



GLIDING NEW ZEALAND INCORPORATED

ADVISORY CIRCULAR
AC 3-02

AERO TOW ROPES

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1. Introduction.

This Advisory Circular provides guidance on glider aero tow rope assemblies, in support of the requirements in the MOAP Appendix 3-B. In particular:

- The requirements for a weak-link.
- How to make up rope assemblies.
- Rope splicing.
- Care of ropes.

2. Rope Specification

- 2.1 All rope types lose strength over time due to UV light, abrasion and general wear. Suitable rope materials are 8-10 mm UV-stabilised polyester, polypropylene or polyethylene – these have about the right elasticity to give a smooth ride to the glider without excessive stretch. Nylon or wire must not be used. *Note that all synthetic ropes must be made from UV-stabilised material.* This is particularly critical for polypropylene and polyethylene ropes as both of these materials have virtually no UV resistance without stabiliser. Cheap ropes of poor quality (readily available from some hardware stores) must be avoided. Specialist suppliers, such as Bridon, are recommended.
- 2.2 Ropes¹ must incorporate a weak link of 750kg_f (750daN) nominal strength at the tow plane end. (For example a Tost **red** link is 750±75kg_f.)

3. Making up Tow Ropes from Bulk Roll

- 3.1 The recommended minimum length for an aero tow rope is 50m ring to ring. When new, rope lengths should be at least 55m from ring to ring, which allows for re-splicing several times without being reduced to less than 50m. By the time this has been carried out a number of times, and the rope is down to its minimum recommended length, the whole rope is usually well weather-beaten and showing distinct need of retirement. This is typically about 12 months for a club doing around 1,500 tows a year on a grassed airfield.
- 3.2 The temptation to get five rope lengths out of say a 250m roll should be avoided, as some or all of them will all end up too short. As about 200mm is used for each splice, nearly half a metre is used in the splices, so 55.5m is required per rope. Four ropes therefore need 222m. The remaining 28m can be used for ground towing ropes or tie-downs, or each rope can be made a bit longer than 55m.
- 3.3 Tow rings must conform to the specifications given in Appendix 1. The standard single tow rope assembly consists of rope, spliced at the glider end to ring B of a standard tow ring pair, with the weak-link at the other end using one shackle between the weak-link and ring B of a standard tow ring pair, and a rope splice to another shackle on the other end of the weak-link – see Appendix 2.

¹ The only exception to this is the rope formerly supplied by GNZ. The actual strength of the GNZ rope when new is greater than that actually required. However this has to be balanced against time of usage. Extensive experience in the field has led to the conclusion that this rope is suitable as a glider tow rope without the need for a weak-link for its total useful life. However, in order to avoid breakages in service, care must be exercised to ensure that the rope is discarded before it becomes excessively worn. Note that this rope should be passed twice around the tow ring in order to reduce wear at this point. The splice should also be as tight as possible against the ring to prevent the double loop from separating.

- 3.4 In years gone by, plastic funnels were sometimes used at the glider end of the rope. This has caused at least one fatal accident – therefore, such funnels must not be incorporated.
- 3.5 Thimbles may be incorporated when the rope is to be used over soft grass. Hard ground or sealed runways will cause excessive wear, so thimbles should not be incorporated in such circumstances.

4. Rope Splicing

- 4.1 Ropes are to be spliced² at each end for the attachment of towing rings and weak-link shackles. Splices should have a minimum of five full tucks. Splices are not to be whipped and must remain open for inspection.
- 4.2 Splices may be tapered by using several tapering tucks at the end. This makes a very neat job and eases the abrupt ending of the splice. However, experience has shown that it is almost always the wear at the rings which prompts the re-splicing of the rope, so tapering is merely a ‘nice to have’.
- 4.3 Splices anywhere along the length of the rope are permissible, providing the rope is in good condition. The inline splice should be made with at least four tucks in each direction.
- 4.4 Each splice makes the rope a little heavier and stiffer, so no more than two in-line splices are recommended.

5. Rope Assemblies for Double Towing

- 5.1 For “double” towing, two separate ropes are to be used, each with a weak link (as specified in paragraph 2.2 above). These consist of a “short rope” of not less than 50m between rings, and a “long rope” of not less than 80m between rings.

Note: A "long rope" of about 50m longer than the "short rope" is recommended to provide increased separation between the gliders.

- 5.2 The “long rope” consists of rope, spliced at the glider end to ring B of a standard tow ring pair, with a weak-link at the other end between the rope and ring B of a multiple tow double-ring assembly.
- 5.3 The “short rope” consists of rope, spliced at the glider end to ring B of a standard tow ring pair, with a weak-link at the other end between the rope and ring C of a multiple tow triple-ring assembly.
- 5.4 The two ropes are coupled together at the tow plane hook via the multiple rings in such a manner that if jettisoned by the tow pilot, they will automatically separate. This is accomplished by fitting the multiple tow *double-ring* assembly over the multiple tow *triple-ring* assembly, and then offering the last ring A of the triple-ring assembly up to the tow plane release in the normal manner. The double-ring assembly will be captured on the triple-ring assembly until released.

6. Care of Tow Ropes.

- (a) Uncoil and coil correctly. Always coil clockwise.
- (b) Watch for kinks that will distort the rope.

² If operational circumstances require a quick temporary repair, a bowline knot may be used. However, this should be replaced by a splice at the earliest opportunity, as knots are not as strong and abrade more quickly than splices.

- (c) Avoid sharp objects that will severely abrade the surface.
- (d) Ensure that splices are correctly made.
- (e) Avoid very hot surfaces.
- (f) Avoid any overloading that produces permanent set.
- (g) Inspect the full length of rope each morning before using, for possible damage, wear, fraying etc.
- (h) Carefully check well worn ropes to see if they should be replaced.
- (i) If continually used in a dusty environment, wash the rope periodically.
- (j) Do not leave ropes out in the sun unnecessarily, as this hastens UV degradation.

Appendix 1 Towing Rings

1. General

Tow rings used for the launching of gliders and powered gliders by aero tow, auto tow, or winch, must conform to the specifications below, or be manufactured by TOST GmbH, as detailed in Para 5 below.

2. Ring Sizes

There are three sizes of ring. The specifications are detailed in para 4. These rings are identified as being:

- (a) Ring A Standard small ring.
- (b) Ring B Standard large ring.
- (c) Ring C Special large ring.

3. Ring Assemblies

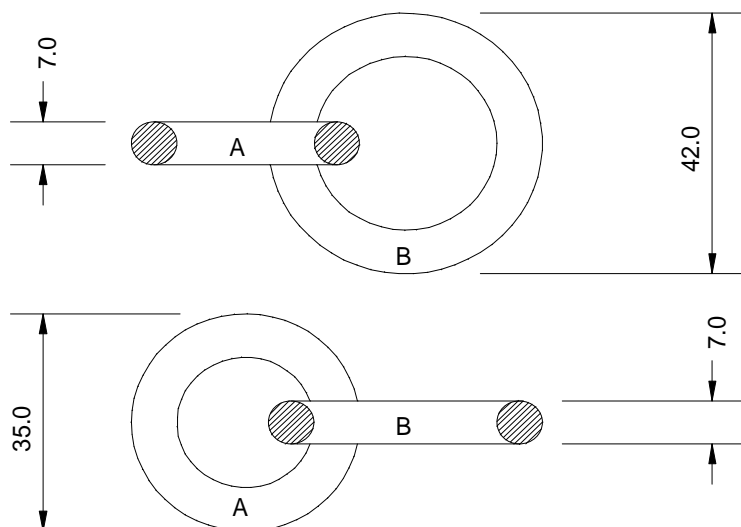
3.1 There are three types of ring assembly.

- (a) Standard tow ring assembly.
- (b) Multiple tow double-ring assembly.
- (c) Multiple tow triple-ring assembly.

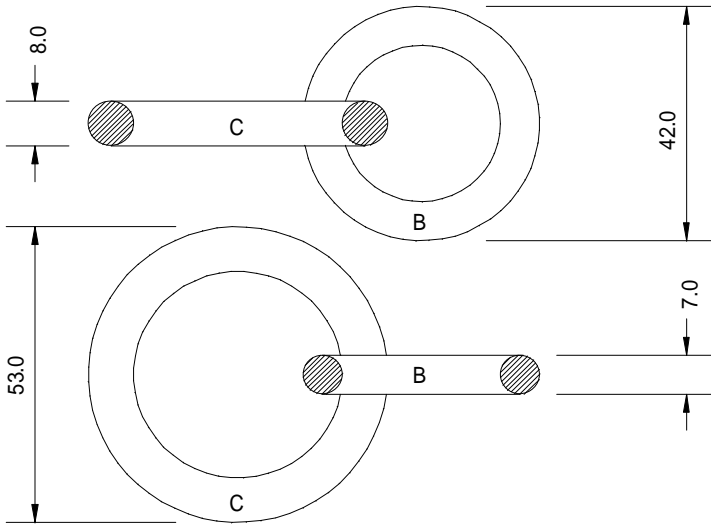
These ring sets are assembled in the following manner.

Note: In all cases the release end is to the left in the following diagrammes, with the rope to the right.

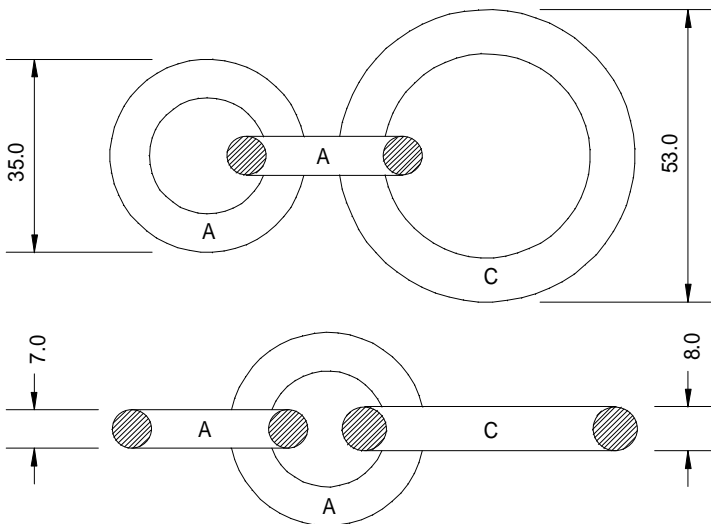
3.2 Standard tow ring assembly: Ring A, Ring B.



3.3 Multiple tow double-ring assembly: Ring C, Ring B.



3.4 Multiple tow triple-ring assembly: Ring A, Ring A, Ring C.



4. GNZ Specifications

4.1 Rings are to be manufactured from round section hard drawn wire to the following Specs:

- (a) Wire diameter (Ring A & B) 7mm + 0, - 0.3
- (b) Wire Diameter (Ring C only) 8mm + or - 0.3
- (c) Material spec (All Rings) ANS/NZS 4671 Grade 500 or equivalent.

4.2 Rings are to be circular in shape and cold formed around a mandrel to achieve the following dimensions after welding:

- (a) Standard small ring (ring A) OD = 35mm, + 0, - 0.3
ID = 21mm, + 0, - 0.3
- (b) Standard large ring (ring B) OD = 42mm, + 0, - 0.5
ID = 28mm, + 0, - 0.5

- (c) Special large ring (ring C) OD = 53mm, + 0, - 0.5
ID = 37mm, + 0, - 0.5

4.3 After forming, and cutting into single rings, the ring should be pressed so that the ends are aligned. The cut ends are to be ground at an angle of approximately 45 degrees, from each side to just less than half thickness, (ie. grind to be in the shape of a "J"). The cut ends are to be welded, using MIG or TIG welding methods and techniques, with appropriate electrodes.

4.4 The small ring is made separately, and the large ring joined to it before the large ring is welded.

Note: During welding care should be taken not to cause heat build-up in the ring, causing it to lose strength.

4.5 Excess weld is to be ground off. The maximum deformity at the weld to be + or - 0.3mm.

4.6 Final treatment.

(a) Rings are to be passivated.

(b) Finished rings may be plated for preservation during storage.

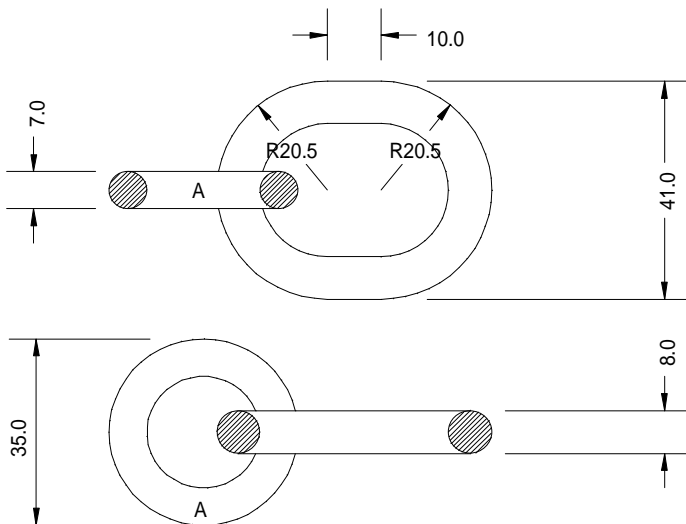
4.7 Identification. Any form of ID, or other information required, may be stamped or embossed ONLY on the standard large ring.

5. Tost Rings

5.1 Tost standard double rings are manufactured to the following specifications:

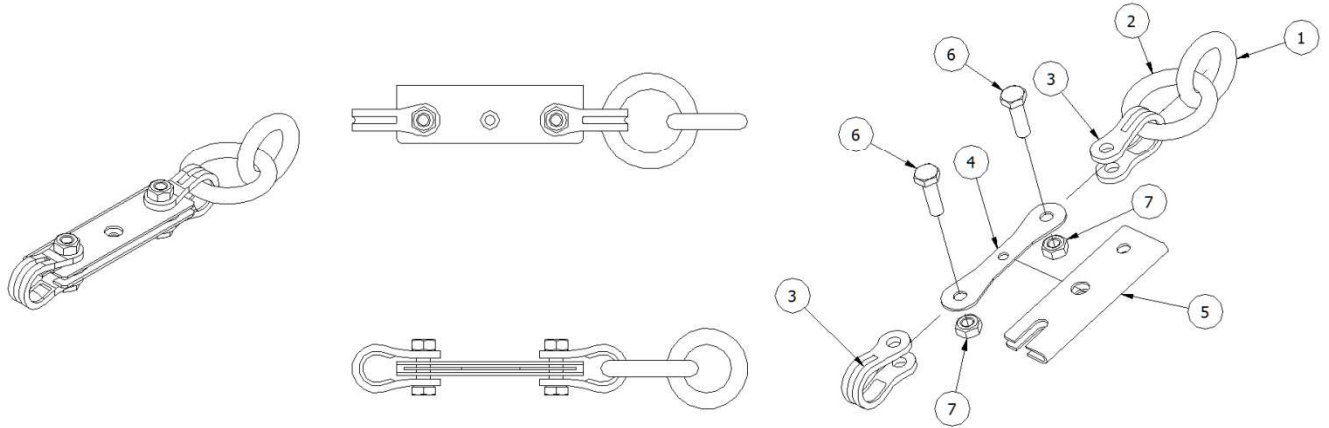
(a) Small ring of 35mm OD in 7mm material

(b) Large ring of 51mm X 41mm race-track shape in 8mm material.



5.2 The above rings are approved only when manufactured by TOST GmbH, identified by the legend TOST, together with the LN number, stamped on the oval ring.

Appendix 2 Typical Aero Tow Weak-Link Assembly



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GNZ Tow ring A	Standard tow ring assembly
2	1	GNZ Tow ring B	
3	2	Tost Part No 9993	8mm weak-link shackle
4	1	Tost Part No 9902	No 3 Red 750daN weak-link
5	1	Tost Part No 9950	Protector sleeve for weak-link
6	2	ISO 4017 – M6 x 20	SS hexagon-head screw
7	2	ISO 4032 – M6	SS hexagon Nyloc nut

Note: Tost weak-link parts may be obtained from the GNZ South Island Regional Operations Officer (ROO):

Jerry O'Neill
jerryo@xtra.co.nz 027 486 7537