OTTAWA February 16th, 1942.

# REPORT

# of the

# ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1165.

Investigation of "Meta" Aluminium Solder.

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DEPARTMENT OF MINES AND RESOURCES MINES AND GEOLOCY BRANCH

BUREAU OF MINES DIVISION OF METALLIC MINERALS

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### Origin of Material and Object of Examination:

We recently received, under R.C.A.F. file No. 902-38-1, a number of samples of aluminium soldering on different gauges of metal and also a piece of the solder. This material was supplied by the Johnson Brazing and Alloy Company Limited, 17 Stephanie Street, Toronto, Ontario. It was requested that the solder and the soldered joints be investigated.

### Physical Testing:

The following tensile test specimens were prepared: No. 1. - 0.252" x 0.116" - Aluminium strip. No. 2. - 1.00" x 0.112" - Aluminium strip containing soldered joint. No. 3. - 0.251" x 0.120" - Aluminium strip. No. 4. - 1.00" x 0.126" - Aluminium strip containing soldered joint. No. 5. - 1.00" x 0.031" - Dural strip containing soldered joint. These test places are shown (from left to right)

in Figure 1. The results of the tensile tests are shown in Table I.

#### Table I.

		Tonsile Te	ests on	Soldered	Aluminiu	n .	O DE L'ALLE DE LE REFERENCE MUNICIPALITZE
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.Test; ]	Material :	Size			strength,		Remarks
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• 1. : A.	laminian s	0.252" x 0,	,116" :	480 :	16,500	: 12,0	; ;
11 12	;	2	u r	*		0 9 0 1	
	luminium :		9	2 6		•	: (Broke in
2 (	soldered :	:1.00" x 0.	,112" :	1,800 :	16,200	•	(parent
с •	c 1	) 1	3	0		5 7	(metal.
. 0		, ,	9 7	3 9		ò	5
3 ; A.	luminium ;	;0.251" x 0,	130" :	500 :	16,700	: 9.0	0 0
9		1 5	а 2	۴ ٥		0 0	
	luminium :	<b>n</b>	6 0	0 4			: (Broke in
3	soldered :	1.00" x 0.	,126° ;	5°100 :	16,700	•	: (parent
¢	:	2	4) 13	8 *		e	:(metal.
0 4	;	р г	a 3	ê e		0	
5 ; Di	ural	9	n 0	0 0		-	: (Broke in
1) 0	soldered	:1,00 <sup>17</sup> x 0,	.081 <i>"</i> :	2,300 :	28,400	-	:(soldered
3		0 0	5	\$ 9		e e	:(joint.
3 0		1) A 	0 5) 2011-01-01-01-01-01-01-01-01-01-01-01-01-	9 • •			o U Name de la companya de

Figure 2 shows some of the tests applied to the soldered pieces. The soldered joint has apparently absorbed considerable punishment without failing. Such treatment would not normally be inflicted upon this material in service except in an emergency or accident.

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Chemical Analysis:

	Per cent
vc3	98.10
-	0.81
est.	0,26
3.24	0.41
11 T	0,50
	et 19

#### Microscopic Examination:

Cross-sections of the soldered joints were prepared for microscopic examination. Two photomicrographs are submitted, in Figures 3 and 4, taken at 100 diameters.

Figure 3 shows that this solder must be very fluid since it can apparently flow into very small crevices. Both Figures 3 and 4 show that the solder fuses perfectly with the parent aluminium.

## Discussion of Results:

It would appear to be possible to make a joint between two pieces of commercially pure aluminium with this solder that is mechanically stronger than the parent metal. However, there is some doubt where duraluminium is concerned. It will be noted that the actual load on the soldered joint was greater in Test No. 5 than in Test No. 4. This would appear to indicate that it might not be possible to develop the full mechanical properties of duraluminium or any of the other strong aluminium alloys, in a joint made by this method.

From an examination of Figure 2, such a joint, made in commercially pure aluminium, is apparently tough.

The microscopic examination indicates that the solder possesses high fluidity and forms a perfect union with commercially pure aluminium.

## Conclusions;

"Meta" aluminium solder would appear to be a satisfactory method of joining two pieces of commercially pure eluminium.

## Recommendations:

Should the use of "Meta" aluminium solder ever be contemplated for making joints in strong aluminium alloys, where high mechanical efficiency is required, it would be advisable to examine this type of application very thoroughly prior to its adoption.

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HVK;GHB.

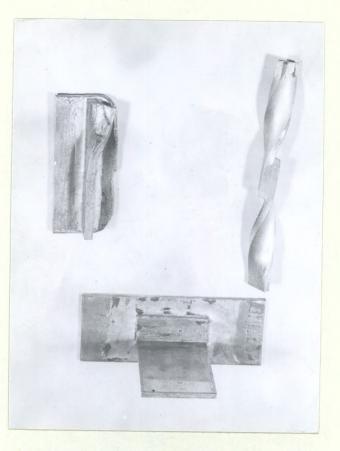




TENSILE TEST PIECES USED IN INVESTIGATION. (Approximately  $\frac{3}{4}$  size).

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# Figure 2.



# SAMPLES OF ALUMINIUM SOLDERING. (Approximately $\frac{5}{4}$ size).

Figure 3.



X100, unetched.

Figure 4.



X100, unetched.

SOLDERED JOINTS.

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HVK:GHB.