

2011-093

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#### 3.5 STRUCTURES AND WEIGHTS

#### 3.5.1 Structural Design Rationale

(U) Considerable emphasis has been given to the structural design during the development of the study configuration. One of the key features of the configuration is an expanded wing-root section, which provides the following effects:

 (1) a reduction of axial forces due to bending as a result of the deeper section;
 (2) the elimination of potential aileron reversal and other dynamic problems because of the stiffer wing;
 (3) a reduction of structural weight, and
 (4) an increase in fuel capacity.

Other structural design features include the following:

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1. Relatively drep fuselage rings that provide load paths for the wing carry-through moment and permit control system routing through the frames. Spar caps are attached directly to these frames for continuity of the basic wing load paths.

2. Main landing gear stowage forward of the basic wing box that permits minimum interruption of the basic wing load paths.

3. A relatively deep mid-fuselage that provides for minimum longeron area requirements.

 A twin-vertical-tail/aft-fuselage-extension configuration that minimizes engine heating and acoustical problems.

5. A relatively low-aspect-ratio wing that results in a reduced wing bending moment because of the shorter span.

6. A relatively low-taper-ratio wing that results in a long root chord which distributes the wing root forces to several ring bulkheads to provide a multi-load path structure.

7. Engine removal from the aft end of the airplane that permits a fixed structure, thereby maintaining continuity of load paths.

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8. A 6-percent thickness-to-chord ratio at the roots of the vertical and horizontal tails and a 4-percent ratio at the tips that provide better stiffness characteristics than a constant thickness-to-chord ratio.

(U) These features have evolved through many trade studies and illustrate to some extent the impact of structural design and analysis on the study configurations.

#### 3.5.2 Weight and Balance

- (U) The weights for Configuration 401B were calculated through the use of analytical-statistical methods developed over several years under corporate-sponsored Independent Research and Development (IRAD) programs. These methods are documented in Convair Aerospace Division reports ERR-FW-242, "Aircraft Structural Weight Estimating Methods" (Reference 16), and ERR-FW-613, "Aircraft Propulsion and Fixed Equipment Weight Estimating Methods" (Reference 17). These reports are on file at ASD for reference purposes. The detailed weight analyses are not presented as a part of this technical report because the detailed weight calculations as defined in the ERR-FW-242 and ERR-FW-613 reports are quite voluminous in nature. However, these calculations are available for review.
- (S) Three gross weights were selected for the growth study on Configuration 4018. The points selected for study and the various gross-weight conditions (in pounds) for each point are as follows:

SRASM TOCW	(80% Fuel) Struct DGW	LRASM <u>Overload GW</u>	Ferry Mission Overload GW
15600	14920	20438	25800
16800	15960	21638	27000
18000	17000	23838	28200

Input data for the weight equations were derived from the scaling data presented in Section 3.1 together with layouts as required to develop specific area and dimensional data. Considerable emphasis was given to the definition of weighing parameters to assure the validity of the resulting growth curve. A weight summary for the three selected airplanes is presented in Table 3.5-1. It should be noted



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Table 3.5-1 WEIGHT SUMMARY: CONFIGURATION 4018 GROWTH STUDY (pounds) (U)

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Thom	1	Airplane Si Tross Weigh	ze t)
	15,600	16,800	18,000
Structure	(5133)	(5426)	(5744)
Wing	1443	1576	1716
Fue lage	2485	2572	2666
Horizontal Tail	318	346	382
Nortion1 TRI	292	316	344
Inding Coar	595	616	636
Brandlaion Sugtem	(3459)	(3530)	(3603)
Engine (F100-PW-100)	2737	2737	2737
Air Induction	296	322	349
Fire1 System	377	42 <u>1</u>	467
Engine Controls	21	22	22
Starting System	28	28	28
Systems and Equipment	(2699)	(2751)	(2804)
Surface Controls	566	593	621
Landing Gear Controls	112	115	118
Instruments	94	94	94
Hydraulics and Pneumatics	271	286	302
Electrical	363	370	376
Avionics	460	460	460
Furnishings	238	238	238
Air Conditioning	142	142	142
Armament	453	453	455
Weight Empty	11,291	11,707	12,151
fiseful Load	(395)	(400)	(405)
Crew	200	200	200
Unusable Fuel	18	23	28
Engine Oil	17	17	17
Missile Racks and Pylons	124	124	124
Miscellancous	36	36	36 -
Basic Operating Weight	11,686	12,107	12,556
Pavload	(633)	(633)	(633)
Ammo (500 rounda)	285	285	285
Missiles (2)	348	348	348
Zero Suel Weight	12.319	12,740	13,189
Fuel	3281	4060	4811
Gross Weight	15,600	16,800	18,000

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88th ABW/IPI OIA-(b)(1) ERO73526 860-3.3. (b)(4) (352) 1.4 (1)(0))(4)

that the fixed-inlet structure has been coded as air-induction weight under Propulsion System. Since this structure is an integral part of the fuselage, it performs the dual function of resisting inlet pressure loads together with resisting the basic body loads. A plot of weight variation versus mission design weight is shown in Figure 3.5-1. The center-of-gravity and inertia properties are summarized below for the 16,800-pound-gross-weight SRASM configuration.

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Properties	Basic Operating <u>Neight</u>	Zero <u>Fuel Weight</u>	Gross <u>Weight</u>
Weight (1b)	12,107	12,740	16,800
Horiz. CG (% MAC)	23.9	23.2	20.5
I <sub>XX</sub>	4932	5702	6727
1 <sub>yy</sub>	30,130	30,515	31,886
I <sub>żz</sub>	32,988	34,058	36,228

The maximum overload condition is defined by the ferry mission requirements. A weight summary for the LRASM and the ferry mission for the 15,800-pound-design-gross-weight configuration is shown in Table 3.5-2. A center of gravity summary for these conditions is as follows:

	L	RASM	Ferry I	lission
Item	Weight (15)	C.G. (% MAC)	Weight (15)	C.G. (% MAC)
Basic Operating Weight Zero Fuel Weight	12,955	21,5	13,797	21.5 20.5
Gross Weight	21,638	19.9	27,000	20.7

When sized to meet LRASM requirements, the design gross weight of Configuration 401B is 17,115 pounds. There is no significant center-of-gravity difference between the 16,800pound configuration and the 17,115-pound configuration. A weight summary for this configuration is given in Table 3,5-3.



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	(5) Table 3.5-2 WET	GHT SUMMARY	:
	CONFIGURATION 401B LRASM	AND FERRY M	ISSION (U)
	(pounds)	1	
			•
	16,890-1D. Al	KPLANE	
		LRASM	Ferry Mission
•	Item	Weight	Weight
	······································		11. 707
	Weight Empty	11,707	/2 000)
	Useful Load	(1,240)	200
•	Crew	200	200
	Unusable Fuel-Internal	23	23
	Engine Oil	17	17
	Missile Racks & Pylons	124	-
	Miscellaneous	36	36
	(2) 300-Gal, Tanks	848	
	(1) 150-Gal. Tank	-	308
	(2) 600-Gal. Tenks	÷.	1,506
	·	•	
	Basic Operating Weight	12,955	13,797
	Payload	( <u>6</u> 33)	(285)
	Amao (500 rounds)	285	285
	(2) AIM 9-X	348	-
			14 003
	Zero Fuel Weight	13,588	14,002 /10 019\
	Fuel	(8,050)	(12,915)
	Internal	4,060	4, UQU
	External		
	(2) 300-Gal, Tanks	3,990	₩ 1
	(1) 150-Gal. Tank	-	1,016
	(2) 600-Gal, Tenks	-	7,842



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		EXCIDATION 4018
	(S) Table 3.5-3 WEIGHT SUMMART COM	NENDE (H)
	SIZED TO MEET LRASM REQUIRE	WENT2 (C)
	(pounda)	
	1tem	Weight_
	, ``	1563.03
	Structure	(3310)
	Wing	2709 1014
	Fuselage	2000
	Horizontal Tail	300 1999
	Vertical Tail	621
	Landing Gear	/354R)
	Propulsion System	9737
	Engine (F-100-PW-100)	398
	Air Induction	
	Fuel System	22
	Engine Controls	22
	Starting System	20 19765)
	Systems and Equipment	ξΩ100). 
	Surface Controls	116
	Landing Gear Controls	110
	Instruments	24
	Hydraulics and Pneumatics	290
•	Electrical	242, 460
	Avionics	738
	Furnishings	149
	Air Conditioning System	1.59
	Armament	423
	Weight Empty	11,824
		(401)
	Useful Load	200
	Crew	200
	Unuseable Fuel	17
	Engine 011	124
	Missile Racks and rylons Miscellaneous	36
	Ragic Operating Weight	12,225
		2285
	Payload	(035)
	Ammo (500 rounds)	402
	Missiles (2)	- 340
	Zero Fuel Weight	12,858
	Fue)	4,257
		17 115
	Gross Weight	
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#### 3.6 PROPULSION (4018/F100-PW-100)

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The engine installed in Configuration 401B is essentially the F100-PW-100. Certain accessories and attachments unique to the F-15 airplane installation are delated. The-Pract & Whitney Aircraft designation for this study derivative engine is JTF22A-27 (Reference 18). In this report the engine will be referred to as the F100-PW-100. Engine per-Formance data are furnished by P&WA in their customer computer deck CCD 1025 (Reference 19), A more recent deck was received on 1 April 1971 from P&WA, However, time did not permit revision of the installed-propulsion-system performance data package. The fuel control schedule selected for the engine performance data presented in this report is that: which provides near-optimum engine thrust during afterburning (Reference 20 ), but exhibits an undesirable airflow schedule at some flight conditions. A brief investigation showed that propulsion performance data from the new deck for the F100-PW-100 design airflow are different from those contained in this report only at altitudes above 50,000 feet (maximum thrust reduction of 25% occurs at low supersonic Mach numbers). Performance below intermediate power is not affected.

- (U) The engine is located in the alreraft aft fuselage, with primary sir flow supplied by a single open-nose inlet located under the forward fuselage. A full description of the inlet is given in Subsection 3.6.2.
- (U) The exhaust nozzle is the P100 engine balanced-beam nozzle (BBN), which is exposed aft of the customer connect. The nozzle exhaust area varies slightly during non-afterburning operation and is fully modulating from minimum to maximum afterburning. At Mach number below about 1.1 the nozzle area ratio is approximately 1.3. At about Mach 1.1, the nozzle exit area is shifted open to give an increase area ratio (approximately 1.6) at higher Mach numbers. This increased area ratio is referred to as "high gear". A more detailed description of, and data for, the nozzle is given in Subsection 3.6.3.
- (U) A small amount of ventilation air flows through the nacelle. The drag for nacelle ventilation is not included in the engine performance data but is accounted for in the airplane drag (see Subsection 3.6.4)

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(U) High-pressure air is bled from the high-pressure-compressor discharge port provided on the engine for operation of the environmental control system. Shaft power is extracted from the high-pressure-compressor rotor to generate electrical and hydraulic power for the airplane

#### 3.6.1 Propulsion System Performance

(U) The installed thrust specific fuel consumption (TSFCS) and propulsion net thrust (FNS) of the F100-PW-100 are plotted in Figures 3.6-1 through 3.6-14. The data shown comprise a complete package needed for airplane energymaneuverability analysis. The installed net thrust presented, FNS, accounts for all drag changes that occur with power setting changes. The installed net thrust is defined as follows:

$$F_{NS} = F_N - F_{SP} - F_{NOZ}$$

where:

is the installed net thrust of the propulsion system for aircraft performance analysis.

FN

FNS

is the CCD 1025-1.1 computer program net thrust which accounts for (1) inlet pressure recovery (see Subsection 3.6.2), (2) shaftpower extraction and high-pressure compressor airbleed (see Subsection 3.6.5), and (3) exhaust nozzle internal performance (contained in F&WA CCD 1025-0.1).

Fsp is the inlet spillage drag, which accounts for the inlet drag when capture area ratios are other than 1.0 (see Subsection 3.6 2).

Fnoz accounts for drag changes associated with power setting when the nozzle is at other than the maximum open position (see Subsection 3.6.3).

Therefore, airplane drag levels used in conjunction with the installed thrust,  $F_{NS}$ , are for the inlet operating at a capture area ratio of 1.0 and the engine exhaust nozzle in the maximum open ("high gear") position.



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- (U) The thrust specific fuel consumption, TSFCS, is the ratio of the installed total fuel flow and installed propulsion system net thrust, F<sub>NS</sub>.
- (U) At Mach 1.1 the performance exhibits a slight discontinuity. This effect is from the shift in the exhaust nozzle operating mode, described earlier, from the low- to the higharea-ratio mode of operation (low gear to high gear) above Mach 1.1.
- (U) In the data curves of Figure 3.6-7, note the shaded areas defined as "Estimated CVP Shift Area". This variation in performance at the low exhaust-nozzle pressure ratios is obtained from the engine computer deck; the affected parameter is CVP (exhaust nozzle internal gross-thrust coefficient). The change in CVP is caused by flow separation in the nozzle divergent section when the nozzle is operating at low pressure ratios.

#### 3.6.2 Inlet

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The baseline inlet configuration is of the fixedgeometry open-nose type, initially elliptical in cross section, connected to the engine face by a subsonic duct about 4.05 compressor-face diameters in length. The inlet and engine face centerlines are offset approximately 14.0 inches or 0.10 times the duct length. The minimum separation between the inlet and lower fuselage surface is 1.9 inches so that low-energy fuselage boundary-layer air will not be ingested by the inlet. The inlet upper-lip leading edge is extended 10.0 inches shead of the lower-lip leading edge to isolate the inlet normal shock from the fuselage boundary layer. The inlet upper-lip leading edge is relatively sharp to preclude shock detachment shead of the lip. The lower lip is moderately blunt to provide good lip suction characteristics and to reduce internal lip flow separation at low speeds and during high-angle-of-attack operation. The lip bluntness used gives an internal area contraction of 4.0 percent.

(0) A minimum amount of upper cowl-lip extension is used to isolate the inlet shock from the fuselage boundary layer; this minimizes boundary-layer buildup on the inlet side of the upper cowl lip. At high supersonic speeds (Mach I.9 to 2.2); moderate boundary-layer control in the form of vortex generators and/or bleed may be required in the inlet throat











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(U) A pressure drag analysis was made of the nozzle for each mode of operation; the estimated drags are shown in Figures 3.6-20 through 3.6-23. The nominal values of exit diameter For maximum augmentation and for dry power are shown in Figure 3,6-19. These values are used for estimating the nozzle drag. Also shown in Figure 3.6-19 is the baseline nozzle diameter used to derive the baseline nozzle drag shown in Figure 3.6-20. The baseline configuration is the same as the maximum augmented power configuration at Mach 1.1 and above (referred to as "high gear"). The baseline noszle pressure ratio is shown in Figure 3.6-24.

(U) The baseline nozzle drag is included in the airplane drag data, and any increment in nozzle drag caused by changing engine power setting, from the baseline, appears in the propulsion data. The maximum augmentation nozzle drags shown in Figure 3.6-21 are included in the propulsion data and are actually the increment in drag between baseline and the true operating conditions (nozzle pressure ratio and nozzle geometry). This increment is zero at Mach 1.1 and above since the baseline reflects the true operating geometry and also is not influenced by changing nozzle pressure ratio.

The dry-power nozzle drags included in the propulsion-(V) data are presented in Figures 3.6-22 and -23. These data are increments from the baseline as described above.

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These data, reflecting the specific installation, were (Y) used for the vehicle performance analysis rather than the uninstalled-nozzle drag data provided in the engine performance data deck, CCD 1025.

#### 3.6.4 Auxiliary Air

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The auxiliary air system serves only to ventilate the (U) nacelle and prevent the accumulation of flammable fluids and vapors. The system consists of a forward-mounted flush inlet (near the engine front-frame) and aft-mounted flush exits (near the nozzle customer-connect). Only a small quantity of sir is required to fulfill the system function and the dragpenalty is estimated to be 2.5 counts (280-sq ft reference area).

3,6.5 Sheft Power and Compressor Bleed Extraction

Power is extracted through the engine gear-box power-(U) take-off shaft to drive the airplane electric generator and

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•	01 02 02 08 08 10 12 14 16 18 20
	FREE STREAM MACH MON MO
	Copen Nozzle (High-Geat Position)

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hydraulic pumps. An estimated value of the total power extraction is 70 hp. The installed propulsion system performance data accounts for 70 hp at all flight conditions and power settings.

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High-pressure bleed air is extracted from the compressor discharge for operating the environmental control system. In flight, the bleed air-flow rate is approximately 0.4 lbm/sec. The installed propulsion system performance data accounts for 0.4 lbm/sec at all flight conditions and power settings.

(U) During ground operation (airplane weight resting on the landing gear), a switch on the landing gear provides signals to values that direct the flow of high-pressure bleed air to additional systems such as nacelle-ventilation and oil-cooler ejectors. The total airflow for weight-on-gear operation is estimated to be about 1.20 lbm/sec for the airplane. The installed takeoff thrust and fuel flow are corrected for this weight-on-gear bleed flow rate.

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#### SECTION 4

#### SMALL SINGLE-ENGINE CONCEPT

#### (403/J101-GE-100)

#### 4.1 VEHICLE DESIGN

(U) In this subsection a description is presented of the small single-engine concept, a brief explanation is given of the overall configuration rationale, and the configuration growth data that were generated for aircraft sizing purposes are summarized.

#### 4.1.1 Vehicle Description

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The small single-engine fighter concept (Concept 2), designated Configuration 403, is presented in Figures 4,1-1 and 4,1-2, which show the general arrangement and basic lines arrangement respectively. This design was developed as one of a family of three configurations generated to establish growth data for the airplane powered by the small GE15-1/JIA5 engine (USAF designation J101-GE-100).

(S) Configuration 403 is essentially the same as the Configuration 401B concept (see Subsection 3.1.1) except for its scaled-down size and changes in some internal relationships which result from the variation in engine-to-sirplane proportions brought about by the engine differences. The 403 design shown in Figures 4.1-1 and 4.1-2 has a gross weight of 13,000 pounds [a wing loading of 60 psf, and a thrust-to-weight ratio of 1.01 (uninstalled).]

Since an aircraft could not be properly sized for the design mission in this case, an example 403 type at the 13,000-1b mission weight is presented. Further explanation concerning aircraft sizing is given in the performance discussion of Subsection 4.2.

#### 4.1.2 Design Rationale

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The rationale for Configuration 403 is the same as that of the 401B concept (see Subsection 3.1.2).

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#### 4.1.3 Growth Data

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The aircraft sizing approach is outlined and the design data developed for the growth study are summarized in the following paragraphs.

Three data points were investigated to supply the necessary design information to develop the growth curves. A complete layout was made of the 403 configuration (13,000-1b mission weight), which served as a focal point of the growth family. A small 10,000-pound configuration layout was also developed along with a 16,800-pound design that was defined by modification of the original 401B configuration to a small-engine version. A family of airplane data was thus generated in which the data from the two layouts and the modified 401B information were utilized to provide growth data curves for the gross-weight range from 10,000 pounds to 16,800 pounds. Weight and balance considerations and internal fuel requirements for this wider range of grass weight combined to alter the fuselage scaling factors from those utilized in the original 4018 growth study. However, virtually all other scaling parameters such as surface area ratios, tail volume coefficience, aspect ratios, taper ratios, etc., remained intact. The basic landing gear dimensions and tire sizes were varied for the main gear but remained the same for the nose gear.

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The variation of airplane wetted area with airplane size (mission weight) is shown in Figure 4.1-3. A breakout of wetted area versus mission weight for the various major airplane components is given in Figure 4.1-4. The variation of several key configuration characteristic dimensions is plotted as a function of mission weight in Figures 4.1-5 and 4.1-6 for the fuselage and surfaces, respectively. In Figures 4.1-7 through 4.1-12, data sheets are presented on which friction drag design data and basic geometric descriptions are tabulated for airplanes at each of the three selected gross-weight data points. A normal-area distribution curve and fuel distribution plot are presented for the 403 configuration (13,000-1b mission weight) in Figures 4.1-13 and 4.1-14, respectively.

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AREA AR - ASPECT A - TAPER R	(FT <sup>2</sup> ) RATIO ATIO E <sub>1</sub>	VING (2000) 216.67 3.00 0.20 + 55 °	<u>3.41</u> 0.1378 + 55°	Vert Tail 17.60 1.33 0.40 + 45°	2.90 0.3733 0.59574	•
$\frac{AREA}{AR} - \frac{ASPECT}{TAPEB R}$	(FT <sup>2</sup> ) RATIO ATIO E1 E1	VING (1000)10000 21667 3.00 0.20 + 55" + 10°41'	$\begin{array}{c} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 $	Vert Tail 17.60 1.33 0.40 +45° -19°21	2,90 0,3733 0,59574 45° +(9° 73'	•
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AREA AREA AR - ASPECT - TAPER R E(0) $TE_2(1)$ C - CUTOUT = - CR - ROOT CHOR $CT - TIP CHORb - SPAR$	(FT <sup>2</sup> ) RATIO E1 E2 E3 RD(TA.) RD(TA.) (IN.) (IN.)	VING (100m/1001) 216.67 3.00 0.20 + 55" + 10°41' 169.961 33.913 305.941 4%	$\frac{10212 + 7212}{94,210}$ $\frac{94,210}{3.41}$ $0.1378$ $\frac{+55^{20}}{+10^{2}41}$ $10.902$ $15.279$ $215.152$ $8700 expects real$	Vert Tail 17,60 1.33 0.40 + 45° -19°21' 62.361 24.944 58.058 4%6 Feet	41.920 24.973 0.3733 0.59574 459 419°22' 41.920 24.973 12.486 6%	•
AREA $AREA$ $AR - ASPECT$ $TAPER R$ $E_{(0)}$ $VE_{2}(t)$ $Q_{-} CUTOUT =$ $CR - ROOT CHOR$ $CT - TIP CHOR$ $b - SPAR$ $AIRFOIL$	(FT <sup>2</sup> ) RATIO E1 E1 E3 RM(rest) RD(T3.) D (DN.) (IN.)	VING (100millars) 216.47 3.00 0.20 + 55" + 10°41' 169.967 33.973 305.941 4% Bicoluver	10212 TAIL (1999) 94.26 3.41 0.1378 + 55° + 10°41' 10.902 15.279 215.152 550° expect rul 460 + 10° Dicouve x	Vert Tail 17,60 1,33 0,40 + 45° -19°21' (22,361 24,944 58.058 UNE FOOT 4400 FOOT 4400 FOOT COLOUICE	2,90 0,3733 0,59574 + 45° +19° 22' 41,920 24.973 12.486 6% BICOUVEX	•
AREA $AR - ASPECT - TAPER R - E_{10}^{-1} YE_2(*)Q CUTOUT = CR CR - ROOT CHOR CT - TIP CHOR b - SPAR AIRFOIL d$	(FT <sup>2</sup> ) RATIO EI EI EI EN EI EN (IN.) (IN.)	WING (100m/1001) 216.67 3.00 0.20 + 55° + 10°41' 169.961 33.913 305.941 4% BICOLIVEX 47.5	10012 TAIL (1004) 94.26 3.41 0.1378 + 55° + 10°41' (10.902 15.279 215.152 6%0° expect rul 4%0 + 10° Dicouvex 44:53	Vert Tail 17,60 1,33 0.40 + 45° -19°21 62.361 24.944 58.058 1%6 Fort 4%6 Fort 4%6 Fort 6000 for 0	2.90 0.3733 0.59574 + 45° +19° 22' 41.920 24.973 12.486 6% Bicouviex	
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AREA AR - ASPECT 7 - TAPER R $E_1^{(0)}$ - TE2(1) $Q_{-}$ CUTOUT - $C_{T}$ - ROOT CHO $C_{T}$ - TIP CHOR b - SPAN AIRFOIL d x Y Z	(FT <sup>2</sup> ) RATIO E: E: E: E: E: E: E: (IN.) (IN.) (IN.) (IN.) (IN.)	WING (100m/1001) 216.67 3.00 0.20 + 55" + 10°41' 169.967 33.973 305.941 4% Biconuvex 47.5 224.5 0 0	10212 TAIL (1994) 94.26 3.41 0.1378 + 55° + 10°41 10.902 15.279 215.152 8%0 expect rol 4%2 + 10° 01000/ex 44:53 385.0 0 - 11.0	Vert Tail 17.60 1.33 0.40 + 45° -19°71 62.361 24.944 58.058 VXC rest 4%01.0 BICOUVEX 0 364.9 ± 47.23 0	2.90 0.3733 0.59574 459 +19°22 41.920 24.973 12.486 6% Bicouldex 0 3.71.9 ± 44.2 -7.0	
AREA AREA AR - ASPECT A - TAPER R L.s. E(0) YE <sub>2</sub> (r) Q- CUTOUT = CR - ROOT CHO CT - TIP CHOR b - SPAR AIRFOIL d x Y Z d = Average b x = Distance surface c z = Distance	(FT <sup>2</sup> ) RATIO EI EI EI EI EI EI EI (IN.) (IN.) (IN.) (IN.) (IN.) (IN.) UTIES E aft from ion poin hord 1in Wy (+) o	WING (100m 100) 216.67 3.00 0.20 + 55° + 10°41' 169.961 33.913 305.941 4% BICOLVEX 47.5 27.4.5 0 0 0 0 0 0 0 0 0 169.961 10 0 0 0 0 0 0 0 0 0 0 0 0 0	idel:       Tant (1000)         94.26       3.41         0.1378         + 55°         + 10°41'         10.972         15.279         215.152         550 expects and         4%6 + 10°         0100000000000000000000000000000000000	Vert Tail 1.33 1.33 0.40 +45° -19°21 62.361 24.944 58.058 UNC Fort 4%2 i.e. GCOUVEX 0 364.9 ±47.23 0 364.9 ±47.23 0 364.9 ±47.23 0 364.9 ±47.23 0 364.9 ±47.23 0 58.058 UNC Fort 4%2 i.e. COUVEX 0 364.9 ±47.23 0 58.058 0 58.058 UNC Fort 4%2 i.e. COUVEX 0 364.9 ±47.23 0 58.058 0 58.058 UNC Fort 4%2 i.e. COUVEX 0 364.9 ±47.23 0 58.058 0 0 58.058 0 58.058 0 58.058 0 58.058 0	2.90 0.3733 0.59574 + 45° + 19° 22' 41.920 24.973 12.486 6% Bicouvex 0 3.71.9 ± 44.2 - 7.0 0° caut 3 functage te or vertical ce intic]	

-SECRET-

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# BASIC DESCRIPTION SECRET

G-W. = 16,100 LSS W/S = 60 +85/ FT-T/W = 0. 95089 Engine ~ GE JIAS (AF Designation J 101-66 - 100

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	BODIES			-
	LENOTH (IN.)	X (IN,	Y (IN.)	Z (IN.
FUSELAGE CENTERBODY	452.0	0	0.	. 0.
FUSELAGE OUTER BOON	449.0	74.0	± 40.0	0
CALLOP Y	130,0	85,0	0	+39.0
······	<i>,</i>			
· · · · · · · · · · · · · · · · · · ·				

WING REF AREA	(IN <sup>2</sup> )		SUR	FACES		•	
40,320		WING (DOBUGE)	HORIZ TALL	Per Side 1 VECTI TAN	(Per Side)	]	:
AREA	<u>(FT<sup>2</sup>)</u>	280,00	123,14	22.12	3.646		
A - ASPECT I	RATIO	3.00	3.415	1,33	0.3733	188th ABI	A//IDIA
A - TAPER RA	TIO	0.20	0,137	0,40	0.59574	FOIA	$\{D_{ij}\}$
Elle I	E,	+ 55°	+ 559	+ 45°	+45°	E.O. 135	6 SEC.
1E1(+)	Ez	+ (0°41	+ 10°411	-19° 22	+190 22	3.3.(b)(4	(a)
a- corour = E	87) 52 30 (84-5)		1		•	17.4. (el)(e	
CR - ROOT CHOR	W(IN.)	193,218	126.74	70	47.03	1 1:46	<u>)</u> (G}
CT - TIP. CHORL	) (IN.)	38,644	17.37	78	28.02	ļ	
b – Span	(IN.)	347.793	246.09	65	14.01		
AIRFOIL	-	4% Biconviex	LY BROAN Dechront AS BROWN CHip Brown P br. Str T	62 Birews at 1001 47 Barens & 100 10010 an 123	6% Bicouver		
d	(IN.)	54.00	51.99	0	0		-
x	(IN.)	257.50	440.00	419.50	429.50		
¥	(IN.)	D	Ø	= 54.40	51.00		
Ż.	(IN.)	0	-13.90	-7,00	-13.00		
		DE GRIEDRAL I		ゆうしんせんち パルルス・1			

d = Average buried semi-span x = Distance aft from fuselage nose to body nose or surface fuselage

surface chord line. z \* Distance up (+) or down (\*) from fuselage ref. lineAto body or surface ref line.

1. 8061-14

-(S)-Figure 4.1-9 Basic Description Data Sheet - Configuration 403 Type at 16,800-1b Mission Weight (U) SECRE7

FRICTION DRAG DATAGW. = 10,000 LEW/5 = 60 LB5/FT/W = 1.4295 (1ENGINE - 515 TH	55. 77 04405TELLED) 85 (AF DIS	) 19. J101-	<u>{</u> 6€+100}	•		88th ABW/
BODIES		· •	- · •.	,		FOIA (b)(1
BODY	VETTED AR	ea (ft <sup>2</sup> )	LENGTH (IN)	WIDTH (IN)	HEIGHT (IN)	3.8.(b)(9); 1.4.(a)(9);
Fucelais Centerbuli		266.0	# 402.0	44.0	63.0	14.CA
Enselve Outerbody	:	157.1	3:46.0	22.0		
Paupen (inc) fairing)		44,4	130.0	34.D	16.0	L
Nozzle - Closed		12.6	25.05	32.4 DIA.	Fail DIA.	
Slozzle - Open	12.0		19,30	32.4 DIA.	72.4 DIA.	
						,
······	┝╍┉╍╍╌┝	<u></u>				
					}	
**************************************						
BODY TOTAL	·	475.1	* Length inclu	der nogale via	sed (Awet	Ì
SUBRACES	<b>-</b>		for hered	e. showin sepe	wiely)	ŀ
<u>307777023</u>			EXPOSED 1	MAY THITPY-	·	
SURFACE	WETTED ARE	(FT <sup>2</sup> )	MAC LENGTH	NESS SWEEP (DEG.)	AIRFOIL	
WI ING		182.1	78.85	14° 301	-1% Brink x	1
HORIZ TAIL	·	58.3	43.28	14° 30'	J Lundin 191000082	
have been a second and the second second second second second second second second second second second second						
VERT. TAIL (2)		54.B	40.85	34° 15	A A A A A A A A A A A A A A A A A A A	1 · ··
VERT. TAIL (2) VENTRAL FIN (2)		54.B 9.0	40.86 30.16	34° 15	1721 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
VERT. TAIL [2] VENTRAL FIN (2)	· · · · · · · · · · · · · · · · · · ·	54.B 9.0		34° 151 I'''''451	1991 (0) 1992 (0) 1993 (0) 1994 (0) 199	
VERT. TAIL (2) VENTRAL FIN (2)		54.B 9.0	40.86 30.16	34°151	176 18 18 1 1 18 18 1	
UERT. TAIL [2] VF UT RAL FIN [2]		54.B 9.0	30.85 30.16	34° 151  :/*451		
UERT. TAIL [2] VF NT RAL FIN [2]		<u>54.B</u> 9.0	40.86 30.16	34° 15' 1*/*45 '	6	
UERT. TAIL [2] VF UT RAL FIN [2]		<u>54.B</u> 9.0	40.86 30.16	34° 15' I::/*45'	177 - 177 ( C) 177 -	
UERT. TAIL (2) VF UT RAL FIN (2) SURFACE TOTAL		<u>54. B</u> <u>9.0</u>	40.86 30.16	34° 15'  */*45'		
VERT. TAIL [2] VE UT RAL FIN [2] SURFACE TOTAL		54.B 9:0	40.86 30.16	34° 15' I*/*45'		
UERT. TAIL [2] VF UT RAL FIN [2] SURFACE TOTAL AIRPLANE TOTAL		54.B 7.0 304.2 304.2	40.85 30.16	34° 15 1		
UERT. TAIL (2) VF UT RAL FIN (2) SURFACE TOTAL AIRPLANE TOTAL BASIC WING GEOM	DETRY 1	54.B 9:0 3:04.2 779,3	10.86 30.16 TENT SOME TON EMALE SOME TON REFERENCES SOME TOP	34° 15 1	<u>122 ENG ( YEN</u> <u>122 ENG ( YEN</u> 	
VERT. TAIL [2] VE UT RAL FIN [2] SURFACE TOTAL AIRPLANE TOTAL BASIC WING GEOM AREA (FT <sup>2</sup> )	ØTRY :	54.B 9:0 3:04.2 179.3	10.86 30.16 30.16 10.16	34° 15° 1:11045	2% EURO I YEA	
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UERT. TAIL (2) VF UT RAL FIN (2) SURFACE TOTAL AIRPLANE TOTAL BASIC WING GEOM AREA (FT <sup>2</sup> ) ASPECT RATIO		54.B 9:0 3:04.2 179.3	10.86 30.16 70.11 con: 5446 Tour Food Contractions with The Food Contractions with The Food Contractions with The Food Contractions of the Food Co	34° 15 1 1:10 A5 1	2% BIR I YEA	
UERT. TAIL [2] VF UT RAL FIN [2] SURFACE TOTAL AIRPLANE TOTAL BASIC WING GEOM AREA (FT <sup>2</sup> ) ASPECT RATI TAPER RATIO		54.B 9:0 3:04.2 779.3	10.86 30.16 30.16 60016 5000 TOU 60016 4000 TO 700 166.67 70 166.67 70 3.00 0.20 25.0	34° 15 1:1°:45 1:1°:45 1:1°:45 1:1°:45 2:000 Winds 2:000 Winds 2:000 2:000 3:0000 3:000 3:000 3:000 3:0000 3:0000 3:0000 3:0000 3:0000 3:0000 3:0000 3:0000 3:0000 3:0000 3:0000 3:0000 3:0000 3:0000 3:0000 3:0000 3:0000 3:0000 3:00000 3:00000 3:00000 3:0000000 3:000000000000000000000000000000000000	ECRET	
UERT. TAIL [2] VF UT RAL FIN [2] SURFACE TOTAL AIRPLANE TOTAL BASIC WING CEOM AREA (FT <sup>2</sup> ) ASPECT RATI TAPER RATIO LEADING EDG -(5) Figure 4.1-10	ETRY : CO E SWEEP (I Friction	<u>54. B</u> <u>7.0</u> <u>3.04.2</u> <u>779, 3</u> DEG. <u>3</u> Drag Da	40.85 30.16 30.16 60000 SHIFF TRA SUME CEFFERENCE WUN TR 164.67 18 3.00 0.20 35.0 ta Sheet = C	34° 15' 1':1":45 ' (ar ):45 (ar )	ECRET 403	
UERT. TAIL [2] VF UTRAL FIN [2] SURFACE TOTAL AIRPLANE TOTAL BASIC WING GEOM AREA (FT <sup>2</sup> ) ASPECT RATI TAPER RATIO LEADING EDG -(S) Figure 4.1-10	ETRY : ETRY : E SWEEP (1 Friction Type at 1	<u>54. B</u> <u>7:0</u> <u>3:04.2</u> <u>3:04.2</u> <u>779, 3</u> DEG.) Drag Da 10,000-1	40.85 30.16 30.16 767/100:5447 70 605/100 605/100 605/100 760 760 760 760 760 760 760 760 760 7	34° 15° 1:1°45° 1:1°45° 1:1°45° 1:1°45° 2:1	ECRET 403	
UERT. TAIL [2] VF UT RAL FIN [2] SURFACE TOTAL AIRPLANE TOTAL BASIC WING GEOM AREA (FT <sup>2</sup> ) ASPECT RATIO LEADING EDG -(S) Figure 4.1-10	ETRY:	54. B 7:0 7:0 7:0 7:0 7:0 7:0 7:0 7:0	40.85 30.16 30.16 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	24° 15 1:1°A5 1 1:1°A5 1 1:1°A5 1 2:0°A5 1	ECRET 403	

EUDICS       (AF Franciskie 100 GG (DC)         BODICS       (AF Franciskie 100 GG (DC)         (B) Toward Surchas (Delayhold)       224.0         (B) Toward Surchas (Delayhold)       218.0         (B) Toward Surchas (Delayhold)       <						<u>;</u>	<del>-SEGK</del> D	k 5 'FT'- Juijustaile	FRICTION DRAG DAT/ G.W. = 13,000 L89 W/S = 60.0 L89/ TAN = 1.0996 (U		-	
BODY         WETTED AREA (FT <sup>2</sup> ) LENGTH (IN)         WHDTH (IN)         WEIGHT (IN)           (9.17.000 functional         284.0         415.0         44.0         52.0           (ex11-01 functional         218.0         376.5         25.5         21.5           Caseapa (functional         218.0         376.5         25.5         21.5           Caseapa (functional         218.0         376.5         22.400         32.4 0.4           Waxale         Closed         72.4         25.5         22.400         32.4 0.4           Waxale         Closed         72.4         25.5         22.400         32.4 0.4           Waxale         Closed         72.0         -         19.50         32.4 0.4         32.4 0.4           Waxale         Closed         72.0         -         19.50         32.4 0.4         57.0         50.0	•.		;				- 101-GE - 101	FIAS Fra Vingastina	EUGIUE - GE, J BODIES (AFP		**	•
(B TI WAS       Find State       284.0       44.0       52.0         (B TI WAS       Find State       215.0       24.0       16.0         (B TI WAS       Find State       215.0       21.5       21.5         (B TI WAS       Find State       21.6       21.5       21.5       21.5         (B TI WAS       Find State       21.6       21.6       21.6       21.6         (B TI WAS       Find State       21.6       21.6       21.6       21.6         (B TI WAS       Find State       21.6       21.6       21.6       21.6       21.6         (B TI WAS       Find State       21.6	•	]	HEIGHT (IN)	WAK. LDTH (IN)	(1N)	LENGT	REA (FT <sup>2</sup>	WETTED A	BODY			•
(ain all foreindig       218.0       376.5       25.5       21.5         (ain all formal)       44.4       130.0       34.0       (6.0         Wasale - Closed       (72.6       25.05       224084       32.404         BODY YOTAL       559.0       Finglin indivise arsiste closed (and for moster stars to protein)       SURFACES         SURFACE       PETTED AREA (PT <sup>2</sup> )       MAD. LENGTH MESS SWEEP ATAPOIL       (HOC)       FOA (t CLOS)         Winite       236.9       27.43       14"30' 47" Stars to protein)       43.400         Viegt. Tail (2)       70.4       46.23       14"50' 47" Stars to protein)       33.400         Viegt. Tail (2)       10.4       34.16' 17" 45' difference to protein)       33.400         Viegt. Tail (2)       10.4       34.16' 17" 45' difference to protein)       33.400         Viegt. Tail (2)       10.4       34.16' 17" 45' difference to protein)       33.400         Viegt. Tail (2)       10.4       34.16' 17" 45' difference to protein)       33.400		1	63.0	A.A. 5	5.0	a ⊿	284.0		Fundase Paulartada			
Rassay (inclighturs)       44.4       132.0       34.0       (6.0         Howards.: Closed       17.16       25.05       32.404       31.404         Hasals.: Closed       12.0       -       19.50       32.404       31.404         Hasals.: Closed       12.0       -       19.50       32.404       31.404         BODY TOTAL       559.0       Flaght mildes setster closed (auch for smelt stars s		1	21.5	.25.5	65	3	218.0	· · · · · · · · · · · · · · · · · · ·	Fixelane Autorbody	(8173-415		
Nazik - Cloud       12:0       -       19:50       32.404       32.404         Weille - Open-       12:0       -       19:50       32.404       32.404         BODY TOTAL       559.0       Plan(1) moldes utster cloud (Augl for merit       30.404         SURFACE       SETTED AREA (FT <sup>2</sup> )       EXPOSED       MAX. THICK-       31.401         SURFACE       SETTED AREA (FT <sup>2</sup> )       EXPOSED       MAX. THICK-       10.405 merit         NUMLIA       236.9       B9.43       1.4° 30'       4'/ brownet       FCIA (t         HORZ, TAU, (2)       11.6       34.16'       17° 45'       4'/ brownet       33.607         Vished, fill (2)       11.6       34.16'       17° 45'       4'/ brownet       33.607         Vished, fill (2)       11.6       34.16'       17° 45'       4'/ brownet       33.607         Vished, fill (2)       11.6       34.16'       17° 45'       4'// brownet       33.607         Vished, fill (2)       11.6       34.16'       17° 45'       4'// brownet       33.607         Mark (FT <sup>2</sup> )       11.6       34.16'       17° 45'       4'// brownet       33.607         SURFACE TOTAL       344.7       3.60       3.606'// 3'// 3'// 3'// 3'// 3'// 3'// 3'//	-	1	16.0	94.0	0.0	17	44.4	1:	Page a by Vine ( famme)	<u> </u>		
Intervent       12.0		1	77 6 714	33 6 14				· · · · ·	lumate flored			
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	-	ł	24 4 54				<u> </u>	10.0	NOTELIC - CIONC			
BODY TOTAL     559.0     Plangh includes unsate claud (Auge for marked Structure Superstate)       SURFACES       SURFACES       SURFACES       SURFACES       SURFACES       SURFACES       SURFACE       SURFACE       SURFACE       SURFACE       SURFACES       SURFACE       SURFACE <td></td> <td></td> <td>2619.D/A</td> <td><u> </u></td> <td></td> <td></td> <td></td> <td></td> <td>.<u>Neza(e Vpen</u>z</td> <td></td> <td></td> <td></td>			2619.D/A	<u> </u>					. <u>Neza(e Vpen</u> z			
BODY TOTAL     559.0     Plaufit includes untit to closed (Auch for arrite Strong Separately)       SURFACE       SURFACE       SURFACE       SURFACE       SURFACE       SURFACE       SURFACE       SURFACE       NINIX       Colspan="2">SURFACE       NINIX       Colspan="2">SURFACE       NINIX       Colspan="2">SURFACE       NINIX       Colspan="2">Colspan="2">SURFACE       SURFACE TOTAL       ATENTIO       SURFACE TOTAL										:		
SURFACES         SURFACE       PETTED AREA (FT <sup>2</sup> )       EXPOSED       MAX. THICK. NESS SWEEP       AIRFOIL         Win126       236.9       89.93       14°30' 47' biconyet       FECO 18         Ho2r2. TANL       75.8       49.34       14°30' 47' biconyet       FECO 18         VESDEAL       TO.4       46.23       34°5' 45' biconyet       FECO 18         VESDEAL       TO.4       46.23       34°5' 45' biconyet       FECO 18         VESDEAL       FUL (2)       TO.4       46.23       34°5' 45' biconyet       FECO 18         VESDEAL       FUL (2)       TO.4       46.23       34°5' 45' biconyet       FECO 18         VESDEAL       FUL (2)       II.6       34.16       17°45' 45' biconyet       FECO 18         VESDEAL       FUL (2)       II.6       34.16       17°45' 45' biconyet       FECO 18         SURFACE TOTAL       344.7       AIRPOLNE TOTAL       953.7       FECO 18       FECO 18       FECO 18         BASIC WING GEOMETRY :       Basic wine for state 18       FECO 18       FECO 18       FECO 18       FECO 18       FECO 18       FECO 18       FECO 18       FECO 18       FECO 18       FECO 18       FECO 18       FECO 18       FECO 18       FECO 18       FEC		·•>	(Augh for Hozzie Shown separately)	iste clored (	clúds <u>n</u>	siength i	559.0	<u>.</u>	BODY YOTAL	. 1		
SURFACEPETTED AREA $(FT^2)$ EXPOSED MAC LENGTH MAC LENGTH MESS SWEEP AIRFOIL (DFG.)MAX.THICK- MAC LENGTH MESS SWEEP (DFG.)AIRFOIL FOLA (DFG.)Nills236.959.9314°32'4% Bicaures Mac Man South Control (DFG.)Nills75.847.3414°30'14°30'WEDT. TAIL VESNEAL FILL70.446.3334°15'15% Bicaures Man South Control (DFG.)VESNEAL FILL VESNEAL FILL70.446.3334°15'15% Bicaures Man South Control (DFG.)VESNEAL FILL VESNEAL FILL VESNEAL FILL VESNEAL FILL VESNEAL FILL Participation11.634.1617°45'SURFACE TOTAL MERCENTRY344.714'70'14% Bicaures Market Man Tot's Bicaures Market Man Tot's Bicaures Market Man Tot's Bicaures Market Man Tot's Bicaures Market Man Tot's Bicaures Market Man Tot's Bicaures Market Man Tot's Bicaures Market Man Tot's Bicaures Market Man Tot's Bicaures Market Man Tot's Bicaures Market Man Tot's Bicaures Market Man Tot's Bicaures 		•							SURFACES			•
Winite       236.9       89.93       14.9 30'       4% dicative       FECT 13         Hager Tain       75.8       49.54       14" 30'       14" 50'       15'       15'       15'       14" 50'       15'		88ti	AIRFOIL	X.THICK- SS SWEEP (DEG.)	d P GTH N	EXPOS MAC LEI (IN	EA (FT <sup>2</sup> )	VETTED AI	SURFACE			
HDEIT, TAIL       75. B.       47.34       14° De'       35 bit states and the states and	1352615	VR.d	A% BICALIVEY	14 4201	42	8	1269		mbistic.		·• •	•
WEQT. Thil (Z)       TO.4 $d_{6,33}$ $34^{\circ}$ (5) $32$ billowing for a statistic transmission of the problem of the statistic transmission of the problem of transmission of the statistic transmission of the problem of the statistic transmission of the problem of the statistic transmission of the statistic transmission of the problem of the statistic transmission of the statistic transmission of the problem of the statistic transmission of the statistic transmission of the problem of the statistic transmission of the statistic transmission of the problem of the statistic transmission of the statistic trate transmission of the problem of the statist	a)(4)	er .3.3.	1 & Bilidy. Orest Les	14"30"	34	<u></u>	96 Q	·	Unera Tau	l l		•
WEAR ALL (IN (2) $11.6$ $34.16$ $17^{\circ}45$ $42.6$ $17^{\circ}45$ $42.6$ $17.45$ $10.4$	a)(9),1	<u> </u>	6% 614404.6 1001	310151	27				HEAT THE ITY	<u>}</u>		
$\frac{1}{12} = \frac{1}{12} $		3.5	ARAIGERE UP	17" 15"	16				JEAN AND LAD	ŀ		
SURFACE TOTAL SURFACE TOTAL ATRPLANE TOTAL BASIC WING GEOMETRY: AREA (FT <sup>2</sup> ) ASPECT RATIO TAPER RATIO COLOR 3:50 TAPER RATIO TAPER A: 1-11 Friction Drag Data Sheet - Configuration 403 Type at 13,000-1b Mission Weight (U)	1)(0)	inc	B/F DICAVITA	11-72-1		<u> </u>			VENIKEL CIN ( C)	ŀ		
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AIRPLANE TOTAL 953.7 BASIC WING GEOMETRY: AREA $(FT^2)$ TAPER RATIO LEADING EDGE SWREP (DEG.) 35.0 (0) Figure 4.1-11 Priction Drag Data Sheet - Configuration 403 Type at 13,000-1b Mission Weight (U)							394.7		SURPACE TOTAL			:
AIRPLANE TOTALL(175.1)BASIC WING GEOMETRY:Reference wing the part of part of the part							013 7		Lange Line and T			•
BASIC WING GEOMETRY: AREA $(FT^2)$ AREA $(FT^2)$ ASPECT RATIO TAPER RATIO LEADING EDGE SWEEP (DEG.) 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 300 - 13 Type at 13,000-1b Mission Weight (U)				1	TLATENDE	1.7010 36416	7-3-3- 7 FG		AIRPLANE TOTALL			
AREA $(FT^2)$ ASPECT RATIO TAPER RATIO TAPER RATIO LEADING EDGE SWEEP (DEG.) 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 3001-13 Type at 13,000-1b Mission Weight (U)		L		Ď,	FOR BOR	BASIC HELLE WIL		ETRY :	BASIC WING GEOM			
ASPECT RATIO <u>3.00</u> <u>3.00</u> TAPER RATIO <u>0.20</u> <u>0.0594</u> LEADING EDGE SWEEP (DEG.) <u>35.0</u> <u>35.0</u> (8) Figure 4.1-11 Friction Drag Data Sheet - Configuration 403 Type at 13,000-1b Mission Weight (U)		F	hwet= 5.24	5 - 67	219	714.47	. f <sup>*</sup>	ŧ.	AREA (FT <sup>2</sup> )			
ASPECT RATIO <u>3.00</u> <u>3.00</u> TAPER RATIO <u>0.20</u> <u>0.1694</u> LEADING EDGE SWEEP (DEG.) <u>35.0</u> <u>35.0</u> (0) Figure 4.1-11 Friction Drag Data Sheet - Configuration 403 Type at 13,000-1b Mission Weight (U)												
TAPER RATIO     0.20     0.1594       LEADING EDGE SWEEP (DEG.)     35.0     35.0       (0) Figure 4.1-11 Friction Drag Data Sheet - Configuration 403       Type at 13,000-1b Mission Weight (U)		· } ]		₽,	3.	3.00			ASPECT RATI			
LEADING EDGE SWEEP (DEG.) 35.0 35.0 (8) Figure 4.1-11 Friction Drag Data Sheet - Configuration 403 Type at 13,000-1b Mission Weight (U)				1	0,1	0.20		)	TAPER RATIO			
(8) Figure 4.1-11 Friction Drag Data Sheet - Configuration 403 Type at 13,000-1b Mission Weight (U)		l l		0	-3	35.0	(DEG.)	e sweep	LEADING EDG	<i></i>	•	
(8) Figure 4,1-11 Friction Drag Data Sheet - Configuration 403 Type at 13,000-1b Mission Weight (U)					 •			· ·	•			
/11			n 403	figuration t (U)	: - Con ni Welj	ta Shee b Missi	13,000-1 213	Frictio Type at	<del>(8)</del> Figure 4.1-11	-	•	•
-SECRET-						<del>]</del>	SECRI					
· •		•										
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TRICTION DRAC DATA           GW = 1G, YGO LB           W/5 : CO LBS / F           V/5 : CO LBS / F           T/W = 0.85019           FUGUE with Data		SECRI	E <del>T -</del> .				
BODIES	J- [0] - 64	-100)					•
BODY	WETTED AR	EA (FT <sup>2</sup> )	LENGTH (IN)	WIDTH (IN)	HEIGHT (IN	5	
Fuelase Prover poly		317.5	# 4570	44.0	63.0		
Inseless Eulerholy		323.6	449.0	32.0	18.0		88th A
Canony livel Fairing		44.4	130.0	34.0	16.0		FOLA
Worale-Closed		12.6	25.05	37 4 DA	32,4 DIA	]	SECT
Nosale-Open	12.0		19.50	37.4 Dr.A	32.4 014		(4) 7 7
					<del>_</del>	ł	1.4 (8)
		<u>`_``````</u> ````			······	4	
	_ <del></del>		·····		<u> </u>	-	
			·····				
BODY TOTÁL		693.1	# Longth include	s viezzle close	d (Anet For	A.	
SURFACES			T Notein in	in an ich an Star	·1 ·		
		_	EXPOSED	KAX THICK-	<u> </u>	].	
SURFACE	VETTED AR	EA (FT <sup>2</sup> )	MAC LENGTH	NESS SUREP	AIRFOIL		1
			(110)	(DEG.)			- [
WANG		306.7	(1N) 102.2	(DEG.) 14° 301	4% Disolvex		-
Waig Horiz Tail		306.7. 98.0	(1N) 102.72 56.1	(DEG.) 14° 70 <sup>1</sup> 14° 30 <sup>1</sup>	4% OIGOLIVEX 6% BICOLIVEX 4% BICOLIVEX 4% BICOLIVE	sila internet interne	-
Wajg Horiz Tail Vert. Fail 12)		306.2 98.0 88.5	(1N) 102.2 56.1 52.0	(DEG.) 14° 30 <sup>1</sup> 14° 30 <sup>1</sup> 34° 15 <sup>1</sup>	4% GIGOLIVEX 6% 516013-F1017 4% 516013-F1017 4% 516013-F101 4% 516013-F100 4% 516013-F100	exp.	
Waig Horiz Tau Vert Tau Ventral ful (2)		306.7 98.0 89.5 14.6	(111) 102.2 56.1 52.0 38.3	(DEG.) 14° 30 <sup>1</sup> 14° 30 <sup>1</sup> 34 <sup>*</sup> 15 <sup>1</sup> 11° 45 <sup>1</sup>	4% GIEGOLYEX GX \$1001-141 4% \$1001-141 4% \$1001-140 4% \$1001-110 6% BICOLUGY	crt.	-
Waig Horiz Tail Vert. Tail (2) Ventral ful (2)		306.7 98.0 89.5 14.6	(11) 102.2 56.1 52.0 38.3	(DEG.) 14° 30 <sup>1</sup> 14° 30 <sup>1</sup> 34° 15 <sup>1</sup> 11° 45 <sup>1</sup>	4% OIGOLYEX C% \$16013-T417 A3& Bucu -1147 BY Bical - 1161 4% Bical - 116 A36 Bical Ver	stp.	-
WAIG Horiz Tail Vert. Tail (2) Veltral ful (2)		306.72 98.0 88.5 14.6	(11) 102.2 56.1 52.0 38.3	(DEG.) 14° 30 <sup>1</sup> 14° 30 <sup>1</sup> 34° (5 <sup>1</sup> 11° 45 <sup>1</sup>	4% OIGOUYEX 6% \$16013-1491 4% 8400 -119 4% 8401, ~110 4% 8401, ~110 BICOUSUEL	5 <b>7</b> 7•	-
WAIG Horiz Tail Vert Tail [2] Ventral ful [2]		306.72 98.0 89.5 14.6	(11) 102.2 56.1 52.0 38.3	(DEG.) 14° 30 <sup>1</sup> 14° 30 <sup>1</sup> 34 <sup>*</sup> 15 <sup>1</sup> 17° 45 <sup>1</sup>	4% GIGOLYCX CX \$10013-141 A% 8400 -141 \$76 \$1001 - 1001 4% 3400 - 100 \$1001 - 100 \$36 BICOLYCU	546	-
WAIG HORIZ TAIL VERT. TAIL (2) VELTRAL FUL (2)		306.72 98.0 89.5 14.6	(11) 102.52 56.1 52.0 38.3	(DEG.) 14° 30 <sup>1</sup> 14° 30 <sup>1</sup> 34° (5 <sup>1</sup> 11° 45 <sup>1</sup>	4% OIGOLYEX UN \$10013-TUN 4% BUCU -149 0% \$10014 ~ [100] 4% BUCU -110 4% BICOLYEL	5 <b>(p.</b>	-
WAIG HORIZ TAIL VERT. FAIL (2) VENTRAL FIN (2)		306.72 98.0 88.5 14.6	(11) 102.2 56.1 52.0 38.3	(DEG.) <u>14° 30</u> <sup>1</sup> <u>14° 30</u> <sup>1</sup> <u>34* (5'</u> <u>17° 45'</u>	4% Gigalyex Gy \$10013-1491 A3& Bucu -149 By \$1401, -110 4% Bicu, -110 Bicauver	5 <b>17</b> •	-
VIAJG HORIZ TAU VERT. TAU VENTRAL FUL (2) VENTRAL FUL (2) SURFACE TOTAL		306.72 98.0 89.5 (4.6	(11) 102.72 56.1 42.0 38.3	(DEG.) 14° 30 <sup>1</sup> 14° 30 <sup>1</sup> 34° 15' 17° 45 <sup>1</sup>	4% OIGOLYEX CYL \$10013 - FWI 4% \$2013 - FWI 4% \$2013 - FWI 5% \$2013 - FWI 4% \$2013 - FWI 54 5013 - FWI 51 COLSTER	547.	-
WAIG HORIZ TAU VERT. TAU (2) VENTRAL FUL (2) SURPACE TOTAL AIRPLANE TOTAL		306.2 98.0 88.5 14.6 507.3	(11) 102.2 56.1 52.0 38.3 38.3	(DEG.) <u>14° 301</u> <u>14° 301</u> <u>34* (51</u> <u>17° 451</u>	4% Gisauvex GY2 \$10013-1491 4% \$10013-1491 4% \$10013-119 4% \$10013-119 Bicouver	<b>51</b> 7•	-
WAIG HORLE TALL VERT. TAIL (2) VELTRAL EUX (2) SURPACE TOTAL AIRPLANE TOTAL BASIC WING GEOM	ETRY :	306.2 98.0 89.5 14.6 507.3	(11) 102.2 56.1 52.0 38.3 38.3	(DEG.) 14° 30 <sup>1</sup> 14° 30 <sup>1</sup> 34° 15 <sup>1</sup> 11° 45 <sup>1</sup> 11° 45 <sup>1</sup>	4% OIGOLYEX 6% \$1003-1491 4% \$10013-1491 4% \$10013-149 6% \$10013-110 6% BICOLUGY	547.	-
WAIG HORIE TAIL VERT. FAIL (2) VENTRAL EUL (2) SURPACE TOTAL AIRPLANE TOTAL BASIC WING GEOM AREA (FT <sup>2</sup> )	ETRY :	306.72 98.0 89.5 14.6 	(11) 102.2 56.1 52.0 38.3 38.3 1000000000000000000000000000000000000	(DEG.) 14° 20 <sup>1</sup> 14° 30 <sup>1</sup> 34* 15 <sup>1</sup> 17° 45 <sup>1</sup> 17° 45 <sup>1</sup> 17° 45 <sup>1</sup> 17° 45 <sup>1</sup> 17° 45 <sup>1</sup>	4% Gisouver 6% filos-run 4% filos 4% filos 4% filos 6% filos	2 <b>4</b> 7•	-
WAJG HORIE TAIL VERT. TAIL (2) VEITRAL FUL (2) VEITRAL FUL (2) SURPACE TOTAL AIRPLANE TOTAL BASIC WING GEOM AREA (FT <sup>2</sup> ) ASPECT RATI	ETRY :	306.2 98.0 88.5 14.6 507.3	(11) 102.2 56.1 52.0 38.3 38.3 10.0 38.3 10.0	(DEG.) 14° 30 <sup>1</sup> 14° 30 <sup>1</sup> 34° (5 <sup>1</sup> 11° 45 <sup>1</sup> 11° 45 <sup>1</sup> 11° 45 <sup>1</sup> 11° 45 <sup>1</sup> 13.353 41 3.20	4% Gidayyex 5% \$1003-F491 4% \$1001,-F491 4% \$1001,-F19 4% \$1001,-T19 5% \$1001,-T19 BICOLVEL	<b>547</b> •	-
WAIG HORLE TAIL VERT. TAIL (2) VERT. TAIL (2) VENTRAL EUX (2) SURFACE TOTAL AIRPLANE TOTAL BASIC WING GEOM AREA (FT <sup>2</sup> ) ASPECT RATI TAPER RATIO	ETRY :	306.72 98.0 89.5 (4.6 507.3 (200.4	(11) 102.2 56.1 52.0 38.3 38.3 28.3 56.0 28.5 28.5 28.5 28.5 28.5 28.5 28.5 28.5	(DEG.) 14° 30 <sup>1</sup> 14° 30 <sup>1</sup> 34° 15 <sup>1</sup> 11° 45 <sup>1</sup> 11° 45 <sup>1</sup> 11° 45 <sup>1</sup> 13.353 3.20 0.1616	4% 01601405 14% 816015 - 149 1 4% 81601 - 149 1 4% 81601 - 169 4% 81601 - 169 BICOLVER BICOLVER And 1 = + 6.7 19	₩. T	-
WAIG HORIE TAIL VERT. TAIL (2) VENTRAL EUL (2) VENTRAL EUL (2) SURPACE TOTAL AIRPLANE TOTAL BASIC WING GEOM AREA (FT <sup>2</sup> ) ASPECT RATI TAPER RATIO	ETRY :	306.7 98.0 89.5 14.6 507.3 (200.4	(11) 102.2 56.1 52.0 38.3 38.3 38.3 5670000 May Trep 3670000 May Trep 280 25 3.0 0.30	(DEG.) 14° 20 <sup>1</sup> 14° 30 <sup>1</sup> 34 <sup>*</sup> 15 <sup>1</sup> 11° 45 <sup>1</sup> 11° 45 <sup>1</sup> 13.353 3.20 0,1689 3.51	4% 0160140x 6% 61001-1491 4% 61001-119 4% 61001-119 6% 61001-119 BICOUNEL 4% 6101-119 BICOUNEL COUNEL COUNEL	<b>-</b> <b>T</b> −	-

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... 2 ï 24 (0) • n Г ONFIGURATION. 403 • Ł • 11 - 1 LANT. (H.1.4. 10 1,000 5.) :u ÷... 1 'n -( . NEIGHT. SUNHARY z FWP INUK-UCER SECTION .1000 ŀ W11,16c. T NE NE т TYPE) LALVOOR! ARCE 1098.9 -... Ć. 1 1 6. 80517 1:30. Flogine 121 File .... 4 1914 Ō. 32,000 Velone int ž a -44 POTAL 2696 10112 Girss fuel 14 463.3 ï 3 14-15.1 Net fuel lus. ß ŭ N -018.9 Aljucies for 162 į ÷ŀ ---{ 4.91% Groce fiel ~ by Alteriore • 22 88th ABW/IPI -11 FOIA((b)(()))(()) E.O. 13526 SEC 3:3((b)(4) 28 5.1 . at Used ik Weight Summing-،انبہ ا ŧ ; ·~~ 0 ide -INJı 1.4, (a)(g) (5)(4) •• 3. Fild TANKSTUNR Sec 101 I. U. LADIG -----ALEA BLADPER , TYPE ). 4. ù: SECTIONAL d.48 92 موا به ļ ... X : 19,200 voline T 540,13 fuel abs <u>Lin</u> ŀ Well fuel , the 5241 Ċ AIRFE. Ø <u>CE055</u> 405.7 Adjusted for As ..... 1 1. \* spine 29 bors 1 100 1.100 . : "' 1 AUKS ----3 (WIESPAL TYE) . \_1 21 · · · ľ ••• 1 ų ~ 60 4:47 Placine Leve Wa \_ . Ť ļ Volume ÷. 58,800 ••• 4.1.1.6. 54.6 TIOL <u><17055</u> Suel the .... Ø Net fual 153818 16. 1 914 Aliberted Lelles .... \$ 93% Grass fuel 3% repause \$1.9 400 •1. .) 309. 200 100 177 . x 1 1 -i 1.2 24 STATION - NICHES 1 LAGE FUSE 

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#### 4.2 PERFORMANCE

Basic performance data computed for the small singleengine concept, Configuration 403, are based on the same mission definitions and performance rules as presented in Section 3.2 for Configuration 4018, Calculations were made on aircraft of three sizes. These were a 13,000-1b size used for the design layout and two growth versions discussed in Section 4.1. The basic data used in the performance calculations are presented in Sections 4.3 through 4.6.

The mission performance capabilities of Configuration 403 at 13,000 1b are summarized in Figure 4.2-1. The performance of Configuration 403 at 13,000 1b is far from satisfactory. The LRASM radius is only 146 n.mi, and the SRASM is not possible under the existing ground rules because the fuel allowances for takeoff, climb, combat, and landing exceed the fuel capacity. Even growing the aircraft, as shown in Figure 4.2-2, will not accomplish the desired mission radius for either the LRASM or the SRASM. The problem with the larger-sized aircraft is the small thrust excess during acceleration. Growing the airplane in size (without increasing engine size) results in lower acceleration capabilities, which require more time and fuel for the acceleration portion of the combat allowance. When the aircraft is grown to approximately 18,500 1b it is incapable of accelerating to Mach 1.5 and cannot perform the mission.

(U) The small single-engine concept was dropped from further consideration.



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