Technical Soaring, the international journal of OSTIV
(International Scientific and Technical Organization for Soaring)

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VG01
Greetings, I'm Ward Hindman of The City College of New York and Chief Editor of the Organisation Scientifique et Technique Internationale du Vol á Voile, OSTIV for short. I am also the Editor if its quarterly, international journal *Technical Soaring*, *TS* for short. I've displayed my e-mail address which is the best way to contact me.

VG02
In this presentation, I briefly will describe the background and philosophy of *TS*, illustrate sample content, demonstrate the online archive and provide subscription information.

VG03
In 1971, the Soaring Society of America (SSA) initiated the quarterly publication called *Technical Soaring.* Dr. Bernard Paiewonsky was the first editor. He assembled a dedicated, volunteer team to publish the journal without today's e-mail, word processing and image analysis tools. In my opinion, his team performed a noble effort.

VG04
The mission statement of the journal read "The goal of the journal is to advance the science and technology of soaring flight through the publication of original papers, review articles and tutorial papers. *TS* publishes qualified papers on sailplane design and analyses, materials and structures, aerodynamics, instrumentation, flight testing, performance, stability and control, meteorology, communications, production and fabrication techniques, human factors, flight safety and other subjects of scientific and engineering interest to soaring."

The main motivation of the journal was to provide a forum for articles too technical for the more popular and monthly SSA *Soaring* magazine.

That mission statement is valid, as well, for today's *TS*.

VG05
How did OSTIV get involved with *TS*?

The SSA is a member of the International Aeronautical Federation (FAI), the official organization for sport aviation. The scientific and technical component of the FAI for motorless aviation is the OSTIV. The connection between OSTIV and the FAI is illustrated in the OSTIV web-site address in the visual.

The mission of the OSTIV is to encourage and coordinate internationally the science and technology of soaring and the development and use of the sailplane in pure and applied research. This mission is accomplished through congresses convened at the bi-annual world gliding championships, through panels of experts and through publications.

So, the mission of *TS* and the mission of OSTIV are in concert.

VG06
The OSTIV Publications (1 to 18) primarily contained the papers delivered at the congresses between 1950 and 1985.

In 1986, the OSTIV ceased the Publications. Thereafter, papers presented at the congresses appear in *TS* beginning with Vol. 10. Nevertheless, the first nine volumes of *TS* are packed with papers presented at the congresses. So, from the beginning, *TS* was important to OSTIV and vice versa.

As a result, in 1986, OSTIV provided the congress papers and appropriate funds and the SSA published the journal. The journal published non-congress papers as well. Therefore, the papers in an issue were identified as being by either from the SSA or from the OSTIV.

This arrangement lasted until 2006, when OSTIV assumed publishing the journal. As before, the journal primarily contains papers presented at the congresses. But, a number of contributed papers appear, as well.

So, the journal has been in continuous publication from its beginning in 1971 to the present. We currently are assembling Vol. 35, No. 2, the April – June 2011 issue.

The continuous publication by primarily an all-volunteer staff for the past 40-years is a significant achievement and contribution to the international soaring community. In my opinion, *TS* is a monument to the passion of the curious participants of our wonderful form of flight. These individuals want to share and document the new knowledge they create.

This leads me to the *TS* principles.

VG07
TS records and disseminates qualified new knowledge. Qualification occurs through the peer-review process. Accordingly, on the Table of Contents page of an issue, you will read: "Submitted research papers will be peer-reviewed before being accepted for publication. Guidelines for preparation and submission of manuscripts can be found on the OSTIV website."

In my opinion, the peer-review process is a sacred, professionally duty. The process is serious and, hence, time-consuming. The process requires the reviewer to understand the proposed new knowledge and determine if it is authentic – the reviewer compares it with their knowledge and experience as well as the knowledge from other sources referenced by the authors. The process is a review and revision iteration between the reviewers and the authors, under the supervision of an Associate Editor. The process is completed when a manuscript is either acceptable or unacceptable to reviewers and editors.

Thus, if you are asked to review an article and you agree, please expedite the review. If you are asked to review an article and do not think you have either the knowledge and experience or the time to do a proper job, please say "no" to the request. By following these procedures, the flow of papers through the journal will be smooth and, hence, fair to all authors.

The journal invites short comments on papers to permit debate and/or clarification of presented new knowledge. This dialogue between critic and author helps to strengthen the accuracy of the content. Guidelines for comments are on the OSTIV web-site.

To be a forum to all reasonable new ideas, the journal accepts papers that the authors request not to be peer reviewed. These papers are not considered 'research papers' and are identified as such. For example, an author may wish to publish a new idea and receive feedback from readers before beginning an in-depth study. To insure the paper is reasonable, a knowledgeable editor will read the paper and work with the author to produce an acceptable paper.

VG08
To increase the value of *TS*, the journal needs to achieve 'learned-journal' status. Here are the three main criteria for such a journal:

1. It must be an 'impact' journal (number of references to *TS* appear in other journals). The Impact Factor is established by the Thomson Reuters 'Journal Citation Reports' (thomsonreuters.com/products_services/science/science_products/a-z/journal_citation_reports/)
2. A large rejection percentage is desired (>50%)

3. OSTIV should become a member of the Association of Learned and Professional Society Publishers (www.alpsp.org)

How well does *TS* match these criteria?

1. *TS* went online (journals.sfu.ca/ts/) with Volume 33, Number 4, the October-December 2009 issue. The journal is now easily accessible to anyone, anywhere. So, it will take more time to become an 'impact journal'.
2. *TS* has a small rejection percentage because it has a small submission rate (papers from biannual congresses plus a few contributed papers). We have had just enough papers to fill the target of 130 pages per volume.
3. *TS* qualifies as a Full Member in the Association of Learned and Professional Society Publishers because OSTIV is a not-for-profit international organization involved in publishing academic and professional information. In my opinion, OSTIV should join.

Due to the efforts of Prof. Dr. Miroslaw Rodzewicz, with my assistance, in September 2009 *TS* became a 'learned journal' in Poland. This initial success should encourage OSTIV members in other countries to perform similar work to have *TS* achieve 'learned journal' status.

VG09

Regardless of whether *TS* achieves 'learned-journal' status, the journal has been an import chronicler of studies that have benefited soaring. I will illustrate two studies with which I'm familiar. The first, by my colleague Dr. Olivier Liechti, led to the development of a revolutionary online glider pilot self-briefing system which is operational in Europe. And, the second chronicles my studies of a possible soaring ascent of Mt. Everest; please forgive my self-indulgence.

VG10

At the OSTIV Congress in 1993, Liechti and collaborator Neininger presented their convection model using the newly developed personal computer, the PC. The model was called ALPTHERM for alpine thermals. Illustrated is a figure from that paper which shows the unique results from the model.

The left-had diagram depicts the early morning atmospheric sounding of temperature and dew point (solid lines) taken in a Swiss mountain valley. The dashed lines illustrate the calculated evolution of the sounding as the surface heated up. The area-elevation distribution of the alpine valley is depicted in the lower-left-hand of this diagram.

The lower right-hand diagram, illustrates the corresponding thermal rise rates. It can be seen the early morning inversion suppressed convection in the valley but convection occurred above the inversion along the slopes of the valley. In the afternoon, the inversion mixed away and the thermals rose at a maximum of 3 meters per second.

Finally, the evolution of the predicted surface temperatures and dewpoints are illustrated in the upper right-hand diagram. Notice the warm and dry afternoon values – respectively, 23C and 8C

VG11

In 1997, Liechti and collaborator Lorenzen used the convection model to identify possibly the best convective soaring on the planet; the middle of the Sahara desert. I like to think that this study might have influenced the remarkable flying done at Bitterwasser in Namibia. This study was presented at the 1997 Congress in France.

Again, the left-had diagram depicts the predicted evolution of the atmospheric sounding. Look at the predicted 5.5km thermal tops! Notice, the area-elevation diagram describes the nearly flat topography of the region.

As before, the lower right-hand diagram illustrates the corresponding thermal rise rates. Eight to nine meters per second! Incredible!

The upper right-hand diagram depicts a 35C difference between temperature and dewpoint at 15UTC! Hot and bone dry.

Finally, the new contribution of this paper is the so-called potential flight distance or PFD for short. It is the distance an unballasted standard class glider is expected to fly from the first-to-last soarable thermal of the day. In this case the PFD was 918km!

All these predictions are consistent with the results of flights at Bitterwasser, to the best of my knowledge. It has been a 1000km 'gold mine' as illustrated by the number of palm trees which line its primary runway. And, Biterwassser is a whole lot 'friendlier' place to fly that in the middle of the Sahara.

VG12
In 2001, at the OSTIV Seminar in South Africa, Liechti presented a refinement to his PFD. We read from the abstract: Methods to obtain glider polars from handicap figures were developed. Common optimization calculations like cross-country speed versus lift rate can thus be obtained with just the handicap figure of the glider known. Application to all gliders, hang gliders, paragliders, and soaring birds is possible and contributes to the assessment of their specific potential flight distance.

VG13
At the same Seminar, Liechti presented an expansion of the original ALPTHERM model which simulated convection in one 'forecast region'; a region of uniform soaring conditions like those expected in mountainous regions or those over nearby plains.

In this figure from the paper, differential heating creates horizontal pressure gradients which drive secondary circulations in the form of sea breezes and valley winds. The sea breeze is driven by differential heating between the sea and land whereas the valley wind is driven by the differential heating caused by the 'volume effect' - the volume of the valley is smaller near its 'top' where the air is warmer than the larger volume 'down stream' where the air is cooler. Introducing a horizontal coupling between neighboring forecast regions into the ALPTHERM model allows one to model the effects of these secondary circulations on the primary convection. The effects are weakened thermals in regions affected by sea breezes and in basins surrounded by elevated terrain. Additionally, the effects of the valley wind are enhanced thermals in mountains. The expanded model was named REGTHERM, short for regional thermals.

VG14
At the 2003 Congress in Poland, the work of Liechti and Lorenzen was captivating. They had developed a revolutionary system for planning soaring flights called TopTask, short for TOPTHERM and Task. TOPTHERM was the new name for the REGTHERM model.

The TOPTHERM model predicts the diurnal evolution of convective lift rates and the wind in forecast regions. TopTask utilizes the lift rates and winds to establish flight plans for individual flight tasks. Flight plans are obtained for all types of soaring flight: slow gliders with small glide ratios and wing loadings which are more sensitive to wind, as well as fast gliders with large glide ratios and wing loadings. An interactive pre-flight optimization of tasks is possible in real-time. Tactical decisions, such as clock- or counter-clockwise attempts to fly a triangular task, are supported. For example, the lower-left diagram predicts an unsuccessful counter-clockwise flight around Mont Blanc while the lower-right diagram illustrates the corresponding clockwise flight that was predicted to be successful. Thus, the task setting for individual and for contest flights is hoped to be substantially simplified with this new tool.

There was no validation of these predictions. That led to Liechti's next contribution.

VG15
He and his German and Swedish co-authors presented the first validation of the TopTask predictions at the 2006 Congress in Sweden.

TopTask was validated using flight recorder data from the 2005 multi-class international gliding championships in Sweden. The routinely operated German meteorological model (TOPTHERM) and the Swedish model (HIRLAM) provided the regional thermal forecasts required by the TopTask algorithm: the depth of the convective boundary layer, the lift rate and the horizontal wind at flight altitude. TopTask predicted speeds for the set tasks were compared to the scored speeds of the first and second place finishers for all days and classes. Shown below right, the TOPTHERM predicted task speeds (108 kph) matched the scored speeds (104 kph). The standard deviation produced three classes of accuracy (below left diagram): accurate predictions (speeds within +/-l0 percent), underestimated predictions (scored speed up to 22 percent higher than predicted) and overestimated predictions (scored speed up to 39 percent lower than predicted). Also, TopTask was used for a intercomparison between the two models. The task speeds obtained from HIRLAM were larger than those from TOPTHERM and indicated the predicted lift rates were too large. Thus, both meteorological models do not yet catch the full range of variation found in the scored speeds of the winning gliders. Nevertheless, routine numerical thermal forecasts have reached a quality that is useful for soaring practice.

The bias of pilots flying faster than the predictions was due to aligned lift; for example, flying in ‘blue’ convective rolls and under cloud streets. Up to this point, TopTask simulated flights in random, isolated thermals. Thus, aligned lift was the subject of Liechti’s next study.

VG16
Liechti tackled the aligned lift problem and reported his findings at the 2008 Congress in Germany. One reviewer wrote me the flattering statement “after this paper, we’ll all be flying according to Liechti, not MacCready”.

Liechti writes in the abstract: “Speed-to-fly theory optimizes the average speed of a glider based on the climb rate in circling flight and on the vertical air motion in straight flight. This paper looks at the optimized average speed when aligned upward motion is available in the straight flight between the circling climbs in isolated lift. The optimized average speed is visualized in a diagram (shown on the visual) with the speed on vertical axis, the circling climb rate on the horizontal axis and the aligned upward motion of the air a superimposed field isolines. For aligned upward motion of sufficient strength, the pure straight flight mode is faster than the circle-and-glide flight mode. A transition line separates the two modes in the diagram. The diagram is an essential component for the meteorological planning of soaring flights with predictions of isolated and aligned lift.”

Validations of Liechti’s theory were made in his next and, perhaps, final contribution to the journal.

VG17
Liechti tackled the validation of flights in aligned lift, primarily in ridge lift, and reported his findings also at the 2008 Congress in Germany.

He writes: “Persisting weather conditions with aligned lift allow for the most spectacular long-distance soaring in mainly straight and level flight. This paper presents a regionalized approach towards predicting such meteorological conditions and their application to planning soaring flights. Since the terrain slope is underestimated in numerical models due to smoothed orography, the cumulative area-elevation distribution is used to predict slope updrafts. In addition, glider flights are analyzed to determine empirically for each region the absolute terrain slope (these calibrated flights are shown in the diagram). Simulations of glider flights with calibrated predictions of aligned and isolated updrafts demonstrate the potential of regionalized forecasts for the planning of long and fast soaring flights.”

VG18
As some of you know, the German Weather Service ‘brought’ the TopTask system to the USA as I described at last years SSA Convention. I reported that during the 2009 soaring season, as an experiment, the system was operated for Colorado and the East Coast USA (the forecast regions and corresponding PFD values are illustrated for 13 October 2009). We validated the East Coast regions using flight recorder data from glider contests and, with a few qualifications, found it successful (no contests occurred in Colorado).

Thus, the system was evaluated by USA glider pilots flying in the mid-Atlantic and northeast States and Colorado during the 2010 soaring season. Thirty-four pilots participated in the experiment and eight provided evaluations that were positive and encouraging (we did not hear from the other 26). Consequently, Dr. Liechti and I are working to make his TOPTHERM-Top Task system available next soaring season in the existing USA forecast regions. The system needs to be connected to a USA numerical weather prediction model to replace now unavailable German global model. If (when) the connection is made and if there is sufficient interest, we plan to expand the system, first, to cover the most popular gliding sites. For example, Uvalde TX, site of the pre-World Gliding Championships this summer, would be my first choice. Then, we will work with you and your colleagues to establish forecast regions that surround other popular sites throughout the USA.

VG19
Now, to my Soar Everest! studies.

I read "Americans on Everest" by Ullman in 1964 and became a student of the mountain. I never desired to climb the peak on foot. But, my early 1980's ascents of peaks in the western USA with my HP-14T glider led me to think of the most unique ascent of Everest which I presented at the 1985 Congress in Italy.

The mountain has been climbed from all major approaches but one: an ascent from near it base to its summit in a sailplane using the rising air expected to flow over the massif. The diplomatic, logistical, aircraft and meteorological requirements for such a flight appear achievable. The required meteorological conditions are a deep, dry, moderately-strong, stably-stratified airflow from the southwest over the massif. A flight track (shown in the diagram) is estimated through graphical analyses of expected hill-lift between Namche Bazar, Nepal, and the Everest summit. The flight analyses indicate that a soaring ascent may be possible. However, like any of the previous climbing ascents of Everest, the actual flight may be a series of climbs and retreats. Accumulated skills and knowledge plus a measure of luck should lead to a successful flight.

This study initiated my campaign for measurements and observations of Everest weather.

VG20
I interviewed the famous Himalayan pilot Emil Wick and the results were reported to the 1989 Congress in Austria. The interview disclosed the exciting airflows he encountered during 12-years of flying to Everest in a Pilatus Porter. The illustrated annotated diagram summarizes the motions and is from the paper. A "funneling" effect was discovered on the face of Lhotse which permitted soaring flights of the Porter to altitudes above its ceiling. Two different air flows are postulated to occur around and over the summit pyramid: flow-separation and laminar flow. Air motion measurements and theoretical studies are identified which may help understand the postulated air flows.

The next study went 'to the birds'!

VG21
This study, reported at the 1991 Congress in the USA, was based on bird sighting reported by climbers in their post-expedition chronicles. The highest flying bird on Mt. Everest appears to be the Alpine chough (shown in the picture), which has been observed "dancing in the wind" (either soaring or performing aerobatics for the observing climbers) just below the south Col at about 26,000 feet and on the summit pyramid at almost 28,000 feet. The glide-polar of the red-billed chough was estimated. It was found that this bird may have one of the lowest sinking speeds of any soaring bird; a possible explanation for the superior aerobatic and soaring skills of this creature. The bird sightings occurred in regions of known rising air around Everest and support the conclusion that the choughs soared to the remarkable heights. The birds are assumed not to be able to fly to these heights under their own power, an assumption requiring supporting observations and calculations. To my knowledge, no bird sightings have been reported from the summit.

VG22
In the fall of 1992, I had the opportunity to trek to the base of Everest and my colleague Engber trekked in the Spring of 1993 which led to the study presented at the 1993 Congress in Sweden.

We concluded from surface meteorological data, it appears that an adequate number of dry days occur during the fall and spring transition seasons to permit morning and early afternoon aircraft operations in the Khumbu Himal. Morning air temperature and frost-point temperature measurements appear to be useful in predicting afternoon cloud development. It was demonstrated that thermals exist above Namche Bazar which are expected to support sailplane flights. A diurnal wind and cloud pattern was observed (see the schematic); for example, the Everest banner cloud was diurnal. These qualitative findings need to be quantified through surface observations coordinated with measurements from soaring flights. The "Second Himalayan Soaring Expedition" planned for the fall of 1995 and spring of 1996 is expected to explore the soaring path to the summit of Everest.

VG23
The Second Himalayan Soaring Expedition became my 1995-96 sabbatical to Nepal hosted by the Tribhuvan

University in Katmandu.

I reported at the 1997 Congress in France, that City College and Tribhuvan University scientists studying air pollution transport in the Himalaya encountered unusual soaring weather. A frequent, stationary line of cumulus clouds formed during the afternoons in the Kathmandu valley. The subcloud updrafts vacuumed the valley of the overnight accumulation of air pollutants. In Tibet, dust devils formed at 4300 m MSL Old Tingri which is 70 km north of 8848 m MSL Mt. Everest (over 29,000 ft MSL). Meteorological measurements confirmed observations of cumulus forming with bases of 8000 m MSL between Old Tingri and Everest. Further, lenticular clouds with associated rotor clouds were observed over the Rongbuk valley indicating mountain wave activity on the north side of Everest. These observations suggest awesome soaring possibilities for gliders launched from Old Tingri over the nearby Himalayas (see the schematics). But, significant diplomatic and logistical obstacles must be overcome.

VG24
Our final study was presented at the 2001 OSTIV Seminar in South Africa. I quote the Summary: Let us learn to soar Mt. Everest! With sufficient experience, as demonstrated by the current commercial climbing activities, ascents of Everest with sailplanes may become an alternative means to "climb" the peak, perhaps the ultimate ascent and, no doubt, the most environmentally-friendly means.

Atmospheric soundings, made near the north-side of Mt. Everest, were analyzed using the ALPTHERM convection model. On the few days in late April and early May with the warmest and driest surface conditions and no stable layers aloft, the model predicted "blue" thermals strong enough to carry a sailplane to the summit of Everest (see the schematics). Sites for a temporary airstrip to winch launch and retrieve gliders were identified close enough to the summit that the soaring attempts would be local flights, not cross-country flights. Glider support from either the Chinese or Indians may be possible and logistic support would be straightforward using a commercial climbing agency.

VG25
I like to think our work on Everest inspired the October 2010 OSTIV Mountain Wave Project trip to Tibet; shown are Renne' Heise and Klaus Ohlmann with their Chinese hosts. Quoting from their website: “Key support comes from Stemme, manufacturer of high-tech motorgliders, who plans to make one or two state-of-the-art S10VT aircraft available as airborne research platforms.”

We also worked with Stemme in our 1995/96 expedition and almost got a S10VT into Nepal except an atom bomb blast in Pakistan caused the ferry flight to be cancelled. Thus, I eagerly await results from the flights in Tibet. I hope they publish the results in *TS*.

Now, how can you find results in *TS*? There are three sources:

VG26
First, an index of *TS* (Vol. 1 through Vol. 34) by John Leibacher is online at the displayed URL. Issues are indexed by author, subject and issue. I used this source to find the references to the Liechti articles.

VG27
Second, additional information on *TS* and information on OSTIV Publications can be found on the OSTIV website in the OSTIV Index. The Index can be searched by right-clicking on the first page, clicking on ‘Search’, typing in the keyword and clicking on the ‘Search’ button.

VG28
When you find the paper containing the results you desire, you can purchase hard-copies of the issue containing the paper from either the OSTIV Secretariat by filling out this form from the OSTIV website or, in the USA, by e-mail from Bernald Smith.

VG29
The journal is online which makes it accessible world-wide. Here illustrated is the URL and the present issue Vol. 35(1), January-March 2011.

VG30
When you click on the 'TABLE OF CONTENTS' link, you see a listing of titles and authors.

VG31
If you want to learn more, click on a title. Here I clicked on the Warshaw paper and obtained the paper's abstract. If, after reading the abstract, I want to read the paper, I must click on the 'Full Text' PDF icon below then abstract. But, at the top of the page it states that I must have a subscription. You receive a subscription by becoming a member of OSTIV.

We are currently setting up a connection to the online PayPal system so a visitor can purchase the paper.

VG32
Online is the present issue back through Volume 33(3), July-September 2009. Additional back issues will be archived as possible. When all volumes are archived, a rich source of knowledge about the science, technology and operations of motorless aviation will be available for researching. This archive is the third source for *TS* content.

VG33
For example, on the right-hand side of the visual, you can see the journal content can be either searched or browsed. To search, the subject is entered, like meteorology, and all the titles and abstracts will be instantly searched producing this visual. But, the papers themselves will not be searched because they are individual files and are not connected to the meta-data, the titles, authors and abstracts.

VG34
Additional back issues will be archived as possible. What's involved?

Initially, this archiving campaign will be straightforward back through Vol. 30 (2006) because the issues are in digital form. Then, the campaign becomes more demanding. Earlier issues are only in hard-copy and the individual papers will have to be scanned into .pdf files and uploaded. Additionally, the titles, authors and abstracts will have to be scanned into text files using Optical Character Recognition techniques and uploaded. I invite two OSTIV members to work with me on the scanning and uploading campaign. If you are interested, please contact me.

VG35
Subscription information:

Either see Bernald Smith at this Conference (bernald@juggernaut.com) or visit the OSTIV website (ww.ostiv.fai.org)

VG36
In this presentation, I have described the background and philosophy of *TS*, illustrated sample content, demonstrated the online archive and provided subscription information.

I invite presenters at this Conference to submit their manuscripts to *TS*.

This talk is online at www.sci.ccny.cuny.edu/~hindman (Soaring meteorology).

Thank you!