gun installation of configuration 501A is similar to that of Configuration 401B except that the ammunition cannisters are located in a more favorable area for easy access as a result of the twin inlet arrangement. A 20mm gun is located on either side of the airplane in the glove region provided by the forward extension of the thickened wing root as in the 401B concept. The gun compartment is thus situated above the inlet duct on either side and is accessible through hinged panels in the upper fuselage skin. A separate ammunition cannister is provided for each gun in a center-fuselage bay between the gun compartments and just forward of the fuselage fuel tank. The ammunition cannisters are easily removable through access panels in the lower fuselage.

5.1.2 Design Rationale

(U) Most of the overall design rationale that applies to the single-engine concept (401B) also applies to the 501A concept. In order to provide the fairest comparison between the twin-engine and single-engine concepts, the primary features of the 401B concept were adopted insofar as possible. Of the six major distinguishing features of the 401B concept,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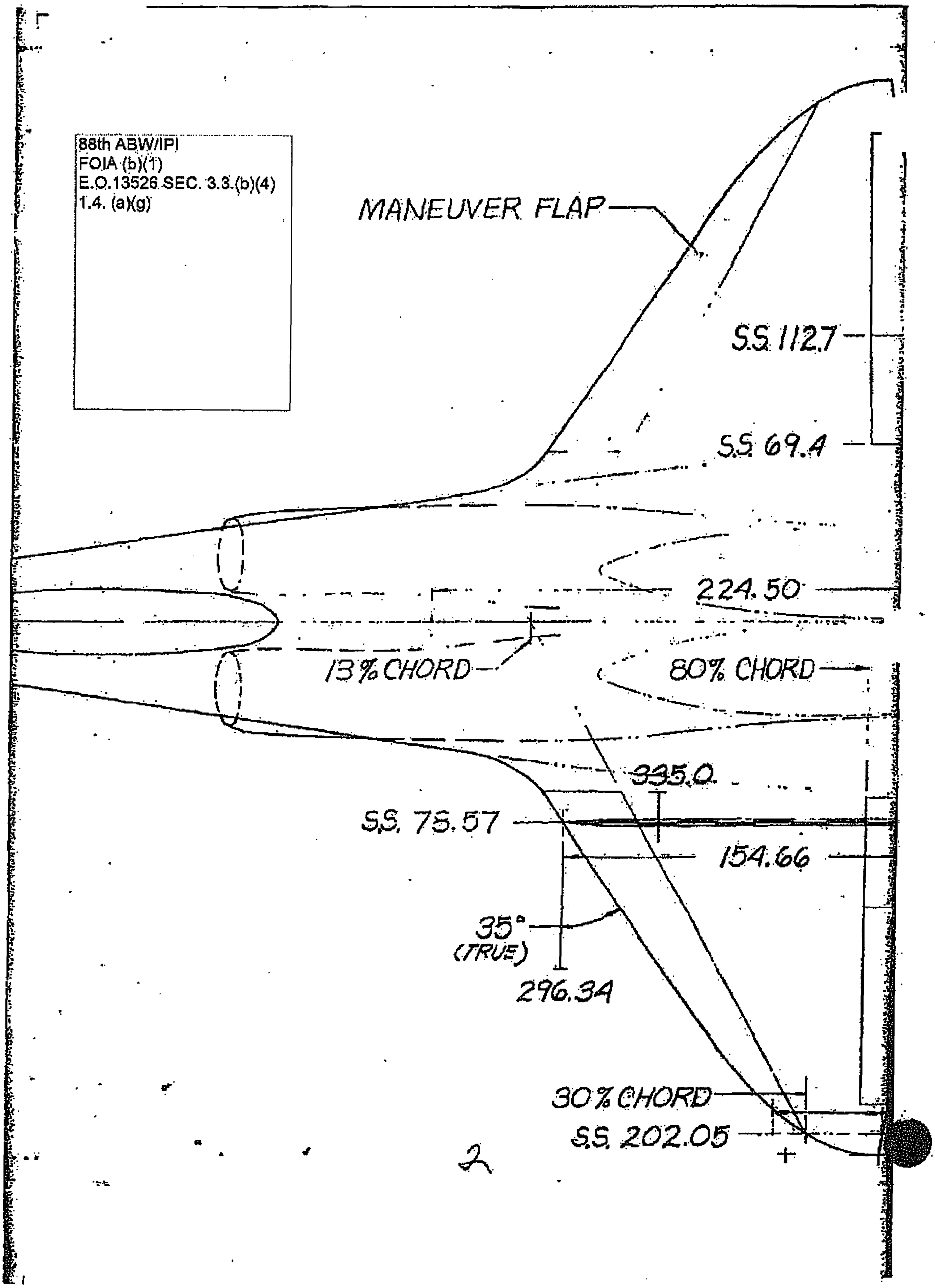

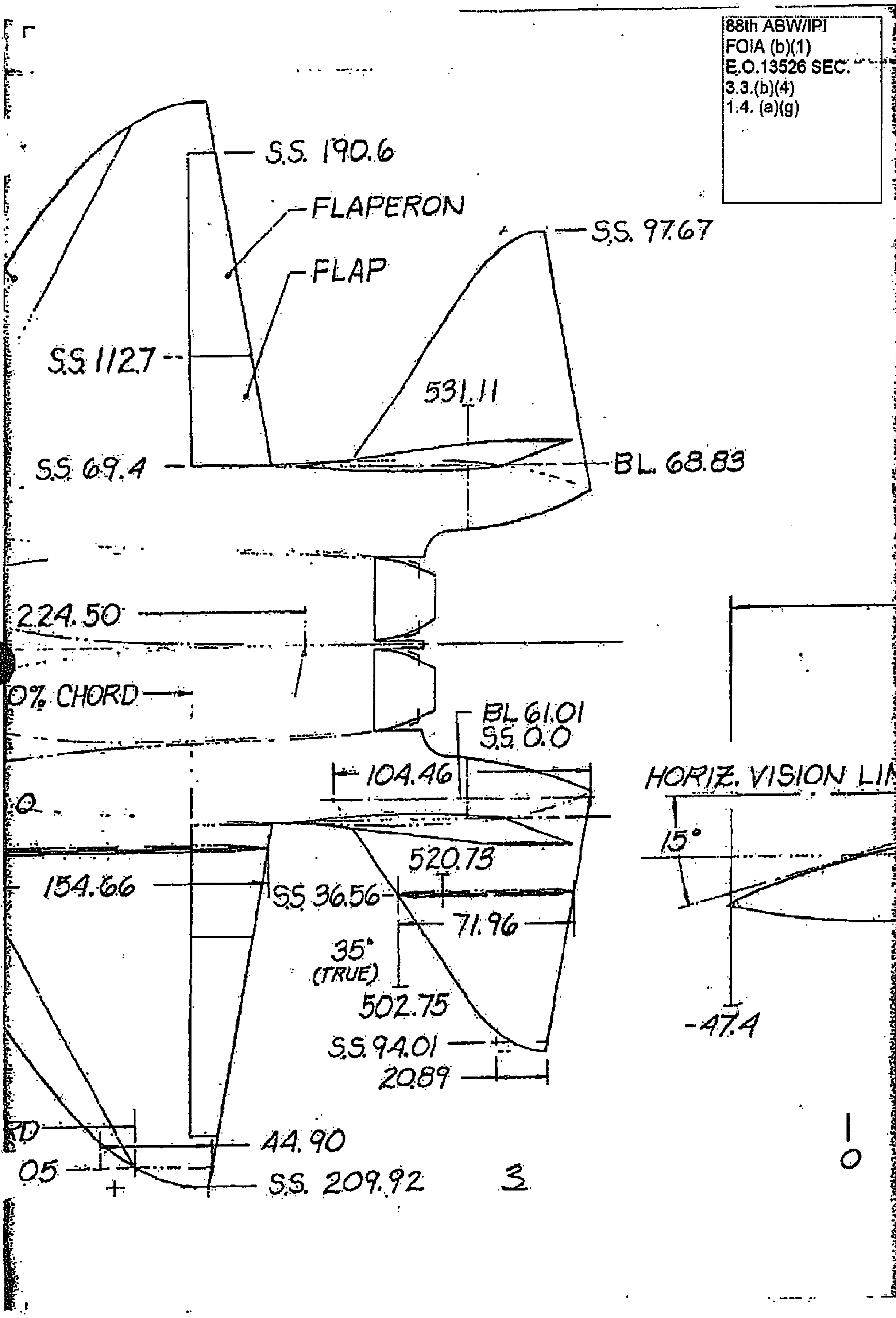
S.S. 190.6
FLAPERON
FLAP
S.S. 97.67
S.S. 112.7
531.11
S.S. 69.4
BL. 68.83
224.50
0% CHORD
BL 61.01
S.S. 0.0
104.46
HORIZ. VISION LIN
0
15°
520.73
154.66
S.S. 36.56
71.96
35°
(TRUE)
502.75
-47.4
S.S. 94.01
20.89
44.90
05
S.S. 209.92
3
0

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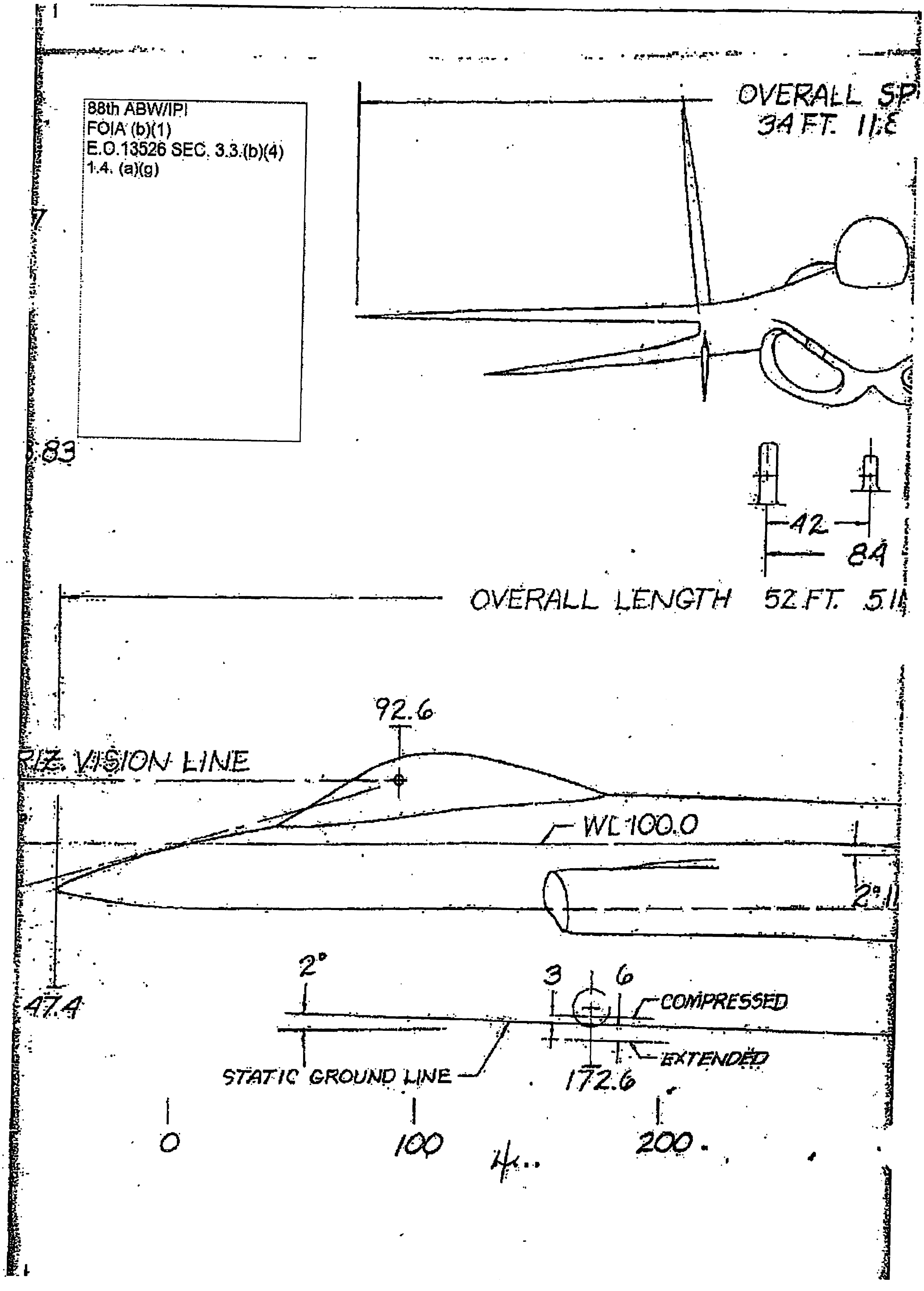

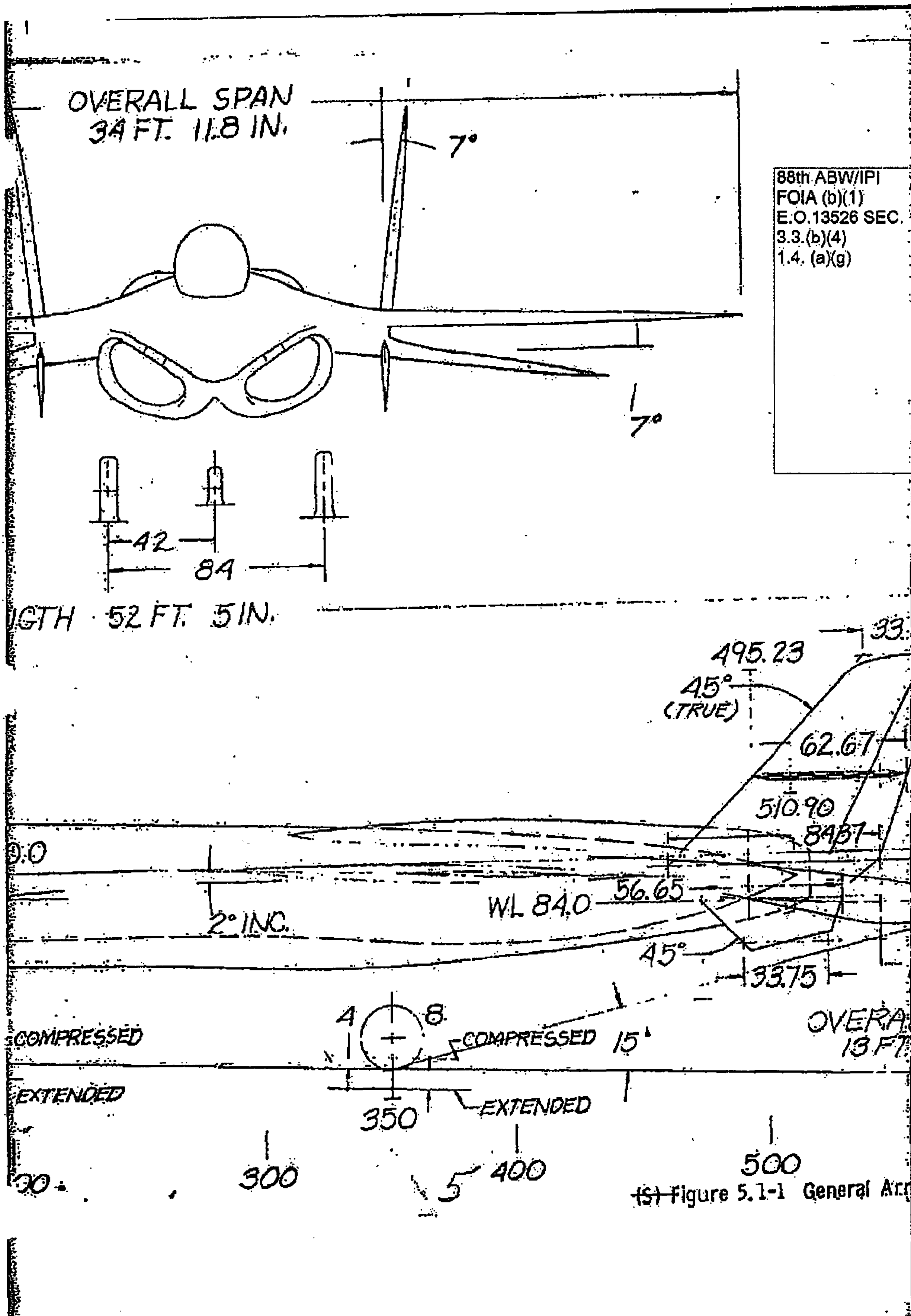

~~(S)~~ Figure 5.1-1 General Arr

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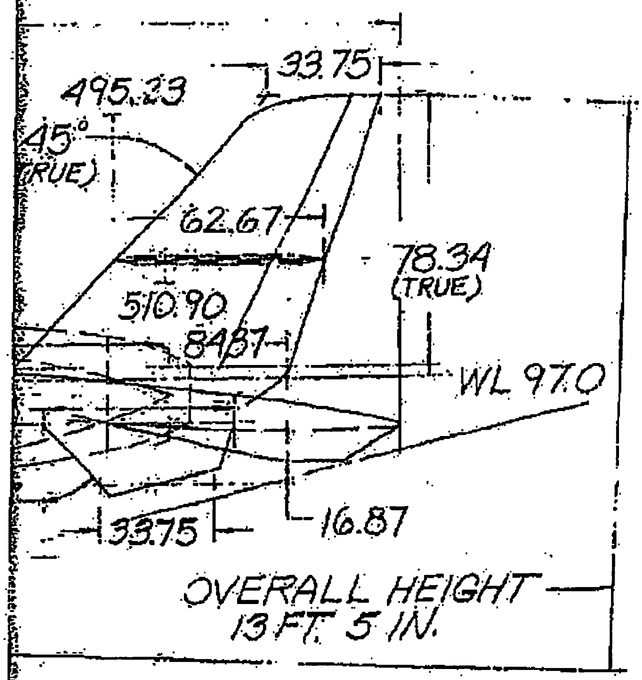
Aircraft Mission Weight -- 22,680 lb



WING (REFERENCE)

AREA	338.00 SQ. FT
ASPECT RATIO	3.5
TAPER RATIO	0.2
SPAN	33.67 FT
SWEEP-LEADING EDGE	35°
ROOT CHORD	276.50 IN
TIP CHORD	46.90 IN
M.A.C.	196.00 IN
AIRFOIL SECTION	4% BICONVEX
INCIDENCE	3°
DIHEDRAL	0°

MANEUVER FLAP

TYPE	PLAIN
TOTAL AREA	39.8 SQ. FT
SPAN-PER SIDE	133.4 IN
ROOT CHORD	[illegible] IN
TIP CHORD	13.5 IN
DEFLECTION	25°
HINGE LINE	
[illegible]	28%
[illegible]	30%

FLAPS

TYPE	PLAIN
TOTAL AREA-INCLUDING FLAPERON	36.0 SQ. FT
ROOT CHORD	37.5 IN
TIP CHORD	24.0 IN
FLAPERON	
TOTAL AREA	17.3 SQ. FT
SPAN-PER SIDE	77.9 IN
ROOT CHORD	26.9 IN
TIP CHORD	11.0 IN
DEFLECTION	-20°, +30°
FLAP DEFLECTION-MAX	30°
FLAP HINGE	80%

VERTICAL TAIL

AREA-TOTAL	66.76 SQ. FT
ASPECT RATIO	1.3263
TAPER RATIO	0.4
SPAN	78.34 IN
SWEEP-LEADING EDGE	45°
ROOT CHORD	84.37 IN
TIP CHORD	33.75 IN
AIRFOIL SECTION	6% ROOT, 4% TIP BICONVEX

RUDDER

AREA-TOTAL	10.03 SQ. FT
SPAN	38.36 IN
ROOT CHORD	21.01 IN
TIP CHORD	8.44 IN
DEFLECTION	±30°

VENTRAL FIN

AREA-TOTAL	10.39 SQ. FT
ASPECT RATIO	0.3733
TAPER RATIO	0.5937
SPAN	16.87 IN
SWEEP-LEADING EDGE	65°
ROOT CHORD	56.63 IN
TIP CHORD	33.75 IN
AIRFOIL SECTION	4% BICONVEX

HORIZONTAL TAIL (ALL MOVABLE)

AREA	81.63 SQ. FT
ASPECT RATIO	3.0
TAPER RATIO	0.2
SPAN EXPOSED	188.08 IN
SWEEP-LEADING EDGE	35°
ROOT CHORD	106.46 IN
TIP CHORD	20.89 IN
M.A.C.	71.96 IN
INCIDENCE	0°
AIRFOIL SECTION	6% AT BL 46.43, 4% TIP - BICONVEX
DIHEDRAL	-7°
DEFLECTION	L.E. UP 15°, DN 30°

POWERPLANT

P&W JTF 22A-[illegible] TURBO FAN ENGINE	2 REQ'D

LANDING GEAR

MAIN GEAR TIRE	26 x 6.5
NOSE GEAR TIRE	[illegible]

TAIL LENGTHS

C/4 WING TO C/4 VERTICAL TAIL	16 FT. 2.4 IN
C/4 WING TO C/4 HORIZONTAL TAIL	15 FT. 5.7 IN

PRELIMINARY DESIGN DRAWING

GENERAL ARRANGEMENT
LARGE TWIN ENGINE CONCEPT
POINT DESIGN, AVFFX PROGRAM

BY B.J. CSASZAR | APPROVED | SCALE 1/40 | DATE 28 AUG 72

GENERAL DYNAMICS
Convair Aerospace Division
Fort Worth Operation

FW7104139

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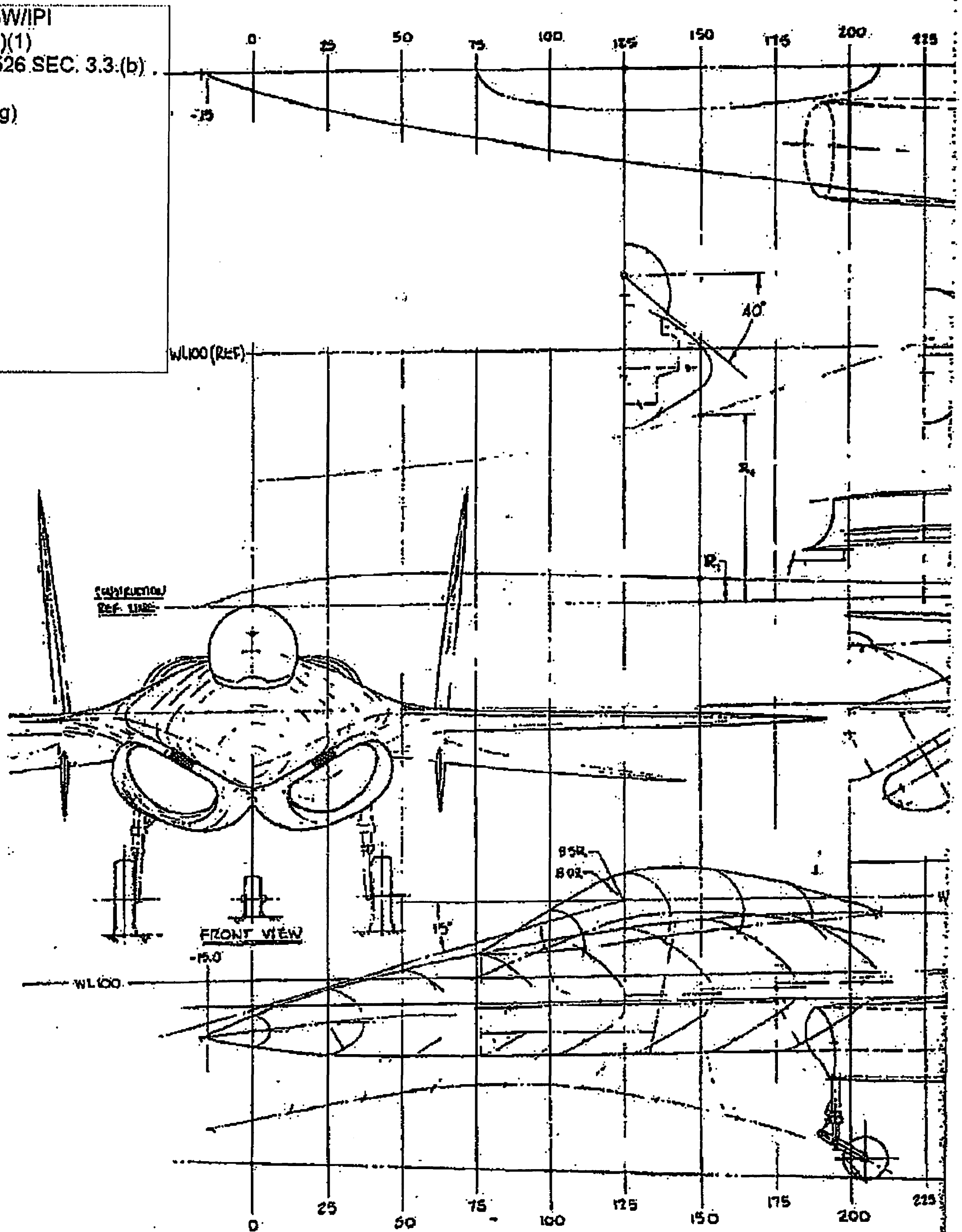
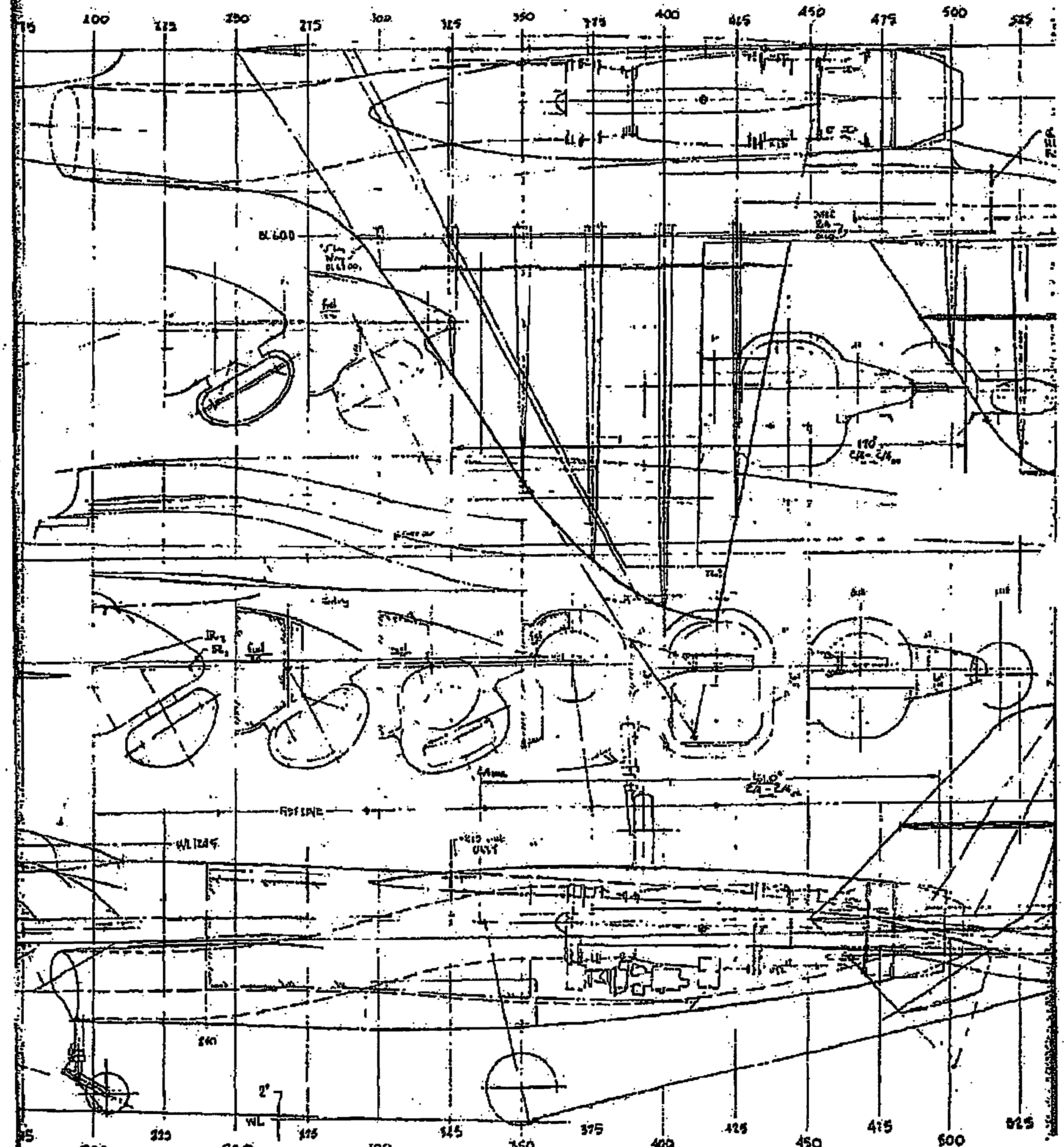
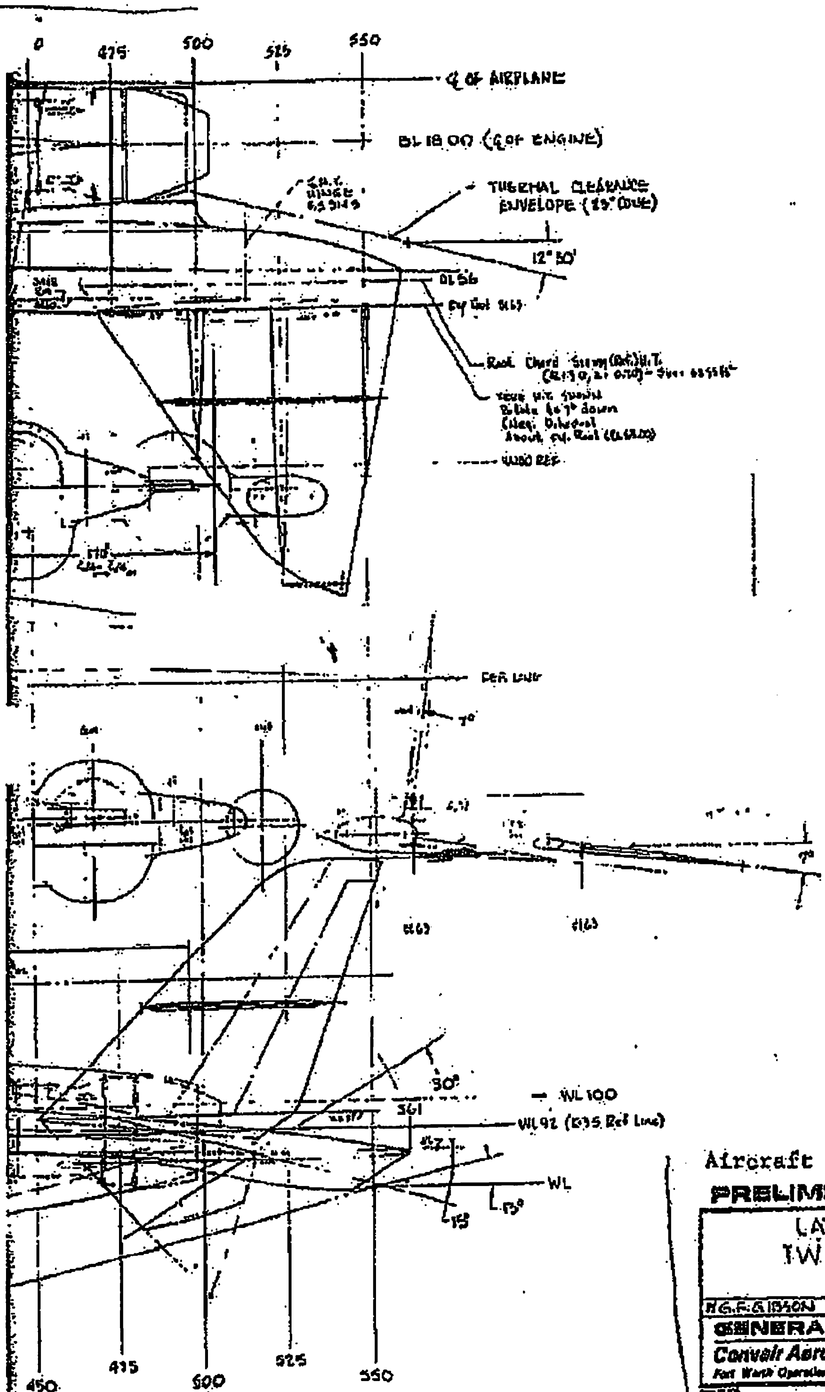
Figure 5.1-1 General Arrangement - Large Twin-Engine Concept Point Design Configuration (U)


0
25
50
75
100
125
150
175
200
225
-15
WL100 (REF)
40°
CONSTRUCTION
REF. LINE
FRONT VIEW
15°
-15.0
WL100



2 ~~(S)~~ Figure 5.1-2 Lines - Large Twin-Engine Co



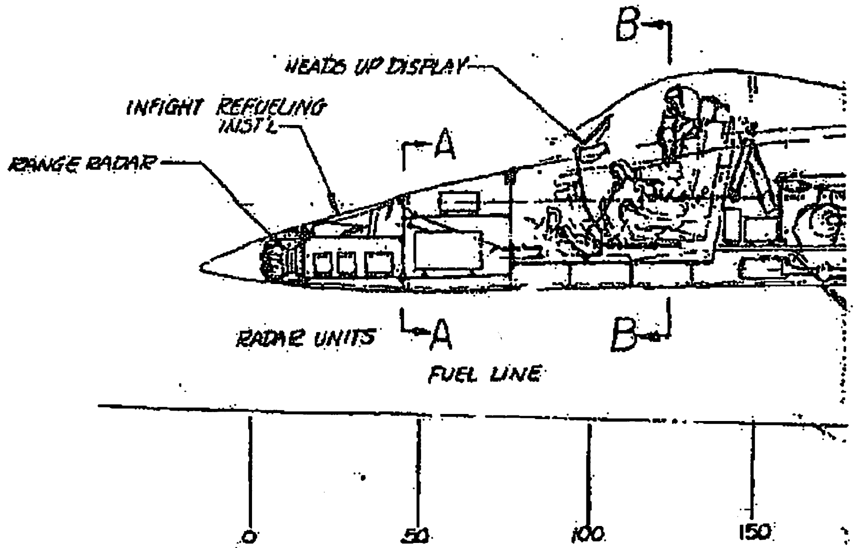
Aircraft Mission Weight -- 19,000 lb

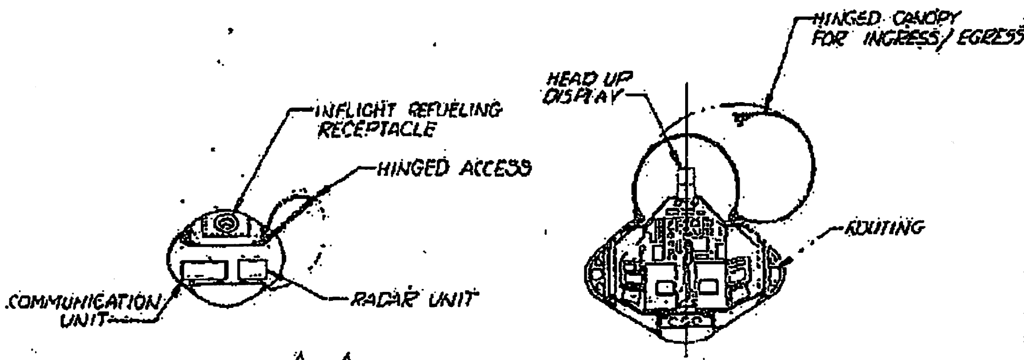
PRELIMINARY DESIGN DRAWING

LAYOUT - CONFIG. 501A TWIN-ENGINE CONCEPT AVFFX PROGRAM	
GENERAL DYNAMICS Convair Aerospace Division Fort Worth Operation	FW7104104

Large Twin-Engine Concept Configuration 501A (U)

88th ABW/IPI
FOIA (b)(1)
E.O.13526 SEC. 3.3.(b)
(4)
1.4. (a)(g)



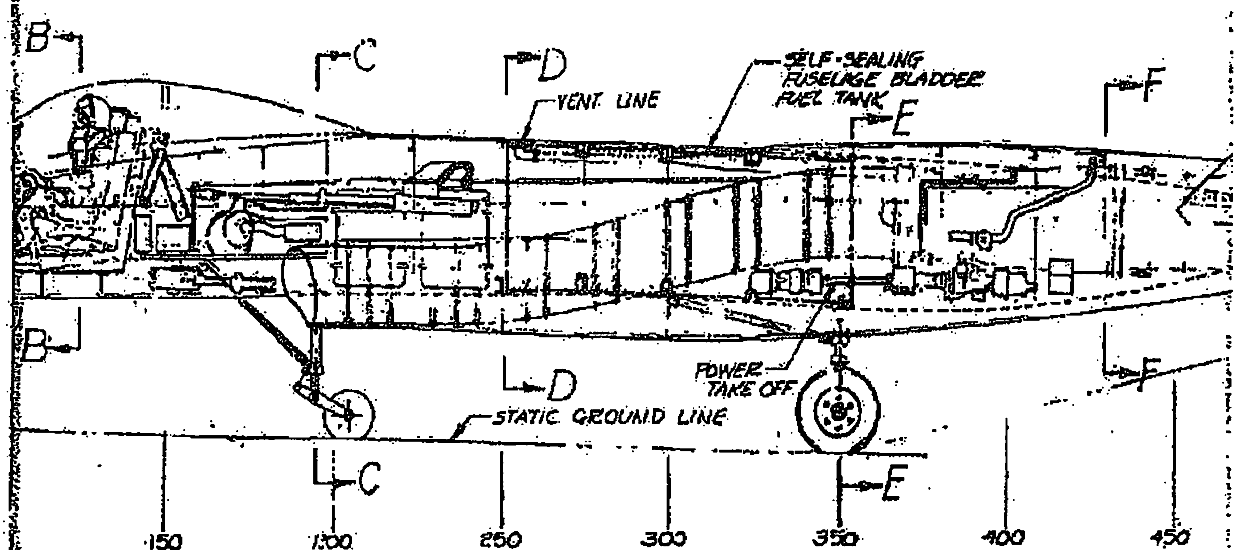


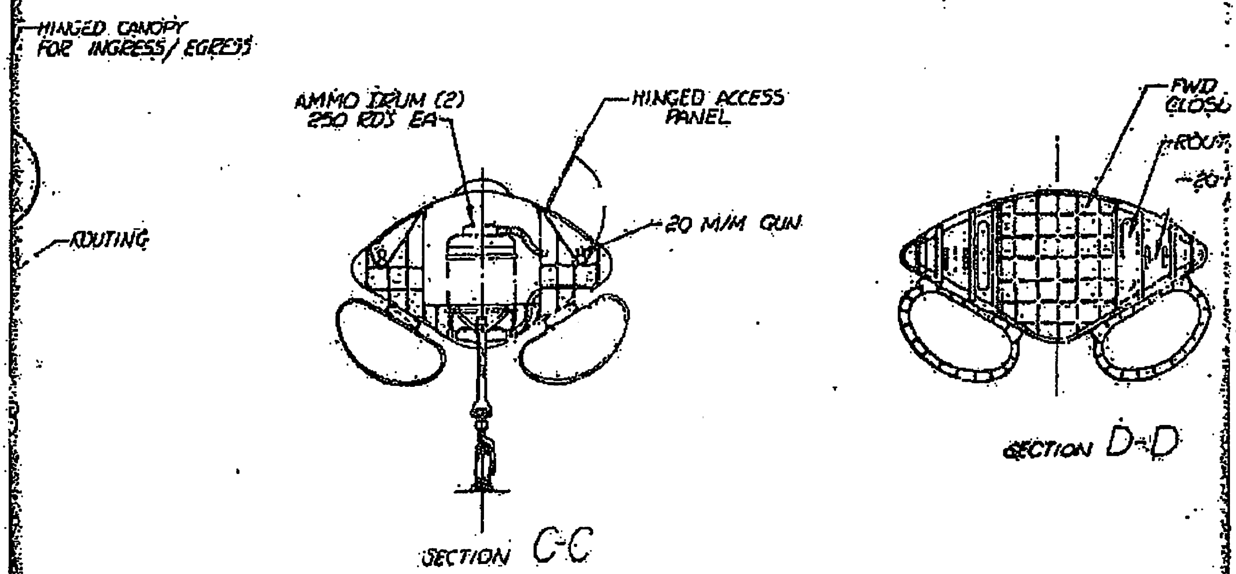
SECTION A-A

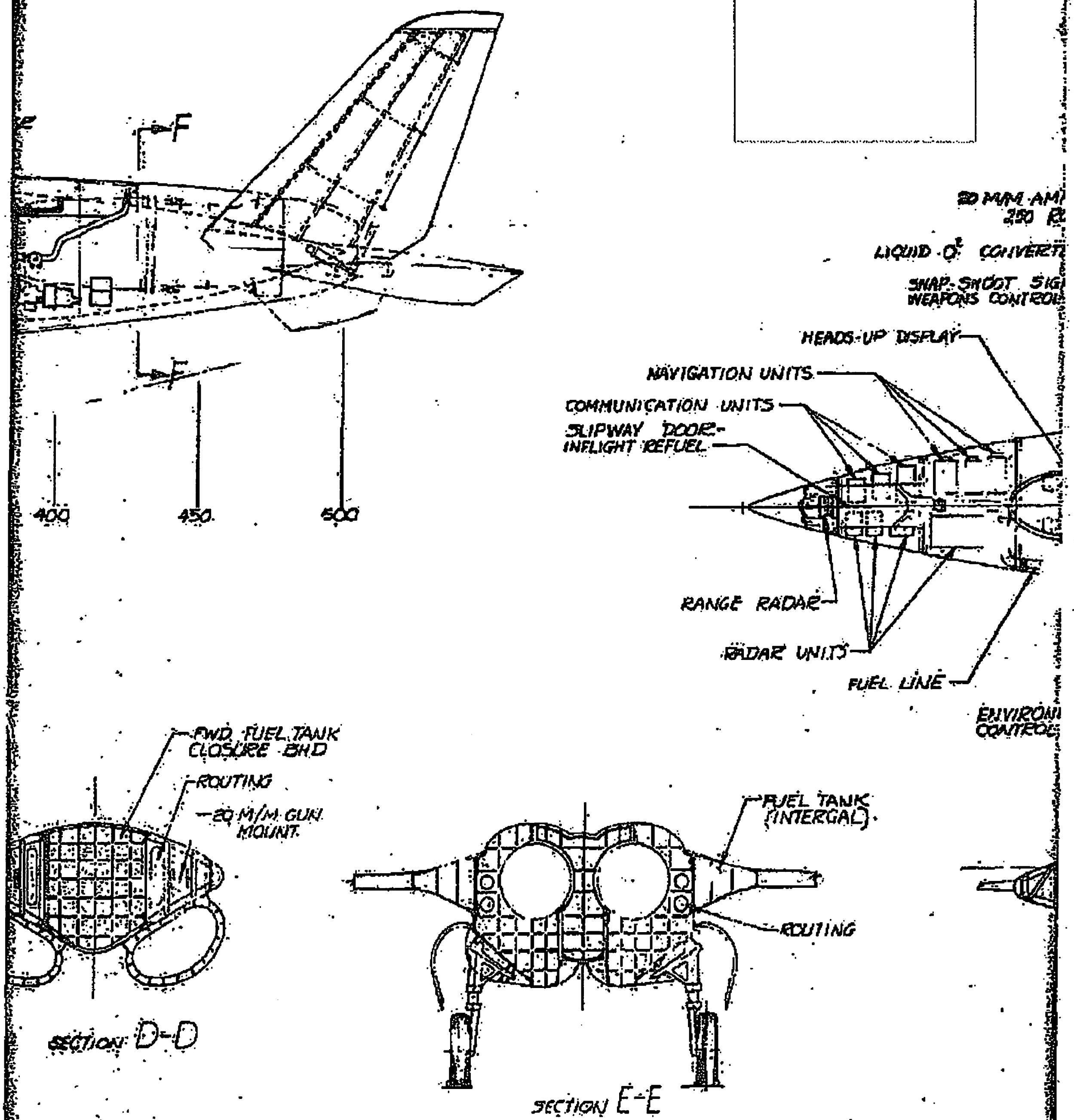
SECTION B-B

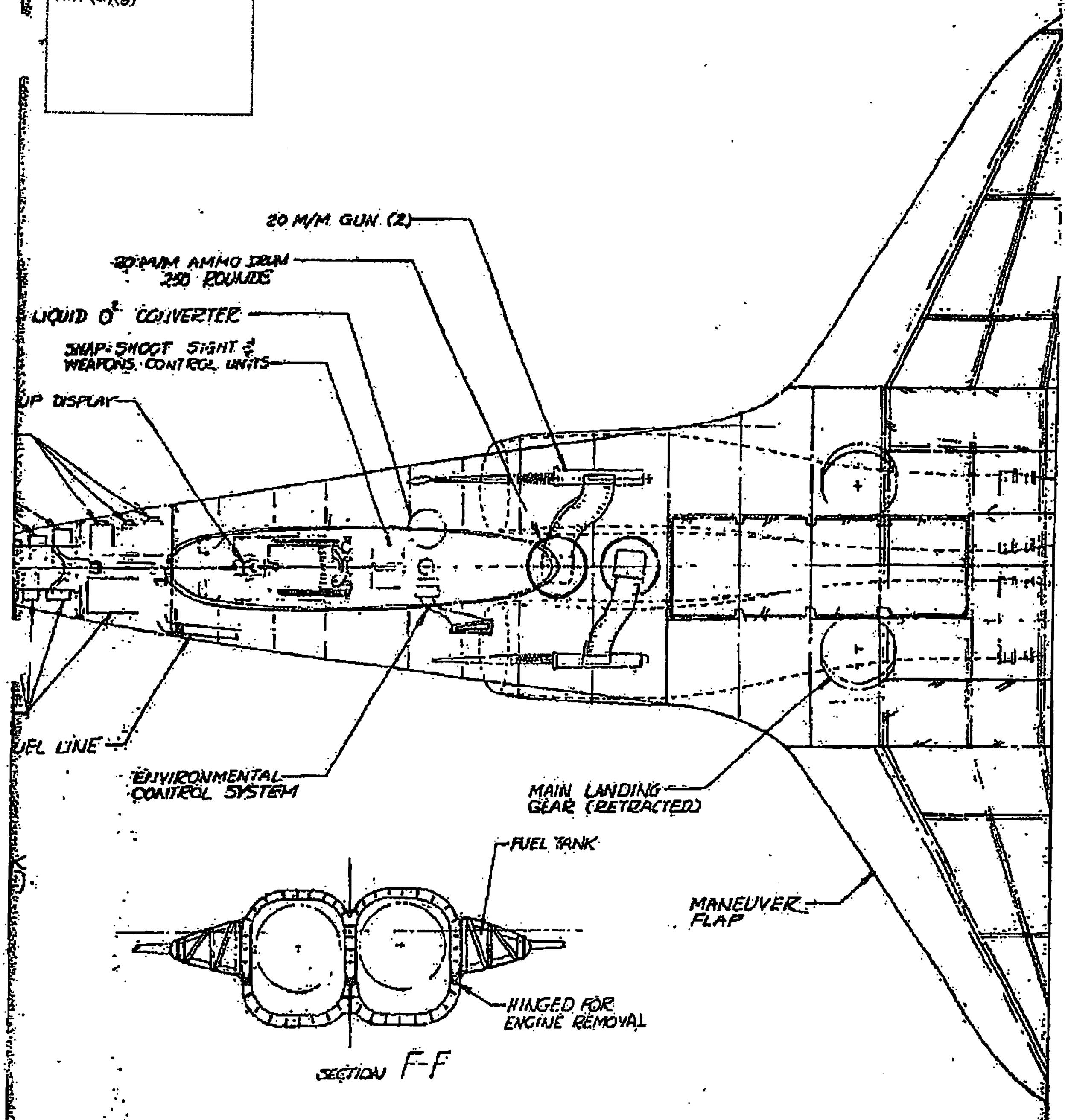
88th ABW/IPI
FOIA (b)(1)
E.O. 13526
SEC. 3.3(b)
(4)
1.4.(a)(g)

88th ABW/IPI
FOIA (b)(1)
E.O.13526 SEC. 3.3.(b)(4)
1.4. (a)(g)






F
F
400
450
500
HEADS-UP DISPLAY
NAVIGATION UNITS
COMMUNICATION UNITS
SLIPWAY DOOR-
INFLIGHT REFUEL
RANGE RADAR
RADAR UNITS
FUEL LINE
FWD FUEL TANK
CLOSURE BHD
ROUTING
20 M/M GUN
MOUNT
SECTION D-D
FUEL TANK
(INTERGAL)
ROUTING
SECTION E-E



4

(S) Figure 5.1-3 Inboard Profile - Large Twin-Engine Concept,

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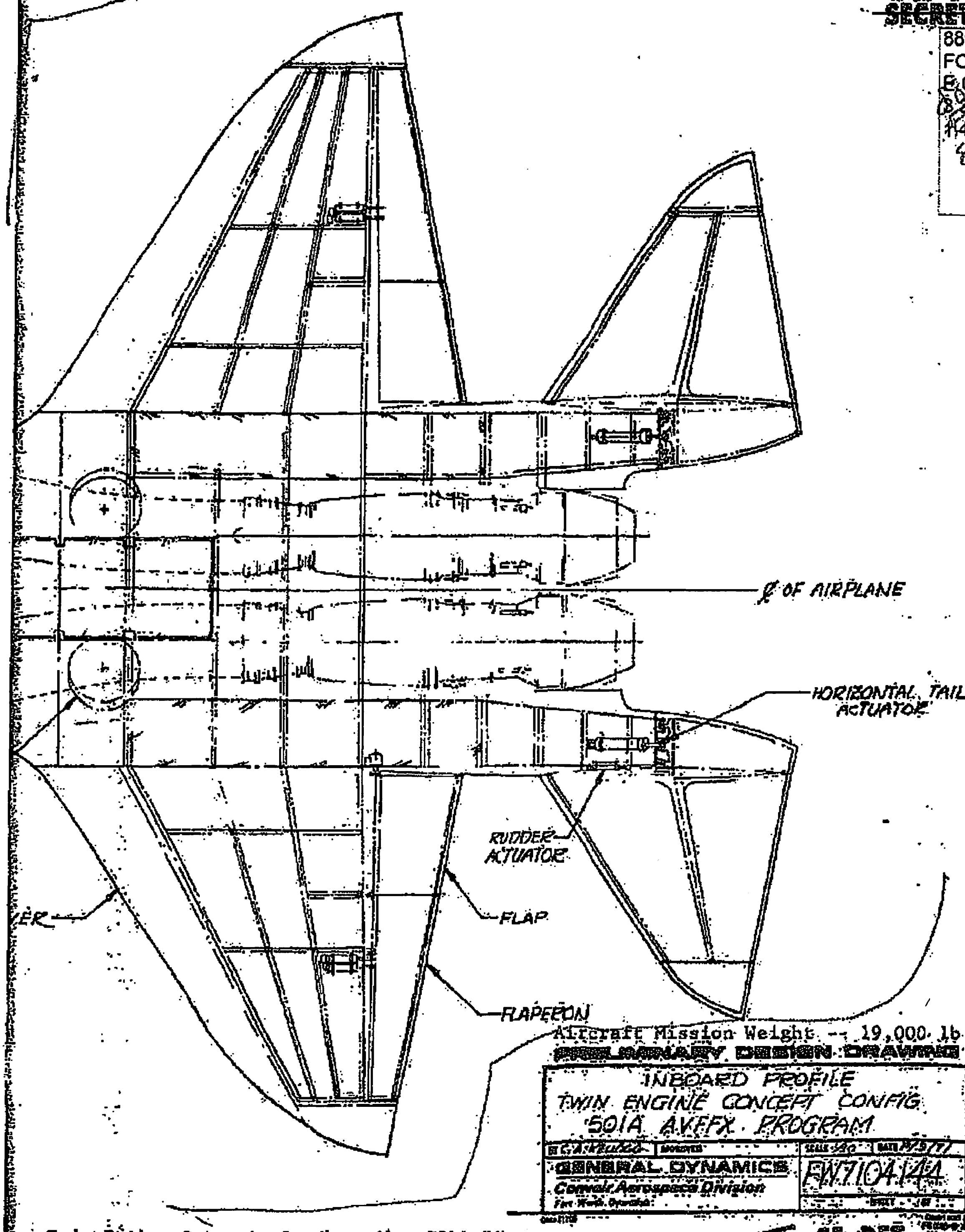
88th ABW/IP
FOIA (b)(1)
E.O. 13526 SEC.
3.3(b)(4)
1.4. (a)(g)



ge Twin-Engine Concept, Configuration 501A (U)

5

~~SF. DET~~
2.5.5/2.5.6

all but one were retained. The lone exception involved the inlet location, and even this feature did not depart radically from that of the former design concept.

(U) To reiterate, the distinguishing features of Configuration 501A are essentially the same as those of 401B (described in Section 3). They are as follows:

1. Forward engine location
2. Mid-wing
3. Outer faired body
4. Twin vertical tails
5. Under-fuselage inlet location
6. Bubble canopy.

(U) A brief discussion of these features, as they relate to the 501A concept and differ with the 401B concept, is presented in the following paragraphs.

(U) The forward engine relationship required in the 401B concept to provide appropriate balance characteristics consistent with reasonable tail moment arms is also a basic characteristic necessary in the 501A arrangement. In fact, this effect is even more pronounced in the twin-engine design because the combined weight of the two small engines is more than that of the single large engine and the distance from the nozzle to the engine c.g. of the small engine is shorter. These two factors combine to increase the tail overhang tendency on the 501A arrangement. In the development of the 501A concept, adjustments were made in forward fuselage length, tail overhang, and engine location to provide a reasonable compromise in airplane geometry and still retain the balance characteristics required.

(U) The mid-wing and wing-body blending features are essentially the same in both the single-engine and twin-engine concepts. The fore and aft extension of the wing-body shaping arrangement serve the same basic functions on 501A as on 401B. The major differences of 501A lie in the fact that the center body section must ring two engines instead of one and that the 501A arrangement also lends itself better to a fuselage-mounted main gear design. In the latter case the volume provided by fairing the inlet duct into the aft fuselage is adequate for stowing the retracted gear and also allows a reasonably short gear length (i.e., reduced weight).

(U) The twin vertical tail feature of 401B was retained on the 501A concept, and the same rationale applies here. A slight increase in the width of the aft root extension was required to allow a reasonable structural cross section for this element alongside the proportionally wider twin-engine installation. This results in a slightly higher proportional relationship between the horizontal tail and wing span on 501A than that of the single-engine concept.

~~(S)~~ The major deviation in the two concepts lies in the inlet/engine arrangement. The inlet/forebody concept of 501A is based largely on experience derived from past test work conducted by General Dynamics on various inlet/airframe integration concepts for highly maneuverable aircraft. The inlet arrangement incorporated on the 501A concept is intended to provide for good flow characteristics at both high angle of attack and yaw conditions. Essentially, the same normal-shock, fixed-geometry inlet features of the 401B concept are also employed to give the best performance in the combat arena (Mach 0.6 to 1.6) with a simple, reliable, light-weight system.

88th ABW/IPI
FOIA (b)(1)
E.O. 13526 SEC. 3.3.(b)(4)
1.4(a)(g)

(U) The transparent bubble canopy with the full-vision capability remains unchanged from that of Configuration 401B.

5.1.3 Configuration Growth Data

(U) In this subsection, the approach utilized to develop the configuration size variations in the growth study is outlined, and the basic parametric configuration design data that was generated to support the structure, aerodynamic, and performance analyses are summarized.

5.1.3.1 Aircraft Sizing Approach

~~(S)~~ Layouts were developed for the 501A concept at a gross weight of 19,000 pounds. This configuration formed the basis for the growth study. Airplane geometry was scaled from the basic 19,000-pound version by use of essentially the same scaling relationships developed for the 401B concept. In general, surface areas were scaled as a function of gross-weight ratio and characteristic lengths were scaled as a function of the square root of the gross-weight ratio. These scaling relationships were used to develop additional data points for gross weights of 16,800, 22,000, and 24,000 pounds in order to provide growth curves for aircraft sizing. For all cases, wing loading was held constant at 60 psf and the family of aircraft configurations

88th ABW/IPI
FOIA (b)(1)
E.O. 13526 SEC. 3.3.(b)(4)
1.4(a)(g)

was developed through use of the wing and tail sizing criteria discussed previously in Section 3.

5.1.3.2 Growth Data

(U) Presented in this subsection is a summary of the configuration design data that were generated in the growth study to support the structure, aerodynamic, and performance analyses. The variation of airplane wetted area with airplane size (mission weight) and a definition of the major airplane components contributing to the wetted-area total are shown in Figure 5.1-4. The major component breakdown of wetted area versus mission weight is shown in Figure 5.1-5. The manner in which selected key characteristic fuselage dimensions vary with airplane size in the growth airplane family are plotted in Figure 5.1-6. Similar variations of selected key characteristic surface dimensions for the growth family are plotted in Figure 5.1-7. In Figures 5.1-8 through 5.1-15, general airplane geometric data are summarized for the data points at the four gross weights used to establish the growth family. A normal area distribution curve and fuel distribution plot are presented for the basic 501A configuration (19,000-lb mission weight) in Figures 5.1-16 and 5.1-17, respectively.