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ARMY AIR FORCES

MATERIEL ENGINEER Command

ENGINEERING DIVISION

MEMORANDUM REPORT ON

RHM:1hb:57

#30-596  
2-2-59  
Lester-Mason

Date May 5, 1943

SUBJECT: Engine Failures on  
P-47 Airplanes.SECTION Power Plant Laboratory

Contract No. \_\_\_\_\_

Expenditure Order No. \_\_\_\_\_

SERIAL No. RHM-57-430-596

Purchase Order No. \_\_\_\_\_

A. Purpose.

1. To report conference held at Republic Aviation Corporation Long Island, New York, on April 26 and 27, 1943, with representatives of Republic Aviation Corporation, Ford Motor Company, Pratt and Whitney Aircraft Division and the Army Air Forces, on engine troubles being encountered in P-47 airplanes, both in the United Kingdom and the United States of America.

B. Factual Data.

1. The following representatives attended this conference:

Messrs. T. E. Tillinghast, Wright Parkins, Jack Bunch, R. C. Palmer, Wm. Gloss, Bert Thompson, Steve Conley and Chas. Roelke, of Pratt and Whitney Aircraft Division; Messrs. P. Weyl, G. F. Meidl and A. M. Brown, of Ford Motor Company; Messrs. C. H. Miller, A. Kartveli, R. W. Flickinger, L. L. Brubham, D. W. Wood, R. H. Higginbottom, D. K. Tasker, H. Lehne and D. Parker, of Republic Aviation Corporation; General B. W. Chidlaw, Assistant Chief of Air Staff, Materiel, Maintenance and Distribution, Washington, D. C., Materiel Division; Colonel R. Keiller, Production Engineering Section, Wright Field; Lt. Colonel M. C. Dealer, of AC/AS-M.M. & D., Washington, D. C.; Lt. Colonel T. Murphy, AAF Resident Representative at Republic Aviation Corp.; Capt. C. J. Watters, Power Plant Laboratory, Engr. Division; Capt. E. D. Hoover, Air Service Command; Messrs. L. Farnakian, Production Engr. Section, Wright Field; W. Worth, Ray Hoffman, R. A. Stein, and E. W. McLane, all of Power Plant Laboratory, Engineering Division, Wright Field.

2. The difficulties outlined in the Agenda of this conference which apply to this particular report were: (a) Cutting out of the engine at altitudes in the region of 30,000 feet and at low engine powers; (b) Engine roughness at high altitudes; (c) Compressor surging at high altitudes.

3. The data which was received from Great Britain in regard to the above general troubles had been paraphrased twice in transmission and the terminology employed was such that a precise diagnosis of the difficulties could not be made. However, the problem was approached from several possible angles and conclusions were reached on that basis.

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4. Since the conference was attended by a considerable number of people, it became rather unwieldy and as a result was separated into two groups of people who worked more or less independently. The representatives of the Power Plant Laboratory were not present at any of the conference which was attended by the engine manufacturers' representatives. Consequently, the picture thus gained may be somewhat distorted by the lack of coordination between the two conferring groups.

#### C. Conclusions.

1. Conversation with Mr. D. Parker, chief test pilot for Republic Aviation Corporation, revealed that some of the turbo difficulties outlined in the Agenda of the conference had also been noted during flight tests at Republic Aviation Corporation. According to their experience, incorrect setting of the interconnected cockpit controls could result in serious power plant malfunctioning at altitude. Therefore, it was concluded that the interconnected control must be correctly adjusted in accordance with the latest Republic Aviation Corporation's (Field) Service Instructions, substantially as outlined in F.S.I. No. 33 Revised, dated December 30, 1942.

2. Compressor surging is a normal function of this or any other present turbosupercharger installation when flying at altitudes in the neighborhood of 30,000 feet or higher while operating at engine speeds below 2,000 RPM and manifold pressures of 30" Hg. or higher. This surge results from the fact that the turbo compressor is operating beyond its designed range. The surge is a breakdown in air flow which occurs because the compressor is attempting to maintain a high pressure ratio at a very low air flow. This causes the air flow on the compressor and diffuser blades to stall at these conditions.

3. The surging can be avoided to a great extent by proper adjustment of the interconnected controls or by a reduction in turbo boost and increase in engine RPM, or by a general increase in power.

#### D. Recommendations.

1. It was recommended that the latest instructions regarding the setting of the interconnected engine controls be made available to the Services in this country and in the United Kingdom in order to eliminate in so far as possible any unsatisfactory operating condition which arises as a result of maladjustment of the controls.

2. It is recommended that revisions be made to Technical Order No. 01-6580-2 to include a more simplified set of instructions for control adjustment in P-47 airplanes. In order to assist in the adjustment of these controls a suggestion was made that a lock nut turn buckle arrangement be included in the cockpit linkage where the test pilot would be enabled to make the final precise control adjustment during actual flight instead of marking the quadrant in flight, then bringing the ship down and permitting

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the mechanics to readjust the linkage to the markings on the quadrant.

3. It was further recommended that the use of the controls in the interconnected state be substantially restricted to high power operation or combat flying conditions. While on cruising or scout missions it is more desirable to disconnect the controls so as to adjust the RPM and manifold pressure to the correct operating conditions. If it is suddenly required to revert to a combat status this can easily be done by a quick movement of the throttle lever which will automatically engage the turbo-supercharger and propeller control levers.

Concurrence:

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