CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS

OTTAWA

MINES BRANCH INVESTIGATION REPORT IR 66-18

METALLURGICAL EXAMINATION OF 2L73 AND 24S CLAD SHEET (FILE NO. 5002-2492 (AIGT)

by

W. A. POLLARD

PHYSICAL METALLURGY DIVISION

COPY NO. 12

MARCH 1, 1966

Mines Branch Investigation Report IR 66-18

METALLURGICAL EXAMINATION OF 2L73 AND 24S CLAD SHEET (FILE NO. 5002-2492 (AIGT)

by

W.A. Pollard*

- - - - - - - -

SUMMARY OF RESULTS

Comparison of two samples of 2L73 and one of 24S clad sheet showed considerable diffusion into the cladding in the 2L73 and very little in the 24S. Both 2L73 samples showed some precipitation at grain boundaries, whereas the 24S sheet showed very little.

---

* Senior Scientific Officer, Non-Ferrous Metals Section, Physical Metallurgy Division, Mines Branch, Department of Mines and Technical Surveys, Ottawa, Canada.

INTRODUCTION

In an earlier investigation (see Mines Branch Investigation Report IR 65-101) samples of corroded aluminum alloy sheet from a "Herald" aircraft were examined and it was concluded that the material, which was to British Specification 2L73, had suffered some reduction in corrosion resistance owing to incorrect heat treatment.

Subsequently, a further sample of 2L73 alloy and one of 24S (Alclad) were received from the same source as the original enquiry (Mr. A.N. Le Cheminant, Department of Transport, Air Services, Accident Investigation) with a request that the new sheet be compared with the corroded samples on the basis of the metallurgical structural features likely to affect corrosion resistance.

MATERIALS

The new sample of 2L73 alloy was clad sheet, about 0.022 in. thick and the Alclad 24S sheet was about 0.025 in. thick. The original 2L75 skin sheet was about 0.035 in. thick.

METALLOGRAPHIC EXAMINATION

Sections of each material were mounted and polished for metallographic examination. Etching with Keller's reagent revealed the grain structure of the base alloy and the degree of diffusion of copper into the cladding.

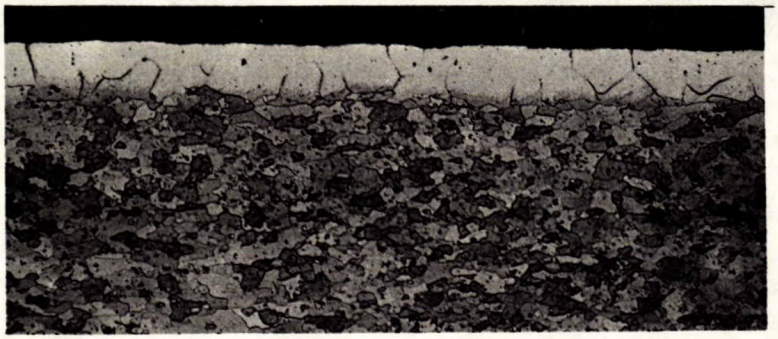
Figures 1 to 3 show the original 2L73, the new sample of 2L73 and the 24S sheet at low magnification. It will be seen that both samples of 2L73 show considerable diffusion into the cladding, whereas the 24S sheet shows very little.

At higher magnification (Figures 4-6) these features are confirmed and, also, within the base alloy there is some evidence of grain boundary precipitation in both the original and new 2L73, but very little, if any, in the 24S sheet.

CONCLUSIONS

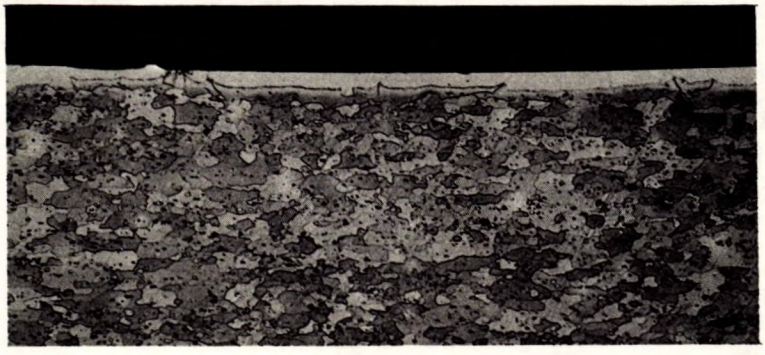
With regard to diffusion into the cladding, the new samples of 2L73 sheet appears to be only slightly better than the original, corroded samples. The sample of 24S sheet, on the other hand, shows very little diffusion into the cladding and it is considered that in this material the cladding would give optimum protection.

The amount of precipitation at grain boundaries appears to be very similar in both new and old 2L73 alloy. However, as noted in the earlier report, this is not considered to be severe and would not be expected to cause a serious reduction in corrosion resistance.



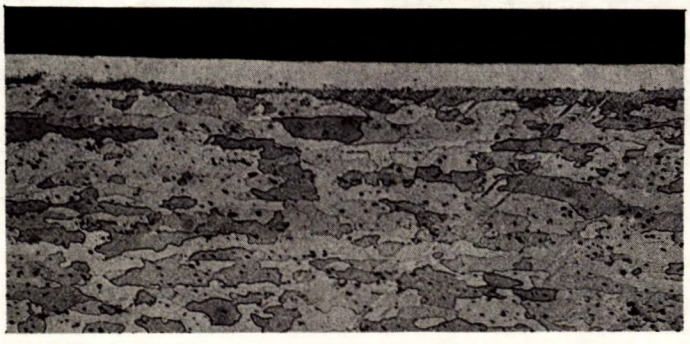
X100

Figure 1 - Original 2L73 alloy sheet showing diffusion into cladding (Etched Keller's Reagent).



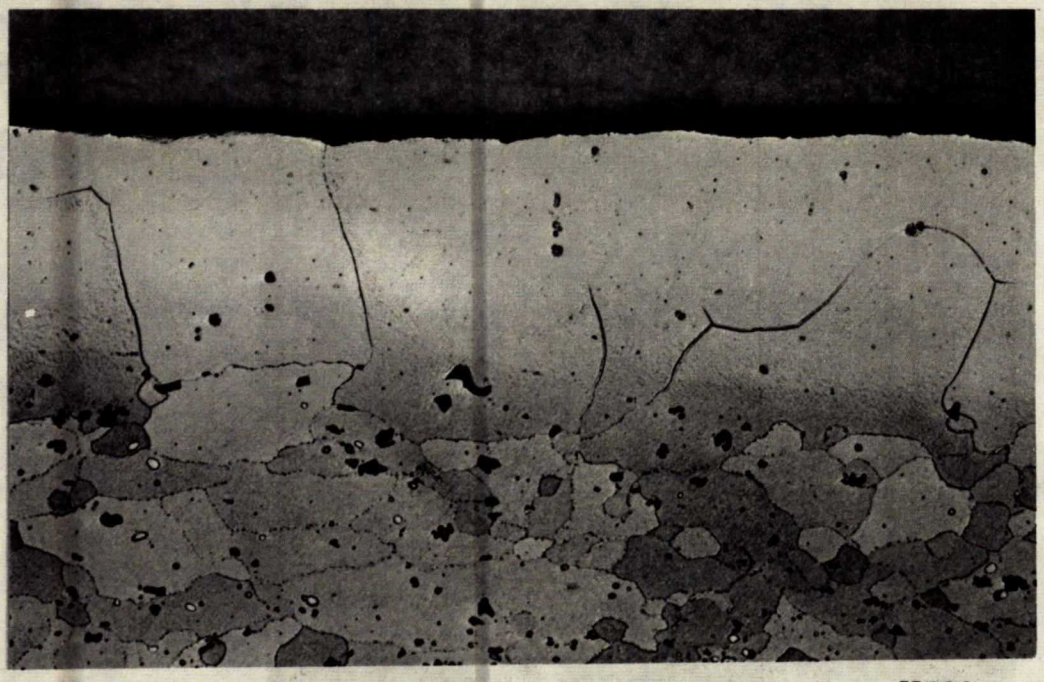
X100

Figure 2 - New 2L73 alloy sheet showing diffusion into cladding (Etched Keller's Reagent).



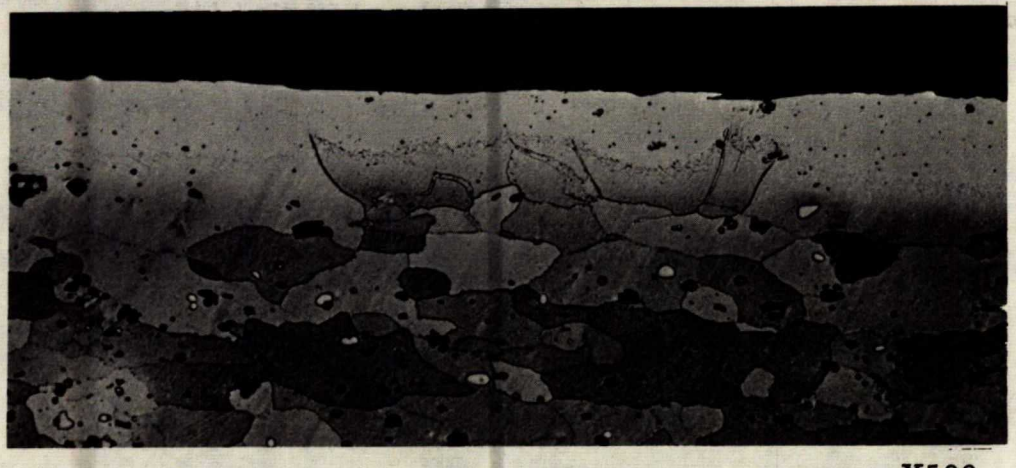
X100

Figure 3 - 24S alloy sheet showing very little diffusion into cladding (Etched Keller's Reagent).



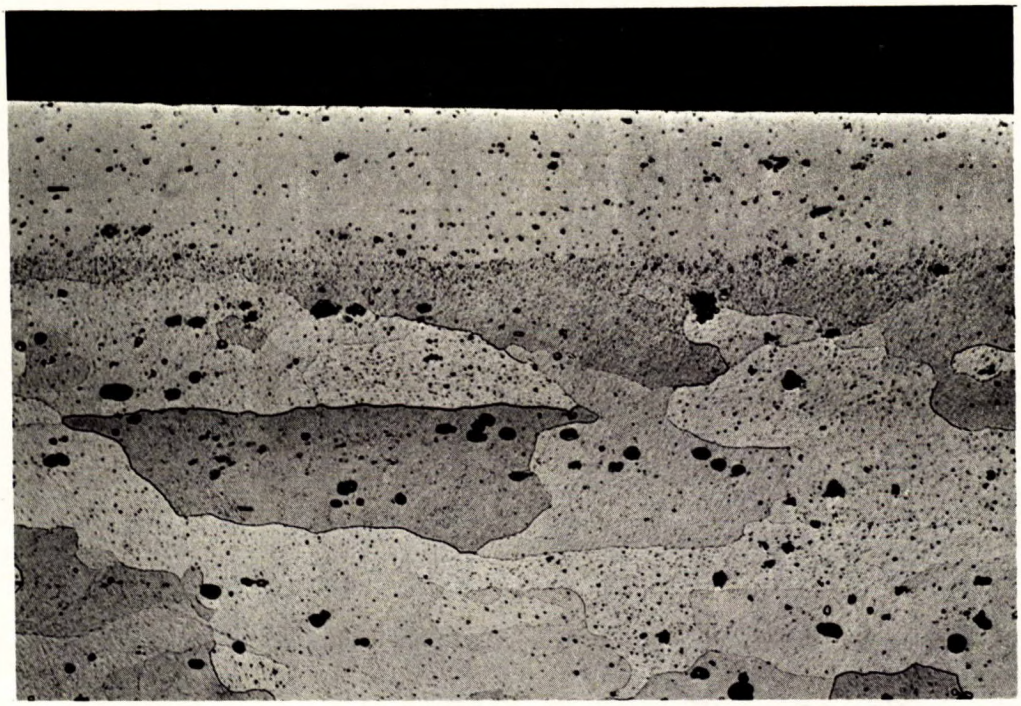
X500

Figure 4 - Original 2L73 alloy sheet showing diffusion into cladding and precipitation at grain boundaries. (Etched Keller's Reagent).



X500

Figure 5 - New 2L73 alloy sheet showing diffusion into cladding and precipitation at grain boundaries. (Etched Keller's Reagent).



X500

Figure 6 - 24S alloy sheet showing no diffusion into cladding and little precipitation at grain boundaries. (Etched Keller's Reagent).