

# MIL-S-8879 Cancelled by DOD — Replaced by SAE AS8879

by:

Joe Greenslade  
President  
Greenslade & Company, Inc.  
2234 Wenneca Avenue  
Fort Worth, TX 76102, USA  
www.greensladeandcompany.com



## Aerospace Threaded Hardware Uses Mostly UNJ Thread Form

Most aerospace fasteners in use today are made with the UNJ thread form instead of the UN or UNR thread forms used on most commercial fasteners. The UNJ thread form differs from the UN and UNR thread forms in that it has a larger minor diameter on both internal and external threads. Also, the controlled root radius on the external UNJ thread form is larger than the UNR thread form that is specified “for reference only.”

The UNJ thread form was first introduced in the 1960s specifically for aerospace bolt applications that were subject to high fatigue stresses. The larger root radius on the UNJ external thread form is much more resistant to fatigue failures than the UNR thread form. The first standard covering the UNJ thread form was *MIL-S-8879*, published by the **Department of Defense (DOD)** in 1960.

## MIL-S-8879C Causes Much Controversy

After its original introduction the standard went through several revisions culminating in revision C, which was a complete re-write. Revision C was published in July of 1991. Ever since the publication of Revision C there has been a tremendous amount of controversy surrounding the specification. Literally thousands of labor hours have been invested by industry and government representatives trying to reach a consensus on the exact interpretation of *MIL-S-8879C* since its publication.

## FAA Conducts Threaded Fastener Audit

In 2000 and 2001, the **FAA** conducted an extensive audit of threaded fasteners used in commercial aircraft. The audit resulted in Report Number FAA-IR-01-02 that was 111 pages in length. The report pointed out many problems related to the way in which *MIL-S-8879C* was written that resulted in inconsistent interpretations by suppliers, purchasers and end users of *MIL-S-8879C* threaded hardware. The FAA concluded with a lengthy list of issues it felt needed to be addressed to assure the FAA and the commercial aerospace industry would receive 100% conforming threaded hardware.

Concerned industry and government bodies responded by forming a task force called the **Screw Thread Conformity-**

**Task Force (STC-TF)**. This group consisted of members from the FAA, the DOD, industry trade associations, aerospace contractors, aerospace threaded product suppliers and thread gage manufacturers. Meetings of the STC-TF began in mid-2001 and will continue until a few remaining technical issues relating to gage usage and calibration are resolved.

## DOD Cancels MIL-S-8879C & SAE Publishes SAE AS8879C

The outcome of the STC-TF work through early 2003 was the official cancellation on February 24, 2003, of *MIL-S-8879C* by the DOD and its replacement with *SAE A8879C* (published by **SAE International** in January 2003). The DOD Notice of Cancellation can be seen at the top of the next page.

The FAA agreed to accept *SAE AS8879C* as the official thread document for UNJ threaded components utilized on commercial aircraft and the DOD agreed to adopt *SAE AS8879C* as the replacement document for *MIL-S-8879C* on all military systems.

## AS8879C Introduces Two Major Technical Changes

*SAE AS8879C* is a complete re-formulation of *MIL-S-8879C*. The primary goal of the STC-TF was to maintain the design intent of the original document while making the conformance requirements clearer for all those using this important specification. The hope is that *SAE AS8879C* will greatly reduce the diversity of conformance interpretations that were associated with *MIL-S-8879C* throughout its existence.

Two major features of *SAE AS8879C* are:

- Products made to *SAE AS8879C* are divided into Categories 1 and 2. Table 8 of the new specification spells out the exact conformance requirements for each category of product in greater detail than the previous specifications.
  - a. Category 1 products relate closely to the “Other” designation in *MIL-S-8879C* and to Method B in *MIL-S-8879A*.
  - b. Category 2 products relate closely to the “Safety Critical” designation in *MIL-S-8879C* and to Method C in *MIL-S-8879A*.
- One of the most significant conformance controversies brought to light by the FAA report was the sometimes inconsistent evaluation of plated and coated threads. Throughout the audit process, the FAA found that the conformance determination of the geometry and size of plain threads was found to be much less controversial than that of plated or coated threads. Through the work of the STC-TF, it was discovered that most of the commonly used finishes on aerospace threaded hardware are relatively soft and apply somewhat unevenly on threaded surfaces. This was determined to be the root cause of many final product conformance discrepancies between different parties.

NOTICE  
OF CANCELLATION

INCH-POUND

MIL-S-8879C  
NOTICE 3  
24 FEBRUARY 2003  
SUPERSEDING  
NOTICE 2  
12 AUGUST 1997

### MILITARY SPECIFICATION

#### SCREW THREADS, CONTROLLED RADIUS ROOT WITH INCREASED MINOR DIAMETER, GENERAL SPECIFICATION FOR

MIL-S-8879C, dated 25 July 1991, and AMENDMENT 1, dated 2 September 1992, are hereby canceled, and superseded by the Society of Automotive Engineers (SAE) Aerospace Specification AS8879. Threads identified as Application Category "Other Thread" in MIL-S-8879C are identified as "Category 1" threads in AS8879. Threads identified as Application Category "Safety Critical Thread" in MIL-S-8879C are identified as "Category 2" threads in AS8879.

Notice of Cancellation of MIL-S-8879C issued by the Department of Defense on February 24, 2003.

This fact was determined to be the cause of some very confusing findings made by the FAA in its audit. Initial examination determined that several lots of hardware were non-conforming due to being oversized. When the same hardware was re-evaluated to verify the initial results, the parts were found to be conforming. It was determined that the plating or coating on the threads had made the threads appear oversized in the initial measurement and that the coating was smeared, moved or penetrated by that first measurement. When parts were re-measured, the gaging reflected more precisely the size of the metal substrate of the thread.

#### Final Conformance to be Determined Through Use of Properly Calibrated Gages

After many hours of debate and discussion, the STC-TF agreed that the final conformance of plated or coated AS8879C threads will be determined by the use of gages that evaluate the "maximum material limits" only. All other thread characteristics must be assessed for conformance and documented prior to plating or coating.

It was agreed by the STC-TF (including the FAA and DOD) that the final conformance determination of AS8879C external threads will be based on the use of properly calibrated GO ring gages and that internal thread conformance will be determined by properly calibrated GO plug gages. The last sentence in the following sections of SAE AS8879C are intended to make this point:

- a. 3.7.1 "...Unless otherwise specified, all external thread characteristics shall be within the adjusted dimensional requirements before coating or plating. After coating or plating, the threads shall not exceed maximum material limits."
- b. 3.7.2 "...Unless otherwise specified, all internal thread characteristics shall be within the adjusted dimensional requirements before coating or plating. After coating or plating, the threads shall not exceed maximum material limits."

#### SAE White Paper Provides Insights into AS8879C

Unlike most work on fastener related specifications, the thoughts behind the decisions made in creating this specification have been very thoroughly and carefully documented. A White Paper regarding the problems related to MIL-S-8879C and the resolution of those problems as determined by the STC-TF will be published by SAE as AIR 5926.

All parties having any involvement with UNJ thread hardware should obtain both a copy of SAE AS8879C and this White Paper. Both can be obtained from SAE International by calling +1 877 606 7323 or by visiting the SAE web site at [www.sae.org](http://www.sae.org).

To learn more or for information on fastener inspection equipment, contact the author or **Circle 207**. 

*Greenslade & Company, Inc. is an ISO 17025 (A2LA) accredited provider of dimensional calibration services to suppliers of mechanical fasteners in the USA. The company offers the "Three Guarantee Calibration Program" that guarantees five day or less turnaround, error-free certificates and the meeting or beating of all published calibration prices within the scope of Greenslade's accreditation. Additionally, Greenslade & Company supplies a broad range of fastener inspection equipment.*

*Joe Greenslade is a regular contributor of articles to this magazine. Greenslade has been active in the fastener industry since 1970 and has held positions with major fastener producing companies.*