

Squawk List for flight 1900,
Second flight flown on Thursday, 13 December 2001,
IMPROVE II CV-580 flight 10.

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

OVERALL LOOK-WEATHER

This flight sampled the main rainband of a strong front over the Cascade mountains of Oregon. The tops of the clouds generally extended well above the aircraft in the main rainband, but (ice tops) were lower and near flight level east of Santiam Pass. Crystals were largely unrimed until the lowest levels were reached and droplet clouds were encountered. Droplet concentrations where liquid cloud was intercepted (at the lower elevations) were again very low, 10s cm⁻³. This resulted in a broad droplet spectrum in spite of the high ice content. A few isolated drizzle drops were also encountered; more were likely to exist below the flight level given the broad droplet spectrum, though freezing via contact with snow is likely to have resulted in a very short lifetime for such drops.

OVERALL LOOK-INSTRUMENTATION

CPI was being repaired on the ground.

Hot wire LWCs did not work.

2-DC very sporadic in coverage, probably less than 50% of data is any good.

1. AIRCRAFT PARAMETERS

No problems noted.

2. STATE PARAMETERS

Rosemount static temperature (tstat): Noise spikes remain absent in this trace since we have begun powering down the J-W while in-flight. The Rosemount temperature is virtually the same as the tstatr at takeoff, but then diverged rapidly at 0205 UTC to several degrees C higher than tstatr. Looks almost like a heater was turned on then that affected this sensor.

This above behavior is very much similar to the old problem we have had with tstat that was first noted around flight 1809 except that the magnitude of the maximum temperature difference (generally about 1-5° C) is less than we were observing in those early days of the problem (5-10° C).

Thus, tstat cannot be considered a reliable measure of temperature except in rare circumstances, usually near the beginning of the flight. No correspondence with TAS has been noted (as has always been the case.)

Cambridge chilled mirror dewpoint (dp): Heating cooling cycles were of constant amplitude and period throughout flight meaning that the changes in amplitudes of this cycle that have been observed regularly on previous flights were somehow eliminated. It is not known at this time what if any work was done on this sensor to improve its performance. Will be checking into this.

Ophir dewpoint (dp_o): Very noisy after 0248 UTC.

Rosemount analog pressure transducer (pstat): Continues to exhibit spurious changes in pressure of up to several mb in per second.

3. Cloud Microstructure Probes

DMT Hot wire device: Did not work; no response whatever to cloud penetrations.

JW Hot wire device: Power was shutoff to the J-W to eradicate the noise spikes seen in several other parameters.

PVM-100: Exhibited a lot of spurious LWC spikes that I now believe on this particular flight are associated with ice aggregates since there is no FSSP-100 response to these spikes and we flew in possibly heavier snowfall than on previous flights. Otherwise agreement with the FSSP-100 LWC is very good.

PMS 2-DC Cloud Probe: The probe was undercounting the ice particles because the end diode array did not appear to be working. This array provides a solid line in the display that demarcates the end of a particle. With this missing, the end of a particle going through the array could not be calculated and so a whole buffer of particles would be counted as only one or two or several particles when, in fact, several dozen should have been counted.

Numerous shutdowns of the 2-DC were tried during the ferry leg and elsewhere in the hopes that doing so would improve its performance when it came back up, but this was only marginally successful, and often had no effect at all.

Since the 2-DC worked fine on the previous and during the following flight right after this one, it is not known what caused the problem other than possibly water contamination. This might have occurred

just before takeoff at Paine Field at the start of this flight since moderate rain was falling at door close through takeoff time with breezy conditions. However, the probe cover was taken off only at the last possible minute (door close time) so any water contamination was unavoidable.

PMS 1-D Cloud Probe: Counts in clear air compromise in-cloud data since the spectra look similar though it did have a “quiet” period in one clear air location. Seems to be the same problem that we have been having. I don’t believe now that the 1-DC probe has worked properly now since it was moved from the right to left wing and interchanged positions with the FSSP-300 even in spite of some spectra that, on first consideration, appeared to be satisfactory. A look back into a previous project (ASTEX) where it worked produced rather different spectra (akin to Marshall-Palmer—steady decrease in concentration as the size channels increase) than those that we are seeing now (semi-Gaussian or inverted Gaussian where the peaks are in the larger and smaller size channels. Looks now like all the recent 1-DC spectra are suspect.

SPEC CPI: Not installed, being repaired in consultation with SPEC by Charlie Black. Progress was made, but it is not yet fixed.

4. AEROSOLS

Not QC-ed.