

## From the Editor

### Publication Date

This issue is the first of Volume 41 of *TS*, corresponding to January-March 2017. For the record, the issue was published in October, 2017.

### OSTIV Congress XXXIV

OSTIV Congress XXXIV will be held in conjunction with the 35th World Gliding Championships in Přeborn, Czech Republic, 28 July to 3 August, 2018. The call for abstracts appears in this issue. We encourage everybody to attend and present their latest work.

### About this issue

The main article of this issue is about transoceanic flights of frigate birds. Unknown to me was their ability to soar in clouds up to 4000 m! which enhances gliding distances substantially. I

think it is a very interesting article and it really is worth it to be published in *Technical Soaring*.

The XXXIII Congress of the OSTIV was held in Benalla, Australia, from 8 to 13 January, 2017. The Congress addressed all scientific and technical aspects of soaring flight. We are grateful to Rolf Radespiel, president of OSTIV, for a short report about the congress following the editor's notes.

Thanks also to Murray Stimson, who wrote for *Technical Soaring* a summary of the discussion that developed during the 'Future of the Open Class' panel session. You will find it after Rolf's report.

Very Respectfully,

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## XXXIII OSTIV Congress Report

By Rolf Radespiel, OSTIV President

The XXXIII OSTIV Congress was held at the same time as the recent World Gliding Championships in Australia, during January 2017. This conjunction of soaring science and gliding contest has a long tradition. It offers great opportunities for exchanging new ideas between sailplane developers, research scientists and contest practitioners.

The OSTIV Congress was hosted by the Gliding Federation of Australia in Benalla, Victoria. A joint Opening Ceremony of OSTIV and the World Gliding Championships on Sunday, Jan-

uary 8, was the beginning of a successful Congress week. The program consisted of 16 scientific and technical sessions held during the mornings and afternoons, whereas three evenings featured outreach sessions advertised for public attendance. The Congress took place at the Benalla Performing Arts Centre near the clubhouse at Benalla Airfield. This conference venue proved to be excellent in its quality of rooms, facilities and technical infrastructure. Access to the site of Championship operations was well organized and easy. Congress delegates and their partners



Congress delegates following presentations (left) and session chair Götz Bramesfeld with presenter Kai Rohde-Brandenburger (right)

were also taken on a wonderful all-day bus tour full of attractions such as a warbird restoration business in Wangaratta, a picnic on Mount Buffalo, a wine tasting and more. OSTIV is very thankful to the Gliding Federation of Australia for its great hospitality.

Preparing the Congress and running it throughout the week took endless hours of work by the Organizing Team, consisting of Murray Stimson and Stuart Smith, both from Australia, and Britta Schlenker and Rolf Radespiel, Germany.

A great number of organizational and industrial sponsors covered the cost of venue rental, refreshments during breaks, congress advertisements, booklet printing and bus rental for the Congress excursion. OSTIV is much obliged to its sponsors who made it possible to offer free access to the Congress and give special support to participating students.

The Call for Abstracts issued by OSTIV generated response by engineers and scientists from 11 countries worldwide. The received extended abstracts were reviewed, and they were published as a proceeding booklet, see <http://ostiv.org/index.php>. A varied program was generated this way. For their efforts in recruiting high-quality contributions OSTIV acknowledges the members of the Program Committee:

Zafer Aslan, Turkey; Mark Maughmer, USA; Lukáš Popelka, Czech Republic; Götz Bramesfeld, Canada; Judah Milgram, USA; Rolf Radespiel, Germany; Helmut Fendt, Germany; Ian Oldaker, Canada; Gerard Robertson, New Zealand.

As many as 55 international delegates registered at Congress Office to attend the technical and scientific sessions. They saw 45 presentations covering recent trends in sailplane development, training and safety, and meteorology. Noteworthy are comprehensive Congress Sessions in the fields of

- Laminar Boundary Layers and Transition
- Aerodynamic Configuration Design
- Electric Propulsion
- Gust Loads of Sailplanes
- Sailplane Performance
- Sailplane Safety
- Mountain Wave Flying
- Atmospheric Convection.

This list demonstrates the span of activity within OSTIV. The extended abstracts are available on the OSTIV website. As might be expected, many of the papers represent ongoing work, with updates being presented at future OSTIV Congresses.

The OSTIV-MacCready Award for the best scientific student contributions to the Congress was given to the joint contribution of Nilkan Akataş and Serhan Yeşilköy, 'Investigation of the Vegetation Effects on Convection by Using COSMO-CLM'. Maike Fröhner received the OSTIV-Mertens Award on the best technical student contribution for 'Measurement and Simulation

of Potential Electromagnetic Interference Sources in Small Aircraft'. The two honored student contributions will soon appear as full papers in the OSTIV Journal Technical Soaring. The joint OSTIV-GFA Prize for the best presentation of the Congress went to Stuart Smith and Murray G. Stimson for 'Comparative Statistical Analysis of Fatal Spin Accidents for Training Gliders'.

To expand awareness of its activities, OSTIV held outreach sessions, covering:

- FES technology development, presented by Luka Žnidaršič
- Presentation by Martin Volck on 'Initiative ProSegelflieger', which aims at advancing crashworthiness of gliders in order to avoid fatal injuries due to crashes
- Panel discussion on the future of the Open Class, with the panel consisting of Oliver Binder, Loek Boermans, Tilo Holighaus, Uys Jonker, and Gerhard Waibel
- Presentation by Morgan Sandercock on the 'First year in Argentina with the Perlan 2 glider'.

One mission of OSTIV is to acknowledge major technical developments by awarding prizes. The OSTIV Congress is certainly the best opportunity for presenting the accomplishments of the award winners to the public. The OSTIV Prize for 2017 was awarded to Stefan Gehrman, Axel Lange, and Luka Žnidaršič for their pioneering works on electric propulsion in sailplanes.

In 1992 Stefan Gehrman started studies on electric propulsion systems and found that the new ultra-light sailplane Silent could be a suitable basis for such an electric motor-glider. In 1997 this concept was first flown under the AE-1 designation. After type certification in 1999 under national micro-light regulation the AE-1 became the first serial-produced electric powered sailplane available to the public. Stefan Gehrman and his company have remained in the business to the present day, developing and producing electric components for different products and projects, with Solar Impulse probably being the largest example. Stefan Gehrman therefore is honored for making electric propulsion available to customers with his AE-1.

Axel Lange started his path toward electrically powered sailplanes as an engineer in the Glaser-Dirks sailplane company. It soon became obvious to him that electric propulsion would be a suitable alternative to using combustion engines. Axel Lange took his chance to start a new business based on his ideas about electric systems. After founding Lange Flugzeugbau, he developed the Antares 20E as his first own product, combining a completely new electric propulsion system with other state-of-the-art elements like modern structures, excellent crash-worthiness and optimized aerodynamics. It took several years to complete type certification for the Antares 20E in 2006. Today this sailplane has become a familiar sight at glider airfields with more than 60 examples produced. The propulsion system now has also been installed into the Arcus E sailplane from Schempp-Hirth



Entrance to congress venue decorated with new OSTIV logo (left) and award of the OSTIV Prize 2017 to Luka Žnidaršič (co-recipients: Stefan Gehrman and Axel Lange) during opening ceremony of OSTIV Congress (right)

Flugzeugbau, making this the first two-seated electrically powered sailplane available on the market. Therefore, Axel Lange is honored for type-certifying an electrically powered sailplane according to sailplane standards and for opening up serial production of such a system.

Luka Žnidaršič was also fascinated about the possibilities of electric propulsion, being an excellent sailplane pilot and working in his company with electric drives and generators. However, he aimed for a much smaller and more affordable system than those available on the market. By developing a compact electric motor, which fits into the nose of a typical sailplane, and combining this with propeller blades folding to the sides of the cockpit, he created a simple and error-proof

propulsion system for a self-sustainer in 2009. He called this system Front Electric Sustainer and under the acronym FES this system is now integrated into several sailplanes produced by different manufacturers. At the time of presenting this award, models of sailplanes from JSC Sportině Aviacija IR KO (LAK-17B FES), Alisport (Silent FES), Schempp-Hirth Flugzeugbau (Ventus-2cxaFES and Discus-2cFES) and HPH (HPH 304 S FES) have been equipped with the FES system. Accordingly, Luka Žnidaršič is honored for developing a simple electrically powered propulsion system which is comparatively easy and safe to operate, and can be used for a wide range of sailplanes.

The Board of OSTIV congratulates Stefan Gehrman, Axel Lange and Luka Žnidaršič on their outstanding achievements.

## Future of the Open Class

By Murray Stimson, Australia

The exciting future of Open Class could see gliders achieving 100:1 glide angle at airspeeds near 150kn, according to some of the worlds leading authorities on glider design. Gathered in Benalla, Australia for the 33<sup>rd</sup> OSTIV Congress and the World Gliding Championships 2017, these designers and manufacturers were giving a sneak preview of some of their dreams and goals under active research and development. Open Class, only restricted by a mass limit of 850kg, is the class where the most advanced concepts are first tested in the cauldron of competition. Balancing against these dreams is the practical reality that all manufacturers need to build, certify and sell enough aircraft to get a return on investment.

Five of the leading figures in sailplane design and manufacture participated in a panel Q&A session with the moderators

and then the audience. Rolf Radespiel (President of OSTIV and Professor of Fluid Mechanics at Braunschweig, Germany) and Mark Maughmer (Professor of Aerospace Engineering at Penn State University, PA, USA ) moderated the session. The great tradition of Open Class at Alexander Schleicher company was represented by Gerhard Waibel, famous designer starting with the D-36 in 1962 continuing through to his recent collaboration with Dick Butler on the Concordia glider in 2014. Renowned CEO's of Schempp-Hirth company, Tilo Holighaus, and for Jonkers Sailplanes, Uys Jonkers, both gave their views quite freely. Oliver Binder represented Walter Binder Flugzeugbau having brought two examples of the new EB-29R Open Class gliders to the WGC 2017 for the German Team. Not least, Loek Boermans, aerodynamics researcher at TU Delft, Netherlands,

has had a major role in the aerodynamic design of many gliders across several different manufacturers (including Concordia) and won the prestigious FAI Lillienthal Medal in 2015 after 19 years as the president of OSTIV. There could hardly be a better qualified or more experienced panel on this topic.

Limitations and technical compromises abound in Open Class even when there are few regulatory limits. Certification to the crashworthiness requirements of a 9g impact is already a limiting factor and there were comments by a number of panelists that the mass of 850kg should not be raised further, as crashworthiness would otherwise be compromised. Aeroelastic tailoring has for many years held the promise of controlling the nose-down twist of the outer sections of a slender wing at high speed. That control may not be far in our future judging by research now underway, resulting in lower drag at high speed. Flutter margin is another limitation that practically limits the span and aspect ratio, particularly for Open Class gliders. But the strength of the carbon fibres themselves was described as a key design parameter that might soon be addressed by new fibres in development for the wider aerospace industry. The key benefits of new fibres would be to allow even thinner wing profiles and lighter wing panels for easier rigging!

But for the holy grail of drag reduction and the 100:1 glide ratio, Loek Boermans and Gerhard Waibel are firmly convinced that laminar flow control via suction is the key by reducing profile drag at higher speeds by as much as a third to a half. "With a drag polar so flat across the speed range, there would be no point flying between thermals slower than maximum permissible speed" concluded Gerhard Waibel. Wind-tunnel models are almost ready to study the effects of ingesting the near-wall boundary layer inside the wing through fine holes and then exhausting it rearward, providing a significant drag reduction. Whilst net thrust by blowing is now technically outside the reg-

ulations, there's nothing to say such gliders could not form their own class in the future, "blowing away" the competition with astonishing performance.

Keeping the sport a pure expression of gliding pleasure could see some proposed developments not included on Open Class gliders. Some gliders in the class already sport self-launching piston engines in the fuselage behind the cockpit. But the current developments for Front-Electric Sustainer (FES) or even mid-fuselage electric motors is unlikely to reach Open Class anytime soon, according to some panelists. Current endurance for battery power is insufficient to compete with combustion engines, and the power insufficient to drag a heavy glider aloft. All of the motor options were seen to take away from the intent of Open Class: to maximize the gliding performance across the whole soaring day with the longest tasks possible. As Gerhard Waibel said: "We must remember that adding an engine amputates the light weight end of the aircraft performance envelope and electric propulsion even more as the current batteries are the highest weight propulsion solution". The panelists agreed that future open-class competitions should exploit the unique features of these superb sailplanes by sending the competitors out early in the day for as large tasks as possible, thereby eliminating tactics games and gaggles before the start line.

Major advances and substantial investments will still continue to drive performance ever upwards. Loek Boermans was happy to share for the first time in public that he is collaborating on a new Open Class sailplane. The new design will be heavier, fly by wire, and with a spanwise scheduled flap system that will be continuously and automatically moving. Wing loading will go up and it will use autoclave-cured structure. We can only dream of the soaring distances and speeds possible with one of these new Open Class super ships.



**The Future of the Open Class panel; left to right, Mark Maughmer, Tilo Holighaus, Uys Jonker, Gerhard Waibel, Loek Boermans, Oliver Binder; Rolf Radespiel as moderator.**