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AEROSPACE RECOMMENDED PRACTICE

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Aircraft Towbar

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1. SCOPE: This Aerospace Recommended Practice (ARP) outlines the basic general design considerations for aircraft towbars.

2. APPLICABLE DOCUMENTS: The following documents, or portions thereof, of the issue in effect on the date of the purchaser's controlling specifications form a part of this ARP to the extent specified herein. In the event of conflicts between this ARP and the listed documents, this ARP shall apply unless otherwise stated herein.

2.1 SAE Recommended Practice ARP-1247B General Requirements for Aerospace Ground Equipment Motorized and Non-motorized.

2.2 SAE Aerospace Standard AS-1614A Commercial Aircraft Towbar Attach Fitting Interface.

2.3 ISO R405 Type Aircraft Towbar Connection to Tractors.

2.4 ISO 8267 Aircraft Towbar Attachment Fittings.

2.5 Aircraft Manufacturers Facility Planning Manuals or Guides.

3. REQUIREMENTS:

3.1 The towbar 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 towbar shall incorporate a protective device or devices, such as shearpins, which will:

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

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

C. 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 towbar shall be designed and constructed to be in compliance with those provisions of ARP-1247B which reasonably apply to this type of equipment. Towbar head, lunette eyes and caliper plates should be designed to allow easy disassembly for maintenance.

4.1 Dimensions:

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

- type(s) of aircraft towbar is to be used on
- type(s) and dimensions of tow tractor operated
- clearances between tow tractor extremes and aircraft nose, lower fuselage, lower fuselage protrusions and engine cowlings
- 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 weight categories of AS-1614A for standardization reasons.

4.2 Operating Speeds:

4.2.1 Free Towable Speed: 32 km/h (20 mph).

4.3 Towbar Head:

4.3.1 The towbar heads 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 towbar attach fitting and clearances will be per AS-1614A.

4.3.2 The latching mechanism which locks the towbar head to the aircraft towing spool shall be positive such that it will prevent inadvertent disconnects.

4.3.3 The towbar head should be designed in such a way to eliminate the possibility of the head spreading the caliper plates or the tube.

4.4 Towbar Eye (Lunette):

4.4.1 The towbar eye shall have an inside diameter of 76 mm ± .8 mm (3 in. ± 1/32 in.) and an annular cross section diameter of 41.3 mm ± .8 mm (1 5/8 in. ± 1/32 in.). For smaller lighter aircraft rectangular cross sections of inside diameter of 76 mm ± .8 mm (3 in. ± 1/32 in.), outside diameter of 159 mm (6 1/4 in.).

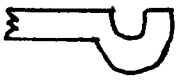
4.4.2 The towbar eye material is to be abrasion resistant and must withstand, without deformation, wear and tear normally expected.

4.5 Undercarriage: The towbar shall be equipped with a wheeled undercarriage to support the towbar while being moved as a free body and to serve as a vertical adjustment while attaching the end connectors. The following features shall be incorporated:

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 towbar 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 shall clear level ground by a minimum to 50 mm (2 in.) during towing operation. Roll of towbar, when turning with an airplane with canted nose gear strut must be considered.

4.5.3 The position of the undercarriage along the length of the towbar 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 towbar 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 towbar is heavier at the lunette end by an amount not exceeding 12 kilos (26.5 lbs).

In the case of a towbar 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 towbar is heavier at the towhead end by an amount not exceeding 12 kilos (26.5 lbs).

The towbar 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 free towing.

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 towbar balance.

4.6 Aircraft Protective Provisions:

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

If the A/C nose gear strength is designed to be consistent with the weight categories indicated in AS-1614A then the protective device(s) can be designed to meet the weight 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 caliper plates should incorporate shouldered bushings to eliminate elongation of bushing holes and loss of bushings. The head should incorporate straight bushing(s). Shearpin bushings shall be of high grade steel, re: drill bushing material.

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

4.6.2.5 See figures 1, 2 and 3 for typical shearpin configurations. It is up to the towbar manufacturer to choose a concept which meets the customer requirements best.

4.6.3 As a safety feature the towbar (body or head holding section) shall be designed to fail at 150 percent 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.

4.8.2 If applicable, storage shall be provided on the towbar for two spare sets of shearpins, and the bar shall be delivered with the spares in place. The storage provided must not trap water or induce water to enter the tube forming the bar.

4.8.3 Protective bumpers are required on both ends of the towbar to prevent the lunette eye or the jaw from making contact with the ground.

5. OPTIONS: The following features may be incorporated on special requests:

5.1 A towbar head designed to separate from the towbar after protective device(s) or shearpin activation failure. After separation, the head must not contact the ground when hanging from the attachment spool of the aircraft.

Alternatively, a means may be provided to prevent "dig-in".

5.2 A shock-absorbing device built into the towbar.

5.3 A flyaway version of the towbar (separates into two lengths for air shipments).

5.4 Protective system warning device.

5.5 Provisions for ground power/intercom cable(s) and attachment fittings. These shall be located such that cables, if fitted, are not subject to damage.

5.6 Storage for the sockets/plugs of the cable(s).

5.7 Both tube ends holding the lunette eye and the tow head are to be designed with detachable flanges (non welded construction).

5.8 The towbar tube may float on its transverse axis to ease the hook-on operation of the head into the A/C NLG attach fitting.

6. IDENTIFICATION AND MARKING:

6.1 The vendor shall rivet a metal nameplate to the towbar, specifying:

Vendor name and trademark
Type designation or model
Serial number
Date of manufacture
Special characteristics

6.2 All instruments and controls are to be suitably identified. Adequate operation instruction placards are to be affixed near all controls.

6.3 Requirements for paint, reflectors and any special marking requirements are to be provided by the purchaser.

7. DOCUMENTATION, TESTS AND ANALYSIS:

7.1 Tests to demonstrate the operation of the protective device(s) or the destruction of the shearpins under the required loads shall be carried out on special request of the customer.

7.2 The vendor shall provide the instrumentation and equipment required to measure and record all technical data to substantiate the performance as defined in this document.