SAE Aerospace
An SAE International Group

AEROSPACE RECOMMENDED PRACTICE

SAE ARP1915

REV. C

Issued 1985-03
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Superseding ARP1915B

Aircraft Tow Bar

1. SCOPE:

This SAE Aerospace Recommended Practice (ARP) outlines the basic general design considerations for transport aircraft tow bars.

It does not cover the requirements for tow bars intended for aircraft with a maximum ramp mass (MRW) below 8,600 kg (19,000 lb).

2. 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.

2.1 SAE Publications:

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

ARP1247C	General Requirements for Aerospace Ground Support Equipment, Motorized and Non-motorized
AIR1375B	Minimum Safety Requirements for Special Purpose Airline Ground Support Equipment
AS1614C	Main Line Aircraft Tow Bar Attachment Fitting Interface
AS5488	Regional Aircraft Tow Bar Attachment Fitting Interface

TO PLACE A DOCUMENT ORDER:
Tel: 877-606-7323 (inside USA and Canada)
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: custsvc@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/ARP1915C

2.2 International Standards:

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002.

ISO 8267-1	Aircraft - Towbar attachment fittings interface requirements - Part 1: Main line aircraft
ISO 8267-2	Aircraft - Towbar attachment fittings interface requirements - Part 2: Regional aircraft
ISO 9667	Aircraft ground support equipment - Towbar - Connection to Aircraft and Tractor

2.3 European Standards:

Available from CEN, Comité Européen de Normalisation, rue de Stassart 36, B1050 Brussels, Belgium, or any of the 29 European national standardization institutes, members of C.E.N.

EN 12312-7	Aircraft ground support equipment - Specific requirements - Part 7: Aircraft movement equipment

NOTE: Applicable to tow bars to be operated in Europe, as one recognized means to demonstrate compliance with the E.U. Machinery Directive.

2.4 IATA Publications:

Available from International Air Transport Association, Publications Assistant, 800 Place Victoria, P.O. Box 113, Montréal, Québec H4Z1M1, Canada.

Airport Handling Manual AHM 958, Functional specification for an aircraft tow bar

2.5 Airframe Manufacturers:

Facility and Equipment Planning document for each aircraft type.

3. REQUIREMENTS:

3.1 The tow bar shall be designed to withstand and transmit pull/push and turning forces when connected to either the front or rear nose landing gear towing connection of an aircraft.

3.2 The tow bar shall incorporate a protective device or devices, such as shearpins, which shall:

3.2.1 Relieve fore and aft and torsional towing forces applied to the aircraft nose gear through the tow bar which exceed the maximum force recommendations of the aircraft manufacturer.

3.2.2 Simultaneously alert the tow vehicle operator audibly, visually or both that the device(s) has functioned.

3.2.3 Transfer overload to a retaining feature preventing separation and therefore loss of control of the aircraft from the towing vehicle.

4. GENERAL DESIGN FEATURES:

The tow bar shall be designed and constructed to be in compliance with the applicable provisions of the referenced documents. The design shall allow for quick and easy servicing.

4.1 Dimensions:

4.1.1 Overall Length: Overall length requirements may vary depending upon:

a. type(s) of aircraft

b. type(s) and dimensions of aircraft tow tractor

c. clearances between tow tractor extremes and aircraft nose, lower fuselage, lower fuselage protrusions and engine cowlings

d. clearance between tow tractor extremes and airport buildings or maintenance facilities

4.1.2 Tube Cross Section: The tube cross section is to be constant within the same or several aircraft mass categories of AS1614C or AS5488, as applicable, for standardization reasons.

4.2 Operating Speeds:

The tow bar, when unladen, shall be both towable and stable at speeds up to 25 km/h (15 mph). The maximum towing speed shall be suitably placarded.

4.3 Towbar Head:

4.3.1 The tow bar head shall be designed to allow safe and easy coupling by one man to and from the nose landing gear towbar attach fittings. Unless otherwise advised, the tow bar attachment fitting and clearances shall meet the requirements of:

- AS1614C (ISO 8267-1) for main line aircraft with a maximum ramp mass (MRW) higher than 50,000 kg (110,000 lb),

- AS5488 (ISO 8267-2) for regional aircraft with a maximum ramp mass (MRW) between 8,600 kg (19,000 lb) and 50,000 kg (110,000 lb).

NOTE: Several common aircraft types designed prior to the advent of the ASs still use non standard nose gear tow bar attachment fittings. Refer to airframer's Facility and Equipment Planning document for interface requirements.

4.3.2 The latching mechanism which locks the tow bar head to the aircraft nose gear shall be positive so as to prevent inadvertent disconnects.

4.3.3 The tow bar head should be designed in such a way to eliminate the possibility of the head spreading and/or damaging the tow bar's head mounting plates and tube.

4.4 Tow Bar Eye (Lunette):

4.4.1 The towbar tow eye shall be of forged steel with a nominal inside diameter of 76 mm (3 in) and an annular cross section diameter of 41 mm (1-5/8 in). For smaller lighter aircraft a rectangular cross section with the same inside dimension may be suitable.

4.4.2 The tow bar eye material is to be abrasion resistant and must withstand, without deformation, normal wear and tear.

4.4.3 A rotating eye (lunette) is highly recommended for aircraft types with a canted nose gear strut.

4.5 Undercarriage:

The tow bar shall be equipped with a wheeled undercarriage to support the tow bar while being moved unladen and to serve as a vertical adjustment while attaching the end connectors. The following features shall be incorporated where applicable based on aircraft requirements:

4.5.1 The undercarriage wheels shall be extendible by the use of a mechanical device or hydraulic hand pump and hydraulic cylinder(s). They shall be mechanically retractable or spring retractable by releasing hydraulic pressure on the hydraulic cylinder(s). Standardization on wheels, hydraulic pumps, and cylinders within all tow bar groups should be considered for easier maintenance.

4.5.2 The undercarriage shall be capable of being adjusted through the range of heights necessary to facilitate connecting to and towing the various intended aircraft. The wheels must clear level ground by a minimum of 50 mm (2 in) during all towing operations. Consideration must be given to aircraft with canted nose gear that will cause the tow bar to roll in a turn, and for the possibility of unlevel surfaces.

4.5.3 The position of the undercarriage along the length of the tow bar shall be adjustable to adapt center of gravity in case of changing heads, modifications and installation of Ground Power Unit cables. In the case of a tow bar designed such that its fixed jaw is to be connected from below the aircraft towing spool with its latching device above, the under-carriage should be positioned such that the tow bar is heavier at the lunette end by an amount not exceeding 12 kg (26.5 lb).

FIGURE 1

In the case of a tow bar designed such that its fixed jaw is to be connected from above the aircraft towing spool with its latching device below, the undercarriage should be positioned such that the tow bar is heavier at the tow head end by an amount not exceeding 12 kg (26.5 lb).

FIGURE 2

The tow bar shall be balanced as defined above no matter to what height the undercarriage has been adjusted.

4.5.4 The width of the undercarriage shall be sufficient to provide stability when being towed unladen.

4.5.5 Heavy duty wheels, pneumatic or cushion tires and hubs with roller bearings shall be provided.

4.5.6 The horizontal travel caused by the extension and retraction of the undercarriage should be as small as possible to minimize effect on tow bar balance.

4.6 Aircraft Protective Devices:

4.6.1 The tow bar shall be provided with a protective device(s) to meet Section 3 requirements. Lower forces than those provided by the aircraft manufacturer may be specified by the customer.

If the aircraft's nose gear strength is designed to be consistent with the mass categories indicated in AS1614C or AS5488 as applicable, then the protective device(s) can be designed to meet the mass categories.

4.6.2 If shearpins are used, they shall comply with the following:

4.6.2.1 They shall be of non-standard diameter and specified by the manufacturer.

4.6.2.2 The pins shall be clearly identified.

4.6.2.3 The tow bar head mounting plates shall incorporate hardened steel bushings for the shear pin locations. This to minimize wear and ensure clean shears. Shouldered bushings are to be used in the tow bar with straight bushings in the head.

4.6.2.4 Shearpin material shall be as required for the particular application.

4.6.2.5 See Figures 3, 4, and 5 for typical shearpin configurations. It is up to the tow bar manufacturer to choose a concept which best suits the application.

4.6.3 As a safety feature the tow bar (body or head holding section) shall be designed to fail at 150% of the protective device(s) functioning point or as otherwise specified by the customer.

4.7 Protective Device(s) Calculation:

4.7.1 The protective device(s) or shearpin calculation must be based on allowables as stated in 4.6.1.

4.7.2 The design strength calculation of the protective device(s) or shearpins, retaining bolts, and body assembly must be provided by the towbar manufacturer upon purchaser request.

4.8 Miscellaneous Features:

4.8.1 Loop handles are to be provided either on each side or on top of the towbar at the lunette eye end.

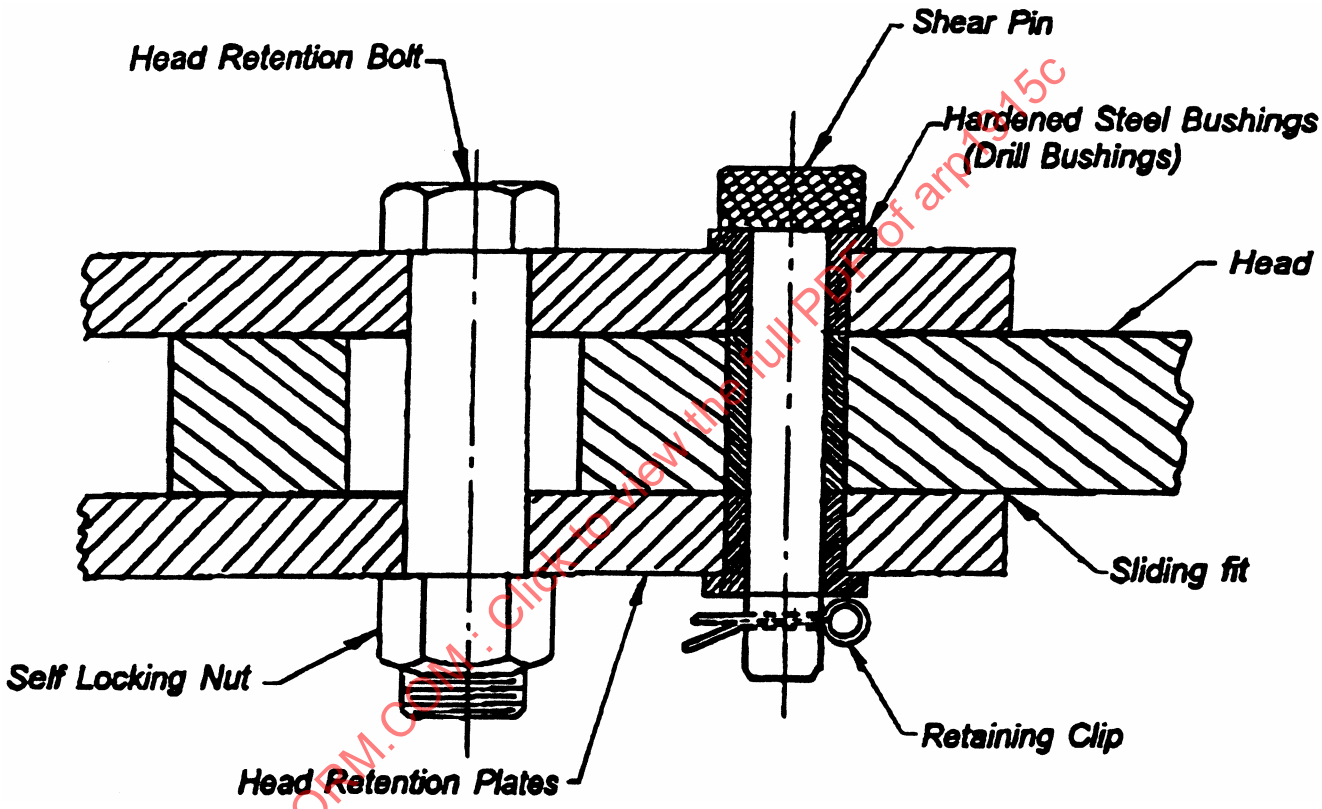
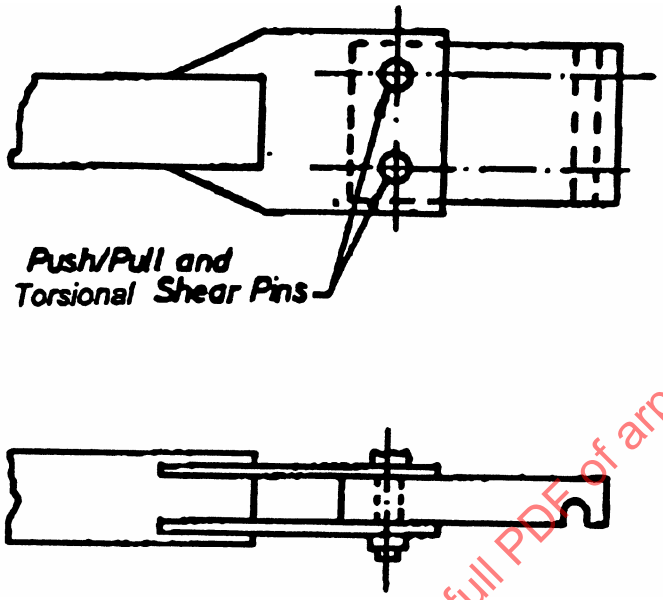


FIGURE 3 - Typical Shear Pin, Bushings, and Head Retention Bolt Configuration



NOTE: For clarity, the head retention bolts are not illustrated

FIGURE 4 - Dual Function Shear Pins

Note: For clarity, the head retention bolts are not illustrated.

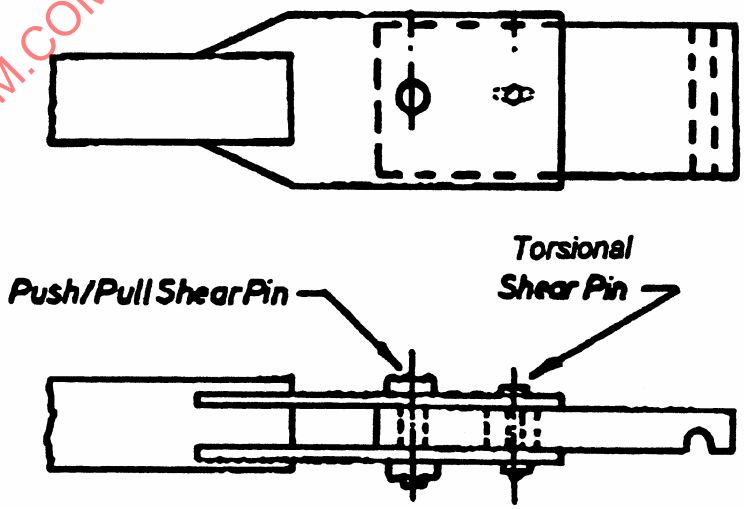


FIGURE 5 - Single Function Shear Pins