

Abstracts of OSTIV Papers Presented at the Soaring Society of America Conference 27-29 January 2011, Philadelphia PA USA

Compiled by Bernald Smith, USA OSTIV Administrator

Low Cost Soaring

Daniel Armstrong (armstronghagen@sbcglobal.net)

Soaring has become very expensive. This tends to reduce participation by both long time pilots and those wishing to enter the sport. This talk discussed some possibilities for significantly lowering both the cost to enter and to continue participation in soaring. The possibilities discussed centered on ground launch methods and equipment and ultralight sailplanes and how these can provide low cost and satisfying soaring flight.

Design of a Sailplane Wing Airfoil for Boundary Layer Suction

Loek M.M. Boermans (l.m.m.boermans@tudelft.nl)

Boundary layer suction can reduce drag by keeping the boundary layer laminar or increase lift by keeping the boundary layer attached. The presented sailplane wing airfoil has been designed for suction to reduce drag because this generates more performance improvement, in a safe way, and requires much less suction power than increasing the lift. Suction is applied between 35% and 90% chord on the upper surface and artificial transition by zigzag tape at 90% chord on the upper surface and 80% on the lower surface. This reduces the profile drag by 50% at high speed to 70% at low speed. The minimum sink rate of a Standard Class glider provided with this airfoil would reduce by 20%, the sink rate at high speed by 30%, and the best glide ratio would improve by 35%.

Wing-Drag Reduction with the Help of Structural-Dynamics and Gusts

Goetz Bramesfeld (gbramesf@slu.edu)

Glider pilots are accustomed to using energies present in the atmosphere. Most commonly, advantage is taken of thermal and wave lift. These soaring methods usually require active flight planning by the glider pilot, e.g. frequent evaluation of flight paths based on cumulus cloud development or turn radius adjustment based on variometer indications. In contrast to those active soaring strategies to exploit the atmospheric energies, some have considered dynamic soaring for such purposes. Passive means may hold the potential of substantial performance gains for modern sailplanes. Pilot reports and simple simulations indicate potentially significant drag reductions of certain wing configurations when passing through gusts. The theoretical models predict up to 30 percent less drag for an 18-meter glider with an aeroelastically tailored wing that passes through a gust with zero-mass net-motion. This talk reviewed the methods of energy extraction commonly used in soaring and expanded on the concept to gain energy from gusts with zero-net mass motion.

A Tale of Three Schweizers and More

Walter Cannon (supercub1@sbcglobal.net)

The talk was about the joys of his experience of restoring three very special vintage Schweizer gliders and two others over a period of more than fifty years.

Why You Hate Your Flight Review (and what to do about it)

Richard Carlson (rcarlson501@comcast.net)

The biannual flight review is one task that most USA pilots seem to dread. This may be because the review is a boring slog though dusty old Federal Aviation Regulations or the pilot is afraid the instructor will ask them to do some lame maneuver they don't practice often (who really boxes the wake?). This talk provided guidelines and steps to make the flight review a worthwhile learning experience. The guidelines and steps even may help the pilot make the instructor work as hard as themselves.

Fast Track - Simulators and Dedicated Instructors

Michael Kristensen (mk@adm.aau.dk)

The talk covered the following topics: FTST (Fast Track Soaring Training) Flight Simulator in basic training; using a TMG to reduce time from beginning to GPL-license; training methods in "the old days"; training using 2-seat conventional gliders; training under FTST-program; description of FTST-program and the syllabus and flight simulator in basic training. A short presentation was given of a flight simulator in Denmark. Finally, information was given on the Danish Syllabus for Simulators.

Dynamic and Gust Soaring

Jack W. Langelan (jlangelaan@enr.psu.edu)

Energy gain from both deterministic wind fields (such as shear layers) and stochastic wind fields (such as random turbulence or gusts) was described, with application to both sailplanes and small uninhabited aerial vehicles (UAVs). For gust energy harvesting, a controller which superimposes a gust-dependent control input on a standard linear state feedback term was proposed, and a genetic algorithm was used to determine optimal controller gain for both sinusoidal gust fields and Dryden gust fields. The effect of gust energy harvesting on overall flight performance (measured as total energy lost per distance traveled) was discussed.

Sailplane Wing Design

Mark D. Maughmer (mdm@psu.edu)

The presentation began with a tutorial dealing with the process of designing wings for modern sailplanes. Topics included how to determine the most suitable planform shape for a given design, how to integrate the airfoil into the wing design, and how to predict the effect of the wing on the performance of the complete sailplane. In addition, some details of winglet design were considered. Finally, design examples of several modern high-performance sailplane wings were presented.

Improve Your Instructing with Basic Laws

Ian Oldaker (ian.oldaker@hbwi.ca)

Improving teaching requires understanding how people learn. This presentation assisted the flying instructor to improve in stimulating the student's effective learning. One learns only through one's own activity; strictly speaking, there is no real teaching art, only the art of helping people learn. Instructional techniques that stimulate student activity were described. Their activities may be mental or physical; through the process of directed activity student pilots learn skills and knowledge to become good, safe pilots. Laws or learning factors were discussed that will ensure the student pilot is ready, and the flying instructor is well prepared. Knowing these laws may require flying instructors to review their own training! During flying training for example, timely reviews of the knowledge and handling skills learned in ground-based and flying lessons are designed to assist long-term memory retention. More learning factors are included applying to instructor and student, and their interactions; e.g. discussion of transfer of responsibility, instructor-student syndrome and decision-making/judgment training are all important to understand. Students need these tools to be good pilots with confidence to make and act on their own decisions, ultimately to make routine decisions habitually and subconsciously always keeping safety foremost.

Proficiency vs. Currency

Ronald Ridenour (ronsnimbus3@aol.com)

A lighthearted presentation was given on how a pilot, who might meet currency requirements of the Federal Aviation Regulations, may need some additional training to be proficient at flying a sailplane. Emphasized were ways to enhance proficiency by attending safety seminars, seeking additional flight instruction and improving decision making skills. The talk finished by examining some accident profiles and discussed ways that these types of accidents might have been prevented.

Uvalde 2012 - Preparations for WGC Weather Presentations

Walter Rogers (wrogers@qnet.com), Dan Gudgel

Preparations and considerations for meteorological support of the 2012 World Gliding Championships (WGC) at Uvalde, TX must consider providing information to the Competition Director and associated tasking, pilot meeting briefing capabilities, posting WGC Website meteorological information, routine and inclement weather advisories, subsequent weather challenge dissemination for the contest site and potential task area, and collecting meteorological information (observations and forecasts). Coordination with private and public meteorological entities will establish a solid weather observation network including profilers and

conventional automated surface observations and radar networks. Additionally, local and regional forecast grid models will be adapted to serve the WGC tasking area. Meteorological support will be conducted as a true team effort with several meteorologists, operational and research, involved in the eventual support package.

FAA/SSA ADS-B Memorandum-of-Understanding Current Status

Robert Strain (rstrain@mitre.org)

The Soaring Society of America (SSA) and the Federal Aviation Administration (FAA) are currently working on a joint project to improve flight safety. The objective is to research and demonstrate the safety benefit of Automatic Dependent Surveillance - Broadcast (ADS-B) technologies and services, suitable for gliders and aircraft without electrical systems, by improving pilot awareness of proximate traffic in daytime visual meteorological conditions. This project is focused on achieving an understanding of the soaring application using ADS-B with documented performance requirements and safety benefits. Additionally, there will be the potential for ADS-B glider avionics available at a price that will lead to widespread equipage. This session presented the status of FAA's ADS-B Program and national implementation of surveillance and broadcast services. The status of the SSA/FAA project and preliminary findings were presented.

Detailed Design of the PSU Zephyrus Human Powered Aircraft

Dan Trew (DanTrew@psu.edu), Grant Dowell and Julia Cole

Recently, the Flight Vehicle Design and Fabrication course at The Pennsylvania State University began designing an aircraft, the PSU Zephyrus, to compete for the Kremer International Sporting Aircraft Competition for human powered aircraft. First established in 1959, the Kremer prizes are a group of monetary awards put in place by Henry Kremer and The Royal Aeronautical Society to stimulate the development of human powered flight. After several iterations, the class has completed the conceptual and preliminary design of the Zephyrus and progressed into detailed design and fabrication.

FLYTOP Club Safety Training

Alfred Ultsch (ultsch@ulweb.de)

It is widely recognized that human behavior is the major source of aviation accidents. It is inevitable that pilots will make errors which may eventually develop into fatal accidents. Training, experience, organizational and technical measures may reduce the probability of errors, but never to zero. The key to successful accident prevention is to place barriers between errors and accidents. These barriers can be likened to slices of Swiss cheese – with holes in them! The FLYTOP training system uses the notion that complex systems (e.g. pilots, clubs, manufacturers, authorities) aim to improve flight safety by actively searching for errors, incidents and even small deviations from optimal performance. Errors must be communicated in a way that the holes in the Swiss cheese slices can be plugged. In most flying clubs the communication culture is, however, punitive, with errors attributed to the deficiencies of a single person (name, shame, blame). FLYTOP training is to effectively change this into a learning-from-error club culture. The FLYTOP program was described, together with an illustrative exercise for all audience members. After more than 50 training sessions in Germany, the program has been exported to Switzerland. Besides FLYTOP club training, the authors of this program have developed training courses for flight instructors. (Note, the talk was presented by Ian Oldaker.)

VFR ADS-B Rulemaking Status

Don Walker (don.walker@faa.gov)

The FAA is drafting Automatic Dependent Surveillance - Broadcast (ADS-B) standards for equipment intended for use outside of the defined ADS-B Rule airspace. The intent is to establish a minimum bar for equipment that broadcasts ADS-B Out data supporting air-to-air applications. ADS-B Out equipment affects all other ADS-B in equipment within range. This equipment must support a minimum level of performance to maintain the integrity of the ADS-B system.