

In reply address not the signer of this letter, but "Commanding Officer, U. S. Naval Air Station, Anacostia, D. C."

U. S. NAVAL AIR STATION
ANACOSTIA, D. C.

Refer to No.

CONFIDENTIAL
VF4F-4/NA6
Ser. #42445
(PT) (218)

SEP 10 1942

From: Commanding Officer.
To : The Chief of the Bureau of Aeronautics.
Subject: Model P4F-4 Airplane with Full Span Flaps - Performance Tests.
Reference: (a) BuAer ltr. Aer-E-211-EM, C-94281, 101166 of 27 July 1942.
(b) Final report of P4F-4 dated 3-24-42.

1. In accordance with reference (a) tests have been conducted on model P4F-4 airplane No. 5262, equipped with full span duplex flaps, to determine performance and flying characteristics. These tests were practically complete when terminated by a crash resulting from a defective flap operating system. The results are reported herewith.

2. The flap system consisted of inboard sections of NACA slotted flap and outboard sections of NACA balanced split flap. All sections were operated by electrically driven worm gears. The inboard and outboard systems were entirely separate in control and operation. Synchronizers were fitted in the outboard flap system, consisting of rheostats mechanically driven by each flap which varied the electrical balance in interconnecting circuits and operated overload relays to stop the movement of the leading flap when out of phase. The inboard flaps were visible to the pilot; a flap position indicator was fitted to the left outboard flap only. The ailerons were of sealed-gap type.

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VP4F-4/NA6
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Flaps - Performance Tests of.

3. The performance of airplane No. 5262 equipped with full span duplex flaps is compared to that of a standard P4F-4, No. 4058, as follows:

	#5262	#4058
Normal fighter		Normal fighter
Loading		
Gross weight (lbs).....	7369	7370
Airplane critical altitude (ft)	21100	19400
Vmax at critical altitude (MPH)	318	319
Service ceiling (ft)	34300	35000
Rate of climb - S.L. (ft/min)..	1850	1850
Take off distances:		
Inboard flaps only -		
Zero wind (ft)	694	725*
25-kt. wind (ft)	850	287*
Airspeed at take-off (MPH)...	69	73*
Inboard and outboard flaps -		
Zero wind (ft)	630	
25-kt. wind (ft)	215	
Airspeed at take-off (MPH)...	65.5	
Stalling speeds:		
Cruising condition, power on (MPH)	81.5	81
Cruising condition, power off (MPH)	82.5	87
Inboard flaps only		
Landing condition, power on (MPH)	66.5	70
Landing condition, power off (MPH)	72	76
Inboard and outboard flaps -		
Landing condition, power on (MPH)	61.5	
Landing condition, power off (MPH)	69	

*Corrected for variation in tail wheel arrangement. (See reference (b)) These figures are not considered strictly comparable due to improved methods subsequently employed for determining airspeed at take off.

SEP 10 1942

Subject: Model F4F-4 Airplane with Full Span
Flaps - Performance Tests of.

4. The following are comments on the general flying characteristics of the subject model airplane:

- (a) The ailerons were unsatisfactory due to excessive control forces at high speeds and inadequate effectiveness with all flaps extended. This was the general opinion of all pilots; rate of roll measurements in the latter condition indicated that the control was deficient but close to the borderline. The airplane was restricted from taking off with all flaps extended but was satisfactory for field landings in this condition.
- (b) The airplane with inboard flaps only or with all flaps extended had a very bad stall. There was generally little warning and complete loss of control, followed by excessive pitch and loss of altitude in recovery.
- (c) The airplane became excessively nose heavy with the lowering of part or all flaps. There was barely sufficient elevator control to stall power off with all flaps extended and insufficient control to land satisfactorily under these conditions.
- (d) Lateral stability was positive under all conditions of flap setting.
- (e) A large amount of right rudder was required for directional trim with power on and flaps down. At full yaw under these conditions the behavior of the airplane was normal with right rudder, and a reversal of force occurred with left rudder.

5. The electrical flap control system was unsatisfactory and undependable throughout. There were many defects in design and final assembly. On several occasions the outer flaps failed to operate until the synchronizing system was cut out, but no significant lack of synchronism in flight had occurred. The final crash however was caused by failure

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Flaps - Performance Tests of.

of the left outer flap to retract. The inboard flaps had operated out of synchronism on one occasion which was attributed to low battery power.

6. As a result of these tests the following conclusions are drawn:

- (a) The flap arrangement is effective in reducing stalling speed, take off speed and take off distance.
- (b) Adequate and satisfactory lateral control could probably be obtained by improvement in aileron design.
- (c) Improved stall and trim characteristics would be required to make the airplane satisfactory for service use.
- (d) Improved flap operating and synchronizing systems would be required to make the airplane satisfactory for service use. Even with a dependable control system it is believed that more than usual precautions should be taken against the effects of unsynchronized flap operation.

W.V. SAUNDERS

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