

Squawk List for flight 1891,
Flown on Wednesday, 28 November 2001,
Pre-IMPROVE II CV-580 flight 1.

Instruments not mentioned as having a problem are believed to have worked satisfactorily.

OVERALL-WEATHER

Very strong southwest flow (>50 kts at 700 mb and upward) with weak cold frontal passage possibly during latter part of flight with a warm frontal passage apparently in the region prior to the flight. Muted cloud indication of a frontal passage during the flight and the air mass remained pretty much "warm sector" according to dewpoints on the ground. Also, there were no pressure checks at the ground or wind shifts noted at flight level suggesting it was a very weak system.

Liquid water, ice concentrations, and even patches of drizzle drops were observed and frequently varied greatly from one second to the next in the legs over Santiam Pass and vicinity. No liquid drops got to the ground, however, according to Mat Gaervert (who was contacted after the flight ended.)

Liquid water content, as measured with the FSSP-100, occasionally exceeded 0.5 g m⁻³. Droplet concentrations were "maritime", averaging less than 50 cm⁻³ in these clouds. Mainly clear ice on the top forward edge of the Piliewsky rod adjacent to the bubble reached a maximum of about 1 inch. A similar amount was visible on the radar pod on the right wing.

In sum, this flight was an outstanding example of an orographic, significantly precipitating cloud system that was approximately steady state during the flight and featured ice multiplication and a rampant collision-coalescence process. Rain rates on the ground (at stn "Yellow") were 0.1 to 0.3 inches per hour during the flight.

OVERALL-INSTRUMENTATION SUMMARY

Progress was made in solving problems mentioned in the previous flight (1890). Namely, the FSSP-100 was cleaned and re-aligned with a huge improvement in the spectra and a resulting drastic increase in FSSP-100 integrated LWC which previously had been "maxed" out in maritime cu at about 0.2 g m⁻³. The phenomenon of having peak concentrations in Channel 1 that had been observed on previous flights was eliminated. The resulting increase in LWC also brought a large degree of agreement between the PVM-100 LWC except for a isolated periods, that in one case was almost certainly due to excessive FSSP-100 icing, a rather rare event.

However, a pernicious new "old" problem has surfaced since flight 1889. Apparently (as per Don) lack of proper shielding of the

radio system used to converse with the ground control during the flight is causing numerous and pernicious noise spikes in tstat, tstatr, and pstat. This is being investigated.

The CPI worked intermittently as did the HVPS leaving gaps in key data. Details of exactly when these instruments experienced outages is not yet known. It was suggested by SPEC that we check the seating of the bridge card that spans the two ITI cards inside the computer. This was done post-flight 1892 (the ferry flight from EUG to PAE) by Don.

1. AIRCRAFT PARAMETERS

No problems noted.

2. STATE PARAMETERS

Rosemount static temperature (tstat): Numerous noise spikes are present in the data that affect from one to several seconds at a time. These must be excised from before use. Tstat tracked the tstatr values well and were very close though a difference (Rosemount lower than the tstatr by 1-5 C) has now been noted even when using the correction factors developed from the rawinsonde comparison. An investigation of this problem is underway. Until this is resolved, the correct temperature should be considered that indicated by tstatr. Be sure to note this!

Reverse Flow Temperature: Also impacted simultaneously by noise spikes but they are of a lesser magnitude (a few degrees or less) than those that affect the Rosemount sensor. It is still believed to indicate the most accurate temperature.

Ophir dewpoint (dp_o): Occasional noise spikes. Will be cleaned post-flight. May have been associated in some way with excessive icing observed.

Cambridge chilled mirror dewpoint (dp): Amplitude and period of heating cooling cycles changed during flight from no heating-cooling cycle evident (broke) to more than 10° C in maximum amplitude cycles! Also was briefly higher than the ambient temperature on the ferry leg to the research site. Will be cleaned post-flight. Some problems may have been associated with the excessive ice accumulated on this flight while performing the legs in orographic clouds, but then this, too, like so many of our venerable instruments, is more than 25 years old and has taken a lot of pounding.

Rosemount analog pressure transducer (pstat): Continues to exhibit spurious changes in pressure of up to several mb in per second. These, in turn, can, cause spurious standard pressure altitude changes of up to 30-50 m in one second. Sensor may be wearing out. It has been acting this way since the SAFARI project. We are in contact with the Rosemount Engineering group about this problem. We have not yet received literature on their comparable digital sensors as of 12/01/01.

3. Cloud Microstructure Probes

DMT Hot wire device: Worked sporadically amid numerous noise spikes.

JW Hot wire device: Worked for a few minutes total during the entire flight.

FSSP-100: Integrated LWCs disappeared for a few minutes while flying in the orographic clouds over the Pass as heavy icing impacted the instrument, a relatively rare event that requires a considerable icing rate. Otherwise the probe functioned extremely well with outstanding agreement (<15% diff. est.) with the PVM-100 LWC overall.

PMS 2-D cloud probe: Worked with the exception of a extensive period (>20 min) during the ferry leg to Oregon. Tom suggested that this was probably due to the fact that our early version of the 2-D probe is unable (the PMS manual indicates) to image particles when the true airspeed is $>125 \text{ m s}^{-1}$. This hypothesis seemed to be verified when the probe worked well in the research area at true air speeds lower than 125 m s^{-1} .

PMS 1-D cloud probe: Still indicating spurious data in clear air that continues when in-cloud thus compromising any usefulness of this probe so far. Don will align the probe today, but this seems more like a wiring problem than an alignment problem to me. Recall that the 15 channel 1-DC is now installed where the 32 channel FSSP-300 used to be.

SPEC HVPS: Periodic malfunctions noted, possibly due to heavy icing conditions. Resusitating either the 2-D or 1-D PMS precipitation probes, perhaps the latter as a replacement for the 1-DC, should be considered lest we not have large particle data. However, while we

physically have the 1-DP, it should first be shipped off for repair and calibration prior to installation. (Don, when he returns and has time, will bench check the 1-DP for problems.)

SPEC CPI: Intermittent outages though it performed somewhat better than on the previous flight. Needed to be “baby-sat” this flight due to software crashes as well as the black image problem. SPEC (Pat) recommended checking the seating of a graphics “bridge” card inside the computer among three possibilities for this problem: the computer, the wiring from the probe to the computer, and the Dhalsa camera itself post flight 1892.

4. AEROSOLS

Not QC-ed formally yet, but Tom has installed the manufacturer’s software that indicates via text in one of the CCN counter windows whether it needs liquid or not. Apparently, it ran out of liquid during the flight. Will be filled regularly by Vidal.