

Far left: Wolf-Dietrich Herold took this picture of lenticulars ahead of an approaching front in Argentina on flight in Stemme S10-VT D-KMTE last year. Used by Klaus for his epic flight, it has been made available to the MWP by the manufacturers. See also [www.mountain-wave-project.de](http://www.mountain-wave-project.de)

Figure 2, left: RBL wave forecast from Thomas Presonil at the Germany Military Geophysical Office. Winds of more than 60kts at 18.00hrs on November 26, 2000, are shown in red. "You want a jetstream in the north and another in the south, not too far apart," says Klaus

Knauff's 1983 world record of 1,646.68km ("It's not easy to know what the weather is like 850km away"); a flight round Aconcagua, the highest mountain in the Andes; and, within two years, he plans to glide full-time ("I'd like to do 'tourist' lead-and-follows; three active volcanoes in a day. I once saw the shadow of the Stemme on the smoke of a volcano...")

Only the introduction in the FAI Sporting Code last year of the category of three free turning point flights made his record possible; the longest glider flight started as a failed 1,700km O/R attempt. When conditions deteriorated, he changed track to achieve something new.

This could stand as a metaphor for his whole approach to gliding. As my final chance to amend this S&G loomed, a series of increasingly-frantic emails, faxes and phone calls to France, Germany and



Argentina elicited no response... because Klaus was away flying, of course! I was told he would return to his hotel for Christmas – but on Christmas Eve, I heard: "I am very sorry, he left at 4am to try another world record". He finally called me back on Christmas Day. I didn't dare ask what his family thought of his giving interviews in the middle of festivities... As we go to press, he still has a month's flying left – I wonder what he'll do.

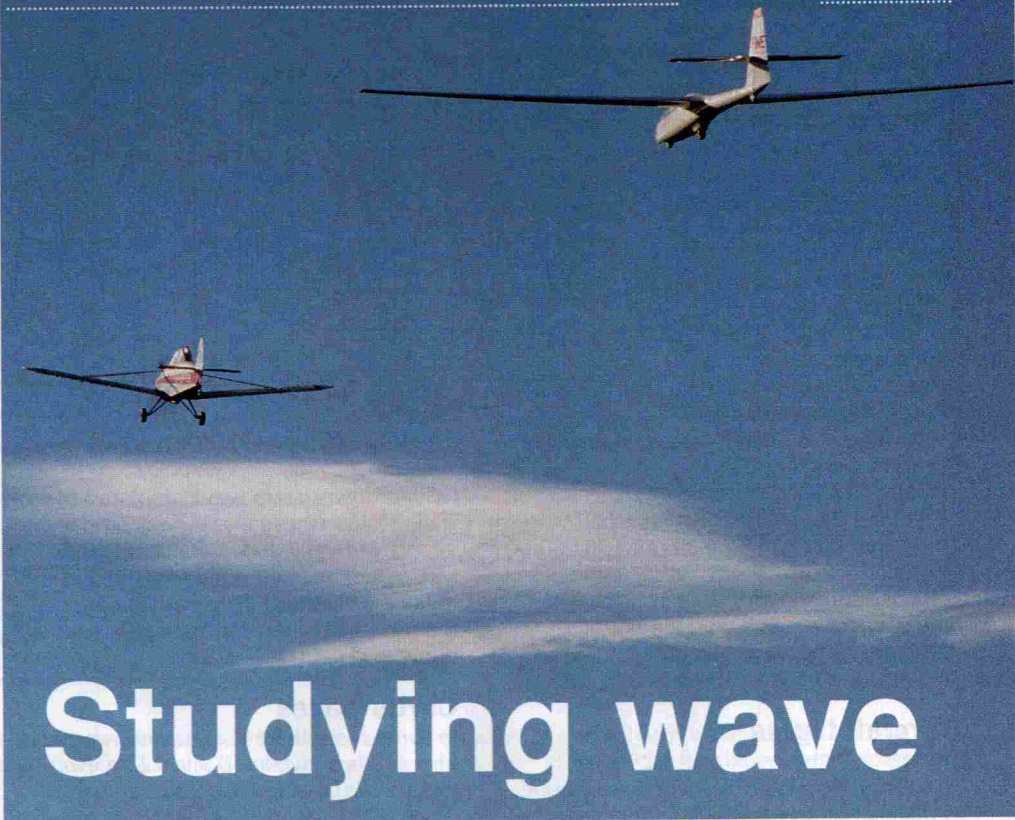
It's no surprise, then, to learn that he thinks determination – "endurance" – is the most important personal quality for a record-breaking pilot. "You have to want to do it," he says. "Even if you think 'no, it's not worth it today,' you must continue. Even if that day you don't make it, what you learn will be very important for the next time. It's a whole philosophy of life.

"All these things start with a dream, and if you really want to do something, it will happen. Never give up!"

**Helen Evans**

Next issue: Klaus, whose epic flights are part of the OSTIV Mountain Wave Project, explains why he came up with the idea and what the project aims to achieve.

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**Tom Bradbury investigates other research into lee waves**

**A**LTHOUGH sailplanes have been soaring in lee waves since the 1930s most meteorologists at first regarded waves as interesting but unimportant phenomena. Then the era of numerical forecasting began. Computers could predict upper winds fairly accurately over the entire globe and it was realised that lee waves were causing enough drag to slow down the airflow. This stimulated research into how waves caused drag.

A thorough study of wave dynamics began using balloon trajectories, making special aircraft flights, probing the atmosphere with radar and comparing

the findings with numerical models and satellite pictures.

**Balloon Studies**

Every six or twelve hours, a few selected stations release large balloons carrying radiosondes. These transmit at 400 to 405 MHz and radio back the pressure, temperature and humidity. The wind is found by tracking the balloons by radar or using self contained navigational systems such as GPS or LORAN.

Most balloons have enough free lift to climb at about 12kts but the actual rate of ascent varies as it goes through the lift or sink in lee waves. By plotting the rate of climb against distance one can display the wave pattern graphically. For research purposes a series of balloons was launched at intervals of ten minutes or even less. In the UK temporary balloon sites were set up at Caersws near Newport in mid-Wales, Eskmeals on the coast of the Lake District, and also near the eastern end of Loch Cluanie in the Western Highlands. Fig 1 (*overleaf*) shows changes in the rate of climb as the balloons drifted downwind. The waves faded out after the balloon had travelled some 60km, probably because it had risen above the wave level.

One series of launches found lee wavelengths varied between 8 and 16km with lift ranging between 2 and 13kts. The strongest lift was found at 3km (about 10,000ft) but the level of maximum lift varied between 1.5 and 8km (roughly 5000-26,000ft). One ascent found lift of 4kts as high as 15km (49,000ft). The highest wave activity was found by a balloon launched from Leuchars (east of Portmoak). The max lift was in the stratosphere



Wave bars, seen from 35-37,000ft, which are probably caused by the Kuhha-ye Zagros (a mountain range in western Central Iran) between Shirāz and Eṣfāhān