INTER-DEPARTMENTAL MEMORANDUM

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To See Circulation
From J. D. Hodge - Technical Flight Test Co-ordinator
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Subject DATA EDITING AND MONITORING PROCEDURE FOR FIRST FLIGHT

The Flight Test Dept. have arranged to record all the required flight data, and the Technical Dept. have considered how to process what data they receive. There is a region in between, however, where the jobs of both departments merge (namely the editing stage) and no definite procedure has yet been suggested.

It is considered that some clarification is needed on this subject so that everyone concerned will be aware of what is expected when flight testing starts. The whole point of editing is to save time, and every effort should be made to ensure full use of it.

A more complete study of the editing problem will be made in the near future, but for the time being we will restrict ourselves to that of the first flight, which is in so many ways different from any other flight. This case has been considered in some detail for the purposes of general familiarization.

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INTRODUCTION

Ths only mandatory rsquirement for data from the first flight is the limited amount obtained via tslemetry. The Flight Test Dept. are not required to be ready to supply additional information on ths airborne Data Tapss, and we will assume that this will not be available. This report will be only concerned with the intelligent viewing of data in rsal time (i.e. at the same time as it is actually occuring)

The two primary purposes of tslemetry are:

(i) Safety monitoring.

(ii) Initial editing.

From ths point of view of the first flight the smphasis is on the former, and to a large sxtent the paramsters requested for telemstry wsrs chosen with this in mind.

Tslsmetersd information is transmittsd by one of ths following two msthods:

(i) FM/FM giving a parameter in a continuous form.

(ii) PWM/FM giving a paramstsr commutatsd at 20/sec.

VISUAL PRESENTATION

In addition to bsing recordsd on magnstic tape, ths telsmetsred parametsrs are mads visibls in one of two forms.

(i) On Sanborn Recordsrs as continuous tracss.

(ii) On ths multi-channsl monitoring 'scope as a vsrtical bar prssentation.

The formsr gives a permanent rscord, while the lattsr doss not. If it is dscided that a permanent continuous tracs rscord of any item on the 'scope is rsquired for furthsr study, ths magnetic tape may bs played back aftsr ths flight to obtain same.

The types of output will bs considersd in turn.

(i) Sanborn Rscorders. Three recorders will be used, each with 8 channsls. Two of these will be ussd for ths 14 Stability and Control parameters (6 FM and 8 PWM), and ths Bypass Gills open and shut indication (ons or two channels, as required). Naturally any PWM channsl which is played back on a Sanborn will appear as smoothsd 20/ssc stsps.

The third Sanborn will be used as followe:

1 - 5 Vibration pick up accelerometers (FM)
6 - 7 Fuel contents in port and stbd. collector tanks (PWM)
8 Air conditioning turbine RPM (PWM)

(ii) Multi-channel 'scope. The scope can accommodate up to 40 parameters. For the first flight we will only be using 9 of them.

1 - 5 Engine inetallation etructural temperatures.
6 Engine oil temperature.
7 Fuel temperature.
8 Flying control hydraulics temperature.
9 Utility hydraulics temperature.

It can be seen that in this particular caee all are temperature readinge. It is propoeed to introduce a yellow and red line system to facilitate the monitoring of temperature. A yellow and a red mark will be made on the screen over each temperature column in the 'scope, corresponding to specific temperaturee. Yellow and red line temperatures will always have the eame meaning, as defined below. Values have been assigned to theee in each case for the first flight, and are listed on sheet 4.

(i) Yellow. A figure at which the monitoring engineer should start to take close notice, although going above this value is not in itself a dangerous condition. The range time (which will be on dieplay throughout the test) should be noted each time this line is croesed (whether increaeing or decreasing).

(ii) Red. A value above this line cannot be tolerated and stepe must be taken to avoid going above it, and in the event of exceeding it, to return below it in all haste.

(iii) Further Reduction. 23 of the telemetered parameters will thus be presented as analog traces by means of the Sanborn Recorders and the 9 viewed via the 'scope can, if necessary, be presented as continuous traces after the flight. This is all that will be required in most cases. In addition portions of the work may be digitized and tabulated versus time, if desired. It is believed that there will not be an I.B.M 704 program completed in time for the first flight, so that it will not be possible to perform any computations. This will mainly be of concern to the Stability and Control group. No serious consequences are forseen however since:

(a) Other than the fact that the aircraft will be in the air, there will not be any actual Stability and Control tests carried out on this flight.

(b) The time gap between first and second flight will be such that manual computation will be possible .

PERSONAL REQUIREMENT

(1) Sanborn Recorders. Two engineers from the Technical Dept. and one from Flight Test will be required for the two Stability Sanbons. For the third Sanborn, one engineer from the Technical Dept. and one from Flight Test for the Structural Integrity accelerometers, and one from Flight Teet for the Fuel System and Air Conditioning traces. This gives a total of six men on three Sanborns (it should be noted that it is considered deeirable to limit numbers to a maximum of two men per Sanborn ).

(2) Multi-Channel 'scope. One engineer from the Flight Test Dept. will be sufficient to monitor the 'scope and to act as necessary should any excessive temperature be approached.

ACTION

(1) Sanborn Recorders. The three engineers required for the two Stability Sanborns should be nominated so that they may discuss the job in hand amonst themselves. They may wish to specify the placing of parameters on the two Sanborns. The engineer ehosen from Flight Test to monitor the Fuel System and Air Conditioning traces of the third Sanborn should make himself familiar, by discussion in the Technical Dept. with the problems likely to be encountered and the remedies.

(2) Multi-Channel 'scope. The coloured line system described above is not as cut-and-dried as it may appear. It is essential that the engineer who monitors this should contact all those concerned in the Technical Dept. so that he may determine such things as:

(a) The order of temperature expected.
(b) A normal rate of change of temperature.
(c) The necessary action to reduce an excessive temperature.
(d) Whether yellow line times are indeed required.
(e) What will decide whether a continuous trace record is required.

| SYSTEM | PARAMETER | YELLOW TEMP (°F) | RED TEMP (°F) |
|---|---|---|---|
| Engine Installation | Centre rear mount. Stn. 711. | 225 | 265 |
| | Top of shroud inner flange Stn. 803. | 225 | 265 |
| | Top flange of I-beam on C.L. Through heat exchangers. Stn. 592 | 225 | 265 |
| | Top flange of former directly below firewall Stn. 663 | 225 | 265 |
| | Lower longeron engine bay. Stn. 591. | 225 | 265 |
| | Oil temperature at starboard engine inlet. | 210 | 250 |
| | Fuel temperature at inlet to starboard engine burner. | 200 | 225 |
| Flying Control Hydraulics | Port engine pump inlet temperature. | 200 | 225 |
| Utility Hydraulics | Pump inlet temperature. | 200 | 225 |