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AEROSPACE RECOMMENDED PRACTICE

ARP 823B
Superseding ARP 823A

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MINIMIZING STRESS-CORROSION CRACKING IN WROUGHT HEAT-TREATABLE ALUMINUM ALLOY PRODUCTS

1. PURPOSE:

1.1 The purpose of this recommended practice is to provide the aerospace industry with recommendations concerning minimizing of stress-corrosion cracking in wrought high-strength aluminum alloy products.

1.2 The detailed recommendations are based on practical engineering experience and reflect those design practices and fabricating procedures which have been found to be most effective in minimizing stress-corrosion cracking in wrought high-strength aluminum alloy products.

2. GENERAL: Stress-corrosion cracking failures of wrought, high-strength aluminum alloy parts have been attributed to the following combination of factors:

a) presence of a sustained surface tensile stress developed as a result of assembly stresses and/or residual stresses due to heat treatment or forming, acting in a direction perpendicular to the plane of predominant grain flow.

b) presence of a corrosive environment, which need not be severe (atmospheric water vapor may be sufficient), and

c) existence, in the product, of a metallurgical condition which makes the product susceptible to stress corrosion.

2.1 The following alloys (bare or alclad) in the tempers listed, and in stress-relieved temper modifications thereof, where applicable, are of particular concern:

2011-T3	2018-T61	2219-T37
2011-T4	2024-T3	2618-T61
2014-T3	2024-T36	7001-T6
2014-T4	2024-T4	7075-T6
2014-T42	2024-T42	7079-T6
2014-T6	2025-T6	7079-T611
2017-T4	2219-T31	7178-T6

3. RECOMMENDATIONS:

3.1 Die Forgings:

3.1.1 Grain Flow: Die design should be such as to preclude excessive grain run-out at the parting line and to avoid sharply re-entrant grain flow at any point in the forging.

3.1.2 Heat Treatment: Solution heat treatment should be accomplished when the part is as close to finished machine size as practicable. Preferably, the forging envelope should closely approximate the machined part envelope to preclude the need for excessive machining after heat treatment. Quenching from the solution temperature should be performed in such a manner as to provide uniform cooling on all surfaces of the part. The quench water temperature should be as high as possible, commensurate with maintaining satisfactory mechanical properties and general corrosion resistance.

3.2 Other Wrought Forms:

3.2.1 Stress-Relieved Products: Products which have been subjected to mechanical stress relief treatments (i.e., stretching or compressing) should be used where possible, in order to reduce the detrimental effects of residual stress. Reheat treatment of stress-relieved products by the user removes the stress relieved condition. Also, assembly stresses can undermine all the benefits of stress relief.

3.2.2 Other Than Stress-Relieved Products: Such products should be rough machined prior to heat treatment. The considerations for rough machining, heat treatment, and finish machining are similar to those for forgings (See 3.1.2).