



AEROSPACE RECOMMENDED PRACTICE

ARP5777™

Issued 2010-05
Reaffirmed 2022-11

Maintenance and Inspection Procedures for Acme Screw Assemblies

RATIONALE

ARP5777 has been reaffirmed to comply with the SAE Five-Year Review policy.

1. SCOPE

This document is to be used as a guide in preparing specifications for maintenance and inspection of acme screw assemblies used in driven linear actuators. It is intended to cover Acme screw assemblies driven by electric, hydraulic, pneumatic, manual means, with or without gear case or speed reduction systems, and micro actuators.

Though the Acme screw is the most common thread form for sliding contact jackscrews this guideline is equally applicable to other sliding contact thread forms such as buttress, square, stub acme, and others including custom thread forms. The term Acme shall be used generally to address all sliding contact thread forms.

1.1 Purpose

This document establishes guidelines and general procedures for inspection and maintenance of Acme screw assemblies for actuators intended for use in applications to position control surfaces in response to manual or automatic power control system inputs.

1.2 Background

Previous service history has shown that inadequate lubrication causes accelerated wear of Acme screw assemblies.

Inadequate lubrication has occurred as a result of difficulty in achieving proper lubrication by maintainers and long lubrication intervals. Wear problems have been compounded by long inspection intervals and variability in inspection results.

2. REFERENCES

2.1 Applicable References

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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Documents

Document Sharing Hub

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

ARP4386 Terminology and Definitions for Aerospace Fluid Power, Actuation and Control Technologies

2.1.2 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://assist.daps.dla.mil/quicksearch/>.

MIL-HDBK-838 Lubrication of Military Equipment

2.2 Definitions

ACME SCREW ASSEMBLIES: Mechanical transformers capable of converting rotary shaft input to linear travel of the output component. These actuators are configured to primarily transmit axial load but may also be designed to support some amount of transverse (side) loads.

SLIDING CONTACT SCREW: A screw utilizing a sliding contact such as Acme screws, square threads, buttress threads, standard 60 degree threads and others. These screws may also be referred to as lead screws, power screws, Acme screws, etc.

JACKSCREW: A generic name associated with any form of screw, rolling contact or sliding contact, which converts rotary motion into linear motion.

SHALL: Denotes a requirement that must be met and verified by test.

WILL: Denotes a requirement that must be met but need not be verified by test.

SHOULD: Denotes a requirement that is desired to be met, but which may be violated if necessary.

MAY: Denotes a requirement that is optional to meet.

NOTE: Each of these definitions may be redefined by the specification writer to meet the specific needs of a given system. Other terms may also be used.

NOTE: Refer to ARP4386 for the general terms that are used in the Aerospace Recommended Practice.

2.3 Abbreviations

Use of ARP4386 is recommended for interpretation of commonly used abbreviations.

2.4 Acronyms

All acronyms used should be listed and defined in the detail specification.

3. REQUIREMENTS

3.1 Configurations

The Acme screw assembly serves as the output device for a mechanical actuation system. A typical actuation system may contain one or more of the following components:

- a. Prime Mover (Hydraulic, Pneumatic, Electric)
- b. Connecting Members (Torque Shafts, Angle Gear Boxes, Couplings, U-Joints, Gearing)
- c. Safety Devices (No-Backs, Torque Limiters, Brakes)
- d. Sensors (RVTs, RVDTs, Tachometers, Hall Effects, Encoders, Limit Switches)
- e. Miscellaneous Devices (Clutches, Sequencers, Accessory Drives, etc.)

These components may be configured and specified apart from or integrated with the linear mechanical actuator assembly. The configuration of the actuation system is determined by the prime contractor and is dependant on the specific air vehicle application.

3.2 Maintainability

3.2.1 Maintainability Characteristics

The ultimate maintainability goal of the Acme screw assembly design is to minimize maintenance requirements over the useful life of the program. The minimization of maintenance does not necessarily eliminate the need for periodic inspection. Inspection intervals shall be determined during development and in service

All attempts should be made, through detail specification definition, to minimize scheduled preventive maintenance/servicing, inspection and maintenance from the design. This would greatly reduce life cycle cost over the life of the program.

It is in the design phase where Acme screw assembly maintenance features should be addressed to reduce life cycle repair costs. Factors such as complexity, accessibility, visibility, testability, simplicity and interchangeability should influence maintenance design.

3.2.2 Maintenance Concept

When an Acme screw assembly requires maintenance, the specification should state the desired maintenance and level of maintenance that will apply. All attempts should be made to mitigate requirements for maintenance labor hours, Aerospace Ground Equipment (AGE), personnel skills and technical publications/data.

The level of maintenance should be classified/defined as:

- a. Organizational Level or Flight Line,
- b. Intermediate or Hangar, and/or
- c. Depot/Repair Station.