

QQ-A-371F
November 22, 1971
SUPERSEDING
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August 24, 1965

FEDERAL SPECIFICATION

ALUMINUM ALLOY INGOT (FOR REMELTING)

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the requirements for aluminum alloy ingots to be used for remelting and recasting into specified shapes.

1.2 Classification.

1.2.1 Composition. The ingots covered by this specification shall be of the compositions listed in table I as specified.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

Federal Standards:

- Fed. Std. No. 102 - Preservation, Packaging, and Packing Levels.
- Fed. Std. No. 123 - Marking for Domestic Shipment (Civil Agencies).
- Fed. Test Method Std. No. 151 - Metals: Test Methods
- Fed. Std. No. 184 - Identification Marking of Aluminum, Magnesium, and Titanium.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

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(Single copies of this specification and other Federal specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.)

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Standards:

MIL-STD-129 - Marking for Shipment and Storage

MIL-STD-649 - Aluminum and Magnesium Products; Preparation for Shipment and Storage.

(Copies of Military Specifications and Standards required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Chemical composition. Aluminum alloy ingots shall conform to the chemical requirements shown in table I.

3.1.1 Analysis shall be made regularly only for the elements specifically mentioned in table I. If, however, the presence of other elements is suspected or indicated in the course of routine analysis, further analysis shall be made to determine that the total of other elements is not in excess of the limits specified.

3.1.2 The contractor shall furnish an analysis of each lot showing the percentage of each of the elements specified in table I.

3.1.3 Chemical analysis of the individual lots by the contractor may be waived at the discretion of the procuring agency, provided the manufacturer's method of composition control is acceptable to it or that all the material in the lot can be identified as being from melts previously analyzed and found to be in conformance with chemical composition requirements of the alloy.

3.2 Identification marking. Each ingot shall be marked for identification in accordance with Fed. Std. No. 184.

3.3 Forms and shapes. Unless otherwise specified in the contract or purchase order, the ingots shall be furnished in commercial standard forms and shapes.

3.4 Workmanship. The ingots shall have a clean surface and shall be free from dross, slag, and foreign material.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Lot. Unless otherwise specified in the contract or order, a lot shall consist of each 25,000 pounds or fraction thereof of the ingots poured from a single furnace, charge, or melt.

4.3 Sampling.

4.3.1 For chemical analysis. A minimum of two ladle test samples shall be taken during the pouring of metal in each lot. These samples shall be used for spectrochemical analysis. One ladle test sample shall be taken at the beginning of the pouring of the lot and one near the end of the pouring of the lot. In cases where the allowable weight of a lot as defined in 4.2 is exceeded, two ladle test samples shall be taken for each lot in the melt.

4.3.1.1 If sampling and analysis is not performed in accordance with 4.3.1, a sample for chemical analysis shall be taken from each of two ingots randomly selected from the lot. Drillings shall be obtained from one end segment and one centrally located segment of each ingot and shall contain metal from both faces of the ingot. The drillings obtained from one ingot shall be mixed to form the sample for that ingot. A minimum of two ounces of drillings shall be obtained from each ingot. The drillings shall be analyzed by wet chemical methods or shall be melted to obtain a spectrochemical analysis sample.

4.3.1.2 Samples for spectrochemical analysis. The sample for spectrochemical analysis shall conform to method 112 of Fed. Test Method Std. No. 151.

4.4 Visual examination. Each ingot shall be carefully examined to determine conformance to this specification with respect to workmanship. On approval of the procuring agency, a system of statistical quality control may be used.

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4.4.1 Inspection of preparation for delivery. Examination of the packing and marking for shipment shall be made for conformance to the requirements of section 5.

4.5 Chemical analysis. The samples selected in accordance with 4.3.1 or with 4.3.1.1 shall be analyzed in accordance with method 111 or 112 of Fed. Test Method Std. No. 151. In case of dispute, referee analysis shall be by method 111.

4.6 Rejection and retest. If any specimen fails to conform to the requirements of this specification, it shall be cause for rejection of the material represented by the specimen subject to the retest provisions of Fed. Test Method Std. No. 151. When no sampling plan is provided, or approved by the procuring agency, and when there is evidence that indicates that a failed specimen was not representative of the lot of material, at least two specimens shall be selected to replace each test specimen which failed. All specimens so selected for retest shall meet the requirements of the specification or the lot shall be subject to rejection.

5. PREPARATION FOR DELIVERY

5.1 Preservation and Packing. Aluminum alloy ingots shall be preserved and packed in accordance with the requirements of MIL-STD-649. Unless otherwise specified (see 6.1) ingots shall be preserved and packed in accordance with level C.

5.2 Marking.

5.2.1 Civil agencies. In addition to any special markings required by the contract or order, marking for shipment shall be in accordance with Fed. Std. No. 123.

5.2.2 Military activities. In addition to any special markings required by the contract or order, marking for shipment shall be in accordance with MIL-STD-129.

6. NOTES

6.1 Descriptive data on various alloys furnished by this specification are covered in QQ-A-591, QQ-A-596, and QQ-A-601.

TABLE 1. Chemical composition limits (percent maximum unless a range is indicated)

Alloy	Silicon	Iron	Copper	Manganese	Magnesium	Chromium	Nickel	Zinc	Tin	Titanium	Other elements		Aluminum
											Zach	Total	
206.1	2.3-3.5	0.9	3.3-4.5	0.50	0.10	--	0.35	1.0	--	0.25	--	0.50	Remainder
206.2	2.3-3.5	0.8	3.5-4.5	0.30	0.03	--	--	0.20	--	0.20	--	0.50	Remainder
213.1	1.0-3.0	0.9	6.0-8.0	0.6	0.10	--	0.50	2.5	--	0.25	--	0.50	Remainder
222.1	2.0	1.2	9.2-10.7	0.50	0.20-0.35	--	1.0	1.5	--	0.25	--	0.50	Remainder
238.1	3.5-4.5	1.2	9.0-11.0	0.6	0.20-0.35	--	0.50	0.50	--	0.20	--	0.50	Remainder
238.2	3.5-4.5	1.2	9.5-10.5	0.50	0.20-0.35	--	0.50	0.50	--	0.20	0.05	0.15	Remainder
A240.1	0.50	0.40	7.0-9.0	0.30-0.7	3.6-6.5	--	0.30-0.7	0.10	--	0.25	0.05	0.15	Remainder
242.1	0.7	0.8	3.5-4.5	0.35	1.3-1.8	0.25	1.7-2.3	0.35	--	0.20	0.05	0.15	Remainder
242.2	0.6	0.6	3.5-4.5	0.10	1.3-1.8	--	1.7-2.3	0.10	--	0.20	0.05	0.15	Remainder
A242.1	0.6	0.6	3.7-4.5	0.10	1.3-1.7	0.15-0.25	1.8-2.3	0.10	--	0.07-0.20	0.05	0.15	Remainder
A242.2	0.35	0.6	3.7-4.5	0.10	1.3-1.7	0.15-0.25	1.8-2.3	0.10	--	0.07-0.20	0.05	0.15	Remainder
253.1	0.7-1.5	0.8	4.0-5.0	0.35	0.03	--	--	0.35	--	0.20	0.05	0.15	Remainder
253.2	0.7-1.2	0.8	4.0-5.0	0.30	0.03	--	--	0.30	--	0.20	0.05	0.15	Remainder
B295.1	2.0-3.0	0.9	4.0-5.0	0.35	0.03	--	0.35	0.30	--	0.20	0.05	0.15	Remainder
B295.2	2.0-3.0	0.8	4.0-5.0	0.30	0.03	--	--	0.30	--	0.20	0.05	0.15	Remainder
308.1	5.0-6.0	0.8	4.0-5.0	0.50	0.10	--	--	1.0	--	0.20	--	0.50	Remainder
308.2	5.0-6.0	0.8	4.0-5.0	0.30	0.10	--	0.35	1.0	--	0.25	--	0.50	Remainder
319.1	5.5-6.5	0.8	3.0-4.0	0.50	0.10	--	0.10	1.0	--	0.20	--	0.70	Remainder
319.2	5.5-6.5	0.6	3.0-4.0	0.10	0.10	--	0.10	1.0	--	0.20	0.15	0.20	Remainder
324.1	7.0-8.0	0.9	4.0-6.0	0.50	0.45-0.7	--	0.30	1.0	--	0.25	--	0.50	Remainder
328.1	7.5-8.5	0.8	1.0-2.0	0.20-0.6	0.25-0.6	0.35	2.0-3.0	0.35	--	0.20	0.05	0.15	Remainder
A332.1	11.0-13.0	0.9	0.50-1.5	0.35	0.8-1.3	--	2.0-3.0	1.0	--	0.20	0.05	0.15	Remainder
A332.2	11.0-13.0	0.9	0.50-1.5	0.10	0.9-1.3	--	2.0-3.0	1.0	--	0.25	--	0.50	Remainder
F332.1	0.5-10.5	0.9	2.0-4.0	0.50	0.6-1.5	--	0.50	1.0	--	0.20	--	0.70	Remainder
F332.2	0.5-10.0	0.6	2.0-4.0	0.10	0.9-1.3	--	0.10	1.0	--	0.25	--	0.70	Remainder
333.1	0.0-10.0	0.8	3.0-4.0	0.50	0.10-0.50	--	0.50	1.0	--	0.20	0.05	0.15	Remainder
354.1	8.0-9.4	0.15	1.6-2.0	0.10	0.45-0.6	0.25	--	0.30	--	0.20	0.05	0.15	Remainder
355.1	4.5-5.5	0.50(5)	1.0-1.5	0.50(5)	0.45-0.6	0.25	--	0.05	--	0.20	0.05	0.15	Remainder
355.2	4.5-5.5	0.14-0.25	1.0-1.5	0.05	0.50-0.6	--	--	0.05	--	0.20	0.05	0.15	Remainder
G355.2	4.5-5.5	0.13	1.0-1.5	0.05	0.45-0.6	--	--	0.35	--	0.25	0.05	0.15	Remainder
356.1	0.5-7.5	0.30	0.25	0.35	0.25-0.40	--	--	0.05	--	0.20	0.05	0.15	Remainder
356.2	0.5-7.5	0.12-0.25	0.10	0.05	0.30-0.40	--	--	0.05	--	0.20	0.05	0.15	Remainder
A356.2	0.5-7.5	0.12	0.05	0.05	0.45-0.6	--	--	0.05	--	0.20	0.05(1)	0.15	Remainder
357.1	6.5-7.5	0.12	0.05	0.05	0.45-0.6	--	--	0.05	--	0.10-C.20	0.05(1)	0.15	Remainder
A357.2	6.5-7.5	0.12	0.10	0.05	0.45-0.7	0.05	--	0.10	--	0.12-0.20	0.05(2)	0.15	Remainder
B356.2	7.0-8.0	0.20	0.10	0.10	0.45-0.6	0.05	--	0.10	--	0.20	0.05	0.15	Remainder
359.2	0.5-9.5	0.12	0.10	0.10	0.55-0.7	--	--	0.10	0.10	--	--	0.25	Remainder
360.2	9.0-10.0	0.7-1.1	0.10	0.10	0.45-0.6	--	0.10	0.40	--	--	--	0.15	Remainder
A360.1	9.0-10.0	1.0	0.6	0.35	0.45-0.6	--	0.30	0.05	--	--	5.05(3)	0.15	Remainder
A360.2	9.0-10.0	0.6	0.10	0.05	0.45-0.6	--	--	0.15	0.15	--	0.05	0.15	Remainder
364.2	7.5-9.5	0.7-1.1	0.20	0.10	0.25-0.40	0.25-0.30	0.10	0.10	0.10	--	--	0.20	Remainder
360.2	7.5-9.5	0.7-1.1	3.0-4.0	0.10	0.10	--	0.10	0.10	0.10	--	--	0.20	Remainder

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TABLE I. Chemical composition limits (percent maximum unless a range is indicated (cont'd))

Alloy	Silicon	Iron	Copper	Manganese	Magnesium	Chromium	Nickel	Zinc	Tin	Titanium	Other elements		Aluminum
											Each	Total	
AJ80-1	7.5-9.5	1.0	3.0-4.0	0.50	0.10	--	0.30	2.9	0.35	--	--	0.50	Remainder
AJ80-2	7.5-9.5	0.6	3.0-4.0	0.10	0.10	--	0.10	0.10	--	--	0.05	0.50	Remainder
AJ80-3	10.5-12.0	1.0	3.0-4.5	0.50	0.10	--	0.50	2.9	0.35	--	--	0.20	Remainder
384-1	10.5-12.0	0.6-1.0	3.0-4.5	0.10	0.10	--	0.10	0.10	0.10	--	--	0.20	Remainder
384-2	10.5-12.0	0.6-1.0	4.0-5.0	0.10	0.50-0.65	--	--	0.10	--	0.20	0.10	0.20	Remainder
390-2	16.0-18.0	0.6-1.0	4.0-5.0	0.10	0.50-0.65	--	--	0.10	--	0.20	0.10	0.20	Remainder
AJ90-1	16.0-18.0	0.40	4.0-5.0	0.10	0.07	--	0.10	0.10	0.10	--	--	0.20	Remainder
413-2	11.0-13.0	0.7-1.1	0.10	0.35	0.10	--	0.50	0.40	0.15	--	--	0.10	Remainder
A613-1	11.0-13.0	1.0	0.6	0.05	0.03	--	0.05	0.05	0.05	--	--	0.10	Remainder
A613-2	11.0-13.0	0.6	0.10	0.05	0.03	0.25	0.05	0.50	--	0.25	--	0.35	Remainder
643-1	4.5-6.0	0.6	0.6	0.50	0.05	--	--	0.10	--	0.20	0.05	0.15	Remainder
643-2	4.5-6.0	0.6	0.10	0.10	0.05	--	--	0.10	--	--	--	0.25	Remainder
CA43-1	4.5-6.0	1.0	0.6	0.35	0.10	--	0.50	0.60	0.15	--	--	0.15	Remainder
CA43-2	4.5-6.0	0.7-1.1	0.10	0.10	0.05	--	--	0.10	--	--	0.05	0.15	Remainder
A644-1	6.5-7.5	0.12	0.05	0.05	0.03	--	--	0.05	--	0.20	0.05	0.15	Remainder
A644-2	6.5-7.5	0.40	0.15	0.35	3.6-4.5	--	--	0.15	--	0.25	0.05	0.15	Remainder
514-1	0.35	0.30	0.10	0.10	3.6-4.5	--	--	0.10	--	0.20	0.05	0.15	Remainder
514-2	0.30	0.30	0.10	0.10	3.6-4.5	--	--	1.6-2.2	--	0.20	0.05	0.15	Remainder
AJ18-2	0.30	0.30	0.10	0.10	3.6-4.5	--	--	0.10	--	0.20	0.05	0.15	Remainder
B576-2	1.6-2.2	0.30	0.10	0.10	3.6-4.5	--	--	0.15	--	0.25	0.05	0.15	Remainder
F518-1	0.30-0.7	0.40	0.15	0.35	3.6-4.5	--	--	0.15	--	0.20	0.05	0.15	Remainder
F518-2	0.30-0.7	0.30	0.10	0.10	3.6-4.5	--	--	0.05	--	0.20	0.05	0.15	Remainder
5314-2	0.50-1.0	0.6-1.0	0.10	0.40-0.46	2.7-4.0	--	--	0.05	0.15	--	--	0.25	Remainder
512-1	0.35	1.0	0.25	0.35	7.5-8.5	--	0.15	--	--	--	--	0.10	Remainder
512-2	0.25	0.7	0.10	0.10	7.5-8.5	--	0.05	--	0.05	--	--	0.15	Remainder
420-2	0.15	0.20	0.20	0.10	9.7-7.5	--	--	0.10	--	0.20	0.05	0.15	Remainder
535-2	0.10	0.10	0.05	0.10-0.25	6.5-7.5	--	--	--	--	0.10-0.25	0.05(4)	0.15	Remainder
AJ35-1	0.20	0.15	0.10	0.10-0.25	6.6-7.5	--	--	--	--	0.25	0.05	0.15	Remainder
AJ35-2	0.10	0.12	0.05	0.35	6.6-7.5	--	--	--	--	0.10-0.25	0.05	0.15	Remainder
8335-2	0.10	0.6	0.20	0.42-0.6	1.5-1.8	0.20-0.40	--	2.7-3.3	--	0.15	0.05	0.15	Remainder
705-1	0.20	0.6	0.20	0.42-0.6	3.5-2.4	0.20-0.40	--	4.0-4.5	--	0.15	0.05	0.15	Remainder
707-1	0.20	0.6	0.20	0.42-0.6	0.65-0.8	--	--	6.0-7.0	--	0.25	0.05	0.15	Remainder
A712-1	0.15	0.40	0.35-0.65	0.05	0.50-0.8	--	--	6.0-7.0	--	0.20	0.05	0.15	Remainder
C712-1	0.30	0.7-1.1	0.35-0.65	0.05	0.30-0.45	--	--	5.0-6.5	--	0.15-0.25	0.05	0.20	Remainder
0712-2	0.15	0.40	0.25	0.10	0.50-0.65	0.40-0.6	--	7.0-8.0	--	0.25	0.10	0.25	Remainder
713-1	0.25	0.8	0.40-1.0	0.6	2.25-0.50	0.35	0.15	6.5-7.5	--	0.10-0.20	0.05	0.15	Remainder
771-2	0.10	0.10	0.10	0.10	2.85-1.0	0.06-0.20	--	--	5.5-7.0	--	--	0.30	Remainder
850-1	0.7	0.50	0.7-1.3	0.10	0.10	--	0.7-1.3	--	5.5-7.0	--	--	0.30	Remainder
A850-1	2.0-3.0	0.50	0.7-1.3	0.10	0.10	--	0.30-0.7	--	5.5-7.0	--	--	0.30	Remainder
8830-1	0.60	0.50	1.7-2.3	0.10	0.7-0.9	--	0.7-1.5	--	5.5-7.0	--	--	0.30	Remainder

(1) Beryllium 0.04-0.07 percent.

(2) Beryllium 0.15-0.30 percent.

(3) Beryllium 0.02-0.04 percent.

(4) Beryllium 0.003-0.005 percent. Boron 0.007 percent max.

(5) If iron exceeds 0.45 manganese content shall not be less than one-half iron content.

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TABLE II - Designations and applicable casting specifications. (1)

QQ-A-371F & Aluminum Association Ingot Designation	QQ-A-371E and Former Commercial Designation	ASTM Designation	Aluminum Assn Castings Designation	Applicable Casting Specifications QQ-A-591D, QQ-A-596D, QQ-A-601D		
208.1, 208.2	108	CS737	208.C		*	*
213.1	113	CS74A type	213.0		*	*
222.1	122	CG100A	222.0		*	*
238.1, 238.2	138(2)	CS104A	238.0			
A240.1	A140(2)	--	A240.0			
242.1, 242.2	142	CN42A	242.0		*	*
A242.1, A242.2	A142(2)	--	A242.0			
295.1, 295.2	195	C4A	295.0			*
B295.1, B295.2	B195	--	B295.0		*	
308.1, 308.2	A108	--	308.0		*	
319.1, 319.2	319	SC64D	319.0		*	*
324.1	324(2)	--	324.0			
328.1	Red X-8	SC82A	328.0			*
A332.1, A332.2	A132	SN122A	A332.0		*	
F332.1, F332.2	F132	SC103A	F332.0		*	
333.1	333	SC94A	333.0		*	
354.1	354	SC92A	354.0	(3)	(3)	(3)
355.1, 355.2	355	SC51A, C	355.0		*	*
C355.2	C355	SC51B	C355.0		*	
356.1, 356.2	356	SG70A, C	356.0		*	*
A356.2	A356	SG70B	A356.0		*	
357.1	357	SG71A	357.0		*	
A357.2	A357	--	A357.0			
B358.2	Tens-50(2)	--	B358.0			
359.2	359	SG91A	359.0	(3)	(3)	(3)
360.2	360	SG100C	360.0		*	
A360.1, A360.2	A360	SG100A, B	A360.0		*	
364.2	364(2)	--	364.0			
380.2	380	SC84C	380.0		*	
A380.1, A380.2	A380	SC84A, B	A380.0		*	
384.1, 384.2	384	SC114A	384.0		*	
390.2	390(2)	--	390.0			
A390.1	A390(2)	--	A390.0			
413.2	13	--	413.0		*	
A413.1, A413.2	A13	S12A, B, C	A413.0		*	

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TABLE II - Designations and applicable casting specifications. (1) (cont'd)

QQ-A-371F & Aluminum Association Ingot Designation	QQ-A-371E and Former Commercial Designation	ASTM Designation	Aluminum Assn Castings Designation	Applicable Castings Specification QQ-A-591D, QQ-A-596D, QQ-A-597D		
443.1, 443.2	43	S5A, B	443.0	*	*	
C443.1, C443.2	A43(2)	S5C	C443.0			
A444.2	A344(2)	S7A	A444.0			
514.1, 514.2	214	G4A	514.0			*
A514.2	A214	GZ42A	A514.0		*	
B514.2	B214	GS42A	B514.0			*
F514.1, F514.2	F214(2)	--	F514.0			
L514.2	L214(2)	GS31A	L514.0			
518.1, 518.2	218	G8A	518.0	*		*
520.2	220	G10A	520.0			*
535.2	Almag 35	GM70B type	535.0			*
A535.1	A218(2)	GM70B	A535.0			
B535.2	B218(2)	--	B535.0			*
705.1	Ternalloy 5	ZG32A	705.0		*	*
707.1	Ternalloy 7	ZG42A	707.0		*	*
A712.1	A612	ZG61B	A712.0			*
C712.1	C612	ZC60A	C712.0			*
D712.2	40E	ZG61A	D712.0			*
713.1	Tenzaloy	ZC81A, B	713.0		*	*
771.2	Precedent 71A	--	771.0			*
E50.1	750	--	850.0		*	*
A850.1	A750	--	A850.0		*	*
B850.1	B750	--	B850.0		*	*

- (1) Listed for similarity only.
(2) Not covered in QQ-A-371e.
(3) Covered in MIL-A-21180.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- a. Title, number, and date of this specification.
- b. Alloy designation (see 1.2.1).
- c. Whether other than commercial forms or shapes are required (see 3.3).
- d. Selection of applicable levels of preservation and packing required, if other than level C (see 5.1).
- e. Special marking, if required (see 5.2.2).

6.3 Designations and applicable casting specifications. This specification utilizes The Aluminum Association designations. These designations and comparable ASTM designations are shown in table II. Also shown is the coverage of the various casting specifications as related to the ingot specification.

MILITARY CUSTODIANS:

Army - MR
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Army - MR

Review activities:

Army - MR, MU
Navy - AS, SH
Air Force - 26

User activities:

Army - GL
Navy - YD

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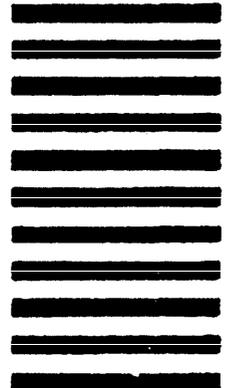
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