

Date: 6/16/55

From: R. L. CALLEN

To: Ozzie

attached summary
is a copy of one
I made up primarily
for my own files.

R/L

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May 23, 1953

Dear Elmer:

With reference to our discussions on the subject of instrumentation for the first airplane I am summarizing below our thoughts.

A. For the first flights we would suggest only the minimum amount of instrumentation until we have an indication of the nature of any particular problems that may require further investigation. This minimum instrumentation should include the following:

1. Turbine Discharge Pressure Gage indicates the total pressure aft of the third stage turbine.
2. Tachometer indicates per cent of MAXIMUM high pressure rotor speed biased by the tachometer gear ratios.
3. Exhaust Gas Temperature Gage indicates the temperature of the exhaust gas immediately down stream from the turbine exit which serves as a relative indication of the temperature at the turbine inlet.
4. Emergency "On" light indicator.
5. Fuel inlet Pressure Gage indicates fuel boost pump output.
6. Oil Temperature Gage indicates the temperature of the oil as it enters the oil pressure pump.
7. Oil Pressure Gage indicates oil pressure pump discharge pressure.
8. Fuel flow gage indicates fuel flow from the engine fuel control.
9. Free air temperature gage which will indicate total temperature for any air speed.

In addition to the above some thought and planning should be given to the following as a provisional instrumentation to assist in evaluating any particular specific problem. This follows basically the outline which I have previously supplied to you but expands slightly on some of the details.

B. On oscillograph

1. Burner pressure ("T" into the control sense line) approximately 800 psi gage required.
2. Low compressor discharge pressure (we will supply pick up when and if needed).
3. Engine fuel flow rate. (Primary stable fuel flow not attempting to get dynamic changes except to record status and time of dynamic change taking place. Photo panel would be satisfactory).
4. Primary differential pressure (fuel pressure across the pressurizing valve. The differential can be measured on a gage having a range of from 0 to 600 psi.)
5. Low pressure bleed valve actuator position lights (by means of adapting mechanical switches to bleed valve.)
6. Static pressure within accessory compartment near low pressure bleed port exit.
7. Power lever position.
8. High rotor speed (N_2 tachometer drive ratio equals .430765.)
9. Low rotor speed (N_1 tachometer drive ratio equals .678245).
10. Outside air temperature.

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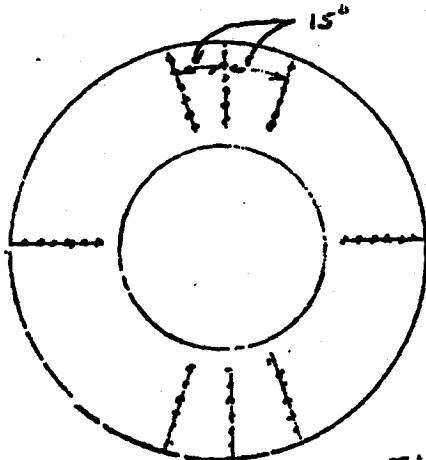
11. P₄₇

I have checked further on the measurement of P₄₇ and as we discussed the arrangement will provide for connection to two indicators; one presumably the cockpit and one the photo panel. The other four pads originally used for the electronic type control are not identical and hence a standard P₄₇ type thermocouple would not fit in these locations. In addition measurements at these points will differ from those taken at the other points indicated and hence we question the value of taking these additional readings at this time.

C. On the photo panel we should record the following:

1. Outside air temperature.
2. Fuel temperature at the fuel meter.
3. Altitude
4. Indicated air speed.
5. Turbine discharge temperature.
6. Holley bilged governor sense pressure. (This would be essentially inlet duct pressure at the governor sense location.)
7. Fuel pump inlet pressure.
8. Inlet duct pressure (rakes)

NOTE: For inlet duct distribution we do not have mounting bosses on the inlet flange at the proper location for surveying your particular duct configuration but would suggest on the basis of visual observation and wind tunnel testing to date that we consider the following locations in the duct immediately ahead of the engine. For this purpose we are willing to make available ten sets of inlet rakes (eight for installation and 2 spares). I would appreciate it if you could process a purchase order to PMA Spare Parts to cover the purchase of these rakes #194026. The price on these rakes is \$212.50 each net to the aircraft manufacturers. If you would prefer to make up your own rakes, this is, of course, perfectly satisfactory to us.



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May 25, 1955

Dear Elmer:

In response to your request I am enclosing a copy of the fuel control drawing No. 261302 with change C-1 included thereon. On this drawing you will find the location marked in red pencil at which the connection should be made for the switch to shift the control from primary to emergency operation and for the locating light which will show that the emergency is on. The control at this point of connection has a common plug No. 6908-165-1P-002 which will mate with end. You should, therefore, supply a connection such as AN5108-165-15.

You will note that these connectors are seven plug connectors but only four of the prongs are utilized in this set up. The location of these four prongs are identified by the letters in red pencil on the referenced drawing. The four prongs which are utilized are as follows:

- B "Emergency on"
- D "Primary on"
- E "Indicator light for emergency on"
- F "Common"

The power requirement of the motor actuator which selects the normal or emergency fuel system is 6.5 amps. maximum at 28 volts. Enclosed is a "Schematic wiring diagram for fuel control motor actuator" from our Installation Handbook, Section 7. Also enclosed is a copy of JTS Information Letter #1C dated June 30, 1954 which describes the emergency control system of the type we will be using except that our system will not have any automatic transfer to the emergency system.

changed to note Kopyak to 1.0 amp

Sincerely,



P.S.

Enclosed is a picture showing at least a portion of the ground disassembly stand for which four are being procured for this project. This shows enough to indicate that it is a somewhat heavy and bulky stand and your people may wish to proceed with additional lightweight stands along the line of our discussion when I was last there.

13 JUNE

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The above is largely a review so that we might have a base line for any questions or discussions which you may have on the subject of instrumentation. In addition, I intend to supply you with a more complete story on our recommendations concerning the use of P₂T for flight operation.

Sincerely,

R/6

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Status Report

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June 1, 1955
(modified as noted)

JUNE '55

A. Contractual & Support

1. Amendment No. 134 to NDas 58-1028-1 received and signed May 18, 1955 for 20 each J57-P-57s.

Total price [REDACTED]

1st P-57 shipped May 23, 1955

2. Amendment to Spare Parts contract to cover 20 overhauls and 50 maintenance cycles.

- a. list prepared by FWA based on 2/1/55 B/M.
- b. list submitted by FWA April 18.
- c. orders (7) received covering above Apr. 30
- d. Orders not yet accepted due to engineering changes to original list

original list [REDACTED]

(peculiar parts originally ordered on E.O.A. #M-382 of 1/25/55)
(final order accepted for [REDACTED])

3. Amendment #134 (see A-1 above) provides [REDACTED] for special tools and ground handling equipment. Specific order is now in ASO's hands who in turn are seeking "Bureau" approval to order. (Tools released by E.O.A. M-388 dated 4/18/55). (6-3-55 order now received at BAR)

4. Mock-up procured and delivered under A.P. contract via Bureau on Feb. 14, 1955 [REDACTED]

5. MIPR issued to Bureau for 20 J57-P-51A's. Order now in process at Bureau (through negotiation stage) [REDACTED]

Stock sales order issued 2/17/55 for deliveries J-2, F-3, M-5, A-5, M-5, 1955. (Proposed amendment submitted to the Bureau 5/18/55). (As of 6/15/55 amendment ready for submittal to FWA.)

6. An E.O.A. #M-386 was issued in March 18, 1955 with supplements since to cover support of 25 overhauls and 50 maintenance cycles. Referral order being prepared in Spare Parts. (6/6/55 priced proposed order [REDACTED]) (Proposed order sent AMC 6/7/55)

7. Additional supplementary referral orders being prepared to submit to ASO via AMC to cover following:

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- a. Additional parts introduced by engineering changes since original list. (KLC-JB 5-15)
 - b. Change in controls from JFC-23-5 to JFC-12-2 in order to "incorporate" emergency control features". (KLC-JB 5-15)
 - c. Retrofit kits for adding one generator drive to top of N₁ drive. (KLC-JB 5-15)
 - d. "Bits and Piece" list for maintenance and overhaul of H.S. control, Cocco fuel pump, and GLA ignition system. (KLC-JB 5-15)
 - e. Parts to incorporate change #00514 (#5 bearing seal) in first engine. (KLC-JB 5-15)
 - f. Maintenance and overhaul parts for (b) and (c) above. (KLC-JB 5-25)
 - g. Deletion of parts not needed for support due to removal of anti-icing lines at airplane manufacturers. (KLC-JB 5-25)
(submitted proposed order to AMC 6/3/55)
8. MIPR has been issued by AMC to ASO to cover 50 overhauls on P-57 and 25 overhauls of P-51A's. (Will check again on 6-11 as to status at ASO.)
- 50 x [REDACTED]
25 x [REDACTED]
- (6/6/55 repairing contract actually received at Airports.)
9. Suggested spare parts orders for "Bits and Pieces" on P-57 to cover Cocco fuel pump, Hamilton fuel control and GLA ignition system submitted to AMC 6/14/55

B. Technical - Engineering and Installation

On P-57 Engine

1. Mock-up shipped 2-14. Revisions supplied on 3/25/55 due to Engineering Changes.
 - a. R.H. oil press line.
 - b. Fuel pump and fuel drain line
 - c. Drain elbow on oil tank
 - d. Oil inlet temperature bulb.

Bringing out fuel control revisions 6/6/55 by R.J.G.

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2. Installation Drawing - #252901 sheets 1, 2, & 3.
5/29 change OS, 1,1
newest copy sent 5/6/55 - R.L.G.
 3. Suggested Initial and potential supplementary instrumentation.
5/28/55 RLC to R.G.
 4. Made arrangements to cover conversion of JFG-12-5 controls to JFG-12-2 controls with "emergency" features at Ham. Std.
5/15/55 RLC to S.Sherwood - H.S.
 5. Reviewed Report #10567 on wind tunnel testing of inlet ducts. Indicated concern that distribution indications may cost as much as 5,000' in critical altitude. 5/15/55 RLC - CEJ
 6. Reviewed prospects of altitude stand testing in response to request. Summarized experience to date and hope of additional testing.
5/12/55 WFO to CEJ
 7. Discussed special fuel with O.R. and C.E.J. and agreed sample is worth calculated risk of procurement for test base. Agreed to advise of any adverse full scale test results as soon as available. To restart test next week.
5/26/55 RLC to CEJ
Verbal RLC to O.R.
- (On 6/15/55 advised O.R. that full scale running completed but inspection and results not yet determined.)
8. On Fuel Control - have pointed out that manual control to tail pipe temperature will be required above 55,000' on P-37.
4/6/55 RLC TO R.B.
Have supplied target curve on P-51A showing auto control to 50,000' and manual leaning above.
 9. The present Fuel-Oil system in the Installation provides fuel-oil cooler (small) plus two "Constellation size" air-oil coolers. The fuel-oil cooler provides a source of heat to prevent "icing" in the control and in the line filter since it is located in the "fuel-in" line. It does result in fuel temperatures under limiting conditions of 180°F. We have expressed concern about -(a.) effect of high fuel temperature on control metering characteristics and (b) effect of pressure drop in fuel-in line on engine fuel pump performance. We have been requested to run tests ^{as} sight experience with (a.) above. (b) is not considered serious because it is primarily a take-off condition that becomes critical and this project could operate with reduced T.O. power if necessary.
5/26/55 RLC - CEJ
5/31/55 verbal RLC - CEJ

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10. On the effect of high pressure bleed flow on engine performance we have plotted to spec. curves when operating by auto. control-fixed power lever position - result - 1% bleed costs approx. 3% in thrust and 1% SFC (P-37 spec. A-1007-A). We made a specific calculation assuming "fixed turbine inlet temp and advised cost 3% in T. and 2% in SFC. (MLC-MS 4/6/55)

11. Having Engineering review exhaust nozzle size recommendations in view of Martin tail pipe test. (MLC - WEB 5/27)

(On 6/8/55 recommended to CEJ the same axis nozzle as we recommended for Martin.)

12. Preparing story on P_7 as operating variable for control. (MLC - WEB 5/27)

(Gave CEJ and O.R. copies of suggested operating curves for P_7 and/or P_7 .)

$\frac{P_2}{P_2}$

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1. Clearance has been obtained and [redacted] is now assigned to this project.

2. Estimate building up to minimum of 9 service men and a maximum of 14 by end of 1956. HLG to FF 5/25/55

3. Clearances are in process for:

[redacted] Project Engineer
[redacted] Control Engineer
[redacted] Flight Test Engineer (O.K. on 6/12. Notified 1011 to have him returned for discussion.)

4. Clearances obtained on following service men:

[redacted] - (O.K. on 6/12. Notified D. Pierce we desire available no later than 7/15.)

[redacted] - O.K.
[redacted] - O.K.

Technical (Cont'd)

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P-31A (JTSC)

1. Inst. Drawing replaced layout on JTSC-1
Prototype #267801 sheet 1 & 2 Apr. 15, 1955
2. Requested control system bias be established for military power
(full) at 30,000' and up. HLC-WHB 5/4/55
3. Requested reinstallation of single H_1 rotor accessory drive for
alternator (approx. 7500 RPM at alt.) in "G" HLC-WHB 5/4/55
4. Requested "Emergency" system in control.
5. Suggested elimination of diaphragm (not used in installation).
(weight saving).
6. Agreed elimination of front mount pads (weight saving) and constant
speed drive *support*. verbal WHB-HLC 6/8/55.

PLC

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