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NOTICE OF
ADOPTION

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Title of Document: AREAS FOR CALCULATING STRESS OR LOAD
VALUES FOR METRIC MJ EXTERNALLY THREADED FASTENERS

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SAE *The Engineering Society For Advancing Mobility Land Sea Air and Space* ®	**METRIC AEROSPACE STANDARD**	**MA 1520**
400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096		Issued 7-87
	Submitted for recognition as an American National Standard	

AREAS FOR CALCULATING STRESS OR LOAD VALUES
FOR
METRIC MJ EXTERNALLY THREADED FASTENERS

1. **PURPOSE:** This standard specifies the areas to be used in calculating stress or load values for use in metric externally threaded fastener procurement specifications and for information of designers.

2. **SCOPE:** Areas for the standard metric series of thread diameter-pitch combinations for aerospace externally threaded fasteners are established for the following conditions:

   a) Area for ultimate shear stress or load in unthreaded shank.

   b) Area for ultimate tensile stress or load in thread.

   c) Area for stress durability test load in thread.

   d) Area for stress-rupture test load at elevated temperature.

   e) Area for tension-tension fatigue test load.

3. **REQUIREMENT:** The following areas are to be used in metric fastener procurement specifications for establishing the minimum mechanical properties which are specified in terms of allowable minimum test loads (unit stress rating times area). See Table I for calculated values.

3.1 Area for ultimate shear stress or load in fastener unthreaded shank.

   For unthreaded shank greater than or less than thread nominal diameter, use maximum shank diameter for d in formula (1). For unthreaded shank equal to the thread nominal diameter, use basic major diameter of thread for d in formula (1). The calculated values for formula (1) in Table I are based on unthreaded shank equal to thread basic major diameter.

$$(1) \quad A = 0.7854(d)^2$$

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3.2 Area for ultimate tensile stress or load in threaded portion.

3.2.1 Area for tensile stress or load in externally threaded fasteners with threads rolled after heat treatment and manufactured from alloy steels, corrosion and heat resistant steels and alloys, or titanium alloys, is based on the following empirical formula:

$$(2) \quad A = 0.7854(d_3)^2 \left[2 - \left(\frac{d_3}{d_2}\right)^2 \right]$$

where d_2 = maximum pitch diameter
d_3 = maximum root diameter

Area based on the maximum pitch diameter, d_2, is used as noted in 3.3 and 3.5 below.

$$(3) \quad A = 0.7854(d_2)^2$$

3.2.2 Area for tensile stress or load in externally threaded fasteners with threads rolled before heat treatment, or not rolled, is based on the mean diameter between maximum pitch diameter, d_2, and the maximum root diameter, d_3:

$$(4) \quad A = 0.7854[0.5(d_2 + d_3)]^2$$

3.3 Area for stress durability test load in thread.

Area based on formula (3). Test load is derived by using a percentage of the ultimate tensile stress as defined in the applicable procurement specification.

3.4 Area for stress-rupture test load at elevated temperature.

Area based on the maximum root diameter, d_3.

$$(5) \quad A = 0.7854(d_3)^2$$

3.5 Area for tension-tension fatigue test load.

Area based on formula (3). High test load is derived by using a percentage of the ultimate tensile stress as defined in the procurement specification.

Low test load is 10% of high test load.

4. <u>SYMBOLS</u>: Thread symbols in formula are per MA 1370.