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ACTION COPY SENT
TO ENGINE SUPT.

21st July 1961.

MISSION AUSTRALIENNE,
S. N. E. C. M. A.
70 Bd. Kellermann,
PARIS 13ème
FRANCE.

Our Reference CB/SS P.17

To the Secretary
COMMONWEALTH AIRCRAFT CORPORATION PTY. LTD
BOX 779H P.O.
ELIZABETH ST.
MELBOURNE - AUSTRALIA.

FR 2/9

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31 JUL 1961	
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ATTENTION - Mr. D.M. CARROLL

SUBJECT - Broaching Equipment ATAR Project

Dear Sir,

We have now been able to make a review of the surface broaching carried out at S.N.E.C.M.A. and the equipment considered necessary.

The work is as follows : -

a) Turbine Disc and Shaft H.P. and Turbine Disc LP.

S.N.E.C.M.A. use 2 Forst Vertical Broaching Machines, Type RSA 10-1800.

These are Single Ram Machines of 10 metric Tons capacity and with a stroke of about 55" - the length of broach being approx. 50". The bucket grooves are broached from the solid in 4 stages as shown in Sketch 1 attached.

Four broaches are fitted at about 5" centres in the bolster and the work table has a cross slide with stops to bring the work into position in front of each broach as required.

The work is faced up to the first broach and successively indexed right round for the first pass, then moved across to the second broach, cut right round - this being repeated for the 3 and 4th positions. The last cut makes the serrations and requires 1200 Kilos = 1.2 tons, speed is approx. 6 ft/min.

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If we continue with our proposed method of rough milling the grooves, and then finish broaching the groove plus cutting the serrations in one pass, our Weatherly Broaching Machine in Dept.42 should meet all requirements.

b) Compressor Discs

SNECMA have two machines, both horizontal.

The first is a very large La Pointe Electro Hydraulic with approx. 156" stroke.

This machine pulls 5 sections of broach adding up to about 90" length, through in one pass to form each dovetail slot.

This type of machine, both in cost and floor area is out of the question for us.

The second machine is a Forst Horizontal Broach of the type used for hole broaching. It is almost the same as our La Pointe, except that the apron or tray is removed, and a large face plate fixture, having three indexing tables, on slides radiating from the centre, is fixed to the platten of the broaching machine. The face plate fixture is a large and complex unit, as each of the three positions has an adjustable circular arc ways, to give the right lead of groove for each wheel, plus a radial slide to retract the wheel being cut, on the return stroke of the broach. Each fixture position, of course, also has to have indexing for the correct number of slots. The indexing is manual.

On this machine, each slot is broached in 3 stages - first a rectangular section; then the angle sides of the dovetail, then the bottom of the dovetail.

Actually, SNECMA regard each pass as a separate operation in this machine and there may be different wheels, being done on any one of the 3 slides at the same time.

I have attempted to make sketches (sketch 2) to give a better idea of the layout.

The capacity of the machine is 19 metric tons, with 1 ton per broach actually used, i.e. 3 tons when all stations are in use. Stroke is approx. 48" and speed 3 ft/minute. The broaches are in sections and a typical case is as follows :

1st pass	3 pieces	totalling	35 5/8" long
2nd pass	3 pieces	totalling	37" long
3rd pass	2 pieces	totalling	39 3/4" long

Whilst it would doubtless be possible for us to obtain the face plate fixture and adapt it to either one of our horizontal broaches or to a specially purchased one; it appears much more desirable to use a vertical broaching machine, with simple indexing fixtures.

In this regard, the La Pointe SRV - 15 - 90 mentioned in Coastal Machinery's letter of July 6th, attached to M-6 would be very suitable, as the 90" stroke would permit us to use the broaches used on SNECMA's large La Pointe, the sections for these totally 87" in length. It should be noted that the broach sections used on the La Pointe and the Forst are different in lengths.

If this machine is considered to be too large, then the next best alternative would be a 60" - 66" stroke 10 ton vertical single ram machine, using two broaches, (again the large La Pointe broach sections) side by side on the bolster and a two position fixture for the work, the two broaches would then be 48" and 39" long respectively.

There are 489 slots to broach on the 9 C allowing 2 minutes per pass and 2 passes per slot :

$$\text{Time / engine} = \frac{489 \times 2 \times 2}{60} = 33 \text{ hours.}$$

This would then leave 7 hours per week for set up - broach bolster and fixture changes.

Compressor Blades

SNECMA use a large Forst RSA 10 - 1800 ZW two ram vertical broach, with one ram only in use, and also 4 small Forst Ra 8 vertical broaches, on the steel blades. The large Forst is only used because it is available - the size is unnecessary.

The Ra 8's are 10 Metric Ton, 1.1 metre stroke vertical broaches, single ram, with two broach sets in the bolster, and two work positions. The first pass does the short side of the root and the second pass the long side. The cutting speed is 4.5 ft/min. and the actual cutting load (2 broaches in action) is 2 metric tons.

The light alloy blades are done on similar machines, in a similar fashion, but cutting speed is 12 to 15 ft/min., but can be up to 30 ft/min.

There are 9 rotor and 1 stator stage broached, totalling approx. 540 blades allowing 2 mins. per pass and 2 passes per blade.

$$\text{Time/engine} = \frac{540 \times 2 \times 2}{60} = 36 \text{ hours}$$

With overtime, it is considered that one 10 ton 60" stroke machine could do the work.

However, the double ram machine referred to in M 9 would be more efficient, and would reduce the time shown above, leaving more time for set up, particularly if the machine was fitted with the double broach on each ram i.e. one complete blade on each ram. The only problem which remains would be to separate steel from light alloy swarf, as the same machine would be called on to do both types of blades. This problem should not be serious.

SUMMARY

Turbine Discs - Weatherly broach at CAC will be satisfactory.

Compressor Discs -

First preference	15 ton 90" stroke Single Ram Vertical Broach
Second preference	10 - 15 ton 60" - 66" broach with cross slide, for two psotion fixture.

Compressor Blades -

10 ton 60" - 60" stroke double ram machine.

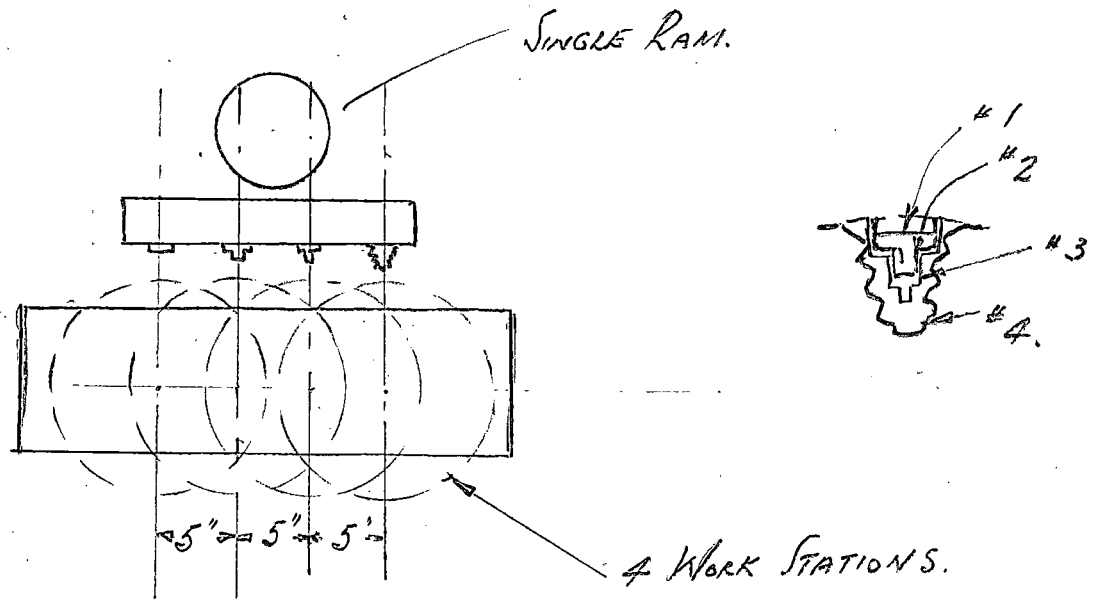
General

We hope to obtain photographs of these and other operations in the near future.

Yours faithfully,

C. Bellward

C. BELLWARD.



TURBINE DISCS. SKETCH #1.

