



AEROSPACE INFORMATION REPORT

AIR1551**REV. B**

Issued 1982-11
Revised 2001-10
Reaffirmed 2006-05
Stabilized 2014-07

Superseding AIR1551A

Torque Tightening Metric Screw Threaded Fasteners

RATIONALE

This document has been determined to contain basic and stable technology which is not dynamic in nature. This standard has been stabilized.

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FOREWORD

Changes in this Revision are format/editorial only.

1. SCOPE:

- 1.1 This AIR supplies information on recommended assembly torque limits for tension type nuts and bolts of the materials and plating combinations given in Table 1.

TABLE 1 - Combinations of Fastener Materials

Bolt			Nut			Typical Coefficient of Friction
Material	Plating	*F _{ty} , MPa	Material	Plating	*F _{ty} , MPa	
8740	cadmium	710	8740	cadmium	710	0.12
A286	unplated	586	A286	silver	586	0.13
Inconel 718	unplated	1034	A286	silver	586	0.14
Waspaloy	unplated	793	Waspaloy	silver	793	0.14

* - Minimum tensile yield strength at room temperature.

- 1.2 In calculating the torque values in Table 2, the following assumptions have been made:

- Threads and bearing surfaces are lubricated with MIL-L-7808 aircraft engine oil.
- The torque is applied to the nut. If torque is to be applied to the bolt head, the induced load may be reduced by friction on the shank.
- The tensile preload stress is 440MPa.

1.3 Purpose:

The purpose of this Aerospace Information Report (AIR) is to provide the aerospace propulsion industry with recommended assembly torque limits for threaded fasteners when a common torque value per fastener size is the objective. (The fasteners are based on the dimensional data in MA1518). It also provides a series of curves that show the effect of the coefficient of friction on the axial load produced in a fastener, when the recommended torques are applied.

2. REFERENCES:

MA1518	Bolts, Screws and Nuts - External Wrenching, Metric Threads - Design Parameters for
MA3266	Nut, Self-Locking, Spline Drive, Extended Washer, UNS S66286, Silver Plate, MJ Thread, Metric

3. REQUIREMENTS:

3.1 Assembly Torques for Self Locking Nuts, (e.g. MA3266):

The assembly torques shown in Table 2 are for the self-locking nut and bolt material and plating combinations listed in Table 1.

3.1.1 The assembly torque is a rounded value derived from the following formula:

$$T = F (K_1 + K_2) \times 10^{-3} \quad (\text{Eq. 1})$$

where:

T	= torque, N·m
F	= axial load, N (440MPa on external thread mean stress area, A x 440 MPa)
K ₁	= 0.5 [P/π + d ₂ bsc (1.1547f ₁)], constant for thread friction, mm.
K ₂	= 0.25 (d bsc + b) f ₂ , constant for washer face friction, mm.
A	= 0.0625π (d ₂ min + d ₃ max) ² , mean stress area, mm ² .
d ₂ bsc	= thread basic pitch diameter, mm. (equals d ₂ max)
d ₂ min	= external thread minimum pitch diameter, mm.
d ₃ max	= external thread maximum root diameter, mm.
P	= pitch, mm.
b	= washer face diameter (bolt or nut), minimum, mm.
f ₁	= coefficient of friction in threads (0.13 assumed)
f ₂	= coefficient of friction at washer face (0.13 assumed)
d bsc	= thread basic major diameter (equals d max), mm.