

NBSIR 76-1166

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6577/12/76

**STRESS CORROSION BEHAVIOR OF
X7050-T76351 ALLOY ALUMINUM
PLATE**

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November 1976

Final Report

Prepared for
Naval Air Systems Command
Department of the Navy
Washington, D. C. 20360



U.S. DEPARTMENT OF COMMERCE, Elliot L. Richardson, *Secretary*

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By

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Reference: (a) Naval Air Systems Command, Department of the Navy, Request by
AIR-52031, January 20, 1972.

Introduction

It was requested by Reference(a) that NBS conduct tests to determine the stress-corrosion behavior of X7050-T76351 aluminum alloy plate in a marine atmosphere environment.

Material

A section of X7050-T76351 aluminum alloy plate [12 in. (30.5 cm) x 2 in. (5.1 cm) x 4-1/2 in. (11.4 cm)] was obtained from the Naval Air Development Center, Warminster, Pa. Specimens in the form of flat tensile bars were machined from this plate so that the principal axes of the specimens were in the transverse direction with respect to the direction of rolling of the plate. The tensile specimens were approximately 9 in. (22.86 cm) long by 1 in. (2.54 cm) wide by 0.125 in. (.32 cm) thick.

Mechanical Properties

Tests were performed by NBS to determine the transverse mechanical properties of X7050-T76351 alloy plate. The results of these tests are shown in Table 1.

Stress-Corrosion Tests

Stressed and unstressed specimens were exposed in the marine atmosphere at Kure Beach, N.C. [80-foot (24 m) lot]. A system of weights and levers was used to obtain the desired stress. For the stressed specimens, the applied

stress was equivalent to 50 and 75% of the yield strength of the alloy as determined by NBS.

Results

Test results show that none of the X7050-T73651 alloy specimens had failed after exposure in the marine atmosphere for a period of 756 days. In order to obtain some indication of the effect of corrosion attack on the alloy, a comparison was made of the tensile strength of specimens not exposed to the corrosive environment vs. that of specimens exposed to the marine environment. The values obtained were then averaged for each condition and stress level and calculated as the percent loss in tensile strength due to exposure in the environment. These test results, given in Table 2, indicate a small average loss (less than 10%) in tensile strength for the exposed specimens.

Conclusions

The results obtained from stress corrosion tests on X7050-T73651 aluminum alloy plate indicate that the alloy is resistant to stress corrosion cracking in a marine atmosphere environment. There were no failures after exposure for 756 days. However, the alloy does exhibit a considerable amount of shallow surface pitting, accompanied by heavy adherent light gray corrosion products. This surface pitting and corrosion resulted in an average loss in strength of less than 10 percent.

Table 1

Transverse Mechanical Properties of X7050-T73651 Aluminum Alloy Plate^a

<u>Tensile Strength</u> Ksi ^(b)	<u>Yield Strength</u> (0.2% offset) Ksi ^(b)	<u>Percent Elongation</u> in 2 in.
75.9 ± 2.1	67.2 ± 1.5	8.2 ± 1.4

^a Average of three specimens with standard deviations.

^b₁ Ksi = 6.8948 MPa



Table 2. Results Obtained from Tests on X7050-IT73651 Aluminum Alloy Plate in the Marine Atmosphere at Kure Beach, North Carolina (80-foot lot).

Percent of Yield Strength	Exposure Stress		Days Exposed (1)	Percent loss in Tensile Strength	Percent Loss in Tensile Strength (3)	Percent Elongation in 2 in. (5.08 cm)
	KSI	Yield Strength				
0	-	-	756 NF	<1		6%
0	-	-	756 NF	8		(2)
0	-	-	756 NF	8	6	4%
50	33.8	33.8	756 NF	<1		
50	33.6	33.6	756 NF	19		6%
50	33.5	33.5	756 NF	3	7	
75	50.3	50.3	756 NF	<1		(2)
75	50.1	50.1	756 NF	5		6%
75	50.8	50.8	756 NF	<1	1	8%

(1) NF denotes no failures after exposure for number of days indicated.

(2) Specimen broke outside gage marks.

(3) Average for three specimens



U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET		1. PUBLICATION OR REPORT NO. NBSIR 76-1166	2. Gov't Accession No.	3. Recipient's Accession No.
4. TITLE AND SUBTITLE Stress Corrosion Behavior of X7050-T76351 Alloy Aluminum Plate			5. Publication Date	
			6. Performing Organization Code	
7. AUTHOR(S) B. T. Sanderson and W. F. Gerhold			8. Performing Organ. Report No.	
9. PERFORMING ORGANIZATION NAME AND ADDRESS NATIONAL BUREAU OF STANDARDS DEPARTMENT OF COMMERCE WASHINGTON, D.C. 20234			10. Project/Task/Work Unit No. 3120410	
			11. Contract/Grant No.	
12. Sponsoring Organization Name and Complete Address (Street, City, State, ZIP) Naval Air Systems Command Department of the Navy Washington, D.C. 20360			13. Type of Report & Period Covered	
			14. Sponsoring Agency Code	
15. SUPPLEMENTARY NOTES				
16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.) Short transverse tensile specimens of X7050-T76351 aluminum alloy were stressed at fifty and seventy-five percent of the alloy's yield strength and exposed in a marine atmosphere environment. After seven hundred and fifty-six days, there were no failures. X7050-T76351 alloy appears to be resistant to stress corrosion cracking in this environment.				
17. KEY WORDS (six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons) Alloy; Aluminum; Atmosphere; Marine; Mechanical properties; Plate; Stress corrosion				
18. AVAILABILITY <input checked="" type="checkbox"/> For Official Distribution. Do Not Release to NTIS <input type="checkbox"/> Order From Sup. of Doc., U.S. Government Printing Office Washington, D.C. 20402, SD Cat. No. C13 <input type="checkbox"/> Order From National Technical Information Service (NTIS) Springfield, Virginia 22151			19. SECURITY CLASS (THIS REPORT) UNCLASSIFIED	21. NO. OF PAGES
			20. SECURITY CLASS (THIS PAGE) UNCLASSIFIED	22. Price

