SIG Aviation Meteorology
Newsletter, April 2013

UK FSC and GASCo Representatives for the RMetS

by Jacob Kollegger

The SIG has has now a new sub-group of three members dealing with representation at both the UK Flight Safety Committee (UK FSC) and the General Aviation Safety Council (GASCo). The members of the sub-group are Bob Lunnon, James Morrison, and Jim Squires. Bob and James are the principal representatives for the UK FSC and GASCo, respectively, and James is a back-up for Bob in case he cannot attend UK FSC meets. These Reps will work with Chris Holcroft, Chief Executive on issues brought up by both organizations.

The Sub-group is put into place in order for the three involved to be able to inform each other of developments and updates. In case one of the Reps can't make it to a meet, one of the other two ideally would then be able to go to the meet knowing what is going on.

The SIG will provide a supporting role for both Reps and the Society, with feedback from meets made available for our newsletter here. SIG members, through their expertise, may be asked to help out on certain occasions when necessity requests it. SIG members, in turn, are welcome to put forth issues they think may prove interesting at these committee meets. There are also a few members outside the three here mentioned who are actively working with or at these organizations.

Report on UK Flight Safety Committee and General Aviation Safety Council

by Bob Lunnon, RMetS Representative at the UK Flight Safety Committee

I attended the GASCo meeting on 27th February, at AAIB in Farnborough, and the UK FSC meeting on 12th March at BAE in Farnborough.

GASCo addresses safety concerns of General Aviation, which in turn comprises mainly umbrella organisations such as Flying Farmers Association, Helicopter Club of Great Britain, Light Aircraft Association, British Parachute Association, Vintage Aircraft Club, British Gliding Association, Royal Air Force Flying Clubs Association, Hayward Aviation Limited, Aircraft Owners & Pilots Association, British Gliding Association, Guild of Air Traffic Control Officers, Unmanned Aerial Vehicle Systems Association, British Women Pilots Association, British Helicopter Association. The main discussion comprised these organisations reporting on safety issues which affect them and may affect the other organisations represented. On this occasion none of these had a meteorological aspect, which is relatively unusual. There was also a presentation on General Aviation Safety Partnership/ Safety Data Analysis by Dr Mike Bromfield of Coventry University. Mike is keen to strengthen his links to aviation and is proposing to undertake an analysis of causes of accidents and incidents affecting General Aviation. However, his proposal did not include meteorological elements, and I did raise this with him in a question. He said that they would use METAR data as the meteorological data source. This does concern me because, for example, an aircraft could lose control on final approach due to icing but there could be nothing in the METAR which would suggest this. Also a lot of General Aviation accidents occur at airfields where no METARs are generated. It would be good if the SIG could have some involvement in ensuring that meteorological factors are properly included.

The UK FSC undertakes a similar role to GASCo but for commercial airlines. At the meeting one airline [name withheld] said that they had experienced icing of the winglets on a Boeing 767 which had affected aircraft performance during final approach. These winglets do not have anti-icing or de-icing systems. Most modern aircraft have winglets and these are potentially prone to icing. Its not clear what if any the role of meteorologists should be here, but if commercial aircraft are more prone to icing than previously, then the issue is unlikely to go away in the short term. Similarly another airline reported an overspeed problem in Clear Air Turbulence – the speaker's concern was that the pilots had responded by throttling back the engines whereas he considered that a better solution was to apply airbrakes. I considered that the best strategy was to try to talk to those who had reported incidents with meteorological aspects during the lunch break rather than raise points during the formal meeting. However, I was unable to get hold of the attendee who talked about the turbulence problem.

QNH: Readback of "Hectopascals" Mandatory, New ATIS message at Luton Airport, EGGW

by Jacob Kollegger

In recent ATIS broadcasts at EGGW (London Luton airport) the phrase "mandatory readback of hectopascals" has provided some confusion and with it frustration amongst pilot circles at having to repeat a three-syllable word after the pressure value number. However, considering UK CAA CAP 413 (Radiotelephony Manual) and ICAO Doc. 4444 (PANS-ATM), proper radiotelephony requires the readback of pressure unit of measurement for values below 1000 hPa and assists in the prevention of level busts and controlled flight into terrain (CFIT).

In the United States of America, QNH is given as an "altimeter setting" and in inches of mercury (in Hg). The ISA pressure at sea level is 29.92 in Hg. In certain radiotelephony circles, the "2" is dropped, and the pressure given as "altimeter setting niner niner two", for example. In Europe, QNH is given in hectopascals/millibars with ISA sea level pressure of 1013 hPa. When values of QNH in Europe fall below 1000 hPa, say 992 hPa, the radiotelephony, without the units, would be "QNH niner niner two." Without the units of measurement, one party may understand QNH in hPa and the other in in Hg, which may lead to gross errors of altimeter settings, and potential altitude busts, along with reduced flight safety.

In the past few years, QNH values given by ATC and read-back by pilots omitted the word "hectopascal", and hence the read-back of units has become rather lax. Due to the potential hazards of altitude busts and confusion, re-invigorating the read-back of "hectopascals" has become necessary.

Therefore, in CAP 413 Chapter 2 Paragraph 1.15.5, proper radiotelephony demands that for values below 1000 hPa, the word "hectopascal" be both transmitted to and read-back by pilots. The word "hectopascal" replaced "millibar" in Britain in 2011 in order to conform to ICAO standards. Even though a valid argument that the extra syllable in "hectopascal" adds to frequency congestion, the use of “hectopascal”provides standardisation. ICAO Doc. 4444 uses examples of radiotelephony that for any value of QNH, the [units] be mentioned. Hence, Luton airport, by issuing the statement, "readback of hectopascals mandatory", is conforming to ICAO and CAA radiotelephony stipulations, and pilots are advised to review radiotelephony procedures in this aspect.

Many thanks to Kevin Crowley (CAA) for his input in editing this article.
Additional thanks go to Anthony Bowles, Philip van Mameren (NetJets), Carl Moore (NetJets), and James Morrison (Ryanair) for their contributions and clarifying aspects discussed in this article.

Non-SIG Meet on Aviation Meteorology

Reducing the climate impact of aviation: the potential of climate-optimal flights

Dr Emma Irvine

University of Reading

Every time we take a flight, the aircraft’s emissions contribute to climate change, but not by an equal amount. This is because the climate impact of a single flight is governed by more than just the quantity of CO_2 emitted; it also depends on the fate of emissions which influence ozone formation and the formation of persistent contrails, all of which depend on the large-scale weather pattern. In this talk we will investigate how the weather, aircraft routing and aircraft climate impact are interlinked for trans-Atlantic flights. We will also focus on the potential to reduce the climate impact of aviation by modifying where aircraft fly in a given weather pattern, a so-called ‘climate-optimal’ routing.

Date: Wednesday 2 October 2013**Time:** 19:00

Location: Victorian Gallery, Reading Town Hall, Blagrave Street, Reading, RG1 1QH

also listed on the RMetS website:
http://www.rmets.org/events/reducing-climate-impact-aviation-potential-climate-optimal-flights

FACEBOOK

by Jacob Kollegger

For those of you not Facebook-inclined, a few articles which were posted on the SIG page for a general audience:

http://www.hispanicbusiness.com/2012/12/12/gps_modeling_system_gives_storm_data.htm

http://www.aviationweek.com/Blogs.aspx?plckBlogId=Blog%3A7a78f54e-b3dd-4fa6-ae6e-dff2ffd7bdbb&plckPostId=Blog%3A7a78f54e-b3dd-4fa6-ae6e-dff2ffd7bdbbPost%3A6ad0e583-202c-46d1-88e6-102510bbb94e

http://www.msnbc.msn.com/id/50090017/ns/technology_and_science-science/

http://washingtonexaminer.com/pilots-get-new-tool-to-avoid-bump-flights/article/feed/2036837

http://onlinelibrary.wiley.com/doi/10.1002/wea.2047/full
also in *Weather* magazine January 2013 issue.

http://news.discovery.com/earth/global-warming/airplane-turbulence-climate-change-130408.htm

I asked a general pilot audience whether they felt that their initial pilot studies at the private pilot to the airline pilot level were adequate to what they have experienced during their careers. Unfortunately I only got one answer, and it had to do with the relief that the Swiss no longer as of their pilots to draw a cross-sectional diagram of a Polar Front Jetstream. Oh well, I will try again at a later stage. :)

PHOTOS


Region of Pau, France, Feb. 19, 2013, morning.


On approach into Casablanca, Morocco, GMMN, February 28, 2013, afternoon

Rome and the Vatican, March 14, 2013, afternoon

The Matterhorn as viewed from the Italian side, March 14, 2013, afternoon.

Pontresina Switzerland, and in the background, the Bernina Pass shrouded in upslope fog from the south, March 27, 2013, noon.

Nucl ear power station near East Midlands airport, cloud formation. April 6, 2013, evening.

A Discussion on the Maloja Wind

Jacob Kollegger, April 27, 2013.

The Maloja Wind flows in the area of southeast Switzerland in the upper Engadine Valley, near Samedan Airport, LSZS.
To understand the Maloja Wind and its properties, we must consider the location of its source and to where it flows, and the concept of thermal lows.

Bregaglia Valley

Fig. 1: Upper Bregaglia Valley, from Vicosoprano (lower left) to the Maloja Pass (upper right). The width of this portion of the Bregaglia Valley is about 2 km. The V and P designations, for valley and peak respectively, are used in the text. Map Source: Swisstopo.

The region of source for the Maloja Wind is the Bregaglia Valley, a rather east-west aligned valley of roughly 30 km in length situated west of the Maloja Pass. The Valley elevation change is roughly 1500 metres. As Fig. 1 shows, the upper part of this valley has steep mountain walls on either side of its roughly 2 km width, and at its terminus by the Maloja Pass, the valley is roughly less than 1 km wide. This creates in itself a relative "box canyon" of sorts, blocking moist air from the regions of the Po Valley to the south of the area from entering the Engadine Valley. The height difference between valley floor (designated “V” in Fig. 1) and mountain peak (designated “P” in Fig. 1) is about 2000 metres, and is quite narrow.

Photo 1 shows the view towards the Bregaglia Valley from the Maloja Pass.

Photo 1: View westwards from the Maloja Pass towards the Bregaglia Valley. Piz Lizun and Vicosoprano designations used to provide a connect to Fig. 1. N designates north.

The Engadine Valley

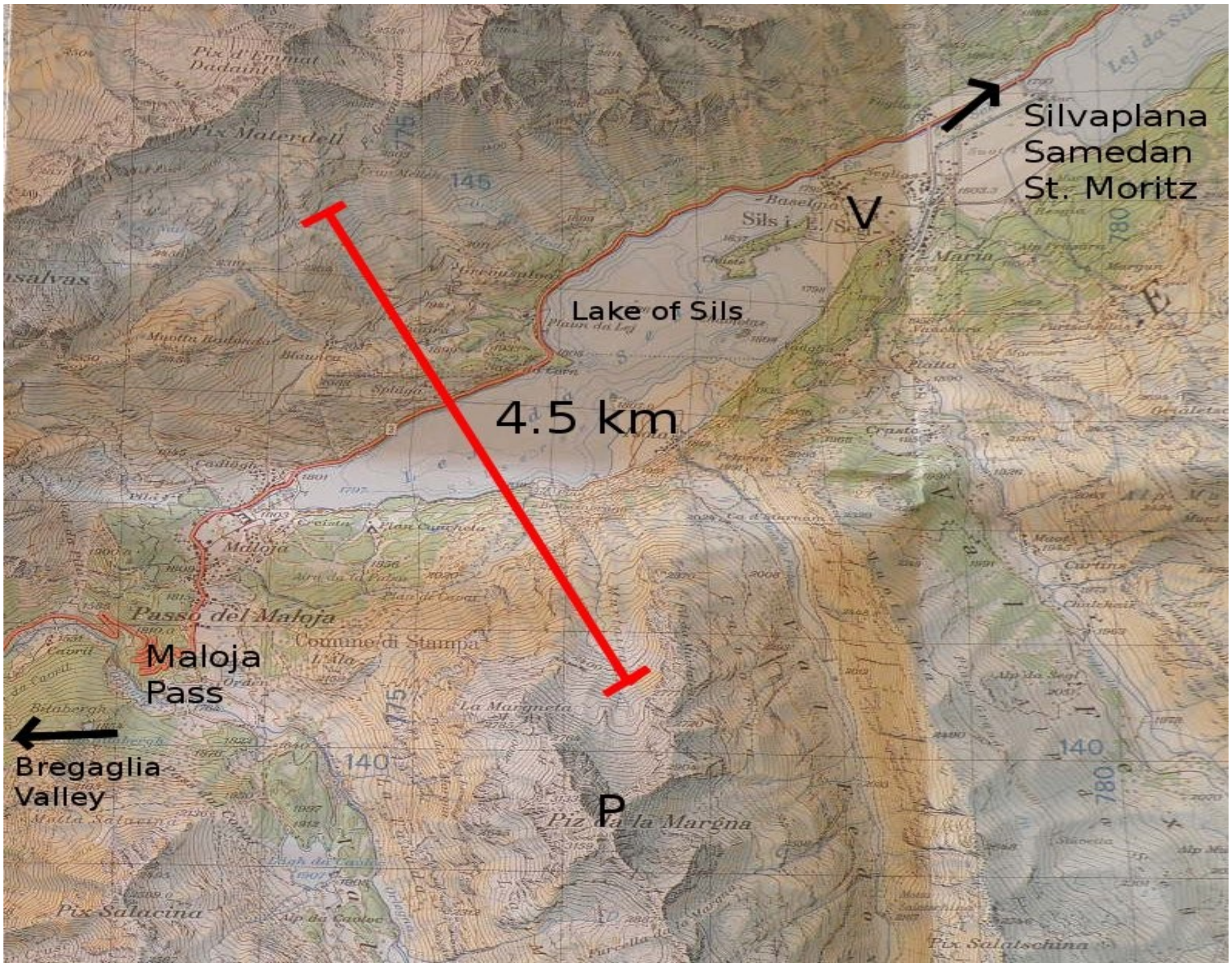

Fig. 2: The Upper Engadine Valley from the north-eastern shores of the Lake of Sils to the Maloja Pass. The width of this portion of the valley is about 4.5 km. The designations V and P are used in the text. Map Source: Swisstopo.

The Engadine Valley, or more precisely in this case the upper Engadine Valley, is a gently sloping wide Valley in comparison to its counterpart to the west, comparing Fig. 1 with Fig. 2. It begins at the Maloja Pass and for our intent in this paper ends near Zernez (roughly 30 km air distance north-east of St. Moritz), with valley elevation change of roughly 350 metres (compared to the relatively steeper 1500 metre change in the Bergaglia Valley). The Engadine Valley itself continues the length of the Inn River until the Austrian border. The height difference from valley floor ("V" designation in Fig. 2) to mountain peak ("P" designation in Fig. 2) is around 1400 metres, and its wide dimensions allow for much insolation. Photos 2 and 3 show the Engadine Valley.

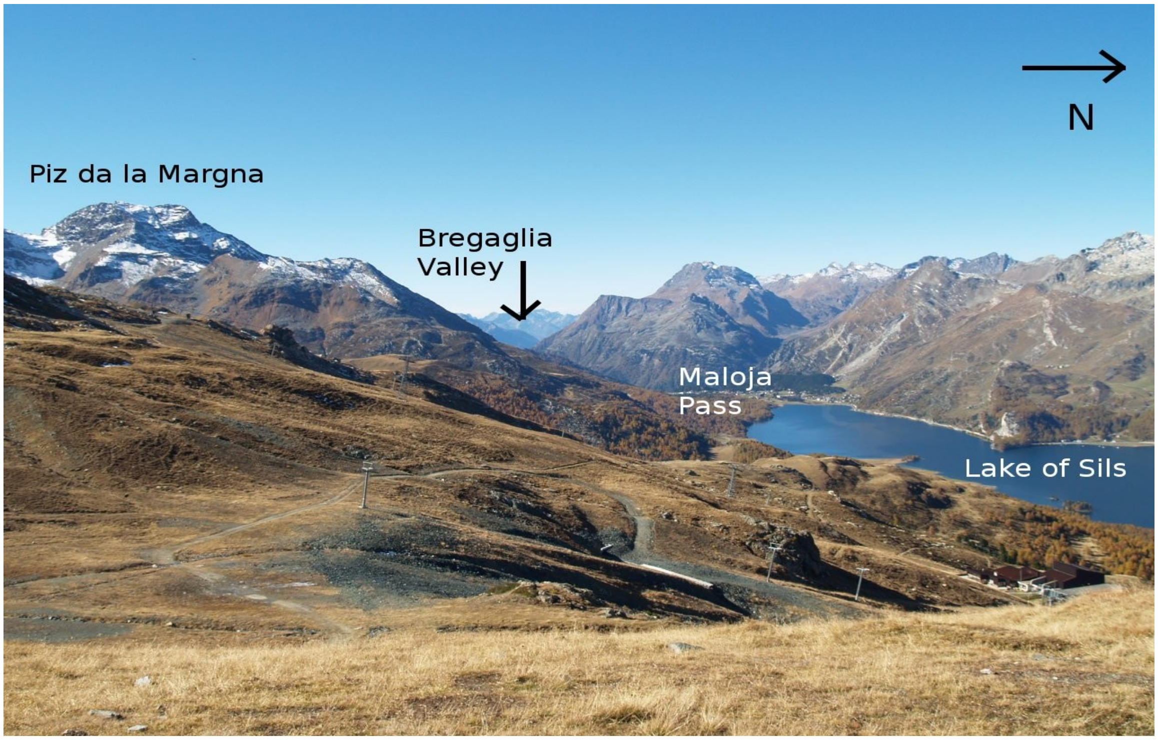

Photo 2: Upper Engadine Valley from the Maloja Pass to the middle part of the Lake of Sils. Geographical designations provided to connect with Fig. 2.

Photo 3: Upper Engadine Valley from the mid- part of the Lake of Silvaplana (roughly 3 km northeast of where Photo 2 ends by the Lake of Sils) to Zernez

Basic Thermal Low Concept

When the sun heats the Earth by way of short-wave radiation, the Earth is heated and the air immediately above the surface of the Earth is heated through conduction. Air is a poor conductor of heat, and therefore with increasing solar radiation a temperature difference at various altitudes can be observed, initially with warmer air below colder air. This leads to instability, as warm air is less dense than cold air, and therefore the warm air rises, resulting in lower pressure near the surface. This results in a thermal low, low pressure at the surface resulting from warm air. At altitude, because isobaric surfaces are spaced further apart in warm air than in cold air, the rising warm air will result in a relative high pressure aloft, as shown in Fig. 3.

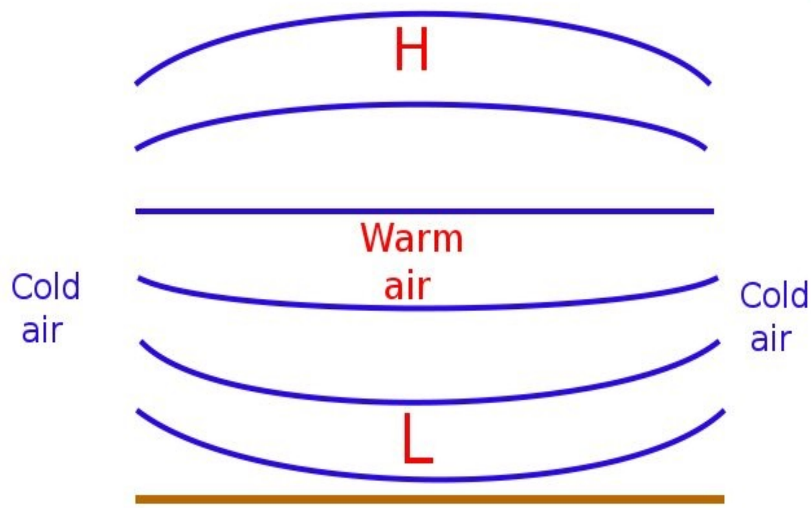

Fig. 3: Diagram of a surface thermal low. The blue lines indicate the isobaric surfaces, the L and H correspond to the resulting low and high pressure areas. For simplicity, the isobaric surfaces were only drawn in for the thermal low and not continued into the thermal high areas in the relative cold air.

In the upper Engadine and Bergaglia Valleys, the thermal low concept can be experienced mainly during the late-Spring to early-Autumn months, from April to October. In the winter, despite sunny weather conditions, the snow cover and resultant albedo greatly reduces the solar heating effect.

<u>**The Maloja Wind**</u>

The lower Bergaglia Valley, which connects to the Lake of Como area and hence to the greater Po Valley region, receives insolation and a moist anabatic valley wind to the Maloja Pass develops.

The wider Engadine Valley, as stated, receives significant insolation, and correspondingly on certain days a thermal low is created. This rising air from the Engadine Valley floor, combined with the height difference between Bergaglia and Engadine valleys, results in relative high pressure in the Bergaglia valley and low pressure in the Engadine, and corresponding pressure gradient (see Fig. 4) . The Bergaglia Valley anabatic wind is also accelerated by the narrowing valley towards the Maloja Pass (Venturi Effect). The air eventually rises over the Maloja Pass and into the Engadine Valley (see Fig. 5). The resulting wind does reach velocities of 20 to 30 knots, depending on atmospheric conditions at the time of development. When the predominant flow in the region is westerly or south westerly, the velocities become more pronounced.

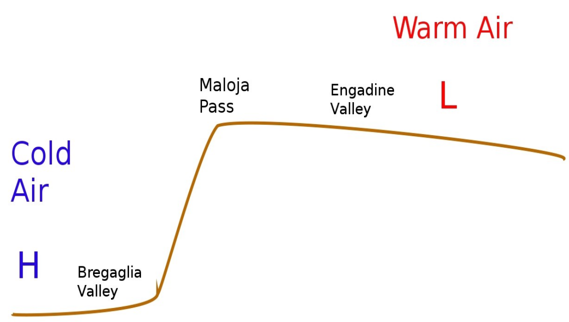

Fig. 4: Cross-sectional diagram of the Bergaglia and Engadine Valleys, and corresponding relative pressure differences. The "Warm" and "Cold" distinctions are relative to one another.

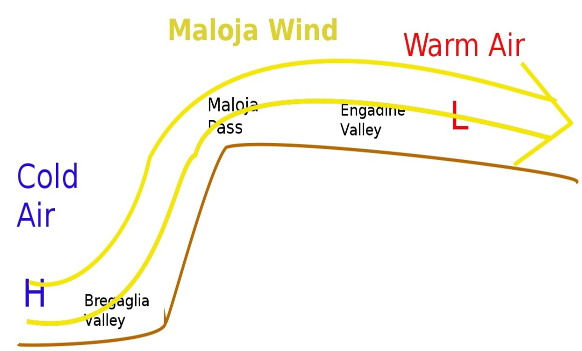

Fig. 5: Fig. 4 with the Maloja Wind drawn in, as per text.

There is also an anabatic Engadine valley wind, called the Bruescha, which forms in a similar way to the Bergaglia anabatic valley wind, but propagates in the opposite direction. However, due to the shallow slope of the Engadine valley, the Bruescha is much weaker than the Maloja Wind.

The Maloja Snake

As the moist air from the Bergaglia Valley rises over the Maloja Pass, occasionally the air's dew point temperature may be reached, at which point cloud will form. The thermals from the valley walls may even shear the flow and create rotation, and the cloud takes on a snake-like form, and is called the "Maloja Schlange" or "Maloja Snake". It generally forms around 500-700 metres above ground level (roughly 8000 feet AMSL) and is about 50 metres (150 feet) thick. This cloud generally dissipates over the Lakes of Sils and Silvaplana, but may even reach St. Moritz before dissipating, partly due to the Bruescha wind halting its propagation. This Maloja Snake is usually associated with deteriorating weather, but can also form when portions of the up slope fog produced from the anabatic flow in the Bergaglia Valley overrun the natural blocking effect of the Maloja Pass. The capping of these clouds may also indicate the inversion level, with possible shear associated with different wind directions and velocities.

Photo 4 shows an example of a Maloja Snake.

Photo 4: An example of a Malojaschlange or Maloja Snake. The cylindrical cloud formation can extend as far as St. Moritz. (Photo: Rene & Elisabeth Buehler)

Considerations and Other Information

The Maloja Wind is generally limited with regards to altitude. The Valley walls are heated to such an extent that an inversion may form, capping the colder wind from reaching higher altitudes. Therefore at higher altitudes calmer winds may be experienced, along with an inversion. This may have consequences for aircraft using Samedan airport, as their performance decreases if air is warmer at altitude.

The Maloja Wind generally flows in the main Engadine Valley, and is not very noticeable in side valleys.

With a general north-easterly flow the Maloja Wind's effects and strength are reduced, to the point of being non-existent, although there may still be a noticeable SW-wind component near the Maloja Pass due to the effects resulting in the Maloja Wind.

In the evenings, as insolation is reduced, the Maloja Wind lessens in intensity. At night, the katabatic wind flow patterns are generally the norm.

Sources:

http://www.segelflug-csvm-engadin.ch/page19/page7/page7.html

http://de.m.wikipedia.org/wiki/Malojawind

http://www.meteoschweiz.admin.ch/web/de/faq/malojawind.html

METEOROLOGY FOR PILOTS

Mike Wickson, author of this book, which has been in use for many years by many aviation schools, has asked if support for the book can be gotten from the SIG and GASCo. The info has been passed on to Jim Squires (GASCo Rep), and I trust he will deal with the issue as best he can. As mentioned in the second newsletter of last year, former Chief Executive Paul Hardaker did mention that the Society is willing to help reform the way aviation meteorology is taught.

My personal opinion: The book has a wealth of information and should be supported. The book is updated, I would suggest to provide JAR-OPS / EU-OPS references to the PPL, CPL, and ATPL syllabi for easy follow-up by students in their studies, and to add a bit of colour to the book. Considering the incidents and accidents arising from inadequate knowledge or appreciation of meteorological factors in aviation, there is no doubt that educating the pilot must be an important priority in aviation meteorology.

Jacob Kollegger

FEEDBACK

As always, feedback is welcome. Thanks for your interest!