VULCAN FATIGUE TEST SPECIMEN TEST DIARY

DATE	REMARKS
5.3.64	Zeroing of the following L.M. rings carried out preparatory to counterpoise run. 1-6F port, 1-6F starboard, 5 M.I starboard (done whilst convenient). Rear tie and forward tie.
6.3.64 Prelim. 1.	Counterpoise run to 300 p.s.i. No results taken coming down.
9.3.64	Correcting levers on 3R set and 4 M.I. rigged up for trial but found to be out of place.
10.3.64 Prelim. 2.	Counterpoise run attempted to 330 p.s.i. Abandoned at 270 p.s.i. due to fouls discovered on D.2 counterpoise, 5GB (insignificant) D3 counterpoise, 6F extra counterpoise (incipient).
11.3.64	Fouls cleared, Prelim. 3. Results showed very high on front tie. Discovered that D2 counterpoise was too heavy so put 1000 lb. weight in D.2 Prelim. 4. Improved by amount expected but still heavy. All counterpoise weights checked and corrected as necessary (to 330 p.s.i.).
12.3.64	Prelim. 5. Forward tie now light due to 1000 lb. weight in the D.2 being now surplus to requirements. removed for :- (330 ps.i.). Prelim. 6. Results acceptable within close limits counterpoise pressures required seem to be about 16 p.s.i. which ties in quite well with latest calculated figures. (330 p.s.i.)
"	Groups 1-3R port and starboard were connected in before Prelim. 7. To 500 ps.i. on all systems A. Abandoned at this stage due to pad pulling off on 2F starboard. Two 22g alum. plates had been fitted.
13.3.64	Prelim. 8. To 700 p.s.i. on all System A. Run successful except for excessive hysteresis on rear tie and running out of travel on Group 6F extra counterpoise After main test with strain gauges and desynns, two runs were done reading ties only to check loop.
14.3.64	Checks done on 4M.I. port and starboard. Satisfactorily result obtained.
17.3.64	Prelim. 9. To 1000 p.s.i. on all System A. Desynns, strain gauges and all L.M. ring results read.
18.3.64	Prelim. 10. 600 p.s.i. was applied to all System A to check for fouls on the rig. A run was then commenced to 1000 p.s.i. on all System A but was abandoned at 650 p.s.i. due to a foul recurring on the port undercarriage beam support mechanism although an extra $1\frac{1}{2}$" of travel had been obtained before the test. Mods. were put in hand overnight. U/V recorder - exploratory tests.
19.3.64	Prelim. 11. a.m. To 1000 p.s.i. on all System A abandoned at 900 ps.i. due to running out of travel on the starboard undercarriage beam supporting lever. Modified as port over lunch time. U/V recorder :- 1 to 5F port and starboard, 1 to 3R port and starboard read. Some groups unsatisfactory.

Fatigue Test Diary Cont.....

19.3.64	Prelim. 12 p.m.	To 1000 p.s.i. on all System A. Abandoned at 1000 p.s.i. due to further foul on main undercarriage beam due to the large universal links being too close to the welds in the corners. U/V recorder 6FP, 6FS and ties read - 6FP, 6FS unsatisfactory.
	Prelim. 13 p.m.	To 1000 p.s.i. on all System A. No fouls but abandoned at 1000 p.s.i. due to excessive friction in starboard universal link, On main undercarriage support beam. Major mods. put in hand overnight.
20.3.64	Prelim. 14	To 1000 ps.i. on all System A with main undercarriage support beams disconnected from the aeroplane. U/V recorder :- 6FP, 6FS, 1FS, 4FS, 3FP, 2RS read. 6FS, 1FS, 4FS poor results.
21.3.64 23.3.64		Plugging in all connections on compound rigs and M.I's to enable the aircraft to be set up for ground case.
24.3.64		Setting of aircraft to correct position and all linkages to correct length accomplished by lunch time of :-
25.3.64	Prelim. 15.	Systems A and B selected for a complete gust case. Abandoned at 600 p.s.i. due to foul on groups 4 M.I.
31.3.64	Prelim. 16.	To 800 p.s.i. on all Systems A and B. First attempt abandoned at 700 p.s.i. due to malfunction of system A2 valve starboard side which had stuck in. Pressure reduced to 200 p.s.i. and test restarted by repeating 600 p.s.i. reading. A further reduction to 200 p.s.i. occasioned by the discovery of a panel missing from the starboard wing was followed by a further set of readings at 600 p.s.i. after which the load was increased to 800 p.s.i. The valve on System C+ was then found to have malfunctioned, somehow sticking in a central position covering the C+ return to tank and causing the compound rigs to stop moving at mid travel. The valve cleared itself when clonked and the test was then repeated from 500 p.s.i. to 800 and then reduced to a ground case configuration.
1.4.64	Prelim. 17	To 800 p.s.i. on all systems A and B. Discovered at 500 p.s.i. that the A2 valve on starboard side had stuck. Test restarted from 400 p.s.i. after the valve had been freed. Only looms C and D were read and selected L.M. readings taken. Aircraft left fully trestled after test whilst A2 valve investigated.
2.4.64	Prelim. 18	First attempts at cycling. Systems A and B selected. 4 successful cycles between 580 and 440 p.s.i. abandoned due to malfunction of programme unit. U/V recorder :- 1 to 5F port, 1 to 3R port, ties, and port GB read and strain gauges A6, A9, poor results.

Fatigue Test Diary Cont.....

Date		Remarks
2.4.64	Prelim. 19	Systems A and B, 8 successful cycles between 580 and 440 p.s.i., 5 unsuccessful between 500 and 580 p.s.i. Evening spent fettling programme unit. U/V recorder same positions as P18 - better results.
3.4.64	Prelim. 20	Systems A and B, 41 successful cycles between 595 and 430 p.s.i. completed interspersed with 15 between either 500 and 580 or 440 and 500 p.s.i. It is thought that these faults may be connected with using the programme unit manually, i.e. one level only selected. All pressure switches are now to be set accurately, and some cycles done on each gust level prior to trying the auto selection on gusts. U/V recorder :- Groups 1 to 5F port, 1 to 3R port, 2, 4, 5, and 7 GB port and strain gauges A6, A9 (aircraft) read - good results.
3.4.64 evening	Prelim. 21	Systems A and B. Pressure switches set. Attempts made at manual cycling. Some trouble with programme unit not having time to select future level traced eventually to wrongly set pressure switch. All levels of gust tried and settings for control valves compatible with all levels of gust ascertained. An automatic cycle was then tried with reasonable success, being fairly random. All the level inhibitions were set high for this attempt. The only fault which showed itself was the programme unit failing to select on 2 occasions, thought to be the uniselector sticking in the 31st position. A brief list of damage done to the specimen is included below and the typewriter output is on the facing page.

Manual Selctions

Level 1.	120 applications.
Level 2.	59 applications.
Level 3.	8 applications.
Level 4.	8 applications.
Level 5.	10 applications.
Level 6.	7 applications.

Automatic Selction

The various levels selected automatically were as follows :-

1122123112214213421 2 131332133114246233 12 312

After each of the above runs the aircraft was lowered to the trestles.

6.4.64	Prelim. 22	Systems A and C selected for a manoeuvre case. Test started by increasing pressure to 500 p.s.i. 9 and 10 M.I.pulled up at 520 p.s.i. One collapsing link on 7 M.I. port does not collapse far enough resulting in bending of collapsing link. Pressure increased to 700 p.s.i. when pad in Group 4F which is also loaded by 5 M.I. pulled off due to having two aluminium plates on it, Test abandoned. U/V recorder : attempt at calibration of various manoeuvre groups proved unsuccessful - insufficient increments tested.

Fatigue Test Diary Cont.....

Date	Remarks
7. 4.64 Prelim. 23.	U/V recorder :- all port wing M.I. groups, and all port wing ballast groups plus 2RP, 3RP, forward tie, rear tie, 2RS and 6FS were read. All responded. Systems A and C selected. Successfully tested to 1000 p.s.i. slight foul remaining on 4 M.I. which can be burnt out. The travel of the functioning jacks on 4 and 7 compound rigs may have to be further restricted. On 4 M.I. the large beam is in danger of striking the L.M. ring at the start of manoeuvre. On 7 the strain gauge link is put into compression due to insufficient collapse in collapsing link.
8. 4.64	Manoeuvre pressure switches set and others checked results as follows :-

G	Pressure Switch	Required Pressure	Actual Pressure
1.25	1	700	742
1.36	3	752	783
1.56	5	806	830
1.35	7	738	791
1.46	8	813	862
1.7	9	925	954
2.3	10	1134	1122
.75	2	425	404
.64	4	380	358
.44	6	298	325
.925	7	504	503
.885	8	487	476
.825	9	462	406
	10	480	480
1.0	Mean Level	576 (Gust)	591
1.0	Mean Level	535 (Gust)	550

	System A gauge checked against the Avery and found to be approximately 10 p.s.i. high.
9. 4.64	Mods. carried out on rig.
10. 4.64	Mods. completed at 3.30 p.m. pressure applied to system D after jacks were lowered to check ground case. Satisfactory. Manually selected manoeuvre levels attempted, but failed due to the programme unit not having time to get a future selection. Decision to throttle the master valves. This was done and the valves rebalanced by operating against the cocks. An automatic flight was then attempted. Completely successful right up to landing where the rate of loading System D proved incompatible with the unload rate of system A and C. Two further landings were done after the last few manoeuvres were repeated and were OK provided the D loading rate was manually operated. A further automatic flight was then attempted but after 103 levels a foul on starboard side cleared itself and resulted in the programme unit inadvertantly selecting a gust.

Fatigue Test Specimen Test Diary Cont.....

Date	Remarks
13.4.64	No success. Problems both electric and hydraulic, list of damage on aircraft :-
	Level 1 59 attempts - 7 failures (3 cycles between 150 and 350 psi.) (1 cycle between 170 & 440 psi) (1 cycle between 170 & 400 psi) (2 cycle between 340 & 610 psi) Pressure trapped in system A2 and programme unit malfunction.
	Level 2 43 attempts - 9 failures (1 cycle between 270 & 320 psi) (1 cycle between 260 & 370 psi) (1 cycle between 280 & M.L) (1 cycle between 350 & M.L) (1 cycle between 330 & M.L.) (1 cycle between 250 & M.L) (1 cycle between 180 & M.L) (1 cycle between 270 & M.L) (1 cycle between 260 & M.L) Programme unit malfunction.
	Level 3 14 attempts - 3 failures (1 cycle between 270 & 710 psi) (1 cycle between 370 & 710 psi) (1 cycle between 150 & 710 psi)
	Level 4 15 attempts - 1 failure (1 cycle between 370 & 770 psi)
	Level 5 1 attempt - 0 failures.
	Level 6 3 attempt - 0 failures.
14.4.64	Some fixed levels done initially. Then a flight attempted which was interupted by a foul on the end of 4 M.I. correcting lever. Successful flight then carried out except for change from gust to manoeuvre. Landing loads applied manually.
	Switch then fitted to isolate system A manually during change from gust to manoeuvre and further successful automatic flights carried out, switching out system A and holding against the shut unload sook until system C built up to 400 p.s.i. A delay was imposed on System D loading until Systems A and C had leaked off.
	The above proved satisfactory so it was decided to make both mods. automatic. This consisted of initially an A auxiliary valve in the A unload line and energising this and degenerising the main A valve by a relay operated from the maneouvre load relay after the start manoeuvre relay is energised. The reverse procedure is operated by a pressure switch in the System C line set to operate a relay at 400 p.s.i. This relay reselects A and deselects A auxiliary and then remains latched in until the flight reset relay at the end of the flight master and system B are not selected at landing now until a thermal delay device has provided time for A and C to leak to zero.

Fatigue Test Specimen Cont.....

Date	Remarks
14.4.64	Level 1 129 attempts - 0 failures.
	Level 2 108 attempts - 2 failures (pressure dropped from M.L. to 260 psi cause unknown but probably malfunction of programme unit).
	Level 3 33 attempts - 0 failures
	Level 4 32 attempts - 0 failures
	Level 5 4 attempts - 0 failures
	Level 6 6 attempts - 0 failures
	Level 7 120 attempts - 0 failures
	Level 8 34 attempts - 0 failures
	Level 9 12 attempts - 0 failures
	Level 10
	Level 11 4 attempts - 3 cycles from 0 to 900 psi 1 cycle from 0 to 1000 psi
	After completion of cycling the deflection results were analysed and the deflection of the tips for the maximum manoeuvre found using zero pressure with the aircraft on undercarriages and rear tie. A mean of these was taken and a 25% allowance added. The safety micro-switches on the tips were then set to these dimensions. Actual deflection in maximum manoeuvre. Port 13.1", starboard 10.5". Microswitches set 15" clear of the wing each side.
16.4.64	Three flights carried out with satisfactory changeovers from A to C but a tendency to drop through the minimum level on level 2 showed itself. System D was selected and deselected instantaneously before any pressure built up in system A fault on the programme unit was found which was thought to account for the first of the above faults. Both LLR, A and B relays were found to be energised sometimes due to feed back through the uniselector circuit. This was put right before :-
17.4.64	$1\frac{3}{4}$ automatic flights done without great success due to level 7 gust dropping through minimum level. sixty manually selected level 7's were carried out, after which the bottom changeover on the master valves was throttled, the pressure switch was restricted and further attempts made. Decided that mean level descending and main level on level 7 are too close, thus causing a double signal. Reliability achieved on a further five flights. Only remaining bother was system D not remaining selected at ground case. This was put down to a transient pressure when D valve selected against the fairly high (450 psi) idling press. There was no restrictor in system D pressure valve, being an only one. Restrictor to be fitted in D and system A2 to be bled in an attempt to smooth the top changeover over weekend.

Fatigue Test Specimen Test Diary Cont.....

20.4.64	Attempt to do static gust case. Abortive due to being unable to raise pressure on Avery pump No. 1 carried on to :-
21.4.64 Prelim. 24.	Tried Towler pumps and still failed due to pressure relief valves blowing off. One other bank of pumps it was ascertained that oil was getting through to system C and returning to tank. Checked that none of the double acting jacks on B and C were causing it, then went on to check that the 4 M.I. auxiliary A2 valve was OK. Found that a flow was getting into C at this point on port side. Valve taken out and checked OK. System piped up to starboard valve only using the balance pipe to the pressure relief valve. Test restarted but now 4 M.I. correction jacks found to have oil locked in them. Jacks disconnected and test to 800 psi on systems Prelim. 24. A and B carried out successfully. Valve on starboard side checked and found to be piped erroneously, system A2 being onto the B pilot tapping and system B onto the tapping. Where A2 should have been. Thus there was no pilot pressure applied and the shoot could stop where-ever it liked. At 500 psi the velocity head of C relative to A2 pushed the spool to a position connecting B on the supposed A2 tapping to the correction jack on starboard and thus through the balance pipe to the correction jack on port and thus through the valve, selected properly on this side, to system C and then to tank.
22.4.64 Prelim. 25.	Valve replaced on port side and repiped correctly on starboard side and a manoeuvre static test commenced without fairing under front spar, strain gauges, U/V recorder, desynns and L. M. rings read. Tested to 1,134 psi. Night shift left to put fairing on under front spar centre line.
23.4.64	Fairing not completed and due to error in assembly will not be completed in the day. Time spent bleeding A2 lines and 7 M.I. correction jack and sorting out results from Test 25. Found that the results are invalidated by gross friction on the M.I. groups presumably due to tight pins and malignments. All pins to be greased and freed.
24.4.64 a.m.	Pins not yet greased due to experimental having no gen. When pins have been slackened a gust static test will be carried out with the fairing under the front spar in position. Gust static test Prelim. 26 carried out to 800 psi in the morning. Strain gauge, L. M. results, U/V results and desynn results taken. Manoeuvre incremental linkages greased over lunch time and an investigation into the M.I. and tie point loads carried out. The alternating loads on the M.I. groups found to be fairly close to the required but the slope of the rear tie considerably in error. Balance to be done.

Fatigue Test Diary Cont.....

Date	Remarks
24. 4.64	New information has been recieved regarding the various levels of load and the number of applications per flight. The relevant pressures have been calculated and the pressure switches set to suit. A summary of this information is included below :-

Level	Pressure	Approach	No.of Applic.	'g'
1	715		10	
2	422		10	
3	779		3	
4	358		3	
5	824		1	
6	313		1	
(7a	784		10	
(7b	501		10	
(8a	862		2	
(8b	481		2	
(9a	955		11	
(9b	458		1	

25. 4.64	Six accumulators fitted in system A adjacent to the A2 take off point in an attempt to smooth the top change over.
26. 4.64	Two flights done successfully but top change over no better, manoeuvre static test Prelim. 27 carried out with fairing fitted to 1134 p.s.i. Strain gauge, L.M. and desynn results taken.
27. 4.64 a.m.	Further capacity to be installed in System A for P.M. fixed cycling carried out with D unloading rate partially closed to keep a pressure of 50 p.s.i. minimum in System A2 during loading. This was found to smooth the change over but still not very good.
p.m.	Some air in system due to oil level getting too low console bled and cycling tried with D type jack in System A as accululator. Inconclusive result. All rear spar jacks to be bled again overnight.
28. 4.64	Finishing off bleeding rear spar prior to doing a flight. Restrictors have been made to fit in the supply line from system A to the A2 valve. Will be fitted after the flight has been completed. Restrictors fitted. After experiment ones with $\frac{1}{8}$ dia. holes have been fitted port and starboard. Four successful flights carried out getting down to $6\frac{1}{4}$ mins. Attempts made to put air pressure in tanks with fair degree of success.
29. 4.64	The air pressure to tanks system sorted out but for leaking safety manometers. Two successful flights carried out without air pressure. Then problems with programme unit developed. Dropped through and went up through mean level on several occasions. No fault apparent in programme unit.

Fatigue Test Specimen Test Diary Cont.....

30.4.64

Fault occurred in further flights. Thought to be due to missing diode after Thorne X relay contact occurred once even after replacement. Does not occur with front of programme unit down. Total of 31 flights now carried out on new load levels. 15 flights on old levels. Mods. put in hand to put the load developed by 4 M.I and 7 M.I to the same value as the corresponding groups 2 M.I and 5 M.I. The errors were making the bending moment on manoeuvre approximately 5% low.

1.5.64
Day Shift.

Mods. still in progress.

1.5.64

Static run carried out on manoeuvre to 1,134 psi groups 4 have good answers but seven parallel but light. Stops put in under 1-3R and 7 M.I over weekend. This was Prelim. 28.

4.5.64

Day spent attempting to sort out programme unit troubles. Total of nine flights done. Possible cause of trouble found and eradicated. Amount of lead to be removed from 7 M.I S & P has been calculated prior to removing some of the lead and repeating the static test on manoeuvre :-

5.5.64
Prelim. 29.

Static test on manoeuvre to 1000 psi. Prior to start of test proper, 5 runs to 900 psi were completed whilst checking 7 and 4 M.I.

The L.M. results were good on port side but the aircraft rolled port wing up. This was thought to be due to 7 M.I port and 4 M.I port having the ram seal on the correction jacks removed. A further run, Prelim 29a to 1,100 psi was done immediately before tea to check these non-linear deflection results and obtained substantially the same answer. In between the static tests, 5 auto flights were carried out but recurrence of previous troubles of dropping through mean level made further cycling pointless.

7 and 4 M.I starboard correction jacks were brought into line with port during overtime.

6.5.64

A further run on manoeuvre was done to 1,100 psi Prelim. 29b but substantially similar results were obtained as previously.

A run reading desymns only on gust to 800 psi was then carried out. This was named Prelim. 30. A similar amount of roll was found on this test as on 29a and b.

Further auto cycling was then started but a universal rod on group 1MB unscrewed and allowed the roof correcting lever to tip backwards, damaging the pivot pin and oilite bearings. Whilst this was being fixed the troubles in the programme unit were sorted out. The cause was the Thorne X and the ACR relay not being 100% interlocked. Also some relay contacts were reset at the same time.

Fatigue Test Specimen Test Diary Cont.....

Date	Remarks
7.5.64	Some gust cycling done whilst the IBM was being repaired seems to indicate that the fault is cured. The equivalent of 10 flights of gust was carried out without trouble.
8.5.64 Morning	Auto cycling reducing to $6\frac{1}{2}$ minute flights. Delivery rate increased to two full pumps - cycle reduced to $5\frac{3}{4}$ - auto selector selected gust during manoeuvre. Typewriter missing 2's.
Afternoon	Auto cycling continued at $5\frac{3}{4}$ minutes per final 10 flights - pump still on full delivery - auto selector selected B valve without presenting a future selection during manoeuvre. This fault was followed by refusal to count seven's which made it necessary to manually select bending case. Also <u>once</u> selected landing case before completing manoeuvres. Ray Wood attributed all these faults to a fault on the level seven counter. On flight 47 selected level 10 pressure held below 600 psi. Evening completed with 7 correct flights - at cycle time of 6 minutes 10 seconds. 69 cycles altogether. Cumulative total : 111 flights on new level. 10 flights gust only. 15 flights on old level.
9.5.64 Morning only	Group 7 M.I. repiped found to be OK. Auto cycling commenced. Gusts and manoeuvres OK - several level landings i.e. pressure not being all cured to build up in system D. One landing system A did not release pressure and ground case had to be manually selected. 12 cycles altogether. Cumulative total : 123 flights on new level 10 flights gust only 15 flights on old level.
11.5.64 First shift (Morning)	Commenced auto cycling with flight counter set to 124 - N.B. This number indicates the flight which you are doing - not the number of completed flights. Numerous faults occurred - drops through mean level both up and down and also selected gust and heavy landings of ground cases before finishing manoeuvres of which there are two types - viz., System D selects but bounces straight up to maximum pressure and deselects and also, at mean level after the final manoeuvre A and C deselect and then almost immediately A and B select. Typewriter is now missing out 8 as well as 2. At 4 p.m. Ray Wood and Maurice did at mod. on the Thorne X relay which has seemingly cracked all the faults barring the landing case fault where D bounces through its maximum pressure, this can be cured by feathering the D loading rate valve. Night shift are to carry on cycling until 8 a.m. LLoyd is to prepare everything for a shut down inspection for tomorrow.

Fatigue Test Specimen Test Diary Cont.....

Date	Remarks
11.5.64 2nd. Shift (Nights)	Took over from morning shift and completed 273 flights (shut down at 7.15 a.m.) Towards end of running time experienced difficulty in stopping the pressure bouncing on consecutive level 2's. Only solution appeared to be to slow down loading rate considerably. Had approx. 5 flights during the night with one extra gust (a random selection, which counted on the event counter but not the counter associated with the particular level). Also experienced bad landings which went straight to gust. Both were manually corrected. When bouncing on 2's was excessive (about two occasions) future selection 10 comes up, but was manually corrected before pressure builds up. Overall by far the majority of flights were good and two were recorded on the U/V recorder (one of these shows the effect of one level two bounce).
12.5.64	Inspection started after 273 flights. (242 with tank pressurisation) two large cracks found in No. 3 tank port and repair of most severe under way. Due to these cracks it was decided to open up tanks No. 4 and 5 and No. 3 on starboard side. Cracks found in No. 5 tank. As a result No. 5 tank starboard has been opened along with No. 3 for inspection. No. 4 tank port can be reassembled. Repair of No. 5 tank port under way. Area 36. S.I. 43 complete for point 2, rib 301 (leading edge butt straps.) Deicing plate (most outboard to be taken off). Hinge pins to be removed one at a time and inspected. Inspectors have the sheets for these. As soon as inspection is complete and repair schemes in tanks are complete all panels are to be put back. Tanks No. 3 and 5 starboard side to be inspected and if any large cracks are there, will you ring up Rex at Home. (Use your discretion and only call him if the cracks are big). Telephone Marple 2314. Crack in Tank No. 3 port and aft wall (see inspection sheet) to have proper sketch made of it and length measured. Put layer of white tape over crack in No. 3 tank before load goes back.
12.5.64 Night Shift	Tank 3P modification. When the new skin was being fitted at the forward side of the sump (see sketch) the holes in the new skin did not clear the edge of the rib and unfortunately this fact was not discovered until the holes had been drilled. The result is that the edge of the rib is now serated.

Fatigue Test Specimen Test Diary Cont.....

Date	Remarks
12.5.64 Night Shift Cont.....	
No.5 Tank P	Where the button had been forced through the skin adjacent to rib 408 a crack had started (J.T.C's sketch). A 1/16" dia. hole was drilled to stop the the crack and the patch plate was fitted in the following manner.
13.5.64 Day shift	Inspection completed and all tanks closed and panels replaced. Commenced running at 5.45 p.m. approx. On pressurising the tanks manometer relief valves on Tank No. 5 port blew off and pressure was let off. Manometer refilled and no modification observed again. Small oil leak forward from A2 jack on Group 2R port not readily seen from exactly oil is coming from but this leak to be observed. As there was only approximately 1½hours of the day inspectors shift remaining this time was spent in giving the linkage a general inspection. Nothing was found amiss all universal links were in safety. Night shift inspection can start running inspection when they come on. Damage cards in the form of Ozalids were produced and a damage record and index book started.

Fatigue Test Specimen Test Diary Cont.....

13.5.64
Day Shift. Cont...

Started at flight 273 finished at flight 295. Faults occurring are bounced through the first levels of gust, if the levels selected are 1 and 3. Bounce in the first levels of man. where it selects 7 then back to gust, then back to manoeuvre. These faults were cured by turning the rolling pressure up to 450 psi and turning the unloading rate down a notch.

13.5.64
Night Shift

Auto cycling continued, all gust levels function correctly although there tends to be some overlap of pressure after reaching top levels. This can be seen on the U/V recorder sheet for typical night shift flights, the peaks on any event are not as clear as on previous flights.

The only major fault of the evening was consistent bad changes from gust to manoeuvre. After any positive gust (never after a negative gust). Accord -ing to the U.V recording of one of these bad change it has no outstanding effect on the aircraft. We were never able to correct these bad changes.

On flight 330 the mercury blew out of the manometer on No. 5 tank, we topped it up and carried on. Also on two occassions the air pressure built up to 3.7 psi due to intermittent functioning of the A.P.V. Although we now have 47 events per flight the air pressure is still released at event 40.

It can be seen that on a great number of the man. cycles almost all the 7's are completed first. Invariably this is not due to the future selection which often shows 8's and 9's early on, but the bounce on the bottom of a seven change over rides the future selection and puts up another seven.

Towards the end of the 12 hours we began to experience bouncing on consecutive level 1's at the beginning of a gust only running inspection on starboard wing (L) satisfactorily completed. Day shift inspection can start on port wing (M) when they come on.

Inspection Items

1. It appears that the firm have promised to suppl the works inspectors with overalls but these have not yet arrived. We found it impossible to borrow any last night so can something be done to hurry delivery of same.

2. After the modifications to the No.3 & 5 fuel tanks, the night foreman (Mr. Chadwick) got our shift work inspectors to cover the repair scheme (we were not consulted in this matter) and our inspectors obliged them. The following day, how- ever, the night shift chief inspector came over and asked our inspectors for a history sheet on this work and this seemed to upset them. After having a chat with our inspectors after this incident they seemed to think that they should not be asked to do anything outside our own particular inspection schedule, so would it

Fatigue Test Specimen Test Diary Cont.....

Inspection Items Cont.....

be possible to sympathise with then in this matter and arrange for normal night shift inspectors to do this work.

3. Area 59 Centre Section Front Spar Area

Nut missing from bolt on starboard top boom about 6" from centre line. The bolt is flush with spar and cannot be rectified without dismantling No. 2. tank pressurisation system.

4. Area 21 starboard Jet Pipe External

On most outboard jet pipe along rib 162.5 about 18" forward of wing near jacking point a special nut is missing (Item 60F/7592) a thorough search in the area did not find the nut, also screws loose in panel between jet tubes.

5. No. 2 Tank Cover Plate Starboard Side

Some loose and some badly pulled Dzus fasteners.

6. See Area 16 (Flexible Joint Area)

Bolt missing - chalked up on aircraft.

7. Please can we have some boxes to stand on and also a platform underneath the air intakes to enable areas 17, 18, 19 and 23 to be more satisfactory inspected.

14.5.64
Day Shift

Running inspection on Port side was incomplete due to lack of time. Areas uninspected are as follows :- Areas 13, 20 and 21. Running of the rig was stopped at flight 426 and the bomb doors opened for hinge inspection. Running was delayed for approximately 20 minutes. Strain gauge wires at rear spar were detrapped whilst doors were open. Only damage found were Avdel rivets on bottom surface between ribs 338 and 448 along stringers, 4 rivets along stringer 16 were seen to be sticking proud of their holes early morning and during the day more rivets along this stringer and along other stringers (See inspection sheet for area 11 and 10) were found to be proud. The same condition on starboardside was found to a far lesser degree.

Cycling started at flight 378 various faults - bouncing through levels - missing mean levels. Mod. done to electrics by Maurice also Mod. to hydraulics - piping pressure switches into line of the floor instead of the main console gallery. Much better flights - time down to 5 minutes 12 seconds (best) average time 5.20. Still missing mean level about once in 8 flights roughly. Stopping for 12 hour inspection after flight 445.

Flight counter now reads the flight which is being done. Flight numbers altered to corredt for bad landing xxxxxx xounts.

Fatigue Test Diary Cont.....

Date	Remarks
14. 5.64	The stopped inspection b(b) was completed except for the X-Rays, Ultra-sonic and S.I's. The latter could not be carried out because we do not know what the S.I's entail. Damage was found in the No.3 tank part of a similar nature to that found at the previous inspection - one button having been pushed through the tank (see damage card 1D). The tank was left for a repair to be carried out and G. Trevor was informed at about 7.0a.m. In No.5 tank port the crack in the sump hole is now 0.68" long - see damage card 3D. The tank bag was replaced and requires inspecting before the blocks are refitted. No. 4 tank port was not inspected. Several panels still require to be fitted on starboard wing but the port panels No. 5, 8, 9, 10, 11, N, B, H should be left off for Ultra-sonic and X-Ray inspections to be carried out also on starboard side. The only other thing outstanding is that in areas 35 and 35 the engine doors were not opened and therefore the door hinges and spigot plates were not inspected.
15. 5.64	The results from spar strain gauges (on U/V recorder) for flight 414 were analysed and the new pressure switch settings detailed below were calculated. On completion of stopped inspection the pressure switches should be reset to these values and a check on the effect of the changes should be made.

Level	Actual Press.	Theo. Press.
1	691	715
2	413	422
3	756	779
4	343	358
5	816	824
6	290	313
7	748/485	784/501
8	820/467	862/481
9	904/445	955/458
MLG (=MLM + 1ve	570	582
MLG (=MLM - 1ve	560	576

See note below :-

Note : The pressure switches have been adjusted to the above whilst running against the cocks - a check on these is required whilst running against the aircraft, but don't waste time resetting unless errors are appreciable.

With regard to inspection, will you please understand that the schedule prepared by L.Wright has to be adjusted to suit circumstances. In view of the early tank damage which has been found, it has been decided that tanks 3, 4 and 5 port will be inspected on each breakdown and the schedule for last night was made out to do this.

Fatigue Test Specimen TestDiary Cont.....

15.5.64 Cont..... I was surprised to find that a concession not to inspect had been given for No. 4 tank last night - in view of the time left today only a limited inspection of this tank was done by removing the first two columns of blocks and folding bag back around the sump aperture. If future doubt exists about what is to be inspected etc. please ring me up (or B. Taylor) - but not in the middle of the night. (I suggest the forbidden hours except in case of real emergency are 11 p.m. to 7 a.m.).

Pressure in the accumulators on the A2 system has been increased to 500 psi in the hope of preventing the rear spar jumping up at the tip in top gust changeovers.

A new mobile air pump now supplies the big vessel - since it only arrived at 4.15 p.m. we have'nt had much time to play with it, so keep a cautious eye on it. The next inspection breakdown will start at 7.30 a.m. Monday.

Up to this stage i.e. flight 445 the level 10 has been inhibited, henceforth this level will now operate once every 100 flights, and will operate on the hundreth flight every time i.e. it will not happen at random during the 100 flights but will come in on the last one every time.

Day Shift. Aircraft ready at 6.50 p.m., could'nt get hold of Bryan till 8.15. No cycles done as we were asked to wait until Bryan got here.

15.5.64 Started auto cycling and adjusted level 1 and mean load level reducing pressure switches. Everything well up to 500 flights with flights at 6 minutes 45 seconds.

After 500 flights various faults occurred culminating in flight 513 at which juncture during gust we went through mean level twice in each direction and during manoeuvre the typewriter stuck down on 7's, the event counter would not count 7's, therefore there was danger of going into landing case with tanks press. We switched to manual 7's for one flight, making the event counter register by using the inching button. But all the methods we tried were much to involved to try to continue flights with the machine malfunctioning.

Running inspection N satisfactorily completed with the exception of Area 60 - fretting on bomb door hinge (2nd. hinge aft of front spar) see damage card 6a & b.

16.5.64
Day Shift. Commenced first flight 514 cleared various faults from night shift. No tank pressure until flight 519. Accumulator pressure reduced from 500 to 350 psi. Suspect that mean level pressure switch for negative gusts set about ± 40 psi, too level their is affecting level 2 and 7.

N.B No. 1 mean level switch normally open - re gusts and manoeuvres. No.2 mean level switch normally closed +'ve gust only.

Fatigue Test Specimen Test Diary Cont.....

16.5.64
Day Shift

Reset pressure switch mean level No.1 was so low as not to allow a Thorne X change when doing level 7. This is the fault which occurred during night shift, increased B unloading rate to stop wing being dragge up at first level 7. Checked tip desynn. 1st is about 9.5, 2nd 9.6 increases a bit as you go on, but the first is the lowest.

At about flight 548 linkage group 3R, the one most inboard, on port side, the jack started groaning, it was decided not to change the jack but to press on until Monday morning. All periodic checks must be made to make sure that the ring readings on this group port and starboard do not vary by more than 5 divisions on top and central levels. If the load does go all awry then the jack must be changed, but otherwise it is to be left until Monday also check the clamping on the pillon of the same group as this started to work loose.

Also we are back on the comparison but we are leaving the air block open so that it does'nt cut in and out so often and overheat. You will find which block I mean as soon as you switch on because the air will rush out of it, this is at 1c and you can then control the output by means of the proper valve After the ball is filled switch the output down to 35 psi as this just holds the pressure required.

I will leave all the valve positions in their respective positions except the loading rate valve, which is approximately $9\frac{1}{2}$ turns from fully shut, and lines up the tape stuck to the console.

Keep checking the tip desynn spasmodically to see that the first level 7 is not bigger than the others

The scraping noise in the bomb bay is the hinge rubbing up and down the bomb rib. See damage card.

For the last hour our inspectors are doing a linkage inspection, suggest you do the same if you have the shut down early, or if you have an hour to spare for any reason. Last flight 568.

17.5.64

After flight 624 the universal link which picks up the gust ballast lead weight on 5 G.B (port) was found to be disconnected. It was reconnected and fitted with a locking tab.

For the last four flights prior to shut down after flight 632 the pressure took less and less notice of the mean load level switches both ascending and descending until during flight 632 almost every mean load level change was a manual one. Allied to this the manoeuvre cycling included two unwelcome gust selections. Having now arrived at a stage where the machine had altered from auto - matic to manual for correct functioning we stopped (5.30 a.m.).

Fatigue Test Specimen Test Diary Cont.....

17.5.64
Night Shift.

The air compressor now vibrates at a very high frequency so that the valves unscrew. I am sure there is something wrong with it.

N.B 5-6a.m. is obviously the witching hour for night shift.

Inspection.

On the next stopped inspection look at the starboard rear undercarriage door catch bracket for suspected crack (P. Brooks.). Area 52 cannot be inspected properly because of oil on the wing and back of any safety barrier. Area 17 cannot be done because there is no platform under the intakes on the starboard side. Area 16 cannot be completed because the edges of the reinforcing plate aft of the flexible joint are still araldited.

Completed 632 flights.

Area 3 - starboard outboard jet tube - crack found (see Area 3 sheet on running P).

18.5.64
Day Shift.

Commenced a stopped inspection at about 8. 30 - 9.00 Presumably you start running as soon as this is completed and the aircraft put back in working order. I heard a rumour that they might do a mod. to 10 M.I. tonight, but I have'nt been told by Rex or anyone like that. I suggest that you look in the foreman's night book to see whether or not they have decided to do it. If they have you will have to pressurise the jacks for them so that they can block the local cuts up while they do the mod.

Maurice and Bill Greenwood have been fiddling with their machine today but again, no one has said whether it is working or not, I presume that it is. Anyway Maurice is going on nights next week to pull you through.

Stopped inspection C * c is complete and everthing is signed off on the sheet except starboard under-carriage door. This door still wants dropping and the suspected crack inspecting. The actual catch plate is to be removed so as to examine crack closely. Main jack in 3R changed.

Night Shift.

Checked out stopped C + c as requested for inspection notes. Found notes on areas 34, 35, 39 and 41. Could only check 35 and 39 port (no damage card required, not able to check 34 and 41 because panel and door were back. Removed starboard undercarriage door and inspected for crack. None found.

Made up next stopped inspection (D and A) and completed a further 10 running inspections. Work finished on aircraft for 7. 0 clock but start delayed because of a "dead" typewriter (since told we should have switched it on).

19.5.64
Day Shift.

Started auto cycling at 9 a.m. U/V recording of flights in $7\frac{1}{2}$, 7 and 6 minutes taken, then static levels on gust and manoeuvre done for comparison. Most levels found to be satisfactory on 7 min. flight, but mean load descending found to be too low and level 5 too high. These were put right, but then trouble was experienced on level 1 due to it bouncing through mean level.

Fatigue Test Diary Cont.....

19.5.64
Day Shift

Situation used by putting in accumulator at 350 psi on pressure switch line. Changeover made better by deleting accumulators in system A, those on port side being found to have leaked air into the hydraulic oil - hence loading jacks on 1R and 2R port removed and bled, and R/S 'A' lines port and starboard bled also.

It is important to check that all pressure is lost in Systems B and C during a first event following gust/man. change and undercarriage/gust changes respectively, and if necessary manually adjust unloading rates every flight.

When the landing case is completed and before the first gust pressure comes on increase the C unload rate 1 full turn, until you are well into the gusts and then turn back to its normal position. At flight 658 the air system broke down. Tank pressure back on after flight 676 - tank pressure off at 677 - can't get the thing to work properly. Air Valves Air dump valve No. 2 not working at all. No. 1 and A.P valve working spasmodically.

The system is such that when the solenoid is energised it drags the valve off its seat and allows pressure in or out when de-energised the spring inside pushes the valve back on its seat. My theory is that the springs which are made from bits of wire are jamming the valve as it slides up and down.

When the gusts start as the pressure passes mean level the AP valve enegises and allows air to flow from the ball to the tanks. The final pressure being controlled by the master manometer. When you reach event 45 the air dump valves operate and dump the air. A.P. valve has at the same time de-energised and hence cut off supply.

N.B. watch the pressure in C when you gushing - it should be zero. Check the desynns a couple of times during the shift, against the values stuck on the desynn console.

When you have got it running at a steady speed, turn the variable pumps back up, to two pumps value and switch the other pumps off.

19.5.64
Night Shift.

Took over auto-cycling from day shift with instructions to try to fettle the A.P.V and A.D.V. We found that both valves were recieving and an electrical signal but neither was responding. If the valves were actuated manually the pressure would be held steady at 3.3 psi as required. Since we could not spare a body to sit in the undercarriage bay working the valves we shut off all air supply after flight 705 and continued from thereon without air in the tanks (as instructed by day shift).

After flight 700 we switched off one pump and continued with the variable delivery pump at full capacity (flight time 7 minutes 30 seconds). We found it impossible to do a fully automatic landing case. The D loading valve always needed adjusting to complete the landing. For 2 consecutive flights in the 760's the level 7 counter did not count, but after manual selection of 8's, 9's and ground case for the two flights everything started working again.

Fatigue Test Specimen Test Diary Cont.....

19.5.64
Night Shift

After flight 760 we were at last able to function with an automatic ground case, by reducing the idling pressure during ground case to 350 psi. Would someone in day shift please strip all paint off vent panel in area 7 (Port and starboard) as most of the vent louvres are cracked (we could'nt get any paint stripper to do this job - it would have taken too long using acetone). 1st. R running inspection could no be completed - probably due to having to finish off 1st Q running inspection areas, 3, 4, 6 12 and 55 starboard are still outstanding.

Item (1) on area 16 still cannot be inspected due to the edges of the reinforcing plate being covered with Araldite. (Incidentally this item has been passed off previously by works inspectors).

20.5.64
Day Shift.

Will you please see that the mercury blown out of No. 5 tank vent is wiped off the wing and trestle when ever the tank is over pressurised. No damage cards made out for areas 34 and 35 Port on inspection (C+c) (stopped) Could you please remedy this; also area 37 port.

Day shift started at flight 791 faults experienced are A Aux. valve not selecting on change over. This was cured by setting C pressure switch. Tank pressure back on at flight 803. We are pressurising manually now to make up for the pressurisation lost, we are averaging 3 per flight i.e. making up two per flight. Estimate that it should be back to normal at flight 892. To change back to auto pull the plugs out of the console and replace the Thorne relays, with the screw facing away from you. Idling pressureset to 450 normal, turn down to 350 for landing. Open C valve one turn extra for gusts and close again for manoeuvre. You can change back to sharp aim tonight if the compression packs pin. Watch how you connect in the valves up in the control room. Run the rig until 8 a.m. or 1000 flights whichever happens first. Chack desynns a couple of times in the night.

20.5.64
Night Shift.

As estimated caught up on tank pressurisations by flight 892. Changed to automatic and shop air. At flight 900 we were not able to raise nore than 1.5 psi in the tanks. Everything on the electrical side was working, and shop air was on full delivery - also, we could not detect a leak anywhere. This remained a mystery, so rather than carry on flight with some nonedescript pressure in the tanks we shut off the air pressure altogether from flight 905. Last flight 980. Running T inspection competed (see damage cards 9a and 10a).

Theareas 34 and 35 which you asked me to check on)C + c) cannot be done until the rig is stopped. In area 37 I could'nt find the items entered up on the sheet so can you have a chat with Shatwell and check it out for yourself. We have used up all the completed stopped inspections so could you please make up some more - you will find my book most useful in this matter. We also need a new sheet for the running inspections, could you obtain some and call it Sht. 2. M/C shop night men brought over oilite bushes and restrictors, have supplied R. Staniforth with bushes and L. Pearson with restrictors at 8.0 a.m.

Fatigue Test Specimen Test Diary Cont.....

21.5.64
Day Shift.

Stopped inspection D+a started. Pad on top surface port row which was pulling off at one corner, had the gap filled with Thiocol and a 100 lb lead weight was placed on top whilst the Thiocol set. No new damage was found in tanks 3 and 4 port. No. 4 only having partly dismantled and the bag pulled back from sump hole. Repairs carried out to 4 M.I. rig port bearings replaced and cleared inspection. 10 M.I. beams have been removed for redrilling, bearing plates have been put on. Work remaining on 10 M.I. beams - holes to be opened up and beams put back and lead weights repositioned. 4 M.I bearing starboard have not been started. NOTE : The sheet must be initialled when panels are put back after inspection. Starboard tower on 10 M.I. has been repositioned but port tower has'nt been moved. 2R port shackle jack seal has been changed, starboard side has'nt been touched. 3R port 'L' type jack is U/S and we are leaving it for Rex to see on Monday. This means YOU CAN NOT START THE RIG RUNNING.

All the inspection done except areas 30 bottom, 29 S, 44 S, 25S, 47 S, 48 S, and 49S. Suggest that you strip down and put a little oil on the valve in the air pressure valve in the under-carriage bay. This seems to have been the trouble.

24.5.64
Night Shift

All areas inspected for stopped inspection except for area 30, for which the fitter did not have the time to remove the panel (i.e. the fairing forward of the front spar, designated panel 2).

In area 48 there are two items (6 and 7) which cannot be inspected. The elevator shrouds foul the linkage and cannot be moved away to allow visual inspection. There are still a few panels to be fitted in place (See sheet under aircraft). Oiled the pistons of all three air valves.

25.5.64
Day Shift.

Stopped inspection completed. Aircraft all back together bar the elevator shrouds, the mod on 10 M.I. ERI/1018/280 and replacement of the jack in 3R. The air system is now working, a U tube in the bomb bay had blown out the mercury. You must do the pressurisation manually until you catch up as before. N.B. Ring Bryan at 9.00 clock. Check around 10 M.I. to see that no blocks have been left under it.

In future when area 30 has to be inspected only the tank sumpplate and the circular panels in the fairing are to be removed.

When inspecting the aircraft any crack or damage that has been found has to be inspected whether it is on the scheduled inspection being done or not i.e. if inspection is on port side any previous damage has also to be re examined. The only exceptions to the above are the cracks in the fuel tanks which cannot be done on a running inspection. Your next inspection is a K (2nd) running. Please make out any damage cards necessary and please put area No on as can be seen on previous sheets.

Fatigue Test Specimen Test Diary Cont.....

25.5.64
Day Shift

NOTE : Remove the 100 lb. lead weight off the port wing tip before commencing running. This was used whilst resticking loading pads top surface. There is also some roofing up to complete on the top surface. Suggest you see Dave Merrick to find out what is outstanding. When they fit the auxiliary jack in 3R you will have to blow the jack down for them with the hand pump.

25.5.64
Night Shift

Commenced auto-cycling about 12.30 a.m. and carried out 20 flights with all systems functioning automatically (6 minute 30 seconds flights) every thing OK. Then substituted manual air valve control to catch up on tank pressurisation. Have 75 additional pressurisations to work in.

At flight 1,000 we did not get the expected level 10. Maurice says this is something to do with the flight counter returning to zero.

2nd K running inspection completed, with routine checks on existing cracks in vent in area 7 starboard as an extra. Would you please bring damage card for the port and starboard vents up to date using sketch provided. We could not find the damage card (9a) so assume yours sent for printing. One crack found of some importance damage card 11a suggest you see Rex or someone with a view to having a stopping hole put in before too long.

Where is the lead weight on port wing you asked us to move? We could not find it.

26.5.64
Day Shift

2nd L running inspection completed. It is hoped to do a stopped inspection tomorrow if all goes well tonight and you get somewhere near 1,250 flights. I have made out the sheet for removal of panels and would be glad if someone would check it and make sure I have not missed anything. Hinge pins on outboard engine doors were found to be coming out (they can just be seen through the joint of door to T T/R) those on centre door starboard being worse. Please keep an eye on them and check both port and starboard areas. (See Inspection sheet for area 20 - 2nd L inspection). The amount the pivot had worked out at flight 1,118 are shown. Please do same on your inspection. No damage card taken out yet.

Keep an eye on connecting levers for 1, 2 and 3R large amounts of play in pivot bearings.

Commenced flying at flight 1,035, last flight 1,125 Stopped running at flight 1.054 to change jack in 3R. Keep running until 1,250 flights as close as possible.

26.5.64
Night Shift

Took over at flight 1125. Machine very sluggish especially on loading. Time for flight 7 minutes 15 seconds. All landings needed manipulation of D valve.

Then at flight 1,141 we could raise no pressure in system D during landing case. Investigation revealed a broken hydraulic coupling in the left hand side of the console. On repairing this couplin all troubles disappeared like magic; automatic landings were easy and flight times were down to a steady 6 minutes and 30 seconds.

Fatigue Test Specimen Test Diary Cont.....

26.5.64
Night Shift

Suggest you have the drip tray in the left hand part of the console emptied during the day. The broken coupling episode almost filled it. Laurie might also like to check the coupling repair we effected.

During a rig inspection at flight 1,209, the friction correction jack on Group 3R starboard was found to be disconnected from the correcting lever. It appears that the screwed attachment had unscrewed itself. Both ends of the jack looked to be badly damaged and it was now 7 a.m. I decided to shut down completely even though we were almost 42 flights short of the target (we have completed 228 flights since the last stopped inspection).

Complete running inspection M (2nd). No serious damage but cracks in louvres of vent panels on starboard side particularly are really galloping. Half checked your panel chart, but by this time we had had to stop, and as day shift were in we gave them the chart to work to.

27.5.64
Day Shift

Stopped inspection E. B completed - Engine Doors All pins in engine doors to be watched extremely carefully especially the outboard engine doors. These pins are coming out at a great rate so keep your eyes open. Sealing strips on all the out - board doors has been removed and you can see the pins clearly from inside the engine bay.

There is a suspected crack on the bottom beam spar web butt strap reinforcing strap between ribs 366 and 380. See Damage sheet 17a. Before you put panel 5 back somebody must go down the leading edge and watch it while you put 200 psi in the gust system - to see if the crack opens up. GOOD JOB FOR PETE IS THIS.

The L type jack in 3R starboard and the Coley in 1R starboard are ready to go back.

Please make out damage card for area 21 for inspection M-2nd. Please arrange for inspectors to put less cryptic notes on the inspection sheets. Also please get them to sign their names as well as stamp them.

27.5.64

Went down leading edge and pressurised up to 400 psi no sign of suspected cracks opening, I think they are both scratches. When doing a linkage check we discovered that the pivot beam of group 2M.I was very badly splayed

suggest you stop for a while tomorrow so that a tighter clamping arrangement can be made (too dark tonight) it looks reasonably safe for a while.

Fatigue Test Specimen Test Diary Cont.....

27.5.64
Night Shift Cont.....

Eventually began auto cycling around 4 0 clock. There are several unnecessary reasons for part of the long delay. First would you try to ensure that the fitters remove only the panels you require off so far as we could see they have been taking them off on their own initiative, all over the place. Secondly, in future when any piece of the rig is dismantled would you see to it that all the parts are left where everyone known where to find them. Tonight this applied to A.G.S couplings and olives in the air systems and several pieces of the jack attachments.

It would be a wise move to have another jack mounting attachment manufactured for the correction jack on group 1R starboard. The hole in the present one is very elongated and the phospher bronze bearing is fractured. You will need to watch it while you are running today - I should think failure is iniment.

The rig is functioning well at 6½ minute flights, C unloading rate being the only valve which needs adjusting during cycling.

Recorded flight 1,220 on U.V.R.

Commenced at flight 1,209.

Partially completed running inspection N (2nd) but soon ran out of time would you continue please, could'nt find what you meant by damage card for area 21 at M 2nd, no damage on inspection sheet.

Though we did'nt do areas contaning engine doors fully, we did go in during flight to watch pins, all remained in safety, though a tendency was noted for pins to move out until Tufnol of blocks stopped them, suggest they could have been assembled wrongly before the last stopped.

Finished shift at flight 1,245.

Fatigue Test Specimen Test Diary Cont.....

28.5.64
Day Shift

Started at flight No. 1,246 after about 2 hours the landings went all wrong and had to be applied manually, by setting the D loading rate low so that it would no bounce through the landings and then when D had selected increase the D loading rate to get it over.

At flight No. 1,308 an accumulator was fitted in the D pressure switch line and this cured the trouble until flight 1,319 when it came back just as before. The landing trouble is also accompanied by a ½ minute increase in the flight time and upon investigation found this ½ minute to be due to the manoeuvres taking longer. Have checked against the other logs and found that whenever landing trouble is experienced the flight time gets longer. I can't see the connection between bad landings and longer manoeuvre times, but it is worth thinking about. Flight time about 7 minutes.

The rig is scheduled to run until tomorrow at 8, unless there is a holdup during the night and we get behind on the flights. Estimate stopping at about 1,440 or so.

Keep an eye on the hinge pins in the engine doors. THEY DO COME OUT. and there is no chance of bad fitting becuase you cannot shut the doors with them wrongly fitted. No action taken on 2 M.I. on 1R starboard. 1R port correction jack attachment hole also badly elongated. Keep two things, a) your eye on it, b) your distance from it.

Barry Please keep your comments to Norman out of his book, he was doing his nut today.

Maurice When you touch certain parts of the programme unit as well as the cock handles you sometimes get a small electric shock. Although it is'nt much Rex says can you do something about it.

2nd N inspection started by you is complete. 2nd Q inspection started approximately 5.0 p.m. As Tony has said previously the hinge pins can get past the tufnol blocks in certain places, the hinges to watch closely are the forward hinges of the forward and centre doors both port and starboar A book listing the various cracks etc. that have to be measured during each running inspection, it is recommended that they be done in the order in which they are listed so that there is approx. the same interval between each inspection. Please put the new crack lengths etc. on to the appropriate damage card and raise the issue. If any hinge pins do come out stop the rig and have them put back, if you have to drop doors on Port side please replace rope slings. Will you check through the sheet listing panels to be taken off on tomorrows stopped inspection. Last flight 1,343.

Fatigue Test Specimen Test Diary Cont.....

28.5.64
Night Shift7

Took over cycling at flight 1,343. Continued all night without mishap. Shut down after 1.445 Recorded flight 1,400. Completed running inspection O (2nd). No new damage of note, kept close check on existing damage and made at least two entries on damage cards. Outboard engine door hinge pins observed at regular intervals. None moved past the tufnol blocks forward most pin on each side rotated sufficiently to clear the block but did not move past it.

29.5.64
Day Shift

Inspection F + b completed and damage cards written up and all entered on wall sheet. Fitters still in process of putting the aircraft back together so you'll have to wait for starting up until they are finished. Support beams for giant link on 2 M.I. have been straightened up but we want you to watch them when you are running the rig as the studs are bent. The drawing for the beam shows phospher bronze washers between link and beam but there does not appear to be any on the job. Would you check through E.R.I's to see if at any time these have been asked to be ommitted. Get someone to squirt some oil down the gap. No. modifications have been done to 1, 2 and 3R rigs, so watch these. Also watch the undercarriage door pins again. Readings taken on U/V recorder of 18 spar strain gauges with relevant mean level values etc.

29.5.64
Night Shift

All reassembled and auto-cycling started by 3 clock. The air pressure is now supplied by the mobile compressor (for which half the assembly pieces were missing). The air pressure in the vessel is such that the pressure in the tank only just builds up to 3.25 psi - for quite a lot of the flight it stays at 3.2 psi.

We have checked for leaks - without success and the compressor is working on full delivery rate. Suggest you get on shop air as soon as possible, but please keep the attachments off the little compressor.

Started at flight 1446.

Finished shift at flight 1495.

Completed 2nd P running inspection also checked all recorded damage, did not check odd loose rivets etc, The inspectors say they've found perhaps someone could thumb through the inspectors sheets and check any if they feel inclined. Fitters would'nt go up in roof, would you please try to arrange some more lights to be fitted.

30.5.64
Day Shift

Readings taken on U/V recorder of spar strain gauges taking great care to obtain correct M. L. values. Started shift at 1495, finished after 1586. Machine working OK. Stop for running inspection at 8 A.M. Monday morning unless you have a long breakdown during the night. Estimate you should have about 1700 up. Compressor still acting up - dont know what the trouble is, if it goes worse connect it straight into the ball i.e.

Fatigue Test Specimen Test Diary Cont.....

30.5.64
Day Shift Cont.....

take out those two valves which are leaking. But watch it very carefully. If you do this I suggest you open the air block at the bottom of the two control valves, this will give you a bit of extra leeway. Just now 5.45, flight 1581 we have had a fault, the machine is missing putting up level 7's hence it does not inhibit and it keeps on leaving them. The total event counter is still working, flight 1582, this fault is happening again. When the 7 counter gets to 9 and you do another 7 it goes to 00 instead of 10 and hence it starts doing them all again. Flight 1583 did it OK last three flights OK. Running inspection Q completed, 2 small cracks found in area under the air intakes internally, see Inspection Sht., no damage card made out yet.

31.5.64
Night Shift

Started auto-cycling at flight 1587. Recorded flight 1560. Shut down after flight 1690. Hydraulic functioning well and the air system working a bit better - the air pressure in the tanks actually rising to cut-out pressure after about 24 events.

Running inspection R completed. Bolt failed on forward blue steel crutching housing see damage card 22a - dont know what kind of failure this is. We still can't inspect area 16 completely because of the Araldite around the reinforcing plate just aft of the flexible joint. The fitters have definetely refused to go into the roof again to carry out greasing etc., until the lights have been fixed. All the applicable damage cards have been brought up to date.

1. 6.64

G + a inspection completed and aircraft is in the process of being put back together. No new damage found. Please note that panel 5 starboard bottom is not on and that on the panel sheet 5 top is called to be taken off. Make sure they put it back. The '0' tubes are in the box in the office.

Running to commence as soon as the rig is put back together. Maurice has been down today and has put a mod. in to use when the level 7 fault occurs again. If you have trouble with the level 7 i.e. it does not count them, when you have done 10 of them, hold the little button in until you have done the landing case and the board is cleared of events. This button is hanging next to the typewriter. Also if the machine falters a bit while you are running make sure that the plugs just above the back of the typewriter are seated properly.

LLoyd - could you make up some running inspection sheets for us and if you are any prints short make a list and we will get some run off.

Fatigue Test Specimen Test Diary Cont.....

1.6.64
Night Shift.

Completed full set of 3 R.D running inspection sheets - except for a few area 59's. Those missing are marked up on each batch.

Commenced auto-cycling at half past two after panel fitting completed.

Started at flight 1691.

Recorded flight 1720.

Finished shift at flight 1744.

The flight cycle counter is two flights ahead of the number actually completed - presumably due to the fiddling Maurice did during the day. Everything is running OK at 6 minutes, 30 seconds per flights.

Inspection

The following areas were not completed an running inspection 2nd S.

Area 59, 60, 61, 62 and 63.

Area 7, 15.

Areas 10, 11.

Areas 5, 12, 54.

Areas 17, 19.

Please complete inspection.

All damage cards are up to date; no new damage found so far.

2.6.64
Day Shift

Rex examined the 2 B.A bolt you found on Damage Card 22a. This has been put down to bad fitting, the bolt being over tightened on assembly.

You are not to stop the rig tomorrow morning as it has been decided to run all night and stop for inspection tomorrow evening. Inspection 2nd T is complete except for the following areas 5, 12, 20 21 and 54, these have been given to the night inspectors. All damage cards are up to date.

Commenced auto cycling at flight 1745 and finished at 1846. Rig will run until Wednesday night.

Flight time has been slowed down to 7½ minutes as far as I know this has been done to stop the rig shuddering as much. Everything worked OK, no faults. Flight counter still two flights ahead.

Fatigue Test Specimen Test Diary Cont.....

2.6.64
Night Shift

Took over auto cycling at flight 1846.

Recorded flight 1898.

Finished shift at flight 1945.

Rig running OK.

Inspection

Inspection 3rd OK completed and the remaining sheets of 2nd T. New damage was found in area 19 (see sheet and damage card 25a) starboard side was also examined in this area but no cracks were found.

All other damage cards were brought up to date. Will you please make up the next stopped inspection and also the panel sheet.

3.6.64
Day Shift

Started cycling at 1946. Pad pulled off at 1964, finished of flight 2000 for repairs and stopped inspection.

Start stopped inspection and also other jobs. Change jack in 4 M.I starboard, the most outboard of the pan. Also fit extra 50 lb. weights x 2 to the link on 1 M.B port and starboard. Have done port side weights are on floor outside Rex's office. Have got the giraffe from Experimental and it must go back after use.

Will you please clarify the damage cards 9 c and 9 b. Rex says that they are very difficult to follow. N.B I have modded 9a.

Dont connect up 1 M.B linkage the pad is drying.

Panel sheet complete and is on the board. No. 3 port tanks is to be completely stripped. 4 and 5 port are partially stripped. Check all damage cards for the tanks both port and starboard.

3.6.64
Night Shift.

Stopped inspection H + b completed except for area 48 and 49 which your shift inspectors already have in hand. Area 40 not done because of intrascope trouble. Panel 14 has got to come down (some of the screws are stripped). We did not remove the sumps on No. 2 tank - just the access panels. You do not gain anything by removing the sump plates. Several new cracks found in tanks 4 port (see damage card 4c).

New cracks in tank 5 port (see damage card 3i). All damage cards up to date. Could not think of a way of making damage cards 9b and 9c clearer. Have not entered up the sheets on the master table We need a lot of U2 batteries - there are none in General Stores.

Fatigue Test Specimen Test Diary Cont.....

4.6.64
Day Shift

H + b stopped inspection completed and entered up on sheet. Bearings have been changed at the pivot on groups 2R port and starboard. Put some extra hinges on 2 M.I. Running inspection 3rd M has been started.

Began auto cycling at 5 p.m. flight 2001 finished at flight 2029. Machine working OK. Would you please watch the pad that pulled off on port side just to see that it has stuck down OK, keep your eye on the outboard three pads on the same line. These last three have shown signs of deteriorating.

N.B The over travel switch on the port side is only an inch clear when you do a level 9 manoeuvre while the starboard one is about 9" clear. Obviously the aircraft has rolled since they were set up. The only snag is that there is a distinct possibility of tripping it off when a level 10 is done. This needs watching very carefully.

One way out is to disconnect the port one before you do the level 10 and see if it would have tripped.

4.6.64
Night Shift.

Took over auto cycling at flight 2030 to be told there was 8" (approx.) of roll on the aircraft. After checking the deflections, we found that this roll occurred on manoeuvres. We checked around the rig for disconnected weights, hydraulics etc, but found nothing to cause the roll. We asked all available personnel to congregate on the port tip for a complete manoeuvre cycle, but this made no difference to the roll. We did discover that certain linkages were on the verge of fouling stops (3R port) when we did level 9's. Therefore with this in mind, I decided to cut out the level 10 on flight 2100. Operating the manual selection caused the flights cycle counter to show one extra flight.

Incidently, we were not sure whether the flight cycle counter was still two flights ahead prior to the above incident so we have been calling out flights as shown on the counter. Fitted bungee strand to 2 M.I (Port).

Inspection

The forward hinge pin on the port outboard engine door has rotated so that it can pass the tuffnol block and as yet it has not moved linearly. Running inspection 3rd M completed and all damage cards brought up to date.

Will you please make up the next stopped inspection and sheets, which I presume we shall need tonight. New cracks have appeared in the engine bay titanium cut out (15a) and in louvres of vent panel (9b &c).

Fatigue Test Specimen Test Diary Cont.....

5.6.64
Day Shift

Commenced cycling at 2130. Finished at 2201. Flight cycle counter 3 flights ahead. Stopped at flight 2137 for mods on weights which were sliding off beam. Mean level pressure switches reset. Flight time has been purposely reduced to 7½ minutes at flight 2173. The setting of the unload rate valve is 6½ segments clockwise to the tape or three segments anti-clock to the wire.

Keep the flights at 7½ minutes and stop at the end of your shift. I could'nt get an answer out of Rex about the level 10's so I am going to stop it doing them. I suggest you do the same.

There is a job for Laurie Pearson to do when he comes in, I will leave the chit in the book. Tell him this is most important and takes first priority over 780 and anything else outstanding on the Vulcan. He has got to connect the main system A pressure gauge into the line which runs from the floor to the pressure switches and take out restrictors in gauge line.

Fault on flights 2177 instead of selecting D on the landing, it went straight to A and B. With no selection on the lights. N.B. When doing the landing make sure that the left over pressure in system C is correct to the sheet of running instructions.

When there is any request for Norman Skilton to do any job on the aircraft outside of a manual stopped inspection, whether on an E.R.I or not it must be noted down in the book provided which is hanging on the window above my desk. When the job is complete it must be crossed off. This is so that we have a complete record at all times of the jobs outstanding on the rig. Roll in the aircraft is caused by 4 M.I on starboard is developing too much load.

3rd N running inspection almost complete except for 4 sheets, no cracks have been measured today. Crack? found near panel E is not a crack but watch it.

5.6.64
Night Shift.

Took over auto cycling at flight 2201. Recorded flight 2250. Shut down at flight 2290.

Inspection

Running inspection 3rd O completed and the remainder of inspection 3rd N. Several more cracks found in area 19 see Damage Card 27A, and some mechanical damage in area 12 (no damage card yet). All damage cards brought up to date.

Fatigue Test Specimen Test Diary Cont.....

6.6.64
Day Shift

I + b inspection completed - rubber blocks have been stuck on beams on 7 M.I, 1, 2 and 3R on starboard side also 9 M.I beam. Cracks found in the nose of No.3 tank port and cracking much more extensive in the nose of No.5 tank port. Photograph taken of damage in No. 5 tank port. All three pressurised tanks have been put back only panels and sump remain before restart.

7.6.64
Night Shift

Night shift now under new management. Commenced cycling at approximately 12.15 a.m. Bungees knotted to give extra tension on 2 M.I linkage at bottom end. They seem to have lost a good deal of their resiliance. Suggest more bungees are made up as replacements.

Nut on weight clamp on final beam of 5 M.I port was found to be fouling beam of 5 G.B when 5 G.B was not applying load. This means some of linkage weight of 5 G.B will be relieving load when 5 M.I is in operation. Rubber blocks were stuck on correcting lever beams on port side except 3R where the gap between lever and stop is only about 1½". Trimmer rubber is required.

Small crack found at inboard corner of intake on top of fuselage adjacent to front spar. Could you please find out what this intake is called and pop it on the damage card 28a.

Rigs that have damaged bearings don't appear to be getting any worse.

First flight 2291, last flight 2357. Machine running OK, flight cycle counter still three flights ahead. Manually deselected level 10 as aircraft is still rolling abnormally. This makes three level 10's that have been missed. Working off compressor for tank air supply. This works a lot better if the release valves are opened to stop it cutting out so much. Flight time approximately 7.15 minutes.

2 M.I roof attachment beam looks a little splayed out.

8. 6.64
Day Shift

Took over auto cycling at flight 2357. Finished cycling at flight 2451.

You are to continue until end of night shift. It is imperative that John Shortland carries out the instructions in Rex's enclosed note. Hand in hand with this keep the idling pressure at 600 p.s.i. throughout the night.

Rex would like the potentiometer and dial gauge spindles in all the L.M. rings to stop moving in and out until they are required for U.V recordings etc. In this respect I have fitted rubber bands round all the spindles on the top surface port wing with the exception of 6F. If these are still on when you have settled in will you do the same to the rest of the rings. If not, use imagination and try to think of alternative method of fixing.

Fatigue Test Specimen Test Diary Cont.....

8.6.64
Day Shift Cont...

Running inspection R complete and the remaining sheets of Q. All damage cards brought up to date. We have caught up to two level 10's, you catch up the remaining one by putting it in at 50 flight mark. Let the others come in as usual. Finished at flight 2451.

8.6.64

Auto-cycling commenced at 2451. Finished after 2499 due to failure of pin in 4 M.I port. Began to replace bearings and pins to carry on but discovered holes in HTS link were badly rounded at the edges so to save the new bearings being damaged unneccessarily cycling was stopped. We would only have had an hour's running anyway. Fitters are now engaged in a complete bearing change for the whole compound rig. New link will have to be made for the area that is damaged. Flight counter still three ahead. One level 10 still left to catch up on. Aircraft is not stress rigged.

Inspection 3rd R started but not completed. Previous damage card which were outstanding have been done. Panel sheet has been done and is on the board. No cracks have been increased during the night due to helping fitters on the damaged rig.

U/V recorder : Took readings of 14 strain gauges on front and rear spar bottom booms. Analysed five of these to find stresses (using a static mean level as datum) and compared with corresponding results on static tests.

9.6.64

We are leaving you a load of odd jobs, as follows :-

1. The fitters are dismantling 4 M.I. starboard, 4M.I port is already dismantled. Check which bearings and studs need replacing and do necessary paper work for manufacture of same. Get this to machine shop tonight. Have the fitters reassemble as much of the 4 M.I's as they are able.

   If the particular fitters assigned to this work come to a standstill they are to begin dismantlin 1R and 3R port and starboard and renew all shattered bearings (we have replacements in the office). Do these rigs one at a time so that one is complete before you start the next.

2. Try to replace broken link on 1 F.S starboard (can be seen if you stand on leading edge platform).

Inspection

1. Bomb door fairing should be down in an hour. Please inspect this area promptly. Norman's fitters will reassemble fairing tomorrow.

   Running inspection inferred there was new damage on the fairing. Please check this out. (Area 23, running inspection 3rd R - Lloyds desk).

Fatigue Test Specimen Test Diary Cont.....

9.6.64
Day Shift Cont...

2. Areas 36 and 40 are still to be done for this stopped inspection. Introscope now works at 1/1 magnification.

All stopped inspection damage cards need bringing up to date with the exception of the fuel tanks.
Note Tank 4 starboard must not be put back yet as new damage has been found and not yet recorded.

9.6.64
Night Shift.

4 M.I port not completed. 4 M.I starboard not stripped - no point in stripping it until 4 M.I is complete, as there are only two fitters on this job. Bomb door fairing not off. 4 Tank starboard inspected. Damage card made out for new damage. Leading edge has still to be inspected. Machine shop working on manufacture of bearings for 4 M.I starboard. Broken link on 1 F not replaced.

I don't know whether you seriously expect us to get all the bearings changed in these rigs because there is about a weeks work for two fitters to do it. The weight on 4 M.I starboard that has been chocked up need'nt have been. To strip the rig the other weight has to be lifted. I could'nt turn the rig over with the pumps as half of the electrics are out of the console.

Continued analysis of U/V recorder results of 8.6.64. Completed a table of percentage errors. Also analysed front spar bottom boom strain gauge C.I for flights at intervals of approximately 300 flights from 150 to 2460 to find how the stresses have been varying throughout the flight done so far Drew graphs showing this variation.

2 Pins in 4 M.I rig are bent and will need replacing. There are supplies of studs in the stores or in N. Skiltons office.

10ft. of 1 7/16" dia. phospherous bronze bar was sent from Chadderton during the night so we should have ample material for making bearings.

10.6.64
Day Shift

With luck you should be in a position to start running by midnight, providing 4 M.I starboard and groups 3R are reassembled satisfactorily. If so, the following instructions for running apply :-

1. Analyse C.12 as you did C.1 last night for all traces with C.12 on.

2. Construct diagrams as per specimens done today. Check that C.12 and C.1 give similar answer i.e. after flight 600 results are reasonably consistent.

3. When rig is ready record all loads i.e. wing bending port and starboard and man. inc. (remove rubber bands from potentiometers). C.I must appear on each trace recorded. (e.g read C1 and 15 rings).

Fatigue Test Specimen Test Diary Cont.....

10.6.64
Day Shift

4. These flights must be typical of recent flights. i.e. 7 minute, 15 seconds flight 600 p.s.i. idling pressure.

5. Mean levels must be established for each group of loads on each trace.

6. Do not analyse the above results.

7. Put on C.1 and C.12 assess the error at mean level on a 7 minute, 30 second flight.

Attempt to correct mean level error by altering mean level pressure switches to suit. i.e. put on static mean level and check which switch is in error.

If time available and satisfaction on point 7 reached, continue correcting individual levels (cms) starting with the worst and checking reliable operation throughout flight after each change.

If successful on above record complete flight and analyse in detail.

10.6.64
Night Shift.

4 M.I rig starboard back together at 2 a.m., had trouble with the two tank linkage which had shifted in the tank and we could'nt get the sump panels on. Finally got it right and shut the bomb doors.

Point 1) Done OK.

Point 2) Done OK.

Point 3) Done OK.

Point 4) Done OK.

Point 5) Done OK.

Point 6) Done OK.

Groups 1FP, 1FS not working for some reason.

Group 3FP, pot spindle sticking.

Also some spots very faint or badly focussed.

Group 4 MIP - spindle sticking but now fettled OK.

All cocks left OPEN.

The outstanding inspection of bomb fairing has not been done.

Fatigue Test Specimen Test Diary Cont.....

11.6.64
Day Shift

We have to try to adjust all the levels to give the correct signals on gauges C1 and C12. (See sheet of signal values).

Begin by adjusting the mean levels to get rid of gap or overlap on the two traces. We have adjusted M.L switch 2 as far as it will go without stopping level 7's from functioning. Therefore any further adjusting will be on mean level 1 switch (suggest a reduction of 5 p.s.i.).

We thought we had the means cracked at one stage and began reducing level two. We had this fettled to the correct value - hten discovered the means had shifted.

All these alterations are fairly suck it and see, based on the U.V recorder scrolls.

N.B Keep the unloading rate valve in its present condition and the idling pressure at 600 p.s.i.

11.6.64
Night Shift

Bad leak on jack at 4 M.I port. Creaking link on 2 M.I.

We began by adjusting the mean level switch 1 as you suggested and found out that this is the wrong switch. M.L. 1 is for -'ve gusts and manoeuvres, M.L. 2 is for + 've gust. Due to this faux pas everything was in a shambles. So we started again and took 14 traces in all making adjustments all the time. A precis of what we did is as follows, the appended sheets are what we did in detail.

Traces 1-8 inclusive show our alterations to the mean level switches. Traces 9-14 inclusive show our alterations to the load level switches with a static mean level on trace 14.

From trace 8 onwards tank pressure was raised to 3.25 before we started cycling, as we were measuring stress in the boom next to the tanks, thought it might make a difference to the stress for the first levels. Cocks left open.

Trace 1

Measured stresses on consecutive level 1 & 2 in order to find out from where we started.

Trace 2

Altered wrong switch in error - would'nt do 7's so altered it back down so it would do level 7's, altered correct switch as well. Mean level 1 too high, mean level 2 too low.

Fatigue Test Specimen Test Diary Cont.....

11.6.64
Night Shift.

Trace 3

Adjusted mean level 2 and mean level 1 down. Thus corrected mean level 2 to trace 1 but mean level 1 too high.

Trace 4

Adjusted mean level 1 down and got it back down to original trace 1, but static mean level gust is now higher than original. Another mean level static was taken at the beginning of the next fligh and was slightly low. We will now try holding it for longer time to give it a chance to steady out.

Trace 5

We did five statice mean levels during the gusts to get an average. The last was discontinued as it was a bit high (Pressure.)
Average was 21.67. We then took a trace of the next flight and superimposed our average mean level static on it. The first 2's and 1's were wrong and then it went OK.

Trace 6

Altered mean level 2 down a bit. Trace shows that mean level 1 and 2 are now below static mean level. We propose now to run off a couple of flights to see whether this still occurs. After altering both switches up a bit.

Trace 7

Altered both switches up and did two flights. Both flights the mean level line tapers and both a bit high on the static mean level. Decided that this was as near as we can get it, and we would attempt to drop mean level 2 down a bit.

Trace 8

Altered mean level 2 down a bit and did three flights, on the last one let the tank pressure build up to 3.25 before we started to cycle. Both mean levels havemoved above the static mean level but the mean level 1 and mean level 2 are the same. We have now decided to chuck the mean level game and go the load level peaks, as we cannot put the mean level 1 switch down anyway. The mean level 1 switch being set so close to the bottom of level 7, bringing on a strange U/C case. If the last level is a 7, A and B systems deselect but the pressure does not fall off much, but waits until selects. Have checked the trace and the bottom peaks of U/C case is the same as always - so we dàcided to leave it. The jack inthe fornt spar outer outer wing port rig is spewing oil now as well.

Fatigue Test Specimen Test Diary Cont.....

11.6.64
Night Shift

Trace 9

Altering all gust pressure switches to suit except five which is OK. We now get levels :-

	C1	C12	
Level 1	2.25	1.63	High pressure at peak.
Level 2	1.85	1.35	High pressure at peak.
Level 3	3.23	2.33	High pressure.
Level 4	3.3	2.43	High pressure.
Level 5	3.75	2.65	Did'nt alter switch
Level 6	4.05	2.9	High pressure.

Trace 10

Altering all gust and pressured switches except five which we will watch to see what it does, as it altered on its own accord last time. We now get :-

Level 1	1.95	1.4	Pressure high at peak.
Level 2	1.7	1.24	Pressure low at peak.
Level 3	2.7	1.95	Pressure low at peak.
Legel 4	3.22	2.35	Pressure high at peak.
Level 5	3.7	2.62	Pressure high at peak.
Level 6	3.9	2.8	Pressure hight at peak.

Trace 11

Altering all gust switches to suit last trace. We now get :-

Level 1	1.77	1.3	Pressure peak low.
Level 2	1.8	1.35	Pressure peak low.
Level 3	2.9	2.07	OK.
Level 4	3.0	2.17	Pressure peak high.
Level 5	3.58	2.55	OK
Level 6	3.5	2.58	OK

There is now a slight gap between the mean levels and the static mean level is getting progressively further away.

Fatigue Test Specimen Test Diary Cont.....

11.6.64
Night Shift

Trace 12

Altering gust switches 1, 2 and 4 to suit last trace. We now get :-

Level 1	1.9	OK
Level 2	1.9	Pressure peak low
Level 3	2.9	OK
Level 4	2.6	Pressure peak low
Level 5	2.6	OK
Level 6	3.6	OK

Gap in mean levels getting bigger and further away from static mean level. But we can't drop mean level 1 any because it won't do 7's, so we will try to get pressure switches right first and then worry about static mean levels. We are taking values from a mean line between the two mean level's in the hope of bringing one up to it and are down to it, when we have set the level switches right. 2 and 4 are now out, we alter these now.

Trace 13

Altering gust switches 2 and 4 to suit

Level 2	1.89	Peak low
Level 4	2.81	OK

2 is still low we'll have another go at it.

Trace 14

Altering gust switch to suit (2)

Level 2 now 1.86 again. Mean levels now not too bad varying a bit. Are you sure that the level 2 signed is right ?

Level 1 = 1.892 and 2 = 1.97. Static mean now OK. This is how we ended up on Trace 14.

Level	Static		Dynamic	
1	1.892	1.333	1.88	1.33
2	1.970	1.485	1.86	1.4
3	2.890	2.030	2.9	2.05
4	2.840	2.210	2.8	2.08
5	3.580	2.515	3.55	2.5
6	3.550	2.725	3.56	2.65

12.6.64
Day Shift

Because of incompatible results between gauges C1 and C12 are introduced the following gauges

Gauge	Channel
C1	1
C12	4
C2	5
C13	6
A6	7
A7	8

Fatigue Test Diary Cont.....

Date	Remarks
12.6.64 Cont...	As a result of the investigations we made it was decided to alter the manoeuvres by reducing the top level only. The reduction applied to each level was the average shown to be required by each of the above gauges.
	Level 7 — 16% reduction
	Level 8 — 17% reduction
	Level 9 — 11% reduction
	The pressure switches were fettled to give the appropriate top level pressures :-
	Level 7 — 759 p.s.i.
	Level 8 — 798 p.s.i.
	Level 9 — 917 p.s.i.
	A trace was the recorded and the magnitude of the range for each level was measured and compared with the required value. We should just about have the results of these by the time you come in and you will be able to see whether further alteration of the switches is required.
	Once the levels are suitably adjusted commence cycling and carry on all night. The two Johns are to devote themselves to the task of recording all the loads (L.M. rings) on the U.V.R - keeping C1 on each trace, and anlysing the results. Finished at flight 2,576.
	Inspection
	During the day I had the inspectors finishing off Running R (the one left over from last Monday or so). I have not booked in these sheets or checked them for damage notes.
	Will you start another running inspection giving the inspectors all the areas and at the same time select the most intelligent of the four and show him how to measure the cracks on area 19 - we must keep up with the propagation in this area. This same inspector must also do a thorough rig inspection during the night - particularly bearings etc.
12. 6.64 Night Shift	Commenced to try and get the manoeuvres correct to the sheet of figures that was left for us, but first it was found that it was possible to get one gauge right for the levels but most of the rest were either high or low. After a few alternative attempts along a similar line it was decided to average all the percentages up and get the mean of them to 100% or thereabouts. We got this to about 102%.
	The event counter has gone U/S it now goes to 9 and them back to 000 so I have put the air system on the manual box otherwise it won't cut out.

Fatigue Test Specimen Test Diary Cont.....

12.6.64
Night Shift Cont.....

The first proper cycling flight is 2,596, there is still the strange landing case where although A and B deselect the pressure stays there until it is blown out by the selection of D.

Event counter fault cleared itself on flight 2,601. Bulb blown in the ApV warning light. Pressure holding steady about 3.35 psi.

U/V recorder

Complete set of load measuring rings read, in four sections, along with strain gauge C1. MLg steady and MLM steady recorded on each section, also AR/R % VS Cm for each position. Groups 1FP 1FS U/S. Channel 3 U/S so groups 3FD, 5MIP not read otherwise good results. Last flight 2,610.

13.6.64
Day Shift

Stopped flying at 2,690.

Inspection

Please prepare a panel sheet for a stopped inspection first thing monday morning.

John Cooper

You are personally to look after Area 19 particularly the crack which is running across the spar boom i.e. crack C on damage card 25A. This crack has to be watched all the time and if the crack extends to the second row of rivets you are to stop the test. I suggest you measure the cracks at the beginning of the shift and also at the end. You will find enclosed in this book a graph of the rate of growth of this crack. Also twice during the shift will you remove the air brake panel in this area and have a close look at the spar boom. This job is super priority.

The running isnepction sheets are in the inspectors office so could you please enter them up.

You are to run until 7.30 a.m.whereupon I suggest you get two fitters to remove the Rattermole jack from 4 M.I port rig. Laurie has the seals for mending same. Also please loosen the doped on 2 M.I port by at least 2". We have investigated your levels and come to the conclusion you were plain lucky.

14.6.64
Night Shift.

Regarding the manoeuvre level levels, we were'nt just lucky we had beenn doing the right thing in the end. Air brakepanel off at flight 2,723 no damage visible inside. Stopped after flight 2,731. Bearing in centre pillar of outer outer wing rear spar rig completely broken up.

The main beam has been dismantled and only the bearings in the beam channels were found to be worn. A sketch has been sent over to the

Fatigue Test Specimen Test Diary Cont.....

14.6.64
Night Shift

machine shop for the manufacture of two new oilite bearings at 7.40 a.m. Main pin (1¾" dia.) was found to be slightly bent but do not consider it necessary to replace it. The pin is a good fit in the bearings in the pillar. The jack on 4 G.B port has been removed, front spar compound rig.

The nuts on the pivot stud on the Dow rear spar starboard rig were found to have unscrewed thus allowing the bearing to break off its flange and extrude itself out of the hole in the channel. Vertically all of the 3rd T inspection has been completed except sheets for areas 18 and 19. Cracks that have been measured during the night are as follows :- Damage Card Nos. 29a, 27a and 25a. A new crack (j) was found on sheet 27a, Crack C which was previously said to be run into much has not.

15.6.64
Day Shift

Completed stopped inspection 2nd A + a. All damage cards brought up to date.

There is a repair scheme in progress for cracks in No. 3 tank (Port). When this is finished and the tank back, you are to start running. Strain gauges have been fixed to the edge of the spar boom directly over crack 'C' on damage card 25a. The strain gauges are on port and starboard and have been fitted into a manual set under the intakes (all balanced). Suggest you leave the heater lamps in as long as possible before putting the air brake panels up and stating cycling.

When you begin cycling you are to start gusts by manually a level 5. This you will apply in increments at 400, 500, 600, 700 and 750 psi, reading the gauges on the manual set. Finish the gusts automatically and begin manoeuvres by manualy selecting a level 10. Apply the pressure in increments at 500, 600, 700, 800, 900, 1000, 1100 psi readings, the gauges on the manual set.again. The main interest lies in obtaining straight line plots from this gauge and the comparison between port and starboard. The most important job tonight is to finish the analysis of the L. M. ring traces you took on Friday Night. These are upstairs in the new office partially completed. Bryan stresses these must be finished by morning.

Keep you eye on crack 'c' - the one running under the spar boom. Check the propagation rate and have the air brake panel off a couple of times during the night for a close internal inspections.

Please enter up the stopped inspection sheets on the chart and check them for funny notes written by the inspectors.

No running inspection has yet been issued but a 4th running K is all ready on top of Lloyds desk.

Fatigue Test Specimen Test Diary Cont.....

15.6.64
Night Shift

Completed analyis of results taken on 12/13.6.64 in terms of alternating loads. After an extensive search we were still unable to find values of static loads for groups other than 1 to 5F port, 1 to 3R port, 2, 4, 5, and 7 M.I.P which were shown on results analysed by Jeff Coulthard for 10/11.6.64. The analysis in terms of absolute load, for 20.5.64 is incomplete. Also no express instruction had been left as to the required form of the analysis of results for 12/13.664 so we have obtained both alternating and absolute loads and compared them with what static results we have.

A box has at last been made for the U/V rolls, but we have not yet had time to file them. If possible could day shift arrange for an apprentice to do this job. A larger book has been started, and each roll should have flight No, Date, and type of readings taken, on the outside, be rolled up tight with an elastic band round and all details entered in the book. The sheets of calcs and graphs should also be filed, and indexed so as to fie up with the rolls.

Tank repair finished and all panels except the airbrake panel and the tank sump panel back on, by 7.30 a.m. The gauges on the span are red hot and the spat on the galvo is moving as they cool down, so you will have to wait for them to cool off or the results will be howhere near linear, also the siting of the galvo is pretty crude as the planking is not firm enough to keep the galvo steady. Also the batteries are duff. These last two points weare are trying to rectify.

We have fixed the batteries up. Have had to put 3 in series to get the 4 volts. Will you tell Harry that there are a lot of the batteries in there that are well below capacity or nothing at all, and ask him to get Alf to change them up properly. The galvo is still very shaky. If you read them in the position that they are in, don't let anyone come within 3 yards of you. The gauges have now steadied out and are ready to read.

16.6.64
Day Shift.

Started auto cycling at flight 2,732. During the first three flights we applied pressure incremental during the three level 5's and one level 10. At each increment gauges on the spar were read on a manual set. The results were linear and both sides were comparable.

You are to continue running all tonight and we will run all tomorrow, the next stopped inspection being tomorrow night when there should be over 3,000 flights on the board. Keep the idling pressure at 600 psi and the unloading rate set so that the piece of white tape is half a segment clockwise of the bottom centre position. Flight time should then be about $6\frac{3}{4}$ minutes.

Fatigue Test Specimen Test Diary Cont.....

16.6.64
Day Shift Cont....

Finished shift at flight 2817, inspection 4th K completed but not entered up. Several more cracks have been found in area 19 and a new damage card is needed. All other damage cards need bringing up to date - this is important. The airbrake panel should again be taken of and the spar boom inspected - once only unless crack 'c' on damage card 25a grows considerably.

16.6.64
Night Shift

Took over cycling at flight 2818. Finished at flight 2929.

3.0 a.m. first casualty, John Shortland gashed his thumb open, and has had to go to hospital to have it stitched (3 stitches).

On group 3R Port (the most outboard group) there is a loading point which had a stud going through the trailing edge and on to a pad on the top surface. This stud is chafing madly and could do with a close look if you ever stop tomorrow (OK).

Starboard undercarriage making a grinding noise during manoeuvres. The second and third most outboard panels on 1 M.B port are getting pretty bad. I think arrangements should be made to fillet them with Thiocol as soon as we stop, as failure seems fairly iminent.

Have made a start at organising the U/V recorder traces. These are now in cabinet in order starting at top of cabinet working from left to right, downwards. The rolls we have correspend to those entered in the diary except that a short trace, (on which we proved that 0.1% is gauge (active) arm giving some deflection as 0.1% on pin board) appears to be missing. Also there are several traces taken by day shift on 12th and 13th June which have no flight No., date or gauge idents on, please finish this information andthese traces can be filed properly.

The forward tie linkage seems to collapse extremely violently (on undercarriage case) just recently. This does'nt do the L.M. ring, in particular any good. Could somebody on days please fix some bungee up to pull the bottom beam over.

The link from the weight to the correcting lever on 5 G.B port is sometimes catching the wing on the change to manoeuvre, also it has demolished the gaurd rail on the trestling.

We need lots more bungee as we have a lot of collapsible links which are not doing so and allowing linkage to collapse.

Jack on 4 M.I starboard is leaking oil again. There is also an ominous pool of oil under the rigs at the port tip. The hole in the ouboard aileron hinge loading attachment is very worn and the attachment grinds up and down in the hinge. I could not ascertain whether the hole in the link was worn or whether it was the hole in the lugs or both. I think they deserve looking at in case they need modification, when it would be desirable to have a replacement at hand.

Fatigue Test Specimen Test Diary Cont.....

17.6.64
Day Shift

Commenced cycling at flight 2,930. Recorded flight 2,977. Shut down after flight 2,993.

Stopped in afternoon to fit new bearings in 5 G.B port correcting lever pivot. This is mentioned amongst attached sheet of jobs to be done on rig during this stopped inspection.

Jobs on Rig (None Done)

To be carried out during next stopped stage (17-18 night/6/64). On Group 1R port where link is chafing wing skin (see your note in night book 16/17/6/64) a bigger clearance is to be made.

Arrange for links on 1 R countepoise port and starboard which are badly bent, to be straightened and if there are any signs of cracking, replaced. Also shorten forward carching wire on 1 R counterpoise port to stop the links collapsing so much.

On 5 G.B port new bearings have been put in at pivot to correcting lever connection, this has to be done on starboard, using bearings put by for 2R. New ones for the 2R groups have been ordered and may be ready during night if not when you come in. 200 ft. of bungee has been ordered and should be over at dispatch waiting for you, these want cutting out and lashing up where required, this may be difficult in absence of ferrules.

When you know how many bearings are available with the ones we've got plus the ones ordered, the rigs in question are to be dismantled and the bearings replaced. Please leave a list of where bearings have been changed to Phosphor Bronze, so that the fitters know which ones needs greasing most regularly.

If work is incomplete at shift end, please tell us at what stage they are, and any new rig work to be done, on following sheet.

17.6.64
Night Shift

Re outstanding damage cards, I could only find one crack at the edge of the air brake.apperture port side and have entered this on the damage card 25a.

As to crack found by Inspectors on area 17 at flight 2,983. There is only one crack at outboard corner of cut out. The suspect one at inboard corner polished out. Damage card 34a. Outstanding inspection sheets for inspection 4th L entered upon sheet. Damage card No. 5 for 4th M entered up.

No. 5 tank port left open because of severe damage to nose skin at outboard tank bulkhead. This will probably need repairing.

No other job has been done on the rig other than work for the inspection itself.

Fatigue Test Specimen Test Diary Cont.....

17.6.64
Night Shift Cont.....

N.B. Starboard wing tip skins appear to be pulling off at the wing tip joint. Several screws are loose and the skin has pulled down about $\frac{1}{8}$". This definately needs looking at.

Ask Bryan whether a damage card is required and if so will you do one. One or two screws seem to be stripped (i.e. near the aft row of pads at the front spar bottom surface).

Damage cards 3i and 3h have been redrawn. All tank damage has been entered up on damage cards. No X-Ray personnel have been in during the night.

Inspected area 40 using the introscope. This is still very unsatisfactory - the bulbs in both heads contact only intermittently and I spent some time trying to get the things to stay on. In spite of several attempts I could not get the introscope on the strap at station 494 using 3 extensions, but (when it works) the introscope now gives a good clear picture and there is plenty of light.

18.6.64
Day Shift

Inspection

O_4 running inspection is next on the agenda and you should be able to start this after about 2 hours or so. At the moment the night inspectors are finishing off N4.

We found cracked brackets in the bomb bay on bomb arch 151 and I have instructed Shatwell to cover both sides of the bomb bay and to mark or indicate any others that he may find. I have told him to do this extra work at the expense of his other areas so if you see the other inspectors out of work you can give them his other sheets. The damage card originals are over in the print room, so can you use old prints or something to record the damage in the critical areas. Can you please do a damage card for the wing tip.

From the results of L.M. ring traces on the 13/14 of this month it is necessary to reduce the top level 7 by 20%, the top level 9 by 7% and to reset the level 8 putting the mean level in the correct position reducing the amplitude by 12%. Initial pressures to do this have been calculated and when you arrive you will find the machine running with the pressure switches already adjusted to give a close approximation to the required pressures.

You must now take a trace of gauges C1, C2, A6, and A7, which are already set up on the U.V recorder on channels 1, 5, 7 and 8. (Please believe me this time). This recording must contain 05% calibration and mean level line. You will check the trace to see that the mean level for each load level comes at the right position (0.2 of the total amplitude). It should be OK for 7's and 9's

Then take traces of all L.M. rings with C1 on each trace and begin analysis. Desired results are on the desk in Rex's office.

Fatigue Test Specimen Test Diary Cont.....

18.6.64
Night Shift

U/V Recorder : 1. Recorded C1, C2, A6, A7 for several flights, with static mean levels and calibrations as requested. On analysis it was found that (on average) level 7 was 23% low, levels 8 was 8% low, level 9 was 2% high, on measurements of amplitude, for level 7, the mean level (static) occurred at 32.2% for level 8, the mean level (stati occurred at 21.7%, for level 9, the mean level (static) occurred at 27.0%. Since the day shift were trying to obtain 20% reduction of level 7, 12% reduction of level 8 and 7% reduction of level 9, and on consideration of the previous stress values (latest) it was decided that the desired effect had been achieved.

2. A complete set of loads was then recorded (with mean levels and calibrations) in 4 sections, each with s.g. C1.

It is expected that the measured dynamic loads will be correct, if so, we will then have two sets of results for strain gauges and rings, on one of which the pressure switches were set to give correct average stress; on the other the switches were set to give correct average load. The first results in excessive measured loads, the second results in inadequate stress

Commenced cycling at flight shut down at flight 3115 when the link from the compound rig to correcting lever on 5 G.B bent itself and scraped the U/surface of the wing. What happened is that the universal at the correcting lever end unscrewed and allowed the links to rotate so that instead of bleeding into each other they bent themselves. The angle on the link for the bungees was then scraped the underside of the wing.

The fitters are straightening out the links and sawing off the inverted pieces of the bungee angle. They are fitting a backing bar to the universal link as well. It would probably be a good thing to weld a plate up the link to cover where it was bent, just in case it cracks because they have straightened it out cold.

Previous inspection 4th N completed and 4th O partially complete. Damage card has been done for the wing tip and (new cracks have been found at the edge of 12G skin on area 19, one of these was found on the previous day at flight 3015). Damage card has been done for this. Cracks in areas 19 port and starboard and area 17 have been measured and also the bomb fairing.

The universal link on starboard corresponding to the one on port which came loose has no locking bar on and you would do well to keep it under observation. Find out whether a damage card is required for leading edge damage due to bent link.

Fatigue Test Specimen Test Diary Cont.....

19.6.64
Day Shift

Took over ready to continue cycling, but had to wait for 5 G.B linkage, repair to be completed. Eventually got under way but had almost immediate trouble with the A.P valve. The retaining nut had come off the piston head and disappeared. Fixed a replacement only to find that the A.D valve would not shut off. Found this was due to the disappear ihg nut, which had turned up under the A.D valve piston.

We completed a few flights then made a very sudden stop when we found the correction jack on 1R port had come undone at the top of the ram, just as the one on starboard didsome time ago.

We had this fixed, then had to stop again to take off panel N (port) to look at the progress of the cracks in No. 5 tank skin, for Brock's benefit. He decided that the cracks were good enough to allow you to continue cycling tonight, but you must stop in time to allow your night shift fitters to take half the blocks out of No. 5 tank and roll back the bag, ready for Norman's blokes to do the two repairs in there as soon as they come in. Please be sure to measure up the damage in there before they start cutting the skins up. Incidentally, whilst taking off panel N we broke off a screw in the middle of the middle rib. The left in portion needs drilling out once you have stopped.

Norman has the drawings for one of the repairs and he has made all the parts he can. Suggest you give the drawings for the second repair to your fitters and ask them to make up some parts if there is any available material.

We read the strain gauges on the boom in the region of the skin crack and the results were OK.

Inspection

Will John T please make out a panel sheet for the next stopped inspection. Also bring all the damage cards up to date.

Running inspection P4 is finished except for area 16 which you will have to give out with the next lot. Finished shift at flight 3159.

19.6.64
Night Shift

Started at flight 3160, shut down after flight 3220 because of power failures which cut out air system and 28 volt generator and all lights. 3.00 we were going to stop at 4.00 anyway to strip the tank.

No. 5 tank stripped half way. No. 4 tank port stripped complete ready for inspection. The damage cards for the parts in 5 tank which are to be repaired have been brought up to date, but only for the repair positions. There is also a rubbing of the damage in the nose of 5 tank.

The screw in panel N that you asked us to have drilled out - does'nt need drilling, it just needs a new screw.

Fatigue Test Specimen Test Diary Cont.....

20.6.64
Day Shift

You will find 2nd C stopped inspection sheets locked up in the inspection office - sort out what remains to be done. Tanks 4 and 5 port have been inspected but repairs are in progress in both tanks I have taken a rubbing of both the cut-outs in tank 4. You will meed to do the same for the patch plates once they are fitted, before you allow the refitting of the tank bag.

I doubt whether you will be able to start running, but, if everything is finished, then you may. Your main task is to complete the analysis of the last lot of L.M. ring readings you took and work out the percentage errors.

Query

Why did you do a full inspection on tank 4 this time Lloyd says it should have been tank 3. (it was 5 last time).

Can you please fill in the chart for the running inspections O, P and Q - these are on my desk (areas 18 and 19 from O4 cannot be found - do you know anything about them).

21.6.64
Night Shift

Carrying on with repairs in Nos. 4 and 5 tanks. No drawings for 4 tank, so we have had to do what we thought best. Also onthe repair on 5 tank in the nose of the tan, there has been made a drilled on extra packing ring. This is not called up on the drawing so it is assumed that somebody decided to put it on as an after thought. This had not been fitted. We were going to fit it between the patch plate and the skin, but this would mean that the patch plate would be joggled by a skin gauge where it goes over the packing strip on the rib angle. The patch plate on the button holes on tank 4 has just a single row of rivets in as shown below.

Answer

Answer

No. 4 tank was stripped complete this time because 5 tank was done last time and 3 tank the time before (remember the other repair we did on tank 3)

The two rubbings of the 4 tank repairs are in the back of the book.

U/V Recorder : Completed analysis of L.M. results for 18-19-6.64 Drew up a table of total alternating and peak values of loads and C1, approx. $\frac{1}{3}$ complete for static test P29, results of 10/11-6-64 and 18-19-6-64.

Fatigue Test Specimen Test Diary Cont.....

22.6.64
Day Shift

There is now a file for the flight record sheets. It will be kept on top of the cabinet for U.V recordings. We should just be starting up when you come in, having waited for the completion of the repair in No. 5 tank.

When you are running tonight there are two things you must do, these must be done once every running shift :

1. Take a U.V recording of gauges C1, C2, C12, C13, A6 and A7. The trace must contain .05% of R - R calibration for each gauge and a mean level line for gust and manoeuvre.

2. Read the two gauges on the manual set (gauge 1 - port, gauge 2, starboard) and check that both give similar answers.

Running inspection 4th R is ready and please bring all the damage cards up to date.

N.B Rex says you are a dirty lot of smokers and has banned you from his office - Tell Rex we swept his office before going home).

22.6.64
Night Shift

On measuring the cracks on damage card 27b crack 'd' was found to be non existant.

U/V Recorder : Checked on a number of values of load quoted for traces on 12.6.64 and 18/19.6.64 and found several errors.

Note Will day shift please obtain some more U/V recorder paper, as the present supply has run out. Also, as requested, set up, balanced, and recorder flights of strain gauges C1, C2, C12, C13, A6 and A7, with all relevant data. Analysed gauges 5FP, 1RP, 2RP, 3RP, 5FS, 1RS, 2RS, and 3RS for results taken 18/19.6.64 (gusts).

Bearings in the links at main jack pick up on correcting levers for groups 2R port and starboard have the flanges cracked.

Commenced running at flight 3227 finished at flight 3338. No faults except that the air system has a marked tendency to go to 3.8 psi on the gusts only coming down to 3.25 during the manoeuvres.

Fatigue Test Specimen Test Diary Cont.....

23.6.64
Day Shift

Took over at flight 3339; finished at flight 3430. You are to continue running all night; the stopped inspection will begin tomorrow. Just for the record, we replaced tube 175M today. The dekatron now rotates much faster.

I have turned down the air supply pressure to nullify the effect of this fairly persistent overshoot once a flight.

We sent for some paper for the U.V recorder, but this arrived too late in the evening for us to make use of it. Therefore your most important job when you come in is to take a trace of the 6 gauges you have on the recorder. Bryan says your last trace was a bad one so please be sure to do the following :

1. Make sure the load is steady before you take a .05% calibration.

2. Drop your pressure right down after A. Aux. has come in on manoeuvre, then take a real long mean level at 576 psi for about 2minutes.

3. Take a mean level for gust also (576 psi).

4. Recrod at lease 2 flights.

5. Make sure that one of the recorded flights has a level 9 far removed from the landing case.

6. Analyse your results tonight.

Inspection

Running inspection S4 completed except for area 16 which we have not had time to do - please try and fit this in with T4. I have given out T4 to the inspectors except for your usual sheets.

Can you please make a valiant attempt to bring all the damage cards up to date for a running inspection. I don't suppose you will have time to make out new damage cards for areas 19 and 8 on port side but make a note of all cracks and we will try to make up damage cards tomorrow.

Please make up a panel sheet for the reset stopped inspection which we will start first thing in the morning. During tonights running time do a check on the strain gauges on the spar boom above crack C on damage card 25a but this time do the gusts on a level 5 and the manoeuvre on a level 9 - do not excee level 9 top limit. Typewriter sometimes missing on 3's.

23.6.64
Night Shift

Commenced at flight 3431. Finished after 3487. Spar strain gauges read on manual set last night were done according to the way we were told - see notes for 15.6.64 except that the top pressure we went to was 1000 psi and not 1100 as the note states.

Fatigue Test Specimen Test Diary Cont.....

23.6.64
Night Shift Cont...

The paper for the recorder had not arrived when we commenced the shift.

The trace last night was a bad one because as the air pressure rises when you take a mean level gust, the centre section strain gauge change in value. The trouble is that the air pressure more often than not goes to 3.8 and therefore gives a false reading on the trace.

John managed to acquire some paper from photographic department. If ever you need any in a hurry this is the place to go to get it, because they always have a good stock of it there.

Stopped after flight 3443 to try and fettle air system, stripped everything and cleaned the hol[illegible] in manometer tube but failed, still overshooting on the gusts. The only remedy seems to keep the pressure on the ball below so that when 3.25 psi is reached in the tanks the ball pressure is about 3.4 psi. The trouble then is that it takes so long to reach 3.25 that the traces for C1 + 2 are wrong until about event 18 or 19. It seems tocure itself when A Aux. deselects and brings A in. Air system OK after flight 3455.

The mean levels for the traces were done with the air system on the manual box, pressure being kept steady at 3.25.

5 Tank mercury tube blew out at 3.25 on flight 3451.

After taking the mean level on flight 3451 it did not get a charge on mean level when the rest of the manoeuvres were finished off on auto. This fault occurred when we held for the mean levels on flight 3440.

Tank pressurisation was off for about seven flights while the mercury tube on 5 tank was refilled. There was no mercury left in the bottle, so we drain all the manometers in the control room.

On flight 3486 faults occurred on level 5 counter would not count. This meant that you had to do a great many of the gusts manually - because it kept selecting the 5 that was not inhibited, and all of the manoeuvres manually, because it changed back to gusts to do the 5 and also the landing had to be done manually. After trying to clear the fault it was decided to pack it in and start the inspection.

U/V Recorder : Due to trouble with the air system which affected C1 and C2 particularly, we spent quite a time before a reasonable looking set of results was obtained. Meanwhile we had observed that just prior to max. pressure on landing case, gauges A6 and A7 very suddenly came back to about mean level stress. This occurred on several flights. Looking back at previous traces we see that the same effect occurred last night (22/23.6.64) but

Fatigue Test Specimen Test Diary Cont.....

23.6.64
Night Shift Cont.

N ot on 12/13.6.64. I went to scout round and see if anything was wrong with rig or specimen around this region such as to cause this sudden stress reversal but I could find nothing omiss, and re-set up gauges A6 and A7 alone on the screen to include U/C case, whereupon the effect disappeared.

On closer inspection of the set of results it was found that although two correct sets of mean level steady had been recorded, neither was within 0.5 cms. of the dynamic values, and the two sets of steady mean levels differed by about 1.0 cms.

By this time the rig had been stopped due to the fault on level 5 counter so that no further readings on the recorder could be taken (it was decided that a manually selected flight would be unrepresentative. A start was then made on analysing the results in terms of alternating values which should be of some value. Completed analysis of above strain gauges.

24.6.64
Day Shift

By the time you come in the outstanding obstacle to cycling should be the bomb door fairing. If you have the labour to spare and the time, so as not to delay the start, you can change the main bearings in Group 2R (Port).

Maurice has cleared the trouble on the No. 5 event counter (He say's). Incidentally, if you get this repetitive 8 trouble again, I found a simple way to clear it was to press the silver, then the red button below the manual selection turret, as the 8 reaches it lower level (this, I believe opens the Thornex).

When running read the manual gauges and a couple of traces on the U, V. recorder - with all the trimmings. This is to be standard procedure for every running shift.

24.6.64
Night Shift

Commenced running at 6.30 a.m. at flight 3488, finished at flight 3501. Bomb doors were jacked up but when run by there the hand pump started dragging in air instead of oil. Decided to run anyway and let Laurie bleed then during the day. Flight Counter has been reset and is now reading the flight that you are actually doing.

Dehanged the main bearings in 2R port and starboar More oil needs to be put into the reader tank, we are running with the level at $\frac{1}{4}$ instead of 11/16.

U.V Recorder : Took readings of C1, C2, C12, C13, A6 and A7 with calibrations and steady mean level gust and manoeuvre.

Fatigue Test Diary Cont.....

Date	Remarks
25.6.64 Day Shift.	Took over cycling at flight 3502. Finished shift at flight 3612. Altered the bottom level 8 pressure; reduced it to 514 p.s.i. Also increased the top level 7 pressure to 746 p.s.i. This brough the two levels in question to more acceptable values for which we took a trace of gauges C1, C2, C12, C13, A6 and A7. After these alterations we now have a top priority job which two men must spend all their time on tonight at the expense of everything else - except drawing the machine of course. We must have a complete set of L.M. ring traces. These I have started, having completed the following :- 1FP, 2FP, 3FP, 4FP & C1, 5FP, 1RP, 2RP, 3RP) 2MIP, 4MIP, 5MIP, 7MIP & C1, 9MIP, 10MIP, C1MIP) All dangling from U. V. Recorder. One of you can begin the analysis of these while John S records the rest. I have already selected the following on the box in the gantry. 1FS, 2FS, 3FS, 4FS, 5FS, 1RS, 2RS, 3RS) 26, 27, 28, 29, 30, 32, 33, 34) These are on the channels in the little book. C1 Channel 1 The most urgent job is to finish the sheet of applied loads for various levels and flights (Geoff. will fill you in.) To finish these sheets you will need the level 7 values, only from the traces we are now taking. Inspection If you can read the strain gauges on the spar please do because the crack is almost at the other rivet line but do not do this at the expense of the above work on the traces. I have'nt done any inspectioning all day and I don't suppose you will have time but see that the works inspectors do areas 16,17,18 and 19 both port and starboard as these have not been done for about 250 flights - Please make out a panel sheet for a stopped inspection first thing in the morning.

Fatigue Test Specimen Test Diary Cont.....

25/26.6.64
Night Shift

Commenced cycling at 3613. Finished after flight 3715 and commenced stopped inspection. At the end of flight 3631, after the landing case, instead of clearing all the event numbers, the gust events cleared but the manoeuvres did'nt, leaving the level 7 at 70 the 8 at 2 and the 9 at 1. I did another landing to see if it would clear but it did'nt. After about half a minute they suddenly cleared themselves and everything resumed normally.

26.664
Day Shift

We will probably be running when you arrive in which case you carry on all tonight. We run all Saturday and you run again Sunday night. These instructions depend upon the condition of the crack which is running under the front spar boom. You must keep a very careful check on its propagation rate and read the strain gauges on the manual set to ensure that both sides are similar. If the crack travels half way across the boom or the stresses become extremely dissimilar ring Rex (or, as a last resort, send someone to contact Brock.) Dont forget to put gauges C1, C2, C12, C13, A6 and A7 on the recorder each shift. Check the values on the trace against enclosed sheet. You will find the beginning of a collection for pete in my desk - please contribute.

Note from Brock

In future when any work is done on the rig which involves making items, an E.R.I must be written, an immediate carbon copy of w ich must go out to the job.

Note from Rex

Will you please steal 6 chairs from the canteen and put them in his office. Nobody must see you take them.

Stopped inspection complete and as soon as you star' running dish out running inspection 5M. Please do the damage cards and in particular can you bring the bomb bay card up to date, this is outstanding from running inspection K see sht. Please enter up the stopped inspection sheets that have just come in.

26.67.6.64
Night Shift

Commenced cycling at flight 3716 - 1 a.m. finished at 3781. Rig running OK. Strain gauges on spar port side undersurface.

Note to Rex

Could'nt pinch chairs as there were too many eyes watching. Know a chap called Bill Sykes who will be glad to help you out.

Fatigue Test Specimen Test Diary Cont.....

27.6.64
Day Shift

Took over cycling at flight 3782. Shut down completely at flight 3868. Recorded two flights on U.V recorder.

Of the four desynns on the wing tips only one is working. Would you please mend the three broken ones and record in this book the deflection, both maximum and aplitude, for a level 1 and level 7. This is another Brock editto be be carried out each running shift. Would you have another try for the six chairs please.

Dont forget your U.V recorder trace. Run through all Sunday night - rig permitting and watch that crack.

The running inspection 5N will be in the inspectors office so will you please enter it up. All damage cards brought up to date with the exception of area 36 which is being completely re-issued. Please make out a panel sheet for the reset stopped inspection first thing Monday morning, and also finish making up the inspection sheets for same (there is enough sheets on my desk to do this).

28.29/6.64
Night Shift

Desynn Deflections

Repaired four desynns, set up wires to aircraft and ran out cables from box. Readings for maximum pressure on level 1, level 7 and undercarriage cases were taken. It was noticed that during manoeuvre the specimen gradually rolls approx. 1.10" from the gust position (readings for level 7 as laste as poosible in flight). The specimen rolls back during the undercarriage case and first gusts. *to starboard at wing tips.

	Port		Starboard	
Case/Dial	F/S	R/S	F/S	R/S
	1	6	26	21
1 7 U/C Mean Man. Defn.	-5.7 +9.0 +9.7 (8.6)	-7.6 +7.8 +8.3 (7.2)	-11.1 + 9.6 +7.9 (9.0)	Poor Results
Defn. Diff. U/C - gust	14.7	15.4	20.7	
Defn. diff. U/C - man.	15.4	15.9	20.0	

U/V Recorder

Took readings of strain gauges C1, C2, C12, C13, A6 and A7 with all relevant data. Also recorded a level 10 for these gauges. Analysed results, comparing with previous. Several new cracks found at rivets on stringers 26 and 29 port see damage sheets 39, 40a and 41a. Running inspection 5th T completed.

Fatigue Test Specimen Test Diary Cont.....

28.29.6.64
Night Shift Cont.....

Commenced cycling at flight 3,868, finished at 3,972. No faults - canteen locked on Sunday night why did'nt you get chairs on Saturday.

29.6.64
Day Shift

Completed stopped inspection 2nd F. Running inspection 5th O ready to hand out (on Lloyds desk) Please bring running inspection damage sheets up to date, the double sheets of which are in the middle drawer of the small desk next to Lloyds.

The aircraft should be ready for testing at the start of night shift.

29,30.6.64
Night Shift

Commenced cycling at 3,972, finished after 4,047. No. 3 tank port had excessive air leak and this turned out to be a broken sack on the sump plate. A lot of the nuts on the sump plate were loose and most of the rest were only finger tight. Whoever passed off the sump plate needs his eyes examining. New seal has been made and will be ready to fit next stop, this is being done now.

At flight 4,017 a union came off in the console. This was tightened cap and is OK.

Fault on level 7's - did a few extras for a couple of flights but then it cleared itself.

On flight 4,043 a fault developed on level 7's - whereby, although there were 10 on the counter it still tried to do more ne. it did not inhibit. On the next flight on gust, it missed the peak change on a 1 and 3 a couple of times, manoeuvres OK. On the next flight it missed peak changes on 1-3-2-7, by flight 4,047 it missed every level almost every time. It was found that when you went past the correct level pressure and then held it at the increased pressure - say 750 psi when it had missed a 1 - that after a short time the pressure switch worked. Anyway, we could'nt see head nor tail of it so we stopped. Mean level changes were OK all the time, it was only peak values that were not functioning. Could it be due to air in the pressure switch line? Remember a union came off tonight.

The bearings in the rear spar outer outer wing rig starboard that were changed a week or two ago have been fitted incorrectly. Instead of being flange to flange, they are as shown below :-

The flange on this bearing is between the nuts of the stud and the outside face of the channel.

U.V Recorder

Readings taken of C1, C2, C12, C13, A6, A7. Results analysed and compated with static. There is now a noticeable gap at mean level and dynamic mean load values vary somewhat. This could be something to do with the trouble experienced later in the shift.

Fatigue Test Specimen Test Diary Cont.....

30.6.64
Day Shift

Completed running inspection 5th O and brought all damage cards up to date except the one covering the bomb door fairing. This must be brought up to date tonight. Please ensure that the next running inspection you hand out is on starboard side and make out a panel sheet for the next stopped inspection. This sheet must be handed out at 7.30 a.m.

From the above you will gather that you are running all night.

Got your fault at 7.45 p.m. Fought it through on the silver button. The fault must be due to a sticking Thornex or relay.

1.7.64
Night Shift

Commenced cycling at 4,131 at 4134 previous fault occurred again, shut down at 4136 after Rex had come in to see it. Commenced stopped inspection.

1.7.64
Day Shift

Had the machine mended during the day. The trouble had been the R.L.X relay which was staying open. If you got the old fault again take the front down and havea look at this relay (it is marked) and ensure that it is positively closing, not arking.

Rex is not happy with the mean levels, he thinks it is something to do with the flight time, so he wants you to record a few flights with verying times between 6 min, 15 sec. and 7mins. on gauges C1, C2, C12, C13, A6 and A7.

Your visitors are expected between 10 p.m. and 11.30 p.m. Suggest you ring up the club house and leave a message from Structural Test Dept. for Mr. Whitehead. This must say something along the lines XXXXX Yes it's OK. You are not to mention what it is because the visit is being "planned" as a casual outing. If the rig breaks down before he shows, ring up and tell him its off - he only wants to see it working. You will probably be expected to make with the chat. Brock says please keep the place tidy - at least until they have been.

We have started running inspection 5th R - by no means complete, since we began at 3.20 p.m. By the same token we have not touched the damage cards for recording during cycling. Started cycling at flight 4136. Finished shift at flight 4174.

N.B You must inhibit the level 10 at 4,200, since we did one by accident during the faulty session.

Fatigue Test Specimen Test Diary Cont.....

1.6.64
Night Shift

Commenced cycling at flight 4178, finished at flight 4,278. Link in 1F port broke at flight 4,192 - replaced it.

During Mr. Whiteheads visit, he was very eager to see a level 10, as he happened to arrive just at the right time, so rather than dissapoint him and his mate, the level 10 was not inhibited.

Had a fault on flight 4,272 during manoeuvres at repeatedly selected a level 2 even though the level 2 counter was at 13 i.e. inhibited.

U/V Recorder Took readings of C1, C2, C12, C13, A6 and A7 for flights with times of 6-15, 6-30, 6-45, 7-0. On examination of results it was observed that : 1. the gap between mean levels on gust increases as flight time increases. 2. the static mean level gust varies (stresses increased with the time the rig had been running) by approximately 0.15 tons/in^2 for C1, C2,. 3. M.L. decreasing on dynamic invariably seems correct, ile corresponds to its static mean level. Since levels 1 and 2 are in general approximately 10% low, this suggests that mean level pressure switch should be nudged up slightly and mean level pressure switch should be nudged down (both approximately 5 ps.i). A flight time of approximately 6-30 should then be about optimum (any faster would result in too much over-shoot on the bigger levels and when -ve and positive gusts are successive).

2.7.64
Day Shift

Inhibited level 10 on flight 4,300; this gives the correct number of level 10's at this stage. After inhibiting 10, the flight cycle counter was found to be 1 ahead.

After landing case on flight 4,314 all the lights went out. We discovered a blown mains fuse and replaced it with a spare. Started flight 4315, which yielded 15 gust events (all 1's and 2's) then a landing case, then went into a landing case. When we looked at the display panel every event had its correct number (i.e. all levels manoeuvre and gust were registered) except for level 2 which registered 65 events. Anyway, after the landing case the machine continued with correct auto flight

2.7.64
Night Shift

Commenced cycling at flight 4,372, finished after flight 4,478. Fault occurring again - selecting gust halfway through manoeuvre, and ending up with A & B systems selected with onee a level 3 selected once with no selection at all.

U/V Recorder Started to take a set of readings on C1, C2, C12, C13, A6 & A7 as usual and found that A6 and A7 were giving very jumpy traces. Went out to examine area round gauges and found that U/C leg was lifting off the ball on manoeuvres and creaking noises coming from near fwd. end of U/C door. Stopped the rig and made close inspection of area immediately round gauges but could find no damage. Restated rig and went round whole rig to try to find some explanation, but no luck.

Fatigue Test Specimen Test Diary Cont.....

2.7.64
Night Shift Cont.

Checked deflections and found them all haywire. Since rig in general appeared to be perfectly normal, carried on to take traces of the FIS strain gauges with mean levels and calibrations.

NOTE There is still a large gap in mean levels dynamic.

3.7.64
Day Shift

Position of valves for benefit of future shifts
Master valve controls :
Loading Rate - screwed fully in, when starting have it screwed fully out.
Unloading Rate - 1 turn and 3 segments anticlockwise from fully in (should position plastic wire just clock wise of top centre).
Idling press. valve - approximately $1\frac{1}{2}$ turns from fully in to give idling pressure of 600 psi.
Loading rate valves :

B - fully closed.
D - $\frac{1}{3}$ anticlockwise from fully in.

Unloading rate valves :

A - 3 turns anti-clockwise from fully in.
B - $2\frac{1}{4}$ turns anti-clockwise from fully in.
D - $1\frac{1}{4}$ turns anti-clockwise from fully in.
C - 2 turns, 2 segments anti-clockwise from fully in (Gusts).
1 turn, 2 segments anti-clockwise from fully in (Manoeuvres).

System C pressure must hold not less than 150 psi when D selects on landing. Inspection 2H complete The strain gauges on the spars over crack 'c' are now working so will you please take a set of readings. The U.V recorder is not working - (a fuse or something) we will attend to this in the morning.

3.7.64
Night Shift

Commenced cycling at 4,472 finished at 4562.
One fault on machine which kept recurring - when landing was selected it selected valves A and B simultaneously and left A and B in with a landing case on present selection and landing on future. This was cleared by selecting landing manually and then switching back to auto.

Strain gauge on spar not read - short handed last night.

Inspection 6L completed and cracks measured.

4.7.64
Day Shift

First flight 4563, last flight 4641. Experienced 4 bad landings (as described above) otherwise all the flights were OK, read the spar strain gauges both comparable, also took a trace off the U. V. recorder. Running inspection 6M completed and the damage cards for panel M and the 14c panel in area 19 brought up to date. On typed sheets indicate bad landings.

Fatigue Test Specimen Test Diary Cont.....

5.7.64
Night Shift

First flight 4642, last flight 4708. Started cycling about 9-40 the delay being due to the landing light and leading edge access panels having to be fitted (these were removed on Saturday for the X-Ray people). At the end of the first flight the event counter did not clear and showed 70 events to start the next flight with. I had not met this problem before so I was at a loss what to do. (Quite a lot of head scratching went on at this juncture). I decided to try a very short manual flight consisting of 4 gusts - one manoeuvre and a landing to try and clear the counter but this resulted in 90 being left on the event counter. Then quite suddenly without any assistance the counter cleared and everything carried on normally.

Stopped cycling at 4681 and removed panel M on port side to examine stringer - stringer found to be OK.

Checked the gauges on the spar above crack 'c' on damage card 25a, sheet 2, both port and starboard were comparable. Flight time 6 min. 35 sec. Recorded two traces on the U.V recorder (C1, C2, C12 C13, A6, A7 and level 10).

Nota Bene We have finished what seems to be the last roll of paper for the recorder. During the night we had 5 bad landings i.e. simultaneous selection of present and future landing lights with systems A and B.

Due to catching up with entering and making out damage cards for previous inspections we have not been able to analyse the recorder results; however it is immediately apparent that the gap between mean levels is still present.

6.7.64
Day Shift

Commenced stopped inspection - this inspection all finished rig should be ready to run at 8 p.m. Bomb doors to have 400 psi in when they are shut.

If the landing fault occurs again - wee which uni-selector the machine is stuck on.

One damage card for 5 tank wants redrawing on a double sheet - I could'nt find any so I am having same printed. All the measurements are on the inspection sheet.

When you start running run at 6.25. Take a trace straight away and see if the mean level gap is still there, as we have filled an accumalator today and we think it may be the trouble, if the gap is still there take another trace about 7.30 a.m. so that we can analyse one flight, hot off the press as it were. Take this trace whether or not the mean level fault is cured. Mean level press. 568 psi. When you take mean levels make sure that for the gust you take it on the first event i.e. from 0 press. after landing up to the first level 1, and when you do the manoeuvre, after C is selected and A aux. drops out, drop the press. right down to zero again and bring it up slowly.

Remeber 568 psi for mean level gust and manoeuvre.

Fatigue Test Specimen Test Diary Cont.....

6.7.64
Day Shift Cont.

Rex wants in addition to reading the strain gauges on the spar once a shift, he wants the spar looking at i.e. the airbrake panel on port has to come off while you have a look.

Lloyd If ever you stop running for any time at all, switch the 5o volt switch off, becaus if one of the typewriter keys are stuck down and you leave it on, there is a good chance it will burn out the coil.

There is a visit tomorrow and Rex says leave the place like a new pin.

6.7.64
Night Shift

First flight 4708, last flight 4752. Commenced cycling at 11-45 p.m. The delay being due to having to complete tank 5 and closing the bomb doors There must have been an hours delay in finding C spanners and even when we found the spanners L. Pearson had done them up so tight we could'nt undo them. There was no shirking in the part of the night fitters in finishing off the tank whoever estimated that we would start by 8.Op.m. must have no idea.

U/V Recorder Took trace of C1, C2, C12, C13, A6, and A7, and on examination found results excellent. Flight time 6 minutes, 25 secs. (no air pressure in tanks). An initial appraisal of the trace shows that the dynamic mean level gust decreasing is just the slightest shade high, making levels 1, 3 and 5 slightly low.

At 6-0 a.m. during flight 4753 the machine would not change over on bottom level 7's and even when a new level was selected manually I still could not get a change over. To complete each level selected I had to reduce almost to zero so I decided not to finish the flight in this fashion. At this stage I decided to inspect the stringer at panel M and also the front spar boom through the airbrake panel. The landing fault did not occur last night.

7.7.64
Day Shift

Fault on machine due to AZ valve starboard not functioning properly. Commenced cycling flight 4756.

There is now a large leak on this valve. This is being channeled into a tin in the cable duct. Periodically change the tins. This oil may be thrown away. If the oil level in the leader tank gets below $\frac{1}{2}$ full switch on the pump and fill it up again to $\frac{3}{4}$ full after the landing case.

Unless oil starts gushing out keep running till morning and shut down at 7.30. Panel sheet etc. will ready. Inspection Ta

The running inspection P will probably not be finished so finish that and try and finish the © as well.

A trace of the strain gauges must be taken and analysed tonight. Please leave this analysed trace in a promiment position for Bryan to find.

Fatigue Test Diary Cont.....

Date	Remarks
7.7.64 Day Shift Cont....	Strain gauge on the spar to be read on the manual set, and the airbrake panel taken off to look at the spar, also panel M to look at the stringer. Flight time to be kept at 6.25.
7.7.64	U/V Recorder Took a set of results for strain gauges C1, C2, C12, C13, A6 and A7 with mean levels and calibrations. On analysis we found that the 2½ minutes steady mean level gust and man. valves came below the average dynamic mean levels by quite a large amount. To make perfectly sure we took a second trace with all relevant data and steadied off for 5 minutes for each mean level. On analysis the second set appeared very much the same as the first, so John Shortland analysed these in detail. Summarising the results :- 1. Alternating values : Levels 1, 2, 3, 4, 5, 6, 9. OK. Levels 7 and 8 slightly low. 2. Mean levels (average lines through). 1. Gap between dynamic mean levels - approx. 5 p.s.i. 2. Both dynamic mean levels rather higher than steady mean level by 15 to 20 p.s.i. This is probably due to (a) using 578 p.s.i. instead of 587 p.s.i. and (b) the fact that when the pressure gauge was calibrated on 3/7/64 the last inch of the needle was straightened, (it was previously bent, indicating a lower pressure). Gauges A6 and 7 These gauges are picking up 'noise' from somewhere and it was found that earthing the negative terminal of the power pack reduced the effect; which is solely to increase the thickness of the trace. The gauges also show considerable bounce (this has been getting steadily worse during the last few shifts) during gusts and manoeuvres but are reasonably steady during undercarriage case and the first one or two events of gusts or manoeuvres. If we believe these gauges it suggests that there is considerable fretting in local structure. Last flight 4875. Leak rate on AZ did not appear to get any worse and we only filled 1½ tins with oil during the last 12 hours. I carried out an inspection on the T stringer at panel M and also the spar boom forward of the airbrake aperture but no damage was observed. We could not take strain gauge readings on the spar because all the battery's were flat. (When we put all the available volts from the 12 volt battery across the galvo it was still as dim as a Toch H lamp.) All the most important damage cards were brought up to date. The machine ran smoothly all night at 6-25 min/flight. We are now up to date with the tank pressurisation.

Fatigue Test Specimen Test Diary Cont.....

7.7.64
Night Shift Cont...

Tony : In case I forget to mention it when you come in will you get Norman Skilt to clean and degrease the top surface as the inspectors have complained that they can't inspec it thoroughly in its present condition. Also apparently the fluorescent lamps wont reach the top surface so can you organise longer cables on say two of the lamps.

Will you please tell Rex that 3 of the illuminated magnifying head lights are now duff, he knows we need replacements but he may have forgot to order them. Please have a look at the damage cards we've brought up to date as there are several new cracks on a few. We suspect the bearings in 2 M.I. pivot to correcting lever is absolutely shattered, the sound is horrible, we tried to have it oiled but apparently there was none available.

8.7.64
Day Shift

When you shut down the rig please switch off the isolator switch in the console and also the air supply. We found the air on this afternoon - good job the blow off valve on the air tank works U/V recorder also left on.

Strain gauges on the spar on the manual set, and a trace of the usual strain gauges to be taken as soon as you start running. The trace has to be analysed by morning. Flight time to be 6.25.

Stopped inspection completed - waiting for the completion of the rig. Tank 4 port still being replaced and the bolts which are removed for S.T1 108 and 158 port and starboard - some have been replaced but not tightened up. Please be sure to check these.

8.7.64
Night Shift

First flight 4876. Commenced cycling about 4.0 a.m. Read the strain gauges on the spar but I'm not happy with the results - starboard side reads higher, than port. We checked the wiring to ensure that the gauges were numbered correctly and these checked OK. I suggest you read them again at the beginning of your shift. We have not measured any cracks on this shift because of the late start and the fact that very few cycles have elapsed since we last measured them. There are more cracks on the bottom surface - in the aft acute corner of the landing light panel on port and at the corner of panel D on starboard (both painted green). We have not done any damage cards for these new cracks because we have only just found them.

Running inspection 6R has not been completed. Flight time consistent at 6.25 secs.

U/V Recorder Took traces of C1, C2, C12, C13, A6 and A7. Almost completed analysis. Noticed that one level 8 stopped at mean level instead of going through to min. Also on some flights, all values of stress varying in "wave" type effect (see trace as this is difficult to explain in words).
Mean level steady values obtained (after 2 abortive attempts) are very good, different from last night.

Fatigue Test Specimen Test Diary Cont.....

9.7.64
Day Shift

Commenced cycling at flight 3919, finished at flight 4999. No faults on programme unit. pad was found to be pulling off at flight 4965 in group 4MI, 4GB port. A mod. was done to spread the load from this pad to the two outboard and inboard of it. This mod. needs looking at from time to time as it is a bit hairy.

Damage cards for the cracks on the landing light aperture and panel D have been made. No crack measurement has been done today as all the damage cards have been in the print room, so I would appreciate it if you made an attempt to measure all the relevant cracks. Also read the strain gauges on the manual set and look at panel M stringer and the spar through the airbrake aperture. The last two items are now to be standard procedure.

Take a trace of the usual spar gauges on the recorder and analyse them.

The first small desk opposite the brew room is now your desk - Rex asks would you please clean it up generally and transfer your own stuff into it as someone else is scheduled for your old one. (John Shortland).

Bungees

There are some new bungees in my desk if you need them. Don't use a pile because we are going to change a lot tomorrow. The next stopped inspection is scheduled for Saturday. You are to shut down at 4 a.m. Saturday morning.

9.7.64
Night Shift

First flight 5000, last flight 5090. All running inspection damage cards are now up to date. Running inspection 6s complete and about $\frac{2}{3}$'s of 6T. Read the spar strain gauges and more or less repeated the previous results i.e. put lower than starboard. Also inspected Panle M stringer and the spar through the airbrake - both OK, although there are several new cracks on panel M stringers. Fetched a new barrel of oil from the oil stores and replenished the tank to $\frac{3}{4}$ full after landing.

The portal type linkage of 2M.I starboard where it reacts against the cross beams was minus the packer (Item 20) and quite a bit of graunching was going on at the other end of the beam. We replaced the packer but I suggest you get it tack welded. I stopped the clanging of the forward tie by pulling the final beam forward with bungee which in effect drags over the anchorage to the floor (the cause of the noise). At the moment the bungee looks untidy so could you try getting a stand fixed up with shorter length of bungee.

Fatigue Test Specimen Test Diary Cont.....

9.7.64
Night Shift Cont.

U/V Recorder : Took usual trace of C1, C2, C12, C13, A6 and A7 not as good as previous night. Levels, 1, 3, 5, 7 and 8 slightly low others OK. Dynamic mean levels slightly high.

10.7.64
Day Shift

Commenced cycling at flight 5091, finished at flight 5170. Strain gauges on spar not read - panels M and airbrake looked at.

Take trace and analyse also read spar gauges.

Shut down at 4 a.m. tomorrow morning for the inspection. The sheets are on my desk A B. If you get chance will you make up some running inspection for me, as I will be on my tod next week.

The linkage on 2 M.I has been welded down, as has the bungee attachment on the forward tie.

10.7.64
Night Shift

Commenced cycling at flight 5171, finished at flight 5235. Finished off running inspection 7K and made up a complete set of running inspection with the exception of a few sheets - these mis sing sheets are indicated on the front of the respective group of sheets. We could not read the strain gauges because someone had left the battery out and it was flat. We have made a start at measuring the cracks but will probably not finish same.

We found 4 M.I correction jack on starboard side loose and free to move along the beam so we have clamped it in position at 13.11" from the pivot. We are not sure about this dimension becuase when we looked up the clacs. they said 13.11" from starboard and 13.02" for port and then further on the calcs. say 10.92" for starboard and 10.85" for port. When we checked port side however we found the jack clamped at 15" approx. Of course a possible explanation would be that we have not found the latest calcs, so we wish you luck in sorting it out.

There are two faults on the machine :-

1. Rapid selection of level 1's which do not get applied to the aircraft - we have a trace of a flight in which this fault occurred once and the trace only shows 12 level 1's. This fault occurred about 10 times in all and not always at the start of the flight.
2. The landing flight occurred once in which system A, B and master were selected instead of D and no future seledtion put up - the fault was cleared manually.

Flight time consistent at 6 min. 25 secs. Commenced stopped inspection 3a and b but have'nt got very far owing to shortage of labour (no permanent night men in Exoerimental becuase of early Friday night finish) but the two fitters gave us access to the leading edge which we have inspected, they make start on tank 3P but said they could not take out blocks until they had some decent staging, it the old story of lines of demarkation again, anyway this was about 7-15 so to save a row he's taking of all necessary sump plates

Fatigue Test Specimen Test Diary Cont.....

10.7.64
Night Shift Cont.

and the back for partial inspection, also other relevant panels.

U/V Recorder : Took usual trace of gauges C1, C2, C12, C13, A6 and A7. Levels 1 to 5 and 9 OK. Levels too slightly high, levels 7 and 8 slightly low. Mean level dynamic generally a bit high. Managed to analyse A6 and A7 which were not as bad as previous, set for bounce and results quite good. On both flights analysed, one level 1 ommitted. This was selected OK but de-selected immediately due to pressure bounce.

Stopped Inspection Leading Edge

Tony : Please go in and look at station 301 bottom surface skin butt strap. On opposite side of riblet to damaged rivets (Card 2a) paint flaked off but I cannot see any cracks there, if this is due to scratch, I have'nt noticed it before.

11.7.64
Day Shift

Inspection complete rigs ready to go. Inspection sheets not all collected up. Damage cards brought up to date for tanks only.

12.7.64
Night Shift

U/V Recorder : Took usual trace of C1, C2, C12, C13, A6 and A7. Levels 1, 2, 6 and 9 OK. Levels 3, 4, 5, 7 and 8 rather low. Flight time very consistent at 6 mins. 25 secs. Mean levels dynamic generally slightly high.

Commenced cycling flight 5236, the only point of note about the machine is the odd double bounce on level ones, the 2nd of which never got to the aircraft at 1-0 a.m. (flight 5274). We had panel M and airbrake panel down for a looksee, everything OK. We have tried unsuccessfully to get the strain gauge gear going, first it was flat batteries and then using about four batteries on the Galvo alone, we managed to get a metered 4 volts, but also we discovered that the galvo bulb was U/S, so we gave up in absence of a replacement, suggest you try to get a new bulb plus a couple of spares, we put all the batteries back on charge so you should have some joy with them.

Inspection : Running Inspection 7L given out to inspectors. Level 10 manoeuvre successfully selected automatically at 52000 level 10 was ommitted and had to be manuall selected. Clocked consistent 6-25 per flight throughout the night. Bounce on level ones very infrequent on latter $\frac{2}{3}$s of shift (7-0 a.m.) At flight 5323 we had a spate of bouncing level ones again. Inspection 7L completed and entered on master sheet. Last flight 5323.

Fatigue Test Specimen Test Diary Cont.....

13.7.64
Day Shift

Commenced cycling flight 5324, finished at 5837. No faults on machine besides slipping a quick level 1 in every now and then.

8 Inspection 7M finished and ready to be entered up. Also stopped inspection made up and panel sheet likewise. Stop at 7.30 a.m. tomorrow.

Running inspection 7N ready for issue bar the three sheets that are missing. I had same printed and they are in the office somewhere - but I can't find them as yet.

X-Ray discovered that the stringers at the centre corners of both landing light apertures are cracked right through so will you keep a close watch on the skin at the acute corners.

Please read strain gauges on spar - have a look in panel M and take and analyse a trace of the usual gauges at flight time of 6.25.

When you stop tomorrow please remember to close all cocks and jack up the aircraft.

The main jack on the port front spar outer outer wing compound rig is leaking. We have placed a tin to catch this oil - so periodically will you have a look at it and empty it into the barrels that we fill the leader tank from.

Have measured all relevant cracks once - will you please do same, they are on a board on my desk.

13.7.64
Night Shift

Commenced cycling flight 5388, finished at flight 5479. Machine running reasonably well apart from the usual level one trouble, this, however seemed to improve considerably as the night wore on, although on the first 20 or so cycles almost every flight contained up to 4 bad level ones. (some of these can be seen on trace recordings).

At flight 5425 we had M and airbrake panels down and the inspectors gave us nothing to report. We have kept a close watch on the landing light panel acute corners, but apart from existing damage at port aft corner there is nothing to see at this stage (5430). At flight 5436 a level 10 was selected after 22 gusts, but before system c could build up I have wound the loading rate fully open, and after manually selecting one of the remaining gusts the flight was completed successfully. Rest of nights run on machine uneventful.

U/V Recorder : Took usual trace of C1, C2, C12, C13, A6 and A7 and also recorded a level 10. Analysed all above and noticed that level 10 is rather high. levels 1 to 5, 7 and 8 slightly low. levels 6 and 9 OK. Mean levels, surprisingly appear low compared to steady.

Fatigue Test Specimen Test Diary Cont.....

13.7.64
Night Shift Cont...

Inspection : Entered up running inspection 7M. Inspection 7N completed and entered up. No new damage. All cracks measured for damage cards 45a, 40a Sht. 2, 34b, 41a, 41b, 11b, 46a, 38a, 27c, 25a Sht.2, 29b. Kept an eye on landing light apertures. Crack on port landing light aperture moving quite quickly.

From day shift inspection 7M one of the inspectors put on his sheet "fractured forward of H panel, but we were unable to find any. Please ask John O' Flaherty where they are.

Stopped inspection 3B'c' given to inspectors, our sheets and X-Ray + Ultra-sonic on cabinet nearest door (Middle).

NOTE : 2 MIP roof correction lever making a lot of noise. Group 3RP jack making vibrating rubbing noises also 3RP fouls its correcting lever stop on level 9 if this occurs late in manoeuvres. Undercarriage lifts off its ball also during later manoeuvres.

During the first few gusts there is a bang from somewhere on port side, on some flights, which we have not been able to locate as yet, but is probably due to collapsed linkage untangling.

14.7.64
Day Shift

Stopped inspection completed and entered up. Work outstanding is refitting of blocks in 5 tank and refitting of jack on outer outer wing front spar compound rig. The connection for the pipes on this jack are :- The tension side connects with the Avery on the forward side of the rig, and the compression side to the avery on the aft side. The jack is primed and ready for fitting.

Will you please make out a damage card for a broken bracket on the forward face of the aft undercarriage bulkhead on starboard - on the bottom inBoard corner.

Running inspection 7'0' has been issued.

If it looks like the rig will not be ready for midnight ask the Chadwick for some temporary help.

Take an trace and analyse same, measure cracks. Dont bother removing panel M and the airbrake panel we will do that sometime tomorrow. Keep an eye on the landing light apertures.

14.7.64
Night Shift

Fitters refilled 4MI loading rig jack and completed tank 5 starboard. Commenced cycling 11 p,m. first flight 5480. Last flight . At flight 5534 we stopped the rig and had panel M down, this was done in view of an alarming number of new crack at forward inboard corner (18). The stringers looked to be OK so we pressed on. Machine performed flawlessly throughout night.

Fatigue Test Specimen Test Diary Cont.....

14.7.64
Night Shift Cont...

Tony : If anyone moves the typewriter when you'r about, would you aks them to put it back with care, so that it is not fouling up the plugs and leads under the counter board, luckily I found this before we started otherwise some damage would certainly have been done. Could you also ask one of your helpers to do a new damage card for panel M area, with more scope for future cracks, and mark up damage card reference on master sheet on wall.

U/V Recorder : Took usual trace of front spar bottom boom gauges with a level 10 and analysed. Gauges A6 and A7 very poor (not analysed). Levels 1, 2 - OK. Levels 3, 4,5, 7 and 8 slightly low. Levels 6 and 9 high, level 10 very high. Mean levels - OK. Inspection 7P issued with sheets 3, 4 and 7 missing.

Damage Cards : Due to late start and a lot of time spent on panel M inspection, only the following damage card up to date :

40a.	Sht.2	Panel T	New Cracks.
41a.		Panel D	
38a		Panel M	18 New cracks.
25a	Sht.2	N.A.C.A Port front spar.	
45a		Landing light port (cracks moving quickly.	

Inspection 70 completed except for 13, 61 entered so far.

15.7164
Day Shift.

Commenced flight 5555, finished 5640. Watch 4 MI port for leak. Landings have to be done manually Running inspection 7P completed but not entered up. Stop at 7.30 a.m. for stopped inspection. Take a trace and analyse same. Look in panels M and the airbrake.

15.7.64
Night Shift

Commenced shift flight 5641, finished 5721. Had panel M and airbrake panel down, could see no sign of stringer cracking (flight 5693). At flight 5711 we had to stop because the Lindapter on one side of the starboard 4 M.I correcting jack had come adrift and the clamp had moved about $1\frac{1}{2}$" along beam. Could you ask someone to try and find the latest calcs for the correcting jack position, and have Roger Hacketts men weld the arrangement up, and the flange of the lever is 'dished' something shocking. Stopped at 6-30 a.m. (5717) because a $\frac{1}{4}$R.D2530 link on 1F starboard failed, we had a replacement put in and carried on until 7-30.

No new troubles on machine managed to get pretty consistent flight of 6-35 to 6-40 last flight 5721. Stopped at 7-30 a.m. for stopped inspection.

Fatigue Test Specimen Test Diary Cont.....

15.7.64
Night Shift Cont....

U/V Recorder : Took usual trace of spar gauges and analysed results, which were reasonable except for levels 7 and 8 (low, due to slow cycling on manoeuvre) and level 6, (high).

Inspection : Completed inspection 7Q and entered up 7P and 7Q. On inspection 7Q, small crack on bomb rib station 153" possibily requires damage card - not had time to look at it (Area 61 P).

Measured all cracks except rib 468 starboard (46a) and found 8 morecracks on panel M. Started to draw a new damage card for panel M.

Note : Areas 57 and 58 starboard (done) want entering up on sheet if this is the idea.

16.7.64
Day Shift

Read and analysed forward and rear ties, and C1 on same trace. Work out static loads for all levels and compare with dynamic. If you don't get decent results out of the above, try different channels - in other words this job is most important and must take first priority over everything else. Inspection 3Ca completed and entered up.

There is plenty of work left on the rig before cycling can commence, as well as what is left on the panel sheet. There are the 4 M.I jacks to finish off on starboard. These need the top pin fitting and correcting to the system. Pump up the compression side of the jack until you can fit the top pin, then pump up the tension side until oil runs out of the bleed holes. Refit the bleeders and connect into system. System C, Tension B compression, the steel strap that held them in position has been burnt off, please tope the jacks back against pillar to stop them falling inboard during gusts.

All cocks on console shut - reset before you start up. See old test diary for settings 3.7.64.

Measure cracks and have a look inside panels M and airbrake on port side.

The valve in the console has been fettled so the machine may run properly, if not you will have to run as you did last night. Running inspection 7R issued to inspections. Extra labour is coming fro eight to help out.

16.7.64
Night Shift

With rig running at flight time = 6/50 approx. took trace of ties and C1 and analysed as requested Decided that results satisfactory. Stopped at flight 5757 look at panels M and airbrake. Stringer inboard of panel M OK, but on looking in the air brake hole at the spar, Peter noticed a crack in the reinforcing plate round the N.A.C.A intkae, crack length 0.5" and crack is near the rivet of crack C on outside skin. Decided that it was'nt serious enough to warrant stopping, so carried on.

Fatigue Test Specimen Test Diary Cont.....

16.7.64
Night Shift Cont.....

Took a trace of spar strain gauges C1, C2, C12, C13, A6 and A7 as usual but had time for only cursory examination -appeared OK. Took a look at landing light panels, port no change, starboard - we now have a crack - correcting 2 cracks. Commenced cycling at 12-15 a.m. (5722) after tanks had been replaced, and jacks on 4 M.I's. The fettling to the faulty valve doe's'nt seem to have made much difference to running of machine (still woefully slow on manoeuvre).

Note : There have been no tank pressurisation as the mercury blew out of U tube on first flight, I think the fitters must have spilled some or something when taking the tube off. We could'nt find any more mercury so carried on without air. Only a few load level ones occurred during shifts. On the inspection side, 7R has been partly completed, and those sheets that have been dome are entered up. We had not time for bringing damage cards up to date, but John did go round to see if there were a lot of new cracks, and there's a couple near panel M.

Could you do a damage card for this crack in A.B hole. On flight 5777 the machine slipped in 4 extra level 7's these were not recorded on level 7 counter only on event counter, and they were typed, then the aircraft did a normal landing. Last flight 5780.

17.7.64
Day Shift

Commenced cycling at 5781. Shut down after flight 5808.

No tank pressurisation since flight 5721, i.e. 87 cycles to catch up.

Mercury manometer in the undercarriage bay smashed - this is the reason why the tank pressure overshot on flight 5722 and blew out, the tank manometer.

13.8.64
Day Shift

Recommenced cycling late afternoon, first flight 5809. Shut down after flight 5819.

14.8.64
Days

First flight 5820. Shut down after flight 5891. Slight trouble with one air dump valve.

15.8.64
(Overtime)

First flight 5892. Shut down after flight 5954. Two faults occurred during running :

1. Selected a level 3 during manoeuvres.
2. Went into manoeuvre after only 24 gust events.

This selecting manoeuvre during gusts became more prevalent during the last hour and always followed a bad level 1.

16.8.64
(Overtime)

First flight 5955. During flight 6000 level 10 was introduced manually after which the system selected a level 2 and registered it on the counter. This meant that the inhibition on level 2's would not function so the flight had to be completed manually through the remaining manoeuvres. Subsequent flights were alright. Shut down after flight 6008.

Fatigue Test Specimen Test Diary Cont.....

17.8.64
Days.

Commenced after flight 6009, finished at 6059 for stopped inspection.

Only fault being missing the level 7 count during one flight, trace taken of usual strain gauges.

19.8.64
Day Shift

First flight 6059. Stopped early in the morning to fit an additional piece of packing beneath the correction jack attachment on 4 M.I port.

After recharging the accumulator the landing case has become automatic, although the adjustment required on the D loading valve is very fine.

Strain Gauges

Gauges B6 and B7 on channels 8 and 9 respectively have replaced gauges A6 and A7 on the U.V. recorder. One trace is still required from each shift.

Inspection

Panel M which used to be removed for internal inspection during each shift, is now to be removed only once a week. This weeks removal was completed this afternoon.

Spar Strain Gauges

These are to be read as soon as possible and compared with previous results to note if the repair patch has made a difference to spar stresses. The gauges will then be read sometime in the future.

We would have read the gauges today but it took considerable time to get them set up and it appears that one gauge (gauge 50) is duff.

We have not been able to measure cracks today as we have been on queries and rig work all day, so please take a full set of readings.

I have reorganised and re-distributed all the inspection kits and the system now is that Sets 1 to 4 are permanently issued to the inspectors and must not be used by us. Set 5 and the few odd parts of what should have been set 6 are allocated to us. The inspectors will now be responsible for handing the kits over to the next shift and if the inspector recieving the kit is not satisfied that the kit is complete then he will inform one of us and we will have to look into it.

19.8.64
Night Shift

Inspector on nights found the probe light extension on Set 3 completely useless. Will Lloyd look into it.

Fault on level 9 counter cleared itself at flight 6142.

On doing level 10 a loud bang was heard in the region of panel G starboard side. Nothing seems to be amiss externally.

Trace taken of the gauges on the U/V, did not analyse. The level one a bit erratic becuase of having to control the air system manually i.e. this was before the fault floored itself.

Fatigue Test Specimen Test Diary

Night Shift Cont.....

The mean levels are good though, air pressure and oil pressure held steady for these. After the mean levels were taken, the fault on the unit cleared itself and the next flight was done with air systems working normally. No more faults during the night except that D loading rate has a very fine edge to it. Several more cracks found on panel M starboard. Spar strain gauges not read. Flight cycle counter is way ahead of itseof, for correct flight number - check typed sheet.

20.8.64
Day Shift

Took over at flight 6200, handed over to night shift at flight 6290. The flight cycle counter has now been corrected to read the number of flights completed. If you have a recurrence of the level 9 counter trouble, or any level counter as we had with 6's this morning, you will find it easy to overcome by manually turning the small plate which presses against four ball bearings at the back of each counter. You, of course, turn the appropriate one, watch out for shocks.

When you arrive at flight 6,300 will you please inhibit the level 10, because we put in one extra this morning. The strain gauges on the U/V recorder have been messed about today. You will have to reselect gauges C1, C2, C12, C13, B6 and B7 for tonights trace.

Night Shift.

Note Re Typewriter Settings

Please leave the paper thickness selector in position F, if you don't it puts too much pressure on the rollers. Trace taken of flight 6347 and 6348.

Could not get channel 5 on the U/V to function correctly so I have transferred gauge C13 to channel 6. Trace not analysed.

No faults until flight 6381 when on gusts the pressure fell through the mean level, i.e. no Thorne change at mean level for +ve gusts. We did not inhibit thelevel 10 so you are still one ahead.

21.8.64
Night Shift

We commenced by setting the mean level pressure switches correct to a trace of C1. This was finally achieved at flight 6400., after a lot of false starts. A proper trace was taken of flights 6406 and 6407. On analysis the manoeuvres were seen to be absolute rubbish. On looking round the rig we found that the starboard wing did not deflect anything like. On checking it was found that the A2 valve was not functioning. We stripped it several times and it still would'nt work - even with the rod being pushed down manually. Finally gave up after flight 6415 as it was obvious that there was nothing like the required load applied during the manoeuvres.

Fatigue Test Specimen Test Diary

22.8.64

Mended the A2 valve first thing in the morning. It not functions properly, although the repair must be a temporary one.

The first trace we took on the U.V. recorder showed the descending mean level (Switch 2) to be functioning at much too low a pressure. We had two attempts at correcting this, the second of which gave rise to a very good trace with good values for all the gust events and the mean levels in their correct positions. This trace was taken during flights 6446 & 6447.

Everything should be working fine when you come in Sunday night. Please inhibit level 10 this time. Shut down after flight 6462.

Inspection 8S complete - you will find this in the inspectors office. The inspection that you hand out is the last one so will you please make up a new batch of running inspection. When you do the damage cards please start with the bomb fairing.

23.8.64
Night Shift.

Commenced cycling at 6463, finished at 6545 - no faults. Trace taken of 6513 and 6514 satisfactory mean levels.

Inspection 8T finished also all inspections entered up. New series made out and are on my desk - we need some more sheets printing, the numbers of which are as follows : 1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 19, 20, 21, 22, 23, 38, 48. I would be obliged if you could arrange to have about 20 of each run off.

New cracks found on bomb bay fairing, panel M starboard and panel D starboard. The inspectors have been given 9K for today. Could you also have a running inspection schedule sheet printed.

24.8.64
Day Shift

First flight 6546, shut down after flight 6599, when A2 valve failed again. Obtained replacement spring which is being fitted. It may need modding before the valve works properly. (you will need the maintenance electrician to connect up the valve).

Please ensure all valves are open before you start again. Prepare for a stopped inspection tomorrow. Remember all tanks must be inspected in the sump area.

24.8.64
Night Shift

Commenced at flight 6600, finished at 6675 and shut down for stopped inspection.

Lloyd Could you please get some prints of area 59. Have issued the stopped inspection sheets to the inspectors, panel sheet is also outside. Have made up the damage card prints ready for issue.

Fatigue Test Specimen Test Diary

24.8.64 Night Shift	The last flight on the machine was a bad one. The level 6 would not count and hence it kept jumping back to it from manoeuvres. Usual trace taken. New cracks found at Rib 618 and stringer 13 joint starboard side damage card 9c.
25.8.64 Day Shift	Rig ready to start. Check the functioning of the starboard A2 valve which has been modified again. The flight cycle counter is severed in advance due to fettling level 6 counter, should be 6675.
25.8.64 Night Shift	Commenced at flight 6676, finished at 6763 no faults. Took trace of 6749 and 6750. Inspection 9M completed and entered up. Flight cycle counter is now correct. All cracks measured.
26.8.64 Day Shift	Started at flight 6764, finished shift at flight 6842. Took trace of 6830, 6831 after attempting to increase each mean level pressure by 6 p.s.i. Had reasonable success on mean level switch No.1 but little effect on switch No.2 Trace is being analysed by John at the moment. During flight 6844 the dekatron ceased to function. I changed the 175 M valve with no effect, then changed the dekatron itself and all was OK.
26.8.64 Night Shift	Commenced at flight 6843, finished at 6914. Flight counter is 4 ahead. Found link to gust ballast 5 port side broken in two so we repaired this and the starboard side wing group link that was too short. Various faults on the machine landing fault i.e. selecting A and B instead of D and also selecting level 2's during manoeuvres even though the gusts were completely inhibited. During one of the latter, the wing bounced high enough to knock the overtravel switch out. Inspection 9O complete and entered up, all outstanding damage cards made up except for the cracked louvre in area seven starboard. Another club foot bracket bolt sheared in bomb bay - card 36N. Took a trace of the usual strain gauges at flight 6889 and 6890.

Fatigue Test Diary Cont.....

Date	Remarks
27.8.64 Day Shift	In future all traces taken on the recorder as a check on the loading pattern are to be analysed by H. S. Dynamics at top shop using a highly testible Wodgenob. In order to simplify the work of analysis the following procedure for taking readings should be adhered to :- 1. Allow at least 30 minutes for the recorder etc. to warm up before taking any readings, during which time the bridge volts should be on. 2. When recording loads adjust Sifam mA meter to 0.75 mA. When recording strain gauges adjust to 0.70 mA. When recording both loads and strain gauges adjust to 0.75mA. 3. At the start of each trace, on the outside write the date, shift, flight No. and gauges and/or positions read. At the end of a flight, i.e. after undercarriage case, remove air supply valves from programme unit console and reduce air supply to ball. On the first gust selected, bring pressure up to approximately 581 p.s.i., hold steady. Remove all pins from sockets for less than 0.1% R/R in pinboard. Set up galvo spots equally spaced across screen allowing 6cms clear each side. Position event marker/datum spot 2cms from left hand of screens. Reduce pressure to zero, then bring back up very slowly to 470 p.s.i. hold for 30 seconds; carry on VERY GRADUALLY (about 20 p.s.i./10 secs.) up to 587 p.s.i. Start recording. Hold at 587 p.s.i. for two mins. Insert 0.95%. R/R calibrations as close as possible to end of 2 minute period. After a total time of two minutes at 587 p.s.i. carry on with flight at normal speed, (no mean level required on manoeuvre). No extra flight is required. NOTE This means that flight is done without air pressure to tanks.
27.8.64 Night Shift	Commenced cycling at 6955. Finished at 7043. Took trace of 7005. Faults on machine numerous - most common, changing from manoeuvre to gust, from any mean level to any gust level also landing fault as described previously. All damage cards that could be brought up to date have been - except the bomb door fairing which still needs doing. Twenty odd more, cracks found last night in areas Panel M port, panels T port and starboard and engine bays.

Fatigue Test Specimen Test Diary

28.8.64
Day Shift

Started at flight 7044, took trace of 8055, finished shift after flight 7100. The flight cycle counter is one ahead. Still getting some gusts during manouevre, although we have had the lads looking at the electrics. Please note the faults you get as they occur.

The setting of the unload valve is very important - 2 segments past top centre. Best of luck; your money is in my drawer.

28.8.64
Night Shift

Started at flight 7100, finished at 7185.

Some faults as before on machine, but not as frequent. Took trace of flight 7173.

Inspection 9S complete and entered - cracks measured except for bomb fairing. Few more new cracks in the usual place.

4 M.I. jacks on port side - leaking oil very fast now - so watch the oil level, remember that on Sunday night we wont have any fitters on to fix a new barrel on for us.

39.8.64
Day Shift

Started at flight 7186, closed down at flight 7240.

You have a new barrel of oil connected, ready to pump if you need it. Just remember to unscrew the top cap to let the air in.

We had Trevor round during the morning and he witnessed the gust during manoeuvre fault. He was not able to sort it out - but will be back for another try on Sunday, before you come in.

In a bid to assure everyone concerned that the fault was not pressure trouble I reduced the level 8 minimum pressure to 500 p.s.i. making it 6 or 7 p.s.i. below the 7 min. pressure. The fault continued. It looks as if you are going to spend the night with the fault, if so you may find the following notes useful.

1. If the machine selects a positive gust (1, 3, or 5) during manoeuvre it should clear quite simply by pressing the silver button near the manual selection switch.

2. If the machine selects a negative gust (invariably a level 2) during manoeuvre, you can only get back to manoeuvres by going through the complete manual selection process. After which, I suggest you complete the flight on manual selection, because you will have broken your inhibition on the negative gust.

The flight cycle counter is now 5 ahead.

FATIGUE TEST SPECIMEN TEST DIARY

30.8.64
(Electronics - Day)

We have changed some contacts over on the Thorn stepping relay and check the limit relays. On checking the programme board manually we find it functioning correctly. N.B. If the manoeuvres to gust fault occurs again please record the present and future status. Flight counter result as before.

30.8.64
Night Shift

Commenced cycling flight 7241, finished shift flight 7310. Only on three occasions did we get a fault on the machine, on all of these system B was suddenly put in whilst doing manoeuvres, with neither present or future selections up, system C having cut-out. A complete manual selection back onto manoeuvre sorted things out.

Trace taken at flight 7272, Inspection 10K finished and entered up. New damage at panel M and A-A port and panel C and B-B starboard. Damage cards made out up to date - bomb door fairing is not done.

Bolt sheared in linkage 2F port, fixed it ourselves

31.8.64
Day Shift

Commenced cycling at flight 7311, finished shift at flight 7367.

Stopped mid-afternoon to reposition pivot pin in cross beam on outer outer wing rear spar compound rig. The lock nut had dropped off one side and the pin and one bearings were almost out of the beam.

Stopped again at flight 7367 when it was discovered that several holding bolts on the locking tabs on universal links had sheared or were in the process of shearing. I decided we could run for the rest of the evening without replacements if we kept an eye on the universals in question.

Along with this discovery came one of major importance. The holding nut on the adjustable link on groups 2F starboard was within a thread of coming off. This would have deposited group 2F linkage all over the wing. We fixed it ourselves but it will only see you through tonight. A safe locking agent is required. The flight cycle counter is now correct.

The U.V recorder must run all night, recording the electronics workings with a view to finding the cause of the gust during manoeuvre faults. If you get a fault during the night press the event marked as soon as you can afterwards and write beside it what kind of a fault you experienced. If you have a lot of trace with no faults you can throw it - please don't throw ours, we already have two minor faults of interest recorded.

Fatigue Test Specimen Test Diary

31.8.64
Night Shift

Lloyd, will you please req. out some thistle brushes for us. Commenced 7367, finished 7420.

Broke link in 2F port - stopped for repairs also replaced all broken backing bolts in universals. Inspection 10M complete and entered.

More new cracks found on panel M port - landing light starboard and outboard of 618 starboard.

Machine faults recorded as required (4 traces) along with loads of uneventful flights, these can be found on shelf opposite trace recorder if required, the relevant flights in which faults occured will be deposited on Stuarts desk. Would you please order up a lot more paper for the recorder.

1.9.64
Day Shift

Completed stopped inspection 3F (flight 7420) and initiated a repair to skinning in No. 4 tank port.

1.9.64
Night Shift

No running due to tank repairs.

2.9.64
Day Shift

Held up for most of the day whilst the flexible joint failure was X-rayed and discussed. At length it was decided that the mark shown on the forward radius was not a crack and the aircraft was loaded to take boom strain gauge readings in the area. They were insufficient and inconclusive.

Auto-cycling commenced, whereupon running inspection revealed the aforementioned mark to be a genuine crack. Opening of the gap showing over the flexible joint on the undersurface (the weatherproofing) on both port and starboard revealed very little difference. Rex was informed by phone and he gave the go-ahead for continued cycling.

The starboard flexible joint gap must be measured about every four flights at 800 p.s.i. on a level 9. If it appears to be increasing rapidly or the crack in either the forward radius or the middle of the bowler hat section has run wild, then you must stop running.

Bags of scope for discretion here, since nobody is keen to make a decision. Also inspect the port flexible joint regularly in case failure begins there.

2.9.64
Night Shift

Commenced cycling flight 7477, finished after flight 7515. Various faults on machine - usual kind about 6 in all.

Kept watch on cracked top hat - did not stand to increase until after the level 10. The gap (c) in the bottom skin did not increase during the night - no sign on port. New cracks found on landing light starboard rib 618 starboard of aft of panel D starboard. Insp. 10N completed.

Fatigue Test Specimen Test Diary

3.9.64
Day Shift

Commenced cycling at flight 7516, completed only a few cycles during the day since we stopped for X-Rays, photo's and reading strain gauges on the spar boom and shackles.

X-Rays showed the port flexible joint to be cracking along the middle. Both joints will now watching in case they become too bad to allow you to continue. If any crack in the starboard joint travels far enough to be 13" from the open end of the joint you stop. This of course applies to the port one as well but it is not likely to reach this stage before thestarboard one.

New cracks have been found along the kink rib 526" port (Area 6). These need especial observation and a propagation chart must be made and kept up during the night. Further new cracks around the R.A.T. panel port.

3.9.64
Night Shift

Commenced cycling at flight 7525, finished at 7607. Usual crop of faults on machine - no more or less than usual. Trace taken of C1, C2, C12, C13 only, could'nt get B6 and B7 to work on any channel.

Kept eye on cracked top hat - has not grown in overall length but seems to be changing direction at one end - see damage card for details. Running inspection 10P complete and entered up.

4.9.64
Day Shift

Commenced cycling at flight 7608, finished shift after flight 7682.

Trevor has been fettling the machine again and this time it looks as if he has cured the fault - judging by the initial success. If the fault does occur during the night he wants you, if possible, to particularly note the behaviour of the two uni-selectors (they should change over at each mean level ascending on manoeuvres). The flight cycle counter is now three flights ahead.

We have slightly altered the setting of 'B' unloading valve - in case you should be tempted to readjust it. Itis ipen another quarter of a turn. The cracked flexible joint seems to have slipped from the limelight and the main intention is to get as near to 8,000 flights by the time we shut down Saturday night, as possible. But keep an eye on them just in case you have to shut down prematurely.

There is no more oil, other than that in the barrel connected to the pump. We have robbed the No. 1 and counterpoise tanks. Please remember to leave some money in my desk towards Roy's wedding.

4.9.64
Night Shift.

Commenced cycling at flight 7682, finished at flight 7764. No faults on machine.

Running inspection 10Q completed new camage in bomb bay - broken club foot bracket and another bolt sheared in front spar web.

Cracks measured including bomb fairing, which we have redrawn on to two damage cards 18F and 18G. It is not half as bad a job now. The top hat section crack has increased in length quite a fair amount (compared with what it has been increasing.

Fatigue Test Specimen Test Diary

4.9.64 Cont..8
Night Shift.

Linkage 2FS seems to be unscrewing itself again, so would you please have a look at it.

All the oil from the barrel has been pumped into the header tank, so with a bit of luck you might last out the day.

5.9.64

Started cycling at flight 7765, shut down after flight 7827.

Experienced two bad landings (selecting systems A and B) early in the morning. Otherwise everything ran well.

Took several photo's of cracks in wing undersurface skinning.

13.11.64

Completed modifications and repairs to specimen as follows :-
No. 3 fuel tank port :- Mod. 1741 was incorporated and additional repair work carried out to E.R.I/1028/9.
No. 4 fuel tank port :- Fully repaired tonE.R.I. 1028/9.
No. 5 fuel tank port :- Fully repaired to E.R.I. 2028/9 and also certain aluminium alloy nose skins fitted to D.O.I./698/D.242/16.
No. 4 Starboard, 5 Starboard, 6 Port fuel tanks :- fully repaired to E.R.I. 1028/9.
Landing light aperture : external skin cracks were repaired to D.O.I. 698/D.242/14 and kink rib 526.
Drawing F.12390 Shts. 1 - 4 - internal stringer failures were repaired and modified to D.O.I./698/D.242 13 - F.12390 Shts. 1-4.
Panel M :- Skin failures in region of panel M repaired and modified to D.242/B (F.12318, F.12328).
Inspection hole between panels B and D :- repaired and modified to D.242/19 - F.12391 Shts. 1 & 2.
Panel T and Stringer 29 :- Repaired to D.242/11 - F.12389.
14g N.A.C.A intake panel :- Repaired and modified to D.242/4 - F.12319 Shts. 1-3.
Main undercarriage sideload beam :- Repaired and modified to E.R.I. 1028/14, D.242/18 and 20. F.12416.
Flexible joint :- replaced to D.242/16.
Front spar web :- Repaired to D.242/10 - F.12388 Shts. 1-2.
Elongated holes in front spar flange (bottom) :- opened up and special bolts fitted - E.R.I. 1028/29.
Panel T frame :- Replaced to D.242/17 item 849/850/ F.9704.
Front spar web in bomb bay :- Failed 2 B.A bolts on centre line joint replaced to D.242/16.
Bomb arch 182 :- Bolt failure of club foot bracket port only - replaced to D.242/16.
Bomb arch 123 :- Bolt failure of club foot bracket port only - replaced to D.242/16.

Prelim Test 31. a.m.

Carried out on gust to 800 p.s.i. to recalibrate the linear pots against the D.T.I's. Groups 1-3F P and 4FP and 5FS, 1 and 2R and forward and rear tie.

Fatigue Test Specimen Test Diary

13.11.64 — Prelim. Test 32 p.m.

Carried out on gust to 800 p.s.i. to recalibrate the linear pots on groups 6FS, 1-4FS, 5FP, 1-3RS and 3RP.

16.11.64 — Commenced auto cycling at flight 7828 finished after flight 7833.

17.11.64 — Commenced auto cycling at flight 7834, finished after 7850.

Prelim Test 34 p.m.

Increments - 200, 250, 300, 350, 400, 450, 500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1000.

18.11.64 — Prelim. test 35 to verify results on test 34.

200, 250, 300, 350, 400, 500, 600, 700, 800, 900, 1000.

Prelim. Test 36 Gust, 200, 250, 300, 350, 400, 450, 500, 550, 600, 650, 700, 750,

Prelim. Test 37 Manoeuvre. Increments
200, 300, 400, 450, 500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1000 - 900, 800, 700, 600, 500, 400, 300, 200.

19.11.64 — Auto cycling commenced 7851, finished after 7859. Level 2 bottom pressure putndown to 412 - this cured the bouncing that had been experienced.

Pressure transducer fitted in the pressure switch line, 2FP roof beam jacked up. Auto cycling commenced 7860 finished after 7872.

20.11.64 — Commenced cylcling flight 7873, reading all checks on U/V recorder. Pressures are as follows ϕ Dynamic ϕ.

1 = 670, 2 = 426, 3 = 726, 4 = 391, 5 = 781, 6 = 356, 7 = 721 - 521, 8 = 791 - 511, 9 = 873 - 457.
ML 1 = 536, ML 2 = 566. Static mean level = 587.
Finished cycling after flight 7900.

21-22,11.64. — Setting up pressure switches, approximately equivalent of 24 flights done.

23.11.64 — Flight No. 7924. Flight time established at 7min.10sec Gust unload time 106. Total unload time at present 186 but may change when manoeuvre pressure switches finished.

Changeover pressures (dynamic) approximately as below after final adjustment using gauge C1 (7-30 p.m.).

ML Up (for levels 2, 4, 6)	565, 570 found to be 29.11.6		
ML down (for levels 1, 3, 5)	552, 550		
1	665	665	
3	715	705	Static mean level up.
5	773	760	Gust 587.
2	425	430	Man. 601
4	360	380	
6	318	310	
7 Top	755	755	
7 Bottom	508	515.	

23.11.64

8 Top	832	835
8 Bottom	487	*
9 Top	915	910
9 Bottom	445	Turn back 415 clicks 530.
10 Top	1140	
10 Bottom	506	

* Turns back at 485, clicks at 535.

23.11.64 N ights. Completed to traces to all loads, started to analysise as you requested.

1-6 F P and 1-6 FS complete 1-3 RS complete. The rest are in various stages of completion.

Fault on programme unit - whilst on manual level 1 it did a few 1's then a 5 and was going on in this vein until I changed to another level. This fault did not repeat itself.

24.11.64 Started cycling 7938. Established flight time at 7-25 secs. with unload time for gusts at 108 ~~xixex~~ secs. To achieve this time unloading rate is $1\frac{1}{3}$ times from fully in which makes the blue wire one segment past T.D centre.

Redone allyesterdays work i.e. 1-6 and 1-3R P and S and the M.I's port and starboard and a complete flight measuring stresses. These are now being ~~axixx~~ analysed Themachine developed the same fault as you experienced yesterday i.e. selecting 4's and 6's during manual 1's. Also one occurrence of uniselector B operating consecutively from a 7 to an 8. Four static tests are now required namely (1) 1-3R and 4 M.I - Port (2) 1-3R and 4MI - Starboard. (3) 7 M.I Port (4) 7 MI starboard.

Test (1) completed pressure range 400 to 1000 p.s.i.
Test (2) " " " " " " "
Test (3) " " " " " " "
Test (4) " " " " " " "

All the load on factors worked out and inserted in the tables except for the M.I's which we were told to leave.

25.11.64
Day Shift. Flight time to be maintained at 7 mins. 30 secs.
Unload time for gust 108 secs.
Total unload time 198 secs. approx.

The setting for the unload rate valve is very critical and will probably need adjusting every third flight. Level 7 counter occasionaly does not count the 10 levels.

You are to cycle all night. Please watch the pressure in system A when D is selected. We havenoticed about twice that the pressure in A was about 350 p.s.i.

Night Shift. Cycled all night - had a couple of landing faults selecting A and B insfead of D. Took trace as required, air system operating except when the trace was taken. Linkage 3FS has been trapped under a ballast linkage - this we are getting fixed when the day shift fitters come in. It needs the linkage taking to pieces at the bottom and a fairing. Also link found to be broken on 1FS thisnis also being replaced.

Fatigue Test Diary

26.11.64
Day Shift.

Last Flight 8082. at 8100 flights please inhibit level 10. Bolt failed in 9 M.I. linkage correcting lever and K. Taylor is making new bushes and pin for night shift to fit. You will have to contact Mr. Chadwick to get the bushes and pin fitted. Be very careful when fitting the stud because it is a bit short on plain length and will need locking. Loading fault only occurred once. You are to measure all the loads on 1-6 P and S and 1-3 P and S and also the M.I's port and starboard. All these measurements to be taken at .2"/sec. (as set at the moment). After these traces you are to do stress trace at .05" /sec, then continue cycling all night.

Note : If any reading on the traces is duff you are to fix it and produce a complete trace. If unfixable move on to next complete set and produce complete trace of them. 1-6 FP and 1-3R all set and zeroed up at moment.

Night Shift.

Traces recorded as follows :-

1-6 FP & 1-3 RP on flight 8085.
1-6 FS & 1-3 RP " " 8088
MIP and Ties " " 8091
MIS and U/C " " 8105.

Commenced cycling at approx. 2.15 a.m. Traces were run as listed on previous page. Attempted a trace on the strain gauges as instructed but found A7 on channel 10 U/S. It's not the galvo as the spot appears on the screen without the 4 volt supply. The ballast weight at the front spar inboard compound rig was found to be fouling. Something is required to separate the ballast weight and the weight on the compound rig.

The stud in the 9 M.I linkage replacing the broken one is a R.D 3217/60/5 stud and will require changing to a grooved one. We could'nt find a grooved stud anywhere.

27.11.64
Day Shift.

Cycled most of the day and completed a full set of load traces and a stress trace. All cracks measured and damage card made out to the bomb bay damage you found during the night. Please measure the cracks again and fill up the chart for 11N and 11'o' - I have given out the next inspection. Examine the pot on 2 M.I starboard and if you can fix re-do the M.I trace (load) on starboard.

Night Shift

Uneventful nights running 2 M.I's trace was put on U/V recorder but itstill had the flats on it. Examined the linkage and ring and everything appears to be working correctly. The dial gauge does not show this step. There is a notice on the ring about calibrated instrument do not remove so we did'nt. All cracks measured. The 4 M.I link into the roof brought down some ofnthe new hand rail. See Laurie about the extension pieee to put the compressor on. I had to change the union in the Reservois itslef.

Fatigue Test Diary

28.11.64
Day Shift.

First flight 8260 approx. Last flight 8337. Counter one ahead. Cycled all day with various faults namely (1) Event counter faulty - sometimes does not count in event and sometimes counts an extra one. (2) Loadings are getting worse - up to 500 psi in system A when D comes in. A unload valve does'nt get the pressure down in fact all our attempts to reduce pressure failed. The only time you can gaurantee a good landing is after a level 9.

The air reservoir has a new union which does away with t the old extension piece. The compressor gives off a weird humming noise which we did'nt have before, but it seems to function OK.

Carry on cycling as usual, I don't know whether we are stopping on Monday or not for a stopped inspection. We have read all the cracks and are making a new damage card out for 46A. We will shutndown completely after this shift.

Night Shift.

Commenced cycling at 8338. It was found that on event 7 it was coming in at approx. 640 p.s.i. so the pressure switch was adjusted back down to 500 p.s.i. At first this had no effect until the switch was given one or two sharxp taps this seemed to free it and from then on everything worked. The pressure setting being approx. 510 p.s.i.

The rig was stopped for a linkage failure at about 2.30 A 5/16" bolt had pulled out of the links and beam. This bolt was replaced and cycling recommenced.

Please get Rexto look at the undersurface of the starboard tip as its pulling away again and the part of the pad which is on the wing itself is coming away. All the CSK screws holding the tip on are loose.

On flight 8400 when doing the level 10 the top of the pillar supporting the correcting level for 7 MI port tore off strapping 6 - $\frac{1}{2}$" bolts. the rig was theh shut down (about 7.10).

Inppection Q11 complete and entered up. Last flight 8400.

N.B Night Shift Please Note

Just because we've been stopped for 3 months there is no reason to think that it has suddenly become unnecessary to take a stress trace and check the desynss once per shift. Make sure that the stress trace is in the standard form as now formulated. B. Taylor.

Fatigue Test Diary

30.11.64
Day Shift.

You are to finish stopped inspection 4A and then continue cycling as normally. As far as the inspection is concerned your only job is to see that the fitters keep going on the repair in tank 3P and that all the panels are replaced. All the damage cards are up to date but please fill in the chart (use new chart for X-Ray).

When you do your stress trace (see previous page) see that you set up the trace as per the one enclosed in this book - fully identified - and the trace is to be taken on an autoflight with mean level gust at the beginning and mean level manoeuvre at the end.

Check and compare desynns for roll on level 5, 6, 9a, and 9b. and record in this book (Compare with chart enclosed.)

Night Shift

Repairs uncompleted so running unable to commence E.R.I. for temporary clamping on 4 M.I G.B has been done. A sheet has been done and requires printing for filling in the desynn readings.

All panels on except No.3 and 5 tank. Sheet has not been entered up as they have not finished with it outside.

1.12.64

First flight 8401. Last flight 8412.

Day Shift

The leadings don't seem to be any better unless the flight finishes on a level 9. We have had 'Pot' trouble when trying to run off a lead trace so we are doing a stress trace first. Will you run off a load trace as soon as you can and then later on, on the shift another load and stress trace. (the 'pots' probably need a drop of 'trico' on them). When checking the roll do not forget to zero the desynns in a landing case. We have not had sufficient flights on to measure the cracks.

(Load trace for by's benefit to consist of :-)

Strain gauge	C1	Channel 1
	2FS	3
	3FS	5
	4FS	7
	5FS	9
	6FS	10
	1RS	12
	2RS	14
	3RS	16

6FS was giving trouble, if you can't fettle pot, read 1FS on same channel instead of 6FS.

1.12.64
Night Shift.

Commenced cycling at flight 8413.
Made a desynn check at flight 8437. Gauges zeroed during landing.

FATIGUE TEST DIARY

1.12.64
Night Shift Cont.....

Level	Port	Stbd.	Roll	
1	13.9	12.75	1.15	to Starboard
2	17.25	9.8	1.45	" "
3	14.25	13.15	1.10	" "
4	10.8	9.0	1.8	" "
5	14.6	14.15	0.45	" "
6	9.85	8.25	1.60	" "
7a	14.55	11.5	3.05	" "
7b	12.0	8.15	3.85	" "
8a	15.1	12.9	2.2	" "
8b	11.6	8.0	3.6	" "
9a	15.8	14.1	1.7	" "
9b	11.3	7.6	3.7	" "

When we were taking the traces we did not know whether to take them in block application or in an auto flight. A couple of days ago - block was the fashion but in your notes on the 30.11.64 you refer to traces being taken in auto flight. Would you please clarify the point. To avoid dissappointment we did them both ways tonight.

Flight counter is now reading the correct flight.

Running inspection 11R completed - only one new item of damage reported - sheared rivet in Area 9S. A damage card has not been taken out for this.

2.12.64
Day Shift.

First flight 8488. Last flight 8524.

Look on the last page of the latest U/V recroder operating data book for trace speeds. Very few cracks measured due to very few flights being achieved. Please do a new damage card for the cracks aft of panel D port (make it another sheet No.). Counter reading the flight commencing. Please set down in this book the content of each trace you do.

Night Shift.

Commenced cycling at 8525, finished after flight 8589.

Took traces of 1-6 F.S and 1-3 RS all M.I's port and starboard - with C1 on each trace, also stress trace. Had a lot of trouble with the pots sticking and causing flat spots on the trace. We tried all sorts to cure this but did not completely get rid of it. Owing to all this fettling - did not have time to read desynns.

Could you please get Maintenance to put some new bulbs along the roof walkways.

Damage card for cracks on port side aft of Panel D has been done. Also damage card for sheared rivet on starboard side (Insp. S.11) has been done. This damage card required a number . All cracks have been measured.

Fatigue Test Diary Cont.....

3.12.64
Day Shift

First flight 8590, last flight 8650.

Top Priority

All damage cards must be up to date for the meeting in the (Brock's request). New damage in Area 18 (See area 23 inspection 12K for location) please do a new damage card for these cracks. Starboard stress trace required and desynn check. Try to get someone greasing the rigs during the night, some are getting noisy again.

Night Shift

Commenced cycling at flight 8650, finished after flight 8740.

All cracks measured and new damage cards brought out for cracks in area 18 and the missing rivet on panel P also for crack in starboard vent panel. Cracks in area 18 spreading rapidly.

All the inspections except tonight's has been entered up on the chart.

Desynns were read and entered on the check sheet. Trace taken of strain gauges C1, C2, C12, C13, A6 and A7.

During the level 10 a loud bang was heard but a subsequent search did not turn up any damage to go with it.

4.12.64
Day Shift.

Re stress and load traces for tonight. A full set of load traces are required i.e. 1-6 FP, 1-3 RP + C1, 1-6 FS, 1-3RS + C1, 2, 3, 5, 7, 9, 10 M.I.P + C1 2, 4, 5, 7, 9, 10 M.I.S + C1. and before and after you do these a stress trace is required i.e C1, C2, C12, C13, A6 and A7. Don't let a lot of flights go under the bridge whilst doing the above.

Points to watch.

Set spots up to give reasonable space between each, when doing M.I.S set up spots at manouvre mean level on all others, set up on gust mean level but take manoeuvre mean level at end speed for all but stress traces .2"/sec trace stress at .05/sec. All block application bar stress, when doing blocks, change event at mean level which gives uniselector maximum time to work. If there are any duff pots indicated stop trace and do following :- clear plunger with carbon tet (our desynn panel), hold plunger and make sure that knob end is tight. If these fail on another trial run, take wires from T.B on pot where there are more than one in any hole and solder them together (iron incontrol room) this should eliminate chance of not gripping one of wires. You can do no more. We have not been able to measure the cracks today due to rig repairs, stoppages etc. so please fit them in during your shift.

We were attempting to bring level 1's and 2's nearer to mean level by 20% but can only make it 12% due to bouncing on 2's.

Fatigue Test Diary Cont.....

28.1.65
Day Shift.

Commencing after repair to front spar web, SK.49956 at flight 8797.

The programme of work to be carried out before recommencement ofroutine cycling is as follows :-

1. Finish off outstanding items of Inspection 4B i.e. Ultra-sonics DONE
X-Rays DONE

2. Do an hours cycling.

During this period check all pressure settings. Compare with figures for 23.11.64 except for levels 1 & 2 which were altered 4.12.64.

Also check roll after zeroing up in landing one.

3. Do static check to level 9 pressure reading 5M.I. and 4 M.I. port and starboard. Compare with previous static result.

At the same time read the new strain gauges on the undercarriage side load beam brackets and the new gauge on the steel plate. Only the new gauge on the steel plate has been connected on to C loom. This gauge is ident No. C49. Apparently the wiring of channel 3 of the recorder is U/S, therefore whenever channel 3 is called for use Channel 2.

4. Read regular group of strain gauges in Standard Stress Check form.

Do"dynamic 6" full load check. All the usual comments apply. i.e. all the points reiterated on 4.12.64, the flight times are to be maintained as per 25.11.64.

5. Recheck dynamically the stresses measured in the undercarriage diagonal tubes. Include a full landing in this and a mean level and steady off at 2 or 3 other pressures as well. If they are finished in time get a dynamic trace from a couple of the gauges on the side load beam brackets at the same time.

6. Analise the results obtained in 3, 4 and 5 above.

LLoyd Please note missive from R.L.B.

N.B. All level 10's to be done slowly with maximum quiet with spare bodies all round aircraft listening for anything untoward.

LLoyd Would you please sort out the following damage cards and leave them for Maureen to get 6 prints off each first thing in the morning. Most Urgent.

Fatigue Test Diary Cont.....

28.1.65 Cont....

Commenced cycling at flight 8798, landing faults occurred straight away i.e. A.B and master selected instead of dropping out all systems.

Level 10 negotiated without trouble. 2 bangs heard on level 10. Seems to be coming from starboard going into No. 2 tank starboard. More clearance in hole and panel required as threads on starboard catch panel. Assume this is what caused bangs.

Please continue cycling until 8.45 p.m. this will complete the hours cycling which is required - Please see proceeding page for list of instructions for the night.

Desynns are zeroed and ready to read.

D 1	=	Port F/S	D 21	=	Stbd. F/S
D6	=	Port R/S	D 26	=	Stbd. R/S

Flight time to be 108 for gust 198 total.

28.1.65
Night Shift

First flight 8802, last flight 8853.

Completed hours running as prescribed and started to work through various jobs.

First checked pressures they were O.K. then did roll check (entered) then we read 4 MIP and 5MIP statically with a static reading on new gauge (C49) then 4 MIS and 5 MIS, plotted these CM against DTL. and found calibration factor, these dont compare with P34 and P37 very well, but compare with,the figure of old calibration on J. Shortlands desk.

Next we did a standard load trace i.e. C1, C2, C12, C13, A6 and A7 (Flight 8840) before this we had had trouble with the recorder on which kept blowing a fuse in the power unit, this came alright at the 17th attempt. We then attempted to do the port wing benders for dynamic 6, this was one frustration after the other, on finding that Group 4FP would'nt balance up I went ont to investigate and found that the T.B had been ripped off the post and all it's wires with it. Managed to fix up a temporary arrangement but it wants seeing to. Groups 6 FP was the next not to balance up and again the wires had been ripped out, again a temporary job has been done, finally did port bending but thats all, we managed to overcome bad pots on 6 FP, 1RP and 3RP by loading spindles with rubber bands.

Fatigue Test Diary

29.1.65
Day Shift.

Beset with difficulties all day. All sticking and doubtful linear pots have been removed and dismantled. They should all work smoothly now. Continue to attempt traces, traces completed are : Port man. groups and a stress trace. Traces to be done peferably before the level 10 are, starboard benders and man. groups. Also port benders, desynss are also to be read as usual.

One of thenloading jacks on 4 M.I is leaking badly and a can has been pleased to catch the oil. Please keep an eye on this and periodically empty the can into the large drum against the hangar door opposite the jack. Dont forget the level 10.

Port adjustable link on 9 M.I had to be shortened as weight on floor was bottoming on floor beam. Plasticene was packed round plate air inlet on starboard side of No. 2 tank to prevent leaks and plate in No. 4 tank screwed up. This has cured the air problem although you will of course go on to the internal machine,

Faults have been occurring on the machine, i.e. selecting gusts when in the manoeuvre. There is a tendency to only do 46 events as can be seen from the typed sheet. Once on selecting the landing it went into gust.

When you do a trace please time the next flight and put it on the trace. The U.V. Rec. is all set up for port benders but time is 8.0.

Analysis of gauge C49 on steel reinforcing plate on spars web showed 9.80 tons/in^2 (absolute) stress for 1.7g on manoeuvre.

29.1.65
Night Shift.

First flight 8892. Last flight 8950. Please read desynns as soon as possible, we have had so much trouble during the night that we would'nt fit them in. The machine has given considerable trouble :- 1. Changes from gust to manoeuvre and vice-versa.

2. Dropping through bottom of 8's and occasionally 7's

3. Usual bad landings.

The pots are still giving trouble - particularly wing benders. Counter is 5 ahead.

The pot on 5 FS was giving an erratic signal and when it was stripped down the spring was found to be broken. The pointer also looked as if it had been damaged at same time. We exchanged it for a spare off Bryans desk.

After much fettling, re-wiring etc. we managed to get stuck into Dyn. 6 results, between flight 8928 and 8943 we did port wing benders, starboard wing benders, and port and starboard MI's and ties. On port wing benders we had to dispense with S.G as channels 12 and 8 seem duff, where channel 12 was to be used we used 13 on benders, and 10 on MIS a reading of ballasts should now be done by

29.1.65
Night Shift Cont...

day shifts followed by a stress trace to check earlier one.

30.1.65
Day Shift

First flight 8945. Last flight 8981.
J. Shortland says there is no need to do the ballasts on a trace so they have'nt been done. Port and starboard manoeuvre groups have been done on a trace with the strain gauge C1 on. All channels are working so if 9 or 12 go demic again just fiddle with the shorting plugs until they work. Dont touch them as they are working at the moment. Suggest you do a stress trace and repeat the wing benders with C1 on the trace. Had a long stop in the morning as a universal link on bal last weight on 5 M.I. see-saw was knuckled over and links bent and twisted. This was rectified and the link relocked. Dont forget the can under 4 M.I starboard. We forgot to read the desynns so they could do with being read straight away.

The paper has run out on the recorder so you will have to use the old type paper which is, next to the recorder.

All cocks are shut and trestles up. There is a drum of oil connected in if you run short. Dont forget the times on any traces.

31.1.65
Night Shift.

First flight 8982. Last flight
On consulting B. Taylor at start of shift, it was decided that the 4 traces taken last thing Friday night shift i.e. Port and starboard benders and port and starboard MIS were acceptable and are to be analised in conjunction with standard load trace (strain gauges) taken by day shift on Sat. 30/1/65 as it fitted in with no. of flight limit. The change of pot on Group 5FS starboard necessitated a new static pot - D.T.I calibration to be taken, this was done during the first part of the shift, it has now been graphed and a new factor calculated. To help with the analysis of the above 5 traces, the mean level lines have been drawn and relevant calibration deflections written in. The whole series is on J. Shortlands desk. Inspection completed and all cracks have been measured (some new cracks on stringer 26). Can you please enter up some of the backlog of inspection sheets(an apprentice could do this). We had a link failure on 4 FP which we managed to repair. The machine behaved quite well overnight - only one bad landing and once when the counter did not clear after the landing. Level 10 negotiated without incident. Counter 1 ahead if you corrected for the 5 ahead on Saturday.

Bryan Dont forget to organise the cutting up of some specimen cracks for Brock, you said you would see to it, but you seem to have forgotten about it. I could'nt get a saw to see to it myself. The phone was unconnected last night.

Fatigue Test Diary

1.2.65
Day Shift

Commenced cycling but did not do many flights as the dynamic 6 loads have not yet been ratified.

Did static run 38 - gust with increments up to 800 p.s.i.

Began to discover how many groups need recalibrating - this was done - night shift to carry on and calibrate as many as possible.

2.2.65
Day Shift

Calibrated all groups against dial gauges. Commenced with stress trace for Dynamic 7.

2.2.65
Night Shift

Completed traces for Dynamic 7. Level 10 was inhibited until dynamic 7 was completed which got us up to Flight 9115. Flight counter is now correct and the number showing is flight commencing.

The machine still does regular bad landings and occasionally does not count the right number of 7's - usually the second series is missed. Also during one flight the 8's were not inhibited after the 2 normally done.

3.2.65
Day Shift

Continued cycling throughout the day - holdups due to butt in linkage breaking. Cracks have been measured.

The air system does not work properly when connected to the compresser, so will you get it changed over at the earliest opportunity.

Requirements for the night consist of :

a. Stress trace.
b. Tip desynn check
c. Cracks measured - these will need doing towards the end of the shift as we measured at 7 p.m.
d. Stopped inspection made ready and panel sheet drawn up.

Rig to be stopped for inspection at 7.30 in the morning. Please check corners of panel B port for cracks - See X-Ray on Bryans desk.

3.2.65
Night Shift.

Last flight 9284. Aircraft ready for stopped inspection 4C. All D.C's up to date. Inspection schedule have been given out.

Typewriter is duff, can you please fix. Unload time device is duff, please fix. Starboard front spar tip desynn needs fettling every time we do a desynn check, it needs a new length of wire (which we could'nt find last night) can you please fix.

4.2.65
Day Shift

Broken down all day for stopped inspection of which there are still inspectors items to be done. Please complete the inspection and commence cycling. A night shift has been asked for but if no one appears ask Mr. Chadwick for as many blokes as he can spare. The typewriter and the inboard inner have been repaired and are now OK.

Only two damage cards have been taken out as yet for minor damage in 3 and 4 tanks.

Night Shift

Took all night to finish stopped inspection - Panel 4 still to go on, then you're ready to go. New damage in Area 31 port see also Shts. 3 and 4. Can you please put up a new running inspection check sheet.

5.2.65
Day Shift

Note to whoever takes the stress traces on nights. In order to make it easier for H.S.D. to analyse the traces and yet maintain accuracy, please note the following changes in the "technique" :-

	Gauge	Channel
Select as follows	C1	1
	C2	5
	C12	9
	C13	12
	A6	13
	A7	16

When the gauges are electrically balanced, adjust them to the screen graticule positions as follows, at MLG steady

C1	23.5	cms	from	L.H	end	of	screen
C2	19	"	"	"	"	"	"
C12	15	"	"	"	"	"	"
C13	12½	"	"	"	"	"	"
A6	10	"	"	"	"	"	"
A7	7	"	"	"	"	"	"

On each trace, in addition to flight time etc., note the gust and total unload times current. The modus operandi is other wise unchanged. In case of doubt, consult trace 142A.

Commenced flight 9284, finished flight 9372. Odd landing fault but otherwise plain sailing. Changeover to compresser at 9 O.clock when night shift go off - compressor has never been repaired.

Night Shift

First flight 9372, last flight 9457. Uneventful night. Measured all cracks and entered up all outstanding inspection sheets. Took stress trace (on J.S. Desk). Checked aircraft roll.

6.2.65
Day Shift

First flight 9458. Took stress trace. On flight 9488 the level 10 was selected but we got it off in time. Level 10 was performed at flight 9500. No bangs. Shortly after taking over the machine started to select an unlimited number of level 7's, this was overcome by pressing the small wander switch. This had to be done on each flight counting the number of level 7's performed which were printed on the typewriter paper. This had to be done owing to the counter for level 7 ceased working and showed 00 all the time.

Fatigue Test Diary

6.2.65
Day Shift Cont...

Soon however the typewriter went berserk typing innumerable levels so we dispensed with the typewriter all together. In manoeuvre you have to make sure that the required number of levels 8 and 9 are performed and when event counter shows 47 events, use the wander switch.

It was also found that on pressing the wander switch a landing was not always selected and that there was neither future or present selection lights showing. In this case the landing was selected manually. The cracks were not measured as there was only just over 100 flights since last measured. By the time came to go home. Oil content is OK. You could try the typewriter again if you will and see if its put itself right. Compressor working OK. Apart from the trouble with the machine nothing untowards has occurred. Trestles are in position and cocks shut.

7.2.65
Night Shift.

First flight 9530. Last flight 96 . A new crack on front spar web see D.C 59 Sht. 5. New cracks inboard of panel M see D.C for port and starboard (on new skin joint which was formed when repair was carried out after 7827 flights).

Level 10 inhibited in view of the failure on the spar web.

We had a very busy night and coundn't fit in the roll check.

All cracks measured and up to date.

Please get some green paint.

Stress trace taken at start of shift.

Machine behaved in same as on previous day shift, but typewriter is now working (9603), how long for we could'nt say. Counter reads 2 flights too many.

8.2.65
Day Shift

Load traces for Dynamic 8 started. Those completed are sections A, B, C and D on the list made out by J. Shortland. Please do the two remaining groups namely E and F as soon as possible For both groups set up spots on a manoeuvre mean level and then reduce load, come up for a gust mean level and calibrate. Perform flight in block and after landing select a manouevre and do a manouvre mean level and calibrate again. Electronics came and fixed the machine but carriage return will still not work at the end of a flight. We inadvertently performed a level 10 so will you inhibit the next on coming up. Cracks were measured at approximately 9840 onwards. All damage cards are up to date. N.B Regarding the next stopped inspection - I think we are doing it tomorrow morning, but nothing has been said officially. Will you please ring Rex and confirm this.

8.2.65
Night Shift

Tried to get Rex as requested but he was out. Bryan called in and said Wednesday morning is stopped inspection day. Bryan wants to know the flight number when you inadvertantly put in a level 10 - you are to talk to him about this first thing in the morning. We will put in a Level 10 as usual at flight 9700.

50v fuse blew and before we realised what had happened the typewriter started to smoke. We then quickly disconnected the supply but the typewriter still smoked for a full minute afterwards. We did not attempt to use the typewriter again.

Please note that settings of spots on screen (U/V) for sections E and F in the procedure, are not those which were on J. Shortlands sheet. These were displaced from galvo normal position by up to 4.5 cms (channel 7) some mistake was made somewhere.

Checked aircraft roll at flight 9710. We have removed panel 9 from the undercarriage bay in order to do a routine check on the spar web in this area - will you check to see if we can leave it off permanently. In the inspection sheet letter box there are several numbers which are almost empty - can you please get Andrew to refill.

Can you get the rig greased please, its making an awful racket. One of the inspectors accidentally broke the 'U' tube for the air system (undercarriag bay) so we have not been able to pressurise the tanks since flight 9700. New cracks on stringer 16 at acute corner of Panel C - port. Also crack in port undercarriage bay, see Damage Card 37 Port Sht. 3. Several new cracks on various current damage cards.

All outstanding traces for Dynamic 8 are finished (How did you get the settings for your first stress trace as these do not tie up with the channel numbers.

9.2.65
Day Shift

Please Note - when you take out a new damage card please put it in the index otherwise we have no idea whether one has been done until we come across it accidentally. Several damage cards have been duplicated because of this failing.

Extra level 10 went in at approximately 9660, the level 10 from the previous shift went in at approximately 9625.

During the day shift, traces of gauges C41 to C48 read, (affixed to U/C sideload brackets of which the previous items failed in fatigue). Gauges 41, 43, 45 & 47 are on one trace, 42, 44, 46 & 48 on the other. Will night shift please have a stab at analysing these traces as follows :-

Fatigue Test Diary

9.2.65
Day Shift Cont...

1. Let x = .05% calibration - deflection (in cms) then stress/cm = $\frac{20.10}{20, x}$ tons/ins^2/cm
hence obtain the 8 values of stress/cm.

2. Measure amplitude in cms of typical levels 1 to 9.

3. Tabulate and factor up to give the stresses for the various levels.

NOTE a. Positions of spots for "standard stress check" are, as you observed, not correspondent with galvo positions, but were arrived at as a compromise between wanting accuracy and not wanting to confuse the trace readers at H.S.D.

b. Positions quoted on sheet for Dyn. 8, for sections E & F were incorrect, a position for rear tie having been erroneously included. (The positions were measured off the Dyn. 7 traces).

Cracks measured at 7.00 clock. New cracks on various cards - new crack in front spar web on starboard in same position as port, see 59 Sht. 5 Would you please finish off the damage card, which will be an addition to Card 59 Sht. 4.

There will be a stopped inspection tomorrow, so will you please get all necessary paperwork ready, and will you make sure that there is a sheet included for the inspection of the side load brackets in the engine bays.

Level 10 at 9800 missed out to make up for extra at 9660.

Night Shift

Please Note When you do a stopped inspection please measure all the stopped inspection "cracks" - not just the ones in the tanks. I would'nt like you to find a crack 25ft long in the engine bays for instance - I would have difficulty in chosing a suitable scale for plotting propagation rates.

Also do you think you could give some thought to doing a desynn check so that perhaps in the not too distant future you might raise the enthusiasm to actually carry one out - it is now well over 1000 flights since you last did one. I trust this neglect on your behalf will soon be rectified.

Analyse the strain gauges C41-C48, and calculated stresses above and below mean level for events 1-9, you can do the necessary additions if you require either alternating or absolute values.

Regarding the above traces, you can appreciate the difficulty in analysis if (a) the traces are run out at the wrong speed. (b) the level 9 trace on one strain gauge disappears off the sheet by approximately $\frac{1}{2}$". The job is hazardous enough in the middle ofthe night without such willy nilly trace testing.

Fatigue Test Diary

9.2.65
Night Shift Cont...

All cracks measured - checked aircraft roll. Completed stress trace as standard procedure.

Important Measure cracks in engine bay before fireproof skins are taken out, if any more needs to be taken out besides the ones that were left off. New damage cards taken out 28 Port - Sht. 1 and 9 Port, Sheet 10. Finished off 59 Sht. 4 as requested. All the necessary paper work done for the stopped inspection. One damage card we have not been able to do is for mechanical damage to port leading edge where 5 M.I has savaged the nose of the leading edge and caused a dent and a few cracks.

Incidentally, should the outer engine bay fireproof skins have been left off (port and starboard) The last time they were removed for inspection purposes (flight 8797) they were officially recorded as being put back - Is this a concession that J.T,C. got when he strain gauged the brackets.

The running inspection was not completed due to 1 inspector missing off the team so several areas are still outstanding. Just prior to stopping I started to inspect area 19 Port and found 2 cracks in the 14g skin under the spar (marked on aircraft) also a broken chobert rivet where we had all the cracks before. The inspection on this area is still unfinished so there may be more cracks. I have not done a D.C for this above mentioned damage Last flight 9905.

10.2.65
Day Shift

Dear Lloyd - regarding your snide little notes about the desynns. It may occur to you, having said so much yourself about it, that we may have been too busy during the day doing odd jobs, to read the desyhns. Or it may be due to the fact that they were being used on the 780 all day. Anyway we can do well without your words of (no doubt) wisdom.

Dear Peter - Regarding your whining noises about the traces. Quite frankly, I cant understand your difficulty reading the traces - if you cant read them, if they are going one or two speeds too fast - which incidentally was intentional - or extrapolate one peak ½" then its about time you gave up.

If nights are getting the pair of you down, just say so and your places will be gladly taken.

Fatigue Test Diary

10.2.65
Day Shift Cont...

Regarding measuring the cracks in the engine bays - most of the fireproof skins have been off in the outboard bays ever since the under-carriage side load brackets were replaced. These skins must go back before you start tonight.

The inspection is nearly finished and all that is outstanding is the replacement of all panels out. The main job is the bomb door fairing and the bomb door seal structure. All the others are just sumps and panel covers.

Ray Staniforth would like to remind you that if you fill in the requisite square for the removal of a tank bag, on the panel sheet, please fill in the square to remove the panel as well, otherwise his fitters stand around looking lost.

We will be getting the damage cards out ready for issuing, and would be obliged if you would finish this job off. Also will you please enter up the stopped inspection on the sheet. You will notice that the X-Ray has not been done - dont worry about this as it is being done tomorrow sometime.

Bryan says will you not leave the stop watch upstairs when you shut down as it stands a good change of being pinched.

There are two X-Rays of the starboard landing light panel on the desk, with cracks visible. Will you have a look on port before the panel is replaced to see if you can see anything in the same position

As soon as the aircraft is ready, please run. I dont know if Ray has asked for a night shift - but if no one turns up pretty smartish I should go and ask Mr. Chadwick, to provide one.

10.2.65
Night Shift

We will finish this little episode without too much snideness in saying that working nights suits all three of us fine and we are even prepared to carry on nights for the duration.

Examined the internal structure around the landing light aperture (port) but could'nt find any cracks. It is very difficult in that area for crack detection without bending the wing. Entered up the stopped inspection except for the X-Rays.

We cleaned more paint off the spar web and discovered another crack which we put on D.C 59 Shts. 4 and 6. New damage in port outboard engine see Cards 35 Port Shts 9 and 10.

Aircraft not ready yet for flying, fitters were on the job very early and stuck at it all night, but the following items remain unfinished :-

1. A few screws in bomb fairing.
2. Panels 4 and 6 on starboard.
3. Fireproof skins in port outboard engine.
4. 6 M.B weight is still anchored to the platform.
5. Bomb doors need closing.

Fatigue Test Diary

11.2.65
Day Shift

All damage cards printed except 59 Sht. 4, 5, and 6.

Not much running done today as X-Rays were being taken. Flexible joint on starboard side is cracked and there is a crack in the undercarriage bay in the rib web. Damage cards have been taken out for both of these.

We have not measured the cracks today because we have not done enough flights to warrant it. Please enter up running inspection sheets for today.

11.2.65
Night Shift

All cracks measured and both desynns and stress trace completed. New cracks see D.C 28 port Sht. 2 and 23 Sht. 2, the latter are probably important. Incidentally does Rex know that under the present inspection schedule the spar and spar web immediately outboard of the bomb rib only gets inspected every (1200 flights) which seems to me to be too great an interval when there is a very convenient panel that could be removed for inspection. Anyway we stopped cycling after 10,000 flights and took panel 4 off on port side and gave the spar a good inspection, with 1g load on, and fortunately we found nothing.

I'm not looking for work but it occurred to me that maybe Rex is'nt aware of the number of flights between inspections and that he may want this area looking at more frequently than is planned at the present time. Please bring this to Rex's attention

We could'nt enter up the last inspection of yesterdays day shift because we could'nt find the sheets.

12.2.65
Day Shift

Stopped cycling about 10.30 for X-Rays on cracks in reinforcing plate under spar, and only started cycling again at 6.00 clock. This means that we will not have measured the cracks again.

The instructions are that you are to carry on cycling, but if any of the cracks in the spar web get to within $\frac{3}{8}$ of the spar boom you are to stop.

It is probably certain that on Monday there will be a breakdown of about 10 days, but the shift change-over will carry on as scheduled i.e. this weekend and we will ring up on Monday night to check if we have to come in.

X-Ray department called approximately 6.0 p.m. to say that the pictures taken in the afternoon of the reinforcing plate and the angle immediately above show no further failures other than the one on the plate itself.

The inspection sheet has been sent over to obtain more prints but has'nt come back yet. Could you please do a stress trace as soon as possible.

Fatigue Test Diary

12.2.65
Night Shift

Flight 10,060 to 10,144. Measured all cracks, took stress trace, read desymns. steel plate under front spar now completely fractured. Air seems to be leaking from somewhere every time we tried to pressurise it seeped out.

13.2.65
Day Shift

First flight 10,145. Air system performed properly although it took a long time to build up pressure on the tank. spar cracks have not increased in length. On attempting a stress trace channel 12 went U/S, channel 2 and 9 acting up. On reading the side load brackets 2 of the gauges see m to have gone U/S. Will check on next shift. Last flight 10,206.

14.2.65
Night Shift

Commenced cycling at flight 10,207. Finished flight at 10,276.

I saw Brock on my way in on Sunday night and he expressed the desire that only the reinforcing plate under the centre section be replaced on Monday morning, as he is lecturing, and then bringing a party round on Tuesday, and he would like the rig to be running.

In any case we will be ringing up on Monday late afternoon to find out what is happening.

Tell Bryan that the extra level 7 that I told him about some time ago is still occurring, despite attempts to get rid of it by different valve settin

Regarding your alteration to damage card 8P Sht. 6 I dont think you are right, will you please check. Also can you redraw D½C . 9P Sht. 7 also 1 or 2 cracks on stringer 26 Port, I cant find - will you please check these also.

Channel 9 on U/V is duff. Nothing wrong with side load brackets. Also channel 16 does not show up on trace. Had to use wrong type of paper as there was none of the other left. Most of cracks read shut down at 7.30 for repair. Almost eliminated air leak - tanks now pressurise OK on compressor

Would you please finish trimming and folding the D.C prints and send oof the same. They're on Peter's desk.

Fatigue Test Diary

15.2.65
Day Shift

Finished the inspection side of "stopped inspection 4E" measured all the cracks and brought damage cards up to date. You are to run as soon as possible. Due to starting late on the inspection we did'nt have time to redraw damage card 9p Sht. 7 so will you please oblige. Also we could'nt find a drawing for the cracked (front spar web) diaphram so can you do a D.C on what you can see for now (J.T.C. knows about this). What is the initial length of crack 'h' D.C 59 Sht. 6. I could'nt check your remarks about my alteration to 8P Sht. 6 as we have'nt been running but I seem to remember this crack running on top of a score mark that had the same length as the dimension I crossed out, and the crack itself was the shorter length as quoted. Anyway if I'm wrong I apologise but please check again to make sure.

I agree with your remarks about the cracks on stringer 26 port, this also applies or has applied to numerous D.C's in the past where small cracks have mysteriously "healed" up. I suggest that you discreetely rub out all reference to the crack both on the drawing and in the table.

New crack on front spar web so 59 Sht. 6 was redrawn to accommodate.

Can you do a D.C for the cracks yountold me about at the landing light acute corners which were found by X-Ray - I have'nt seen these plates.

Night Shift.

Replacement of panels etc. nowhere near complete.

Damage cards that needed redrawing have been done. Damage card for diaphram in the process of being done. (Can'f find X-Ray so the landing light aperture D.C is still outstanding). Found it and done.

In the reinforcing plate under the spar one of the rivets is hanging out a long way. I have mentioned it to Ray, as it will have to be changed Mercury manometer smashed again. Dont know when or who by.

Fatigue Test Diary

16.2.65
Day Shift

First flight 10,276, last flight 10,415

Measured all cracks. Level 10 inhibited because of visitors. Please put in on flight 10,350. Stress trace taken at 10,311 but no Desynn check.

You must make sure that the template of the front spar failure is finished for first thing in the morning or is D. Beswick willing to stay tonight for a while. You must see Chadwick and get all speed on if so that Derek can use it tonight. Please enter up backlog of inspection (on my desk) we have been extremely busy today.

Night Shift

Cycled all night, level 10 was put in on the 10,350 flight as asked and another was done at 10,400. All cracks measured and all out standing inspection sheets entered up. There is a query on the 4E stopped inspection. Two inspections sheets have damage written on them and I cannot find any damage cards corresponding with them, so no D.C has been put on the inspection sheets or the chart. Could you please look into the same. The new template for the front spar was completed. Stress trace taken at 10,393 channel 9 has a bad connection somewhere and suspects its at the shorting plug end.

17.2.65
Day Shift

First flight 10,415, last flight 10,478.

John Cooper, would you please dig out a full set of strain gauge results from Prelim. Test 27 manoeuvre. These are for Laurie Trier. If we have analysed them, then produce a figure in stress per g (440 p.s.i. = /g on manoeuvre), if not acopy of the typewriter output will do.

Looking back through the book it is all too often impossible to sort out how many flights have been done in a day. It is essential that the flight number be written in the book at the start of each shift at least, and also at the end of the shift if the rig is going to stop for any reason. B. Taylor.

Read the desynns and taken a stress trace. We have not read the cracks as we have been stopped for considerable periods due to the machine being repaired and consequently have not put many flights on. During the day we've got considerable work to do for the meeting on Friday, so could you oblige and make up a batch of 20 running inspection - we are nearly out. Any prints that are short in the letter box will be found on P. Brooks desk.

Fatigue Test Diary

17.2.65
Night Shift

First flight 10,479, last flight 10,569.

The strain gauge results for Prelim. 27 have not been graphed so a copy has been put on Bryan's desk. We have now only one copy of Prelim. 27 left so don't go giving any more away.

Completed 10 running inspections - need a few more sheets Area 59 for another 10. The prints on Petes desk are all for stopped inspection and are therefore no use.

Would you please have a scout round for the tin of green paint, it seems to have disappeared.

Trace and desynn check completed at flights 10,532 and 10,567 respectively.

Whilst doing a desynn check I discovered that the starboard desynns were crossed over i.e. front spar resting on rear spar, and vice versa. Alf tells me you know about this and allowed for it. They are now reading correctly as I have swapped the plugs over.

18.2.65
Day Shift

First flight 10,570, last flight 10,640.

Read all the cracks, done a stress trace and a desynn check. There will not be a stopped inspection in the morning, so carry on running. On the centre section layout on my desk (the one showing damage etc.) could you please write on in the appropriate colour, the flight number when the damage was first discovered. This is for the meeting in the morning. Also could you please do a damage card for the port landing light and call it 47 port Sht. 2. I have left the X-Ray out on my desk. Incidentally do you know where the damage card index book is?

All damage cards are to be up to date and in the file for first thing in the morning.

Night Shift

First flight 10,640, last flight 10,731.

Unload timmer malfunctioning.

Regarding this drawing that we have marked up, I think that 59 Sht. 3 should be in brown, as these bolts were replaced and one has since broken off.

Stress trace - desynn check and cracks all done. Damage card for landing light Not done. See damage cards 60 Sht. 7 and Sht. 8 for new damage on outboard side of bomb rib, port and starboard. Could you enter up damage which is marked on inspection shts. 15K - areas 60P, 59P and 23P.

Concerning the cracks on the bomb ribs port and starboard, on the bomb bay side of cracks on port it looks as if two butt straps is cracked

Fatigue Test Diary

18.2.65
Night Shift Cont....

about 3rd rivet down. Its not easy to get at but perhaps a small person could get nearer to the suspect crack and confirm.

Could you please find out for definite what's going to happen about stopping the rig and whether the shifts are continuing next week and are duenin Sunday night.

19.2.65
Day Shift

First flight 10731, last flight 10796.
Done stress trace and read the worst of the cracks. We have been stopped for long periods today repairing the machine and doing a partial stopped inspection.

Shift work is now finished for about a fortnight so come in Monday for a normal working week. Damage load for landing light is now done, I have'nt entered up the outstanding inspection sheets but I will do this tomorrow.

One level 7 has been knocked out so only I should show giving 46 events in all - to account for the "ghosting 7". Unloader is now working O.K.

Night Shift

First flight 10,797, last flight 10,885.
Stress trace, desynns and cracks - all done.
Normal run - no faults.

20.2.65
Day Shift

First flight 10,885, last flight 10,953.
New cracks at forward corner of panel D - Port
Damage card in process of being done. Bad landings on every flight i.e. selecting gust systems A and B instead of D. All cracks measured, desynns checked stress trace taken and all inspection sheets entered up except the one being finished by the Saturday inspectors.

Stopped inspections 4H ready for use and panel sheet issued for 7.30 start on Monday morning. Stopped to repair bowler hat starboard and stringer 26. Port and starboard.

N.B. First job on restarting is to ascertain the stress during landing of the following spar strain gauged. A4, A9, B4, B9, C25, C36, D25, D36, A44, A14, B44, B14.

This will necessitate starting from a landing and doing a static on Manoeuvre up to 700 p.s.i. in hundreds. The relevant negative stress in the landing can then be interpolated. B. Taylor.

7.3.65
Night Shift

First flight 10,954, Where has the typewriter gone? Reset all valve positions according to settings as laid down on the 3.9.65 and 4.9.65.

7.3.65
Night Shift Cont...

Loading Rate	-	Fully closed.
Unload rate	-	To give correct flight time.
Idling Press. Valve	-	To give 525 p.s.i.
B Loading	-	Fully closed.
D Loading	-	Inboard from fully in.
A Unload	-	3 turns from fully in.
B Unload	-	$2\frac{1}{2}$ turns from fully in.
D Unload	-	$1\frac{1}{4}$ turns from fully in.
D Unload	-	$1\frac{1}{4}$ turns from fully in. Manoeuvre.
C Unload	-	$2\frac{1}{4}$ turns from fully in. Gusts.

When the D unload rate was increased we took you to mean - increased by an extra two turns and was therefore at $3\frac{1}{4}$ turns open.

After the comparison was made i.e. before and after the download valve was altered - it was concluded that the extra two turns made no difference to the stress trace. The only difference in the desynn was that it made the roll higher on the gust levels. The overall effect was negligible - plotted on the graph it shows the points falling into the same band as has been followed for the last 2200 flights. Flight time for these traces was approx. 7' 25".

The A2 pressure from the trace shows that it does not fall to zero when it should, and that the extra 2 turns on the valve has little or no effect on this.

Because the extra 2 turns on the D unload valve had seemingly no advantageous effect, we carried on cycling with the D valve at its original setting for ease of operation.

Stress trace taken and the cracks read. Several new cracks were found - aft corner panel D port - stringer 24 port - Rib 576 and stringer 39 joint port - rear spar inboard of 576 port - rib 618 starboard forward of panel N. There is also a crack in the R.A.T. forward bulkhead which has not had a damage card done for it. Would you please oblige. Timer has gone U/S.

The rear spar starboard desynn, you will notice is working backwards but the readings it gives are OK. Last flight 11027 flight time kept to 7 mins. 25 secs.

8.3.65
Day Shift

First flight 11028, last flight 11034.
If Maurice fixes the power pack would you repeat last nights trace and desynn exercise. We have changed the orifices in the outlet from A2 system to ones with a No. 48 hole in them instead of a 1/16" hole. Let us know the result in the morning

8.3.65
Night Shift

First flight 11035, flight time 7. 25.
Last nights exercises were repeated as requested. The orifice in the line had the effect of reducing the A2 pressure to zero when de-selected, on the gusts only, manoeuvres still had pressure in when de-selected. The orifice had no effect on the first levels as they are as they were before the effect of the orifice on the desynns, was to bring the total deflection higher - in point of fact it halved the gap between what is required and what they normally have been since 8700. This is obviously a step in the right direction - but it needs further modification to make it back to pre-8700 values.

The extra two turns on the D unload valve were then employed - these had no effect to the trace, and on the desynns the only result was the roll on gusts got slightly higher, and also the total deflection was slightly higher - but not of any signification.

As a result it was thought that the extra D unload opening had little or no effect and it was discarde cycling preceeding with this valve at an opening of $1\frac{1}{4}$ turns.

Note for attention of Bryan : During readings taken with C loom 1-25, port L.M. and pressure transducers, a short somewhere out on rig hampered operations, but this temporarily cleared itself. On re-selecting for the stress trace, gauge C12 was found to be intermittently shorting* so this could not be read. (Please ask Alf to find and correct fault). Also after much messing about I gave up trying to make channels 9 & 12 work simultaneously and I suggest in future we use channels 8 and 11 instead (as I have done in latest trace) - electrical balance and screen positions for new channels in U/V book. * i.e. probable cause of above.

All cracks have been read excepting for 5 cards on starboard wing. Damage Card 28, Starboard Sht. 4 has been completed but another sheet will be required to cover new cracks outboard on the same member (outer elevator shroud hinge).

Note Oil level gauge on console is down to $\frac{3}{8}$.
Last flight 11,111.

9.3.65
Day Shift.

First flight 11,112, last flight 11,1
It was concluded that the change to No. 48 drill orifices in the outlet showed an improvement so No. 42 drill orifices were fitted in the outlet only. These registered a further improvement at zero pressure, but the extra oil required to refill was proving to be beyond the capacity of the 1/16" orifices in the inlet. After doing quantitative pressure checks on the transducers it was decided to change the inlets to No. 48 drill orifices.

The last change of orifices must not be done by night shift - I have been in touch with Chadwick and he should be sending someone over, but in case

9.3.65
Day Shift Cont....

no one arrives by 8'0' clock I suggest you go looking for him.

We have been bogged down with X-Rays and photographs today and have only done a few flights consequently we have not measured the cracks but we have done a desynn check.

Can you adjust air system up to 3¼ p.s.i. at the moment its registering 3.1 p.s.i.

Check the effect of the new orifices as previously but there is no need to adjust D unload valve.

I have not given out the next inspection sheets.

Due to funny changes in amplitude of transducers trace, we did a calibration on all three T/D's directly after a full trace (inc. 1RP). Would you please analyse this calibration. Also Bryan wants the strain gauge on enclosed sheet calibrating from landing to mean level and analysing.

9.3.65
Night Shift

First flight 11,128, last flight 11,174.

Some delay was occurred in fitting the new orifices as a) the fitter could not undo the couplings on port side and b) when he did undo them, the thread on the nut was stripped. Luckily a replacement nut was found and this was put back on. Recommenced cycling at 2. a.m.

Desynns read at 11,151. Almost no change was found against the previous set of readings of total deflection.

All cracks read.

U.V. recorder : found that 12v battery was only developing 2.5v so had to read pressure transducers separate from other positions. Also took stress trace. Also found that 2 of special strain gauges to be read were duff, and 4 runs would be required. Completed 2 off.
N.B. Analysed calibration done by day shift before finding out that battery was duff.

10.3.65
Day Shift

First flight 11,175, last flight 11,248.
All cracks measured, desynns read and traces of transducers and R.Ps + C1 and C2 have been taken along with calibrations for transducers after fitting ⅛ dia. orifices to both supply and return of A2 system. Also during the day the above traces have been taken and analysed for orifices you had put in last night. Would you analyse the later traces as the first ones.

J. Shortland. Would you try again on those strain gauges I've had themmall checked and they're all working except A9 and C36, this time after trying landing go incrementally to M.L. (50 p.s.i. steps). None of todays traces have been entered up, would you bring this kind of thing up to date.

Vulcan Fatigue Test Diary

10.3.65
Night Shift

First flight 11,249, last flight 11,311. At about 8.30 p.m. the long links on 5 G.B port got mangled around the compound rig and the trestling unfortunately there were no fitters available until late on. so we did not manage to start again until about 11 p.m. Traces have been entered up and analysed as you requested. Took readings of strain gauges (4 traces) as requested. Read desynns. Took stress trace and level 10. Flight counter is now 1 more than it should be an extra landing case was selected inexplicably after the proper landing (and the event counters had cleared) on flight 11,296.

Traces have been read despite the fact there was only about 60 flights on sice the last time. Several damage cards are getting a bit full up so I wonder if you could oblige and copy same for us. The following is a list of the ones which need doing 7P Sht 2. 18P Sht. 4, 8P Sht. 4, 8S Sht. 2, 9S Sht7, 9S Sht. 5. New cracks on Port and Stbd. stringer 24 - Panel A port and the outboard face of bomb rib Area 34 Sht. 5.

11.3.65
Day Shift

First flight 11,312, last flight 11,360. Please prepare sheet for stopped inspection 4G for 7.30 tomorrow. Please arrange for the following additional items to be covered. Port and Stbd. outboard engine fireproof skins. No. 2 tank cover plates . Panel Q starboard. Will you please make a note on the panel sheet to inform Ray Staniforth to start with the engine doors first and then the pressurised tanks and X-Ray item

Most Important

A new crack on starboard honeycomb panel at corner of panel Q must be watched closely and if the crack reaches halfway from the rivet to the edge you are to stop running and start the inspection.

We have read the cracks today as we have only put on 50 flights since they were last read due to stoppages for X-Ray and hydraulic mods.
As requested we have redone all except one of the damage cards you itemised and we will probably have time to fit it in tomorrow if you don't manage it yourself. I have not yet given the new sheets a number so could you please book one out.

We have just discovered cracks - on the leading edge as found on service Vulcans (Port and Stbd.) so I suggest you give the leading edge a good purge tonight since the cracks are fairly hard to see (before rubbing up) and we may,have raised some, also its nearly 7.30 and I may not have time to do a card for this damage. Another crack has been reported on the bomb door seal and I'm afraid I have to lumber you with this damage card also.

Vulcan Fatigue Test Diary

11.3.65
Day Shift Cont...

John Shortland. As accmulators (fitted to A2 valve, cylinder 'B'. The existing fitments being $\frac{1}{8}$ dia. orifices on A2 supply and return) have been fitted port and starboard it was necessary to repeat yesterday's exercise on the recorder with C1, C2, 1RP, 2RP, on one trace and the three transducers on another and calibrations for the transducers on a third, these have been done, would you please analyse them in the same manner as we did yesterday and you and Tony did last night, also I have got part way in analysing those strain gauges and would like you to complete them if you would, the method is to plot the spot position against pressure from 160 p.s.i. to 587 p.s.i., get a line for these and find true 160 psi deflection from graph then find stress for the 427 p.s.i. step.

After this subtract landing spot position from true 160 p.s.i. position, find stress step and add the two results together giving landing to ML. We have done roll check at 11,344.

11.3.65
Night Shift

Analysed the pressure transducer results as requested, also the landing case M.L. traces. First flight 11,361, last flight 11,424. Shut down at 5.30 because of a leaking pipe in the console, an attempt was made to repair this, but there seemed to be no way of getting pressure off it and every time the nut was loosened oil gushed. Rather than lose a lot of oil it was decided to shut down for the stopped inspection and let Laurie cope withnit in the morning. All cocks on console are locked shut.

All cracks measured and new damage cards have been drawn. New damage around panel Q starboard. Panel sheet has been made out for the 4G inspection which I found on the front desk. I hope this is the one you meant us to use.

12.3.65
Day Shift

IMPORTANT The club foot bracket on port aileron hinge rib 197 is to be inspected with the load held statically every 10 flights. If the crack appears above the bolt, stop and contact myself or Brock. Do not let level 10's occur until further notice. R. L. Bowman.

Please do a damage card for the above item, and also panel Q on port side. Every effort must be made to replace all panels and tanks ready for running tomorrow and night shift fitters are to be utilised as soon as possible, I think Rex has fixed it with P. Roberts so that Chadwick gets the message. Ignore the fact that X-Ray panels are not signed up complete.

The leading edge butt straps are going to be X-Rayed on Sunday so when you come in panel 5 on the leading edge will have to be replaced. I'm telling you now in case I forget tomorrow. We are to design a repair scheme for the club foot bracket at rib 197 and Rex has suggested that J. Lilley starts the job tonight and A. Stearn can carry on tomorrow. J. Shortland and yourself to tend to the other jobs outstanding. Incidentally leave panel 5 off until last thing unless you can start running tonight.

Vulcan Fatigue Test Diary

12.3.65
Day Shift Cont...

We will try to finish the routine crack measurements but there is only two of us and one of us is holding the load on for X-Rays, so please finish off what we leave. There are one or two inspection sheets to enter up also.

There is still a slight leak on the connections that failed last night in the console but the drip tray should cope until Laurie comes in in the morning, that is, if you start running before morning.

13.3.65
Day Shift

Laurie has fitted a new pipe and union in console and we pressurised without a leak showing itself. The fitting work was not completed on Saturday and will probably take most of Monday before the rig can be run.

Outstanding work to be completed on Saturday Days and Sunday Night Shift

Enter up backlog of inspection sheets. Finish of new damage cards. Make up new sets of inspection sheets.

14.3.65
Night Shift

Entered up inspection and made out 10 more sets of running inspection sheets. Tried to test pots on U/V preparatory to Dyn. 9 but in warm up period there was a load Crack, from inside, the light source had gone out I think it's blown, suggest you contact Maurice and get him to fettle it before you start running.

15.3.65
Day Shift.

No flights today. Putting the panels back and X-Ray work has taken all day. You are to cycle all night as usual and measure the cracks. You will not be able to take any traces since the U.V. is still broken down.

Can you please carry out the following little experiment for Mr. Brocklehurst :- It is required to know the stress level in the bomb rib web where the horizontal cracks have been found D.C. 34 port - Sht. 4 You are to position a Huggenberger across the plane of a rivet - near to the edge and measure the stress after zeroing at about 160 psi and working up to 800 or so in 100's. Use $\frac{1}{2}$" gauge length Huggenbergers which is on J. Shortlands desk. Pick a rivet that is not cracked of course, in fact you had better try several positions both at the top and bottom of rib and also on both sides of the skin joint.

15.3.65
Night Shift.

First flight 11,425, last flight 11,504. Unload timer also U/S - would you get Maurice to have a look at it when he comes to see the U/V recorder.

The experiment on the bomb rib butt strap rivets was carried out, on one rivet only, due to the fact that time was running out on us. The rivet tested was both at the bottom of the rib, one each side of the joint. The results are attached. Trouble was experienced in keeping the Huggenberger on the web, as the web flexed the knife edge lifted off.

Vulcan Fatigue Test Diary

15.3.65
Night Shift Cont....

On flight 11,490 after the first level 1 the over travel switches operated and cut everything off. We had a look round but could not find anything amiss, so the pump was restarted and cycling commenced uneventfully.

The cracks have not been read as the 100 flights only came about 7.30 this morning, there are some new cracks on 7S Sht. 6. Level 10 inhibited at 11,500.

16.3.65
Day Shift

First flight 11,504, last flight 11,508. Stopped for X-Rays and further hold ups due to works strike. Measured all cracks with 1g steady load. Did further checks with Huggenbergers and found virtually no stress in bomb rib. Please finish specimen bomb rib which I have started, and marked up large seale wing damage diagram for Friday's meeting. Continue normal cycling if and when you can start.

16.3.65
Night Shift

First flight 11,510, last flight 11,510¾. On commencement of cycling a fault occurred immediate loading carried on through top level. After a bit of tinkering this fault was cleared. Cycling started again, but again another fault appeared immediately i.e. uniselector would not stop running and changing from a gust to manoeuvre. After a time a resistor was found to be loose from its connection as 5CRA. This was soldered on. Cycling commenced again - it finished off the gusts with no trouble but after a few manoeuvres the fault occurred again, this time changing from manoeuvre to gust. The resistor was found to be still connected. It seemed that the fault is occurring on uniselector A (during these faults the Dekatron was operating normally). As we did'nt know what to try next, we decided to leave it to the experts.

By the way, where is the large marked up layout that we were supposed to finish off. Test specimen drawing has been completed. Would you ask Maintenance electricians to have a look at pump house light, probably bulb gone.

17.3.65
Day Shift

First flight 11,509, last flight 11,548. Started cycling about 5.0 after the machine had been repaired. You are to carry on with Dynamic 9, which should be done as follows :-

1. Desynn check - completed.
2. Stress trace at correct time - completed.
3. All the usual load traces.
4. Stress trace.
5. Desynn check.

Remember to establish mean level on load traces by going from 540 to 620 psi in increments of 20 psi. Please measure the cracks later on. Stress in starboard club foot bracket at hinge rib 197 was measured at 7.2 tons/sq.in so level 10 still to be inhibited until further notice and every hour inspeet the broken club foot bracket on port side.

Vulcan Fatigue Test Diary

17.3.65
Night Shift

First flight 11,549, last flight 11,590.
Please get some damage cards printed. Cracks have been read - new batch of cracks on stringer 14 port - just outboard of rib 618. I could not do a damage card for this, as there were some available, but there is a rubbing with all relevant data on it, so would you please oblige. As can be seen, not many flights were done, due to the fact that various pots were U/S and cycling was held up while attempts were made to fix them, as we did not wish to get too many flights in between the traces.

During one cycle the overtravel switches operated again on the first level of gusts, the pressure at the time being about 700. No explanation could be found for this.

At about 6.30 a fault occurred which we attributed to the solenoid in one of the valves in the right hand side of the console. You know the buzzing noise that occurs when you switch on the valve mains, well the buzzing turned into a growl, and the pressure kept rising through the top levels. So with a sigh of resignation the rig was shut down to await the healing hand of the day shift.

Re-Traces :- A start was made on Dyn. 9 and at the end of the night we had completed 3 full traces and ½ trace during which the final fault occurred on the machine. It seems as if we start from scratch every time we do a dynamic, at least 5 pots gave trouble, some due to bad or wrong wiring, others due to spindles not engaging on anvils, and 2 M.I. was so bad it had to be removed and fettled with fettling oil this needs a static D.T.I. to pot calibration doing if you start again. Perhaps it would be as well if Alf Faulkner went round them to check wiring etc. during time taken to mend machine.

18.3.65
Day Shift

First flight 11,590, last flight 11,606.
Further to note on Friday 12th March, level 10's are to be done to schedule again. The one that has been missed is to be put in 10 flights after the next one. The brackets on both sides of the aircraft are to be inspected with the load held statically after each level 10 and then each subsequent 10 flights. B. Taylor.

After reading cracks put all damage cards in file rady for meeting in the morning please.

Read section of L.M. rings set up on recorder, this proved to be section D which appears to have been done already. Reselected to section E and read these. Reselected to section F. Dont forget level 10 on flight 11,610. You had better check from spar web cracks after this latter one. I have done some after flight 11,600 and found no further damage. Both port and starboard club foot brackets on hinge rib 197 are OK after flight 11,600.

18.3.65
Night Shift

First flight 11,607, last flight
During the level 10 at flight 11,610 the bolt in 4 M.I. port linkage broke. On examination it was found that besides the broken bolt the links 27 R.D 5905 were bent, and all the bearings in the associated assembly were cracked and broken. However, a new stud was found and the links were sent to the welder at the top shop for straightening They were then all successfully refitted, utilising the broken bearings. These obviously will not take much more wear, so there is an E.R.I. 1028/70 which calls up new ones for that linkage. Cycling restarted approximately 2.30 a.m.

After the second level 10 i.e. at 11,610 the spar web and the club foot brackets were inspected and found to be OK (i.e. no change).

The cracks have not been read, due to the fact that as we have been stopped most of the night only about 60 flights have elapsed since the last reading.

Re Traces

At last dynamic 9 (of sorts) has been completed. The pot on 5 FP had to be removed and on examination it was found that one of the two small nut and bolt assemblies holding the plastic block to which the wiper springs are attached had come undone and the nut and washer were wedged so as to only allow the spindle to travel half its travel. This pot has never been touched before both ends being locked with wire, so it makes one wonder how an assembly inside can come undone.

Sorry about the trace paper used for Section C but it was all there.

New damage in Area 14 starboard and Area 61 Port and Area 62 starboard. This last one 62S is a crack on the bomb rib web just below the top beam to arch attement on the aft side of arch 182. We did not have time to do a damage card for this, so will you please obliged. It was found at flight 11,628 and the end of the crack,has been marked out at this flight.

19.3.65
Day Shift

First flight 11,634, last flight 11,659.
We have not been able to measure cracks today, but not many flights have been done either due to repairs and X-Ray work, please try and make this your first job. Read the desynns both on statie pressures and dynamically on all levels as requested, and have tabulated same. You are to carry on flying as normal doing all the routine checks.

The next stopped inspection will be on monday morning first thing. Sorry, but I did'nt get chance to do a damage card of the new crack on the bomb rib.

19.3.65
Night Shift

First flight 11,660, last flight 11,734.
After a few flights the typewriter started to smell a bit hot, and the 50v sump fuse blew three times in as many minutes. I uncoupled the typewriter and this stopped the fuse blowing. Moral of the story is 'dont plug the typewriter in'

There are new cracks in areas 7 port and starboard and 17 port. On area 7 starboard one of the new cracks is on the honeycomb panel i.e. the one where we are to stop if it gets half across. I have marked a deadline on it, so keep an eye on it.

Will you please get the stopped inspection and the panel sheet ready for Monday. I would have done it last night only I did not know which inspection you had decided to do. The last one being G, but there is an F which has'nt been done yet. Anyhow I will leave it to you.

The clubfoot brackets were inspected and found not to have changed. All cracks read.

20.3.65
Day Shift

First flight 11,735, last flight 11,805.
Re-assembled links and saddle on 5 M.B port and the links now collapse correctly, but there is still a danger of the links unscrewing so a mod. is being drawn up.

All the most important cracks have been read.

New cracks on panel M, these cracks are in the new skin and are identical to the original ones. Crack on front spar web has now come out of the rivet and must not be allowed to grow to less than $\frac{3}{8}$ below the spar boom.

21.3.65
Night Shift

First flight 11,806, last flight 11,880
Measured all the cracks, read the desymns, and prepared and issued stopped inspection. Carried out routine stress trace.

<u>Bryan</u>

I have only provided for a normal X-Ray schedule to be carried out at this stop, but I know Brook intends to have every joint of the bomb rib web X-Rayed at some time. If you decide to do it today it will mean extensive removal of fireproof skins (unless X-Ray can penetrate titanium easily) I just thought I would warn you.

Crack 'e' on front spar web has now come out of the rivet.

The crack on the honeycomb panel on starboard side is growing rapidly.

New cracks on panel M port - identical to those originally found at 3347 flights and latter repaired at 7827 flights. It would appear that the mod. carried out after 7827 flights was little better than the original set up.

We have'nt typed any flights since you reported the typewriter smelling on Friday night so will you please inform Maurice and try to get it fixed.

22.3.65
Day Shift

Stopped inspection in morning. As far as we are concerned our inspection is finished. The inspectors may have some sheets left to do. AT present we aredrawing new damage cards for damage on the bomb door fairing and the bomb door seal structure, and also measuring the cracks we can get to with the panels we have of 31S cannot be done as the panel has been replaced. Dont have it taken off again unless area 32 has not been inspected.

As will be seen there is a lot of work still to be done on getting the aircraft in cycling order, so you are to finish off what we leave, as regards the damage cards and crack measurement, mentioned earlier, and perhaps you could tidy up all the damage cards as well.

23.3.65
Night Shift

No flights. Drawn new damage cards for bomb fairing and bomb door seal as requested also filed all the damage cards.

Fitting work almost complete - No. 4 tank sump and panel to replace and a few screws to replace in bomb fairing. Bomb door require to be closed. Starboard inboard engine bay fireproof skins have only just been replaced and we have'nt read the cracks on this.

23.3.65
Day Shift

First flight 11,881, last flight 11,931.
Static and dynamic deflection check doen on manual box to check same results done on 19.3.65.

N.B. Regarding the burning out of coils on the typewriter - if the pressure is to be held for any length of time between doing the landing and reaching mean level on the first gust, the typewriter is to be unplugged. This is because when a bending is doma the watts are held on the carriage return coil until mean level has been passed, therefore, any excessive period of time eloping between bending and mean level causes this coil to overheat and eventually burn out. This procedure must be followed until such time as a switch can be fitted to obviate the unplugging.

You are to cycle tonight as usual, taking a desynn check and stress check. Also there is a special job for Brock. This consists of measuring the buckle pattern on the outsode of the bomb rib web, i.e. in the inboard engine bay, across the two butt straps which are sucessible. The pattern is to be measured at the top and bottom of the web, and is to be measured at 160 p.s.i. gust mean level top of a level 9 and at 100 p.s.i. in the landing case. Also he requires the stress in the top and bottom booms over the butt strap joints at these increments (by Huggenberger). Tje length of web to be measured is as follows, From the forward engine bay bulkhead to just aft of the second butt strap joint, in other words about 4 ft. or so. Sorry to leave you this to do, but as there are only two of us on the shift our time is all tied up.

23.3.65
Day Shift Cont...

N.B. Things to keep an eye on :-

The clubfoot brackets in the hinge ribs for which you are to stop if the crack appears out of the top of the bolt.

The crack running in the honeycomb from panel Q to P, for which you are to stop if the crack reache panel P.

The cracks on the front spar web, for which you are to stop if the cracks come within $\frac{3}{8}$" of the boom.

The port flexible joint on which there are three cracks in the crown of the section, these being visible from the outside. You will see that they have been bracketed with pencils marks. You will also see a pencil line across the section about a foot from the end, if the cracks join up and reach this line you are also to,stop running.

Measure what cracks you can manage, we started measuring right after the level 10 at 11,900. We could not manage them all so would you please finish off what we left. They are loose on J. Shortlands desk. Also could you mod. the damage card for the port flexible joint to incorporate the new cracks.

23.3.65
Night Shift

First flight 11,932, last flight 12,001.
Finished off reading the cracks , done stress trace and desynn cheek. Measured buckle pattern on bomb rib web - see separate graphs and table. We spent hours trying to measure the stress in the top and bottom bomb rib booms but could not find a satisfactory way of holding the Huggenberger. From our primitive attempts it seems that there is about 7 tons/sq.in compressive in bottom boom from 0 p.s.i. to 890 p.s.i. on level 9 and virtually zero in top boom, but these are not reliable figures. I think there is definetely a case for strain gauges here.

Drawn up new damage cards for flexible joint port and panel M starboard.

After reading your instructions just now I realise I have clanged horribly in that I misread your gust mean level for manouvre mean level when doing the buckle pattern - sorry - hope it does'nt need redoing.

Slight plop on level 10 from starboard side but we could'nt find anything, although there was a jump on the pressure gauge. Flexible joint getting worse but still within tolerance. Forgot to return straightedge which I borrowed from 539 in flight sheds - please return.

24.3.65
Day Shift

First flight 12,002, last flight 12,058.
Carried out Test No. Prelim. 39 to check strain of bomb rib bottom boom relative to bomb door by measuring float at each hinge position port side. Gauges C19 and C20 read.

24.3.65
Day Shift Cont...

Note

The usual strain gauges are still set up ready to read. C19 and C20 have been read on channels not used for stress checks. Just in case any further readings of C19 and C20 are required, these may therefore be left selected.

X-Rays of port flexible joint taken at flight 12016 cracks have increased in number and magnitude since flight 11,880.

I am preparing an issue of damage cards for tomorrow so there may be one or two missing when you read the cracks (i.e. still in print room). Also due to hold ups - static tests etc., we have not read cracks today, so could you make this your first task, as there will be well over 100 flights on since last time. Compressor would not start tonight, so we have been running without air from 4.30 p.m.

If you decide to fetch any damage cards back from the print room in order to measure the cracks, would you please make a note of them, otherwise it will cause confusion tomorrow.

Routine cycling to be carried on tonight with conditions laid down yesterday still applying.

24.3.65
Night Shift

First flight 12,059, last flight 12,115.
Read cracks except for ones over in the print room.

New Cracks

Stringer 24 starboard side about 30 cracks. Access panel on port in between tanks 4 and 6. This is the circular hole that cracked previously and now has a big circular plate round it.

Crack in 7g leading edge skin at corner of port undercarriage bay adjacent to flexible joint. We stopped flying and took panel 5 off to inspect the spar boom and flange - these appear to be OK from inside the leading edge, but on the aft side the 7g skin and also the spar flange is cracked so we stopped the rig. There is a strain gauge adjacent to the cracks and we have a trace of this to compare with previous readings (Port A6 and A7 - Starboard B6 and B7). Night shift are in the process of dropping both undercarriage doors, so we can inspect more thoroughly. There is a lot of Araldite on starboard side which needs getting off. Desynn check and stress trace (starboard) not done.

These damage cards are not complete :-

9 Starboard Sht. 7 - three cracks only.
7 Starboard Sht. 3
7 Starboard Sht. 4
8 Starboard Sht. 4

On looking at the stress trace for A6, A7, B6 and B7 there is a large difference between static and dynamic mean level which is probably significant.

25.3.65
Day Shift

DO NOT APPLY MANOEUVRE LOAD TO AIRCRAFT. USE GUST ONLY - 7 M.I. RING HAS BEEN REMOVED.

Carried out investigation into crack on 7g plate, by removing external plate and checking with ultra-sonic equipment. Cracks from two bolt holes in please and 1 crack in aft spar flange.

Tonight you are to do the desynn layout for the 780 in accordance with the drawing. On the dwgs. DD = double desynn. SD = single desynn. VT = vernier tape and DG = dial gauge. The figures in circles next to the DD numbers, indicate the clock numbers which they are to read on. Apparently the single desynns can be put on any clock number as long as note is made of which position reads on which clock.

Most of the double desynns you will find upstairs in the electricians compound. Cables are laid out there, and all the brackets are presumably still on. If these brackets are missing, get night shift to put them on. <u>This job is most important</u>, if it is not finished by morning we will all be in the mire as Mr. Ashly and Co. are coming down to see the test.

Re-started cycling after port spar boom and miscellaneous other repairs had been completed.

25.5.65.
Day Shift.

First Flight 12,116
Last Flight 12,145
Re-established flight at 7 mins.-30 secs. approx
with unload time for gusts at 109 secs.
" " " manoevres at 89 secs.
Total 198 secs.

Carried out Prelim 40 which consisted of Looms A,B,C,D,E and F on gust pressure from 400 p.s.i. to 800 p.s.i. in increments of 50 and also a check on the wing tip desynns.
Completed Standard Stress Trace. Also Standard Desynn Check. The first item on the job list left by J.S. has been carried out i.e. i.g. stress in u/c. sideload brackets from static test results. We also started setting up the same gauges on u/n for a dynamic.

26.5.65.
Day Shift.

First Flight 12,146
Last Flight 12,197
Completed dynamic check on stbd. fwd. and aft u/c sideload brackets, and also measured spot deflections of these for landing to mean level increment. X Ray Dept. came and did some spots at mid-day. Desynn check for all levels carried out and results compared with previous. Strange forces are at work again regarding overtravel knock-out, at flights 12,184 and 12,188 the port switch was actuated, but on closeley inspecting the Rig etc. nothing "funny" was found. On the very next flight (12,189) we found the trouble; on 4 MI-GB the bungee had snapped and the link was failing to collapse sufficiently, a new bungee was put on and cycling commenced again.

27.5.65.
Day Shift.

First Flight 12,198
Last Flight 12,215
Not many flights were completed due to linkage modification and faults occurring on the strain gauge recorder.
Panel A stbd. was removed but the cracked stringer could not be seen due to the amount of structure at the panel corner.

28.5.65.
Day Shift.

First Flight 12,216
Last Flight 12,272
Normal cycling. Static test 41 gust was carried out to check strain gauge results on test 40*.
Desynn checks done and stress trace - no cracks measured. * Looms A + F inclusive.

29,5.65.
Day Shift.

First Flight 12,273
Last Flight 12,330.
Cracks measured - no faults.

1.6.65.
Day Shift.

First Flight 12,331
Last Flight
Not many flights were done due to an investigation of the kinked lines obtained in the strain gauge and deflection results. Carried out P.42.

2.6.65.
Day Shift.

A series of slow pressurisations between 250 p.s.i. and 700 p.s.i. were carried out on gust system, to determine relationship between press. ring reading on groups 1 - 6F,P & S 1 - 3R P & S with readings every 10 p.s.i. a special note being made of pressure drop and their effect on Ring Reading, this was done on load and unload.
Test 44 a & b - S.G. run with 1 and 2 F P. & S removed.

Mods to loading Facts Prior to starting up a Rig on 17.6.65.
Group 2F port and 2F stbd: Jack D3 was removed from 2 FP and replaced in Group 2F stbd. with one seal, a spare jack D2 being fitted to 2F port (1 side). The jack D4 which was in 2F stbd. is now off the Rig.

On 1FS Jack DS was modified (one seal) and replaced. New Run Seals.

7MIP Jack F1 was modified (one seal) and replaced.

7MIS Jack F2 was modified (one seal) and replaced.

17.6.65.
Day Shift.

S.G. Run to check against test 41 - test 45 - Gust up to 800 p.s.i.
Test 46 - slow dynamic to check jack calibrations,

18.6.65.
Day Shift.

Normal running - last flight 12,403.

21.6.65.
Day Shift.

First flight 12,404.
Normal cycling - stress trace done and 3 desynn checks. Cracks mostly read.

22.6.65.
Day Shift.

First Flight 12,435.
Desynn check done - as a result of which restrictions were taken out and cleaned. Load traces of 2FP, 1F and 2F S.
Also check on ring readings and of normal dynamic run for block levels.

23.6.65.
Day Shift.

First Flight 12,436
Last Flight 12,490
Discovered cracks along leading edge butt straps at stn. 428" on port and starboard. Testing was discontinued tofacilitate repairs to same.

(It was decided to repair crack j on front spar web and also cracked str. at aft acute corner of panel 'B' stbd.) Not done.

2" holes were cut in the leading edge top skin above each butt strap for inspection purposes.

During above repairs, following mods to rig effected. All D type jacks removed stripped.

Tests carried out to try to improve friction characteristics of gland seals.

Jack F2 removed, fitted with new ground (.005" interference on dia.) seal.

NOTE! At start of running of rig a further inspection is required on area 67. ie. leading edge butt straps at stns. 495 p & s, and all outboard of 495 stbd. to verify marks on butt straps under ig.load.

Ultrasonic people had a crack indication from the bolt hole in the 1st intercostal up from the port spar bottom boom in the same place as the start of the failure on stbd.side.

During the tests carried out on 2.6.65. it was ascertained that the D type jacks on 2 FP & S and 1 FS and the F type jacks on 7 MI P & S had increased their friction band width considerably.

These jacks were then taken off the aeroplane and dissembled. On the D type jacks some distortion of the piston seal retaining rings particularly on the top seal, and signs of top seal extrusion over the ring were found. It was also noted that the seals had swollen so that the interference was substantially more than the initial 5 or 6 thou. The ram seal carrier was also found to be very tight on the ram.

New bottom piston seals were ground to 5 thou. interference and fitted to all 5 jacks but unfortunately the F type jack on stbd. was not measure up before the seal was ground. New ram seals from stock were fitted to all jacks. The top seals were left out of all the 5 jacks. The jacks were then all replaced on the aeroplane, calibrations being carried out in situ. The result was only a marginal improvement to the 2 D types which were replaced on the aircraft. D4 was found to leak on pressure testing, so was replaced by the spar jack D2, which was fitted to 2 FP (D 4 was originally on 2 FS). The 1 FP jack D1 was good when checked and was not removed for investigation. This resulted in two good jack on port D1 and D2 (the spare) and two hardly improved jacks D3 (2 FS) and D5 (1FS), and the aircraft deflection was almost totally restricted to port side during gust.

After finding the butt strap failure it was decided to take down all the D types and the 2 F types off 7 MI again and continue the investigation. The ram seal carriers on D 3 and D 5 were found to be very tight and upon investigation it was found that with the new ram seals there was 0.028" interference on diamter, ie. 14 thou. interference on the fit of the seal between the back of mits groove and the ram. The seals which had been removed from the jacks on 2.6.65. were found to have only 5 to 10 thou.interference on diamter except for 2 seals which were most likely off D 3 which had had new ram seals fitted at flight 7827? The interference on this jack was thous. This seemed a likely reason for D 3 being the worst jack, so an investigation into the effect of ram seal interference was carried out on jacks D 5 and D 3 on the calibration rig.

On D 5 it was found that fitting worn seals (between 5 and 10 thou. diametral interference) produced an answer very close to the original calibration. The worn seals were then removed and new seals fitted. The answer remained good!! The interference was rechecked but was found to be 0.028" on the diameter as expected. It was then though that changing from calibrating on the aircraft to calibrating on the rig might be having an effect, so jack D 3 was fitted to the calibration rig with seals as on the aircraft. The answer was bad (90 hsi friction). D 3 was then stripped and the same worn seals as had been inD 5 were fitted. (between 5 and 10 thou. diametral interference). The result showed a substantial improvement

in friction. At 3000 hsi the band width became the same as on the original calibration, but was greater low down. This may have been due at least in part to the neoprene piston seal material contact as mentioned below.

The reason for the jacks leaking across the piston (D 4 and F 2 and D 3 slightly.) was found to be that the ground seals had been machined to have a straight taper so that the wiping edge was in the neoprene rather than the fabric. The original ground seals were machined to the required interference at the leading edge of the fabric part of the seal and then the soft neporene was backed off. New seals were ground in this manner with 5 thou. interference and fitted before final calibrations.

It was decided to fit this same jack, D 3, with a new piston seal ground as above and new gland seals ground down to 6 to 8 thou. interference. This jack produced a good calibration, only slightly wider friction band than the original, but unfortunately leaked from the gland seal. Upon checking the other gland seals machined at the same time it was found that they were slightly undersize and measured 4.073 (3 off) 4.074 (4 off) 4.0745 (1 off) when fitted on the ram. This was an interference of only 4 to $5\frac{1}{2}$ thou. Also it was realised that the actual gland carrier on this jack had not been measured and hence could be a further source of error. All gland carriers were then measured, with the following results:-

D 1. 3.911 - 3.75.3. + 3.911 = 4.069 = Dia at bottom of annular ring top and bottom seal.

D.2. Top seal 3.912 - 3.753 + 3.912 = 4.071
Bottom seal 3.9125 - 3.753 + 3.9125 = 4.072

D 3. Top seal = 4.069
Dia at bottom of annular ring = bottom seal = 4.072

D 4. Dia at bottom of annular ring = 4.069
Top and bottom seals.

D 5. Dia at bottom of annular ring = 4.069
Top and bottom seals.

The gland seals taken from the satisfactory jacks D 1 and D 2 were fitted on their respective rams and the O/D was measured as follows:-

D.1. Top seal 4.076" (7 thou. interference)
Bottom seal 4.073" (4 thou. interference)

D 2. Top seal 4.074" (3 thou. interference)
Bottom seal 4.0755 ($3\frac{1}{2}$ thou. interference)

The above readings agreed reasonably well with readings taken with the seals in the gland carrier and it was decided to just fit new single piston rings (one per jack) and leave the gland seals as they were.

D 3 was then stripped to investigate the gland seal link and it was found that the seals had rolled over on assembly due to their smaller diameter resulting from their being ground on the O/D. The seals were taken out and the gland carrier dimensions checked, the results of which are included above, and then the jack was reassembled using two more ground seals, (dimensions when mounted on ram, 4.074" top and bottom seals). The calibration obtained

was very good indeed, in fact slightly better than the original F.T.S. calibration.

While D 3 was being investigated D 5 had been reassembled with new piston seal and new gland seals ground to an outer diameter of 4.074 and 4.0745 respectively and an only moderately good calibration obtained. It was decided to fit the jack to Group 2 FP, and also to fit D 3 to 1 FP in the expectation that D 2 would be very good and D 1 would be fair.

In the event, D 1 and D 2 produced almost identical very good calibrations. It is now thought that perhaps one of the two gland seals may have rolled over during assembly, thus increasing the friction, particularly at ~~the~~ low pressures.

The four jacks were fitted to the aircraft as follows:-

1 FP	D 3
1 FS	D 1
2 FP	D 5
2 FS	D 2

A balance in roll was carried out and proved that this distribution of jacks was acceptable. (0.1×10^6 lb.in max error).

The two F type jacks removed from 7 MI P & S were stripped and new piston seals ground so described on Page 3. On assembly it was found that they had been ground small and that there was negligible interference. It was decided to fit the seals which had been on the top side of the piston before. This gave an interference of approx 6 thou. on F 1 and approx. 2 thou on F 2. The jacks were fitted in this form.

Conclusions.

The original trouble on the jacks is thought to have been piston seals swelling and thus giving excessive friction and also the top seal being extruded past the retaining ring and thus deforming it. The first attempt to put the jacks in order corrected the above, but new gland seals were fitted, and, due to excessive interference, the overall improvement was negligible. It is thought that Electro-Hydraulics originally fitted seals as supplied to us., but this led to unacceptable calibrations, so they probably ground the seals down as we have. Poor answers were obtained from jacks F 1 and D 5. F 1's answer probably results from a piston seal with 6 or 7 thou. interference being used, and D 5 can only be presumed to be due to one of the two gland seals rolling on assembly. Both need further attention.

The relevant jack and seal dimensions are as follows:-

The seal dimensions apply to jacks reassembled between 12.7.65 to 14.7.65.

Measurements taken on D 5:-

Ram diameter	3.7473"
Diameter of ram seal groove	4.069"
Depth of groove	0.158"
Width of groove	0.127"
Depth of new seal.	0.175"
Therefore interference with new seal	0.0283"

Average depth of seals after 12500 flights. 0.164 to 0.166 all jacks.

Depth of seal for zero interference	0.161
Bore of gland carrier	3.753" (This applies to all packs)
Piston seal diameter	6.259"
Ram seal diameter. Seals on ram. Top.	4.0745
Bottom	4.074

D 3 Ram seal diameter - Seals on ram. Top. 4.074"
Bottom 4.074

5.8.65
Day Shift. Static Testing:-
Calibration of L.M. Rings (L.V.D.T.S) Test P50 Section A 1 - 6 FP, 1 RP, 2 RP C 1.
Also Test P 51, L.V.D.T. Section B - 1 - 6 FP, 1 RP, 2 RP, C 1

Cycling was carried out inbetween calibrations last flight 12,531. Dekatron failed to function hence all kinds of odd selections were being made. Dekatron and the 175 M valve were changed but it made no difference.

X-Ray of joint 11 stbd. shows a 3" cracks in the nose of the butt-strap running spanwise. This was assumed to be a stress corrosion failure. As a result of this finding it was decided to X-Ray the noses of butt-straps 12 and 13 p & s.

6.8.65.
Day Shift. Cycling carried out, first flight 12,532 - last flight 12,590. Panel repair on 4 M1 5 carried out. X-Rays of joints 12 and 13 P & S.

Reread several LVDTS on recorder, test P.52 groups 2 FP 6 FP, 1 RP, 2 RP.

7.8.65.
Day Shift. Cycling carried out, first flight 12m591 last flight 12,650. Cracks read stress trace carried out.

9.8.65.
Day Shift. Cycling continued last flight 12,692. U/sonic check done on the f/s web. No cracks in as yet visible. Desynn check carried out.

Prelim Test 5.3. Calibrs. of groups 3FS, 6FS, 1RS, 2RS re-read (L.V.D.T's)

Also prelim test P54, calibrs of L.V.D.T's of groups 2MIP, 4 MIP, 5MIP, 7MIP, 9MIP and 3RP.

New cracks found on landing light panel port and ventilation panel post.

10.8.65.
Day Shift. Cycling continued - last flight 12,737, Start made on crack measurement. Several static runs were carried out on gust and manouevre , reaching desynns and the nominal stress trace strain guages. Increments for gust 450 - 800 p.s.i. in 50's. Manouevre 500 - 1000 p.si. in 50's. Prelim Test P55 (stbd. MI group L.V.D.T's calibrations) and Prelim test P56 (gust) and P57 (man) reading C1, C2, C12, C13, A6.

11.8.65.
Day Shift. Cycling continued - last flight 12,802. Crack measurement completed new cracks around panel T port and hinge 29. Attempt made to read looms C D and E but recorder again

went U/S. Second time in two days. Traces taken of standard stresses and dynamics load trace. This may have to be done again due to SR bottoming. The correcting lever prop is to be burnt out before any more dynamics load traces are taken.

12.8.65.
Day Shift. Static tests on wing tip desynns. Gust P58 Man.P59.

Cycling continued last flight 12,831. Stress trace and the resb of the dynamic levels read. The cracks in the honeycomb panel between Q & P is now completely broken and a crack is also appearing in the frame of panel P.

13.8.65.
Day Shift. Cycling continued last flight 12,838. Centre level 10 done on flight 12,836. Next level 10 to be inhibited. Panel Q to be left on when mean level is applied during stopped inspection for X Ray purposes.

Tests	P60	Calibrs.	L.V.D.T. groups	2 FS 4 FS
	P61	"	" "	2,4,5,7,9MIS, 3RS.
	P62	"	" "	7MIP. 9MIP.

14.8.65.
Day Shift. No cycling. Strain gauges fitted between ribs 76 and 93 port and starboard as shown on F/S web:-

Prelim Tests. P63 and P64 done on gust and manoeuvre respectively - guages. 1 - 6 stbd. read on both tests. Repair scheme fpr F/S web between ribs 60 and 76 port nearly completed.

15.8.65.
Day Shift. Prelims 65 and 66 carried out - as 63 and 64 but on port side. Repair scheme finished.

16/17/18/8.65.
Day Shift. Stopped for repairs and stopped inspection 4I. All complete 5.00 clock on 18.8.65. Cycling recommended. Last flight ;2,862.

Attempted to read looms C,D and E on ASR but ASR U/S. Most cracks measured.

19.8.65.
Day Shift. Test P67 (man) 500 - 1,000 calibrs. of LVDT on group 9MIP (ring 31) and buckle measurements on F/S web between ribs 76 & 93 stbd.

Test P68 - slow dynamic reaching group 3R port and stbd. 200 - 900 psi. - Man.

Test P69 - buckle measurements on F/S web between ribs 76 & 93 stbd. - 450 - 900psi. Man.

Cycling continued last flight. Cracks measured - dynamic desynn check carried out.

At flight 12,894 - correction jack in 3RS was disconnected and Test P70 was carried out. This was a slow dynamic 200 - 900 psi man., in order to determine the effect of

the correction jack on the calibration. The opinion on analysing the graph of the result, was that the correction jack was U/S. A spare is available but needs modifying for use in compression instead of tension. The calibration also showed that the main jack is not too bright either.

Last flight 12,905 - level 10 inhibited.

20.8.65.
Day Shift. Replaced correction jack in 3R stbd. This did alter the loading line, but the calibration asa whole is still not correct. A spare of the main jack - J cattermole short type is being calibrated and is scheduled for fitting at the earliest opportunity.

Test P71 carried out - slow dynamic on 3RS. 200 - 900 psi on manouevre.

Desynn check and stress trace taken - also looms C, D & E read on Test P72 & P73.Gust and Mon respectively 350-800 400-900. Last Flight 12,944.

21.8.65.
Day Shift. No cycling. Stopped for removal of panels and tanks for X Rays only. Cattermole J type jack calibrated. Results of P72 and P73 analysed.

22.8.65.
Day Shift. No cycling. Hold mean level load on for X Rays. Most of cracks read.

23.8.65.
Day Shift. Panels replaced during morning. Tests P74 Gust 700-800, P75 Man 400-900 P76 Gust 200-800, P77 Man 400-900, carried out calibrating C1, C2, C12, C13 A6 and A7 on U/V X Ray Dept. informed us of a new crack on the stbd. flexible joint about 1.75" long. Finished measuring cracks. Stress trace and desynn check carried out as requested.

New cracks found around landing light panels port and stbd. fwd. and aft corner of panel D stbd. and aft corner panel J stbd.

Damage cards for landing light panels still to be done. Last flight 12,993.

24.8.65.
Day Shift. The indicated pressures at changeover were recorded previously on 10.8.65. They were as follows:- (Flight 12,700)

Level.	Press. indicated.
1	655
2	435
3	705
4	390
5	790
6	320
7a	745
7b	515
8a	825
8b	490
9a	922
9b	435
ML↑ (ML1)	555
ML↓ (ML2)	565

Level 10 applied statically 1130

Cycling continued normally - last flight 13,074. Stress trace and desynn check done. Cracks read. New cracks on stringer 9 between ribs 76 and 93 port and stbd. Damage cards still to be done for these areas.

25.8.65.
Day Shift. Cycling continued normally, level 10 performed without mishap. Last flight 13,162.

New cracks at stringer 1 and rib 126 joint stbd. and port and more along str. 5 port and stbd.

Desynn check and stress trace carried out.

26.8.65.
Day Shift. Cycling continued normally, Last flight 13,223, shut down due to oil leak in console.

Flex joint X Rayed. During level 10 loud bang was heard, it is thought that this was due to part of the trestling breaking.

Cracks read but desynn check and stress trace not done.

Fault in the event counter causing tank pressure to stay in during landing case.

New cracks found on Rib 618 port and stbd. and stringer 13 and 16 stbd. and panel M stbd

27.8.65.
Day Shift. Repaired console leak and continued cycling normally. Last flight 13,291
Desynn check and stress trace done.

28.8.65.
Day Shift. Stopped for stopped inspection.

29.8.65.
Day Shift. Held M/Level on all day for X Rays. All done bar the L/E butt straps.

31.8.65. Commenced cycling at 4.0 pm. Last Flight 13,324.
Stress trace desynn check done F/S web impacted after level 10 at 13,300. Most cracks read - port to finish off.

New crack at str. 9 and rib 520 intersection on port.

1.9.65. Normal cycling all day. Last flight 13,400. Cracks finished off. Desynn check and stress trace and f/s. web done. Panel B removed to check crack in stiffening plates. According to X Ray Dept. the crack in this stringer is now completely through.

New cracks along str. 9. port and stbd. also o/b. corner panel B port.

2.9.65. Cycling continued until 6.00 pm. Last flight 13,463. Shut down due to discovery of large crack under c/s. stbd. adjacent to aft o/b. corner of No. 2. tank.

Cracks read but no desynn check or stress trace done.

3.9.65. Cycling continued. Last flight 13,531. Level 10 inhibited. Stress and desynn check done. Tests P78 and P79 - show dynamics 200 - 900 psi carried out, reading 3RS and 5MI5 New crack on l/e inbd. of joint 3. Flex joint X Rayed f/s web uktra panicked.

First flight 13,532

4.9.65. Cycling continued last flight
Cracks read. Manual level 10 inserted at 13,552. Stress check and other daily check completed.

Last flight 13,596.

6.9.65. Cycling continued, stopped at flight 13,604 to inspect large crack inbd. of panel D corner.

Detail ~~x~~test on loading plates.

Two 8" x 8" standard loading plates (without rubber) were bonded with Thiokal direct to the inside surface of the bomb doors and a loading jack connected between them. A lead of 2,000 lbs. was applied to eacg plate without any sign of the plates coming off. ie. 31.3 psi.

29.9.65. Commenced cycling 11-45. Flight 13,611. Did stress trace and Dynamic (slow) check on Group 3RS. Test P80. Still no typewriter.

30.9.65. Flight 13,634 did Desynn Check and 2 Static tests P81 and P.82. Gust and manouevre respectively to read deflections and Group 3RS.

Test of deflections against fixed label press. all levels gust and manouevre P83a and P83B respectively.
Last flight 13,670.

Repairs carried out at flight 13~~,~~610.

1. Starboard flexible joint.
2. Port and starboard ventilation panel.
3. Panel 'B' port new skin insert and stringer section (Str.18)
4. New skin insert fwd. of panel 'D' port and starboard.
5. Honeycomb panel between 'P' and 'Q'
6. Skin patch over N.A.C.A. intake.
7. ⅜" tear hole in crack on D.C.59 Sht. 9.

1.10.65. No intentional cycling, but Rig was operated whilst investigation into load were carried out.

Repeated fixed levels of yesterday (83a, 83b) these were designated 84a and 84b respectively. Also did dynamic level this test was P86.

2.10.65. Gust P85.
Again load investi~~x~~gation, did a static test both loading and unloading gust with transducers sets up on u/v from p/switch line, A2 line, f/s. wing benders line and jack of 3FP. Also read on this were "Tipsters" and strain gauge C1 (all analysed). Man P.87.

Then we did another static loading and unloading, this time manouevre, with "Tipsters" 3FP loading group and strain gauge C.1. 3FP ring was read in conjunction. These partly analysed we could not do any block cycling or random cycling with trace being taken and indicated pressure noted as the Battery was flat.

4.10.65. Fixed up new power supply for u/v. finished analysing statics 85 and 87.

Did fixed static levels 88a and 88b manouevre then ran block flight, followed by Random flight 13,680. Started analysis of these. Cycled till flight 13,699.

5.10.65. First flight on board 13,700
Altered pressure switches to new recommended pressures as shown on next page. Finished analysis of pressure transducers, C1, 3 FP L.K.D.T. and "Tipsters". Cycled to even out no of events done whilst setting pressure switches. We took 2 stress traces and one is analysed the other is well on. At about 5-45, a bolt on a first stage beam of 1 FS sheared so we had this repaired. Finished cycling at flight 13,783.

6.10.65. Re-established flight time at 7 minutes 37 seconds and unload times as follows:- Gust 115 seconds, gust plus manoeuvres 201 seconds, This was achieved with unload rate set at 1 turn and 5 segments i.e. with filed notch at top centre. System 'C' unload setting is hereby stated as 2 turns 4 segments for gust, and 1 turn 4 segments for manoeuvre. In each case filed notch is at bottom centre

The accepted pressures as indicated on 'A' gauges for all levels are as follows:-

Level	New Pressure (13,700)	Old Pressure
1	680	655
3	733	705
5	797	790
2		
4	380	390
6		
7a	780	745
7b		
8a	855	825
8b		
9a	972	922
9b	465	435

No mean levels have been altered.

Due to adjustments to ML. 76 pressure had to be altered and have the whole range of pressures were rechecked and the flight time altered.

(7b and ML were so close together that 7½ were not counting. So 7b was lowered until the counter started to function).

Flight 13,784.
Established flight time as follows:-

Gust unload time 125
Total unload time 222
Total time 7m55

The accepted indicated pressures for dynamic 11 are as follows:-

Level	New press.
1	675
2	440
3	740
4	375
5	790
6	325
ML	555
ML	560
7a	775
7b	505
8a	855
8b	495
9a	970
9b	485
10	

7.10.65. First flight 13,797
Dynamic 11 completed - cracks read. Last flight 13,847

8.10.65. First flight 13,848. Last flight 13,931

Checked all pressures against those accepted for Dynamic 11 and found that ML had slipped to 550 p.s.i. All other pressures were O.K.

Stress trace and desynn check done.

9.10.65. First flight 13,932. Last flight 13,987.

Recalibrated L.V.D.T's on rings on groups 3 FS, 4 MP and 9 M.I.P. Static (Test P 89). Analysed the results for the above. Took stress trace, Did desynn check. Measured cracks (not complete).

11.10.65. Last flight 14,063.

Recalibrated L.V.D.T's Test P90. Cracks almost complete. Stress trace done and desynn check. Air system stopped operating at 7.00 and we did not find the cause of this trouble prior to going home.

12.10.65. First flight 14,064.

Did more static calibrations of L.V.D.T's against D.T.I's P.91, P.92 and P.93.

It was found that the air pressurization valve was out of commission due to the fact that a small circlip had broken loose and allowed the solenoid part of the actual piston of the valve to become permenently seized in the solenoid body, this was fixed and all sliding parts greased (silicone grease), this should be done on all three valves approx. every 1,000 flights.

Cracks measured. Desynn check and stress trace done.

Slow dynamic done in 3 RS - P94 on mon up to 900 ps.i.
Static test measuring depth at 3 RS - P95 on mon up to 900

Last flight 14,102.

13.10.65. Flight 14,129 all pressures checked against those accepted for Dynamic 11 and all were O.K. except ML which was 570 and should be 560.

Stress trace and desynn check done. P96 calibration of

L.V.D.T's. up to 900 on mon. Fault occurring on 1's, 3's and 7's. i.e. following thro mean level.
Last flight 14,155.

14.10.65. Cracks have begun to be measured but not finished. John Shortland reports that bearings in the mean load level correcting lever are useless. Desynn check. Reset pressure switches as follows.

8a	-	825	) Last Flight
8b	-	490	)
7a	-	745	) 14,234.

Flight unload time = 125 seconds 213 Total.(secs)
Could not do a stress trace as there was no paper.
Desynn check done. Flight time 7.40 mins.

15.10.65. Flight 14,240. Checked all pressures (indicated) against those required for Dynamic 11 (see Dynamic 10 + figures in red). All O.K. except 7a was 735 instead of 745. =

Due to errors in measurement of alternating B.M. on manoeuvres (Dyn. 11). Some pressure switches have been adjusted the latest list of pressures is as follows:-

Level	Press.
1	675
2	440
3	7,40
4	375
5	790
6	325
7a	745
7b	505
8a	825
8b	490
9a	970
9b	485
ML	555
ML	560

Dynamic 12 completed - cracks measured.
Last flight 14,266. Shut down for stopped inspection.

16.10.65. All relevant tank and panels removed for inspection. Technicians Inspection completed. New damage in tank 3 and 5 port and repairs of these have been initiated. Both are typical of previous damage and therefore earlier repair schemes are being repeated.

17.10.65. Ultrasonics completed except f/s. web in bomb bay, where bomb door is in way. X Rays have been completed.

18.10.65. Stopped inspection and repairs still in progress.

19.10.65. A/C. and rig work still in progress until 12-noon. Did static calibrations of D.T.I. L.V.D.T's. P 97, P 98, P 99 and P 100. Started cycling at flight 14,267.
Last flight 14,299

WINGTIP DEFELCTION CHECK - VULCAN F.T.S.

Flight Level.	5			6			9a			9b		
	Port	Stbd.	Roll	Port	Stbd.	Roll	Port	Stbd.	Roll	Port	Stbd.	Roll
8,623	14.8	14.7	+.1	10.1	8.4	+1.7	15.9	14.7	+1.2	11.6	8.4	+3.2
8,767	14.8	14.6	+.2	10.1	8.2	+1.9	16.0	14.7	+1.3	11.8	8.1	+3.7
8,814	14.6	13.85	+.75	9.3	8.68	+.62	15.1	12.4	+2.7	11.5	8.1	+3.4
9,031	14.55	14.5	+.05	8.75	9.45	-.7	15.2	12.75	+2.45	11.0	8.75	+2.25
9,275	14.25	14.75	-.5	8.8	9.35	-.55	15.25	12.65	+2.6	11.25	8.35	+2.9
9,420	14.2	14.97	-.77	8.8.	9.5	-.7	15.2	12.75	+2.45	11.3	8.5	+2.8
9,714	13.95	15.15	-1.2	8.55	9.8	-1.25	14.9	13.05	+1.85	10.75	9.05	+1.7
9,869	14.65	15.7	-1.05	7.7	11.75	-4.05	15.18	12.85	+2.33	11.25	8.65	+2.6
9,930	13.85	15.2	-1.35	7.35	10.8	-3.45	15. 2	12.6	+2.6	11.1	8.5	+2.6
9,984	14.05	14.9	-.85	8. 0	10.0	-2.0	15.25	12.6	+2.65	11.05	8.45	+2.6
10,058	13.9	15.2	-1.3	8.7	9.6	-0.9	15.1	12.9	+2.2	11.15	8.65	+2.5
10,135	13.2	15.35	-2.15	7.5	10.15	-2.55	15.15	12.75	+3.4	11.25	8.5	+2.75
10,170	13.6	15.55	-1.95	7.85	10.4	-2.55	15.2	12.75	+2.45	11.2	8.45	+2.75
10,243	13.4	15.25	-1.85	7.75	10.35	-2.6	15.1	12.75	+2.35	11.25	8.5	+2.75
10,431	13.8	15.1	-1.3	7.9	10.2	-2.3	15.35	12.75	+2.6	11.4	8.2	+3.2
10,567	14.2	15.05	-0.85	7.85	10.3	-2.45	15.45	12.65	+2.8	11.45	8.25	+3.2
10,630	13.95	14.55	-0.6	8.3	9.75	-1.45	15.2	12.85	+2.35	11.2	8. 4	+2.8
10,685	14.4	14.7	-0.3	8.4	9.85	-1.45	15.05	13.0	+2.05	11.05	8.7	+2.45
10,874	14.2	14.6	-0.4	8.15	9.7	-1.55	15.2	13.1	+2.1	11.2	8.65	+2.55
10,905	14.65	14.85	-0.2	8.55	10.05	-1.5	15.35	13.05	+2.275	11.5	8.8	+2.7
10,963	13.2	15.2	-2.0	7.6	10.7	-3.1	14.35	13.3	+1.05	10.85	9.3	+1.55
10,976	12.55	15.55	-3.0	7.05	10.95	-3.9	14.4	13.2	+1.2	10.75	9.05	+1.7
11,045	13.55	15.6	-2.05	7.8	10.15	-2.35	15.45	13.75	+1.7	11.0	8.85	+2.15
11,048	13.35	15.8	-2.45	7.4	10.55	-3.15	15.345	14.0	+1.45	10.9	9.1	+1.8
11,120	13.8	15.4	-1.6	8.1	9.8	-1.7	15.4	13.8	+1.6	10.75	8.7	+2.05
11,125	14.4	1500	-.6	8.8	9.2	-.4	15.85	14.15	+1.7	11.05	8.65	+2.4
11,151	14.45	14.9	-.45	8.45	9.55	-1.1	15.7	14.2	+1.5	10.95	8.25	+2.7
11,231	14.3	15.2	-.9	8.7	9.25	-.55	15.8	14.65	+1.15	11.2	7.95	+3.25
11,294	13.75	15.25	-1.5	8.05	9.8	-1.75	15.9	14.45	+1.45	11.1	7.95	+3.15
12,140	14.65	13.75	+.9	10.07	7.55	+2.5	15.8	13.6	+2.2	11.7	6.75	+4.95
12,149	14.6	14.05	+.55	9.9	7.75	+2.15	15.8	13.5	+2.3	11.7	6.8	+4.9
12,211	14.65	14.1	+.55	9.95	7.85	+2.1	15.4	12.45	+2.45	11.85	7.35	+4.5

WINGTIP DEFELCTION CHECK - VULCAN F.T.S

	5			6			9a			9b		
	Port	Stbd.	Roll	Port	Stbd.	Roll	Port	Stbd.	Roll	Port	Stbd.	Roll
12,231	14.75	14.3	+.45	9.95	8.25	+1.7	15.95	13.6	+2.35	11.95	7.2	+4.75
12,233	14.7	14.3	+.4	9.9	8.3	+1.6	15.9	13.6	+2.3	11.95	7.2	+4.75
12,355	15.0	13.15	+1.85	8.3	9.55	-1.25	15.45	12.8	+2.65	11.5	7.6	+3.9
12,408	14.6	12.65	+1.95	8.8	7.75	+1.05	15.7	11.7	+4.0	11.65	6.35	+5.3
12,411	14.5	13.72	+.78	7.55	10.2	-2.65	15.7	12.72	+2.98	11.7	7.35	+4.35
12,414	14.5	14.15	+.35	7.62	10.1	-2.48	15.85	13.0	+2.85	11.77	7.65	+4.12
12,437	15.0	13.5	+.85	7.32	10.65	-3.33	15.75	12.85	+2.9	11.52	7.7	+3.82
12,477	15.1	13.45	+1.65	7.25	11.0	-3.75	16.0	13.15	+2.85	11.75	7.65	+4.1
12,500	13.15	11.72	+1.43	10.0	5.05	+4.95	13.165	11.15	+2.5	10.65	5.43	+5.22
12,522	14.97	12.95	+2.0	11.7	5.8	+5.9	15.95	12.7	+3.25	12.25	6.2	+6.05
12,671	14.9	12.5	+2.4	11.0	5.7	+5.3	15.9	12.7	+3.2	12.3	5.8	+6.5
12,804	15.75	12.55	+3.2	10.05	7.45	+2.6	16.15	13.05	+3.1	12.05	7.35	+4.7
12.875	15.7	12.35	+3.35	9.9	7.53	+2.38	15.9	12.98	+3.93	11.6	7.4	+4.2
12,934	15.5	12.4	+3.1	9.7	7.4	+2.3	15.8	12.9	+2.9	11.4	7.42	+4.2
12,971	15.6	12.75	+2.85	9.7	7.55	+2.15	15.95	13.15	+2.8	11.5	7.4	+4.1
13,065	15.7	12.75	+2.95	9.8	7.6	+2.72	16.0	13.15	+2.85	11.45	7.52	+3.94
13,161	15.75	12.8	+2.95	9.8	7.65	+2.15	16.0	13.2	+2.8	11.5	7.5	+4.0
13,229	15.75	12.3	+3.45	9.5	7.5	+2.0	16.05	13.0	+3.05	11.45	7.3	+4.15
13,308	15.9	12.6	+3.3	9.2	8.25	+0.95	16.05	12.9	+3.15	11.0	8.05	+2.55
13,393	15.85	12.5	+3.35	9.2	8.3	+0.9	16.05	12.95	+3.1	10.95	8.1	+2.85
13,482	15.8	12.5	+3.3	9.2	8.2	+1.0	16.05	12.9	+3.15	11.0	8.0	+3.0
13,576	15,85	12.75	+3.1	9.15	8.3	+.85	16.1	12.95	+3.15	10.8	8.07	+2.73
13,640	16.025	12.0	+4.025	10.7	6.45	+4.25	16.05	12.45	+3.6	12.2	6.43	+5.77
13,780	15.95	11.9	+4.05	10.07	6.4	+3.67	16.35	13.25	+3.1	12.4	6.55	+5.85
13,975	16.05	11.9	+4.15	10.65	6.4	+3.23	16.27	13.3	+2.97	12.37	6.55	+5.82
14,060	15.9	12.1	+3.8	10.6	6.7	+3.9	16.2	13.35	+2.85	12.35	6.6	+5.75
14,092	15.85	12.1	+3.75	10.65	6.4	+4.25	16.25	13.4	+2.85	12.35	6.55	+5.8
14,134	15.9	12.15	+3.75	10.6	6.6	+4.0	16.3	13.45	+2.85	12.45	6.8	+5.65
14,226	15.9	12.4	+3.5	10.85	6.55	+4.3	16.45	13.55	+2.9	12.55	6.7	+5.85
14,340	15.75	12.4	+3.5	10.7	6.6	+4.1	16.35	13.55	+2.8	12.45	6.7	+5.78
14,413	15.8	12.4	+3.4	10.65	6.6	+4.05	16.3	13.6	+2.7	12.4	6.7	+5.7
14,530	15.7	12.35	+3.35	10.65	6.5	+4.15	16.3	13.6	+2.7	12.35	6.75	+5.6
14,627	15.95	12.3	+3.75	10.75	6.5	+4.25	16.45	13.55	+2.9	12.55	6.65	+5.89

WINGTIP DEFLECTION TEST - VULCAN F.T.S

Flight Level	8,550			8,695			12,157			12,518		
	Port	Stbd.	Roll	Port	Stbd.	Roll	Port	Stbd.	Roll	Port	Stbd.	Roll
1	14.2	12.15	+2.05	13.95	12.7	+1.25	12.95	12.0	+.95	12.4	9.22	+3.18
2	12.6	9.0	+3.6	11.4	9.6	+1.8	11.0	9.0	+2.0	11.47	6.4	+5.07
3	14.5	13.1	+1.4	14.2	13.45	+0.75	13.6	13.05	+.55			
4	12.3	8.0	+4.3	10.85	8.85	+2.0	10.6	8.55	+2.05			
5	14.9	14.25	+7.5	14.8	14.45	+0.35	14.5	14.1	+.4	13.2	12.2	+1.0
6	11.4	8.1	+3.3	10.1	8.3	+1.8	10.2	7.55	+2.65	10.45	5.05	+5.4
7a	15.0	11.75	+3.25	14.7	11.9	+2.8	14.2	10.55	+3.65	12.7	8.9	+3.8
7b	12.5	8.2	+4.3	12.65	8.85	+3.8	12.2	7.4	+4.8	11.3	6.32	+4.98
8a	15.5	13.0	+2.5	15.35	13.4	+1.95	15.05	12.0	+3.05			
8b	12.5	8.0	+4.5	12.3	8.5	+3.8	12.0	7.2	+4.8			
9a	15.9	14.4	+1.5	16.0	14.65	+1.35	15.75	13.55	+2.2	14.2	11.9	+2.3.
9b	12.0	7.75	+4.25	11.95	8.0	+3.95	11.65	6.75	+4.9	10.77	5.6	+5.17

20.10.65. Calibrating L.V.D.T's.
Test P101. Group 1F5
Test P102. Groups 2, 4, 5, 7, 9MIS, 3RS.
Test P103. Groups 2MIP, 9MIP.

Cracks started but not finished.
Last flight 14,345.

21.10.65. Cracks finished.
Three statics done. P104, 105 and 106 up to 900 p.s.i. on manoeuvre. Also test P107 (Man)
Last flight 14,417.

22.10.65. Cycled all day, first flight 14,418. Last flight 14,496. Also did static ~~x~~tests P108 and P109 on L.V.D.T's did stress trace desynn check and other daily's.

23.10.65. First flight 14,497. Last flight 14,535.
Stopped cycling at the above at 3 p.m. because crack at panel 'A' port seems to have taken a turn for the worse and its propagation curve has now flattened out. Considered it safe to allow more statics but not in excess of 800 p.s.i. Gust statics P110. Did cracks and all daily checks bar pressures.

25.10.65. Stopped all morning whilst awaiting decision whether or not to carry on running in the light of Bu items of damage i.e.

Crack for panel 'A' port which had suddenly extended.

Two cracks in spar web between ribs 60 and 76 and rib 60 and 42?

Cycling continued - last flight 14,592. Deflection check and trace not done, so not many flights had been done since the last checks.

Counted cracks after flight 14,757 and found 2,575 which includes 340 tank cracks.

9.3.66. Commenced cycling at flight 14807.

Flight time steady at 7.57.

Oil found to be leaking from the 1MB46B port compound rig, this was attributed to the oil reservoirs being overfilled.

All checks done i.e. F/S web port b/bay and O/B 618. R/S Stbd. in No. 6 Tank, clubfoot brackets.

Stress trace done at flight 14814.
Desyn check done at flight 14816.

Damage found today :-

F/S web in B/bay on 6 of the bolts are coming out of the intercostals again, also the web is badly buckled in a few places and one of the intercostals is cracked.

Both B/Rib top beams are cracked about half way down the bomb bay.

The bomb rib web is cracked on Stbd. foward of the first bomb crack near the top boom.

Also there are some cracks round an oxygen bottle meeting on the bomb rib web inside the first double crack, port and starboard.

* Remember to remind Ron to get the repairs scheme drawn by Frank Lees.

10.3.66. First Flight 14,852.

Last flight 14873.

Stopped in order to have electrics overhauled. Removed clubfoot bracket on Stbd. side in order to inspect broken bomb rib boom. This was found to be cracked in two places, also the web in the engine bay was cracked between the holes for the club foot.

Tank 6 sump and panel were removed and the R/S inspected. No damage was found.

11.3.66. First Flight 14874.

The club foot bracket was replaced and a new bolt fitted where the previous one had sheared . Cycling commenced, the F/S C/S web was inspected at flight 14875 - No damage was found.

Fault on typewriter - typing 2 and sometimes 3 (and sometimes 4) level 7's. Once at the top of 7a, once at main level coming down and once at the bottom of 7b.

Level 10 done - No damage found.

12.3.66. First flight 14901.

Inspection checks done and desynn check. - No damage found.

14.3.66. First flight 14911.

Cycled normally - no checks done. Air system went U/S and had to be repaired.

Cracks found around panel M. Port.

15.3.66. First Flight 14938.

Indicated pressure check.

Level	Flight 14760	Flight 14943	Flight 15927	18010
1	675	680		675
2	435	435		440
3	745	740		735
4	375	375		380
5	790	790		790
6	330	330		330
7a	745	745	740	735
7b	500	500	500	500
8a	825	830	830	830
8b	490	490	490	490
9a	965	975	965	975
9b	485	490		485
ML ↙	565	565		560
ML ↗	565	565		545

Ulevel timer is not operating - also typewriter is not typing level 7's.

Cracks found in skin adjacent to R/S repair Stbd. also in join-up skin O/B of 618 leading edge Stbd.

Level 10 was inhibited at 15000 as per instructions, as travel measurements used to be carried out during the level 10.

16.3.66. First Flight 15001.

Panel removed for check on R/S repairs Stbd. Level 10 was done at 15001 and check on travels delayed to a later date.

Finished after flight 15040 as counter panel would not clear.

Damage found - cracks between panels B & E Port also Rib 576 and str. 39 joint Port.

17.3.66. First Flight 15040.

Cycling discontinued at 15052 due to recurrent fault in programme unit i.e. level 4 counter fails to reset after the bending case and hence machine carried on doing level 11's.

18.3.66. Removed No.6 Tank panel and sump to do inspection checks - No damage.

First Flight 15041.

19.3.66. First Flight 15059.

Last Flight 18002 - fault in master valve - not coming in at the mean level change.

22.3.66. First Flight 15063.

Fault on A2 valves - cleared itself and cycling commenced normally.

Desynn check at flight 15074, stress trace at flight 15076.

Fault on machine :-

Level 4's not counting, this was cleared by manually clocking them up.

23.3.66. First Flight 15130.

Level 10 done on static at 15133 in order to check travels for 50% case.

Leading edge inspection done during this static. F/S C/S web inspection done - no damage.

24.3.66. First Flight 15187.

R/S Repair inspection done at 15191. Level 10a 15200. During flight 15,210 the level 7 pressure switch did not function and the pressure went straight up to 1220p.s.i. before the haddle could be wound off. Overtravel switches check and found to be set at 21" Port to 22¼" Stbd. measured from a level 11.

25.3.66. Overtravel swtiches reset and pressure blow off reset. However on first flight, pumps were switched off by the Port overtravel switches. On investigation it was found that 1½" travel had been best on Stbd. side.

26.3.66. An inspection was done and checks on the Stbd. tip compound rigs were carried out but be anamalies were found.

28.3.66. Static check P.112 done on gust reading all wing benders, no change. A dynamic desynn check was done and the 1½" was still there. However on re-checking the zero on Stbd. ribs was found to be 1.4" low. This explained the lost 1½ travel, but no conclusive explanation was found for the fault which caused it.

The Stbd. U/C beam was reset and cycling commenced.

First Flight 15212.

29.3.66. First Flight 15237.

At the start of cycling - the A2 valve was malfunctioning i.e., pressure dropping thro' the bottom levels. This fault cleared itself after the first flight. Typewriter went U/S, carriage return coil burnt out.

After flight 15257 the A auxiliary valve failed to function, and the rig was stopped to facilitate the necessary repairs.

30.3.66. Stopped all day repairing the A auxiliary valve.

31.3.66. Valve replaced and trial runs against the cracks were carried out satisfactorily.

1.4.66. Last Flight 15261 - stopped for inspection 5E.

2.4.66. Inspection.

3.4.66. Put load on for X Ray's to be done.

4.4.66. Stopped inspection.

5.4.66. Commenced flight No.15262.

Run continuously all day. - No faults. Level 10 done at 15300.

6.4.66. First Flight 15332. Last flight 15355 at lunch time. Stopped to inspect crack in R/S shroud hinge to check whether the boom flange was O.K. Took all afternoon.

7.4.66. First flight 15356. At 10.a.m.

At flight 15371 the A auxiliary valve failed to function. This fault did not occur again.

During flight 15377 a small bone pipe blew off in the console and neccessitated repairs.

12.4.66. Repairs completed - stainless pipe replaced by a mild steel one to provide more malleability at the coupling. A drain pipe for the system was also provided. First flight 15377.

After flight 15380 a fault occurred which cut off the HT supply, this was found to be due to a plug coming adrift in the unit. Upon restarting a fault occurred on the uniselectors which caused a launching to be selected frequently during gust and manouvre. This is thought to be due to the relay which selects the uniselectors not operating properly.

13.4.66. Relay changed by dinner time, cycling commenced at flight 15387.

Fault occurred on flight 15416. Level 3 selected pressure went thro' top level and held steady at 850 after blow offs got working. Valves selected AB and A2!!!? After about 10 seconds the master selected and everything ran smoothly.

Level 10 was omitted due to the fact that on extra one was done during 15210.

Desynn check done at 15395.

Trace taken at 15404.

(Flights done since stopped inspection 161).

14.4.66. First flight 15423.

Check on Stbd. R/S repairs done first thing & no change.

On commencement of cycling two faults appeared immediately. The A Auxiliary valve fails to hold the pressure at the required figure and the level to counter fails to clear straight away.

The cure for the A Auxiliary valve is to wind the A unloading rate valve in 2 Turns at the beginning of the gusts and to wind it out of the start of the manouvres after the A Auxiliary has been De-selected.

As far the level 6 counter, the master loading rate valve must be wound off until it clears.

(Flights done since stopped inspection 216)

15.4.66. First flight 15477.
Same faults as yesterday.
(Flights since stopped Inspection 246).

16.4.66. First flight 15508.
Time consistent at 8 minutes.
Last flight 15542.
(Flight since stopped Inspection 281).
Same faults as previously stated plus failure of A2 valve - i.e. dropping thro' bottom levels - this fault cleared itself after a while.

18.4.66. First flight 15543.
Usual faults.
(Flights since stopped Inspection 328).

19.6.66. First flight 15590.
Starboard R/S repair inspection done first thing. OK.
All machine faults have now cleared themselves.
(Flights since stopped Inspection 379).

20.4.66. First flight 15641.
Level 10 done @ 15700 - no failures.
(Flights since stopped inspection 450).

21.4.66. First flight 15712.
Stbd. R/S inspection done first thing.
X Rays done of bending light panels.
(Flights since last stopped 497).

22.4.66. First flight 15758.
(Flights since stopped 547).

23.4.66. First flight 15808.
(Flights since stopped 568).

24.4.66. First flight 15829.
Last flight 15869.
D.C. drawn, cracks read.

25.4.66. First flight 15870.
A loud bang was heard at about 1100p.s.i. during a level 10 - the level 10 was completed and a general inspection in the area of the noise (F/S centre section) was made. Panels 5, 6 and 7 both port and starboard was removed and also starboard forward outer engine door was dropped. The most forward O/B hinge pin was out, but no other sign of damage was found on the hinge bracket or pin. The following bolts were found to be failed but it is difficult to ascertain whether these were associated with the bang.

Stbd. Side

Forward outer engine door pin was almost out. Could this have been the bang.

Port Side

At flight 15904 a bang was heardand the F/S Bottom C/S boom Stbd. was completely broken 21.3" O/B of centre line. A comprehensive inspection was carried to try and find the cause of the first bang at flight 15900.

1. X-Ray all leading Edge joints.

2. Front Spar joint, web and 7g plate connections.

3. Attachment of transport rib top and bottom boom to F/S.

4. Rib 338 boom attachment to F/S.

5. Remove No.5 P and S tank skin (nose only). to examine F/S boom and web and joint at 618.

6. Spar and web adjacent to landing light.

7. All bolts and rivets connecting bottom skin to spar boom in area where bolts were found broken (see sketch above) were inspection by screwing or tapping.

4.8.66. Commenced flight 15910.
Last flight 15956.
Did pressure check, Desynn Check. * Stress trace, and Gust and Manoevre static deflection check.

* results seen to have returned to state of events which existed prior to flight 1 when pressure switches were fettled, Roll is now only slight (3.95 max.) on level 96.

9.8.66. Last Flight 16058.
Mended broken Pad and cleared minro fouls.

19.8.66. First flight 16059.
Last flight 16108.
Carried out static test P.113 and P.114, Manourvre and Gust respectively to check deflections, strain gauges C1, and C2 (replaced) and jack at S.F.S. (Re-sealed).

11.8.66. First flight 16,109.
Last flight 16,160.
Repeated the two Static Calibrations (P.115 Gust and P.116 Manouvre) put in level 10 and 16,150,Cycled all day.

12.8.66. First flight 16,161.
Last flight 16199.
Cycled all day.

13.8.66. On level 10 flight 16,200 a medium sized bang was heard at 1,120 p.s.i. the load was released to it was found that an existing crack in L/E skin adjacent to rib 350 had suddenly propagated a further 7" in brittle failure a repair was initiated.

Material involved in L/E repair on Port Side was allocated as follows.

1st. Skin. Job. No. 432940.
Batch No. D.52383

2nd. Skin. Job. No. 433059.
Batch No. D.54224.

Out of the two skins sent for the repair, neither skin had a job No. or Batch No. stamped on, and consequently we do not know which skin was fitted. The Job Card appertaining to the first skin was sent away by S.T.D. Foreman.

11.10.66. 16,201 to 16,209. Running.

Milled all L.V.D.T's and read calibration of port Section A L.C.D.T's but found to be abort.

12.10.66. 16,209 to 16,224. Running.

Modified U/V Demod. circuits. Found air leak on No.4 tank sump. This job is in hand, with R. Staniforth to replace seal.

13.10.66. 16,225 to 16,229. Running.

Also calibrated group B L.M. Rings and milled manoeuvre groups. Air system now working O.K.

14.10.66. 16,230 to 16,250. Running.

17.10.66. No Running.

18.10.66. No Running.

Zeroed A gauge against avery and found that at 600p.s.i. on gauge actual was 599.

19.10.66. 16,250 to 16,292. Running.

Read Stress trace and Desynns prior to Dynamic 13. Checked full and unload times - O.K.
Checked dynamic pressures - O.K.
Read Section A of l.m. rings.
" " B " " "
" " C " " "
" " D " " "
" " B " " "
Did post dynamic stress trace.

20.10.66. 16,293 to 16,315. Running.

Flight time consistent at 7' - 5" $(^{125}_{215})$
Pressure O.K. as on 8.3.66.
Desynn check completed.

Checks after Dynamic 13.

1. Check overtravel switches;
   i. By having motor running and pressing each micro-switch in turn to stop motor.
   ii. By measuring above wing tip at M.C.
   iii. At next level 10 check clearance.

2. Do all things necessary to run against cocks.
   Then do following:-
   i. Select level 10 and without pressing safety button see what pressure load is released.
   ii. Press safety switch and check level 10 press-switch mock-up.
   iii. Select systems A & B and check blow off pressure.
   " " A & C " " " " "
   " " D " " " " "
   On all these apart from second safety switch must be pressed.

Requirements for ensuring an Authentic Dynamic Measurement are as follows :-

1. Check 'A' gauge against avery gauge.
2. Check flight total and unload times.
3. Check deflections.
4. Take stress trace.
5. Do visual pressure check for each level. All these must be done immediately before and after Dynamic reading.

* NOTE : Before reading L.V.D.T's check all are being lit at intervals, switch off hangar fans, and ensure that generator air cooling is in operation.

21.10.66. First flight 16,316 - last 16,331.

Typewriter traverse return operating several times per flight during first flight after wich it cleared. On visual check of pressure after Dynamic 13 the following discrepancies were found from pressures read at 8.3.66.

Level	8.3.66.	21.10.66.
3	745	735
8a	825	830
9a	965	970

21.10.66. From previous page blow offs are found to be :-

	Steady pressure p.s.i.	Cracked just open p.s.i.
A	1250	1190
B	850	770
C	1220	1140

D Cannot be selected except on programme unti. Safety switch (Button on overtravel board). Triggered at 1005 p.s.i.

Ouvertravel micro switch are at present set at Port Switches and Stbd. present. Above wing at M.L. this gives max. clearance of ½/side at level 10.

24.10.66. First flight 16,332. Last flight 16,359.
Counted 2 extra flights on setting up.
Also insisted on carrying on doing levels 6 (not real unit level 6, but only apparent!) uninhimitedly - completed flight manually.
Next flight doing 6's without selecting?

Solution

A2 valve faulty - not deselecting.
(causes drop to about 200p.s.i. (gust) and 350p.s.i. (nam.) before master in reselected.

25.10.66. First flight 16,360 - 16,404.

On first flight the A2 fault occured again but was not repeated. Another fault at this time is that the typewriter has gone "return" happy. Switching the carriage back to the left about 5 times for flight - Typewriter disconnected - carriage return solenoid overheating.

26.10.66. Cycling 16,405 - 16,457.

Maurice Kerwin came and fettled the carriage return solenoid but shortly after it began to smoke, so we unplugged it.

27.10.66. Cycling 16,458 to 16,495.

Did not start until 9.45. because a loading patch, which was coming off was reinforced.

A2 valve taken out for inspection fault on valve occuring regularly.

Consol control weel settings as follows before shut down.

Loading pate on system side B fully closed
D ⅓ turn from fully closed.