3125 ⑧

MAC RPT

F3H DEMON

COMBAT CAPABILITY

REPORT NO. 3125

1 SEPTEMBER 1953

RESTRICTED DATA

ATOMIC ENERGY ACT 1946

McDONNELL *Aircraft Corporation*

[redacted]

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COMBAT CAPABILITY
F3H DEMON

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INTRODUCTION

The F3H-2N Demon is an all-weather, high performance, carrier-based, general purpose fighter airplane. It incorporates a 45° swept wing in a conventional single-seat single-engine design. The power plant is the Allison J71-A-2 turbo-jet engine with 14,500 lbs. maximum thrust at 6100 rpm. Provision is incorporated for carrying two 300 gallon external fuel tanks and for accomplishing in-flight refueling of all tanks, including external. This feature makes it possible to take off "light", climb to "cruise out" altitude, and take on full fuel load by in-flight refueling for maximum range.

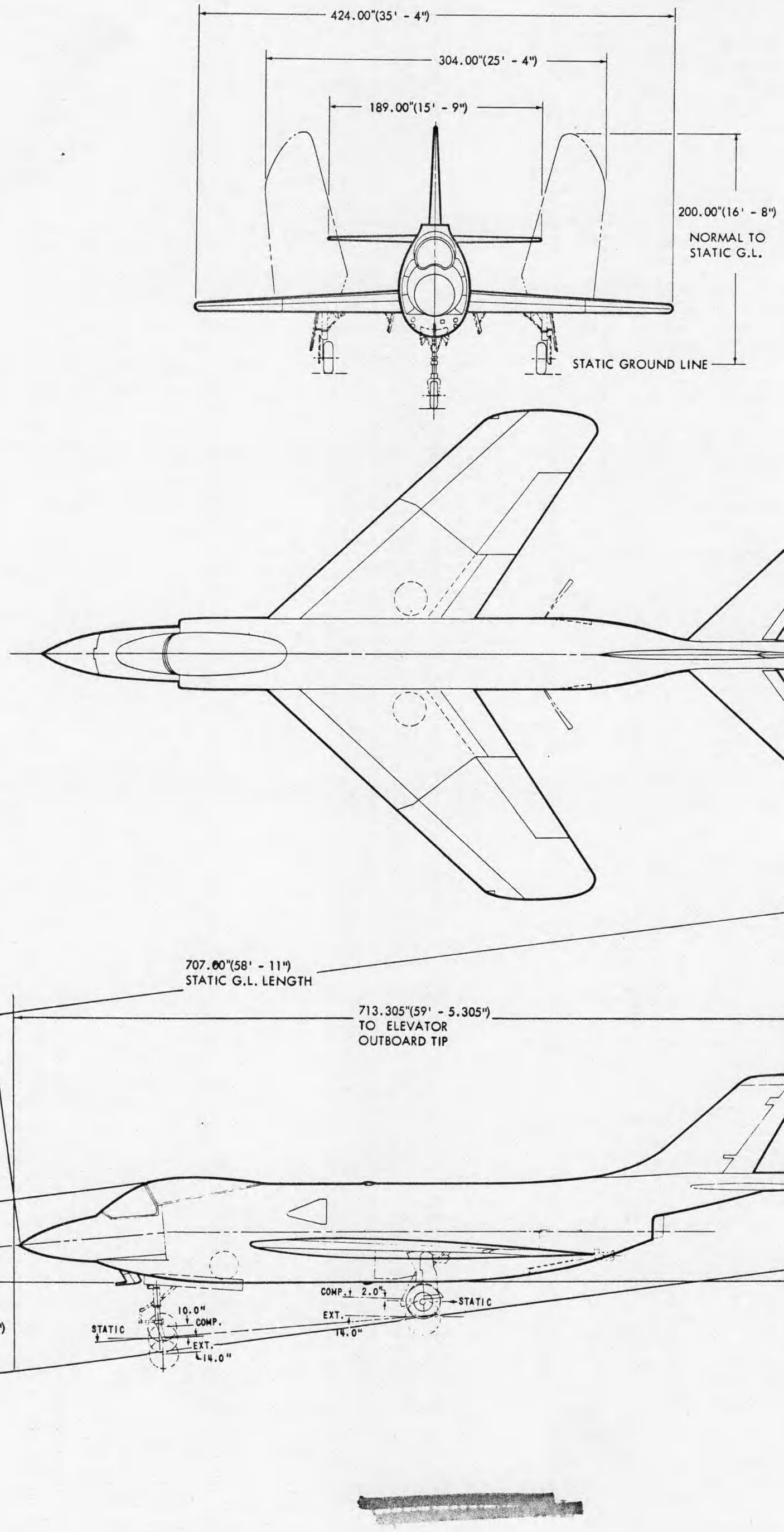
The airplane combines interceptor speed and fighter maneuverability with attack-bomber load-carrying ability. It is capable of Mach. 1.4 speed in a dive and has over 1300 nautical miles range. Heavily concentrated firepower is provided by four 20 mm cannon with 760 rounds of ammunition, and a total of one hundred fourteen 2.75 inch rockets carried externally on wing racks. In addition, the airplane is equipped to carry multiple combinations of conventional or special stores on six wing launchers and two fuselage racks.

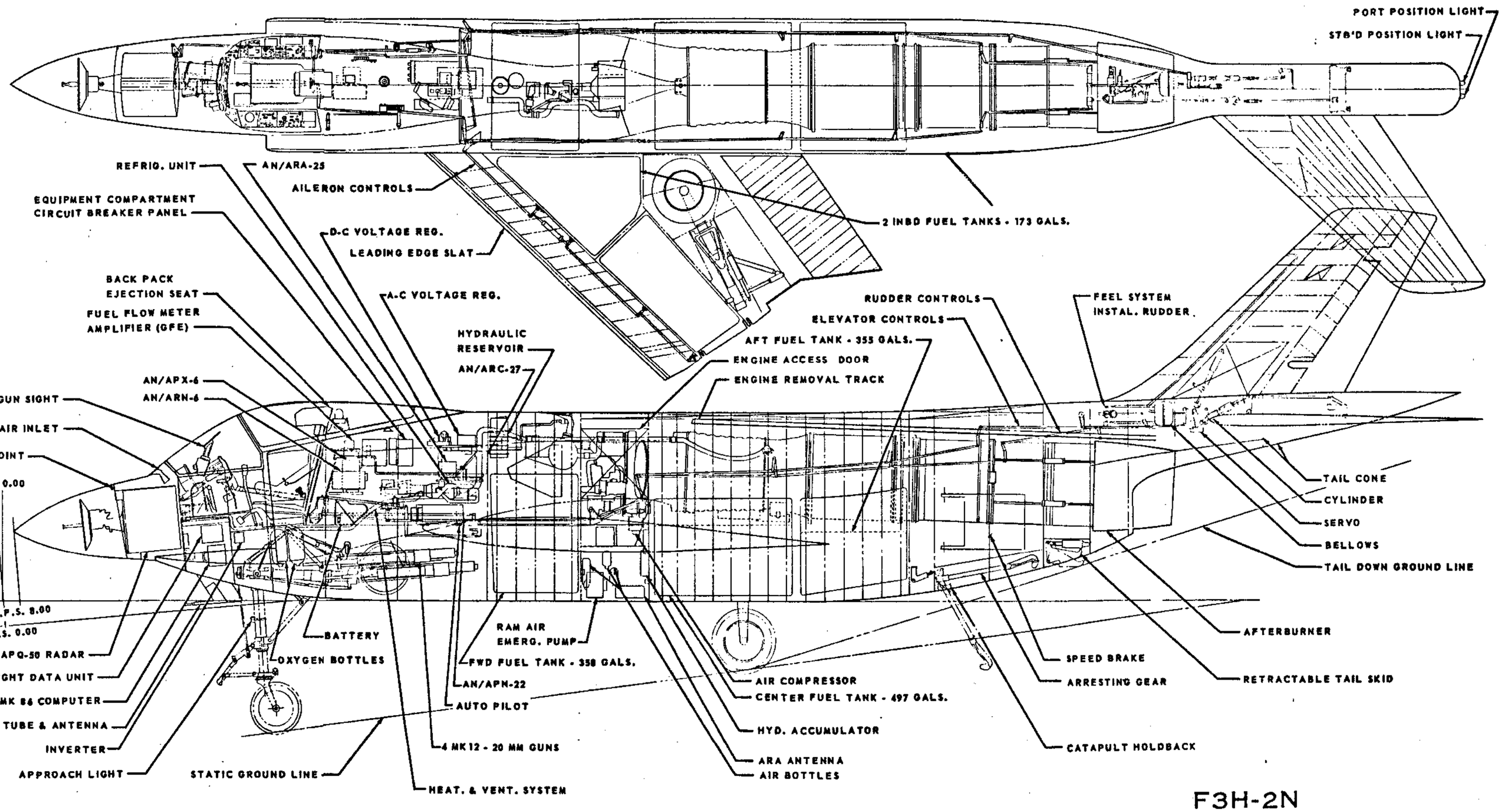
The landing gear is designed for 17 ft/sec sinking speeds and will absorb up to 20.8 ft/sec sinking speeds before failure. The wing is designed for 7.5 "G" at combat weight, and will take 8.6 "G" before evidence of yielding and 11.25 "G" before failure.

Pilot visibility is superior, with 18 1/4 degrees line of sight over the nose from the horizontal. There is excellent accessibility for maintenance and quick servicing provided by large, quick opening doors to the engine accessories, electrical and hydraulic systems, and electronic and armament components. Access to the AN/APQ-50 radar components is an example. The entire nose radome assembly swings easily upward on a single hinge, exposing the antenna. The cylindrical radar package slides out forward on an integral track. Both sides of the cylinder may then be readily opened in sections as required for servicing.

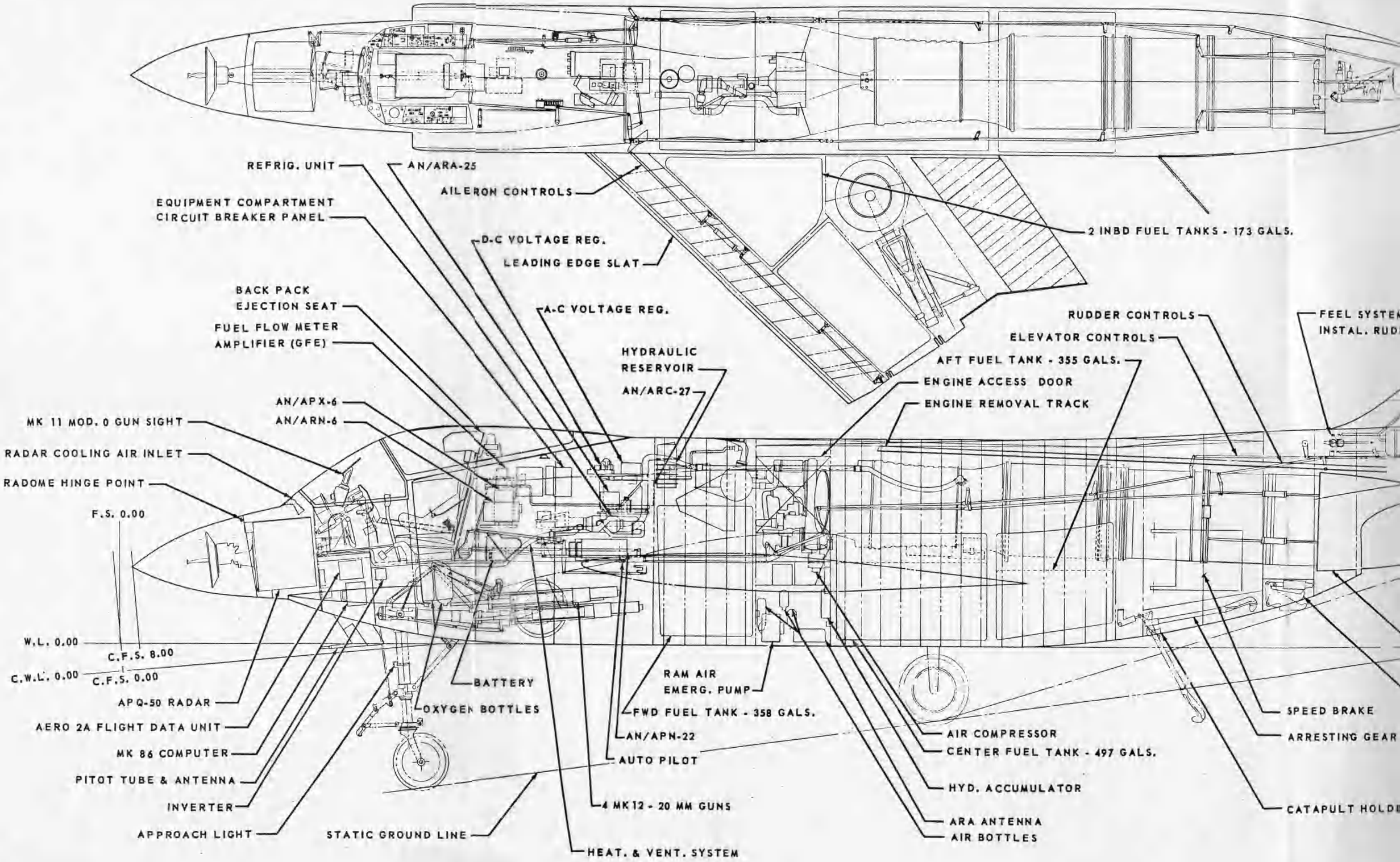
The early F3H-1N airplanes will be delivered with Westinghouse J40-WE-22 engines producing 10,900 lbs. maximum thrust at 7260 rpm. The combat capability described herein, including provisions for the J71-A-2 engine, external fuel, and in-flight refueling, will be available on all aircraft starting with Serial Number 61 and up.

F3H-2N GENERAL ARRANGEMENT





F3H-2N
INTERIOR ARRANGEMENT



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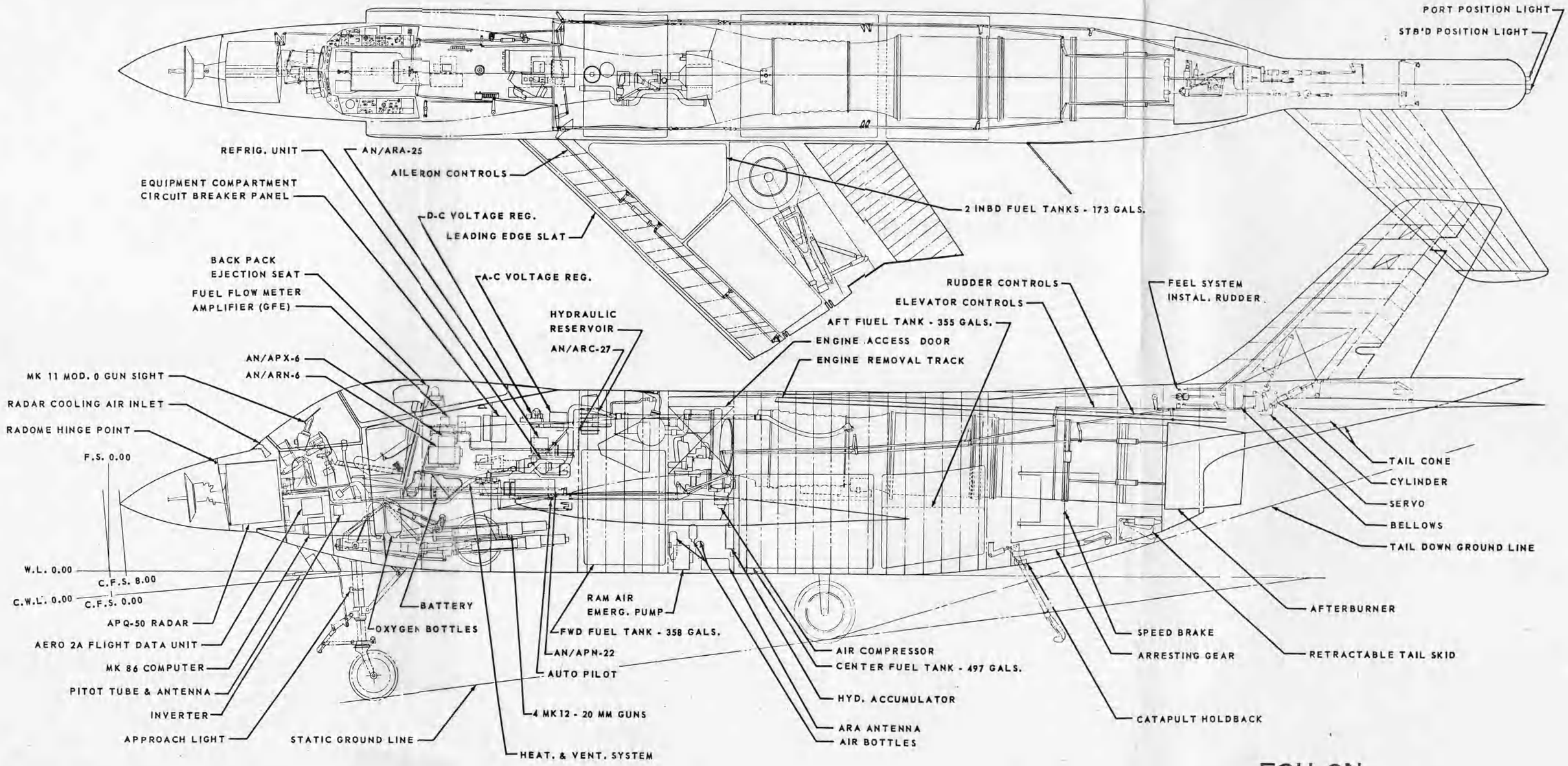
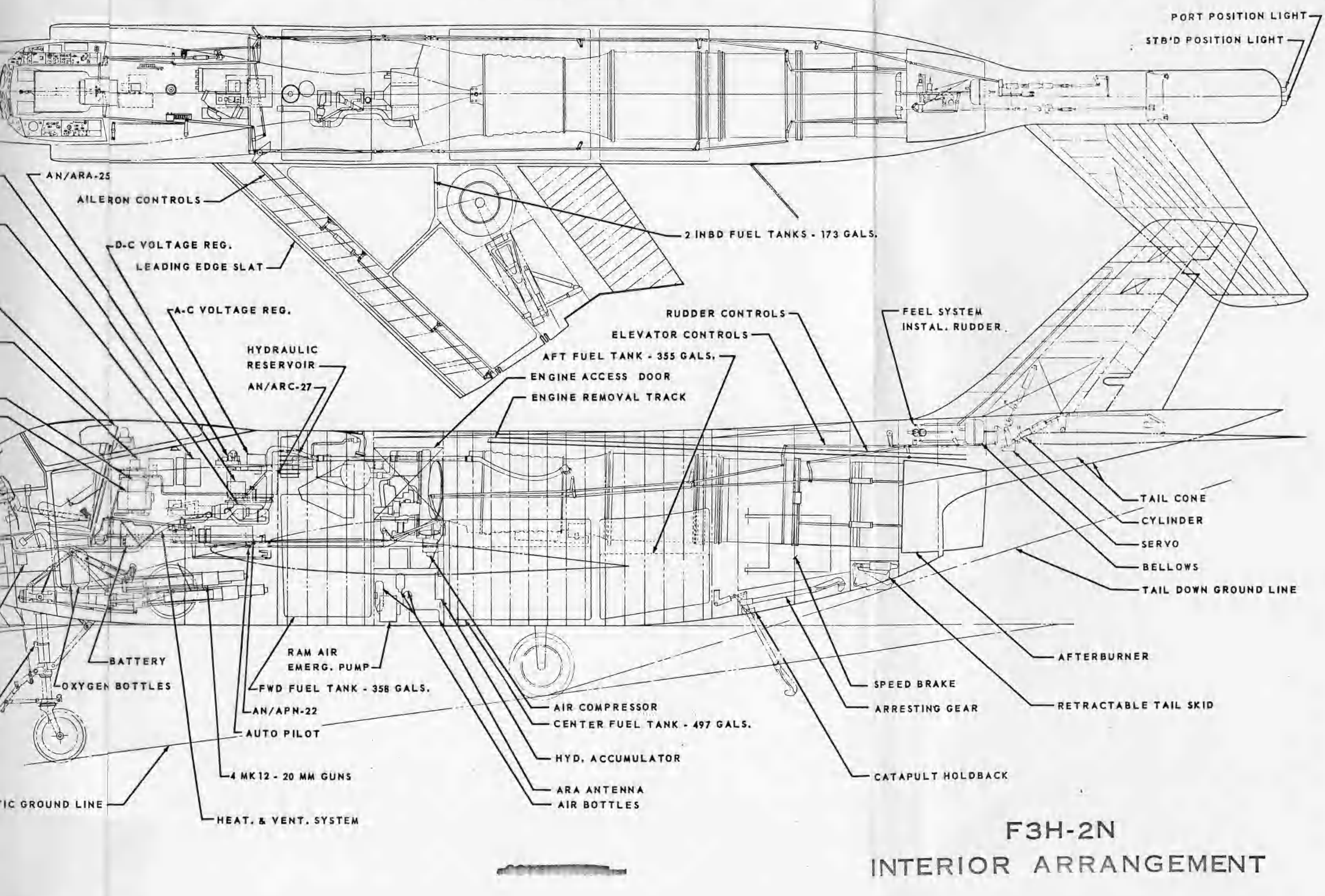


F3H-2N
INTERIOR ARRANGEMENT



F3H-2N
INTERIOR ARRANGEMENT

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ATOMIC ENERGY ACT 1946

SUMMARY OF ESTIMATED PERFORMANCE CHARACTERISTICS F3H

IN ACCORDANCE WITH MIL-C-5011A

		F3H-1N (J40-WE-22)	F3H-2N (J71-A-2)					
		A CLEAN CONFIG.	B CLEAN CONFIG.	C CLEAN PLUS 2 - 300 GAL. EXTERNAL TANKS	D CLEAN PLUS 2 - 300 GAL. EXTERNAL TANKS PLUS INFLIGHT REFUELING	E CLEAN PLUS 2 - 2000 LB. BOMBS	F CLEAN PLUS 1 - MK 7 SPECIAL STORE	G CLEAN PLUS 1 - MK 7 SPECIAL STORE AND 1 - 300 GAL. EXTERNAL TANK
WEIGHTS (NOTE #1)								
1. Take-Off Gross Weight	(Lbs.)	29789	31120	35776	30484	35254	32532	34860
2. Take-Off Fuel	(Gal/Lbs.)	1506/9789	1506/9789	2106/13689	1285/8353	1506/9789	1506/9789	1806/11739
3. Combat Gross Weight (Note #2)	(Lbs.)	25876	27207	29843	29887	31341	28619	29937
4. Percent Total Fuel for Combat	(%)	60	60	60	60	60	60	60
5. Combat Fuel	(Gal/Lbs.)	904/5876	904/5876	1264/8216	1264/8216	904/5876	904/5876	1084/7046
6. Landing Gross Weight (with 1500 Lbs. Fuel)	(Lbs.)	21500	22831	23127	23171	26965	24243	24391
PERFORMANCE AT TAKE-OFF GROSS WEIGHT (NOTE #3)								
7. Combat Radius of Action (Note #4)	(Na. Mi.)	373	374	549	750	346	384	476
8. Wind Required over Deck (H8 Design Catapult), Mil. Power (Note #5)	(Knots)	23.8	25.5	39.3	23.5	38	30	36.8
9. Wind Required over Deck (H8 Design Catapult), Mil. Power + A/B (Note #5)	(Knots)	20.5	22.0	36.0	19.8	34.5	26.5	33.5
10. Required Catapult Take-Off Speed (Note #5)	(Knots)	111.7	112.5	121.5	111.1	120.7	115.4	120.0
11. Catapult Rate of Climb, Mil. Power + A/B	(Ft./Min.)	665	1550	846	1700	895	1160	926
12. Stalling Speed, Power Off	(Knots)	112	114	122.5	113	122	117	121
13. Stalling Speed, Mil. Power + A/B	(Knots)	105	105	114	104	113	108	112
14. Rate of Climb at Sea Level, Mil. Power	(Ft./Min.)	3580	6235	4680	5740	4940	5600	4850
15. Take-Off Ground Run, Mil. Power (Note #6)	(Ft.)	4800	3115	4410	2945	4260	3500	4145
16. Take-Off Ground Run, Mil. Power + A/B (Note #6)	(Ft.)	2530	2030	2757	1940	2665	2232	2596
PERFORMANCE AT COMBAT GROSS WEIGHT								
MILITARY POWER + AFTERBURNING								
17. Maximum Speed at Sea Level	(Knots/M)	619/.937	632/.956	625/.946	623/.943	618/.935	620/.938	616/.932
18. Maximum Speed at 35332 Ft. (Note #7)	(Knots/M)	552/.959	563/.979	555/.965	553/.962	548/.953	552/.960	548/.953
19. Maximum Rate of Climb at Sea Level	(Ft./Min.)	11560	16680	14350	14000	12950	14610	13680
20. Maximum Rate of Climb at 35332 Ft. (Note #7)	(Ft./Min.)	3595	5200	4120	4005	3420	4330	3810
21. Minimum Time to Climb to 35332 Ft. (Note #7)	(Min.)	4.64	3.43	4.12	4.21	4.65	3.96	4.36
22. Combat Ceiling (1 g)	(Ft.)	44200	48200	45750	45500	44400	46300	45400
MILITARY POWER								
23. Maximum Speed at Sea Level	(Knots/M)	538/.814	592/.896	575/.870	570/.863	559/.846	570/.863	562/.850
24. Maximum Speed at 35332 Ft. (Note #7)	(Knots/M)	496/.862	524/.911	503/.875	496/.751	459/.798	504/.877	487/.847
25. Maximum Rate of Climb at Sea Level	(Ft./Min.)	4395	7350	6400	6275	5750	6560	6150
26. Maximum Rate of Climb at 35332 Ft. (Note #7)	(Ft./Min.)	350	1165	520	440	110	615	290
27. Time to Climb to 35332 Ft. (Note #7)	(Min.)	19.1	9.97	13.28	14.2	17.8	12.70	15.32
PERFORMANCE AT LANDING GROSS WEIGHT								
28. Stall Speed (Power Req'd for 1.20 Power Off Stall Speed)	(Knots)	92	94	95	95	102	97	97
29. Stall Speed (Power Off)	(Knots)	95	98	98.5	98.5	106	101	101
30. Wave-Off Rate of Climb, Mil. Power	(Ft./Min.)	475	1810	1745	1720	1175	1550	1522
31. Wave-Off Rate of Climb, Mil. Power + A/B	(Ft./Min.)	2080	3248	3180	3150	2460	2945	2921

NOTES:

(1) JP-4 fuel at 6.5 Lbs. per Gallon is used.
(2) Combat and landing gross weights assume store attached and external tanks dropped. Store off configuration performance reflected in Columns (A) & (B)
(3) J71-A-2 Engine Performance Characteristics per Reference (14) with appropriate corrections for Engine Duct Loss. J40-WE-22 Engine Performance Characteristics per Reference (15) with appropriate corrections for Engine Duct Loss.
(4) Combat Missions consistent with MIL-C-5011A dated 5 November 1951.
(5) Basic Catapult Characteristics and Corrections for Engine Thrust and Airplane Drag are based on BuAer Sketch SI-1253B dated 5 August 1952. Catapult Take-Off Speed is at speed for .90 $C_{L_{max}}$ including thrust effects on lift.
(6) Lift Off speed equals 110% of Power Off Stall Speed.
(7) At 35000 Ft. for F3H-1N (Column A).
(8) All performance assumes satisfactory engine operation.

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FIRE CONTROL AND RADAR CAPABILITIES

The DEMON is equipped with Armament Control System Aero 13D which consists of the AN/APQ-50 radar, the Armament Control Director Aero 5B and Aircraft Fire Control System Mark 16. The ACS Aero 13D provides the following functions:

a. Air-to-ground and air-to-surface long range search and mapping.
b. Air-to-air long range search and target detection.
c. Air-to-ground long range interrogation of radar navigational beacons.
d. Air-to-air visual attacks with 20 mm guns using a lead pursuit course with radar ranging.
e. Air-to-air visual attacks with 2.75" rockets using a lead pursuit course with radar ranging.
f. Air-to-ground visual attacks with 20 mm guns.
g. Air-to-ground visual attacks with 2.75" and 5" rockets.
h. Air-to-air zero-visibility attacks with 20 mm guns using a lead pursuit course.
i. Air-to-air zero-visibility attacks with 2.75" rockets using a lead pursuit course.
j. Air-to-air zero-visibility attacks with 2.75" rockets using a lead collision course.

RADAR SEARCH AND TRACK

The AN/APQ-50 provides search, track, beacon interrogation, and radar ranging functions. Target rate, position, and range information is supplied to the ACD Aero 5B, and target range information is supplied to the AFCS Mark 16. The radar has a peak power output of approximately 200 kilowatts and is the newest and most powerful airborne search-and-track radar available. The equipment is capable of excellent ground mapping presentation and can display ground targets at ranges up to 100 miles. Beacons can be interrogated and their replies received at ranges up to 200 miles. Maximum detection ranges for aircraft targets of Banshee size will vary from 6 to 14 miles depending upon target aspect and operator proficiency. Bombers of B-29 size can be detected at ranges of 24 miles or greater.

RADAR SIGHTING

The ACD Aero 5B receives target rate, position and range information from the AN/APQ-50 in the automatic tracking mode and computes the proper lead angle for lead pursuit courses for 20 mm guns or 2.75 inch rockets and for lead collision courses with 2.75 inch rockets. The lead collision course is particularly advantageous against bombers since it permits making straight-line-course side attacks well outside the bomber's deadly tail cone. Optical gun sights cannot be used for this type of attack because they cannot cope with the extremely large lead angles involved.

OPTICAL SIGHTING

The AFCS Mark 16 receives target range and range rate information from the AN/APQ-50 in the automatic tracking mode and computes the proper lead angle for air-to-air lead pursuit courses with 20 mm guns or 2.75 inch rockets and for air-to-ground attacks using 20 mm guns, 2.75 inch rockets, or 5-inch rockets.

COMBINATION SIGHTING

The combination of radar and optical systems comprising the ACS Aero 13D enables the pilot to detect and locate his target at long range under any visibility conditions, accurately close on the target using the radar in the automatic tracking mode, and make the final attack using either the radar or the optical gun sight. The installation is designed to provide smooth transition from radar to visual attack or vice-versa by providing for concurrent operation of the radar and optical fire control systems and integration of the systems and controls to the greatest practicable extent. Complexity and redundancy are reduced by using a single angle of attack system to supply angle of attack information to both the AFCS Mark 16 and the ACD Aero 5B (and the pilot's angle of attack indicator), and by sharing the auto pilot vertical gyro with the radar instead of using a separate gyro for the radar in the conventional manner.

RADAR IDENTIFICATION

The AN/APX-6 radar provides IFF by replying to interrogations from ground-based, shipboard, or airborne interrogators. The AN/APX-6 radar is not considered part of the ACS Aero 13D.

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BOMBING SYSTEM CAPABILITY

The F3H-2N and -1N aircraft have provisions for quickly installing the Mk-3 Mod-4 bomb director. With this bomb director installed and in combination with the optical sight provided as part of the Mk-16 fire-control system, it is possible to deliver bombs by any of the following approaches:

a. Toss bombing at moderate altitudes

b. Dive bombing from high altitudes

c. Dive or toss bombing from low altitudes

d. Other delivery techniques (Classified higher than the security classification of this report)

TOSS BOMBING TECHNIQUE

The F3H with bomb installed approaches the target area at altitudes of 20,000 to 45,000 feet. The pilot visually picks out the target and dives toward the target at an angle of between 30 and 60 degrees. During this dive, the pilot aligns the target with the image of the fixed reticle of the optical sight and presses the bomb release button, which starts the computer of the Mk-3 Mod-4 bomb director operating. The bomb director continuously measures the airplane altitude and dive speed and, at the proper time, flashes a "pull-up" light. The pilot performs a 3 to 4 g pull-up at about 10,000 to 20,000 feet and, at the proper point during this pull-up, the bomb director closes a circuit which releases the bomb. With this toss bombing technique, the pilot is in a pull-up and heading for the escape path at the time the bomb separates from the aircraft.

DIVE BOMBING TECHNIQUE

The F3H aircraft with bomb approaches the target area at as high an altitude as practicable for compromise of least vulnerability, maximum range, and ability to discern the target. Upon nearing the *target, the pilot rolls the airplane so that he may see the target and, at the proper time, rolls and* dives nearly vertical toward the target. During the dive, he aligns the target with the fixed reticle of the optical sight and upon reaching an altitude which will still permit safe escape, say 15,000 to 25,000 feet, presses the bomb release button which immediately releases the bomb. The pilot then performs a pull-up and makes his escape. The bomb director is not used for this approach.

DIVE OR TOSS BOMBING TECHNIQUE - LOW ALTITUDE

Dive bombing with the optical sight of the Mk-16 system and toss bombing with the Mk-3 bomb director may also be performed from low altitudes and at low angles of approach with delayed action bombs or with small bombs whose explosion effects will not be disastrous to the delivering aircraft.

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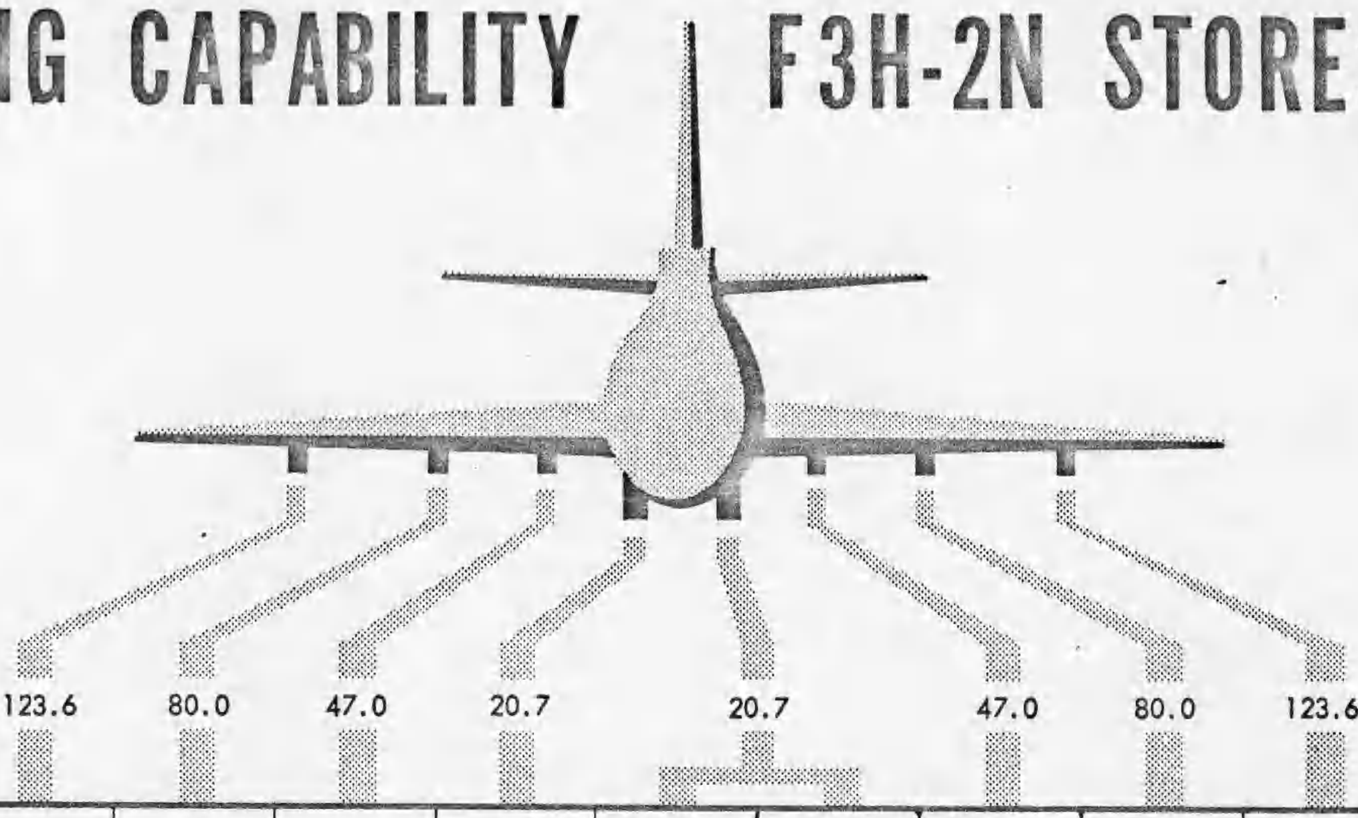
CARRYING CAPABILITY | F3H-2N STORES

NOTE:
VARIED COMBINATION OF STORES MAY BE CARRIED UP TO 4000 LBS. TOTAL.



STORES	TYPE RACK	STA. 1	STA. 2	STA. 3	STA. 4	STA. 5 S.S. FWD	STA. 5 G.P. AFT	STA. 6	STA. 7	STA. 8
100 LB G.P. BOMB	○	●	●	●	●		●	●	●	●
220 LB FRAG. BOMB	○	●	●	●	●		●	●	●	●
250 LB G.P. BOMB	○	●	●	●	●		●	●	●	●
500 LB G.P. BOMB	○	●	●	●	●		●	●	●	●
250 LB L.D. BOMB	○	●	●	●	●		●	●	●	●
500 LB L.D. BOMB	○	●	●	●	●		●	●	●	●
1000 LB L.D. BOMB	[1]				●		●			
2000 LB L.D. BOMB	[1]				●		●			
1100 LB STORE	△					●				
1750 LB STORE	[2]						●			
3300 LB STORE	[2]						●			
3600 LB STORE	[2]						●			
14B SPRAY TANK	[1]				●		●			
5.0" HVAR ROCKET	○	●	●	●	●		●	●	●	●
AERO 6A PKG (7-2.75" ROCKETS)	○	●	●	●	●		●	●	●	●
AERO 7A PKG (19-2.75" ROCKETS)	○	●		●	●		●	●		●
AERO 10A PKG (4-5.0" ROCKETS)	○				●		●			
DOUG. STARTER UNIT	[2]						●			
LOOSE EQUIP. POD	[1]						●			
FUEL TANKS	[1]				●		●			

RACK DESIGNATION

△ SPEC. STORES PYLON (FWD)
14" & 30" EJECTOR RACK
OR - 14" EJECTOR RACK F2H-3

○ AERO 14C (AFT FUSELAGE LOCATION REQUIRES LIGHT DUTY PYLON)

[ ] G.P. HEAVY DUTY PYLON (AFT) USING THE FOLLOWING:

[1] MK51 OR MK62A WITH OR WITHOUT AERO 1A ADAPTERS
[2] DOUGLAS 14" & 30" EJECTOR RACK

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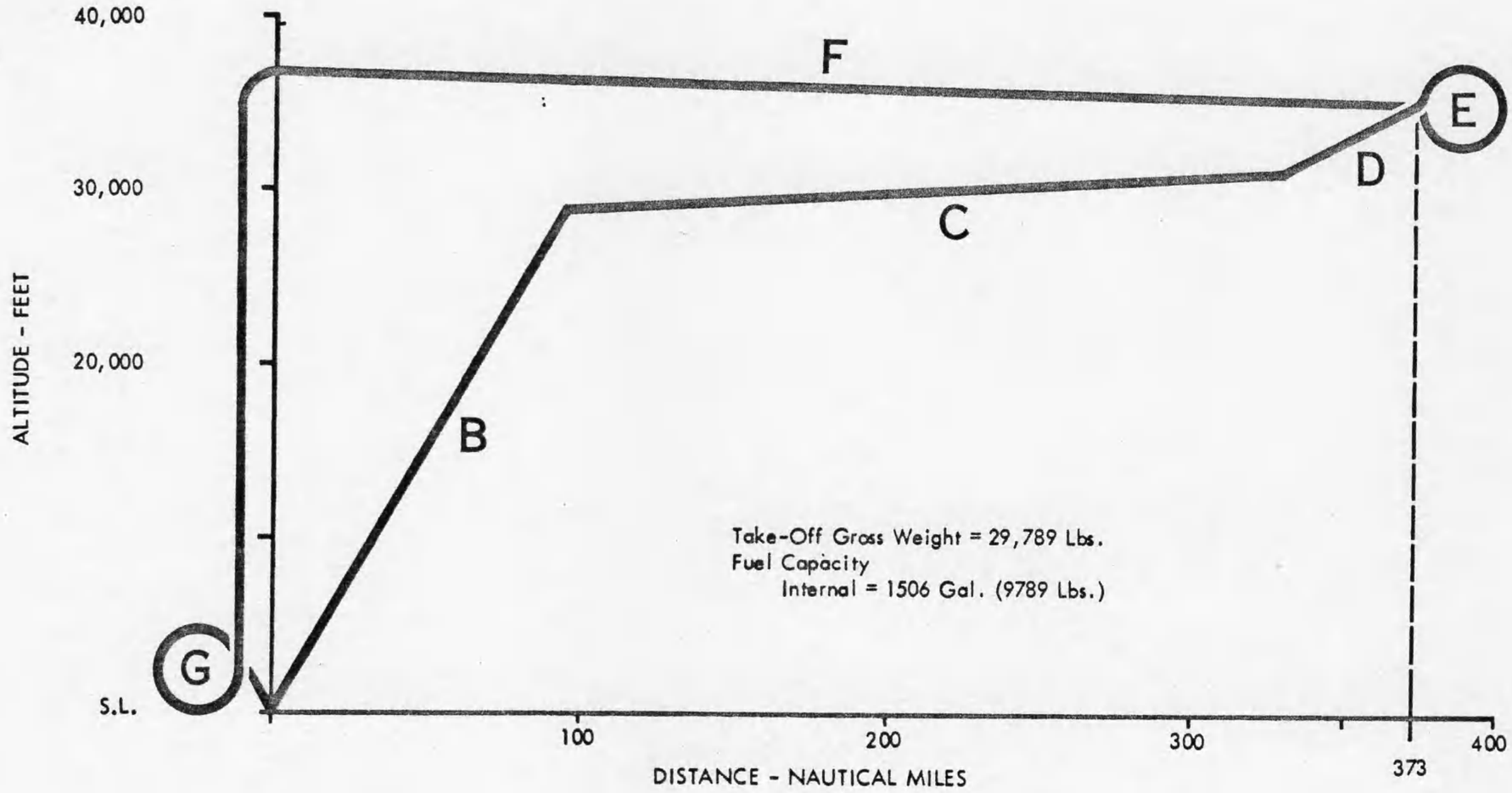
GENERAL PURPOSE & ESCORT FIGHTER MISSION

WITH INTERNAL FUEL ONLY
J40-WE-22 ENGINE
COMBAT RADIUS **373** NAUTICAL MILES

(MIL-C-5011A SPEC.)
(USING JP-4 FUEL AT 6.5 LBS./GAL.)

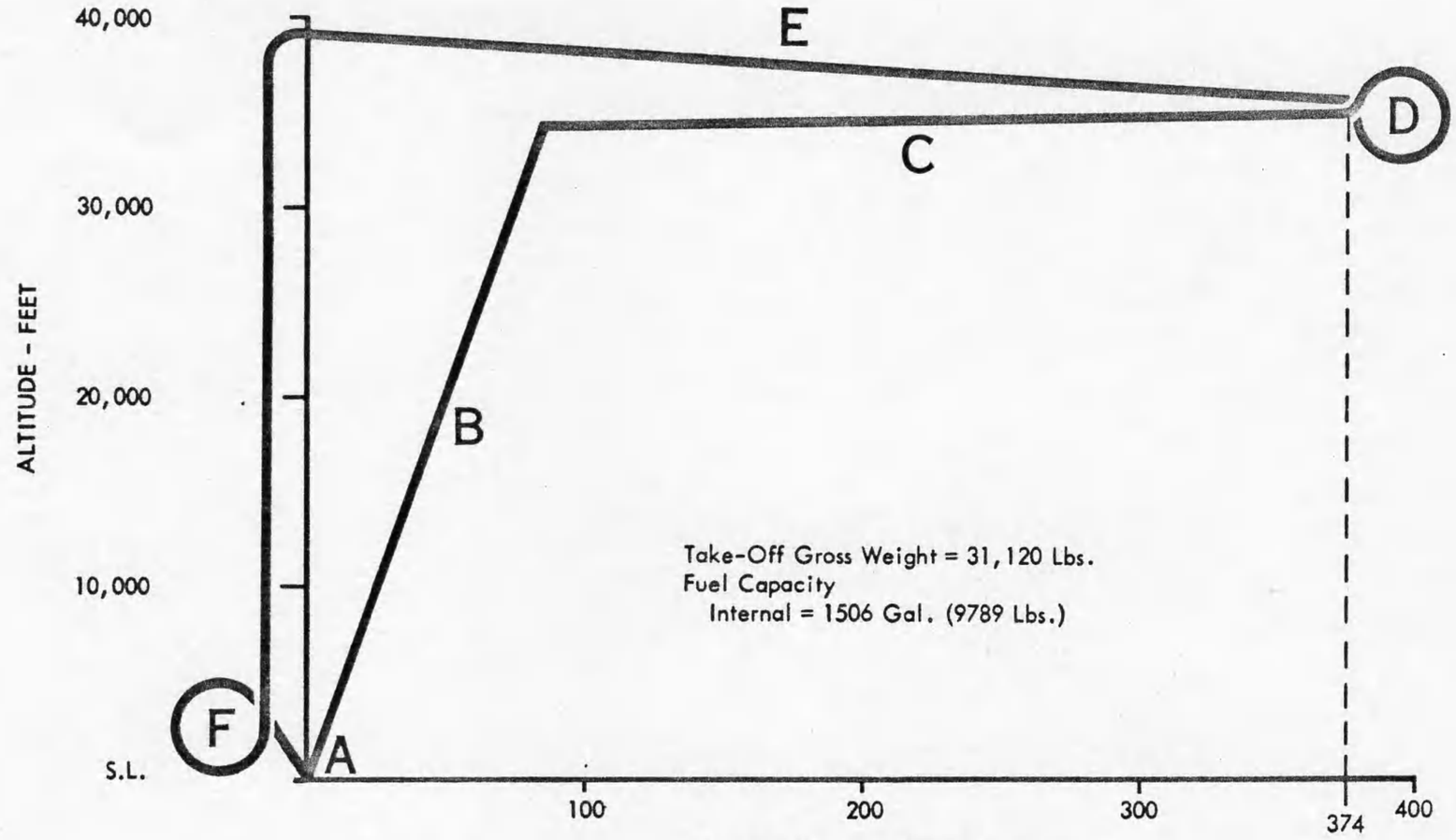


OPERATION	FUEL USED LBS.	DIST. NA. MI.	AV. SPEED KNOTS	TIME HRS.
A Warm-Up and Take-Off 5 Min. Normal Power	562	-	-	.083
B Mil. Pwr. Climb on Course to Opt. Cruising Alt. (28,800 Ft.)	1396	97	382	.254
C Cruise out to 31,200 Ft. at Speed for 99% Max. Range	1727	233	483	.482
D Mil. Pwr. Climb on Course to 35,000 Ft.	345	43	435	.098
E Combat at 35,000 Ft.				
5 Min. Max. Pwr. at High Speed	980	-	552	.083
15 Min. Mil. Pwr. at High Speed	852	-	496	.250
F Cruise Home to 36,600 Ft. at Speed for 99% Max. Range	2240	373	480	.777
G Reserve Fuel - 5% of Initial Fuel at Take-Off	489	-	-	-
20 Min. Max. Endurance at S.L.	1198	-	181	.333
TOTAL	9789	746		2.360

GENERAL PURPOSE & ESCORT FIGHTER MISSION

WITH INTERNAL FUEL ONLY
J71-A-2 ENGINE
COMBAT RADIUS **374** NAUTICAL MILES

(MIL-C-5011A SPEC.)
(USING JP-4 FUEL AT 6.5 LBS/GAL)



OPERATION	FUEL USED LBS.	DIST. NA.MI.	AV. SPEED KTS.	TIME HRS.
A Warm-Up and Take-Off 5 Min. Normal Power	662	-	-	.083
B Mil. Pwr. Climb on Course to Opt. Cruising Alt. (34,200 Ft.)	1244	88	440	.200
C Cruise Out to 35,500 Ft. at Speed for 99% Max. Range	1928	286	489	.585
D Combat at 35,000 Ft.				
5 Min. Max. Pwr., at High Speed	1156	-	563	.083
15 Min. Mil. Pwr., at High Speed	1034	-	524	.250
E Cruise Home to 39,000 Ft. at Speed for 99% Max. Range	2133	374	483	.774
F Reserve Fuel - 5% of Intial Fuel at Take-Off	489	-	-	-
20 Min. of Max. Endurance at S.L.	1143	-	186	.333
TOTAL	9789	748	-	2.308

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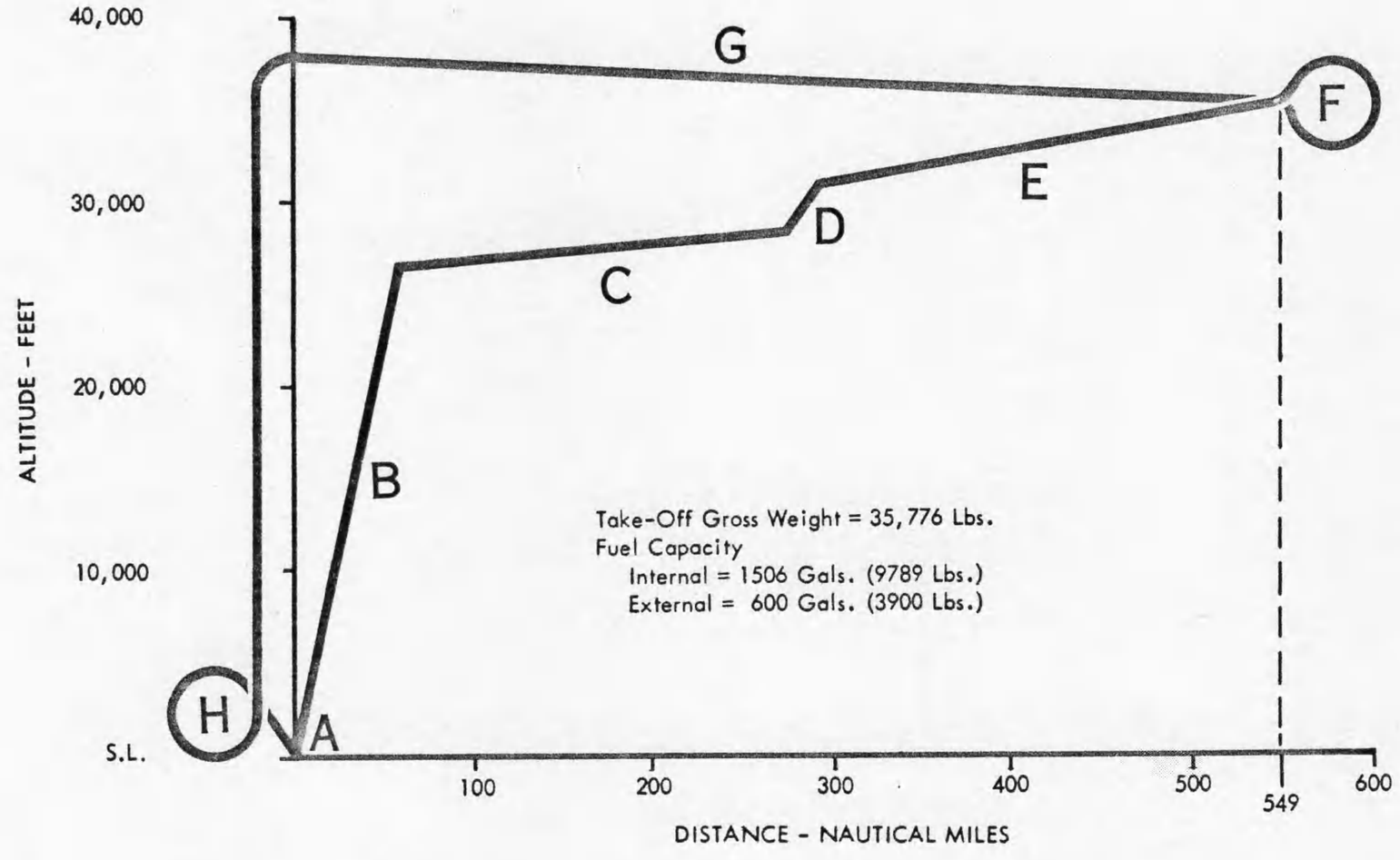
GENERAL PURPOSE & ESCORT FIGHTER MISSION

WITH TWO 300 GAL. EXTERNAL TANKS
J71-A-2 ENGINE
COMBAT RADIUS **549** NAUTICAL MILES

(MIL-C-5011A SPEC.)
(USING JP-4 FUEL AT 6.5 LBS/GAL)



	OPERATION	FUEL USED LBS.	DIST. NA.MI.	AV. SPEED KTS.	TIME HRS.
A	Warm-Up & Take-Off - 5 Min. Normal Power	662	-	-	.083
B	Mil. Pwr. Climb on Course to Opt. Cruising Alt. (26,450 Ft.)	1261	68	386	.176
C	Cruise Out to 28,200 Ft. at Speed for 99% Max. Range and Drop Tanks	1977	207	448	.462
D	Mil. Pwr. Climb on Course to Opt. Cruising Alt. (30,900 Ft.)	170	16	444	.036
E	Cruise Out to 35,000 Ft. at Speed for 99% Max. Range	2072	258	472	.550
F	Combat at 35,000 Ft. 5 Min. Max. Pwr. at High Speed 15 Min. Mil. Pwr. at High Speed	 1146 1011	 - -	 556 506	 .083 .250
G	Cruise Home to 37,900 Ft. at Speed for 99% Max. Range	3548	549	470	1.168
H	Reserve Fuel - 5% of Initial Fuel at Take-Off 20 Min. Max. Endurance at S.L.	684 1158	- -	- 188	- .333
	TOTAL	13689	1098	-	3.141

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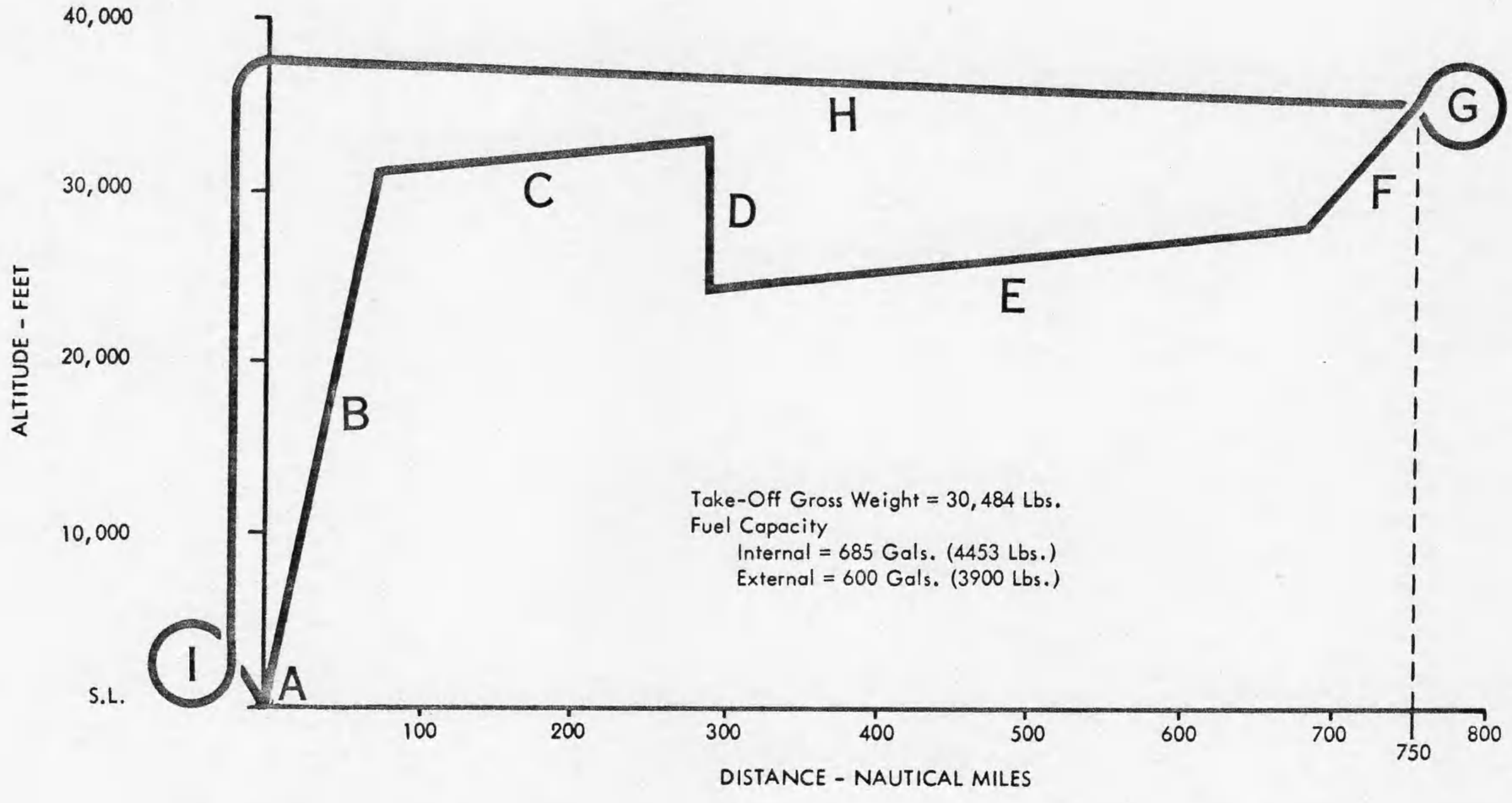
GENERAL PURPOSE & ESCORT FIGHTER MISSION

WITH TWO 300 GAL. EXTERNAL TANKS & I.F.R.

J71-A-2 ENGINE

COMBAT RADIUS **750**. NAUTICAL MILES

(MIL-C-5011A SPEC.)
(USING JP-4 FUEL AT 6.5 LBS./GAL.)



OPERATION	FUEL USED LBS.	DIST. NA.MI.	AV. SPEED KNOTS	TIME HRS.
A Warm-Up & Take-Off 5 Min. Normal Power	662	-	-	.083
B Mil. Pwr. Climb on Course to Opt. Cruising Alt. (31,200 Ft.)	1200	72	387	.186
C Cruise out to 32,900 Ft. at Speed for 99% Max. Range	1742	213	452	.471
D Descend to 24,000 Ft. with Reserve Fuel Expended in Search and Refuel (9590 Lbs.)	650	-	-	-
E Cruise out to 27,900 Ft. and Drop Tanks	3900	392	452	.867
F Mil. Pwr. Climb on Course to 35,000 Ft.	703	73	436	.168
G Combat at 35,000 Ft.				
5 Min. Max. Pwr. at High Speed	1145	-	553	.083
15 Min. Mil. Pwr. at High Speed (65% Fuel in Wing Internal Tanks)	992	-	491	.25
H Cruise Home to 37,500 Ft.	5104	750	470	1.596
I Reserve Fuel 5% of Maximum Fuel	684	-	-	-
20 Min. Max. Endurance at S.L.	1161	-	188	.333
TOTAL	17943	1500		4.037

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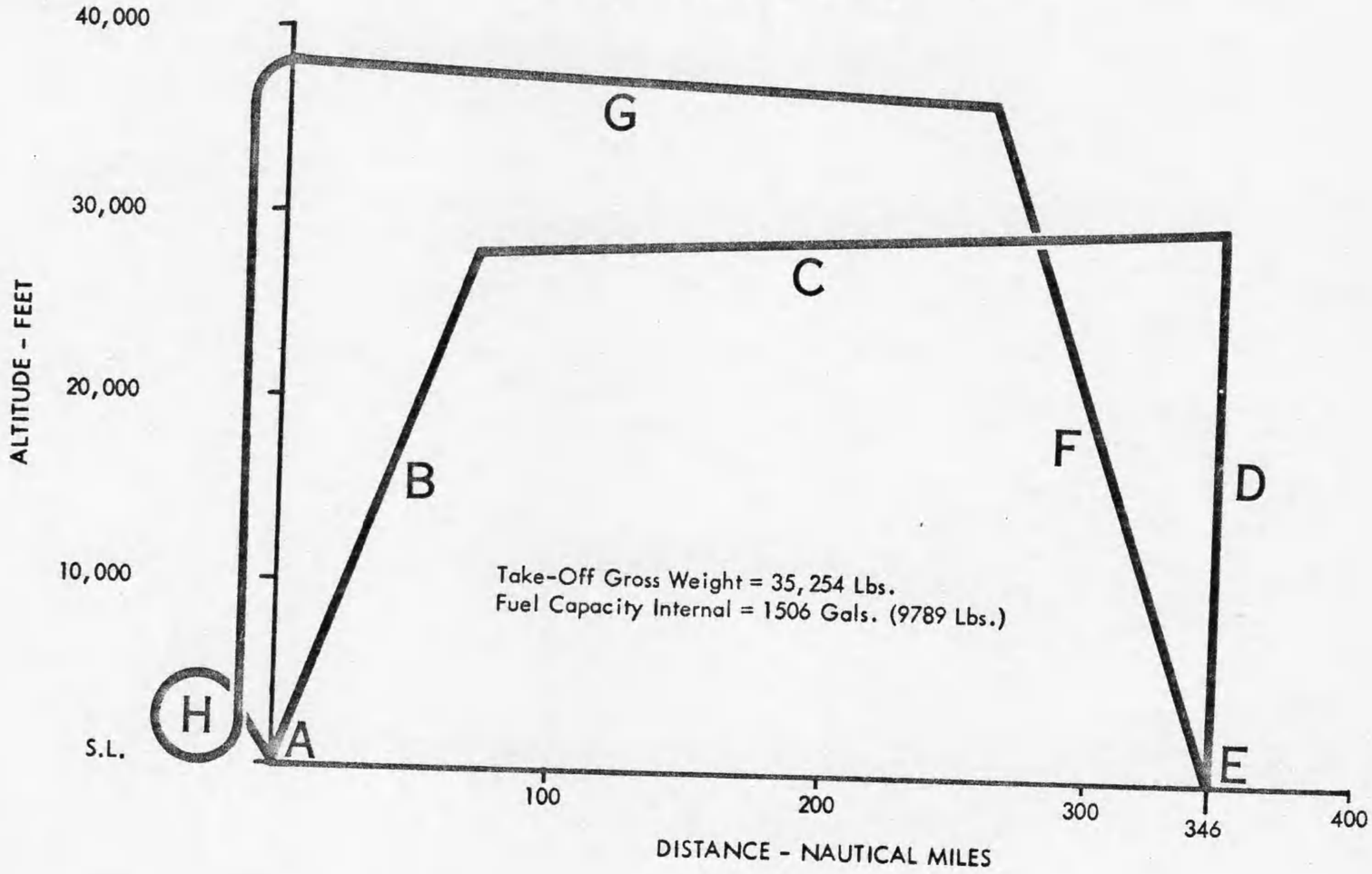
BOMBER MISSION

LOW ALTITUDE ATTACK & GROUND SUPPORT BOMBER MISSION
WITH TWO 2000 LB. BOMBS
J71-A-2 ENGINE
COMBAT RADIUS **346** NAUTICAL MILES

(MIL-C-5011A SPEC.)
(USING JP-4 FUEL AT 6.5 LBS/GAL)



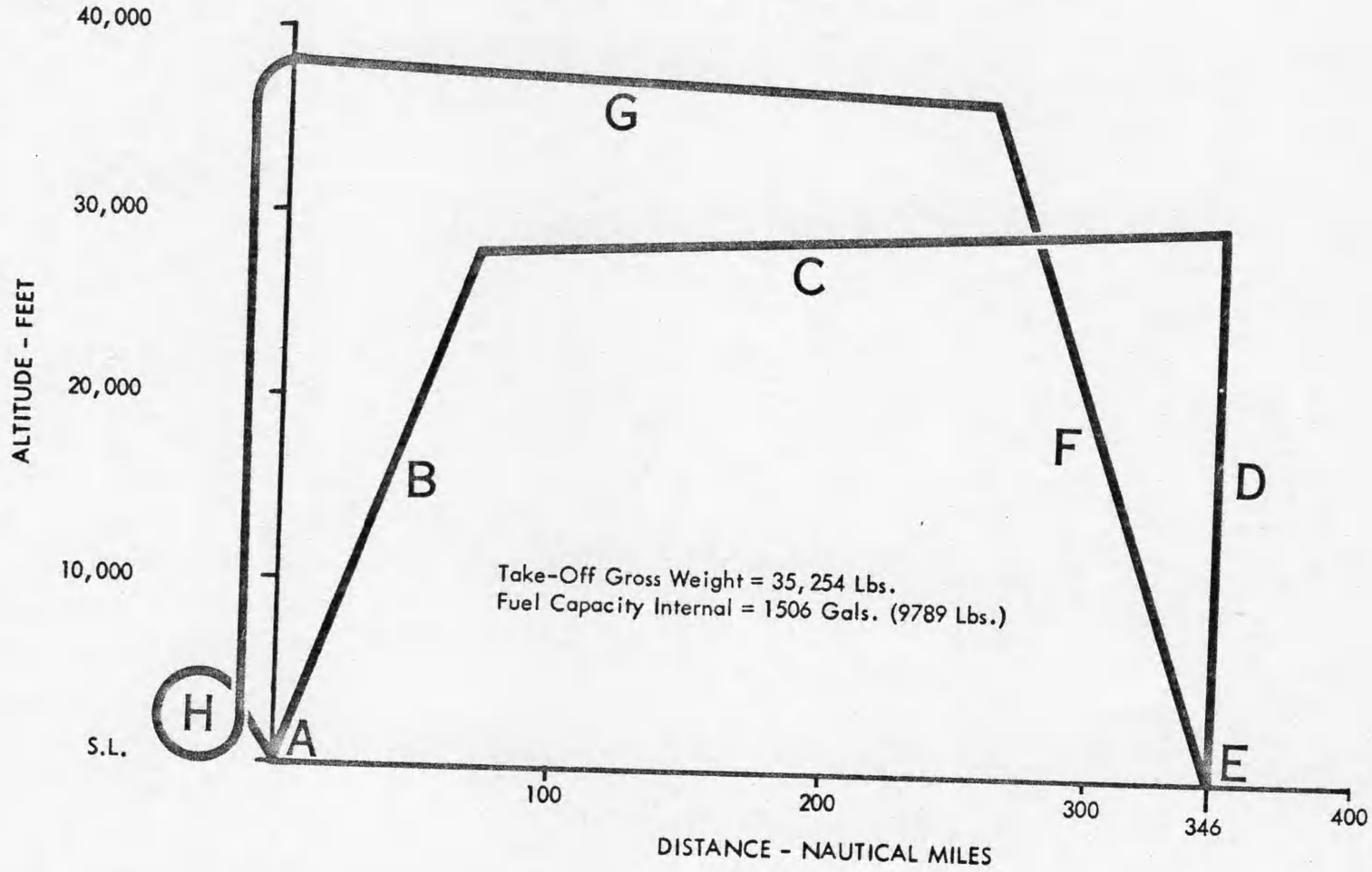
OPERATION	FUEL USED LBS.	DIST. NA.MI.	AV. SPEED KTS.	TIME HRS.
A Warm-Up & Take-Off 5 Min. Normal Power	662	-	-	.083
B Mil. Pwr. Climb on Course to Opt. Cruising Alt. (27,900 Ft.)	1273	72	396	.182
C Cruise Out to 30,000 Ft. at Speed for 99% Max. Range	2439	274	470	.583
D Descend to Sea Level and Drop Bombs	-	-	-	-
E Combat at S.L. for 5 Min. With Mil. Power	1046	-	576	.083
F Mil. Pwr. Climb on Course to Opt. Cruising Alt. (36,600 Ft.)	1104	83	432	.192
G Cruise Home to 38,100 Ft. at Speed for 99% Max. Range	1618	263	470	.560
H Reserve Fuel - 5% of Initial Fuel at Take-Off	489	-	-	-
20 Min. Max. Endurance at S.L.	1158	-	188	.333
TOTAL	9789	692	-	2.016

[redacted]

BOMBER MISSION

LOW ALTITUDE ATTACK & GROUND SUPPORT BOMBER MISSION
WITH TWO 2000 LB. BOMBS
J71-A-2 ENGINE
COMBAT RADIUS **346** NAUTICAL MILES

(MIL-C-5011A SPEC.)
(USING JP-4 FUEL AT 6.5 LBS/GAL)



OPERATION	FUEL USED LBS.	DIST. NA.MI.	AV. SPEED KTS.	TIME HRS.
A Warm-Up & Take-Off 5 Min. Normal Power	662	-	-	.083
B Mil. Pwr. Climb on Course to Opt. Cruising Alt. (27,900 Ft.)	1273	72	396	.182
C Cruise Out to 30,000 Ft. at Speed for 99% Max. Range	2439	274	470	.583
D Descend to Sea Level and Drop Bombs	-	-	-	-
E Combat at S.L. for 5 Min. With Mil. Power	1046	-	576	.083
F Mil. Pwr. Climb on Course to Opt. Cruising Alt. (36,600 Ft.)	1104	83	432	.192
G Cruise Home to 38,100 Ft. at Speed for 99% Max. Range	1618	263	470	.560
H Reserve Fuel - 5% of Initial Fuel at Take-Off	489	-	-	-
20 Min. Max. Endurance at S.L.	1158	-	188	.333
TOTAL	9789	692	-	2.016

[redacted]

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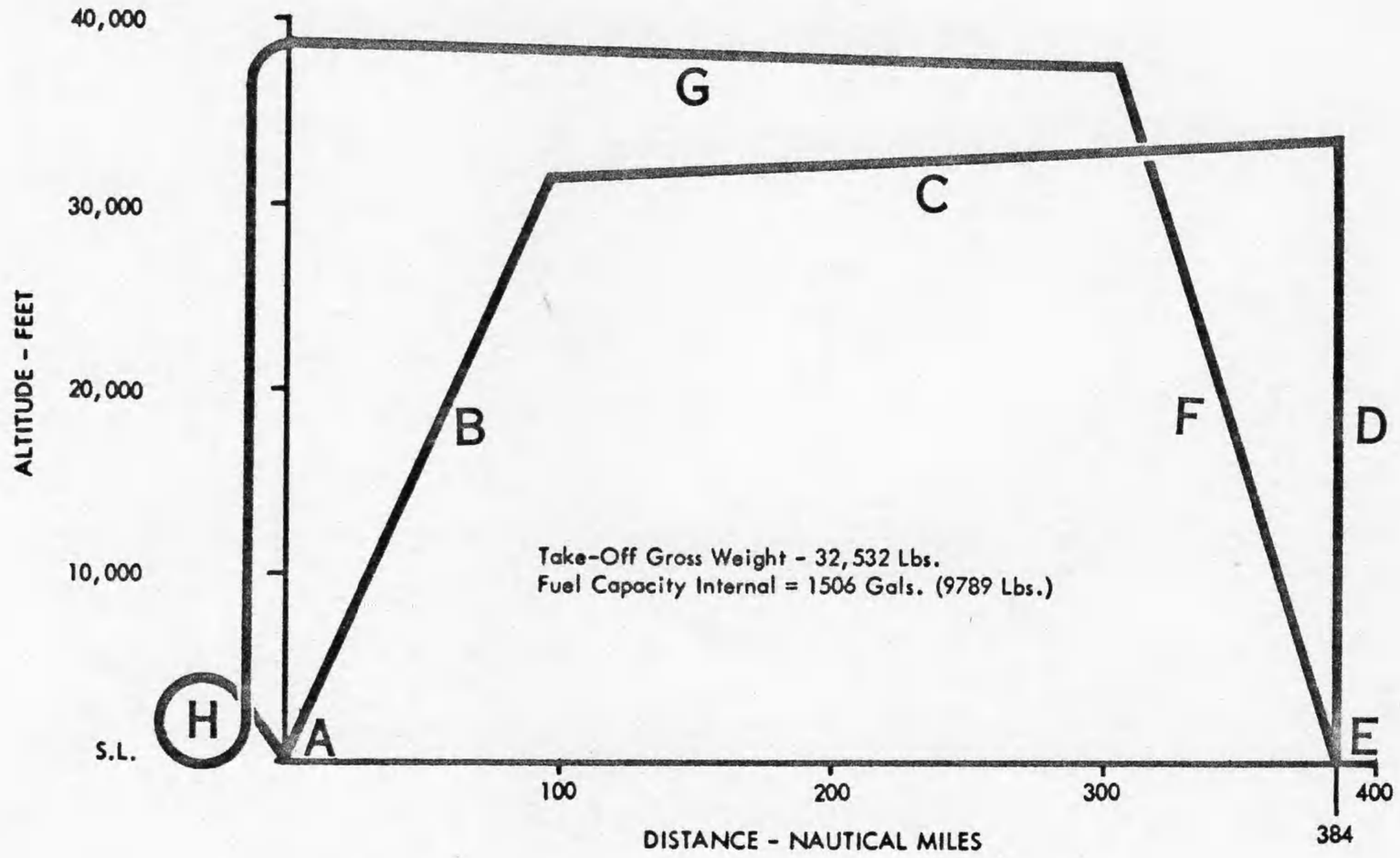
~~SECURITY INFORMATION~~

RESTRICTED DATA
ATOMIC ENERGY ACT 1946

BOMBER MISSION

LOW ALTITUDE ATTACK & GROUND SUPPORT BOMBER MISSION
WITH ONE MK-7 STORE
J71-A-2 ENGINE
COMBAT RADIUS 384 NAUTICAL MILES

(MIL-C-5011A SPEC.)
(USING JP-4 FUEL AT 6.5 LBS/GAL)



OPERATION	FUEL USED LBS.	DIST. NA.MI.	AV. SPEED KTS.	TIME HRS.
A Warm Up & Take-Off 5 Min. Normal Power	662	-	-	.083
B Mil. Pwr. Climb on Course to Opt. Cruising Alt. (31,300 Ft.)	1383	96	423	.227
C Cruise out to 33,300 Ft. at Speed for 99% Max. Range	2242	288	475	.606
D Descend to Sea Level and Drop Store.	-	-	-	-
E Combat at Sea Level for 5 Min. Mil. Power, at High Speed	1050	-	584	.083
F Mil. Power Climb on Course to Opt. Cruising Alt. (37,200 Ft.)	1065	82	439	.187
G Cruise Home to 38,700 Ft. at Speed for 99% Max. Range	1756	302	475	.636
H Reserve Fuel - 5% of Initial Fuel at Take-Off 20 Min. Max. Endurance at S.L.	489 1142	- -	- 184	- .333
TOTAL	9789	768	-	2.155

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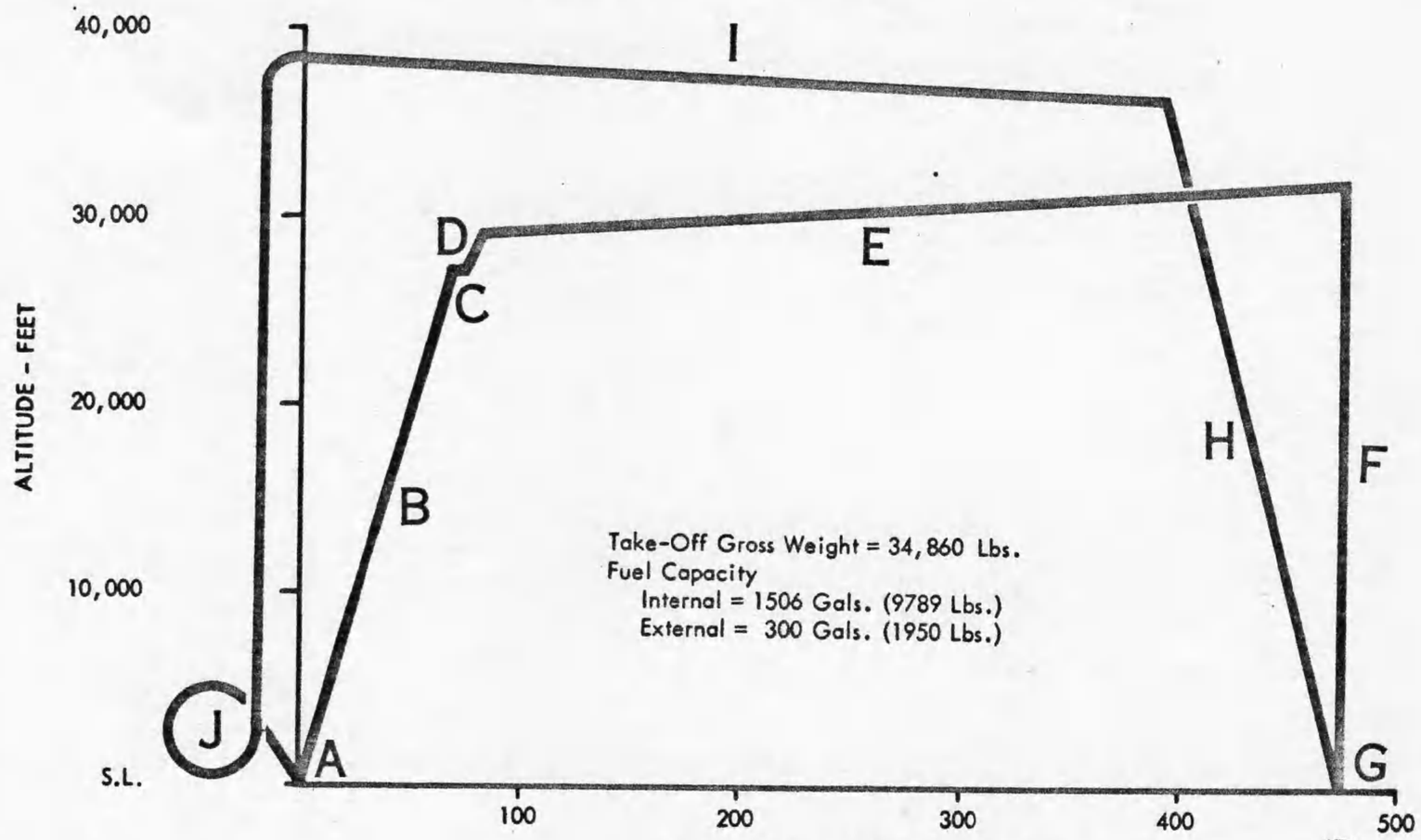
~~SECURITY INFORMATION~~

RESTRICTED DATA
ATOMIC ENERGY ACT 1946

BOMBER MISSION

LOW ALTITUDE ATTACK & GROUND SUPPORT BOMBER MISSION
WITH ONE MK-7 STORE & ONE 300 GAL. EXTERNAL TANK
J71-A-2 ENGINE
COMBAT RADIUS **476** NAUTICAL MILES

(MIL-C-5011A SPEC.)
(USING JP-4 FUEL AT 6.5 LBS/GAL)



OPERATION	FUEL USED LBS.	DIST. NA.MI.	AV. SPEED KTS.	TIME HRS.
A Warm Up & Take-Off 5 Min. Normal Power	662	-	-	.083
B Mil. Pwr. Climb on Course to Opt. Cruising Alt. (27,200 Ft.)	1250	68	384	.177
C Cruise Out to 27,250 Ft. at Speed for 99% Max. Range & Drop Tanks	38	4	459	.009
D Mil. Pwr. Climb on Course to Opt. Cruising Alt. (28,900 Ft.)	120	10	422	.025
E Cruise Out to 31,800 Ft. at Speed for 99% Max. Range	3334	394	467	.844
F Descend to Sea Level & Drop Store	-	-	-	-
G Combat at S.L. for 5 Min. With Mil. Pwr. at High Speed	1046	-	576	.083
H Mil. Pwr. Climb on Course to Opt. Cruise Alt. (36,100 Ft.)	1119	83	435	.191
I Cruise Home to 38,350 Ft. at Speed for 99% Max. Range	2434	393	470	.836
J Reserve Fuel - 5% of Initial Fuel at Take-Off 20 Min. Max. Endurance at S.L.	587 1149	-	186	.333
TOTAL	11739	952		2.581

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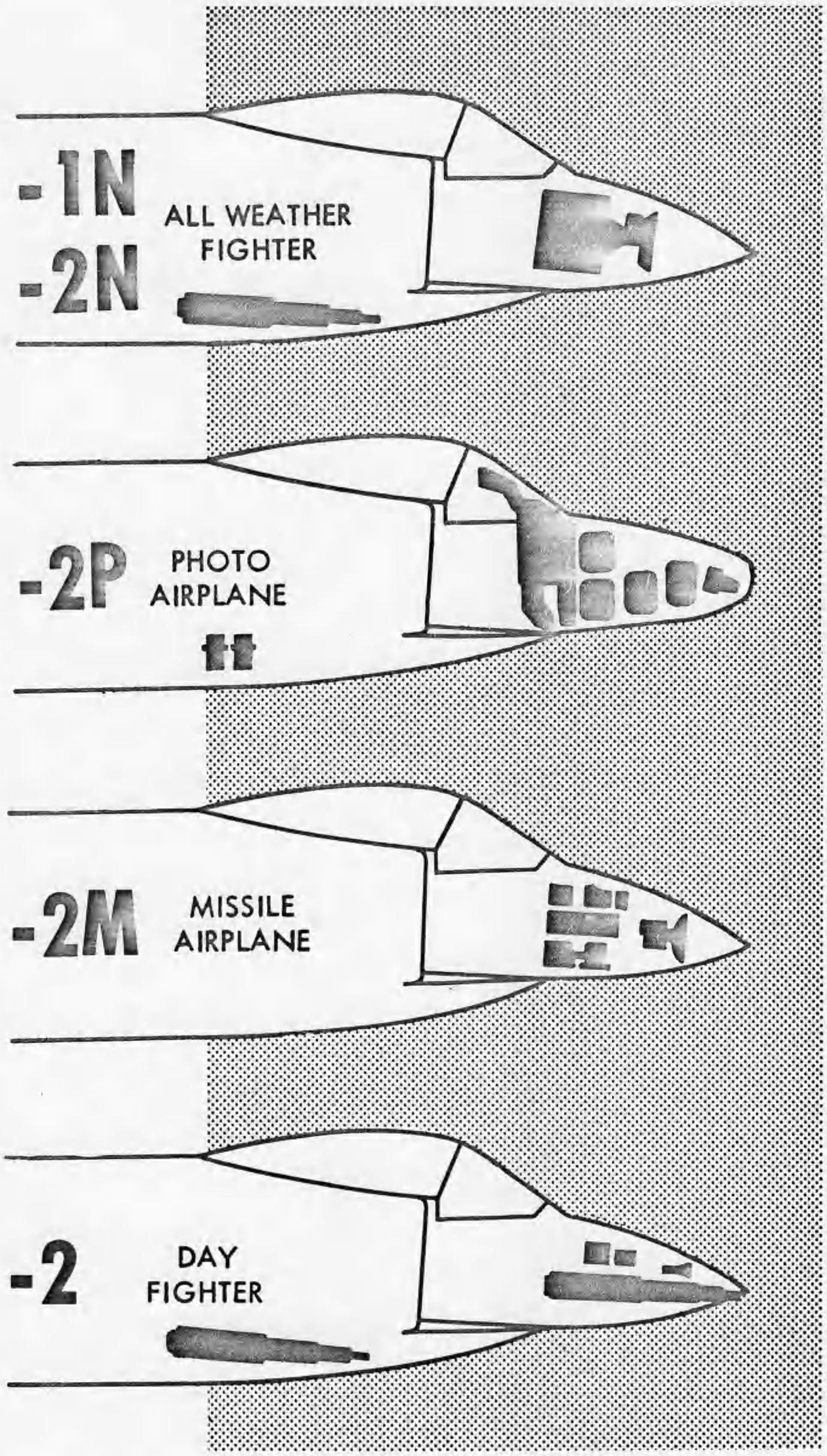
F3H NOSE VERSIONS



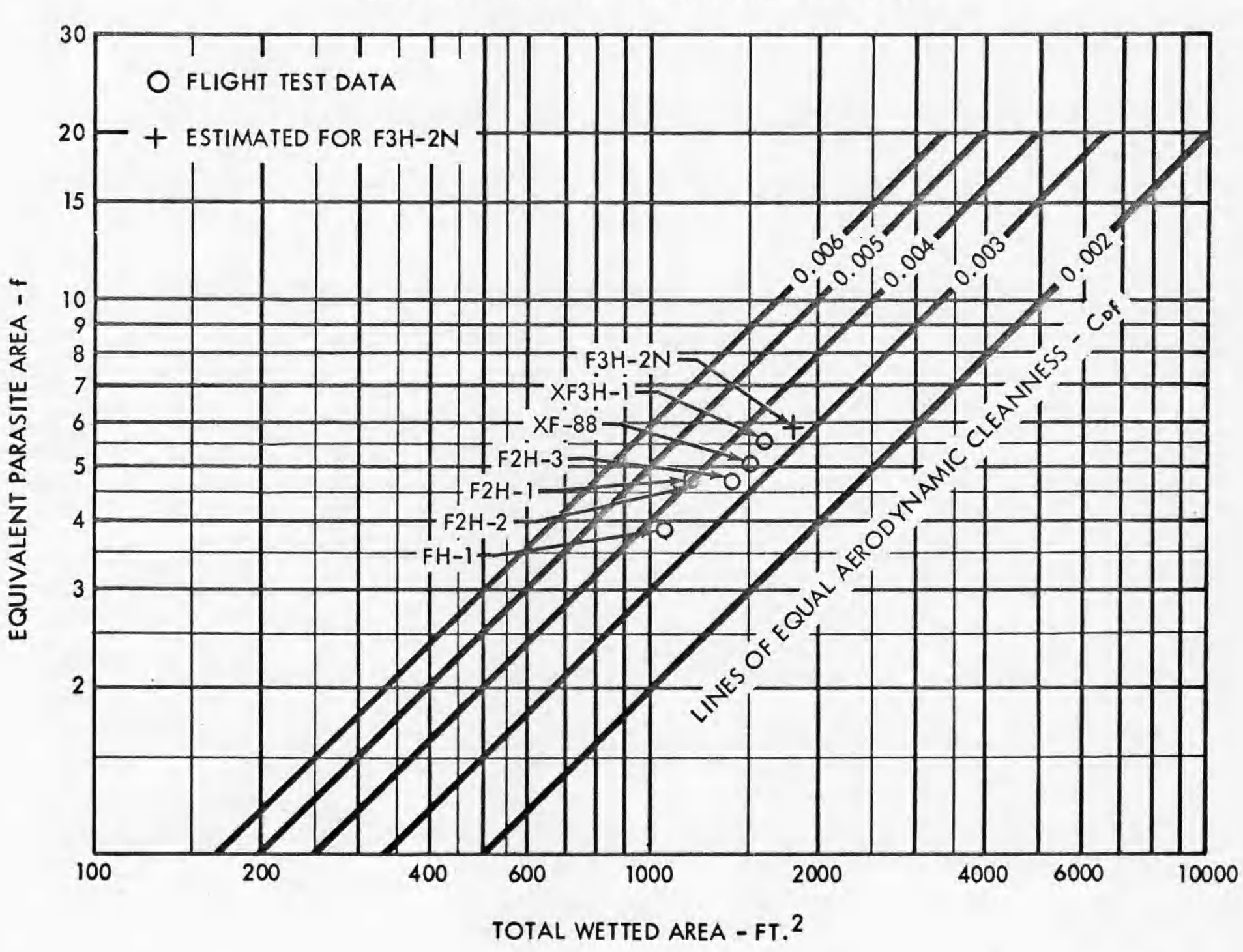
	MAJOR INSTALLATIONS
-1N -2N ALL WEATHER FIGHTER	AN/APQ-50 RADAR 4 MK 12 GUNS
-2P PHOTO AIRPLANE	PHOTOGRAPHIC EQUIPMENT
-2M MISSILE AIRPLANE	AN/APQ-51 SPARROW MISSILES (DESIGN STUDY)
-2 DAY FIGHTER	AN/APG-30 RADAR 2 ADDITIONAL MK 12 GUNS (6 TOTAL) (PROPOSED)

DERIVATION OF PERFORMANCE

The skin friction coefficient, C_f, for the F3H-2N airplane is estimated to be .0033. As shown below, this is in excellent agreement with flight test data on the experimental prototype XF3H-1 and other McDonnell aircraft.

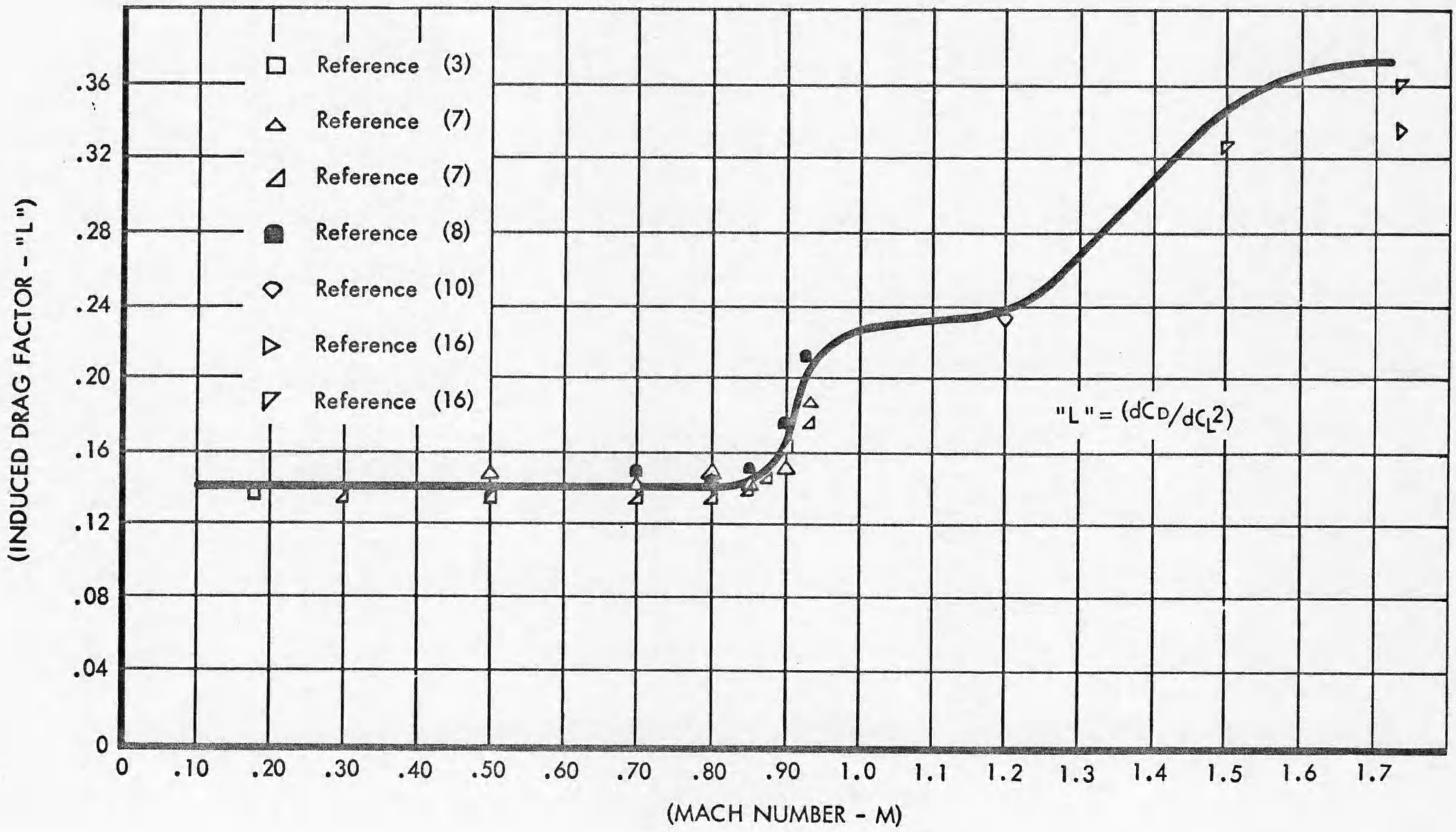
A detailed breakdown of the incompressible profile drag is as follows:

Item	Section Area (Sq. ft.)	Wetted Area (Sq. ft.)	C_{D_s}	C_{D_f}	C_{D_o}
Wing (exposed)	360	726	.0063	.00312	.00513
(theoretical)	442	-	-	-	-
Fuselage and Canopy	31.4	841	.0820	.00306	.00582
Horizontal Tail (exposed)	69.0	139	.0068	.00338	.00106
Vertical Tail (exposed)	48.2	97	.0068	.00338	.00074
Miscellaneous					.00071
Total		1803	f = 5.949		.01346



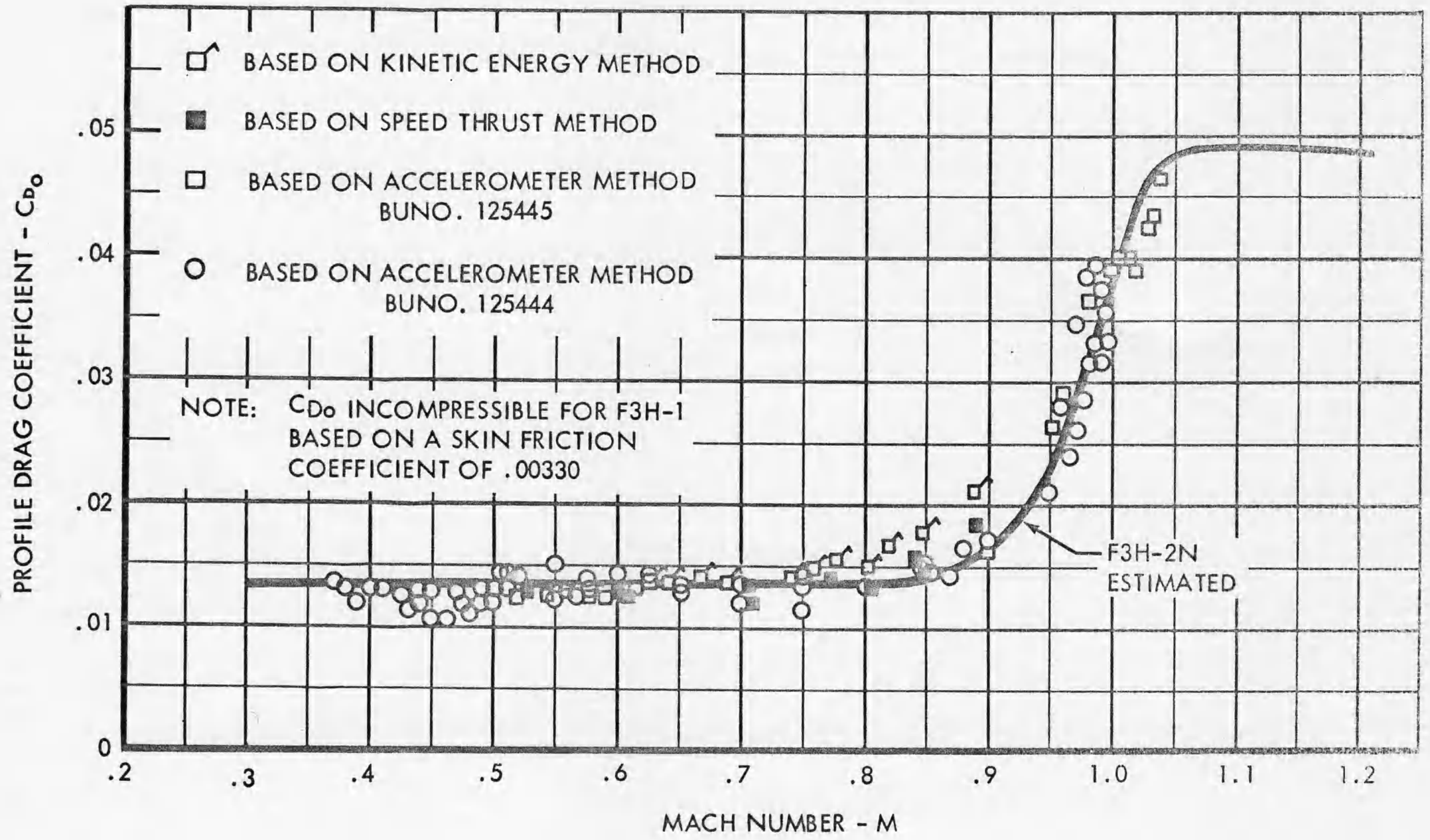
The estimated variation of the induced drag factor "L" with Mach number is shown based on the F3H-1 Wind Tunnel test data as referenced. The XF3H-1 flight test data at the lower Mach numbers shown in Reference (1) indicates good agreement with the estimated variation shown.

VARIATION OF INDUCED DRAG FACTOR WITH MACH NUMBER

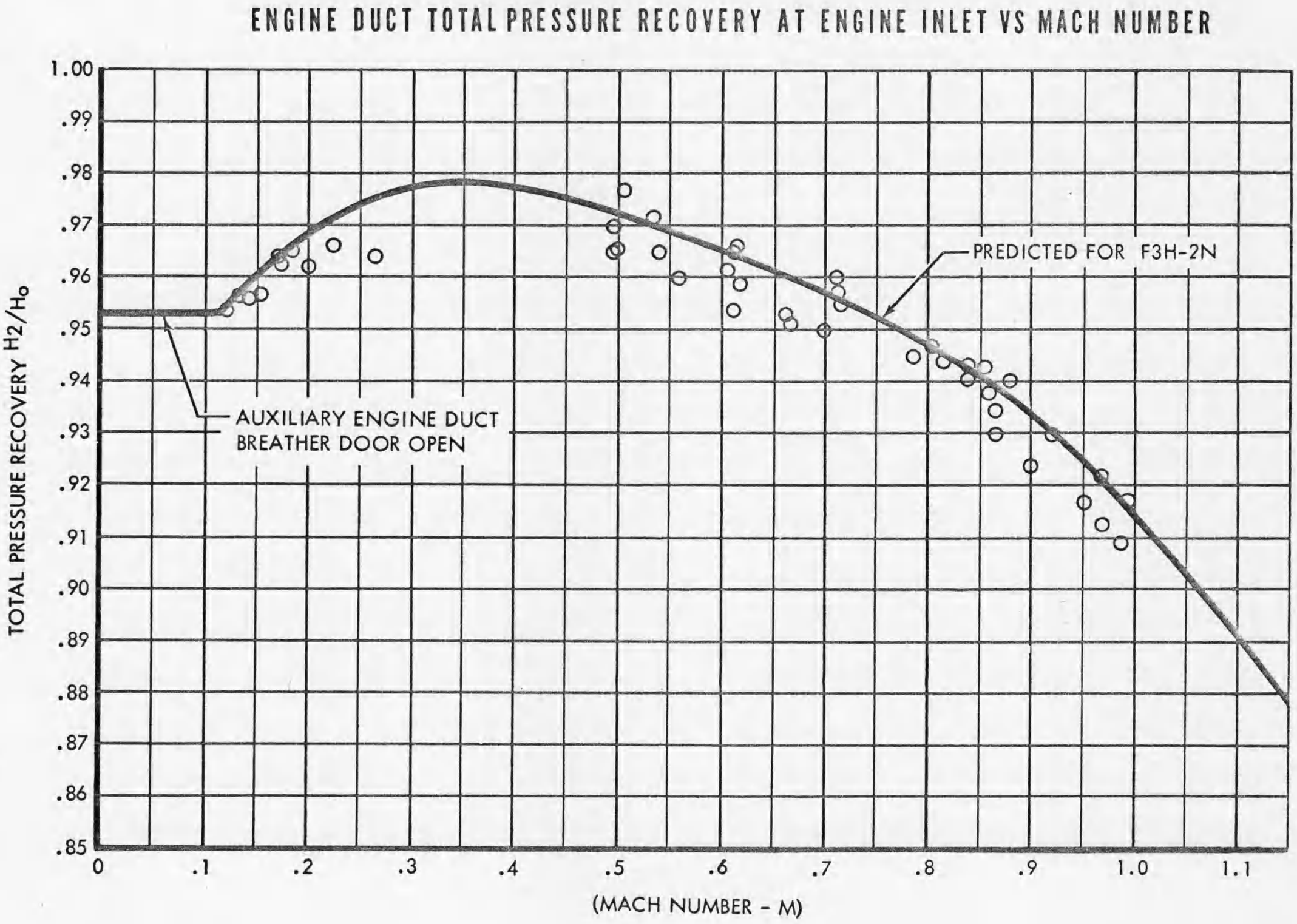


The estimated variation of the profile drag coefficient, C_{D_o}, with Mach number is shown for the F3H-2N. Excellent agreement with XF3H-1 flight test data from Reference (1) exists. The wind tunnel test data obtained on the F3H-1 from M = .18 through M = 1.20, References (2) through (11), form the basis for the estimated variation shown below.

COMPARISON OF C_{D_o} VS MACH NUMBER
(XF3H -1 FLT. TEST DATA)



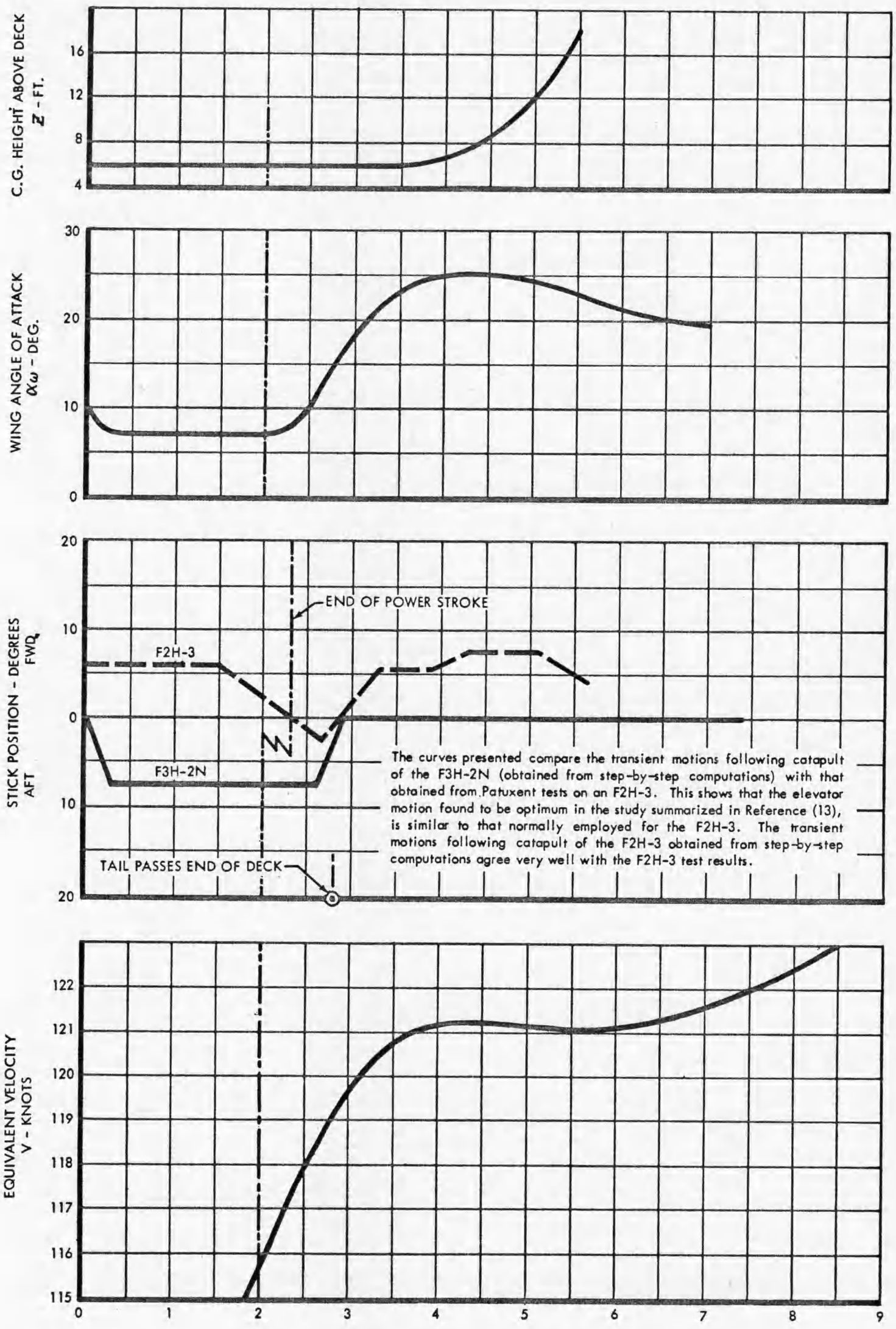
The estimated variation of the engine air duct total pressure recovery (H_2/H_o) with Mach number for the F3H-2N is based on flight test data on the XF3H-1 as presented in Reference (1). The test points shown correspond to the experimental prototype fitted with the production F3H-2N radome and nose. These recoveries were used to correct the specification thrust and fuel flows (References (14) and (15) to the values used in all performance calculations contained in this report.



CARRIER LAUNCHING CAPABILITY

SHOWING TIME HISTORY OF CATAPULT LAUNCH

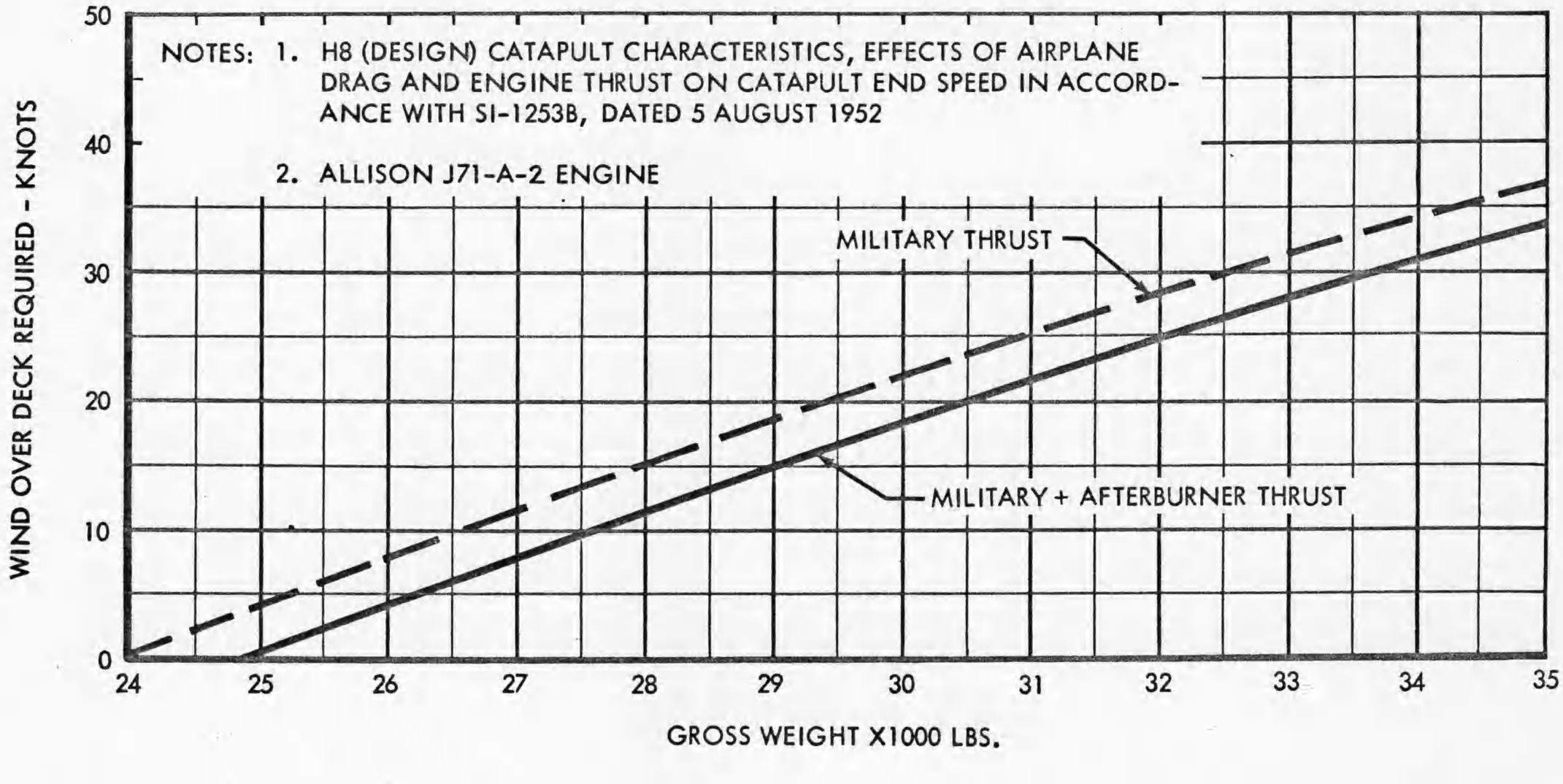
THRUST = MILITARY (J71-A-2)
GROSS WEIGHT = 30,000 LBS.
WIND OVER DECK = 25 KNOTS
INITIAL VELOCITY - 25 KNOTS



The curves presented compare the transient motions following catapult of the F3H-2N (obtained from step-by-step computations) with that obtained from Patuxent tests on an F2H-3. This shows that the elevator motion found to be optimum in the study summarized in Reference (13), is similar to that normally employed for the F2H-3. The transient motions following catapult of the F2H-3 obtained from step-by-step computations agree very well with the F2H-3 test results.

The curves presented show the relationship between the wind over deck required for catapulting, versus catapult gross weight. These basic catapult characteristics and corrections for engine thrust and airplane drag on the catapult end speed are based on the H8 design catapult data of Reference (12). Catapult take-off speed is assumed to be that corresponding to the speed for .90 C_{Lmax} including the effects of engine thrust on lift. As is noted, the step-by-step computations on the F3H-2N show that a "no-sink" catapult can be made at only a few knots above the speed obtained from theoretical consideration. Indications are that a satisfactory catapult could be made at the theoretical required end speed with little or no sink below the carrier deck.

WIND OVER DECK VS GROSS WEIGHT
(H8 DESIGN CATAPULT)



CURRENT WEIGHT DATA

	Current Weight
Weight Empty (Report 2137-9)	18662
Remove: J40-WE-22 & Provisions	- 3793
Add: J-71 & Provisions	5124
Prov. for In-Flight Refueling	31
Prov. for External Fuel	21
Weight Empty (Revised)	20045
Add: Useful Load - Combat	
Pilot	200
Fuel (Engine) (904 Gal. JP-4 at 6.5 lbs./gal)	5876
Oil (Engine) (2 Gal.)	15
Trapped Fuel & Oil	56
Armament	935
Equipment	80
Gross Weight Combat	27207
Remove: 904 Gal. Fuel	- 5876
Add: 1506 Gal. Fuel	9789
Gross Weight Take-Off	31120
Add: In-Flight Refuel Probe	44
External Fuel Provisions	
Pylons (2)	296
Tanks	460
Fuel - JP-4 (600 Gal. at 6.5 lbs./gal)	3900
Gross Weight Take-Off (2106 Gal. Fuel)	35820

REFERENCES

1. Model XF3H-1 Analysis of Preliminary Flight Test Results, Revision No. 1, dated 29 August 1953.
2. Report on Wind Tunnel Tests on a 15% Scale Model of the McDonnell F3H-1 Airplane, GALCIT Report No. 583, dated 27 February 1952.
3. Report on Additional Wind Tunnel Tests on a 15% Scale Model of the McDonnell F3H-1 Airplane, GALCIT Report No. 583-A, dated 22 August 1952.
4. Report on Wind Tunnel Tests on a 25% Scale Panel Model of the McDonnell F3H-1 Airplane, University of Maryland Report No. 41, dated September 1951.
5. Report on Additional Wind Tunnel Tests on a 25% Scale Panel Model of the McDonnell F3H-1 Airplane, University of Maryland Report No. 48, dated February 1952.
6. Report on Wind Tunnel Tests at Transonic Speeds of 0.02 Scale Left-Hand Reflection-Plane Model of the McDonnell F3H-1 Airplane, C.W.T. Report No. 267, dated 10 November 1952,
7. Report on High-Speed Wind Tunnel Tests of a 0.10 Scale Model of the McDonnell F3H-1 Airplane, C.W.T. Report No. 272 dated 28 July 1952.
8. Report on Additional High-Speed Wind Tunnel Tests (Series II) of a 0.10 Scale Model of McDonnell F3H-1 Airplane, C.W.T. Report No. 297 (to be published).
9. Report on Additional High Speed Wind Tunnel Tests (Series III) of a 0.10 Scale Model of the McDonnell F3H-1 Airplane, C.W.T. Report No. 360 (to be published).
10. Report on Wind Tunnel Tests at M = 1.20 of a 0.10 Scale Model of the McDonnell F3H-1 Airplane, C.W.T. Report No. 314 (to be published).
11. Report on Additional Wind Tunnel Tests at M = 1.20 of a 0.10 Scale Model of the McDonnell F3H-1 Airplane, C.W.T. Report No. 349 (to be published).
12. Service Catapult Ratings. BuAer Sketch SI-1253B, dated 5 August 1952.
13. Aircraft Design Considerations for Optimum Catapulting Characteristics. MAC Report No. 2699, dated 28 November 1952.
14. Allison Engine Specification No. 333C, revised date 4 April 1953.
15. Westinghouse Electric Corporation Report WAGT-40E2-4C dated 20 May 1953.
16. Supersonic Wind Tunnel Tests at Ordnance Aero Physics Laboratory on 1.5% and 4.5% Scale Models of the McDonnell XF3H-1 Airplane, MAC Report No. 1685, dated 19 May 1950.