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ARROW 2 **CONFIDENTIAL**
A STUDY OF THE
BASIC CONCEPT OF AN ENGINE RUN UP FACILITY
Report No. 72/GEQ/8 **ANALYZED**

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J. H. PARKIN
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J. H. PARKIN
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BASIC CONCEPT OF AN ENGINE RUN UP FACILITY

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Report No. 72/GEQ/8
May 1958.

ANALYZED

Prepared F. Halpin
F. Halpin
G.S.E. Engineering

Approved A.R. Littleboy
A.R. Littleboy
Section Chief Ground Equipment

Approved J.P. Booth
J.P. Booth
Chief of Equipment Design

Authorized C.V. Lindow
C.V. Lindow
Engineering Project Manager
Arrow

ENGINEERING DIVISION
AVRO AIRCRAFT LIMITED, MALTON, ONTARIO.

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ERRATUM

TO

AVRO REPORT NO. 72/GEQ/8

OCTOBER, 1958.

"ARROW 2. A STUDY OF THE BASIC CONCEPT
OF AN ENGINE RUN UP FACILITY"

PAGE 3 PARA. 3.2 LAST LINE

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Prepared

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F. Halpin
G.S.E. Engineering



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1.0 INTRODUCTION

The buried installation of the Iroquois engine in the Arrow 2 aircraft makes it necessary to remove the engine from the airframe for all maintenance functions other than minor servicing and limited inspection. In order to perform the maintenance functions on the engine when removed from the airframe, a run up and test facility will be required at all Arrow bases.

The facility must provide for:

- (a) Testing of a complete power plant prior to installation in the aircraft. The power plant consists of an engine, afterburner, and accessories, such as the constant speed drive, alternator, power take off gear box and lubrication system.
- (b) Trouble shooting of a defective engine removed from an aircraft in accordance with the engine maintenance concept outlined in Chapter 2.

The purpose of this report is to describe a facility which will be adequate to accomplish the recommended maintenance procedures of the engine and airframe manufacturer.

1.2 AUTHORITY FOR WORK

This report is prepared in accordance with RCAF letter S1038-105-11 (ACE-1) dated 4th October 1955 which requests a study of 2nd line maintenance facilities required for support of the Arrow.

2.0 ENGINE MAINTENANCE CONCEPT

To overcome the servicing problems associated with "Buried installation" of the Iroquois engine in Arrow aircraft, the installation design permits rapid removal and replacement of the engine for servicing and trouble-shooting purposes.

Therefore in order to return a defective engine to a serviceable condition in the quickest possible time, each Arrow base should be equipped with an adequate trouble shooting facility. This facility to be equipped to perform defect isolation and supported with a work-shop capable of rectifying defective engine equipment by replacement or adjustment.

Experience gained on the servicing of the "Orenda" engine has shown that through lack of adequate trouble shooting facilities, engine and engine accessories are being returned to manufacturers in a serviceable condition.



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2.0 ENGINE MAINTENANCE CONCEPT (Continued)

This has resulted in the need for a pipeline of costly spares and has obscured the serviceability record of many components.

The high cost of Iroquois engine and its accessories makes it essential to provide a run up test facility designed to minimize the need for a spares pipeline and to ensure maximum utilization of each engine.

The proposed facility will be equipped and instrumented to conduct pre-installation tests and a thorough trouble shooting program. Suitable silencers for twenty-four hour operation are included in the proposal.

The engine when received at an Arrow base will be delivered to the build up and storage area. Here the components such as the afterburner, constant speed drive and alternator will be added, thus completing the power plant assembly.

The power plant assembly will then be installed in the run up stand, operated adjusted and checked out for installation in an aircraft.

Defective engines removed from the aircraft will be operated in the run up stand and sufficiently instrumented to isolate any defect.

The workshop will provide facilities for adjustment of fuel controllers - replacement of hydraulic and lubricating oil seals in actuators and valves, pump servicing etc.

3.0 DESCRIPTION OF PROPOSED FACILITY

3.1 The proposed facility consists of two adjacent buildings:

- (a) An enclosed run up stand and supporting services, a permanent structure typical of an engine test cell.
- (b) A storage area and workshop, adjacent to the test cell and jointed by a covered passageway.

The total covered area is illustrated in Fig. 1. and encloses about 8500 square feet.

3.2 Test Cell

The test cell consists of the engine run up area and test stand, a control room, intake silencing, exhaust silencing with afterburner water supply and pumping equipment, a fuel storage tank and pumping equipment.

It is proposed to use the mobile engine starter for all starting duties in the run up area.



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3.2 Test Cell (Continued)

Auxiliary equipment will include a hydraulic system for the constant speed drive, a load bank for the alternator, and possibly a dummy load for the power take off gear box.

The hydraulic system for the constant speed drive consists of a reservoir, a pump (5 $\frac{1}{2}$ GPM Minimum), a 5 micron filter, a de-aerator tank and a heat exchanger capable of dissipating ~~250~~ BTU/MIN.

1180

*Amended - See
erectum.*

3.3 Workshop & Storage Area

This building will enclose an engine receipt and storage area, stores for engine auxiliaries and spares, office and crew room facilities, and the engine workshop.

3.4 General Considerations

The proposed facilities would be most conveniently located close to the 2nd line maintenance hangar and thus the silencing equipment must be designed to reduce the noise level to below the nuisance factor value, i.e. below 80 db.

This sound pressure level although acceptable for working conditions is too high to permit location close to domestic installations.

Because of this a remote site is desirable.

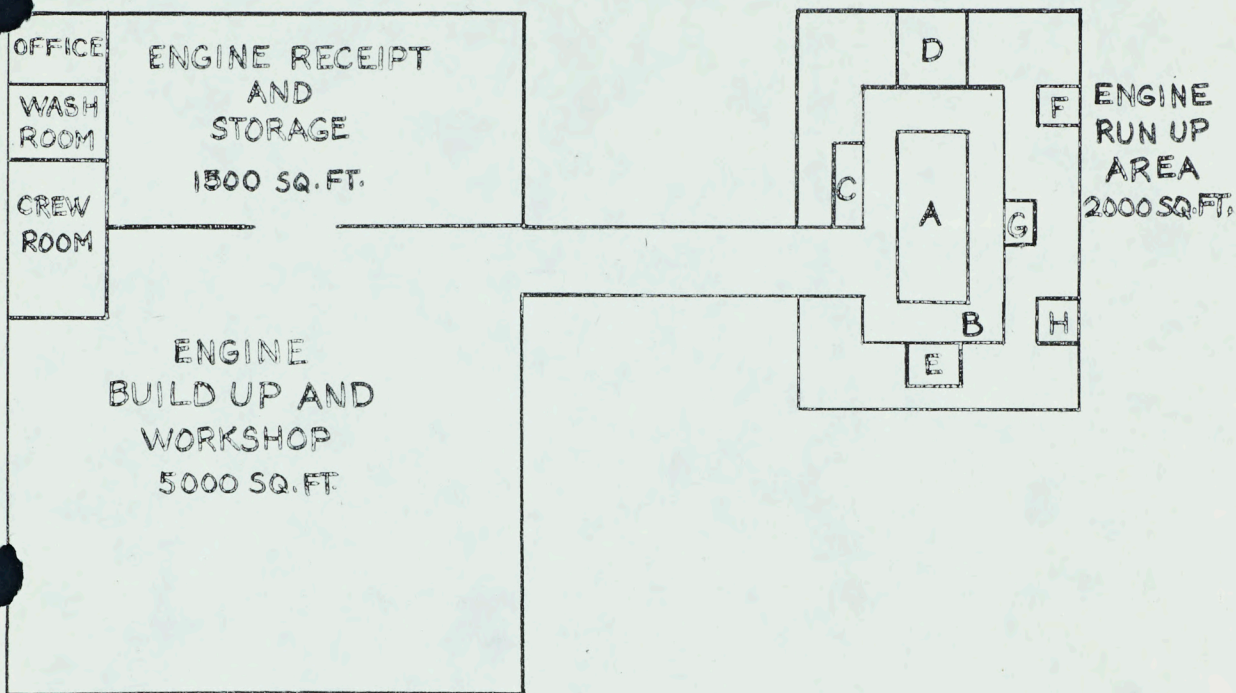
The cost of the proposed facility will be high but it is considered that the expense will be justified by the reduction in logistic support required to maintain a supply of serviceable engines.

The Ground Support Equipment List Report # 70/GEQ/1 details a requirement for four engine run up facility installations for use by the R.C.A.F. Orenda Engines Ltd. have the design responsibility for the engine run up facility but as yet no contractual arrangements have been made.



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- A- ENGINE RUN UP STAND
- B- TEST CELL
- C- CONTROL ROOM
- D- EXHAUST SILENCING
- E- INTAKE SILENCING
- F- EXHAUST SILENCER WATER SUPPLY (AFTER BURNER OPERATION)
- G- MOBILE ENGINE STARTER
- H- FUEL TANK

FIG. 1
ENGINE RUN UP & TEST FACILITIES