21th, November 1961

Our reference : P 214 WJM/AQ

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FR 7/25

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Attention : The Manager

Subject : Test Rig Program

Dear Sir,

Attached herewith is a copy of Mr. Melbourne's report relative to the principal rigs required for the ATAR 9C program. There are (14) rigs involved in this program and the total approx. estimated cost is £ 76,000 exclusive of any rearrangements which may be necessary.

It will be necessary to provide additional area to accomodate these rigs and it is considered that this could best be achieved by locating (2) of the sub-assembly checking rigs in the assembly dept annexe. If the government proceeds with the 40' x 40' building in the test house area, this will provide sufficient accomodation for the fuel control unit rig together with some area for bench work.

CIRCULATION / COPIES 29/11/61

E.F. MNGR ✓	FCT. ADM. SUPT.
DSGN. ENGR	MC. SHOP. SUPT.
DEV. ENGR ✓	PRODUCN. SUPT.
SERV. ENGR	ASSMLY. SUPT.
QUAL. ENGR	FOUNDRY. SUPT.
PROD. ENGR	METLLAL. SUPT.
MATL. ENGR	PROCESS SUPT.
CH. TL. DSGR	TOOL. PROD. SUPT.
CH. INSP. E. F.	TOOL. ROOM. SUPT.
A/F MANAGER	SUPT. INSPECTION

Yours faithfully,

C. Bellward

C. BELLWARD

22nd, November 1961.

WJM/SG

TEST RIG PROGRAM
ATAR 9 C Engines.

1) SUMMARY OF RIGS

A review has been made of the principal rigs required for the ATAR 9 C engine program. These rigs may be classified in 2 main groups and the rigs together with estimated costs are listed as follows :

a) Engine sub assembly proving rigs

Central casing rig	£: 1250
* Afterburner fuel manifolds rig (kerosene)	750
Afterburner fuel manifolds rig (water)	2000
Accessories support and drives rig	4000
* Oil pump rig	2500
Total	£ 10500.

b)"Trouble shooting" Rigs.

Fuel control units rig	£ 45000
Air system rig	5000
Kerosene rig (general purpose)	5000
* Fuel pump rig	1250
* Burner rig	1000
* Starter rig	2000
Capsule rig	1000
Oil rig (general purpose)	3000
Electrical rig	2250
Total	65500

* Note : existing rigs modified.

Grand Total : £ 76,000

2) Basis of RIG REQUIREMENTS

Whilst the engine accessories are to be purchased overseas, our own previous experience and SNECMA experience indicates that it is essential to have a comprehensive range of rigs to check and adjust those accessories which may develop defects during engine testing. In addition it is necessary to be able to cope with any accessory modifications which may arise from time to time. A study has been made of the accessories rejected during testing of ATAR 9 B engines and this has been an important factor in assessing our needs. Provision has been made to cope with all checking and adjustment requirements of accessories, but those tests peculiar to a manufacturing program are not provided for in their entirety.

In view of the huge expense involved in a complete rig program, it is proposed to provide a number of general purpose rigs which are capable of accommodating groups of allied accessories.
The principal rig is for the testing of fuel control units and it is proposed to combine the features of the (2) types of SNECMA rig so that main fuel control units and Afterburner fuel control units can be accommodated on the one rig.

3) CAPACITY OF RIGS

In general, the rigs proposed are ample to cope with the engines build program of 3 engines per month and in most instance have capacity to cope with an overhaul program of a similar rate.
The principal limitation is expected to be the fuel control unit rig. On the basis of a continuing engine build program of 3 engines per month, the overhaul of fuel control units would be limited to not more than 2 engines per month on a (1) shift basis.
In regard to the availability of the present C.A.C. fuel system rigs, it is presumed that (2) pump rigs and (1) burner rig will continue to be fully utilized for AVON or other fuel systems work.

4) LIMITATIONS OF ASSESSMENT

Technical information relative to the Approach Fuel Control Unit and the kerosene Starter is not yet available from SNECMA. A tentative proposal has been made for the kerosene starter but it is not yet known whether the general purpose rigs proposed will accommodate the testing of all features of the approach fuel control unit.
The testing of production ATAR 9 C engines has not been started at this date and consequently the assessment of rig capacity cannot be made on actual 9 C achievements.
In almost all cases, it will be necessary for a detailed design study to be made of the rigs. The estimated costs given are therefore approximate only.

5) ACCOMODATION OF RIGS

In view of the large number of rigs involved, it will be necessary to locate some of the sub-assembly rigs away from the rig room area and it is proposed that they should be located in the assembly dept annexe. With the exception of the fuel control unit rig, the remaining rigs can be accommodated in the existing fuel systems rig area if our current proposal for the utilization of the rig room annexe for rigs is approved.
It will be necessary to accommodate the new fuel control unit rig in the proposed new 40' X 40' building which has previously been submitted to the Government for approval. This building had originally been intended for bench work under this scheme. Some structurel modifications would be necessary to accommodate the fuel control unit rig and on a long term basis, this building should be capable of housing a second fuel control unit rig because of the possible capacity limitations of one rig. It may be of interest to record that one of the SNECMA fuel control unit rigs occupies a space of approx. 22' X 45'.

.../...

6) SUMMARY OF PROPOSED ATAR RIG LOCATION

Aircraft division

" Afterburner fuel manifolds rig (water)

Engine assembly dept annexe

" Accessories support and drives rig

" Oil pump rig (existing wheelecase rig)

Main rig room area

Central casing rig
Kerosene rig (general purpose)
Fuel pump rig (existing endurance rig)
Burner rig (existing rig)
Afterburner fuel manifolds rig (kerosene)

Rig room annexe

Oil rig (general purpose)
Air systems rig
Capsule rig
Electrical rig (tentative only)

Starter rig area

Kerosene starter rig.

New building

Fuel control units rig.

7) REARRANGEMENTS

This scheme provides for the transfer of (1) only additional rig i.e. the existing wheelcase rig. The rearrangement of burner rigs and small fuel pump rig has previously been approved prior to the ATAR projects.

Some rearrangement of the fuel reticulation system will be necessary to accommodate the extra rigs and it is possible that some form of heat exchanger system may be required. This is stillunder review.

Some rearrangement of the electrical supply system will also be necessary to accommodate the additional power requirements.

8) RIGS AND EQUIPMENT NOT INCLUDED

No provision has been made for the testing of the afterburner fuel pump. Whilst this pump has been developed and built under SNECMA's technical direction, it is an airframe supply part. A major rig would be required because of the necessity to drive the pump with air. This pump is to be mechanically driven on the 9K engine and the large expense of a rig would hardly seen warranted.

In the event of accessory manufacture being undertaken, ovens would be required for percentage "hot" check and deep freeze cabinets would be required for "cold" operating tests. In addition, vibration equipement is required for certain acceptance tests.

A. Melbourne

I. CENTRAL CASING RIG

Classification
Sub assembly proving rig.

Purpose
Check pressure tightness of fuel manifold and flow distribution of burners.

Test fluid
Kerosene plus 5% oil (Ambient temperature).

Proposed Location
Rig room area adjoining fuel pump endurance rig.

Test schedule DT 65-05.

Design status
C.A.C. study required for the simplification of rig and utilization of existing fuel supply.

Manufacturing status
New rig required.

Completion
Required on completion of first central casing sub assemblies at C.A.C.

Rig capacity
Ample for program of 3 engines per month. Approx utilization 4 hours per engine.

Remarks
Rig modification may be required to suit 9 K engine.

Estimated Cost
Allow £ : I250.

2. AFTERBURNER FUEL MANIFOLDS RIG

Classification
Sub assembly proving rig.

Purpose
Check of flow rate of upstream and downstream fuel manifolds.

Test Fluid
Kerosene (temperature 20ºC +_ 5)

Location
Rig room area adjoining burner rig

Test schedule DT 63-08

Design status
C.A.C. study required for utilization of existing fuel supply.

Manufacturing status
New rig required.

Completion
Required on completion of manufacture of afterburner fuel manifolds in Aircraft Division

Rig capacity
Ample for program of 3 engines per month.
Approx utilization 6 hours per engine.

Estimated Cost
Allow £ : 750.

a.l.h.

3. ACCESSORIES SUPPORT & DRIVES RIG

Classification
Sub assembly proving rig

Purpose
Check functionning of the following drives under partial load:
a) Accessory support gearbox
b) Accessory support drive (Renvoi de commande)
c) Angle drive for air frame accessories (Prise de mouvement)

Test Fluid
Synthetic oil (High temperature)

Proposed Location
Seperate area in Nine annexe.

Test schedules
DT 65-07 and DT 65-08.

Design Status
C.A.C. study required to ascertain whether all of this work can be combined on the one rig.

Manufacturing Status
New rig required.

Completion
Required on completion of initial sub assembly build of the parts concerned.

Rig capacity
Ample for program of 3 engines per month.

Remarks
This rig will need modification to suit 9 K engine.

Estimated Cost
Allow £ : 4000

W. Rob.

4. FUEL CONTROL UNIT RIG

Classification
Trouble shooting rig

Purpose
Check functioning and permit adjustment of the following major accessories.
a) main fuel control unit.
b) afterburner fuel control unit.

Test Fluid
Air
Synthetical oil
Kerosene
Petrol..

Proposed location
In new 40' X 40' building previously proposed in test cell area.

Test schedule DT 62.00/II and DT 63.00/II

Design status
C.A.C. STUDY to be made to enable the testing of both fuel control units on the one rig. Schematic diagrams of fuel, oil, and air circuits available from SNECMA.
Ambient temperature tests should be suitable for the initial trouble shooting requirements. Provision will be made in the initial rig for incorporation of high temperature fuel, oil, and air circuits as a second stage to the rig.
The building will be required to have special features to accomodate the rig.

Manufacturing status
New rig required.

Completion
Required to be available for trouble shooting as soon as possible after commencement of engine testing program on basis of I7% rejection of principal fuel control Units and I4% rejection of Afterburner Fuel Control Unit during engine test.
Target date for completion. End of march I963.

Rig capacity
Ample for trouble shooting on a 3 engines per month basis, probable utilization on fuel control unit work is 50% of capacity.
An additional rig would probably be required to cope with a build or overhaul program.

4. FUEL CONTROL UNIT RIG (continuation)

Remarks

The fuel flow characteristics of the rig are being designed on the basis of 9 C engine requirements plus 30%. This will be sufficient to cover 9 K requirements and still leave a margin for future increased demands.

Estimated Cost

A rig of this type has been quoted at approx. £ 50.000 AUS. to the Swiss Mission.

It is estimated that approx £ : 30.000 would be required for the initial conception of the rig without high temperature tests.

Allow say £ : 45.000 for rig complete with all high temperature testing facilities.

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5. OIL PUMP RIG

Classification
Sub assembly proving rig.

Purpose
a) check assembly and functioning of LP oil pump.
b) check assembly of nozzle jacks.
c) check functioning and permit adjustment of HP oil pump on a trouble shooting basis.

Test Fluid
Synthetic oil (high temperature).

Proposed location
Separate area in Nene annexe.

Test schedules DT 65-02, DT 65-I2, DT 62-I8.

Design Status
SNECMA use different rigs for testing these units. C.A.C. study required to ascertain whether the existing wheelcase rig at C.A.C. can be redesigned to accomodate the units listed.

Manufacturing Status
Alter existing rig and relocate to permit accomodation of kerosene rigs in rig room area.

Completion
Required to be available for trouble shooting as soon as possible after commencement of engine testing program. Required for sub assembly work by end of June I963. Target date for completion end of March I963.

Rig capacity
Requirement for sub assembly checking estimated at 10 hours per engine. Ample capacity availableefor defect investigation of HP oil pump.

Remarks
The defect investigation requirement is important as 20% of HP oil pumps were removed during engine test on the ATAR 9 B program.

Estimated Cost
Allow £ : 2,500.

6. AIR SYSTEMS RIG

Classification
Trouble shooting rig.

Purpose
Adjustment of the following accessories:
a) Centrifugal metering stop corrector (Correcteur de butée).
b) Thrust corrector (Correcteur de poussée).
c) Thrust corrector electro-valve (Electro robinet correcteur de poussée).
d) Reduced P2 pressure electro valve (Electro robinet à vanne de décharge).

Test Medium
Air (Pressure and vacuum)

Proposed location
Rig room area.

Test Schedules
DT 62-14, DT 62-I3, DT 62-I2.

Design Status
C.A.C. study required. No SNECMA drawings available.

Manufacturing Status
New rig required.

Completion
Required to be available for trouble shooting as soon as possible after commencement of engine testing program on the basis of 12% rejection of metering, Stop correctors and I8% of starting group detectors during engine test. Target date for completion end of March I963.

Rig Capacity
Ample for trouble shooting on 3 engines per month basis. Should be ample capacity for build or overhaul program.

Estimated Cost
Allow £ : 5000.

7. GENERAL PURPOSE KEROSENE RIG

Classification

Sub assembly checking rig.

Purpose

a) Check assembly and functioning of nozzle jacks.
b) Checking of main fuel control unit sub assemblies (11 items)
c) Functional checking of miscellaneous fuel system unit as follows :
   Combined dump and distributor valve (Purgeur distributeur)
   Double manifold distributor A.B. (Distributeur double rampe)
   A.B. ignition electro valve (Electro robinet allumage P.C.)
   Fuel Filter (Filtre à carburant)
   Pump for kerosene starter (Pompe à carburant "RETHEL")
   Check valve-starting system (Soupape de retenue)
   Check valve - AB ignition (Soupape de retenue).

Test Fluid
Kerosene plus 5% oil (Ambient temperature).

Proposed location
Rig room area

Test schedules a) DT 65-I2
b) DT 62-00/I
c) DT 62-02, DT 63-04, DT63-06, DT 63-03, DT 62-06, DT63-I0.

Design Status
C.A.C. study required on the basis of Test schedule requirement of the parts to be tested.

Manufacturing Status
New rig required.

Completion
Nozzle jacks will require testing approx June I963.
Remainder of rig attachments should be available for checking of fuel system components which require partial strip for defect investigation.
Target date for completion of entire rig - end of September I963.

Rig capacity
This rig should have ample capacity to cope with trouble shooting requirements and may possibly cover requirements arising from and overhaul program.

Remarks This rig has been included on the premise that (2) of the existing fuel system rigs will be continuously required on AVON or other fuel system work.

Estimated Cost Allow £ : 5000.

8. FUEL PUMP RIG

Classification
Trouble shooting rig.

Purpose
Checking of main fuel pump

Test fluid
Kerosene and petrol

Proposed location
Rig room area (existing rig).

Test schedules DT 62-OI.

Design status
C.A.C. study required to enable existing petrol endurance rig to be modified to accommodate the ATAR pump.
Ambient fuel temperature tests should be suitable for initial trouble shooting requirements.

Manufacturing Status
Adapt existing petrol endurance rig - alternatively existing fuel systems rig could be modified for this purpose.

Completion
Major rig modification is not required and the work can be fitted into the program to the best advantage.
Target date for completion end July I963.

Rig capacity
Rig capacity will be ample for the small amount of rectification work expected on fuel pumps. Some capacity should be available for work on other fuel system components.

Remarks
Redesign of fuel pump is under consideration to give greater delivery for 9 K engines. This rig would also be suitable for testing the mechanically driver afterburner fuel pump as used on the 9 K engine, subject of course, to the provision of the necessary adaptation.

Estimated Cost
Allow £ : I250.

9. BURNER RIG

Classification
Trouble shooting rig.

Purpose
Checking of burners as follows :
a) main burners (20 per engine)
b) Starting injector (2 per engine)
c) Afterburner injector (1 per engine).

Test Fluid
Kerosene

Proposed location
Rig room area

Test schedules
DT 62-03, DT 62-05, DT 63-05

Design Status
C.A.C. study required to permit modification of existing burner rig.

Manufacturing Status
Alter existing burner rig.

Completion
Major rig modification is not required and the work can be fitted into the program to the best advantage.

Rig capacity
Rig capacity will be ample for any trouble shooting required. Sufficient surplus capacity should be available to cope with a manufacturing or overhaul program.

Remarks
Nil

Estimated Cost
Allow £ : 1000.

IO. STARTER RIG

Classification
Trouble shooting rig.

Purpose
Check functioning of kerosene starter.

Test fluid
Kerosene

Proposed location
Cartridge starter test area.

Test schedule
Not available

Design Status
C.A.C. study required for modification and adaption of existing cartridge starter rig.

Manufacturing Status
Modify existing starter rig.

Completion
Kerosene starters are not yet in service on ATAR engines. Consequently, we must be prepared at an early stage for any troubles which may arise.
Target date for completion - end of March I963.

Rig capacity
No cartridge starter overhaul work has been allocated to C.A.C. so that the entire capacity of the rig should be available for kerosene starter work.
Ample capacity should be available, for any trouble shooting work required.
It is anticapited that the capacity should be sufficient to cope with any overhaul program.

Remarks
Documentary information relative to the design of the kerosene starter will not be available before the end of december I96I. It is not known at this stage whether any rig design data will be available from SNECMA.

Estimated Cost
Allow £ : 2000.

II. CAPSULE RIG

Classification
Checking of capsule charateristics.

Test Fluid
Air

Proposed location
Rig room area

Test schedule DT 62-00/I

Design Status
C.A.C. study required.

Manufacturing Status
New rig required.

Completion
To best advantage target date for completion - september 1963.

Rig capacity
Ample for defect investigation work and overhaul program of fuel control units.

Remarks
Nil

Estimated Cost
Allow £ : 1000.

I2. GENERAL PURPOSE OIL RIG

Classification
Trouble shooting rig

Purpose
a) Preregulation of the main Fuel Control unit.
b) Checking of F.C.U. oil system sub assemblies as follows :
   Oil pump (F.C.U.)
   Metering device actuator (Vérin de secours)
   Servo valve
c) Functional checking of miscellaneous oil system accessories as follows :
   By pass valve (Chapet by-pass)
   Oil filter
   Oil metering pump
   Oil spray nozzles.

Test Fluid
Synthetic oil (high temperature).

Proposed location
Rig room area.

Test schedules DT 62-00/II, DT 62-00/I, DT 62-I9, DT 64-0I, DT 64-04, DT 65-02.

Design Status
C.A.C. study required to evolve suitable general purpose rig.

Manufacturing Status
New rig required.

Completion
To best advantage. Target date for completion - september I963.

Estimated Cost
Allow £ : 3000.

I3. ELECTRICAL RIG

Classification
Trouble shooting rig

Purpose
Checking of electrical accessories of engine as follows :
a) Electro-robinet allumage P.C. (AB ignition electro valve)
b) Détecteur de vitesse de démarrage (Starting detector)
c) Bougie à incandescence (Glow plugs)
d) Boite de protection (Labavia box)
e) Tachymêtre (Tacho generator)

Testing Medium
Electrical

Proposed location
To be determined.

Test Schedules DT 63-06, DT 64-I6, DT 64-08, DT 64-07.

Design Status
No SNECMA rig is available.
C.A.C. study required to determine form and scope of rig.

Manufacturing status
New rig required.

Completion
To best advantage. Target date for completion - September I963.

Rig capacity
Ample for trouble shooting and assembly checks.

Remarks
It may be found possible to make provision for some of these checks to be incorporated on the pneumatic or other rigs. This aspect will be covered during the design study.

Estimated Cost
Allow £ : 2.250.

I4. AFTERBURNER FUEL MANIFOLDS RIG (WATER)

Classification
Sub assembly proving rig

Purpose
Check spray characteristics of upstream and downstream fuel manifolds.

Test Fluid
Water

Location
Aircraft division

Test Schedule

Design Status
C.A.C. study required for rig simplification

Manufacturing Status
New rig required

Completion
Required during manufacture of afterburner fuel manifolds to permit adjustment of spray holes.

Rig capacity
Ample for program of 3 engines per month approx utilization 50 man hours/ per engine.

Estimated Cost
Allow £ : 2000 (being treated as tooling).