XXXII OSTIV Congress - Summery

Day 1 (Thursday 31 July 2014)

The first talk of the first technical session was by J. Bosman form South Africa. He talked about a theoretical investigation of the NACA scoops for providing air to pneumatic turbulators. The turbulator is located on the trailing edge flap. The computational fluid dynamics model included the scoop, the plenum, and the wing section with blow holes. The results indicate approximately 2 – 5 N drag savings due to blowing, but also 1.9 N additional drag of the scoop.

Lukas Popelka of the Czech Republic reported of wind-tunnel tests, flight-tests, and theoretical modeling approaches. A particular focus was the experimental validation of an airfoil that was designed gradual flattening of the lift curve slope as stall is being approached. The purpose of this characteristics is to improve the thermaling behaviour in turbulent air. The experimental results reconfirmed the desired lift-curve effects, but also that the off-design conditions are good.

M. Weinzierl of the Akaflieg München introduced a concept study of a wing with a flexible leading edge. The drooped leading edge is supposed to improve the high-lift capabilities, thus enabling a smaller wing are. Preliminary results predict significant performance advantages over an ASW 27. To allow drooping the leading edge, the wing structure in front of the spar is hinged on the lower surface and has a highly flexible (in extension) element on the upper surface. The highly extensible element consists of a silicon-honeycomb sandwich design that allows significant extensions as demonstrated in experiments.

The next talk was presented again by Lukas Popelka who presented experimental results of measurements on airbrakes. The deployment of airbrakes drastically reduces the local angle of attack and lift coefficient. The larger the airbrake, the more effective. Other effects are the gap size and chordwise location (more effective if larger and more forward). The ensuing discussion was very animated and was about the operational issues of deploying airbrakes at high speeds. As pointed out by several members of the audience, one should deploy airbrakes well before reaching V_{NE}.

The last talk was by G. Bramesfeld from Ryerson University in Toronto. He discussed a concept study of using a glider to explore the atmosphere of Titan (a moon of Saturn). The potential advantage of a glider is the simplicity of the system and possible durations and ranges that are much more significant than what is possible with drop probes.

Day 2 (Friday 01 August 2014)

Day 2 of the OSTIV Congress began with a presentation by Jan Himisch Germany. Jan discussed the experience of using a design stream for winglets that uses an optimization algorithm. The underlying performance calculations are based on a potential flow method that captures any viscous effects with profile data and other corrections. For the optimization process, Jan stressed the importance of well-defined target functions. During the design process several winglet parameter were manipulated, for example height, twist distribution, cant angle, and sweep. Jan discussed the impact of the different parameters on the average cross-country speed for various weather models. He also introduced flight-test results of two different winglet designs for the SB 14. Theoretical and experimental results show similar trends in drag differences of the two configurations, but disagreement in the absolute drag values.

The second speaker of the day was Loek Boermans of the Netherlands. He discussed the purpose of turbulators and the different kind that are commonly used, zig-zag tape and pneumatic turbulators. Both devices are used to avoid laminar separation by causing transition from laminar to turbulent flow, which in general reduces profile drag. Loek also discussed how to size the height of zig-zag tape and the subsequent drag penalties of zig-zag tape and pneumatic turbulators.
After the coffee break Andreas Reh of Darmstadt, Germany presented his research on the impact of turbulence on airfoil performance. Two turbulence levels affect the aerodynamics of laminar airfoils: moderately large scale turbulence with respect to chord length that result in the aircraft to be upset and smaller scale turbulence that can cause early transition. Andreas´ focus was on the moderately large scale turbulence that changes the pressure distributions and pressure gradients. One of the consequences is the change in transition behaviour. Unsteady and quasi-unsteady analyses show promising results, although some discrepancies do exist.

The next presentation was related to the previous one. Milan Marejka talked about measurements of atmospheric turbulences using a glider and hotwire anemometry. The measurements were done in thermals and wave lift at various altitudes. The turbulence levels were of similar magnitude with the ones measured in wave being slightly greater. The measured longitudinal turbulence levels ranged from approximately 0.25% to 0.75%, which can possibly impact the transition behaviour due to Tollmien-Schlichting instabilities.

The last presenter of the day was Louis van der Walt from South Africa. Louis did a review of common practises related to the fatigue life of sailplanes. Certification requirements of sailplanes demand adequate fatigue behaviour, whereas manufacturers need the ability to assess the actual fatigue state. For certification purposes full-size fatigue tests are generally accepted as well as static load tests to elevated load values. Full-size fatigue testing is very time intensive and elevated load tests provide little insight in failure behaviour. An alternative is an accelerated load test that uses a mix of load spectrum and static test. Also equivalent load levels are considered. Louis proposed a test using a beam and a simple step load, equivalent load, as well as a load spectrum test.

Day 3 (Saturday 02 August 2014)

The first presentation of the fourth day of congress was given by Nick Grassen, a student of the Pennsylvania State University talking about applying game theory models to analyze sailplane racing. For that scope he used the igc-Files of the 2011 Standard class US-Nationals to gather data to feed his models. He divided the pilots due to their used height band, the average speed they flew between thermals and if they flew in a gaggle or not into conservative or aggressive flying pilots. After applying his models he could show that most likely on a one day competition an aggressive flying pilot will win while as more days are taken into account it will get more likely that conservative flying pilots succeed.

The second presentation with the title “Improvement of sailplane crashworthiness through keel beams with silicon cores” was given by Uwe Schuster of the Technical University of Dresden. He introduced the idea of implementing silicon Material in the crash structure of a glider. For that purpose he gave an introduction in a-Gel materials. He told about the material testing used for determination of material properties as input for a FEM model of the D-B 11 fuselage. The D-B 11 is the current double-seater-sailplane project of the Akaflieg Dresden. The FEM crash-simulations carried out afterwards are showing a distinct improvement of crash behavior if 2 keel beams containing the a-Gel are implemented.

The presentation after the coffee brake was given by Zelldra Lombard from Jonker Sailplanes South Africa. Her talk about “A composite manufacturing process for producing Glass A finishing components” first introduced us into how to define and measure standards of surface finishing defined by e.G roughness and waviness. She afterwards gave a good overview how the complete production process from CNC cutting the plugs, building the molds and finally producing the parts in mold has to be enhanced to satisfy a high quality standard.

In the next talk Linar Yusupov from the Russian Federation introduced his ideas of an open platform collision warning system. He introduced how it should be possible to build such a system with components easy and cheap to buy. He gave an overview of specification of hardware and software and informed about the software components already developed. Finally he showed the results of testing a first prototype.

The last task of the day had more of a demonstration. Benjamin Pipenberg also a student from the Pennsylvania State University introduced us into the “Design and Fabrication of Micro Radio –Control Ornithopters, Helicopters and Fixed-Wing aircraft” He introduced us into the troubles of aerodynamics of very low Reynolds numbers of just 3000 for his smallest model having just a span of 75mm. After telling how to build such small models we got nice live demonstration of 2 of his models.

Day 4 (Sunday 3 August 2014)

Excursion

OSTIV participants visited to Breslau/Wroclaw, guided tour, boat trip on the Oder, dinner, visit to Panorama painting, Baroque Church and old University.

Day 5 (Monday 4 August 2014)

Day 5 of the OSTIV Congress began with a presentation by Zafer ASLAN (Istanbul Aydın University). Zafer discussed the results of Comparison of three model outputs for now casting in a convective boundary layer. This presentation was on a cooperative paper prepared by N. Şen, A.C. Moral, B. Efe, A. Lauber, O. Mertol, Z. Aslan; Istanbul Technical University Istanbul, Turkey; Karlsruhe Institute of Technology, Karlsruhe, Germany. In this study, the accuracy of three models and outputs of programs (meteograms from PC-MET, HEZARFEN and CLASS Model) were investigated for two locations in Turkey (Istanbul and Eskişehir). Validation of model results for prediction of soaring conditions for the CBL were presented in this paper.

The second presentation with the title of "A free, on-line soaring weather forecasting system for world-wide use" was given by Edward HINDMAN (The City College of New York, USA. Edward pointed out some details on forecasts of the weather elements important to planning a soaring flight (for example, depth of thermals, winds). The system has been used successfully to produce soaring forecasts for national competitions on the east coast and desert southwest of the USA as well as mountain wave forecasts. Examples of the forecasts and their validations were presented. Use of the system and its validation is encouraged for other locations in the soaring world.

The presentation after the coffee brake was given by Rick Millane from University of Canterbury, New Zealand. It was a co-operative paper on "Analysis of mountain wave 3D wind-fields in the Andes derived from high-altitude sailplane flights" and, prepared by N. Zan, E. Enevoldson and J. Murray, (University of Canterbury, New Zealand and NASA Dryden Flight Research Center, California, USA). R. Millane described methods for determining wind velocities from logged sailplane flight data that are suitable for slowly varying wind fields such as occur in mountain waves. He discussed results from the application of these methods to data from two high-altitude Perlan Project sailplane flights in the lee of the Andes. The results were discussed in terms of lee-wave wavelength and location, in relation to other observational data including reanalysis wind speed and temperature calculations, Scorer parameter, and visual satellite pictures of cloud cover.

The last presentation of the day was related with "Analysis of the wind persistence in Southwest Anatolia in terms of paragliding" and presented by Atamtürk ÇAKIN (Istanbul Technical University). This paper was about a co-operative study together with İ. Ceyhan, C. Temiz, V. Yavuz, K. Koçak, and C. Kahya from Istanbul Technical University. This paper was on wind persistence methods; a measure of continuity of the wind at any time and place. Authors applied these methods to the wind speed data collected from Antalya, Kaş (Antalya), Isparta, Denizli and İzmir. In this study the wind analysis were calculated using two

different persistence methods namely Conditional Probability Approach (CPA) and Speed Duration Curves with Threshold (SDCWT) and as a result of this study needful information were obtained for those interested in sport aviation.

Day 6 (5 August 2014)

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Day 6 of the OSTIV Congress began with a presentation by E. T. Özdemir (Turkish Meteorological Service, Istanbul, Turkey). This paper was related with a case study of the wet microburst on 2nd. AUGUST 2011 at Esenboğa International Airport. It was a co-operative research prepared by A. Deniz from Istanbul Technical University, Maslak Istanbul. In this study they analyzed heavy thunderstorms with rain (+TSRA) and wet microburst with an observed maximum wind speed 79.3 knots influenced Esenboğa International Airport (LTAC) in Ankara. In this study, results of microanalysis were presented for some meteorological elements such as precipitation, wind velocity, pressure, temperature (dew and dry), Doppler radar echo, sounding, etc. They analyzed the developing stage of microburst by using data from Automated Weather Observing System (AWOS) for every minute, Aviation Routine Weather Report (METAR) and Aviation Selected Special Weather Report (SPECI).

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The second presentation with the title of "Detection of overshooting cloud tops (OTs) and their relationship to severe weather over Europe" was given H. B. Baltacı. Authors of the co-operative paper were Kindap, A. Ünal and M. Karaca from Istanbul Technical University, Eurasia Institute of Earth Sciences, Istanbul, Turkey. This study explains the identification of overshooting tops from satellite images and differences in the frequency between over land and over water surfaces, day-night times, and also emphasizes the detection and characterization of overshooting tops. In this study, objective overshooting cloud tops (OTs) method was applied to Meteosat Second Generation (MSG) Spinning Enhanced Visible and Infrared Imager (SEVIRI) brightness temperature data. In order to add tropopause temperature to the OTs algorithm, 6 hour forecast from the European Center for Medium Weather Forecast (ECMWF) NWP model was also used.

3

The presentation after the coffee brake was given by F. Dökmen (Kocaeli University). The last presentation of the day was related with "The Effects of Climate Change on Agricultural Production under High Evaporation and Their Role on Aviation and Gliding in Southeastern Anatolia Region of Türkiye". This paper was about a co-operative study prepared together with M. Kuzucu from Pistachio Research Station Directorate, Gaziantep, Türkiye. In this study, the effects of evaporation and evapo-transpiration from agricultural areas in Southeast of Türkiye were discussed by their role on aviation and gliding over all on the long years of climate data. Long term average evaporation was 2047 mm over the 30 years in the research area. The effects of high evaporation create of many stress conditions in terms of aviation and gliding depend on agricultural activities.

Day 7 (6 August 2014)

Day 7 of the OSTIV Congress began with a presentation by J. Durman (Germany). His paper was related with Analyses of common conceptual model for the kinematics of atmospheric gravity waves. The common model of thought to explain the kinematics of atmospheric gravity waves by the idea of a ballooning air parcel in a stable stratified air mass under wind shift was questioned critically. A more elaborated conceptual model based on horizontal pressure differences occurring in vertically oscillating air masses was presented. The conclusive derivation of a longitudinally acting wave propagation mechanism has provided the key for a vivid and coherent understanding of the generation and propagation of different types of gravity waves for glider pilots.

The second presentation with the title of "Analysis of the forest health state based on multispectral images acquired by Unmanned Aerial Vehicle was presented by M. Kacprzak. This paper is a co-perative study prepared with collaborations of P. Czapski, , J. Kotlarz, K. Mrowiec, K. Kubiak and M. Tkaczyk, from Institute of Aviation, Warszawa and from Forest Research Institute, Raszyn, Poland. The main purpose of this study was to present the current progress of the work associated with the use of a lightweight unmanned platforms for various environmental studies. Current development in information technology, electronics, and sensors miniaturization has allowed mounting multispectral cameras and scanners on Unmanned Aerial Vehicle that could only be used on board aircraft and satellites. In this paper applicability of multispectral images analysis acquired several times during the growing season from low altitude (up to 800m) were presented. Mr. M. Kacprzak discussed remote sensing indicators computed by our software and common methods for assessing state of trees health. The correctness of applied methods was verified using analysis of satellite scenes acquired by Landsat 8 OLI instrument (Operational Land Imager).

The third presentation related with "Soaring Flights on Thermal Waves" was given by C. Lindemann (FU- Berlin, Germany). Some soaring flights of the author and some experiences over the North German plain of thermal waves above well developed cumulus were discussed as below: If there was no cloud street wind profile was detected but only very slow wind speeds, but the profile above cloud base had constant wind direction and increasing speed. The waves formed not earlier than at approximately at time of maximum surface warming. C. Linmedann explained some examples on their research activities together with satellite data and pictures.

The last presentation was delivered by K. Uysal from Turkish Aeronautical Association, İnönü Training Centre, Gliding School in Turkey. This paper was on the formation of urban heat island in Eskişehir (by A. Tokgözlü, B. Gönençgil, E. Özkan, K. Uysal and E. Yadsıman, Süleyman Demirel University, Isparta, Turkey; Istanbul University, Istanbul, Turkey; Turkish Aeronautical Association, İnönü, Gliding School, Eskişehir, Turkey). The summary of her presentation was about contemporary metropolitan cities, as a result of lessening green areas and evaporation surfaces, increasing asphalted surfaces and built areas meteorological parameters change. This differentiation between urban areas and surrounding semi-rural and rural areas was determined as 'urban heat island'. The climate parameters are changing as a result of rapid and rapid urbanization in Eskişehir. The meteorological differentiations and urban heat islands at regional scale in Eskişehir metropolitan area caused by the changes in land use and land

coverage since 2000 years were discussed in this paper. The relations between densities of built up areas, green areas and meteorological parameters had been put forwarded through meteorological measurements.