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*Shield Meetings*

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OX-9140-65  
 Cy 7 of 13

23 AUG 1965

MEMORANDUM FOR THE RECORD

SUBJECT : BLACK SHIELD Technical Meeting [Redacted]  
 12 August 1965.

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This report constitutes:

- Part I - General Aircraft Items
- Part II - Propulsion Oriented Items
- Attachment I - Agenda
- Attachment II - Decisions and Actions
- Attachment III - Aircraft Summary
- Attachment IV - Engine Charts

Part I - Aircraft General:

1. Attention is called to Attachment II, Decisions and Actions which summarize highlights of subject meeting.

2. With the exception of listing de-bug modification service bulletins applicable to BLACK SHIELD aircraft and presenting electrical and power transient mod status (charts to be available in D/TECH), the LAC presentation focused on management actions taken as a result of Mr. Johnson's personal in-house investigation at [Redacted] Burbank. This investigation with its revealing findings was made possible by Mr. Johnson's reorientation into OXCART matters at the expense of other corporate responsibilities resulting from discussions and agreements reached between the initiator, Mr. Parangosky and Messrs Dan Haughton and Kelly Johnson.

3. Currently all Lockheed effort is focused on the primary BLACK SHIELD aircraft 126, 127, and 128 in order

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that they be delivered to the detachment by 1 September as reliable weapon systems. Additional overtime effort is needed and scheduled on aircraft 126 because of improperly cured tank sealant in order to meet the 1 September delivery. Nos. 127 and 128 were reported as out of trouble in the sealant area with a good chance of meeting the 1 September delivery.

4. A brief report by [REDACTED] R&D indicated that aircraft 122 tests showed that the [REDACTED] SIP programs were in good shape.

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Aircraft Systems Division  
Special Activities

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Part II - Propulsion:

1. A chart supported presentation of engine related agenda items was given by Mr. Caleen and Mr. McDermott of Pratt & Whitney. Copies of the more significant charts are included with this report and copies of other engine charts are available in D/TECH.

2. Recent flight experience with "frosty" Hamilton-Standard fuel controls was reviewed. The fact that some trimming will be required for BLACK SHIELD was repeated. It is recommended that minimum trimming to near side of trim band only be used and that further test flights in aircraft 122 be accomplished using this technique while recording EGT and CIT with trace data. The effect on cruise SFC with variation of EGT over trim band was quoted as an improvement of 2.5% in SFC as EGT increases from 755°C to 805°C.

3. A brief review of experience acquired with the derichment device on article 129 was reviewed. Results to date show a maximum temperature of 868°C for a period of less than 10 seconds.

4. "Chugging" and "die out" problems on the ground with engine 207 on the Scotch Mist exercise due to a defective compressor bleed pilot valve were reviewed. This problem has since been more thoroughly reviewed through phone calls and a meeting at Pratt & Whitney in Florida on 17 August.

5. The number 3 bearing compartment oil leakage problem was reviewed. One flight on article 129 was accomplished which reported good pressure data. It now appears that this data agrees with seal pressures calculated at FRDC. It is hoped that the testing now being accomplished on J engine 316 at FRDC might result in a simple field operable fix to the problem. A change to the no. 3 compartment already instituted in later J engines may result in some tendency to reduce oil leakage through seals in this compartment during windmilling conditions. General expected levels of in-flight oil consumption were reviewed. The amount of oil which would be consumed before

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warning lights flicker etc. is 3.2 gal. For flights of approximately three hours duration, oil consumption rates should not exceed one quart per hour. As shown on one of the attached charts for flights longer than three hours in duration, average hourly oil consumption rates are less than one quart per hour.

6. The problem of burning holes in burner cans, especially in the cross-over tube area between cans as experienced in engines 215 and 233 was reviewed. Engine no. 233 with 9 hours, 10 minutes of Mach 3 time was the first engine to approach the 10 hour limit of Mach 3 flight time between hot section inspections. This engine had some history of overtemperatures experienced in-flight but these were not considered at the time. It is hoped that J cans will realize some improvement. Five Y engines are now equipped with J cans, three sets are being installed and deliveries will continue until all Y engines are equipped with J cans in early 1966. It appears that this experience may "put a crimp in the effort" to increase Mach 3 hot section time beyond 10 hours, at least for Y cans. It is hoped that the J cans will provide some improvement. Engine 242 with J cans is now installed in the left side of article 129 and will soon be due for hot section inspection.

7. The gearbox bearing problem was reviewed and the modifications to the gearbox which will eliminate the gearbox vibration check on future overhaul and production engines were delineated.

8. The various engine wiring problems were discussed. These problems were also discussed in complete detail by D/TECH personnel during the visit to West Palm Beach on 17 August. A list of these wiring areas is as follows:

- a. Thermocouple harness nut retention.
- b. Tachometer cable connectors.
- c. Wiring and connectors to trimmer motor.
- d. General P&W experience with Bendix high temperature connectors, methods of attaching, etc.
- e. Supports for wiring and connectors so excessive lengths of unsupported wire do not exist.
- f. Jumper cable extension for right hand engine.

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9. One case of compressor first stage blade root cracking on a shimmed blade has been discovered to date. This discovery was made at overhaul on a blade from engine 241. This engine had experienced 14 cycles to Mach 3. This blade had been reworked for adaptation of the shim and had therefore had .020" of material milled from the root including the original root surface plating. The instrumentation program on engine 226 to investigate blade stresses and boundary layer airflow at the engine face was reviewed. This program was also reviewed in detail at the FRDC meeting on 17 August.

10. Priority engine flight test items were reviewed and a list of these are included on an attached chart. However, due to disagreements in priorities this list will be revised by P&W and a copy forwarded to Headquarters.

11. Other miscellaneous engine developments were discussed including the following:

- a. Engine relight experience with the Bill of Material 50 cc and the reduced 25 cc TEB shots.
- b. Mach 3 flight time by months.
- c. Ice ingestion tests on J58 engine.

25X1 [ ] 12. It appears that the detachment especially Col. [ ] may offer some resistance to use of the new AAR technique whereby one engine is left in A/B and throttle adjustments are made only on the other engine which operates below military power. It appears that there is some misunderstanding as to the exact procedure used by LAC pilots. The exact procedure being used by the LAC pilots and the weights of aircraft during recent successful refuelings with the new technique will be reviewed with the detachment. Due to the apparent success of the new technique it appears that every effort should be made to encourage the detachment to use it.

13. Engine associated action items are listed in the attached action item list.

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14. P&W representatives present at the meeting were:

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[Redacted]

Aircraft Systems Division  
Special Activities

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ASD/OSA/[REDACTED] (20 August 1965)

Distribution:

- Cy 1, 2, 3 - ASD/OSA
- 4 - D/FA/OSA
- 5 - OXC/OSA
- 6 - D/OSA
- 7 - MD/OSA
- 8 - PS/OSA
- 9 - C&FE/OSA
- 10 - CD/OSA
- 11 - D/TECH/OSA
- 12 - chrono
- 13 - RB/OSA

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AIRFRAME AGENDA ITEMS

- A. Debug Mod program and progress.
- B. Preliminary results, if any, of all weather mods as result of SCOTCH MIST.
- C. Replacement of tank sealant.
- D. Outstanding items/systems not contemplated for BLACK SHIELD aircraft.
- E. SB915 - isolation of ARC-50 induced power transients.
- F. SB931 - Suppression of power transient effects on the INS.
- G. Aircraft 129 recommended test schedule priorities in support of BLACK SHIELD and others.
- H. Is electrical connectors and wire debugging to encompass areas beyond inlet control critical areas? If so, what are Mods and S/B numbers.
- I. Plastic and other critical spares for BLACK SHIELD deployment.
- J. Big brakes.
- K. Configuration freeze
- L. Smoke in cockpit.
- M. Electrical problem experiences encountered in Lac area for possible dissemination to sub, or other, contractors.

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ENGINE AGENDA ITEMS

1. "Frosty" fuel control/EGT trim experience, and status to date.
2. Derichment device experience, status, review of selected EGT for automatic activation.
3. Modified TEB ignition relight experience. Progress of tests to redefine relight envelope especially on a cold windmilling engine. Possible effect of new AAR technique on required number of shots.
4. Third bearing compartment, results of recent #129 instrumented flights, FRDC testing results, relation to BLACK SHIELD single engine testing, etc. Review of normal oil consumption rates (i.e., expected rate of oil consumption under average flight conditions on a quart per hour basis.)
5. Inspection results of engines #215 and #233, burner can burning problems, relation to installation effects, relation to current HSI and overhaul time intervals and possible improvements. Expected improvement with "J" cans and availability of these units.
6. Recent roughness tests conducted on Article #122.
7. Engine main gear box status, inspection results,
8. Engine related aspects of recent recurring reports of "Smoke in the cockpit".
9. Review of proposed BLACK SHIELD priority engine flight test items and schedule for Articles #122 and #129.
10. Review of solutions to problem of retaining nuts on EGT thermocouple harness.
11. Review of first stage compressor blade situation. Results of analysis, if available, of shimmed blade recently discovered to have root crack at overhaul. Review of delivery schedule for 30 additional sets of waspalloy blades, and program for installing these sets in engines.

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Att. II to  
OXC-9140-65

DECISIONS AND ACTIONS

A. Aircraft 129 to be scheduled for multiple refueling Scotch Mist/Silver Javelin route range flight prior Scotch Mist re-deployment. (Accomplished)

B. Additional aircraft 129 major flight test priorities (not in order) to include additional Silver Javelins (high altitude, low KEAS) range improvement, one engine out performance as soon as engine windmilling restriction lifted, other BLACK SHIELD specifics on pacing schedule, and investigation current BLACK SHIELD pacing flight problems as required.

C. Aircraft 122 to perform small number additional production [Redacted] tests prior to engine instrumentation switchover. Engine program immediately following ECM or concurrently where feasible to include Frosty fuel control EGT operating band limits confirmation tests with recommended manual trim procedure in addition to other BLACK SHIELD and engine specifics.

D. Aircraft 132 to perform Hycon, PE and EK camera and MH family tests as time permits prior modification.

E. Aircraft 121 to perform engine compressor blade strain gage survey tests as soon as feasible and prior to scheduled 34K engine performance confirmation.

F. All OXCART contractors including [Redacted] and Comm-NAV suppliers to be briefed asap by Kelly Johnson on LAC BLACK SHIELD management/technical acceleration improvement program [Redacted]. In addition, stress to be placed on quick reaction capability to problems, quick feedback test results, cross polinization techniques, and concurrent actions for problem resolution.

G. Voice recorder destruct, heretofore a BLACK SHIELD go-no go requirement, because of technical problems will not be finalized prior deployment and mission procedural changes will be made in the use of the recorder prior destruct availability.

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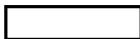
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K1 H. Four outstanding previously coordinated details of the [redacted] design freeze will be finalized between LAC and Headquarters communications.

K1 I. Installed timing of increased capacity brakes to be coordinated between [redacted] LAC.

J. Detailed information will be supplied to Detachment by LAC delineating AAR procedure with one engine in afterburner and adjusting thrust with other engine. This information should include experience acquired from recent Silver Javelin and Scotch Mist flights with data on weights of A-12 aircraft, amount of fuel onloaded, etc. at each refueling.

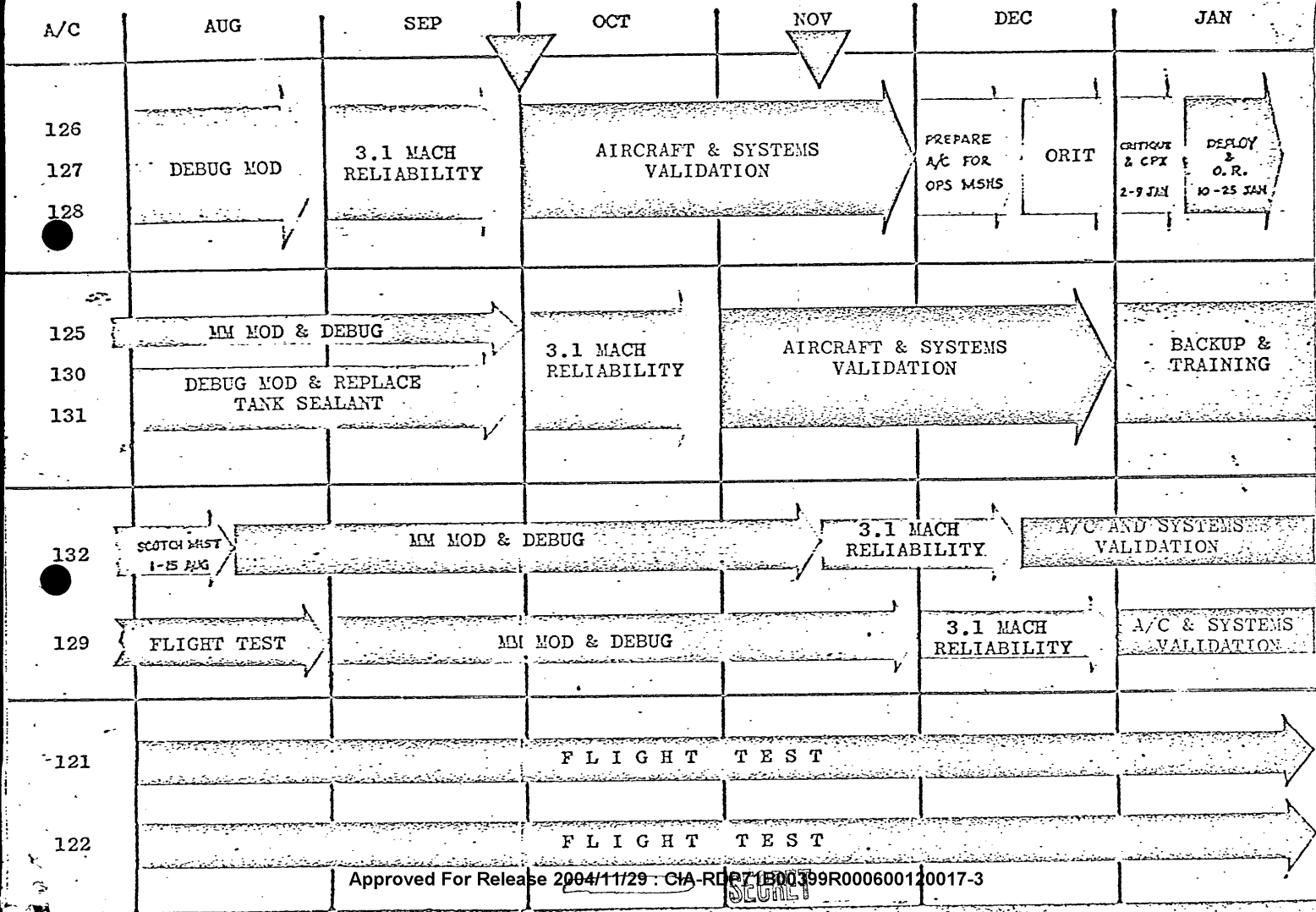
K. P&W will provide at General Ledford's request a paper delineating management response and procedures being enacted to intensify effort to improve the general level of engine reliability for BLACK SHIELD.



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FLIGHT TEST

A/C PREPARATION

PERFORMANCE TEST

ENGINE TEST

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FEB  
A-50  
MACH HOLD

BASIC AIRPLANE  
DEMONSTRATE 3.1  
RELIABILITY.

MINIMUM OF 2 FLTS  
NON REFUELED.

MINIMUM OF 2 FLTS  
WITH REFUELING.

MINIMUM OF 1 FLT WITH  
ELECTRONIC EQUIPMENT.

MINIMUM OF 1 FLT WITH  
CAMERA SYSTEMS.

ENGINES  
CAMERAS I & II  
TACAN  
SCDM  
IFF  
ARC-50  
ECM  
SIP  
BW  
SSB  
WX MOD

COCKPIT HEAT RADIATION SHIELD  
FUEL READOUT  
DERICHMENT VALVE.

MINIMUM OF ONE 3  
REFUELING FLT PER B/S  
A/C TO BE DEPLOYED.

CERTIFY 2 A/C

PERIODIC INSPECTION  
AND CANNIBALIZATION OF  
BEST SPARES AND SYSTEMS.

ENGINES  
SPIKES  
VERTICALS  
TURBINES  
I. N. S.

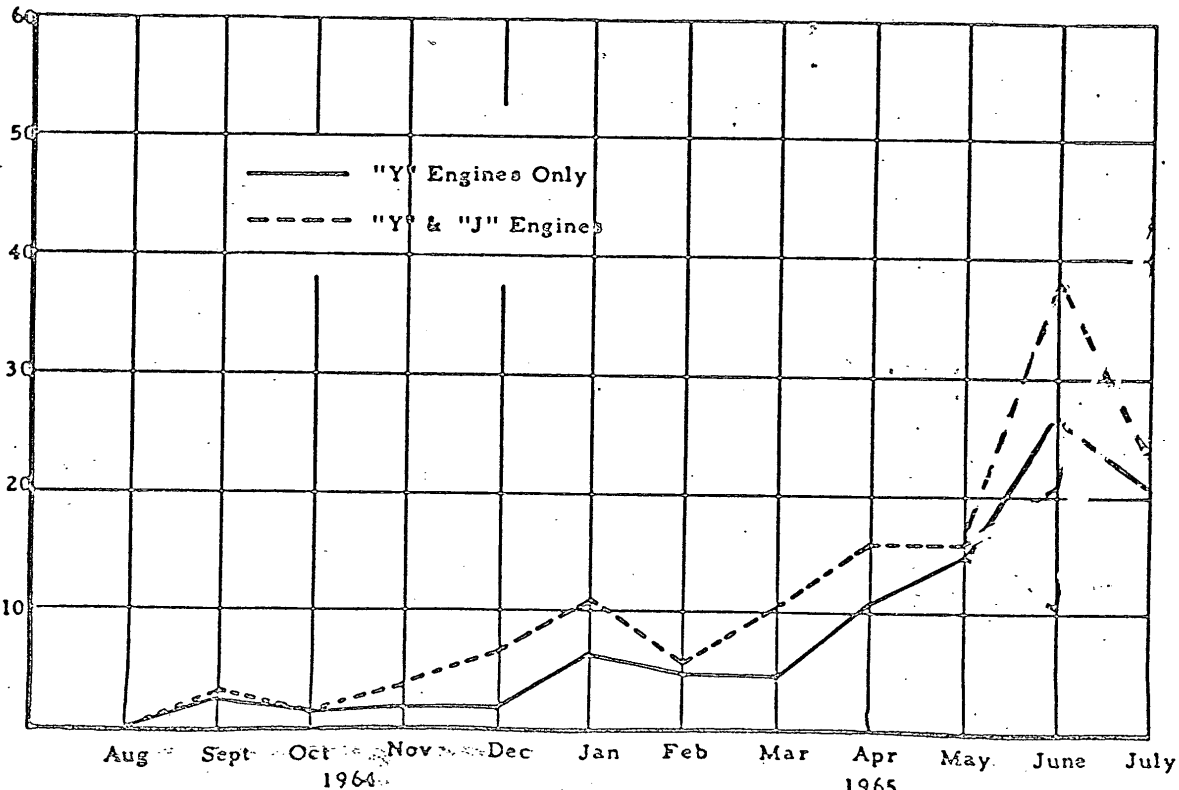
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MACH 3.0 TIME

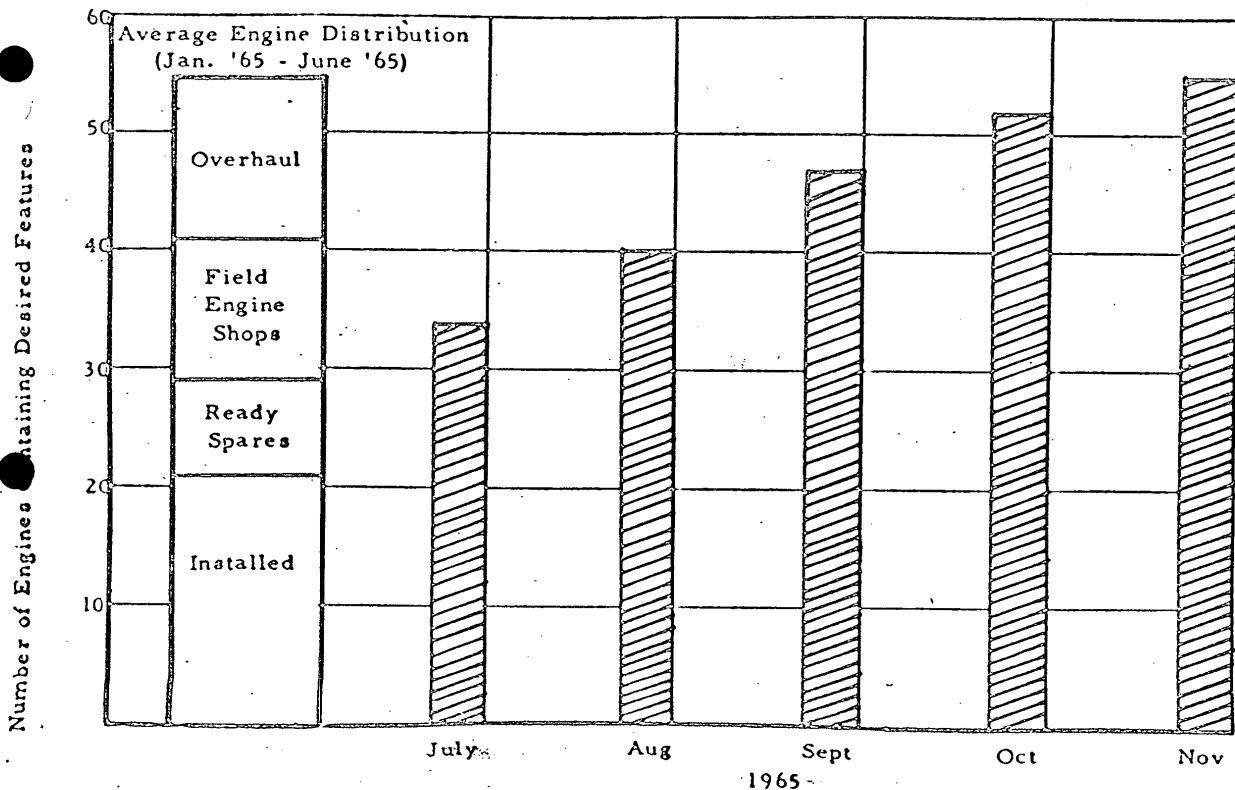
MACH 3.0 AND ABOVE TIME  
IN ENGINE HOURS



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### BASIC ENGINE STATUS

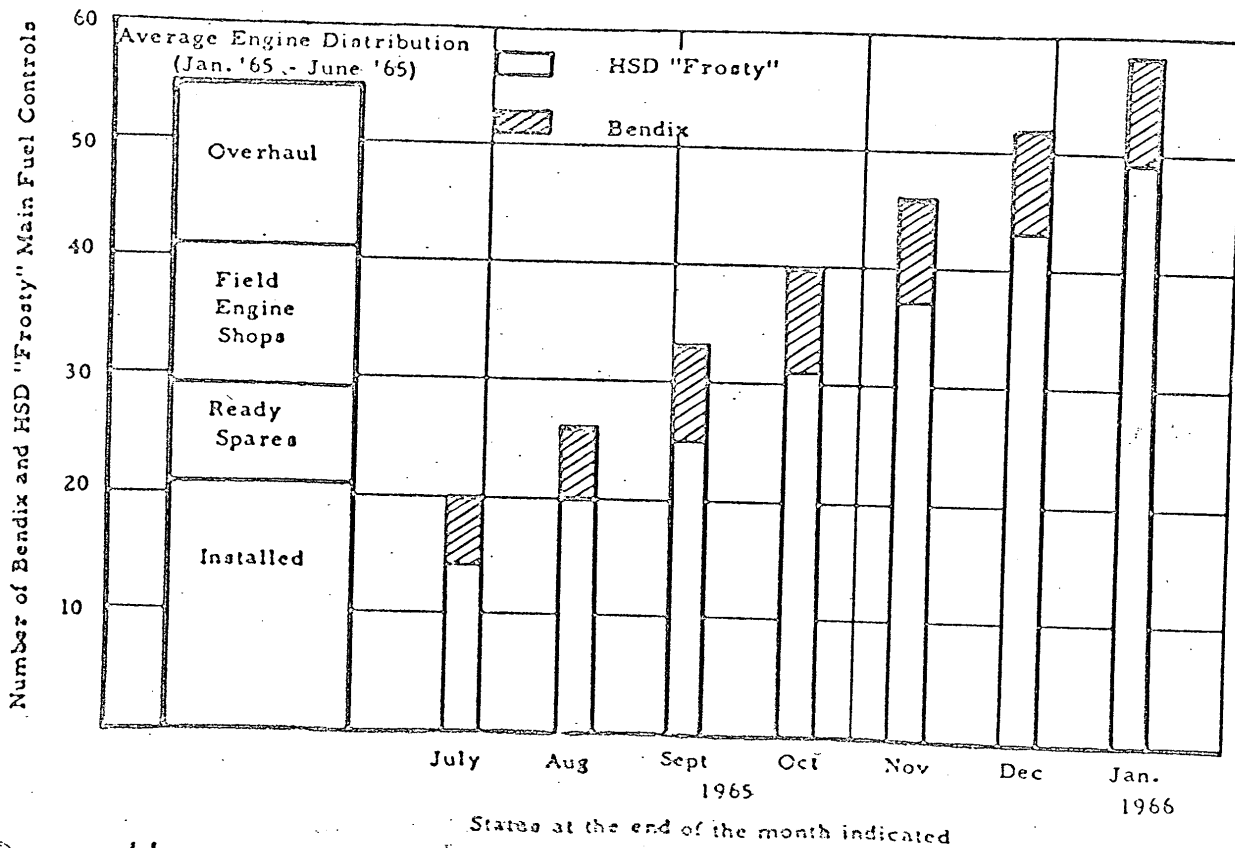


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### MAIN FUEL CONTROL STATUS



Status at the end of the month indicated

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## Flight Test Results:

<u>Article - Flight</u>	<u>Altitude</u>	<u>Mn</u>	<u>Max. T<sub>t5</sub></u>	<u>Time at Max T<sub>t5</sub></u>	<u>Time Over 805°C</u>
129 133L	83K	3.08	868°C	7.5 Sec.	29 Sec.
129 134L	81.5K	3.13	864°C	10 Sec.	15 Sec.
129 134R	81.5K	3.13	865°C	6 Sec.	11 Sec.

## Delivery Schedule:

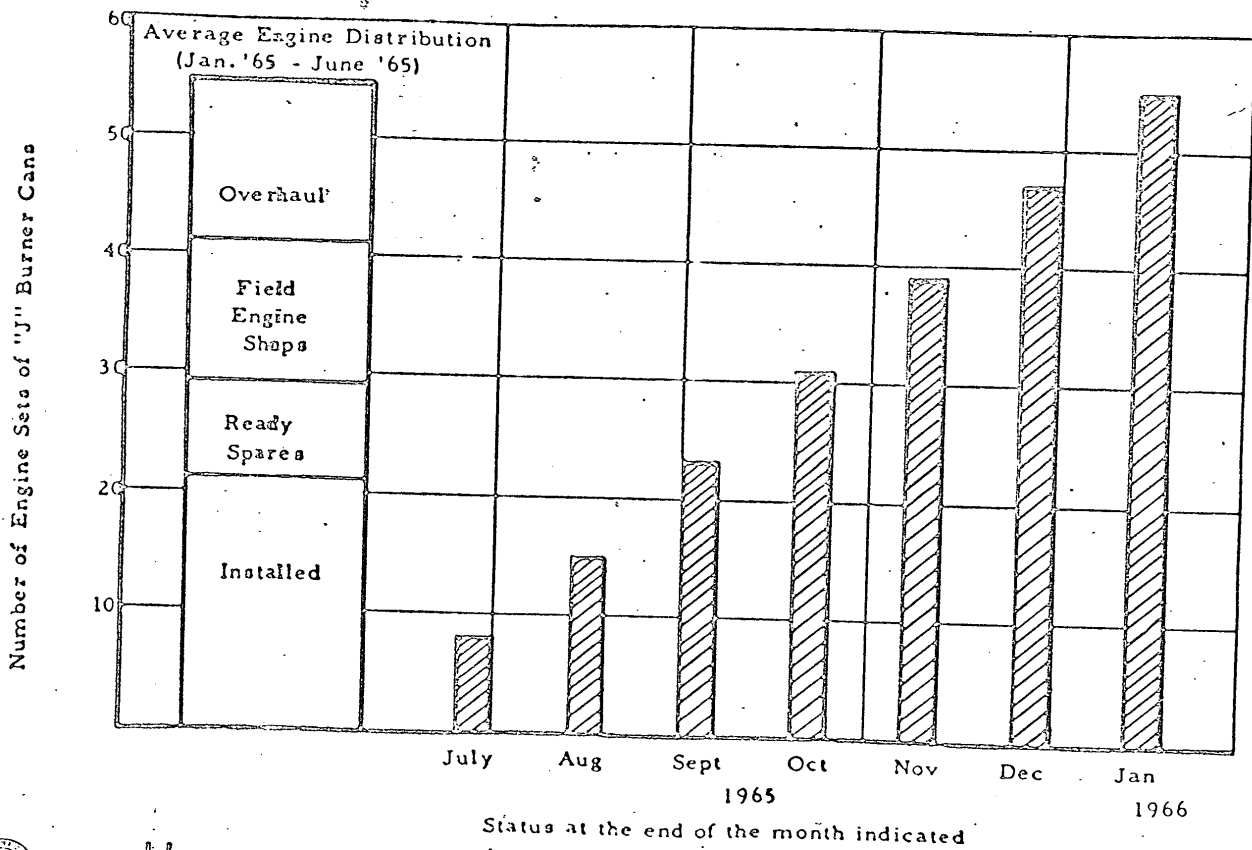
- 6 Engine Sets on Service Test No. 39
- 2 Engine Sets Delivered for Engines for Article 2001
- 28 Engine Sets to be Shipped August 20, 1965

Retrofit Engineering Change 172058K Being Issued - Parts Schedule Not Yet Available.

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### "J" Burner Can Delivery Status

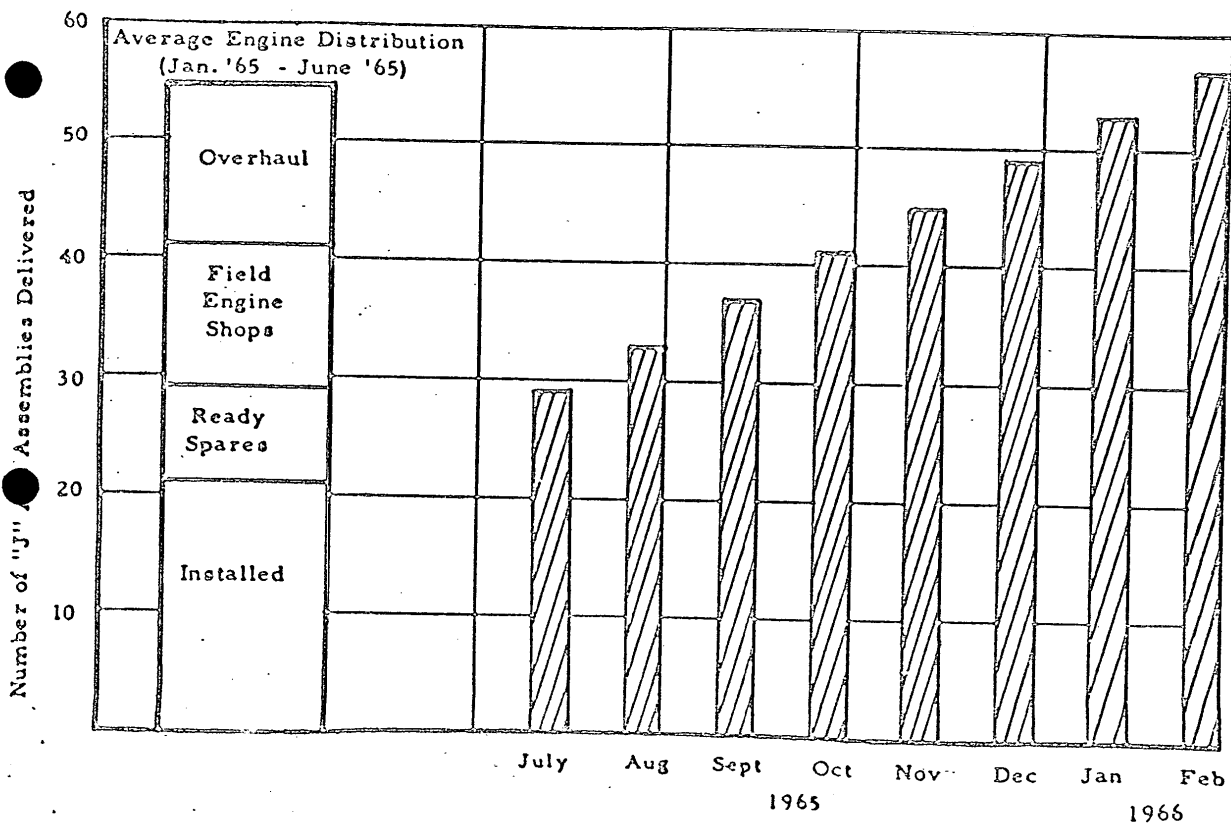


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"J" Afterburner Assemblies for "Y" Engines - - Delivery Status



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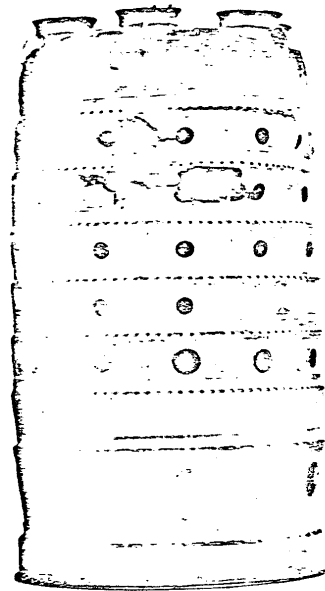
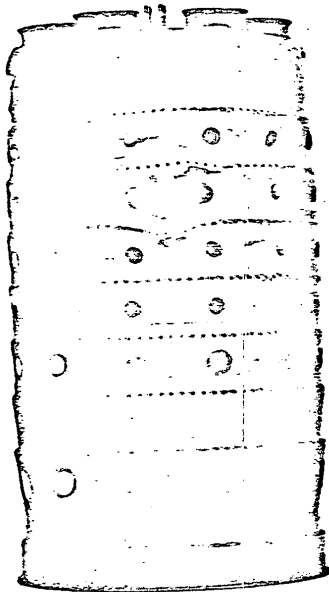
ENGINE FLIGHT TEST PROGRAMS

1. Evaluation of 34K Engine
2. Investigation of Compressor Blade Root Cracking
3. High Altitude, High Mn Fuel - Oil Heat Rejection Program
4. Breather Pressure, Chamber 4 Pressure, Nacelle Pressure Investigation
5. Fuel Control System Programs
6. Altitude Relight Envelope Program (Main Engine and A/B)
7. Establish Engine and A/B Blowout Limits
8. Evaluation of Fixes for A/B Liner Distress
9. Evaluation of Improved Flame Pattern A/B
10. Miscellaneous Tests and Evaluations

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### Rig 233 Burner Cans

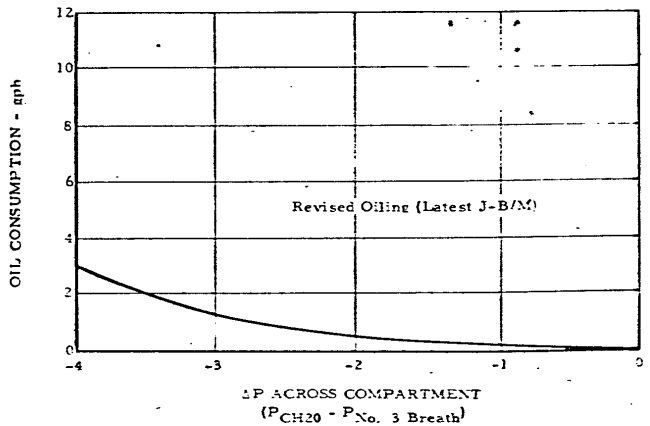
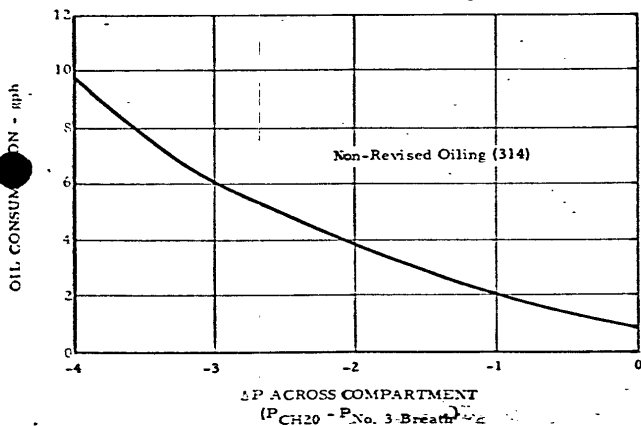
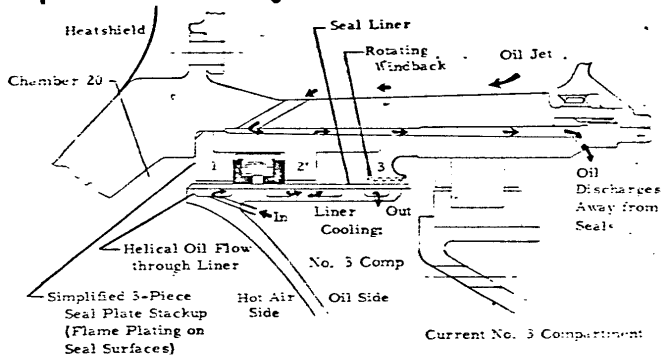
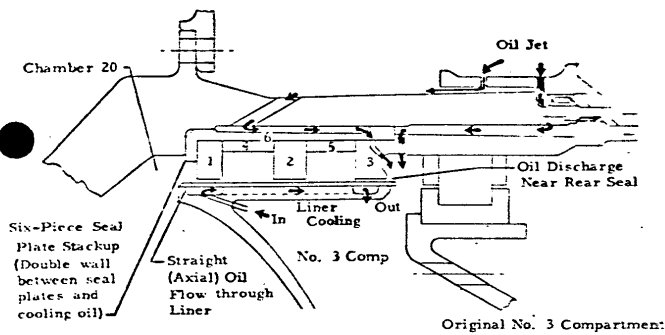


POSITION NO: 3, ENGINE 233

Rotated 180°

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### Past and Present (No. 3 Compartment) Oiling Schemes



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### MAIN GEARBOX VIBRATION STATUS

Main engine gearboxes containing all of the following requirements may be used without any vibration survey or restrictions:

EC 172319C	High clearance bearings at idler locations
S. B. 211A	Red lead check of gear track
S. B. 220	Increased seating torque for hydraulic idler stub shaft

Above requirements are in 328 and subsequent from Production and last August engine and subsequent from O/H. Three O/H engines already delivered to the above requirements.

Main engine gearboxes not containing above requirements must be subjected to vibration survey (0.15 Mil limit) which will place the box in one of the following categories.

- 30 Accepted - unrestricted use, no further vibration check required
- 2 Conditionally Accepted - must periodically (5-7 hours) undergo vibration check
- 3 Rejected - must be disassembled and rebuilt to latest requirements
- 35 Gearboxes checked to date

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**FIXES FOR ELECTRICAL PROBLEMS ON ENGINE**

**1. LOOSE NUTS ON  $T_{t5}$  PROBES AND J-BOX**

Tab Locks will be Retrofitted in Field Starting Approximately  
16 August

**2. J ENGINE  $T_{t5}$  PROBE POTTING COMPOUND BREAKDOWN**

Corrected by EC 160152 on Engine 310 up  
Retrofitting all Earlier Engines

**3. BROKEN HARNESS EYELETS**

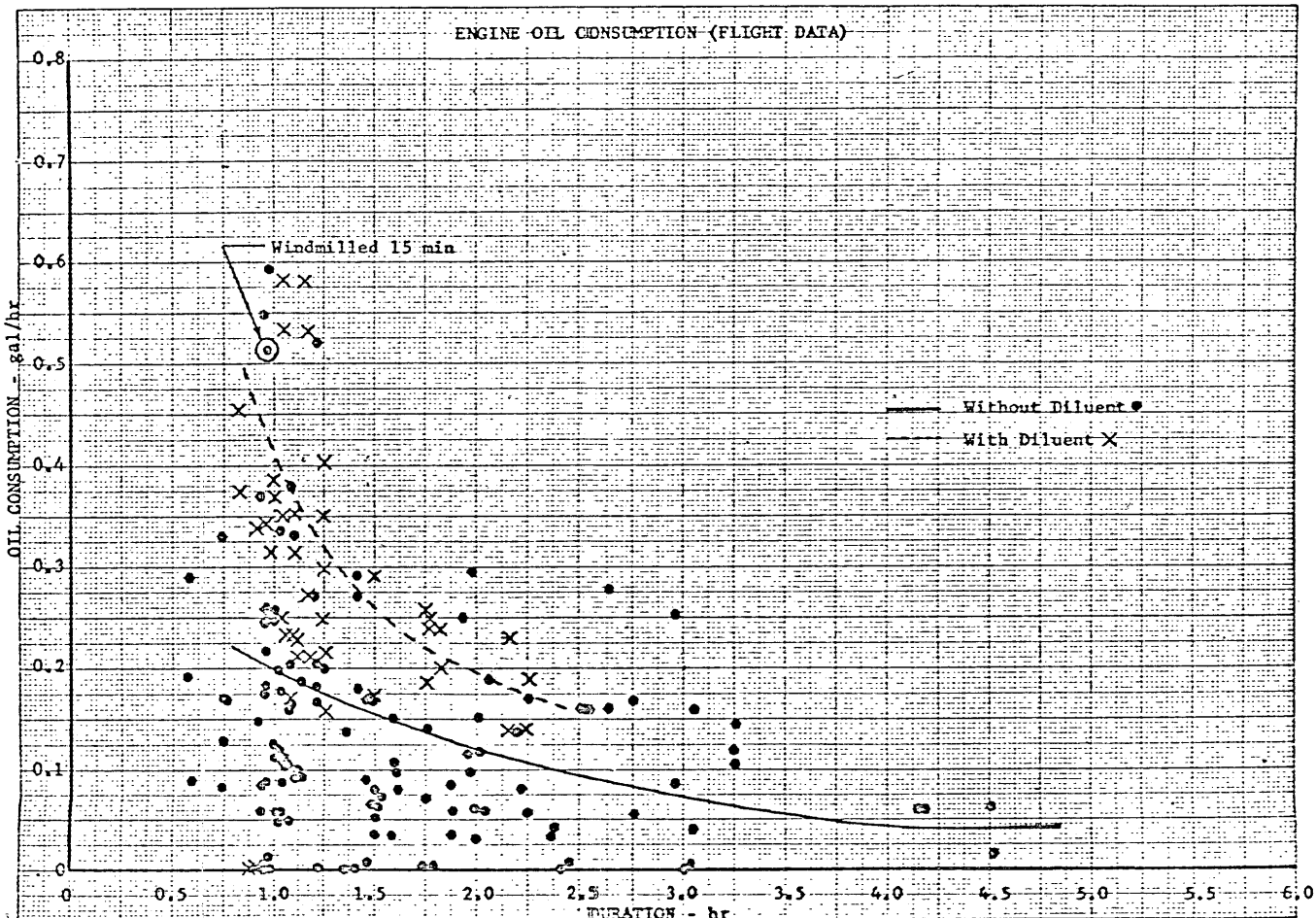
- a. Heavier Terminals on Latest Harnesses
- b. Split Separators to Remove Restraints
- c. Testing at FRDC to See if More Support Required for  
High Secondary Air Velocities over Leads

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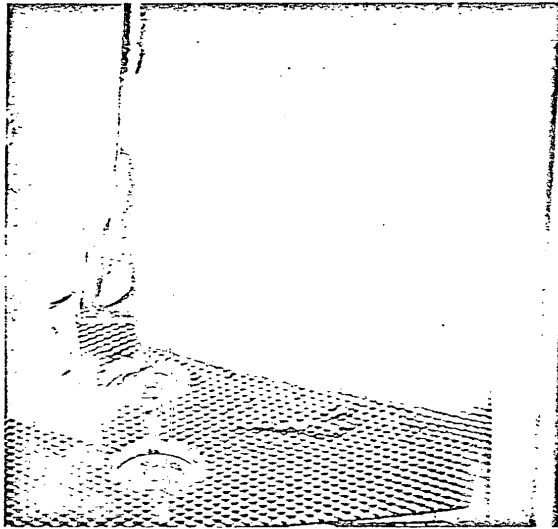
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### Ice Ingestion Test



BLADE DAMAGE DURING RUN NO. 1

Run	Rpm	Ice Size - in.	Remarks
1	6820	12 x 12 x 1/4	1 Blade Torn 1/4 in. x 2 1/4 in. and 1 Blade 1/4 in. Vee Tear 15 Rolled Tips and LE Dents
2	4500	12 x 12 x 1/2	Hit Nose Cone and Broke Up. No Blade Damage
3	4500	12 x 12 x 1/4	One 1st Blade Dented
4	4500	12 x 12 x 1/4	Eight 1st Blades Dented.
5	4500	12 x 12 x 1/4	Eight 1st Blades Dented
6	6500	12 x 12 x 1/4	10 Blades Dented, 4 with Tears and 2 with Dents

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