Summary of Reported Defects on Microlight Aircraft to December 1992

P.C. Lovegrove
**FOREWORD**

In this document, I have summarised all the information which I have issued up to December 1992 which relates to operational problems with microlight aircraft. You can therefore safely scrap most of the paperwork which you have been sent by me over the last nine years.

I have covered the Defect Reports and General Notes, the contents of the "Spotlight" section from the original version of the Inspectors’ Handbook, relevant data from Tech Topics, FlightLine and Microlight Flying, and snippets culled from conversations with BMAA members.

As I did in the last issue of this summary, I have repeated quite a bit of the information under different section-headings to make it easier to locate any given item or topic, whether you recall it as, say, a filter, something on a Rotax, or something on a 'Q'. At the request of several Inspectors, I have also put any relevant drawings back into the text.

Finally, forgive me if I again state the obvious. The fact that some sections are so much more voluminous than others is not indicative of a particularly fallible type of machine or product. Primarily, it is simply a reflection of the extent to which firm's products have taken a grip on the market. Hence, the Solar Wings/Pegasus section is the largest, followed by Mainair. In the engine area, Rotax are clearly the current leaders.

So the more of a given product there is on the market, obviously, the more often a reported defect is likely to be related to it.

Note that some of the earlier reports mention 'fixes' which, today, with the regulations and controls under which we work with Permit aircraft, would have to be dealt with as Minor or Major Modifications, with prior approval sought and obtained.

Finally, let me thank all of those members who sent in sketches and drawings which I have reproduced here.

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**SECTION**

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AEROTECH AIRCRAFT

DEFECT REPORT No 051: The flat seal in a Aerotech (Cooper) filter-unit distended so much that it could not be refitted and black paint was also leached from the inside of the bowl.

A seal of cork-rubber or Viton was the cure for the former problem. It had to be a flat seal as an O-ring was totally unsuited to the application.

Any paint found to be present, either had to be carefully removed or the filter-unit rejected. It was important not to scrape the inside of the bowl, as it had been protected with a sprayed-on anti-corrosion finish.

DEFECT REPORT No 092: The drawshaft which secured the propeller on the Nicklow reduction of an Aerotech MW5 (Robin 440) sheared in flight. (This had happened on at least one other occasion).

BULLETIN (May 1988): This drawshaft on the reduction-gear of the Sorcerer was the subject of a Mandatory Modification.

The older version of the drawshaft had not only been inadequately secured to the pulley and propeller, allowing them to separate from it; it was also made from aluminium-alloy, which lacked adequate strength. This had to be changed to a 12 mm diameter, high-tensile steel version.

GENERAL NOTE No: (91)-90: A BMAA MANDATORY bulletin required owners of MW5s carefully to examine the brackets which form a part of the wing-spar attachments. If these folded alloy brackets were found to be cracked, they had to be immediately replaced. It was necessary to have bend radii incorporated in any new brackets, such that they were at least three times the thickness of the sheet. (It was too small radii which caused the failures initially). On existing brackets, dye-penetrant testing of them had to be carried out and the question of replacement decided on the basis of the results of those tests.

DEFECT REPORT No: (92)-309: The tailplane on an MW5K Sorcerer is constructed by bonding plywood ribs to the alloy spar, with wraps of polyester glass-fibre round the tubular spar and against the faces of the ribs. Both sides of all but the end-ribs are bonded; the latter are bonded only on their inner faces.

On this machine, (2 years old, 150 hours) only one rib on each side - which happened to be those with a rivet through the wrap/spar joint were secure. ALL others were free to rotate on the spar, the failure having occurred between the wrap and the spar.

This form of construction, properly executed, is extremely strong. The spar will fail in torsion before correct joints will fail. In this particular instance it appears, from the nature of
the failure, that there had never been a proper bond between the wraps and the spar, because the etch-primer had come away from the spar and was keyed to the wraps.

One possible explanation for this could be inadequate degreasing of the tube before bonding. Others are use of etch-primer which was past its 'sell-by date' so to speak, or which was incorrectly proportioned when mixed, or simply because too long an interval was allowed between etch-priming the spar and carrying out the bonding.

Repair had to be effected by firstly removing all of the useless glass-fibre, then cleaning up the rib-faces and thoroughly cleaning and degreasing the spar. New etch-primer could now be applied to the spar, followed by complete rewarping exactly as per the instructions for the building of the aircraft. (Skysport can provide full information on this process, and also recommend installing a rivet through each wrap-to-spar joint on the horizontal centre-line - as is now standard practice on the MW6 - to act as a failsafe).

The designer, Mike Whittaker, gave details - see Figure - of the testing procedure to be applied to wing, tailplane and rudder-ribs.

CHIEF INSPECTOR'S COMMENTS: If an aircraft had a fault such as this, one should ask oneself if it were of a type which might occur elsewhere on the machine. There are enough MWs flying safely to demonstrate that this had to be a building error. If the wing-ribs, or rudder/fin ribs, were bonded in the same unsatisfactory manner, could the same fallibility be lurking there? Obviously, one would take very great care to ensure that nothing similar had been missed.

The reporter went on to point out that one can easily check the integrity of these bonds between the ribs and the spar. Simply lock the elevator control and then twist the outboard end of each tailplane half, looking for movement. In cases of doubt, remove the fabric for a fuller inspection.

DEFECT REPORT No: (92)-309: FIRST AMENDMENT Mike Whittaker, designer of the MW series, sent in details of the torques to be applied to each wing, tailplane and rudder rib.

Essentially, each rib should be tested separately, with the aircraft fully rigged as appropriate, with the torque applied for a minimum of three seconds, and with a detailed examination after the test.

19 kg were to be applied downwards at a distance of 495 mm behind the mainspar centreline, on all wing-ribs.

Additionally, 19 kg were to be applied downwards at the hinge-line of the aileron-bearing ribs.

12 kg were to be applied downwards at 165 mm behind the spar centreline of the tailplane and the rudder.

DEFECT REPORT No: (92)-309: SECOND AMENDMENT

Mike Whittaker sent in further notes about his machines, paraphrased as follows:-

*RIB/SPAR JOINTS

During the renewal inspection of an Aerotech-manufactured MW5K, all but the inboard tailplane ribs were found to be loose on the spar-tube. A close examination revealed that the joints had
separated between the spar-tube and the glass-fibre flange, leaving the etch-primer attached to the glass fibre.

These joints are normally very strong and stand up to much abuse. The fact that all had failed, with separation at the etch-primer interface, suggests a problem with the primer, which could be due to any one of a number of reasons. But it has been my experience that too low a temperature is the most common cause of adhesion problems. The drawings call for spars to be etch-primed to the manufacturers' (Neogene Paints) instructions, as spelled out in their leaflet 399/3.

New tail surfaces, and those being recovered, should have a pop-rivet inserted through the joint as shown in the sketch.

Components should be regularly checked for looseness in the joint. To do this, hold two adjacent ribs at the trailing edge and lightly flex them in opposite directions. If a joint has failed, the resisting stiffness will be enormously reduced. In such an instance, one should reveal the component by peeling back the fabric. Remove the old joint completely without damaging the spar. (Use paint stripper). Re-etch prime the area and lay up a new flange. Load-test the rib, re-attach the fabric and heat-shrink it tight.

The question arises, what load case caused the joints to fail? Many of these aircraft are subjected to loading cases way beyond Section S. I have seen children swinging the trailing edge of the HW4 wing and many aircraft have suffered forced-landing damage.

Some aircraft are kept fully rigged in the open, with no protection (NOT recommended!). Severe damage can occur to elevators, rudder, ailerons and wings if the aircraft is tethered tail-first in the up-to-100 MPH gusts which we have seen in recent years. One has only to sit - with one's back to the wind - waiting to take off, to feel the gusts snatching at the stick. Good airmanship calls for aircraft always to be parked into wind².
SERVICE BULLETIN (March 1986): The nose-rib pocket on some SX3D machines (prior to the keel-swing traxle-hinge) chafed on the cross-tube.

A patch of sailcloth needed to be sewn over the affected area.

DEFECT REPORT No 045: The carabiner on an Aerial Arts SX130 was not safetied.

Either a different unit which was capable of being safetied needed to be fitted or a suitable method devised for the present one.

DEFECT REPORT No (89)-150: The pilot of a Chaser S felt the fuel-tank pushing into his back, just after he landed the aircraft. Inspection showed that the weld on the base-tube elbow had failed due to totally inadequate penetration.

It transpired that early sub-70 machines had been assembled with poor control of the standard of welding. Later machines were welded to a high standard. A thick disc was also inserted into the joint between the tubes, to prevent their failure under crushing loads.

Owners were advised to check whether an insert was fitted, by looking down the end of the keel, using a bright light. If no insert was seen, the keel had to be totally replaced with a new type.

DEFECT REPORT: Petrol was seen to be issuing from the small vent-hole on the fuel-pump of a Chaser S, although the engine continued to run satisfactorily.

The problem seemed to be resonance of the pulse-pipe from the engine crankcase. Some models had been fitted with a pipe 22.5 inches (572 mm) long. The correct length was 19.5 inches (495 mm) and care had to be taken not to kink the tube over the rather tight bend at the exit from the crankcase.

DEFECT REPORT: Some owners damaged their Chaser wings internally, by attempting to remove the washout-limit tubes (tip-sticks) after de-tensioning the sail. This problem applied to machines with the Serial Number 701 or greater.

The manufacturers pointed out that the tip-sticks had to be inserted and removed with the wing fully tensioned. The tip-strut had to be taken out first, to make room for one's arm inside the end of the wing, then allowing one to lift up No 6 rib to facilitate removal or insertion.

DEFECT REPORT: Some Chaser pilots found a tendency for the trike to 'snake' during fast ground-runs, especially on hard surfaces.

The manufacturers said that the problem was caused by pylon wires being too slack; the main undercarriage then took up the slack and caused over-steer.

The pylons wires needed to be checked with the trike empty and with no wing fitted, as follows:

A spring-balance (of the type popular for fishing, say) had to be hooked on to the stay-wire at about its mid-length.

A steel tube had to be rested against the undercarriage leg and the stay-wire, to measure deflection.

Exerting a pull of about 10 to 30 pounds (5 to 15 kg) with the spring-balance would produce a deflection of about a half-inch (12 mm) if all was correct.

If any greater deflection was obtained, the cable had to be replaced.

DEFECT REPORT: On the Rotax on a Chaser S, the rubber gasket sealing the split-line of the inlet manifold - wore and allowed air to enter. This weakened the mixture and made the engine run lean (and hot).
A new gasket was needed. Cyclone Hovercraft also suggested a form of Silicone sealant to help to ensure a good seal.

**DEFECT REPORT:** On the large bend of the exhaust, near the engine, long cracks appeared. They could be as long as 2 to 3 inches (50 to 76 mm) and could sometimes run as far as the mount. The problem arose after about 120 to 150 hours of use.

Welding was found to effect a temporary cure. A new exhaust gave, typically, another 120 hours of operation before the cracks reappeared.

**DEFECT REPORT:** On a Chaser, the fuel-pipe split where it joined the aluminium tube entering the tank. During handling of the latter, this pipe could easily suffer some abuse and this seemed to be the cause of the problem.

Very careful handling of the whole unit was the only real way to prevent or delay the problem. It had to be noted that, because the tank was low-slung, the point of failure was at negative pressure (under vacuum) during engine operation. So air could be sucked in through any crack, rather than fuel being drawn up.

**DEFECT REPORT:** The plastic caps, which were fitted to the red fuel-tanks on Chasers, could be easily fractured. Splitting tended to occur at the top.

The manufacturers of the tanks were of the opinion that the splitting was caused by over-tightening of the caps. They promised to find a complete solution but none was ever reported.

**DEFECT REPORT:** During flight, the pilot of a Chaser heard a loud bang, followed by violent vibration. He switched off the engine and made a safe landing. It was found that the starting handle and cord had come away from the engine and hit the propeller. One half of the latter had gone through the wing. More detailed examination revealed that the spot-welds which held the spring-housing to the outer casing had failed. The trike on this machine was an early specimen.

Rotax stated that the material thickness had been increased to prevent the problem from happening again. Cyclone Hovercraft also pointed out that failure of the spot-welds could be observed from the outside, where they were visible. Failure began as small cracks around the rim of a spot-weld and then propagated.

**DEFECT REPORT:** Several steel hang-point brackets on Chaser S machines were found cracked at the junction of the sheet-metal strap and the bearing tube. The cracks began at the end of the weld-seam and propagated upwards at 45 degrees into the main strap. The fault appeared to arise after at least 70 hours of operation.

Careful monitoring of the items was necessary, with replacement if any cracks were seen. Welding was not really not an option for the repair of such a vital part as this.

**DEFECT REPORT:** The front strut on a Chaser was attached to the lower fitting by means of a pin and stainless-steel keep-ring. This ring could be seen to rotate and become unfastened whilst the engine was running.

The problem seemed to arise when the ring was in contact with the pod. If this was avoided by readjusting the pod's position, the problem disappeared. If this repositioning could not be achieved, then some secondary means of securing the ring was required.

**DEFECT REPORT No: (91)-260:** On the down-wind leg, the Rotax 337 engine on a Chaser S failed; the problem was later found to be a blocked idling jet.

The jet was cleaned, the filter replaced and the tank cleaned of all dirt and debris.

**DEFECT REPORT No: (91)-265:** Three Chaser S aircraft all showed a tendency to erratic steering on landing in crosswind conditions.

The problem was traced to severe wear in the joints between the under-carriage legs and (i) the cluster-plates and (ii) the drag-links. Rear-wheel toe-in and toe-out could readily be induced by simply moving each wheel by hand. Furthermore, the wheel bearings were found to have excessive play.

All play and sloppiness in the relevant structure was removed by
appropriate tightening of bolts with packing washers and shims, as necessary. The bearings were adjusted and repacked with grease. This solved the problem.

GENERAL NOTE No: (91)-59: Cyclone Airsports issued a MANDATORY Service Bulletin, (CH0006 Issue 3), concerning the inspection of the hang-point bracket, on all Chaser S flex-wings, for cracks. If any were found, the part had to be replaced immediately, with Part Number CH 03 13 BA.

DEFECT REPORT No: (92)-311: During inspections, cracks were found to be emanating downwards from the lower hole on the hang-tube of a pre-Section S Chaser. (The cracks were virtually impossible to see beneath the dirt and aluminium dust generated by the pin in the hole. A magnifying glass was needed). A new factory-supplied component was installed.

Cyclone Airsports use a 10 swg (3.25 mm wall) tube in this location, whereas the specimen in question (very much pre-Cyclone days) was only 17 swg (1.42 mm wall), with a local reinforcement.

DEFECT REPORT No: (92)-312: During close inspection of the engine on a Chaser, after carrying out re-timing, it was found that the starting cord had chaffed against the fuel-line sufficiently to expose the foundation braid of the tubing. The abrasion was on its underside and had therefore not been observed during normal pre-flight inspections. The tube was replaced.

DEFECT REPORT No: (92)-312 FIRST AMENDMENT: Bill Sherlock, of Cyclone Airsports Ltd, commented on this Defect Report as follows:-

Further to the above Defect Report, we have been aware that the Chaser pull-cord can contact the fuel-line during the starting procedure and, as the fuel-line stiffens with age, the resistance to moving away from the pull-cord will increase and, in consequence, the contact will be firmer.

To date, we have not seen a similar case and, as inspection is simple, we do not feel action is necessary, other than for us to circulated information on the problem to owners. We commissioned Nigel Beale, of Cyclone Hovercraft Ltd, to redesign the Chaser fuel-system for our own production aircraft. The same problem cannot arise on the new fuel-system which is fitted to all Chaser S aircraft sold by us, starting from Serial Number CH829.

W H Sherlock, Director".

GENERAL NOTE No: (91)-66: A BMAA Inspector described the problems involved in meeting the terms of the Service Bulletin CH-006 Issue 3, (General Note No (91)-59), on replacement of the hang-point bracket on Chasers S.

Cyclone Airsports gave advice on the problems and stated that they would help directly in difficult cases or as called upon.

GENERAL NOTE No: (91)-74: This gave instructions for an urgent inspection of the wing-keel on all Chaser S machines (up to 1-9-91). Abrasion could occur where the cross-tubes contact the keel. If the observed result merited action, specific guidance was given as to what that action should be.

GENERAL NOTE No: (91)-75: An owner had found a crack in the top-cap on the king-post of a Chaser S. Therefore a check was required on all Chasers S with Serial Numbers from CH701 to CH827.

If cracks were found, the top-cap and all associated cables had to be replaced.
TECH TOPICS: Some owners fitted strobe units by drilling the kingposts of their Chasers S. This is acceptable on a kingpost tube with a 16 s.w.g. (1.6 mm) wall but not on a 20 s.w.g. wall.

If you have the latter (which were common on early Chasers) obtain a thicker-wall version from Cyclone Airsports. The top fitting needs to be modified to suit.

Alternatively, Cyclone suggested running the cable to the top of the kingpost, piercing the black plastic 'boot', and running the cable outside the post, down to the strobe.

DEFECT REPORT No: (92)-332: On checking a Chaser S - which had logged a total of 45 hours - against the information given in GN-(91)-75, it was found that the bolt-threads had badly abraded the landing and fore-and-aft wires.

On checking them, it was found that they could be unscrewed with the fingers, with virtually no effort. Having owned the aircraft from new, the pilot knew that the nuts had never been removed.

Had any of these nuts been lost completely, the stage would have been set for an in-flight structural failure, with all that that implies.

Almost certainly, the problem stemmed from a faulty batch of Nylon-locked nuts. The ones in question had green inserts.

The nuts had to be replaced with new ones with standard off-white inserts.

In 1991, Mainair had a problem with a batch of green-insert Nylon-locked nuts (GN-(91)-65). In that case, it was 5/16" nuts which were at fault - they stripped their threads easily - and Mainair had to jettison the whole of their stock of that size.

Here, it would seem that was a batch of 1/4" nuts of the same variety which were equally poor but in a different mode.

All owners of microlights were strongly advised to examine their machines to see if they had any green-insert Nylon-locked nuts installed. If they found any, they needed to be scrapped and replaced with white-insert types.

It is believed that the damage was caused because the bolt was not fitted carefully into place.

DEFECT REPORT No: (92)-338: After starting the engine of his Chaser S from outside the aircraft (standard on Chasers), the pilot was waiting a few seconds before turning the choke off, when the screw which retains the fuel-tap lever dropped out, leaving the lever free to fall into the propeller.

The screw was refitted securely with Lokoite applied to it.

DEFECT REPORT No: (92)-340: During various preflight inspections of his Chaser S on the "Round Britain" rally, it appeared to the pilot that the Nylon-locked nuts which retained the front and rear flying wires, near the A-frame corner-joints, were in a slightly different position.
CABLES

DEFECT REPORT: Metrically sized ferrules were found to have been fitted on to imperial cables.

It is critically important that imperial cables and ferrules and metric cables and ferrules are not inter-mixed. For example, whilst a 1/8 inch (3.17 mm) ferrule might appear suitable for a 3 mm cable, it is not.

EMAA NOTE: Many early trikes were found to have serious stretch in the cables between the undercarriage legs and relevant wear in the attachment-bolt holes, etc.

This gave rise to a lack of bracing on the monopoles.

DEFECT REPORT: Aluminium ferrules were found on stainless-steel cables.

This combination can cause accelerated electrolytic corrosion when water gets on to both, that is, as rainfall or by condensation in the small spaces between the ferrule and cable.

Copper ferrules, with or without plating, must be used on stainless-steel cables. Aluminium ferrules are for use on carbon-steel cables.

BULLETIN: The poor manufacture of flying wires was the direct cause of a pilot’s death, when they failed in flight and his machine crashed. The ferrules had actually been crimped with the wrong part of the tool, causing the cables to be partially cut, right from the start.

Owners should not attempt to make cable-assemblies, or to have them made ‘on the cheap’.

Professionals who make cables have all the necessary equipment to test and guarantee that their products are to the strength standards required of them, and the accreditation to prove that they are so capable.

GENERAL NOTE GN-(91)-113: Dr Bill Brooks, of Solar Wings, pointed out that - contrary to what most people might think - cables can sometimes break strands in their central core without there being any obvious breakages visible externally. There might only be some signs of prior kinking.

The only way to reveal this is to ease the cable open locally, by gently twisting it back against its inbuilt ‘wind’, over the length which needs to be examined. If this is carefully done, the cable returns correctly to its former state afterwards. If any broken wires are observed in the core of the cable it must, of course, be replaced (with a new cable made by a qualified, properly equipped supplier).

Bill also mentioned that FAA publication EA-AC 43.13 -1A and 2A is an excellent reference for cable inspection.

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DEFECT REPORT No: (92)-331: With the wing of a Pegasus XL-R separated from the trike and during its preflight inspection, the reflex lines were found to be corroded where they pass through the thimble at the top of the kingpost, where there is an area of high contact-pressure. Obviously, had these failed in flight, it could have been extremely dangerous.

The reporter pointed out that the defect could not be seen with the wing installed on the trike, as it is normally kept in the hangar.

(The reporter asked the question, "Would it not be possible to have a pulley as is fitted to the Q7?")

New, factory-supplied, cables were installed.

DEFECT REPORT No: (92)-365: During inspection of four different Spectrum aircraft, aluminium ferrules were found installed on stainless-steel cables. Serious corrosion had occurred at these points, typical of the form to be expected with this incorrect combination of materials, which leads to electrolytic acceleration of the corrosion, once water has reached the joint. On these aircraft, heat-shrink sleeving had to be removed before the ferrules could be examined.

New cables had to be installed. They were fitted with the correct zinc-plated copper ferrules appropriate to stainless-steel cables.
CHARGUS AIRCRAFT, (T250 and TITAN)

DEFECT REPORT: PVC tubing, used as the fuel-tank sight-tube on both the T250 and the Titan, shrank due to attack by petrol mixture.

New tube was needed - installed with some slackness in length - at fairly frequent intervals.

DEFECT REPORT: Motorcycle switches, used as ignition-switches on the T250s, failed easily.

Mains-rated switches were needed, as on all microlights. Ideally, heavy-duty, double-pole switches should have been used, with the contacts wired in parallel.

DEFECT REPORT: The dual steering-system could crack in a heavy landing, due to the force from the occupants' feet. It could also become stiff to operate.

DEFECT REPORT: The cross-booms were prevented from dropping on to the keel by a wire which ran from the king-post, through a shackle on the cross-boom's centre-plate, and up to the nose. The shackle-pin passed through a hole in the bolt which - in some cases - had been drilled too close to the end of the bolt and was therefore prone to break open in hard landings.
CHASER (CYCLONE AIRSPORTS AIRCRAFT).

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DEFECT REPORT: Some Chaser pilots found a tendency for the trike to 'snake' during fast ground-runs, especially on hard surfaces.

The manufacturers said that the problem was caused by pylon wires being too slack; the main undercarriage then took up the slack and caused over-steer.

The pylon wires needed to be checked with the trike empty and with no wing fitted, as follows:

A spring-balance (of the type popular for fishing, say) had to be hooked on to the stay-wire at about its mid-length.

A steel tube had to be rested against the undercarriage leg and the stay-wire, to measure deflection.

Exerting a pull of about 10 to 30 pounds (5 to 15 kg) with the spring-balance would produce a deflection of about a half-inch (12 mm) if all was correct.

If any greater deflection was obtained, the cable had to be replaced.

DEFECT REPORT: On the Rotax on a Chaser S, the rubber gasket - sealing the split-line of the inlet manifold - wore and allowed air to enter. This weakened the mixture and made the engine run lean (and hot).

A new gasket was needed. Cyclone Hovercraft also suggested a form of Silicone sealant to help to ensure a good seal.

DEFECT REPORT: On the large bend of the exhaust, near the engine, long cracks appeared. They could be as long as 2 to 3 inches (50 to 76 mm) and could sometimes run as far as the mount. The problem arose after about 120 to 150 hours of use.

Welding was found to effect a temporary cure. A new exhaust gave, typically, another 120 hours of operation before the cracks reappeared.

DEFECT REPORT: On a Chaser, the fuel-pipe split where it joined the aluminium tube entering the tank. During handling of the latter, this pipe could easily suffer some abuse and this seemed to be the cause of the problem.

Very careful handling of the whole unit was the only real way to prevent or delay the problem. It had to be noted that, because the tank was low-slung, the point of failure was at negative pressure (under vacuum) during engine operation. So air could be sucked in through any crack, rather than fuel being drawn up.

DEFECT REPORT: The plastic caps, which were fitted to the red fuel-tanks on Chasers, could be easily fractured. Splitting tended to occur at the top.

The manufacturers of the tanks were of the opinion that the splitting was caused by over-tightening of the caps. They promised to find a complete solution but none was ever reported.

DEFECT REPORT: During flight, the pilot of a Chaser heard a loud bang, followed by violent vibration. He switched off the engine and made a safe forced landing. It was found that the starting handle and cord had come away from the engine and hit the propeller. One half of the latter had gone through the wing. More detailed examination revealed that the spot-welds which held the spring-housing to the outer casing had failed. The trike on this machine was an early specimen.
Rotax stated that the material thickness had been increased to prevent the problem from happening again. Cyclone Hovercraft also pointed out that failure of the spot-welds could be observed from the outside, where they were visible. Failure began as small cracks around the rim of a spot-weld and then propagated.

DEFECT REPORT: Several steel hang-point brackets on Chaser S machines were found cracked at the junction of the sheet metal strap and the bearing tube. The cracks began at the end of the weld-seam and propagated upwards at 45 degrees into the main strap. The fault appeared to arise after at least 70 hours of operation.

Careful monitoring of the items was necessary, with replacement if any cracks were seen. Welding was not really not an option for the repair of such a vital part as this.

DEFECT REPORT: The front strut on a Chaser was attached to the lower fitting by means of a pin and stainless-steel keep-ring. This ring could be seen to rotate and become unfastened whilst the engine was running.

The problem seemed to arise when the ring was in contact with the pod. If this were avoided by readjusting the pod’s position, the problem disappeared. If this repositioning could not be achieved, then some secondary means of securing the ring was required.

DEFECT REPORT No: (91)–260: On the down-wind leg, the Rotax 337 engine on a Chaser S failed; the problem was later found to be a blocked idling jet.

The jet was cleaned, the filter replaced and the tank cleaned of all dirt and debris.

DEFECT REPORT No: (91)–265: Three Chaser S aircraft all showed a tendency to erratic steering on landing in crosswind conditions.

The problem was traced to severe wear in the joints between the under-carriage legs and (i) the cluster-plates and (ii) the drag-links. Rear-wheel toe-in and toe-out could readily be induced by simply turning each wheel by hand. Furthermore, the wheel bearings were found to have excessive play.

All play and sloppiness in the relevant structure was removed by appropriate tightening of bolts with packing washers and shims, as necessary. The bearings were adjusted and repacked with grease.

GENERAL NOTE No: (91)–59: Cyclone Airsports issued a MANDATORY Service Bulletin, (CH0006 Issue 3), concerning the inspection of the hang-point bracket, on all Chaser S flex-wings, for cracks.

If any were found, the part had to be replaced immediately, with Part Number CH 03 13 BA.

DEFECT REPORT No: (92)–311: During inspections, cracks were found to be emanating downwards from the lower hole on the hang-tube of a pre-Section S Chaser. (The cracks were virtually impossible to see beneath the dirt and aluminium dust generated by the pin in the hole. A magnifying glass was needed. A new factory-supplied component was installed.

Cyclone Airsports use a 10 swg (3.25 mm wall) tube in this location, whereas the specimen in question (very much pre-Cyclone days) was only 17 swg (1.42 mm wall), with a local reinforcement.

DEFECT REPORT No: (92)–312: During close inspection of the engine on a Chaser, after carrying out re-timing, it was found that the starting cord had chafed against the fuel-line sufficiently to expose the foundation braid of the tubing. The abrasion was on its underside and had therefore not been observed during normal pre-flight inspections. The tube was replaced.

DEFECT REPORT No: (92)–312 FIRST AMENDMENT: Bill Sherlock, of Cyclone Airsports Ltd, commented on this Defect Report as follows:-

Further to the above Defect Report, we have been aware that the Chaser pull-cord can contact the fuel-line during the starting procedure and, as the fuel-line stiffens with age, the resistance to moving away from the pull-cord will increase and, in consequence, the contact will be firmer.

To date, we have not seen a similar case and, as inspection is
simple, we do not feel action is necessary, other than for us to
circulate information on the problem to owners. We commissioned
Nigel Beale, of Cyclone Hovercraft Ltd, to redesign the Chaser
fuel-system for our own production aircraft. The same problem
cannot arise on the new fuel-system which is fitted to all Chaser
S aircraft sold by us, starting from Serial Number CH829.

W H Sherlock, Director."

**GENERAL NOTE No: (91)-66:** A BMAA Inspector described the problems
involved in meeting the terms of the Service Bulletin CH-006 Issue
3, (General Note No (91)-59), on replacement of the hang-point
bracket on Chasers S.

Cyclone Airsports gave advice on the problems and stated that
they would help directly in difficult cases or as called upon.

**GENERAL NOTE No: (91)-74:** This gave instructions for an urgent
inspection of the wing-keel on all Chaser S machines (up to 1-9-
91). Abrasion could occur where the cross-tubes contact the keel.
If the observed result merited action, specific guidance was
given as to what action should be taken.

**GENERAL NOTE No: (91)-75:** An owner had found a crack in the top-
cap on the king-post of a Chaser S. Therefore a check was
required on all Chasers S with Serial Numbers from CH791 to
CH827.

If cracks were found, the top-cap and all associated cables had
to be replaced.

![Diagram of Chaser S keel](image)

Whilst a Chaser S, with a total of 45 hours logged, was being
checked against the information given in GN-(91)-75, it was found
that the bolt-threads had badly abraded the landing and fore-and-
avt wires.

Needless to say, failure of either flying or ‘landing’ wires
(actually a misnomer) during flight, can mean disaster.

It is believed that the damage was caused because the central
bolt was not fitted carefully into place.

- C3.05 -

**DEFECT REPORT No: (92)-338:** After starting the engine of his
Chaser S from outside the aircraft (standard on Chasers), the
pilot was waiting a few seconds before turning the choke off,
when the screw which retains the fuel-tap lever dropped out,
leaving the lever free to fall into the propeller.

The screw was refitted securely with Loktite applied to it.

**DEFECT REPORT No: (92)-340:** During various preflight inspections
of his Chaser S on the "Round Britain" rally, it appeared to the
pilot that the Nylon-locked nuts which retained the front and
rear flying-wires, near the A-frame corner-joints, were in
slightly different positions.

On checking them, he found that they could be unscrewed with the
fingers with virtually no effort. Having owned the aircraft from
new, the pilot knew that the nuts had never been removed.

Had any of these nuts been lost completely, the stage would have
been set for an in-flight structural failure, with all that that
implies.

Almost certainly, the problem stemmed from a faulty batch of
Nylon-locked nuts; the ones in question had green inserts.

The nuts had to be replaced with new ones which had the usual off-
white inserts.

In 1991, Mainair had a problem with a batch of green-insert
Nylon-locked nuts (GN-(91)-65). In that case, it was only 5/16"
nuts which were found at fault - they stripped their threads easily - and Mainair had to jettison the whole of their stock of that size.

Here, it seemed that a batch of 1/4" nuts of the same general variety had been used: they were equally poor but in a different way.

All owners of microlights were strongly advised to examine their machines to see if they had any green-insert nuts installed. If any were found, they had to be scrapped immediately and replaced with white-insert types.

**DEFECT REPORT No: (92)-352: During routine inspection of the 377 Rotax engine on a Chaser S, both pistons were found to have cracks in their skirts. The aircraft had logged 200 hours of operation.**

The cause of the failure is not known. But because it was similar cracks being found on another engine which alerted the owner to check for like problems on his machine, it might be that a poor batch of pistons were involved.

**DEFECT REPORT No: (92)-367: After 30 hours of operation on a new Chaser S, the wheel on the starboard side of the aircraft broke up on take-off, necessitating a landing on two wheels.**

On removal of the tyre from the other wheel, stress cracks were found all round the inner well.

The manufacturers commented that the wheels supplied on this trike were identical to those fitted to all Chaser S aircraft since 1988. Their experience operating from rough fields had been that, provided the bearings were greased regularly, the wheel-bearings only reached unacceptable wear levels at about 100 hours. They believed that long-distance taxiing on tarmac with dry bearings would cause excessive wear.

They claimed that the incident had been reported to them by telephone. On questioning, the reporter had been unable to state that the aircraft had not had a heavy landing, because other pilots had flown it.

On goodwill grounds, they offered to replace the wheels - which they did immediately - so long as they could have the damaged wheels for examination. After several weeks, they were still waiting.

As the description of the damage was very vague, they surmised the following:

1. The roller-bearing ran dry and accelerated the wear, due to heat destroying the outer bearing-surface.
2. The bearing itself corroded and caused accelerated wear.
3. The wheel was subjected to heavy landing loads.
4. A combination of the above occurred.
5. A thorough pre-flight examination of the wheels had not taken place.

Because this was the first incident of wheel collapse brought to their attention in four years and after many hundreds of operating hours, and they were unable to examine the wheels in question, they could not react further.

But they did advise regular greasing of the bearings and walking-pace taxiing if long taxiway distances needed to be covered.
CHEVRON AIRCRAFT

DEFECT REPORT No: (89)-133: Leaks were found in the fuel-tank system of a Chevron.

Repairs by the manufacturer were the only acceptable ones.

DEFECT REPORT No: (91)-248: On the ground, it was observed that the trailing-edges - between the flaps and ailerons - were compressed along their length.

Two possible causes were suggested: Firstly, that both wings might have struck the hangar doors. This was not a plausible suggestion, since the impact would have needed to be exactly symmetrical and simultaneous (not too plausible). The second suggestion - put forward by the manufacturer after detailed examination of the damage - was that the aircraft had been operated at an airspeed significantly above its stated Vne.

See Figure overleaf.

A repair had to be effected in accordance with a factory-defined scheme.

C4.01

DEFECT REPORT No: (91)-284: The flap-operating lever failed to hold the flap in the UP (zero flap) position. A combination of vibration and a worn mechanism were to blame.

A new mechanism was installed to cure the fault.

DEFECT REPORT No: (91)-287: The column-mounted brake failed during taxiing. The fault was in the lever mechanism, not at the brake end.

It was found that the owner had dismantled the brake-operating unit and had afterwards reassembled it with the piston inserted upside down. This meant that the spring did not seat properly and the pressure pin, which operated the piston from the hand-lever, did not locate as designed. This highlights the foolishness of owners undertaking maintenance work on their aircraft, for which they are not really competent or adequately informed.

C4.02
WRONG!
SPRING TILTS
AND SCAFFLES CYLINDER,
PINS SLIDED
to SIDE OF REEFS AND
GIVES LARGE FORCES ON LEVER FULCRUM,
POOR THRUST ON PISTOL.

CORRECT
PIN PROPERLY CENTERED IN CONE,
SPRING CAPTURED IN REEFS.
DEFECT REPORT No 019: The small drive-belt pulley on the engine reduction slid forward, shedding three out of the four belts and abrading the propeller.

A means of locking the pulley in place was the required remedy. The SMAA Technical Office can advise.

DEFECT REPORT No 029: On the Cuyuna 430 of a Quicksilver, the propeller-driveshaft failed in fatigue, where the cross-bolt passed through it at the engine-coupling end. The shaft was retained by the clamping action of the split coupling, and this hid the fracture, possibly for some time.

A new factory-made component was required.

The factory ‘lifed’ the components at 400 hours.
DEFECT REPORT: The propeller-boss, on some machines, had flanges which were only 5 mm thick. They should have been 15 mm thick.

If the thin flanges were found on the boss, they had to be replaced with the thicker version, before further flight was attempted.

DEFECT REPORT No: (91)-257: The cables inside the wing, which lock up the compression struts and brace the entire wing, had become dangerously slack. Bolts which acted as pivots for the folding mechanism were also installed with their heads hanging downwards. Had a nut been lost, the bolt would simply have dropped out and a structural collapse would have followed.

The cables were all replaced and the bolts correctly installed. Interestingly, after the wing was correctly assembled and braced,
DEFECT REPORT: Problems were experienced when the fan-belt slipped, giving inadequate cooling-air to the engine. Under these conditions, the engine overheated badly and the pistons could melt.

DEFECT REPORT: Clevis pins were used which had their holes drilled much too near to their ends. At high loads, or with the extra wear associated with age, they could have pulled out.

\[
\begin{align*}
\text{Recommended Values} \\
D_{\text{max}} &= \frac{D}{3} \\
D_{\text{min}} &= \frac{3}{4} d
\end{align*}
\]

its planform was noticeably different and, more importantly, the aircraft's climb-rate had increased because of the better maintenance of wing-section, etc.
FILTERS

DEFECT REPORT No 018: The paper element in a fuel filter began to disintegrate after about 10 hours, blocking the fuel system. There have been a significant number of reports of this problem.

A filter with a stainless-steel element was fitted, as one solution to the problem.

DEFECT REPORT No 051: The O-ring seal in an Aerotech filter-unit distended to the point of being unfixable and black paint was also leached from the inside of the bowl.

A seal of cork-rubber or Viton was the cure but the paint, if found to be present, either had to be carefully removed or the filter-unit rejected.

DEFECT REPORT No 075: The filter element in the Cooper unit on a Pegasus XI, had been installed upside down. This led to fuel starvation.

The filter needed to be installed properly!

DEFECT REPORT: The in-line fuel-filter on a Thruster became blocked, to an extent that the hand primer-bulb had to be used to get the aircraft down safely.

It was later established that - with any water present - the detergent additive in certain oils could generate a colloidal precipitate. This slimy material could easily block a filter element. When dry, however, it almost disappeared as is common with gel-like substances.

The obvious pointer is to the danger inherent in leaving a fuel-tank half-full during storage. Either fill the tank or, if long storage is intended, drain it completely.

There has been an extremely large number of reports of this problem, right up to the present time.

DEFECT REPORT: On the Raven and Sprint, a diesel-type filter was used. As stated in several other Defect Reports, like the above, the owner found an emulsion forming and blocking the element. In cold weather, when the emulsion was particularly viscous, the fuel-feed to the engine was inadequate and power-output suffered.

Follow the advice given above, about totally filling or draining your tank. Also, if you have a water-drain on your fuel system, use it regularly and carefully.

DEFECT REPORT No (90)-242: In flight on a Mainair Flash 2A, the engine RPM fell from 6000 to 5000. A precautionary landing was made and the fuel-level in the carburettor was found to be low. The filter was cleaned and a full-power run-up was satisfactory. At 150 feet in the next attempt at flight, the engine failed and, after another safe landing, a low fuel-level was again found. No cause was identified. Five minutes later, in another attempt, the engine failed again and all flying was abandoned.

No certain cause was identified but the following were mooted: Carburettor icing may have been occurring. The pilot wondered if the filter may have been blocking due to the synthetic oil thickening out in the fuel. To avoid that possibility, he was considering moving the filter closer to the carburettor to obtain a measure of heat from the engine.

But another possible, and very much more likely, cause exists: The blockage could have been due to the gel-like material which comes out of fuel which contains traces of water and oil which bear emulsifying agents, as discussed above.

Immediately prior to publication of this document, another possibility for the cause of the 'gel' has emerged. In-flight refuelling specialists have told the author of microbiological growths in water-fuel mixtures. These microbes were described as liking to grow "with their heads in the fuel and their feet in the water". This is somewhat picturesque but it means that the peculiarities of the bugs is that they will not grow in either medium on its own; both must be present.

DEFECT REPORT No: (91)-286: The locking wire on the air-filter of the Rotax 447 on a Raven was cutting its way through the end rings. In time, the filter would have been able to fall free and enter the propeller-disc.

- F1.01 -

Thicker wire, less tensioned and installed through new holes, was the cure. - F1.02 -
TECH TOPICS: The paper element in the 'Moprod' filter (on a Pegasus Flash 2) was found to be rotating inside the casing. The element had become detached from the end-plate of the unit, making the filter almost totally ineffective.

The filter - common to many types of machine - had to be replaced.

DEFECT REPORT No: (92)-342: The level in the fuel filter on a Pegasus XL was found to be only about one quarter of full.

A full-power run of two minutes duration achieved no change in the level in the filter. The engine temperature was normal.

(The filter was of the right-angled type. (Moprod? PCL)

No proven cause was found, except that the filter simply refused to fill properly. A new Rotax fuel-filter was installed and it filled completely, almost instantly.
FLEXIFORM-SKYSAILS AIRCRAFT; DUAL AND SOLO STRIKERS, SEALANDERS.

DEFECT REPORT No 004: Compressive failure occurred at the inboard section of the leading-edge on an early Solo Striker wing.

The required rectification was devised by David Simpson and agreed with the CAA. The information is available from him or from the BMAA Technical Office.

DEFECT REPORT No 006: Further failures occurred on an early Solo Striker wing-structure during ground-testing.

Again, the appropriate rectification was as spelled out by David Simpson.

DEFECT REPORT No 012: On an old Striker wing, the centre tailboom leach-line failed during ground inspection.

The webbing loop needed to be remade as recommended by the original manufacturer. The BMAA Technical Office can advise.

DEFECT REPORT No 024: Structural failure happened with a Solo Striker, during flight.

Mandatory modifications were agreed with the CAA. Some information is given below and further details can again be obtained from David Simpson for ALL Strikers and Sealanders. The BMAA Technical Office can also advise.

DEFECT REPORT No (89)-128: On a dual Striker, the hang-bracket was found to be cracked.

Inadequate radii were found in the shaping of the bracket.

DEFECT REPORT: The wing-tip battens were located on steel pegs which were pop-rivetted to the leading edge. These pegs could become loose. Also, the related pop-rivets were made from aluminium and they needed to be replaced with steel rivets.

DEFECT REPORT: The outboard, batten-retaining Velcro's often scraped along the ground during careless handling. They had to be carefully checked for wear and, if any were found, they either had to be replaced or lined with other material, at the point of contact.

DEFECT REPORT: On Solo Strikers and Solo Sealanders, the CAA required Mandatory Modifications to be carried out. Unless these modifications were done, and properly signed off, these machines could not be flown.

It was required that internal sleeves of 1 inch outside-diameter by 16 swg HT-30-TF tubing, or external sleeves of 1 1/4 inch outside-diameter by 17 swg HT-30-TF tubing, be installed in or on the down-tubes of the control-frame. They were to be the same full length as the down tubes.

It was also required that the bowsprit be extended to a length of 50 inches. This was to be constructed from a single, unsleeved length of 1 7/8 inch outside-diameter by 17 swg, HT-30-TF, seamless drawn tubing.

The rear (inner) bowsprit-to-leading edge rigging was 3 mm diameter cable (to BS W12 or W13), which was kept at the same length and in the same location as the original.

New front (outer) bowsprit-to-leading edge cables were needed. They were also 3 mm diameter. Turnbuckles of a rating of at least 450 kg (10 cwt) could be incorporated in these cables.

If the pulley was incorporated in the old bowsprit, it had to be replaced by a 5/16 inch diameter bolt (to BS 1768, 1083 or 2A 25), on to which both front bowsprit-cables were individually anchored.

The top front-to-rear cabling had to be extended - in wire which was at least 2.5 mm diameter - to the tip of the bowsprit (again, using cable to BS W12 or W13).

The control-frame-to-bowsprit rigging had to be extended to the tip of the new bowsprit (with BS W12 or W13 cable).

New rigging (W12 or W13) had to be added to run from the control-frame to the nose-plate. (Separate cables to each nose-plate leading-edge bolt provided a gap for the top of the control-frame when rigging, but any position on the nose-plate was acceptable. The leading-edges could also be reinforced with sleeves but this was not mandatory.

DEFECT REPORT No (89)-138: The back-up loop of cable, which was covered in rubber, jammed in the king-post bracket and locked the pitch-control of a Trifyler/Dual Striker. It freed itself just in time to allow a safe landing! It was a non-standard cable installation.

The accepted version of the cable system was installed and no further trouble was encountered.

DEFECT REPORT No: (91)-247: During the take-off roll, the radius arm tore away from the keel attachment. The aircraft was seriously damaged.

The arm had been getting progressively more and more worn and this had not been picked up during pre-flight inspections.

See Figure below.
DEFECT REPORT No: (91)-267: In flight, three of the four studs which held down the rear cylinder on the Fuji Robin 330, failed flush with the top of the crankcase. The studs had probably not been checked for tightness since the aircraft was bought, because they were obscured by the cooling shroud.

All owners were advised to check the torque on these studs on their engines.

DEFECT REPORT No: (91)-278: The original 'coat-hook' clip, used to hold the end of the tip-tube, failed in flight.

The owner devised some smart machined, plastic housings which provided a much more positive and robust grip for the two tip-struts.

See Figure below.
FUJI ROBIN ENGINES

DEFECT REPORT: The copper cores of the ignition wiring were sometimes found to have work-hardened and broken, under the combination of flexing and vibration.

New cabling was needed.

DEFECT REPORT: The use of incorrect spark-plugs resulted in overheating of the engine.

Normally, only the spark-plugs specified by the manufacturer of the engine should ever be used on a microlight aircraft.

DEFECT REPORT No 001: This related to failures of crankshafts on the "Lightweight" Robin 440. Over 50% of the engines known to the BMAA, had had such breakages.

BMAA Inspectors were instructed not to examine or sign off any machine with this engine. This mandate still stands.

Replacement, (stronger) shafts and seals, etc., became available later from main agents.

DEFECT REPORT No 003: This was a further report of crankshaft failure (see 001 above).

DEFECT REPORT No 014: Part of the thin (metal) engine covers, adjacent to the flywheel casing on a Robin 440, fractured and struck the spinning propeller. Cracking was observed on four other aircraft.

Factory replacement was the only course.

DEFECT REPORT No 015: The HT-lead retention-clip on a Fuji Robin had been over-crimped and had bitten through the ignition cable. (See Defect Report No: (90)-201 below).

New cable was needed, installed with care to ensure that the clip was not again cutting into it after completion.

DEFECT REPORT No 021: The crankshaft broke on a Robin 440 "Heavy" standard engine. The break was close to the big-end crankpin hole. Machining may have removed the corner-radius, allowing cracking to begin and then propagate.

A new shaft was required.

DEFECT REPORT No 062: After a Robin engine misfired badly, the pump diaphragm was found to be split. (See Defect Report No 105 below).

Replacement was - as in every case like this - the only cure.

DEFECT REPORT No 105: The Fuji Robin 330 on a Tripacer abruptly started to misfire.

The fault was traced to a failure of the diaphragm in the Mikuni fuel-pump.

DEFECT REPORT No (89)-122: The Robin EC25PS engine on a Triflyer stopped in flight.

A faulty ignition-capacitor was found to be the cause.

DEFECT REPORT No (89)-164: In flight, the engine of a Hybred XL faded.

The engine had the wrong plugs installed, along with the wrong size of jets.

The engine-manufacturer's specifications for such items must be followed.

DEFECT REPORT No (90)-199: The rear cylinder of a Fuji Robin EC44 PH on a Panther XL lost compression in flight. The cause was later found to be due to a holed piston. Fibrous material was blocking the rear carburettor; it was believed to have come from disintegration of the fuel-filter element.

A filter with a stainless-steel element was the recommended cure, after repair of the engine.

DEFECT REPORT No (90)-201: Two, quite separate, failures occurred on Fuji Robin 34-PL 333 cc engines, at the coil-ignition wiring. After 375 hours, the earth-return wire fractured inside the plastic sheathing, where it was gripped under the clip.

After another 100 hours of operation, the wire from the live terminal fractured just where it emerged from the supporting 'blob' of plastic material.

Both were repaired after their nature and location were determined with an Avo-style instrument, by simply applying normal electrical-repair techniques.

DEFECT REPORT No (90)-209: After tensioning the reduction-belt on the Fuji Robin EC-44 of a Puma Sprint, the engine was then run. After switching off, the belt was found to be slack! It was found that three out of four support-studs - securing the gear to the engine - were broken.

Simple studding (with cut, not rolled, thread) had been used and collars had been brazed to it. Fatigue due to vibration, and/or corrosion probably contributed to the failures.

New studs were made, (hopefully from rolled-thread material).
DEFECT REPORT No (90)-216: During flight, the propeller-shaft snapped on the reduction-gear attached to the Fuji Robin EC-44-PM of a Shadow. A safe landing was carried out.

This was one of only two Shadows ever built with this Fuji engine. Since the aircraft and power-plant were rather old, the failure could have been due to fatigue from an unbalanced propeller, for example. The second machine was not affected.

DEFECT REPORT: A detailed report on the sequence of events which happened with a Southdown Sprint, with 440 Robin engine, went as follows:

1. The filter sponge and its coiled-wire insert came off the air-box.
2. The filter struck the propeller.
3. The propeller broke.
4. Part of the propeller went through the wing-fabric, causing a 3 foot (900 mm) tear in the trailing edge.
5. Vibration began to occur.
6. The reduction-drive struck the fuel-tank.
7. The reduction-drive began to break up.
8. The fuel-tank was ruptured and began to leak.

DEFECT REPORT No (90)-225: Whilst a 440-powered Hybred XL was in flight, the engine misfired and lost power.

The coil-wire had detached itself from inside its connector.

An exhaust-spring also broke in flight: it lacked any safety-wire and passed through the propeller-disc.

DEFECT REPORT No (90)-226: The 330 engine failed in flight and was later found to have a hole on front piston.

Debris in the feed to the front carburettor was thought to be the cause.

DEFECT REPORT: On a Tiger Cub, the 440 engine overheated badly and holed its pistons. The failures occurred at 14 hours and then after another 12 hours.

The problem was put down to the faulty construction of the exhaust system. The latter had a diffuser cone welded to the stinger pipe, in such a way as to reduce the inside diameter from a minimum of 28 mm to 25 mm (a 25% reduction in area).

Betacraft recommended cutting away the tube and replacing it with a 30 mm inside diameter tube, rewelded correctly with a new muffler box which they were able to supply.

DEFECT REPORT: Two 440 engines suffered recurrent burned-out pistons. The cause was finally identified as being due to leaking crankcase seals. During the vacuum part of the rotational cycle, air leaked in and weakened the fuel mixture, causing the overheating which melted the pistons.

Since the seals were inexpensive (which the rebuilds were not!), they should have been replaced every time the crankcase was worked upon, during engine stripping.

DEFECT REPORT No (90)-235: Whilst servicing the Robin 440 power-plant on a Pegasus XL, the Wicklow exhaust-manifold was found to have been repaired by amateurish welding (which had not been recorded in the Airframe and Engine log-book). The standard of this welding was appalling, with over-run fillets and severe splatter round the engine flange. Close examination and dye-penetrant testing revealed a crack of about 2 1/4" (57 mm) length round one flange and a crack about 1 1/2" (38 mm) round the other.

It was not thought that the manufacturer of the aircraft had any involvement in this welding.

The cracking was probably due to a combination of poor welding and the usual vibration to be found on any microlight aircraft. A new factory-supplied component had to be installed.

DEFECT REPORT No (90)-244: During the take-off roll on the third of three check-circuits on a Mainsair Flash 1, powered with a Fuji Robin 440, the engine suddenly raced. Power was immediately reduced. Inspection of the engine showed that the main pulley and propeller-flange unit had broken apart, leaving the propeller to rotate freely.

The casting had fractured at the pulley end, not at the propeller end as has been observed on previous occasions. The break was at
the centre of the large tooted pulley.

A slightly different 'feel' had been noticed during pre-flight inspection but, with no cracks visible on closer scrutiny, had been attributed to the flexibility of the engine mountings.

A second problem occurred with this aircraft a few days later. After an engine failure, a safe landing was made and it was subsequently found that a piece of a piston had broken away.

The machine had logged about 220 hours in total.

The cause of the broken propeller-hub unit was not definitely identified, but that for the broken piston was. The small locator, which prevents the piston-ring from rotating, had come adrift and the ring had moved until it jammed in the exhaust-port and broke the piston. One of the rings in the other piston was showing signs of doing exactly the same thing.

The hub-unit was replaced with a factory-supplied item and, in all subsequent preflight inspections, any unusual 'feel' would always be assumed to mean danger, since both ends of this type of hub had now been known to fail in a similar way.

The reporter of these defects went on to suggest that more frequent 'decokes' would afford the opportunity to examine the security of the ring-locators.

DEFEKT REPORT No: (91)-249: On the Fuji EC44PM engine of a Panther XL-S, the front spark-plug blew out during flight. The owner had made a practice of removing the plugs before a day's flying to wash off the drained oil. The threads in the cylinder-head therefore became dangerously worn.

A repair was made with a 'Helicoil' insert.

DEFEKT REPORT No: (91)-271 On a Panther XL with a Fuji Robin 440, a loud bang was heard in flight, followed by an increase in engine RPM and total loss of thrust.

After a safe landing, it was found that the drive belt had vanished and the propeller had been split during the belt's departure. No fault with the belt was seen during the preflight inspection.

DEFEKT REPORT No: (91)-267: In flight, three of the four studs which held down the rear cylinder on the Fuji Robin 330, failed flush with the top of the crankcase. The studs were probably not checked for tightness since the aircraft was bought, because they were obscured by the cooling shroud.

All owners were advised to check the torque on these studs on their engines.

DEFEKT REPORT No: 91-277: The Nicklow exhaust on a Hybred XL trike (Fuji Robin EC44PM) had been secured with a single 'cotton reel' isolation mount, which allowed the whole exhaust system to oscillate back and forth. Had the exhaust broken free, it would inevitably have passed through the propeller.

Better mountings and safety-wire were called for.

DEFEKT REPORT No: (91)-280: During a dual lesson, the power from the Fuji Robin 440 on a Puma Sprint began to fluctuate. Finally, the engine stopped in flight.

The owner had substituted a non-vented cap for a vented version on the fuel-tank and the vacuum created finally stopped the fuel feed to the engine.

DEFEKT REPORT No: (92)-353: During ground running, the carburettor fell off the rear cylinder of the Fuji Robin 440 on a Puma Sprint and struck the propeller.

A third of one blade broke off and passed through the new sail.

DEFEKT REPORT No (92)-363: Following a full-power climb to 2500 feet in a Mainair Gemini Sprint with Robin 440 engine, a loud bang was heard and very severe vibration ensued. The engine was switched off and an uneventful forced landing was made. The logged engine hours were 219.

It was found that the end-stub outlet-pipe from the silencer had fatigued and broken free, smashing into the propeller as it departed.

A new silencer was fitted and a safety wire was installed, securing the stub to the silencer.

With four hours logged on the new silencer, preflight inspection revealed that one of the manifold springs was broken at the acute bend where the hook is formed. The safety wire had also broken.

Mainair supplied a new spring free of charge, and very quickly, and advised that at least two loops of wire with 1/2 inch (12 mm) of slack should be used. (Mr Epps had used one loop and 1/4 inch (6 mm) of slack, as fitted to the original).
GENERAL ITEMS

DEFECT REPORT No 023: An axle-stub snapped during take-off.

An owner had lengthened the axles by sleeving them with alloy tubes and allowing plastic wheel-hubs to abrade them.

Solid stubs of steel or high-strength alloy, plus careful and regular inspection, were required.

DEFECT REPORT No 026: On a Fuji Robin 330 engine:

(i) A hole blew in the piston during flight on a humid day.

The wrong spark-plugs and weak mixture were in use.

(ii) The engine was misfiring.

The ignition wiring had work-hardened and was failing.

DEFECT REPORT No 030: The connector for the fuel-pump pulse-pipe snapped off during installation.

The item was identified as part of a faulty batch. The fitting was pressed into its locating hole in the crankcase and the surrounding metal was then peened into a groove cut round the wall of the tube, to grip it. This groove had been machined too deeply into the tube, and the remaining metal had been too weak.

New fittings were installed, using Lektite 648, and without the need for peening and grooving.

DEFECT REPORT No 036: The 'spokes' of the large reduction-gear pulley broke. The shaft was also found to be worn in its bearings.

New parts were fitted. (Corrosion was suspected of contributing to the failure).

DEFECT REPORT No 043: A parachute deployed in flight. The retaining bands and straps were found to have degraded and failed.

Regular replacement and careful monitoring was needed. However, the installation of the parachute system was not an approved modification, anyway.

DEFECT REPORT No 044: Stainless-steel cables were found fitted with aluminium ferrules.

Copper ferrules must be used; aluminium ferrules are for use on carbon-steel cables.

DEFECT REPORT No 058: The primer-bulb of the fuel-line 'perished' with age, allowing air to enter the line. Such rubber devices need to be carefully checked for the almost inevitable degradation.

DEFECT REPORT No 068: The plastic rim became detached from the fuel cap. It could easily have entered the spinning propeller.

Use of the locking key would have avoided the wear which led to the rim detaching. But this was not a good cap design for microlight use, anyway.

DEFECT REPORT No 086: Cables were made up for a microlight by a boat-yard. The ferrules had seriously damaged the cables by being grossly mis-set. Nor was it certain that they were ever the correct ferrules for the cables in question.

Cables must be made up by professional specialists who have the necessary skills, equipment and verification gauges, etc.

Such cables can usually be obtained with a Certificate of Conformity, if requested.

DEFECT REPORT No 100: The Jubilee clip at the top of the fuel-pump broke beneath the clamping screw.

A new clip was fitted and monitored carefully thereafter.

DEFECT REPORT No 89-173: Damage to sheathed cables led to the ingress of water beneath the PVC coating. This led directly to corrosion.

Careful scrutiny of sheathed cables for damage, was always necessary.

DEFECT REPORT No 90-223: This report concerned an instance where, when the owner turned over the propeller of his machine with the ignition switch in the 'off' position, during routine care and maintenance, the engine burst into life and he narrowly missed a serious injury.

One Inspector, who had experienced a somewhat similar failure, commented as follows:

My problem was a high-resistance contact inside the switch, presumably due to a damp atmosphere and relatively little use. Most switches rely on a measure of 'wipe' to keep the contacts clean and connecting, so operating them a few times before each flight must help.

I always now install a heavy-duty double-pole switch, wiring both contacts in parallel, thus considerably increasing the likelihood of a good short-circuit each time the switch is turned 'off'.
A very suitable switch is:

10 ampere Toggle Switch, Double-pole, single-throw, ON-OFF.

Ordering Code: JK 26D "10A TgPST" from:-

Maplin Electronics PLC, PO Box 3, Rayleigh, Essex, SS6 8LR

Maplin give the detailed specification of the switch as follows:

- 10A 250V AC: 15A 125V AC
- Contact Resistance: 50 milliohm.
- Insulation Resistance: 100 Megohm
- Life: 50,000 make/break at full load
- Body size: 32.5 x 19.5 x 20 mm
- Panel cut-out: 12.7 mm diameter.

The Chief Inspector totally endorsed the use of double-pole, heavy-duty switches to control the ignition on microlight aircraft. He declared this small modification to be acceptable, because it came under the "Category 2" specified in the BMAA Inspectors' General Note ON-(90)-42 of 4 November 1990. It was an item which could readily be obtained from sources other than the manufacturer of the aircraft to which it was fitted. It was almost certain not to be a component which had been specifically manufactured for a given microlight manufacturer. (Switches are usually made in very large quantities).

What is obligatory is that the installation of any replacement switch is properly carried out and checked by a BMAA Inspector before the aircraft was flown. Arguably, the majority of people cannot make satisfactory soldered joints.

DEFECT REPORT No: (91)-281: During inspections, the seat-belts on two machines were found to be incapable of sustaining a tensile load.

It was found that both belts had been assembled incorrectly, with the load-bearing section (in direct tension) on the outside of the buckle, instead of inside, with the free end wrapped back on the outside.

GENERAL NOTE No: (91)-65: Reports were received of 5/16" Nylon-locked nuts stripping their threads out, under low torques. The nuts were characterised by the Nylon being dark green.

Comparative hardness values were obtained for standard Simmonds nuts and the failing nuts. They were 258HV30 and 146HV30, showing almost a 2:1 ratio in hardness, a good indicator of the general quality of the nuts.

GENERAL NOTE No: (91)-71: This note showed a picture of 6.5kg of unapproved junk, removed from a previously Permitted XL, brought to Solar Wings for its annual Renewal.

GENERAL NOTE No: (91)-79: The continued failure of Nylite wheels was discussed. This is an ongoing problem which has persisted since they were first used on light aircraft in the late 1960s.

Some possible methods to reduce their fallibility were described. Sketches showing techniques for the preparation of special washers, etc., are shown in the Figure overleaf.
GENERAL NOTE No: (91)-88: This note again referred to solving the problems with Nylite wheels, specifically by substitution of a type of wheel which had been thought to be an acceptable alternative to them. However, it had since become apparent that it was not a suitable choice.

- G1.05 -

GENERAL NOTE Gn-(91)-92: INSPECTION AND TESTING OF SAIL FABRIC.

At the October '91 Inspectors' seminar, John Tevers again brought up the excellent concept of adding a sacrificial strip to each new wing cover, so that small pieces could be removed annually and a tensile test conducted on them. It was suggested that manufacturers would go along with this but, first, they had to know that a suitable testing service was available.

Mike Rudd said he would be able to operate such a service at some reasonable charge but needed to establish some standards for fabric strengths at various stages of exposure to the elements. He called for samples of Dacron, which had been subjected to exposure to the weather, so that he could test and categorise them against that known exposure.

It was asked that the samples be sent to M Rudd, K T Alloys, Astral House, Byron Rd, Weybridge Trading Estate, Addlestone, Surrey, KT15 25s.

Typically, his tests showed that some 3 1/2 oz Dacron, about 8 years old, had failed from a 'new' strength of 216 lb per inch of width to 102 lb per inch width, almost exactly a 50% drop.

On some other samples of Dacron, some new and some exposed to the weather for many months, the results were astonishingly constant for each group. The new material gave strengths - per inch of width - of 176, 174 and 175 lb, whilst the weathered and bleached material gave 38, 37 and 37 lb. At roughly 25% of new strength, even the old Dacron was not going to drop the pilot out of the sky, even if it did need replacement.

GENERAL NOTE Gn-(91)-114 FLEX-WING HANDLING CHARACTERISTICS; UNDER-SURFACE TENSION AT WING-TIPS

Dr Bill Brooks, of Solar Wings, wrote a report in which he discussed the following aspects of flex-wing flight stability.

When flying at fairly high speed and low incidence, one wing-tip can be sucked down, resulting in an unintentional and quite powerful bank. This can be opposite to the control input made by the pilot and therefore promotes the onset of a series of alternating roll manoeuvres. This effect has been experienced during the development of designs and during the investigation of higher-speed flight on certain existing wings.

The higher the speed, the more is the potential for this effect to occur.

Research and experiment showed that the effect can be cured, or moved out of the aircraft's speed-range, by tightening the wing-tip undersurface cords.

- G1.06 -
A control roll will lift into a sort of 'super pitch' and cannot continue in sequence, giving a powerful low incidence. Only if the pilot feels confident, and the air is slow and an aileron lock can be set, can this be tried.

In part, the expansion of a power pitch over a risky accentuates.

In part 2, the pilot feels confident enough to make the more under-critical patterns also rectify the problem but make the tilt more.

In part 3, the pilot feels confident enough to make the tilt more.
GENERAL NOTE GN-(92)-115: Gerry Breen and Kelvin Wilson reported that they had found over ten locations on Pegasus machines, where bolts of the wrong grip-length have been used. This meant that loads had to be carried on the threaded portions of the bolts, which was, and is, very poor engineering practice.

Rear and side flying-wires on the XL are two regular examples.

GENERAL NOTE GN-(92)-119: AN INSPECTOR’S FINDINGS DURING A ‘GENERAL CHECK’. A Pegasus Q was brought for general checking by a BMAA Inspector, after ‘falling off its trailer’, when it reportedly broke its propeller and bent a spat.

The log-book showed that rebuilding work had been undertaken after a crash and the engine had been changed. The log-book also showed that the engine and airframe were supposed to have done 75 hours.

During the inspection of the trike, the top bolt which attaches the front strut to the monopole was found to be bent by about 10°. Both sets of spat-brackets had been distorted and one was actually torn. The bolts which hold the connecting stub-axles and side-wires were corroded and bent.

The lower engine-mount showed clear evidence of being crudely re-aligned with a bar and/or a hammer and the engine-mounting plate was warped, either from the same root-cause or the ensuing brutality.

A 50-hour check revealed that the engine had done at least 150 hours and was a old-type engine.

The HT leads and spark-plugs were not Rotax standard.

A primer (from Rotax but not Section S) had been fitted with a vulnerable thin-walled tube (‘beer-hose’) to the dashboard. A regulator had also been installed but neither items were entered in the Air-frame and Engine log-book.

Inspection of the wing showed that it had been back to Solar Wings and replacement parts had been fitted and signed off. Yet the outboard section of the port-wing leading-edge was installed 180° out of position, a silly mistake which they would never have made.

The ball-race at the outer tip was minus the thrust-washers which were found stuck by corrosion to the leading-edge.

The Solar-Wings Mandatory modification, requiring a sacrificial tape to be fitted to the trailing-edge of the sail at the fin - to prevent the fin-tube from damaging the sail-stitching - had been fitted to the actual fin-tube, thus making the problem worse.

There seemed little doubt that this machine had sustained all this unlogged damage after it had been serviced by the manufacturer.

DEFECT REPORT No: (92)-319: On returning from the “Round Britain”, the owner found that the fuel primer-bulb had been removed from his Chaser S whilst it was in the hangar. (The CPI admitted that he had authorised someone to remove it to get another aircraft flying).

When the owner attempted to fit a new one, he found part of the bulb-outlet broken off in the fuel-pipe, presumably due to a haphazard effort to remove the old one.

This, in itself, was dire enough but, had the person decided to give up and put the clips back, the owner would never have known that the primer-bulb now had only the tiniest of holes through which to supply fuel. An engine failure would have been almost a foregone conclusion.

DEFECT REPORT No: (92)-340: During various preflight inspections of his Chaser S on the “Round Britain” rally, it appeared to the pilot that the Nylon-locked nuts which retained the front and rear flying wires, near the A-frame corner-joints, were in a slightly different position.

On checking them, it was found that they could be unscrewed with the fingers, with virtually no effort. Having owned the aircraft from new, the pilot knew that the nuts had never been removed.

Had any of these nuts been lost completely, the stage would have been set for an in-flight structural failure, with all that that implies.

Almost certainly, the problem stemmed from a faulty batch of Nylon-locked nuts. The ones in question had green inserts.

The nuts had to be replaced with new ones with standard off-white inserts.

In 1991, Mainair had a problem with a batch of green-insert Nylon-locked nuts (GN-(91)-65). In that case, it was 5/16" nuts which were at fault - they stripped their threads easily and Mainair had to jettison the whole of their stock of that size.

Here, it would seem that was a batch of 1/4" nuts of the same variety which were equally poor but in a different mode.

All owners of microlights were strongly advised to examine their machines to see if they had any green-insert Nylon-locked nuts installed. If they found any, they needed to be scrapped and replaced with white-insert types.
DEFECT REPORT No: (92)-343: In flight on a Medway Hybred "XL", the locking-wire for the air-cleaner retaining-ring broke and the air cleaner unscrewed due to normal engine vibration. When it detached, it hit the propeller, breaking one blade in half. The consequent fierce vibration caused the locking wires on the exhaust-manifold joint to break and the joint sprang apart.

A successful forced landing was achieved.

The wires were all stainless-steel. The remaining wires were found to be extremely brittle.

(These was a classic case of work-hardening, to which stainless-steel is liable. FCL).

Apart from installing new factory-supplied components as required, the owner proposed to replace the stainless-steel locking wires at every 50 hours; this was a very wise move.

GENERAL NOTE GN-(92)-129: Owners of Puma Sprints were informed that, once their aircraft has passed either the 5-year mark or has been operated for more than 750 hours, whichever it reaches the sooner, significant replacements must be made to the airframe. These include the monopole, the hang-plates, the hang-bolt, rigging wires and associated nuts and bolts.

The CAA have since agreed to these components on these aircraft, and on Ravens and Ravens X, being examined in detail according to a BMAA "On-condition Inspection Schedule" and, if found satisfactory, being allowed to continue in use.

GENERAL NOTE GN-(92)-131: Discussions between the BMAA and one of our leading manufacturers highlighted a vital point about rigging information recorded in the Airframe and Engine logbook or, rather, in many instances, the lack of it.

When any new aircraft leaves the manufacturer or the approved agent, as the case may be, it will be rigged and tuned as they intend, so that it yields the designed performance and handling characteristics, with the highest safety standards.

It is most important that details of that rigging are recorded exactly in the Airframe and Engine log-book. Commonly, one may expect to find that most features are at neutral but this is not inevitably so. Factors such as engine torque with specific propellers may, for instance, have to be taken into consideration.

As the aircraft ages, is repaired, or extra equipment is added, or if a minor crash has occurred and a total strip-down been executed, it is entirely possible for some slightly revised tuning to be needed. On a Mainair machine, for example, one could easily visualise one tip-stick being set at a slightly different angle to the other.

Whether the factory, their agent or the BMAA check-pilot find it necessary to do this, IT MUST BE ACCURATELY RECORDED IN THE AIRFRAME AND ENGINE LOGBOOK. That is the only reliable reference for the owner, or any subsequent owner, whereby he or she can ensure that the aircraft goes on being rigged for best and safest overall performance.

DEFECT REPORT No: (92)-360 Out of ten aircraft which were checked as to the condition of their Nylite wheels, four were found to have cracks in those wheels. These cracks could only be found if the wheels were cleaned and very closely scrutinised.

Of the four failures, two sets were on old aircraft and the characteristic yellowing of the Nylion was visible.

DEFECT REPORT No (92)-366: After a few weeks of operation of a new Spectrum, it seemed to be wobbling on its main-wheels during take-off runs. Examination revealed that the tyres had severe casing separation.

It was found that they were clearly marked on their side-walls, "Do not exceed 7 miles per hour". They had to be replaced immediately with suitable types of tyre.
GOLDWING AIRCRAFT

DEFECT REPORT: The bearing spacer, on the Huntair reduction-gear, was made from material which was too soft and 'flowed' out of shape. This allowed the propeller-shaft system to become loose.

The spacer had to be replaced with a hard aluminium-alloy (or steel) spacer, which adequately held the two bearings correctly in relation to one another.

DEFECT REPORT: The slots ahead of the spoilers were of insufficient width to allow proper and free movement of these control-surfaces.

The slots had to be carefully widened.

DEFECT REPORT: Owners were known to have attempted to 'improve' the undercarriage system on some of these machines, sometimes with disastrous results. Stub axles, for example, were occasionally made from the wrong material and to incorrect dimensions.

Any unusual undercarriage arrangement had to be carefully vetted by a competent engineer, before the machine could be signed off as airworthy by a BMAA Inspector.

DEFECT REPORT No 022: The spoiler cables were found to be corroded.

After replacement, the cables needed careful lubrication to inhibit corrosion, along with frequent and detailed examination.

DEFECT REPORT No (89)-158: Aileron cables, inside the fuselage of a Goldwing with a central control column, were found to be corroded.

New cables were needed and regular inspection had to follow.
HALFPINT AIRCRAFT (MEDWAY MICROLIGHTS)

DEFECT REPORT No (89)-140: The engine-bearer plate on a Medway Half-Pint was extensively cracked. The cracks emanated from the large fixing-bolt holes.

A stainless-steel plate was supplied by the factory and fitted.

98-28
HIWAY AIRCRAFT, (SUPER SCORPION 1 AND 2, SKYTRIKES, DEMONS).

DEFECT REPORT: Early Valmet-160 powered trikes had aluminium fuel-tanks with welded-on support-ears, which cracked as the structure flexed during taying, for example.

DEFECT REPORT: Early Valmet-160 powered versions had separate steel bearing-housings bolted to their axle-ends. No spacer was fitted between the bearings to keep the bearings locked to the shaft. As a result, the right-hand wheel tended to tighten its bearing and seize up on the shaft, causing slipping between the aluminium stub-axle and the wheel. The left-hand stub-axle tended to loosen and fall out.

DEFECT REPORT: On the Skytrike Mk 2, with the 250 Fuji Robin, the top seat-support was prone to bending.

The items concerned needed to be replaced with tubes and over-sleeves, rather than tubes and internal steel rods.

DEFECT REPORT: On the Skytrike Mk 2, the holes for the two pippins, which secured the seat supports to the frame uprights, tended to become enlarged under vibration. The pins could fall out. (See also Defect Report No: 002).

The only real cure was to install bolts, washers and Nyloc nuts in place of the pippins.

DEFECT REPORT: On the Skytrike Mk 2, the exhaust tended to crack at the welds round the cylinder exhaust-port stubs. The retention springs and their lugs also tended to fail.

It was acceptable for the cracks and the lugs to be repaired by welding and the springs could easily be replaced.

DEFECT REPORT: The resilient mouldings, which joined the carburettors to the cylinder-flanges, tended to split. In the extreme, this could allow the carburettors to fall off. Careful monitoring was required, along with the installation of a retaining safety-wire.

DEFECT REPORT: The throttle cables on the Mk 2 Skytrike could fray and snap at the foot-pedal. Also, the Bowden cable was terminated by a plastic electrical clip. This could pull through the stop and allow the throttle to close.

Replacement with a more conventionally constructed cable-assembly was the best solution.

DEFECT REPORT: The lower engine-mount of the Skytrike Mk 2 was secured to the engine by pop-rivetting it to the fan casing. The casing had to be carefully checked because cracks tended to emanate from the rivet-holes.

DEFECT REPORT: As with the Valmet Skytrike, the wheels of the Mk 2 gave trouble. On the latter, the bearings tended to overheat and seize on the aluminium-alloy stub-axles.

DEFECT REPORT: On the Hiro-powered Skytrike Mk 2, the carburettor resilient mountings failed in the same manner as on the 250 Robin engine.

DEFECT REPORT: On the Hiway Demon Wing, the junction between the cross-boom and the leading-edges had to be checked carefully.

It was necessary, firstly, to withdraw the outboard leading-edge half then draw back the sail to the inboard leading-edge section. Using a tape-measure, it could now be determined that the inner sleeve extended at least 3 inches (76 mm) beyond the holes. (This was most important).

DEFECT REPORT: On the Hiro-powered machine, the control-frame eye-bolts - for the lower rigging-wire terminations - had to have just enough freedom to allow movement of the thimbles.

DEFECT REPORT: One pair of the cross-boom centre-plates of the Hiway Skytrike Mk 2 was attached in such a way as to apply a bending moment to the pair of bolts on their threaded portions. The bolts in question were only commercial M6 items.

They needed to be replaced with 1/4" diameter aircraft-quality bolts of a more suitable length. Also, the offending end of the tube needed to be over-sleeved (and pop-riveted) for 6 inches (150 mm) to remove the need for the stack of washers.

DEFECT REPORT: Some Hiway models had insufficient clearance between the propeller and the airframe. Where a parachute was installed - an unapproved practice! - with its extra weight, the danger was even greater. The added weight could, in a heavy landing, give adequate momentum to bend the keel and allow the cables to contact the propeller.

DEFECT REPORT: The bolts which secured the hang-bracket to the keel could too easily bend. The small channel at the top of the control-frame also wore and became slack.

DEFECT REPORT: A brass bush was used in the hang-bracket assembly. In close proximity to aluminium, it suffered severe electrolytic corrosion and needed frequent checking.

DEFECT REPORT: The cross-tubes between the two frame uprights were prone to crack if excessive vibration had occurred.

DEFECT REPORT: The channels which form the hang-brackets on Hiway Skytrikes usually had enlarged holes where the bolts fitted. It was necessary to know how long this could be tolerated before the item had to be replaced.
The initial construction actually led to excessive wear, because M6 bolts were fitted into holes drilled 1/4 inch diameter. 
If the holes in the keel were not unduly enlarged and the main problem lay with the channel bracket, the following was safe practice: - If the holes had not become large enough to take a 9/32 inch (7.15 mm) diameter probe, they could continue to be used.

If a 9/32 inch probe could be fitted through them, they could be drilled and/or reamed out to 5/16 inch diameter, to receive 5/16 inch diameter bolts (or M8; the difference is negligible).

This procedure was only safe to apply if the material of the bracket was at least 3 mm (1/8 inch) thick and that - even after the holes had been opened up to 5/16 inch diameter - there was not less than 1/4 inch (6 mm) between the edge of the holes and the nearest edge of the bracket.

DEFECT REPORT No 002: This report again related to the enlargement of pin-pin holes in the tops of the seat-support/upright frame-tubes, due to wear and tear and vibration.

If the tubes were not replaced to give new pin-holes, the pippins had to be replaced by bolts with safetied nuts.

DEFECT REPORT No 009: This concerned the failure of the stub-axle on a Hiway trike, on landing. The axle was 5/8 inch diameter, low-grade aluminium-alloy.

New stub-axles of 1/16 inch diameter HT30TF were fitted, along with Delrin bearings.

DEFECT REPORT No 017: The tubes forming parts of the engine and frame support-system failed on a Hiro/Hiway Demon flex-wing.

Replacement of the broken parts and careful monitoring was required thereafter.

DEFECT REPORTS No 039 AND No 046: The recessed fuel-cap on Hiway trikes could trap water and dirt, which then got washed down into the fuel-tank during filling.

The recess had to be kept totally clean and free of water before and during refuelling.

DEFECT REPORT No (89)-142: An excessive number of bolt-holes, (by poor design) in the cross-boom tensioning arrangement of a Demon wing, allowed selection of one which locked up the hinge.

Typically, the second bolt-hole was the tightest one which should ever be selected.

DEFECT REPORT No: (91)-290: The pin which secured the cables to the swan-neck on a Demon 175 was simply screwed into the bracket. It lacked any means of locking into place. An owner found that it had simply fallen out and was lying in the wing bag.

A positive locking method was required, (spring-clip, lock-nut etc...)

Hiway Hang-Gliders said that any such wings, used for power, ought to have this pin replaced by an M5 nut and bolt. (They could supply the necessary parts).
DEFECT REPORT No 101: The propeller on a Hornet Raven 462 struck the port, rear flying-wire, when the machine dropped into a pot-hole during the take-off run.

A compounding of all flexibilities in the engine-mounting system and in the airframe, apparently combined to allow the amount of movement needed to cause contact. A properly rigged machine was said by the manufacturers not to be at risk.

DEFECT REPORT No (89)-123: On a Hornet Raven, cracks were found (a) in engine-mounting base and (b) in the channel which joins the top of the two main uprights.

But an Amendment to the Report stated that the machine had been tipped over in a landing and had also lost its propeller when poor bolts supplied wrongly when bought in good faith had progressively broken.

EARLY DEFECT REPORT: On the Ravens and Sprints, diesel-type filters were used. As in several other Defect Reports, an owner found an emulsion forming and blocking the element. In cold weather, when the emulsion was particularly viscous, the fuel-feed to the engine was inadequate and power-output suffered.

It was pointed out that this problem was not unique to diesel-type filters. It was widely known. The root cause might be a reaction between water and the emulsifying agents contained in the oil, or it might be a microbiological growth only possible in the same combination of media.

The simplest and most clear-cut advice given was: Always try to keep your fuel-tank totally empty for storage or absolutely full. Water will then be much less likely to gain access.

Also, if you have a water-drain on your fuel system, use it regularly and carefully.

EARLY DEFECT REPORT: On the very early trikes, the pop-rivets tended to loosen, where they attached all end-fittings to the tubes. They needed frequent replacement.

SERVICE BULLETIN: Hornet Microlights issued a Bulletin, carrying CAA Mandatory status, concerning the chromium-plated propeller-bolts used on the Dual Trainer Raven. These were found to be cracking - probably due to hydrogen embrittlement arising from inadequacies in the plating technique - and had to be replaced with zinc-plated bolts which Hornet supplied.

DEFECT REPORT No: (91)-298: Inspection showed that the dual-ignition leads on an RS-ZA were abrading between the top of the pod-support bracket and the pod itself.

Damaged leads needed to be replaced, slightly re-routed and secured in place.

DEFECT REPORT No: (92)-275: After a ZA had stood idle for several months, it was found that the hand- and foot-throttles had ceased to operate.

The throttle-mixer block - a plastic slide - had seized in its aluminium-alloy tubular housing, due to absorption of oil or, possibly, recovery from machining. The slide had to be machined down until it was a free fit in the tube.

DEFECT REPORT No: (92)-337: Just after a Rotax 462-powered Hornet ZA had taken off and reached about 800 ft, the engine failed.
Examination showed that the teeth were sheared from the pinion gear, at the end of the crankshaft. No reason was suggested.

DEFECT REPORT No: (92)-337 FIRST AMENDMENT

Nigel Beale, of Cyclone Hovercraft, had the following comment to make on the above Defect Report:-

"The only reasons we have ever found for damaged gear-teeth are
(a) no oil in the gearbox
and
(b) a bent propeller-shaft due to a previous propeller-impact".
HUMMER AIRCRAFT

DEFECT REPORT No 007: On the Hummer with the 250 Robin, the stainless-steel tangs, at the forward end of the engine-bracing cables, failed at their restraining bolts on the trailing edges of the wings.

This was rectified by fitting a small safety-cable from the thimble at the forward end of each engine-bracing cable to a second thin tang on each bolt. This prevented a complete breakaway of the cable from occurring.

DEFECT REPORT No 027: On a Robin 250 installation, an exhaust-retention spring broke free and struck the propeller in flight. The exhaust itself then moved and struck the propeller. The resultant out-of-balance, in what remained of the propeller, caused significant damage to the reduction gear. The softwood propeller appeared to aggravate the damage by disintegrating easily.

A safety cable should be wired across each retention spring.

DEFECT REPORT No (90)-175: Diagonal bracing tubes, which formed critical parts of a Maxair Hummer fuselage, were found badly cracked and damaged.

The relevant items had to be replaced and the rest of the fuselage examined in scrupulous detail.
HOVEY WHING-DING AIRCRAFT

DESIGN/CONSTRUCTION GUIDANCE:

1. The loaded Centre of Gravity (pilot on board) had to be carefully determined and had to fall within the design limits of 15 and 30% of Standard Mean Chord. If it did not, the aircraft was not safe to fly.

2. The maximum empty weight of the aircraft was limited strictly to 100 kg.

3. (a) Main and rear spars had to be made from knot-free Grade 'A' spruce.

   (b) Wing-ribs were made from HE30TF tube or similar. Annealed hydraulic-quality tubing was too soft and could fail in flight.

   (c) The boom-tube was made from 6061-T6 or L114, with the recommendation that the diameter be increased from 3 to 3 1/4 inches diameter, if the aircraft weighed over 70 kg.

   (d) Only Aerodux, Aerolite or epoxy-resin glues could be acceptably used. FWA cements of any kind were absolutely forbidden.

4. All cables had to be larger than the design-drawings showed.

   (a) Flying and landing wires needed to be 3 mm.

   (b) Wing-warp wires had to be extra flexible, 2.5 mm cable.

   (c) Rudder and elevator cables had to be 2 mm diameter.

5. The strut-end fittings needed to be replaced with rod-ends, to facilitate the wing-warping control.

6. Stress-analysis showed that the top wing front-spar needed a reinforcement.

7. A four-point restraint harness was required.

8. A fourth wing-spacer was needed at Wing Station 94.

9. Commercial hexagon-head screws were fitted, as standard, between the reduction-pulley and the propeller-hub, on the Skycraft Pixie 175 engine.
HUNTAIR AIRCRAFT: PATHFINDER 1

(Note that the Pathfinder 2 was grounded by the CAA and is not permitted to fly, under any circumstances).

General Points: Two undesirable features were common to this aircraft: Firstly, wing-nuts and spring-rings were used to secure bolts in locations where this was clearly not acceptable; a Nyloc nut or castellated nut with split-pin would have been better. Secondly, ordinary, rather low-grade M6 bolts were installed in holes which had been drilled 1/4 inch (6.35 mm) diameter; this led to early and avoidable wear.

DEFECT REPORT: The lower engine-mount was attached to the keel by a bolt, with a wing-nut and spring-ring.

For an adequate margin of safety and reliability, the nut and ring had to be replaced with a self-locking nut.

DEFECT REPORT: The tubes which supported the engine at its sides were very prone to enlarge their holes, where they were attached to the cross-bar at their rear ends.

They needed to be carefully and frequently checked, and replaced if necessary.

DEFECT REPORT: The propeller retention-bolts had nuts and spring-rings securing them.

These had to be replaced with either self-locking nuts or castellated nuts and split-pins.

DEFECT REPORT: Socket-head screws, with a very small flat surface filed on each of them, were used to mount the propeller-hub to the reduction-gear.

These screws had to be replaced with hexagon-head screws which locked properly into place.

DEFECT REPORT: The bearing-spacers on the propeller-shaft tended to become grossly out of shape, due to their being made from inappropriate material.

They had to be replaced with hard-alloy or steel spacers, against which the bearings could be properly clamped.

DEFECT REPORT: The control column pivoted on an M6 bolt which passed through a bush with an internal diameter of 1/4 inch. The resulting slackness led to rapid wear. A standard 1/4 inch diameter aircraft bolt needed to be installed, if the bearing holes were not too enlarged by wear to be re-used without repair work.

DEFECT REPORT No (89)-144: On a Pathfinder 1, the sheet-metal ribs of the elevator had all cracked at both their front and rear attachment-points (to the spar and the trailing-edge).

Using a repair procedure on the same lines as the primary build at the factory, would simply have led to the same failure again. Instead, new ribs were made, with gussets which wrapped fully round the spar and trailing-edges, and which were then pop-rivetted to the rib flanges.

DEFECT REPORT No (90)-197: During overhaul of a Pathfinder 1, the plates which attach the front wing-structure to the fuselage were found to have ovalled holes. Yet again, M6 bolts in 1/4 inch diameter holes had helped to accelerate the wear.

Reaming out slightly ovalled holes to 8 mm (5/16 inch diameter) and installing M6 or 5/16 inch diameter bolts, was acceptable.

If, however, the largest dimension of the holes was found to be greater than 8 mm, new plates had to be fabricated from suitable material, using the originals as patterns.

And, again, any M6 bolts, fitted into 1/4 inch diameter holes in this area, had to be replaced with suitable 1/4 inch diameter bolts.

GENERAL NOTE No: (91)-63: Weight-and-balance checks on two Pathfinders 1, revealed that the CGs were outside the range quoted on the TADS. Both aircraft had apparently been flying completely satisfactorily.

- H6.01 -
IGNITION PROBLEMS

DEFECT REPORT: On Cuyuna engines, it was found - on several occasions - that the timing could alter and make the engine overheat.

DEFECT REPORT: Motorcycle switches, used as ignition-switches on the Chargus T250s, failed easily.

Mains-rated switches were needed, as on all microlights. Ideally, heavy-duty, double-pole switches were required, with the contacts wired in parallel.

DEFECT REPORT: On Fuji Robin engines, the copper cores of the ignition wiring were sometimes found to have work-hardened and broken, under the combination of flexing and vibration.

New cabling was needed, installed with care and competence, ideally, by a trained electrician.

DEFECT REPORT: The use of incorrect spark-plugs resulted in overheating of the engine.

Normally, only the spark-plugs specified by the manufacturer of the engine should ever be used on a microlight aircraft.

DEFECT REPORT: On Puma Sprints, breaks occurred in the ignition wiring, due to the leads having been over-crimped at their terminations.

DEFECT REPORT No 008: Misfiring occurred on early Rotax engines with Bosch ignition.

Cyclone Hovercraft provided detailed guidance on how to increase the ignition voltage.

DEFECT REPORT No 015: The HT-lead retention-clip on a Fuji Robin had been over-crimped and had bitten through the ignition cable. (See Defect Report No: 90-201 below).

New cable was needed, installed with care to ensure that the clip was not again cutting into it.

DEFECT REPORT No 026: On several trikes fitted with 330 Fuji Robin engines, the ignition wiring had work-hardened and was failing.

Replacement with correct material, by a competent electrician, was the solution.

DEFECT REPORT No 033: On the Rotax engine of a Pegasus trike, the rear plug-cap repeatedly came off.

Leads of correct length helped, along with restraining, DRY bungees.

DEFECT REPORT No 055: The Rotax engine failed in flight on a Mainair Flash.

The problem was traced to arcing in loose spark-plug caps. New caps and new retention bungees were required.

DEFECT REPORT No 063: A Rotax 447 was misfiring.

It was found that the capacitor was loose in its clip.

DEFECT REPORT: A 447 engine persistently suffered power loss after about one minute at full power. The cause was that the cylinder-head gasket was crushed excessively and a part of it had extruded into the combustion-chamber, giving a hot-spot and pre-ignition. Cyclone Hovercraft advised owners to proceed thus:-

(i) Re-torque the cylinder-head on a new engine at about 2 hours. Use a good quality torque-wrench and do not over-tighten! The correct setting is 18-24 Nm (13.3 to 17.7 lb.ft).

(ii) De-carbonise the engine at about 50 hours. Renew the cylinder-head gaskets as a matter of course. Torque the heads to correct figure.

(iii) Examine the old cylinder-head gaskets. If the inside diameter has been reduced to less than the bore diameter, the gasket needs to be returned to Cyclone Hovercraft for examination, together with a note of the engine Serial-Number and the hours of operation.

DEFECT REPORT No 069: The coil winding on a Rotax was found to have worked loose.

Vibration was thought to be the reason for this. The coil was shimmed tightly into position.

DEFECT REPORT No 070: Engine misfires on Rotax engines were identified by Cyclone Hovercraft as caused by a combination of Bosch plug-caps and replacement NGK spark-plugs.

Wear led to aluminium powder being produced, with all the attendant problems of easy ‘tracking’ of the spark.

DEFECT REPORT No 089: The Rotax 503 went dead in flight and then, just at the most adverse moment, burst into full throttle. The pilot had not switched off when preparing his emergency landing. Serious damage was caused to the machine.

An ignition wire had broken loose and was making intermittent contact.
DEFECT REPORT No 116: The Robin 440 engine of a Puma Sprint could not be stopped with the ignition switch.

A connecting wire had become dislodged by vibration.

GENERAL NOTE No (90)-33: On a Pegasus Q, the coil-mounting bracket cracked and had to be replaced.

SAFETY BULLETIN: This Bulletin related to 582 engines prior to Serial Number 3918817. It concerned the installation of special distance-pieces, or spacers, behind the coil-supporting plate.

The Company was free-issuing the rectification parts to owners of these engines.

DEFECT REPORT No (89)-119: A Rotax 447 engine lost power in flight.

A crankshaft was breaking up and producing particles of metal which bridged across the sparking-plugs. Over-speeding of the engine may have contributed.

DEFECT REPORT No (89)-122: The Robin EC25PS engine on a Triflyer stopped in flight.

A faulty capacitor was found to be the cause.

DEFECT REPORT No (89)-153: The plugs on the Rotax 337 of a Chaser were changed to a NGK type, which grips the thread at the top of the plug. Ignition became erratic and the engine misfired.

Reversion to the plugs specified by the manufacturer, properly secured, gave the cure.

DEFECT REPORT No (89)-155: On his Tiger Cub 440, the owner had fitted completely the wrong plugs (Bosch W8CC instead of NGK B9ES) and the rear one melted!

The engine distributors advised on the problem and suggested an even better type of plug to use.

DEFECT REPORT No (89)-164: In flight, the engine of a Hybred XL faded.

The engine had the wrong plugs installed.

DEFECT REPORT No (90)-176: An early Snowbird had been subject to a great number of problems, mostly due to vibration. Engine failure happened several times.

On one of the occasions when the engine failed, it was found to be due to a broken wire on the generator coil, possibly caused directly by vibration. The effect of this was to cause loss of sparking. (Cyclone Airsports - said the reporter - suggested that this was not the first case of generator-coil failure).

DEFECT REPORT No (90)-181: Severe engine-power problems occurred with a Rotax 447 on an XL.

No single cause has been reported but the engine distributors have suggested a range of possibilities, all associated with ignition equipment and its behaviour.

DEFECT REPORT: It was important, on the Rotax 377 and 503
engines, to re-torque the flywheel-magneto nut to 60 foot-pounds (8.3 kg.m) after the first 50 hours of use, and every 100 hours thereafter.

DEFECT REPORT No (90)-183: The engine on a a Raven failed in flight. The cause was found to be loss of proper ignition-earth, because someone had replaced two of the coil-mounting-screws with self-tapping screws. One of these had dropped out, removing the earth connection.

DEFECT REPORT No (90)-198: On a 'Q' with a Rotax 462, the alloy plate bolted to the front of the engine to hold the ignition coils, was found cracked at a top retaining-bolt hole. The secondary effect of the fracture was also to cause the earth connector from one of the coils to break, resulting in loss of ignition at the rear cylinder. On dismantling, further cracks were found in the plate.

A new factory-supplied plate had to be installed. Welding of the cracked plate is not permissible.

DEFECT REPORT No (90)-201: Two, quite separate, failures occurred on Fuji Robin 34-PL 333 cc engines, at the coil-ignition wiring. After 375 hours, the earth-return wire fractured inside the plastic sheathing, where it was gripped under the clip.

After another 100 hours of operation, the wire from the live terminal fractured just where it emerged from the supporting 'blob' of plastic material.

Both were repaired after their nature and location were determined with an Avo-style instrument, by simply applying normal electrical-repair techniques.

DEFECT REPORT No (90)-204: In a full-power climb, the Rotax engine on a Pegasus Q misfired. It was smooth at modest RPM. Ground-runs repeated the effect.

The problem was a known one, of indifferent connection between non-recommended aluminium plug-caps and the lead-clips. Only steel-topped plugs must be used.

DEFECT REPORT No (90)-205: In the climb at full power, the engine fired intermittently. The Westach tachometer also read high, whilst this was occurring.

The spark-plugs had unwisely been fitted "Straight from the box".

One plug was found to have an acceptable gap (0.015 - 0.020 inch) whilst the other was set at 0.037 inch. As the latter plug failed to spark, large transient voltages were fed to the tachometer, which then read high.

DEFECT REPORT No (90)-206: One cylinder suddenly began to misfire in flight on a Gemini Sprint. A plug-lead had fractured where it passed through a copper P-clip on the fan housing.

The owner replaced the lead and secured it - rather more freely - to the P-clip with a tie-wrap.

Mainair suggested passing the tie-wrap through a very short piece of fuel tubing, between the P-clip and the cable, to provide a form of 'stand-off' and grip the cable securely but not cut into it.

DEFECT REPORT No (90)-211: On a Pegasus Q, with Rotax 462-LC, the engine began to back-fire in flight and a precautionary landing had to be made.

The main bearings were worn excessively and had temporarily seized; the points therefore opened erratically.

DEFECT REPORT No (90)-223: This report concerned an instance where, when the owner turned over the propeller of his machine with the ignition switch in the 'off' position, during routine care and maintenance, the engine burst into life and he narrowly
missed a serious injury.
One Inspector, who had experienced a somewhat similar failure, commented as follows: My problem was a high-resistance contact inside the switch, presumably due to a damp atmosphere and relatively little use. Most switches rely on a measure of ‘wipe’ to keep the contacts clean and connecting, so operating them a few times before each flight must help.

I always now install a heavy-duty double-pole switch, wiring both contacts in parallel, thus considerably increasing the likelihood of a good short-circuit each time the switch is turned ‘off’. A very suitable switch is:

- **II.05** -

10 ampere Toggle Switch, Double-pole, single-throw, ON-OFF.

Ordering Code: JX 26D "10A TgDPST" from:-

Maplin Electronics PLC, PO Box 3, Rayleigh, Essex, SS6 8LR

Maplin give the detailed specification of the switch as follows:

10A 250V AC: 15A 125V AC
Contact Resistance: 50 millionm.
Insulation Resistance: 100 Megohm
Life: 50,000 make/break at full load
Body size: 32.5 x 19.5 x 20 mm
Panel cut-out: 12.7 mm diameter.

The Chief Inspector totally opposed the use of double-pole, heavy-duty switches to control the ignition on microlight aircraft. He declared this small modification to be acceptable, because it was under the “Category 2” specified in the BMAA Inspectors’ General Note GN-(90)-42 of 4 November 1990. It was an item which could readily be obtained from sources other than the manufacturer of the aircraft to which it was fitted. It was almost certain not to be a component which had been specifically manufactured for a given microlight manufacturer. (Switches are usually made in very large quantities).

What is obligatory is that the installation of any replacement switch is properly carried out and checked by a BMAA Inspector before the aircraft is flown. Arguably, the majority of people cannot make satisfactory soldered joints.

**DEFECT REPORT No (90)-225**: Whilst a 440-powered Hybred XL was in flight, the engine misfired and lost power.

The coil-wire had detached itself from inside its connector.

**DEFECT REPORT No (90)-237**: The low-tension generator part of the ignition coil - mounted behind the flywheel - failed on two Pegasus Qs with Rotax 462 engines. These, in turn, resulted in total engine-failures without warning, on both machines. Both aircraft were about 27 months old, one having logged 180 hours and the other about 140 hours. The coils had over-heating marks on the windings, close to where the coil increases in diameter.

Replacement coils from Cyclone Hovercraft were installed. But, as no specific cause for the failures were identified, Nigel Beale at Cyclone Hovercraft Ltd was consulted; he commented (in late November 1990) as follows:

"From the number of spare generator (ignition) coils we have supplied, we would estimate that there has not been more than a dozen or so failures in about six years and thousands of engines.

The only failures I have seen personally, are one case of faulty connections at the ends of the coils and a couple of cases of coil breakdown, causing a misfire when the engine and coil got hot. I have not seen a burned coil and nobody has returned a burned one to us. If anyone has such a failed coil, could they please send it to us, so that we can send it to Rotax for examination? (The failed components were returned on this occasion).

Ignition faults can be difficult to trace and it is sometimes the case that the owner or service engineer will change all the internal ignition components (generator coil, points and condenser) in order to be sure of curing a problem, without the need to strip the engine twice. Thus, the number of replacement generator coils fitted does not necessarily indicate the number of failures.

A failure of the generator coil could be due to:-

(a) Faulty manufacture, with insufficient Shellac insulation.
(b) Breakdown of the insulation due to excessive vibration.
(c) Breakdown of the insulation due to excessive heat. (Possibly a combination of electrical load and heat transmitted, from an over-heating engine).
(d) Physical damage to the coil insulation from previous mishandling.
(e) Incorrect installation of a replacement coil. The rotating magnets on the flywheel run in very close proximity to the coil laminations. A special Rotax alignment-tool is available to position the coil precisely during re-assembly. Without the use of this tool, it is possible that the magnets will scrape on the coil laminations, causing damage to both coil and flywheel, and possible over-heating of the coil, leading to early failure."
DEFECT REPORT: The spark-plugs in a Rotax 447 were replaced with BR8ES plugs, because BR8ES types were not available. On climb out in the next flight, and at 700 feet, the engine RPM fell and the cylinder-head temperature rose. A safe landing was carried out.

After 1 1/2 to 2 minutes of full-power running on the ground, the same thing happened. With the original plugs refitted, no problems were found with 3, 4 or 5 minute full-power runs.

The same temporary power-loss was observed with the Rotax 462 on a Flash 2. During a long power-check prior to take-off, the engine actually almost died completely. Subsequent examination revealed that it, too, was equipped with BR8ES plugs. Changing those for BR8ES plugs gave trouble-free, full-power runs of up to 5 minutes.

BR8ES plugs were listed as approved replacements in the Pegasus manual for the XL, on which the fault was first observed.

SERVICE INFORMATION BULLETIN SUL 90-E: Rotax put out this Bulletin to guide owners of the 503 UL C.D.I. and 582 UL C.D.I. with Ducati ignition, who might be experiencing anomalous behaviours from their tachometers, Type 966-072.

 Basically, if the misreadings were shown not to be due to a faulty tachometer, and only then, they may have been produced by a resistor circuit, which was not functioning quite correctly. The note gave clear instructions on how to modify this circuit and, thus, return the tachometer system to proper working.

New tachometers, of the Rotax type 966 074, already had the modified resistor circuit incorporated in them and, thus, needed no alteration. (This type of tachometer was identified with a blue label on the rear face).

As usual, the Bulletin was available from Cyclone Hovercraft Ltd.

DEFECT REPORT No: (91)-249: On the Fuji EC44PM engine of a Panther XL-5, the front spark-plug blew out during flight. The owner had made a practice of removing the plugs before a day’s flying, to wash off the drained oil. The threads in the cylinder-head therefore became dangerously worn.

A repair was made with a ‘Helicoil’ insert.

DEFECT REPORT No: (91)-259: On a Pegasus Q (Rotax 462) the rear-seated instructor accidentally knocked the ignition switch to the OFF position, whilst in flight. This is known to have happened on at least three occasions.

Its relocation was considered by the BMAA Technical Officer to be a Minor Modification.

GENERAL NOTE GN-(92)-118 COMMENTS ON IGNITION SWITCHES.

An Inspector wrote in to say that, on the Quasar single-switch system, he considered that the size of the protective channel and the proximity of the skirt – combined with the fact that one had to feel for the switch, rather than look at it – made it too much of a ‘fumble’ exercise.

On the Quasar double-switch system, the switch channel was partially blanked off at the aft end, exacerbating the ‘one-switch’ problem and this made the second switch impossible to turn off with a gloved hand.

The positioning of these switches made access easier from the rear seat, since one’s naturally relaxed right hand fell just where it was needed.

The Inspector felt strongly that any aircraft controls should be installed with their PRIMARY function totally in mind. That is, the front seat is for the PI. If one says the average life of a microlight is, say, 1000 hours, only about 20 hours of that, as a maximum, will have been spent in dual instruction. He thought that that was ample reason to ‘jury rig’ the ignition for instruction, and the front panel was where a novice would expect to find the switch if the crew were incapacitated.

As Chief Inspector – and I am sure the Technical Office would agree – I cannot encourage people to go ‘jury-rigging’ something as important as ignition-switches. But the manufacturer might well offer either a ‘Novice set-up’ at sale, to be modified to standard later at some small pre-agreed charge or, alternatively, offer a simple system of removable switching which could readily be altered (and checked by a BMAA Inspector) when training was complete.

DEFECT REPORT No: (92)-341: During flight in a Rotax 532-powered Renegade Spirit at cruising level, the engine speed dropped suddenly to around 4000 rpm. The throttle setting was increased but the revs remained unaltered.

A forced landing was made but the aircraft was substantially damaged when trees were struck on the approach.

The pilot received minor injuries but the passenger was unhurt.

The local fire service had cut the fuel-lines and drained the fuel from the tanks. They had also disconnected the electrical system. The fuel pump and carburettors had been disturbed by a local pilot. The aircraft had been moved to a friend’s hangar.

Fuel was present in the carburettor bowls and the fuel-pump was found to be operative.

The rear spark-plug was not functioning. When a new plug was
installed, only a weak spark was achieved.

The offending plug was tested in another aircraft, where it did not respond initially to attempts to start the engine. But, eventually, the engine ran well with the plug in place.

The rear coil was removed and tested on another aircraft where it failed to produce a spark and the engine ran only at 3000 rpm.

This test was repeated on another aircraft for two more attempts but, again, the coil refused to function.
DEFECT REPORT: Reports were received of damage being caused by the use of so-called "Wizz" pins to secure the front struts of trikes. The pin has a taper at the handle-end, which rapidly enlarges the hole in the tube.

Wherever these pins were used and excessive wear was found, the relevant tube had to be replaced.

To prevent the wear from occurring, it was simply a matter of fitting a "skiffy" nylon cap-base to the pin. This stopped the taper from reaching or affecting the tube. (These cap-bases were available free from Mainair, if one had purchased Wizz-pins from them).

DEFECT REPORTS: On Solo Triflyers, the following defects were noted and reported:

1. The thimbles at the front ends of the axle-drag cables tended to become elongated, as did the the holes in the axle tie-wire bolt-holes.

In particular, the latter elongations allowed the axles to assume a 'flatter' attitude, with an exponentially increasing tension-load in the relevant cables and runaway failure, see the Figure below.

Because the cross-axle cable and the pylon-bracing cables worked together - in a form of 'closed-loop' tensioning/support system - it was always necessary to ensure that they were maintained in the correct overall tension.

2. The rubber isolation-mounts on the exhaust needed to be monitored carefully. Also the Nyloc securing-nuts on the exhaust were inappropriate (the plastic locking-ring softened with the heat) and had to be replaced with all-metal Simmonds-type, or similar, nuts.

3. On some early models, the propeller-shaft could rub on the fuel-tank under certain conditions.

GENERAL NOTE: (89)-004: Mainair used to supply a webbing strap to prevent transit damage to a folded trike. The straps were usually wrapped round the gearbox casing and tensioned. Occasionally, the straps jammed into the propeller-shaft and spoiled the shaft-seals. The recommended way to avoid this was to insert a 1" diameter dowel into the propeller flange-hole and to strap round this dowel.
DEFECT REPORT: On Dual Triflyers, the following defects were reported:

(1) The 1/4 inch diameter bolt which secured the Lord mount to the pylon, tended to bend on landing. It had to be replaced with a 5/16 diameter bolt.

(2) Thimbles and bolt-holes elongated on the axle-system, as with the Solo Triflyer.

DEFECT REPORT: On the reduction-drive of the Gemini, it was important to check the tightness of the four socket-head screws, which held the propeller-bearing housing. Despite the punch-marks still being aligned, they could actually be loose, probably due to fretting of the metal clamped under them.

DEFECT REPORT: When the seat frame on a Gemini Flash 2 was being erected, a resistance was felt. It was found that the telescopic seat-strut had buckled instead of sliding.

When installing new factory-supplied parts, the owner found that the small channels at each end of the assembly were completely seized on the tubes. These channels must rotate freely on the tubes, or the strut will buckle under the generated bending loads.

Owners were advised to check that the items did slide freely and, if they did not, to work them so that they would do so. Grease could be applied to both the hinge and the telescopic mating surfaces.

A MAINTAIR BULLETIN ISSUED FROM THE FACTORY, GAVE THE FOLLOWING INFORMATION:

FLASH WINGS:

(a) Chafing was found between the cross-tube tension-wires, where they were held together by heat-shrink tubing at the tang attachment.

The heat-shrink sleeving needed to be removed and the cables tied together more loosely with a tie-wrap or Nylon cord. (They were only held together to ensure that pull-back brought both cables to the rear simultaneously.) The condition of the cables had to be checked and any necessary replacements made.

(b) The side wires had to be replaced at 250 hours intervals; this was set out in the Owner's Manual.

GEMINI TRIKES:

(a) On machines with upright Rotax engines, the filters fitted to the tank dip-pipe on the rear fuel-tank proved inadequate at trapping minute particles. A fire-proof, aluminium filter was offered, for fitting in the fuel-line in series with the existing unit.

(b) Heavy nose-wheel landings could cause failure of the front-strut at about 9 inches from the top, at the end of the sleeve. After any hard landing, this area had to be carefully checked.

(c) The black aluminium tray, supporting the air-cleaner and fuel-pump on upright Rotax installations, tended to fail in fatigue.

(d) Monopoles marked with a number 2 right at their bases, had additional sleeves and a 6 mm internal cable. This feature should have been sought - by contacting the factory - on all subsequent machines.

(e) A special 2:1 throttle-mixer was developed to ensure independent spring retraction of the hand and foot throttle-cables; this was to prevent cable sticking and kinking.

DEFECT REPORT: On a Gemini Flash 1, It was found that the fuel-tank had abraded the electrical cables against a bracket.

DEFECT REPORT: Early Geminis had a silver-coloured fuel-tap mounted on a plate at the end of the seat-frame channel. Fuel starvation had, on several occasions, been traced to these taps mal-functioning.
The tap had a rubber sleeve round the barrel, which could turn relative to it and - with the resultant distortion round the through-hole - partially seal off the flow of fuel.

If examination showed the through-hole to be other than a clean, unfrayed orifice, the tap had to be replaced.

Another point to consider was that the mounting plate for this tap was screwed on to the same thread as the pipe union. It was thus essential that the nut be fully tightened on to the tap before it was tightened against the plate.

Also, because the fuel had to be drawn upwards from a low-placed tank, the inleak of air was a serious risk. Fittings and connections had therefore to be totally secure.

**DEFECT REPORT No 005:** Clevis pins had their cross-holes drilled dangerously near to their extremities. With normal wear or sudden loads, these could break out.

**DEFECT REPORT:** Failure occurred of the studs holding the reduction-gear on to the Robin 440 engine.

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**DEFECT REPORT:** On a throttle-lever unit called a "Suntour", the cover-fixing screw tended to fall out. An alternative form of unit was recommended for installation.

**A SERVICE BULLETIN FROM MAINAIR SPORTS.**

Airworthiness Bulletin No 17.

Re: **GEMINI TRIKE:**- The main monopole cracked round its periphery, starting from a 1/4" bolt-hole. The safety cable held long enough for survival, aided by additional engine-support rigging.

Detailed and repeated inspection was called for. The tube had to be replaced if cracked; it was lifted at 500 hours.

**DEFECT REPORT No 028:** The engine on a Gemini trike was changed, at the factory, from upright to inverted. Unnoticed, it later chafed at the fuel tank beneath.

The tank should have been sent to the manufacturer with the trike, to ensure that they would arrange adequate clearance.

**DEFECT REPORT No 041:** On a 250 trike, in flight, the plunger on the fuel-tap vibrated closed, although stiff to operate.

A different type of tap was installed and the fault disappeared.

**DEFECT REPORT No 047:** The lever on a fuel tap, normally downwards when fully open, vibrated upwards in flight and turned itself off!

Extra frictionising was ineffective. Shortening the lever arm changed its mass and removed the effect.

**DEFECT REPORT No 057:** The owner of a Flash wing washed it with a weak solution of bleach. It became totally weakened and easy to rip.

Similar gross weakening of Dacron has been noted when owners have persistently used strong detergents (eg 'Truckwash') to clean their wings.

Ideally, use only soap and water to wash Dacron and rinse the fabric well. Accept dirty marks as the price of having your sail last for more years!

**DEFECT REPORT No 059:** The top rubber mounts of the radiators, especially the left-hand ones, tended to fail on Gemini 462 trikes.

Variation in rubber quality may have contributed. Careful checking and avoidance of splashing with oil, petrol or anti-freeze was advised. A tie-wrap was suggested as a safety
DEFECT REPORT No (89)-156: Fuel was rapidly lost and engine problems encountered on a Gemini Alpha, when the bowl for the fuel-float worked loose.

The bowl had to be wire-locked.

DEFECT REPORT No (90)-177: The pins in the carburettor float-chamber, on the Rotax 503 of a Gemini Flash 2, were found worn.

The engine distributor suggested that resonant vibration may have contributed. Prolonged operation at critical engine-speeds needed to be avoided.

DEFECT REPORT No (90)-194: Immediately prior to take-off in a Flash 1 with a Fuji Robin 440, the driven-pulley/propeller-hub casting failed at the forward end of the necked section. The propeller and hub came completely free. The machine had logged 295 hours.

Mainair said that a batch of castings had accidentally missed being heat-treated. Several from this batch had failed, most of them sooner than 295 hours.

Replacement with a heat-treated unit was vital. (Heat-treated castings bore the marking "25T")

Crack-testing is also now called for, at 50-hour intervals.

DEFECT REPORT No (90)-195: During formal inspection of a Gemini Flash 2, broken strands were found in the four main cables from the A-frame to the leading edges, just at the point where the cables enter their swaged ends.

As in the previously reported instances, this problem was certainly associated with mishandling during rigging and de-rigging.

To minimise it, two things were required:

(i) The utmost care when handling the slack cables and

(ii) a careful inspection by bending the cables almost at 90 degrees to their swages, to allow scrutiny of the strands.

This latter sort of inspection MUST always be logged in the Airframe and Engine log-book, so that it is not repeated too often, being - in itself - a procedure which can initiate or aggravate the very damage which it seeks to expose.

DEFECT REPORT No (90)-202: During flight, the nose of a Flash 2 dropped and the machine developed a strange 'feel'. A safe landing was made.

Ground investigation revealed that the lower bracket for the front strut had broken. There was considerable disagreement, between the owner and Mainair, as to the real cause of this. A previous heavy landing was said by the manufacturer to have been the root cause of the eventual failure.

Factory-supplied replacements were fitted wherever damaged components were identified.

DEFECT REPORT No (90)-206: One cylinder suddenly began to misfire in flight on a Gemini Sprint.

A plug-lead had fractured where it passed through a copper P-clip on the fan housing.

The owner replaced the lead and secured it - rather more freely - to the P-clip with a tie-wrap.

Mainair suggested passing the tie-wrap through a very short piece of fuel tubing, between the P-clip and the cable, to provide a form of 'stand-off' and grip the cable securely but not cut into it.

DEFECT REPORT No (90)-213: During ground inspection of a Gemini Flash 1, it was found that a hole had been worn through the inner side of the right monopole-to-axle side-strut. It occurred where the lower, internal member slid against the inside of the upper tube.
Replacement with new factory-supplied parts was carried out. This kind of failure can be jointly attributed to age (the machine had done at least 200 hours from farm fields), with two items simply being incessantly rubbed together, and the ingress of abrasive grit during that time, which would have accelerated the wear.

DEFECT REPORT No (901-218): After a flight and out-landing at a friend’s farm, the pilot found that one side of the engine-mount on his Geonix Flash 2 was sheared at the weld. He had noticed nothing unusual during the flight.

He only found the problem before attempting to fly again, because the engine had been difficult to start and — whilst changing the plugs — the engine was noticed to be too free on its mounts. Both mounts were replaced.

SERVICE BULLETIN 25: This covered the following points:-

(1) A machine with a rear fuel-tank was stored for a longish period. When next prepared for flight, the fuel pick-up pipe was found to have taken an upward ‘set’ and was intermittently above the fuel level, even with a considerable amount of fuel in the tank. At steep climb-out angles, the pick-up would probably have been completely above the fuel-level, as happened on a similar machine, stored in the same way.

It was found that the pick-up pipe had ‘taken a set’ after being doubled up during storage.

A careful check needs to be made after storing a machine (any with a rear tank or any make of aircraft which might use a similar form of fuel pick-up), to make sure that the pick-up is at the bottom of the tank.

Mainair were intending to make a spring-retention unit to keep the pick-up down in its correct position.

(2) On Flash wings, as a result of an earlier Defect Report, the two pull-back cables for the cross-booms were clamped together with a zip-wrap. This sometimes stuck and the second cable had to be ‘fished for’.

The cure was to clip the tang of the second cable on to the pull-back cord, in the same way as for the first wire.

(3) If the fuel-tank on some Mainair machines was not secured tightly with its strap, it could move forward and chafe against the monopole. The problem was more unesthetic than dangerous.

On older machines, the problem could be avoided by fitting a 6 inch (150 mm) length of propeller-tape to the monopole in the appropriate area.

(4) Because the pull-start cord on a Rotax had been allowed to spring back violently, it broke its internal spring.

After being fully extended, the cable should always be allowed to rewind gently.

(5) On an inverted Robin engine, the fuel tube was rather old and fairly tightly curved between fittings. It split at the point of maximum curvature, as it became embrittled by the fuel.

Such tubing should be inspected regularly and, if at all suspect, it must be replaced.

(6) On the Alpha side-struts, abusively hard landings caused the struts to bottom completely and the axles failed at their lower strut-fittings.

The system — like any items on microlight aircraft, where weight precludes ‘railway engineering’ — could only be expected to perform within its design envelope, which could not include "Controlled crashes!"

MAINAIR SERVICE BULLETIN: The following points were highlighted, all in connection with ALPHA flex-wings:-

1. The original tyre pressure was specified as 10-12 psi. This needed to be increased to 22 psi for all tyres.

2. With too low a tyre-pressure, the front-wheel tyre could ‘creep’. If this happened, it could be recognised by the odd angling of the valve. If this is seen, deflate the tyre, put on the brake and rotate the tyre on the wheel, until the valve recovers to its correct orientation. (It is good practice to paint a white line radially across the rim and tyre. If this is 'broken', the tyre has moved).

3. The back-plate fork on the front-wheel brake could open up, where it slid on the peg. A new, bolted link-plate was said to be under design.

Mainair pointed out that this brake was intended only as a taxying aid, at speeds of only a few miles per hour. It had to be conservatively applied, for exactly that purpose.

4. The early designs of front brake-cable and throttle-cable attachments had shown themselves to be poor. New cables had swaged thimble-eyes on their ends; all machines should have had these installed.

5. Due to the requirement to conserve weight for expanding on the quicks and suspension, the cockpit pod was admittedly rather fragile. The seat-frame — not the pod — had to be used to lift the machine. Care was also necessary when entering or leaving the cockpit.
6. The steering-bar was accepted as being too far away from the pilot. A new design was in manufacture, and would be available as a retrofit option.

7. The front and rear suspension slider-units benefitted from a regular oiling, as described in the manual. One needed to use an oil-can to reach between the springs to oil the telescopic, where it entered the aerofoil.

8. The ball-bearings on all wheels needed adjustment after the first 10 hours of use and regularly thereafter. The screwed cones allowed this adjustment.

DEFEAT REPORT: There was confusion about "Bowing" of the cross-booms on the Flash wing. Mainair attempted to clarify matters as follows:

The cross-tubes were 2 5/8" OD by 17 swg and were 11 feet long. They were not pin-jointed on the tube centre-line but had a butt-joint against each other, at the centre, where they were fully floating and attached to the wing keel by a loose webbing (to prevent upward 'bursting' only). They were scarfed off and bolted to the leading-edge only through the lower side of the boom.

The side flying-wires further complicated the loading by being inboard about 7 inches, giving a cantilever loading from the leading-edge.

When the aircraft was stationary, the two wings hung on the top rigging, supported by the king-post. The 12-foot wires stretched slightly and, in addition, slack was intentionally built into the lower flying-wires, to aid handling in the air.

The sail tension caused a compressive load and, because of the way the strain line passed through the centre-point and the leading-edges, the cross-tube would now bow upwards slightly, at the centre.

With flight loads, the position was different. The centre-joint was now closed (and preferably open at the bottom), the flying-wires limited the upwards movement and the cantilever loading reacted against the flying-wires. The centre-joint put the contact square-on (or preferably at the top of the tube) and the leading-edges pushed upwards against the cantilevered wires-anchorages. The bow seen on the ground disappeared in the air.

Due to perfectly normal and acceptable manufacturing tolerances, variations could occur between different Flash wings. The centre-cut was designed to be 5 degrees, when viewed from the front or rear, and 11 degrees when seen in plan. Tolerances made it impossible to get such dimensions precisely consistent.

Because the design concept could not be matched by manufacturing techniques, the cross-tubes were made from 2 5/8 inch diameter tubing. This was far larger than necessary to carry the design loads.

In spite of all the foregoing, the Company found instances where individual wings could be improved by relieving the centre-joint. To achieve this, about 0.03 inch (0.7 - 0.8 mm) needed to be filed off the bottom edge (only) of the tubes where they abutted at the centre. They then could only bear on each other at the top, where the designer intended.

To determine if the bow was purely a visual impression, one first rigged the wing. Then it was necessary either to support the whole aircraft, off the ground, at the leading-edge/cross-tube positions or, if this could not be done, two strong men needed to push upwards at those points. The bow then usually disappeared.

If it did not, the centre-joint needed inspection with the
upward thrust still applied. The tube should have butted together over their internal spigot but only at the top. If they were clearly touching at the bottom, they had to be relieved as described above.

The factory standard was that up to 5/16 inch (8 mm) of bow was acceptable, checked against a taut-string reference.

**DEFECT REPORT No (90)-230:** During a protracted flight in a Fuji Robin-powered Flash 1, (mostly over water!) it became apparent that power loss was occurring and the engine was over-revving. A successful touch-down - on dry land - was achieved.

It was found that all of the teeth had been stripped from the belt and the driver pulley was loose on its taper. The pilot felt certain that this was not the case at the time of take-off, as he always does a particularly careful inspection of the reduction gear, having once suffered a cracked reduction-pulley during training. The failed belt had done 40 hours of operation.

The propeller rotates anti-clockwise and the driver gear was secured to the shaft with a right-hand threaded bolt. It was therefore thought, at first, that the small pulley had loosened and the inappropriate thread-direction had helped things along rapidly. The belt failure was - with this scenario - a secondary event.

Later, however, it became more evident that it was much more likely that the belt had failed first and had then begun to slip rapidly over the driver pulley. With the evident loss of thrust, higher RPM had been maintained for longer than would normally have been the case, just for the pilot to keep flying long enough to get to dry land. This only made the problem worse.

The extreme friction generated (which had been enough to produce some transmission of power to the propeller, due to the heat making the rubber sticky) had also raised the temperature of the driver pulley sufficiently to expand it and break the grip on the shaft taper. Once loosened, the inappropriate thread had allowed the small pulley to loosen more easily.

The belt was replaced but both driver and driven pulleys were considered undamaged and serviceable. The only additional move made by the owner has been to apply Loktite inside the taper-fit of the small pulley to the engine shaft. This was not an adequate remedy. If that small pulley has been rotating at rather high speed, relative to the engine crankshaft, there would undoubtedly have been unacceptable abrasion of the mating faces. THE DRIVER PULLEY NEEDED TO BE LAPPED ON TO THE CRANKSHAFT AGAIN. That was the only way to restore the correct degree of fit between these two crucial components. Loktite would help in the short term but it could not rectify a serious lack of lapped fit, on which this design of assembly entirely depends. The bolt was only there to ensure that the taper went on doing its job.

The owner also applied a 'creep' mark - as used on tyres - to the drive pulley and shaft, to identify the onset of any relative movement.

**DEFECT REPORT No (90)-231:** During ground-examination of a Flash 2a, broken strands were found in the leach line which passed through the lowest point of the adjuster. This cable apparently had the greatest amount of applied bending of its group, due to the relatively tight radius. This, plus any normal working of the cable over the pin, will have caused the strands to begin snapping due to fatigue.

A factory-supplied cable was installed.

**DEFECT REPORT No (90)-233:** Thirty minutes into an instructional flight in a Gemini Flash 2a, with the aircraft at 300 feet and the Rotax 503 engine at full power, it rattled momentarily and immediately seized. A safe forced landing was carried out by the instructor. The failure was due to a disintegrated big-end bearing on the front cylinder.
In all failures such as this, it is almost a prerequisite to involve the engine distributor, and not simply to purchase spares to make a repair. It is only if he has the opportunity to examine the offending parts and debris, that he can learn what failures are occurring and why. It is by such means that improvements are developed on products such as engines.

Mainair also made the following comments:

"We understand that this aircraft was being flown with a “Warp Drive” propeller, which could have generated unacceptably high inertial loads. (The Rotax engines should only be used with propellers which have rotational inertias within the limits specifically laid down by the engine manufacturers. FCL).

This combination is not an approved arrangement for this aircraft (and should therefore NOT have been in use! FCL)."

MAINAIR BULLETIN No 34 (CAA "Mandatory" Category): The front stub on a Gemini trike failed during flight, leaving the lower end of the stub unsupported. A safe precautionary landing was achieved.

Prior heavy landings were established as the probable cause of the failure. However, the CAA demanded a Mandatory check on these components on all of these machines, up to Serial Number 594.

The items had to be carefully examined for cracking or bending. If found damaged, they had to be replaced with factory-supplied components. And, whether or not any damage was found, the details of the examination had to be recorded in the Airframe and Engine log-book. It was Mandatory that this check be carried out prior to any further flight.

DEFECT REPORT No (90)-241: The front stub failed during taxiing, prior to take-off. (See Mainair Bulletin No 34 above). Only a little time had been logged since the machine was acquired, with 100 hours on it. No heavy landings had occurred with the new owner.

The Mainair Bulletin 34 was classed by the CAA as MANDATORY, yet the previous owner appears not to have taken heed of it, if he or she actually knew of it.

DEFECT REPORT No (90)-242: In flight on a Flash 2A, the engine RPM fell from 6000 to 5000. A precautionary landing was made and the fuel-level in the carburettor was found to be low. The filter was cleaned and a full-power run-up was satisfactory.

At 150 feet in the next attempt at flight, the engine failed and, after another safe landing, a low fuel-level was again found. No cause was identified. Five minutes later, in another attempt, the engine failed again and all flying was abandoned.

No certain cause was identified but the following were mooted: Carburettor icing may have been occurring. The pilot wondered if the filter may have been blocking due to the synthetic oil thickening out in the fuel. To avoid that possibility, he was considering moving the filter closer to the carburettor to obtain a measure of heat from the engine.

But another possible cause exists: Readers will recall the earlier, and repeated, discussion of the gel-like material which comes out of fuel which contains some water and oil with emulsifying agent in it. This gel plugs up filters dramatically, yet dries out to almost invisible dust. If this gel were present on this occasion and were also almost frozen, the effect would indeed be as experienced here.

All that could sensibly be recommended here was that the filter be kept scrupulously clean and the fuel totally free of water. That is, the tank needed to be filled completely at all times, or dried out completely. (The latter is often the more practical solution).

Immediately prior to publication of this document, another possibility for the cause of the ‘gel’ has emerged. In-flight refuelling specialists have told the author of microbiological growths in water-fuel mixtures. These microbes were described as liking to grow “with their heads in the fuel and their feet in the water”. Somewhat picturesque but meaning that the peculiarity of the bugs is that they will not grow in either medium on its own; both must be present.

DEFECT REPORT No (90)-244: During the take-off roll of the third of three check-circuits on a Flash 1, powered with a Fuji Robin 440, the engine suddenly raced. Power was immediately reduced.

Inspection of the engine showed that the main pulley - which
includes the propeller-flange - had broken apart, leaving the propeller to rotate freely.

The casting had fractured at the pulley end, not at the propeller end as has been observed on previous occasions. The break was at the centre of the large toothed pulley.

A slightly different 'feel' had been noticed during pre-flight inspection but, with no cracks visible on closer scrutiny, had been attributed to the flexibility of the engine mountings.

A second problem occurred with this aircraft a few days later. After an engine failure, a safe landing was made and it was subsequently found that a piece of a piston had broken away.

The machine had logged about 220 hours in total.

The cause of the broken propeller-hub unit was not definitely identified. The broken piston was caused by the small locator - which prevents the piston-ring from rotating - coming adrift; the ring had then moved round until it jammed in the exhaust-port and broke the piston.

One of the rings in the other piston was showing signs of doing exactly the same thing.

The hub-unit was replaced with a factory-supplied item and, in all subsequent preflight inspections, any unusual 'feel' would always be assumed to mean danger, since both ends of this type of hub had now been known to fail in a similar way.

The reporter of these defects went on to suggest that more frequent 'decokes' would afford the opportunity to examine the security of the ring-locators.

DEFECT REPORT No (90)-245: During a renewal inspection on a Flash 1 wing, the rigging was found to be seriously amiss in several respects, all of them due to changes introduced by the owner(s).

The trailing-edge ends of the battens were bent upwards - equally on both wing-halves - way beyond the manufacturer's profiles. Presumably because these profile changes had turned the trailing edges of the sail up excessively, the leach lines were far too long. This secondary problem had then been overcome in two ways, firstly, by locating all of the leach-lines at the uppermost locations of the adjuster at the king-post. Secondly, when even this had not proved adequate, extra spacers were installed on the outer pairs of leach-lines, beneath the sail, to take up the remaining slack! These spacers comprised a dished washer, below which was a 3/4 inch (19 mm) length of aluminium tubing. Below that was a spring washer and, finally, a spring ring. Last, but not least, the index tips were set at the last hole for the downward direction.

- M1.19 -

- M1.20 -
The Inspector was very familiar with the type and proceeded on the very rational basis of putting everything back to the standard as set out in the Owners' Operators' manual. After this, the machine was test-flown and found to handle extremely well.

DEFECT REPORT No: (91)-299: During a pre-flight inspection on a Flash 1, it was found that about 50% of the strands - on a top side-wire - were broken, directly where they emerge from the swage.

This problem is a well-known one and it stems from mishandling of the cables during rigging and derigging. Owners and operators must be careful to keep the cables straight where they emerge from the swages, otherwise, very large stresses are induced in the strands and they will fail, as here.

DEFECT REPORT No: (92)-310: During a 45-minute cross-country flight in a Gemini Flash 2A, (total hours 142) there was a loud bang and then fierce engine vibration. The engine was switched off and a safe emergency landing accomplished. It was found that the GRP exhaust cover was missing - and had presumably passed through the propeller, since a blade was smashed, causing the bad vibration - and, also, the exhaust bracket was broken.

This GRP cover is held partly by a single self-tapping screw. This had been found loose on the previous day and had been tightened. There was animated discussion as to whether the screw loosened again and the GRP was then allowed to break the propeller, whose excessive vibration then forced the mounting, OR, whether the exhaust-mounting broke first, forcing the GRP cover off and thus leading to a broken propeller.

Mainair commented as follows: "Only twice has this problem been notified to us and, on both occasions, it was in relation to this particular aircraft. The GRP cover is not held only by the screw but is secured primarily by being a push-fit on its mount. In fact, we would go so far as to say that, with all such aircraft other than this one, the self-tapping screw could be omitted with almost no risk of losing the GRP moulding. However, we are now applying Loctite to the screw as a double safeguard."

It has to be said that owners have disagreed with the claim that the unit is held primarily by the push fit on the mounting stub. It is argued that vibration soon removes any friction which might exist in that joint. Therefore, dependence on the self-tapping screw is high, far higher than some owners are happy with. Safety wiring would therefore seem a wise precaution.

DEFECT REPORT No: (91)-250: On a Flash 2A, the retaining pin-pin in the rear tank-support strut, failed internally. It had worked its way about halfway out of position, although normally difficult to remove.

DEFECT REPORT No: (91)-255: In flight, the drain-plug came out of the gearbox of the Rotax 503 on a Flash 2, and struck the propeller, which split.

The owner had been distracted whilst doing maintenance work and had not wire-locked the plug.

DEFECT REPORT No: (91)-258: During preflight inspection of a Flash 2A, it was found that the bolt which secures the hang-strap channel had broken. (Its ends were normally obscured by the plastic caps).

The nut and bolt had been secured by drilling through the flats of the nut and through the thread, to allow locking. This was both a wrong way to secure such a bolt and extremely dangerous practice.

There have been several known fatalities due to cracks propagating from drilled cross-holes like this, which have easily reached the loaded side of the nut.

TECH TOPICS: During the 'full and free' control-range check, prior to take-off, the retaining wire on the quick-release pin in the left-hand end of the control-frame, caught around the throttle. It was subsequently found that this could happen when
the frame was moved from left or right, past the throttle. The control-frame could thus lock in flight or the throttle be opened during a control check.

The cure was to turn the control-frame round so that the quick-release pin was at the right-hand end of the control-bar.

DEFECT REPORT No: (91)-263: A Flash 1 had a pronounced tendency to turn one way. One of the floating tips had jammed because what should have been the stop-torque had risen up on to the land which ought to have limited its rotary movement on the ball-bearings, and simply stuck hard. It is thought the problem arose during ground-handling.

A new stub was obtained from the manufacturer.

DEFECT REPORT No: (91)-295: The whole exhaust came off the machine during attempted takeoff, disposing of the propeller.

The stud-and-disc sandwich type of rubber mounts had all failed, allowing the exhaust to fall off. Obviously, they could not have all failed in the short interval between the preflight inspection and the aborted takeoff, so one must assume an inadequate inspection, which proved expensive.

DEFECT REPORT No: (91)-296: The propeller locked solid and gave out crunching noises when turned on the ground.

The cause was decided to have been torsional resonance. An incorrect preload on the spring-stack in the gearbox would help to increase this problem. Owners were also encouraged not to let their engines linger in the 'clattery' low-speed range.

GENERAL NOTE GN-(92)-110: Mainair put out an urgent notification that grey primer-bulbs, used on some of their machines, could be hazardous in some circumstances.

The 'shuttlecock' valve could become dislodged from the outlet valve-body and - by virtue of its shape - take up a reversed position when sucked back into the body. It would thus block the flow of fuel.

Mainair asked that owners check immediately and, if they found that their machines had these grey primer-bulbs installed, they remove and replace them immediately.

See Figure overleaf.
DEFECT REPORT No: (92)-318: At 300 feet in a Flash 1, the engine revs suddenly dropped to idle and there was no response to the throttle. A safe emergency landing was made. The total hours accrued on the airframe were about 200.

Subsequent examination of the engine showed that the piston-ring locating-pins were burnt away and the rings had rotated and popped out into the exhaust port.

The previous owner had apparently re-assembled the engine with the piston markings facing in the wrong direction. This meant that the locating pins were facing the exhaust ports, which led to their destruction.

Factory-supplied parts and a complete engine-overhaul were required.

TECH TOPICS: Black paint-flakes broke free from the fuel-tank float and blocked the fuel system. Areas of the cork float were bare and confirmed the diagnosis.

The system needed to be cleaned and the float replaced.

DEFECT REPORT No: (92)-320: A brand-new Mainair Alpha (with Rotax 462 LC High power) was ground-run as per the Rotax manual, inspected and then a preliminary test-flight was made.

Approximately 10 minutes into the flight, there was a loud bang and a precautionary landing was immediately made.

Investigation revealed that a cylinder-head nut was missing. On this installation, the outer four cylinder-head nuts are removed and refitted by the aircraft’s manufacturer in order to attach the engine-mounting plates. It was, however, one of the central four nuts which had come undone, which the manufacturer had no need to remove.

A new cylinder-head nut was fitted and one of the propeller-blades also had to be replaced. All cylinder-head nuts were checked for the correct torque.

The person reporting the defect went on to add, “Although the Aircraft Owner’s Manual was followed precisely for running-in the engine and for the preflight checks, in future I shall also check the tightness of all nuts and bolts before test-flying any new aircraft. Should not the Manuals be amended to this effect?”

DEFECT REPORT During preflight inspection, it was found that the slack back-up wire (inside the fin of a Gemini Sprint) had failed at the top swage.

Being able to flop around loosely inside the fin, the cable had simply failed by fatigue. The installation of a light tension-
spring or bungee would stop this, but allow the cable to come into full operation when needed.

DEFECT REPORT No: (92)-324: The spats were removed from a Gemini Flash 2A to avoid entanglement when operating from long grass. During take-off, the left rear wheel fell off. The pilot and student were unaware of this until, on approach, it was noticed that a van was parked on the runway and people were waving at them.

Realising the problem, the instructor took control and landed the aircraft with the engine switched off. The machine only slewed slightly to the left before stopping. The instructor had logged 4000 hours, 3000 on type, (which explains his consummate skill in landing the machine undamaged).

It was believed that, in removing the nuts which secured the spats, the independently secured wheel nuts had become loosened. (Alternatively, the wheel nuts may already have been loosened and simply held in place by the spat lock-nut system).

DEFECT REPORT No: (92)-328: On a Gemini Flash 2, (Rotax 503), on the base leg, as the student pilot was checking that the hand throttle was ‘Off’, the hand-throttle inner wire kinked and jammed, locking the engine revs at 4000 rpm.

The pilot switched off the engine and glided down to a safe landing.

It is a known problem with this throttle system that, if one

turns the hand-throttle off whilst the foot-throttle is depressed, there is a risk that the hand-throttle inner wire will kink because the spring force from the carburettor - pulling on the cable - is absent, (see sketch). No obvious remedy seems to be available. Pilots must simply be aware of the risk.

DEFECT REPORT No: (92)-330 The pilot of a Gemini Flash 1 (Robin 440) was told to check his aircraft after completion of maintenance and corrective work and to conduct engine run-up tests for at least ten minutes on various high RPM settings, including full power. This was done with the wing installed but tied down to one side, and with the pilot sitting in the trike.

After about ten minutes, the aircraft came free of the chocks on full power and lurched forward. The pilot was using the hand-throttle but his hand was not actually on it.

He snatched down at the hand-throttle to reduce the power and, in doing so, jammed the throttle-cable (see sketch and Defect Report No (92)-328 above). The aircraft raced around the field completely out of control for some time, on full power, until the pilot was finally able to switch off the engine.

DEFECT REPORT No: (92)-331 In flight, the crankshaft of the Rotax 503 broke and, in the process, a small piece of the web caused a large crack in the lower crankcase and pushed a hole about 15 mm diameter in the upper half. The aircraft had logged 170 hours. Fortunately, a safe landing was achieved.

Failure was not attributable to constant use at high rpm or anything of that nature, so may be put down to a typical fracture of a small but high-duty crankshaft, which is what our types of engines have to use.

A distributor-implemented rebuild was required.

DEFECT REPORT No: (92)-340: During various preflight inspections of his Flash 2A on the "Round Britain" rally, it appeared to the pilot that the Nylon-locked nuts which retained the front and rear flying wires, near the A-frame corner-joints, were in a slightly different position.

On checking them, it was found that they could be unscrewed with the fingers, with virtually no effort. Having owned the aircraft from new, the pilot knew that the nuts had never been removed.

Had any of these nuts been lost completely, the stage would have been set for an in-flight structural failure, with all that that implies.

Almost certainly, the problem stemmed from a faulty batch of Nylon-locked nuts. The ones in question had green inserts.
The nuts had to be replaced with new ones with standard off-white inserts.

In 1991, Mainair reported a problem with a batch of green-insert Nylon-locked nuts (GN-(91)-65). In that case, it was 5/16" nuts which were at fault - they stripped their threads easily - and Mainair had to jettison the whole of their stock of that size.

Here, it would seem that was a batch of 1/4" nuts of the same variety which were equally poor but in a different mode.

All owners of microlights were strongly advised to examine their machines to see if they had any green-insert Nylon-locked nuts installed. If they found any, they needed to be scrapped and replaced with white-insert types.

DEFECT REPORT No: (92)-355 After removing the engine from a Mainair Flash 1 for a major overhaul, it was found that the rear upper engine-mounting plate was cracked across the bolt-hole. Unfortunately, this could not be seen during normal preflight inspections because of the 5/16" penny washer which obscured a large part of the relevant area of the plate.

The aircraft had logged over 970 hours!

John Bridge, of Mainair Sports Ltd, suggested that this component should be carefully checked after 500 hours of operation had been logged, if it was not dismantled earlier for engine servicing.

DEFECT REPORT No: (92)-358 As the Rotax 582 engine had been operating on a Mainair Flash 2, the glass-fibre engine-cover had been bitten into the top hose to the radiator. It had already penetrated through about 1/4 of the hose-wall thickness when detected. The aircraft was one year old.

A new radiator hose was obviously needed and it appeared that - if the hose could not be re-routed - the cover needed to be relieved in the relevant area.

Se Figure below

DEFECT REPORT No (92)-363: Following a full-power climb to 2500 feet in a Mainair Gemini Sprint with Robin 440 engine, a loud bang was heard and very severe vibration ensued. The engine was switched off and an uneventful forced landing was made. The logged engine hours were 219.

It was found that the end-stub outlet-pipe from the silencer had fatigued and broken free, smashing into the propeller as it departed.

A new silencer was fitted and a safety wire was installed, securing the stub to the silencer.

With four hours logged on the new silencer, preflight inspection revealed that one of the manifold springs was broken at the acute bend where the hook is formed. The safety wire had also broken.

Mainair supplied a new spring free of charge, and very quickly, and advised that at least two loops of wire with 1/2 inch (12 mm) of slack should be used. (Mr Epps had used one loop and 1/4 inch (6 mm) of slack, as fitted to the original).
MIRAGE MARK 2 AIRCRAFT.

DEFECT REPORT: The propeller-shaft was a steel tube with an aluminium insert. It had to be replaced with a solid steel rod, lightened where possible.

DEFECT REPORT: The welds at the base of the control column could crack.

The assembly needed reinforcement in this area.

DEFECT REPORT: The keel assembly was prone to cracking and needed careful inspection after about every 10 hours of flying time or every 5 hours of ground operation. The checks had to be particularly rigorous directly behind the engine plate.

DEFECT REPORT: If the control-column mounting-bracket was made from other than black- or gold-anodised alloy, it had to be regularly and carefully checked for cracking.

(a) Stainless-steel had to be gussetted, because the original welds were inadequate.

(b) If plain, unanodised aluminium-alloy had been used, it had to be replaced.

DEFECT REPORT: Small cracks in the welds which attached the bearing-mounting tabs were tolerable, provided that they were carefully monitored and not allowed to grow unobserved.

DEFECT REPORT: The upper wires at the king-post attachment had to be checked, at the tang on each side, secured with one AN4 bolt and nut. The tang centre-hole, on either side, could become elongated and the tang bent, if subjected to constant heavy 'g' loads.

DEFECT REPORT: The outer sheath of the rudder cable could become internally rusted. This could cause loss of rudder travel and even total jamming.

Replacement of the cable assembly was the best cure.

DEFECT REPORT: The diagonal cage-uprights had to be checked for
cracks at the top, near the lower bolt-hole.

If the angle of the tube did not match the flat face of the tube, shims could be installed to take up any clearance and remove the stress caused by forced alignment.

DEFECT REPORT: The spar end-caps had to be riveted using three steel rivets on each. The caps had to be rivetted, to prevent 'tuck' effects under loads.

DEFECT REPORT: The tailboom bolts were prone to take on a small 'set', due to the angle of the boom-tubes. This was considered acceptable but the bolts had NEVER TO BE STRAIGHTENED. If it was necessary to remove them, either they had to be replaced in the positions from which they were removed, or brand-new bolts fitted.
The older version of the drawshaft had been inadequately secured to the pulley and propeller, allowing them to separate from it. The new design of shaft was intended to avoid the problem.

DEFECT REPORT No (90)-179: Unexpected free movement was found at the tips of the tailplane of a Sorcerer MW5B.

Wear in the pivots (synthetic resin-bonded plates) was suspected. They were replaced with new ones, as a safeguard.

DEFECT REPORT No: (91)-293: The Fuji Robin EC44FM on an MW6 seized instantly in flight at 1200 feet, without the slightest advance warning.

The owner had unwittingly used an oil sold as equivalent to "Silicolene Super 2", normally used in the engine. There was evidence of marked lack of lubrication in the internals of the stripped engine, after the failure.

GENERAL NOTE No: (91)-90: A BMAA MANDATORY bulletin required owners of MW5x carefully to examine the brackets which form a part of the wing-spar attachments. If these folded alloy brackets were found to be cracked, they had to be immediately replaced. It was necessary to have bend radii incorporated in any new brackets, such that they were at least three times the thickness of the sheet. (It was too small radii which caused the failures initially). On existing brackets, dye-penetrant testing of them had to be carried out and the question of replacement decided on the basis of the results of those tests.

DEFECT REPORT No: (92)-309: The tailplane on an MW5x Sorcerer is constructed by bonding plywood ribs to the alloy spar, with wraps of polyester glass-fibre round the tubular spar and against the faces of the ribs. Both sides of all but the end-ribs are bonded; the latter are bonded only on their inner faces.

On this machine, (2 years old, 150 hours) only one rib on each side - which happened to be those with a rivet through the wrap/spar joint - were secure. ALL others were free to rotate on the spar, the failure having occurred between the wrap and the spar.

This form of construction, properly executed, is extremely strong. The spar will fail in torsion before correct joints will fail. In this particular instance it appears, from the nature of the failure, that there had never been a proper bond between the wraps and the spar, because the etch primer had come away from the spar and was keyed to the wraps.
One possible explanation for this could be inadequate degreasing of the tube before bonding. Others are use of etch-primer which was past its 'sell-by date' so to speak, or which was incorrectly proportioned when mixed, or simply because too long an interval was allowed between etch-priming the spar and carrying out the bonding.

The designer, Mike Whittaker, gave details of the testing procedure to be applied to wing, tailplane and rudder-ribs.

CHIEF INSPECTOR'S COMMENTS: If an aircraft had a fault such as this, one should ask oneself if it were of a type which might occur elsewhere on the machine. There are enough MWs flying safely to demonstrate that this had to be a building error. If the wing-ribs, or rudder/fin ribs, were bonded in the same unsatisfactory manner, could the same fallibility be lurking there? Obviously, one would take very great care to ensure that nothing similar had been missed.

The reporter went on to point out that one can easily check the integrity of these bonds between the ribs and the spar. Simply lock the elevator control and then twist the outboard end of each tailplane half, looking for movement. In cases of doubt, remove the fabric for a fuller inspection.

DEFECT REPORT No: (92)-309: FIRST AMENDMENT Mike Whittaker, designer of the MW series, sent in details of the torques to be applied to each wing, tailplane and rudder rib.

Essentially, each rib should be tested separately, with the aircraft fully rigged as appropriate, with the torque applied for a minimum of three seconds, and with a detailed examination after the test.

19 kg were to be applied downwards at a distance of 495 mm behind the mainspar centreline, on all wing-ribs.

Additionally, 19 kg were to be applied downwards at the hinge-line of the aileron-bearing ribs.

12 kg were to be applied downwards at 165 mm behind the spar centreline of the tailplane and the rudder.

DEFECT REPORT No: (92)-309: SECOND AMENDMENT

Mike Whittaker sent in further notes about his machines, paraphrased as follows:

**RIB/SPAR JOINTS**

During the renewal inspection of an Aerotech-manufactured MW5K, all but the inboard tailplane ribs were found to be loose on the spar-tube. A close examination revealed that the joints had separated between the spar-tube and the glass-fibre flange, leaving the etch primer attached to the glass fibre.

These joints are normally very strong and stand up to much abuse. The fact that all had failed, with separation at the etch-primer interface, suggests a problem with the primer, which could be due to any one of a number of reasons. But it has been my experience that too low a temperature is the most common cause of adhesion
problems. The drawings call for spars to be etch-primed to the manufacturers' instructions, as spelled out in their leaflet 3993 (which is attached).

New tail surfaces, and those being recovered, should have a pop-rivet inserted through the joint as shown in the sketch.

Components should be regularly checked for looseness in the joint. To do this, hold two adjacent ribs at the trailing edge and lightly flex them in opposite directions. If a joint has failed, the resisting stiffness will be enormously reduced. In such an instance, one should reveal the component by peeling back the fabric. Remove the old joint completely without damaging the spar. (Use paint stripper). Re-etch prime the area and lay up a new flange. Load-test the rib, re-attach the fabric and heat-shrink it tight.

The question arises, what load case caused the joints to fail? Many of these aircraft are subjected to loading cases way beyond Section S. I have seen children swinging the trailing edge of the MW4 wing and many aircraft have suffered forced-landing damage.

Some aircraft are kept fully rigged in the open, with no protection (NOT recommended!). Severe damage can occur to elevators, rudder, ailerons and wings if the aircraft is tethered tail-first in the up-to-100 MPH gusts which we have seen in recent years. One has only to sit – with one's back to the wind – waiting to take off, to feel the gusts snatching at the stick. Good airmanship calls for aircraft always to be parked into wind"
MIDLAND-ULTRALIGHTS AIRCRAFT: (FIREFLY)

DEFECT REPORT No 040: On a Midlands Ultralights Firefly:

(i) the lower engine bracket was thin and prone to fatigue failure.

(This was cured by adding a welded fillet to the bracket).

(ii) The plastic fuel-tank had no top restraint and sat on a sharp-edged tray, which could cut into it.

(This was cured by fitting a restraint and smoothing the edges of the tray).

(iii) The crimps on the Griflex tubes were quick to work loose.

(This was cured by fitting BS fire-resistant hose and Jubilee clips).

(iv) The exhaust system had Nyloc nuts on it.

(All-metal Simmonds-type nuts were fitted).
NICKLOW REDUCTION-GEAR

DEFECT REPORT: There were many reports of failures of the aluminium-alloy drawshafts in Nicklow reductions. (See below).

DEFECT REPORT No 020: Pop rivets failed and allowed the flange to break free from the crankshaft pulley. The propeller was damaged.

A new pulley was required and it had to be properly monitored thereafter.

DEFECT REPORT No 015: On a Phantom UL107, the drawshaft on a Nicklow reduction shaft broke.

A new shaft (of better-quality steel), plus new bearings and belts, were needed.
POWERED PARAGLIDERS

GENERAL NOTE GN-(91)-96 PARACHUTE INSPECTIONS

The routine for dealing with powered paragliders is that - for the present - the Inspector must make arrangements for a professionally qualified Parachute Rigger to examine the canopy and make such repairs as are needed and sanctioned by the owner, and then to sign that part of the form which specifically refers to the canopy. Only then can the BMIA Inspector sign off the whole aircraft as fit for Permit Renewal, always assuming the trike was satisfactory.

Inspectors should note that (a) the British Parachute Association’s riggers are only insured to deal with canopies owned by their members and (b) few have lofts large enough anyway to handle the huge ones used on powered machines.

These canopies can, of course, be readily consigned by Post or carrier, since they weigh little.

DEFECT REPORT: A Raider was reported to have its wheels bent out of alignment, the side-stay buckled and the two lines at the front of the machine were very slack.

DEFECT REPORT: It was reported that the lower engine-mounting had broken on several occasions.

DEFECT REPORT: It was reported that the propeller tip-plates had become loose on the blades.

DEFECT REPORT: Two reports were received indirectly, of wheels coming off Powerchute International machines.

These were attributed to the use of self-locking nuts to secure the main wheels, with both being ordinary threads. Consequently, one nut loosens with use, eventually allowing the wheel to come off completely if the approaching problem is not noticed, the other nut tightens up and confines the bearing.
SERVICE BULLETIN, (Mandatory):  In June 1986, Solar Wings issued a
Service bulletin (number 0002), classified by the CAA as
"Mandatory". It concerned the fuel-cleaning system and its
inspection. The models affected were the Pegasus XL-R, the
Pegasus Flash and the Pegasus Flash 2. All aircraft with trike
Serial Numbers prefixed with ‘SW-TB’ were affected.

Essentially, the Bulletin related to two problems,

(i) the suction side of the fuel system becoming partially
blocked by foreign objects at the fuel-cock and at the tank pick-
up tube, and

(ii) air leaks developing at the connection between the flexible
hose to the tank and the tank pick-up tube, and also at the
washers which sealed the air-bled screws on top of the fuel-
filter bowl.

Full details were given on how to deal with the problems and how
to identify their presence before they became a serious hazard.

(Copies of Service Bulletins are usually available from the
manufacturer of the aircraft to which they relate).

OWNER’S REPORT: An owner experienced the problem of punctures
with Nylite wheels, (which have often been reported as occurring
on Southdown and Pegasus machines and ‘Orphan’ types). The
punctures are caused where the wheel-halves cut into the inner-
tube. The owner machined their mating faces as described in an
earlier report.

However, as he tightened the wheel-bolts to the value recommended
(by Pegasus, in this instance) the abutting joint was seen to
peak into a ridge. Spacing washers of fibre - installed where
Nylon had effectively been machined away - stopped the ridging.
But when the tube was inflated to 12 psi, as recommended, he
observed that the Nylon was straining under the bolts.

He knew he had to buy new wheels and so carried out a further
test; he inflated the tyre to the 20 psi figure recommended by
Pegasus for use on hard surfaces. The wheel halves blew apart,
fortunately not injuring the owner (in which he was extremely
fortunate). The failure was caused directly by lack of residual
plastic material round the bolts.

On the new wheels, his ‘preventative-maintenance’ solution was to
put a 5mm bead of clear silicone-rubber round the edge of one of
the wheel-halves, and allow it to dry thoroughly. He then
assembled the wheel, tube and tyre with a rubber band (cut from a
car inner-tube) round the abutting edges. He has since had no
problems.

DEFEAT REPORT: On a ‘Q’, considerable abrasion of the pulse-pipe
to the fuel-pump had occurred, almost to failure point. It had
been rubbing against an adjacent bunch of electrical cables from
the carburettor-heat unit, the CHT sensor and the water-
temperature sensor.

The pipe needed careful checking and replacement if there were
the slightest chance of failure. If it appeared to be located so
as to be likely to begin abrading, it needed to be re-routed
and/or wrapped with a sacrificial tape. It was important not to
alter the length of the pipe as - in any pulse system - the
length can be critical to correct performance.

DEFEAT REPORT: After checking that he had about 1/3 to 1/2 of a
tank of fuel, the pilot took off. The engine stopped almost
immediately after lift-off and the machine was damaged in the
ensuing hard landing.

The problem was that the machine’s ground attitude caused the
fuel level to be completely misjudged. In this instance, there
was actually only about 4 litres (nearly a gallon) left in the
tank. In the steep climb with a single occupant, the machine was
well inclined rearwards and the pick-up in the tank was actually
above the fuel-level, so the engine soon stopped.

DEFEAT REPORT: An early Panther XL prototype wing had the
attachment of the A-frame to the wing-keel BEHIND the hang-
bracket. It was possible for the bolts on the A-frame to scour
the monopile.

DEFEAT REPORT: The cross-frames, on the large Storm wing, HAD TO
CARRY OVER-SLEEVES ON EACH HALF. This was a mandatory factory-
modification, if the wing was intended for use on a Flex-wing
monoculture. It was necessary to check that the sleeves were
installed and that the booms were not bent forward.

DEFEAT REPORT: The bolts which held the hang-bracket on to the
wing-keel on the Storm wing, tended to become bent.

DEFEAT REPORT No 032: On a Pegasus Flash, the steel front-wheel
bracket failed due to poor welding.

A correctly welded component was fitted.

DEFEAT REPORT No 038: The nose-catch unit on a Typhoon was found
snapped during ground inspection.

A new component had to be fitted.

DEFEAT REPORT No 049: On a Pegasus Flash, the tip-strut was
thought not to have been fully inserted into its socket. The
normal loads bent the strut and it needed replacement.
This sort of problem can be prevented by taking care always to insert the strut to the full, designed extent. (But see a later comment.)

DEFECT REPORT No 050: After a Pegasus Flash wing was serviced, it was flown - in ignorance - with both floating cross-tube tension-wires positioned - by the factory - on the same side of the fin strut.

This could have been prevented, had the pilot carried out a careful pre-flight inspection, which should have included checking for correct routing of all cables after assembly.

DEFECT REPORT No 071: The paper element, inside the filter of an XL-SE Rotax 447, disintegrated and the particles blocked the lines.

As in earlier cases like this, the use of a filter with a stainless-steel element was a better solution.

DEFECT REPORT No 072: The lower, port, radiator-hose ruptured and all coolant was lost from the Rotax 462 on a XL-SE. The rear silencer bracket also snapped.

The hose was set clear of the engine by installing a a spacer behind the retaining bolt. The silencer bracket was known to be weak and a new design was supplied by the manufacturers.

DEFECT REPORT No 075: The filter element in the Cooper unit on an XL had been installed upside down. This led to fuel starvation.

The filter needed to be installed properly!

DEFECT REPORT No 080: The tape stripped off of the propeller blade of a Pegasus Flash 2, in flight over the Kalahari desert.

In high-temperature environments, the adhesive on these tapes may reasonably be expected to 'let go'. Careful scrutiny is mandatory during pre-flight checks.

DEFECT REPORT No 081: On a Pegasus Flash 1, broken strands were noted in the cables connected to the A-frame.

Replacement was required. The damage could have come during rigging etc.. (This problem has been identified before, by Mainair themselves. They have suggested measures to check for such damage, and point out the extreme care needed in handling these cables and in examining them for damage).

DEFECT REPORT No 082: On an XL-SE, the spindle of the choke lever came adrift.

A replacement part was needed and it was then monitored to see if it wore loose or was struck during rigging, de-rigging, etc.

DEFECT REPORT No 097: Splits occurred in the rubber sleeves at the carburettor of the Rotax 462 on two 'Q's. Factory replacements were needed.

DEFECT REPORT No 103: On a Pegasus Flash with a Rotax 447, the two straps, which hold the pump/filter unit to the engine-mounting, had failed.

Factory replacements were installed.

DEFECT REPORT No 107: On two Pegasus trikes, cracks were found in the two top-mounting plates which support the front end of the underslung petrol-tank.

Professional welding was the recommended method of repair, plus more careful installation of the tank and its straps.

DEFECT REPORT No 112: The Rotax 447 misfired and failed in flight in Africa, on a Pegasus Flash 2.

A high alcohol-content in the African fuel used in this aircraft, was thought to have attracted water which blocked the filter. The latter looked clean but resisted fuel-flow. (But see the many comments, earlier, on the formation of gel which can block filters).

DEFECT REPORT No 113: The small-end roller-bearing in the Rotax 447 of an XL-SE broke up in flight and the engine failed.

Cylcone Hovercraft had earlier put out a note about the risk of this happening if the engine was over-heated for any reason of use or by the aircraft design. They have a better bearing in newer engines.

DEFECT REPORT No (89)-129: On an XLR-SE, the exhaust pipe had broken off at the front, port flange.

The mounting screws (Part Nos 840-991) on the exhaust-port flange of the Rotax engine had worked loose, allowing the pipe to move.

DEFECT REPORT No (89)-134: Flakes of paint, of unidentified source, were found in the fuel-tank of a 'Q'. They had caused engine failures. (See also Defect Report No (89)-141).

Total, thorough cleaning of the tank and fuel system was required.

DEFECT REPORT No (89)-136: Considerable structural damage was sustained on a 'Q', from high winds which blew it over.

Full repairs and inspection - to factory standard - were
required, and approved spares fitted in the primary structure.

**DEFECT REPORT No (89)-137**: The gearbox on the Rotax engine of a ‘Q’, became loose.

The socket-screws on the gearbox had been tightened with the wrong type of Allen-key. As a result, they could not be given the full torque. The correct key - obtainable from Cyclone Hovercraft Ltd - has a central locating-peg.

**DEFECT REPORT No (89)-141**: Resin, used in the construction of the fuel tank of a ‘Q’, agglomerated as flakes and particles in the tank, causing a risk of fuel-line blockage. (See also Defect Report No (89)-134).

Also, the tank-mounting strap moved and allowed the tank to become loose in its installation.

The manufacturer modified the technique for making the tanks and also changed the design and installation of the tank-mounting strap.

**DEFECT REPORT No (89)-145**: A pip-pin, used in the nose-catch of an XL, came apart during rigging.

A new type of pip-pin was installed and is now supplied as standard by the manufacturers.

**DEFECT REPORT No (89)-147**: Propeller hub-bolts broke on ‘Q’ 462s. This problem has been reported on several occasions. Although the Rotax propeller-flange had been drilled out to allow the bolts to pass through them in the normal way, some operators had reported that the actual bolts were of such a length that the threads remained well inside the flange bolt-holes. (The manufacturer disputed this).

For normal safe practice to be adhered to, the bolt-threads had to be fully through the flange. This usually meant that new bolts - genuinely of aircraft-quality - had to be fitted and the torque on them monitored carefully and regularly. Alternatively, there is a long-term solution available in the form of a system of disc-springs under the nuts.

If bolts which screw into the flange are found on a microlight, it is vital to ensure that the lock-nuts which normally secure them tightly against the flange are loose, before checking bolt-torque. (There have been many instances of propeller-bolts breaking after owners have ‘checked’ their apparent tightness by trying to torque them with a spanner, only to find a large resistance (due to the bolts actually be lock-nutted into the flange). All the application of torque did was to overstress the threaded portion of the bolts, just in front of the propeller-flange).

**DEFECT REPORT No (89)-151**: Engine-failure occurred on an XL-S with a Robin EC44PM. A small particle of Lokitite had become trapped in the bore of the fuel-tap. A tap with a bore larger than the 1.5 mm diameter of this unit was recommended.

**DEFECT REPORT No (89)-154**: The ignition switch fell apart on a Pegasus Flash 2 after 100 hours of use. The assembling screws had loosened with vibration. The manufacturer decided to lock the screws on this type of switch with paint (or Lokitite) after they were properly tightened.

**DEFECT REPORT No (89)-162**: A bolt, joining the cylinder-head to the engine-mount of an XL-SE, broke in flight. Bits of it shattered the propeller, which then struck the wing fabric. Over-tightening of the bolt was thought to have been a factor, possibly aggravated by vibration.
DEFECT REPORT No (89)-163: A thin rod was found missing from the exhaust arm-guard on a 'Q'. (This form of failure has been reported on many occasions).

After replacement, the thin rods were wired together to lock them in place.

DEFECT REPORT No (89)-165: On an XL-SE, the weld cracked, on the joint of the support-plate for the air-inlet tube.

An additional support was added, with the manufacturer's agreement.

DEFECT REPORT No (89)-168: The engine failed on an XL during flight.

The factory-supplied in-line filter was found to be internally disintegrating. A factory replacement gave no further problem, so it was a 'one-off' trouble.

GENERAL NOTE No: (89)-017: There was one known case of an XL-R, (with liquid-cooled Rotax) being manufactured with a monopole designed specified for the air-cooled equivalent.

This error meant that the minimum clearance between the propeller and the lower rigging-wire was reduced to an unacceptable figure (about 15 mm).

Although Solar Wings believed this to be the only instance when

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this might have happened, they issued a Mandatory Service Bulletin, No 0026, asking all owners to carry out a check to ensure that their aircraft was correctly assembled.

DEFECT REPORT No (89)-170: The brake-plate on an XL-SE contacted the tyre at such an angle that it locked solid.

The plate welded to the brake-tube was found to be at the wrong angle. (See also Defect Report (90)-240 below).

DEFECT REPORT No (90)-181: Severe engine-power problems occurred with a Rotax 447 on an XL.

No single cause has been reported but the engine distributors have suggested a range of possibilities, all associated with ignition equipment and its behaviour.

DEFECT REPORT No (90)-180: The union worked loose at the top of the fuel-tap on a 'Q', spraying fuel over the passenger.

No definite cause was identified.

DEFECT REPORT No (90)-186: On an XL, the speed of the Rotax
were found in the plate.

A new factory-supplied plate had to be installed. Welding of the cracked plate is not permissible.

DEFECT REPORT No (90)-203: During de-rigging, fuel was seen to be dripping from below the trike. The source was again found to be a minute hair-line crack in the top of the tank.

The manufacturers said that owners should exercise great care in maintaining the tank-securing straps taut and the mounting-lugs should also be carefully monitored for cracks. The cracks can be repaired by expert welding.

DEFECT REPORT No (90)-208: Several instances were reported of breakages of the front-suspension springs on ‘Q’s. Only one spring failed on each occasion, just at the base of the securing 'hook'.

New springs were needed - from the factory - who recommended simple tests on the condition of existing springs, exactly as spelled out in the Owners/Operators manual. Elongation of one spring can, for example, cause the two suspension links to rest at different heights.

DEFECT REPORT No (90)-214: When replacing the bowl on the Bing Carburettor of a Rotax 502, on a Quasar, the spring-clip was not seated properly in its grooves. Had this been unnoticed, the bowl could have shaken off in flight.

The error was partly due to the inaccessibility of the carburettor on this particular machine. However, it was helped by the non-positive location of the clip on the carburettor body.

This feature had already been noted by Nigel Beale, of Cyclone Hovercraft, to whose comments Bing have responded. They are reverting to the earlier design, where the clip was sprung into two holes, rather than resting in shallow grooves.

DEFECT REPORT No (90)-217: A new Quasar was found to have a leak at the drain-point, due to the round metal plate - moulded into the plastic tank - being able to rotate. The seal was therefore not complete and fuel was lost at the rate of 1/2 gallon in 24 hours.

This aircraft, and a second machine, also leaked at the fuel pick-up plate, for the same reason, when the trike was moved.

Solar Wings asked owners to make sure that it really was the insert that was leaking and not the drain-valve or sealing-washer.

They offer "Fuel pick-up sealing kits" or "Fuel-drain sealing kits" which effectively cure the problem. They are also developing different methods of tank manufacture to avoid even
engine increased and decreased erratically on take-off. Ground-running repeated the effect.

The "Moprod" filter was found to be leaking round its peripheral seam, admitting air (and, no doubt, seriously overheating the engine).

DEFECT REPORT No (90)-187: On what was later identified as a prototype ("Orphan") Panther XL, there was a loud bang just after take-off and the aircraft wallowed and lost power.

It was found that a starboard landing-wire had snapped at its turnbuckle and trailed into the propeller. The latter had smashed and its vibration had broken the gearbox free. The broken propeller had also almost severed the monopole.

A full strip-down and rebuild were ultimately required, on both wing and trike.

DEFECT REPORT No (90)-189: On a 'Q' with a Rotax 462, the top engine-mounting bolt came adrift and struck the propeller, causing slight damage. (It is believed that the machine was on the ground at the time).

Factors contributing to the problem were, (a) an unsupervised helper probably over-tightened the bolt, (b) the locking nut was re-used, when it ought to have been replaced and (c) the bolt was fitted with its head towards the propeller. Installing all bolts with their heads against the airstream does not absolutely guarantee their staying in place (because of vibration effects, for example) if the nuts are lost, but it often helps. An airborne nut does rather less damage than a complete bolt!

DEFECT REPORT No (90)-190: Several reports have been received concerning hair-line cracks in the fuel-tank seams on 'Q's. The cracks are usually in the front, vertical welds but they have also been noted in the top, horizontal welds.

It would appear that the cracks are essentially extensions of the internally unwelded joint-lines between the sheets of formed material from which the tanks are fabricated. The tanks can be factory-repaired.

DEFECT REPORT No (90)-192: During ground-inspection of a Panther XL (Fuji Robin 440), the centre exhaust-bracket was found to detached from the exhaust, leaving a hole about 25 mm (1 inch) square.

A satisfactory weld-repair was made.

DEFECT REPORT No (90)-193: On a 'Q', a slight fuel-weep was noticed. It came from the large fibre washer above the fuel-cock.

It was corrected simply by tightening the associated fitting, turning it through 'two flats'.

DEFECT REPORT No (90)-194: On a 'Q' with a Rotax 462, the alloy plate bolted to the front of the engine to hold the ignition coils, was found cracked at a top retaining-bolt hole. The secondary effect of the fracture was also to cause the earth connector from one of the coils to break, resulting in loss of ignition at the rear cylinder. On dismantling, further cracks
The owner has changed to semi-synthetic oil.

(Solar Wings suggested a 50-hour check on the state of the pistons, as a standard procedure).

(x) There was a leak between the exhaust manifold and the engine block.

(Solar Wings suggested that this was a problem which they found more prevalent in owner-maintained machines. They suggested - as did Cyclone Hovercraft - that it was important to tighten up the exhaust-mounting bolts before torquing up the head. Two gaskets were also a useful aid to good sealing.

Cyclone Hovercraft suggested that a thin smear of "Silastic 736 RTV Red" on the clean, abutting faces, prior to assembly, would normally help provide a good seal).

(xi) A baffle became loose in the fuel-tank.

(Solar Wings suggested that the failure could well be due to a great deal of taxiing or trailering with the tank only half-filled. It should be kept full, or empty, if at all possible).

(xii) The radiators seemed to be screened by any passenger carried, to an extent depending on their size.

(Solar Wings said they had received reports of this - see Defect Report No (90)-229 below - but could not repeat the problem on their demonstration machines, in spite of often having to fly in the ideal conditions to produce it. They were thus unable to give a definitive cure for the problem).

INFORMATION BULLETIN: Some pilots found it difficult to get the Photon 210 to settle down on landing, with the engine idling-speed set to the factory-recommended RPM. This was a fairly high figure, needed with a small, single-cylinder two-stroke engine if harsh vibration was to be avoided.

Owners tended to tune the engine down to a lower idling RPM. This gave rise to massive torque impulses which resulted in belt failures, splitting of the carburettor rubber-sleeves and - in one instance - a separation of the transmission from the engine.

The manufacturers were testing a replacement drive system.

Nothing further was heard of this, when events overtook the 'Sub-70 kg' class of microlight.

GENERAL NOTE GM (90)-34: In common with the practice of other owners, an XL had been fitted with a safety strap of parachute-harness fabric, between the top of the trike and the wing-keel.

In flight, this had slid back along the wing-keel and dangerously restricted pitch-control in the downward direction.

The Inspector was able to advise its re-location between the king-post and the hang-bracket. It could not then move rearwards.

DEFECT REPORT No (90)-219: With an XL-8E in flight at 1500 feet, the tip-batten fell away. The pilot put the loss down to his own carelessness in not fitting the batten properly, or else in not observing that it had moved out of its correct location.

DEFECT REPORT No (90)-221: On a 'Q', the engine-side of the Lord mount broke completely, during flight.

As with the previous defect, more careful pre-flight inspections would have given added safety.

DEFECT REPORT No (90)-222: The tip-strut fell off the wing of a 'Q' whilst in flight. The exhaust-mount also broke and left the
They also pointed out that, on no account, should Silicone RTV-type sealants be used.

GENERAL NOTE GN (90)-33: The private owner of a Q with Rotax 462 listed the problems he had encountered during a year’s operation. Whilst only being indicative of the normal ‘wear and tear’ of a microlight and not of any particular fallibility of the type, they were, in summary:-

(i) The radiator-hose wore away on the base of the gearbox.

Solar Wings normally prevent this by locating the hose away from the gearbox with a tie-wrap. Cyclone Hoversports suggest that the hose can also be moved down the radiator stubs a little, to gain the requisite clearance.

(ii) The inner-tubes were punctured by the rough joint between the wheel-halves.

This is the perennial problem with Nylite wheels.

Solar wings use a protective seal between the wheel-halves. It is available as a retrofit option.

(iii) He damaged the wheels by over-tightening their bolts.

Again, this a standard problem, easily caused, with Nylite wheels.

(iv) and (v) Cracks occurred on the exhaust and the passenger exhaust-guard.

Solar Wings say the former seems to be due to owner/maintenance problems. But they admit that the exhaust-guards were sometimes prone to crack and their new version is not attached to the exhaust.

(vi) A seam-weld on the Rotax exhaust cracked.

Solar Wings find that this happens sometimes and they cure it permanently by running a weld round the seam.

Cyclone Hoversports suggest that such sort of problems can be avoided by the use of double flexible joints, which they always urge manufacturers to incorporate.

(vii) The coil mounting-bracket cracked.

Solar Wings commented that they knew of several instances of failure of this Rotax part.

Cyclone Hoversports again suggested that – as with all vibration-related failures – this could be a direct result of the design of the engine-mounting system.

(viii) The oil-seal, between the engine and gearbox, failed.

Cyclone Hoversports only knew of one instance where this seal had been ‘nipped’ during assembly.

Solar Wings pointed out that a new seal was all that was required.

(ix) The secondary piston-rings stuck in their grooves.
bulk of the exhaust-system dangling on one mount and the locking wire.

One would automatically assume that the former may have been partly due to inadequate insertion of the strut, into its fittings. But other Defect Reports belie this.

Also, the exhaust-bracket probably showed signs of impending failure long before it actually happened, so more detailed pre-flight inspections would have revealed the problem in time to prevent its becoming a serious hazard.

DEFECT REPORT No (90)-223: An owner of an XL-SE made a practice of running his engine once a week, during any period of storage. On one occasion, he checked that the ignition was off, as usual, and then turned the propeller to prime the engine. It fired instantly and he was lucky not to sustain a serious injury, (and equally pleased that the throttle was set at idle)! The ignition switch had failed in the open position.

It is worthwhile remembering that we normally depend on our switches to short the ignition to earth. But since most switches fail to ‘open circuit’ the odds are a little stacked against our safety.

As the owner decided in this case, it is wise to use the pull-starter and keep well away from the propeller, no matter what you may be trying to do.

An Inspector gave details of a double-pole, heavy-duty type of switch, (described earlier), which was ideally suited to micro-light application, to minimise this kind of risk.

DEFECT REPORT No (90)-229: This was a report by an owner that the engine temperatures on his Pegasus Flash 2 were consistently too high, (between 88 and 105 degrees C), when a passenger was on board.

No obvious cure was, or is, known, as was explained above.

DEFECT REPORT No: (90)-237: The low-tension generator part of the ignition coil - mounted behind the flywheel - failed on two Pegasus Qs with Rotax 462 engines. These, in turn, resulted in total engine-failures without warning, on both machines. Both aircraft were about 27 months old, one having logged 180 hours and the other about 140 hours. The coils had over-heating marks on the windings, close to where the coil increases in diameter.

Replacement coils from Cyclone Hovercraft were installed. But, as no specific cause for the failures were identified, Nigel Beale at Cyclone Hovercraft Ltd was consulted; he commented (in late November 1990) as follows:

"From the number of spare generator (ignition) coils we have supplied, we would estimate that there has not been more than a dozen or so failures in about six years and thousands of engines. The only failures I have seen personally, are one case of faulty connections at the ends of the coils and a couple of cases of coil breakdown, causing a misfire when the engine and coil got hot. I have not seen a burned coil and nobody has returned a burned one to us. If anyone has such a failed coil, could they please send it to us, so that we can send it to Rotax for examination? (The failed components were returned on this occasion).

Ignition faults can be difficult to trace and it is sometimes the case that the owner or service engineer will change all the internal ignition components (generator coil, points and condenser) in order to be sure of curing a problem, without the need to strip the engine twice. Thus, the number of replacement generator coils fitted does not necessarily indicate the number of failures.

A failure of the generator coil could be due to:-

(a) Faulty manufacture, with insufficient Shellac insulation.

(b) Breakdown of the insulation due to excessive vibration.

(c) Breakdown of the insulation due to excessive heat. (Possibly a combination of electrical load and heat transmitted, from an overheating engine).

(d) Physical damage to the coil insulation from previous mishandling.

(e) Incorrect installation of a replacement coil. The rotating magnets on the flywheel run in very close proximity to the coil laminations. A special Rotax alignment-tool is available to position the coil precisely during re-assembly. Without the use of this tool, it is possible that the magnets will scrape on the coil laminations, causing damage to both coil and flywheel, and possible over-heating of the coil, leading to early failure."

DEFECT REPORT No (90)-239: Persistent turning and a general 'out-of-tune' effect was observed on an XL, during flight. The problem was tracked to a partial stripping of the plastic sheathing on the leach-lines. The loosened sheath tended to bunch up and prevent free movement of the cable, back and forth through the thimble. The outboard leach-lines were considered most vulnerable. It could, of course, be argued that because there were typically three leach-lines, this compounded the problem.

Another inspector reported that this problem had been apparent on every Sprint wing he had examined, and with fairly new cables.
His solution was carefully to remove the plastic sheathing from the cables, over the lengths which were required to slide through the thimble. (Other manufacturers have chosen to avoid the problem by incorporating unsheathed cables in these locations).

With such defects as this, the Inspector must use his or her discretion. It may be necessary to replace the cables entirely with factory-supplied components but, if the fault has occurred in a very short period of use (as seems common) the technique of locally removing the sheathing seems acceptable, since the cables themselves cannot rightly be regarded as defunct.

An adequate scrutiny for corrosion of the exposed cables must then be a regular part of the preflight inspection.

DEFECT REPORT No (90)-240: When the pilot braked an XL-Q in the landing roll, the front wheel locked and the machine cartwheeled.

The problem was that the tyre was sufficiently flexible to 'bunch' and crowd the shoe. - P2.19 -

DEFECT REPORT No (90)-243: The front-wheel suspension-arms on an XL-Q pivot on bolts. All four plates were found to be badly worn at these pivot-holes. The outboard plates actually pivoted on the threaded portion of the bolts and this accelerated the wear to both.

The machine had logged about 400 hours, so some of this was certainly fair wear and tear.

Clearly, replacement of the worn links was required. However, the bolts-cum-pivots had also to be replaced, but with items which would not allow the links to ride on their threaded length. (The very high stresses inherent in components which bear on the crests of threads will always cause this degree of wear, often in a rather short period of use).

DEFECT REPORT No (91)-246 On an air-cooled 447-powered Pegasus XL, a propeller-bolt failed - during flight - where it threaded into the tapped driving-flange. The threaded part of the bolt and the lock-nut remained in the flange.

This was only one reported instance of a problem which has been worryingly commonplace with this particular form of propeller-mounting.

The problem is that - if the wood dries out during hot weather or storage, and shrinks - the propeller becomes loose on its studs. The resultant bending of the bolts (as they 'wind up' and 'unwind' under the oscillatory forces from the engine) causes them to crack at the point of maximum bending stress, which coincides with the reduction in bolt diameter at the thread, which MUST be allowed at the propeller-side of the tapped flange.

The common problem is that, during preflight inspections, owners may check propeller-bolt torque and tightness by the application
of a spanner to the bolt-head. If the rear lock-nut has not been previously loosened, all this action does is to over-torque the bolt and hasten its failure.

As with all previous instances of this type of failure, the owner was advised to drill the flange-holes out for normal through-bolts.

A repair was made with a ‘Helicoil’ insert.

DEFECT REPORT No: (91)-249: On the Fuji EC44PK engine of a Panther XL-S, the front spark-plug blew out during flight. The owner had made a practice of removing the plugs before a day’s flying, to wash off the drained oil. The threads in the cylinder-head therefore became dangerously worn.

DEFECT REPORT No: (91)-253: In flight, the engine of a Rotax 442- LC Pegasus XL-C overheated to 100-110 degrees C. The expansion-tank seemed to be full to overflowing when examined on the ground later. It was found that the impeller of the water-pump had been slipping on its shaft, showing signs of melting. There had thus been inadequate water circulation and boiling in the engine cooling-channels.

Rotax issued a new form of impeller as a replacement for the faulty type. The change affected 442 engines up to (and not beyond) Serial No 3642690 and 532 engines up to (and not beyond) Serial No 3722150.

DEFECT REPORT No: (91)-259: On a Pegasus Q (Rotax 462) the rear-seated instructor accidentally knocked the ignition switch to the OFF position, whilst in flight. This is known to have happened on at least three occasions.

DEFECT REPORT No: (91)-270: On a Rotax-462 LC powered Pegasus Q, a small amount of oil was seen on the gearbox drain-plug after a 15 minute flight. The plug was tightened and the problem assumed solved.

The problem re-occurred and was traced, not to the plug but to the whole gearbox being loose on the engine. A strip-down revealed that the upper, port-side fixing screw had sheared and the other three fixing-screws were little more than finger-tight.

New screws, Loktited into place, were needed. The Rotax distributor also emphasized the vital importance of having these mounting screws correctly torqued to 55 Nm.

DEFECT REPORT No: (91)-271 On a Panther XL with a Fuji Robin 440, a loud bang was heard in flight, followed by an increase in engine RPM and total loss of thrust.

After a safe landing, it was found that the drive belt had vanished and the propeller had been split during the belt’s departure. No fault with the belt was seen during the preflight inspection.

DEFECT REPORT No: (91)-274: The instructor kicked the nose-wheel straight at touch-down in a Pegasus XL-EC. The pupil had his legs braced on the steering and the steering Rose-joint broke at the front fork. It had to be replaced.

DEFECT REPORT No: (91)-279: When a Quasar was landed in a field with grass 6 to 12 inches (200-300 mm) long, one of the blades of the propeller was found to have developed holes in its leading edge. It was about 9-15 mm long and about 2-4 mm deep. These were considered to be due to separation between the gel-coat and the tensile structure of the blade.

The propeller was replaced.

DEFECT REPORT No: (91)-285: When taxying a Pegasus Q (462-LC), or at idle, petrol would be discharged through the float-bowl overflow. Under full throttle and load, power would be lacking.

A small, C-shaped fragment of rubber, about 15 mm long, 2-3 mm wide and 1 mm thick - presumably sheared from the connecting hose during manufacture of the aircraft - was intermittently becoming jammed between the float-needle and its seat.

DEFECT REPORT No: (91)-291: On two XLS, it was found that the A-frame pin-pins had their ‘pips’ retained against a disc spring (a dished washer). The pins were gripping the bore of the washers but were not actually on the outside of them, beyond the bore. In this mode of assembly, the pin-pins could easily work themselves
The washers had always to be installed with their 'hollow' face away from the joint.

DEFECT REPORT No: (91)-292: Power was suddenly lost in flight on a Pegasus Flash 1. It was found later that there was no compression on the magneto cylinder.

It was found that the gudgeon-pin circlip had come out of its location and wrecked the piston and cylinder. (The owner had used the wrong technique to install the circlip after maintenance. He had also elected to delay a 50-hour service slightly, which would have shown the fault in time to rectify it, had he done it before the flight in question).

DEFECT REPORT No: (91)-294: A puncture occurred in the front wheel of an XL. Whilst the wheel was dismantled for the repair, cracks were found in one half of the assembly, across the bearing housing and radiating outwards past the large holes in the wheel-half.

DEFECT REPORT No: (91)-297: When the front wheel of a Pegasus Q struck a small rut at 10 mph, it shattered its bearing housing.

DEFECT REPORT No: (91)-300: The support bracket on the radiator top-up bottle broke, on two 'Q's' (total hours about 100). On one craft, it had occurred twice before and had been replaced.

DEFECT REPORT No: (91)-302: On landing a 'Q' in a fairly rough field, the front wheel - the Nylite type - collapsed and the centre part disintegrated. The machine was safely brought to a standstill. The pilot had logged 100 hours on the Q and this particular aircraft had done 125 hours.

The direct inference is that the wheel failed because of the harsh treatment produced by the rough field. However, recent evidence has suggested that progressive failure - around the hub area - is common with these Nylite wheels.

A new, alloy wheel was installed.

DEFECT REPORT No: (91)-303 The day was warm (about 80°F) and the 'Q' 462 had been flown to a tarmac airfield, where it stood for about two hours.

It was then given its pre-flight inspection and taken off for its next flight. After it had climbed to only about 100 feet, the
engine RPM began to fall from maximum to about 4000.

With full throttle applied continuously, the engine produced intermittent power and a landing had to be made.

The fault was believed to have been traced directly to the method used to vent the fuel-tank. A plastic pipe was employed, secured as shown in the first sketch. In the warm weather, it had effectively closed off at the sharp bends, sealing off the vent. Once a reasonable seal had occurred, it was considered that the developing vacuum would have helped it to become more secure. It should be noted that the tank has a non-vented cap.

During subsequent discussion with the Solar Wings factory, it was learned that the vent-pipe installation had been modified, about September 1990. The factory’s advice should be sought in relation to any Q about which the owner is concerned.

However, it has been pointed out that - under hot-weather conditions - the vapour-pressure of the fuel would probably have made good any vacuum created by the consumption of the small amount of fuel in the time-span involved. One would thus need to look for an alternative reason.

One possibility which might be contributory is that the tank could have had a high vapour pressure in the small air-space above the filled tank volume, due to the hot weather. Pressure would actually have been vented past the crushed vent-pipe. Subsequent air-cooling from the slipstream could have then condensed some of this vapour and - drawing the plastic pipe into a natural vacuum seal - created the requisite vacuum to starve the engine.

TECH TOPICS: The right-hand bolt, securing the suspension-arm to the wheel-axle on Pegasus trikes, tended to loosen as the arm repeatedly moved. The bolt became extremely loose in only 15 hours of operation, on one machine.

A reasonable solution was to drill across one corner of the bolt-head (not across the head) and wire-lock. But even wire-locking can fail, so such a cure still needs regular preflight inspection.

GENERAL NOTE GM-(91)-50: This concerned Solar Wings Service Bulletins, numbers 0027 and 0028.

BOTH WERE CATEGORIZED BY THE CAA AS MANDATORY.

0027: FUEL-TANK SEALING ON THE PEGASUS QUASAR.

This Bulletin concerned the possible leakage of fuel from the inserts for the fuel-drain and the fuel-feed. (Defect Report No (90)-217 also discussed this particular problem).

A full examination of each tank had to be carried out before the next flight. If leaks were observed, the Bulletin spelled out the actions to be taken. Primarily, this involved the installation of a sealing-plate system, as mentioned in the Defect Report.

0028: CRACKING OF THE GEL-COAT ON THE REAR UNDERCARRIAGE BEAM OF THE PEGASUS QUASAR AND QUASAR-TC.

Some operators had seen cracks appearing in the gel-coat of the rear undercarrriage beam. These were the product of excessive compressive strain in the top skin of the beam.
In itself, the cracking was not enough to require replacement of the beam.

However, the Bulletin discussed the checks to be carried out — ideally before the next flight but certainly before the ensuing ten flying hours had elapsed — and showed how the propensity for the onset of cracking could be reduced by small alterations to the preloading of the rear suspension.

**GENERAL NOTE No:** (91)-51: Solar Wings issued a MANDATORY Service Bulletin (No 0029) affecting Pegasus XL-S, XL-R, XL-R-LC, FLASH 1 and 2, AC and LC, and relating to the tyre pressures.

The tyre pressure quoted in the operator’s handbooks for these aircraft was 12 psig. Operational experience with the Pegasus ‘Q’ had shown a greater resistance to punctures and better front-brake performance, with the tyres set at 22 psig.

Therefore, all three tyres on all of the above types of machines had to be immediately raised to 22 psig, and the handbooks amended accordingly.

**GENERAL NOTE No:** (91)-73: A Service Bulletin was issued by Solar Wings, concerning ‘Q’ wings and Quasar wings.

Renewal, the sail-seam had failed at the centre stitching at the trailing edge, due to abrasion on the fin-tube. If this were found again, Solar Wings Modification No 0082 had to be implemented.

**GENERAL NOTE No:** (91)-78: This described how an Inspector had found what appeared to be badly bent uprights on the control-frame of an XL-R.

The previous owner insisted that the wing had never been crashed and could not have been damaged since it had only recently been purchased from him, by the current owner, and had not yet been flown again.

When the control-frame was dismantled for closer examination, the fault was instantly revealed.

It transpired that the corner hinge had been folded in the wrong direction, in which it fouled and did not permit the tubes joined by it, to hinge freely to their designed position.

The cure was simply to assemble it properly.

**GENERAL NOTE No:** (91)-89: Solar Wings gave advice on how to avoid breakage of the axle-bolt in the front wheel of XL flex-wings.

They suggested careful checking at each preflight inspection and re-torquing of the bolts at 10 hours from new, or after 10 hours if the wheel had been removed and replaced.

The bolts also needed to be removed after 200 hours of use, or at annual inspections. If any sign of a problem was evident, they should be replaced.

**DEFECT REPORT No:** (92)-316. On a 462LC XL-Q, the earth-strap — between the engine and the airframe — became detached from its...
that the cables could slip out of the ferrule and was more positive than wire locking.

He was circulating Gerry's letter to their trike-assembly shop. The throttle splitter-box now incorporated individual return-springs on each cable to avoid loops, etc. An improved hand-throttle was also fitted.

(B) The ignition-switch was put into its new position to enable access by both pilot and instructor. It was up to the pilot to familiarise himself with the positions of the controls. Dr Brooks considered that the provision of further switches would give more hazards through accidentally turning off of the ignition.

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Gerry then went on to another point:

Whilst taxiing to the hold-point in an XL, his student carried out the taxi checks and, on applying full right movement of the nosewheel steering, the wheel became detached and the aircraft fell on to its forks.

On examination it was found that the bolt which secures the right side of the axle had sheared across the thread, where it enters the axe. The left bolt had been left with the impossible task of supporting the assembly.

The aircraft had just completed its 100 hour service and the threads of the bolt were Loktited on reassembly. On reflection and after further examination of other similar aircraft, he noted that the axle internal thread was exposed to shear-loads between the forks and the axle. The manufacturers should also consider this problem in other areas, as he claimed to have found that there were several places where loads were being carried across threaded portions of the bolts, for example, on the side flying-wires!

Dr Brooks response was this:

(C) The front-fork axle-bolts could be lengthened up to 70 mm (from the present 60 mm) and the axle drilled to give an 8.0 mm diameter plain hole with a depth of 10 mm.

He had not heard of failure of this bolt before, although they could tend to slacken if Loktite were not used. But he suspected that the bolt was over-torqued.

(But see General Note GN-(92)-89 above. PCL)

(D) He agreed that shear-loads acting on bolt-threads is not good practice and would investigate. The XL was now an old design but with a very good safety record in its existing standard.

Solar Wings would be redeveloping an XL-type machine with Q/Qusar technology in the near future.

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Gerry's final comment was:

3. After landing, a student had applied aerodynamic braking on the wing of an XL which tended to put extra loads on to the upper rigging.

After shut-down, it was noticed that one of the reflex-retention wires (luff lines) was trailing behind the aircraft and was dangling very close to the propeller. On further examination, it was found that the wire had broken through where it attaches to the sail-cord at the trailing edge. Gerry considered that the fatigue was brought about by the absence of thimbles fitted into the wire termination before swaging.

He had also found further evidence of fatigue on his other Pegasus XL. He had informed the manufacturer and had made new lines with thimbles fitted at every termination.

Dr Brooks made no comment on this last point.

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THE BMAA CHIEF INSPECTOR COMMENTED AS FOLLOWS:

1. All of its manufacturers admit that Cyanoacrylate cement deteriorates with exposure to water and it has to be recognised that our machines do get wet. Hence, wire-locking was probably more reliable, if sensibly applied.

2. Whilst both Gerry and Bill Brooks seemed to agree with the possible retention of the existing switch, the Chief Inspector could not see that the addition of a switch in the centre of the dashboard would give a serious risk of its easily being switched off inadvertently.
crimped-on terminal at one end, breaking the electrical earth-return circuit.

Examination revealed that the terminal at the other end of the strap was also about to break free. It was noted that the crimps had been made at the extreme ends of the loose strands of the cables. The machine had done only 7 hours in total.

The ends were properly inserted into the terminals and soldered.

DEFECT REPORT No: (92)-317: After an engine failure, the fuel-tank on an XL was flushed and a considerable amount of charred material and clear pale-green plastic film was retrieved. It was apparent that the protective material applied to the stock metal, from which the tank had been made, had not been removed before welding.

The tank was removed and replaced with a new one.

TECH TOPICS: The element inside the ‘Moprod’ filter unit on a Pegasus Flash 2 became detached from its end-plate and rotated inside the casing, due to vibration. It was thereby rendered virtually ineffective as a filter.

It had to be replaced. It is of a type common to many different machines.

GENERAL NOTE GN-(91)-115: FIELD PROBLEMS WITH THE PEGASUS XL.

Gerry Breen wrote in from Portugal with the following comments about operational problems which he had seen or experienced in using Xls. His letter is paraphrased, as is the response from Dr Bill Brooks of Solar Wings.

1. Whilst starting his engine, an ex-student suffered a stuck throttle and during the ensuing fast taxi forward, found extreme difficulty in switching off the engine. The aircraft gained excessive ground-speed even though he also tried to use the brake, which lacked effectiveness.

In order to avoid hitting two other aircraft, he elected to try to turn his machine, at speed, to the right. The aircraft ended up on its left side with the monopole twisted off just below the hang-bracket.

Throughout all of this and at rest, the pilot was still trying to find and operate the ignition switch.

Examination showed that the outer sleeve of the foot-throttle cable had slipped out of its socket just in front of the throttle pedal.

Gerry Breen suggested a three-stage remedial process:

(i) Wire-lock all outer sleeves in place, even at the ‘two-into-one’ tube and especially near control levers.

(ii) Improve by practice and testing, the student’s reaction time when given simulated ‘stuck throttle’.

(iii) The manufacturer should consider the following:-

Originally, the ignition switch was just below the seat, on the right side. The aircraft was brought up to the current standard by positioning the switch on the right side of the seat frame. This caused some pilots instinctively to go for the old position when acting quickly. But this, he considered, was not the whole story: Historically, the ignition-switch on trikes was positioned below the seat because they did not have dashboards or anywhere else on which to mount them, which could both be reached quickly and not accidentally switched off.

But flex-wings have moved on, have dashboards and are used for training. Therefore, a single switch-position cannot do the job required of it.

Gerry explained that, if the student or pilot in the front seat wanted to switch off the ignition quickly, he could only use his right hand and has to ‘feel’ for the switch, due to its ‘accidental switch-off protection bracket’. (This is difficult with thick gloves on!)

Gerry’s solution would be - in future - to mount ALL ignition switches in the centre of the dashboard, large enough to be seen easily and reached for, and switched off WITH EITHER HAND QUICKLY.

On instructional aircraft, another switch could be fitted in any position easily accessible to the instructor. (He suggested the position used for the switch at present). Thus, two switches (wired in series) would have to be in the ‘On’ position for starting, but either switch alone would be sufficient to kill the engine.

He argued that this would increase the safety for both the instructor and student alike, without the potential for both to be fighting for one switch at the same time.

After the accident, Gerry carried out reaction tests on several students and PIC Instructors and the average time for switching off in a simulated ‘stuck throttle’ situation varies between 3 and 15 seconds: He thought this was far too long.

Dr Brooks gave the following information:-

(A) At Solar Wings, all throttle end-ferrules were required to be cyanoacrylate-bonded (‘Superglued’) to the cables. This ensured
3. However, where it might give added risk could be if it did not close properly if left in storage for a time. Switches get dirty and not short out as intended and the engine stays 'Live' when assumed 'Dead'. With two switches in series, this nasty little hazard would be twice as likely to arise. So, during winter turnings-over of the propeller, one might get a painful shock as it smacked or severed you, if you had not also removed the spark-plugs or their leads!

4. On the bolt-in-shear question, he could see no defence for this. Good engineering does not allow the threads of bolts to be loaded in shear. And, on this axle-assembly, the change to good practice was so trivial that not doing it was indefensible.

5. If anyone wanted to make the little modification which Bill Brooks described, all they needed to do was tell their Inspector and make a note in their Airframe and Engine Logbook of what they had done. The Chief Inspector did not regard it as even a Minor Modification and he did not need to be involved. But owners were told to stick to aircraft-grade or plated high-tensile bolts.

6. But, if Gerry were right and threads were loaded in shear in places like flying wires, he was appalled. He had thought (or hoped) that that had all gone with the early flex-wings. He would welcome any reports if Inspectors find it anywhere on ANY microlight aircraft. It simply is not acceptable aviation practice.

7. If Gerry had fitted new cables anywhere on his aircraft, it was expected that he had had them professionally made, to guarantee their quality. This was obligatory.

DEFEAT REPORT No: (92)-221: Whilst servicing the gearbox of a new Quasar, it was found that the gearbox oil-filler plug was only finger-tight. If this item became detached from the engine, it would probably enter the propeller-disc and would certainly lead to oil loss.

This item had recently been uprated by Rotax from a plastic tube on a threaded stub, to a black plastic cylinder with tapered sides. The former type of breather was always wire-locked in place; this new type was often not wire-locked.

It was clearly good sensible practice to wire the new breather tightly to the nearby gearbox lug by wrapping wire round the breather just above the hexagon-head. Presumably all aircraft produced in the early months of 1992, with the new breather installed, could have been at risk.

(Mainair already wire-locked their breathers in place).

which appeared to have distorted before falling completely. The actual failure seems to have been initiated by a deep indent at exactly the crucial point which, inexplicably, has the form of the side of a bolt-head.

Since this swan-neck is only used for initial location and bears no subsequent flight loads, this failure did not represent a flight hazard. The swan-neck was simply replaced with a new, factory-supplied component.

GENERAL NOTE GIC-(92)-118 MORE COMMENTS ON IGNITION SWITCHES. An Inspector sent in some more comments about the location and accessibility of ignition switches, following on from GN (92)-115.

On the Quasar single-switch system, he considered that the size of the protective channel and the proximity of the skirt combined with the fact that one must feel for the switch, rather than look at it, made it too much of a 'fumble' exercise.

On the Quasar double-switch system, the switch channel was partially blanked off at the aft end, exacerbating the 'one-switch' problem and making the second switch impossible to turn off with a gloved hand.

The positioning of those switches made access easier from the rear seat, since one's naturally relaxed right hand fell just where it was needed.

The Inspector felt strongly that any aircraft controls should be installed with their PRIMARY function totally in mind. That is, the front seat is for the PI. If one says the average life of a microlight is, say, 1000 hours, only about 20 hours of that, as a maximum, will have been spent in dual instruction. He thought that that was ample reason to 'jury rig' the ignition for instruction, and the front panel was where a novice would expect to find the switch if the crew were incapacitated.

As Chief Inspector - and I am sure the Technical Office would agree - I cannot encourage people to go 'jury-rigging' something as important as ignition-switches. But the manufacturer might well consider having 'Novice tie-up' at a point to be modified to standard later at some small pre-agreed charge or, alternatively, offer a simple system of removable switching which could readily be altered (and checked by a BMAA Inspector) when training was complete.

DEFEAT REPORT No: (92)-333: With the wing of a Pegasus XL-R separated from the trike and during its preflight inspection, the reflex lines were found to be corroded where they pass through the thimble at the top of the kingpost, where there is an area of high contact-pressure. Obviously, had these failed in flight, it could have been extremely dangerous.
The reporter pointed out that the defect could not be seen with the wing installed on the trike, as it is normally kept in the hangar.

(The reporter asked the question, "Would it not be possible to have a pulley as is fitted to the Q?")

New, factory-supplied, cables were installed.

DEFECT REPORT No: (92)-342: The level in the fuel filter on a Pegasus XL was found to be only about one quarter of full.

A full-power run of two minutes duration achieved no change in the level in the filter. The engine temperature was normal.

(The filter was of the right-angled type. (Moprod? PCL)

No proven cause was found, except that the filter simply refused to fill properly. A new Rotax fuel-filter was installed and it filled completely, almost instantly.

DEFECT REPORT No: (92)-344: During preflight inspection of a Pegasus XL-R, the carburettor-heat tube was found to be loose.

Further investigation showed that the tube had detached from its mounting plate, due to a fatigue crack following the line of the weld. The tube remained in place, attached to the air-filter by the jointing hose.

The carburettor-heat had been in place for about 110 hours.

The long cantilevered length of the tube mass was conducive to such a fatigue failure.

DEFECT REPORT No: (92)-345: During replacement of kinked flying wires (starboard side) on a Pegasus XL-R, the two Nylon-locked nuts which secure the attachment bolt in the cross-bar were removed. It was noticed that the inner nut had no locking friction and, on examination, it was noted that there was no Nylon collar fitted to the nut. The nuts had been in place since the aircraft was purchased.

The port side was carefully checked. The defective nut was sent to Solar Wings. This could only have been a basic manufacturing defect in the production of the nut. But the omission of the insert ought to have been detected by the aircraft builder, because of the ease with which the nut would have screwed on to the bolt.

CHIEF INSPECTOR'S COMMENT: If the nuts had been used as lock-nuts
- jammed against each other - a small measure of security might have stemmed from this. But that would have been an entirely inappropriate use of Nylon-locked nuts: The area of interference between the back of one nut and the front of the other is less than that prescribed by the hexagon. Also, the thin rolled grip which holds the insert in place is resilient enough to make the lock-nut principle invalid here. The thin rolled grip would recede and the locking would eventually be lost.

This was a training machine, so logged hours were probably high.

With regard to the first defect, it seemed that the damage to the bolt-thread and the engaging hole might have been due to the wrong length of bolt being used. However, it was found that the spacer-channel was over-long, forcing the legs of the hang-strap apart and unnecessarily bringing the thread into a bearing mode.

On the second defect, the welds which retained the side-plate had not penetrated the parent metal, apart from about one square millimetre at one end.

The spacer-channel was reduced in width and the legs of the hang-strap were then parallel. The replacement bolt fitted correctly, with the loads bearing on to the plain shank. But the hang-bracket needed to be replaced with one having secure side-plates.

DEFECT REPORT No: (92)-346 Two problems were identified on a Pegasus XL:
(1) It was found that the hang-strap had been bearing on the threaded portion of the crossbolt, rather than on the smooth shank. Inevitably, the bolt threads had worn away in the loaded area and the hole in the hang-strap was enlarging.

(2) The side-plate on the bracket (designed to bear against one of the faces of the head of the bolt and prevent its turning) had also fallen off during ground-handling.

- P2.37 -

- P2.38 -
It was found to be from the monopole base-plate. It had severed at the end of the shank and, when the remaining part was removed, it was extremely bent. The aircraft had logged over 150 hours. A new factory-supplied bolt was installed.

The cause of the failure of the bolt was believed to be mainly due to overtensioning of the cables which are installed between the monopole and the undercarriage legs.

(The reporter also said that he believed that hard landings may have contributed!)
DEFECT REPORT No 035: On a UL107, the drawshaft of a Nicklow reduction-gear broke.

A new shaft (of better-quality steel), plus new bearings and belts, were needed.

DEFECT REPORT No (89)-161: Cracks appeared in the engine-mounting of a PH 107R.

A change of engine (from air-cooled 440 Robin to a EG 34 PL) was thought to have led to unbalanced forces and vibration.

At a later stage, two more bolt failures occurred on this installation. Relocation of the engine-reduction-silencer masses, relative to the fuselage, was proposed as the overall cure.

It was not reported whether the required cure had been achieved.
PROPPELLERS

DEFECT REPORT No 016: The propeller split from hub to tip. It had been made from inadequately seasoned timber.

BMAA NOTE: A scheme was suggested, whereby the change in propeller bolt tension, due to wood shrinkage, can easily be accommodated. It uses a stack of disc springs and has found wide favour in the ultralight gyroplane field for many years.

DEFECT REPORT: A Thruster failed to perform as expected with the propeller which was installed. Measurements revealed that its pitch had been interpreted incorrectly from the manufacturer's code-number on the hub.

DEFECT REPORT: A Danish member wrote (in August 1986) complaining that he felt the blade-retention system on a Kolecki variable-pitch propeller was inadequate to the point of being dangerous. He explained that the blades were retained in a rubber 'sleeve' system, which he did not regard as capable of sustaining the required centrifugal loadings.

BMAA Inspectors were urged to dismantle the hub unit of any Kolecki propeller which they came upon, and to satisfy themselves (or seek guidance if necessary) before considering signing off the Orphan aircraft to which it was fitted. If there was any doubt, the Inspector had to insist on a new propeller being installed.

DEFECT REPORT No (90)-234: In a climb and at 1500 feet, the propeller failed and a forced landing was necessary. Both tips had been repaired - by fitting pieces about 6 inches by 1 inch (150 x 25 mm) to them - about a year earlier. One of these pieces had broken free and damaged the trailing-edge during its departure.

When the tips of the propeller were repaired, (by a professional, teaching carpenter) the added pieces were glued and dowelled in place. It is probable that the angle of the inner-end joint, towards the trailing edge of the propeller, was far too direct. Under the centrifugal force on the piece, this face was subjected to a significant component of tensile stress, which the glue alone would not have been able to sustain. Once that joint had broken, the remainder of the glued face would probably have failed progressively.

As well as the dowels, a long scarf-joint should have led to the trailing-edge of the blade. But, realistically, any propeller with both tips damaged to this extent should probably have been scrapped. Certainly, the manufacturer of the propeller or the aircraft should have been consulted.

(It is well known that microlights are all too often manoeuvred...
on the ground by pushing on their propellers, albeit it sometimes very gently but, nevertheless, quite wrongly. Could such handling have contributed to the initial cracking of the joint in this instance?)

**BMAA NOTE:** Guidance was given as to the methods of propeller-attachment, as defined by CAA Airworthiness Notes.

**DEFECT REPORT No: (91)-279:** When a Quasar was landed in a field with grass 8 to 12 inches (200-300 mm) long, one of the blades of the propeller was found to have developed holes in its leading edge. It was about 9-15 mm long and about 2-4 mm deep. These were considered to be due to separation between the gel-coat and the tensile structure of the blade.

The propeller was replaced.

**DEFECT REPORT No: (91)-288:** The engine noise and vibration level increased markedly in flight, when an anti-erosion tape stripped off the leading-edge of one propeller-blade.

The remaining tape was removed, both blades cleaned and new tapes installed on them.

**DEFECT REPORT No (92)-354:** During ground running, a thin section of a new Catto propeller began delaminating at the trailing edge.

The described nature of the failure appears not be anything which could be explained by other than a possible flaw in the manufacturing process.
DEFECT REPORT: On the 330-Robin-powered Pterodactyl, the engine was mounted largely by its fan casing. This had to be thoroughly and frequently inspected for cracks.

DEFECT REPORT: On the Cuyuna-powered Pterodactyl, the adjustment-cam for the belt-tensioning could work loose. If it did, it allowed the propeller to rub against the driver pulley.

A much revised form of belt-tensioning device needed to be installed.

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DEFECT REPORT: On the Rotax-powered machines, the following points were reported:

(1) It was important to mount the fuel-pump clear of the crankcase. If this was not done, normal engine-vibration was believed to be the cause of fuel starvation. Engine heat may also have contributed to the problem.

(This problem has been much reported elsewhere and has been recognised by the manufacturers and distributors, who suggested the cure given).

(2) The Bing carburettor slide-guide should have been a ridge raised in the barrel and not two steel pins, as fitted to some models. These pins were known to break off and be ingested by the engine, with disastrous results. The design was therefore changed by the manufacturer.
PUMA SPRINT, LIGHTNING, RAVEN, RAVEN X
(SOUTHDOWN AIRCRAFT) See also OAS.

BMAA ALERT: Doubts arose about the suitability of some early Southdown Lightning wings for use on powered flex-wing microlights.

The simplest way to identify those wings considered safe for use with power, was that the control-frame uprights would have been sleeved at the time of manufacture.

So, if the control-frame sleeves were (a) not fitted at the time of manufacture, (b) were installed but appeared to be sub-standard or (c) had never been fitted, that particular wing should not have been flown with power until the BMAA Technical Office had confirmed that it was suitable for such use.

DEFECT REPORT No 118: On a Southdown Raven X, the securing pin for the cross-tube back-up cable rubbed against the cross-tube primary tensioning cable.

The factory supplied - and recommended general installation of - a modified carrier-block for the pin.

DEFECT REPORT: On Puma Sprints, the following problems were reported:

1. The top seat-support webbing fouled the top seat-frame nuts and was badly worn.
2. The wing-batten retention bungees at the trailing edge of the sail, were tied by simply doubling them and tying in a single turn.

They had to be untied and retied in straightforward reef-knots.

3. It was necessary to check that undue wear was not occurring between the thin steel rings - fitted on either side of the block - and the keel. Some machines had only one (Front) ring fitted.

4. It was possible for the ignition-switch, located underneath the pilot’s right thigh, to be turned off accidentally. It could be relocated, subject to authorisation as a Minor Modification by the Chief Inspector.

5. Breaks occurred in the electrical wiring, owing to over-crimping of the leads and terminations.

6. The fuel-tank pick-up pipe could sometimes press so firmly against the tank wall, that it might eventually pierce it.

7. With too many hard landings, the monopole could crack - and even fail completely - at the top engine-mounting bolt-holes.

DEFECT REPORT No 010: On a Puma Sprint with a Robin 440, two of the four studs, which held the reduction gear to the engine, failed.

The manufacturer recommended total replacement of the four bolts after 100 hours of engine operation.

DEFECT REPORT No 042: This concerned another fracture of the monopole of a Puma Sprint, as advised earlier.

A factory replacement was required.

DEFECT REPORT No 085: A Puma Sprint (Rotax 447) was tied down and left in high winds. In subsequent flight, the machine had a violent and forceful left-hand bank.

The wing-tensioning wire had jammed alongside the hang-block, instead of on top. Better pre-flight inspections were called for.

DEFECT REPORT No 114: The lower, stainless-steel engine mounts were found cracked on a Puma Sprint.

New components were required.

DEFECT REPORT No 116: The Robin 440 engine of a Puma Sprint could not be stopped with the ignition switch.

A connecting wire had become dislodged by vibration.

DEFECT REPORT No (89)-127: On a Puma Sprint, the swan-neck on the
DEFECT REPORT No: (91)-247: During the take-off roll, the radius arm tore away from the keel attachment. The aircraft was seriously damaged.

The arm had been getting progressively more and more worn and this had not been picked up during pre-flight inspections.

DEFECT REPORT No: (91)-280: During a dual lesson, the power from the Fuji Robin 440 on a Puma Sprint began to fluctuate. Finally, the engine stopped in flight.

The owner had substituted a non-vented cap for a vented version on the fuel-tank and the vacuum crested finally stopped the fuel feed to the engine.

SERVICE BULLETIN FROM SOUTHDOWN INTERNATIONAL. 11-9-85

Re: PUMA SPRINT:- On all Sprint wings which employ a "D" ring sail-fixing at the tip-attachment points: if the bolt is not fully tightened as it passes through the D-ring and the leading edge, there may be a tendency for the large-diameter washer at the bolt-head to cut into the webbing of the sail-attachment point.

![Diagram](image)

Worn, frayed webbing must receive servicing from a professional sail-manufacturer.

DEFECT REPORT No: 91-282: In trying to assess why a UAS trike and Lightning would not perform as well as previously, a pilot attempted to fly it in front of observers. He was short in stature and, when the aircraft began to misbehave, with the engine revving fast with the throttle shut, he tried to shut off the ignition. He was unable to reach the dash-mounted ignition-switch and the machine was landed heavily and damaged.

The jamming of the throttles was traced to friction in the 'splitter' assembly. It had to be slightly modified to make it slide freely.

The short pilot was, of course, unwise to fly an aircraft in which he could not reach all controls.

The Technical Officer regarded relocating the ignition switch as a Minor Modification.

DEFECT REPORT No: (92)-359: Whilst the wing was being folded on a Medway Puma Sprint for de-rigging, the hang-bolt attachment bracket was seen to have slipped forward along the keel. It was found that the forward locking-ring pin was missing. The pin is normally held in via keep-rings on either side.

A pre-flight inspection had been previously conducted by the instructor and the pupil and nothing amiss was observed then.

On a previous flight some days before, a broken keep-ring was found adjacent to the aircraft but a thorough inspection of the relevant area did not reveal any such item as missing. It was therefore assumed to be from another aircraft.

The aircraft had been operated for between 40 and 60 hours.

GENERAL NOTE GN-(92)-146: The CAA agreed that Puma Sprints, Ravens and Ravens X, manufactured by both Southdown International Ltd and Medway Microlights Ltd, may - on completion of 500 hours of operation or on achieving five years since they were manufactured - have the components previously specified for mandatory replacement subjected instead to an "On condition" inspection.

If the components are shown to be in good working condition - in accordance with the tests and standards set out in BMAA ON-CONDITION INSPECTION SCHEDULE OCI-No:001 - they may be re-installed and continue to be used for another year, when the examination must be repeated.

When the aircraft in question have logged 750 and 1000 hours, other components will become subject to the same form of 'On condition' revalidation.

All BMAA Inspectors were informed that, if they were called upon to examine such a Puma Sprint, Raven or Raven X, they must have a copy of both the relevant TADS and BMAA On-Condition Inspection Schedule OCI-No:001 in their possession before attempting the task.
front rigging-wires (hose catch) fell off.

It was thought that either the ring was non-standard or it had accidentally been partially removed.

DEFECT REPORT No (89)-149: On a Puma DS, the belt-retainer on the cutboard side of the pulley came off. It was only held in place by a push/snap fit.

A back-up system is recommended by the current engine distributors.

DEFECT REPORT No (89)-152: The hingeing-bolt at the base of the monopole of a Puma Sprint had snapped. It was found to be of commercial quality, with a long threaded portion, most of which was concealed within the brackets and tube. Not only was it causing excessive wear there but it was virtually just waiting to snap.

A new (aircraft-quality) bolt was fitted and monitored carefully.

DEFECT REPORT No (89)-171: The ball-valve on a Puma Sprint partially dismantled itself and the ball could then rotate to any position, including 'closed'.

A new form of cap was installed.

DEFECT REPORT No (90)-209: After tensioning the reduction-belt of the Fuji Robin EC-44 of a Puma Sprint, the engine was then run.

After switching off, the belt was found to be slack! The cause was that three out of four support-studs - securing the gear to the engine - were broken.

Simple studs (with cut, not rolled, thread) had been used and washers had been fitted to it. Fatigue due to vibration, and/or corrosion probably contributed to the failures.

New studs were made (hopefully, from rolled-thread material).

BMAA SERVICE BULLETIN WS.006/App 1: It was found possible for Southdown Soli Lightning wings to have had oversleeves fitted to the X-frame, but with the existing eye-bolts retained. Apparently, not all models had such eye-bolts.

The tubes could be crushed to give a seemingly adequate amount of thread to retain the nuts. Alternatively, there may have been insufficient thread engaged in these nuts. The sleeves could properly be shortened by up to 4 inches (100 mm) to allow the eye-bolts to protrude sufficiently to receive the nuts, which had to be new AN quality items, because of the stringent duty they performed.

The eye-bolts were specially manufactured components, using EN16T steel. If they were found not to be in re-useable condition, the BMAA Technical Office had to be consulted before proceeding.

DEFECT REPORT: Cracking occurred on the stainless-steel, welded assembly which supported the engine on the Puma Sprint. It happened at the fillet weld between the engine-bearer and the cross-piece.

On one specimen which was found to have cracked, no welding had ever been done on the front ends of the cross-piece.

DEFECT REPORT No (90)-236: On examination of the top rigging on a Sprint wing, it was found to have deformed thimbles and a worn tension-wire on the cross-boom. Both thimbles were tending to pull out straight under excessive tensile loading and the cables and thimbles were also abrading the king-post at the top of their outlet holes.

The cable set had been replaced 40 hours earlier.

The primary cause of the wear was probably that the aircraft had been regularly used on an uneven farm-strip, with the resultant high 'g' forces.

The Inspector reported having seen the same problem already developing on two other Sprint wings.

The only possible rectification was the installation of new cables supplied by the manufacturer of the wing. The Inspector said that the manufacturer had declined to fit thimble-buttons to spread the load, reportedly taking the view that they would not be of help. (They later confirmed this view but were happy to supply the buttons if any customer required them).

To avoid the abrasion at the top of the outlet holes, the Inspector suggested relieving them at their upper edges.
DEFECT REPORT No 025: Several faults were found on the Quicksilver MX-1 and 2.

(i) The wing-root battens came out of their pockets and slightly damaged the propeller.

(This was cured by 'forking' the ends of battens, to retain them against the trailing edge).

(ii) The zipper belt-drive on the Cuyuna failed by stripping its pulley-teeth in flight.

(This was rectified with a new pulley. But an Elper modification was later available).

(iii) A parachute was installed on top of the wing. It altered the handling and made the machine fly nose-down.

(The parachute is not a legal fitment on a British microlight).

(iv) The Cuyuna engine, being run on synthetic oil, seized and damaged its sprocket and pistons.

(This was cured by reborring, with the cooling-casing carefully sealed. The factory recommended a check on the timing and also suggested the use of new timing figures. Also carburetion is critical). The same fault was observed on another engine. Timing was then the problem.

(v) A Rotax 503-powered MX2 suffered severe erosion of propeller-blades when flying in rain.

(The cause was the use of soft and hard (alternated) laminations in the propeller construction. The soft ones were away. A new hardwood propeller was fitted).

(vi) The bottle intended to catch the overflow from the carburettor, actually overflowed and caused misfiring.

(This was rectified by re-routing the vent pipe. But Aerolite Aviation Ltd said that the carburettor might not have been in good working order).

DEFECT REPORT No 029: On the Cuyuna 430 of a Quicksilver, the propeller-driveshaft failed in fatigue, where the cross-bolt passed through it at the engine-coupling end. The shaft was retained by the clamping action of the split coupling, and this hid the fracture, possibly for some time. Single, cross-bolt assemblies of this type are known to be extremely fallible.

A new factory-made replacement was required.

The factory 'lifes' the components at 400 hours.

DEFECT REPORT No 053: On at least two further occasions, the ANS-17a bolt which passes radially through the propeller-hub on the Quicksilver MX2, sheared. Only a slight 'squeak' had been heard previously when checking for drive-shaft problems in the pre-flight inspection. Fatigue was analysed as the cause. One bolt had lasted only five hours.

A new bolt was needed. But the ends of the hole in the shaft were slightly rounded, to relieve the local high stress-concentration. However, because of the extremely high cyclic stresses, it was still considered advisable to replace the bolt every 50 hours anyway.

DEFECT REPORT No (89)-120: On a Quicksilver MX2, the engine-reduction drive-belt failed.

Excess grease had worked its way out of a bearing and on to the belt.

DEFECT REPORTS: Specifically on the MX 2, the following defects were publicised:

1) With cork fuel-cap seals, flakes tended to come off and contaminate the fuel.

Cork-rubber replacement seals cured this problem.

2) All coarse-thread bolts on these aircraft had to have Loctite 260 or 242 applied to them whenever they were reinstalled.

If, however, the bolts were used to secure rotating components, they had to carry castellated nuts with split-pin. Under other circumstances, Nyloc or Simmonds nuts were probably acceptable.
(3) The ends of Teleflex cables should never be straightened. They sometimes got bent at their attachment to the control column, when the pilot's legs came back against the cable during ground operation. The rudder-attachment end could get damaged in storage or transit. If so, a new cable was mandatory.

(4) When operating from longish grass, the safety rings could be caught and snatched out of the fittings. Careful attention needed to be paid to the main-gear rings and the lower tail-wire rings.

(5) There was a slight tendency for the propellers to develop small cracks near the hub.

(6) On the Rotax 377 and 503, it was important to re-torque the flywheel magneto-nut to 60 foot-pounds (8.3 kg.m) after the first 50 hours of use, and every 100 hours thereafter.

If the flywheel was loose, it had to be removed, cleaned at the bore and refitted using Loctite 242. The ignition timing then also needed to be checked.

(7) Carburettor jet-sizes sometimes needed looking at, to cope with different winter and summer conditions.

(8) The flying-wire shackles needed to be properly and regularly examined for wear and, if necessary, replaced; it was important to use the correct item for replacement.

(9) The king-post channels on some machines were found to crack and split at their ends. The posts would not fall out and there was always adequate time to find the defect by good pre-flight inspection.

(10) Cracks were found at the trailing-edge of the root-tube, where the channel bolt-holes were drilled. If the aircraft had logged more than 200 hours, it was important to get a thorough check and professional rebuild done in that area. During this rebuild, a 5/16 inch bumper-washer would be placed under the head of the trailing-edge bolts, inside the root-tube.

Also, if left for any length of time, in a fully rigged state, the king-post detunes. Always check for any undue slackness which may have developed.

(11) On Cuyuna engines, it was sometimes found that the timing could alter and make the engine overheat.

(12) Considerable damage could be caused on a rigged Quicksilver left tied down in storm winds, as with any type of microlight aircraft.

DEFFECT REPORT (January 1993): Detailed maintenance measures were discussed for the Cuyuna and the general power-plant ancillaries like the installation of oversize pistons, the MX 2 drive-shaft, engine mount-angles, self-locking nuts, safe engine-operating temperatures (cylinder-heads and exhausts), cracking of the lower fan-belt pulley, rear-shaft bearings, and Bing carburettor mounting-blocks.

DEFFECT REPORT: (4) On the very early Yamaha-powered MX, the belt-drive system needed period adjustment for tension and tracking.
After running-in for 1-2 hours, the tension had to be checked by applying about 4 lb (2 kg) to the belt. Deflection should have been about 1/32" (3.5 mm). If it were more, shims had to be added between the large factory-fitted 'fender' washers and the bearing. Small corrections needed shim washers on only one side, large corrections needed them on both. It was most important to install whatever thickness of shims were required, at both front and back bearings, not only at either one.

With the belt properly tensioned, the tracking had to be checked by rotating the drive-shaft clockwise and anti-clockwise alternately (looking from propeller-end of shaft forward). The belt should have run in the centre of the clutch sprocket. If it did not, one had to loosen the four 8 x 75 mm engine-mounting bolts by several turns first. Then the rear Sealmaster bearing was unbolted from the rear mounts. Now, if the belt tracked aft on the clutch sprocket during clockwise rotation, one moved the rear of shaft to the left about 1" (25 mm). If it tracked forward, one moved the rear of the shaft 1" to the right.

The four engine-mounting bolts were now re-tightened, then the Sealmaster bearing was replaced and the tracking re-checked. The rear of the shaft could be offset by up to 2" (50 mm) maximum.

DEFECT REPORT: All Quicksilvers, when tied down, should have the nose-wheel anchored firmly to the ground. These aircraft should never be left tied down outside with the tail resting on the ground. High winds will cause the tail-booms to break and even moderate winds will have the same effect after long periods of exposure.

DEFECT REPORT: If a Chrysler- or Yamaha-powered Quicksilver were damaged in a crash or hard landing, or anything happened which could make the propeller become unbalanced, the rear-spar attachment-bolt (AH4-31a or AH4-26a) needed to be replaced immediately.

In normal use, the bolts were lifted for replacement after 100 hours.

BULLETIN: On all Doublequick and MX models with Cuyuna engines, the rear shaft-bearing had to be changed to a Sealmaster LP-16 unit.

Shaft alignment with the root-tube had to be inspected and the 5/8" spacer-block might have had to be removed.

DEFECT REPORT: The lower fan-belt pulley halves cracked on some machines. New pulley-halves and screws were required.

BULLETIN July 1981: The factory shipped out some MXs with seat-mount tubes which could cause cracking in the glass-fibre seats, round the two aft bolt connections.
operations and very hard landings, the elevator push-pull tube could contact the propeller.

A temporary modification to avoid this - and the manufacturers emphasized the term 'temporary' - was to tie a strap between the push-pull tube and the beginning of the centre bend of the rear axle.

A Teleflex cable was introduced in February 1982 (as P/No 20631) to remove the hazard completely.

DEFECT REPORT: The ball-locks in the 3/16" pip-pins used on the elevators could fail. It was advised that a 1/16" (1.6 mm) diameter hole should be drilled at a distance of 3/32" (2.5 mm) from the end of the pin, and a safety spring-clip or spring-ring should be installed.

Alternatively, a 3/16" by 3/8" clevis pin, (AN394-13) with a safety spring-ring, could be fitted in place of the faulty pip-pin.

Yet another possibility was to install a bolt and castellated nut with split-pin or spring-clip.

DEFECT REPORT: The piston-pin washers in the Yamaha engine, used on early machines, needed replacement every 50 hours.

DEFECT REPORT: On some Cuyuna installations, the root-tube assemblies could cause the development of excessive friction in the propeller-shaft bearings. This had to be rectified without fail.

DEFECT REPORT: The tension of the 560-8M drive-belts on Cuyuna installations had to be checked carefully before every flight and replaced every 25 hours. The tension should have been such that a force of 6 pounds (2.7 kg) produced a deflection of 1/64" (0.4 mm) for each inch (25.4 mm) of belt span.

DEFECT REPORT: The Teleflex rudder-cable needed a 10-32 nut threaded on to it to stop its coming far enough out of its sleeve to jam.

DEFECT REPORT: Some 3/16 inch locknuts were supplied, which lacked their locking feature. Other nuts were found to have hairline cracks in them. All such nuts had to be carefully examined and replaced where necessary.

DEFECT REPORT (1982): Problems occurred with some Yamaha expansion-chambers and a modification was required urgently.

It involved (i) dismantling the expansion-chamber, (ii) wrapping glass-fibre round the silencer-core, (iii) inserting the assembly into the pipe (sometimes an interfering mounting-bracket weld needed to be ground down) and (iv) drilling 3/16" rivet-holes and rivetting the assembly together.

Some 430D mufflers (P/No 60105) were also found to be incorrectly welded and had to be factory-replaced.

DEFECT REPORT: Some 430D mufflers were found to be incorrectly welded and needed rectification.

DEFECT REPORT: The rudder balance-tab on the MX was found to be able to flex slightly, upsetting the trim. Correction involved quite important modifications to the whole rudder.

DEFECT REPORT (May 1982): On the MX-2, constantly operated at high RPM, problems could arise with the drive-shaft.

DEFECT REPORT (June 1982): Drive-shaft fatigue failure could occur on the "V-belt" drive system. Replacement with a new design was the only solution.

DEFECT REPORT: A small but important modification was introduced to the MX Tri-bar cross-tube gusset plate. This change made assembly of the aircraft much easier.

One had to measure across 3/4" from the gusset-plate and 7/8" up from the centreline of a sting hole, to drill for a new 1/4" hole.
DEFECT REPORT: Heavy landings, especially with heavyweight pilots, could damage the seat-mount assembly on the MX. The part (No 70190) was changed from aluminium-alloy to a chrome-alloy steel one.

Careful inspection of the seat-frame was then needed at 50 hour intervals.

DEFECT REPORT: All under-wing Yamaha-powered Quicksilvers and all direct-drive Gypsy-powered Quicksilvers had to have the existing AN4-26A rear-spar-channel bolt removed. The root-tube then had to be drilled - along with both trailing-edge spar-channel holes - to 5/16" diameter. New AN5-6A bolts were now to be inserted FROM INSIDE the root tube and torqued to 120 lb.in. (13.6 N.m).

DEFECT REPORT: The elevator push-pull tube on MXs could, under some rough-field operation - especially hard landings - come into contact with the propeller-tips, causing serious damage.

The Push-pull Safety Cable was introduced to remove this problem and should have been fitted to all MXs.

DEFECT REPORT (June 1982): An updated root-tube assembly was introduced, for incorporation in the Doublequick and MX machines.

DEFECT REPORT (November 1982): The manufacturers expressed concern at the lack of inspection by owners, for wear due to vibration.

They asked that owners look especially at
(a) 3/16" and 1/4" pip-pins,
(b) all channel holes,
(c) all holes in tubes,
(d) bolt shanks,
(e) plastic saddles where they rub against aluminium,
(f) cable thimbles,
(g) clevis pins,
(h) safety-pins and safety-rings,
(i) where the lower tail-wires rub the tail-brace tubes.
(Here, ideally, they suggested cable-guides should be installed).

DEFECT REPORT (April 1983): The rubber manifold-ring connecting
the Ring carburettor and the Rotax intake manifold slipped and rotated on some installations. New-type blocks had to be fitted.

DEFECT REPORT (December 1982): The following note had to be inserted in the Airframe Maintenance Manual for all Quicksilvers.

"Every 100 hours, the entire surface of the 2" square aluminium root-tube should be inspected for cracks. In particular, attention should be paid to the ends and all bolt-holes.

The root-tube should be replaced every 200 hours on the MX II (two-seater).

The root-tube should be replaced every 300 hours on all Doublesteady, MX and QC models".

DEFECT REPORT (August 1983): Leakage began at the outlets from the plastic tanks, due to the plastic seals being cut by the sharp edges of the hole in the tank.

The main attachment-bolt (P/N 10332) was increased in diameter from 1/4 inch to 5/16 inch.

The modification steps were:

(1) Take off the control-stick from the stick-attach tube and throw away the old AN4-30a bolt.

(2) Drill to 5/16" diameter through (i) the 7/8" Saddle (20265), 2 off, (ii) 1/4" x 1/8" Saddle (20270), 2 off, (iii) 1" x 1/8" Nylon Washer (20345) 1 off, (iv) existing stick-attach holes in the stick-attach tube and in the control-stick.

(3) Reassemble the control-stick to the stick-attach tube as shown in the sketch. Tighten the thin locknut until the split-pin can be inserted through the hole in the bolt.
Rectification included chamfering the inside of the hole through the base of the tank and fitting a new type of rubber seal.

**DEFECT REPORT (November 1983):** A detailed arrangement for relocation of the fuel-pump was described. It placed the pump on the left engine angle-mount. This was a Mandatory Modification.

**DEFECT REPORT (November 1983):** Some early king-post channels cracked and split at the bend. It was recommended that all aircraft built before October 1993 should be modified.

Cracks had also been reported as appearing at the trailing-edge of the root-tube, where the channel bolt-holes were drilled. This problem was most severe on MX II machines. If machines were more than a year old at the time, or had logged more than 300 flying hours, owners were asked to contact their dealers about the required rectification.

**DEFECT REPORT (November 1984):** The GT tail-support struts were prone to being damaged during ground-handling. To prevent this, they were fitted with an outer sleeve. (The new Part Number was 450208).

**DEFECT REPORT (March 1984):** Older, round cross-sectioned shackles (P/Nos 20330 and 20331) - used to secure the ends of the upper and lower flying-wires - tended to wear badly. They were replaced with a new rectangular cross-sectioned version (see Page Q1.03).

**DEFECT REPORT (April 1984):** A modification was introduced for the Tri-bar nose-wire attachement fittings on the MX 2, to extend the lives of these cables. (The new Tribar Nosewire system was installed on machines with Serial Nos above 1691).

**INFORMATION BULLETIN (November 1993):** The subject was "Pilot-weight range for stock aircraft".

The weights (given below) were for stock aircraft. If accessories were added, the minimum and maximum pilot-weights had to be again calculated for that aircraft.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>MINIMUM PILOT-WEIGHT</th>
<th>MAXIMUM PILOT-WEIGHT</th>
<th>SEAT IN AFT POSITION</th>
<th>SEAT IN FORWARD POSITION</th>
</tr>
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<tr>
<td>MX</td>
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<tr>
<td>MX Super</td>
<td>154 lb</td>
<td>210 lb</td>
<td>110 lb</td>
<td>210 lb</td>
</tr>
</tbody>
</table>

- Q1.13 -

- Q1.14 -
DEFEKT REPORT (October 1984): GTs with Serial Nos 1001 to 1050 were equipped with fuel squeeze-bulbs (P/No 30340) which deteriorated rapidly and needed replacement with a better unit.

DEFEKT REPORT No: (91)-272: The Fafnir propeller drive-shaft bearing broke up in flight.

There had been indications during earlier flights (variations in engine speed and thrust, for example), that something was amiss.

The problem ought to have been picked up during the preflight inspection.

DEFEKT REPORT (January 1983): It was found possible, under certain conditions of load and wear, for the main wing-ribs to back out from their sleeves.

There were two suggested remedies:- For the inner four ribs, one should drill their ends and wire them to the trailing-edge spar.

For the others, the rear end-piece could be rotated 180° so that airloads would force the rib tight against the trailing-edge spar.

DEFEKT REPORT No: (92)-364: During the check-flight of a Eipper Quicksilver MX-11 for its airworthiness renewal, and whilst turning from a 45° left bank to a 45° right bank, an engine overspeed occurred and all thrust disappeared. The engine was immediately shut down. The aircraft was safely landed with no further incident.

Post-flight examination of the propeller drive revealed that the 5/16" nut and bolt, which secure the drive-shaft coupler to the drive-shaft, had become detached. This left the drive-shaft free

DEFEKT REPORT (1982): 75 degree cable-tangs, used on the MX, MX2, MXL, MX-2 and MX-Super, tended to crack at the bend. If dye-penetrant testing showed cracks, immediate replacement was necessary. This was a MANDATORY RECTIFICATION.

75° TANG

20355 A = 1/4" 20356 A = 5/16"

DEFEKT REPORT (November 1984): On the GTs, the original design of choke cable (P/No 45813) was replaced with a new version which had less friction and incorporated a twist lock.

Installing the new choke cable necessitated modifying the throttle mounting-plate.

- Q1.15 -
RAVEN, RAVEN X (SOUTHDOWN MESSWAY-MICROLIGHTS AIRCRAFT, HYBRED).

DEFECT REPORT No 108: The hole for the rigging-pin in the lower front-strut section on a Raven X, had lengthened by about 4 mm.

A factory replacement was needed. It was likely that some initial end-clearance had been wrongly allowed when the abutting tubes were drilled (possibly at the factory).

DEFECT REPORT No 111: On a Hybred Raven, the fuel-cap came off in flight and struck the propeller.

The locking arrangement on the cap could permit it to seem firmly in position, yet not be so. Care had to be exercised — in accordance with a Factory Bulletin (number 003) — to make sure it was properly in place after locking. This Bulletin read as follows:

"It is essential that the cap be fitted in an unlocked state, that is, with the key turned fully anti-clockwise. The key can then be turned fully clockwise and removed. This results in the cap being free again to rotate in either direction, but with the locking lugs now located in the retaining groove, thereby securing the cap."

DEFECT REPORT No 118: On a Southdown Raven X, the securing pin for the cross-tube back-up cable rubbed against the cross-tube primary tensioning cable.

The factory supplied — and recommended general installation of —

- R1.01 -
a modified carrier-block for the pin.

DEFECT REPORT No (89)-125: On a Southdown Raven, the Rotax 440 engine misfired in flight.

Particles of "Explosafe" — then used in fuel tanks — had partially blocked the fuel-lines. Absolutely every trace of the material had to be removed.

DEFECT REPORT No (89)-126: The exhaust system on the Rotax 440 of a Southdown Raven had cracked repeatedly.

Extra bracing, as used on later models, cured the problem after repairing the exhaust.

DEFECT REPORT No (89)-143: On a Raven, the rear big-end bearing failed in the Rotax 447.

At the time, Cyclone Hovercraft Ltd suggested the engine may have ingested parts of pop-rivets, (used on the intake silencer on this aircraft) or other debris. But the same type of big-end failure was later reported relatively often.

DEFECT REPORT No (89)-164: In flight, the engine of a Hybred XL faded.

The engine had the wrong plugs installed, along with the wrong size of jets.

DEFECT REPORT No (89)-172: Broken strands were found in the wing floating-cross-tube cables on a Raven.

This was fair wear and tear but needed extreme care to find it in time to avoid an accident. If noticeable wear was detected, the cables had to be replaced.

DEFECT REPORT No (90)-183: The engine on a a Raven failed in flight.

The cause was found to be loss of proper ignition-saterring, because someone had replaced two of the coil-mounting-screws with self-tapping screws. One of these had dropped out, removing the earth connection.

DEFECT REPORT No (90)-184: On inspection of a Raven trike,

(i) the propeller was found not to be approved for use on it,

(ii) holes in the 'snoot' tube were found to be elongated,

(iii) the seat-frame was bent.
(iv) the front-strut had an S-bend in it.

(v) the hang-bush was badly worn, AND on the wing,

(vi) there was 1/4" (6 mm) play in the A-frame side-tube connections to the top bracket,

(vii) it appeared to have a Pegasus XL thrust-ring behind the hang-point on the keel, and no thrust-ring at the front,

(viii) the general condition was scruffy and ill-kept and the log-book had not been properly completed.

General refurbishment was required, along with a lecture to the owner-pilot on his legal responsibilities.

DEFECT REPORT No (90)-191: The owner of a Medway Raven had repaired the attachment of the keel-noot to the base-tube. He told the Inspector that only specific bolts had been removed and replaced.

During a recovery from a left turn in the ensuing check-flight by that same Inspector, the front strut detached from the noot assembly. Bearing in mind that a similar event had earlier caused the death of both pilot and passenger, the check-pilot was more than fortunate to land the machine safely.

It transpired that the owner had removed the bolt at the base of the front-strut and, in carrying out the reassembly, had only pinched the strut between the cheeks of its lower attachment-bracket; he had not fed the bolt through the strut itself. Friction alone had held it in place up to the time of release.

DEFECT REPORT No (90)-210: The mounting-screw broke, where it had been securing the underside of the Rotax 447 to the bracket which held it to the monopole on a Raven X.

The remainder of the screw had to be core-drilled and removed and the hole re-tapped cleanly, before fitting a new screw.

DEFECT REPORT: A pilot rigging his Raven wing tore the sail fabric round the eyelet under the leading-edge, at the point where the flying wires exit from the sail. The swage on the cable had snagged the eyelet before the wing was fully open. Because of the large force needed to open the wing, the slight extra pull of the snagged fabric had not been detected.

The only way to be sure of avoiding this problem was to make quite certain that the swage and eyelet were not interfering, before the wing was drawn open.

DEFECT REPORT No: (91)-254: A Raven X did not handle as usual in a flight, and subsequent examination - after removing the sail - showed that the inner leading-edge was bent. (A section of prefabricated shed had toppled on to the wing, whilst it was in storage!)

DEFECT REPORT No: (91)-261: During preflight inspection of a Raven X with Rotax 447, one of the engine-mounting bolts was found to have 1/4" (6 mm) of clearance under its nut. The Nyloc nut was still firm on the thread, so it was presumed that the bolt had never been properly tightened after the owner had worked on engine maintenance.

DEFECT REPORT No: 91-277: The Nicklow exhaust on a Hybrid XL trike (Fuji Robin EC448W) had been secured with a single ‘cotton-reel’ isolation mount, which allowed the whole exhaust system to oscillate back and forth. Had the exhaust broken free, it would inevitably have passed through the propeller.

DEFECT REPORT No: (91)-286: The locking wire on the air-filter of the Rotax 447 on a Raven was cutting its way through the end rings. In time, the filter would have been able to fall free and enter the propeller-disc.

Slightly thicker wire, less tensioned and installed through new holes, was the cure.

GENERAL NOTE No: (91)-64: This concerned a Service Bulletin (006), put out by Medway Microlights, in which it was said that spares supplied for Ravens by Hornet Microlights Ltd, were 'bogus'.

They needed to be replaced by parts supplied by Medway.

DEFECT REPORT No: (92)-343: In flight on a Medway Hybrid 44 XL, the locking-wire for the air-cleaner retaining-ring broke and the air cleaner unscrewed due to normal engine vibration. When it detached, it hit the propeller, breaking one blade in half. The consequent fierce vibration caused the locking wires on the exhaust-manifold joint to break and the joint sprang apart.

A successful forced landing was achieved.

The wires were all stainless-steel. The remaining wires were found to be extremely brittle.

(This is a classic case of work-hardening, to which stainless-steel is liable. PCL).

Apart from installing new factory-supplied components as required, the owner proposed to replace the stainless-steel locking wires at every 50 hours; this was a very wise move.
ROTAX ENGINES

DEFECT REPORT: Flex-wing owners tend to tie their trikes to the trailer by fastening the rope or webbing round the propeller-shaft and then hauling it tight. There were instances where the webbing jammed into the propeller-shaft and damaged the shaft oil-seal. This happened if the propeller was turned at all whilst the strapping was taut.

Owners were strongly advised to be careful to avoid turning their propeller if the tie-down was taut or, ideally, to avoid putting the strapping round the shaft at all.

An alternative suggestion was to insert a 1" inch diameter dowel into the propeller-hole and then to secure the strapping round this. Owners who used this method were also reminded to take the dowel out prior to flying!

SAFETY BULLETINS: AUTUMN 1987: Cyclone Hovercraft Ltd issued notification of a set of Safety Bulletins (obtainable from them) relating to the following aspects of Rotax engines:

CH UL 1/5/87 Rotax engine small-end bearings.
CH UL 2/5/87 Rotax engine gearbox-mounting bolts.
1 UL 87/5 Rotax engine installation instructions. It should be noted that this was an updated version of the Bulletin, with a number of important changes.
6 UL 86/E Rotax Service Information. This related to the pre-load setting of 12-spring gearboxes.
2 UL 87/E Rotax Service Bulletin. This related to the pre-load setting of the 12-spring gearbox with the 4-dog hub.

CH UL 1/4/87 Cyclone Gearbox Servicing Guide and Summary. This document needed to be read in conjunction with the above Gearbox Service Information Sheets.

BULLETIN: GEARBOXES AND PROPELLERS.

This bulletin stated that the maximum propeller inertia, for use with the standard gearbox and shock-absorber springs, was 3000 kg-cm squared. It gave the dimensions for the support system to be used in the measurement of propeller inertia.

It also pointed out that the gearbox, its systems of springs and the pre-load on them, should be carefully checked and - if necessary - reset, at intervals of 50 hours of use, or less.

BULLETIN: DATED MAY 1987: Rotax made further amendments to their Service Bulletin No 2UL 87/E issued earlier that year. Both Bulletins related to "Reduction gear: torsional shock-absorber. Configuration with propeller-shaft in one piece".

This May issue related very specifically to "the pre-load setting of the 12-spring assembly; execution with a 4-dog hub".

DEFECT REPORT No 008: Misfiring occurred on early Rotax engines with Bosch ignition.

Cyclone Hovercraft provided detailed guidance on how to increase the ignition voltage.

DEFECT REPORT No 031: After servicing by the owner, a Rotax gearbox was excessively noisy.

The distributor found that the owner had misaligned the dog-coupling halves by 90 degrees during assembly; they rectified this.
DEFECT REPORT No 033: On the Rotax engine of a Pegasus trike, the rear plug-cap repeatedly came off.

Leads of correct length helped, along with restraining, DRY bungees.

DEFECT REPORT No 034: The cap-head screws securing the exhaust manifold to the engine block, on several Rotax engines, came loose.

The distributor recommended drilling and wire-locking the screws into position. Future engines were supplied with the screws drilled and wired.

DEFECT REPORT No 037: On some Rotax 462 and 532 engines, the rubber inlet-manifolds began to split in only a few hours of use.

They were part of a bad batch and the distributor replaced them free of charge.

DEFECT REPORT No 052: The pressure-balancing pipe ruptured, between the two radiators on a Rotax 462 engine. It appeared to be clear PVC ‘beer-hose’.

The problem was removed by fitting a more suitable hose supplied by the distributor.

DEFECT REPORT No 055: The Rotax engine failed in flight on a Mainair Flash.

The problem was traced to arcing in loose spark-plug caps. New caps and new retention bungees were required.

DEFECT REPORT No 061: Wear developed in the final drive of geared Rotax engines.

The distributor needed to be consulted about maintenance.

DEFECT REPORT No 063: A Rotax 447 was misfiring.

The ignition-capacitor was found to be loose in its clip.

DEFECT REPORT: A 447 engine persistently suffered power loss after about one minute at full power. The cause was that the cylinder-head gasket was crushed excessively and a part of it had extruded into the combustion-chamber, giving a hot-spot and pre-ignition.

The carburettor was attached to the cylinder considerably out of square, making that cylinder run lean. This would have made it also run too hot and possibly soften the gasket, allowing it to extrude. Since it took 60 hours for the problem to manifest itself, Cyclone Hovercraft felt that it could always be found before it became a serious hazard. They advised as follows:

(i) Re-torque the cylinder-head on a new engine at about 2 hours. Use a good quality torque-wrench and do not over-tighten! The correct setting is 18-24 Nm (13.3 to 17.7 lb.ft).

(ii) De-carbonise the engine at about 50 hours. Renew the cylinder-head gaskets as a matter of course. Torque the heads to correct figure.

(iii) Examine the old cylinder-head gaskets. If the inside diameter has been reduced to less than the bore diameter, the gasket needs to be returned to Cyclone Hovercraft for examination, together with a note of the engine Serial-Number and the hours of operation.

DEFECT REPORT No 069: The coil winding on a Rotax was found to have worked loose.

Vibration was thought to be the reason for this. The coil was shimmed tightly into position.

DEFECT REPORT No 070: Engine misfires on Rotax engines were identified by Cyclone Hovercraft as caused by a combination of Bosch plug-caps and replacement NGK spark-plugs.

Wear led to aluminium powder being produced, with all the attendant problems of easy ‘tracking’ of the spark.

DEFECT REPORT No 072: On a Pegasus XL-SE, the lower left radiator-hose ruptured and all coolant was lost from the Rotax 462. The rear silencer-bracket also snapped.

The hose was set clear of the engine by installing a a spacer behind the retaining bolt. The silencer bracket was known to be weak and a new design was supplied by the manufacturers.

DEFECT REPORT No 088: When a Rotax 447 was turned over, a clicking noise was heard.

The plastic cage on the crankshaft bearing had split open, melted and resolidified in another part of the crankcase.

DEFECT REPORT No 089: The Rotax 503 went dead in flight and then, just at the most adverse moment, burst into full throttle. The pilot had not switched off when preparing his emergency landing. Serious damage was caused to the machine.

An ignition wire had broken and was making intermittent contact.

DEFECT REPORT No 090: The upper pulley-wheel, which drives the air-cooling fan on a Rotax 503, was found to be cracked completely round its periphery.
The part was factory-replaced but the problem can be avoided by careful monitoring of belt-tension and the rate of abrasive wear.

DEFECT REPORT No 097: On two Pegasus 'Q's, the rubber sleeves at the carburettor of the Rotax 462 split.

Factory replacements were needed.

DEFECT REPORT No 106: A propeller-bolt on a Shadow was found broken, during ground-inspection.

The bolt was replaced but the availability of six larger bolt-holes was being viewed as the right course of action. The drilling out of the 6 x 5/16 inch diameter holes and fitting the larger bolts to all of these Rotax engines is now accepted as a very safe and sensible practice.

DEFECT REPORT No 112: The Rotax 447 misfired and failed in flight, on a Pegasus Flash 2 being operated in Africa.

A high alcohol-content, in the local fuel used in this aircraft, was thought to have attracted water which blocked the filter. The latter looked clean but resisted fuel flow. Gel formation was again a strong possibility.

DEFECT REPORT No 113: The small-end roller-bearing in the Rotax 447 of a Pegasus XL-SE broke up in flight. The engine failed.

Cyclone Hovercraft had earlier put out a note about the risk of this happening if the engine was over-heated for any reason of use or by the aircraft design. They have a better bearing in newer engines.

DEFECT REPORT No (89)-119: A Rotax 447 engine lost power in flight.

A crankshaft washer was breaking up and producing particles of metal which bridged across the sparking-plugs. Over-speeding of the engine may have contributed.

DEFECT REPORT No (89)-129: On a Pegasus XLR-SE, the exhaust pipe had broken off at the front, port flange.

The mounting screws (Part Nos 840-991), on the exhaust-port flange of the Rotax engine, had worked loose and allowed the pipe to move.

DEFECT REPORT No (89)-137: The gearbox on the Rotax engine of a Pegasus Q, became loose.

The socket-screws on the gearbox had been tightened with the wrong type of Allen-key, having no centre-spigot for location. As a result, they were not given the full torque.

DEFECT REPORT No (89)-143: On a Raven, the rear big-end bearing failed in the Rotax 447.

At the time, Cyclone Hovercraft Ltd suggested the engine may have ingested parts of pop-rivets, (used on the intake silencer on this aircraft) or other debris. But this type of big-end failure later became rather well-known.

GENERAL NOTE No: (89)-003: Rotax issued a Service Bulletin (1-UL 89-2) concerning the introduction of a new type of cooling fan for 503 engines.

DEFECT REPORT No (89)-153: The plugs on the Rotax 337 of a Chaser were changed to a the NGF type, which grips the thread at the top of the plug. Ignition became erratic and the engine misfired.

Reversion to the plugs specified by the manufacturer, properly secured, gave the cure.

DEFECT REPORT No (90)-177: The pins in the carburettor float-chamber, on the Rotax 503 of a Gemini Flash 2, were found to be worn.

The engine distributor suggested that resonant vibration may have contributed. Prolonged operation at critical engine speeds needed to be avoided.
DEFECT REPORT No (90)-181: Severe engine-power problems occurred with a Rotax 447 on a Pegasus XL.

No single cause has been reported but the engine distributors have suggested a range of possibilities, all associated with ignition equipment and its behaviour.

GENERAL NOTE No (89)-015: Rotax issued a Service Bulletin concerning the problem with worn grooves in carburettor-needles.

DEFECT REPORT No (90)-196: On a Mainair Gemini Flash 2a, with a Rotax 503, the engine stopped suddenly in flight. It was found to have seized, because the fan-belt snapped and over-heat ing occurred.

Corrosion of the fan-belt pulleys (due to the aircraft having been stored in a damp environment) caused slipping and accelerated wear of the belt, culminating in its final failure and the seizure of the engine.

Cyclone Hovercraft Ltd advised owners not to store their aircraft in damp surroundings, checking often and carefully for corrosion, checking that the belt is turning properly before flight and monitoring the belt tension.

DEFECT REPORT No (90)-196: FIRST AMENDMENT: The same problem occurred on another Mainair Gemini Flash 2a. Here, the owner/pilot commented on the difficulty of testing the tension of the belt and determining the precise condition of the pulleys, due to very limited access to the relevant parts of the engine.

DEFECT REPORT No (90)-198: On a 'Q' with a Rotax 462, the alloy plate bolted to the front of the engine to hold the ignition coils, was found cracked at a top retaining-bolt hole. The secondary effect of the fracture was also to cause the earth connector from one of the coils to break, resulting in loss of ignition at the rear cylinder. On dismantling, further cracks were found in the plate.

A new factory-supplied plate had to be installed. Welding of the cracked plate is not permissible.

DEFECT REPORT No (90)-204: In a full-power climb, the Rotax engine on a Pegasus Q misfired. It was smooth at modest RPM. Ground-runs repeated the effect.

The problem was a known one, of indifferent connection between non-recommended aluminum plug-caps and the lead-clips. Only steel-topped plugs must be used.

DEFECT REPORT No (90)-205: In the climb at full power, the engine fired intermittently. The Westach tachometer also read high, whilst this was occurring.

New spark-plugs had unwisely been fitted "Straight from the box".

R2.08
One plug was found to have an acceptable gap (0.015 - 0.020 inch) whilst the other was set at 0.037 inch. As the latter plug failed to spark, large transient voltages were fed to the tachometer, which then read high.

DEFECT REPORT No (90)-207: The engine on a Snowbird suffered a sudden power loss in flight. The water temperature stayed at 70 degrees C.

A big-end bearing had failed and the engine needed to be rebuilt.

No cause was identified but the remarks from Cyclone Hovercraft, on this kind of general problem, applied as usual.

DEFECT REPORT No (90)-210: The mounting-screw broke, where it had been securing the underside of the Rotax 447 to the bracket which held it to the monopole on a Raven X.

The remainder of the screw had to be core-drilled and removed and the hole re-tapped cleanly, before fitting a new screw.

DEFECT REPORT No (90)-211: On a Pegasus Q, with Rotax 462-LC, the engine began to back-fire in flight and a precautionary landing had to be made.

The main bearings were worn excessively and had temporarily seized; the points therefore opened erratically.

The engine had done 294 hours, mainly using low-grade oil to save costs, since the machine was used regularly for training.

It was recognised that this had proved to be a very false economy.

DEFECT REPORT No (90)-214: When replacing the bowl on the Bing carburettor of a Rotax 503, on a Pegasus Quasar, the spring-clip was not seated properly in its grooves. Had this been unnoticed, the bowl could have shaken off in flight.

The error was partly due to the inaccessibility of the carburettor on this particular machine. However, it was helped by the non-positive location of the clip on the carburettor body, a feature noted by Nigel Beale, of Cyclone Hovercraft, to whose comments Bing have responded. They are reverting to the earlier design, where the clip was sprung into two holes, rather than resting in shallow grooves.

GENERAL NOTE ON (90)-31: Rotax issued a Service Bulletin concerning the two tubes which are installed inside the air-intake of their engines. An owner had removed one of these tubes and had not pushed it back into place properly. It then worked its way out and so blocked about half of the air-inlet area.

It needed to snap back into place, if ever withdrawn.

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GENERAL NOTE ON (90)-33: The private owner of a Pegasus Q with Rotax 462, listed the problems he had encountered during a year's operation. The engine problems amongst them were, in summary:-

(i) The radiator-hose wore away on the base of the gearbox.

(Solar Wings normally prevent this by locating the hose away from the gearbox with a tie-wrap. Cyclone Hovercraft suggest that the hose can also be moved down the radiator stubs a little, to gain the requisite clearance).

(ii) A seam-weld on the Rotax exhaust cracked.

(Solar Wings find that this happens sometimes and they cure it permanently by running a weld round the seam.

Cyclone Hovercraft suggest that this sort of problem, as with others related to the exact design of the particular exhaust-system, can be avoided by the use of double flexible joints, which they always urge manufacturers to incorporate).

(iii) The coil mounting-bracket cracked.

(Solar Wings commented that they knew of several instances of failure of this Rotax part.

Cyclone Hovercraft again suggested that - as with all vibration-related failures - this could be a direct result of the design of the engine-mounting system).
(iv) The oil-seal, between the engine and gearbox, failed. Cyclone Hovercraft only knew of one instance where this seal had been 'nipped' during assembly.

Solar Wings pointed out that a new seal was all that was required).

(v) The secondary piston-rings stuck in their grooves. The owner has changed to semi-synthetica oil.

(Solar Wings suggested a 50-hour check on the state of the pistons, as a standard procedure).

(vi) There was a leak between the exhaust manifold and the engine block.

(Solar Wings suggested that this was problem which they found more prevalent in owner-maintained machines. They suggested - as did Cyclone Hovercraft - that it was important to tighten up the exhaust-mounting bolts before torquing up the head. Two gaskets were also a useful aid to good sealing.

Cyclone Hovercraft suggested that a thin smear of 'Silastic 736 RTV Red' on the clean, abutting faces, prior to assembly, would normally help provide a good seal.

SAFETY BULLETIN FROM THE DISTRIBUTOR: This Bulletin related to 582 engines prior to Serial Number 3916817.

It concerned the installation of special distance-pieces, or spacers, behind the coil-supporting plate. The Company was freereleasing the rectification parts to owners of these engines.

(See Defect Report No (90)-198 above and General Note No (90)-38 below).

GENERAL NOTE GN-(90)-35: Rotax issued a Safety Bulletin on the starter gear which had cracked on some of the 582 engines.

GENERAL NOTE GN-(90)-36: An owner pointed out that it is possible to assemble the Bing carburettor incorrectly, giving rough running and a thirsty engine at mid-revs.

The main needle and clip should be installed in the carburettor-slide first, followed by the white plastic cup being fitted on top of it, not the other way round.

The top-plate of the Bing carburettor can also be fitted incorrectly, since it is not symmetrical.

Cyclone Hovercraft confirmed the possibility of these problems and pointed out that the manual - always supplied - is directly helpful in preventing them, if properly followed.

SERVICE BULLETIN CONCERNING 462 AND 532 ENGINES: Cyclone Hovercraft issued a Safety Bulletin on these particular engines (Serial Numbers 462) from 3642690 and (532) from 3722150), concerning a problem with their water-pump impellers.

Heating of the impeller-shaft, due to additional friction from a (then) newly introduced sealing-system, could cause the plastic impeller to soften and lose its drive. The latter was via a toothed or serrated friction-washer and a flat on the shaft. If the drive was lost, the engine would rapidly overheat.

Rotax introduced an impeller of plastic with a much higher softening temperature, which had to be retrofitted to all relevant engines.

SERVICE INFORMATION SHEETS:
Cyclone Hovercraft (in 1988) offered a series of documents pertaining to specific areas of operation of Rotax engines.

They were:

(1) 4-UL 87/E Relating to unexpected engine-stops.
(2) 6-UL 87/E Relating to engine instruments. It gave, in particular, great detail on thermocouple temperature-probes.
(3) 7-UL 87/E Concerned with 2-stroke fuel-consumption.
(4) 9-UL 87/E Relating to rotary-valve shafts on Rotax engines type 462 and 532.
(5) 10-UL 87/E Relating to engine type 503, free-air version.
(6) 11-UL 87/E Concerned with the exhaust-systems used on engines type 377, 447, 462, 503 and 532.

DEFECT REPORT No (90)-226: On a Chaser, the Rotax engine gave problems with tickover and over-heating. It was found that the rubber gasket, which sealed the split-line of the inlet manifold, had worn and was allowing air to leak in, giving a weak mixture.

The distributors considered this to be the result of fair wear and tear. They recommended that the gasket be renewed every time the engine was serviced and that it should always be carefully monitored. In any event, it should be replaced every 100 hours. They also suggested that some type of gasket-sealant could be used to enhance the quality of the seal.

GENERAL NOTE No (90)-38: Rotax advised the addition of distance-
caps behind the coil-mounting plate on 582 engines.

DEFECT REPORT No (90)-233: Thirty minutes into an instructional flight in a Mainair Gemini Flash 2a, with the aircraft at 300 feet and the Rotax 503 engine at full power, it rattled momentarily and immediately seized. A safe forced landing was carried out by the instructor. The failure was due to a disintegrated big-end bearing on the front cylinder.

In all failures such as this, it is almost a prerequisite to involve the engine distributor, and not simply to purchase spares to make a repair. It is only if he has the opportunity to examine the offending parts and debris, that he can learn what failures are occurring and why. It is by such means that improvements are developed on products such as engines.

Mainair also made the following comments:

"We understand that this aircraft was being flown with a 'Warp Drive' propeller, which could have generated unacceptably high inertial loads. (The Rotax engine should only be used with propellers which have rotational inertias within the limits specifically laid down by the engine distributors, PCL).

This combination is not an Approved arrangement for this aircraft (and should therefore NOT have been in use: PCL)."

DEFECT REPORT No (90)-237: The low-tension generator part of the ignition coil - mounted behind the flywheel - failed on two Pegasus Qs with Rotax 462 engines. These, in turn, resulted in total engine-failures, without warning, on both machines. Both aircraft were about 27 months old, one having logged 180 hours and the other about 140 hours. The coils had over-heating marks on the windings, close to where the coil increases in diameter.

Replacement coils from Cyclone Hovercraft were installed. But, as no specific cause for the failures were identified, Nigel Beale at Cyclone Hovercraft Ltd was consulted; he commented (in late November 1990) as follows:

"From the number of spare generator (ignition) coils we have supplied, we would estimate that there has not been more than a dozen or so failures in about six years and thousands of engines.

The only failures I have seen personally, are one case of faulty connections at the ends of the coils and a couple of cases of coil breakdown, causing a misfire when the engine and coil got hot. I have not seen a burned coil and nobody has returned a burned one to us. If anyone has such a failed coil, could they please send it to us, so that we can send it to Rotax for examination? (The coils from these failures were returned to Cyclone).

Ignition faults can be difficult to trace and it is sometimes the case that the repairer will change all the internal ignition components (generator coil, points and condenser) in order to be sure of curing a problem without the need to strip the engine twice. Thus, the number of replacement generator coils fitted does not necessarily indicate the number of failures.

A failure of the generator coil could be due to:-

(a) Faulty manufacture, with insufficient Shellac insulation.

(b) Breakdown of the insulation due to excessive vibration.
(c) Breakdown of the insulation due to excessive heat. (Possibly a combination of electrical load and heat transmitted, from an overheating engine).

(d) Physical damage to the coil insulation from previous mishandling.

(e) Incorrect installation of a replacement coil. The rotating magnets on the flywheel run in very close proximity to the coil laminations. A special Rotax alignment tool is available to position the coil precisely during re-assembly. Without the use of this tool, it is possible that the magnets will scrape on the coil laminations, causing damage to both coil and flywheel, and possible overheating of the coil, leading to early failure.

DEFECT REPORT No (90)-238: On a Snowbird IV, whilst flying at 1300 feet, the engine failed without warning. The temperature gauge showed normal readings during the 35 minutes of flight. A safe forced landing was achieved. The machine had flown for a total of 231 hours, but engine failures had also occurred at 139 and 201 hours.

Ground examination of the engine revealed that the engine had seized, shown subsequently to be due to big-end failure. The latter had also led to further damage to the engine. This was the same form of failure as had happened previously. No obvious cause was identified.

DEFECT REPORT: The spark-plugs in a Rotax 447 were replaced with BR8ES plugs, because BR8ES types were not available. On climb out in the next flight, and at 700 feet, the engine RPM fell and the cylinder-head temperature rose. A safe landing was carried out.

After 1 1/2 to 2 minutes of full-power running on the ground, the same thing happened. With the original plugs refitted, no problems were found with 3, 4 or 5 minute full-power runs.

The same temporary power-loss was observed with the Rotax 462 on a Flash 2. During a long power-check prior to take-off, the engine actually almost died completely. Subsequent examination revealed that it, too, was equipped with BR8ES plugs. Changing these to BR8ES plugs gave trouble-free, full-power runs of up to 5 minutes.

BR8ES plugs were listed as approved replacements in the Pegasus manual for the XL, on which the fault was first observed.

SERVICE INFORMATION BULLETIN 5UL 90-E: Rotax put out this Bulletin to guide owners of the 503 UL C.D.I. and 582 UL C.D.I. with Ducati ignition, who might be experiencing anomalous behaviour from their tachometers, Type 966-072.

Basically, if the misreadings were shown not to be due to a faulty tachometer, and only then, they may have been produced by a resistor circuit which was not functioning quite correctly. The note gave clear instructions on how to modify this circuit and, thus, return the tachometer system to proper working.

New tachometers, of the Rotax type 966 074, already had the modified resistor circuit incorporated in them and, thus, needed no alteration. (This type of tachometer was identified with a blue label on the rear face).

As usual, the Bulletin was available from Cyclone Hovercraft Ltd.

DEFECT REPORT No (90)-242: In flight on a Rotax-powered Mainair Flash 2A, the engine RPM fell from 6000 to 5000. A precautionary landing was made and the fuel-level in the carburettor was found to be low. The filter was cleaned and a full-power run-up was satisfactory.

At 150 feet in the next attempt at flight, the engine failed and, after another safe landing, a low fuel-level was again found. No cause was identified. Five minutes later, in another attempt, the engine failed again and all flying was abandoned.

No certain cause was identified but the following were mooted: Carburettor icing may have been occurring. The pilot wondered if the filter may have been blocking due to the synthetic oil thickening out in the fuel. To avoid that possibility, he was considering moving the filter closer to the carburettor to obtain a measure of heat from the engine.

But another possible cause exists: Owners and Inspectors may recall the gel-like material which came out of fuel which contained water and which plugged up filters dramatically, yet dried out to almost invisible dust. If this gel were present and were also almost frozen, the effect would indeed be as experienced here.

All that could sensibly be recommended here was that the filter be kept scrupulously clean and the fuel totally free of water. That is, the tank needed to be filled completely at all times, or dried out completely. (The latter is often the more practical solution).

DEFECT REPORT No: (91)-253: In flight, the engine of a Rotax 462-LC Pegasus XL-C overheated to 100-110 degrees C. The expansion-tank seemed to be full to overflowing when examined on the ground later.

It was found that the impeller of the water-pump had been slipping on its shaft, showing signs of melting. There had thus been inadequate water circulation and boiling in the engine cooling-channels.
This problem had been reported before and was the subject of a Rotax Service Bulletin, discussed earlier in this chapter.

Rotax issued a new form of impeller as a replacement for the faulty type. The change affected 462 engines from Serial No 3642560 and 532 engines from Serial No 3722550 onwards.

**DEFECT REPORT No:** (91)-258: In flight, the drain-plug came out of the gearbox of the Rotax 503 on a Flash 2, and struck the propeller, which split.

The owner had been distracted whilst doing maintenance work and had not wire-locked the plug.

**DEFECT REPORT No:** (91)-268: Two bolts were found to be loose at the 100-hour check on the Rotax 532 on a Snowbird IV. They were tightened and two weeks later, were found to have disappeared. A pair of new bolts were fitted, with Helicolls, and a cracked coil-mounting plate was replaced.

The Rotax distributor rightly pointed out the stupidity of tightening any bolt, screw or stud into a worn thread in aluminium alloy. Even on a temporary basis, this was bound to fail. If shown to be necessary, the Helicolls should have been fitted before the aircraft was used again.

**DEFECT REPORT No:** (91)-270: On a Rotax-462 LC powered Pegasus Q, a small amount of oil was seen on the gearbox drain-plug after a 15 minute flight. the plug was tightened and the problem assumed solved.

The problem re-occurred and was traced, not to the plug but to the whole gearbox being loose on the engine. A strip-down revealed that up to six port-side fixing screws had sheared and the other three fixing-screws were little more than finger-tight.

New screws, Loktited into place, were needed. The Rotax distributor also emphasized the vital importance of having these mounting screws correctly torqued to 55 Nm.

**DEFECT REPORT No:** (91)-285: When taxiing a Pegasus Q (462-LC), or at idle, petrol would be discharged through the float-bowl overflow. Under full throttle and load, power would be lacking.

A small, C-shaped fragment of rubber, about 15 mm long, 2-3 mm wide and 1 mm thick - presumably sheared from the connecting hose during manufacture of the aircraft - was intermittently becoming jammed between the float-needle and its seat.

**DEFECT REPORT No:** (91)-286: The locking wire on the air-filter of the Rotax 447 on a Raven was cutting its way through the end rings. In time, the filter would have been able to fall free and enter the propeller-disc.

Slightly thicker wire, less tensioned and installed through new holes, was the cure.

**DEFECT REPORT No:** (91)-292: Power was suddenly lost in flight on a Pegasus Flash 1. It was found later that there was no compression on the magneto cylinder.

It was found that the gudgeon-pin circlip had come out of its location and wrecked the piston and cylinder. The owner had used the wrong technique to install the circlip after maintenance. He had also elected to delay a 50-hour service slightly, which would have shown the fault in time to rectify it, had he done it before the flight in question.

**DEFECT REPORT No:** (91)-296: The propeller locked solid and gave out crunching noises when turned on the ground. It was believed that the aircraft had actually been flown for quite a long period with the fracture present.

The cause was decided as torsional resonance. An incorrect preload on the spring-stack in the gearbox would help to aggravate this problem. Owners were also encouraged not to let their engines linger in the 'clatterly' low-speed range.

**GENERAL NOTE No:** (91)-57: Cyclone Hovercraft Ltd issued two Rotax Bulletins. The first, (1 UL91-E), concerned a non-essential improvement which could be incorporated in older engines which persistently leaked from the water-pump seal.

The second, (2 UL91-E), was more important and concerned the torquing of the nuts on the 'C'-type gearbox.

**GENERAL NOTE No:** (91)-68: Cyclone Hovercraft issued four new documents, viz:

A Safety Bulletin (17-7-91), which discussed the possible causes and effects of resonant vibration in the 'C'-type gearbox, and gave suggestions as to how to remove or minimise it.

A Service Information leaflet (7-UL-91-E), concerning wear in Bing carburettors.

A Service Information leaflet (8-UL-91-E), concerning the wiring of tachometers on the 508 and 447 SCDI engines.

A service Information leaflet (3-UL-91), concerning a preflight and maintenance plan.

**GENERAL NOTE No:** (91)-72: Cyclone Hovercraft discussed crankshaft failures which had occurred on Rotax 532 engines. All had been fitted with magneto-end electrical starters.

The note described how one could help to avoid the occurrence of
such a failure. No problems of this nature had occurred with recoil starters.

GENERAL NOTE No: (91)-87: A Safety Bulletin from Cyclone Hovercraft discussed problems experienced by owners when the rubber carburettor-adaptors have split. These were Part Number 867 484.

The problem was attributed to a faulty batch of mouldings, and was not expected to recur.

The note also reminded owners that it was vital to install the mouldings the right way round. An arrow on them had always to be pointing towards the engine.

TECH TOPICS: Cyclone Hovercraft pointed out that Rotax do not recommend the use of Helicoil inserts for the repair of the spark-plug holes in their engines. The increased thermal resistance of the coil causes the plug to run hotter and detonation to occur.

DEFECT REPORT No: (92)-318: At 300 feet, the engine revs suddenly dropped to idle and there was no response to the throttle. A safe emergency landing was made. The aircraft had logged about 200 hours in total.

Subsequent examination of the engine showed that the piston-ring locating-pins were burnt away and the rings had rotated and popped out into the exhaust port.

The previous owner had apparently re-assembled the engine with the piston markings facing in the wrong direction. This meant that the locating pins were facing the exhaust ports, which led to their destruction. Factory-supplied parts and a complete engine-overhaul were required.

DEFECT REPORT No: (92)-320: A brand-new Mainair Alpha (with Rotax 462 LC High power) was ground-run as per the Rotax manual, inspected and then a preliminary test-flight was made.

Approximately 10 minutes into the flight, there was a loud bang and a precautionary landing was immediately made.

Investigation revealed that a cylinder-head nut was missing. On this installation, the outer four cylinder-head nuts are removed and refitted by the aircraft's manufacturer in order to attach the engine-mounting plates. It was, however, one of the central four nuts which had come undone, which the manufacturer had no need to remove.

A new cylinder-head nut was fitted and one of the propeller-blades also had to be replaced. All cylinder-head nuts were checked for the correct torque.

The reporter of this defect added, "Although the Aircraft Owner's Manual was followed precisely for running-in the engine and for the preflight checks, in future I shall certainly check the tightness of all nuts and bolts before test-flying any new aircraft. Should not the Manuals be amended to effect?"

DEFECT REPORT No: (92)-321: Whilst servicing the gearbox of a new Quasar, it was found that the gearbox oil-filler plug was only finger-tight. If this item became detached from the engine, it would probably enter the propeller-disc and would certainly lead to oil loss.

This item had recently been updated by Rotax from a plastic tube on a threaded stub, to a black plastic cylinder with tapered sides. The former type of breather was always wire-locked in place; this new type was often not wire-locked.

It was clearly good sensible practice to wire the new breather tightly to the nearby gearbox lug by wrapping wire round the breather just above the hexagon-head.

Presumably all aircraft built in the first few months of 1992, with the new breather installed, could have been at risk.

(Mainair already wire-locked their breathers in place).

SERVICE INFORMATION: 1 JUNE 1992: Cyclone Hovercraft put out the following note:

"Propeller Mounting on Rotax Gearboxes."

1) A & B Type Gearboxes.

Until now, Rotax have offered the option of propeller-mounting flanges with either:-

(1) Two sets of clearance holes on 75 mm PCDD to suit 1/4" or 5/16" (8 mm) bolts, designed to utilise bolts with a plain shank passing through the hole, or
(ii) two sets of threaded holes on 75 mm PCD, tapped 1/4" UNF and M8.

Option (i) above will continue to be available for the foreseeable future. The use of this option, using 5/16" or 8 mm bolts with the plain shank passing through the clearance hole is our preferred method if wooden propellers are to be used.

For owners with gearboxes with Option (ii), it is permissible to open out the M8 Tapped holes to 8.2 mm plain holes, but recent shafts are hardened and will require a special tipped drill suitable for hardened steel and a jig for accurate alignment. If the drilling is carried out 'in situ', a shield should be used to prevent damage to the gearbox casing when the drill breaks through the flange. The ends of the opened-out holes must be deburred to avoid stress-raisers.

Owners of gearboxes with Option (ii) may alternatively wish to change to Option (i) by having a new shaft fitted. Owners of new and unused engines supplied by Cyclone Hovercraft can have the shaft fitted free of charge if the gearbox is returned to us. For imported and used engines, the normal commercial rates will apply.

Option (ii) will gradually be superseded by:

Option (iii), which has one set of M8 tapped holes and one set of 1/4" clearance holes on 75 mm PCD. This configuration is suitable for the GSC propeller (as is Option (ii)). Using 1/4" bolts and the additional driving pins provided with the propeller.

2. 'C' Type Gearboxes.

On 'C' type gearboxes, in the near future, in addition to the M8 tapped and 1/4" clearance holes on 75 mm PCD, (as in Option (iii)) an additional set of plain 8.2 mm holes on an increased 100 mm PCD will be provided. It is recommended that plain wooden propellers used on 'C' gearboxes should mount on to these latter holes, using M8 or 5/16" bolts, with the plain shank passing through the flange. Existing 'C' type gearboxes, which have all the holes tapped, may be drilled out if desired, as described above*.

DEFEAT REPORT No: (92)-331 In flight in a Gemini Flash 2, the crankcase of the Rotax 503 broke and, in the process, a small piece of the web caused a large crack in the lower crankcase and pushed a hole about 15 mm diameter in the upper half. Luckily, a safe landing was achieved. The aircraft had logged a total of about 170 hours.

The failure was not attributable to constant use at high rpm or anything of that nature, so may be put down to a typical fracture of a small but high-duty crankshaft, which is what our type of engines have to use. The engine needed to be checked thoroughly and be rebuilt by the distributor with new parts where necessary.

SAFETY BULLETIN 01-07-92

GENERATOR COIL FAILURES:
ROTAX ENGINES FITTED WITH CONTACT-BREAKER IGIITION.

On Rotax engines with contact-breaker ignition, the generator coil inside the flywheel energises the primary winding of the ignition coils. Isolated failures of the generator coil in the past have been found to be caused by:

a) Damage to connecting wires, causing an open circuit or a short circuit to earth (for example, by trapping a wire when fitting new contact-breaker points).

b) Mechanical damage to coil windings (for example, by careless disassembly when servicing).

c) Severe overheating of the engine, causing additional heating of the generator coil by conduction, adding to the electrical heating and causing breakdown of the insulating varnish on the windings.

Recently, however, a small increase in the number of failures has prompted Rotax and Cyclone Hovercraft to undertake an intensive
investigation to look for another cause.

Despite these lengthy investigations, which included temperature measurements of the generator coil during flight, no specific reason for any failure was found, with coil temperatures far below the level which caused insulation breakdown during overload bench tests.

It was concluded, therefore, that no inherent fault exists with the generator coil. Some of the isolated failures may have been due to the reasons previously mentioned, with the addition - in some cases - of insulation damage in transit or handling.

The investigation, however, showed areas where the possibility of long-term damage can be reduced by careful attention from the builder of the aircraft and from the operator. Coil failure is almost certainly caused by:

a) extreme heat

and

b) excessive vibration.

Any steps taken which minimise these effects will reduce the chance of long-term damage to the generator coil.

a) High coil-temperatures can be caused by:-

1) High temperatures of the engine, particularly the crankcase.

To avoid high temperatures, always ensure that the maximum specified temperatures (cylinder-head or coolant and exhaust gas), are within the maximum recommendations.

Ensure that the fuel system is in good order (lean mixtures mean high temperatures). Similarly, ensure that the cooling system is in good order. If the engine is in an enclosed cowling, ensure that ventilation is sufficient to keep the engine crankcase as cool as possible.

2) Use of the 30-watt lighting coil.

The Rotax generator contains, in addition to the ignition generator-coil, two ‘lighting coils’ for auxiliary electrical power. One is 110 watts and has yellow/yellow-black output wires. The other is 30 watts and has green/green-black wires. On new engines, the wires are linked together to give a single output of 140 watts. It is normal for the wires to be separated by the builder of the aircraft, with the 110-watt coil being used for auxiliary power, and the 30 watts for driving a tachometer.

It has long been known that, if auxiliary power is not required, shorting out the lighting coils will slightly boost the power of the ignition system due to the magnetic-flux effect, even though the lighting and ignition generator coils are not connected in any way.

At about the beginning of 1987, when the pole-shoe breakaway-gap of the flywheel generator was increased to 13-17mm, short-circuiting of either of the lighting coils to improve ignition performance became unnecessary.

The present investigation has found that, for engines with this increased breakaway-gap, such short circuiting have a long-term deleterious effect on the generator coil, for two reasons:-

a) The magnetic-flux effect increases the current flowing in the generator coil and, hence, the temperature of this coil.

b) Heat conducted from the 30 watt lighting coil, which is in close proximity to the generator-coil, can also increase the temperature of the generator coil.

Subsequent to these findings, our recommendation for engines with the increased breakaway-gap is therefore NOT to short-circuit the 30 W lighting coil and NOT to use it for auxiliary power. That is, do not connect this coil to electrical ‘consumers’ such as heated gloves, battery chargers, etc.. All auxiliary power should come only from the 110 W lighting coil (yellow/yellow-black wires). The 30 W coil may, however, be used for driving an electronic engine-tachometer, which consumes only a minute current. If the 30 W coil is already short-circuited, it should be disconnected and the ends of the wires insulated. If the two lighting coils are still linked together on an engine and auxiliary power is being used, the wires should be separated, with only the yellow/yellow-black wires of the 110 W coil being used for the auxiliary power. This recommendation applies to engines with the following, or higher, numbers:-

<table>
<thead>
<tr>
<th>ENGINE TYPE</th>
<th>SERIAL No</th>
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<tbody>
<tr>
<td>377</td>
<td>3632491</td>
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<tr>
<td>447</td>
<td>3648567</td>
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<tr>
<td>462</td>
<td>3585458</td>
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<td>503</td>
<td>3642095</td>
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<tr>
<td>532</td>
<td>3671547</td>
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Engines prior to these, which already have the 30 W lighting coil short-circuited, may be left as they are.

3) Incorrect adjustment of the ignition components.

The generator coil is located very close to the rotating magnets of the flywheel. The air gap between the coil laminations and the flywheel is critical. An incorrect gap can lead to higher current and overheating of the coil. In the extreme case, if the magnets rub on the coil, friction heat could add to the problem and soon - R2.23 -
destroy the coil. If ever a generator coil is replaced, it is essential to use the Rotax special centering ring (Part No 876-920) to position the coil accurately.

It is important that the spark-plug gap is set accurately to the figure specified in the Operator’s Manual, as this too can affect the current in the ignition coil and, hence, the temperature of the coil. It almost goes without saying that the correct setting of the contact-breaker gap and ignition timing are also very important.

b) Excessive vibration can be caused by:-

1) A mechanical fault with the engine.

That is, possibly a damaged propeller-shaft or crankshaft due to a propeller-strike or worn bearings.

2) Incorrect engine mounts.

The engine should be mounted reasonably softly, with little evidence of vibration felt by the pilot when the engine is operating above idling speed.

3) An unbalanced propeller.

The propeller should be checked for balance, pitch-setting and tracking at least every 25 hours and immediately following any chip or other minor damage.

CHECKING OF THE GENERATOR COIL.

It is recommended that the generator coils of all engines with contact-breaker ignition be checked at normal service intervals. (at least every 50 hours) to ensure that their coil resistance is in the correct range.

The coil should be renewed as a matter of course at the specified 300-hour overhaul period.

The coil resistance should be between 3.2 and 3.7 ohms. A value below 3.2 ohms indicates a deterioration of the wire insulation which could lead to early failure. It is important for this check to be carried out immediately on engines within the specified range which have had the 30 W lighting coils short-circuited, or used for auxiliary power. The check can easily be carried out 'in situ' on the engine, which MUST be completely cold. The only equipment required is an accurate multimeter. Any owners not sure of the procedure should contact Cyclone Hovercraft or Cyclone Airsports who will advise or carry out the check.

The procedure for checking the generator coil is as follows:-
(Refer also to the wiring diagram in the Engine Operator’s Manual).

1) Turn the engine so that one piston is at the top of its stroke (TDC).

2) Disconnect either of the two wires from the ignition damping box.

3) Disconnect the double blue wire from one external black plastic ignition coil, and the double blue-red wire from the other ignition coil.

With the multimeter, measure the resistance between these two wires. If the reading is below 3.2 ohms, the generator coil must be replaced. If the reading is between 3.2 and 3.7 ohms, recheck with the other piston at the top of its stroke. (This eliminates errors due to contact-breaker resistance). Again, if the coil resistance is below 3.2 ohms, renew the generator coil.

4) Reconnect all wires into their correct positions.

SUMMARY.

The possibility of generator-coil failures can be minimised by:-

i) Ensuring that the engine crankcase does not run hot.

ii) For engines within the specified number range, use the 30 W lighting coil only for a tachometer drive. Remove any short circuits and any 'consumers' connected to this coil.

iii) Ensure that the generator coil is positioned correctly after it is replaced. Ensure that spark-plug gaps, contact-breaker gaps and ignition timing are set correctly.

iv) Minimise the possibility of vibration damage by investigating any unusual vibration and regularly balancing the propeller.

v) Check, at regular intervals, that the generator-coil resistance is between 3.2 and 3.7 ohms. Renew the coil at 300 hour intervals.

Any generator coils which are less than one year old and which are below 3.2 ohms will be replaced by Cyclone Hovercraft free of charge.

Carrying out the above procedures should minimise the possibility of a generator-coil failure. However, an alternative design of generator coil - which will have a different resistance - is presently under evaluation and may be available as a direct replacement in the near future, when trials are completed.

To assist further in the investigation and to establish whether the small number of failures are restricted to a particular
batch, Cyclone Hovercraft would like aircraft owners to supply the following information regarding any past failures of generator coils:-

Engine type. Aircraft Type. Engine Number. Hours of operation. Whether either lighting coil was used for electrical power or short circuited.

N R Beale. Cyclone Hovercraft Ltd.

DEFECT REPORT No: (92)-334: In flight in a Thruster T300, the engine mistired and momentarily lost power. A safe landing was made.

Investigation showed that a spark-plug cap, checked earlier, was loose. The screw-on nipple had become completely off the plug thread, which had stripped. The causes was almost certainly vibration. (But was this a plug with an aluminium nipple, of the type against which Rotax had warned previously? That could certainly have made the problem worse).

New plugs were installed (hopefully of the type with steel caps).

DEFECT REPORT No: (92)-335: In flight in a Shadow B-D with Rotax 447 at 900 AGL, the engine lost all power. A forced landing was made and some minor damage sustained to the undercarriage. The engine had logged 230 hours in total.

When the engine was examined, the "PTO mass cable" was found to be broken at the splice connection to the PTO coil, inside the rubber protection-boot. It was repaired using good electrical practice.

(The reporter commented that this was the third engine failure he had experienced - with this same problem - over the previous 2 1/2 years. He said he was looking forward to the provision of double mass-cables to a double splice fitting, thereby finally obtaining dual protection. In the meantime, he intended to replace the mass cables at 40 hour intervals).

DEFECT REPORT No: (92)-335 FIRST AMENDMENT

Nigel Beale, of Cyclone Hovercraft, had the following comment to make on the above Defect Report:-

"I cannot recall any incidence of the failure of the earth (mass) wire on an ignition coil, with over two thousand engines in service, yet this owner has had three identical failures.

I would be interested to hear from anyone else who had had this problem."

DEFECT REPORT No: (92)-336: Following a 3-hour flight in a Shadow CD (with Rotax 503 with dual ignition and dual carburettors) and a 30 minute stopover, the crew decided to continue their journey. The engine started easily but, when carrying out a power check, it would not run at more than 3000 rpm and appeared to be operating on only one cylinder.

The engine had acquired 60 hours and the airframe 116 hours.

Subsequent examination showed that the carburettor-needle on the front cylinder had sheared at needle position No 2, where it was held by the clip. It had dropped to the bottom and, at low power, the engine was running on the idle jets.

The engine had been serviced at 50 hours but it is not clear whether the carburettor-needles had been examined for wear.

Cyclone Hovercraft advised that the 8A2 needles be replaced with 118 needles. It is not likely that the 8A2 needles necessarily contributed to the problem, but a significant improvement in fuel economy has been noticed since the change.

(The reporter also commented that, prior to the failure, the engine had been run with the carburettors out of balance. The Operator's Manual for the Rotax 503 gives no guidance on the setting up of twin carburettors, particularly in respect of balancing).
CHIEF INSPECTOR’S COMMENT: A few years earlier, Rotax had reported that some needles had been found severely ‘waisted’ behind the groove in which the spring-clip was retained. The needles had obviously been rotating and the total effect was attributed to a particular form of vibration. This would possibly explain why, in this instance, it only occurred on one carburettor.

DEFECT REPORT No: (92)-336

Nigel Beale, of Cyclone Hovercraft, had the following comment to make on the above Defect Report:-

"The 503 twin-carburettor engine had a change of carburettor-calibration from March 1992, which can be incorporated on earlier engines but is not essential.

A change of needle-jet is also necessary if the needle is changed.

The correct calibration is as follows, if small single air-filters or a double air-filter are used.

A different calibration is necessary if an intake silencer is fitted.

503 TWIN CARB. PREVIOUS CALIBRATION NEW CALIBRATION

NEEDLE 8L2 Position 1 11K2 Position 2

WEEDLE-JET 2.74 2.70

Posit. assured from the top of the needle, thus:

The main jet is unchanged at 158.

DEFECT REPORT No: (92)-337: Just after a Rotax 462-powered Hornet ZA had taken off and reached about 600 ft, the engine failed.

Examination showed that the teeth were sheared from the pinion gear, at the end of the crankshaft. No reason was suggested.

DEFECT REPORT No: (92)-337 FIRST AMENDMENT

Nigel Beale, of Cyclone Hovercraft, had the following comment to make on the above Defect Report:-

"The only reasons we have ever found for damaged gear-teeth are

(a) no oil in the gearbox and

(b) a bent propeller-shaft due to a previous propeller-impact".

DEFECT REPORT No: (92)-341: During flight in a Rotax 532-powered Renegade Spirit at cruising level, the engine speed dropped suddenly to around 4000 rpm. The throttle setting was increased but the revs remained unaltered.

A forced landing was made but the aircraft was substantially damaged when trees were struck on the approach. The pilot received minor injuries but the passenger was unhurt.

The local fire service had cut the fuel-lines and drained the fuel from the tanks. They had also disconnected the electrical system. The fuel pump and carburettors had been disturbed by a local pilot. The aircraft had been moved to a friend's hangar.

Fuel was present in the carburettor bowls and the fuel-pump was found to be operative.

The rear spark-plug was not functioning. When a new plug was installed, only a weak spark was achieved.

The offending plug was tested in another aircraft, where it did not respond initially to attempts to start the engine. But, eventually, the engine ran well with the plug in place.

The rear coil was removed and tested on another aircraft where it failed to produce a spark and the engine ran only at 3000 rpm.

This test was repeated on another aircraft for two more attempts but, again, the coil refused to function.

DEFECT REPORT No: (92)-344: During preflight inspection of a Pegasus XL-R, the carburettor-heat tube was found to be loose. Further investigation showed that the tube had detached from its mounting plate, due to a fatigue crack following the line of the weld.

The tube remained in place, attached to the air-filter by the jointing hose.
The carburettor-heat had been in place for about 110 hours.

The long cantilevered length of the tube mass was conducive to such a fatigue failure.

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for pistons cracking, were these:

(i) Overspeeding of the engine,

(ii) engine under-propped,

(iii) engine has been run without a propeller, or has had a propeller break and the engine speed has run away,

or (iv) severe piston-slap due to excessive wear.

Cracks usually appear as shown below:

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DEFEKT REPORT No: (92)-358: As the Rotax 582 engine had been operating on a Mainair Alpha Flash 2, the glass-fibre engine-cover had been biting into the top hose to the radiator. It had already penetrated through about 3/4 of the hose-wall thickness when detected. The aircraft was one year old.

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A new radiator hose was obviously needed and it appeared that if the hose could not be re-routed - the cover needed to be relieved in the relevant area.

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DEFEKT REPORT No: (92)-361 After a loss of power on a Pegasus XL, 447 powered, the aircraft was landed in a field, but sustained
damage when a tractor-wheel rut was encountered. Examination showed that the engine problem was caused by an in-leak of air at the point where the rubber hose connects to the rather small pipe forming the tank outlet.
SCORPION (3-AXIS) AIRCRAFT

These aircraft and the variants of them, were all grounded by the CAA, after causing a series of fatalities, from which the airworthiness regulation of microlights sprang directly.

(This machine should not be confused with the Hiway "Scorpion" and "Super Scorpion" flex-wings).
DEFECT REPORT No 077: The internal strengthening sleeve on a Shadow's nose-leg had been incorrectly rivetted.

The factory had a standard, simple rectification with extra rivets.

DEFECT REPORT No 104: The third of three fuel-cocks, successively fitted to a Shadow, was also found to be leaking.

The valves were from a batch which the factory had found to be faulty once they were 'out in the field'.

DEFECT REPORT No 106: A propeller-bolt on a Shadow was found broken, during ground-inspection.

The bolt was replaced but the availability of six larger bolt-holes was being viewed as the right course of action. The drilling out of the 6 x 5/16 inch diameter holes and fitting the larger bolts to all of these Rotax engines is now accepted as a safe and sensible practice.

DEFECT REPORT No (89)-131: On a CFM Shadow, the steel inserts, at the base of the main wing pin-joint bolts, loosened and became free.

Factory repair or replacement was the only rectification. Owners were reminded to use assembly or re-rigging tools as intended.

DEFECT REPORT No (90)-216: During flight, the propeller shaft on the reduction-gear attached to the Fuji Robin EC-44-PM of a Shadow, snapped. A safe landing was carried out.

This was one of only two Shadows ever built with this Fuji engine. Since the aircraft and power-plant were rather old, the failure could have been due to fatigue from an unbalanced propeller or something in that category. The second machine is unaffected.

GENERAL NOTE GN-(90)-37: An Inspector wrote that he considered that the tautening of the fabric, by the manufacturer, was inadequate. He had seen wrinkles, brush-marks, and variations in tension between ribs.

David Cook replied: "This fabric tautness will vary according to ambient temperature. As the ambient temperature rises, this fabric becomes more taut.

At the factory, we tauten it to the required degree, which should allow extra or lesser tautness. Really taut covering can distort the rear spar and trailing edges of ailerons, flaps, etc. Thus, a Shadow can have marked variations in its covering.

What is not acceptable is variation between panels. But wrinkles can readily be removed by careful use of a domestic iron, using the 'Polyester (low heat)' setting."

2. The fuel tanks tended to crack around the 'lid'.

DC replied: "Cracks do seem to appear round the upper edge of the fuel tanks, but without any leaking. This does seem to be an operational problem."
3. A tapered screw-in fitting was used as the fuel-line fitting at the engine bulkhead. Vibration might have loosened this.

DC replied: "This fitting, used at the fuel-valve, has not shown operational problems. It is assembled with Hermetite.

Furthermore, vibration is not a feature on Shadow monocoques, due to its absorption by the honeycomb structure".

GENERAL NOTE GW-(90)-47: Soon after a report of the unauthorised removal of the fuel tap on a CFM Shadow, came one that the fuel-tap had been by-passed on another machine. This modification was equally non-permissible and, in the event of a crash landing, also presented the chance of a severe fire risk. The dubious justification for the alteration was that the built-in tap was too failable for repeated operation and needed to be by-passed.

The tap which was incorporated - at least, on the machine in question - was one with "O" rings seals which were swept across the fuel orifice as the tap was operated. Although not uncommon, this type of tap design does rather misuse "O" rings. As the ring crosses the hole, it inevitably 'flows' into it. As it 'climbs' out of the other side of the hole, it is subjected to a shearing action, which means it has a rather short life.

But, unfortunately, whether or not the tap is a poor choice remains an irrelevancy in the present context. Neither owners, nor Inspectors acting on their behalf, can remove, change or by-pass the fuel-tap without the written approval of the manufacturer of the aircraft, or by implementation of an approved Minor Modification if one can be permitted.

DEFECT REPORT No: (91)-288: The engine noise and vibration level increased markedly in flight, when an anti-erosion tape stripped off the leading-edge of one propeller-blade.

The remaining tape was removed, both blades cleaned and new tapes installed on them.

DEFECT REPORT No: (92)-326: After a perfectly normal approach and landing in a CFM Shadow C, the starboard stub-axle broke at the weld. The wheel passed through the propeller 'disc', breaking the blades. The aircraft slowed and dropped - at low speed - into a ditch at the edge of the airstrip. The aircraft had logged 106 total hours.

The pilot says this was not a failure due to pilot error and a heavy landing. His aircraft was a pre-production model and he believes that the stub-axes are now more robust on current versions.

DEFECT REPORT No: (92)-335: In flight in a Shadow B-D with Rotax 447 at 900 AGL, the engine lost all power. A forced landing was made and some minor damage sustained to the undercarriage. The engine had logged 230 hours in total.

When the engine was examined, the "PTO mass cable" was found to be broken at the spade connection to the PTO coil, inside the rubber protection-boot. It was repaired using good electrical practice.

(The reporter commented that this was the third engine failure he had experienced - with this same problem - over the previous 2 1/2 years. He said he was looking forward to the provision of double mass-cables to a double spade fitting, thereby finally obtaining dual protection. In the meantime, he intended to replace the mass cables at 40 hour intervals).

DEFECT REPORT No: (92)-335  FIRST AMENDMENT

Nigel Beale, of Cyclone Hovercraft, had the following comment to make on the above Defect Report:-

"I cannot recall any incidence of the failure of the earth (mass) wire on an ignition coil, with over two thousand engines in service, yet this owner has had three identical failures.

I would be interested to hear from anyone else who had had this problem".
DEFECT REPORT No: (92)-336: Following a 3-hour flight in a Shadow CD (with Rotax 503 with dual ignition and dual carburettors) and a 30 minute stopover, the crew decided to continue their journey. The engine started easily but, when carrying out a power check, it would not run at more than 3000 rpm and appeared to be operating on only one cylinder.

The engine had acquired 60 hours and the airframe 116 hours.

Subsequent examination showed that the carburettor-needle on the front cylinder had sheared at needle position No 2, where it was held by the clip. It had dropped to the bottom and, at low power, the engine was running on the idle jets.

The engine had been serviced at 50 hours but it is not clear whether the carburettor-needles had been examined for wear.

Cyclone Hovercraft advised that the 8A2 needles be replaced with 11K2 needles. It is not likely that the 8A2 needles necessarily contributed to the problem, but a significant improvement in fuel economy has been noticed since the change.

(The reporter also commented that, prior to the failure, the engine had been run with the carburettors out of balance. He claims that the Operator’s Manual for the Rotax 503 gives no guidance on the setting up of twin carburettors, particularly in respect of balancing).

CHIEF INSPECTOR’S COMMENT: A few years earlier, Rotax had reported that some needles had been found severely ‘waisted’ behind the groove in which the spring-clip was retained. The needles had obviously been rotating and the total effect was attributed to a particular form of vibration. This would certainly explain why, in this instance, it only occurred on one carburettor.

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"The 503 twin-carburettor engine had a change of carburettor calibration from March 1992, which can be incorporated on earlier engines but is not essential.

A change of needle-jet is also necessary if the needle is changed.

The correct calibration is as follows, if small single air filters or a double air-filter are used.

A different calibration is necessary if an intake silencer is fitted.

- $2.05 -

503 TWIN CARB. PREVIOUS CALIBRATION NEW CALIBRATION

NEEDLE 8L2 Position 1 11K2 Position 2

NEEDLE-JET 2.74 2.70

Position is measured from the top of the needle, thus:

The main jet is unchanged at 158.

- $2.06 -
SHARP REDUCTION-GEAR

DEFECT REPORT: The pulleys were not very secure on the shafts, nor were they properly aligned.

DEFECT REPORT: The shafts tended to break.

These units were eventually taken over and much improved by Hornet Microlights. They were, however, later dropped in favour of better designs.
SKYHOOK-SAILWINGS AIRCRAFT,
(CUTLASS, SABRE, DUAL/SOLO ETC...)

MANUFACTURER'S BULLETIN: Using a Cutlass wing in its original form, the weight of the trike was taken on a sliding-box arrangement via two bolts. The wings had been designed for hang-gliding use and these two bolts were considered more than adequate to support the pilot's weight. The wings were later attached to powered trikes, to become microlight flex-wings.

The designer then felt that - although there was, in principle, enough metal under the heads of the two bolts to support the increased loads - it would be wise to add a third bolt to share this greater weight.

It was subsequently found that a wing, which did not have the third bolt, was in use on a flex-wing microlight.

It was therefore urged that a careful check be carried out on all Cutlass wings being used as microlights, to ensure that they had the extra bolt. Without it, they had to be grounded, until it was added.

DEFECT REPORT: On the Sabre wing, it was found possible to adjust the tension-cable adjusters too far, particularly on rather old wings.

Inspectors were urged to exercise special care when examining this feature of these wings.
SNOWBIRD AIRCRAFT

DEFECT REPORT No (90)-176: The panel of instruments on a Snowbird gave many inter-related problems. One of the engine stabilisers also snapped at the eyebolt.

Replacement instruments were needed and the stabiliser problem was thought to have stemmed from a misalignment of the flat strut with the eyebolt's head, putting bending stresses on the latter.

In a later report, the owner/pilot made the following points:

"The engine seized up, after 139 hours had been logged, due to overheating which caused the big-ends to fail.

When the engine was removed, the four studs which held the mounting-plate to the engine were found to be touching the engine-mounting frame, where they had worn into the metal.

The cross-shaft on the engine was also found to be incorrectly assembled, which led to its being damaged but the source of this erroneous build was not indentified.

After the studs were shortened, no more vibration damage occurred to the engine stabilisers, exhaust brackets, etc. It would therefore appear that the root of the earlier problem was the injection of high-frequency vibration directly from the engine.

When, later, the new Snowbird instrument-panel was fitted, the previous electronic panel was found to have been fouling on the engine bulkhead at the rear, which may well have contributed to the earlier instrument failure. (New Snowbirds have conventional instruments).

Subsequently, the engine failed again but, this time, it was due to a broken wire on the generator coil, possibly caused by the previous engine vibration? The effect of this was to cause loss of sparking. (Cyclone Airports - said the reporter - suggested that this was not the first case of generator-coil failure).

The aircraft had now, at the time of this last report, clocked 200 hours and the owner was hopeful that all was finally satisfactory.

DEFECT REPORT: It was variously reported that every early specimen of the first manufacturer's batch of Snowbirds experienced undercarriage failure. Whilst this might have been an exaggeration, the fault was certainly common.

The failures were later attributed to inadequate penetration of the brazing between components of the undercarriage. This was said to have been properly addressed on the production models sold by the later manufacturer.

DEFECT REPORT No (90)-238: On a Snowbird IV, whilst flying at 1300 feet, the engine failed without warning. The temperature gauge showed normal readings during the 35 minutes of flight. A safe forced landing was achieved. The machine had flown for a total of 231 hours, but engine failures had also occurred at 139 and 201 hours (for example, see Defect Report (90)-176 above).

Ground examination of the engine revealed that the engine had seized, shown subsequently to be due to big-end failure. The latter had also led to further damage to the engine. This was the same form of failure as had happened previously. No obvious cause was identified.

DEFECT REPORT No: (91)-262: A loss of power occurred after 30 minutes of flight. The tank and filters were removed and cleaned. After another 110 minutes of flight, in total, the same problem re-occurred. The engine was a Rotax 912.

For reasons which are not completely understood, the filters on this machine seemed to become blocked with debris after rather short periods of operation. (It is unclear whether the problem of detergents in the oil reacting with water in the petrol, to form a blocking slimes - often reported in previous years - has been considered in this context).

DEFECT REPORT No: (91)-273: Due to vibration, the exhaust bracket had chafed against the silencer, worn to a knife-edge and split.

The engine mounting-plate gives the engine directional offset and the studs which secure the engine to it, protruded too far through it and made direct contact with the engine bearers. There was evidence of severe indenting. Only with the engine stationary was there a healthy clearance between the studs and the bearers.
DEFECT REPORT No: (91)-268: Two bolts were found to be loose at the 100-hour check on the Rotax 532 on a Snowbird IV. They were tightened and two weeks later, were found to have disappeared. A pair of new bolts were fitted, with Helicoils, and a cracked coil-mounting plate was replaced.

The Rotax distributor rightly pointed out the stupidity of tightening any bolt, screw or stud into a worn thread in aluminium alloy. Even on a temporary basis, this was bound to fail. If shown to be necessary, the Helicoils should have been fitted before the aircraft was used again.

DEFECT REPORT No: (91)-306: During flight in a Snowbird Mk IV, (total hours about 90) after about 40 minutes airborne in calm conditions, and after banking turns left and right, the trim changed to nose-heavy and left turn.

Ground examination revealed a broken trailing-edge rib at the attachment to the rear spar, and at the rear of the spoiler, on the lower surface of the port wing.

A strengthening plate was installed, in accordance with the manufacturer's repair scheme.

DEFECT REPORT No: (92)-314: On a Snowbird Mk IV, the 1/4" bolt, which holds the base of the fin front-tube to the tailplane, sheared at the bottom of its thread. The aircraft had logged 95 hours total.

TECH TOPICS: Two Snowbirds developed blockages in the first gauze filter and the fuel-tap. The debris appeared to be grease.

The manual asks for the filter to be changed at 100 hour intervals. Until the nature and source of the blocking material was known, it was suggested that this interval be decreased to ten hours.

DEFECT REPORT No: (92)-325: On the third of three landings in a Snowbird, from solo circuits by a student, the nosewheel was seen to detach and bounce across the runway. Witnesses said the landing was firmly on the main wheels. When the nose-leg contacted the runway, it collapsed. Both runway and aircraft were damaged and the propeller written off. The aircraft was an early Noble-Hardman one.

Examination showed that the fault lay in poor quality of the brazing of the nosewheel strut to the top of the arch of the wheel-yoke. There was a limited amount of superficial brazing at the top and bottom of the yoke but absolutely no penetration into the body of the joint.

Unfortunately, there is no way this can be detected during normal inspection, however diligent.
DEFECT REPORT No 013: This concerned failure of the main monopole during flight, following grossly heavy landings.

It was later found that at least seven such monopole failures and replacements had occurred, though not reported.

Replacement with factory-supplied components (mast and safety cable), was the only correct repair.

DEFECT REPORT No 048: "Expofuse", put into tanks to prevent fire and explosion problems, began to break up and cause blockages in the fuel systems. This became a very widespread problem with these aircraft.

Removing every visible trace of the Expofuse and flushing very, very thoroughly indeed, was the cure. Every fraction of the material had to be removed.

SERVICE BULLETIN FROM SOUTHDOWN INTERNATIONAL. 11-9-85

Re: PUMA SPRINT: On all Sprint wings which employ a "D" ring sail-fixing at the tip-attachment points: if the bolt is not fully tightened as it passes through the D-ring and the leading edge, there may be a tendency for the large-diameter washer at the bolt-head to cut into the webbing of the sail-attachment point.

(ii) The engine was misfiring.

The ignition wiring had work-hardened and was failing.

(iii) The monopole of a Puma Sprint had cracks round it. No safety cable then installed.

A new monopole was fitted, along with an external back-up safety cable.

DEFECT REPORT No 054: The bolt securing the tops of the A-frame on a Sprint wing was found to be loose.

A new bolt, slightly longer, was fitted along with a new nut.

DEFECT REPORT No 056: On a Southdown Sprint, the fuel tubing split inside the braiding which was supposed to protect it.

The tubing was inappropriate for use with petrol.

DEFECT REPORT No 073: Power loss was experienced on the Rotax 447 of a Puma Sprint.

The rubber tube inside the braiding of the fuel line had perished. Replacement was required, with a more suitable material.

DEFECT REPORT: A detailed report on the sequence of events which happened with a Southdown Sprint, with 440 Robin engine, went as follows:

(1) The filter sponge and its coiled-wire insert came off the air-box.
(2) The filter struck the propeller.
(3) The propeller broke.
(4) Part of the propeller went through the wing-sail, causing a 3 foot (900 mm) tear in the trailing edge.
(5) Vibration began to occur.
(6) The reduction-drive struck the fuel-tank.
(7) The reduction-drive began to break up.
(8) The fuel-tank was ruptured and began to leak.
(9) The engine-mounting bolts bent.

Surprisingly, the pilot was not hurt.

OWNER’S REPORT: An owner experienced the problem of punctures with Mylite wheels, (which have often been reported as occurring on both Southdown and Pegasus machines). The punctures are initiated where the halves cut into the inner-tube. The owner machined their mating faces as described in an earlier report. However, as he tightened the wheel-bolts to the value recommended (by Pegasus, in this instance) the abutting joint was seen to peak into a ridge. Spacing washers of fibre - installed where
Nylon had effectively been machined away - stopped the ridging. But, when the tube was inflated to 12 psig, as recommended, he observed that the nylon was straining under the bolts.

He knew he had to buy new wheels and so carried out a further test: he inflated the tyre to the 20 psig figure recommended by Pegasus for use on hard surfaces. The wheel halves blew apart, fortunately not injuring the owner (in which he was extremely fortunate). The failure was caused directly by lack of material round the bolts.

His solution was to put a 6mm bead of clear silicone-rubber round the edge of one of the wheel-halves (as bought), and allow it to dry thoroughly. He then assembled the wheel, tube and tyre with a band - cut from a car inner-tube - round the abutting edges. He has since had no problems.

DEFECT REPORT: On the Raven and Sprint, a diesel-type filter was used. As in several other Defect Reports, the owner found an emulsion forming and blocking the element. In cold weather, when the emulsion was particularly viscous, the fuel-feed to the engine was inadequate and power-output suffered.

It was pointed out that this problem was not unique to diesel-type filters. It was widely known. The root cause seemed to be the reaction between vestigial water in fuel and the emulsifying agents contained in the oils used for microlight engines.

The simplest and most clear-cut advice given was: Always try to keep your fuel-tank totally empty for storage or absolutely full. Water will then be much less likely to gain access.

Also, if you have a water-drain on your fuel system, use it regularly and carefully.

DEFECT REPORT No 076: On two D6 wings, the propeller had struck the fabric.

Taxying downwind, with one wing low, allowed the fabric to sag and make contact with the propeller. Extra leach lines could have helped to prevent this.

DEFECT REPORT No 078: The bolts at the corners of the control frame of a Raven X were carrying the cable thimbles on their threaded regions.

Replacement bolts of correct grip-length were required.

DEFECT REPORT No 094: On a Sprint wing, the slack back-up wire (inside the fin) had failed at the top swage.

The wire was replaced and a suggested addition was that a light spring-tensioner (bungee) should be stretched from the middle of the wire to a suitable anchor point. This would stop the wire from thrashing about and therefore fatiguing.

DEFECT REPORT No 102: The eyebolts which held the lateral flying wires, on a Southdown Lightning wing, had insufficient thread engagement in them.

The Technical Officer agreed a modification which effectively reinstates the correct, designed arrangement.

DEFECT REPORT: During an annual inspection of a Sprint/Raven, it was found that the pilot's seat-belt was impossible to release under tension. With no tension applied, the buckle operated normally. Corrosion and dirt were preventing the internal spring leaf from depressing properly through the corresponding hole in the mating component.

The test for proper operation was to pull hard on the harness, across the buckle, and then to attempt to release it whilst wearing gloves. (This little test needs two pairs of hands). If the buckle showed the slightest disinclination to open, it had to be cleaned with, say, WD 40 until it did work properly. If it
failed to respond to this treatment, it had to be replaced.

BUCKLES MUST BE FREE TO RELEASE UNDER EXTREME TENSION.

DEFECT REPORT No (89)-139: Cracking occurred in the engine-mounting of a Southdown Trike unit.

Factory replacements were obtained from Medway Microlights.

DEFECT REPORT No (89)-171: On the fuel-tap of a Puma Sprint, the driving dog to the ball could move vertically and become disengaged entirely. The ball was then free to move to any position, including 'off'.

There was no alternative to the installation of a completely new valve, ideally of a different type altogether.

DEFECT REPORT No (90)-182: One of the air-filters on the 440 Robin engine on a Southdown Sprint came adrift and struck the propeller in flight.

The replacement need better pre-flight inspection and a safety-wire.

DEFECT REPORT No (90)-209: On a Puma Sprint, the belt tension was adjusted and the engine run to test it. After the engine was switched off, the belt was found to be slack again.

Removal of the fuel-tank, revealed that three out of four support-studs had broken.

The studs were replaced with rolled-thread material. However, more recent examinations of this problem has suggested that the use of single pillars and their associated spacers is not a sound arrangement. Two cross-beams, drilled to act as spacers but also to support the sideways oscillatory forces, would be a better arrangement.

DEFECT REPORT No (90)-227: On a Puma Sprint, the "UNIKE" filters became blocked, leading to a rich mixture and power-loss; the engine would not idle. The filters had been replaced 12 months earlier and the aircraft had logged 200 hours in total.

Such filters needed to be back-washed at regular intervals, with clean petrol, especially during operation in dusty summer weather.
They really needed to be replaced after a specific number of operating hours: a 12 month interval was probably too long.

DETECT REPORT No: (91)-236 The top rigging on a Sprint wing was found to have deformed thimbles, a worn tension-wire and abraded holes in the king-post. Replacements were required.

This had been caused by an overlength pop-rivet, used in securing spats to the undercarriage.

SERVICE BULLETIN: Southdown Sailings issued an instruction that the Nylite wheels on their machines should NEVER be inflated to pressures above 15 psig.

GENERAL NOTE GN-(92)-129: Owners of Puma Sprints were informed that, once their aircraft has passed either the 3-year mark or has been operated for more than 750 hours, whichever it reaches the sooner, significant replacements must be made to the airframe. These include the monopole, the hang-plates, the hang-bolt, rigging wires and associated nuts and bolts.

The CAA made it clear that there could be no exceptions to this, if the Operator’s Handbook called for it.

The BMMA actively sought some alleviation of this over-stringent requirement. (Ultimately, success was achieved; see below).

GENERAL NOTE GN-(92)-129: FIRST AMENDMENT

It became clear that the requirement for major components to be replaced after a certain number of operating hours or 5 years, whichever came sooner, which applied to Southdown International Puma Sprints, had also to be applied to Southdown International Ravens and Ravens X. (Southdown Sailings machines were not affected).

For example, the Operator’s Handbook for the Raven stated that, "at 500 hours or five years, whichever is sooner" owners must replace the monopole, the hang-plates, the hang-bolt, all rigging wires, associated nuts and bolts, etc.

The CAA’s ruling was that this procedure MUST be followed for Southdown International (and Midway Microlights), wherever it was called up for the machine in question.

Even though quite a number of Southdown International machines were sold and supplied with Operators’ Handbooks which did not make such a stringent demand, the ruling still applies to them.

Again, the BMMA pursued its plea for a more rational approach to this matter; see below.

GENERAL NOTE GN-(92)-146: The CAA agreed that Puma Sprints, Ravens and Ravens X, manufactured by both Southdown International Ltd and Midway Microlights Ltd, may - on completion of 500 hours of operation or on achieving five years since they were manufactured - have the components previously specified for mandatory replacement subjected to an "on condition" inspection instead.
If the components are shown to be in good working condition - in accordance with the tests and standards set out in BMAA ON-CONDITION INSPECTION SCHEDULE OCI-No:001 - they may re-installed and continue to be used for another year, when the examination must be repeated.

When the aircraft in question have logged 750 and 1000 hours, other components will become subject to the same form of 'On condition' revalidation.

All BMAA Inspectors were informed that, if they were called upon to examine such a Puma Sprint, Raven or Raven X, they must have a copy of both the relevant TADS and BMAA On-Condition Inspection Schedule OCI-No:001 in their possession before attempting the task.

DEFECT REPORT No: (92)-353 During ground running, the carburettor fell off the rear cylinder of the Fuji Robin 440 on a Puma Sprint and struck the propeller.

A third of one blade broke off and passed through the new sail.
SPECTRUM

DEFECT REPORT No: (92)-365: During inspection of four different Spectrum aircraft, aluminium ferrules were found installed on stainless-steel cables. Serious corrosion had occurred at these points, typical of the form to be expected with this incorrect combination of materials, which leads to electrolytic acceleration of the corrosion, once water has reached the joint. On these aircraft, heat-shrink sleeving had to be removed before the ferrules could be examined.

New cables had to be installed. They were fitted with the correct zinc-plated copper ferrules appropriate to stainless-steel cables.

DEFECT REPORT No (92)-366: After a few weeks of operation of a new Spectrum, it seemed to be wobbling on its main-wheels during take-off runs. Examination revealed that the tyres had severe casing separation.

It was found that they were clearly marked on their side-walls, "Do not exceed 7 miles per hour". They had to be replaced immediately with a suitable type of tyres.
DEFECT REPORT No 098: The valve failed in the priming bulb of the fuel line on a Swallow B. This shut off the fuel supply and stopped the engine.

Careful cleaning or replacement of the whole bulb unit was necessary.
THRUSTER (TST MK 1, T300)

DEFECT REPORT: The diagonal bracing-tube, forming part of the starboard jury-strut assembly, snapped cleanly at a point 13 mm

(1/2") away from the weld at the fore-and-aft member.

DEFECT REPORT No 091: Glass-fibres had blocked the fuel line and the engine stopped in flight.

Careful flushing of the tank, fuel-lines and filter was required.

DEFECT REPORT No 095: The diagonal fin-bracing strut broke free from its riveted bracket.

There was a crack in the fuselage tube, emanating from the rear horizontal-stabiliser through-hole on the starboard side.

A second crack was found when the plastic plug was removed.

Factory replacements and recommended rectification were the only available choices here.

Owners finding such cracks were advised to notify the factory anyway and not fly, pending instruction as to repairs. (They may now need to contact the BMAT Technical Office if no direct help can be found elsewhere).

DEFECT REPORT No 096: The wooden propellers on two Thrusters shrank and became loose on their bolts, some of which broke on each machine. The wood also showed signs of burning at the bolts.

Replacement bolts were needed, along with careful retorquing.

(A stack of disc springs on each bolt would avoid the problem).

DEFECT REPORT No 099: Cracks were found at the forward bolt-holes at the inner ends of both trailing edges. The factory issued a Service Letter (number 5).

A factory-designed reinforcement was proposed but no further information on this was ever published.

DEFECT REPORT No 109: On two Thrusters, cracks were found on the trailing edges of the wings, at the root bolt referred to in Defect Report No 099.

Factory replacements and their approved modifications are required. Careful monitoring thereafter is vital.

DEFECT REPORT No 117: The diagonal bracing-tube of the starboard jury-strut assembly, broke cleanly.

Fatigue caused the break and a factory component was fitted.

DEFECT REPORT No 89-130: After transport of the aircraft over about 250 miles, the trailing-edges were found abraded.

"CORRECT POSITIONS FOR BUSHES"

"WRONGLY PLACED BUSH"

"FOLDING DIRECTION"
Special plastic packing-pieces - specifically designed to protect against such abrasion - had been installed in the wrong locations by the manufacturers.

DEFECT REPORT No (89)-132: The third, outer, underside batten in the wing of a Mk I slipped out of its pocket by about 8 inches (200 mm). It limited the starboard aileron movement to only about 5 degrees.

It was important to check the tension of the wing fabric in the span-wise direction. New clip were obtained form the factory.

DEFECT REPORT: The aircraft failed to perform as expected with the propeller which was installed. Measurements revealed that the propeller-markings had been misinterpreted as to the pitch involved.

DEFECT REPORT: There were several reports of excessive wear of the groove in the carburettor-needle on the Rotax 503 installed on Thrusters. (This was probably yet another outcome of the large amounts of vibration which occurred on Thrusters).

Vibration had the needle rotate in its clip, wearing the groove. Some needles had been reduced to about one-third of the original diameter at the grooves. Only a little more wear would have led to total breakage of the needle and a consequent engine-failure.

The needle had to be examined carefully at intervals of 50 hours or less. Worn needles had to be replaced.

DEFECT REPORT No (89)-135: Cracks were found in the main engine-mounting frame on a Mk I, and needed approved welding.

DEFECT REPORT No (89)-146: On a Mk I, the lower rudder-hinge pin broke free in flight. It was vital that these hinge-pins were given a firm tug during the pre-flight inspection, in order to establish their reliability.
If such a failure did occur again, the only solution was - as here - to fit a new replacement component.

DEFECT REPORT No (89)-157: On a Mk 1, the wing-strut bolts were badly where they bore against thin stainless-steel brackets. This was potentially a very serious hazard and, more importantly, it was only detected because the aircraft was being dismantled for transportation.

Replacement of the bolts and careful, regular monitoring was required.

DEFECT REPORT No (89)-159: Bolt-holes in the rectangular-section axle-tube of a Mk 1 became enlarged, and developed emanating cracks.

This problem has been reported on very many occasions and stemmed from the use of an incorrect material for the axle-beam.

The tube had to be replaced with one made from stronger material, possibly with special bracing inserts installed as well.

DEFECT REPORT No (89)-160: On a Mk 1, the axle-beam became distorted and twisted.

Again, the material was wrong and far too soft for this application.

DEFECT REPORT No (89)-166: (AND MANDATORY SERVICE BULLETIN): On a Mk 1, the lower elevator-control cable broke free at the control column.

Incorrectly located pop-rivets weakened the adjacent components to the point of failure. A factory-monitored rectification was required by the CAA, on a mandatory basis.

See Figure below:

- T1.05 -
DEFEKT REPORT No (89)-169: A propeller-bolt on a Mk 1 had broken at its threaded portion.

No definite cause was identified.

DEFEKT REPORT No (90)-188: Rubber protection-sleeves were installed on the wheels after two punctures.

One of these bands was trapped between the wheel halves and the wheel subsequently broke apart at the joining bolt-holes.

DEFEKT REPORT No (90)-200: During pre-flight inspection of the fixing pin for the port stabiliser, a crack was found in the weld, allowing the fixing-pin to work loose.

A factory replacement-part was the required cure in this instance.

DEFEKT REPORT No (90)-232: During flight on a high-density-altitude day, an instructor noticed a significant decrease in performance, not attributable to any change in power output.

It was subsequently found, during ground-inspection, that the lower ribs/batten had rotated through about 90 degrees - on their tips - at the leading-edge.

This had effectively changed the lower profile of the wing to a reflexed form. This was not immediately obvious on the ground but gave the described drop in flight performance.

The defect has been observed twice. On the first occasion, 3 ribs turned; on the second occasion, only one moved.

Possible methods to remove the problem, or significantly reduce the chance of its re-occurrence, are to slip other complete batten-pockets inside the existing ones, or to sew them so as to reduce their width.

DEFEKT REPORT: The in-line fuel-filter became blocked, to an extent that the hand primer-bulb had to be used to maintain fuel-flow and get the aircraft down safely.

It was later established that - with any water present - the detergent additive in certain oils could generate a colloidal precipitate. This slimy material could easily block a filter element. When dry, however, it almost disappeared as is common with gel-like substances.

The obvious pointer is to the dangers inherent in leaving a fuel-tank half-full during storage. Either fill the tank or, if long storage is intended, drain it completely.

DEFEKT REPORT No: (91)-251: On inspection of a T300, hairline cracks were found in three of the stainless-steel brackets.

Vibration was again judged to be the cause. New components were obtained and fitted.

DEFEKT REPORT: The two Teleflex aileron-control cables were identical and - if removed in their entirety during maintenance, for example - could readily be replaced incorrectly, that is, crossed over.

These cables really needed to be colour-coded at their endpoints, so as to facilitate correct assembly.

DEFEKT REPORT No: (91)-252: Hairline cracks were found in the A-frame bracket, which is located at the rear of the cockpit and which also carries control cables. The factory suggested that the aircraft had been tied down at the wing-struts and the tail-wheel, as is so often done. Restraint against plan-wise movement should be included in such tie-downs.

The aircraft also had its main A-frame and starboard strut corroded into position. The latter would not come off when the bolts were removed and had to be sawn off.
There was also corrosion where the front spar and flying strut meet, on the starboard wing.

DEFECT REPORT: During an overhaul of the fuel system, it was found that the primer-bulb was shedding fragments of rubber from the inside. Enough material was found for it to have easily blocked the filter completely. Similar fragments had jammed the fuel-tap and made it almost impossible to operate.

Replacement with a new bulb was required, after a very careful cleaning of this unfiltered section of the system.

DEFECT REPORT No: (91)-256: The downward fin-post extension, which carries the tail-wheel system at its base, was cracked all round its periphery, just above where the small diagonal is welded to it.

This was obviously a job for factory repair.

On another machine the owner reported that when he replaced the tail-wheel on the ground, after lifting it to push the aircraft backwards, the tail-wheel swivelled about the forward retaining bolt. This was due to failure of the weld which holds the cross-strap below the fin extension.

DEFECT REPORT No: (91)-269: After removal of the fabric from the tailplane halves of a TST, cracked welds were found at the inboard edges of the tailplane leading-edges.

DEFECT REPORT No: (91)-289: The aircraft was always tied down with covers on the wings. When there was wind over the wings, the bags lifted upwards, causing the surrounding bungees to pull the ailerons hard downwards and forward, or hard upwards and forward. Ultimately, the ailerons became damaged.

To avoid a repetition of the problem, with the bags still in use, the bungees were fed through the aileron hinge-gap, leaving the ailerons unaffected by any lifting forces which might be developed in the forward part of the covers.

See Figure below.
DEFECT REPORT No: (92)-308: After being requested to examine the fabric on the elevators of a Thruster TST, the Inspector found that, as he ran his fingers down the Dacron on either side of the ribs, the fabric simply disintegrated, with virtually no applied pressure. On either side of the rib, the fabric was reasonably sound. The rest of the fabric on the aircraft was examined and, to his surprise, was found to be in satisfactory condition.

This aircraft had spent all its time tied down outside, with the tail into the wind. So, whilst UV attack must obviously have contributed, the Inspector contributes the deterioration of the fabric to the wind pressing it hard against the rib, so that they had effectively worn through it.

The entrapment of water may also have contributed to local degradation of the fabric.

DEFECT REPORT No: (92)-315: The normally rigged T300 was dismantled for transportation. A crack was found on one of the aileron operating arms.

Six months earlier, the aircraft had been inspected for its annual Renewal and no crack found, either because it was absent or because it had simply been missed.

The bracket in question - to which is normally anchored the aileron-operating cable - is welded at the top and bottom, where it abuts against the tube.

The lower weld had cracked and was repaired.

See Figure below.

DEFECT REPORT No: (92)-334: In flight in a Thruster T300, the engine misfired and momentarily lost power. A safe landing was made.

Investigation showed that a spark-plug cap, checked earlier, was loose. The screw-on nipple had come completely off the plug thread, which had stripped. The cause was almost certainly vibration. (But was this a plug with an aluminium nipple, of the type against which Rotax had warned previously? That could certainly had made the problem worse).

New plugs were installed (hopefully of the type with steel caps).

DEFECT REPORT No: (92)-335: In flight in a Shadow B-D with Rotax 447 at 900 AGL, the engine lost all power. A forced landing was made and some minor damage sustained to the undercarriage. The engine had logged 230 hours in total.

When the engine was examined, the "PTO mass cable" was found to be broken at the spade connection to the PTO coil, inside the rubber protection-boot. It was repaired using good electrical practice.

(The reporter commented that this was the third engine failure he had experienced - with this same problem - over the previous 2 1/2 years. He said he was looking forward to the provision of
Monel rivets and zinc-chromate paste were used in the reassembly.

No 2:- Lateral play was evident in the control-column due to play in the pivot-pin. This bolt was removed and was found to have a groove worn into it by the stainless-steel plates. The depth was some 25% of the bolt diameter. This was surprising, in that there was only slight play in the control-column. But, as the clamping-bolts on the plates were slackened slightly, the full effect was immediately apparent.

As the amount of play was not proportional to the deep wear in the pivot bolt, it would have been possible for the bolt to reach the failure-point without much warning.

The groove was caused by the Nylon bush being slightly tight, so that the bolt was pivoting in the thin stainless-steel plates. A new bolt was installed and its head was secured by wiring a corner of it to the plate, to prevent turning.

No 3:- Slight fore-and-aft movement was found in the aileron control torque-tube, to which the control-column was attached.

This was due to the rear securing-sleeve being slightly loose.

The sleeve was found to be secured by a solitary, misaligned aluminium rivet located on the underside of the tube and not readily visible for inspection.

The sleeve was not a satisfactory fit over the torque-tube and, as a result, could easily have fatigued this single rivet.

This sleeve carries all the 'up-elevator' reaction force and, if it were to fail, would allow the control-column assembly to come out of its front bush, and all elevator and aileron control would be lost.

The cause was poor fit of the sleeve over the tube and inadequate rivetting of one to the other. Two monel rivets, placed opposite each other, were used in the rectification.

No 4:- Although the base of the control-column was stamped with an 'X', there was no signed entry in the Airframe and Engine logbook or Certificate of Release from Thruster UK or Tempest Aviation to signify that this component had been examined and approved.

The eyebolt was therefore carefully removed and examined. It was found that the rivets-holes had indeed been drilled too deeply and had just 'spotted' the shank of the eyebolt. Since the weakening of the eyebolt is known to be capable of leading to its catastrophic failure, all up-elevator control could be lost if that happened.

double mass-cables to a double spade fitting, thereby finally obtaining dual protection. In the meantime, he intended to replace the mass cables at 40 hour intervals).

TECH TOPICS: PROBLEM 390: The centre support of the windscreen on a Thruster TST fractured at the top where it was attached to the fuselage tube. The windscreen bowed inwards when subjected to propeller-thrust but returned to its normal position when power was reduced. A replacement was required.

DEFECT REPORT No: (62)-356: The following four defects were found on a Thruster TST Mk 1. The logged hours were not stated.

No 1:- On internal examination of the de-rigged wings, it was found that the starboard trailing-edge flying-wire/jury strut bracket was attached only with aluminium rivets, not Monel rivets. On removing the bracket, mild corrosion was found beneath it, because no zinc- or barium-chromate paste had been used in the original assembly.

All similar brackets on both wings were removed and corrosion was found beneath all of them, which points to poor manufacturing standards at the (Camelford) factory. Such corrosion could possibly have led to catastrophic failure of the wing components.
Tempest Aviation were contacted and they confirmed that the item was serviceable. (Had the machine been serviced at the factory, they said they would have replaced the eyebolt as a matter of routine safety).

The Inspector was left, overall, with the impression that some unauthorised person (Inspector or owner) had acted stupidly and stamped the 'X' themselves, without doing anything about inspecting the component.
TIGER CUB 440

DEFEKT REPORT  No (89)-155: The owner had fitted total wrong plugs (Bosch WBCC instead of NGK B9ES) and the rear one melted.

The engine distributors advised on the problem and suggested an even better type of plug to use.

DEFEKT REPORT No (90)-174: On the Robin 440 engine, the pistons burned through.

It was found that the Nicklow exhaust was incorrectly assembled, in that components were joined together in such a way as seriously to restrict the flow path. It was modified successfully.

DEFEKT REPORT: The wing-tip cores were bonded to the end ribs and flight loads on the joints were trivial. However, because of the natural tendency for people to grab the wing-tip to manoeuvre the aircraft about, or for wing folding, damage tended to occur.

By gently pulling and lifting the extreme tip, it was possible to check for looseness at the bonded joint. Ripples in the fabric were a fairly certain sign of damage. If repairs were necessary, they had to be done as follows:

(i) A strip of fabric about 2 1/2 inches (64 mm) wide had to be removed from round the chord of the wing and equally spaced on either side of the joint.

(ii) The core then had to be rebonded using slow-setting epoxy adhesive.

(iii) The joint had to be reinforced using 3 inch (76 mm) wide glass fibre tape and epoxy resin, round the chord of the joint. The tape had to overlap the fabric on each side.

(iv) The glass fibre tape then had to be covered with appropriately coloured, adhesive-backed, carpet-repair tape.

It was important to note that the wings should never be lifted or handled by grasping them right at the extreme tips. They should be lifted only at the interplane struts.

DEFEKT REPORT No (90)-178: The choke-plunger return-spring on the Fuji engine corroded and allowed the engine to run extremely rich.

Rubber sleeves (to prevent water ingress) had never been fitted.

DEFEKT REPORT: Cracking had occurred in the lower left-hand engine-mounting bracket. The aircraft had flown for about 100 hours but had shown excessive engine vibration for a time and this was thought to have contributed to the cracking.

The mounting system needed to be carefully checked during preflight inspections.

DEFEKT REPORT No (90)-212: Fore and aft movement of the control column began to be increasingly stiff, to the point where a precautionary landing was needed.

It was found that Nylatron bushes, through which the push-rod was carried and guided, were seizing on to it.
The bores of the bushes had to be eased out and tube surface cleaned up. A hole was also drilled in the lower region of the housing for the bushes, to allow grit and debris to fall free.

**DEFECT REPORT:** Reports were received of the fabric becoming detached from the upper surface of the wing. A heat-sensitive adhesive had been used in manufacture and this had not proved satisfactory.

It was vital to check the adhesion by sticking a small piece of sticky tape to the fabric and gently lifting. If detachment were identified over an area greater than one square foot (930 square centimetres), the aircraft should not have been flown again until rectification had been achieved.

The joint could not be remade by simply ironing it back into place, because the adhering dust and fragments of foam prevented this. A suitable method was spelled out as follows:

(i) Bond the plain side of 2 inch (50 mm) strips of Solatex covering fabric to the foam top surface at 12 inch (304 mm) intervals chordwise, using epoxy-resin adhesive. Protect the heat-sensitive adhesive on the strips whilst doing this.

(ii) Cover the wing surface with Solatex as described in the building instructions. The bonded strips provide adhesive-to-adhesive contact for the covering and act as rib caps.

(This procedure was recommended for adoption whenever any flying surface was being re-covered.)

**MANDATORY SERVICE/CHECKING BULLETIN:** After a Tiger Cub crashed, killing its pilot, the following Bulletin was issued:

(i) Any Tiger Cub with its door hinged from the rear should not be flown at all. The door had to be hinged from the front and the design had to be BMAA Approved.

(ii) Where a door was fitted, the catches had to be checked and the design of the door and stops assessed. They had to be capable of withstanding a hand-force of about 25 kg without damage, both opening against the catch and against an inward force on the door-stops when closed.

(iii) The hinges had to be checked to ensure that they were capable of withstanding the same loads as in (ii) above.

(iv) The catches had to be such that they prevented opening due to vibration or maneuvering, or as a result of being inadvertently caught up in clothing.

- T2.03 -

- T2.04 -
UAS (SEE ALSO SOUTHDOWN SAILWINGS)

DEFECT REPORT: A Picador pulley was used on the reduction-gear on the Robin 250 of the Tripacer. It was rather prone to cracking.

It could only be carefully monitored and replaced if found to have cracks.

DEFECT REPORTS: On various Tripacer and early Pumas, the following defects were reported:

1. The propeller-flange was supposed to be rigidly attached to the pulley with two parallel pins. They had to be carefully checked for security.

2. The bearing-spacer on the propeller-shaft needed to be carefully checked as to condition and security.

3. The plastic covering had to be stripped from the engine mounts, then the whole assembly shot-blasted and thoroughly checked. If considered to be in a satisfactory condition, it then had to be primed and painted.

4. Again, the plastic covering had to be stripped from the lower seat-frame, to reveal its true condition after blasting. It could then be repainted.

5. It was necessary to check the top of the seat-frame for cracks, where the eyebolts passed through the tube.

6. The plastic covering had to be stripped from the front 'snoot' to allow it to be cleaned, examined and, if satisfactory, repainted.

7. The sling behind the seat had to be properly arranged, so that the fuel-tank could not invert itself.

8. The fuel pick-up tube entered the tank and was prevented from lifting out by means of plastic tape. This tape was destroyed by exposure to petrol, and the pick-up pipe could then work free.

9. On the early machines, the lower engine-mount consisted of a rubber bush housed in a small casting, through which passed a special bolt. The rubber disintegrated with prolonged exposure to petrol. The assembly needed frequent and careful inspection to ensure safety.

10. The bolt-holes at the drag-strut ends were liable to enlarge, to the point where they could break out.

11. The keel could distort immediately in front of the seat-frame.

12. On the rear axle, the bracing cables below it could stretch, the bolt-holes at the outboard ends of the axles could enlarge.

The bolt-holes in the keel-plates and inboard ends of the axles could also enlarge badly.

DEFECT REPORT No 105: The Fuji Robin 330 on a Tripacer abruptly started to misfire.

The fault was traced to a failure of the diaphragms in the Mikuni fuel-pump.

DEFECT REPORT No 110: Cracks were found in the driving pulley of the Robin 440 2PM engine on a Puma trike.

A new pulley was necessary. Lack of machined radii in the failed pulley seemed to be one possible cause.

DEFECT REPORT No: (91)-247. On the take-off roll on a Striker-Tripacer 330, the radius arm to the undercarriage leg broke at one of the attachment holes. Extensive damage was caused to both the trike and the wing, in the ensuing disintegration.

Better pre-flight inspection would have avoided the failure.

RMAA TECHNICAL-OFFICE BULLETIN:
On the Interpretation of Requirements TS 001, Issue A:
On page 1 of the above, against the paragraph heading S 603, is information about the design standard of UAS pre-1984 trikes: The following interpretation could be used:

"Variance which increase the strength are acceptable within sensible constraints of empty and all-up weight limitations".

It was pointed out that the standard shown was "Typical" and manufacturer's variations to that did occur. For example, the keel on some earlier versions consisted of a 2.5 inch diameter x 16SWG tube, which could be considered to be an acceptable alternative to 2.25 inch diameter x 17SWG.

DEFECT REPORT No: 91-282: In trying to assess why a UAS trike and Lightning would not perform as well as previously, a pilot attempted to fly it in front of observers. He was short in stature and, when the aircraft began to misbehave, with the engine revving fast with the throttle shut, he tried to shut off the ignition. He was unable to reach the dash-mounted ignition-switch and the machine was landed heavily and damaged.

The jamming of the throttles was traced to friction in the 'splitter' assembly. It had to be slightly modified to make it slide freely.

The short pilot was, of course, unwise to fly an aircraft in which he could not reach all controls.

The Technical Officer regarded relocating the ignition switch as a Minor Modification.

DEFECT REPORT No: (91)-304: A Tripacer solo was found to weave badly during take-off and landing, making these extremely hazardous.

Investigation showed that the drag-links to the axle-beams were overlength but not equally so. This made the wheels (whose axes were in line with the inclined beams, as was the early practice on many trikes) toe out badly and differently. The drag-ties were removed and shortened (by 1 to 2 inches). This totally cured the problem.

CSIF Inspector's Comments: It is a matter of concern to me that these different and over-length drag-links may have been on the aircraft for as much as six years, and were not noted by the Inspectors or check-pilots involved. That is blatant sloppiness since, even if the owners failed to mention the problem (to avoid making hassle for themselves), the check-pilots ought to have informed the Inspectors about the weaving. Unless, of course, Inspectors and check-pilots were one and the same, which makes the matter even more deplorable.
DEFECT REPORT No 115: Airflow forces lifted the spoiler on the wing of a Vector 600. It locked in the elevated position and badly affected controllability.

The crank to the spoiler had moved beyond its design limit. A bungee system was installed to prevent this in future.

FIRST AMENDMENT:
Two simple modifications were described to overcome the tendency for the spoilers to lift spontaneously. One change involved cutting ten holes, each of 1 1/2 inch (40 mm) diameter, in the metal plates. The fabric was then replaced on the plates, the holes cut through with a sharp scalpel and the edges bonded together with epoxy-based cement. The obvious loss of area had little detectable effect on the controllability of the aircraft.

The second change involved relocating one of the pull-back bungees. It was moved up the relevant tube and then secured with tape and tie-wraps. This measure made sure that the spoilers tended to reseat properly.

- V1.01 -
WEEDHOPPER, JC-24-B

DEFECT REPORT: The flat-bar tangs at the upper ends of the wing-struts were originally made from aluminium-alloy. These failed on several occasions in the USA, due to the bending to which they were subject. They were therefore changed to stainless-steel.

DEFECT REPORT: In the original design, the two lower ends of each pair of front and rear wing-struts were attached to the axle by a single bolt which passed through it. This bolt was thus subjected to a considerable amount of bending during ground-handling and under flight-loads, as the struts were compressed or tried to straighten. These bolts failed on several machines in the USA, causing at least one direct fatality.

The struts each needed to be attached to the axle via some form of channel, into which they were fitted with a bolt in double shear. These channels - one ahead of the axle and one behind - were then secured to it with another bolt, maintained in shear alone, because the pieces of channel were able to pivot.

DEFECT REPORT: Two 1/4 inch diameter bolts were used in the nose-leg in the basic design. On at least two occasions, they sheared in heavy landings.

They needed to be changed to 5/16 inch diameter aircraft-quality bolts.

DEFECT REPORT: The whole empennage and, generally, the rear end of the aircraft tended to twist rather badly.

This could be drastically reduced by bracing the sub-fin lower tube to the two rear fuselage-braces with a suitable cross-member.

DEFECT REPORT: The elevator push-rod was both lengthy and unsupported. It gave the elevator a somewhat spongy feel and diminished the pitch-control response. It was advisable to fit some form of restraint to the elevator push-rod, to remove this undesirable freedom in bending.

DEFECT REPORT: As designed, the two groups of four fuselage braces, on each side of the pilot, converged at the axle and were joined by three bolts (in single shear and largely uncontrolled bending), anchoring three of them to one tube in particular on
each side. The bending of these bolts left them liable to break.

The two groups of four tubes needed to be sandwiched between two pairs of aluminium-alloy plates, keeping their fixing-bolts in similar double shear.
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- propeller gel-coat separation
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- undercarriage beam cracking

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- hang-bracket bolts, bending

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- nose-catch, snapped

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- brake-plate, locked
- carburettor heat-tube loss
- choke-lever spindle, loss
- control-frame misassembly
- cylinder-head/mounting bolt, broken
- drive-belt failure
- earth-strap failure
- exhaust fracture, at flange
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- front-wheel axle failure
- fuel-system blockage
- fuel-tank debir
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- front-wheel suspension-bolts, worn
- front-wheel suspension-plates, worn
- hang-bracket side-plate loss
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- leach-line, sheath stripping
- loose nuts
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- monopole base-plate bolt loss
- monopole hang-bolt bush loose
- monopole, wrong length
- Nylite wheel failure
- pip-pin failure
- pip-pin hole-wear
- pip-pin misassembly

PEGASUS/SOLAR WINGS AIRCRAFT, continued.

XL variants
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- propeller loss
- radiator hose, split
- reflex cable corrosion
- Rose-joint failure
- Rotax 447, small-end disintegration
- safety back-up jamming
- silencer bracket, snapped
- spark-plug blow-out
- switch-location problems
- throttle jamming
- tip-strut, loss
- tyre pressures
- water-pump impeller, slippage

PHANTOM AIRCRAFT
- engine-mounting, cracked
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- gel-coat separation
- leading-edge tape loss
- pitch, incorrect interpretation
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(SOUTHDOWN AIRCRAFT)

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- A-frame, incorrect eyebolts
- ignition-switch inaccessibility
- throttle friction
- unsuitability for power (some types)
Raven X
- engine-mount assembly, cracked
- "On-condition inspection" permitted
- securing-pin abrasion
- Radius-arm failure

Sprint
- batten bungees, wrong knots
- cross-boom tension-wire, wear
- D-ring fouling
- engine-mounting, cracked
- fuel-tap disintegration
- hang-block rings, wear
- hang-bracket slippage
- ignition-switch, mal-operation
- ignition-wire, dislodged
- monopole cracking
- monopole hinge-bolt, fracture
- non-vented fuel-tank
- "On-condition inspection" permitted
- pick-up pipe/tank-wall abrasion
- pulley belt-retainer, loss
- radius-arm failure
- reduction-gear mounting-stud failure
- seat-webbing/frame-nuts, fouling
- "swan-neck" failure
- tank-cap, non-vented
- thimble, top-ripping, deformation
- wind damage
- wing-tensioning wire, jamming
- wiring, over-crimped

QUICKSILVER 1, 2, MX VERSION
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- carburettor jet sizes
- carburettor-manifold slippage
- choke-cable replacement
- coarse-thread bolt locking
- control-column attachment, bolts
- cork fuel-cap seal flaking
- drive-belt failure
- drive-belt tension, Yamaha power
- drive-belt tension, Cuyuna power
- drive-belt tooth loss
- drive-shaft failure, fatigue
- elevator pin-pin ball-lock failure
- elevator push-pull tube/propeller fouling
- engine seizure, Cuyuna
- expansion-chamber problems, Yamaha
- flying-wire shackle wear
- flywheel-magneto nut-torquing

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- glass-fibre seat cracks
- inspection tips
- king-post channel cracking
- king-post detuning
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- maintenance-guide, Cuyuna
- muffler welding, 430D
- overflow bottle problem
- parachute, effect on handling
- piston-pin washers, Yamaha
- plastic fuel-tank leakage
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- propellers, cracking
- propeller drive-shaft fracture
- propeller-shaft bearing failure
- propeller-shaft friction
- pulley-drive bolt-loss
- rear-spar bolt replacement
- rear shaft-bearing replacement
- root-tube inspection
- root-tube monitoring
- root-tube trailing-edge cracks
- rudder balance-tab
- safe tie-down
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- seat-mount failure
- shackle replacement
- squeeze-bulb deterioration
- tail-strut failure
- Teleflex cable, bending
- Teleflex cable, jamming
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- Tri-bar cross-tube gusset-plate
- Tri-bar hose-replacement
- up-dated root-tube assembly
- vibration checks
- weight and balance data
- wing damage
- wing-rib retention
- wing-root batten slippage

RAVEN, RAVEN X, XL AIRCRAFT
(SOUTHDOWN, MEDWAY, HYBRED)
- A-frame side-tube connection play
- big-end failure, Rotax
- coil-mounting screws, loss
- engine failure, ignition loss

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- propeller inertia, excessive
- propeller-mounting data
- propeller seizure
- radiator-hose abrasion
- radiator-hose rupture
- resonance in ‘C’ gearbox

Safety Bulletins:
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  - engine-gearbox bolts
  - engine installation
  - exhaust systems, 377, 447, 462, 503 and 532
- free-air 503
- fuel consumption
- gearbox servicing
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- reduction gear/ shock absorber
- rotary-valve shafts
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- spark-plug bridging
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- tachometer-resistor problem
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- tie-down guidance
- water-pump impeller, plastic, slippage
- water-pump seal leakage

SCORPION 3-AXIS AIRCRAFT

- all models grounded

SHADOW AIRCRAFT, continued.

- fuel-tank cracks
- ignition-coil earth failure
- nose-leg rivetting failure
- propeller-bolt fracture
- propeller-shaft fracture
- propeller-tape loss
- stub-axle failure
- tank-fitting failiiblity
- wing-pin joint insert, looseness

SHARP REDUCTION-GEAR

- discontinued manufacture
- pulley insecurity on shaft
- shaft fallibility

SKYHOOK SAILWINGS AIRCRAFT

- Cutlass wing
  - sliding-box bolt, omission
- Sabre Wing
  - tension-cable adjuster, over-taut

SNOWBIRD AIRCRAFT

- big-end failure
- bolt loss
- engine cross-shaft, incorrect assembly
- engine-mount studs, fouling
- engine-seizure
- engine-stabiliser, fracture
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- filter blockage
- fin-tube bolt shearing
- generator-coil, wire failure
- heat exhaust, repair
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SOUTHDOWN AIRCRAFT.

General
- engine-mount cracking
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- filter, blockage by gel
- ignition-wiring, work-hardened
- monopole failure
- spark-plug hole-thread stripped
- Nylite wheel inflation
- Nylite wheel problems
SOUTHDOWN AIRCRAFT, continued.

Lightning DS
- eyebolts, lack of engaged thread
- propeller/wing-fabric fouling

Raven X
- control-frame bolts, incorrect length
- "On-condition inspection" permitted

Sprint
- A-frame bolt, loose
- air-filter loss
- belt-tension loss
- buckle, unreleasable
- carburettor loss
- D-ring bolt problem
- diesel-filter blockage
- engine misfiring
- engine-mount bolts, bent
- fin back-up wire, failure at swage
- fuel-tank leakage
- fuel-tap failure
- fuel-tube, perished
- fuel-tubing, split
- king-post abrasion
- monopole cracked
- "On-condition inspection" permitted
- piston hole
- propeller, damaged
- seat-bolt, non-releasable
- spark-plug blow-out
- spark-plugs incorrect
- support-stud failure
- reduction gear/fuel-tank fouling
- tyre damage
- tyre pressure
- Uniek filter, blockage
- thimbles deformed
- weak mixture
- wing-fabric, damage by propeller

SPECTRUM AIRCRAFT
- aluminium ferrules on stainless-steel cable
- tyre-wall separation

SWALLOW B AIRCRAFT
- priming-bulb failure

THRUSTER AIRCRAFT
- A-frame bracket cracking
- aileron-arm damage

THRUSTER AIRCRAFT, continued.

- aileron damage by covers
- aileron jamming
- aileron torque-tube problem
- axle-beam bolt-hole, wear
- axle-beam cracked
- axle-beam, distorted
- bracket cracking
- carburettor-needle, wear
- control-column eyebolt damage
- control-column pivot failure
- elevator-cable, breakage
- elevator rigging-screw, bent
- engine-mounting, cracked
- fabric disintegration
- fin-brace strut, failure
- fuel-filter, blockage by gel
- fuel-line, blockage by fibres
- fin-post extension failure
- fuselage-tube, cracked
- gear blockage of filter
- ignition-coil earth failure
- jury-strut bracket fracture
- primer-bulb, disintegration
- propeller-bolt, fracture
- propeller pitch-marking, misinterpreted
- propeller, shrinkage
- punctures, repair
- rudder hinge-pin, fracture
- spark-plug cap looseness
- stabiliser fixing-pin, cracked
- Teleflex cable, mis-assembly
- tailplane failure
- tie-down damage
- trailing-edges, abraded
- trailing-edges, cracked
- wheel-halves, broken apart
- windscreen support fracture
- wing-batten, slippage
- wing-batten, rotation
- wing jury-strut, fracture
- wing packing-piece, omission
- wing-strut bolt, wear

TIGER CUB 440 AIRCRAFT

- choke-plunger return-spring, corroded
- control-column stiffness
- cockpit-door, closure
- elevator push-rod, seizure
- engine-mounting, cracked
- exhaust-assembly, incorrect
- fabric separation
- pistons, burned through
TIGER CUB 440 AIRCRAFT, continued.

- spark-plugs, incorrect type
- tip-cores misfitted
- wing-fabric, detachment
- wing-tips, loosened

UAS TRIKES

- axle-bracing cables, stretching
- bearing-spacer, deterioration
- drag-link lengths
- drag-strut ends, hole enlargement
- engine-mountings, corrosion
- engine-mount rubbers, perished
- front 'snoot', corrosion
- fuel pick-up pipe, retention
- fuel-pump diaphragm, failure
- fuel-tank sling, security
- keel distortion
- keel-plates, hole enlargement
- Picador pulley, cracked
- primary-structure, acceptable tubes
- propeller-flange mounting pins
- radius-arm failure
- reduction driving-pulley, cracked
- seat-frame, corrosion
- throttle jamming
- tube sizes, tolerances

VECTOR AIRCRAFT

- spoiler-bungee, modification
- spoiler elevation, involuntary
- spoiler, modification

WEEDHOPPER JC-24B AIRCRAFT

- cluster-tubes, wear
- elevator push-rod, flexing
- empennage, flexing
- nose-leg bolts, failure
- wing-strut lower fixing, modification
- wing-strut tangs, modification