

Preliminary Squawk List for flight 1893,  
Flown on Thursday, 29 November 2001,  
Pre-IMPROVE II CV-580 flight 3.

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

### **OVERALL LOOK-WEATHER**

This flight occurred in a post-frontal situation with moist southwesterly flow in the Willamette Valley to about 850 mb and northwesterly flow above this level. Convection was muted due to a subsidence layer and was limited to enhanced mounding of cloud tops rather than noticeably (1km or more) protruding tops as occurs with lower temperatures aloft. Tops of clouds over the experimental ranged from 11-13 kft to with the highest tops observed (but not penetrated) at about 14 kft (the latter in an convectively enhanced region just southwest of the pass) at the time of the first east-west leg across Santiam Pass. The clouds situation consisted of multi-layered stratocumulus-like clouds with saddles and merged regions of clouds often consisting of convective regions most likely rooted in the boundary layer.

Liquid water, ice content, and drizzle drops were abundant and frequently varied greatly from one second to the next. Liquid water content, as measured with the FSSP-100, occasionally exceeded 0.5 g m<sup>-3</sup>. Droplet concentrations were "maritime", averaging less than 50 cm<sup>-3</sup>. Mainly clear ice on the top of the Pilewsky rod adjacent to the bubble reached a maximum of about 1 inch.

In sum, this flight, like the previous day's 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.

### **OVERALL LOOK-INSTRUMENTATION**

No progress in solving problems of the previous flight (1892) possibly due to the illness in key personnel. Namely, the DMT and J-W did not work and constitute serious losses in view of the discrepancy between the FSSP-100 and the PVM-100. Most of the time the LWC from this instrument was considerably below that of the FSSP-100 integrated LWC which is thought to be the most accurate nevertheless due to the cleaning and alignment performed prior to flight 1892.

A recurring problem that we are experiencing is receiving supposedly repaired hot wire devices that fail, as in the case of the J-W, soon after installation. It is suggested that a "factory rep" from one of both of the companies that manufacture or repair our hot wire devices

examine our wiring or installation setup to see if we are doing something wrong. This seems like it would be cheaper in the long run than either discarding these probes or sending them in repeatedly for the what seems to be the same problem.

A pernicious new “old” problem has surfaced. Apparently (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 several state parameters in the very numerous transmissions that occur during a flight.

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 two ITI cards inside the computer. This was done post-flight 1893.

## 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 the data. Tstat tracked the tstatr values well and were very close though a difference (Rosemount lower than the tstatr by 1-3 C) has now been noted using the correction factors developed from the rawinsonde comparison. An investigation of this problem is underway.

**Reverse Flow Temperature:** Also impacted simultaneously by noise spikes but they are of a lesser magnitude (a few degrees or less) than those in tstat.

**Ophir dewpoint (dp\_o):** Occasional cyclic noise that changed in amplitude and period during the flight. 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 not evident to more than 10° C in maximum amplitude. 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.

**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 11/26/01.

### **3. Cloud Microstructure Probes**

**DMT Hot wire device:** Did not work at all.

**JW Hot wire device:** Did not work at all.

**FSSP-100:** Integrated LWCs were generally considerably higher (a few tenths) than those being measured by the PVM-100. IT is thought that the PVM-100 is indicating lower than actual LWCs in these cases where there is disagreement since the FSSP-100 was recently cleaned and aligned.

**PVM-100:** Worked but LWCs were nearly always lower than those indicated by the FSSP-100 integrated LWC. It is suspected that the PVM-100 is the less accurate of the two. It is not clear why the PVM-100 is low since Don reported that he had just calibrated this instrument before flight 1891.

**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  $125 \text{ m s}^{-1}$ .

**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. Resustitating 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. Whether this is feasible will be checked on today.

**SPEC CPI:** Intermittent outages though it performed somewhat better than on the previous flight. Needs to be “baby-sat” it appears since one of the problems besides the “balck” images seemed to be software crashes.

#### **4. AEROSOLS**

Not QC-ed formally yet, but Tom has installed the CCN manufacturer’s software that indicates via text in one of the CCN counter windows whether it needs liquid. He found yesterday that it ran out of liquid during the flight yesterday. Details to be added.