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ADDRESS REPLY TO

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Aer-E-213-GS

NAVY DEPARTMENT
BUREAU OF AERONAUTICS
WASHINGTON 25, D. C.



12/9/44

MEMORANDUM

From: Director, Engineering Division
To: Assistant Chief, BuAer

VIA: Military Requirements Division

SUBJ: Model VF Airplanes - Jet Propelled
Proposals - Recommendations.

Ref: (a) Mil. Req. Conf. Memo. Aer-E-3-JTB,
dated 1 Sept. 1944 with Ass't. Chief's
approval noted and dated 1 Sept. 1944.
(b) NAA Conf. Ltr. AL-875, dated 20 Oct.
1944.
(c) NAA Conf. Ltr. AL-890, dated 3 Nov.
1944.
(d) CV Conf. Ltr. E-120202, dated 21 Oct.
1944.
(e) McDonnell Conf. Ltr. JSM/WFW, 01-BA-560,
dated 1 Nov. 1944.
(f) Grumman Conf. Ltr. #1144-3329E, dated
30 Nov. 1944.

Encl: (A) Performance Summary - J.P. VF, dated
HW 12-6-44.
(B) Curve Sheet - V Max. vs. Alt. - J.P.
VF, dated 12-6-44.
(C) Curve Sheet - R/C vs. Alt. - J.P. VF,
dated 12-6-44.

1. Ref. (a) stated that a requirement existed for pure jet propelled VF Airplanes and requested that proposals be solicited from established contractors immediately. Proposals were requested by BuAer letters, dated 4 to 6 Sept. 1944, from Grumman, Chance Vought, North American, McDonnell, Douglas, Lockheed, Boeing, Ryan, and Curtiss (Buffalo). Designs have been received, refs. (b) through (f), from the first four companies listed, while the last four have indicated that they were unable to undertake new designs at this time. Douglas was willing to submit a design, but the Bureau advised them that in view of their limited engineering personnel available, it would be better to confine their efforts to the VB-VT field for the present.

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2. Since the Bureau is vitally concerned with the immediate and rapid development of jet fighters, it is considered that valuable time will be saved by establishing a program for procurement in advance of complete evaluation, and by initiating letters of intent or contracts concurrently with discussions of the details of the designs. The designs and recommendations are briefly discussed in the following paragraphs. In each case, the request for authorization to initiate procurement is to be subject to satisfactory negotiations with the various contractors on design details.

3. Chance Vought submitted a single engine type powered by a Westinghouse 24C jet, which is the smallest in size and which has the best overall performance of any of the single engine designs checked to date, while meeting all the requirements, of ref. (a). The Bureau check of the design has disclosed no serious deficiencies, although a number of detail points remain to be settled. The most important of these is that further consideration of the arresting gear arrangement, proposed unconventionally far forward, may be necessary. The design utilizes a low wing, high horizontal tail arrangement with the jet unit located in the after, lower portion of the fuselage allowing the unit to exhaust below the tail cone without use of a tail pipe. Wing root inlet ducts are used. The construction medium employed is "metalite", now being used in the construction of the XF5U-1, which provides a smooth surface with a high degree of stiffness. The internal fuel is contained in two tanks located above the wing, while the external fuel is carried in two special, flush type wing tanks. The use of standard tanks appears impracticable on jet propelled aircraft because of their relatively high drag. Vision in this design, as well as all others proposed, is excellent with the cockpit located forward of the wing. In general, the design appears to be close to the optimum in the inevitable compromises required between size, performance, accessibility and ease of maintenance. Chance Vought, in ref. (d), quotes an estimated cost plus one dollar fixed fee of \$3,578,001 for three airplanes and one static test article. The completion dates for the flight airplanes are quoted as 30 Sept. 1945, 31 Jan. 1946 and 30 June 1946. Chance Vought is going ahead with detail design layouts and a mock-up. In order that this project may be expedited to the greatest possible extent, authorization is requested to initiate procurement immediately.

4. North American Aviation submitted three designs, the major proposal being around the 24C unit, while designs using the General Electric TC-180 and I-40 units were proposed as alternates. Since both Chance Vought and Grumman, the Navy's

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major VF contractors, were known to be interested solely in designs using the 24C unit, it was considered that North American should concentrate on one of the General Electric units, in order to avoid dependence of the entire jet propelled VF program on a single power plant. Discussions with NAA personnel have been held, and a revised TG-180 design will be submitted shortly, which will be considerably lighter, and with higher performance than that shown on encls. (A), (B), and (C). The choice between the I-40 and the TG-180 units was made on the basis of the performance differences shown, which are considered typical, and also because of the contractors' decided preference for the TG-180. The sole advantage of the I-40 lies in its availability. The North American design will have the jet unit located above the wing, an air inlet at the nose of the fuselage, and a tail pipe exhausting at the extreme aft end of the airplane. Among the distinctive features of this design are the use of picket fence type flaps as speed arresters, hydraulic boost for ailerons and elevators, and wing tip tanks for carrying the external fuel. The latter installation possesses some disadvantages, but the aerodynamic drag advantage is so great that at least an experimental installation is justified. In ref. (c), North American Aviation quoted a total fixed price of \$2,596,575 for three airplanes plus a static test article for their design around the 24C unit. The TG-180 design, being larger will be somewhat higher in cost. Delivery is quoted for the first article in 9 months, with delivery of the other two following at one month intervals. It is believed that North American's revised proposal will be satisfactory, meeting all specified requirements. Authorization is requested to initiate procurement immediately.

5. McDonnell Aircraft has submitted eleven different design studies, ten of which are twin engine types similar in arrangement to the XFD-1, while the other one is a single engine TG-180 design. McDonnell's experience with the XFD-1 makes it desirable that they continue in the twin engine field. It is obvious that an airplane which is but a modification of the present XFD-1 would be available for service use sooner than any of the completely new designs being considered. The XFD-1A design shown in the summary sheets is a clipped wing version of the XFD-1, while the XFD-1A, alternate 1 uses the original wing; both designs are powered with two 19XB units. The clipped wing

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version while possessing a small speed advantage at sea level, has a negative rate of climb in the take-off condition and appears inferior in overall merit to the alternate design. It is believed that the XFD-1A, alternate 1 will be a usable service type, providing extremely valuable experience on pure jet aircraft at the earliest possible date, and may be a much needed airplane if the Japs introduce jet fighters before we can get into production on the other higher performance airplanes proposed. It is recommended that negotiations leading to a production contract of 200 XFD-1A, alternate 1 airplanes be initiated, with continuation of the project contingent upon satisfactory flight characteristics of the present XFD-1. Authorization is also requested to initiate procurement at this time of a new McDonnell airplane design MAC-24B with two 24C units to supersede the interim airplanes recommended above. The MAC-24B, as shown on the enclosures, possesses performance characteristics superior to all other designs under consideration, with a sea level speed of 576 mph and an initial rate of climb of 9990 fpm. The rate of climb for wave-off and take-off conditions is very good, and far superior to the single engine designs. Comparable performance characteristics are unlikely to be obtained with any single engine design using power plants now under development.

6. Grumman Aircraft has submitted a proposal for a 24C powered airplane by ref. (f). The contractor's estimate of performance is shown on the enclosures, since time has not permitted a Bureau check as yet. Grumman has incorporated a few novel ideas which appear to have considerable merit, and which may be applied to some of the other designs under consideration. Wing folding has been eliminated, yet the specified spotting requirement of 35 airplanes per 200 feet of deck space has been exceeded by 15 airplanes. This has been accomplished by retracting the nose wheel, and using a special parking dolly when the airplanes are spotted on the deck. In addition to the saving in weight and complexity achieved, this method of parking directs the jet exhaust into the air, allowing engines to be turned up in the spot. All fuel is carried internally in this design, eliminating the droppable tank problem. Wing ducts are used for the jet inlet, while the exhaust is directed out of the extreme end of the fuselage through a tail pipe. The initial inspection of the design has disclosed that further consideration of wing thickness and tail length may be necessary. However, it is considered that a satisfactory design arrangement can be reached

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by cooperation between the Bureau and the contractor. Grumman, in ref. (f), has quoted an estimated cost of \$3,540,000 including a fixed fee of \$38,522 for three airplanes plus one static test article, with delivery of the first airplane in 12 months, the second in 14 months, and the third in 15 months. Authorization is requested to initiate procurement of three experimental and one static test airplanes in substantial accordance with his proposal.

7. It is felt in many quarters that an airplane with the I-40 should be included in this program, but it is the consensus of opinion of all contractors approached, as well as the engineering personnel of the Bureau, that this unit is the least attractive from a standpoint of size and performance of the resulting airplane and has only one advantage, namely, it is the only unit ready for production. The only proposal submitted (North American alternate) was very disappointing in speed and showed a negative rate of climb for both take-off and wave-off conditions. However, as soon as North American has started on their design with the TG-180, the Bureau will ask them to revise the I-40 airplane to see if its design can be improved enough to make it worthwhile as a second airplane design. Recommendations in regard to this design will be made at a later date.

8. Authority for initiation of the procurement of jet propelled VF types at the earliest possible date will expedite the development of airframes, and provide the necessary impetus to the power plant development and procurement program. Recent combat experience in the European theatre against jet VF opposition indicates that the successful development of naval jet types is mandatory. Approval is requested of the foregoing program, summarized as follows:

- (a) Chance Vought - three experimental and one static test airplanes using the 24C unit. Design CV-340.
- (b) North American Aviation - three experimental and one static test airplanes using the TG-180 unit. Design NAA-134A.
- (c) Grumman - three experimental and one static test airplanes using the 24C unit. Design #71.
- (d) McDonnell - 200 airplanes similar to the XFD with 19XB units. Design XFD-1A, alternate #1.
- (e) McDonnell - three experimental and one static test airplanes using two 24C units. Design MAC-24B.

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PERFORMANCE SUMMARY - J.P. VF

MODEL	CV-340	NAA-134	NAA-134A	NAA-134B	XFD-1A	GRUM. 71	XFD-1A, ALTI	MAC 24B
EST. BY	BU	BU	BU	BU	BU	GRUM.	BU	BU
POWER PLANT	24C	24C	TG-180	1-40	2-19XB	24C	2-19XB	2-24C
GUNS / AMM	4-20 600	6-50 1500	6-50 1500	6-50 1500	4-50 1600	4-20 600	4-50 1600	4-50 1600
COMBAT COND.	FLBU-1							
GROSS WEIGHT	8675	9683	11872	12630	9178	8794	9353	11443
INT. FUEL	370	365	410	525	355	338	330	470
V _{MAX.} - S.L.	549	521	520	464	491	533	483	576
V _{MAX.} - 20,000'	536	516	530	484	475	527	485	552
R/C - S.L.	4950	4400	4290	2690	4550	4930	4520	9990
R/C - 20,000'	2770	2120	2830	1730	1950	2225	2150	5840
V _{ST}	94.5	87.9	88.6	88.7	92.4	90.5	81.6	86.9
WAVE OFF R/C (V ₃₊₁₀ , 95°F)	775	375	445	-165	244	1245 ⁽¹⁾	485	2210
TAKE-OFF COND.								
GROSS WEIGHT	10781	11492	14016	15100	11338	10426	11393	13575
FUEL - DROP	312	270	320	400	325	0	305	317
FUEL - TOTAL	682	635	730	925	680	610	635	787
V _{ST}	105.4	95.7	96.2	97.0	102.4	98.6	89.9	94.7
COMBAT RADIUS	310	265	223	237	213	302		213
R/C - 110 MPH - 95°	33	45	95	-460	-342	1080 ⁽¹⁾	170	1880
"LANDING COND."								
GR. WT. - 1/4 FUEL	7712	8635	10731	10938	8058	7681	8327	9805
V _{ST}	89.2	83.0	78.5	77.4	86.6	84.6	76.8	80.5
GENERAL DATA								
WING AREA	180	240	290	310	223	207	276	296
WING SPAN	30'-2"	37'-9"	39'-5"	39'-11"	30'	32'-6"	42	44
FOLDED SPAN	18'-3"	16'-8"	16'-8"	17'-8"	16'-3"	—	16'-3"	18'-3"
LENGTH - 3 PT.	32'-3"	33'	37'-6"	37'-11"	38'-9"	32'-6"	38'-9"	38'-9"
SPOT No. IN 200'	54	41	37	37	36	50	36	36
TYPE DROP TANK	FLUSH-W	W. TIP	W. TIP	W. TIP	FLUSH-F	NONE	FLUSH-F	FLUSH-F

NOTES -

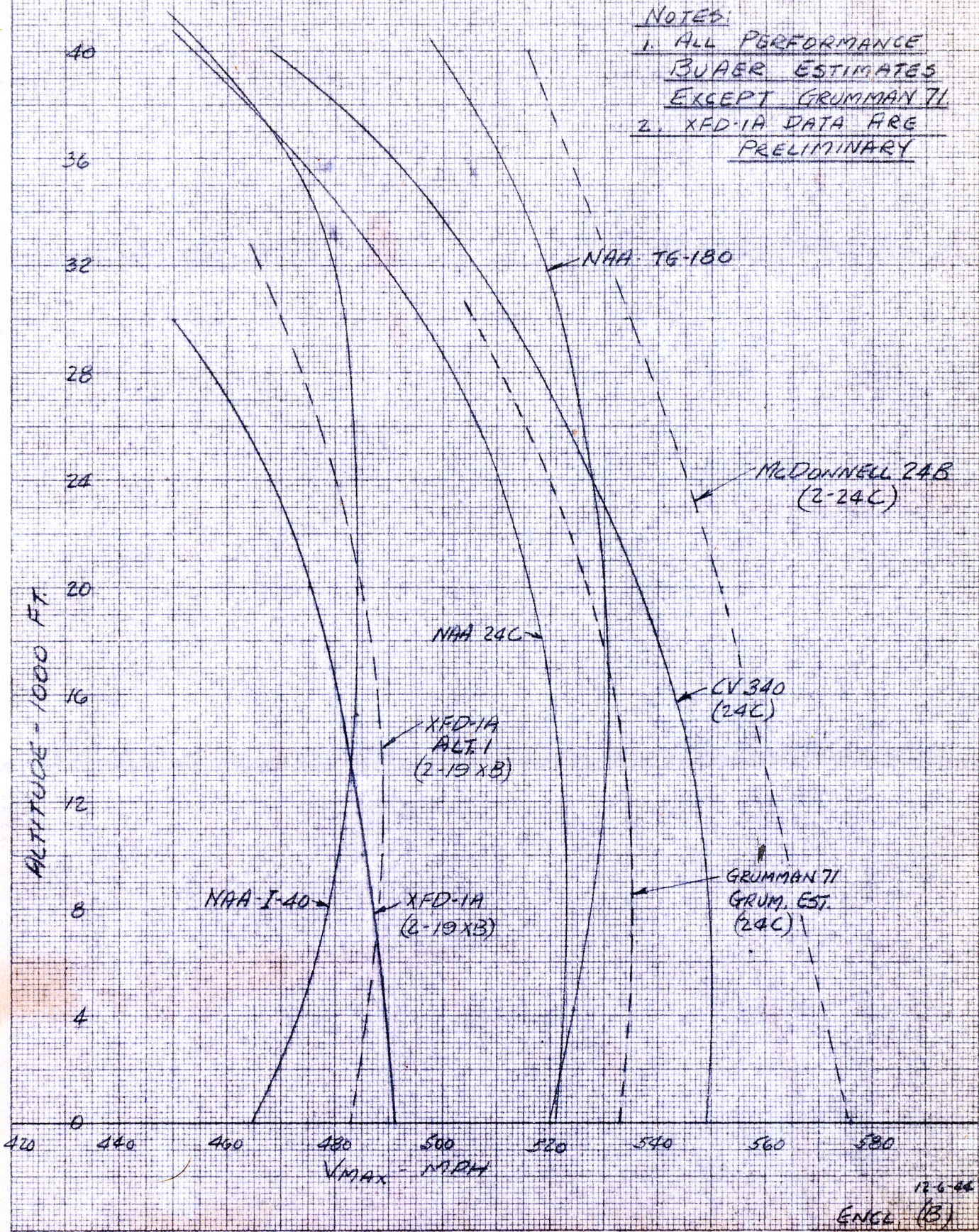
1. GRUMMAN WAVE OFF & TO. R/C APPEAR OPTIMISTIC
2. XFD-1A DATA ARE UNCHECKED

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ENCL. (A)

NOTES:

1. ALL PERFORMANCE BUABR ESTIMATES EXCEPT GRUMMAN 71
2. XFD-1A DATA ARE PRELIMINARY



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ENCL (B)

