

9th, May 1962

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| Mngr.....      | Eng. Supt.....    |
| Sec.....       | A/F Mgr.....      |
| Asst. Sec..... | Ch. Eng. A/D..... |
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| Stores.....    |                   |
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AUSTRALIAN MISSION  
S.N.E.C.M.A  
70, bld Kellermann

PARIS 13e  
France

COMMONWEALTH AIRCRAFT CORPORATION PTY.LTD.

BOX 779 H P.O.

Elizabeth st.

MELBOURNE  
Australia

Attention : the MANAGER..

Subject : Heat treatment of low alloy steel Austenal  
process castings.

Dear Sir,

Enclosed herewith please find a copy of a report "Visit to MICROFUSION  
at 20, rue Vernier on 20/4/62" that deals with the above subject.

Attention is here drawn to the recommendation made at the conclusion  
of this report that provision be made for the purchase and installation of a form  
of carbon restoration heat treatment at C.A.C. A quotation and specification  
details received from RIPOCHE for such an installation is enclosed.

Yours faithfully,


D.M. CARROLL

| CIRCULATION / COPIES |                   |
|----------------------|-------------------|
| E.F. MNGR            | FCT. ADM. SUPT.   |
| DSGN. ENGR           | MC. SHOP. SUPT.   |
| DEV. ENGR ✓          | PRODUCN. SUPT.    |
| SERV. ENGR           | ASSM. SUPT.       |
| QUAL. ENGR           | FOUNDRY SUPT.     |
| PROD. ENGR           | METCAL. SUPT. ✓   |
| MATL. ENGR ✓         | PROCESS SUPT. ✓   |
| CH. TL. DSGR         | TOOL. PROD. SUPT. |
| CH. INSP. E.F.       | TOOL. ROOM. SUPT. |
| A/F MANAGER          | SUPT. INSPECTION. |

Mr Stone, for comment pls

VISIT TO MICROFUSION AT 20, RUE VERNIER ON 20/4/62.HEAT TREATMENT OF LOW ALLOY STEEL AUSTENAL PROCESS CASTINGS.1. Contacts.

Mr. ALLARD      Director MICROFUSION  
Mr. CAMEO      Metallurgist MICROFUSION Foundry.  
Mr. CHAMPION    Interpreter.

This meeting was arranged by Mr. ALLARD in response to our letter to Microfusion dated 12th April, requesting details of heat treatment that Microfusion carry out on their low alloy steel austenal process castings.

For information it was mentioned by Microfusion (Mr. CAMEO) during a previous visit, that a form of surface carbon restoration on all low alloy steel castings produced by the austenal process was being carried out. This process represented a development by Microfusion to perfect the technique, and as such a Microfusion management direction would be needed before these details could be made available.

The discussion on the subject during the current visit took place at the Paris head off of Microfusion, 20 rue Vernier.

Verbal details were supplied by Mr. CAMEO on the make and type of furnace employed, and operating conditions used for the treatment of ATAR 9C investment cast engine parts in 35 CD 4 material.

An invitation was extended to write to Microfusion if we had any future problems in connection with austenal process castings. They would also be interested to hear of our experiences, if and when we installed a carbon restoration furnace for our heat treatment. Write to Mr. Le President Directeur General

MICROFUSION  
20, rue Vernier (Paris 17e)  
and after 1st, July 62 write to 80, rue du Moulin de cage  
Gennevilliers (seine)

2. Carbon restoration furnace details.

Microfusion are using a Ripoche gas carburising furnace type XDG 60 obtainable from Ripoche 5 à 9, rue Ferrus (Paris 14e).

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The furnace gas for treatment is generated from hydrocarbon liquid "Lithanol", which is a mixture of oil of turpentine, ethylene alcohol and lithium.

### 3. Furnace operating details.

- the furnace must be leak proof.
- the furnace is sealed off and brought up to operating temperature without load. The atmosphere is then adjusted to give a CO<sub>2</sub> content of less than 0.1%.
- the parts are arranged on a suitable fixture for ease of handling before and after treatment, and also to allow free access of the furnace gas to all surfaces of the parts.
- As quickly as possible the furnace is opened and the parts on a fixture placed inside and the furnace re sealed.
- The furnace atmosphere is again adjusted.
- the treatment, as applied to 35 CD 4 austenitic investment castings, consists of two stages without removal from the furnace, or breaking the furnace seal, or altering temperature.
  - a) surface recarburisation.
  - b) diffusion of the restored carbon.
- Microfusion are using for treatment of 35 CD 4 a temp. of 910°C, a liquid flow rate of 0.8 l/hour for a period of 30 to 45 minutes. This represents the recarburisation cycle with CO<sub>2</sub> gas content less than 0.1%. The diffusion process at 910°C is carried out in a neutral atmosphere when a liquid flow of 0.3 to 0.2 litres/hour is employed for a period of 1 hour to 1 hour 20 minutes. The parts are then air cooled.
- A rejected part is always included with each batch of parts being treated. This part is later sectioned to evaluate by microexamination the effectiveness of the recarburisation and diffusion process.
- After recarburisation, diffusion, and air cool from 910°C, the 35 CD 4 parts are given a conventional harden at 860°C oil quench from a neutral atmosphere. No extended times are employed for this treatment other than that sufficient to heat the part through as for a heat treatment of a standard wrought alloy part. Oil quenching from the tempering temperature is always employed to cool quickly through the brittle range. Double tempering is not used with this alloy.

### 4. Comments.

In view of our increasing field of application of the investment casting process for the production of low alloy steel precision castings at C.A.C, there does already exist a requirement for a form of surface carbon restoration treatment for application to our castings to bring our process up to date and in line with overseas practice.

In regard to the ATAR 9C engine investment castings in low alloy steels listed for production at C.A.C, there is little justification for such a treatment if considered on production quantities alone, although on the parts concerned there is a surface decarburisation requirement that could only be met by using this treatment.

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For information, the specification stating the decarburisation requirements on austenal process castings is only in draft form and not yet released for official use. The stated requirements in the draft specification is 0.1 mm max. and this is the requirement to which SNECMA are at present checking castings received from Microfusion.

It is of interest to note that there is no such tight decarburisation requirements at present required on any shaw process produced castings. The SNECMA foundry at Gennevilliers do not carry out any carbon restoration heat treatment. There is a decarburisation limit of 0.5 mm referred to in specification DT 84.24 covering the production, by the shaw process, of the support palier turbine casting (hardcore item) in 35 CD 4 material. It must therefore be assumed at this stage that decarburisation of the order of 0.5 mm must be acceptable on all shaw process produced castings.

The subject of casting decarburisation in general has been referred to SNECMA materials section at Kellermann for a direction on this subject. In order to allow initial production to commence at C.A.C., it has further been submitted that liberal decarb. limits of the order of 0.5 mm be allowed on all low alloy steel shaw process produced castings, and a concession, if possible, to allow a similar limit to be applied to the following austenal castings listed for initial production at C.A.C. :

|               |                  |
|---------------|------------------|
| 502.551.018.9 | Plaquette        |
| " 705.015.9   | Support de vérin |
| " " 018.9     | " "              |

The official reply from SNECMA on this subject will be forwarded when received. In the event of the concession not being allowed, it may be advisable to arrange for the purchase of our early requirements for the above listed part numbers from SNECMA.

##### 5. Recommendations.

In view of the foregoing, it is recommended that provision be made for the purchase and installation of a form of carbon restoration heat treatment at C.A.C for application to low alloy steel investment castings.

A quotation and specification details are being requested from Ripoché for a similar furnace to that supplied to and installed at Microfusion.

Yours faithfully,

  
H.A. KING