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No.

AVRO AIRCRAFT LTD

INTER-DEPARTMENTAL MEMORANDUM

Date: May 10, 1956
To: Mr. S.E. Harper - Chief Experimental Engineer
From: Mr. J.W. Ames - Chief Test Engineer (Structural and Mechanical
Subject: MONTHLY REPORT - APRIL 1956

The monthly report for April, 1956 has been especially prepared with respect to the C105, to cover each test job that we have handled on this aircraft. This was done in order to provide the R.C.A.F. with a summary of the testing performed to date as well as a status report on the work in hand. Future reports will revert to the normal technique of recording jobs in work only.

Copies of this report have been sent to the recipients of this memorandum. Five extra copies are delivered herewith for your use, and distribution to the R.C.A.F.

UNCLASSIFIED

Classification cancelled/changed to.....
by authority of.....(date).....
Signature.....Rank.....

J.W. Ames
Chief Test Engineer
(Structural and Mechanical)

JWA:ec

cc. R. Adey
R. Lindley
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Central File
File

+2635	Brake System-Evaluation of Pedal Loads vs Braking Effects.	X7-0850
+2636	Leak Test on Bleed Air Engine Disconnect	X7-0822
+2637	Test on Marman J11 Type Joint Assembly	X7-0822
2638	Resistance Test of Wire to Spec. Avrocan M-11-6	5-715
2639	Alternator Failure Investigation	5-675
2640	Shear Pin Tests-Anti-Spin Parachute	5-008
+2641	Static and Fatigue Strength Tests on Skin Splice at Transport Joint	X7-0860
+2642	Strength of Rib Panels - Main Torque Box	X7-0860
+2643	Test of Duct Mounting Rollers, Clamps and Insulation	X7-0822
+2644	Static & Dynamic Strength Test on Port Side Engine Mount Fittings	X7-0862
+2645	Static & Dynamic Load Test on Starboard Side Engine Mount	X7-0862
+2646	Strength Test on a Typical Outer Wing Rib	X7-0860
+2647	Investigation of "Dieseling" Possibilities in H.P. Pneumatics of Emergency Landing Gear Lowering System.	X7-0892
+2648	Engine Shroud Test	X7-0854

2649	Strength of Nacelle Latch	X7-0859
2650	C100 Hydraulic System Fittings-Leakage	1-064
2651	Strength of Outer Tailplane Hinge Bracket Assembly	5-008
2652	Vibration Tests of Hymatic Pressure Regulator	X7-0816
2653	Production Engine Duct Tests	X7-0850
2654	Performance Test of Special Dry Cell Batteries	5-715
2655	Voltage Brakdown Test on Sample Header for Relay CS-R-131	X7-0813
2656	Pressure test on 6/10 Scale Engine Duct	X7-016-6
2657	Driving Torque on Tuning Mechansim of R10lA/ARN-6 Radio Compass	X7-0800
2658	Endurance of Thin-Walled Fuel Pipes with Flexible Couplings	X7-0816
2659	Endurance of Thin-walled Steel pipes with flexible couplings	X7-0819
2660	Model Test of Worm & Gear Engine Mount	X7-0858
2661	Shear Pin Strength Test	X7-0854
2662	Temperature Cycling Tests-Windscreen Glass	X7-0852
2663	Vibration Test on Air-no-Fuel Valve	X7-0816
2664	PressureTests of Transition Duct (heat Exchanger-to-Turbine)	X7-0854
2665	Side Skin Access Door Shear Test	X7-0856

plastic plug

+2666	Evaluation of Voltabloc Battery Vo-15	X7-0852
+2667	Model Test of Modified Simmonds Latch	X7-0858
+2668	Pressure Sealing Qualities of Ball Bearings	X7-016-6
+2670	Shear Strength of Honeycomb Adhesive	X7-0859
+2671	Vibration Testing of Complete Aircraft	X7-0800
+2672	Remote Deflection Indicating System	96600-3131-XXX
+2673	Static & Fatigue Test of Elevator Bell-crank Lever	X7-0882
+2674	Static and Fatigue Test on Rudder Control Lever	X7-0884
+2675	Investigation of Elevator Links	X7-0815
+2676	Preliminary Tests Of Rudder Hinge Moment Limiter	X7-0815
+2677	Evaluation of Aileron & Rudder Control Valve	X7-0884
+2678	Evaluation of Pilot's Transfer Function	X7-0815
+2679	30 KVA Alternator Pressure Drop	X7-0800

Qualification Tests

Qualification testing for April 1956, has progressed at a uniform rate. Two more items have been given Equipment Approval bringing the total number of approved items to five. A number of qualification test reports and qualification test proposals have been received. As much time as possible has been spent on analyzing these reports and proposals, and informing the vendor of our findings.

Various vendors have been visited by one or more members of the Qualification Test Group during the last month. Mr. R.M. Stuart and Mr. F. Halpin have visited Dowty Equipment of Canada Limited several times to discuss Qualification tests. Mr. K.C. Brown has spent some time at P.S.C. Applied Research Limited discussing testing with them and outside vendors. A considerable number of meetings have been held at Avro with visiting vendors.

R.M. Stuart and K.C. Brown attended the Second Annual Meeting of the Environmental Equipment Institute held in Chicago, Illinois, the 19th and 20th of April 1956. While in Chicago K.C. Brown visited Inland Testing Laboratory to see their test facilities and discuss specifications in general.

On April 17, 1956 the Qualification Test Group moved from the Structural and Mechanical Text Office to a temporary location at the back of the Stress Office. The move has proven advantageous because of the proximity of the Purchasing and Engineering Offices.

At present there is a back log of work such as reports, proposals and specifications requiring analyzing. It is anticipated that the back log will continue to grow and that additional staff will need to be added.

April 1956 Report Including Complete C105 Test Work to Date

Department 3110

C100 Tests

708 Mark 3 Canopy Strength. Tests are continuing at the National Aeronautical Establishment. No further report has been received.

2474 Stress Survey of C100 U/C Leg and Pivots. Tests are continuing at the National Aeronautical Establishment. No further report has been received.

2551 Fairey Hydro-Booster - Contamination Testing. It is now considered unlikely that a Purolator filter will be tested in this application, but alternative suppliers are under consideration by Design Office.

2555 Torsional Strength and Rigidity of Honeycomb Structure. The second of the original series of test specimens has now been repaired after the initial test and is ready for retesting. Modifications to the first specimen of the second series of test specimens is now in work in the Experimental Department. The test rig design for these specimens is complete and will be issued for manufacture shortly.

2631 Test of Centre Section Structure with Modification 1006 under Landing Gear Loads. Manufacture of the test rig is in progress in the Experimental Department and modifications to the Centre Section structure are nearly complete.

2639 Alternator Failure Investigation. A representative fire was finally obtained by running the alternator with one bearing removed, so that the rotor rubbed on the stator. No test investigations were made into possible causes of bearing failure equivalent to this condition. The job is now closed.

2650 C100 Hydraulic System Fittings-Leakage. Leakage tests on the first two of three specimens are complete. The third specimen is complete with the exception of some fittings, the delivery of which is expected shortly.

2654 Performance Test of Special Dry-Cell Batteries. The performance of the batteries under loaded conditions and under intermittent short-circuit conditions was determined. This job is now complete.

C105 Strength Tests

2147 Honeycomb Compression Panel Tests. Most of forty available specimen panels consisting of aluminum alloy honeycomb bonded between two sheets of flat aluminum alloy were tested in compression at ambient and elevated temperatures. The general behaviour of the panels was observed and the Ultimate strength of each panel obtained. These tests were discontinued late in 1954, when it became apparent that the high temperature properties of the bonding resin were unsatisfactory.

C105 Strength Tests (Cont'd)

2302 High Temperature Effects on Laminated Windscreens. Some early tests were conducted during 1954 on the above subject, using C100 windscreen panels and temperatures up to + 250°F. It was established that the vinyl interlayers would evolve vapour bubbles if exposed to local temperatures above about + 170°F for significant periods. Attempts were made to investigate thermal shock, but the apparatus was inadequate, and work was discontinued in favour of Job #2358.

2331 Inner Wing Compression Panels.

Tests were carried out on fifteen panels of rivetted skin/stiffener construction and two panels with integrally machined stiffeners. Proof and Ultimate loads for the various skin/stiffener combinations were obtained. The tests were completed in October, 1954.

2341 Development of Methods for Retaining Bearings in Housings. The retention of anti-friction bearings in housings of restricted width, which precluded the use of the normal flange and spring clip method of retention, has been investigated under this job number. Bearings retained by lips formed in the housing material or in an intermediate sleeve have been tested after installation by the following techniques

1. Ring Staking
2. Roll Swaging
3. Press Swaging of corrosion resistant steel sleeves
4. Double ring staking of 2S Aluminum sleeves.

These tests have been reported in ATR's 2341/1 through 8.

Tests are now in progress on the ring staking and spherical point staking of magnesium alloys using Thermal and Resistance Heating methods of retention.

2349 Outer Wing Posted Box. Three structural boxes, typical of the outer wing construction, were tested under combinations of bending, shear and torsional loads. The behaviour of the skins, webs and stiffener stabilising posts were recorded by means of electrical resistance strain gauges and the proof and ultimate strengths of the boxes obtained. This job was completed on February 24, 1955, with completely satisfactory results.

2351 Static Test of Complete Aircraft. Design work on this test to date has consisted of:

1. Strain gauge installation drawings, of which the Fin drawings have been issued, the Centre Fuselage is ready for issue, the Forward Fuselage Nacelles are awaiting Stress Office approval, and the Inner and Outer Wing are in work. Several thousand gauges are to be installed, and extra technicians have been trained for the purpose.

2. Test loading attachment drawings on the aircraft have been issued on the forward fuselage, centre fuselage and fin.

C105 Strength Tests (Cont'd)

2351 Static Test of Complete Aircraft (Cont'd)

3. Local reinforcements where the omission of aircraft services would adversely effect the strength of the structure have been issued on the forward fuselage, centre fuselage and the fin.

4. Drawings of wing fuel tank test pressurization systems are complete.

5. Drawings of the test rig floor beams and the aircraft supports have been issued and the parts have been built.

6. An aircraft slinging beam for the transport of the test aircraft on overhead cranes has been designed and built and is due for proof testing shortly.

2354 Fin Multi-spar Box Bending and Torsion Tests. These tests were similar in principle to those of Job No. 2349. Four structural boxes typical of the C105 fin structure were tested. The test programme was completed on May 25, 1955, with results that agreed very closely with calculations.

2355 Fuselage Former Stiffness Test. Two typical centre fuselage frames were test d to obtain stiffness figures for design purposes. The frames were finally loaded to failure. This job was completed on July 12, 1955, with satisfactory results.

2356 Engine Intake Duct Pressure Tests. Two engine air intake ducts (A/C Station 333-485) built using preliminary tooling, were subjected to internal pressure and suction tests. The ducts were mounted in the test rig by representative fuselage frames and were tested in turn up to 50 p.s.i.g. and down to -5.5 p.s.i.g. No failure of the ducts occurred. After these tests, one of the ducts, while under 20 p.s.i.g. internal pressure, had five .5" calibre machine gun bullets fired into it. No explosive decompression occurred. This series of tests was concluded in June, 1955.

2358 Windscreen Temperature and Pressure Tests. Preliminary tests have been carried out on one windscreen with no conclusive results. The test rig for the final tests is now nearly complete. In the final tests hot (250°F) and cold (-35°F) fluids will be alternatively passed over the outer surface of the windscreen, while the inside is pressurized and maintained at cockpit temperature. Thermal shock effects will thus be investigated.

2376 Engine Intake Duct (Floating Assembly) Pressure Test. Orders have been issued for the manufacture of the Engine Intake Duct, and manufacture is in progress. Some test rig drawings have been issued and the parts are in work. The specimen will be subjected to appropriate positive and negative pressures.

2377 Fatigue Test-Typical Skin Splice. Static and fatigue tests have been carried out on nearly one hundred test specimens of typical wing skin joints. Test were made at ambient and elevated temperautres.

C105 Strength Tests (Cont'd)

2377 Fatigue Test-Typical Skin Splice (Cont'd)

The tests were completed in December 1955. Some development was necessary in order to obtain satisfactory performance, and the tests brought out the deterioration of performance at high temperatures.

2379 Fatigue Test-Deutsch Drive Pin BlindRivet Application. Tests were made on solid sections of wing spar material into which Deutsch Drive pin blind rivets had been driven. These rivets have grooved ends which are pressed out into the rivet hole by a driven taper pin. Fatigue tests showed the influence on the specimen fatigue life of these grooves. The tests were completed in December, 1954.

2380 Elevator Stiffness and Limit Load Test. Loads up to limit design loads were applied to complete elevators in both the neutral and 30° up position. The elevators were mounted on a dummy wing whose deflection was made to follow the estimated aircraft wing deflections. Deflections of the elevator and wing were recorded, and loads in the elevator control circuit measured. The tests were completed in November 1955, with entirely satisfactory results.

2401 Test of Canopy Latches. Tests were carried out on the canopy latches to investigate operating forces under lubricated and dry conditions. Observations were also made on the wear of rubbing surfaces. The test was completed on March 2, 1955.

2403 Inner Wing Posted Box (Integral Skin and Stringers). Two out of three structural boxes typical of the C105 Inner wing construction have been tested. Bending, shear and torsion loads were applied to the first specimen. In the second specimen tests, internal pressure representing fuel tank pressurization was applied in addition to the other loads. A third specimen is to be tested later, probably at high temperature.

2408 Fuselage Side Skin Panels (STN 485-697) Under Shear Load. Four shear panels in 75ST material were tested in shear. The job was then extended to cover magnesium panels forward of A/C station 485. Two preliminary panels have been tested. Four more magnesium panels (two including typical skin joints) are to be tested at room temperature and two panels will be tested at elevated temperatures.

2409 Fatigue Test of Pressure Pipes for Elevator Jack. Initially, a set of pipes having shapes which are now obsolete were found satisfactory in fatigue, a further set is being manufactured to the current design, but these cannot be completed until a satisfactory method is found for attaching end fittings. Welding was found unsatisfactory because of the difficulty in preventing corrosion at the weld, and copper brazing is now being investigated. The use of flareless tube connections is also to be investigated.

C105 Strength Tests (Cont'd)

2412 Fatigue Tests of Elevator Links. The results of three fatigue tests and one static test at room temperature have been obtained. We are now awaiting results of the last two specimens which are being tested at elevated temperatures at the Krouse Testing Laboratories.

2424 Tensile Capacity of Rosan Inserts in ZH 62 Magnesium Casting Alloy. Tests were made on sixteen Rosan Inserts in a cast section of the windscreen frame ridge. Pull out loads and deflection measurements were made on eight inserts at room temperature and eight inserts at 250°F. This job was closed in December 1954.

2426 Transient Heating of Wing Fuel Tank Model. The model tank is typical of the wing tank structure and by subjecting it to high temperature conditions representative of high speed flight the magnitude of thermal stresses and temperature distribution are to be determined. The testing is about to commence.

2433 Stressed Panel Fasteners - Shear and Combined Shear and Tension Test. Static tests were carried out on a series of 'Camloc' and E.S.N.A. stressed panel fasteners, and proof and ultimate loads were obtained. The test was completed in July 1955.

2435 Cockpit Floor Beam Crippling Test. Two panels-typical of the cockpit floor and supporting beam construction were tested. Water pressure was applied to the top face of the floor simulating cockpit internal pressure. Deflection measurements were made and strain gauges were used to record load distribution. The first specimen proved unnecessarily heavy and the second one showed that a lighter construction was adequate. Tests were concluded in September, 1955.

2436 Shear Test of Bolt-O-Seal Screws. Shear tests were carried out on three sizes of 'Bolt-O-Seal' screws. Load/deflection curves were obtained for the joints, and ultimate loads recorded. The test was completed in May 1955.

2450 Fuselage Compression Panel Tests (Magnesium). Three magnesium panels with 75ST formers attached were required to be tested. Two panels of magnesium sheet to specification QQ-A-44 have been tested. Manufacture of the third specimen in magnesium sheet to specification DTD-41 Cond H-26 is now nearly complete.

2451 Stiffness Test of Light Formers in Power Plant Bay. Stiffness tests have been carried out on two test specimens of the light formers in the Power Plant Bay. Deflection measurements were made as a vertical load was applied to the centre of the former. The tests were finished in December 1955, and showed that some minor reinforcement would be desirable.

2453 Static Test of Dive Brake. Tests of the Dive Brakes are in abeyance.

C105 Strength Tests (Cont'd)

2457 Fuselage Tank Pressure Test. A tank, typical of the fuselage fuel tank, was fatigue tested under repeated internal pressure loading. Tests were continued until failure of the tank bulkhead members occurred. Tests were completed in November, 1955 with acceptable results.

2470 Fatigue Test of Elevator Jack Fitting. Tests are in abeyance pending design of the forged fittings by the Design Office.

2473 Temperature and Pressure Test of Sieracin 611. Tests were conducted in a Sieracin 611 laminated transparent panel. The inner face was maintained at 80°F and pressurized to 6 p.s.i. while the temperature of the outer layer was cycled from -65°F to + 250°F. This job was closed on April 15, 1955 after the material was demonstrated to be highly unsatisfactory in this application.

2476 Tension Tests of Bolt-O-Seal and NAS Bolts with ESNA Barrel Nuts. These tests were carried out in April 1955, to investigate the strength of a proposed attachment in the fin structure.

2478 Longeron Joint at STA.485 - Fatigue Test. Manufacture of the test specimens is now in progress. The joint has titanium plates, joining 75ST spar sections.

2479 Shear Test of Jo-Bolts. Shear Tests were carried out on various size 'Jo-Bolts' in typical lap joints. Failing loads and deflections were obtained for the joints. The job was closed in May 1955.

2481 Fatigue Tests of Bonded ZE-41 Magnesium Alloy Sheet. One static test and three fatigue tests have been carried out during April 1956. The result of the tests on the last specimen is expected shortly from the Krouse Testing Laboratory.

2483 Static Strength and Fatigue Tests-Skin Splice at CFS and CRS. Fifteen specimens of the skin splice were tested to obtain the fatigue life of the joint at various load levels. The final tests were satisfactorily completed in April 1956, after some development resulting from the first tests.

2484 Quick Release Fasteners-Shear and Tension Tests. Shear and tension tests were carried out on a variety of 'Camloc' and E.S.N.A. stressed panel fasteners; failing loads and joint deflection curves obtained. The job was completed in November 1955.

2486 Strength of Main Spar Wing-Fuselage Attachment at Rib 4. Strength tests were carried out on three fittings typical of the main spar wing fuselage attachment at rib 4. Load/deflection curves and failing load of the specimens were obtained. The job was closed in October 1955.

C105 Strength Tests (Cont'd)

2489 Shear Test of Countersunk and Dimpled Hi-Shear Rivets in Clad 75 S-T6 Sheet. The first tests on dimpled and countersunk Hi-shear rivets in joints typical of C105 structure were inconclusive due to inadequate deflection measuring techniques. Improved methods are now being applied to test further specimens, and additional tests are in prospect on Huck Lock Bolts and Jo-Bolts.

2497 Fatigue Test of Wing-To-Fuselage Hinged Joint. Fatigue Tests were satisfactorily completed in November 1955, on lengths of hinge typical of the subject joint, as then designed. Subsequent design changes to facilitate production improved the fatigue conditions, and no re-testing was necessary. This job has been closed.

2502 Shear Test of NAS Bolts with Sealing Grooves. Tests were carried out on various size N.A.S. bolts in lap joints. One plate of the joint was grooved in a manner typical of the wing tank sealing grooves. Ultimate loads and load/deflection curves for the joints were obtained. The job was closed in August 1955.

2504 Aileron Jacks, Pressure Lines Fatigue Test. The test specimens have been ordered from the Experimental Department and design of a test rig to improve the desired motion, (representing the effects of wing bending, aileron operation and jack deflection) has been started.

2505 Fatigue Test of Canopy Latch. One static test and four fatigue tests were carried out on specimens of the canopy latch. The fatigue tests were carried out at the Krouse Testing Laboratories. The job was completed in February 1955 with satisfactory results. In general, fatigue life was limited by the attachment screws, and not by the latch itself.

2509 Fatigue Test on Light Former Joint at Lower Longeron. The test rig and the test specimens have been designed and the parts are now in work in the Experimental Department.

2510 Fatigue Test on Heavy Former Joint at Lower Longeron. Drawings of the test specimens have been issued to the Experimental Department and the parts are in work. The specimens will be tested in the test rig for Job No. 2509 - suitably modified.

2515 Temperature and Pressure Tests of Pilot's Canopy Glass. Two specimens were tested. The first specimen was pressurized on the inner face which was maintained at 80°F while hot air at 250°F was passed over the outer surface. Deflection measurements were made and the failing pressure obtained. The second specimen was tested under internal pressure while at room temperature. Results were satisfactory and the job was closed on April 10, 1956.

2519 Right Frame Stabilizing Tests. Tests were carried out on a section typical of the rear fuselage light frames to investigate the stability of the web and flange members. The job was completed in November 1955, with satisfactory results.

C105 Strength Tests (Cont'd)

2530 Fatigue Test of Engine Bleed Ducting STA.485. The test rig has been constructed and the tests are now under way. A section of this air-conditioning system duct, with flexible ends, is being tested under cyclic bending while its internal pressure is 90 p.s.i.g. and its temperature 900°F.

2534 Rudder Stiffness and Limit load Test. The rudder stiffness and limit load test will be carried out on the rudder functional test rig which is now being designed. The test is scheduled for the late fall of 1956.

2537 Shear Test on "King" Fastener C4707. Tests were carried out to determine the load carryin capacity of the 'King' fastener. Proof and ultimate loads were obtained. The job was closed in September, 1955.

2540 Main Frame Stabilizing. A portion of a typical integrally machined rear fuselage f ame was tested to investigate the stability of the flanges. One specimen was tested and the mode of failure of the flanges and the failing load of the specimen was recorded. The test was completed in November 1955, with results that agreed closely with calculations.

2549 Aileron Stiffness and Limit load Test. The Aileron stiffness and limit load test will be carried out on the aileron functional test rig, which is now being manufactured in the Experimental Department. The test is scheduled for the late fall of 1956.

2550 Fin Rib Shear and Bending Strength Tests. Two similar rib specimens, with different web thickness and lightening hole spacing were tested under bending and shear loads. The behaviour of the web with the flanged lightening holes was observed and ultimate load and load deflection curves obtained. These tests were completed in February 1956, with satisfactory results.

2561 Casting-Aileron Pivot Support CS-C-2001. Tests on this casting have been completed. The job was closed on March 9, 1956.

2562 Casting-Lever Aileron Pivot CS-C-2000. The casting has now been received and is being machined in the shops. Test rig drawings have been issued and these too are in work.

2563 Casting Elevator Lever-Control Column. These tests have already been completed. The job was closed on February 23, 1956.

2564 Casting-Hinge Member-Control Column. Tests have already been completed. The job was closed on April 10, 1956.

2566 Casting CSC 2034 Bracket Pulley Rudder. Our test rig has been manufactured and we are awaiting delivery of the casting from the founder.

2567 Casting CSC 2035 Bracket Pulley Elevator-Flying Controls. The casting and test rig are complete and tests are to commence shortly.

C105 Strength Tests (Cont'd)

2568 Casting CSC 2003 Hinge Bracket Control Column. The test rig has been manufactured and we are awaiting delivery of the casting from the founder.

2569 Casting CSC 2011 Lever -Aileron Flying Controls. This test has already been completed. The job was closed on April 10, 1956.

2570 Casting CSC 2018 Aileron Lever Mounting. Tests on the casting have been completed. The job was closed on April 10, 1956.

2571 Casting - Lever-Aileron Feel CSC 2020. Tests on the casting have been completed. The job was closed on March 2, 1956.

2572 Casting CSC 2017 Bracket-Stop, Elevator. Two castings have been tested under different loading cases. The job was closed on April 10, 1956.

2574 Casting CSC 2036 Pulley Bracket Stn. 186-45LH. Design of the test rig is complete and is in work in the shops. The casting has not yet been received from the founder.

2576 Casting CSC 2044, Elevator Quadrant. Manufacture of the test rig has been completed. We are now awaiting delivery of the casting from the founder.

2577 Casting CSC 2045 Bob Weight Lever. Test rig design is in progress, but no casting has yet been received from the founder.

2578 Casting CSC 2042 Support Bracket-Elevator Quadrant. Tests on this casting have been completed. The job was closed on March 26, 1956.

2579 Casting CSC 2043 Support Bracket-Elevator Quadrant. Tests on this casting have been completed. The job was closed on March 26, 1956.

2580 Casting CSC 2061 Housing - Throttle Quadrant. Design of test rig is complete and has been issued for manufacture. The casting has not yet been received from the founder.

2581 Casting CSC 2062 Lever-Throttle Quadrant Mounting Engine Controls. Tests on this casting have been completed. The job was closed in March 1, 1956

2582 Casting CSC 2060 Quadrant Throttle Quadrant Mounting-Engine Control Tests on this casting have been completed. The job was closed on February 15, 1956.

2583 Casting CSC 2030 Rudder Pedal. The test rig has been manufactured and we are now awaiting the delivery of the casting from the founder.

2584 Casting CSC 2058 Rudder Pedal Quadrant Lever. The test rig has been manufactured and we are now awaiting the delivery of the casting from the founder.

C105 Strength Tests (Cont'd)

2585 Casting CSC 2029 Rudder Pedal Quadrant Lever Pivot. The castings have been machined and the test rig completed. Testing is due to start shortly.

2586 Casting CSC 2057 Foot Brake Lever. The first of three castings has been tested. The other two are now being machined, in view of the fact that Class 1B loads were not withstood. Class 1C rating was passed by the first specimen.

2587 Casting CSC 2056 Rudder Pedal Support Fitting. The test rig has been manufactured and we are awaiting delivery of the casting from the founder.

2589 Casting CSC 2059 Rudder Pedestal Bearing Housing. The test rig has been manufactured and we are awaiting delivery of the casting from the founder.

2590 Casting CSC 2054 Pulley Bracket Stn. 255 Eng. Cont. The test rig has been manufactured and we are awaiting delivery of the casting from the founder.

2591 Casting CSC 2064 Pulley Bracket-Stn. 267 - 5RH Eng.Cont. The test rig has been manufactured and we are awaiting delivery of the casting from the founder.

2595 Casting CSC 2095 Pulley Bracket Stn.157 331H Parabrake. The test rig has been designed and is in work in the shops. The casting has not yet been received from the founder.

2605 Casting CSC 2102 Pulley Bracket-Engine and Flying Controls. The test rig has been designed and is in work in the shops. The casting has not yet been received from the founder.

2606 Casting CSC 2101 Pulley Bracket Flying Controls. The test rig design is complete and the parts are in work in the shops. The casting has not yet been received from the founder.

2612 Casting CSC 2148 Pulley Bracket-W.H. Brake Controls. The test rig has been manufactured and we are awaiting delivery of the casting from the founder.

2615 Casting CSC 2164 Valve Mounting Bracket-Fuel System. The test rig has been designed and is in work in the shops. No casting has yet been received from the founder.

2616 Casting CSC 2165 Valve Mounting Bracket-Fuel System. The test rig has been designed and is in work in the shops. No casting has yet been received from the founder.

2617 Casting CSC 2178 Bracket-Hydraulic Compensator Mounting. The test rig has been designed and is in work in the shops. No casting has yet been received from the founder.

2618 Casting Test CSC 2014 Spigot Ramp Pick Up. The casting has been machined, and the test rig is in work in the shops.

2634 Fatigue Test on Light Former Joint to Lower Longeron at Access Door. All drawings of the test specimen have been issued. The test will be performed on the test rig for Job No. 2509, suitably modified.

2641 Static and Fatigue Strength Tests on Skin Splice at Transport Joint. Drawings of the specimens have been issued and the manufacture of the specimens is nearly complete.

2642 Strength of Rib Panels-Main Torque Box. Four typical rib panels are to be tested. Drawings of the final specimen with its test rig have been issued and are in work in the shops. Drawings of the test rig for the remaining three specimens are now ready for issue. The tests will subject the specimens to shear and bending.

2644 Static and Dynamic Strength Test on Port Side Engine Mount Fittings. Design schemes for the specimen are now in preparation. The test rig will be common to Job No. 2645.

2645 Static and Dynamic Load Test on Starboard Side Engine Mount. Drawings of the test specimen have been issued for manufacture. Design of the test rig is in progress.

2646 Strength Test on a Typpcal Outer Wing Rib. Design work on this specimen will follow the work on Job No. 2642, to which it is exactly similar in principle.

2648 Engine Shroud Test. Design of the specimen and test rig is in progress. In this test repeated applications will be made of internal pressure and physical deflection, to a section typical of the engine shroud.

2649 Strength of Nacelle Latch. Orders for productions parts of the specimen have been issued. Design of the specimen will commence shortly. The static strength, fatigue strength and wear characteristics of the latch will be investigated.

2653 Production Engine Duct Tests. This job covers test department co-operation with production department in setting up procedures for routine production leakage tests on the engine intake ducts, and the procedure for removal of irregularities by pressurising after final assemble, and in carrying out at least the first such procedures. The extent of probable leakage in ducts made with proper production tooling (ref. Job 2356) is to be investigated during May using a section of the centre fuselage duct, specially supplied for test.

C105 Strength Tests (Cont'd)

2660 Model Test of Worm and Gear Engine Mount. Orders have been placed for the test specimen and these are now being manufactured. Operational and wear tests are to be carried out under live loads.

2661 Shear Pin Strength Test. Manufacture of the shear pin and test rig parts is in progress. This arrangement is part of a device for personnel protection, incorporated in the mechanism of an access door operated by the electronic equipment hoist.

2662 Temperature Cycling Tests-Windscreen Glass. A sample windscreen glass with "Penite" plastic edging was subjected alternately to exposure on all sides at -35°F and + 250°F to find the effect on the edging material, or its effect on the glass. The glass centre lamination shattered after two alternations of temperature and the edging was fractured in several places. Failure to pass this crude and overly severe test will probably necessitate further testing under properly representative conditions. If so, the work involved will be added to Job 2358. These tests were completed in March 1956.

2664 Pressure Tests of Transition Duct (Heat Exchanger to Turbine). Orders have been issued for manufacture of the duct. Design of the test rig will commence in due course.

2665 Side Skin Access Door Shear Test. Drawings of the test specimen have been completed and are now ready for issuing to the Experimental Department for manufacture.

2670 Shear Strength of Honeycomb Adhesive. This job was received at the end of April, and no action has yet been taken.

2673 Static and Fatigue Test of Elevator Bell-Crank Lever. This job was received at the end of April, and no action has yet been taken.

2674 Static and Fatigue Test on Rudder Control Lever. This job was received at the end of April, and no action has yet been taken.

2675 Investigation of Elevator Links. Experience to date on the flying controls test rig (reference job 2268) has established the desirability of further investigations of the properties of bearings in the elevator output circuit. Test rig parts are being made up, representative of the actual installation, to facilitate these investigations.

C105 Mechanical and Hydraulic Functional Test

2190 Control System-Bearing Selection. The life of anti-friction bearings subject to oscillation while under load have been investigated. A variety of bearings used on the C105 have been tested. These tests have recently been reviewed by the design office, and new tests have been requested on bearings with high interference fits which represents the increase in interference of the bearings when the aircraft is operating under -65°F conditions. These will commence very shortly.

C105 Mechanical and Hydraulic Functional Test

2268 Complete Mechanical System Test Rig. This job covers testing of the elevator control system together with the provision of common facilities for testing the flying control system as a whole. The test rig contains the complete system from stick to surfaces and a representative hydraulic system is provided. Initial tests were carried out to determine the effect of hinge line bending on the effort required to deflect the elevators, and then a programme of no load, frequency response tests was completed. Some difficulty has been experienced with back lash in the output leakage and this is now being investigated. Frequency response tests with simulated air load will be commenced shortly.

2271 Elevator Hydraulic Power Jack and Valve Control Response Test. Frequency response tests of a single elevator jack and control valve were carried out with no load applied to the jack. It had been planned to continue testing using an inertia weight to simulate the elevator inertia, but before this stage was reached, a more representative rig was available (see job 2402) and this job was therefore closed in December, 1955.

2306 Effectiveness of Dirt Shield as Pressure Seal in Fafnir Bearing. These tests were conducted on a few samples in April 1954, and it was found that the dirt shields were effective pressure seals at the relatively low pressures involved.

2324 Development of Feel System-Elevator and Aileron Cockpit Controls. A dummy cockpit was constructed including a control column, seat and elevator and aileron feel and trim units. Some development of the feel system for the emergency mode was conducted, but recently it was decided to continue the programme on the rig provided for Jobs 2268 and 2449 since the system was more accurately represented. Job 2324 was therefore closed in February 1954.

2326 Suitability Test of the Control and Follow Up Linkage of an Elevator Jack (Fixed Body System). A similar programme to that carried out under job no. 2271 was completed on an actuator which was available substantially earlier than the actual C105 actuator. The jack and linkage was representative in principle only and the object of this test was to gain experience for the C105. The jack was later flown in aircraft 18107, with a modified follow-up linkage. Job 2326 was closed in November 1954.

2328 Determination of the "Engaged Force" Required to Ensure Proper Functioning of Dog-Clutch for Main Undercarriage leg. A model of the proposed locking mechanism was made and the force characteristics were determined in test conducted in June, 1954.

2342 Sequence Valve Tests, U/C Emergency Actuation. Some difficulty was experienced with sequence valves in a pneumatic system with differential pressures as low as those required for the C105. However since the pressure sequence valves were deleted from the aircraft system, the job was closed in August 1954.

2344 Complete U/C System Function Tests. The nose and main undercarriages will be mounted in separate test rigs, each of which will provide for the application of air and inertia loads to the gear and doors. Design of the nose gear rig is approximately 70% complete and manufacture is proceeding. The main gear rig is still in the layout stage. Testing is scheduled for the end of 1956.

2359 End Play for Various Thrust Loads on Fafnir Bearings. The subject properties of several Fafnir bearings were investigated by test in July 1954.

2402 Preliminary Elevator and Control System Response Tests. This was an interim test on the elevator system which was performed between the actuator and valve test (Job 2271) and the complete system test (Job 2268). A single elevator, with representative output linkage and jack was mounted on a test rig, with no attempt made to represent control box stiffness. A programme of no load frequency response and impedance tests was completed and the job was closed in April 1956.

2425 Ground Tests of Fully Powered Elevator Control on A/C 18107. A fully powered elevator control system was installed in C100 A/C 18107 in order to gain experience for the C105. A series of ground tests was necessary to demonstrate that the A/C was airworthy. These were successfully completed and the job was closed in July 1955.

2432 Hydraulic Line Connections for 4,000 p.s.i. An extensive series of tests on flareless tube fittings for 4,000 psi hydraulic lines has been carried out under contract at the National Aeronautical Establishment to prove the suitability of these fittings for the C105 aircraft. The test programme has recently been reviewed and further series of test specimens have been manufactured and shipped to the National Aeronautical Establishment for testing.

2442 Aileron Power Control Unit-Frequency Response Tests. Early attempts to conduct this test were abortive due to difficulties experienced with the Sargent Control valve and with the strength of the actuator itself. After modifications to the valve were completed, no load frequency response runs were performed and further tests with a load representing aileron inertia will be conducted shortly, with a strengthened actuator. This test is preparatory to Job #2449.

2448 Determination of O Ring Seal Friction. This test was performed to obtain design information for the Flying Controls and Utility Hydraulic system compensators. The job was completed and closed in May, 1955.

2449 Functional Tests of Aileron Flying Control System. The elevator system test rig (see Job 2268) will be extended to include ailerons. The design of the rig extension is complete for the first stage of testing, and manufacture is well advanced. Design of a spring system for loaded frequency response tests is proceeding. Testing is scheduled for the late fall of 1956.

2462 Suitability of Wig-O-Flex Pipe and Boss Couplings for L.P. Hydraulics. Initial tests showed that repeated flexing of the coupling resulted in flattening of the beaded end of the tube and in damage to the tube caused by sharp corners of the coupling retainers. Further tests were performed with modified coupling retainers and tubes with reinforced beads. Additional specimens are now being made with a new type of bead reinforcing and some specimens will also be listed with no reinforcing.

2472 Canopy Functioning Tests. Assembly of the specimen in the rig is being completed, and the first tests will commence shortly. In these tests, dummy canopies are to be actuated by the Martin-Baker cartridge system, under representative external loads. In a second phase of testing, similar tests will be conducted with actual canopies mounted on the static test aircraft structure.

2475 Impedance Test of Elevator Jack System. Performed on the interim elevator test rig (see Job 2402) this test was successfully completed and the job was closed in April, 1956.

2482 Cold Temperature Pressure Drop of Elevator Servo Valve. Measurements of pressure drop versus flow were made for three different valve openings using fluid temperatures of zero degrees Fahrenheit. The job was closed in February 1956, but further low temperature tests of the elevator valve are included in Job 2544.

2492 Functional Tests of Rudder Powered Flying Control System. This job is similar in principle to the elevator system test (Job 2268). Design of the rudder mounting beam and many test rig details are complete. Design of the rig frame and beam mounting structure is proceeding. Testing is scheduled for the late fall of 1956.

2493 Preliminary Selection Tests of Hydraulic Pressure Reducing Valve. Sample valves supplied by two different manufacturers were tested and both were found unsatisfactory. Since this particular valve has been cancelled from the aircraft system, the job was closed in November 1955.

2496 Load-Compression Test for C.S.E. Rubber Seals. These are rubber seals of 'P' section for which Design Office needed information on compressibility. The necessary tests were made in March, 1955.

2498 Frequency Response Test of Rudder Power Jack and Valve. This job is similar in principle to the elevator jack test (job 2271). The test will be performed when a rudder valve and servo are available. A preliminary stiffness check of the actuator itself has been completed.

2499 Flareless Tube Fittings-Tightening Torque Vs Displacement. Tests were carried out to determine the optimum tightening torque for a wide variety of Flareless Tube fittings. The tests were completed on March 2, 1956.

C105 Mechanical and Hydraulic Functional Tests (Cont'd)

2503 Tests of Steel Tubing and Fittings for Hydraulic Systems. These tests on steel tubing and fittings for the 4000 psi hydraulic systems are being carried out at the National Aeronautical Establishment for testing.

2506 Speed Brakes Functional and Endurance Tests. This job is in abeyance.

2511 Assembly of Seal at Duct Joint (Stn.485). A test was conducted in June 1955 to determine the manual effort required to assemble this joint, and to investigate the possibility of leakage. The design was found satisfactory in both respects.

2521 Endurance Flexing Test of Rear Spar F/C Hydraulic Line. The hydraulic lines will be installed in the aileron control system test rig, but their behaviour will be reported under this job number. The test is to examine the fatigue characteristics of the installation, and the possibility of mechanical fouling under deflected conditions of the wing.

2527 Fin Inspection Doors (Plugs). Tests were made on a Fin Inspection Door plug which proved the proposed part to be satisfactory. The job was closed on September 22, 1955.

2529 Determination of Efficiency of Compensator within Flying Control Hydraulic System. This test was to determine the change in compensator pressure which occurred with changes of system volume. The job was successfully completed and closed in November, 1955.

2535 Rudder Pedal Adjustment. The test was successfully completed and closed in January 1956. In it, the load resisting property of the pedal adjustment scheme was investigated.

2539 Evaluation of 'O' Ring Materials. Some environmental tests on different O-ring compounds have been carried out by the Metallurgical Department. It was initially intended to carry out a programme of operational tests, but it is now decided to gather o-ring data by observation of the components in the various hydraulic and control system test rigs.

2544 Evaluation of the Elevator Control Valves. Tests to determine flow versus valve spool displacement at low temperature are complete on the M-H valve. Some high temperature tests and measurements of valve spool force versus flow are now in progress. Afterwards, the programme is to be repeated on a Jarry valve.

2556 Functional Test of Rudder Shroud Door. The hinge moment of the spring loaded rudder shroud door was measured over the whole range of Rudder travel, using the installation on the wooden mock-up. This job was closed on December 1, 1955.

2557 Investigation of Interference in Shafer Roller Bearings. Tests were carried out to determine the increase of interference fit pre-loading of bearings due to shrinkage of the housings at low temperatures. In some circumstances this increase proved to be quite serious. Testing was completed in February, 1956.

2558 Investigation of Pressure Drop and Fatigue Properties of 7 GPM Filter Element. The first filters tested were supplied by Aircraft Porous Media and were found to be unsatisfactory in fatigue. Several other types of filters were tested and some improved filters from Aircraft Porous Media will be tried shortly.

2621 Parachute Release Mechanism Functional Test. The test specimen and rig are being manufactured by the Experimental Department. The tests are intended to prove the ability of the mechanism to release the braking parachute over the relevant range of drag load, and load angle relative to the aircraft.

2623 Functional Tests on Automatic Quick Disconnect Couplings for Ground Energizers. Design work in the test rig is not yet started, due to lack of information from the Design Office. Couplings are on order but it is understood that some of these are now obsolete and an R.T. Addendum is expected.

2624 Evaluation of Nylon for Cable Fairleads. The nylon tubing suffered some minor cracking and became rather brittle under repeated heating and cooling, but wear was negligible. No decision has yet been made by the Design Office concerning the acceptability of the tubing. The test work was done during April 1956.

2625 Canopy Seal Inflation System Test. Two prototype valves were tested and found to have excessive leakage. It is understood that the production valves are appreciably different and further tests will probably be required when these are received. Job 2625 was closed in April, 1956.

2630 Pressure Control Valve, Reducing Valve Circuit Test. The valves were found to be somewhat erratic and only approximately to specification. The specimens have been returned to the suppliers for examination.

2635 Brake System-Evaluation of Pedal Loads vs Braking Effects. All the necessary items have been ordered and will be assembled as a part of the flying control system test rig as soon as possible.

2647 Investigation of "Dieseling" Possibilities in H.P. Pneumatics of Emergency Landing Gear Lowering System. The test rig is under construction, but the emergency air bottle has not yet been received. A special booster must be obtained for charging the bottle to 5500 psi.

2657 Driving Torque on Tuning Mechanism of R10lA/ARN-6 Radio Compass. The test was successfully completed and the job has been closed. The results were required for the design of a servo for remote tuning.

C105 Mechanical and Hydraulic Functional Tests (Cont'd)

2658 Endurance of Thin-Walled Fuel Pipes with Flexible Couplings. This test will be performed in the rig for job 2462. The specimen pipes and couplings are on order.

2659 Endurance of Thin-walled Steel Pipes with Flexible Couplings. This test will be performed in the rig for job 2462. The specimen pipes and couplings are on order.

2667 Model Test of Modified Simmonds Latch. The latch is being modified and a simple test fixture is being manufactured.

2668 Pressure Sealing Qualities of Ball Bearings. The bearings are on order. A test rig is available from a previous test (job 2306) and necessary modifications are in work. The pressures against which sealing is desired are much higher than in the original test.

2671 Vibration Testing of Complete Aircraft. Preparatory investigations are being made to establish the arrangements required for resonance tests on the first flying aircraft.

2676 Preliminary Tests of Rudder Hinge Moment Limiter. This job was opened at the end of April, and no action has yet been taken. The mechanism tested will be used later in the rudder system test rig.

2677 Evaluation of Aileron and Rudder Control Valves. This job was opened at the end of April, and no action has yet been taken. The possibility of sub-contracting will be investigated, in view of the lengthy programme to be carried out.

C105 Fuel System Functional Tests

2235 Fuel Level Tests. Tests to determine the fuel level in each tank for different fuel contents at various pitch attitudes. This was done by immersing a wooden scale model of the internal shape of each tank into a vessel of water. The results obtained were satisfactory. Test completed February, 1955.

2236 Fuel Pick-up Tests Fuel-no-Air Valve. Tests to check functioning of Fuel no Air Valves in typical flight attitudes. Valves were fitted to a steel fuel tank mounted so as to be capable of being positioned in any attitude. Valves tested were not satisfactory. The test rig was also used for fuel sloshing investigations, in which the rate of travel of the fuel C.G. was measured, following a tank attitude change. Tests completed October, 1955.

2237 Fuel System Tests. A test rig has been designed and built which contains a full size replica of the port side fuel system, and is capable at simulating any flight altitude. The purpose is to check the fule system for all flight attitudes, fuel temperatures and attitudes. Fuel C.G. checks can also be made. Testing on this rig will commence during May 1956.

C105 Fuel System Functional Tests(Cont'd)

2239 Fuel System-Pressure Drop Across Tees. To obtain data on pipe losses - test completed April 1954.

2300 Sealing Test on Huck Lock Bolts. Tests to determine sealing qualities of Huck bolts under high and low temperature conditions. Test Results satisfactory. Test completed May, 1954.

2321 Effectiveness of Rivet Sealing in Panels Representing Fuselage Integral Tanks. Tests was not completed due to change in fuselage tank design. Test cancelled July, 1954.

2336 Tests on Integral Tank Models of the Wing Structure. Tank models were made incorporating features of tank sealing to be used on the aircraft. Test tanks subjected to bending and torsional loading under high and low temperature conditions. Considerable progress in sealing has been made as a result of these tests, although at present the sealing is not entirely satisfactory, and development continues.

2390 Stress Sealing Effectiveness for Various Fasteners. Test specimens were made incorporating different fasteners which were subjected to shear and internal pressure. Final results were satisfactory. Test completed November, 1955.

2410 Pump Priming Test-Thompson Products Pump. The pump was installed in the rig used for Job 2236 to check its performance in various flight attitudes. The pump performance was found to be below that required. Test completed March 1955.

2418 Nash Booster Pump Test. The pump was installed in the rig used for Job 2236 to check its performance in various flight attitudes. The tests were extended to cover the pump performance with various inlet arrangements. The pump was considered unsatisfactory due to bad priming characteristics. Test completed February 1956.

2430 Fuel Flow Proportioner Test. The test is to check the performance of the proportioner unit under all flight conditions. The test is being made by the manufacture, Eclipse Pioneer, at Teterborough, N.J. U.S.A. The results so far achieved have not been entirely satisfactory. Testing is still in progress.

2501 Fuel Line Pressure Drop Test. Test to compare the actual pressure drop in the transfer pipes with estimated values. Test results were satisfactory. Test completed October, 1955.

2652 Vibration Tests of Hymatic Pressure Regulator. Test to determine the resonant frequencies on the valve operating mechanism and to subject it to the vibration test procedure as laid down in Avrocan Specification E.266. The resonant frequencies of the valve mechanism were determined in April, 1956 but the endurance vibration testing has been deferred until the resonance results are more fully evaluated.

C105 Fuel System Functional Tests (Cont'd)

2663 Vibration Test on Air-no-Fuel Valve. Test similar to that in the Hymatic Pressure Regulator - Job 2652. Test waiting return of specimen valve from manufacturer, following repair.

C105 Air Conditioning System Tests

2363 Air Conditioning System Tests. The rig is a full size replica of the air conditioning system containing aircraft ducting and equipment. The purpose is to check the performance and functioning of the system to determine pressures, airflows and temperatures throughout the system, and to check on thermal expansion. Testing on this rig will commence in June 1956.

2490 Pressure Loss in Corrugated Pipe Bend. This was a minor investigation for Design Office information, and was completed in March, 1955.

2524 Duct Insulation Test. To determine temperature distribution in the vicinity of the engine bleed ducts and efficiency of the insulation on the ducts. Satisfactory results were achieved after some development. Test completed December 1955.

2536 Pressure Loss in Air Supply Duct. Test to determine pressure loss in duct supplying air to the cockpit. Satisfactory results were obtained. Test completed July 1955.

2636 Leak Test on Bleed Air Engine Disconnect. Test rig designed and made. Waiting delivery of test specimen before tests can commence.

2637 Test on Marman J11 Type Joint Assembly. To determine the suitability of the joint assembly for the air conditioning system. Waiting delivery of test specimens before tests can commence.

2643 Test of Duct Mounting Rollers, Clamps and Insulation. To determine the life and suitability of the duct mounting under repeated expansion and contraction of the duct, and under vibratory conditions. Waiting for delivery of test specimen before tests can commence.

C105 Electrical System Tests

2357 Evaluation of Solderless Taper Pin Inserts for Electrical Plugs, etc. Tests of AMP taper pin solderless connectors were made over an extended period, with only partly satisfactory results. The tests were concluded in June, 1955.

2383 Check of the Efficiency of the new Cannon Electric Pressurised Connector. The pressure sealing of this connector was investigated, with results that were satisfactory after development. The work was concluded in December, 1954.

2393 Heat Resisting Characteristics of Terminal Strips AN 3436-2 AN 3436-7. These tests were conducted in October 1954, and the results were entirely satisfactory.

C105 Electrical System Tests (Cont'd)

2399 Electrical System Functional and Operational Tests. These are performance tests of the electrical systems from the bus-bars onward, under conditions representative of service only as regards load magnitudes and sequencing. They are being conducted on the Production electrical breadboard, and were begun at the end of April.

2512 Flexure Test of AN-22 Cable in a composite bundle of AN-20 and AN-22 Cables. A cable bundle representative of a proposed layout near a shock-mounted unit was vibrated until failure occurred of one wire at a clamping point. The failure was associated with original damage to the insulating jacket, and the performance was held to be satisfactory. Testing was concluded in December, 1955.

2514 Electrical Power System Tests. These are performance tests of the electrical power generation system and control gear up to the main bus bars, under conditions representative of actual operation on the ground and in flight, and are due to commence within a few weeks at a sub-contractors plant.

2525 High Temperature Test of AN3140-327 Lamps. The lamps were examined for electrical and physical damage after exposure to high temperature, and were found to be completely unaffected.

2543 Permanency of Wire Idents at High Temperature. Printing by means of a Kingsley automatic machine was investigated and found to be entirely satisfactory. The work was carried out during September, 1955.

2559 To Determine if Hydraulic Fluid-Specification MIL-O-5606 is an Electrical Conductor. The subject property was investigated over a wide range of temperature, and the conductivity was found to be negligible. This work was completed in February, 1956.

2655 Voltage Breakdown Test on Sample Header for Relay CS-R-131. The breakdown voltage of the sample was determined during April 1956, and was found to be about as expected. This job is now closed.

2666 Evaluation of Voltabloc Battery VO-15. This is the SAFT battery. Preparations for test are nearly complete, and testing should begin very shortly.

C105 Engine Installation Tests

2345 Air Intake and Engine Installation Tests. An investigation was made into ground testing a J.67 engine and air intake duct. The test was cancelled whilst in the scheming stage during February, 1955 due to an engine change, and resulting change of policy.

2553 Model Test of Engine Firewall. Tests were carried out to check the satisfactory functioning of the engine firewall, which is a removable item. The job was closed on January 5, 1956.

C105 Engine Installation Tests (Cont'd)

2629 Model Test of Insulation Blanket in Engine Bay. To determine extent of swelling of blanket due to a sudden reduction in external pressure. Test results were satisfactory. Test completed February, 1956.

C105 Oxygen System Tests

2507 Performance of Liquid Oxygen System. These tests are in abeyance.

C105 De-Icing System Tests

2441 Performance Comparison of Three Different Ice Detectors. Tests were conducted, on sub-contract, at the National Aeronautical Establishment, on detectors supplied by three firms, but only the P.S.C. type proved acceptable. This work was concluded in July 1955.

2480 Radome De-Icing Tests. Tests were conducted, on sub-contract, at the National Aeronautical Establishment, on a model of the proposed scheme, and information was obtained which will be useful in the final design. The work was completed in August, 1955.

C105 Model Tests

2208 Torsional Stiffness Test-Model Elevator. A check was made in November 1953 of the stiffness of a metal section intended for use as an elevator in a wind tunnel model.

2227 Bearing Strength of Aluminum Casting. This test was conducted in January 1954 to determine material properties for the design of the free flight models.

2249 Control Surface Actuator Tests-Model. Tests to develop a method of operating the control surfaces on the free flight models. A suitable system has been developed provided that a fluid can be found which will not deteriorate synthetic materials in the system. Testing is still in progress.

2270 Static Tests of Free Flight Model. Manufacture of the test rig is complete. We are now awaiting the delivery of the Free Flight Model for testing.

2312 Actuator Test-Free Flight Model. An available electric actuator was investigated in April 1954 for possible use in the free flight models, but was found unsatisfactory, and was not used.

2313 Limit load on Preliminary Booster Wing- Free Flight Model Booster. Development tests were carried out on wings for the booster rocket used in launching free flight models. Work was concluded in June, 1954 without actually testing the final design.

C105 Model Tests (Cont'd)

2332 Tests on Plastic Model for Strength Investigation. A series of tests were carried out on a strain gauged plastic model 3% thick fin. Strain distribution and deflections of the fin were recorded under various loading conditions. A complete model of the C105 with a 4% thick fin has been manufactured. Tests on this model have been placed in abeyance.

2362 Tensile Capacity of "Nylock" threaded inserts in Magnesium Casting. Tests were conducted in August 1954 to determine the loads required to pull out Nylock inserts from castings, in order to provide design information for the free flight models.

2392 Investigation of Rate of Evaporation of Solvent from Cemented joints Made in Zylonite at Room Temperature and at 160°F. Tests were carried out on coupons of Zylonite bonded together with acetone, to obtain the necessary curing time for this type of joint, for plastic model design purposes. The job was closed on November 15, 1954.

2398 Front Fuselage Plastic Model Strength. Tests were carried out on a plastic model of the C105 fuselage forward of station 485. The fuselage was cantilevered at st.485, and representative inertia loads applied to the structure. Deflection and strain gauge recordings were made. Tests were also carried out on a cut sectional model of the fuselage at frame 371 and 380. The job was closed on September 27, 1955, after valuable information on load distribution had been obtained.

2407 Shock Absorber Strength Test-Model Launcher. Strength tests on automobile shock absorbers intended for use in the free flight model launching device were conducted, and after some modifications had been made to the end attachments, they were found to be satisfactory. Work was concluded in November 1955.

2419 Stiffness of Model/Booster Connection. The stiffness of the joint of the free flight model to the booster rocket was measured and found to be satisfactory. Work was carried out in November, 1954.

2431 Functional Tests of Free Flight Model Launcher. Functional Tests were carried out on the Free Flight Model Launcher. Some minor modifications were made after the first tests, following which the functioning of the launcher was satisfactory. The job was closed on December 2, 1954.

2461 6/10 Scale Model Air Intake Test. Tests were run in the summer of 1955 using a wooden model of the C105 air intake in conjunction with an Orenda engine, to examine the intake characteristics. Some development was shown to be necessary, and preparations for further tests are in progress in the Aerodynamics Department. This job was closed in July 1955, but may be re-opened.

2500 Resonance Test of Free Flight Model-Booster Assembly. Resonance tests were conducted on the first free-flight model and booster rocket assembly, to detect any objectionable features. There were none. This work was done in May, 1955.

C105 Model Tests (Cont'd)

2517 Yaw Pulse Mechanism Tests under 'G' Conditions. Following the apparent failure to operate of the yaw pulse firing mechanism of one of the free flight models, an investigation was made on a centrifuge, without discovering any fault. No conclusions were drawn concerning the flight incident, and the job was closed on June 2, 1955.

2523 Pressure Test on Duct. Three fibre-glass model ducts were subjected to internal air pressure while at a temperature of 300°F and also at room temperature. The third trial was found to be satisfactory. The job was cleared in August 25, 1955.

2554 Pressure Testing of Free Flight Model Ducts. Pressure and leak rate tests were made on the intake ducts of two free flight models, with results that were satisfactory after some rework had been done. The job was closed February 14, 1956.

2656 Pressure Test on 6/10 Scale Engine Duct. To determine leakage rates of duct sections and to check their strength. Test in progress, approximately 70% completed. Reaminder will be carried out when modification in the shops has been finished.

Instrumentation

2060 Strain Gauge Instrumentation. About one and one-half years work has been done to date against this job, to determine the best procedures and techniques for using strain gauges on tests of aircraft structures, particularly with respect to adhesives and waterproofing methods. Observation will continue indefinitely on coupon samples intended to predict the behaviour of installations on the C105 static test aircraft, over the extended period of testing anticipated.

2672 Remote Deflection Indicating System. This job covers the design and construction with transducers now on order. The system is to be used for deflection readings at inaccessible points, e.g. under water, in interiors, or in high temperature locations. Work has been confined to preliminary scheming to date.

Planning and Reporting

Advance Test Results Closing jobs issued during April, 1956

ATR 2359/2 End Play for Various thrust loads on Fafnir Bearings.

ATR 2381/2 Casting Strength Test for Receiving Inspection CSC-1296.

ATR 2383/3 Check of the Efficiency of the new Cannon Electric Pressurised Connector.

ATR 2393/2 Heat Resisting Characteristics of Terminal Strips.

ATR 2406/2 Casting Test for Receiving Inspection CSC-1389, 1390.

Advance Test Results Closing Jobs (Cont'd)

ATR 2413/5 Strength of Light Weight Windscreen Panels

ATR 2419/2 Stiffness of Model/Booster Connection

ATR 2447/3 Nylok Bolts-Self Locking Properties

ATR 2425/11 Ground Test of Fully Powered Elevator Control A/C 18107

ATR 2438/2 Shear Test of Bolt-O-Seal Screws

ATR 2448/3 Determination of O Ring Seal Friction

ATR 2475/4 Impedance Test of Elevator Jack System

ATR 2476/2 Tension Tests of Bolt-O-Seal and NAS Bolts with ESNA Nuts.

ATR 2479/3 Shear Test of "Jo-Bolts"

ATR 2480/2 Radome De-Icing Tests

ATR 2465/2 Strength of Low Temper Windscreen Front Panel

ATR 2495/2 Casting Test for Receiving Inspection CSC 1230

ATR 2540/2 Main Frame Stabilizing

ATR 2546/3 Bendix Brakes Mock-up

ATR 2625/1 Canopy Seal Inflation System Test

ATR 2657/1 Driving Torque on Tuning Mechanism of R101A/ARN-6 Radio Compass

ATR 2662/1 Temperature Cycling Tests-Windscreen Glass

In addition eighteen Pre Test Data Sheets were prepared to define the test arrangements for their respective jobs and thirty-eight Advance Test Results were issued on partially or fully completed jobs.

ARMAMENT

C100

10,020 Calibration and Co-ordination of Latch Test Equipment. One further air operated latch load tester was calibrated for the Production Department.

10,032 T160 Installation in A/C 18103. This job is now complete with the issue of the final report AE 10032.

10,052 52 x 2" Rocket Pod Development Programme. Twenty-six rockets were fired in pairs at .007 seconds from the No.2 pod with the metal nose cap. The metal was lifted from the basic structure causing some damage and preventing further firing.

Armament (Cont'd)

10,052 (Cont'd)

The No.1 pod was repaired and re-shaped with a 1" thick nose cap of Epon and fibreglass. This is presently being finished in the Experimental shop and will be fired early in May.

10,104 Permament Type Rocket Pod Test. Firings of single and three rockets at .007 seconds were performed from the pod with the metal nose cowl and truncated tail cone.

This job is now completed as far as the training pod is concerned, however, further information is required by the Design Office regarding the effect of the cowl in reducing blast load on a full pod. These tests will be performed when the flight tests have been completed.

10,108 Measurement of Look Angle on C100 Aircraft. One further set of measurements have been taken with the missile relocated to give a minimum look angle of 35° from any position.

10,109 V.G. Pylon Jettison Tests. Two initial jettisons were performed with the pylon only, under the rolling pull out air loading case. The pylon jammed on the rails during the second test, bending the pylon rail. The rail has been straightened and ten further jettisons are to be performed to see if the jam will repeat.

The air assisted pylon is now available and will be tested when the unassisted pylon case is completed.

10,113 Devel opment of a Repair Scheme for the V.H.F. Antenna. This job was cancelled by the Design Office.

10,116 Modified 7 Tube Training Launcher Tests. The correct grade aero jablex plugs were received. Testing will start early in May. The delay was caused by other priorities in the Tunnel Butts.

10,117 Rocket Retainer Tests. This test has now been completed on the experimental retainers which satisfactorily hold the rockets under all conditions and make no difference to the rocket dwell time during firing. Further tests are to be performed on the Production version of the retainer.

10,118 2.75" Blast Operated Latch. Tests have been satisfactorily completed on the Experimentally manufactured and assembled latches made with Production tooling. Further tests are to be performed on Production manufactured specimen.

10,119 Muzzle Velocity 2.75" Rocket Tests. Tests have been performed in conjunction with Job No. 10,117. This job No. will be kept open for the accumulation of data on 2.75" rocket dwell times, velocity and accelerations.

Armament (Cont'd)

10,120 Vibration Conditions at Junction Box R1. This test is in hand and awaiting the availability of an aircraft.

C105

The following is a summary of all C105 Armament Test Work.

10,001 Torsional Stiffness Test of Falcon Missile Bay Door. Tests were performed on two doors, one of standard construction and one filled with lockfoam. The tests were performed at room and elevated temperatures. A Final report has been written and is awaiting issue.

10,004 Falcon Functional Mock-up-One Missile Bay. Functional Tests were performed on a one bay mock-up of the Falcon missile launching mechanism. This job was cancelled in November, 1955.

10,005 Mock-up Armament Package. Handling trials were performed using the full mock-up Falcon package in the C105 wooden mock-up. A ground test stand was manufactured. The existing mock-up package is to be modified for preliminary handling trials for the sparrow missile installation and further Sparrow package handling trials will be performed under this job number.

10,006 Missile Actuating Mechanism On a CF100. The installation in the aircraft was approximately 90% complete when this programme was cancelled in November, 1955 all instrumentation was removed from the aircraft, the specimen removed and stored and the aircraft returned to the R.C.A.F.

10,007 Armament Test-Complete Installation. Preliminary Design work was completed on this project to ground function and fire the Falcon and Sparrow missile test packages as originally conceived.

The work on this test is now in abeyance after the Falcon cancellation and this job number closed pending further information on the sparrow installation testing will continue under Job No. 10066.

10,022 Latch-Missile Package Front Attachment. Tests were completed and a report issued on the original specimen which failed. The job is now closed on Design Office request.

10,051 Semi-Submerged Falcon Installation. This test was completed and a report written, it will be issued shortly under No. AE 10051.

10,066 Sparrow Missile Installation on C105 Aircraft. This job is in abeyance pending further information from the Design Office reference the ground testing of the full Sparrow package.

10,099 Cam Plate repeated load test. This job was completed and report AE 10099 issued.

Armament (Cont'd)

C105

10,105 Sparrow Missile Look Angle C105 Aircraft. Various tests have been performed to determine the optimum look angle of the sparrow missile when extended from the package in the aircraft.

All tests to date are reported in A.A.R's 10,105/1 and 2. This job is being kept open.

10,114 Sparrow Package Door Tests. Preliminary Specimen drawings received from the Design Office and issued to the experimental shops for manufacture. Details of the doors and door operating mechanism are still awaited. An existing rig can be used for the tests.

10,115 Sparrow Missile Extension Mechanism Tests. Manufacture of the specimen is approximately 70% complete, the chief hold up being on the jack manufacture. Rig design is in work. The test is estimated to start approximately June 15, 1956.

Armament Data Sheets Issued during April, 1956

10052/22 52 x 2" rocket pod development

10116/2 Modified 7 Tube training launcher tests

10118/1 and 2 2.75" Blast Operated latch.

Armament Advanced Reports Issued during April, 1956

10052/44-46 Incl. 52 x 2" Rocket pod development.

10104/10 & 11 Permament type rocket pod tests.

10108/3 & 4 Measurement of look angle on C100 Aircraft

10109/1 V.G. Pylon Jettison Tests

10117/1 to 7 Incl. Rocket Retainer Tests

10118/1 to 3 Incl. 2.75" Blast Operated Latch.

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