VG01
A weather sampler: a new handbook, Technical Soaring is on-line and an on-line glider pilot self-briefing system

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Presented at the Soaring Society of America Convention, 1100 to 1145LST, Saturday 30 January 2010, Double-Tree Inn, Little Rock AR USA

VG02 Introduction

Significant changes have occurred in weather forecasting for soaring flight since the World Meteorological Organization/OSTIV Handbook of meteorological forecasting for soaring flight was published in 1993. Current numerical weather predictions (NWP) produce the required physical quantities. The data transfer from NWP centers to the pilot has increased significantly and new interfaces between the predicted weather and the pilot have appeared. In return, flight recorders have contributed quantitatively to the improvement of the predictions. The totally new WMO/OSTIV handbook Weather forecasting for soaring flight, published in the spring of 2009, documents this progress. As OSTIV’s Chief Editor, I edited the handbook. Dr. Rolf Hertenstein of the USA contributed significantly to the handbook. I will highlight the handbook’s content and describe how to obtain a copy.

In 1971, the SSA initiated Technical Soaring and in 2006 OSTIV assumed responsibility. This international journal contains pioneering scientific and technical studies. I am the journal’s editor. The journal is now on-line which increases its world-wide access. I will illustrate sample content and give you subscription information.

Finally, my colleagues Drs. Olivier Liechti and Ralf Thehos have developed a glider pilot self-briefing system for Europe at www.flugwetter.de. Using the system, a pilot is able to ‘fly’ a planned task through a NWP to determine the tasks feasibility. After the flight, the forecast can be checked using the resulting flight-recorder file. Recently, I helped them import this system to the East Coast USA and Colorado and validated the East Coast system. I will explain and demonstrate the path-finding system.

VG03 A weather sampler: a new handbook

The handbook was written by members of the OSTIV Meteorological Panel; specifically soaring meteorologists from Argentina, Austria, Germany, Switzerland and the United States. The document was prepared between 2005 and 2009. To make the publication truly international, the document was reviewed prior to publication by experts from Australia, Sweden, Turkey, United Kingdom and the United States. The aim of the handbook is to provide an internationally-agreed set of guidelines for meteorological offices routinely receiving enquiries from pilots as well as those in the field providing
forecasting support during contests and shows.

**VG04 A weather sampler: a new handbook**

**Contents**

The chapter topics and the yellow wording identify topics I will highlight:

Chapter 1: A phenomenological description of atmospheric processes is presented so the meteorological background for gliding activities can be understood. **Idealized two-dimensional mountain wave system**

Chapter 2: A technical description of gliding and soaring flight is presented so the impact of weather on feasibility, timing, range of operations and safety in soaring may be appreciated. **Straight-flight and climb performance**

Chapter 3: Numerical analysis and forecasting techniques that address both the large-scale and smaller-scale features relevant to soaring are described.

Chapter 4: Sophisticated pilot self-briefing systems are described: pilots may use high-resolution soaring forecasts for establishing flight plans for individual tasks. Personal briefings for task-setters and pilots at soaring competitions also are described.

Chapter 5: Recorded flight data are presented that reveal the flight altitudes used, the climb rates achieved and the position of the up draughts. The data are shown to support both the development and the quality of numerical models for the prediction of soaring conditions. **Meteorological support for competitors and task-setters**

**VG05 A weather sampler: a new handbook**

**Idealized 2-D mountain wave system**

I have yet to finish my Diamond Badge; I need the 5 km climb. So, I am returning to Petersburg WVA next month for another attempt using wave lift (I achieved Gold Altitude in wave lift on my first attempt about 25-years ago!). I will bring the handbook because of Dr. Rolf Hertenstein’s (United States) excellent description in Chapter 1 of mountain wave mechanics. Illustrated here are the vertical distribution of wind speed and temperature that lead to a poor wave (left) and a good wave (right).

**V06 A weather sampler: a new handbook**

**Climbing-flight performance**

The handbook was written primarily to help meteorological forecasters and pilot briefers respond to the requirements of glider flight operations. Thus, Chapter 2 contains the fundamentals of gliders and soaring flight. Much of this information should be familiar to glider pilots. But, I highlight Dr. Liechti’s (Switzerland) clear and concise description of straight- and climbing-flight performance because I found it instructive.
For climbing performance, here we see the juxtaposition of a parabolic thermal lift profile and sink rate as a function of turn radii for paragliders (faintest dashed line) to and open-class sailplane (darkest solid line). It can be seen that light and slow gliders can climb when circling in weaker and more confined updraughts while heavy and fast sailplanes need stronger and wider updraughts: 24 m for paragliders versus 74 m for open-class sailplanes.

**VG07 A weather sampler: a new handbook**
**Meteorological support for competitions**

Chapter 4 contains step-by-step instructions for a meteorologist to support glider competitions from Daniel Murer (Switzerland), an experienced contest meteorologist. For example, a time-line is given for the work required to prepare the weather briefing for the pilots meeting (left) and the contents of that briefing (right).

**VG08 A weather sampler: a new handbook**
**How to get a copy**

I hope this information has made you want to buy this valuable handbook. Shown here are two ways (through the WMO and through OSTIV) to obtain the document.

**VG09 A weather sampler: Technical Soaring is on-line**

In 1971, the SSA initiated *Technical Soaring* and in 2006 OSTIV assumed responsibility. This international journal contains pioneering scientific and technical studies. I am the journal’s editor. As of Vol. 33, No. 4 (October-December 2009), the journal is on-line at journals.sfu.ca/ts/.

Only OSTIV members have complete access to TS on-line; other visitors can access titles and abstracts. A pay-per-view feature is being developed.

The main advantage of the on-line version is unlimited use of color; print copies are in shades of grey.

Print copies will continue for the foreseeable future.

Now, I provide information on submissions, sample content, indexing and subscriptions.

**VG10A weather sampler: Technical Soaring is on-line**
**Submissions**

*TS*’ on-line submission guidelines are available at [www.ostiv.fai.org](http://www.ostiv.fai.org) (editor).
VG11 A weather sampler: *Technical Soaring* is on-line

Sample content

A friendly step-by-step *TS* on-line set-up guides is available on the OSTIV web site. Here are the initial steps and the final outcome once you reach a paper.

VG12 A weather sampler: *Technical Soaring* is on-line

Indexing

The *TS* Volumes 1 through 33 (1971-2009) have been indexed - Author, Subject and Issue - by John Leibacher and is at soaringweb.org. *TS* Volumes 10 through 33 are available in hard-copy from the OSTIV Secretariat. I have copies of Volumes 1 through 9 and would be glad to copy any requested articles.

One goal is to get all back-issues of *TS* on-line. This will take more time than available to me. Consequently, I invite interested individuals to work with me to achieve this goal.

VG13 A weather sampler: *Technical Soaring* is on-line

Subscriptions

Only OSTIV members receive *TS*, in print and on-line.

Member categories: Student (35USD/yr), Individual membership is 63USD/yr, Scientific/Technical (libraries, gliding clubs, etc, 112USD/yr) and Active Membership (National Aero Clubs, eg. SSA, 350USD/yr).

All necessary information is at www.ostiv.fai.org (join us!)

VG14 A weather sampler: self-briefing system

Background

My colleagues Drs. Olivier Liechti (ANALYSEN UND KONZEPTE of Winterthur CH) and Ralf Thehos of the German Weather Service (DWD) have developed a glider pilot self-briefing system for Europe. The system resides at www.flugwetter.de. Using the system, a pilot is able to ‘fly’ a planned task through a numerical weather prediction to determine the task’s feasibility. After the flight, the forecast can be checked using the resulting flight-recorder file.

During the 2009 soaring season, as an experiment, we operated the system for the East Coast USA and Colorado. We validated the East Coast system using data from glider contests and, with a few qualifications, found it successful.

I will explain and demonstrate this revolutionary system.
VG15 A weather sampler: self-briefing system
The system in Europe

The system consists of ‘nested’ NWP models of the DWD, (Thehos’s expertise) and Liechti’s TOPTHERM convection model. The global model (GME) with coarse 40km grid-point spacing initializes the higher resolution 7km grid-point spacing regional model (COSMO-EU) and the TOPTHERM convection model initializes from the regional model. The TOPTHERM predicts the local weather in so-called forecast regions; regions of relatively uniform topography and ground cover. The different colors of the regions denote the potential flight distance (PFD) for a glider using randomly-spaced thermals where yellow represents 50km and purple represents 700km. So on this day (2 June 2009), the best flying using thermals was predicted to be in the eastern Pyrenees Mountains.

VG16 A weather sampler: self-briefing system
The system for the East Coast USA

The DWD global model, by its name, extends to the eastern USA (for this schematic, please imagine the GME globe rotated so the East Coast USA is in the box.). However, the DWD regional model, as you might guess, does not cover the eastern USA. So, TOPTHERM was predicting with ‘one hand tied behind its back’.

The following scientific question, then, was explored. Can a high-resolution atmospheric model (e.g. the COSMOS-EU) be replaced with a coarser global model (e.g. the GME) and still allow TOPTHERM to produce soaring forecasts of a quality useful for glider pilot self-briefing? Liechti’s flight planning algorithm, called Java TopTask (jTT), was connected to TOPTHERM. As we reported earlier, the answer is ‘yes’ for the northeast USA but with qualifications.

Some additional comments on what you are viewing. The grey regions in the north mean the PFD values are near zero due to the over 30knot predicted winds in the convective boundary layer (CBL). The thick wind ‘strings’ upwind of the Fairfield PA contest site (red circle) indicate the possibility of convective lift aligned with the wind.

VG17 A weather sampler: self-briefing system
The TOPTHERM forecast for 13 October 2009 for random convective lift

The atmospheric soundings predicted by the GME model at 30-minute intervals for each forecast region are utilized by the TOPTHERM atmospheric model to predict the daily evolution of the CBL (an atmospheric sounding is the vertical distribution of temperature, moisture and winds). The TOPTHERM predictions are displayed as a map of PFDs (left panel) and as a barogram sowing the CBL evolution (right panel). These predictions are for the forecast region surrounding Fairfield PA (red dot) for 13 October 2009.

The map shows Fairfield was at the northern end of the soarable weather. The barogram shows the CBL was predicted to be about 1.4km MSL by 1500EST. The strong
afternoon winds were predicted to align the convection (shown in the barogram by the fat, long wind strings and the row of cumulus icons above the surface T and Td values). Notice the strongest lift (blue) was early and weakened (yellow) as the winds strengthened.

For this day, a PFD of 54km was predicted for a dry, standard class glider using randomly-spaced convection.

**VG18 A weather sampler: pilot self-briefing system**

**The TOPTHERM forecast for 13 October 2009 for aligned convective and ridge lift**

Also, predictions are made for aligned convection, ridge and wave lift. So, if the pilot were to use aligned lift, the PFD would increase from 54 to 147km; the orange line represents the PFD. As can be seen, the extended flight path would be at ridge-level in 15knot northwesterly winds.

**VG19 A weather sampler: pilot self-briefing system**

**Flight plan for 13 October 2009 for aligned convective and ridge lift**

By inspecting the TOPTHERM forecasts, our experienced local pilot knows that aligned lift will be required to fly any distance on 13 October 2009. Further, our pilot knows the task should head west using cloud streets to cross the Chambersburg Valley and run the first ridge. Then, a return to the ridges to the east side of the valley will complete the task.

Using the point-and-click feature of jTT, a 339km task is entered and the ‘optimum’ start-time and ‘aligned’ lift boxes are checked. It is seen, the task should start at 1400EST and be completed by 1809EST with a speed of 82kph.

**VG20 A weather sampler: self-briefing system**

**Analysis of the 13 October 2009 flight**

After the flight, the recorder trace was analyzed by jTT. The jTT analyzed the recorded flight and determined the flight distance (588km) and the flight speed (154kph) (upper-left). The pilot, Baude Litt, is the only person I know who can fly faster than God! Notice the initial climb in convection, the dive onto the upwind ridges and the final climb in convection prior to final glide. Also, notice the unusual uniformity of his flight speed (the red line superimposed over the straight, black diagonal line in the barogram).

**VG21 A weather sampler: self-briefing system**

**Validate the TOPTHERM forecast for random convective lift**

The jTT uses the recorded flight trace to ‘fly’ the glider through the predicted weather. If the flight had relied solely on random convective lift, a landout was predicted: the flight trace in the map loses color and wind strings at the point of the landout and no speed is displayed in the barogram.
VG22 A weather sampler: self-briefing system
Validate the TOPTHERM forecast for aligned lift

Once again a landout was predicted after 1800EST (barogram). The flight was unable to return across the valley (map). So, Baude flew much better than predicted.

VG23 A weather sampler: self-briefing system
Forecasts validated using data from 2009 East Coast USA contests

The GME-TOPTHERM-Java TopTask system was evaluated for the northeast USA using meteorological and flight recorder data collected from glider contests held in spring, summer and fall of 2009 in the following states: New York (Sports Class), Pennsylvania (R2, R4N) and Virginia (R2S). The system made useful predictions of the convective boundary layer (CBL) depth, the flight speed and the Potential Flight Distance (PFD) with the following qualifications:

- The CBLs developed more slowly and lasted longer than the actual CBLs.
- More accurate surface T and Td predictions would improve the CBL predictions.
- For flights in random convection, CBL depths were under-predicted by 75m, flight speeds were under-predicted by 7kph and PFDs were twice the actual flight distances.
- The Java TopTask successfully predicted flights that utilized a mixture of aligned convective and ridge lift, the longer the task the better the prediction. The actual threshold for weak aligned lift seems to be somewhat lower than the threshold assumed in Java TopTask.

VG24 A weather sampler: self-briefing system
Future

These findings are encouraging for setting up the system anywhere on the globe. Due to the coarse global model, limitations exist for convective lift in extremely complex terrain (e.g. Alps, Himalayas, ...), whereas wind generated aligned lift (ridge, wave) may be predicted anywhere. Minor improvements in T and Td values can be expected by adjusting the surface sensible heat and latent heat fluxes. This will improve the growth of the CBL and the predicted base of cumulus clouds. Additionally, the assimilation of surface measurements of temperature and dew-point should further improve the prediction of cumulus (onset, base and depth) as is known from current German Weather Service operational runs.

VG23 A weather sampler: self-briefing system
The experiment will continue in 2010

The system is ready to be evaluated by USA glider pilots flying in the mid-Atlantic and northeast States and Colorado (where a formal evaluation has not been conducted due to a lack of contests). To encourage pilot participation, the system on www.flugwetter.de will available free-of-charge for the 2010 soaring season. Procedures on how to access and use the system will be forthcoming.
If the experimental system is accepted and wanted by the pilots for the 2011 season, the system will be made operational. But, a fee will be required to access the system. The fee structure, necessary to cover the operational costs, has yet to be determined.

**VG24 A weather sampler:**

- a new handbook
- *Technical Soaring* is on-line
- on-line glider pilot self-briefing system

This presentation will be on my website following the Convention: [www.sci.ccny.cuny.edu/~hindman](http://www.sci.ccny.cuny.edu/~hindman)