SUPAIR

LIFE IS IN THE AIR

Sora Technical Commission Internal Report

Preamble

Chavanod, February 18th 2020

Dear customers,

As we committed, we are here providing the SORA technical commission final report. This commission was formed following the three incidents that happened in Autumn 2019 involving our SORA 2 & SORA 1 gliders.

This report aims at describing synthetically and accurately the four audits carried out by the commission along with renown external consultants and experts. With regard to these audits, we recognize that SORA 2 (in size 42) pilots who had their wings called back and refitted, can carry on flying with this gear.

In every event, even this unfortunate and difficult, lessons are to be learned. These audits, interactions with experts and the numerous tests helped us improve in all processes involving innovation, production and control. We genuinely hope that you will give us the opportunity to prove it to you in the following months.

We once again sincerely apologise for all the inconvenience caused and would like to thank you for your trust.

Yours faithfully,

Safe flights.

BARTHELEMY Roman
Head of the SORA Technical Commission

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Summary

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1. Method

The SORA technical internal investigation committee was set up after following the rupture of attachment tabs on two Sora 2 tandem gliders in Annecy, at the end of October 2019, and on a Sora 1 tandem wing in the Reunion Island at the same period.

The first SORA 2 encountered a rupture of fastening tabs A1 through A4 while engaging a SAT manoeuvre. The pilot deployed his safety reserve parachute and both pilot and passenger landed safely.

The second SORA 2 encountered a rupture of fastening tabs A2 through A4 and B2 through B4 while executing wing-overs. The pilot deployed his safety reserve parachute and both pilot and passenger landed safely.

The SORA 1 encountered a rupture of fastening tabs A4 and A5 while executing ong-overs. The pilot managed to carry out a rough but safe landing.

To determine the reasons of the fastening tabs structural failure, the technical committee carried out 4 audits, over a 3-month period (November 2019 to January 2020).

Here are the synthesis and conclusions.

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- **Audit n°1 / Conception**
  Objective : To analyse our methods and look for possible design failures.

- **Audit n°2 / Material**
  Objective : To analyse the material that makes up the fastening tabs, its maximum load breaking point, and look for possible pollutants that may have contributed to damaged them.
  External analysis contributors : French Institute of Textiles and Clothing

- **Audit n°3 / Assembly**
  Objective : To analyse our production methods, as well as those of other manufacturers in the same commercial arena, to determine if there is a fault in the assembly procedures.
  External contributors : Luc ARMANT, Xavier Dufresne (ex-Parachute de France), Control centres : Certika, Ripair & Plaine Altitude.

- **Audit n°4 / Aging**
  Objective : To evaluate material aging, we have assembled an array of more than 30 attachment tabs, taken from a number of Sora 1 and Sora 2 tandem wings (new, used, affected by breakage or having undergone load and shock tests) prior subjecting them to 900 cycles each.
  External contributors : Petzl, Porcher sport, Atelier Addict Parapente, Ripair, Certika

These audits generating tests, made us as a result, set specify targets to assess traction and cycle limit values to be reached. The forces exerted on the tabs were numerically estimated and then validated during flight tests, using sensors (line tension and accelerometers). New fastening tabs were also structurally and age tested for comparison.

Note : We would like to sincerely thank all the external consultants that provided their expertise in elaborating this report.

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2. Design audit results

The SORA 1 and the SORA 2 have an internal structure and a very different arch. In fact, these are two wings with very different behaviours and flight dynamics. In both cases, the audit found no design issues.

The wings are extensively tested before being certified. They comply with the standards in place (EN-926).

Additionally, we subjected other tandem gliders who had an intensive season behind them (according to the EN-926-1 standard). No structural failure took place below 1700 daN, or 7.9G (max flying weight range).

In conclusion, if this audit made it possible to identify areas for improvement, none of the design processes showed any critical problems.

3. Material audit results

The attachment tab is entirely made of PA6 nylon: a material intended to be used for traction and made of a weave able limit abrasion.

Individually, each fastener sample, taken from several tandem wings, broke between 90 daN and 130 daN. In straight flight the tension of the most stressed fastening tab is 7.8 daN (max flying weight range).

The frayed tabs scanned under a microscope were used as a reference during aging tests. Fraying does not seem to be the cause of breakage until the fibres that make up the tab are cut (warp and weft).

According to the audit report of the French Textile and Clothing Institute, the solvents (hydrocarbon compounds) found on some of the fastening tabs, are far too small a quantity to degrade the material.

On the other hand, a significant quantity of sand, very abrasive black sand more specifically, was found on the Sora 1 used at the Reunion Island.

In conclusion, the material used for the fastening tabs on SORA gliders is in compliance with the required standards for its use.

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4. Assembly audit results

The reinforcements and the tabs did not show any defect in the assembly process. Several renowned experts in the field and other safety textile industries were consulted: the assembly is compliant and carried out as it should be.

In conclusion, the assembling process is not the cause of fastening tabs rupture.

5. Aging audit results

We equipped several wings to find out the real traction and acceleration forces during the most aggressive flight phases (for example SAT: 35 daN max against 7.8 daN in straight flight and 4.2G max raised at harness level at max flying weight range), then carried out series of 900 traction cycles on a test bench at 35 daN then 41 daN and 51 daN. This is to simulate an extreme use scenario, where the tandem wing would perform 900 SAT-type acrobatic tricks systematically on the same side, throughout the life cycle of a tandem glider!

We took samples from the tandem wing which had already undergone a rupture, as well as from a tandem panel which had already undergone, either a load-test, a shock-test (according to standard EN-926-1) or a season intensive flight.

In all cases, none of the attachment tabs were damaged before the end of the 900 cycles at 35 daN. The weakest (and only) specimen reached the breaking point at 41 cycles at 51 daN. For the others, it was the line that had not withstood the aging cycles.

In conclusion, it was not possible to attribute the rupture of fastening tabs to the material during aging tests in conditions of intensive use and flying conditions not following the recommendations of the flight manual.

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6.Analysis

None of the 4 audits revealed a failure concerning the attachment tab of the tandem gliders SORA 1 and SORA 2

None of the tests carried out called into question the qualities of the material. On this subject, we want to bring to your attention that:

- All materials are carefully chosen during the research and development process.
- The part concerned was supplied to us by our subcontractor and did not present any reliability problem.
- That it was also used on tens of thousands of paragliders from various brands and models over for a 13-year period.

If the extensive tests, carried out during the audits, had been carried out prior to development, the material would still have been selected and validated and deemed to be safe for use.

- The breakage of the attachment tabs of the two SORA 2 was probably the result of **an accelerated aging process caused by an external element, improper practice, poor storage or, more likely, the combination of several of these factors**.

- With regard to the rupture that affected a SORA 1 in the Reunion Island, the analysis reveals that some of the critical materials of this tandem wing were abnormally altered. Our tests and analyses show that, in this particular case, the problem clearly resulted from improper storage of the wing in hot and humid conditions. This therefore does not in any way call into question the overall integrity of the SORA 1 and **does not require a recall of this particular model, nor calls for any additional precautions to be taken other than those recommended in the flight manual**.

- As precautional measures, identical tests were carried out on solo wings. **The results excluded any possibility of a fastening tab structural failure. Considering that the stress exerted on a tandem glider is slightly half of what it would be on a solo wing, these solo gliders do not present any objective risk if flown respecting the recommendations from the flight manual**.

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7.Conclusion

As a precautionary measure, we asked the pilots to return their SORA 2 tandem wings to SUPAIR, or to a competent repair workshop (in the case of glider sold overseas), for the installation of an additional safety support on the fastening tabs A and the fastening tabs B which are the most stressed. We now consider that pilots, whose wings have been updated, can resume their flights and activities using the SORA 2 glider (in size 42) with peace of mind.

To respond to these incidents and as a precautionary measure, SUPAIR has taken the following decisions, with very short-term application :

- Installation of an additional strap/lanyard on SORA 2 gliders to enhance the safety margin already in place in the event of a fastening tab structural failure taking place.
- Implementation of an audit program and new product quality procedures to provide pilots (and passengers, if applicable) with greater safety and comfort.
- Enhance the safety factor for critical parts.
- Development in cooperation with a French partner specializing in the aeronautics field - a new material for our fastening tabs. This material has been intensively tested for several weeks with a safety factor twice as high as the requirements called for by the standard EN-926-1.
- Development of a tool with test protocol, made for laboratory glider technical control and analysis, and finally for a periodic inspection of the fastening tabs.

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8. Reminders

Finally, we recall some principles :

- All gliders are guaranteed in the event of use where acrobatic practice is limited. SAT type manoeuvres are stressful to the equipment. During a SAT, the majority of the load is carried over onto one side of the wing. If the pilot / passenger pair experiences a load peak of 3 G upon entry, the inner side of the wing suffers a factor of 4.5 G.
- Gliders and equipment in general must be stored in a dry and temperate environment.
- Each pilot must strictly respect the glider scheduled factory recommended inspections periods indicated in the owner keep his wing in optimal flying condition.

9. Addendum

- N : unit of force, 1 daN = 10 N, 1 daN ≈ 1,02 kg (force)
- Fastening tab : strap/lanyard linking the glider to the lines
- SAT : acrobatic manoeuvre generating a great load factor
- Specimen/sample : item used in traction tests, in our case fastening tabs coming from SORA gliders

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