4. (C) Memo 7 Feb. 1941
Fr: E.W. Miller
Head Mech. Engr., LMAL
Langley Field, Va.
To: Engineer-in-charge, LMAL
Langley Field, Va.
(File: Contract Files)

During a conference held at Langley Memorial Aeronautical Laboratory (hereinafter referred to as LMAL) it was concluded that it would not be practical either to change the fuselage shape of the A-26, or to shorten the nacelles, which were unusually long and extended far forward of the leading edge of the wing. The program planned by Douglas for the development of the XA-26 included: routine tests of a 1/8-scale model in the Caltech tunnel, a comprehensive test program in the NACA 19-foot tunnel, tests of a full-scale nacelle, and tests of large scale wings in the NACA low-turbulence tunnel.

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LMAL

Langley Field, Va.
February 7, 1941.

MEMORANDUM For Engineer-in-Charge.

Subject: Conference with representatives of the Douglas Company and the Army Liaison Office on the XA-26 airplane.

Reference: Mat. Div. L. O., Langley Field Let. Feb. 3, 1941.

1. On request of Colonel Greene, a conference was called to discuss certain questions with reference to the XA-26 airplane. Those present were: Dr. M. U. Clauser, representing the Douglas Company; El Segundo Division; Mr. T. De Port, representing the Liaison Office, and Messrs. E. N. Jacobs, Abe Silverstein, and E. W. Miller, representing NACA. Two questions had been suggested for discussion: First, fuselage shape; second, nacelle length. The Douglas XA-26 airplane is a light bomber of about 25,000 pounds gross weight. It is thus intermediate in size between the A-20 and the Martin B-26. It is powered by two 2800 engines in nacelles which extend especially far forward with respect to the wing. The nacelles are below the wing, the upper surface being tangent with the upper surface of the wing. The nacelles appear unusually long.

Fuselage shape:

The main question seemed to be whether it would be better to use a square-section fuselage as contemplated in the preliminary design or whether a circular fuselage would be more efficient. The circular fuselage would have to be larger than the square one, forward by circumscribing a circle about the square. It appeared that the Laboratory has little data on this subject other than a series of fuselages of narrow shapes which were tested in the variable density tunnel several years ago. In those tests the circular fuselage appeared better but it was the general opinion that the intersection of the wing with the fuselage tended to overcome the difference between the two shapes and that as the square fuselage had rounded corners, there would be little to choose between the two. It is the general opinion that the fuselage shape might be designed largely on the basis of surface area.

Mr. Jacobs pointed out that in this design, as well as in numerous others that had been considered, a disturbed

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flow condition might be expected due to interference of that part of the wing between the fuselage and the nacelle. He thought the design might be improved by increasing the wing chord between the fuselage and the nacelle. This device has apparently been tried by some other manufacturers.

There was a discussion of the general program laid out by the Douglas Company for the development of this airplane as follows:

(1) Routine tests of a 1/8-scale model in the Caltech tunnel.

(2) A rather complete test program in the NACA 19-foot tunnel. These tests would be for the purpose of studying the laminar-flow wing, the use of flaps, longitudinal stability, stalling, and other pertinent questions.

(3) Tests of a large nacelle, preferably full size, to study the cooling of the power plant.

(4) Tests of several large scale wings in the NACA low-turbulence tunnel.

There was a general discussion of the above items. It was the consensus of opinion that as much general information about the design as possible should be obtained from item (1) in the Caltech tunnel. It was agreed that a test program in the 19-foot tunnel as suggested under item (2) would be the best means of getting general information on the proposed design. There was considerable discussion here of the use of laminar-flow wings, the effects of surface roughness, and a discussion of icing and ice prevention. It was suggested that further information regarding the use of heat in preventing ice would be available in the near future from the Ames Laboratory. Dr. Clauser was concerned about the added weight if the exhaust method of heating were used and about the wing roughness if rubber de-icers were used. It was agreed that there would be no difficulty in making the required tests of the proposed large scale wing models in the low-turbulence tunnel.

Nacelle length:

With reference to the length of the nacelle, it appeared that the length was determined by the position of the propellers with reference to the pilot's cockpit and the personnel quarters in the fuselage and by the space needed for retracting the landing gear. It did not appear possible to make it any shorter for practical reasons and nobody

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suggested making it any longer. It was the general opinion that the drag of the nacelle would depend largely on the skin friction and more especially on the number of scoops and other protuberances on the surface.

Mr. Jacobs pointed out that in a design of this type, the drag of the nacelles constitute a considerable portion of the drag of the complete airplane and if the engines could be buried in the fuselage and the propellers driven by gears and shafting, that a considerable gain might be expected. Dr. Clauser thought it very unlikely that any manufacturer would be willing to proceed with such a radical design any time during the present emergency.

Elton W. Miller,
Head Mechanical Engineer

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