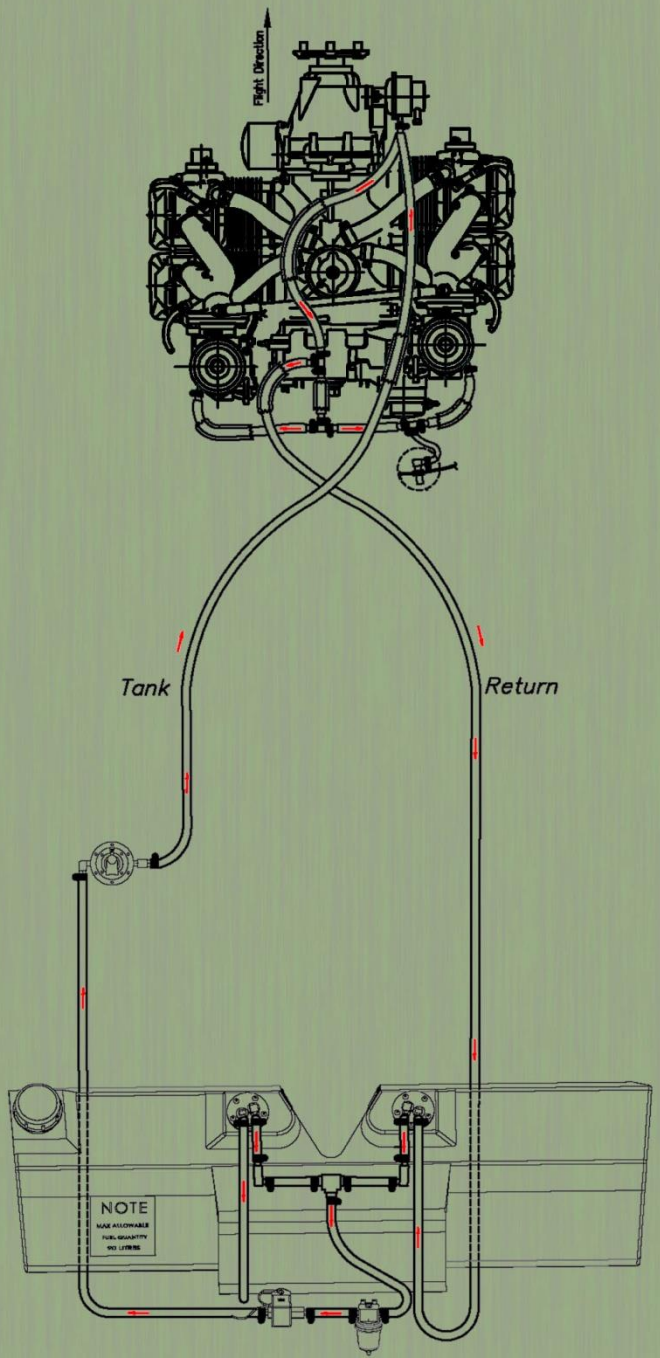
Bush Cat

by SkyReach

Detailed Maintenance Procedures Manual



BCMP-NT-001-000

SkyReach

DETAILED MAINTENANCE PROCEDURES MANUAL

BushCat

NOSE-WHEEL AND TAIL-DRAGGER
FITTED WITH ROTAX 912ULS ENGINE

APPROVED FLIGHT MANUAL PART NUMBER:	BCMP-NT-001-000
AIRCRAFT TYPE:	CHEETAH – BUSHCAT*
DATE OF ISSUE:	24 October 2019

**Refer to the POH for more information on aircraft type.*

ISSUES AND REVISIONS

This detailed maintenance procedures manual may be revised and amended periodically and as a result new issues and revisions will be made and published. Revisions will be made to rectify small changes or errors with this manual which do not change page numbering. Corrected pages simply replace existing pages. New issues will be released if major changes to this manual are made and page many or all page numbers change. If this manual has been shipped with an aircraft it will be suitable for the aircraft and subsequent issues will not be required for it to be complete - i.e., a later issue operating manual will only be applicable to aircraft shipped after that particular issue. If revisions are published you will be notified by SkyReach or by your distributer as they will apply to the correctness of your manual. It should be noted that all revisions and manuals are available on the SkyReach website as downloadable PDF files. The part number of your manual (shown on the front cover) will have the following format:

BCMP-NT-aaa-bbb

The first two parts show that it is a BushCat detailed maintenance procedures manual for nose-wheel and tail-dragger variants. The numbers replacing 'aaa' show the issue number of your manual, and the numbers replacing 'bbb' indicate the latest revision which has been included in this manual. If you receive a revision to your manual, your manual number will change in the 'bbb' section.

A record of issues and revisions are given on the following page.

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RECORD OF ISSUES AND REVISIONS

The following issues have led to this current issue:

Issues Number	Date Published	Notable Changes
001	24/10/2019	Original

The following revisions have been included in this issue. Please document further amendments in the blank spaces provided:

Revision Number	Date Published	Notable Changes
000	N/A	Original (No revisions)

The following table lists the most up-to-date revision for each page:

Page	Issue-Rev	Page	Issue-Rev	Page	Issue-Rev	Page	Issue-Rev	Page	Issue-Rev
1	-001-000	2	-001-000	3	-001-000	4	-001-000	5	-001-000
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11	-001-000	12	-001-000	13	-001-000	14	-001-000	15	-001-000
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161	-001-000	162	-001-000	163	-001-000	164	-001-000	165	-001-000
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FEEDBACK FORM

Please use the following form to notify us of any improvements or corrections needed, as well as for continued operational safety reporting or for an owner's change of address notice. After completing the form please fax or email it to the relevant contact shown on the next page. In addition, please keep a copy of the completed form in your Maintenance Manual.

Name:

Email:

Phone Number:

Date:

BushCat Serial Number:

Registration number:

Feedback information:

Email or fax to:

South African Address:	**USA Address:**	**New Zealand Address:**
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Brazilian Address: Use South African contact details		

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CHAPTER 1. GENERAL

1.1. INTRODUCTION TO THE MANUAL

Thank you for purchasing a BushCat Light Sport Aircraft.

The BushCat represents the best value in a light sport aircraft without any compromise in quality and safety.

In order to extract maximum safety and performance from your BushCat please familiarize yourself with the entire contents of this Detailed Maintenance Procedures Manual.

This manual conforms to ASTM F2483 standards – Standard Specifications for Maintenance Manuals (MM) for Light Sport Airplanes.

This aircraft is equipped with a non-certified engine which meets the ASTM F2339-06 engine standard.

All factory-built aircraft have been manufactured by Rainbow SkyReach (PTY) LTD – a part 148 approved manufacturing organisation, approved by the South African Civil Aviation Authority.

1.2. INTRODUCTION TO THE CHEETAH SERIES

It should be noted that the term 'BushCat' refers to the third (and most current) variant of Cheetah aircraft; The Cheetah-BushCat. Original production acceptance certification with the SACAA was obtained under the name of 'Cheetah'. The two main upgrades to the aircraft were approved as 'Cheetah-XLS' and 'Cheetah-BushCat'. For certification in foreign countries which was based on the South African approval the term 'BushCat' was used in place of 'Cheetah-BushCat'. This manual applies only to the Cheetah-BushCat and not to the Cheetah-Standard or Cheetah-XLS aircraft.

1.3. A NOTE ON STANDARD UNITS

Aircraft manufacturers traditionally present figures in the standard units adopted by the country of manufacturer. The BushCat is a South African designed and manufactured aircraft and as such it presents metric units as default. However, Rainbow SkyReach (PTY) LTD makes efforts to present both Metric and Imperial units in all published documentation where practical. The operator should bear this in mind to avoid errors from using figures with incorrect units.

1.4. REFERENCE DOCUMENTATION

The following documents are referenced within this manual:

1. ASTM 2245 – Specifications for the design and performance of a Light Sport Aircraft
2. The BushCat kit assembly manual.
3. The BushCat pilot operating handbook.
4. Line Maintenance Manual for ROTAX engine type 912 series.

1.5. SUPPLIED DOCUMENTATION

The following manuals are supplied in either hardcopy or electronic format as part of your BushCat aircraft in addition to any pertinent avionics and equipment manuals

1. The Rotax 912 ULS engine operators manual
2. The BushCat Pilots Operating Handbook
3. The BushCat Quick Reference Handbook
4. The BushCat Maintenance Manual
5. The BushCat Detailed Maintenance Procedures Manual
6. The BushCat Assembly Manual (for kit build option)

CHAPTER 2. DETAILED MAINTENANCE PROCEDURES

The following section can be photocopied in separate sections, signed off and stored separately from the body of the file as a record of the completion of each of the tasks. All maintenance and/or inspections conducted on an aircraft must be logged in a suitable logbook (e.g.: the aircraft maintenance logbook, an airframe or engine logbook, a journey log, etc) as per the requirements of the country of registration.

All procedures that are omitted from this section (including, but not limited to, wing structure repair, engine overhaul and carburettor overhaul) have separate overhaul manuals that will be made available to facilities approved by the manufacturer to perform such work.

Since this aircraft comes in kit build format, a large portion of the major structural assemblies are detailed in the Kit Build Manual and are omitted here to avoid duplication.

2.1. GENERAL

2.1.1. AIRCRAFT HANDLING

AIRCRAFT HANDLING	
Special tooling required	Nil.
Level of maintenance*	Level 1
Reference documents	BCPH-NT-012-000
Maintenance packing list	Not applicable.

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

The BushCat can be manoeuvred by hand on the ground safely as long as care is taken to avoid injury and/or damage to the aircraft. The aircraft should not be handled if the engine is running or if there is an occupant in the cockpit who is not a qualified pilot current on the type.

Towing behind a motorized vehicle is not recommended.

Persons may push the aircraft by applying pressure to the lift struts as close to the wing attachment point as possible. The aircraft can also be pushed or pulled by the propellers at the root. Applying pressure to the propeller tips, spinner, dorsal fin or empennage area is not advised.

Tail-dragger specific:

To turn the aircraft in any desired direction, the tail of the tail-dragger BushCat may be lifted using the aft lower fuselage longerons (provided the aircraft is not heavily loaded and no persons are in the cockpit) as a pick up point placing hands approximately 12 inches apart so as to spread the load. Do not lift the tail more than 12 inches to avoid the propeller touching the ground or over balancing the aircraft. If the aircraft is heavily loaded this technique is not advised.

Nose-wheel specific:

To turn the aircraft in any desired direction, the tail of the BushCat nose-wheel may be lowered by applying pressure to the upper fuselage longerons at a point close to the tail of the aircraft. Hands should be placed on the longeron at approximately 12 inches apart to spread the load. Only lower the tail enough to raise the nose wheel an inch or two off the ground. One may then 'walk' the aircraft to the left or right to steer it in the intended direction.

The aircraft should always be parked into wind and chocked. If the wind is (or has the potential to be) gusting or increasing in velocity, the aircraft should be tied down and pegged with the use of an aviation grade tie-down kit. Additionally flight controls can be secured by means of the seatbelt “lap strap”.

2.1.2. AIRCRAFT TIE DOWN

AIRCRAFT TIE DOWN	
Special tooling required	Nil.
Level of maintenance*	Level 1
Reference documents	BCPH-NT-012-000
Maintenance packing list	Not applicable.

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

1. Tie down points to be used are at the very top of the forward lift strut (left and right). The tail should also be tied down using the tail wheel spring on tail-dragger variants and the leading edge of the horizontal tail through the zip on the nose-wheel variant.

2. The control stick should be locked back (elevator up) with the use of the occupant seat belts.

3. The Pitot cover should be placed over the Pitot tube after each flight.

2.1.3. AIRCRAFT JACKING

AIRCRAFT JACKING	
Special tooling required	Wing stands or wheel jacks, sandbags, small cushioned chair and a tail stand as applicable.
Level of maintenance*	Level 1
Reference documents	Nil
Maintenance packing list	Not applicable.

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure: Main landing gear – Jacking point/s

This is the preferred method of jacking the aircraft, and is only not suitable for use when removing the spring gear itself.

1. Ensure that the aircraft is on a level surface indoors such that it will be uninfluenced by wind or slope.

2. With reference to figure 2.1.2.1, make use of blocks of wood and a standard bottle jack to lift the aircraft at the bolts on the bracket that secure the spring gear to the aircraft. This will lift one wheel at a time or both with the use of two bottle jacks as required.

3. It is good practice to chock the wheels that remain in contact with the ground.

Raise the jack until the wheel is no more than 50mm from the ground, which will give you adequate clearance to accomplish all required maintenance.

Procedure: Main landing gear – Lifting the aircraft by the wing/s

This method is only recommended if the spring gear itself is to be removed with both wings lifted on to stands, but may be used in the absence of jacks.

1. Ensure that the aircraft is on a level surface indoors such that it will be uninfluenced by wind or slope.

2. With reference to figure 2.1.2.2, lift one wing at the junction where the top of the wing lift strut meets the wing and position the wing stand. This lifts one of the main gear wheels clear

of the ground at a time. It is better to have 2 people accomplish this task, with one person lifting the wing and the other person positioning the stand.

3. The second wing can then be lifted onto another stand in the same position as required.

4. It is good practice to chock the main gear wheel still on the ground.

The height of the factory recommended wing stand is adjustable, but has a maximum height of 190mm. Do not lift the wing beyond this to prevent the aircraft tipping on to the opposite wing. A wheel clearance of 50mm from the ground will give you adequate space to accomplish all maintenance on the landing gear.

Procedure: Nose gear (nose-wheel only):

1. Ensure that the aircraft is on a level surface indoors such that it will be uninfluenced by wind.

2. With reference to figure 2.1.2.3, place sand bags on the aircraft tail and gently lower it on to a cushioned chair (a distance between the vertical tail tube and the ground of 340mm will give you sufficient clearance to accomplish all work on the nose gear). Position sandbags to either side of the dorsal fin to keep the tail on the chair while you work.

3. It is better to have 2 people to accomplish this, with one person lowering the tail on to the cushioned chair and the other positioning and securing the sandbags.

Procedure: Tail wheel (tail-dragger only):

1. With reference to figure 2.1.2.4, lift the aircraft tail and position it on a custom made tail stand such that it is supported by the front tail wheel spring attachment bolt.

2. It is recommended that two people accomplish this task, one person lifts the tail and the other positions the stand. Take care not to tip the aircraft too far forward as it will fall on to the props.

3. As for the nose-wheel variant above, position sand bags on top of the tail once it is positioned on the stand to prevent it tipping forward.

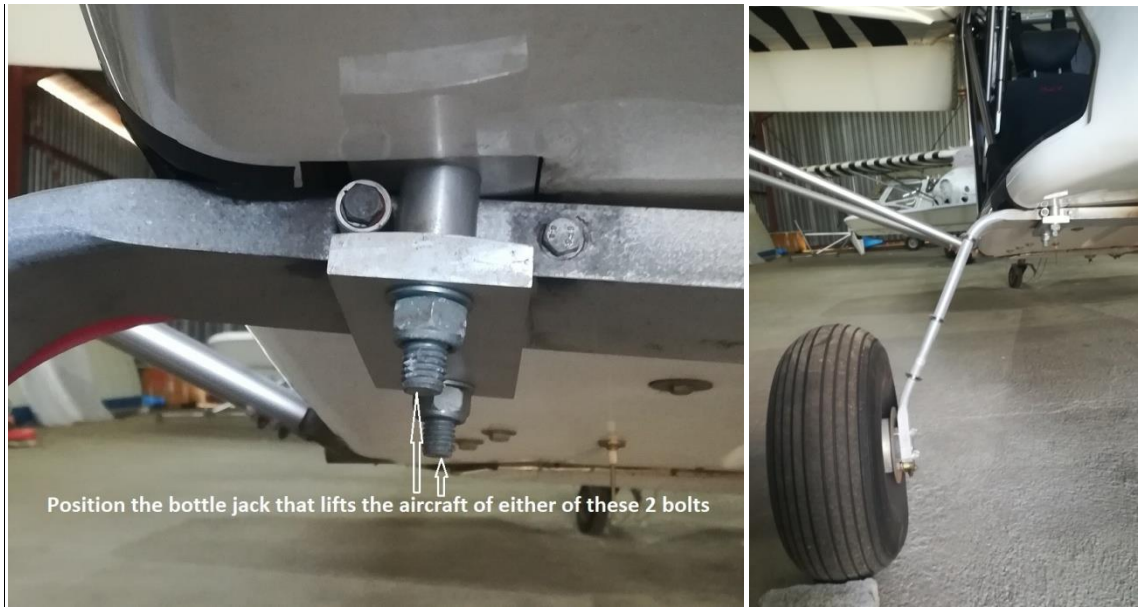


Figure 2.1.2.1 – Raising the main gear using the jacking points

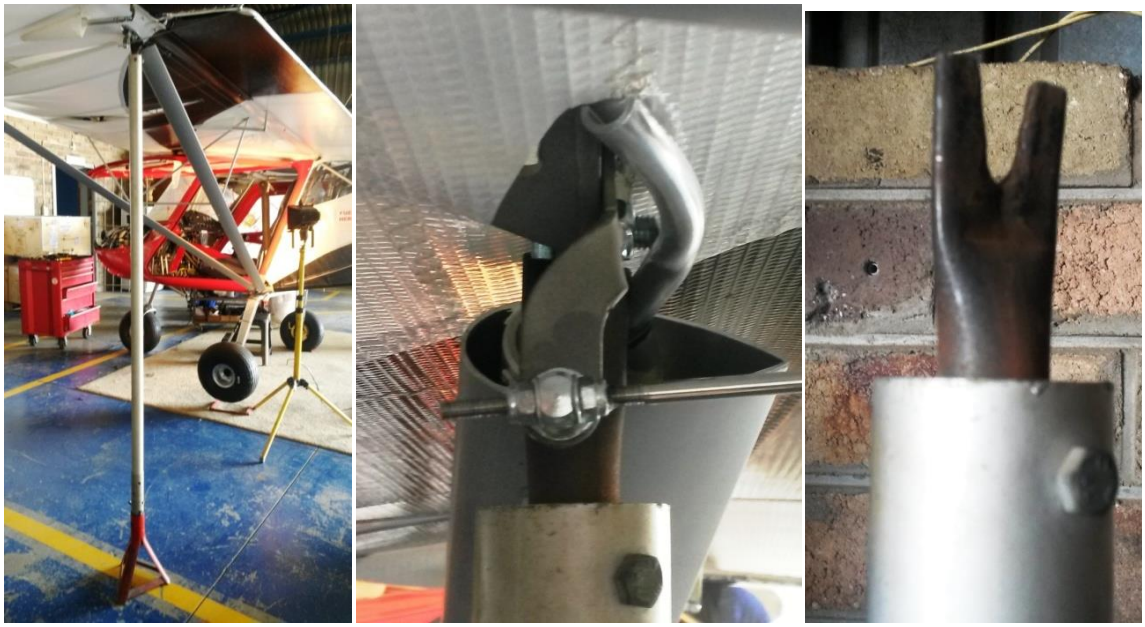


Figure 2.1.2.2 – (a) Raising the main gear using a wing stand, (b) wing stand mounting point at the wing/strut intersection point and (c) wing stand detail

Figure 2.1.2.3 – Raising the nose gear by positioning weights on the tail on a cushioned chair

Figure 2.1.2.4 – (a) Tail wheel stand, (b) position on aircraft and (c) stand

2.1.4. AIRCRAFT WEIGHING AND C.G. DETERMINATION

AIRCRAFT WEIGHING AND C.G. DETERMINATION	
Special tooling required.	Shims, spirit level, carpenter's square, tape measure, masking tape, calculator, plumb line, 3 scales and a custom stand (tail-dragger only).
Level of Maintenance*	Level 1
Reference documents	BCAM-NT-003-003, BCPH-NT-012-000.
Maintenance packing list	Not applicable.

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

1. Place the aircraft on a level floor, preferably indoors to keep it out of the wind.

2. Ensure that the aircraft is level laterally by measuring the joining plate to either side of the top cabin cross-frame tube with a spirit level, protractor and ruler arranged to determine angle (refer to figure 2.1.1.1).

3. If the aircraft is not level laterally, place shims under the lower wheel on the main gear until it is level with the other wheel as per the readout at the joining plate.

4. To level a tail dragger variant longitudinally for measurement, lift the tail and place it on a custom tail stand and apply blocks until the measurement readout indicates that it is level.

5. To level a nose gear variant, either place shims under each of the main wheels until it is level or deflate the nose wheel.

   Remember to inflate the tyre to the desired pressure prior to flight once measurements have been taken.

CAUTION Refer to section 3.1.9 in the Maintenance Manual for the pressures tabulated against tyre variant. The tyre pressures vary with type, and not position, so the nose wheel and main gear will be inflated to the same pressure if they are of the same type.

6. Ensure that the aircraft is level longitudinally by measuring the joining plate in line with the top cabin tube with a spirit level, protractor and ruler arranged to determine the angle (refer to figure 2.1.1.2).

7. With the aircraft level, drop a plumb line from the leading edge of the wing from the wing strut top mounting bolt (refer to figure 2.1.1.3). Mark a section of masking tape on the floor at this point.

8. Repeat this step on the other side and mark out a straight line between the 2 datum points on the floor using masking tape.

9. Mark the floor at the points directly below the centre of the axles of all 3 wheels using masking tape (refer to figure 2.1.1.4).

10. Mark a straight line between the centres of the axles of the main landing gear.

11. Using a carpenter's square, mark out perpendicular lines from the nose/tail wheel axle to the datum line and the main landing gear centre axle to the datum line.

12. Measure the distances using a tape measure and record them in the table below:

Position	Arm
Front wheel arm	-
Left main arm	+
Right main arm	+
Tail wheel arm	+

13. Prior to weighing the aircraft, siphon all accessible fuel from the aircraft and ensure that all essential equipment is in situ. It is good practice to record all items on board additional to the basic airframe structure.

14. Using an angled block of wood or something similar, align each of the wheels with the scales (refer to figure 2.1.1.4), taking care to ensure that each of the wheels are straight and aligned with the centre of each of the scales.

15. Take the Tare reading on each of the scales prior to loading and record them in the table below.

16. Push the aircraft on to its scales (it is better to have at least 2 people to accomplish this).

17. Record the aircraft masses in the table below once the readout has stabilized.

Position	*Scale Reading*	*- Tare*	*= mass 'P'*
Front wheel			
Left main			
Right main			
Tail wheel			
Aircraft Empty			

18. Compute the aircraft moments by multiplying each scale reading by its arm:

Position	*Mass 'P'*	*x Arm 'L'*	*= Moment 'M'*
Front wheel		-	-
Left main		+	+
Right main		+	+
Tail wheel		+	+
Total		N/A	

19. Now divide the total moment by the total mass to calculate the empty CG from datum:

$$\text{Empty CG} = \frac{\sum \text{M}}{\sum \text{P}} = \_\_\_\_\_$$

Finally, for reference purposes record your aircraft's empty mass, CG arm, and moment below:

Empty mass ('P')	
Empty CG arm (calculated above)	
Empty moment ('M')	

20. These figures will be used for mass and balance calculations for different load cases before each flight. Ensure that the Centre of Gravity is within the published limits as presented in section 3.1.9 in the Maintenance Manual.

Figure 2.1.1.1 – Aircraft lateral angle determination

Figure 2.1.1.2 – Aircraft longitudinal angle determination

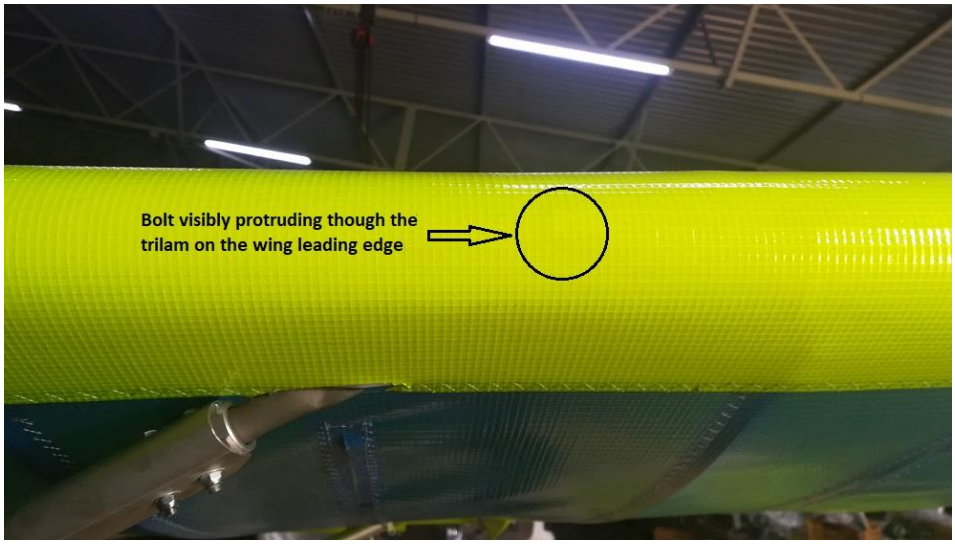


Figure 2.1.1.3 – Leading edge of the wing, wing strut top mounting bolt

Figure 2.1.1.4 – Point directly below the centre of the axle

Figure 2.1.1.5 – Aligning the scales with the aircraft wheel

2.1.5. WIRELOCKING

WIRELOCKING	
Special tooling required	Wire locking pliers.
Level of maintenance*	Level 2
Reference documents	AC 43.13-1B Section 7
Maintenance packing list	Not applicable.

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
1	Locking wire as specified			

Procedure:

WARNING

Do not use stainless steel, Monel (Nickel Alloy), carbon steel, or aluminium alloy safety wire to secure emergency mechanisms such as switch handles, guards covering handles used on exits, fire extinguishers, emergency gear releases, or other emergency equipment. Some existing structural equipment or safety-of-flight emergency devices require copper or brass safety wire (.020 inch diameter only). Where successful emergency operation of this equipment is dependent on shearing or breaking of the safety wire, particular care should be used to ensure that safety wiring does not prevent emergency operation.

There are two methods of safety wiring; the double-twist method that is most commonly used, and the single-wire method used on screws, bolts, and/or nuts in a closely-spaced or closed-geometrical pattern such as a triangle, square, rectangle, or circle. The single-wire method may also be used on parts in electrical systems and in places that are difficult to reach. Refer to figures 2.1.5.1 and 2.1.5.2.

When using double-twist method of safety wiring, .032 inch minimum diameter wire should be used on parts that have a hole diameter larger than .045 inch. Safety wire of .020 inch diameter (double strand) may be used on parts having a nominal hole diameter between .045 and .062 inch with a spacing between parts of less than 2 inches. When using the single-wire method, the largest size wire that the hole will accommodate should be used. Copper wire (.020 inch diameter), aluminium wire (.031 inch diameter), or other similar wire called for in specific technical orders, should be used as seals on equipment such as first-aid kits, portable fire extinguishers, emergency valves, or oxygen regulators.

CAUTION Care should be taken not to confuse steel with aluminium wire.

A secure seal indicates that the component has not been opened. Some emergency devices require installation of brass or soft copper shear safety wire. Particular care should be exercised to ensure that the use of safety wire will not prevent emergency operation of the devices.

1. When bolts, screws, or other parts are closely grouped, it is more convenient to safety wire them in series. The number of bolts, nuts, screws, etc., that may be wired together depends on the application.

2. Drilled bolt heads and screws need not be safety wired if installed with self-locking nuts.

3. To prevent failure due to rubbing or vibration, safety wire must be tight after installation.

4. Safety wire must be installed in a manner that will prevent the tendency of the part to loosen.

5. Safety wire must never be over-stressed. Safety wire will break under vibrations if twisted too tightly. Safety wire must be pulled taut when being twisted, and maintain a light tension when secured.

6. Safety-wire ends must be bent under and inward toward the part to avoid sharp or projecting ends, which might present a safety hazard.

7. Safety wire inside a duct or tube must not cross over or obstruct a flow passage when an alternate routing can be used.

Check the units to be safety wired to make sure that they have been correctly torqued, and that the wiring holes are properly aligned to each other. When there are two or more units, it is desirable that the holes in the units be aligned to each other. Never over-torque or loosen to obtain proper alignment of the holes. It should be possible to align the wiring holes when the bolts are torqued within the specified limits. Washers may be used to establish proper alignment. However, if it is impossible to obtain a proper alignment of the holes without under-torquing or over-torquing, try another bolt which will permit proper alignment within the specified torque limits.

To prevent mutilation of the twisted section of wire when using pliers, grasp the wires at the ends. Safety wire must not be nicked, kinked, or mutilated. Never twist the wire ends off with pliers; and, when cutting off ends, leave at least four to six complete turns (1/2 to 5/8 inch long) after the loop. When removing safety wire, never twist the wire off with pliers. Cut the safety wire close to the hole, exercising caution.

Install safety wire where practicable with the wire positioned around the head of the bolt, screw, or nut, and twisted in such a manner that the loop of the wire fits closely to the contour of the unit being safety wired.

<u>Using wire-locking pliers:</u>

CAUTION When using wire twisters, and the wire extends 3 inches beyond the jaws of the twisters, loosely wrap the wire around the pliers to prevent whipping and possible personal injury. Excessive twisting of the wire will weaken the wire.

1. Grip the wire in the jaws of the wire twister and slide the outer sleeve down with your thumb to lock the handles or lock the spring-loaded pin.

2. Pull the knob, and the spiral rod spins and twists the wire.

3. Squeeze handles together to release the wire.

Although there are numerous safety wiring techniques used to secure aircraft hardware, practically all are derived from the basic examples shown in figures 2.1.5.4 through 2.1.5.5.

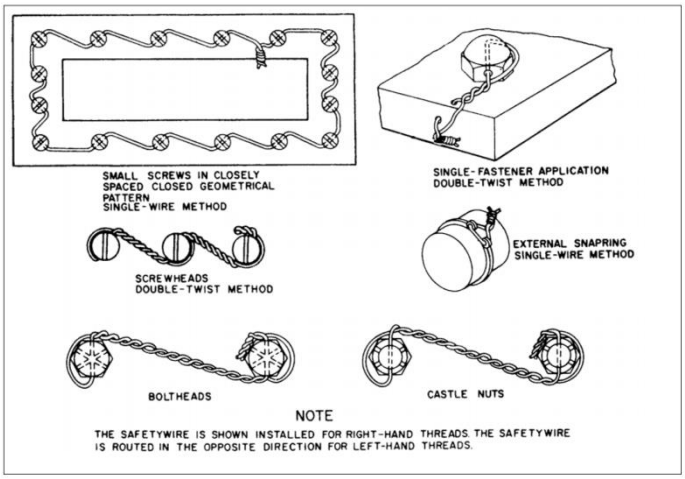


Figure 2.1.5.1 – Securing screws, nuts, bolts, and snap rings.

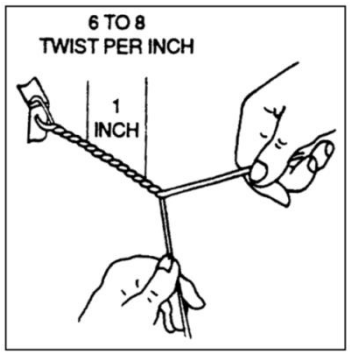


Figure 2.1.5.2 – Wire twisting by hand

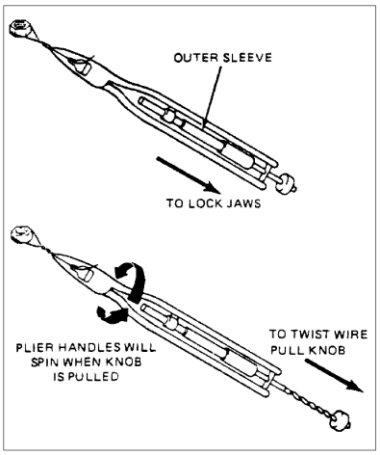
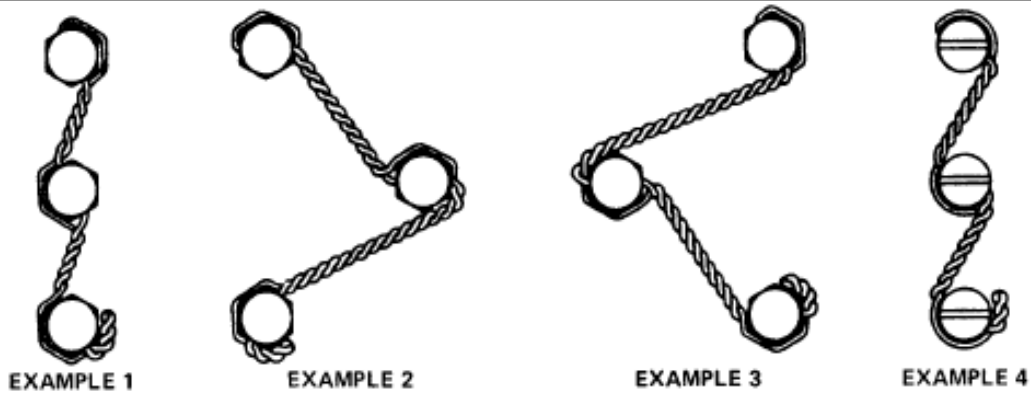


Figure 2.1.5.3 – Use of wire locking pliers



EXAMPLE 1 EXAMPLE 2 EXAMPLE 3 EXAMPLE 4

Examples 1, 2, 3, and 4 apply to all types of bolts, fillister-head screws, square-head plugs, and other similar parts which are wired so that the loosening tendency of either part is counteracted by tightening of the other part. The direction of twist from the second to the third unit is counterclockwise in examples 1, 3, and 4 to keep the loop in position against the head of the bolt. The direction of twist from the second to the third unit in example 2 is clockwise to keep the wire in position around the second unit. The wire entering the hole in the third unit will be the lower wire, except example 2, and by making a counterclockwise twist after it leaves the hole, the loop will be secured in place around the head of that bolt.

EXAMPLE 5 EXAMPLE 6 EXAMPLE 7 EXAMPLE 8

Examples 5, 6, 7, & 8 show methods for wiring various standard items, NOTE: Wire may be wrapped over the unit rather than around it when wiring castellated nuts or on other items when there is a clearance problem.

EXAMPLE 9

Example 9 shows the method for wiring bolts in different planes. Note that wire should always be applied so that tension is in the tightening direction.

EXAMPLE 10

Hollow-head plugs shall be wired as shown with the tab bent inside the hole to avoid snags and possible injury to personnel working on the engine.

EXAMPLE 11

Correct application of single wire to closely spaced multiple group.

Figure 2.1.5.4 – Wire-locking methods 1

EXAMPLE 12 **EXAMPLE 13**

Examples 12 and 13 show methods for attaching lead seal to protect critical adjustments.

EXAMPLE 14

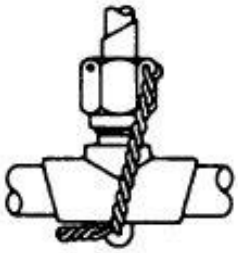
Example 14 shows bolt wired to a right-angle bracket with the wire wrapped around the bracket.

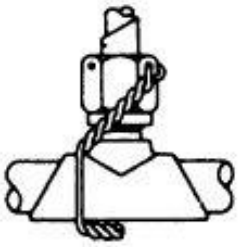
EXAMPLE 15

Example 15 shows correct method for wiring adjustable connecting rod.

EXAMPLE 16

Example 16 shows correct method for wiring the coupling nut on flexible line to the straight connector brazed on rigid tube.



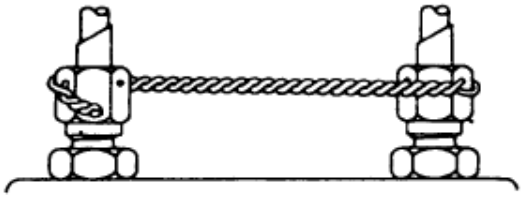


EXAMPLE 17 **EXAMPLE 18** **EXAMPLE 19** **EXAMPLE 20** **EXAMPLE 21**

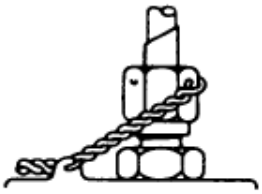
Fittings incorporating wire lugs shall be wired as shown in Examples 17 and 18. Where no lock-wire lug is provided, wire should be applied as shown in examples 19 and 20 with caution being exerted to ensure that wire is wrapped tightly around the fitting

Small size coupling nuts shall be wired by wrapping the wire around the nut and inserting it through the holes as shown.

Figure 2.1.5.5 – Wire-locking methods 2

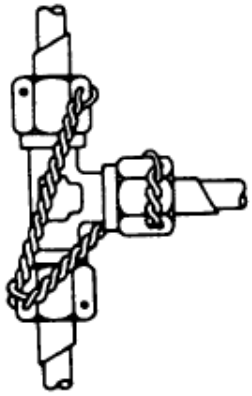


EXAMPLE 22



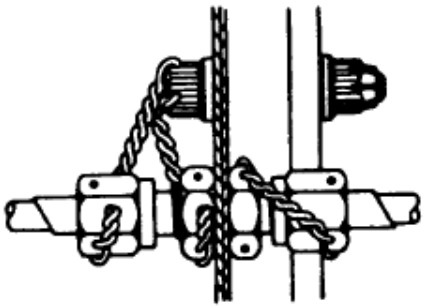
EXAMPLE 23

Coupling nuts attached to straight connectors shall be wired as, shown, when hex is an integral part of the connector.



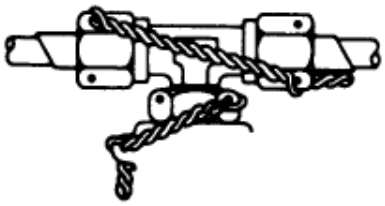
EXAMPLE 24

Coupling nuts on a tee shall be wired, as shown above, so that tension is always in the tightening direction.



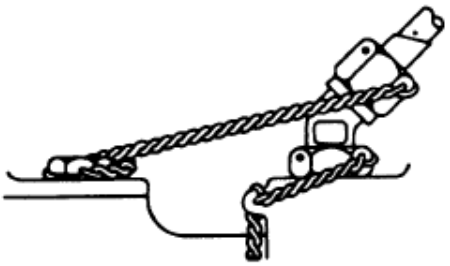
EXAMPLE 25

Straight Connector (Bulkhead Type)



EXAMPLE 26

EXAMPLE 27



EXAMPLE 28

Examples 26, 27, and 28 show the proper method for wiring various standard fittings with checknut wired independently so that it need not be disturbed when removing the coupling nut.

Figure 2.1.5.6 – Wire-locking methods 3

2.1.6. TURNBUCKLE WIRELOCKING

TURNBUCKLE WIRELOCKING	
Special tooling required	Wire locking pliers.
Level of maintenance*	Level 2
Reference documents	AC 43.13-1B Section 10
Maintenance packing list	Not applicable.

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
1	Locking wire as specified			

Procedures:

Safety-wire securing the terminals

Before securing turnbuckles, threaded terminals should be screwed into the turnbuckle barrel until no more than three threads of either terminal are outside the barrel. After the turnbuckle has been adjusted for proper cable tension, two pieces of safety wire are inserted, half the wire length into the hole in the center of the turnbuckle barrel. The safety-wires are bent so that each wire extends half the length of the turnbuckle on top and half on bottom. The ends of the wires are passed through the hole in the turnbuckle eyes or between the jaws of the turnbuckle fork, as applicable. The wires are then bent toward the center of the turnbuckle and each wire is wrapped around the shank four times, binding the wrapping wires in place as shown in figure 2.1.6.1.

1. When a swaged terminal is being secured, one wire is passed through the hole in the terminal and is looped over the free end of the other wire and both ends wrapped around the shank. All lock wire used in the securing of turnbuckles should be carbon steel, corrosion- resistant steel, nickel-chromium iron alloy, nickel-copper alloy or aluminium alloy. For safety cable diameter of safety wire size and material, refer to the table below.

2. Care should be exercised when safety wiring, particularly where corrosion will present a problem, because smaller wire sizes tend to crack when twisted.

Safety-wire securing turnbuckles

Secure all turnbuckles with safety wire using either the double or single- wrap method, or with any appropriately approved special securing device complying with the requirements of FAA Technical Standard Order TSO-C21. The swaged and unswaged turnbuckle assemblies are covered by AN standard drawings. Do not reuse safety wire. Adjust the turnbuckle to the correct cable tension so that no more than three cable threads are exposed on either side of the turnbuckle barrel.

Double-wrap method

Of the methods using safety wire for securing turnbuckles, this method is preferred, although either of the other methods described is satisfactory. The method of double-wrap securing is shown in figure 2.1.6.1 (A).

1. Use two separate lengths of wire. Run one end of the wire through the hole in the barrel of the turnbuckle and bend the ends of the wire toward opposite ends of the turnbuckle.

2. Pass the second length of the wire into the hole in the barrel and bend the ends along the barrel on the side opposite the first. Spiral the two wires in opposite directions around the barrel to cross each other twice between the center hole and the ends.

3. Then pass the wires at the end of the turnbuckle in opposite directions through the hole in the turnbuckle eyes or between the jaws of the turnbuckle fork, as applicable, laying one wire along the barrel and wrapping the other at least four times around the shank of the turnbuckle and binding the laid wires in place before cutting the wrapped wire off.

4. Wrap the remaining length of safety wire at least four turns around the shank and cut it off. Repeat the procedure at the opposite end of the turnbuckle.

5. When a swaged terminal is being secured, pass the ends of both wires through the hole provided in the terminal for this purpose and wrap both ends around the shank as previously described. If the hole is not large enough to allow passage of both wires, pass the wire through the hole and loop it over the free end of the other wire, and then wrap both ends around the shank as previously described. Another satisfactory double-wrap method is similar to the previous method, except that the spiralling of the wires is omitted as shown in figure 2.1.6.1 (B).

Single-wrap method

The single-wrap methods described in the following paragraphs and as illustrated in figure 2.1.6.1 (C) and (D) are acceptable, but are not equal to the double-wrap methods.

1. Pass a single length of wire through the cable eye or fork, or through the hole in the swaged terminal at either end of the turnbuckle assembly. Spiral each of the wire ends in opposite directions around the first half of the turnbuckle barrel, so as to cross each other twice. Thread both wire ends through the hole in the middle of the barrel so that the third crossing of wire ends is in the hole, again, spiral the two wire ends in opposite directions around the remaining half of the turnbuckle, crossing them twice. Then, pass one wire end through the cable eye or fork, or through the hole in the swaged terminals, in the manner previously described. Wrap both wire ends around the shank for at least four turns each, cutting off excess wire. This method is shown in figure 2.1.6.1 (C).

2. For the method shown in figure 2.1.6.1 (D), pass one length of wire through the center hole of the turnbuckle and bend the wire ends toward opposite ends of the turnbuckle. Then pass each wire end through the cable eye or fork or through the hole in the swaged terminal, and wrap each wire around the shank for at least four turns, cutting off excess wire. After securing, no more than three threads of the turnbuckle threaded terminal should be exposed.

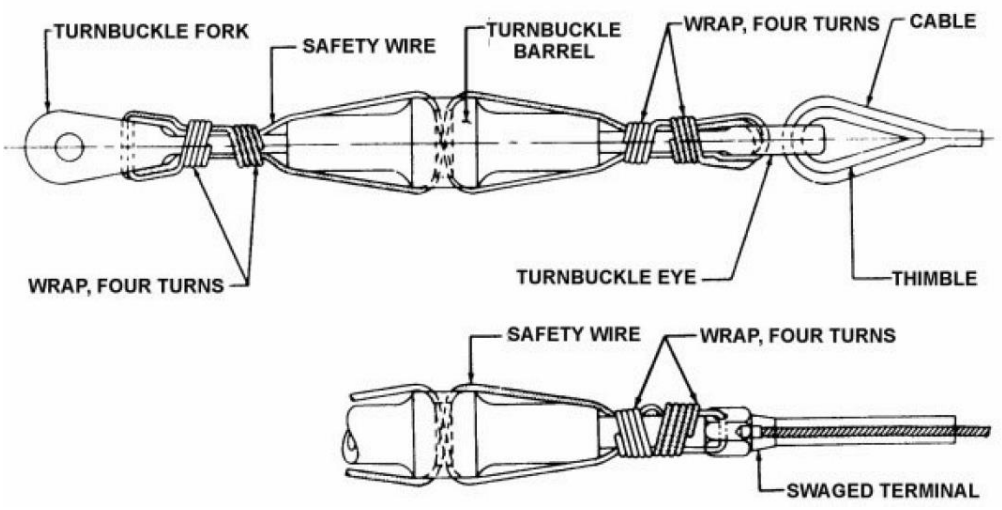


Figure 2.1.6.1 – Securing turnbuckles

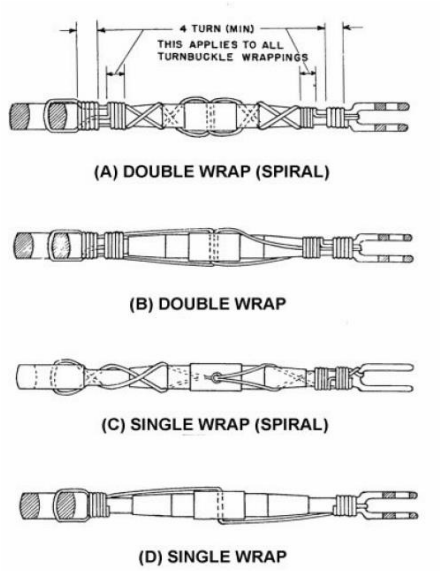


Figure 2.1.6.2 – Wire locking methods for turnbuckles

Table 2.1.6.1: Turnbuckle wire locking guide

Cable Size	Type of Wrap	Diameter of Safety Wire	Material (Annealed Condition)
1/16	Single	0.040	Copper, brass.[1]
3/32	Single	0.040	Copper, brass.[1]
1/8	Single	0.040	Stainless steel, Monel and "K" Monel.
1/8	Double	0.040	Copper, brass.[1]
1/8	Single	0.057 min.	Copper, brass.[1]
5/32 and greater.	Double	0.040	Stainless steel, Monel and "K" Monel.[1]
5/32 and greater	Single	0.057 min.	Stainless steel, Monel or "K" Monel.[1]
5/32 and greater	Double	0.0512	Copper, brass.

2.1.7. COTTER PIN SECURING

COTTER PIN SECURING	
Special tooling required	Nil.
Level of maintenance*	Level 2
Reference documents	AC 43.13-1B Section 7
Maintenance packing list	Not applicable.

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
1	Cotter pin as specified			

Procedure:

Cotter pins are used to secure such items as bolts, screws, pins, and shafts. Their use is favoured because they can be removed and installed quickly. The diameter of the cotter pins selected for any application should be the largest size that will fit consistent with the diameter of the cotter pin hole and/or the slots in the nut. Cotter pins should not be reused on aircraft.

To prevent injury during and after pin installation, the end of the cotter pin can be rolled and tucked.

NOTE: In using the method of cotter pin securing, as shown in figure 2.1.7.1, ensure the prong, bent over the bolt, is seated firmly against the bolt shank, and does not exceed bolt diameter. Also, when the prong is bent over the nut, ensure the bent prong is down and firmly flat against the nut and does not contact the surface of the washer.

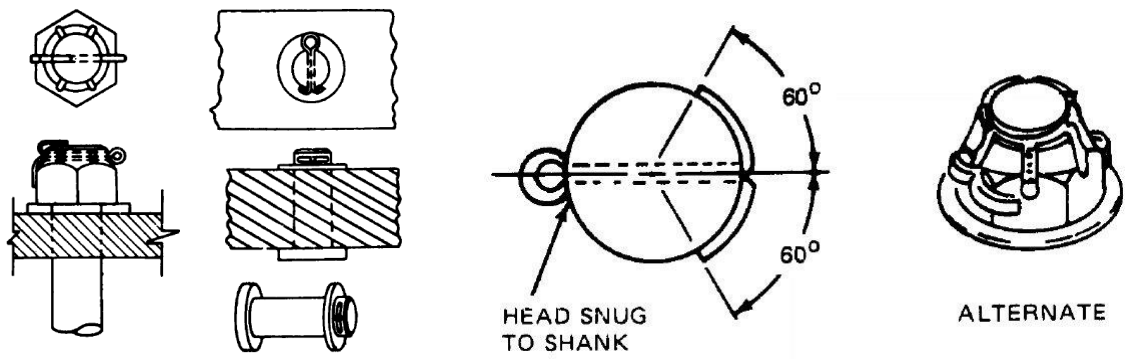


Figure 2.1.7.1 – Securing with cotter pins

2.1.8. RECOMMENDED FASTENER TORQUE VALUES

Do not exceed the values set out in this table as this will lead to inadvertent crushing of the aluminium tubing.

STANDARD AVIATION TORQUE VALUES - METRIC SYSTEM							
In the absence of specific torque values, the following chart can be used as a guide to the maximum safe torque for a particular size/grade of fastener. There is no torque difference for fine or course threads. Torque values are based on clean, dry threads. Reduce value by 10% if threads are oiled before assembly.							
Relative Strength Marking		8,8 or 9,8		10,9		12,9	
Bolt markings							
Diameter	Wrench Size	Maximum Torque		Maximum Torque		Maximum Torque	
		Ft ln	Nm	Ft ln	Nm	Ft ln	Nm
M3	5,5mm	1	1,3	1,5	2	1,5	2
M4	7mm	2	3	3	4,5	4	5
M5	8mm	4,5	6	6,5	9	7,5	10
M6	10mm	7,5	10	11	15	13	18
M8	13mm	18	25	26	35	33	45
M10	16mm	37	50	55	75	63	85
M12	18mm	63	85	97	130	111	150
M14	21mm	103	140	151	205	177	240
M16	24mm	159	215	232	315	273	390
M18	27mm	225	305	321	435	376	510
M20	30mm	321	425	457	620	535	725
M22	33mm	435	590	620	840	726	985
M24	36mm	553	750	789	1070	926	1255
M27	41mm	811	1100	1154	1565	1353	1835
M30	46mm	1103	1495	1571	2130	1837	2490

2.1.9. CABLE SYSTEM INSPECTION

CABLE SYSTEM INSPECTION	
Special tooling required	Hand held inspection mirror and torch.
Level of maintenance*	Level 1
Reference documents	AC 43.13-1B Section 8
Maintenance packing list	Not applicable.

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

Aircraft cable systems are subject to a variety of environmental conditions and deterioration. Wire or strand breakage is easy to visually recognize. Other kinds of deterioration such as wear, corrosion, and/or distortion are not easily seen; therefore, control cables should be removed periodically for a more detailed inspection.

1. At each annual or 100 hour inspection, all control cables must be inspected for broken wires strands. Any cable assembly that has one broken wire strand located in a critical fatigue area must be replaced.

2. A critical fatigue area is defined as the working length of a cable where the cable runs over, under, or around a pulley, sleeve, or through a fair-lead; or any section where the cable is flexed, rubbed, or worked in any manner; or any point within 1 foot of a swaged-on fitting.

3. A swaged-on fitting can be an eye, fork, ball, ball and shank, ball and double shank, threaded stud, threaded stud and turnbuckle, compression sleeve, or any hardware used as a termination or end fitting on the cable. These fittings may be attached by various swaging methods such as rotary swaging, roll swaging, hydraulic pressing, and hand swaging tools. The pressures exerted on the fittings during the swaging process sometimes pinch the small wires in the cable. This can cause premature failure of the pinched wires, resulting in broken wires.

4. Close inspection in these critical fatigue areas, must be made by passing a cloth over the area to snag on broken wires. This will clean the cable for a visual inspection, and detect broken wires if the cloth snags on the cable. Also, a very careful visual inspection must be made since a broken wire will not always protrude or stick out, but may lie in the strand and remain in the position of the helix as it was manufactured. Broken wires of this type may show up as a hairline crack in the wire. If a broken wire of this type is suspected, further

inspection with a magnifying glass of 7 power or greater, is recommended. Figure 2.1.9.1 shows a cable with broken wires that was not detected by wiping, but was found during a visual inspection. The damage became readily apparent when the cable was removed and bent as shown.

5. Kinking of wire cable can be avoided if properly handled and installed. Kinking is caused by the cable taking a spiral shape as the result of unnatural twist. One of the most common causes for this twist is improper unreeling and uncoiling. In a kinked cable, strands and wires are out of position, which creates unequal tension and brings excessive wear at this part of the cable. Even though the kink may be straightened so that the damage appears to be slight, the relative adjustment between the strands has been disturbed so that the cable cannot give maximum service and should be replaced. Inspect cables for a popped core or loose strands. Replace any cable that has a popped core or loose strands regardless of wear or broken wires.

6. External wear patterns will extend along the cable equal to the distance the cable moves at that location and may occur on one side of the cable or on its entire circumference. Replace flexible and nonflexible cables when the individual wires in each strand appear to blend together (outer wires worn 40 to 50 percent) as depicted in figure 2.1.9.2. Actual instances of cable wear beyond the recommended replacement point are shown in figure 2.1.9.3.

7. As wear is taking place on the exterior surface of a cable, the same condition is taking place internally, particularly in the sections of the cable which pass over pulleys and quadrants. This condition (shown in figure 2.1.9.3) is not easily detected unless the strands of the cable are separated. This type of wear is a result of the relative motion between inner wire surfaces. Under certain conditions, the rate of this type of wear can be greater than that occurring on the surface.

8. Examine cable runs for incorrect routing, fraying, twisting, or wear at fair-leads, pulleys, anti-abrasion strips, and guards. Look for interference with adjacent structure, equipment, wiring, plumbing, and other controls. Inspect cable systems for binding, full travel, and security of attaching hardware. Check for slack in the cable system by attempting to move the control column and/or pedals while the gust locks are installed on the control surfaces. With the gust locks removed, actuate the controls and check for friction or hard movement. These are indications that excessive cable tension exists.

NOTE: If the control movement is stiff after maintenance is performed on control surfaces, check for parallel cables twisted around each other, cables connected in reverse or excessive cable tensions.

9. Check swaged terminal reference marks for an indication of cable slippage within the fitting. Inspect the fitting assembly for distortion and/or broken strands at the terminal. Ensure that all bearings and swivel fittings (bolted or pinned) pivot freely to prevent binding and subsequent failure. Check turnbuckles for proper thread exposure and broken or missing safety wires/clips.

10. Inspect pulleys for roughness, sharp edges, and presence of foreign material embedded in the grooves. Examine pulley bearings to ensure proper lubrication, smooth rotation; and freedom from flat spots, dirt, and paint spray. During the inspection, rotate the pulleys, which only turn through a small arc, to provide a new bearing surface for the cable. Maintain pulley alignment to prevent the cable from riding on the flanges and chafing against guards,

covers, or adjacent structure. Check all pulley brackets and guards for damage, alignment, and security.

11. Various cable system malfunctions may be detected by analyzing pulley conditions. These include such discrepancies as too much tension, misalignment, pulley bearing problems, and size mismatches between cables and pulleys. Examples of these conditions are shown in figure 2.1.9.5.

Figure 2.1.9.1 – Cable inspection technique

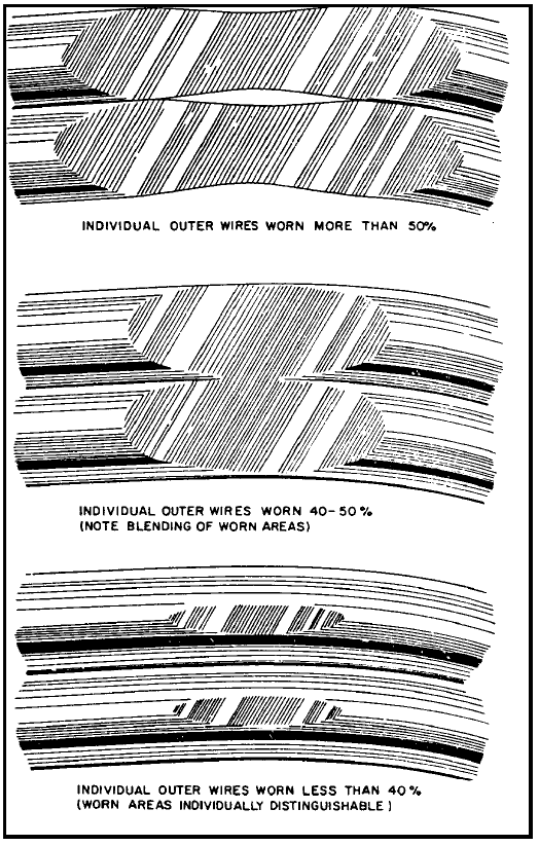


Figure 2.1.9.2 – Cable wear patterns

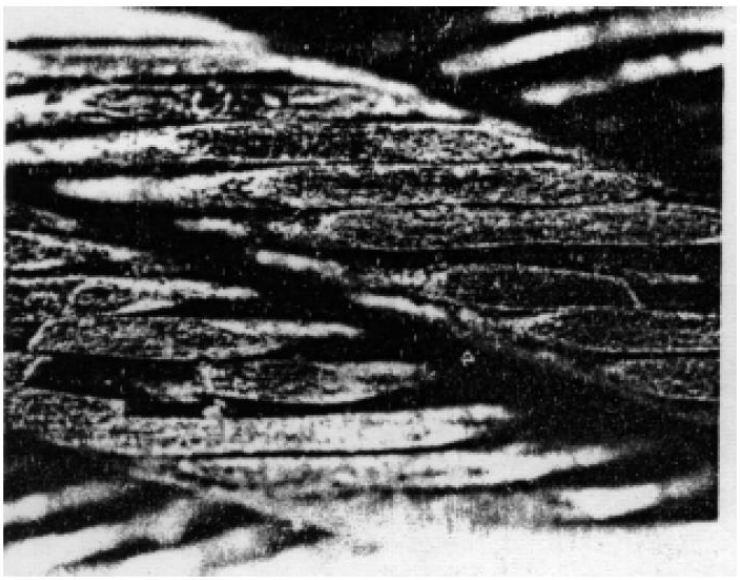


Figure 2.1.9.3 – Worn cable

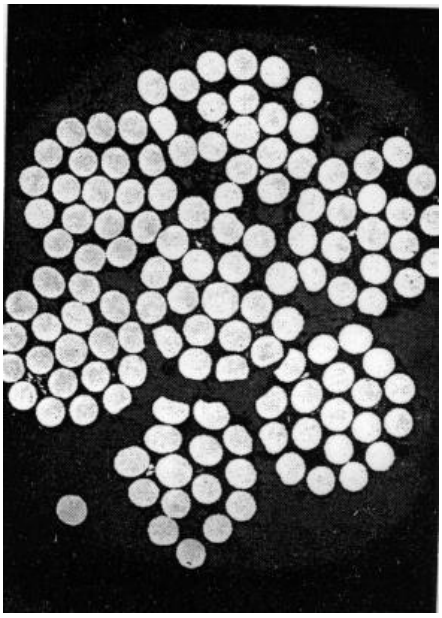


Figure 2.1.9.4 – Internal cable wear

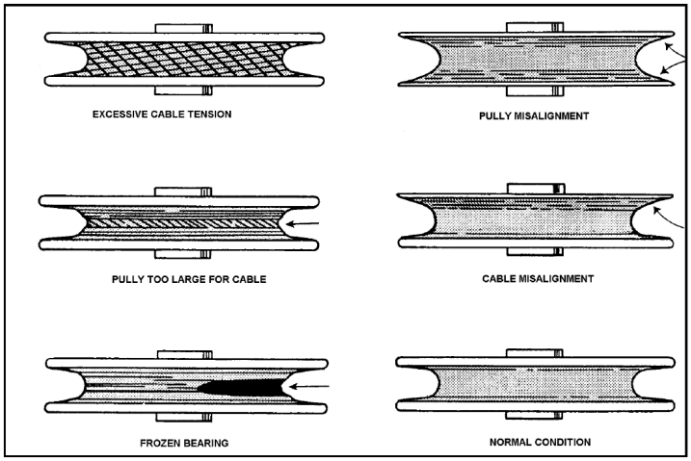


Figure 2.1.9.5 – Pulley wear patterns

Inspection Findings:

_____
_____
_____
_____
_____
_____
_____

COMPLETED BY	
STAMP	
SIGNATURE	

2.2. WING

2.2.1. WING REMOVAL / INSTALLATION

WING REMOVAL/INSTALLATION	
Special tooling required	2 x custom made padded stands for the wings for removal.
Level of Maintenance*	Level 2
Reference documents	BCAM-NT-003-003
Maintenance packing list	BCUG-002-001

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts list:

No.	Description	Qty each	Qty Total	Part No:
1	M8 x 22mm (Shank 10mm) special bolt	2	4	CH-00-00013
2	M8 x 71mm (Shank 59mm) special bolt with washer, nut & split pin	1	2	CH-00-04220
3	M8 x 91mm (Shank 79mm) special bolt with washer, nut & split pin	1	2	CH-00-04210
4	M5 x 16mm button head cap screw (M. Steel)	2	4	STD-000180
5	M5 x 16mm bolt	1	2	STD-000008
6	M5 x 10mm washer	5	10	STD-000124
7	M8 x 16mm washer	2	4	STD-000131
8	M5 Nylock nut	2	4	STD-000093
9	M8 Nylock nut	2	4	STD-000095
10	Ø0.82 x 440mm safety wire	2		
11	Torque Seal			

Procedure: Removal

CAUTION

Prior to removal / installation of the wing, place the aircraft in a controlled environment where it is guarded against strong winds. It is further recommended that the floor by covered with a carpet to protect parts from minor damages. The facility should be well lit from multiple sources.

1. Place padded stands under the left hand and right hand wing tip ribs respectively. (Use the line of pop rivets to locate the wing tip ribs).
2. Gain access to the cockpit.
3. Detach the aileron cables from the Joystick butterfly in front of the centre console.
4. Remove the turnbuckles on the aft cable and the single turnbuckle on the forward cable

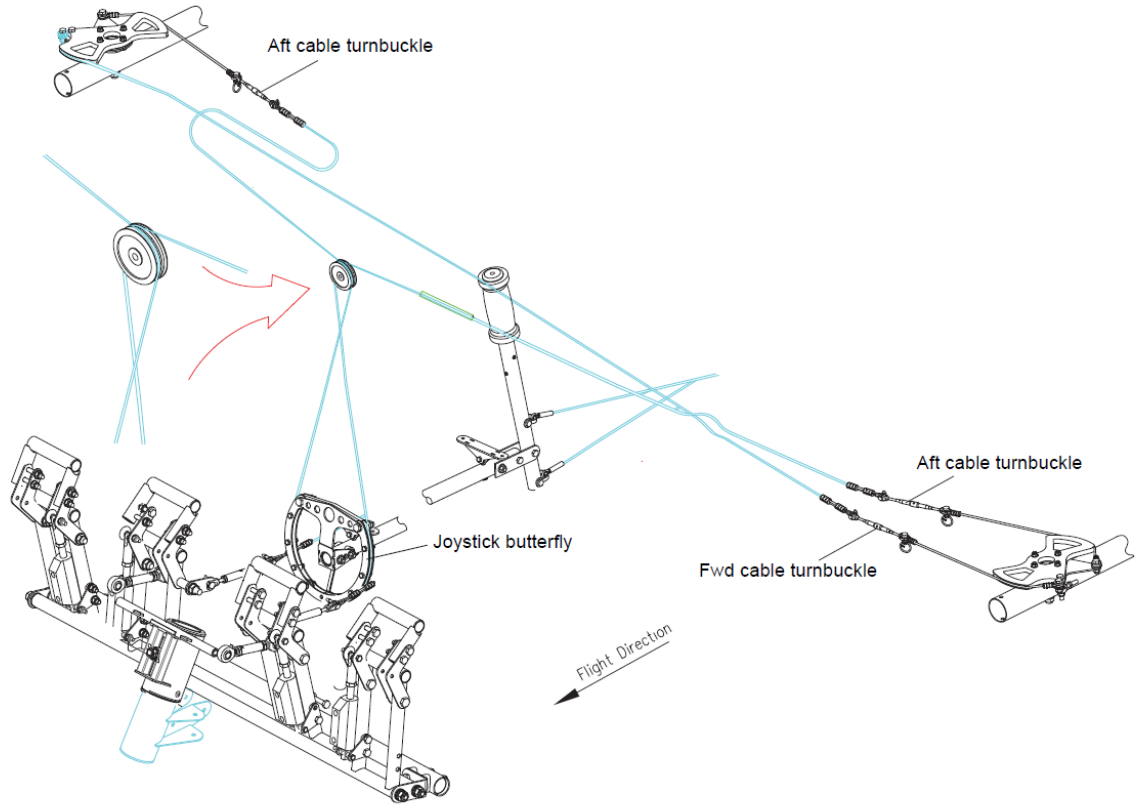


Figure 2.2.1.1: Disconnecting the aileron cables

5. Undo the flap control push-pull rods

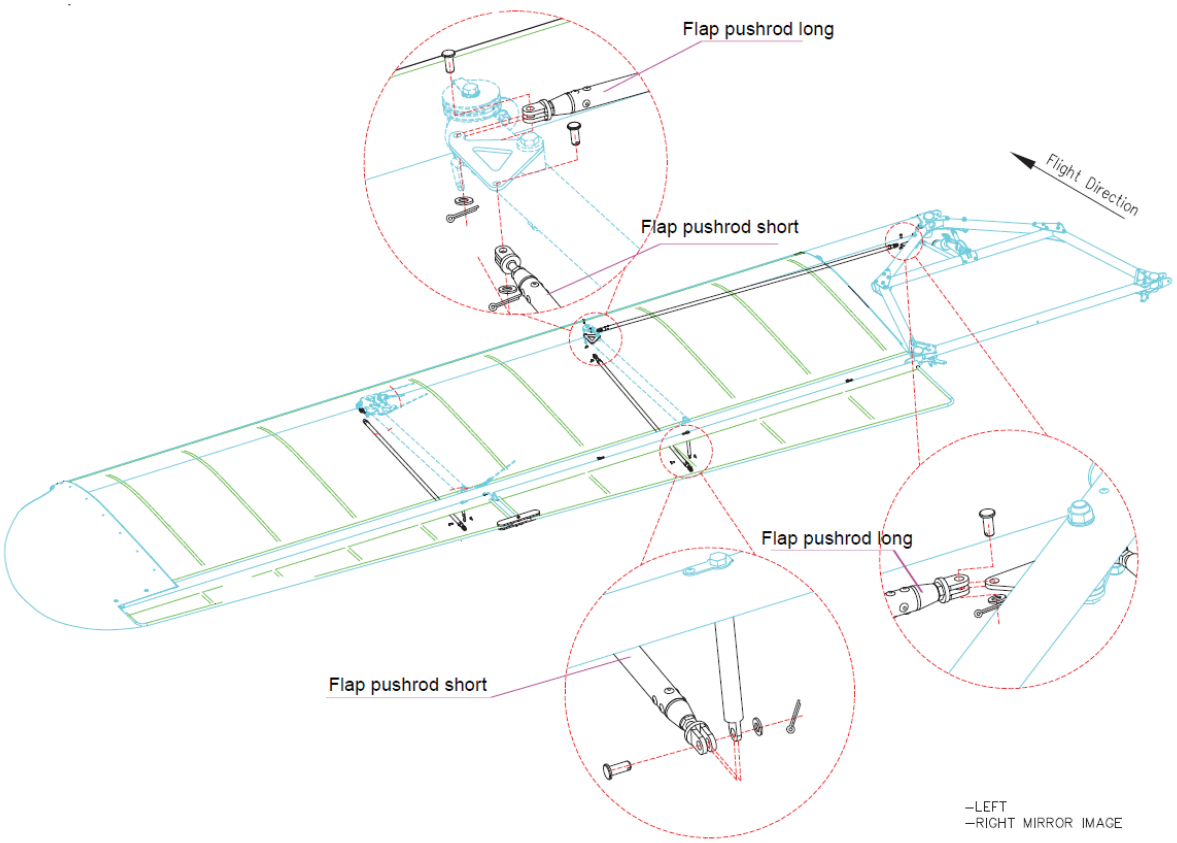


Figure 2.2.1.2: Flap control pushrod positions

6. Undo the electrical wires inside the cockpit that feed the landing lights and position lights. It's advisable to mark the wiring prior to removal to facilitate the installation.

7. Drill holes in the windscreen to facilitate the removal of the leading edge tube wing mounting bolts.

8. Remove the 2 main attachment bolts for the leading edge tube inside the cockpit (A).

9. Remove the 2 main attachment bolts inboard of the flaps on either side of the airframe (B).

10. Remove the jury struts at the points where they attach to the wing.

11. Undo the wings struts at the points where they attach to the wing (C and D).

12. With one person supporting the wingtip and another person supporting the inboard section the wing, lift it away from the airframe. The wing mass is less than 201lbs. /91 kg.

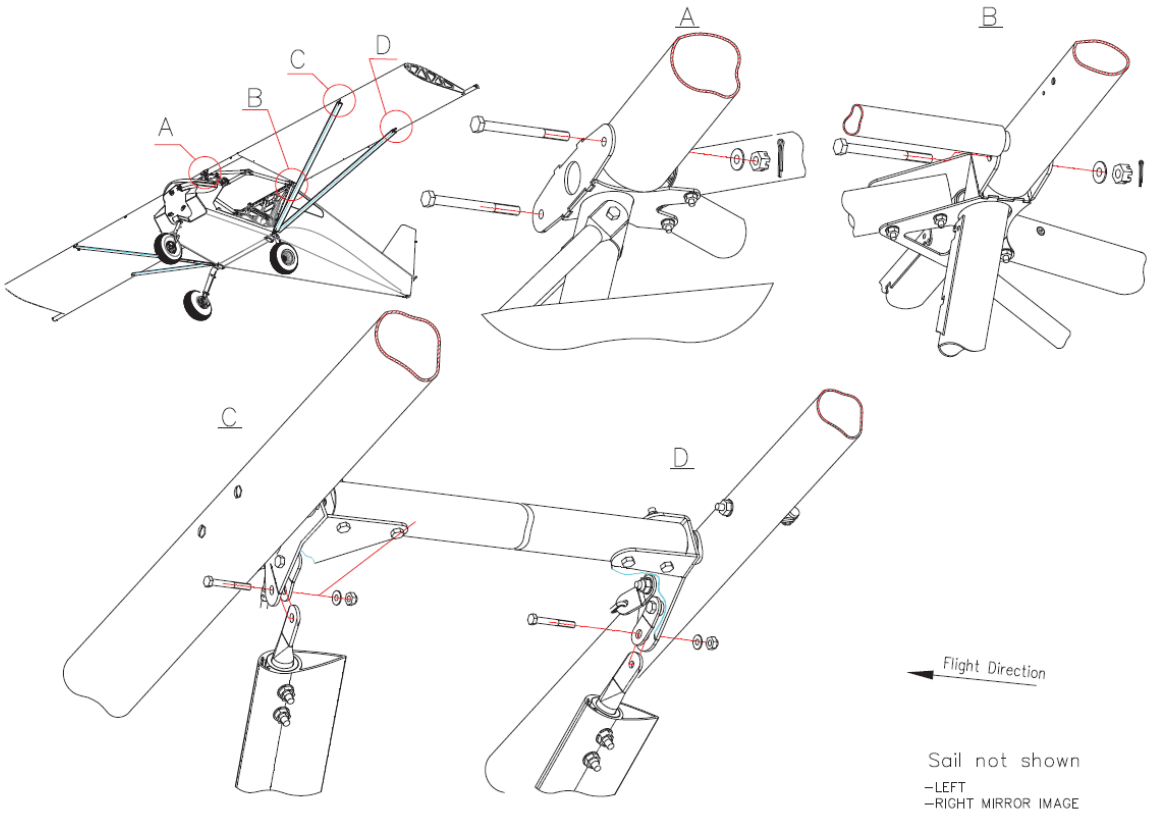


Figure 2.2.1.3: Wing attachment points

Procedure: Installation

1. Using the padded wing stands, position the wings relative to the fuselage in preparation.

2. Mount wings to fuselage sequentially at sections A, B, C and D using figure 2.2.1.3 above. Note that nuts and split pins in item 3 which fasten the leading edge do not need to be fastened and split yet as they will need to be removed to allow the aileron control cable to pass through this narrow area.

3. Tension the diagonal cables to 160kg (353lbs) (±5%). After tensioning, fix in place with safety wire.

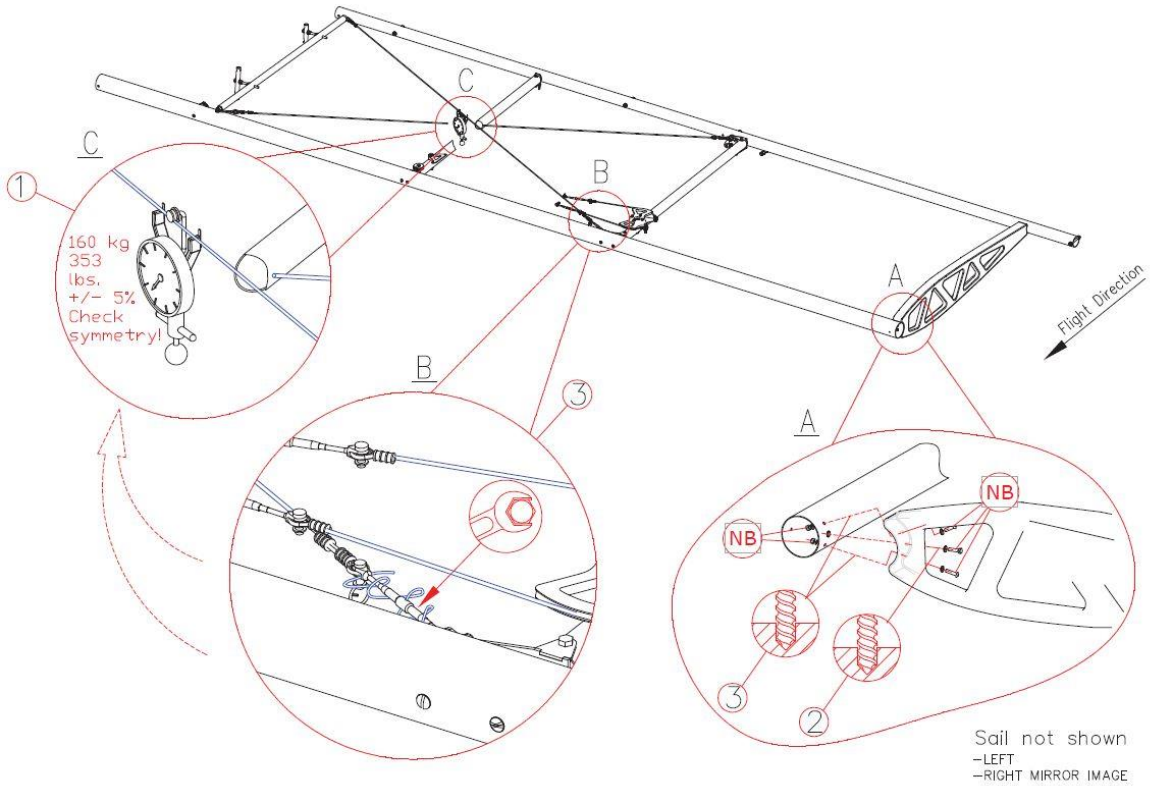


Figure 2.2.1.4: Tensioning the fuselage cables

4. Drill and fasten the leading edge of the wing end profiles. Note that the wing end profiles should fit flush with the edge of the leading edge tube.

5. Route the aileron cables back into the cockpit to the front of the centre console to reattach to the Joystick Butterfly (see figure 2.2.1.1 above).

6. Reconnect the flap pushrods (see figure 2.2.1.2 above).

7. Apply torque seal to all fastened nuts.

8. On completion of the installation, the ailerons and flaps will have to be set up. For the aileron setup procedure, refer to section 2.3.1. For the flap setup procedure, refer to section 2.3.2.

Final Inspection:

1. Confirm the aileron cables are installed correctly by performing a functional check. Ensure that when the control stick is moved to the left, the L/H aileron moves up and the R/H aileron moves down. Conduct the check in reverse to ensure that when the control stick moves to the right, the R/H aileron moves up and the L/H aileron moves down.

2. Confirm that the ailerons can achieve full and free movement.

3. Confirm the correct installation of the flap control push-pull rods.

4. Conduct a functional check of the flaps, ensuring that each selection in the cockpit results in the correct flap attitude on the aircraft.

5. Confirm that the flaps can achieve full and free movement.

6. Confirm that all turn buckles are wire locked.

7. Inspect all control cables to ensure that there is no binding or chaffing.

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2.2.2. WING VORTEX GENERATOR (VG) REPLACEMENT

2.2.2.1. SELF ADHESIVE VORTEX GENERATOR (VG) REPLACEMENT

SELF ADHESIVE VORTEX GENERATOR (VG) REPLACEMENT	
Special tooling required	Masking Tape or similar tape that can easily be removed and a small step ladder that will allow the installer to reach the top of the wing.
Level of maintenance*	Level 1
Reference documents	• BCUG-051-000 Installation Guide • Instructional video that shows how to fit the template and install the VG's (video accessible by following the link on our website)
Maintenance packing list	BCUG-051-000

Parts List:

No.	Description	Qty each	Qty Total	Part No:
1	Vortex generators with self-adhesive base	100	100	BC-00-04221
2	Semi-span template	1	1	BC-00-04222

Procedure:

NOTE:

- Clean the wing properly before attaching the VG
- Be mindful of the fact that the adhesive on the VG is very strong, and if it has been incorrectly applied it cannot simply be pulled off and repositioned without damaging the adhesive and possibly the Trilam. (See removal of vortex generators at the end of this document)
- Measure twice, stick once.

NB: **The windscreen requires the use of the self adhesive base due to the chemical incompatibility of the Sil-Poxy® with the windscreen.**

This section assumes that you have a full set of VG's on the wing and fuselage already, but 1 or more of the self adhesive variants have come off and need to be replaced. It is advised that you don't attempt to simply position the VG where the previous one was, but use the supplied template once more to check the position.

The original vortex generator kit issued contained 100 VG's, of which 94 were used. Should you have sufficient remaining to replace any that are missing, make use of those in addition to the supplied template. Otherwise contact the factory for more.

Follow the link to the installation video on our website to revise the procedure behind fitting the template to the wing and accomplish that as required to reach the missing VG. The ones still in place should make it relatively quick to align.

1. Unfold the template and note that one side is for the left (port wing) and the other side is for the right (starboard) wing. Also note that each side has been marked on 1 edge indicating which edge should be placed against the wingtip.

2. Clean the region where the VG /'s is / are missing with a damp cloth and allow it to dry before continuing.

3. Centre the ailerons.

4. For VG's missing on the right wing, use the side of the template that has "Right wing" written on its one edge and vice versa.

5. While standing behind the aileron feed this edge over the wing against the inboard edge of the composite wingtip until it makes contact with the existing line of VG's

6. Move around to the front of the wing and use a small ladder or stool to gain easy access to the front of the template.

7. Starting on the wingtip side, start positioning the template using the existing VG's. Tape it in place as you work with masking tape. A piece of tape after every 2 to 3 VG's will hold it adequately in place.

8. Once the template is secure stand on a small ladder by the wingtip and look down the wing to check that the alignment of the template relative to the existing VG's and the clarity of the position of the missing ones.

9. Start at the wingtip and move methodically inward, being careful not to miss any absent VG's. Remove the protective backing film and take care not to touch the adhesive. Using the template as a guide, carefully stick the VG into position and apply pressure on the base to stick it down firmly.

10. Once all the missing VG's have been replaced, carefully remove the template. Perform a final check to ensure that all the VG's are still securely attached.

2.2.2.2. SIL-POXY VORTEX GENERATOR (VG) REPLACEMENT

SIL-POXY VORTEX GENERATOR (VG) REPLACEMENT	
Special tooling required	Masking Tape or similar tape that can easily be removed and a small step ladder that will allow the installer to reach the top of the wing.
Level of maintenance*	Level 1
Reference documents	• BCUG-052-000 Installation Guide • Instructional video that shows how to fit the template and install the VG's (video accessible by following the link on our website)
Maintenance packing list	BCUG-052-000

Parts List:

No.	Description	Qty each	Qty Total	Part No:
1	Vortex generators	100	100	STD-000706
2	Semi-span template	1	1	BC-00-04222
3	Trilam square	1	1	BC-00-04223
4	Sil-Poxy® 0.5 oz. silicone rubber adhesive			

Procedure:

NOTE:

- Clean the wing properly before attaching the VG
- Be mindful of the fact that the Sil-Poxy adhesive will take some time to cure and will therefore be able to slide out of position if bumped during the installation process.
- Measure twice, stick once.

NOTE: The windscreen requires the use of the self adhesive base due to the Chemical incompatibility of the Sil-Poxy® with the windscreen.

This section assumes that you have a full set of VG's on the wing and fuselage already, but 1 or more of the clear silicon adhesive variants have come off and need to be replaced. It is advised that you don't attempt to simply position the VG where the previous one was, but use the supplied template once more to check the position.

The original vortex generator kit issued contained 84 VG's without an adhesive base and 16 with an adhesive base. 2 spares were provided with the self adhesive base (for the windscreen) and 4 for the

wing. Should you have sufficient remaining to replace any that are missing, make use of those in addition to the supplied template. Otherwise contact the factory for more.
Follow the link to the installation video on our website to revise the procedure behind fitting the template to the wing and accomplish that as required to reach the missing VG. The ones still in place should make it relatively quick to align.

1. Unfold the template and note that one side is for the left (port wing) and the other side is for the right (starboard) wing. Also note that each side has been marked on 1 edge indicating which edge should be placed against the wingtip.

2. Clean the region where the VG /'s is / are missing with a damp cloth and allow it to dry before continuing.

3. Centre the ailerons.

4. For VG's missing on the right wing, use the side of the template that has "Right wing" written on its one edge and vice versa.

5. While standing behind the aileron feed this edge over the wing against the inboard edge of the composite wingtip until it makes contact with the existing line of VG's.

6. Move around to the front of the wing and use a small ladder or stool to gain easy access to the front of the template.

7. Starting on the wingtip side, start positioning the template using the existing VG's. Tape it in place as you work with masking tape. A piece of tape after every 2 to 3 VG's will hold it adequately in place.

8. It is important to only tape along the leading edge of the wing as this reduced the chance of inadvertently moving the silicone adhesive vortex generators once they have been stuck down, and because the template will be flipped forward once completed, for the same reason.

9. Once the template is secure stand on a small ladder by the wingtip and look down the wing to check that the alignment of the template relative to the existing VG's and the clarity of the position of the missing ones.

10. For the silicone adhesive, apply a small layer of Sil-Poxy® along the underside of the vortex generator. The idea is that when the vortex generator is pressed down on to the Trilam with a bit of force, all air bubbles should be pushed out and glue should fill the base of the vortex generator, but there should not be so much glue that it oozes out the side. Excess silicone around the edges will make for a messy finish and may glue the template to the vortex generator which will make removal of the template difficult without dislodging the vortex generator. Best is to put a small amount of silicone first, the vortex generator can easily be removed when the silicone is still wet if more Sil-Poxy® needs to be applied, whereas removing excess silicone later when it has started to cure is difficult. We recommend perfecting the amount of Sil-Poxy® required by practicing with a spare vortex generator and the provided piece of Trilam. Lastly, note that the vortex generator can easily slide around on the Trilam if the silicone has not cured yet, therefore care must be taken to not bump the template.

11. Allow some time for the silicone to cure to the point where the vortex generators do not slide around easily. Then starting at the inboard section of the wing the template will slowly be flipped forward, clear of the vortex generators. Press down firmly on the first vortex generator and pull up on the rear of the template to lift it above the vortex generator; this will prevent the vortex generator from being peeled from the Trilam if the Sil-Poxy® has stuck the template to the vortex generator. Then move on to the next vortex generator and repeat the process until the entire template has been flipped forward (an extra set of hands may be helpful here).

12. Once fully flipped forward, recheck all the vortex generators to ensure that none were displaced during the previous step. If they are all still in the correct position the template may be removed.

2.2.2.3. VORTEX GENERATOR REMOVAL

VORTEX GENERATOR REMOVAL	
Special tooling required	A small step ladder that will allow the installer to reach the top of the wing and a craft knife.
Level of maintenance*	Level 1
Reference documents	• BCUG-051-000 Installation Guide • BCUG-052-000 Installation Guide • Instructional video that shows how to fit the template and install the VG's (video accessible by following the link on our website)
Maintenance packing list	Not applicable.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

1. The adhesive is strong once applied and cured; care should be taken upon removal. Do not simply pull the vortex generator until it comes off, as this may damage the Trilam, especially on older aeroplanes where the Trilam is reaching the end of its operational lifespan.

2. We recommend using a small craft knife with the blade held parallel to the base of the vortex generator and angled ever so slightly upward to avoid cutting into the Trilam. Then slowly cut your way through the adhesive.

3. Again practice on the provided piece of Trilam before attempting a removal on your aircraft.

2.3. CONTROL SURFACES

2.3.1 AILERON SETUP

AILERON SETUP	
Special tooling required	Aileron alignment jig.
Level of Maintenance*	Level 2
Reference documents	BCAM-NT-003-003
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
1	Ø0.82 x 440mm safety wire	1	3	
2	Control surface alignment jig*	1	1	CH-J0-23000

Procedure:

1. Position the ailerons such that they are in line with the wingtips. By means of alignment jigs or otherwise, hold the ailerons in this position.

2. Adjust the turnbuckles on the aileron cables until the control stick reaches its neutral position.

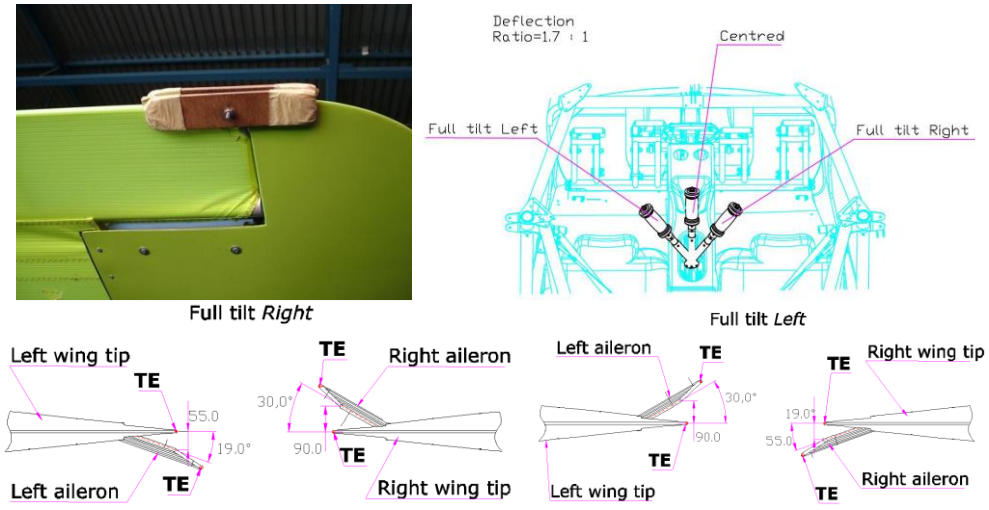

Figure 2.3.1.1: (a) Aileron setup jig, (b) Control stick range of motion, (c) Full right position & (d) Full left position

3. Once the cables have been adjusted to set the neutral position, gradually tension each cable until both cables have a **tension of 11kg (25 lbs) ±5%.** Ensure that the neutral position does not change during the tightening.

4. Once the correct tension is achieved, double check the neutral position. Check that the full deflections of the control stick meet the minimum deflection angles of the ailerons specified.

5. Once satisfied with the setup, use the safety wire provided to lock the turnbuckles.

Final Inspection:

1. Confirm the aileron cables are installed correctly by performing a functional check. Ensure that when the control stick is moved to the left, the L/H aileron moves up and the R/H aileron moves down. Conduct the check in reverse to ensure that when the control stick moves to the right, the R/H aileron moves up and the L/H aileron moves down.

2. Confirm that the ailerons can achieve full and free movement.

3. Confirm that all turn buckles are wire locked.

4. Inspect all control cables to ensure that there is no binding or chaffing.

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2.3.2 FLAP SETUP

FLAP SETUP	
Special tooling required.	Aileron alignment jig.
Level of Maintenance*	Level 2
Reference documents	BCAM-NT-003-003
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
1	Control surface alignment jig*	1	1	CH-J0-23000

Procedure:

1. Set the flap lever in the 'up' (0°) position.

2. Set the ailerons in their neutral position, using the aileron alignment jig as required (refer section 2.3.1).

3. Ensure that the flaps line up with the ailerons. If any discrepancies are noted in either flap, make adjustments at the eye-bolts.

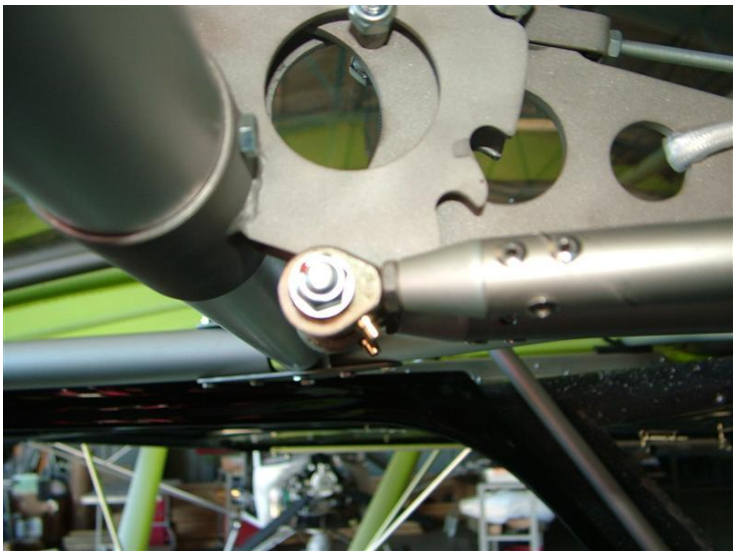

Figure 2.3.2.1: Flap push rod adjustment

4. Check the flap deflection angles relative to their starting positions.

Figure 2.3.2.2: Flap deflection angles

5. If an inclinometer is not used, one can check the deflections by noting the distances from the trailing edges of both the flaps and ailerons.

Figure 2.3.2.3: Flap deflection distances

Final Inspection:

1. Conduct a functional check of the flaps, ensuring that each selection in the cockpit results in the correct flap attitude on the aircraft.

2. Confirm that the flaps can achieve full and free movement.

3. Confirm that all turn buckles are wire locked.

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2.3.3 ELEVATOR SETUP

ELEVATOR SETUP	
Special tooling required.	Nil.
Level of Maintenance*	Level 2
Reference documents	BCAM-NT-003-003, Tail installation procedure V.4
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
1	Ø0.82 x 440mm safety wire	1	2	

Procedure:

1. Position the elevator such that it is parallel with the horizontal stabilizer and level.

2. Use an assistant to hold the elevator in this position.

3. Adjust the turnbuckles on the upper and lower elevator cable until the control stick reaches the neutral position. This is achieved when the horizontal distance from the centre of the top of the PTT switch (on top of the control stick) is 740mm (±5mm) from the forward surface of the fuel tank centre tube.

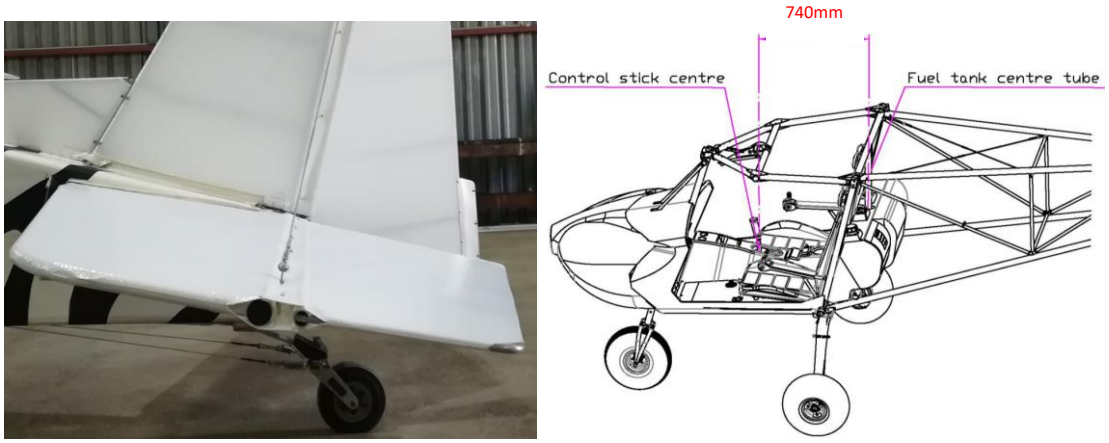

Figure 2.3.3.1: (a) Elevator neutral position, (b) Distance from PTT switch to the fuel tank centre tube

4. Once the cables have been adjusted to set the neutral position, gradually tension each cable until both cables have a tension of **21kg (46 lbs) ±5%.** Ensure that the neutral position does not change during the tightening.

5. Once the correct tension is achieved, double check the neutral position. Check that the extreme positions meet the minimum angles specified below as well.

Figure 2.3.3.2: (a) Full nose down deflection position, (b) Full nose up deflection

6. On completion, lock the turnbuckles with the specified safety wire.

Final Inspection:

1. Confirm the elevator cables are installed correctly by performing a functional check. Ensure that when the control stick is moved to the forward position, the elevators move down. Conduct the check in reverse to ensure that when the control stick moves to the aft position, the elevators move up.

2. Confirm that the elevators can achieve full and free movement.

3. Confirm that all turn buckles are wire locked.

4. Inspect all control cables to ensure that there is no binding or chaffing.

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2.3.4 RUDDER SETUP

RUDDER SETUP	
Special tooling required.	Rudder pedal alignment jig.
Level of Maintenance*	Level 2
Reference documents	BCAM-NT-003-003
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
1	Ø0.82 x 440mm safety wire	1	2	
2	Control surface alignment jig*	1	1	CH-J0-23000

Procedure:

1. Insert rudder pedal alignment jig to set the neutral position of the rudder pedals. Note that the nose wheel/tail wheel should be lifted off the ground when moving the rudder pedals.

2. Adjust the turnbuckles on the left and right rudder cables until the rudder reaches its neutral position. An assistant to aid in identifying the rudder neutral position and to hold the rudder in position during the tensioning of the cables will be necessary.

Figure 2.3.4.1: (a) Control surface alignment jig, (b) Rudder neutral position

3. Progressively tighten both rudder cables until a tension of 20kg ±5%.

4. Once the correct tension is achieved, double check the neutral position. Check that the extreme positions match those shown.

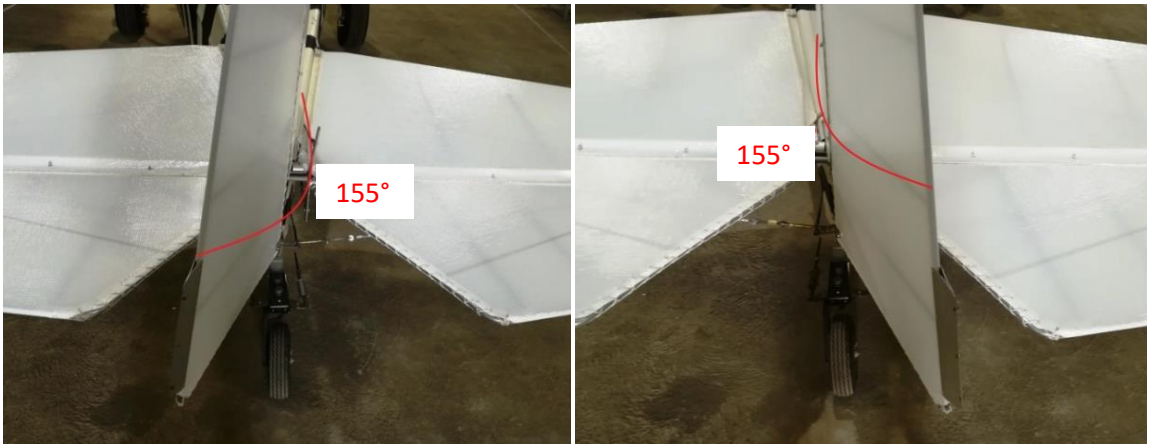

Figure 2.3.4.2: Rudder extreme positions

5. On completion, lock the turnbuckles with the specified safety wire.

Final Inspection:

1. Confirm the rudder cables are installed correctly by performing a functional check. Ensure that when the left rudder pedal is pushed forward, the rudder moves to the left. Conduct the check in reverse to ensure that when the right rudder pedal is pushed forward, the rudder moves to the right.

2. Confirm that the rudders can achieve full and free movement.

3. Confirm that all turn buckles are wire locked.

4. Inspect all control cables to ensure that there is no binding or chaffing.

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2.4. LANDING GEAR

2.4.1. FITTING A TYRE TO THE MATCO SPLIT RIM

TAIL WHEEL INSTALLATION – TAIL-DRAGGER ONLY	
Special tooling required	Dishwashing liquid, a paintbrush and a compressed air source (pump / compressor).
Level of Maintenance*	Level 2
Reference documents	BCAM-NT-003-003, http://www.matcomfg.com/
Maintenance packing list	Not applicable.

Parts List:

Refer to BCAM-NT-003-003, Section 28 for the parts list for the specific tyre and tube combination or tubeless tyre used.

Procedure:

Tubed Tyre:

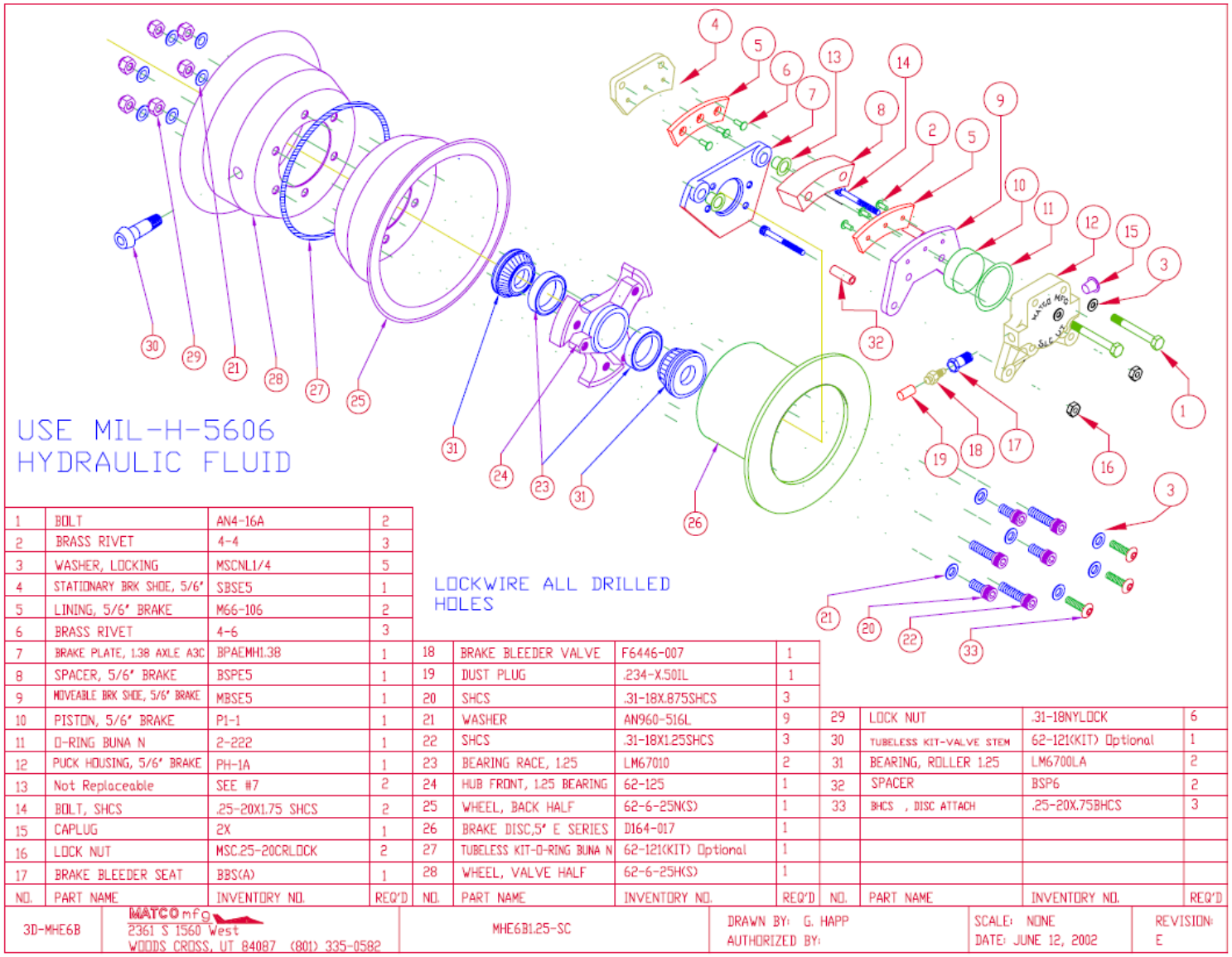
CAUTION Place the aircraft in a controlled environment where it is guarded against strong winds. It is further recommended that the floor by covered with a carpet to protect parts from minor damages. The facility should be well lit from multiple sources.

1. Place the tyres in the warm sun for about an hour before starting this section. The temperature increase makes them more pliable and easier to work with. (This step is optional, if it is not possible, continue to the next step.)

2. Using dishwashing liquid (or any soap) and water, paint the inner rim of the tyre. This will allow the rim to slide more easily.

3. With the tyre lying flat on a table top, gently insert the tube, noting that the inflation nozzle should be aligned with the mark on the tyre. Also ensure that the tube is positioned so that it can inflate without folding. In some cases, it might help to inflate the tube slightly.

4. Dissemble the wheel hub with calliper assembly and axle and separate the two halves of the hub with reference to figure 2.4.1.1 below. Please note that this drawing is the property of Matco MFG and is subject to change. The latest version of this drawing can be found on the manufacturer's website.



NO.	PART NAME	INVENTORY NO.	REQ'D	NO.	PART NAME	INVENTORY NO.	REQ'D	NO.	PART NAME	INVENTORY NO.	REQ'D
1	BOLT	AN4-16A	2	18	BRAKE BLEEDER VALVE	F6446-007	1				
2	BRASS RIVET	4-4	3	19	DUST PLUG	.234-X.50IL	1				
3	WASHER, LOCKING	MSCNL1/4	5	20	SHCS	.31-18X.875SHCS	3				
4	STATIONARY BRK SHOE, 5/6"	SBSE5	1	21	WASHER	AN960-516L	9	29	LOCK NUT	.31-18NYLOCK	6
5	LINING, 5/6" BRAKE	M66-106	2	22	SHCS	.31-18X1.25SHCS	3	30	TUBELESS KIT-VALVE STEM	62-121(KIT) Optional	1
6	BRASS RIVET	4-6	3	23	BEARING RACE, 1.25	LM67010	2	31	BEARING, ROLLER 1.25	LM6700LA	2
7	BRAKE PLATE, 1.38 AXLE A3C	BPAEMH1.38	1	24	HUB FRONT, 1.25 BEARING	62-125	1	32	SPACER	BSP6	2
8	SPACER, 5/6" BRAKE	BSPE5	1	25	WHEEL, BACK HALF	62-6-25NK(S)	1	33	BHCS , DISC ATTACH	.25-20X.75BHCS	3
9	MOVEABLE BRK SHOE, 5/6" BRAKE	MBSE5	1	26	BRAKE DISC,5" E SERIES	D164-017	1				
10	PISTON, 5/6" BRAKE	P1-1	1	27	TUBELESS KIT-O-RING BUNA N	62-121(KIT) Optional	1				
11	O-RING BUNA N	2-222	1	28	WHEEL, VALVE HALF	62-6-25HK(S)	1				
12	PUCK HOUSING, 5/6" BRAKE	PH-1A	1								
13	Not Replaceable	SEE #7	2								
14	BOLT, SHCS	.25-20X1.75 SHCS	2								
15	CAPLUG	2X	1								
16	LOCK NUT	MSC.25-20CRLOCK	2								
17	BRAKE BLEEDER SEAT	BBS(A)	1								

3D-MHE6B	MATCO mfg 2361 S 1560 West WOODS CROSS, UT 84087 (801) 335-0582	MHE6B1.25-SC	DRAWN BY: G. HAPP AUTHORIZED BY:	SCALE: NONE DATE: JUNE 12, 2002	REVISION: E

Figure 2.4.1.1: MATCO Wheel hub & calliper assembly drawing

5. Fit the two hub halves either side of the tyre / tube assembly. Note that the outer hub half has a hole for the valve stem of the tube to protrude. The tyre should be oriented such that this lines up with the valve stem of the tube.

6. Ensure that the tube is note being pinched by the two hubs and fasten the assembly.

7. Reassemble the remainder of the hub with reference to figure 2.4.1.1 above, taking note that the tubeless kit valve stem and tubeless kit O-ring shown in item 30 and 27 respectively are not required for this assembly.

8. Inflate the wheel to the pressure stipulated in section 3.14 of the Maintenance Manual.

9. Apply torque seal to all fastened nuts.

Tubeless tyre:

1. Place the tyres in the warm sun for about an hour before starting this section. The temperature increase makes them more pliable and easier to work with. (This step is optional, if it is not possible, continue to the next step.)

2. Using dishwashing liquid (or any soap) and water, paint the inner rim of the tyre. This will allow the rim to slide more easily.

3. Dissemble the wheel hub with calliper assembly and axle and separate the two halves of the hub with reference to figure 2.4.1.1 below. Please note that this drawing is the property of Matco MFG and is subject to change. The latest version of this drawing can be found on the manufacturer's website.

4. Inspect the rim face at the radius where the O-ring will seat for any deep scratches or imperfections. Smooth out any imperfections with a medium grit emery cloth.

5. Insert the valve stem through the ½" hole and pull through from the inside. Soapy water may make it easier to install.

6. Take the brake half rim (the one without the valve hole) and insert it through the tyre opening that will face toward to landing gear.

7. Push the large O-ring (lubricated lightly with silicon or petroleum grease) over the diameter of the rim inside the tyre and roll it onto the bead seat of the rim.

8. Insert the other rim (with the valve stem) in what will be the outside of the wheel assembly. Bolt the rims together using the three socket head cap screws, washer, and nuts which were disassembled.

9. Roll the O-ring to the centre of the rim assembly. This is done by pushing the tyre bead down evenly on the brake half side until it reaches the mating point of the rim halves. The O-ring will seal the joint against leaks.

10. Align the valve stem with the lightest point on the tyre (shown with a coloured dot or mark).

11. Install the remaining bolts, washer, and nuts.

12. Inflate the wheel to a suitable pressure. It may help to seal the tyre against the hub by tightening a ratchet strap around the circumference of the tyre, for the initial part of inflation.

13. Reinstall the brake disk and loosely reassemble the calliper and axle.

14. Apply torque seal to all fastened nuts.

Final Inspection:

1. Check that all fastened nuts are tight.

2. Check the tyre pressure is correct and that there is no evidence of leaks.

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2.4.2. TAIL WHEEL INSTALLATION – TAIL-DRAGGER VARIANTS ONLY

TAIL WHEEL INSTALLATION – TAIL-DRAGGER ONLY	
Special tooling required	Chocks and a padded tail stand / support.
Level of Maintenance*	Level 1
Reference documents	BCAM-NT-003-003
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts list:

No.	Description	Qty each	Qty Total	Part No:
1	Wheel unit	1	1	XT-01-45100
2	M8 x 45mm bolt	1	1	STD-000045
3	M8 x 22mm washer	1	1	STD-000132
4	M8 Nylock nut	1	1	STD-000095
5	Matco tail wheel base adapter (WHLTWB-1)	1	1	STD-000510
6	Torque Seal			

Procedure:

CAUTION

Place the aircraft in a controlled environment where it is guarded against strong winds. It is further recommended that the floor by covered with a carpet to protect parts from minor damages. The facility should be well lit from multiple sources.

1. Place the chocks in front of the main wheels and lift the tail on to the padded stand such that the tail wheel is accessible
2. Assemble as per the assembly steps shown in figure 2.4.2.1.
3. Apply torque seal to the fastened nut.
4. Ensure that the tail wheel is inflated to 130 – 200 kPa / 1.3 – 2.0 bar / 20 – 30 psi.

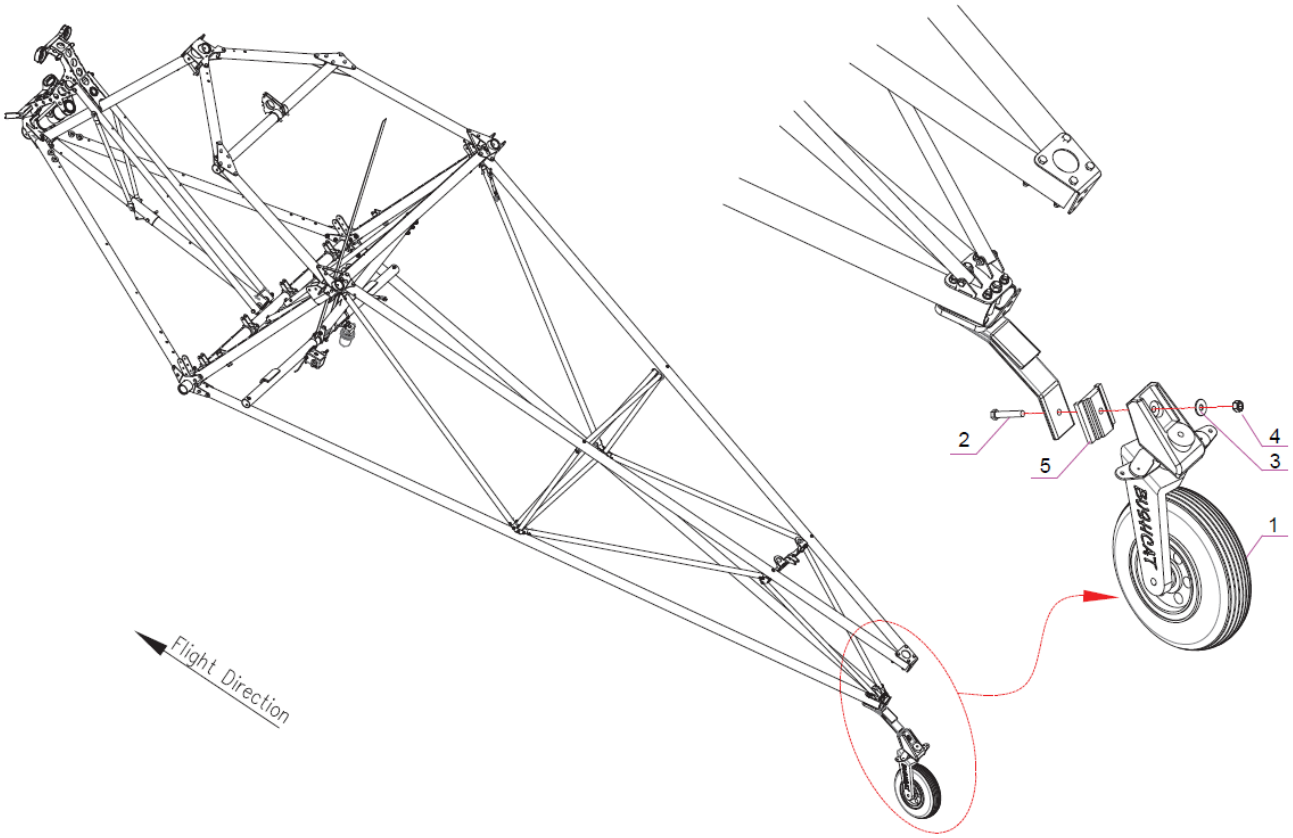

Figure 2.4.2.1: Tail wheel installation procedure

Final Inspection:

1. Once work on the landing gear is complete, perform one taxi without the intention to take-off prior to operating again.

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2.4.3. BRAKE CALLIPER & MAIN WHEEL INSTALLATION & REMOVAL

BRAKE CALLIPER & MAIN WHEEL INSTALLATION & REMOVAL	
Special tooling required	Trolley Jacks / wing stands and sand bags as required.
Level of Maintenance*	Level 1
Reference documents	BCAM-NT-003-003
Maintenance packing list	Contact SkyReach (with spacer and without spacer)

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts list: Installation without spacer:

No.	Description	Qty each	Qty Total	Part No:
1	3/8-16 x 2 1/2" bolt	2	4	STD-000500
2	5/16-18 x 2 1/2" bolt	2	4	STD-000504
3	M8 x 16 x 1.6mm washer	4	8	STD-000532
4	M10 x 18 x 2.0mm washer	4	8	STD-000531
5	3/8-16" Nylock nut	4	8	STD-000528
6	5/16-18" Nylock nut	4	8	STD-000529
7	Torque seal			
8	Grease – see list below			

Procedure:

CAUTION

Place the aircraft in a controlled environment where it is guarded against strong winds. It is further recommended that the floor by covered with a carpet to protect parts from minor damages. The facility should be well lit from multiple sources.

With reference to section 2.1.3, jack the aircraft as required. It may be jacked with trolley jacks to lift 1 wheel at a time, or it may be lifted with a wing stand to raise 1 wheel at a time off the ground.

Installation without spacer:

1. Assemble as per the assembly steps shown in figure 2.4.3.1.

2. Ensure that the wheel bearings are correctly packed with a generous amount of grease. A list of approved lubricants is given below.

3. Apply torque seal to all fastened nuts.

Approved lubricants for item 8:

1. MIL-G-81322
2. MOBIL 28
3. MOBIL SHC-100
4. AEROSHELL 22

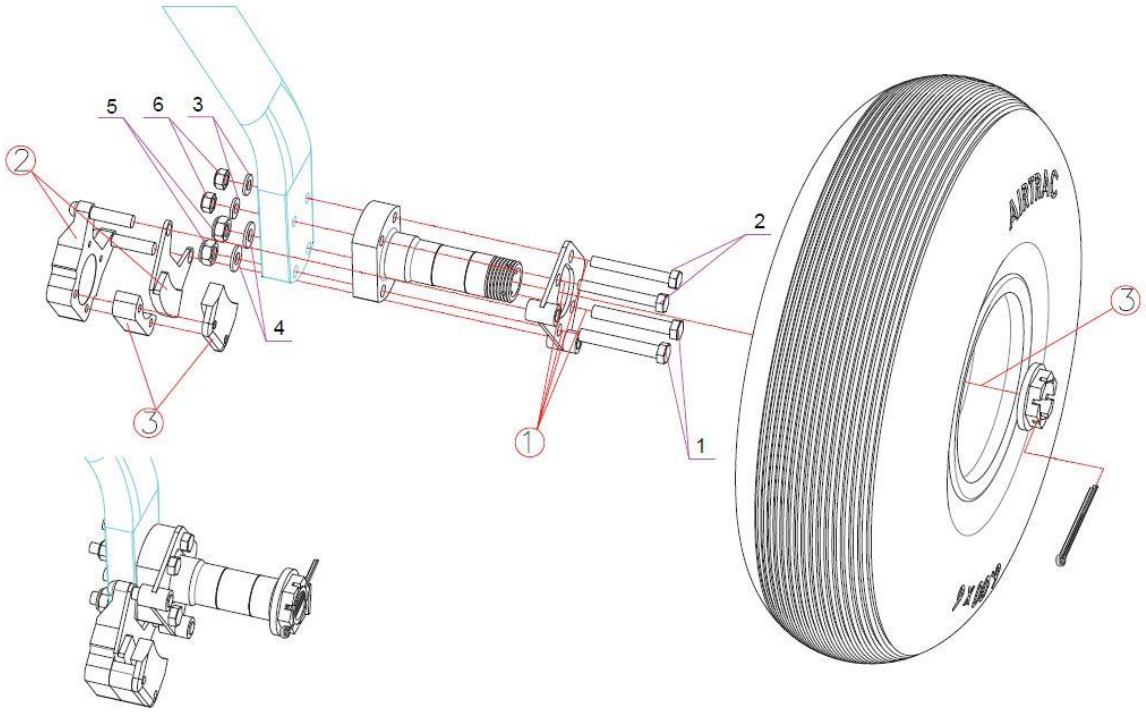

Figure 2.4.3.1: Main wheel installation with no spacer

Parts list: Installation with spacer:

No.	Description	Qty each	Qty Total	Part No:
1	Matco A3C axle spacer (0.625”)	1	2	STD-000491
2*	3/8-16 x 3 1/4” bolt	2	4	STD-000503
3	5/16-18 x 3” bolt	2	4	STD-000505
4	M8 x 16 x 1.6mm washer	2	4	STD-000532
5	M10 x 18 x 2.0mm washer	2	4	STD-000531
6	3/8-16” Nylock nut	2	4	STD-000528
7	5/16-18” Nylock nut	2	4	STD-000529
8	Torque Seal			
9	Grease – see list above			

* This item may be replaced with 3/8-16 x 3” (STD-000502) bolt if necessary

Installation with spacer

1. Assemble as per the assembly steps shown in figure 2.4.3.2.

2. Ensure that the wheel bearings are correctly packed with a generous amount of grease. A list of approved lubricants is given in the section above.

3. Apply torque seal to all fastened nuts.

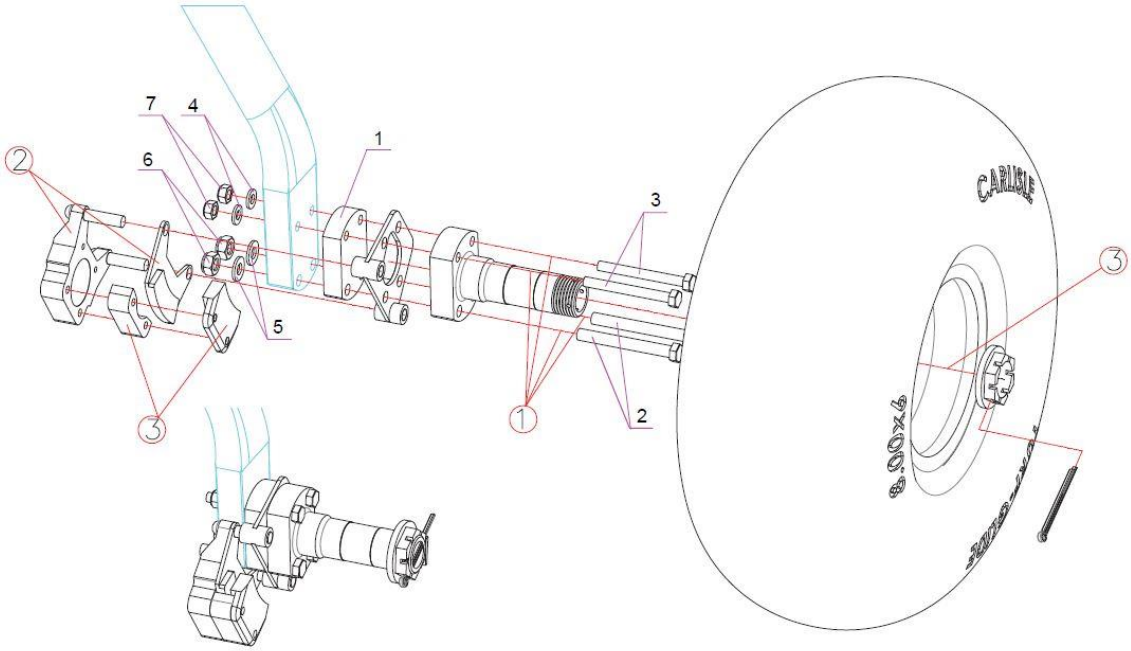

Figure 2.4.3.2: Main wheel installation with spacer

Procedure: Wheel Removal

1. Undo the wheel bolt and place it on the work bench.

2. Remove the wheel by sliding the wheel off the axle. Note that the brake disk will remain around the axle as it is clamped between the brake pads. After removing the wheel, remove the disk. Place the wheel and disk on the workbench.

3. The brake pads are located inside the Black Max calliper. Use the flat screwdriver to wedge the pads out of the calliper.

CAUTION Make use of tools before resorting to working by hand.

4. Replace the brake pads as required.

Final Inspection:

1. Ensure that all the bleed nipples are closed.
2. Ensure that no leaks are evident.
3. Press on the toe brakes and ensure positive pressure.
4. Once work on the landing gear is complete, perform one taxi without the intention to take-off prior to operating again.

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2.4.4. NOSE WHEEL INSTALLATION – NOSE WHEEL VARIANTS ONLY

NOSE WHEEL INSTALLATION – NOSE-WHEEL ONLY	
Special tooling required	Chocks and sandbags for tail.
Level of Maintenance*	Level 1
Reference documents	BCAM-NT-003-003
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
1	M12 x 30mm (Shank 11mm) special bolt	1	2	BC-00-41103
2	Ø0.82 x 500mm safety wire	1	2	
3	LOCTITE® 243			

Procedure:

CAUTION

Place the aircraft in a controlled environment where it is guarded against strong winds. It is further recommended that the floor by covered with a carpet to protect parts from minor damages. The facility should be well lit from multiple sources.

1. Chock the 2 main wheels and put sufficient sandbags on the tail to raise the nose gear from the ground. (Refer to section 2.1.3)

2. Assemble as shown in figure 2.4.4.1.

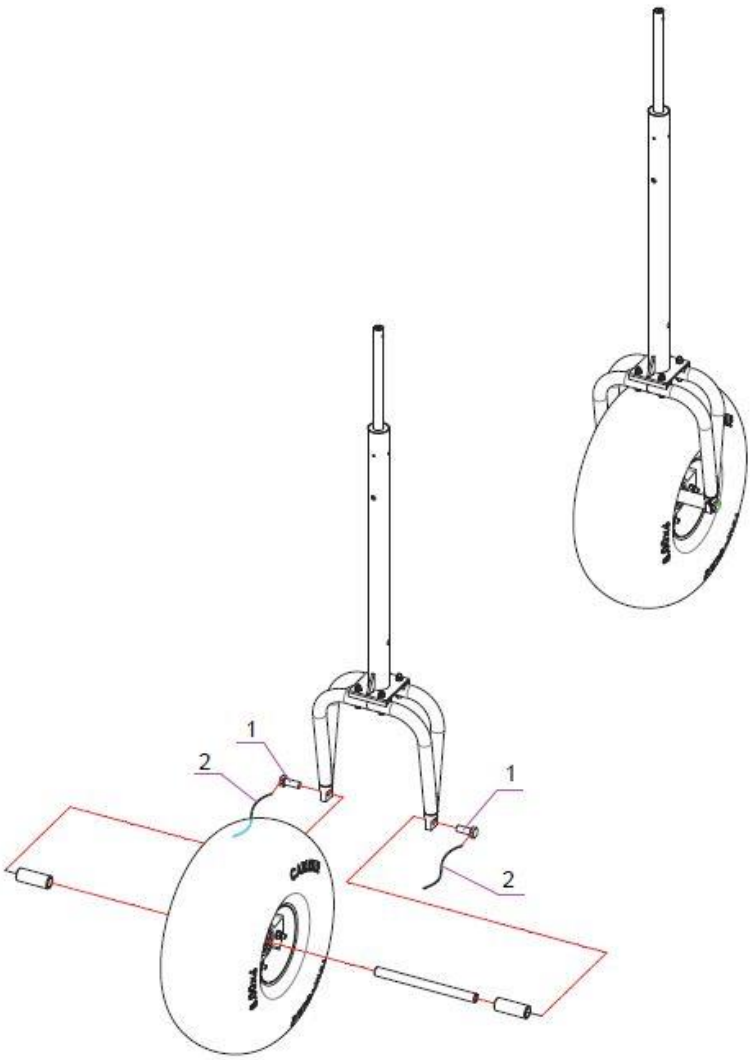

Figure 2.4.4.1: Nose wheel installation

3. Apply Loctite to the bolts before fastening

4. Wire lock the bolts with the safety wire specified on completion.

Final Inspection:

1. Once work on the landing gear is complete, perform one taxi without the intention to take-off prior to operating again.

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2.4.5. BLEEDING THE BRAKES

BLEEDING THE BRAKES	
Special tooling required	Vacuum tank or source / hand pump or pressure tank
Level of Maintenance*	Level 1
Reference documents	BCAM-NT-003-003, Matco technical support: Wheels and brakes
Maintenance packing list	Not applicable.

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

Vacuum bleeding: (Refer to Figure2.4.5.3 for the vacuum bleeding schematic)

1. Temporarily plug the vent in the reservoir (refer to 2.4.5.1 for the schematic of the layout for the toe brakes and figure 2.4.5.2 for the remote reservoir position in the aircraft).

2. Connect the vacuum tank or source to the reservoir or the line below the reservoir.

3. Attach a tube from the nozzle of the pressure tank containing brake fluid with low pressure or reservoir of fluid to the top of the brake bleeder valve. Be sure the hose is bubble free before attaching.

4. Make sure that the master cylinder shaft is fully extended to open up the internal bypass valve.

5. Apply a vacuum to the system and open the bleeder valve at the clipper to allow brake fluid to be drawn into the housing and continue until the fluid travels though the system and air is removed.

6. Air in the system will be drawn up and out in to the reservoir. Check the high point in system for remaining air. Vacuum will normally remove air in high spots better than pressure bleeding.

7. Fluid should be drawn through the system until it reaches approximately ¼ inch from the top of the master cylinder or remote reservoir. Disconnect vacuum and reopen vent to reservoir if it was closed.

8. Close the brake bleeder valve, and remove the service hose.

9. Gently stroke each cylinder. If the brake system is free of air, the brake pedal should feel firm and spongy. If not, repeat steps 1 through 7 until the system is free of trapped air.

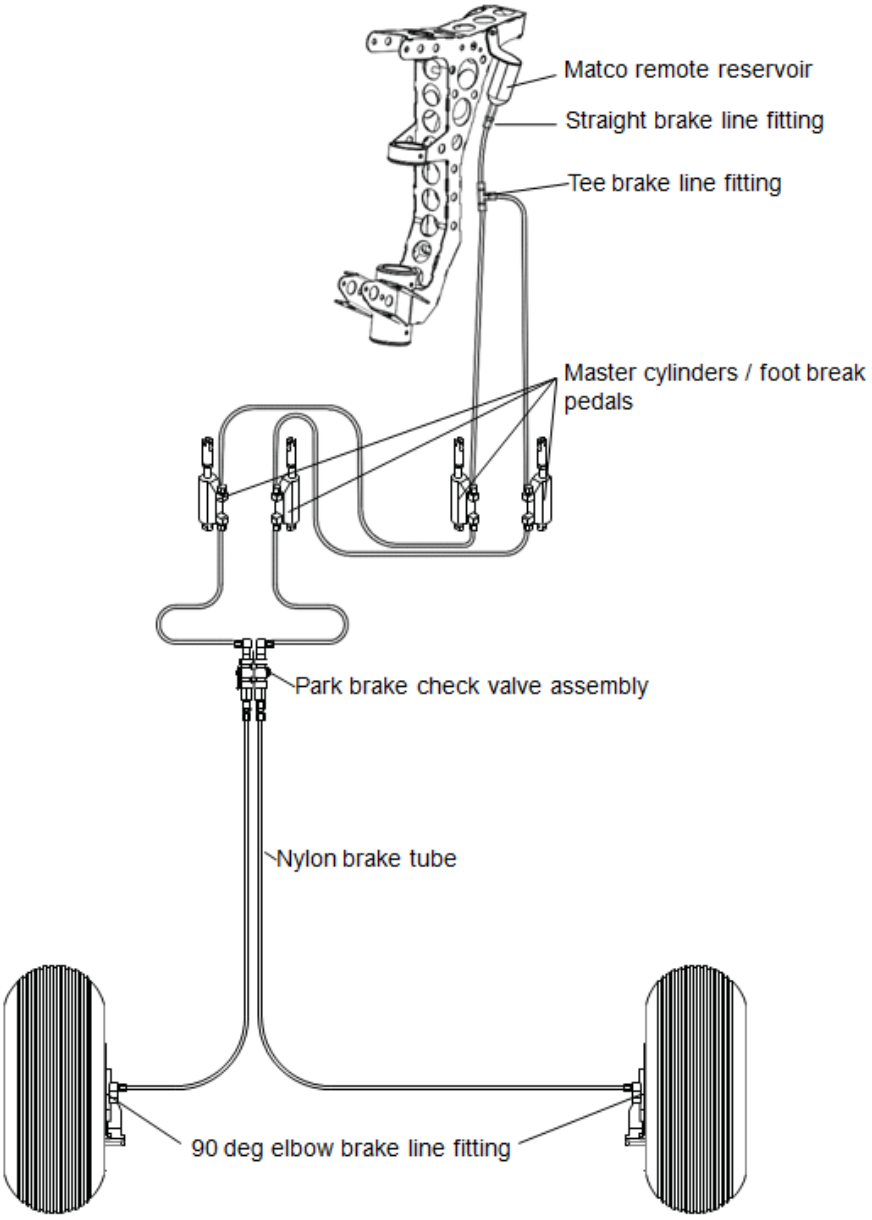

Figure 2.4.5.1: Toe brake and park brake schematic

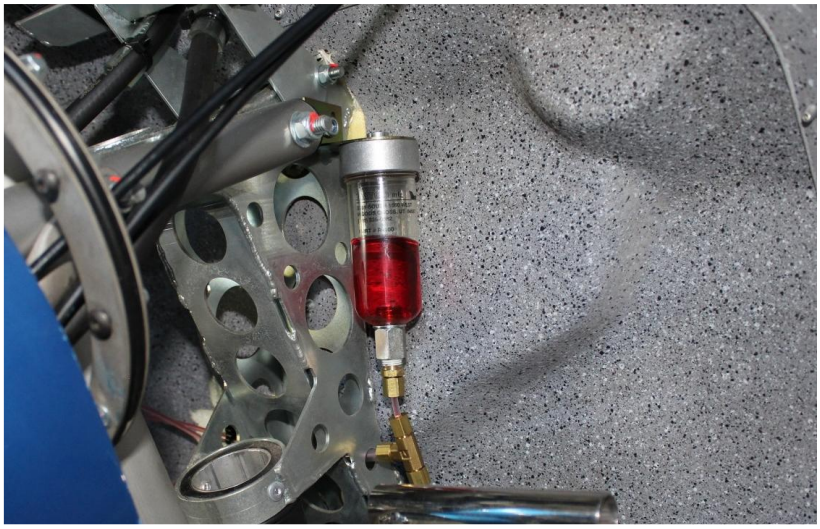

Figure2.4.5.2: Matco remote reservoir in aircraft

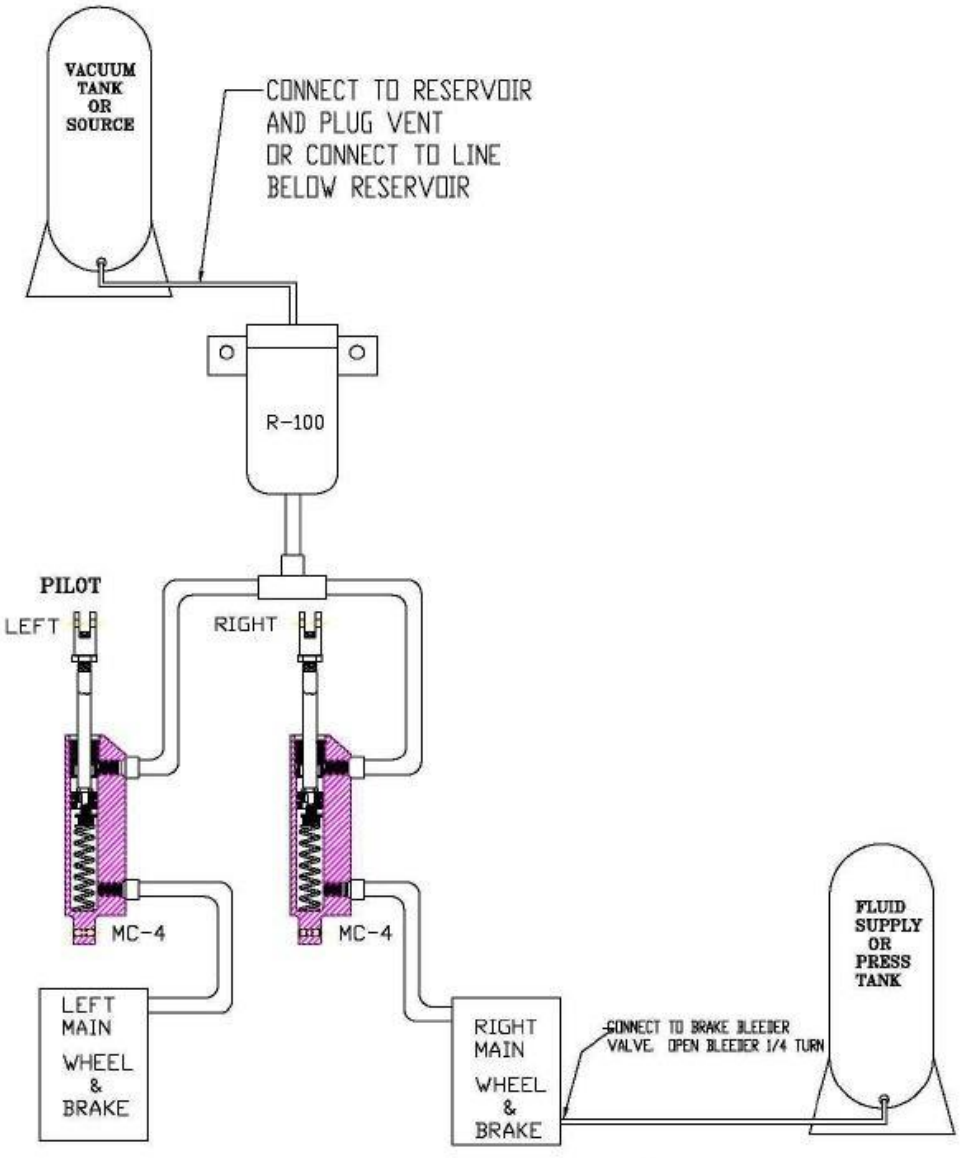

Figure 2.4.5.3: Vacuum brake bleeding schematic

Pressure bleeding: (Refer to figure 2.4.5.4 for pressure bleeding schematic)

1. Open brake bleeder valve slightly on the brake calliper to facilitate bleeding for air from the system.

2. Attach a tube form the nozzle of a squirt can (such as the MATCO squirt can part #MSCCHPSS) or bleeder tank containing brake fluid, to the top of the brake bleeder valve. Pump the handle until oil flows bubble free from service hose before attaching.

3. Make sure that the master cylinder shaft is fully extended to open op the internal bypass valve.

4. Inject brake fluid into the puck housing and continue injecting until the fluid travels through the system in to the master cylinder.

5. Air in the system will be pushed up and out in to the master cylinder only if the remote reservoir is at the highest point in the system and there are no loops in the brake lines.

6. Fluid should be pushed through the system until it reaches approximately ¼ inch from the top of the master cylinder or remote reservoir.

7. Close the brake bleeder valve and remove the service hose.

8. Gently stroke each cylinder. If the brake system is free of air, the brake pedal should feel firm and spongy. If not, repeat steps 1 through 7 until the system is free of trapped air.

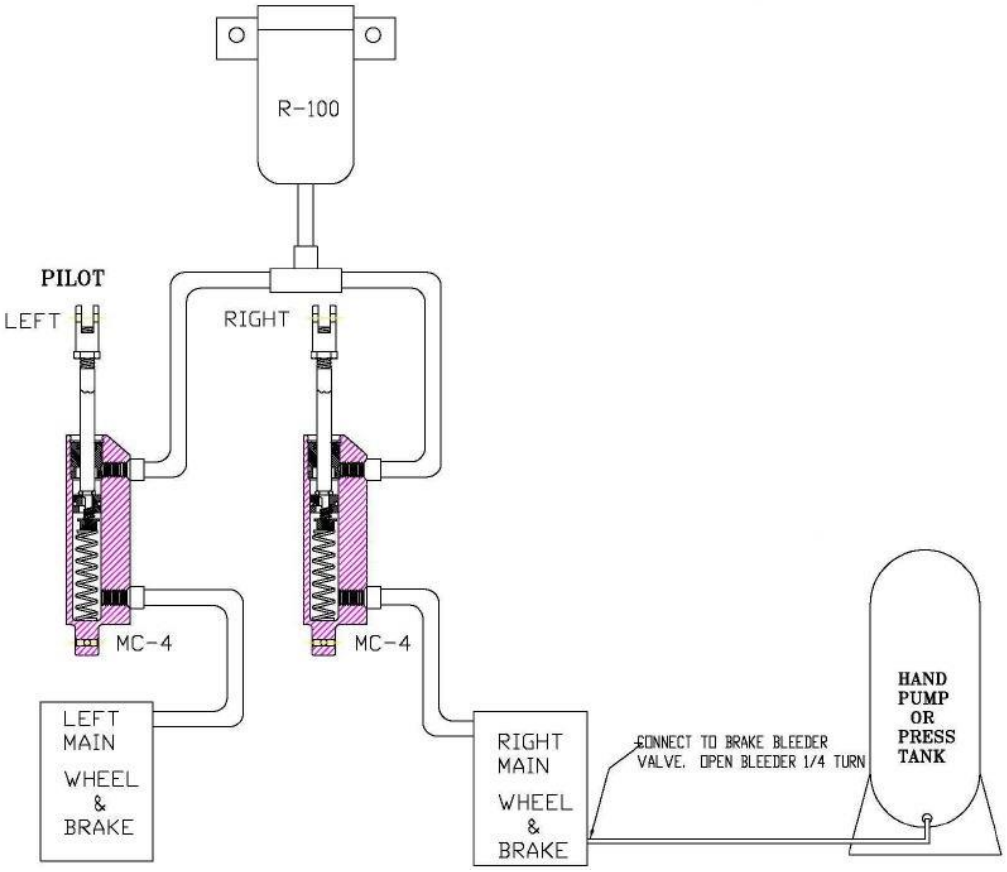

Figure2.4.5.4: Pressure brake bleeding schematic

Final Inspection:

1. Check that positive pressure is assured on brake application prior to testing.

2. Check the essentially closed system for leaks.

3. Perform a brake functionality check during a taxi without the intention to take off prior to flying.

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2.5 ENGINE

All maintenance procedures in this section were included from the ROTAX maintenance manuals for line maintenance / heavy maintenance / installation / overhaul 2012 for the reader's convenience.

While every effort has been made to provide a true and up to date representation of the ROTAX inspections, should the ROTAX manual differ from the instructions presented here, the ROTAX manual supersedes this manual in all cases.

In the event of omissions in procedures, the reader is referred to the ROTAX Installation, Line Maintenance, Heavy Maintenance and Overhaul Manuals as applicable. The latest editions of these can be downloaded from https://www.flyrotax.com/services/technical-documentation.html.

2.5.1 ENGINE CLEANING

ENGINE CLEANING	
Special tooling required	Drip Tray, rags and container to collect for disposal the cleaning residues.
Level of Maintenance*	Level 1 (in situ clean) / Level 3 (strip and clean)
Reference documents	MML Line Maintenance Manual ROTAX 912 Series, Ch. 12-20-00 and Ch. 05-00-00
Maintenance packing list	Not applicable.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

If necessary, the engine must be cleaned with due care. To accomplish proper cleaning, the engine needs to be removed and stripped to its component parts. External cleaning in situ can also be achieved, provided the necessary precautions are taken to protect the engine from cleaning agents from going where they shouldn't, but it will naturally be less effective.

NOTE: When cleaning the engine, the dissolved residues of fuel, oil and other environment-contaminating agents are rinsed off. Collect the residual liquids and dispose of them in an environmentally friendly way.

1. Before cleaning, all openings though which cleaning agents and/or dirty water could enter the engine must be closed off. Failure to do this may result in engine damage.

2. Always clean the engine in a cold state.

3. The use of a commercially available cold cleaning agent for the engine is recommended. Very good results have been achieved with "Clenvex 2000", a solvent cold cleaner. It is free of halogen, on the bases of selected fuel fractions with tensides; and it is biologically disposable.

4. Use only approved cleaning agents (e.g. kerosene, varsol etc.) for cleaning all metal parts. Never use caustic, easily flammable or corrosive cleaning agents.

5. Do not use lye-based cold cleaner or degreasing agents.

6. Do not clean coolant or oil hoses with aggressive solutions.

7. Clean off sealing compound residue with sealant remover.

8. Soak combustion chamber, piston and cylinder head with cleaning agent and remove combustion residues with a bronze brush.

CAUTION

Never clean an engine with a high pressure cleaner. This is detrimental to the electrical installations and shaft seals. Oxidation of the various components and their failure are the consequence.

9. After cleaning the engine, dry all electrical components using compressed air. Components that need to be dried include

    a. The battery
    b. The ignition unit
    c. The spark plug connector
    d. Clamp connections
    e. Plug connections

2.5.2 AIR FILTER INSPECTION

AIR FILTER INSPECTION	
Special tooling required	Low pressure water source.
Level of Maintenance*	Level 2
Reference documents	MML Line Maintenance Manual ROTAX 912 Series, Ch. 12-20-00
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
1	K&N air filter cleaner	1	1	
2	K&N air filter oil spray	1	1	RAW-000377

Procedure:

1. Conduct a visual inspection of the air filter after the maintenance interval prescribed in chapter 4.

2. To clean the filter, lightly tap and brush off surface dust.

NOTE: In the event of excessive dust formation, clean the air filter at shorter intervals. A dirty filter will not only reduce the engine performance but may also promote wear of the engine.

3. Spray K&N filter cleaner onto filter surface and leave to soak for approximately 10 min.

CAUTION Never use gasoline, steam, caustic liquids, strong detergents, particle cleaning agents or high pressure cleaners to clean the filters.

4. Rinse the air filter with low pressure water from inside to outside and let the element dry naturally.

CAUTION Do not dry over a naked flame, with compressed air or with a hot air gun.

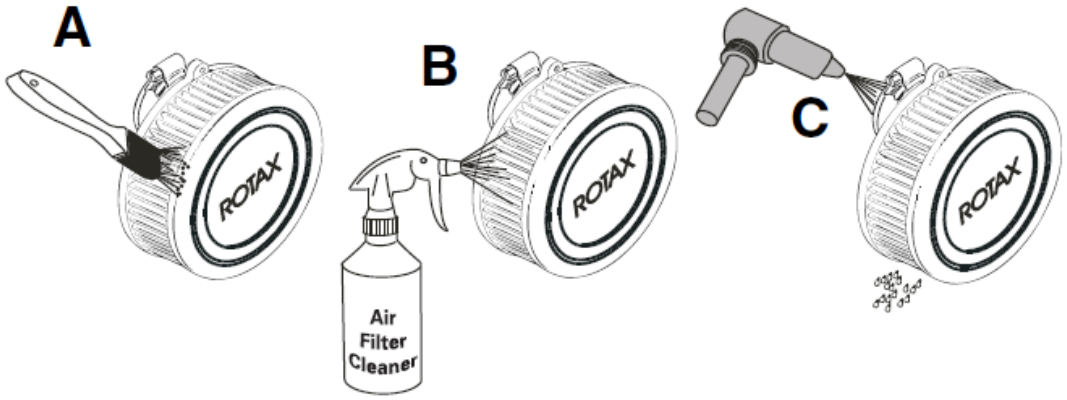

Figure 2.5.2.1: Cleaning the engine air filter

5. After cleaning, spray each filter pleat with ROTAX air filter oil. After 5 to 10 minutes, the filter will be soaked with oil, noticeable by the uniform red colouring.

CAUTION Never use gear oil, diesel or engine oil as they attract humidity.

6. If the filter mat is damaged, replace the air filter.

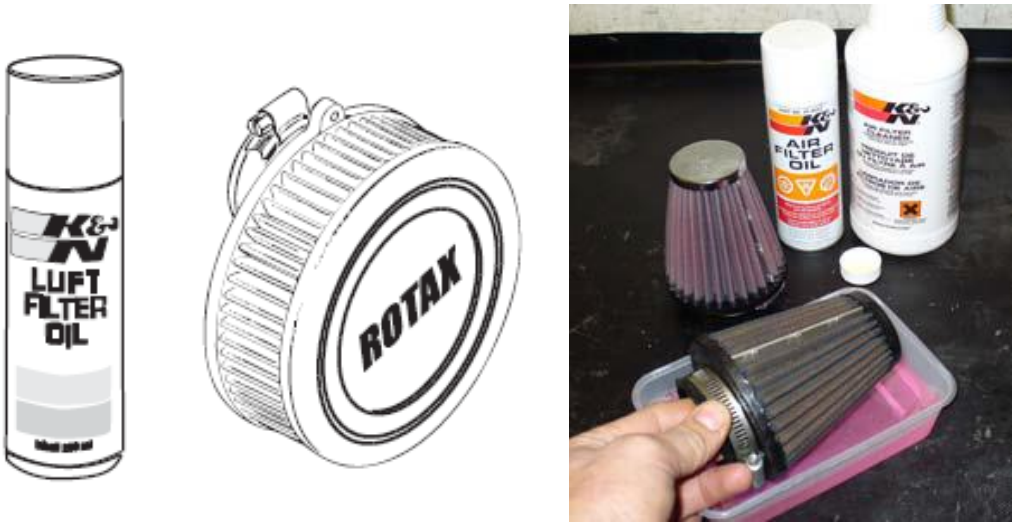

Figure2.5.2.2: Applying oil to the engine air filter

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2.5.3 AIR FILTER REPLACEMENT

AIR FILTER REPLACEMENT	
Special tooling required	Nil
Level of Maintenance*	Level 2
Reference documents	MML Line Maintenance Manual ROTAX 912 Series, Ch. 12-20-00
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
1	Air filter	1	1	R912AIRFILT

Procedure:

1. Attach a new air filter, free of grease, to the connection faces and wire lock to prevent loss.

NOTE: Each air filter must be secured by a clamp attachment and a wire securing element as per the ROTAX Line Maintenance Manual, chapter 05-00-00, section 1.6.

NOTE: Only use the dry type air filters which are specified by the aircraft manufacturer and from ROTAX.

Final Inspection:

1. Check all clamps are tight and wire-locking in place to properly secure the filters.

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2.5.4 VISUAL LEAK CHECK & REPAIR

VISUAL LEAK CHECK & REPAIR	
Special tooling required	Hand held inspection mirror and torch.
Level of Maintenance*	Level 1
Reference documents	MML Line Maintenance Manual ROTAX 912 Series Ch 12-20-00.
Maintenance packing list	Not applicable.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

Leaking connections can lead to engine problems or engine failure. A visual inspection of the whole engine for leaks is thus recommended periodically. If leaks are visible, the cause must be located and the fault remedied.

If a leak is suspected, the following check needs to be conducted:

1. Clean the engine (refer to section 2.5.1)
2. Operate the engine until the temperatures have stabilized for a period of 5 minutes (the engine oil temperature needs to be in the range of 50 to 10°C (122 – 160°F).
3. Switch off the ignition and secure the engine against unintentional operation. Simultaneously secure the aircraft against unauthorized operation.
4. For a period of 1 minute after the engine has been stopped, no liquid must drip down.

Specific checks that can be conducted include:

1. Check the water pump for leaks.
    a. If the leakage bore, located at the base of the ignition housing, is dripping oil, the oil seal on the water pump shaft may be defective and must be replaced.
    b. In the case of coolant drips at the leakage bore, the coolant mechanical seal must be replaced and the quality of the coolant must be inspected.

2. Inspect the fuel lines (in the engine), their connections and screw fasteners. Look for scuffing marks. A detailed visual inspection especially on the steel fuel lines in the area of connections for leaks and cracks is necessary.

CAUTION Avoid overstretching the fixing elements. Always comply with the specified torque.

3. Inspect the fuel pump and isolating flange for leaks. For a period of 1 minute after shut down the engine must not drop oil out of the ventilating tube. In the case of uncertainty, determine the oil amount. An oil leak is confirmed when after a 20 minute engine run more than 0.5ml oil loss is detected.

4. Check the coolant hoses and connections and fittings for leakage. Include an examination of the surrounding areas to aid in detecting leaks.

5. Inspect all oil feed lines from the oil tank to the oil cooler and to the engine for leaks. Also inspect the oil return line from the crankcase to the oil tank. Check the pressure oil line from the oil pump to the governor flange of the governor.

6. Check all hoses, particularly in the area of the hose clamps and hose connections, for porosity, damage and kinks. If damage is detected, replace the hose immediately.

Inspection Findings:

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2.5.5 MAGNETIC PLUG INSPECTION & REPLACEMENT

MAGNETIC PLUG INSPECTION & REPLACEMENT	
Special tooling required	Nil.
Level of Maintenance*	Level 2
Reference documents	ROTAX Line Maintenance Manual Ch. 12-20-00, Rotax 912 servicing pdf from www.conairsports.co.uk.
Maintenance packing list	Not applicable.

Parts:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

The magnetic plug is located in the crankcase near the gearbox and is primarily designed to catch metal particles from the gearbox, but due to the common oil supply for the gearbox and engine, it is possible for the plug to be contaminated if a problem arises elsewhere in the engine.

There are 3 different head configurations for the Magnetic Plug: 6mm Allen screw, Torx TX40 and 17mm Hex. The magnetic plugs are often difficult to remove, and removal can be eased by tapping the head of the plug prior to unscrewing it. Note when removing the plug, that there will be a small accumulation of oil behind the plug.

Figure2.5.5.1: (a) Tapping the magnetic plug to ease removal & (b) the oil accumulation behind the plug

1. Remove the magnetic plug and inspect it for accumulation of chips.

2. If the level of contamination is difficult to establish due to the presence of oil behind the iron filings, rinse the magnetic plug in some carb cleaner which will remove the oil and leave the iron filings behind on the plug.

Figure 2.5.5.2: (a) Magnetic plug contaminated with oil and iron filings, (b) Cleaning the plug & (c) Plug after cleaning still showing iron filings

3. Steel chips in low numbers as shown below can be accepted if the accumulation is below 3mm (0.125 in)

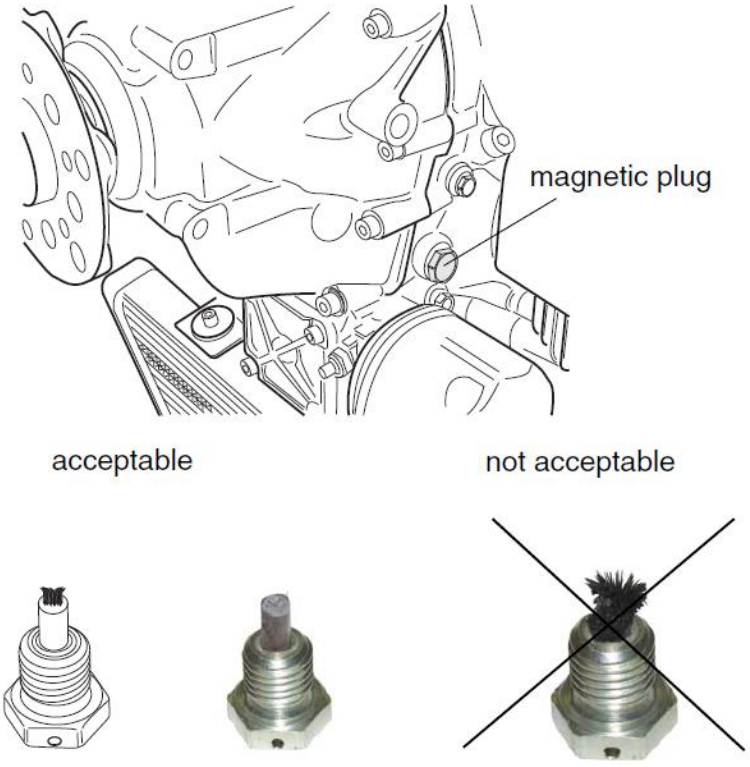

Figure 2.5.5.3: Rotax magnetic plug inspection findings guide

4. If there are larger accumulations of metal chips on the magnetic plug, the engine must be repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.

5. In the case of unclear findings:
    a. Flush the oil circuit.
    b. Fit a new oil filter.
    c. Install the magnetic screw.
    d. Complete an engine test run using the method prescribed at the end of this section.
    e. Inspect the magnetic screw once more.
    f. Inspect the oil filter once more.

NOTE:

If the oil circuit is contaminated, replace the oil cooler and flush the oil circuit. Complete the detailed inspection as per the ROTAX Line Maintenance Manual, chapter 12-20-00, section 11.7.

6. Trace the cause and remedy.

7. After inspection:
    a. Clean the magnetic plug
    b. Refit the magnetic plug
    c. Torque it to 25Nm
    d. Wire-lock it

Inspection Findings:

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2.5.6 SPARK PLUG INSPECTION

SPARK PLUG INSPECTION	
Special tooling required	Nil.
Level of Maintenance*	Level 2
Reference documents	ROTAX Line Maintenance Manual CH 12-20-00, Rotax 912 servicing pdf from www.conairsports.co.uk.
Maintenance packing list	Not applicable.

Parts:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

1. Inspect all spark plugs for mechanical damage.

2. Inspect the electrode gap on all spark plugs (including new ones) to ensure that the distance falls within the limits specified in the Rotax line maintenance manual, reproduced below for convenience.

Table 2.5.6.1: Rotax spark plug electrode gap limits

Electrode gap	
New	**Wear limit**
0,6 - 0,7 mm (0.023 - 0.027 in)	0,9 mm (0.035 in)

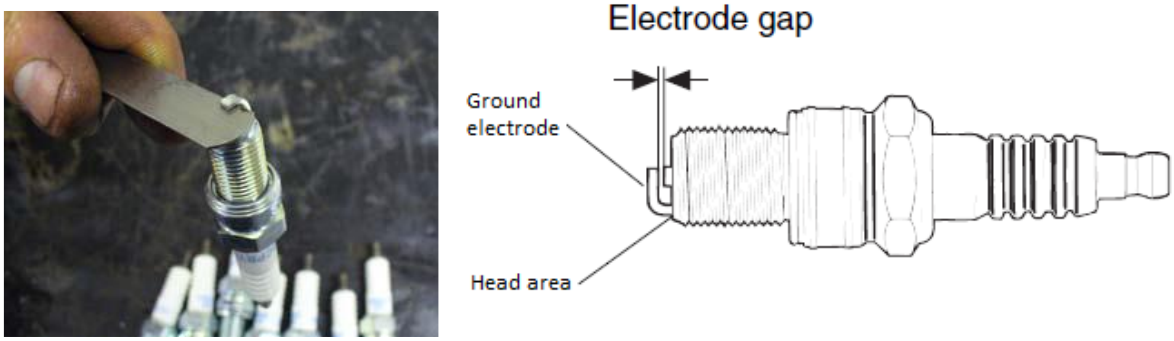

Figure 2.5.6.1: Checking of the gap using a feeler gauge

3. Inspect the spark plug face to ascertain the operating condition of the engine as per the guidelines in the Rotax line maintenance manual, reproduced below for convenience.

Spark plug face	Information
light coloured to brown	plug and calibration of the engine are correct
velvet black	Indicates the following: - mixture too rich - insufficient air intake (clogged air filter) - engine operating temperature too low
oily, glossy coating	Indicates the following: - damaged valve stem seal - misfiring - too much oil in combustion chamber - worn cylinder and piston rings
white with formation of melt beads	Indicates the following: - mixture too lean - leaking valves

Figure 2.5.6.2: Rotax spark plug face inspection

Inspection Findings:

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2.5.7 SPARK PLUG REPLACEMENT

SPARK PLUG REPLACEMENT	
Special tooling required	Nil.
Level of Maintenance*	Level 2
Reference documents	ROTAX Line Maintenance Manual CH 12-20-00, Rotax 912 servicing pdf from www.conairsports.co.uk.
Maintenance packing list	N/A

Parts:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

NOTE: Use of incorrect spark plugs can result in ignition problems and pre-ignition and consequent engine damage.

Because of the differing thermal load, particular spark plugs have been specified for each engine type. In numerous tests the best possible heat range has been determined to make sure that the spark plug will burn off deposits but will not overheat.

NOTE: Operation with leaded fuels (such as AVGAS 100LL) can result in increased wear of the spark plugs, and the renewal intervals will have to be reduced accordingly.

Refer to the table specifying the correct spark plug per engine type in the Rotax line maintenance manual, reproduced below for convenience.

Table 2.5.7.1: Spark plugs corresponding to engine type

Engine	Part no.	Designation	Size of socket
912 A/F/UL	897255	DCPR 7E	16 mm (0.63 in)
912 S/ULS	297940	DCPR 8E	16 mm (0.63 in)

1. Remove the spark plugs and store them according to cylinder and position.

2. Always replace both spark plugs of a cylinder and do not interchange spark plugs between cylinders.

3. Conduct an inspection on the spark plugs themselves (Refer to section 2.5.6 above).

4. Before every installation, the spark plug thread and the spark plug seat at the cylinder head should be cleaned to remove the residue of heat conduction compound.

WARNING Eye and skin irritation risk from contact. Rinse off with water in the case of contact with eyes or skin. May be harmful if swallowed.

5. Apply a small amount of heat conduction compound (a specific heat sink paste) to the spark plug thread prior to installation.

NOTE: Heat conduction compound at the ground electrode of the head area can lead to ignition problems. Apply heat conduction compound sparingly and do not apply to the first three threads.

Figure 2.5.7.1: Applying heat conduction compound

6. Tighten the spark plug to 20 Nm (177 in.lb) on the cold engine.

Final Inspection:

1. Check all clamps are tight and wire-locking in place to properly secure the filters.

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2.5.8 ENGINE TEST RUN

ENGINE TEST RUN	
Special tooling required	Aircraft anchor point and chains / ballistic chute chords to secure the aircraft.
Level of Maintenance*	Level 2
Reference documents	ROTAX Line Maintenance Manual.
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

WARNING Danger of life threatening injuries from the spinning propeller and rotating parts of the engine, always observe the engine from a safe place while it is running. Check that the cockpit is occupied by a competent operator.

Preparation:

1. Ensure that all the operating fluids (e.g. engine oil, coolant and fuel) are replenished to the specified level.
2. Make sure that no loose objects (e.g. tools) are left in the engine compartment.
3. Inspect the propeller to confirm that it is securely fitted.
4. Anchor the aircraft suitably to the ground and position the wheel chocks. Ensure that the propeller zone is clear and safe before starting the engine.

Test Run:

1. Establish fuel supply.
2. Activate choke.
3. Throttle lever to idle position.
4. Master switch “ON”.
5. Ignition for both ignition circuits “ON”.

6. Press starter switch for max. 10 seconds (followed by a cooling period of 2 minutes).

7. After engine start, observe oil pressure. Oil pressure has to be built up within 10 seconds.

8. Let engine run for approximately 2 minutes at 2000 rpm. Then first use the throttle lever to bring the engine to approximately 2500 rpm and then run through the warming up period until the oil temperature reaches 50°C (122°F)

9. Check temperatures and oil pressure: At a steady oil temperature above 50°C (122°F) and oil pressure above 2 bar (29 psi) engine speed may be increased.

10. Complete ignition check as per the current ROTAX Operators Manual.

11. Conduct a short full throttle run and check that the engine reaches the maximum full power speed. Consult the pilot's operating handbook for maximum speed, as it depends on the propeller used.

12. After a full-load run, conduct a short cooling run to prevent steam locks in the cooling and fuel system after shut-down.

13. Shut engine down.

NOTE: On switching off the engine, switch off ignition and withdraw the ignition key.

14. Inspect rotary seal for leakage.

NOTE: Due to the design of the rotary seal, the manufacturer tolerates a certain amount of leakage. If the leakage is in excess of the limit rotary seal must be renewed.

<u>Tolerated leakage:</u>

For this check the engine must be operated until all temperatures have stabilised for a period of 5 minutes. At that point shut down the engine and ensure the ignition is switched off and the engine is secured against unintentional operation. Coolant must not drip through the leakage bore, located at the base of the ignition housing, for a period of 1 minute after the engine has been stopped. Should leakage occur, the leakage test has been failed and the rotary seal must be renewed.

WARNING There is a risk of severe burns and scalds when the engine is hot. Never open the radiator cap when the cooling system is hot. For safety's sake, cover the cap with a rag and open slowly. Sudden opening of the cap could result in the escape of boiling coolant and result in scalding.

Replenish engine oil and coolant as required once the engine has cooled down.

NOTE: If the oil filter has been replaced, re-tighten by hand after the trial run on a cold engine.

15. Inspect the engine for oil, fuel or coolant leaks and repair as necessary (refer to section 2.5.4).

Inspection Findings:

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2.6 FUEL SYSTEM

2.6.1 REFUELLING

REFUELLING	
Special tooling required	Funnel, refuelling pipe, cleaning rags, jumper cables and section of conductive wire.
Level of Maintenance*	Level 1
Reference documents	ROTAX 912 ULS MANUAL
Maintenance packing list	Not applicable.

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure: No external refuel cap installed

Fuelling from plastic jerry cans:

1. Keep a fire extinguisher that is in good working order in reach at all times during the refuelling process.

WARNING The fire extinguisher must be useable on **Class B** fires to be effective against fuel based fires. Also ensure that the pressure readout is in the green arc and the fire extinguisher has been recently serviced.

2. Position the jerry can on a stable surface, open the lid and insert the conductive length of wire into the fuel for sufficient length that the wire touches the bottom of the jerry can.

3. Clip the wire to the opening of the jerry can with the crocodile clip on one end of the jumper cable.

4. Open the door on the captain's side and access the fuel tank through the cockpit. Clip the other end of the jumper cable on to the top of one of the fuel tank pickups (refer to figure 2.6.1.1).

WARNING Failure to equalize the charge on the fuel in the jerry can and the fuel in the aircraft fuel tank during the refuelling process can lead to static discharge causing a catastrophic fire.

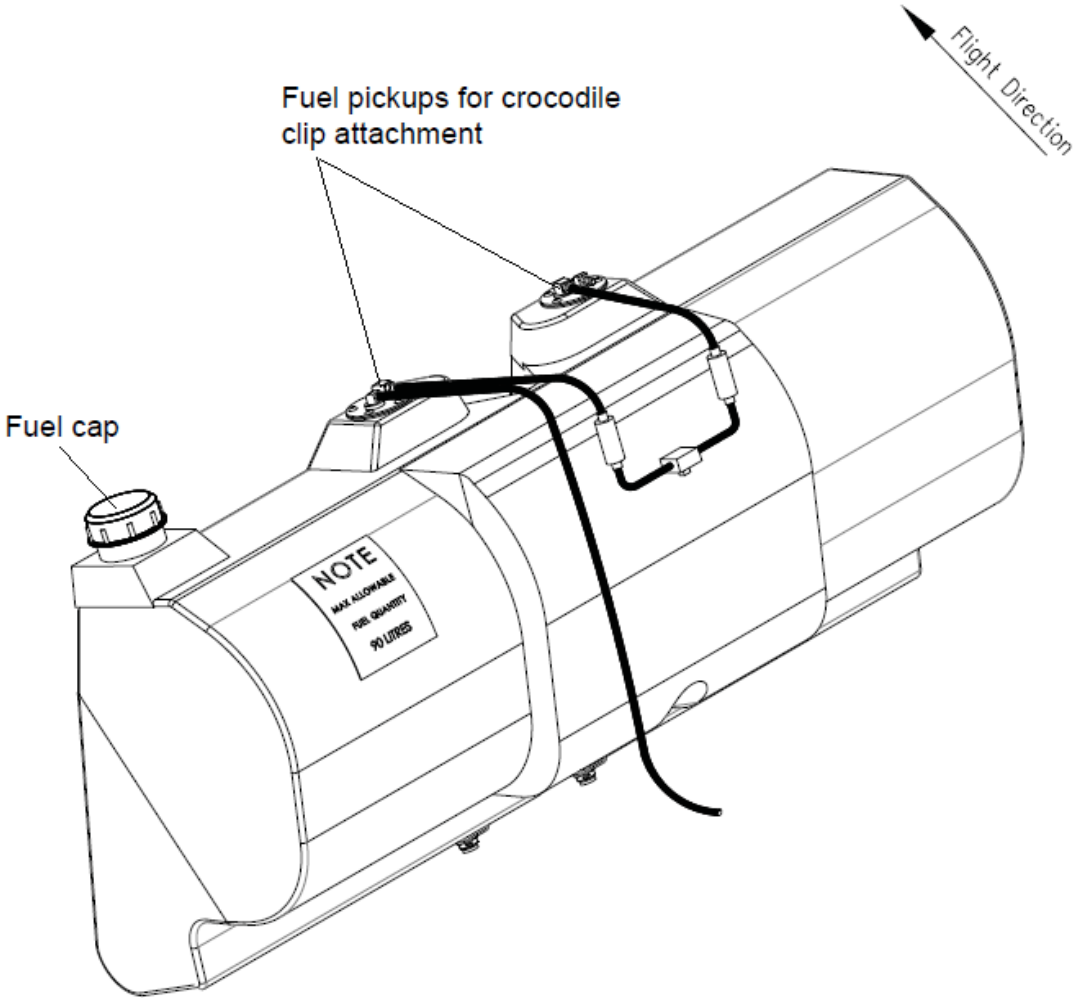

Figure 2.6.1.1: Fuel tank

5. Unzip the baggage area and gain access to the fuel tank refill plug on the captain's side.

6. Open the fuel cap on the fuel tank and insert the free end of the refuelling tube.

7. Insert the valve end of the refuelling tube into the jerry can and start the flow, ensuring that the Jerry can is higher than the fuel tank.

8. Once the required amount of fuel has been dispensed, remove the refuelling tube from the jerry can first and allow the fuel remaining in the tube to drain into the fuel tank prior to removing it from the fuel tank.

CAUTION Avoid spillage of fuel wherever possible. In the event of fuel spillage, clean it thoroughly before flight.

9. Remove all equipment after the correct amount of fuel has been added.

10. Close the refuelling cap.

11. Complete the mass and balance check once fuelling is complete (refer to section 2.1.4).

Fuelling from metal jerry cans:

Accomplish steps 1 to 11 above, except that instead of accomplishing steps 2 and 3, the crocodile clip can simply be attached to the opening of the metal jerry can without the insertion of the wire.

Fuelling from a Fuel Bowser:

1. Keep a fire extinguisher that is in good working order in reach at all times during the refuelling process.

WARNING The fire extinguisher must be useable on **Class B** fires to be effective against fuel based fires. Also ensure that the pressure readout is in the green arc and the fire extinguisher has been recently serviced.

2. Clip the crocodile clip on one end of the jumper cable to the appropriate place on the Fuel Bowser.

3. Open the door on the captain's side and access the fuel tank through the cockpit. Clip the other end of the jumper cable on to the top of one of the fuel tank pickups (refer to figure 2.6.1.1).

WARNING Failure to equalize the charge on the fuel in the Fuel Bowser and the fuel in the aircraft fuel tank during the refuelling process can lead to static discharge causing a catastrophic fire.

4. Unzip the baggage area and gain access to the fuel tank refill plug on the captain's side.

5. Open the fuel cap on the fuel tank and insert the nozzle from the Fuel Bowser.

CAUTION Avoid spillage of fuel wherever possible. In the event of fuel spillage, clean it thoroughly before flight.

6. Remove all equipment after the correct amount of fuel has been added.

7. Close the refuelling cap.

8. Complete the mass and balance check once fuelling is complete.

Procedure: External fuel cap installed

Accomplish the procedures above but instead of unzipping the fuselage sail to access the fuel tank, make use of the fuel cap on the top of the aircraft.

Figure 2.6.1.2: Fuel cap on top of the aircraft close up

Figure 2.6.1.3: External fuel cap position on the aircraft

2.6.2. FUEL FILTER INSPECTION / REPLACEMENT

FUEL FILTER INSPECTION / REPLACEMENT	
Special tooling required	Sharp blade for cutting fuel filter.
Level of Maintenance*	Level 1
Reference documents	BCAM-NT-003-003
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
1	In-line fuel filters	1	2	STD-000314
2	148 x 3.5mm cable tie	3	6	STD-000219

Procedure:

NOTE:

The BushCat makes use of 2 diesel inline fuel filters positioned on the fuel lines leaving the tank. The use of two on separate lines provides redundancy until such a time as the fuel drops below the minimum level in the tank that allows the fuel to move from one side to the other. This is necessary as the filters do not allow fuel to bypass in the event of failure.

1. Each fuel filter is secured primarily with a clamp at the top to the fuel line from the fuel tank and a clamp at the bottom to the fuel line going to the fuel pump. Additionally tie wraps are used to secure additional lines to the filter. Loosen the clamps and cut any tie wraps to remove the fuel filters.

Figure 2.6.2.1: Fuel filter position on aircraft fuel tank

2. The fuel filter is made of semi-opaque plastic, and a visual inspection can be conducted to ascertain the level of contamination in the filter.

3. Cut the fuel filter outer casing with a blade and pull the mesh filter free. Tip the contents of outer casing out and inspect for rust, dirt etc.

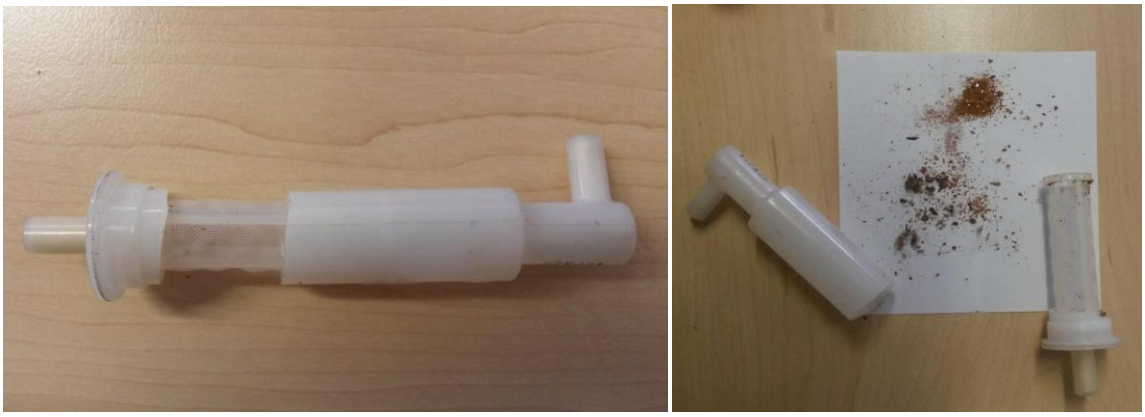

Figure 2.6.2.2: Fuel filter inspection

CAUTION Use a fuel testing kit to test fuel before every flight. In the event of excessive contamination, increase the fuel filter replacement interval to 50 hours instead of 100 hours.

4. Replace both fuel filters, ensuring that the clamps are tightened and all tie wraps are replaced.

Inspection Findings:

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2.6.3. CARBURETTOR SYNCHRONIZATION

CARBURETTOR SYNCHRONIZATION	
Special tooling required	Feeler gauge set, vacuum gauges or flow meter, sections of flexible rubber hose to attach to the vacuum gauges, applicable clamps, cable / chain for engine ground runs and suitable anchor point for attachment during ground runs.
Level of Maintenance*	Level 3
Reference documents	BCQH-NT-004, MML Line Maintenance Manual ROTAX 912 Series, Ch. 12-20-00; Rotax 912 servicing pdf from www.conairsports.co.uk
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

On a new installation, carburettor synchronization needs to be carried out in two stages: mechanical synchronization and pneumatic synchronization. If the balancing is being carried out as a part of route maintenance; mechanical synchronization can be skipped but pneumatic synchronization is essential.

Correct carburettor synchronization will result in a smoother running engine and correct mixture distribution.

Procedure:

2.6.3.1 INSPECTION FOR CARBURETTOR IMBALANCE INDICATORS

1. Inspect the spark plugs as an indicator for carburetor balance. A single black spark plug on one side accompanied by a lean looking spark plug on the opposite corner of the engine often indicates poor carb balance.

2. Poorly balanced carburetors result in uneven torque pulses, which should be evident in a “rough running” engine and engine vibration, particularly at lower throttle settings. Check for any mention of the above in the aircraft snag list.

2.6.3.2 MECHANICAL SYNCHRONIZATION

This is really only necessary if you are installing a new engine or replacing the throttle cables. All steps in mechanical synchronizing are to be carried out without running the engine.

For synchronous basic throttle adjustment proceed as follows for both carburettors:

1. Remove the cable fixation on the throttle lever.

2. Return the throttle lever to its idle stop position by hand. There should be no resistance during this procedure.

3. Unscrew the idle speed adjustment screw until it is free of the stop.

4. Insert a 0.1mm (0.004”) feeler gauge between the idle speed adjustment screw and the carburettor idle stop, and then gently turn the idle screw clockwise until contact is made with the 0.1mm (0.004”) feeler gauge.

5. Pull out the feeler gauge and then turn each idle speed adjustment screw 1.5 turns counter clockwise.

6. Gently turn each idle mixture screw clockwise until it is fully inserted and then reopen by 1.5 turns counter clockwise.

7. Check that the throttle valve opens fully automatically.

8. Adjust the 2 Bowden cables for simultaneous opening of the throttle valves.

At this point you must place the throttle lever in the cockpit to the idle stop position. It is advantageous at this point to enlist the help of an assistant to ensure that the throttle lever remains in this position during the next steps of the synchronization process.

9. As soon as the throttle lever in the cockpit remains in the idle stop position, check the throttle valve is at the carburettor idle stop position.

10. Using the cable fixation, secure the Bowden cable accordingly.

11. As soon as the two carburettor Bowden cables are installed (throttle lever in cockpit in idel position), check that the idle speed adjustment screw rests fully on the idle stop without pressure.

12. Start the engine and verify the idle speed. If the idle speed is too high or too low, adjust the idle speed adjustment screw accordingly.

NOTE: An idle speed which is too low can result in gearbox wear, and an idle speed which is too high can make the engine harder to start.

13. Check the true running of the engine. If necessary, adjust with the idle mixture screw (refer to section 2.6.5)

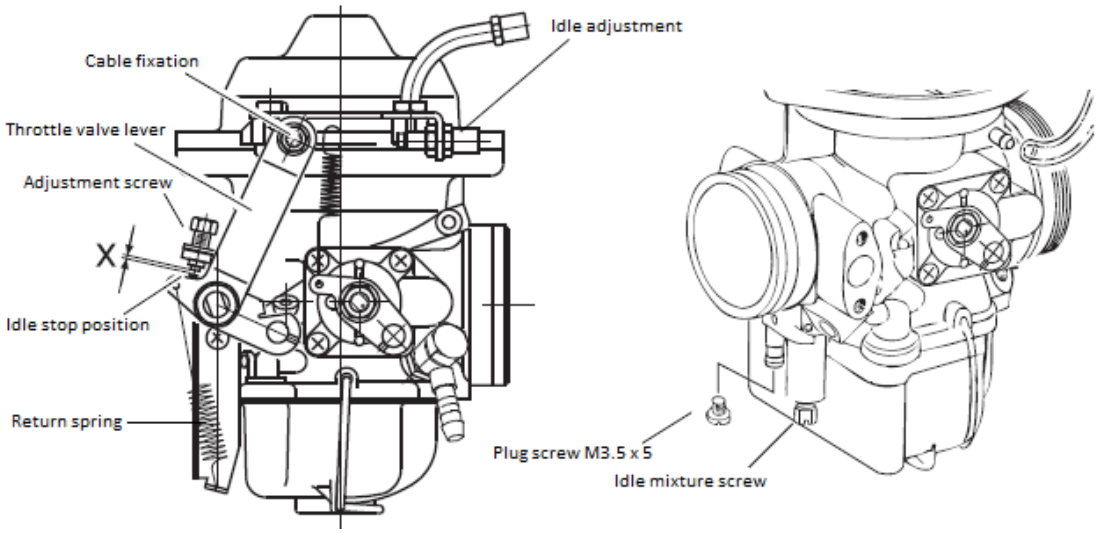

Figure 2.6.3.2.1: Mechanical Carburettor Synchronization

2.6.3.3 PNEUMATIC SYNCHRONIZATION

1. Secure the aircraft for engine ground run testing with the use of a suitable anchoring point and length of chain / strap of sufficient strength (refer to section 2.5.8).

2. Warm the engine to normal operating conditions using standard procedures (refer to the Quick Reference Handbook for engine start procedures).

3. Accomplish the chosen setup for the inclusion of the vacuum gauges in the system for testing as per the below, ensuring that the routing of the throttle cables has not been altered as extra bends or kinks could affect the balance.

4. Start the engine and run it until warm. It may run roughly during the balancing process especially as the automatic compensation provided by the compensation tube has been removed.

5. Open the throttle to give approximately 2200rpm.

6. Check the readings on the gauges.

NOTE: The carburettor that has the widest open throttle will produce a smaller vacuum level readout.

7. Adjust the cable adjusters until the indication on both gauges is the same.

8. Close the throttle and ensure that the idle speed is as required (normally 1500rpm). If it is not, the cable length will need to be adjusted to achieve the correct idle speed and balance.

9. Stop the engine, remove the gauges and refit the compensation tube, clamp and carburettor support spring as required.

10. Start the engine and check the idle rpm. If any adjustment is required, stop the engine and alter the cable adjusters evenly.

11. Once the idle rpm is satisfactory, turn the engine off and close the throttle fully. The throttle control should come up against the throttle hard stop in the cockpit. Check the gap between the throttle stop screw on the carburettor and the throttle valve lever stop with reference to section 2.6.3.2 above using a feeler gauge.

There are several set up options for the inclusion of the vacuum gauges in the loop for testing purposes:

<u>Setup option 1:</u>

1. Remove the compensating tube from the push on angular tube after removing the two clamps.

2. Using the push on angular tube and compensating tube, install a flexible rubber hose leading to the vacuum gauge.

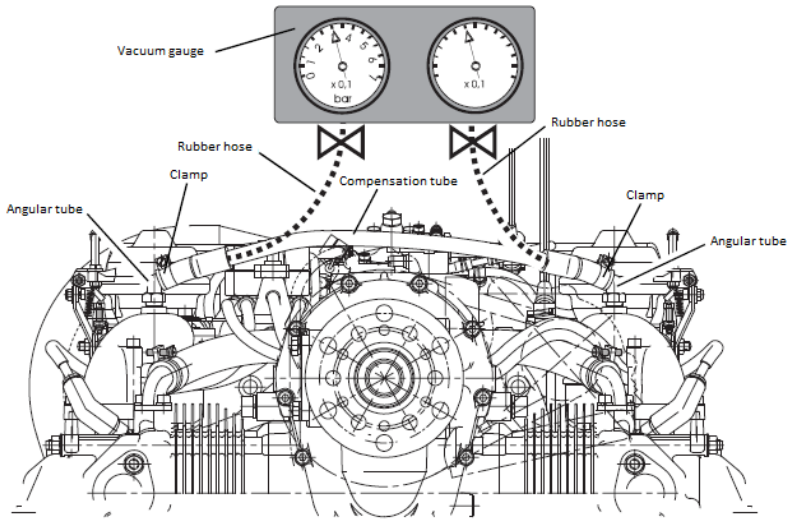

Figure 2.6.3.2: Setup for pneumatic synchronization option 1

<u>Setup option 2:</u>

1. Remove one end of the compensating tube and tube from the push on angular tube after removing the 2 tension clamps.

2. Using the push on angular tube and compensating tube, install a flexible rubber hose leasing to the vacuum hose.

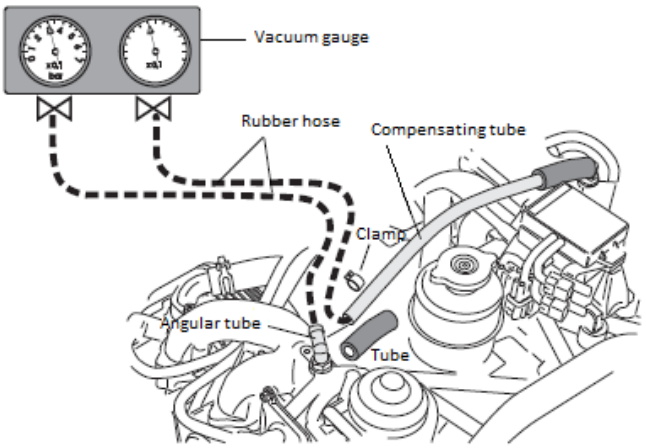

Figure 2.6.3.3: Setup for pneumatic synchronization option 2

Setup option 3:

1. Remove the M6 x 6 from the intake manifold and connect the vacuum gauge.

2. Remove the compensation hose with the attached resonator hose (connection between intake manifolds) and plug the fittings in the intake manifolds.

3. After synchronization, tighten the M6 x 6 screw with LOCTITE 221.

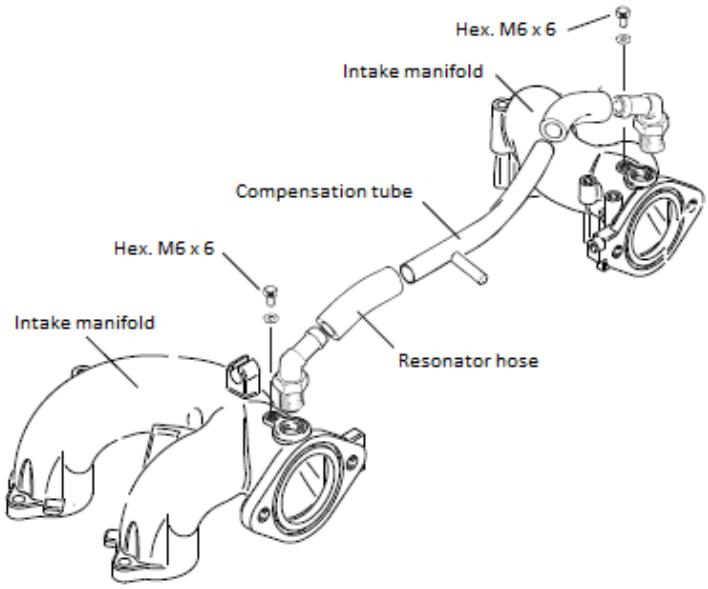

Figure 2.6.3.4: Setup for pneumatic synchronization option 3

Setup option 4:

1. Install the vacuum gauge

2. Clamp the tube with hose

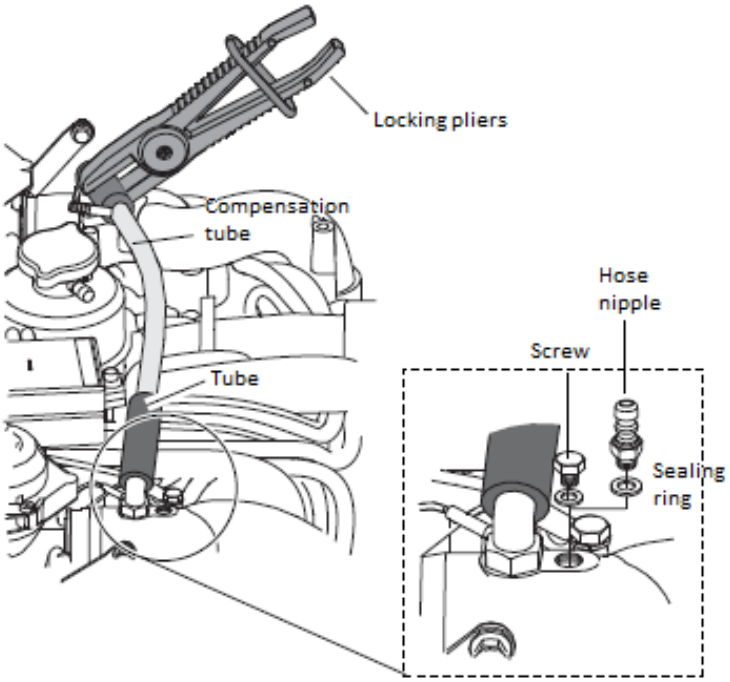

Figure 2.6.3.5: Setup for pneumatic synchronization option 4

Figure 2.6.3.6: Pneumatic carburettor balancers

Final Inspection:

1. Conduct a final engine test run to check:
    a. The synchronization at idle speed. To accomplish this, detach the resonator hose of the compensating tube to separate the two air intake systems. In this condition, a slight difference in the engine running should be noticeable.

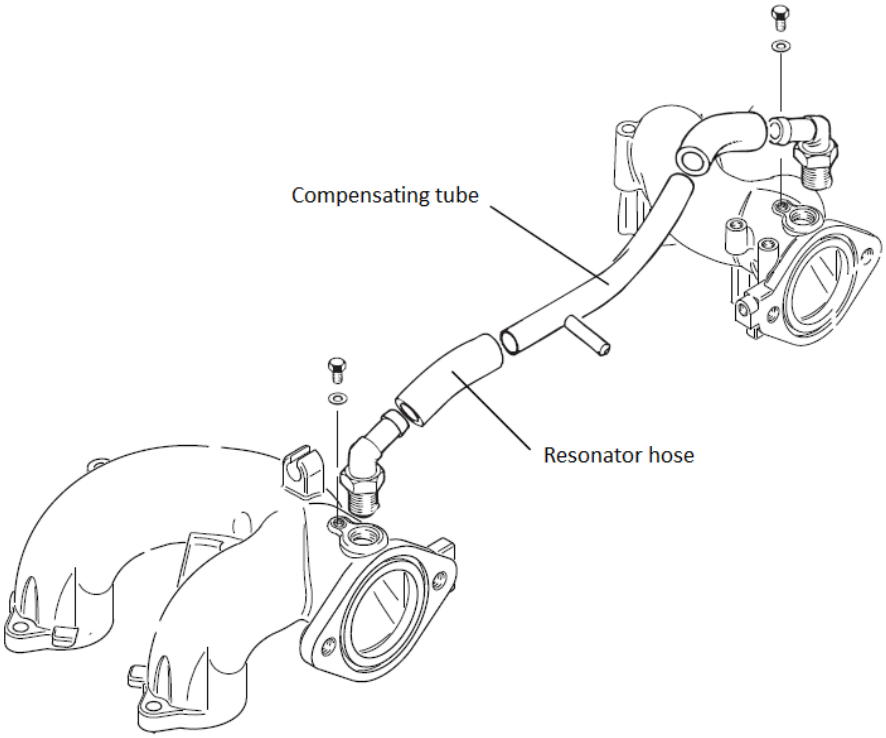

Figure 2.6.3.6: Synchronization check at idle speed

    b. That the carburettors are not flooding.

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2.6.4. INSPECTION AND SERVICING OF THE CARBURETTOR FLOAT CHAMBER

INSPECTION AND SERVICING OF THE CARBURETTOR FLOAT CHAMBER	
Special tooling required	Sensitive scale.
Level of Maintenance*	Level 3
Reference documents	BCQH-NT-004, MML Line Maintenance Manual ROTAX 912 Series, Ch. 12-20-00; Rotax 912 servicing pdf from www.conairsports.co.uk
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

1. Remove the drip tray.
2. Open the spring clip
3. Remove the float chamber with gasket and both floats.
4. Remove both floats from the float chamber.
5. Check the weight of the floater:
   a. Let the floats dry for 1-2 minutes.
   b. Check the weight of all affected floats using a calibrated balance. The maximum measuring tolerance of the balance is 0.1 grams.
   c. The results of the measurement must be documented in the maintenance records. The maximum allowable weight of both floats together is 7 grams.

NOTE: This check is only applicable to floats that were in contact with fuel, it is not applicable to new spare parts which have not yet had contact with fuel.

6. Replace all floats that exceed the maximum weight.
7. Inspect the float chamber for contamination and corrosion.

NOTE: If any contamination is found in the float chamber, ascertain the reason for the contamination, take action to remedy the problem and clean the complete fuel system including the carburettor. Water can enter the float chamber as a consequence of icing or fuel contamination.

8. Reassemble and reinstall the float chamber in reverse to the disassembly procedure. When reinstalling, check that the gasket is still in good condition, and replace it if it is not.

9. Accomplish the idle speed adjustment as per section 2.6.5.

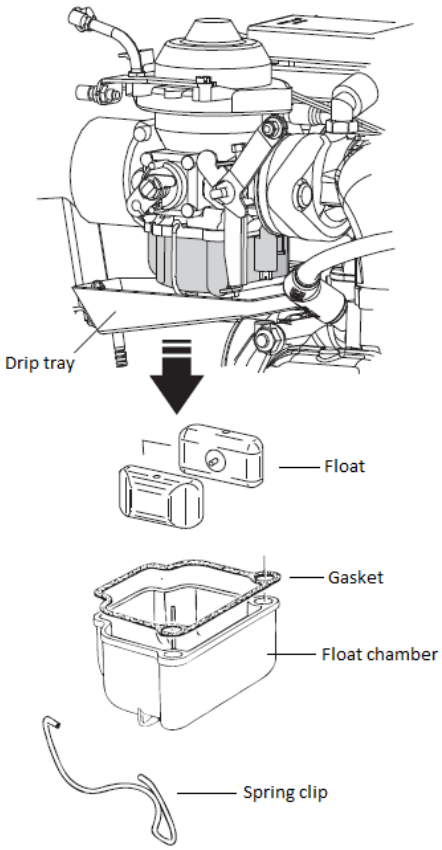

Figure 2.6.4.1: Carburettor float disassembly schematic

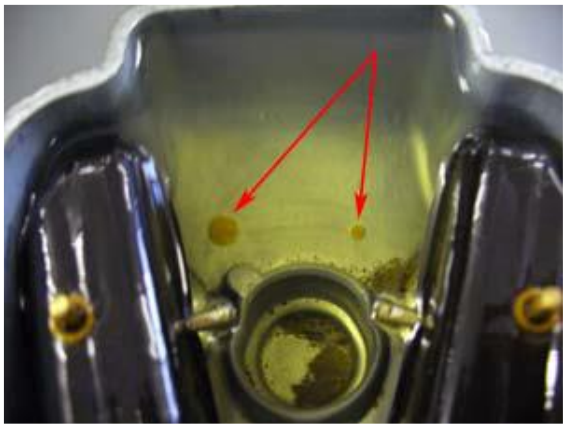

Figure 2.6.4.2: Water evident in the float bowl

10. After all major work on the engine, perform an engine test run prior to the next flight (refer to section 2.5.8).

Inspection Findings:

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2.6.5 IDLE SPEED ADJUSTMENT

IDLE SPEED ADJUSTMENT	
Special tooling required	Nil.
Level of Maintenance*	Level 3
Reference documents	BCQH-NT-004, MML Line Maintenance Manual ROTAX 912 Series, Ch. 12-20-00; Rotax 912 servicing pdf from www.conairsports.co.uk
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

NOTE: Always carry out idle speed adjustment when the engine is warm.

Basic adjustment of the idle speed is first effected using the idle speed adjustment screw of the throttle valve (refer to section 2.6.3.2, figure 2.6.3.2.1).

1. Close the idle mixture screw by turning it clockwise to screw in fully, and then open it again by 1.5 turns counter clockwise.

2. Starting from this basic adjustment, the idle mixture screw is turned until the highest idle speed is reached.

3. The optimum setting is the middle between the two positions at which an rpm drop is noticed.

4. Readjustment of the idle speed is carried out using the idle speed adjustment screw and, if necessary, by slightly turning the idle mixture screw again.

NOTE: Turning the idle mixture control screw in the clockwise direction results in a leaner mixture and conversely turning it counter clockwise results in a richer mixture.

Final Inspection:

1. After all major work on the engine, perform an engine test run prior to the next flight (refer to section 2.5.8).

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2.6.6 CHECKING THE CARBURETTOR ACTUATION

CHECKING THE CARBURETTOR ACTUATION	
Special tooling required	Nil.
Level of Maintenance*	Level 3
Reference documents	BCQH-NT-004, MML Line Maintenance Manual ROTAX 912 Series, Ch. 12-20-00; Rotax 912 servicing pdf from www.conairsports.co.uk
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

CAUTION Bowden cables need to be routed in such a way that carburettor actuation will not be influenced by any movement of engine or airframe, which can potentially falsify idle speed settings and synchronization.

WARNING With the carburettor actuation not connected, the throttle valve is fully open (i.e. the initial position of the CD carburettor is full throttle). Never start the engine with the actuation disconnected.

To test the carburettor actuation, accomplish the following:

1. Inspect the Bowden cables and levers for free movement. The Bowden cable must allow full travel of lever from stop to stop.
2. Adjust the throttle cables to a clearance of 1mm (0.04 in) if this has not been accomplished in a previous step.
3. Inspect and lubricate linkage on carburettor and the carburettor joints with engine oil.
4. Inspect the return springs and inspect the engagement holes for wear.

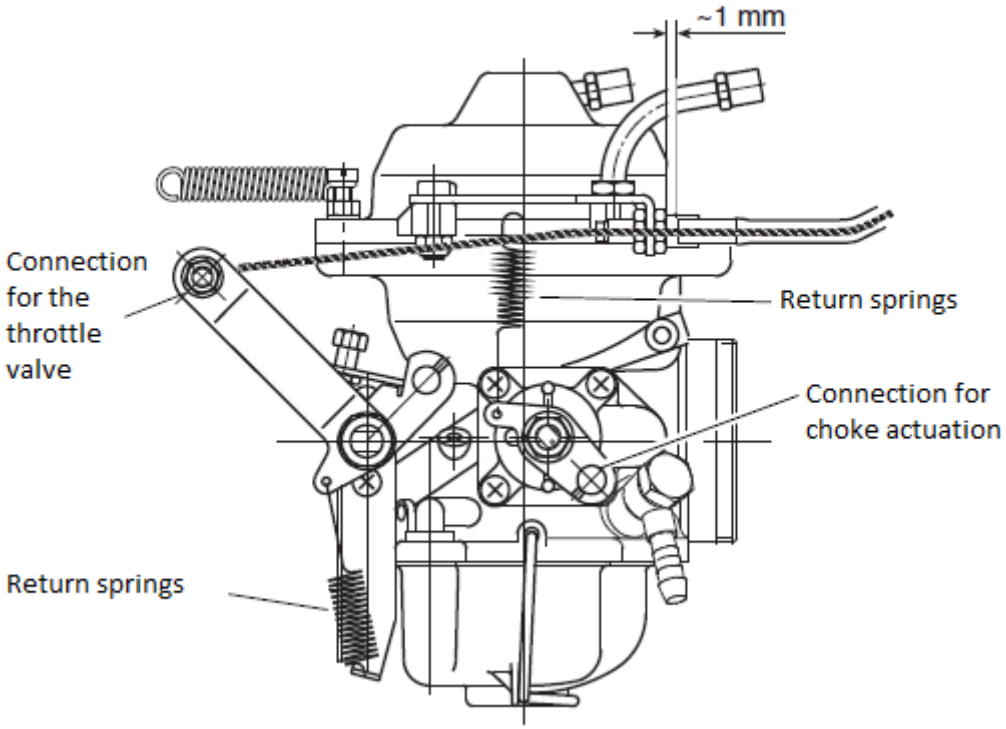

Figure 2.6.6.1: Checking the carburettor actuation

Inspection Findings:

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2.7 OIL / LUBRICATION SYSTEM

2.7.1. CHECKING THE OIL LEVEL

CHECKING THE OIL LEVEL	
Special tooling required	Rags.
Level of Maintenance*	Level 1
Reference documents	BCQH-NT-004, MML Line Maintenance Manual ROTAX 912 Series, Ch. 12-20-00; Rotax 912 servicing pdf from www.conairsports.co.uk
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

CAUTION Under certain conditions it is possible for oil to remain in the crankcase of the engine, giving a false indication on the oil dipstick. To get an accurate indication, it is necessary to return the oil back to the tank.

1. Remove the cowling.
2. Remove the cap from the oil tank.
3. Rotate the engine until you hear a gurgling noise, wait and few seconds and repeat. This ensures that all the oil in the system is in the oil tank, so that you achieve an accurate reading.
4. Remove the dipstick and determine the level of the oil.
5. As per Rotax recommendations, the ideal oil level is between the middle and upper mark on the dipstick. Check the oil level with the dipstick.
6. Top up the oil as required.
7. Confirm the new oil level.
8. Replace the dipstick and secure the cap.

9. Replace the cowling.

Figure 2.7.1.1: Removing the cap from the oil tank

Figure 2.7.1.2: Removing the dipstick

Figure 2.7.1.3: Opening for pouring the oil in

2.7.2. OIL FILTER INSPECTION

OIL FILTER INSPECTION	
Special tooling required	Rotax oil filter cutting tool (PN 877670), tissue paper, sharp knife, small container to catch old oil and a magnet.
Level of Maintenance*	Level 2
Reference documents	BCQH-NT-004, MML Line Maintenance Manual ROTAX 912 Series, Ch. 12-20-00; Rotax 912 servicing pdf from www.conairsports.co.uk
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

The inspection of the oil filter is important as it allows conclusions to be drawn regarding the internal condition of the engine and provides information about the possible cause of any damage.

1. Cut the oil filter open using the special tool, taking care not to produce chips.
2. Remove the anti-drain membrane.
3. Cut the top and bottom edges off the mat with a knife.
4. Remove the filter mat, fold it up and press the remaining oil out. It can be cut into manageable lengths for inspection and placed “outside up” onto tissue paper to draw the remaining oil out.

NOTE: Oil flows through the filter from the outside to the inside of the mat, so all the contamination will be evident on the outside of the mat.

5. After about half an hour on the tissue paper, inspect the sections for metal chips, foreign matter, contamination and abrasion.
6. Pass over the mat with a clean magnet and inspect it for metal.
7. Inspect the filter housing at the contact surfaces for increased wear.
8. Check both springs of the oil filter for increased wear.

9. Check the anti-drain membrane for damage in the area of filter contact.

Possible findings include steel chips, bronze chips, aluminium chips, slivers of bearing material, remains of sealing compound, plastic from the thrust washer, carbon fibre or slivers of copper.

If an increased amount of metal particles are found, particularly brass/bronze chips or slivers of bearing abrasion, the engine needs to be repaired or overhauled by a suitable facility for continued airworthiness.

If the filter mat is clogged by foreign matter, the oil reaches the bearing points unfiltered via the bypass valve in the oil filter.

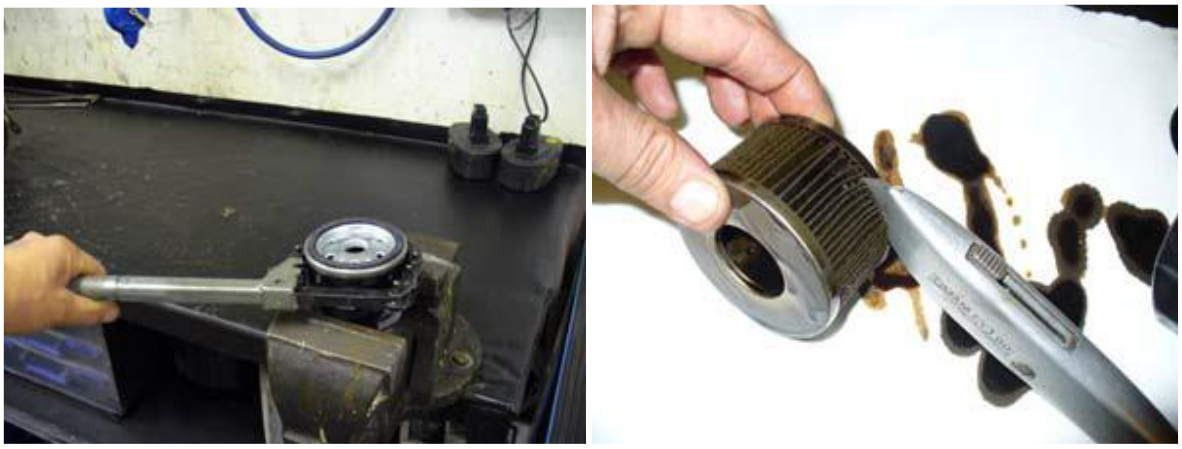

Figure 2.7.2.3: (a) Cutting open the filter and (b) Removing the filter paper

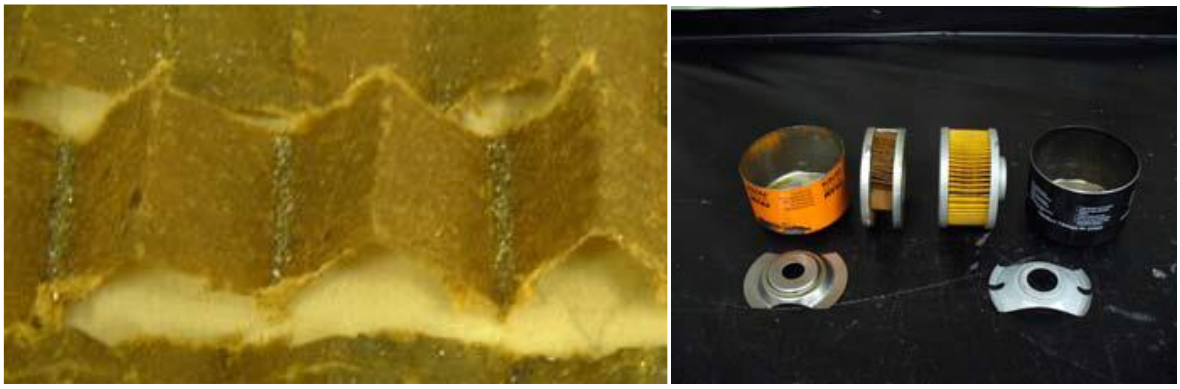

Figure 2.7.2.4: (a) Contaminated filter paper and (b) Copy filter (left) and genuine Rotax filter (right)

CAUTION It is very important that a genuine Rotax oil filter is used. The quality of the filtering media, the filtering area, the bypass valve pressure, the canister burst pressure and the correct thread have all been determined by Rotax to suite the engine.

<u>In the case of unclear findings:</u>

1. Flush the oil circuit as per section 2.7.4.
2. Fit a new oil filter as per section 2.7.3.
3. Conduct an engine test run in accordance with section 2.5.8.
4. Repeat the oil filter inspection.

Inspection Findings:

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2.7.3. OIL FILTER CHANGE

OIL FILTER CHANGE	
Special tooling required	Oil filter wrench (PN 877670), clean cloth and engine oil.
Level of Maintenance*	Level 2
Reference documents	BCQH-NT-004, MML Line Maintenance Manual ROTAX 912 Series, Ch. 12-20-00; Rotax 912 servicing pdf from www.conairsports.co.uk
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
1	ROTAX Oil filter	1	1	STD-000313

Procedure:

1. Remove the used oil filter with an oil filter wrench.
2. Clean the contact surface of the oil pump housing with a clean cloth.
3. Apply a thin film of engine oil on the gasket of the new oil filter.
4. Install the new oil filter on the engine, screwing on the oil filter until the gasket is seated solidly.
5. Tighten the oil filter with a ¾ turn (270°). Sign the 270° mark on the oil pump housing so that the tightening of the oil filter can be controlled.
6. Inspect the used oil filter in accordance with section 2.7.2.

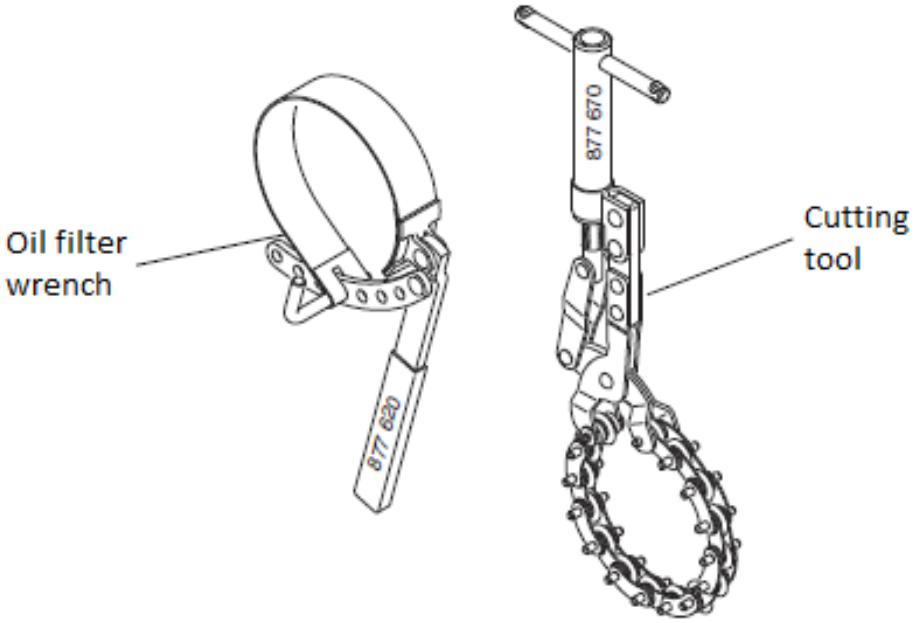

Figure 2.7.2.1: Oil filter wrench and cutting tool

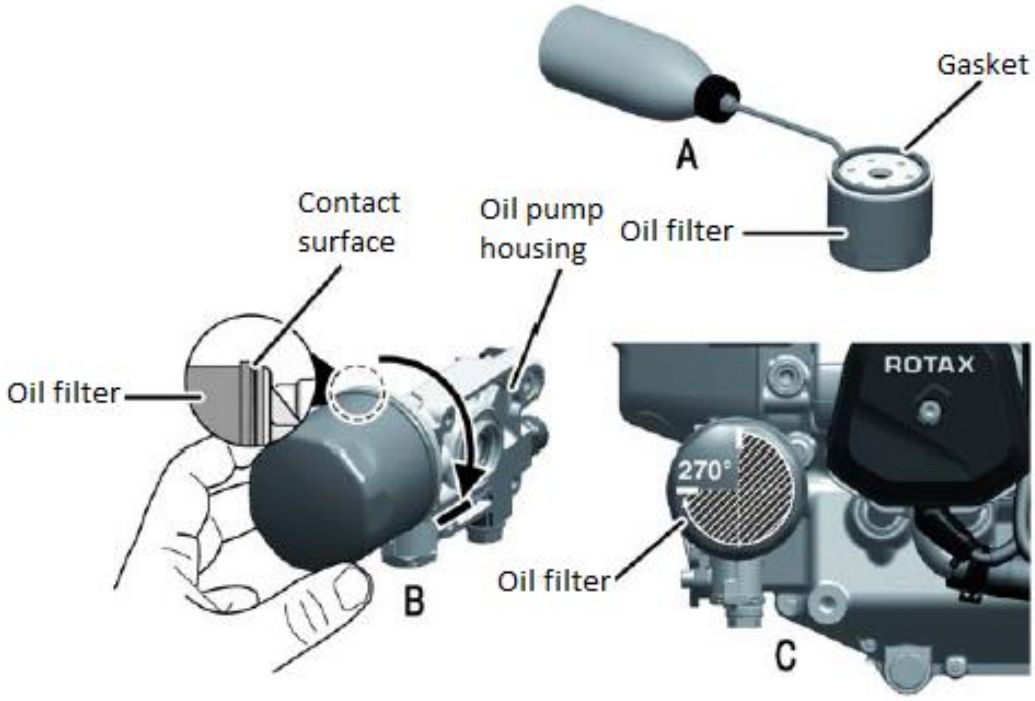

Figure 2.7.2.2: Oil filter installation

Final Inspection:

1. Confirm the oil filter has been tightened in accordance with the above.

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2.7.4. OIL CHANGE

OIL CHANGE	
Special tooling required	Oil filter wrench (PN 877670), clean cloth and engine oil.
Level of Maintenance*	Level 2
Reference documents	BCQH-NT-004, MML Line Maintenance Manual ROTAX 912 Series, Ch. 12-20-00; Rotax 912 servicing pdf from www.conairsports.co.uk
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

NOTE: Run the engine to warm the oil before beginning the oil change procedure. Do allow the surfaces to cool sufficiently to handle prior to beginning though.

1. Crank the engine by hand to transfer the oil from the crank case (refer to section 2.7.1).
2. Remove the locking wire and oil drain screw from the oil tank, drain the used oil and dispose of it as per environmental regulations.
3. Replace the oil filter at each oil change and inspect the filter components.
4. After inspection, dispose of the oil filter components in accordance with environmental regulations.
5. Install the oil drain screw with a new gasket and tighten it to torque 25 Nm (18 ft. lb) and lock it with locking wire.
6. Install a new oil filter.
7. Pour in approximately 3 litres (0.8 U.S. Gallons) of fresh oil.
8. After carrying out the oil change, the engine should be cranked by hand in the direction of engine rotation for approximately 20 turns to completely refill the entire oil circuit.

NOTE:

- The engine must not be cranked when the oil system is open.
- Compressed air must not be used to blow through the oil system (i.e. any of the oil lines, oil pump housing or bores in the housing.

Final Inspection:

1. Perform an engine test run as per section 2.5.8 and check for leaks accordingly.

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2.8. LIQUID COOLING SYSTEM

2.8.1. REPLACING THE COOLANT

REPLACING THE COOLANT	
Special tooling required	
Level of Maintenance*	Level 1
Reference documents	BCQH-NT-004, MML Line Maintenance Manual ROTAX 912 Series, Ch. 12-20-00; Rotax 912 servicing pdf from www.conairsports.co.uk, BCAM-NT-003-003, BCPH-NT-012-000
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

1. Open the radiator cap on the expansion tank.
2. Remove the bottom attachment screw with the sealing ring of the water pump.
3. Drain the engine coolant.
4. Fit the stainless steel attachment screw along with a new sealing ring and tighten it to 10Nm (90 in.lb.).
5. Flush the system by opening the lowest located coolant hose and using pure water at a pressure of 2 bar (29 psi).

NOTE: Where water free coolant is used, the cooling system must be drained of water after flushing and the residual water must not exceed the maximum permissible limit prescribed by the coolant manufacturer. With Evans NPG+, the cooling system needs to be flushed with their special preparation fluid before re-filling, as Evans cannot be mixed with water (the maximum permissible water content for Evans is 3.6%)

6. Refill newly mixed coolant into the expansion tank which is the highest point of the cooling system. The system can either be filled with ethylene glycol mixed at a ratio of 50:50 with distilled water or Evans EPG+ with no water.

7. Fit the radiator cap.

Figure 2.8.1.1: Water drain screw on the water pump

Final Inspection:

1. Run the engine for a minute and replenish with clean coolant as required.

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2.9. PROPELLER

2.9.1. ADJUSTMENT OF THE PROPELLER PITCH ANGLE

INSTALLATION OF THE PROPELLER & ADJUSTMENT OF THE PROPELLOR PITCH ANGLE	
Special tooling required	Kiev Prop blade setting tool and masking tape or bubble inclinometer and bubble inclinometer jig.
Level of Maintenance*	Level 2
Reference documents	BCAM-NT-003-003
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

NOTE: The nominal pitch setting for the propellers is 15° measured at 75% of the blade radius. This should result in a static RPM of 5200, the maximum allowable by Rotax for the 912 UL/ULS engine.

Method 1: on the bench using the Kiev pitch setting tool

NOTE: The use of the Kiev Prop blade pitch setting tool to set the blade inclination is best achieved with the propeller assembled on a workbench.

1. Loosen the nuts in the adapter (if they are not already loose in the process of installation) so that the blades can easily rotate but can't fall out.

2. Fit the Kiev Prop blade setting tool to the centre of the hub and fit the other side to the propeller blade. It is advisable to use masking tape to protect the propeller from being scratched by the tool.

3. Adjust the blade pitch to the required setting.

4. Tighten the nuts on the hub to either side of the adjusted blade.

5. Repeat this for all 3 blades.

6. Complete the installation of the propeller on the aircraft (refer to BCAM-NT-003-003, section 110).

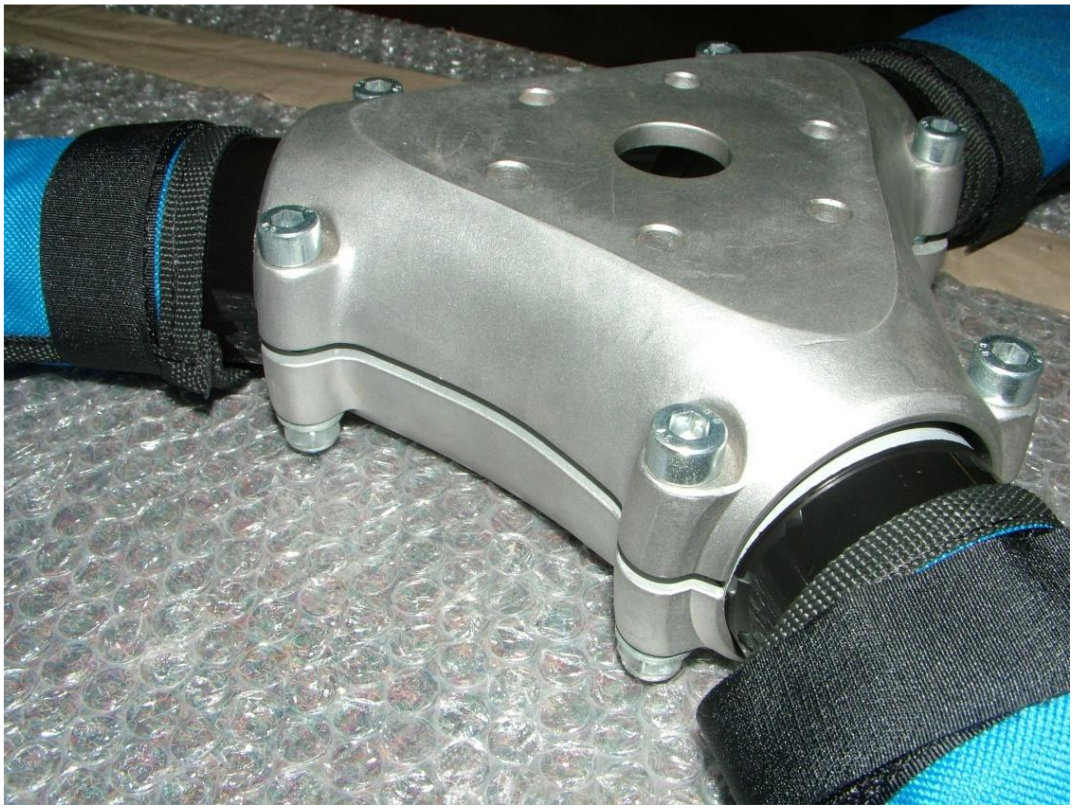

Figure 2.9.1.1: Propeller and adapter on the workbench

Figure 2.9.1.2: Kiev pitch setting tool

Method 2: on the aircraft using the Bubble inclinometer and jig

NOTE: This method can be accomplished with the propeller on the aircraft.

1. Remove the spinner from the aircraft.

2. Loosen the nuts to either side of each propeller blade sufficiently that the blade rotates freely but not sufficiently that it falls out.

3. Fit the blade inclinometer at its correct distance from the blade tip on a horizontal blade positioned to the left of the aircraft.

4. Adjust the blade pitch to the correct setting.

5. Tighten the nuts on the hub to either side of the adjusted blade.

6. Repeat this for all the blades, moving each until it is horizontal on the left hand side of the aircraft.

7. Tighten and torque the nuts and replace the spinner on the aircraft (refer to BCAM-NT-003-003, section 110).

Figure 2.9.1.3: Fitting the inclinometer to the blades

Final Inspection:

1. Perform a final check of the propeller blade angle for each of the 3 blades:
    a. Blade 1: _____ º
    b. Blade 2: _____ º
    c. Blade 3: _____ º
2. Perform a final check of fastener security and a final tool inventory.
3. Perform an engine test run as per section 2.5.8 prior to the next flight.

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2.9.2. BLADE MINOR REPAIR

BLADE INSPECION AND REPAIR	
Special tooling required	2 part epoxy filler / adhesive, sandpaper and automotive 2 part acrylic paint.
Level of Maintenance*	Level 2
Reference documents	BCAM-NT-003-003, http://kievprop.com/.
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

- The propeller is guaranteed against defects for 12 months from delivery date irrespective of the number of hours used.

NOTE:

- The blades have a nominal life of 6 years, with no limit to the number of hours flown, though if the prop has less than 600 hours and the blades are free of any significant damage, it is acceptable to extend the use by 1 year or 750 hours, whichever occurs first.
- The hub has a life of 15 years, with no limit to the numbers of hours flown. After this it must be replaced.

1. The propeller blades should be inspected as part of the pre-flight check of every flight.
2. Small stone chips on the leading edge (up to 1.5mm in depth) can be repaired with 2 part epoxy filler of adhesive.
3. As little filler as possible needs to be added so that the blade weight and balance is not affected.
4. Over time, particularly if the aircraft is operated from gravel strips and/or the prop has a small ground clearance, the backs of the blades can show light pitting.
5. Provided the weight and balance of the prop is not affected, it is acceptable to lightly sand the back of the propeller and repaint it with automotive 2-part acrylic paint.

Final Inspection:

1. Perform an engine test run in accordance with section 2.5.8 and check for any usual vibration after repairs to the propeller.

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2.10. INSTRUMENTS AND AVIONICS

Due to the variance of instrument panels used on the BushCat, the operator is referred to the maintenance manuals for the specific equipment installed in the aircraft.

2.10.1. ASI INSTRUMENT ERROR DETERMINATION

ASI INSTRUMENT ERROR DETERMINATION	
Special tooling required	Calibrated differential manometer, 5ml syringe, rubber / silicone tubing of roughly 4mm internal diameter, T-piece connector, cable ties and a second person to help.
Level of Maintenance*	Level 1
Reference documents	BCTG-NT-001-000 (available on the website http://www.fly-skyreach.com/tgm/)
Maintenance packing list	Nil

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

1. Connect one end of the differential manometer to the T-piece connector using a length of rubber tubing.
2. Secure a syringe to a free leg of the T-piece connector with another length of rubber tube.
3. Zero the reading on the manometer. If there is no zeroing function, note the zero-IAS pressure reading as an entry in Column 1 of the referenced spreadsheet for an IAS of zero.
4. Ensure that the plunger of the syringe is inserted and on its lower stop.
5. Carefully attach the last end of the T-piece to the Pitot tube itself with a third length of rubber tubing.
6. Have one person sit in the pilot's seat and view the ASI.

7. Have the second person incrementally apply pressure to the syringe until the needle on the ASI reads the closest round value (usually about 20 to 25 mph for analogue instruments).

8. Release the pressure on the syringe and allow the pressure to stabilize prior to recording the reading on the differential manometer in column 2 of the **ASI Instrument Calibration Sheet** provided in section 2.10.2. The friction on the plunger should be sufficient that it can be released without moving.

NOTE: Leaks will be evident by a steadily decreasing pressure value on the differential manometer. If the leak rate exceeds between 5 and 10 Pascals per second, it is likely that the Pitot line itself has a leak and will have to be changed.

CAUTION If the desired airspeed value on the ASI is overshot, the pressure on the system must be reduced to about 5mph below the intended value before pressure is reapplied to obtain the correct value.

9. Continue increasing the pressure incrementally and taking the readings in 5 mph increments up to at least 90 mph.

10. Once the highest speed has been obtained, incrementally reduce pressure and retake the readings at the same intervals that the readings were first taken at and record them in column 3, from bottom to top.

CAUTION If the desired airspeed value on the ASI is overshot while reducing the pressure, increase the pressure to approximately 5 mph above the intended value before reducing the pressure slowly again to obtain the correct value.

11. Once the applied pressure has been reduced to zero and the plunger of the syringe has been completely removed from the cylinder, note the zero reading again on the manometer again in the zero IAS row.

Figure 2.10.1.1: Arrangement of instrument calibration system

2.10.2. GENERATING THE IAS-CAS RELATIONSHIP

GENERATING THE IAS-CAS RELATIONSHIP	
Special tooling required	Pocket calculator (or downloaded spreadsheet)
Level of Maintenance*	Level 1
Reference documents	BCTG-NT-001-000 (available on the website http://www.fly-skyreach.com/tgm/)
Maintenance packing list	Nil

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

Columns 4 and 5:

1. Convert each measured pressure to the CAS that it corresponds to (denoted as V_{qc}) using the formula below.

2. If there was a zero IAS pressure reading during the calibration, subtract this from the measured pressure.

NOTE:

- If the difference between V_{qc} for the upscale and downscale values is less than 1mph, average the two values for each IAS and use those averages for the remainder of the calculations (rather than continuing the calculations for both upscale and downscale columns).

- Pressure values must be in Pascals for this formula to apply.

$$V_{qc} = 2.8583\sqrt{(Measured\ Pressure - Zero\ IAS\ pressure)}\ in\ mph$$

Columns 6 and 7:

3. Calculate the instrument error (E_{ins}) for each measured pressure:

$$E_{ins} = IAS - V_{qc}$$

Columns 8 to 11:

4. In-flight calibrations have been conducted to estimate the position error present for a factory-built aircraft. Equations to calculate the position error for both descent and level flight are given below.

NOTE: These equations are only applicable for values of V_{qc} between 50mph and 75mph, but serve as good estimates at speeds below 50mph.

$$\boldsymbol{Descent}: E_{pos} = 0.3189 \times V_{qc} - 17.805$$

$$\boldsymbol{Level}: E_{pos} = 0.3182 \times V_{qc} - 15.455$$

Columns 12 to 15:

5. Estimate what the indicated airspeed in flight would be for the CAS that was simulated by applying a pressure to the Pitot tube using the following formula.

$$IAS = V_{qc} + E_{ins} + E_{pos}$$

6. Produce a plot of IAS versus V_{qc} to achieve the IAS-CAS relationship.

NOTE: If the difference between upscale and downscale readings is relatively small (below 5mph), the average of the upscale and downscale IAS values can be plotted against the average of the upscale and downscale values of Vqc for both descent and level flight. If the difference between upscale and downscale values exceeds 5mph, it is advisable to obtain a new ASI.

7. The average values are determined from the following formulae.

$$IAS_{average} = \frac{IAS_{upscale} - IAS_{downscale}}{2}$$

$$CAS_{average} = \frac{CAS_{upscale} - CAS_{downscale}}{2}$$

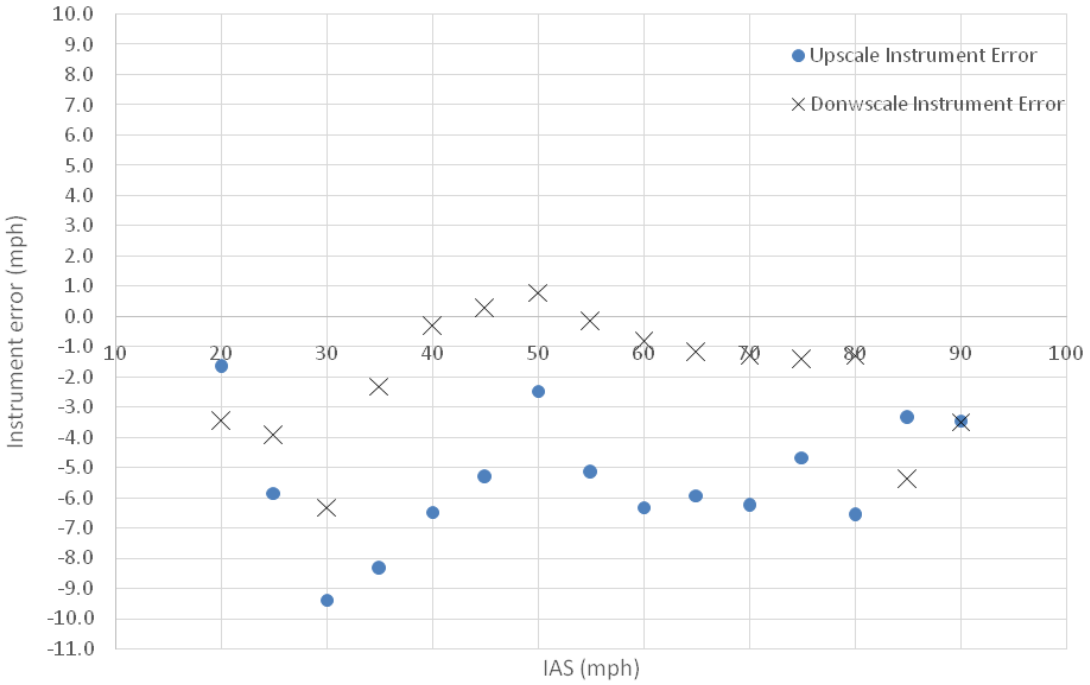

Figure 2.10.2.1: ASI instrument error sample plot

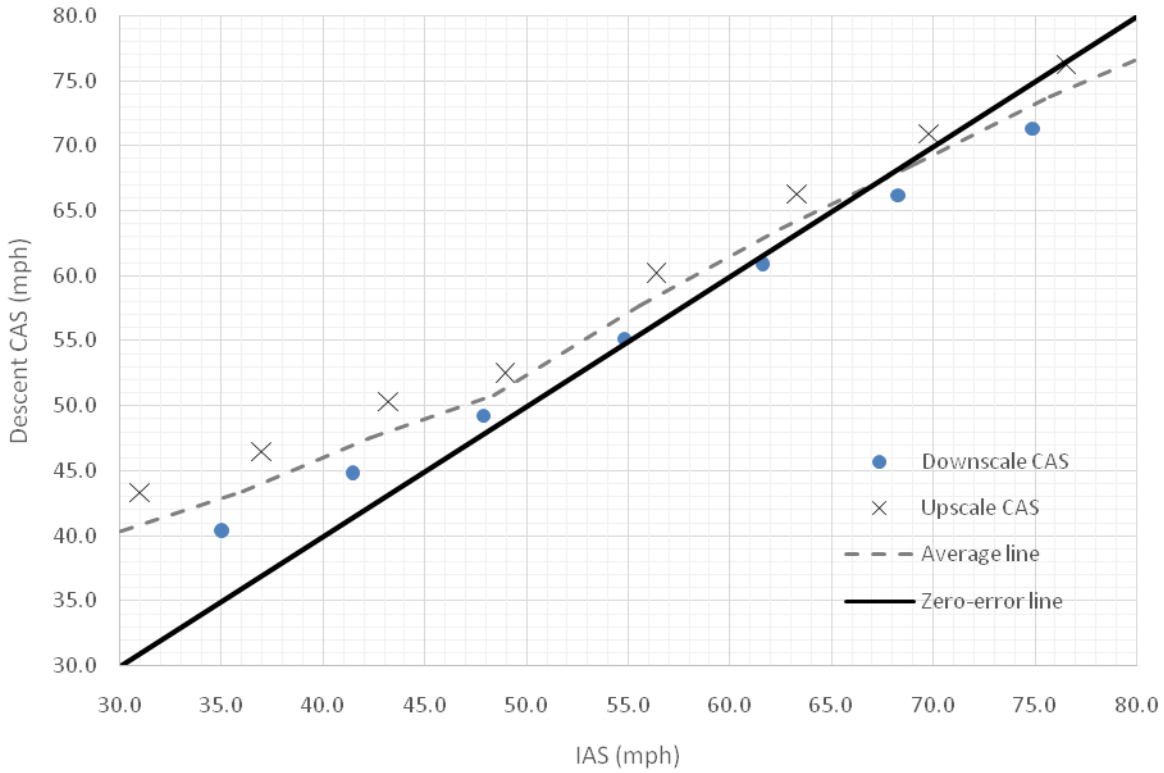

Figure 2.10.2.2: Sample relationship between IAS and CAS for power off descent

Table 2.10.2.1: ASI instrument error sheet

Date:		Sheet to generate IAS-CAS curves																	
Aircraft registration:																			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
	Pressure (Pa):		Vqc (mph):		Eins (mph):		Epos - Descent (mph):		Epos - Level (mph):		IAS-Descent (mph):		IAS-Level (mph):		Average Descent (mph):		Average Level (mph):		
IAS:	Upscale:	Downscale:	Upscale:	Downscale:	Upscale:	Downscale:	Upscale:	Downscale:	Upscale:	Downscale:	Upscale:	Downscale:	Upscale:	Downscale:	IAS (mph):	CAS (mph):	IAS (mph):	CAS (mph):	

2.10.3 CORRECT ALIGNMENT OF THE PITOT TUBE

CORRECT ALIGNMENT OF THE PITOT TUBE	
Special tooling required	Nil
Level of Maintenance*	Level 1
Reference documents	Nil
Maintenance packing list	Nil

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

1. Looking directly down the tube from the front, align the tube with the zip on the bottom surface of the wing, as shown in figure 2.10.3.1.

2. Looking at the pitot tube from the outboard side, align it with the horizontal jury strut sitting between the two main struts of the wing, as shown by the dashed red lines in figure 2.10.3.2 below.

NOTE: These checks can be incorporated in the pre-flight check to ensure correct alignment before each flight. Care should be taken when removing and replacing the pitot cover during operational flying to keep prevent misaligning the Pitot tube.

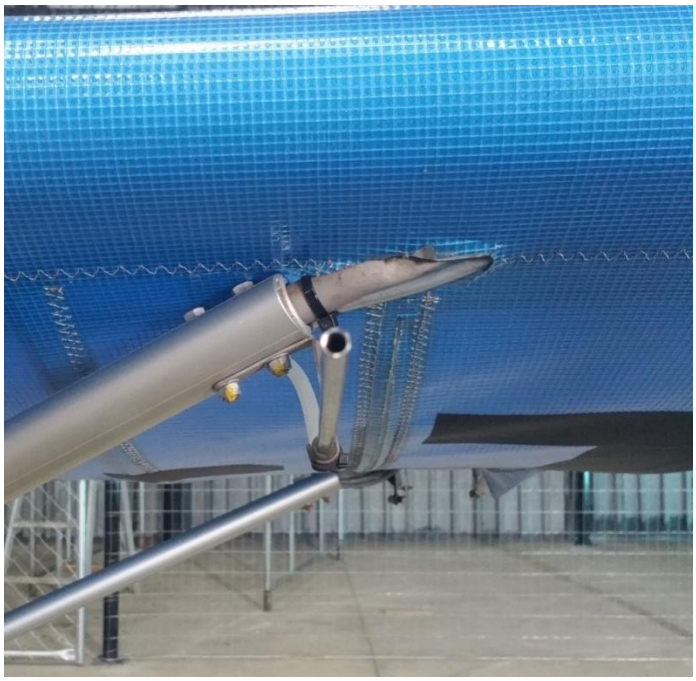

Figure 2.10.3.1: Longitudinal alignment of the Pitot tube

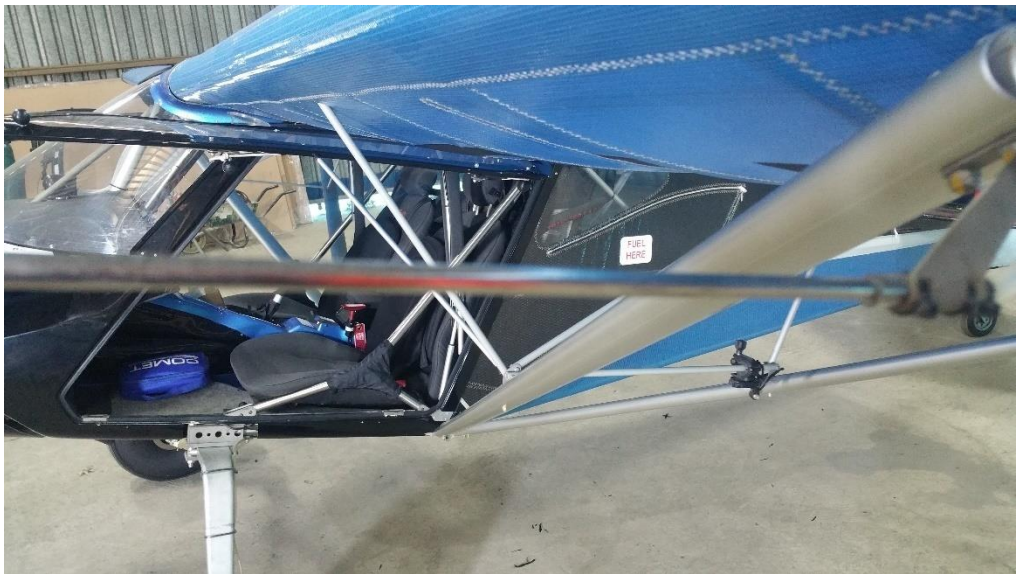

Figure 2.10.3.2: Vertical alignment of the Pitot tube

2.10.4 INSPECTION OF THE PITOT STATIC SYSTEM

INSPECTION OF THE PITOT STATIC SYSTEM PROCEDURE	
Special tooling required	Nil
Level of Maintenance*	Level 1
Reference documents	Nil
Maintenance packing list	Nil

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

1. Remove the cover from the Pitot tube and inspect it visually to ensure that there are no obstructions in the entry to the tube.

2. Remove the flexible translucent tube on the instrument side and follow its passage.

3. Check for any signs of obstruction or damage or any loose connections.

4. Check the static ports for signs of obstruction.

Figure2.10.2.1: Pitot tube on the aircraft.

CAUTION Ensure that the Pitot tube is covered at all times to prevent debris from entering the tube at the intake

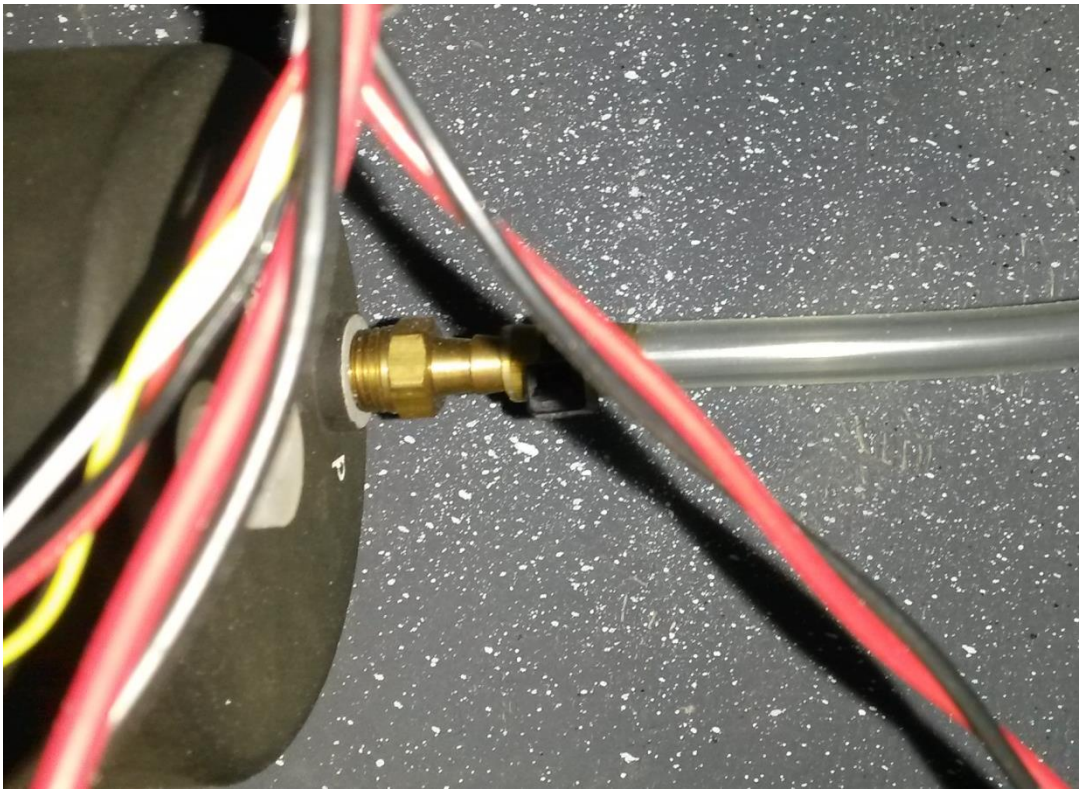

Figure 2.10.2.2: Pitot tube attachment to airspeed indicator

Figure 2.10.2.3: Pitot static tube cover

Inspection Findings:

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2.11. ELECTRICAL SYSTEM

2.11.1 REPLACEMENT OF THE BATTERY

REPLACEMENT OF THE BATTERY	
Special tooling required	Nil.
Level of Maintenance*	Level 1
Reference documents	BCAM-NT-003-003
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
1	Battery	1	1	
2	Bolt M6 x 80mm	2	2	STD-000033
3	M6 Nylock nut	1	1	STD-000094
4	M6 temporary nut	1	1	STD-000103
5	M6 x 12mm washer	2	2	STD-000127
6	390 x 7.8mm cable tie	4	4	STD-000215
7	Torque seal			

Procedure:

1. Ensure that the aircraft master switch is off and disconnect the wiring routing to the battery from both terminals. Take care to note which colour wire attaches to which terminal for the battery reinstallation process.

2. Cut the cables ties which hold the battery to the battery brackets.

3. Loosen the pipe clamp which attaches the aft bracket to the structure.

4. Rotate and move the aft clamp downward to allow the battery to pivot about the forward clamp.

5. Lift the battery up to clear the walls of the inside front of the main fairing and move it sideways out of the clamp area.

6. Manoeuvre the replacement battery into position to place it on the clamps.

7. Secure it with 2 cable ties attached to one another to achieve the desired length.

8. Rotate the clamp and battery, position the aft clamp and tighten it.

9. Reattach the electric cables to the battery terminals.

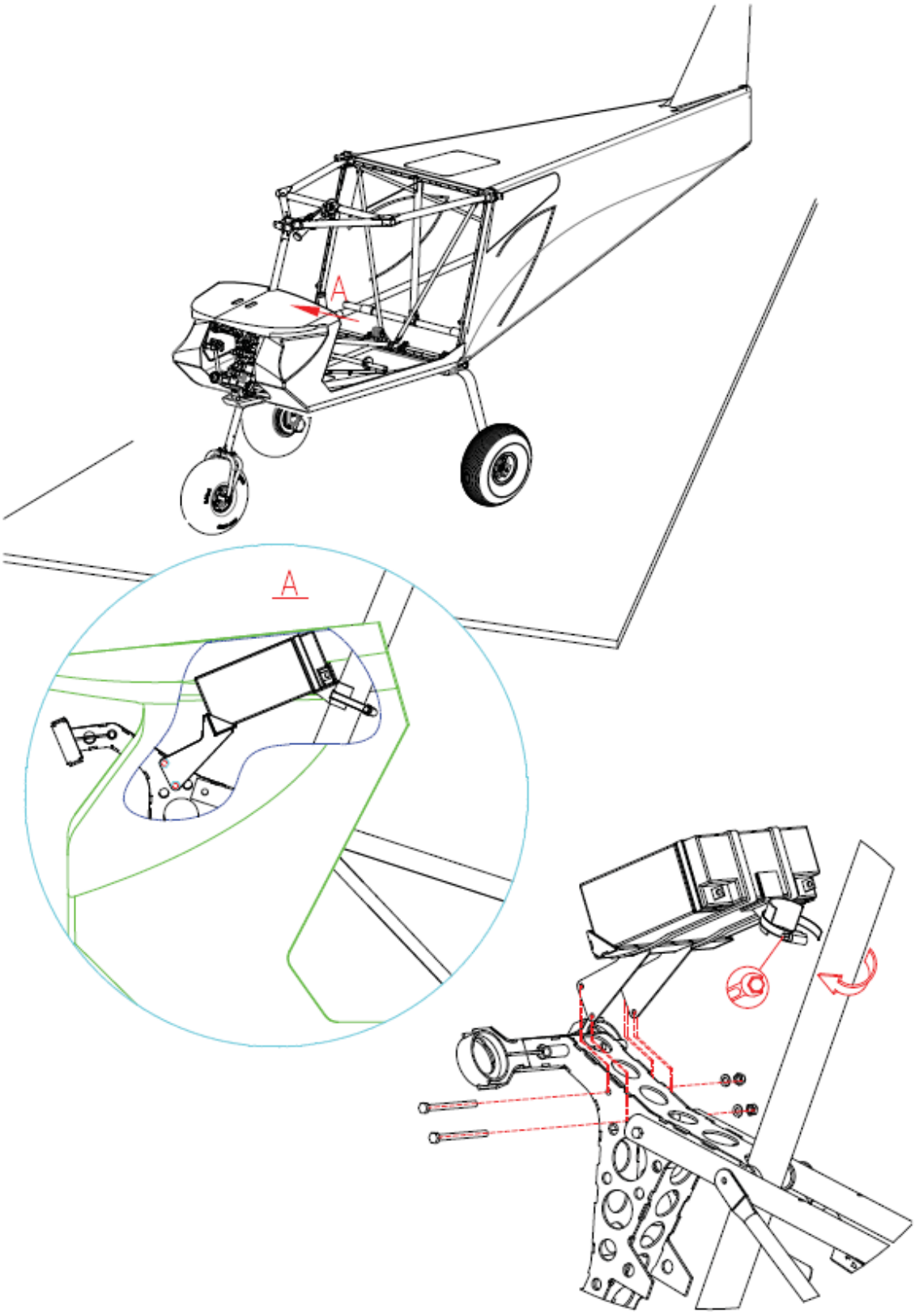

Figure 2.11.1.1: Battery position in aircraft

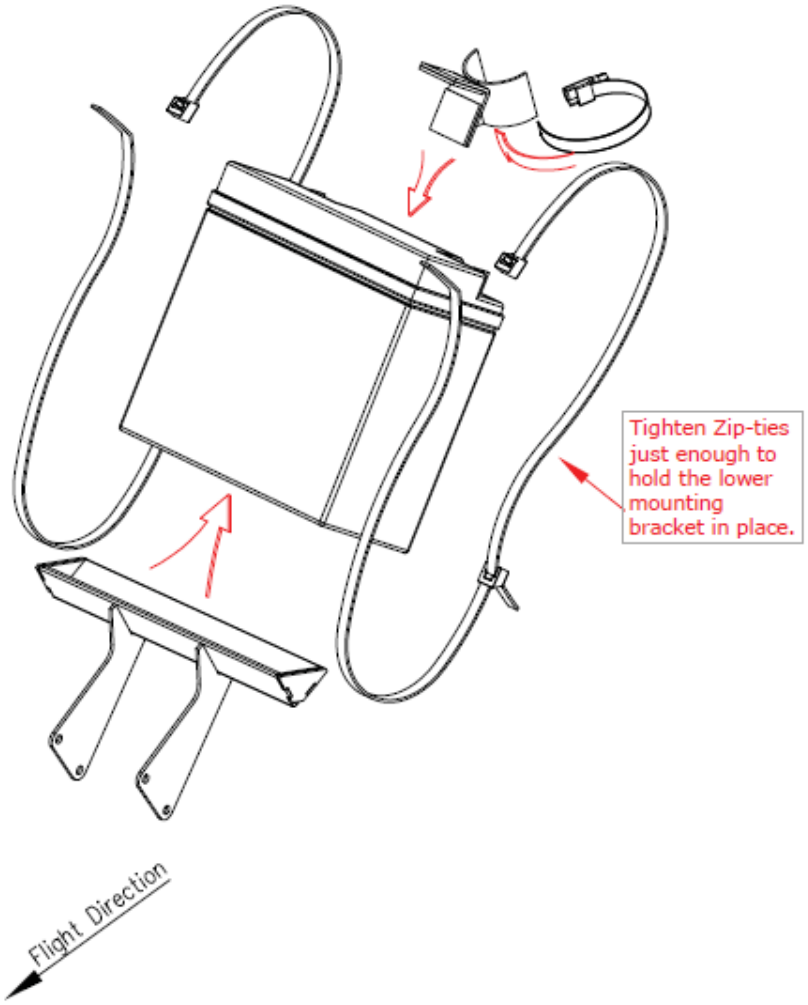

Figure 2.11.1.2: Attaching the battery to the bracket with cable ties

Figure 2.11.1.3: Battery terminal wiring (a) Left hand side and (b) Right hand side

Final Inspection:

1. Perform a functionality check of the battery prior to operation.

COMPLETED BY	
STAMP	
SIGNATURE	

2.12. PAINTING AND COATINGS

2.12.2 TRI-LAMINATE SAIL CLOTH REPAIR

TRIL-LAMINATE SAIL CLOTH REPAIR	
Special tooling required	Adhesive Dacron patch.
Level of Maintenance*	Level 1
Reference documents	Nil
Maintenance packing list	N/A

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

Procedure:

1. Gain access to the inside of the damaged/cut/torn area of the tri-laminate.
2. Clean around the damaged area (within at least 1 foot radius) and leave it to dry.
3. Cut the patch such that it overlaps the damaged area by at least 3 inches.
4. Ensure that the patch is cut with rounded corners and no sudden changes in geometry.
5. Place the patch on top of the area to confirm patch sizing.
6. Remove the backing from the patch
7. Place the patch on the damaged area and apply even pressure, ensuring that the edges are flat. Ideally pressure should be applied from the opposite side of the sail if accessible as well.
8. Should the patch not adhere properly, use a heat gun lightly behind the patch to warm the glue. Avoid prolonged heating or heating too close to the Dacron patch.
9. If the position of the damaged region allows, a Dacron patch can be applied on both sides of the trilam to give additional strength to the repair.

Final Inspection:

1. Perform a final check of the security of the tri-lam attachment to the airframe.
2. Check it once more after the first flight.

COMPLETED BY	
STAMP	
SIGNATURE	

2.12.2 AIRCRAFT WASHING

TRIL-LAMINATE SAIL CLOTH REPAIR	
Special tooling required	Chamois, buckets, dishwashing liquid and clean cloths.
Level of Maintenance*	Level 1
Reference documents	Nil
Maintenance packing list	Nil

* Refer to Chapter 2 for the description of the levels authorisation to perform the task.

Parts List:

No.	Description	Qty each	Qty Total	Part No:
	NO PARTS			

WARNING Under no circumstances make use of a high pressure hose to wash the aircraft as this will damage the tri-laminate aircraft covering.

1. Always wash the aircraft in a cold state.
2. Wash the aircraft with a bucket and cloth with soapy water. Dishwashing liquid is a suitable soap for use on the aircraft.

CAUTION Care needs to be taken when washing the windows as they scratch very easily. Make use of a chamois dedicated to window washing with dishwashing liquid and water to wash the windows.

CAUTION Ensure that the Pitot tube remains free of soap and water during the washing process.

CAUTION Take care when cleaning the top of the wing, although the vortex generator is difficult to pull off when pulling on the vane, if a rag or microfiber cloth gets hooked on a corner with enough force it could result in the adhesive in that region delaminating, and once that starts it may compromise the rest of the adhesive.

3. On completion, rinse the aircraft with a fresh cloth in clean water.
4. Open all the zips to ensure that no water has accumulated in the aircraft after washing.

APPENDIX 1: EQUIPMENT CHANGE REQUEST

Date: _____

To whom it may concern

Subject: BushCat equipment change authorization

Manufacturer authorizes repairman, A&P, IA (Authority certificate number) to install the following equipment in LSA BushCat (insert serial number here)

Product Name_____ Model_____ Part Number_____
Product Name_____ Model_____ Part Number_____
Product Name_____ Model_____ Part Number_____
Product Name_____ Model_____ Part Number_____
Product Name_____ Model_____ Part Number_____

All equipment will be installed in accordance with the Rainbow Aircraft's written instructions and diagrams. Such instructions, diagrams, and any additional instructions for continued airworthiness must be kept indefinitely with the owner's Aircraft's Maintenance Manual.

Manufacturer or agent authorization block:

Title	Name	Authorization given by

Signature

Affidavit of ASTM compliance:

I certify that the installation of the above equipment will not alter the applicable ASTM design and performance of this aircraft. I have followed all the Manufacturer's instructions and the installation has been checked for compliance

Title	Name	Authorization given by

Signature