THE
McDONNELL AIRCRAFT
CORPORATION

Presents

MODEL 40A

TWIN-JET FIGHTER

CONFIDENTIAL REPORT
NUMBER S-147

SERIAL NO. 1
1 April 1946

SUMMARY

Model 40A is a twin-jet propelled fighter designed for a higher speed than any airplane has yet flown. The principal characteristics are:

1. The size has been kept to the minimum consistent with good design practice and maintenance.

2. Kneeling of the nose gear and folding of the wings to enable an increase in deck spot to 39 airplanes on a 200' x 96' deck space.

3. Zoomability: Maximum rate of climb of 51,000 feet per minute can be obtained in a zoom from V_{max} at sea level.

4. Performance consistent with guarantees (combat fuel):

	With Afterburning	Without Afterburning
High Speed (mph)	664	631
Rate of Climb at Sea Level (ft/min.)	9430	6500
Combat Weight (lbs)	15152	----
Combat Radius (nautical miles)	~~377~~ 328	----

5. Two Westinghouse 24C engines arranged side by side in the fuselage permitting operation on one or both engines with little change in trim and producing little yaw with sudden applications of power assymetrically.

6. Fuel system fully automatic arranged so that the aft tank empties before entering combat.

7. A rigid laminar flow wing 8% thick and sweptback 35° to reduce the adverse effects of compressibility at high Mach nos. and having an unbroken section from fuselage to tip.

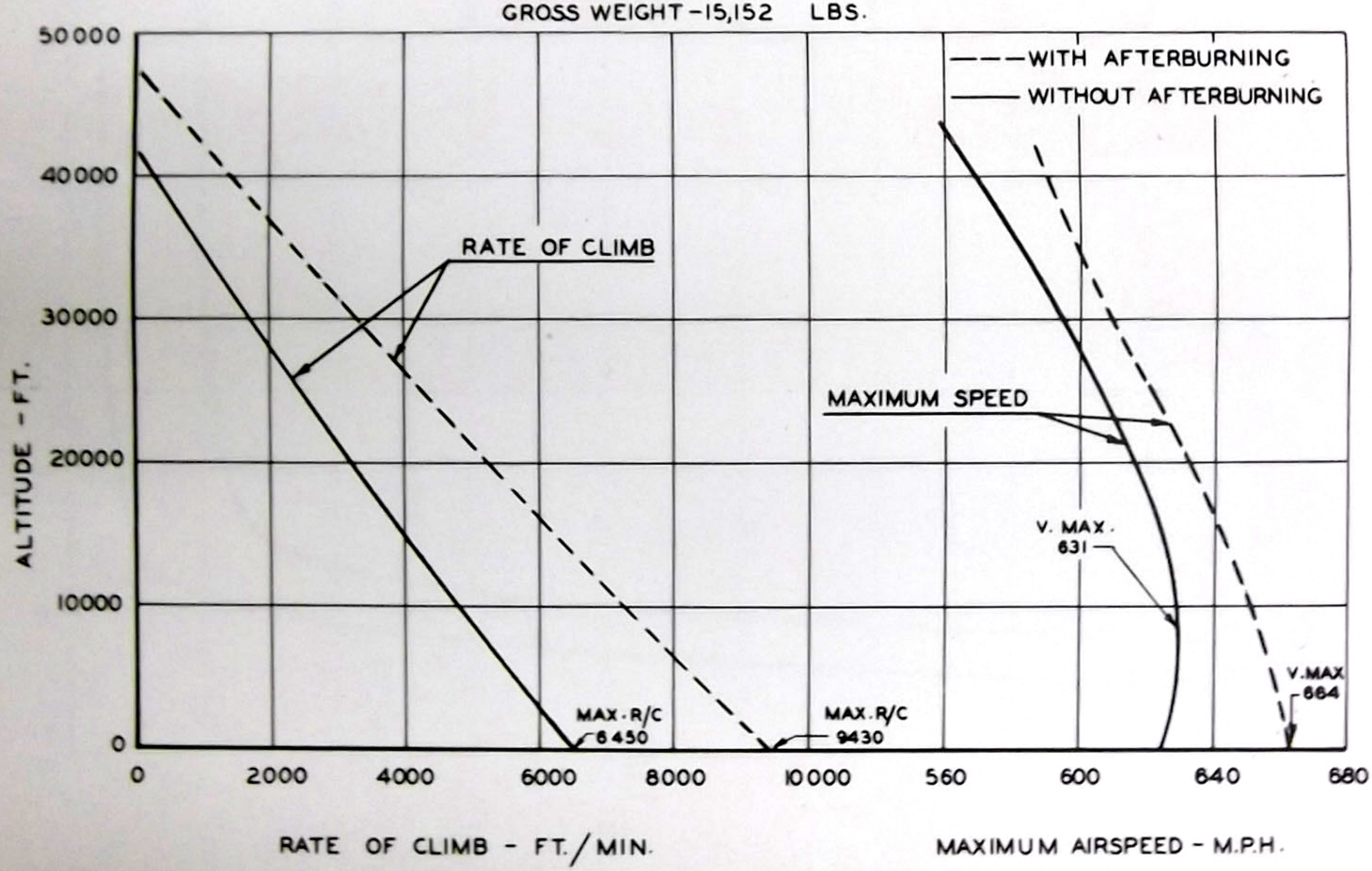
8. Wing tip M.A.C. leading edge flaps deflecting downward to eliminate tip stall. This flap plus the slotted flap provides a maximum lift coefficient of 1.6.

9. A console cockpit incorporating pressure and temperature controls, pilot ejection and superb all-around visibility, including 16°30' over the nose.

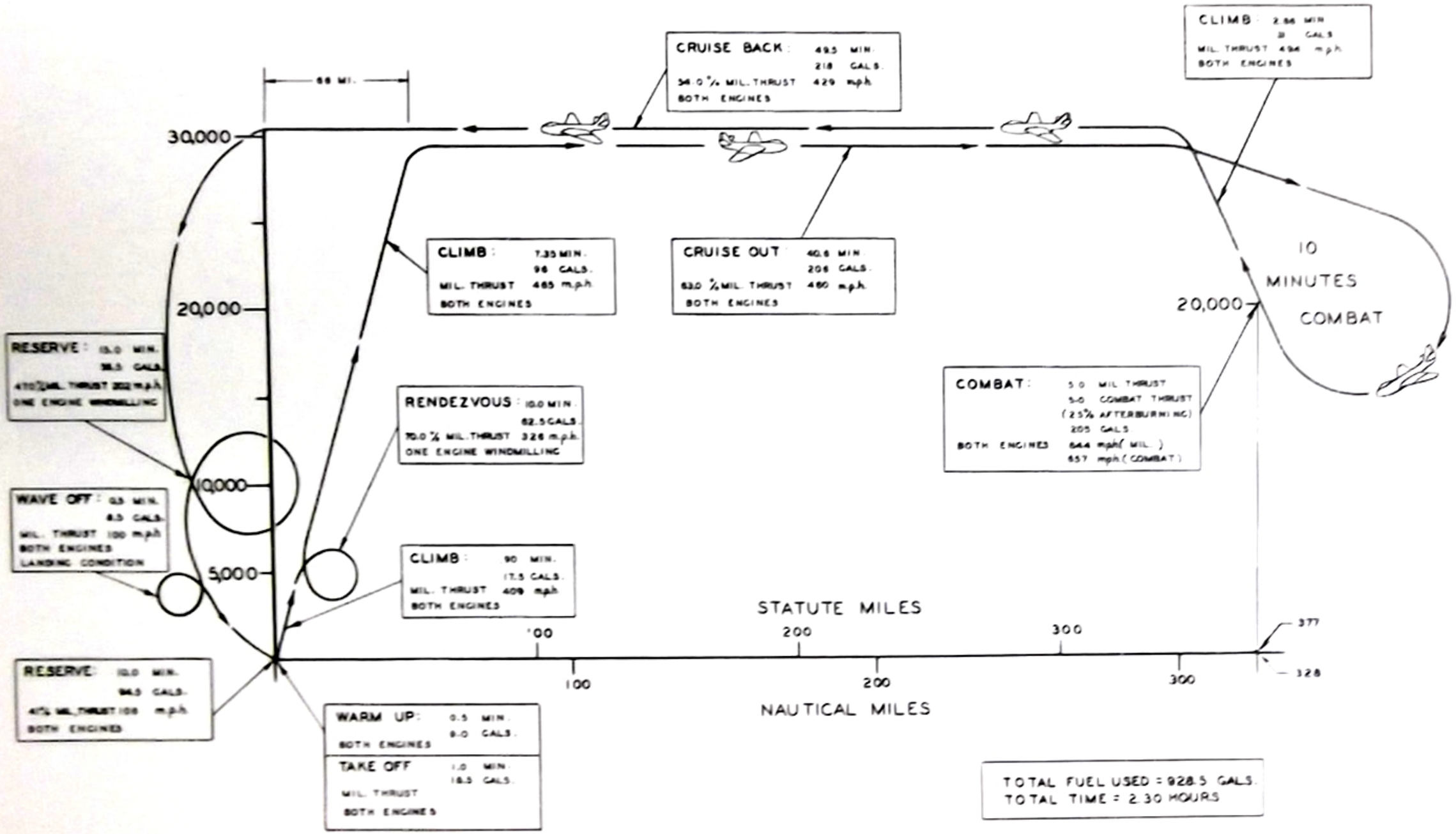
10. Four 20 mm. cannon with 250 rounds per cannon, arranged so that four 60 caliber guns can be installed interchangeably with a minimum of effort.

11. Speed brakes designed to open automatically and in so doing to limit the power-off dive speed to the maximum level flight speed of the airplane. A manual override is provided in order to give the pilot control over the drag of the airplane at lower speeds.

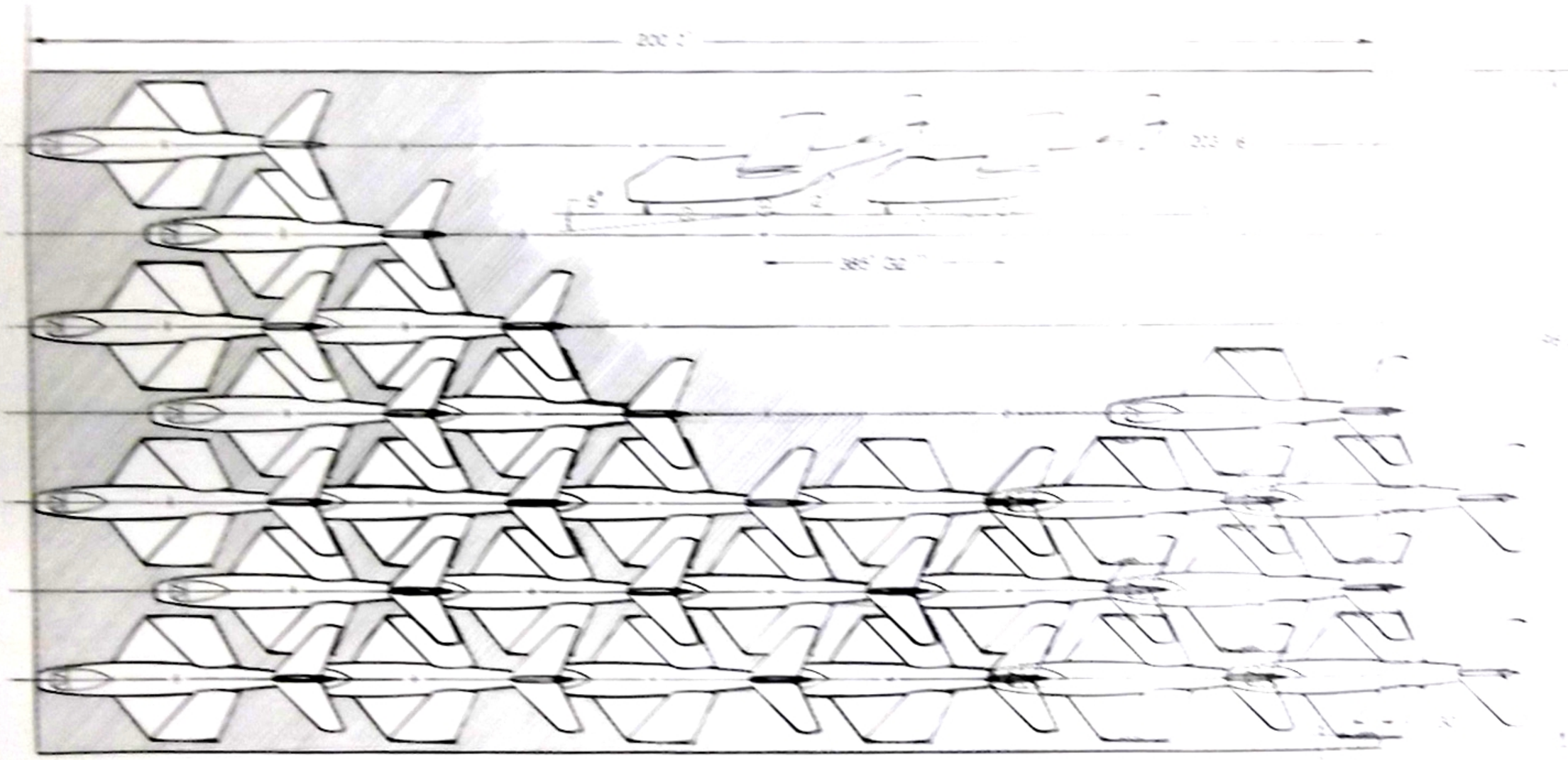
ESTIMATED RATE OF CLIMB & MAXIMUM AIRSPEED V S. ALTITUDE



MODEL 40A
COMBAT RADIUS



SPOTTING DIAGRAM
MODEL 40A



WEIGHT SUMMARY

Weight Empty			9924
Wing Group		2310	
Tail Group		450	
Body Group		1200	
Alighting Gear-Land Type		800	
Engine Section		15	
Power Plant Group		3740	
Engines (as installed)	2450		
Engine Accessories	140		
Power Plant Controls	40		
Lubrication System	40		
Fuel System	1070		
Fixed Equipment		1409	
Instruments	65		
Surface Controls	370		
Electrical	325		
Communicating (IFF)	150		
Armament Provisions	310		
Furnishings	124		
Auxiliary Gear	65		
Useful Load - Fighter, Normal Fuel and Oil			
Gross Weight			15158
Useful Load		5234	
Crew	200		
Fuel (614 gals.)	3684		
Fuel (trapped in system)	18		
Oil	75		
Armament	1208		
Equipment	49		
Useful Load - Fighter, Max. Fuel and Oil			
Gross Weight			17612
Useful Load		7688	
Crew	200		
Fuel (1023 gals.)	6138		
Fuel (trapped in system)	18		
Oil	75		
Armament	1208		
Equipment	49		

PART I

CHARACTERISTICS

10a. The following characteristics are established as basic for this airplane and shall be applied, or, if possible, bettered.

10b. The gross weights are estimated to be as follows:

(a) Fighter (614 gals. fuel) (design fuel)	10,000 lbs.
(b) Fighter (1023 gals. fuel) (max fuel)	17,125 lbs.

10c. The useful load as a fighter with normal fuel and oil shall be as follows:

USEFUL LOAD			6234#
Crew (pilot and parachute)		200	
FUEL		5702	
Engine (614 gals.) (in main tanks)	3684		
Trapped in system (3 gals.)	18		
		75	
OIL			
Engine (10 gals) (in tanks)	75		
		1208	
ARMAMENT			
Fixed gun installation	1144		
Four 20 mm gun installation	483		
1000 rds. ammunition	661		
		60	
Gunsight		4	
Gun camera			49
EQUIPMENT			
Navigating (charts, plotting board chartboard)		4	
Oxygen		23	
Miscellaneous (one pararaft and equipment)		22	

10d. The useful load as a fighter with maximum fuel and oil shall be as follows:

USEFUL LOAD			7668#
CREW (pilot and parachute)		200	
FUEL		6156	
Engine (1023 gals.) (in main tanks)	6138		
Trapped in system (3 gals.)	18		
		75	
OIL			
Engine (10 gals.)	75		
ARMAMENT (Same as 10da above)		1208	
EQUIPMENT (Same as 10da above)		49	

CHARACTERISTICS (Cont'd)

108a. The weight empty as a carrier fighter airplane is estimated to be as follows:

WEIGHT EMPTY			9924#
Wing Group			2310
Center Section panel	1140		
Outer panels	735		
Ailerons	160		
Flaps	85		
Speed brakes	60		
Leading edge flap	130		
Tail Group		450	
Stabilizer	290		
Elevator	78		
Fin	37		
Rudder	45		
Body Group		1200	
Fuselage - less engine section	1200		
Alighting Gear - Land Type		800	
Main alighting gear	575		
Auxiliary alighting gear (nose wheel)	225		
Engine Section Group		16	
Power Plant Group		3740	
Engine (as installed)	2450		
Engine accessories (duct valves)	140		
Power plant controls	40		
Lubricating system	40		
Fuel system	1070		
Tanks and protection	840		
Piping, etc.	230		
Fixed Equipment Group		1409	
Instruments	65		
Surface controls	370		
Electrical	325		
Communicating (IFF)	150		
Armament provisions (incl. gunfire protection)	310		
Furnishings	124		
Personnel accommodations	63		
Emergency accommodations	0		
Provisions for flight	11		
Air conditioning equipment	50		
Auxiliary gear		65	
Arresting hook installation	65		

CHARACTERISTICS (Cont'd)

106a. Unit weights:

Weight of wing group per sq. ft. - total wing area (385.0 sq. ft.)	6.00#/sq. ft.
Weight of tail group per sq. ft. - gross tail surface area (157.6 sq. ft.)	3.27#/sq. ft.
Weight of fuel system per gal. capacity (1023 gals. fuel capacity)	1.05#/gal.

107a. The thrust shall be as defined in paragraph 601c.

108a. Areas: (in accordance with BuAer Specification SR-45).

Wing area, incl. 64.0 sq. ft. of fuselage, ailerons, and flaps			385.0 sq. ft.
Wing flap area, trailing edge,			37.5 sq. ft.
leading edge,			23.7 sq. ft.
Ailerons (aft of hinge line) - total			29.4 sq. ft.
Horizontal tail area - total (incl. fuselage)	(chord plane)		94 sq. ft.
Stabilizer to elevator hinge	(chord plane)	61.1 sq. ft.	
Elevator aft of hinge	(chord plane)	32.9 sq. ft.	
Tabs (included in elevator area)			
Vertical tail area - total (incl. 3.0 sq. ft. of dorsal)			43.6 sq. ft.
Fin to rudder hinge		29.4 sq. ft.	
Rudder aft of hinge		14.2 sq. ft.	
Tabs (included in rudder area)			

110a. The unit loadings shall be as follows:

	WING LOADING (385 sq. ft.) Lbs./sq. ft.	THRUST LOADING (NORMAL) (4860 lbs. thrust) Lbs./lb.
(a) Fighter (614 gals. fuel)	39.37	3.12
(b) Fighter (1023 gals. fuel)	45.75	3.62

111a. The airfoil section for the wings and the tail surfaces parallel to centerline of airplane shall be as follows:

Wing at theoretical root	NACA 65_1-013
Wing at wing fold (B.L. 108.0)	NACA 65_1-008
Wing at theoretical tip	NACA 65_1-008
Horizontal tail	NACA 65_1-008
Vertical tail	NACA 65_1-008

1 April 1946

112a. The performance is estimated to be as follows: (consistent with contract guarantees and based on notes appended).

	FIGHTER (Combat Fuel)	FIGHTER (Max. Fuel)
Fuel (gals.)	613	1023
Gross Weight (lbs.)	15152	17612
High Speed, COMBAT THRUST		
at sea level (mph)	664	663
at 10,000 ft. (mph)	652	652
at 20,000 ft. (mph)	634	633
at 30,000 ft. (mph)	610	608
at 40,000 ft. (mph)	592	588
High Speed, MILITARY THRUST		
at sea level (mph)	625	623
at 10,000 ft. (mph)	631	631
at 20,000 ft. (mph)	618	617
at 30,000 ft. (mph)	595	593
at 40,000 ft. (mph)	570	
Stalling speed at sea level with full load, without power (mph) (landing flap setting)	95	103
Stalling speed at sea level with full load less fuel without power (mph) flaps down	83	83
Stalling speed at sea level with full load less 3/4 fuel without power (mph) (flaps down)	86	88
Rate of Climb, COMBAT THRUST		
Initial R/C at sea level (ft./min.)	9430*	7950
at 10,000 ft. (ft./min.)	7320	6150
at 20,000 ft. (ft./min.)	5340	4490
at 30,000 ft. (ft./min.)	3370	2660
at 40,000 ft. (ft./min.)	1470	930
Rate of Climb, MILITARY THRUST		
Initial R/C, at sea level (ft./min.)	6500	5400
at 10,000 ft. (ft./min.)	4760	3940
at 20,000 ft. (ft./min.)	3250	2600
at 30,000 ft. (ft./min.)	1760	1230
at 40,000 ft. (ft./min.)	370	
Time of Climb, COMBAT THRUST		
to 20,000 ft. (min.)	2.77	3.30
to 30,000 ft. (min.)	5.07	6.10
Time of Climb, MILITARY THRUST		
to 20,000 ft. (min.)	4.28	5.20
to 30,000 ft. (min.)	8.27	10.42
Service Ceiling, COMBAT THRUST (ft.)	48000	44700
Service Ceiling, MILITARY THRUST (ft.)	41860	38640
Take-off Climb (ft./min.)		383*
Wave-off R/C (1/4 total fuel) (ft./min.)		1287
Max. Endurance at 30,000 ft. (hr.)		3.91
Max. Range at 30,000 ft. (mi.)		1430

* The calculated performance on these two items as shown by MAC Report # 422 is in excess of the minimum requirements of type spec. NAVAER OS-105

1 April 1946

	FIGHTER (Combat Fuel)	(Max. Fuel)
Average speed for Max. range, 30,000 ft. (mph)		447
Average speed for Max. endurance, 30,000 ft. (mph)		321
Take-off distance in calm (ft.) (take-off flap setting)		1598
Take-off distance in 15-knot wind (take-off flap setting) (ft.)		1163
Take-off distance in 25-knot wind (take-off flap setting) (ft.)		901
Radius of action, fighter radius (statute mi.)		377
Interceptor Radius (statute miles)		115
Cruising Radius, endurance (hrs)		3.0

NOTES:

(1) The performance given above is with flush type radio antenna and is based on Westinghouse Corrected Performance Chart for Model 24C dated 17 November 1944. (See following page). The performance as determined from flight will be corrected for differences in thrust measured by thrust meters.

(2) Combat thrust includes afterburning and is taken as military thrust increased 25%.

(3) Take-off rate of climb is calculated at sea level with temperature of 95°F (when loaded with full internal ammunition and fuel required for fighter radius of action) at a speed of 115 mph, landing gear down and flaps adjusted for take-off.

(4) Wave-off rate of climb at sea level is computed with temperature 95°F (when loaded with full internal ammunition and 1/4 total fuel) at a speed of 100 mph, landing gear and flaps down.

(5) The radius of action formula is taken from Confidential Outline Specification OS-105, Amendment No. 1, dated 8 February 1946. The calculated drag is used and the fuel consumption taken from the engine specification is increased 7-1/2%.

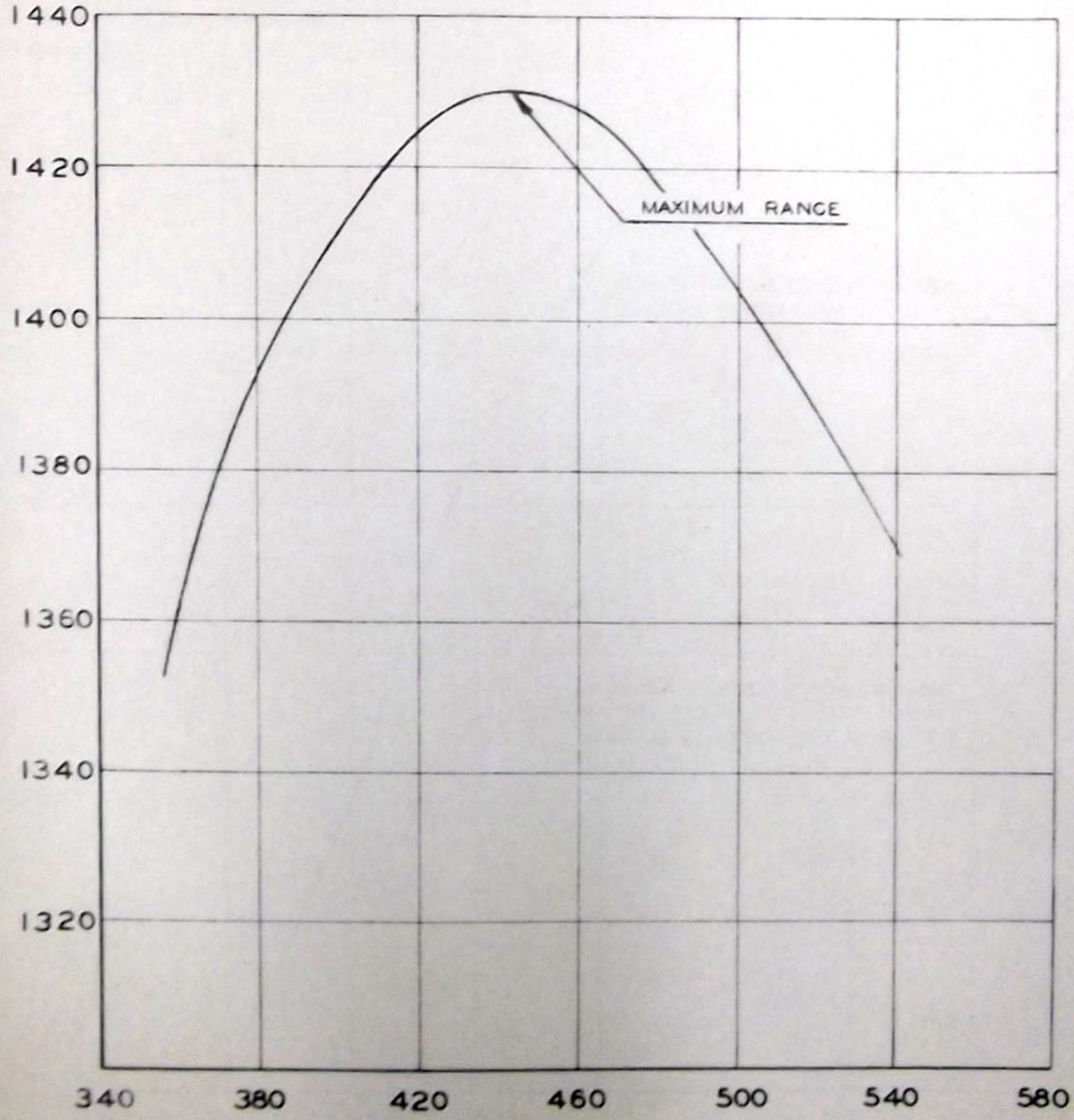
112b. Contract Guarantees: The following items shall be guaranteed and demonstrated:

(a)	Weight Empty (lbs.)	9924
(b)	High Speed at 20,000 ft., military thrust, combat fuel (mph)	618
(c)	Rate of Climb at 10,000 ft., military thrust, combat fuel (ft./min.)	4760
(d)	Stalling Speed at Sea Level with full load less 3/4 fuel without power (mph) (flaps down)	88
(e)	Catapult Rate of Climb at 115 mph, 95°F. (ft./min.)	383

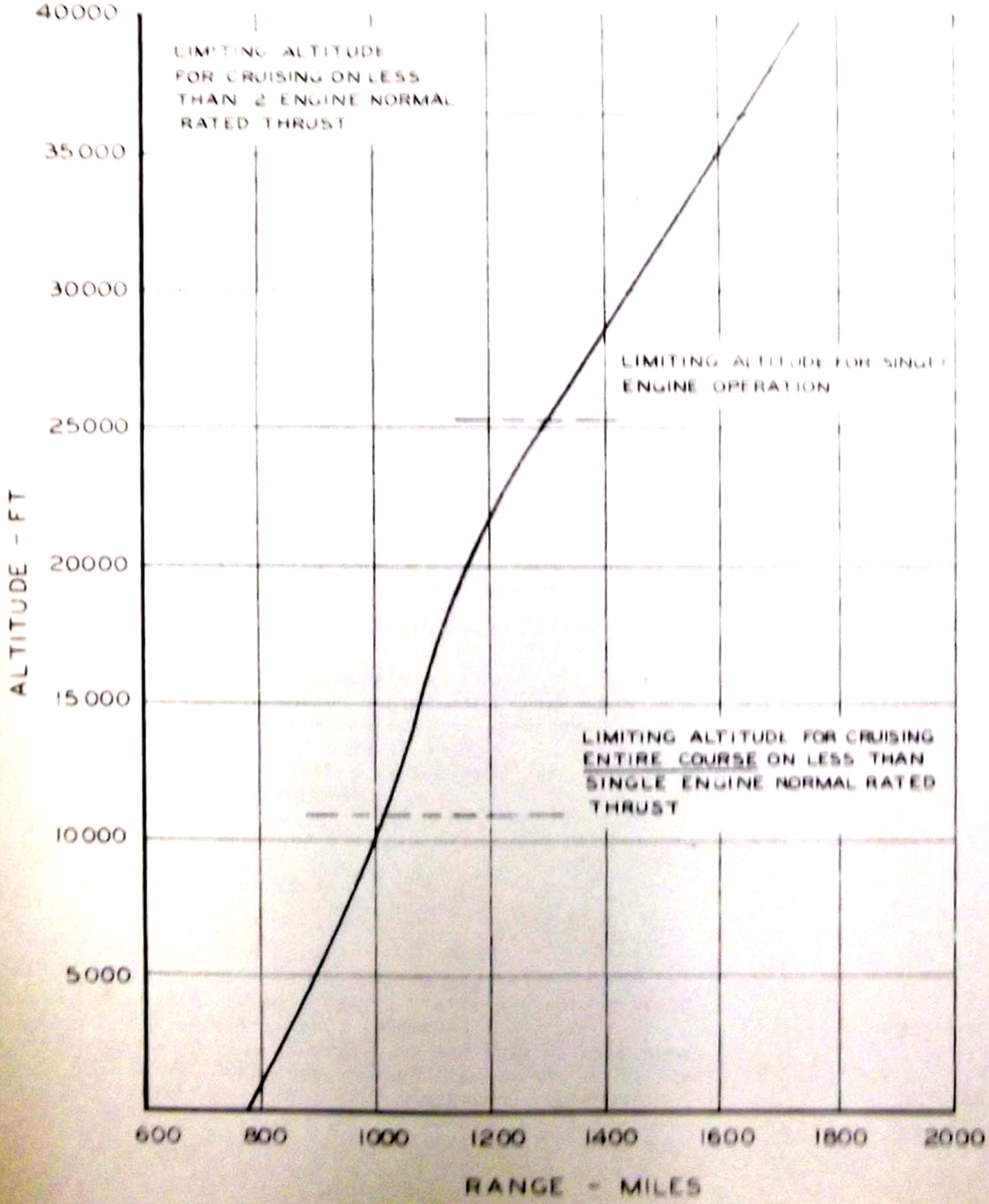
RANGE VS SPEED

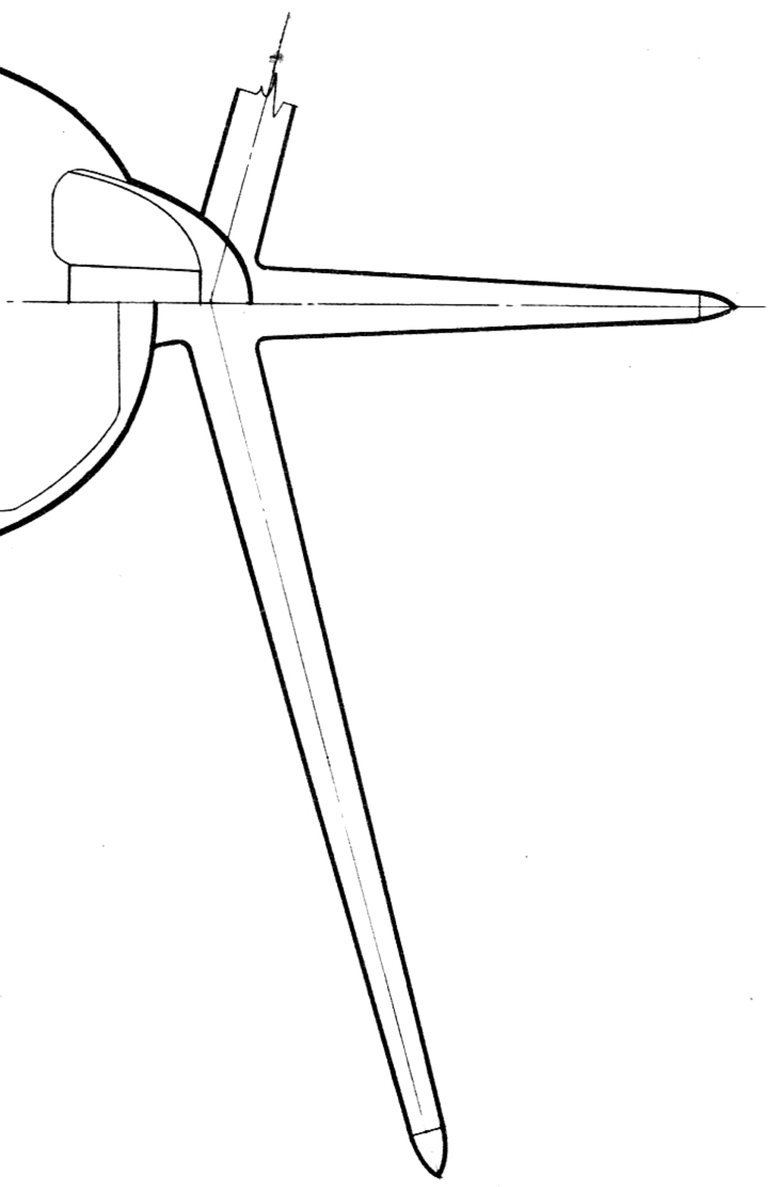
2 ENGINE OPERATION AT 30,000 FT.

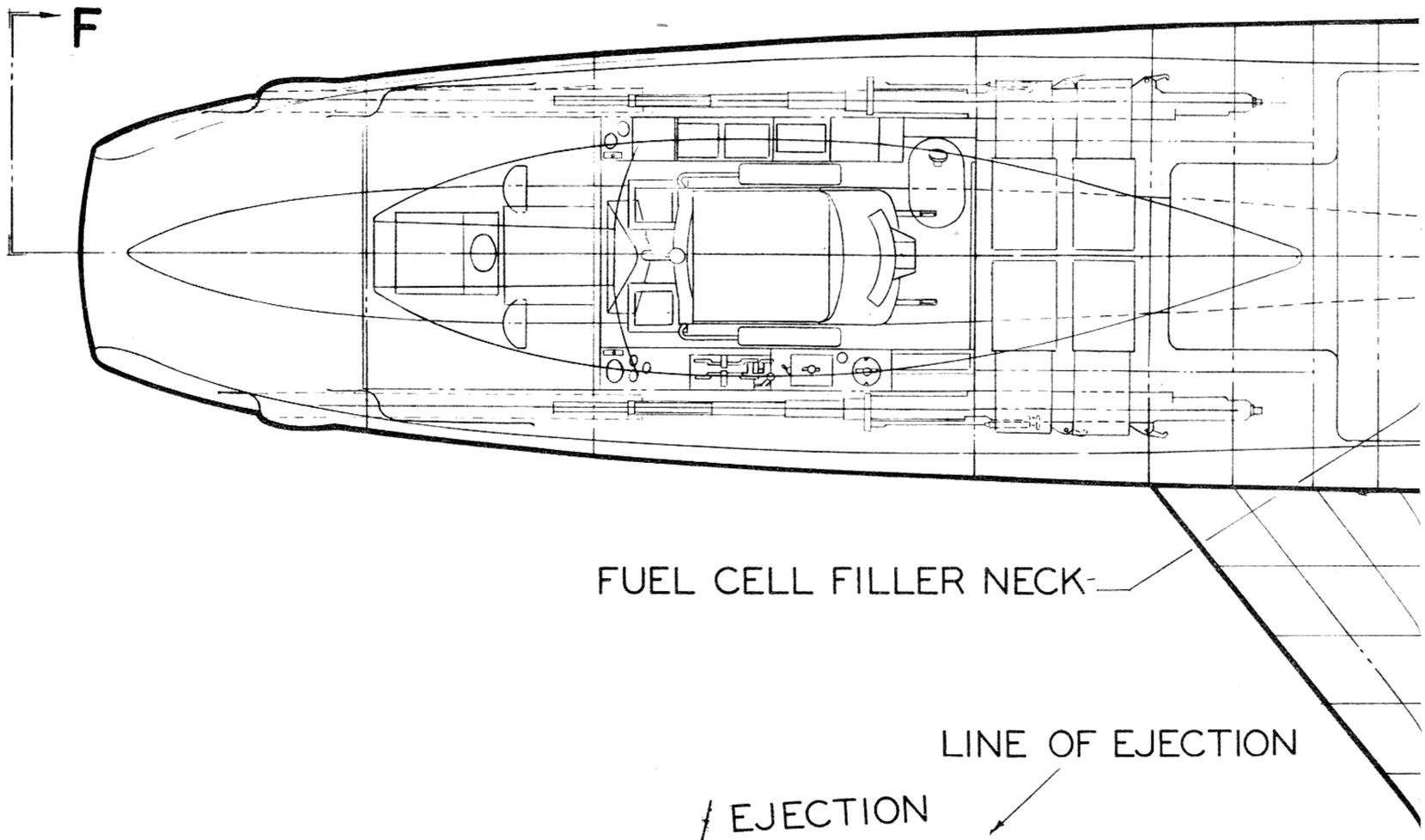
1023 GALS. FUEL

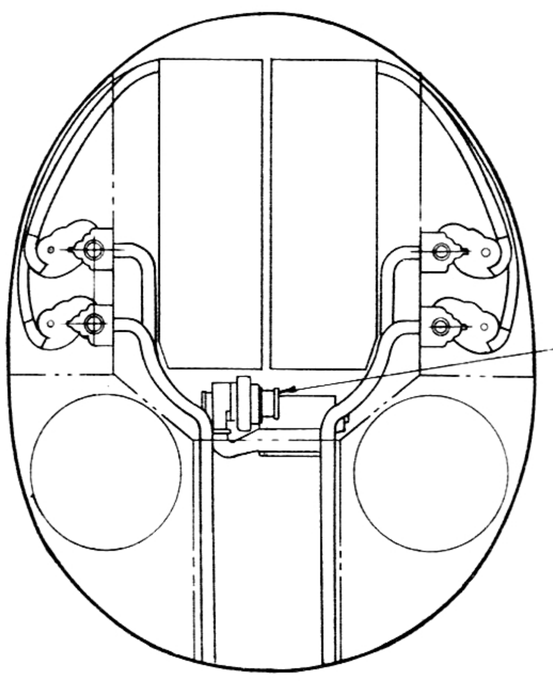


MAX RANGE VS ALTITUDE
1023 GALS FUEL
TAKE OFF G.W 17,612

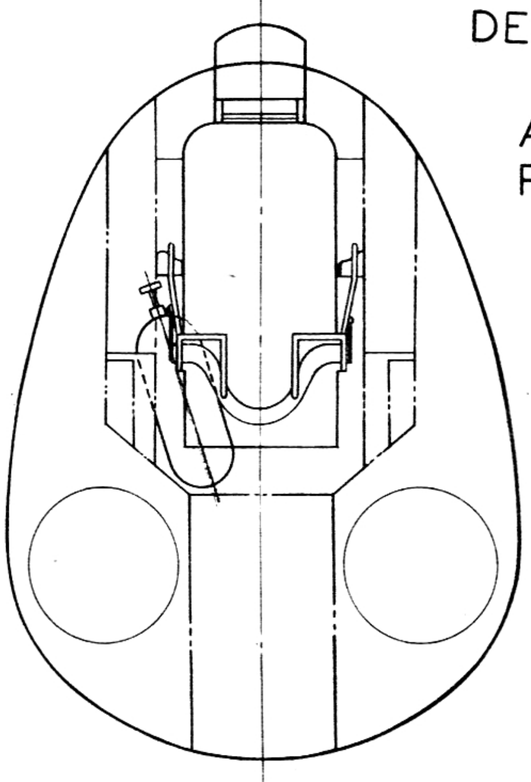




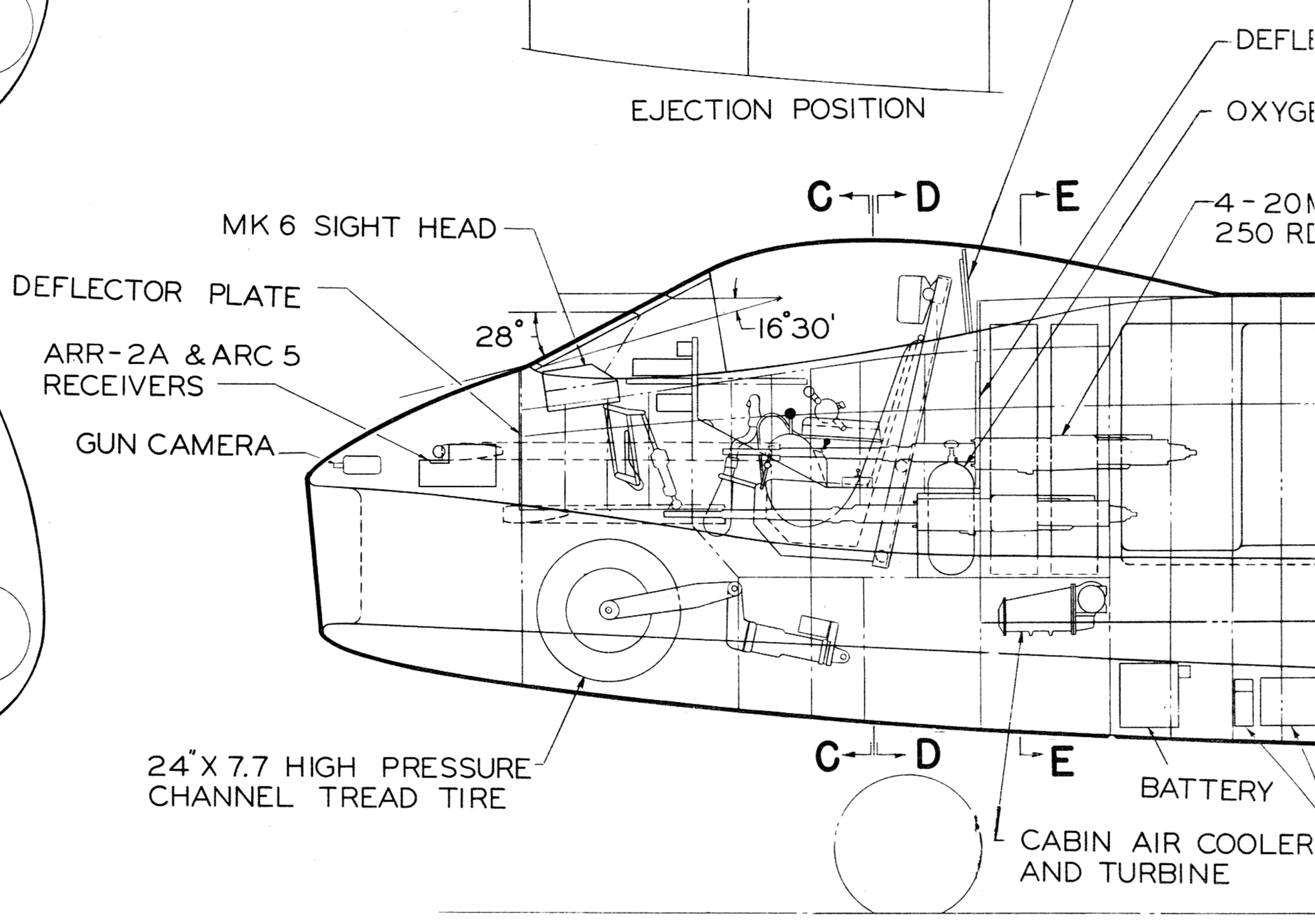


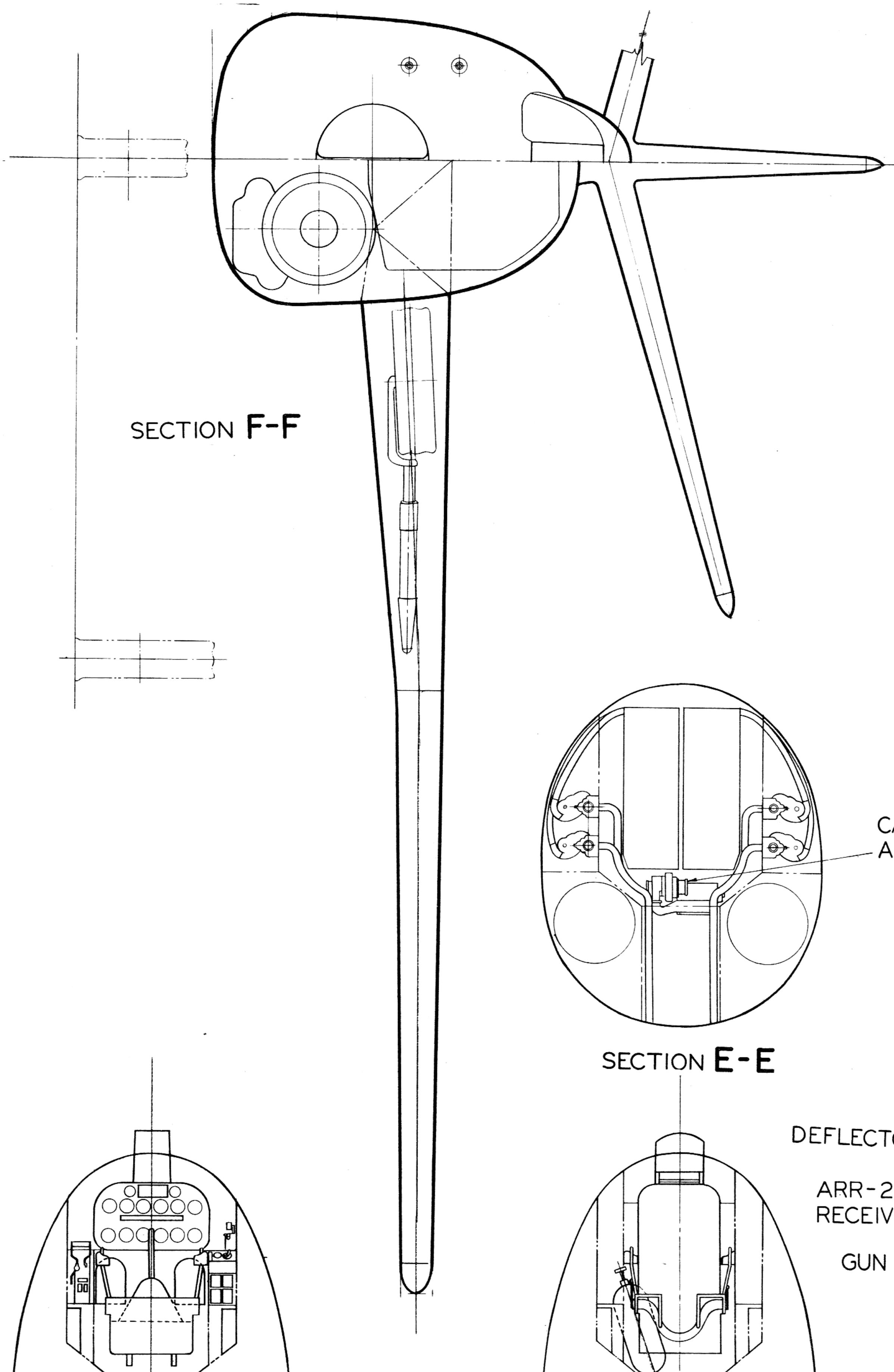


SECTION **E-E**



SECTION **D-D**





SECTION F-F

CA
A

SECTION E-E

DEFLECT

ARR-2
RECEIV

GUN

SECTION C-C

SECTION D-D

APX- , RADIO

ARC-1 RADIO

2-24C-6 WESTINGHOUSE
JET ENGINES WITH AFTERBURNING

OTTED FLAP

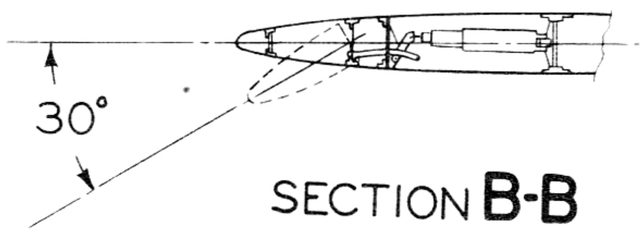
SPEED BRAKE RETRACTED

SPEED BRAKE EXTENDED

SECTION **A-A**

SPEED BRAKE

TRIM TAB



SECTION **B-B**

ADJUSTABLE LEADING
EDGE SECTION

BALANCE TAB

TRIM TAB

TRIM TAB

BALANCE
TAB

RETRACTABLE
ARRESTING HOOK

QUICK REMOVABLE ENGINE FAIRING

ATAPULT
NG

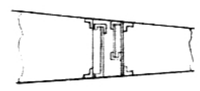
INTERIOR ARRANGEMENT
MODEL 40A

APX-, RADIO

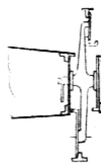
ARC-1 RADIO

2-24C-6 WESTINGHOUSE
JET ENGINES WITH AFTERBURNING

SLOTTED FLAP



SPEED BRAKE RETRACTED

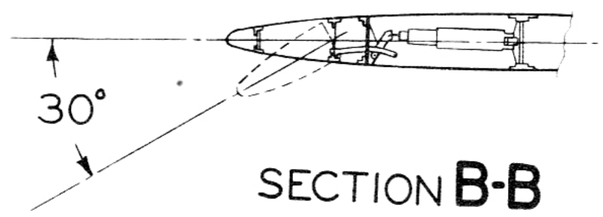


SPEED BR

SECTION **A-A**

SPEED BRAKE

TRIM TAB



SECTION **B-B**

ADJUSTABLE LEADING
EDGE SECTION

BALANCE TAB

HIGH PRESSURE
ELTREAD TIRES

R PLATE

DEFLECTOR PLATE

OXYGEN BOTTLE

4-20MM CANNONS
250 RDS. AMMUNITION EACH

FUEL CELL

FUEL CELL

F

RETRACTABLE
ARRESTING HOOK

QUICK REMOVABLE ENGINE FAIRING

RETRACTABLE CATAPULT
HOLDBACK FITTING

TTERY

COOLER
NE

MK 6 COMPUTOR

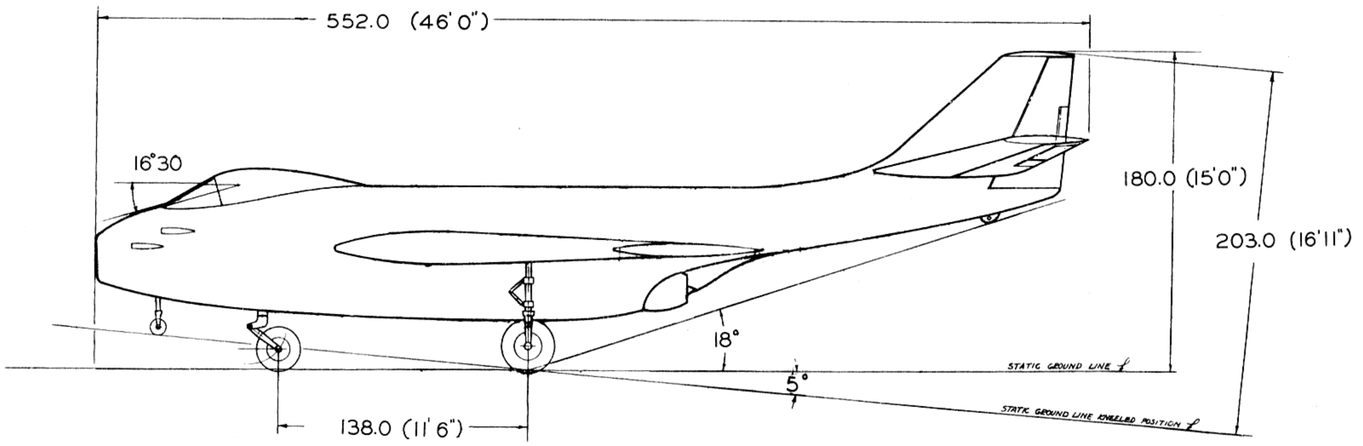
MK 6 INVERTER

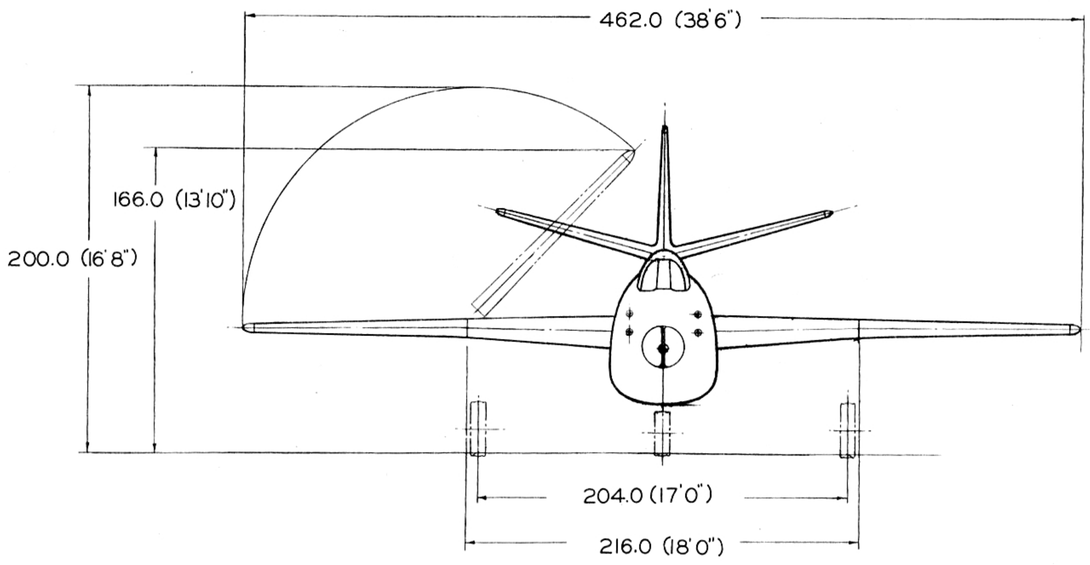
MK 6 JUNCTION BOX

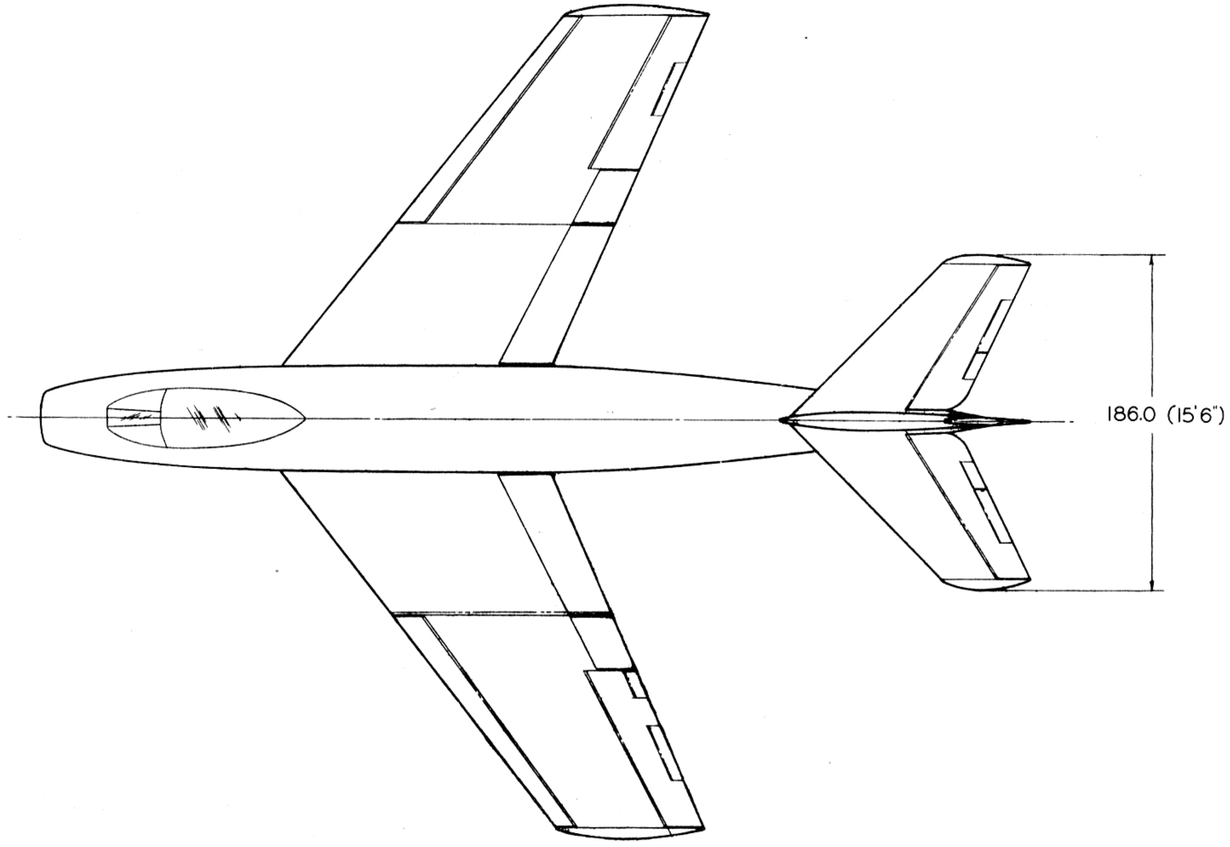
RETRACTABLE
CATAPULT HOOK

GENERAL ARRANGEMENT
MODEL 40A

WING:		
TOTAL WING AREA INCLUDING AILERONS, FLAPS & FUS. AREA OF 64.0 SQ. FT.	385	SQ.FT.
AILERON AREA (AFT OF HINGE LINE)	29.4	SQ FT
TRAILING EDGE FLAP AREA	37.5	SQ.FT.
LEADING EDGE FLAP AREA	23.7	SQ.FT.
INCIDENCE	0°	
SWEEPBACK (.25 CHORD LINE)	35°	
TAIL:		
TOTAL HORIZ TAIL (INCLUDING FUS.) CHORD PLANE	94	SQ. FT.
STABILIZER	61.1	SQ.FT.
ELEVATOR (AFT OF HINGE)	32.9	SQ.FT.
VERTICAL TAIL AREA (INC. 3.0 SQ FT OF DORSAL)	43.6	SQ.FT.
RUDDER AREA (AFT OF HINGE)	14.2	SQ.FT.
FIN AREA (INCLUDING DORSAL)	29.4	SQ.FT.
DIHEDRAL	15°	
SWEEPBACK (.25 CHORD LINE)	40°	
INCIDENCE	0°	
AIRFOIL DESIGNATIONS: (PARALLEL TO ℄ AIRPLANE)		
WING AT THEORETICAL ROOT	NACA 65,-013	
WING AT WING FOLD (B.L.108.0)	NACA 65,-008	
WING AT THEORETICAL TIP	NACA 65,-008	
TAIL AT THEORETICAL ROOT	NACA 65,-008	
TAIL AT THEORETICAL TIP	NACA 65,-008	
HIGH LIFT DEVICE:		
SLOTTED FLAP ANGLE MAX. DEGREES	45°	
LEADING EDGE FLAP ANGLE MAX. DEGREES	30°	
M.A.C.		
LENGTH	124.46	
INCIDENCE	0°	







NAVAER-1510A (Rev. 9-44)

ISSUE OF PAGES

AIRPLANE CHARACTERISTICS & PERFORMANCE

BUREAU OF AERONAUTICS, NAVY DEPT.

COLUMN NUMBER		1	2	3	4
LOADING CONDITION		COMBAT	COMBAT	TAKE-OFF	LANDING 1/4 FUEL
GROSS WEIGHT	LBS.	15152	15152	17612	13009
EMPTY WEIGHT	LBS.	11474			
FUEL / OIL	GALS.	613/10	613/10	1023/10	256/10
FIXED GUNS / AMMUNITION		4 - 20 MM/1000 Rds.			
FLEXIBLE GUNS / AMMUNITION					
ENGINE POWER USED FOR PERFORMANCE		Combat (Afterburning)	Military	Military	Military
WING LOADING	LBS./SQ.FT.	39.4	39.4	45.7	33.8
Thrust LOADING ①	LBS./ Lb.	2.02	2.53	2.94	2.17
V-MAX. SEA LEVEL	MPH	664	625	623	625
V-MAX. / CRITICAL ALT.	MPH / FT.	634/20000	618/20000	617/20000	618/20000
V-STALL GROSS WEIGHT ②	MPH.	95	95	103	88
V-STALL WITHOUT FUEL ②	MPH	83	83	83	83
TIME-TO-CLIMB -10000 FT-	MIN.				
TIME-TO-CLIMB -20000 FT-	MIN.	2.77	4.28	5.20	
SERVICE CEILING	FT.	48000	41860	38640	
TAKE-OFF DISTANCE -CALM-	FT.			1598	
TAKE-OFF DISTANCE -15 KN-	FT.			1163	
TAKE-OFF DISTANCE -25 KN-	FT.			901	
TAKE-OFF DISTANCE -50 FT OBST.	FT.				
TAKE-OFF TIME	SECONDS				
RATE OF CLIMB -SL-	FT/MIN	9430	6500	5400	
MAX. RANGE / V-AV. ③	ST. MI. / MPH.			1430/447	
RANGE / V-AV. -60% NSP-③-	ST. MI. / MPH				
SEARCH RADIUS / V-AV -20% R-	NMI. / KN.				
Cruising Radius	hrs.			3.0D	
Interceptor Radius	N MI.			100	
COMBAT RADIUS	N MI.			328	

ENGINE / PROP GEAR RATIO: 2 Westinghouse 24-C J.P. Units
Static Thrust S.L. 3000 Lbs./Eng.

ENGINE RATING BHP/RPM/ALT.: Afterburning for combat thrust 25% increase over military thrust.

TANKAGE IN GALLONS		OIL	FUEL
AUX. FIXED	PROTECTED		1023
	UNPROTECTED		
	TOTAL FIXED INTERNAL		1023
	DROPPABLE		
	DROPPABLE		
	TOTAL		

Performance is based on proposed guarantees. Range and radius are based on NAVAER SR-152, OS-105 and SD-24-E. Fuel consumption data increased by 7.5% to conform with past experience

NOTE
STATUTE MILES USED-EXCEPT-RADIUS IS GIVEN IN NAUTICAL MILES & KNOTS
① Static Thrust
② STALL-WITHOUT POWER Flaps down
③ AT 30000' ALTITUDE

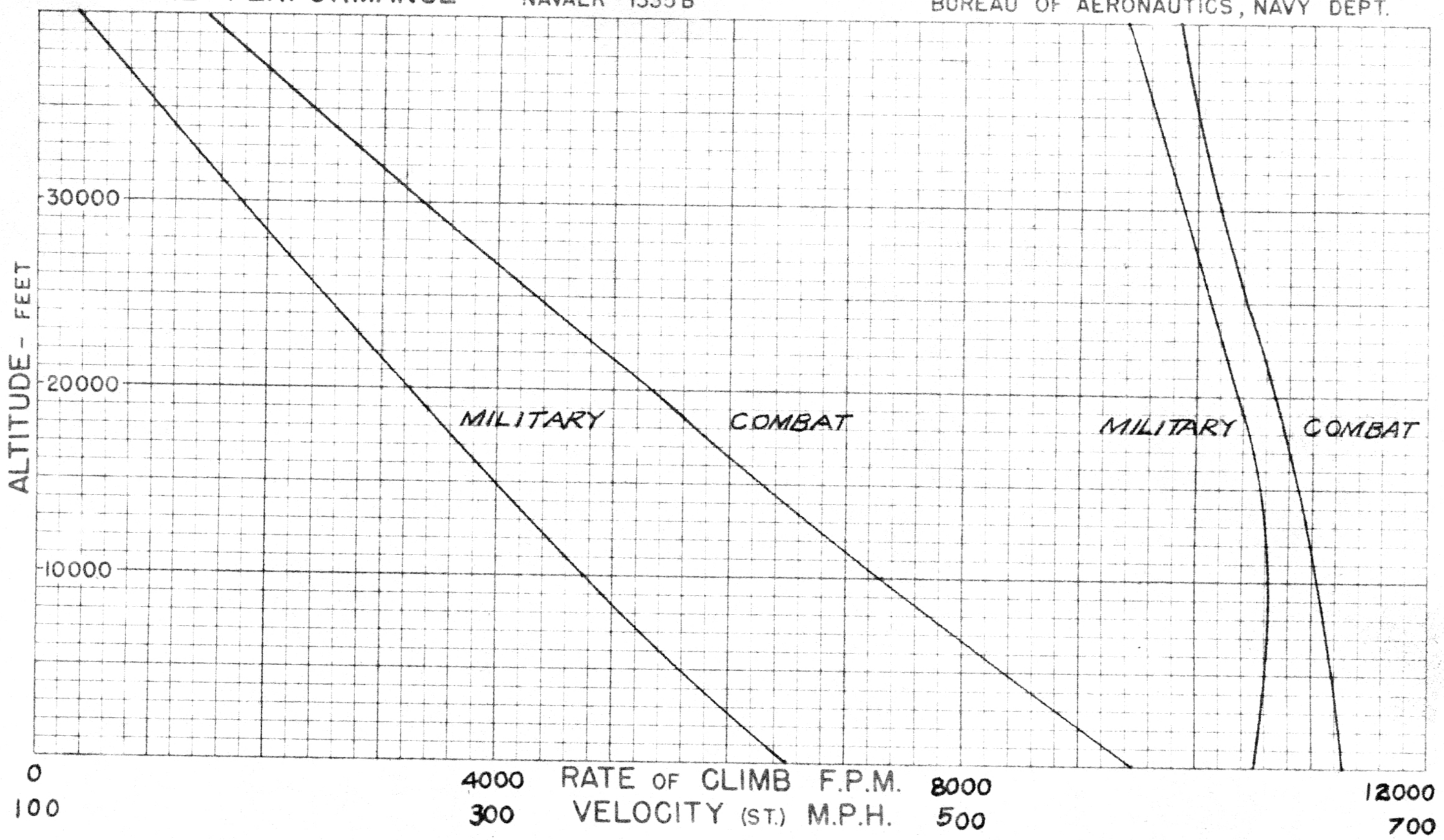
MCDONNELL AIRCRAFT CORP.

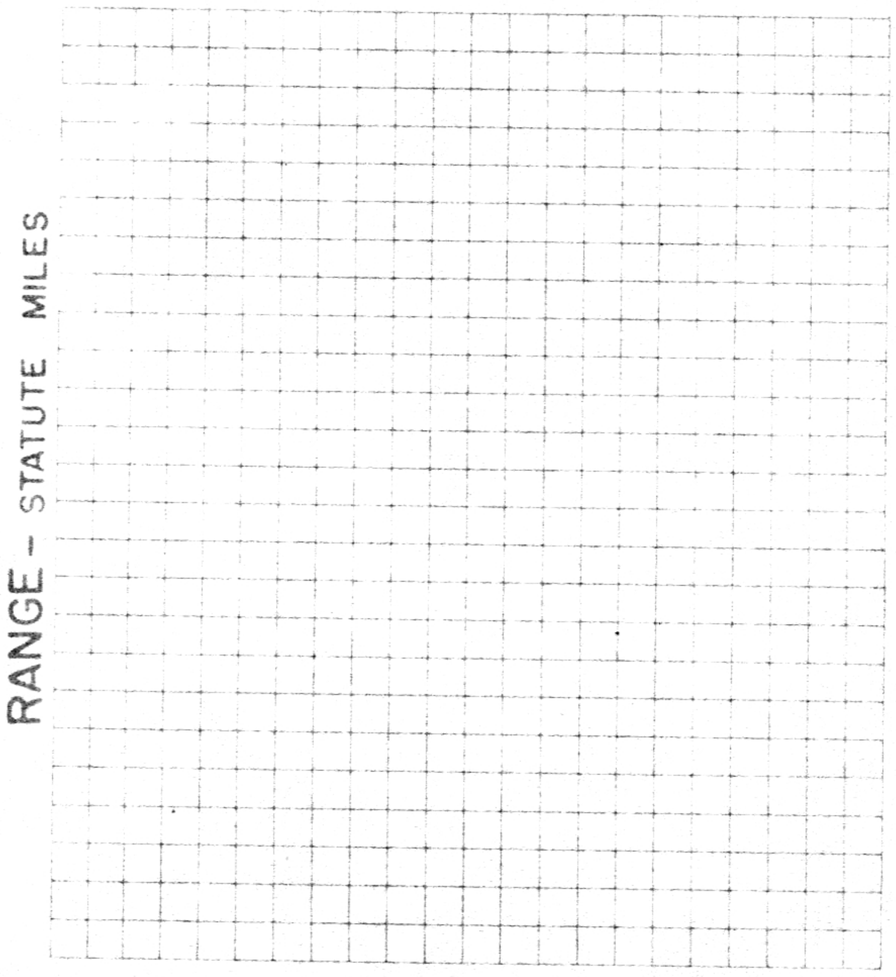
DATE 19 April 1946 PAGE 1 CONFIDENTIAL MODEL 40A

MODEL- McDONNELL 40A

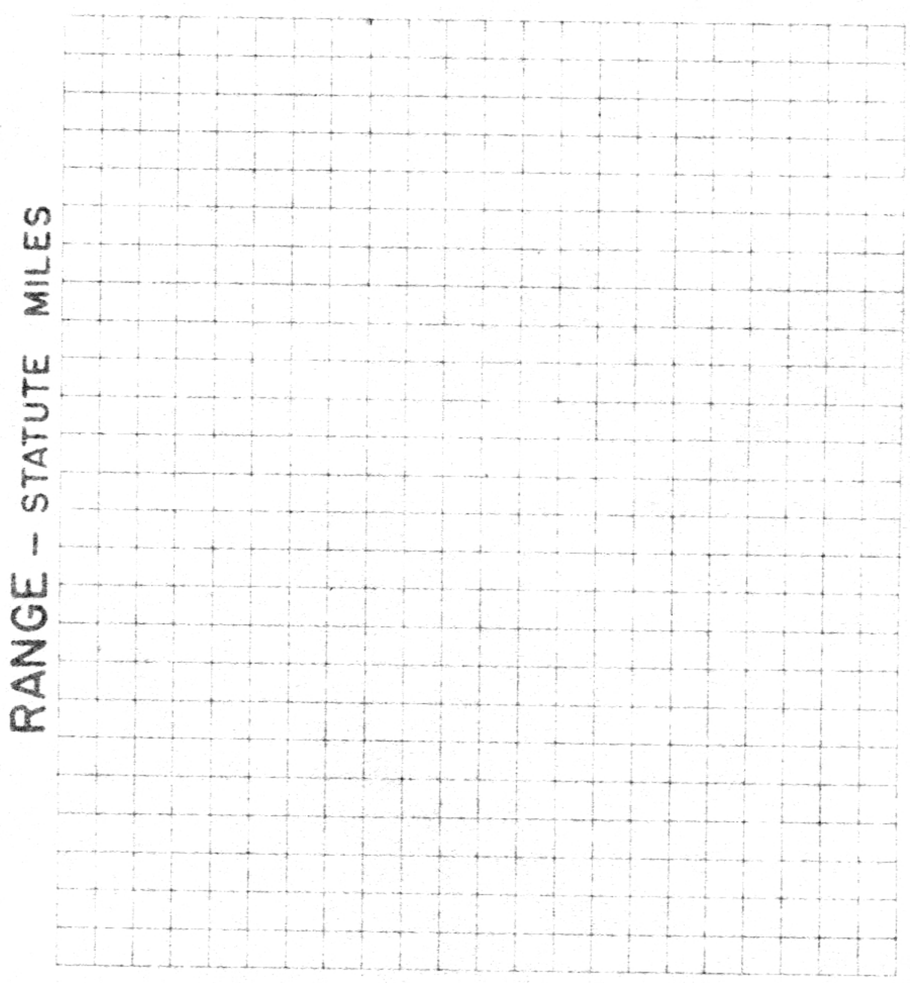
AIRPLANE PERFORMANCE NAVAER - 1335 B

BUREAU OF AERONAUTICS, NAVY DEPT.





AV. VELOCITY- (ST.) M.P.H.



AV. VELOCITY- (ST.) M.P.H.

① LOADING CONDITION COLUMN NUMBER