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Superseding AS567H

**Safety Cable, Safety Wire, Key Washers, and Cotter Pins for
Propulsion Systems, General Practices for Use of**

RATIONALE

This document has been reaffirmed to comply with the SAE 5-year Review policy.

1. SCOPE:

This SAE Aerospace Standard (AS) covers devices whose primary function is the retention of fasteners, except for such devices that are integral with the item being retained.

1.1 The practices cover the types of retaining devices described in the following sections:

- a. Section 3: Safety Cable and Safety Wire
- b. Section 4: Key Washers
- c. Section 5: Cotter Pins

1.2 Purpose:

The purpose of this document is to establish the requirements and basic principles for retaining fasteners and other parts in aerospace propulsion systems.

2. REFERENCES:

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 5687	Wire, Alloy, 74aNi 15.5Cr 8.0Fe, Annealed
AMS 5689	Wire, 18Cr 10.5Ni 0.40Ti, Solution Heat Treated
AMS 7210	Cotter Pins, 18Cr 9.5Ni, Corrosion Resistant Steel
AMS 7211	Cotter Pins, 18Cr 10.5Ni 0.40Ti, Corrosion and Heat Resistant Steel

AS4536	Safety Cable Kit, Procurement Specification and Requirements for Use of
AS123751-AS123850	Cotter Pin - Corrosion Resistant

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2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MS9245 Pin, Cotter & CRES, AMS 7211

2.3 Definitions:

- 2.3.1 SAFETY CABLE/SAFETY WIRE: Safety cabling or wiring is the securing together of two or more parts with a cable or wire, which shall be installed so that any tendency for a part to loosen will cause an additional tightening of the safety cable or wire. Safety cable or wire is not a means of obtaining or maintaining torque, but a safety device used to prevent disengagement of the part (Figure 1 applies to safety wire only).
- 2.3.2 ABRASION: Material worn, ground, or rubbed away from surface by frictional means. There is no sharp notch present; however, surface finish may be smooth or rough, raised material may or may not be visible.
- 2.3.3 KINK: Permanent deformation in the wire having a sharp radius less than or equal to the wire diameter and locally forming an angle less than 160° (see Figure 2).
- 2.3.4 NICK: A surface impression that is greater than .003 inch in depth having a sharp notch at bottom.
- 2.3.5 PART: Parts or units that are bound by the safety cable or wire.
- 2.3.6 SCRATCH: A surface impression that is less than .003 inch in depth.
- 2.3.7 PIGTAIL: Termination point of safety wire.

3. SAFETY CABLE OR WIRE:

3.1 Basic Rules for Installation of Safety Wire:

For Safety Cable, see 3.4.

- 3.1.1 For general purpose safety wiring, use the preferred sizes shown in Table 1. Use smaller diameter wire where parts are too small to permit a hole diameter to accommodate the preferred sizes, or where space limitations preclude the use of the preferred sizes. The larger sizes are used where stronger wire is required. The proper wire shall be specified on the drawing by part number.

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TABLE 1 - Safety Wire and Safety Wire Hole Data

Wire Diameter in	Wire Diameter mm	Recommended Twists per inch (25.4 mm)	Recommended Hole Diameter /1/ /2/ in	Recommended Hole Diameter /1/ /2/ mm	Recommended Chamfer Diameter (90° ± 5 incl) in Keep Edge Breaks Below .005 in	Recommended Chamfer Diameter (90° ± 5 incl) mm Keep Edge Breaks Below .005 in
0.015 - 0.017	0.381 - 0.431	10 - 15	0.037 - 0.057	0.94 - 1.44	0.070 - 0.090	1.78 - 2.28
0.019 - 0.021	0.483 - 0.533	8 - 14	0.037 - 0.057	0.94 - 1.44	0.070 - 0.090	1.78 - 2.28
0.024 - 0.026	0.610 - 0.660	8 - 14	0.060 - 0.080	1.53 - 2.03	0.090 - 0.110	2.29 - 2.79
0.030 - 0.034	0.770 - 0.860	6 - 11	0.060 - 0.080	1.53 - 2.03	0.090 - 0.110	2.29 - 2.79
0.038 - 0.042	0.970 - 1.070	6 - 11	0.060 - 0.080	1.53 - 2.03	0.090 - 0.110	2.29 - 2.79
0.049 - 0.053	1.250 - 1.340	4 - 9	0.060 - 0.080	1.53 - 2.03	0.090 - 0.110	2.29 - 2.79
0.061 - 0.065	1.550 - 1.650	4 - 9	0.070 - 0.090	1.78 - 2.28	0.100 - 0.120	2.54 - 3.04
0.089 - 0.093	2.270 - 2.360	4 - 8	0.100 - 0.120	2.54 - 3.04	0.140 - 0.160	3.56 - 4.06

/1/ Where safety wire is used to secure a castellated nut on a threaded item, selection of safety wire hole diameter for the item shall be based on cotter pin requirements.
/2/ Where parts cannot accommodate the recommended hole size, it is permissible to use a smaller hole provided a minimum diametral clearance of 0.003 in (0.08 mm) is maintained between the wire and the hole, except on the two largest wire sizes.

- 3.1.2 The safety wire material for use up to 1200 °F (649 °C) shall be corrosion resistant steel such as AMS 5689, and for use up to 1800 °F (982 °C), a corrosion and heat resistant alloy such as AMS 5687 shall be used. Where AMS or other material specifications are used, the specified diameter tolerances in Table 1 shall supersede those in the material specifications.
- 3.1.3 The common method of installing safety wire shall consist of two strands of wire twisted together (double twist method) where one twist is defined as being produced by twisting the wires through an arc of 180° and is equivalent to half of a complete turn. The single strand method of safety wiring may be used, when specified on the drawing, such as in a closely spaced, closed geometrical pattern (triangle, square, rectangle, circle, etc.), or parts in electrical systems, and in places that would make the single strand method more advisable. In such cases the single strand wire shall be limited to the pattern or group of similar parts.
- 3.1.4 The maximum span of safety wire (between tension points) shall be 6 in (152mm). The wire shall be taut within the requirements of 3.3.1.5.
- 3.1.5 Where multiple groups are safety wired by either the double twist or the single strand method, the maximum number in a series shall be determined by the number of units that can be safety wired by a 24 in (609 mm) length of wire.
- 3.1.6 Caution must be exercised during the twisting operation to keep the wire taut. Gripping surfaces of pliers shall have edges sufficiently rounded to preclude nicks. Abrasions and scratches are allowed; however, nicks are not allowed.
- 3.1.7 Exercise caution when installing safety wire on parts subject to relative movement such that the wire itself is not chafed, fatigued through vibration, installed over radii less than .005 in (0.13 mm) or given additional tension other than tension imposed on the wire to prevent loosening.