Wave Meteorology and Soaring

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Winds at record height 121 mb-49,009 feet

Temp inversion mtn top 583 mb-14,491 feet

12Z 17 Feb 1986
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Record Soaring Wave Conditions
~7,000 feet on tow
~10,000 feet
~14,000 feet
~15,000 feet
~16,000 feet
~15,000 feet
~24,000 feet
~18,000 feet
~20,000 feet
~30,000 feet
~35,000 feet
~49,009 feet
Scott,
This picture was taken
at Inyokern Feb 17, 1986, 4:30 PST.
It was a good wave day!! Regards, Biff Harris
Dec 22, 83 FL350
Nov 17 1983: 30,000 feet
Nov 17, 1983: 29,000 feet
Mar 27, 1985: 34,000
Trapped mountain waves
“Never fly downwind in a mountain wave” Paul Bickle

- Einar Enevoldson and Steve Fossett moved downwind to get 50,699 feet in the Andes mountains (Aug 29, 2006)
- Bob Harris used S Sierras for 49,009 feet (Feb, 17, 1986)
- Joach Kuettner’s downwind dash is still doable but has not been realized YET! (3 very high climbs and dash)
- Trapped mountain waves may be a factor in the downwind dash with a higher workload
- Night launches, ATC cooperation, faster, strong sailplanes will all play a role wherever in the world the next record in mountain wave is set
WUA018 LG148 L LLU097 DLPD
TDLPWS WASHINGTON DC14 246A PST
PAULF BIKLE JR, DO NOT FWD
44926 NORTH RAZSACK AVE LANCASTER CALIF

YOUR RECORD BREAKING FLIGHT IN A SINGLE-PLACE GLIDER -- 45,000 FEET -- IS A NOTEWORTHY ADDITION TO THE ANNALS OF AVIATION PROGRESS. CONGRATULATIONS AND BEST WISHES ON YOUR ACHIEVEMENT.

N E HALAEB ADMINISTRATOR FAA.

1058A PST MAR 14 61
Clips from Argentina, Gliding in the 5th Dimension, 3000 km in a glider

- Have asked for permission to use this DVD but have not received the permission yet. This slide will be removed if permission is not received prior to release and presentation.

- Following 8 slides are also from this DVD and will be removed if permission is not granted as well.
The Wave Project wave strength forecast
6-8am
“No two wave days are the same”
Jim Payne-JP
λ - Mountain Wave Wavelengths

λ = Wave length = 0.6 U -3
λ - where U is wind speed at the mountain top in meters per second
λ - wavelength is in kilometers
λ - Probably the reason for the maximum wave lift leaning into the wind at high altitudes
λ - If lift is lost move upwind when windspeeds decrease or go downwind to the secondary wave crest
Long mountain waves: long flights

Ten Longest Mountain Ranges
- Andes: 4,500 miles
- Rocky Mountains: 3,000 miles
- Himalayas: 2,400 miles
- Great Dividing Range: 2,250 miles
- Transantarctic Mountains: 2,200 miles
- Brazilian Coastal Range: 1,900 miles
- Sumatra-Java Range: 1,800 miles
- Aleutian Range: 1,650 miles
- Tien Shan: 1,400 miles
- New Guinea Range: 1,250 miles

Canadian and US Sierras?
Mountain wave rotor damage
Jet lands minus engine, wing tip
MOUNTAIN WAVE TURBULENCE OPERATIONAL HAZARDS TURBINE POWERED

• REDUCE SPEED TO BELOW $V_a$
• TURN ON IGNIGHTERS BEFORE TURBULENCE PENETRATION
  – TO ASSIST IF THE TURBULENCE DISRUPTS THE AIRFLOW TO THE ENGINES AND ASSIST IF RESTART IS NECESSARY
  – SEVERE TURBULENCE COULD CAUSE ENGINE FLAMEOUT
Record soaring flights in MTN WV

- Combination of polar and subtropical Jets
- Speed tasks do not require upper level support
- Altitude records require a very high Tropopause
- Years of study, preparation and a great deal of knowledge of meteorology and weather support required
- A broad spectrum of mountain waves can be used to obtain world records
- Good soaring techniques are required but with determination and planning, even lower time pilots can become record setters
FURTHER STUDIES

• Get igc flight files and map record flights to the terrain and flight winds in See you

• Velocity limits for good wave on Polar and Subtropical jetstream flow (usually <150 knots)

• Height of the surfaced based inversion in relation to mountain peaks is a key

• Braking waves must be understood and forecasted better
QUESTIONS?

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