OXC - 2794
Copy 6 of 6

13 December 1961

MEMORANDUM FOR : The Record

SUBJECT : Current Outstanding Major Technical Problems
JT11D-20 Engine Development

1. The purpose of this report, which is based in part upon a visit to Pratt & Whitney on 6 December 1961, is to summarize major outstanding technical problems and simultaneously to describe major factors leading to the recently acknowledged take-off performance deficiency. That the report focuses on outstanding (unresolved) problems only may present a distorted picture unless it is recalled that the majority of problems by virtue of previous or impending resolution and therefore of lesser import are not considered.

2. Currently anticipated take-off thrust for Y prototype engines is 30,000 lbs. This is 2500 lbs. below the specified thrust of 32,500 lbs. Whether part or all of this deficiency will be removed by delivery of the 30th Y engine is questionable. [redacted] 25X1A has expressed confidence, however, that specified performance will be met by the 150 hour qualification test. The magnitude of the deficiency is due in part to the initial criterion that any performance deficiency be shifted if possible to the take-off and transonic regimes in order that the Mach 3.2 cruise regime not be compromised. Factors contributing to this deficiency, listed in detail on Attachment 1, are: 25X1A

(1) Turbine Profile/Burner Cans.
(2) Afterburner Performance.
(3) Compressor Matching and Efficiency.
(4) Thrust Balance and Turbine Cooling Airflow.
(5) Turbine Matching and Efficiency.

Items (1) and (2) reflect combustion phenomena which are believed to be resolvable without basic rotor hardware geometry changes. Burner can, diffuser case, and spraybar configurations as they effect temperature profile, cooling air flow, and augmentation respectively are believed the key factors. In the writer's opinion, item (1) must be improved prior to flight and item (2) must be improved in order to attain 30,000 lbs. take-off thrust now scheduled for June 1962. Initial (Mach 2) March 1962 delivery engine take-off thrust has not changed from 28,000 lbs. as defined 11 September 1961.

Items (3), (4), and (5), reflect mechanical configuration which probably will require basic rotor hardware geometry changes. Excepting item (5), which is new, items (3) and (4) were predicted in August as contributing probably 6 to 8% with an unprobable maximum of 15% to performance deficiency.

3. Current outstanding problems are listed on Attachment 1 under the general headings of reliability, take-off performance, controls, and durability. Probably the three most important outstanding problems as of today are:

(1) Turbine Profile/Burner Cans.
(2) Hydraulic Pump.
(3) Hydraulic System Flow Dynamics.

4. Questions initiated at recent meetings concerning a possible imbalance between development and endurance testing have been investigated as far as time has permitted. Specific items in question involved experimental burner cans and five ring spraybars for performance improvement. Attachment 1 should attest to the soundness of pursuing these items. The writer has been unable to uncover further indication of imbalance between development and endurance based upon the above limited investigation. Although the contractor will be prepared to discuss this subject at the next meeting, indications point to a sound development philosophy.

SIGNED

[redacted]

25X1A

Development Branch
DPD-DD/P

Attachment:
As cited
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