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WEATHER FORECASTS FOR SOARING CONTESTS

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Introduction

Unlike jets or airplanes, sailplanes depend totally on the atmosphere for lift and power during flight. Sailplane pilots, also known as glider or soaring pilots, often look for lift in meteorological conditions that their power counterparts try to avoid. Sailplane pilots look for lift in thermals and convergence boundaries, which can be found frequently over mountains. Experienced pilots love to soar along the ridges of the Nation's mountains, including the Blue Ridge Mountains and Sierra Nevada. On the extreme end of soaring, pilots fly sailplanes in strong mountain waves over the Sierra Nevada reaching altitudes of 50,000 feet.

Sailplane pilots are very aware of microscale meteorology. They are hungry for as much weather information as they can get. You'll never here a glider pilot say, "Why check the weather, I'm flying anyway." Many sailplane pilots can interpret atmospheric soundings, and most are familiar with the various stability indices. However, sailplanes are still subject to the same dangers as other aircraft. While an unstable air mass is desireable for lift, an air mass too unstable, with abundant thunderstorms, poses a safety threat to the pilot and sailplane. The cessation of low-level convection due to the over-development of clouds often forces the sailplane pilot to land in fields away from the airport.

Meteorological support for sailplanes pilots poses interesting challenges for the meteorologist. This paper will describe the meteorological information that the soaring pilot needs, along with a discussion of the weather support given during the 1991 World Soaring Championships (WSC-91). WSC-91 was selected to illustrate the support required at the highest level of this facet of aviation.

Weather Requirements

Weather support for sailplanes range from single pilot weather briefings to specialized support during multi-day contests. Soaring contests usually involve a loop course, consisting of three or four legs, with the size of the loop being governed by the weather forecast. A typical loop course, also known as the "task", may be 300 miles in length, but can be as long as 500 miles under ideal meteorological conditions. The course is determined on a daily basis by the tasking committee after consultation with the meteorologist.

Soaring contest winners are the pilots who fly the course in the shortest elapsed time. Winners are awarded 1000 points for the day. Subsequent finishers are assigned points by virtue of the time difference between themselves and the winner-of-the-day. During multi-day events, the overall winner is the pilot who accumulates the highest total points.

Since the glider is dependent upon the atmosphere for flight, various meteorological parameters need to be examined by the meteorologist before briefing a soaring pilot or contest tasking committee. These parameters include:

1) Information on thermal development. This information is best represented by plotting thermal altitude, which is the height of dry convection (limited to cloud base), as a function of the time of day, and thermal lift rates as a function of the time of day.

2) Trigger-temperature and time-of-day at which thermals begin to support soaring flight. The trigger temperature is a term used for the surface temperature that generates dry convection to a specified altitude, usually between 2,000 and 4,000 feet AGL.

3) Various atmospheric stability indices such as the 850-to-500 mb temperature lapse rate, "K" index, thermal index, and a soaring index. The latter two indices are those specifically established to quantify expected sailplane climb rates.

4) Freezing levels are important to the pilot since water is carried in the wings for ballast and to achieve faster glide speeds.

5) Winds and temperatures aloft are needed by the pilots to calculate optimum speeds.

6) Sky condition, including the convective cloud base, is necessary because the race must be flown in visual meteorological conditions, obeying Federal Aviation Regulations concerning visibility and cloud separation.

7) General information on the weather for the day must be provided so that pilots are briefed not only for soaring possibilities but also for implications of severe weather.

Weather Support for the 1991 World Soaring Championships (WSC-91)

During late July and early August, 1991, the National Weather Service (NWS) provided support for the 22nd World Soaring Championships at Uvalde, Texas. WSC-91 was the "Olympics" of soaring with 114 pilots from 26 countries competing over a two-week period. The contest area for WSC-91 was 140 miles by 240 miles, centered 140 miles west-northwest of the Texas coast on the Gulf of Mexico. Uvalde Airport served as the start and finish.

The meteorological support team began work at 4:30 a.m. (local time) each day preparing the forecasts for the tasking committee. This weather forecast package, which was used for the contest course selection, was completed by 8:00 a.m. Once the tasking committee was briefed, the meteorologists began preparing for the mass pilot weather briefing, which was presented to all pilots and crew at the daily pilot's meeting. [Figure 1 shows the meteorological information sheet used during WSC-91.] Each pilot was given a copy of this sheet prior to the daily pilot's meeting. The meteorological information sheet was displayed on an overhead projector in conjunction with a monitor displaying satellite pictures. Overlays indicating the weather problem of the day were also presented. In the course of these meetings, the contestants and crews were given information to enable them to make decisions for safety considerations as well as contest strategy.

The weather office at WSC-91 was well-equipped with meteorological data systems. The meteorologists had access to high resolution satellite imagery and overlaying graphics capability from the National Severe Storms Forecast Center. They also had computer access to NWS alphanumeric and graphical databases, and radar information. A personal computer provided programming ability to analyze weather plots with applications in soaring and atmospheric instability.

Site weather idiosyncrasies must always be considered by the meteorologist at a soaring contest. At WSC-91, morning stratus was common and the length of the contest day was determined by when the stratus would give way to convection. In addition, differential surface heating and resulting pressure gradients would drive a sea-breeze front deep into southwest Texas. This boundary would then act as a convection focal point varying in intensity from light to severe depending upon accompanying atmospheric characteristics.

The tasks flown during WSC-91 were usually over 300 miles with the farthest pilot-chosen task being 476 miles. Pilots usually launched by 11:30 a.m. (local time) and flew until 7:30 p.m. Pilots often chose to delay their start until after the thermal convection was well underway, which sometimes was as late as 1:30 p.m.

It was a large undertaking to support 114 competing sailplanes. In addition to sailplanes, a fleet of 16 towplanes were used to launch the gliders. At launch time during WSC-91, the Uvalde Airport became as busy as any major hub airport. Three hundred forty two take-off and landing operations occurred in less than one hour as the 16 towplanes launched the 114 gliders.

Besides the role that meteorologists have in aiding sailplane pilots in contest task selection, the large number of landing and takeoff operations highlight the need for meteorological warning concerns. Twice during WSC-91, local airport advisories were issued by the NWS support unit due to microburst winds which threatened both grounded and landing aircraft.

Conclusion

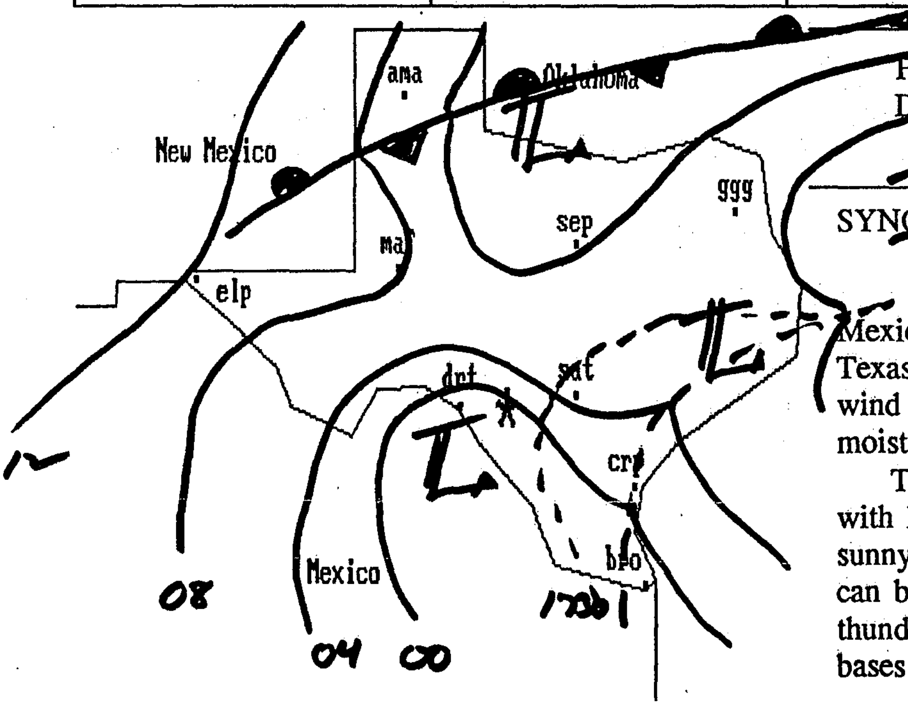
The components of a successful meteorological support team for soaring contests must have local knowledge, soaring forecast expertise, data, and personnel management skills. The meteorological support team must be able to understand the needs of the contest, in addition to meteorological forecast and warning responsibilities.

At WSC-91, the team effort within the NWS garnered recognition from international soaring meteorologists as one of the finest seen to date. Through the effort of this team, the NWS was able to serve this category of aviation, thereby enhancing safe flight.

SOARING WEATHER FORECAST WORKSHEET

Freezing Level 14,000 Ft / 4.3 Km	Date AUGUST 4, 1991	Contest Day SEVEN (7)
Trigger Temp °F/°C 90°F / 32°C	Time (Local) 1230	SFC Winds (Deg/Kt) 160/15
Max Temp °F/°C 98°F / 37°C	Time (Local) 1600 - 1730	Max Alt (Ft/Km) 8,500 Ft / 2.6 Km
850-500 Lapse 29°C	"K" Index 36	Showalter Index -3
Soaring Index 3.3 M/S	"TI"@850 Mb -4	Lifted Index -6

WIND DEG/Kt	TEMP C°	FT/Km
170/14	-53	40/12
180/11	-33	30/9.1
210/10	-18	24/7.3
160/15	-9	18/5.5
150/13	4	12/3.7
140/16	8	10/3.0
150/17	13	08/2.4
140/16	20	06/1.8
160/15	26	04/1.2
160/15	33	02/0.6



Forecast By
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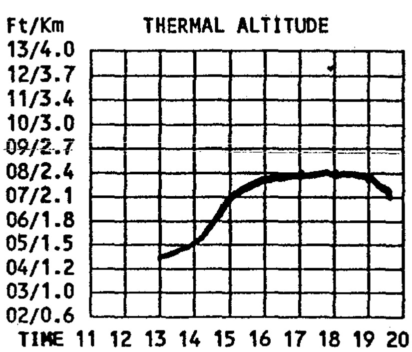
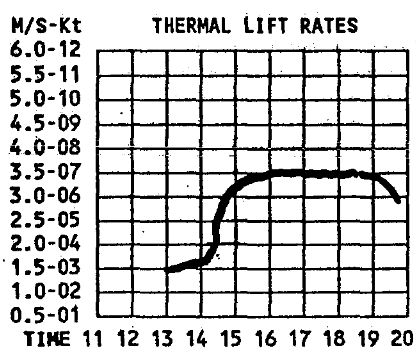
SYNOPSIS:

High pressure over the Northern Gulf of Mexico combined with low pressure over West Texas/Northern Mexico is providing a south-easterly wind flow over the contest area. Increasing moisture will be noted from this type of flow.

Temperatures today will be similar to yesterday with highs in the upper 90s (37 deg C.) and skies sunny in the mornings to early afternoon. Cumulus can be expected at mid-day but also the chance of thunderstorms will be increased. Afternoon cloud bases today will be 7500 to 8000 feet (2500 meters) MSL.

The sea breeze will move into the contest area after 1600 hours again but unlike yesterday make better westward progress. With the sea breeze scattered thunderstorm activity is __________ expected.





Satellite pictures and loops provided by WSI CORPORATION