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66. (U) IOM 13 June 1944
Fr: Col. P.H. Kemmer
Chief, Airc. Lab.
Eng. Div., WF
To: Chief, Prod. Eng. Sect.,
WF
(File: Bomb. Br., Prod. Div.)

Seven static tests had been conducted on the A-26B airplane wing. In the first four tests, the wings failed at between 80 and 90% ultimate load, although reinforcements were made. Additional reinforcements were made and on the fifth test the wings failed at 95% load. Two more tests were conducted, but both times the wing failed and Airc. Lab. (WF) concluded that redesign of the wing would be required in order to support 100% load and to secure additional bending strength. A wing of conventional design could easily be reinforced to give added bending strength but the A-26 wing was designed so that the wing spars must support the entire bending load. Airc. Lab. listed poor design features of the wing and recommended certain changes. Subsequent let Ind. by Prod. Eng. Sect., dated 10 June 1944, furnished information that wing reinforcements were being incorporated in production of all A-26B airplanes, effective 5 June 1944, and that Douglas had been requested to proceed with redesign of the wing to increase strength by approximately 10% and eliminate unsatisfactory design features.

INTER-OFFICE MEMORANDUM

ARMY AIR FORCES
 MATERIEL CENTER
 Office of The Commanding General

Lt. V.B. Greinmann:51
 Ext. 2253.

Wright Field, Dayton, Ohio

Date 13 JUN 1944

TO: Chief, Production Engineering Section, Wright Field.

Load Factor - G.M.

SUBJECT: Redesign of the Wings of the Douglas A-26B Airplane.

1. A series of seven static tests were conducted on the wings of the A-26B airplane in the Positive Low Angle of Attack Conditions. In the first four tests, failures of either the wing or the fuselage carry-through structure occurred between 80 and 90 percent ultimate load, despite the fact that various reinforcements were made on the wings and fuselage. In the fifth test, the wings supported, then failed at 95 percent ultimate load. The reinforcement made before this test consisted of the following changes:

- a. The wing attaching pins were changed to new pins with a smaller inside diameter.
- b. The upper forward and upper aft fuselage carry-through members were reinforced with the addition of stabilizing blocks and the substitution of several bolts for rivets.
- c. The 9 rivets securing the lower surface skin to the rear spar between the nacelle and the oil cooler exhaust vent were replaced with steel screws.
- d. The rivets securing the lower surface skin assembly to the wing between the fuselage and nacelle were replaced with steel screws of the same diameter.
- e. The bolts through the wing attach pins were replaced with 3/4 inch bolts with special washers on each end.
- f. Fillets were increased at the inboard end of the front spar lower skin attachment flange.
 (The reinforcements outlined above are now being incorporated on all A-26B airplanes.)

Two additional tests were conducted using further reinforcements designed by the Materiel Command in cooperation with the Contractor. These additional reinforcements, however, gave no additional strength to the wing, and in each case both the front and rear spars failed in tension. It must be deduced that the wing cannot be readily reinforced to support 100 percent ultimate loads and that some redesign is necessary to gain the desired strength.

Signature

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2. Observations of the wing during the static tests have disclosed a number of poor detail design features. Although no attempt is made to enumerate all of these faults in detail design, a few examples are listed below:

- a. The fillets at the junction of the shear web attachment flanges and the spar caps are considered to be too small. This is also true of the fillets at the junction of the skin attachment flanges and the spar caps.
- b. The fillets at the termination of these flanges on the front spar are considered to be too small.
- c. Holes have been drilled through the spar caps without any apparent consideration for reduced area and stress concentrations. This is particularly evident in the front spar at the nacelle and in the rear spar at the flap brackets.
- d. The rear spar has been counterbored at the flap attachment brackets with insufficient filleting and with no apparent consideration for reduced area and stress concentrations.

3. In view of the need for a redesigned wing, it is recommended that the Contractor proceed, without delay, to make a redesign incorporating the following changes:

- a. Increase the spar cap cross-sectional area of front and rear spars, upper and lower chord members by at least 10 percent each. It is recommended that at least a part of this increase in area be achieved by increasing the thickness of the skin attachment flanges and shear web attachment flanges, and by increasing the fillets of these flanges.
- b. Eliminate the counterbore in the rear spar caps at the flap attachment brackets.
- c. Give due consideration to all reduction in spar cap cross-sectional area due to bolt holes, and allow for stress concentrations at all holes.
- d. Eliminate all other poor detail design features such as sharp corners, excessive tension pick-up in the skin, and unduly large clearances at the wing-fuselage attachment fittings.

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4. The redesign outlined in paragraph 3 should be made immediately. However, it is recommended that the Contractor proceed, as planned, with a strain gage survey of the wing with a view to further redesign at a later date. It is well to bear in mind that in a wing of conventional design, the skin-stringer combination is easily reinforced to give added bending strength; however, the wings of the subject airplane are designed in such a manner that the spars must support the entire bending load. For this reason, reinforcement of the wing, without major changes, is virtually impossible when additional bending strength is required. While it is desirable to place the redesigned wing into production as soon as possible, it should not interfere with present production of A-26B airplanes with reinforced wings, as shown in paragraph 1 above.

Paul H. Kemmer
PAUL H. KEMMER,
Colonel, Air Corps,
Chief, Aircraft Laboratory,
Engineering Division.



Bomb. Div.
(Pg. 1/1)

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Basic Communication - ICM from Aircraft
Lab., (Lt. V. E. Greimann:es:51) dated
15 June 1944. Subj: Redesign of the
Wings of the Douglas A-26B Airplane.

1st Ind.

Capt. R. F. Bachs/Tel: 2-6157
1as/79-2 (P-26)

Chief, Production Engineering Section, Wright Field, Dayton, Ohio. 19 June 1944

To: Chief, Engineering Division, Wright Field, Dayton, Ohio. Attn: Chief,
Aircraft Laboratory.

1. Information is furnished that the wing reinforcements outlined in paragraph 1 of basic communication are being incorporated in production in all A-26B airplanes effective as of 5 June 1944. In addition, kits of parts and a service bulletin are being prepared for these modifications to be incorporated in service airplanes at the earliest possible date.

2. When these modifications have been accomplished, the present restrictions as covered by Technical Order 01-4, OAJ-11 will be lifted.

3. It is understood that Aircraft Laboratory has prepared a Load Factor--Gross Weight--Speed Chart for the A-26B airplane based upon the actual strength of the airplane being 95% of design load and based upon the current gust factor of 25-feet per second.

4. The contractor has been requested to proceed with a redesign of the wing with a view to increasing the strength by about 10% and to eliminate the undesirable detail design features in the spar caps substantially as recommended in paragraph 3 of basic communication. The contractor has been requested to keep Materiel Command informed in detail of proposed design changes and all information pertaining to design changes will be forwarded to Aircraft Laboratory for examination and comments as received.

GEORGE E. PRICE,
Colonel, Air Corps,
Chief, Production
Engineering Section.

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