

Flight 1897
December 8, 2001
Voice Transcriptions*
IMPROVE-2

8:29 PM

PH: This is UW flight 1897. Onboard are Hobbs, Rangno, Wilson, Salazar, Larry and Zan Sutherland, Ken McMillen and Bob Eatwell. We're heading out again on an IMPROVE-2 flight to the Santiam Pass area in Oregon to sample a cold front that's moving in and is probably now over the Willamette Valley. We may possibly have two flights today.

8:30 PM

AR: Looking to the southwest a multilayered situation with a stratocumulus overcast with some breaks below the aircraft. Top estimated depth was about 1,000 ft and bases only about 2,000 to 3,000 ft above the surface and they were undulatus-like bases with some turbulence up to cloud base and then it's been smooth into the cloud and above. Typically the undulatus indicating an over running situation with a cold dome underneath, somewhat colder air, an inversion right at cloud base. The Olympics are visible except for some tops are obscured in precipitation from a liquid-water topped altostratus-like clouds some of which are just above the aircraft. This will be seen in the forward video off about 1 o'clock and a little further out at 2 o'clock an elevated range of tops, boundary layer clouds, rising up estimated depths maybe 1 to 2 kilometers. Significant bunching of cloud tops there about 1:30 to 3 o'clock and then out to about 5 o'clock. That could be a frontal boundary suggesting something like a convergence zone, which would be expected today.

PH: We have no CPI onboard today. Charlie Black has been working on it yesterday and today. He found some water inside and some circuits that were corroded, but he hasn't got it back working yet.

8:32 PM

TW: Can someone let me know when it's a good time to zero the liquid water?

PH: Yes, but not just yet.

AR: There's no liquid water right now, Peter. There are some ice particles out there here and there.

* AR = Art Rangno, BE = Bob Eatwell, KM = Ken McMillen, LS = Larry Sutherland, PH = Peter Hobbs, TW = Tom Wilson, VS = Vidal Salazar, ZS = Zan Sutherland

PH: I was just waiting for a really clear spot.

AR: I don't know if there's anything ahead. I'd say looking forward anyway there's nothing imminent for quiet some minutes.

PH: It looks pretty good here.

VS: The CCN is up and running and is working very well.

AR: The 2-D is encountering in cool air it's usual characteristic after takeoff. I don't know whether we need to cycle the power or what, but it's not doing a good job.

TW: Art, I'll cycle power in just a second.

AR: We're getting a few snowflakes in the HVPS, which seems to be working normally. Here's another spot. We're actually free of ice crystals so it would be I suppose a little bit better. We'll be heading back into ice in about 30 s to a minute. There was something back there at the north part of Puget Sound, Peter, back behind the right wing that looked like it might be the frontal system. There was an elevation of enhanced boundary layer tops kind of resembling the convergence zone and today's frontal passage will bring that north wind at the same time it comes into Puget Sound so it would look like a convergence zone when it came through. Maybe up here it's beginning to make some landfall.

PH: The front was over Astoria about an hour ago.

AR: Will it be late then?

PH: No, it won't be late.

AR: If they had a windshift down there already, wow!

PH: The concern was we might be too early.

AR: Astoria is not very far from Santiam Pass. I can't image it's going to be moving that slowly because it will take an hour and 15 min to get down in the research area from here. Oh well, those guys are watching it so they know better than me.

PH: The 2-D is working okay now.

AR: Yes.

8:36 PM

VS: Tom, the CN-1 is not on. It didn't come up.

LS: Hello Peter, are you up?

8:38 PM

AR: After fiddling with the computer laptop, which takes a fair amount of time, I'm now looking through the bubble at water droplet cloud above the aircraft. Ice fallen and getting some nice it appears to be unrimed dendritic-type crystals. The sun's disc was visible there for a minute through the droplet clouds. Winds look good at 220 at about 60 knots, about a dead headwind of 60 knots, that is it looks good relative to model predictions for this time of day.

8:40 PM

PH: Charlie worked on the J-W the last few days. He thought he had it working. It is getting a signal, but it's not correct, well off, way too high.

TW: It seems to be jumping around a lot. Yet on the meter here, it doesn't show any jumping around so I'm going to look at the connections.

LS: Peter, are you up on the intercom?

PH: Yes, Larry.

LS: It looks like to me they put us on the east-west track now instead of the northeast-southwest.

PH: Okay. Initially we're going to be on southwest, but we'll take the coordinates we've got in hard copy here and I'll get an update as soon as I can make communication with them, which will just after cross the Columbia River.

LS: Okay. The first point that they gave us, 33°55'N/123°W, is right on the east-west leg.

PH: Okay. Then they must have changed it to an east-west leg. Yet on the diagram northeast-southwest.

LS: Yes, that's right too.

8:42 PM

AR: Looking back we're in between layers. The higher layer appeared to be composed of droplets with an ice fall, some ice crystals here, and the lower layer appears to be droplets. Correct, leave that as a question mark right now. It's either very low droplet concentration or ice cloud maybe below us. Things look like they're merging ahead in precipitation.

8:43 PM

AR: Now indicating droplet cloud in the low tens about 30/cc here. Liquid water content is low about a tenth.

PH: The FSSP and the PVM look okay. The J-W is not showing any signal at the moment.

AR: Roger.

PH: Except for noise spikes.

8:44 PM

AR: HVPS is impacted by noise of some kind at this time.

PH: Big dendrites on the 2-D probe.

8:46 PM

AR: Picking up some light icing here between clear and rim. I don't know how much icing you want to pick up en route, Peter. It could be a problem if we fly in a low icing situation even you know if the duration is there.

PH: Right. Larry or Zan?

LS: Go ahead, Peter.

PH: We're picking up some low icing here. If you can get out of it, it would probably be better so we don't pick up too much before we get on station.

LS: Okay. We'll see what we can do, Peter.

8:47 PM

LS: Peter, right now it doesn't look like we're going to be able to get out of it. This stuff is pretty extensive.

PH: Okay.

8:48 PM

LS: Peter, do you copy?

TW: He's on the radio right now.

LS: Okay.

8:51 PM

TW: Peter, Larry wanted to talk to you.

PH: Yes, Larry.

LS: Peter, have you got a point for us to start on this trek?

PH: Yes, it will be the point that's given on our hard copy, 43°55'/123°1. That's pretty near the S-Pol radar. It's normally our start point for an east-west track, but that's the start point. In fact, the tracks that we will be flying will be southwest-northeast.

LS: Okay. But that point doesn't follow in that track, does it?

PH: We go from 43°55' to 44°27'. It doesn't look very southwest-northeast, does it?

LS: No. Peter, that looks pretty good to me.

PH: It's supposed to be a southwest-northeast track except we start off pretty close to the S-Pol radar. Now the cloud tops down at the S-Pol radar are 16,000 ft. That's where we're starting so I think maybe you can break out of this if you climb another 1,000 ft or so.

LS: Okay. We'll see what they say about altitudes.

8:54 PM

AR: We're continuing to pick up some icing as you can tell, Peter. It's getting a little more significant. Maybe if the tops around here are somewhere near 16,000 ft, they seem higher than that to me actually, but anyway we could get out of this stuff and dry out a little bit. I think the 2-D is stuck again.

PH: Yes.

8:55 PM

AR: It's disappointing that the J-W is not fixed. Yes, I was expecting that to work because it seemed like there was a switcheroo thing there that was going to take care of that. You know, the wrong probe had been put on or something like that. Actually, we're developing a little slot here off the right wing between layers. This is good probably because it means we're not going to get any icing here for at least a couple of minutes. Tom, did you copy that the 2-D is dead?

TW: I'll take a look at it.

8:56 PM

AR: There's been quite a little liquid water in here up to 0.2 now so the icing is really building up.

PH: Larry?

AR: Okay, the 2-D is alive.

PH: Larry?

8:57 PM

PH: Also tops they say on the radar, echo research tops, this cloud top maybe much higher.

AR: Roger. I just noticed a little burst of what looked like some small drizzle drops there too.

PH: I saw that.

8:57 PM

AR: Did you say he was going to climb or is that something he's working out? More drizzle drops it looks like anyway.

PH: Getting spherical graupel here now.

AR: Beginning to brighten a little bit up top now.

8:58 PM

AR: I'm sorry, Peter, did you say Larry was going to work on getting higher?

PH: Well he has, he's gone higher. He's gone about 1,000 ft higher. I just spoke to him.

AR: Roger.

PH: But we haven't broken out.

AR: I suspect the tops down there must be a little different than here because there is no indication we're too close to cloud top. Probably another 3,000 ft, I would say, we would have to climb.

PH: They're saying radar echo tops.

AR: Roger. That's probably not the same down there as here. We're probably a little closer to that front than they are if the front is oriented north-northeast/south-southwest.

PH: Right. We could be pretty close to the front here. Larry?

9:00 PM

PH: How are the CN counters doing?

VS: The CN counters are showing zero counts. It's because of the piping I guess.

PH: And the CCN?

VS: The CCN is working pretty well. It's showing lower counts at this altitude and the detected voltage is pretty stable.

PH: Okay. It's a pity we've picked up this icing before moving on station here.

AR: We're coming into a slot here.

9:01 PM

AR: Peter, is there some reason why we can't climb on top, maybe we'd use up too much fuel? Get rid of some of this ice.

LS: Peter, are you up?

PH: Yes, Larry.

LS: Peter, it's going to be another 50 min before we're on station down there on the line.

PH: Okay. Can you climb anymore to see if you can get rid of this icing?

LS: No. We've got icing here up to 21,000 ft. I tell you what, if we're not out of it here in another 20 min, we'll ask for it and try to get clear.

PH: Okay.

AR: The chances are this cold front as you can imagine, Peter, it's going to be pretty bad over the mountains if we do get that frontal passage and we may have to exit something important early just because of our darn ice buildup.

PH: Well if it's a deep system we may not get that much icing high up.

AR: Well we can hope it's a deep one. Do you know if this is a narrow cold frontal-type of band because a lot of times those things have pretty deep icing along the wind-shift line.

9:03 PM

AR: Peter, I understand they want us to start at 16,000 ft on that first pass.

9:04 PM

AR: Peter's on the radio so I'll hold off.

9:05 PM

PH: The precip is only starting to move into the Willamette Valley, so this system is still proceeding slowly. Because there is nothing to look out over the Santiam Pass, the P-3 is working just along the coast at the moment. They may have us go and join them on the coast to look at the system as it comes inland.

AR: Roger and it might give us an opportunity to get rid some of this ice before we really do the science we want too. That sounds pretty good.

PH: I suggested that if we're early we land and get rid of the ice, but that's one possible option. Just had some ice fly off the cowlings of the engine just then.

9:06 PM

AR: It looks like the 2-D has gone dead again. There it goes.

9:07 PM

AR: Tom, I think the 2-D has a problem. It's triggering occasionally, but with the FSSP spectrum indicating drops way up around 30 microns or so it should be triggering almost constantly.

TW: Do you want me to reset it?

AR: Yes, and it looks to me like there's snow up there too. See what Mr. HVPS says. It looks dead too.

TW: I just recycled power. How is it looking?

AR: HVPS is dead and the 2-D is responding, but I don't see any particles. There's something there. It's looking better now.

TW: We're gaining altitude, aren't we?

AR: That's a negative right now. We did climb a while back 1,000 ft. We've more or less leveled out at that height about 15,700 TANS alt.

9:09 PM

AR: Not much change in the opacity of the clouds over us. It's still pretty dark looking, no disc of the sun, and ice continues to build up.

PH: Larry?

LS: Go ahead, Peter.

PH: We're building up quite a bit of icing and hearing it flying off.

LS: Okay.

AR: I was just going to mention, Peter, that the next thing that might go wrong here is the FSSP will start under representing the liquid water out there because the heater might not be able to keep up with this amount of icing. So far so good. The FSSP and PVM are doing real well, but that would be something to look for in the minutes ahead.

PH: Larry?

LS: Go ahead, Peter.

PH: Maybe we should go down lower and get below freezing and get rid of all this stuff.

LS: Okay. We're just discussing that, Peter, but you want to come back up when you're done there, right?

PH: Yes, but we've got the option of landing today. So fuel is not as big a question.

LS: Okay. There's always a chance, of course, that we could run out of this down here too.

PH: Yes. I'm just concerned about going into the research area with this amount of ice to begin with.

LS: Okay. We're not due down there for another half hour, Peter, why don't we hang it up here for another 5 or 10 min and, if we don't get rid of it, we'll go down there and get low enough to melt it off and then climb back up.

PH: Okay.

9:12 PM

AR: The Pilewskie rod now has about equal to the most icing I've seen sticking forward at the top of the rod. That Mr. FSSP is doing a good job still.

9:15 PM

AR: Peter, is the radar indicating precipitation to the ground in this region or are we just flying in sort of mid-level altocumulus with virga hanging out of it?

9:16 PM

PH: Larry?

LS: Okay, Peter, we're out of 16,000 ft now and going down to 9,000 ft.

PH: I think that's the best thing to do. Since the front is still just off the coast, they're talking about us having to go out to the front as it comes in onshore. In that case we would be down low anyway so you might as well lose that altitude now.

LS: Okay.

TW: I need to restart this.

AR: Peter, the front hasn't gone by Astoria yet?

PH: Well Cliff told me it went by Astoria before we took off. It's still just off the coast so it's landed. They're seeing a good narrow cold-frontal rainband on the front on the coast and they're sending the P-3 up to get radar images of that and talking about possibly having us go out to intercept that front as it comes in.

AR: Roger. Tom, it looks like the 2-D has stopped again.

PH: They're going to go down to 9,000 ft and see if we can shed some ice.

AR: The 2-D is back.

PH: What was the freezing level, Art?

AR: I would guess it's going to be... I didn't look it up in Salem this morning, Peter, sorry. It's going to be in the 7,000 ft area, my guess. It's just a guess.

PH: Larry?

LS: Go ahead, Peter.

PH: You're probably going to have to descend to about 7,000 ft to get below the freezing level.

LS: Okay. I figured 9,000 ft would do it. But if it doesn't, we'll just keep going down.

PH: Okay. We're getting nice agreement between the FSSP and PVM.

AR: Yes, thank heavens.

PH: The J-W is out of it.

LS: Peter, right now I've got us going through that first point after we pass Newberg down here, which is another 13 miles. If you want to go out and pick up that front from the west, I'll standby for a new coordinate.

PH: Okay. I'll get back to you.

9:20 PM

AR: It looks like maybe the FSSP has been impacted by icing now. That good agreement has seemingly dissipated here in the last 10 to 20 s or so, Peter. I'm looking at the spectra and it looks like all the FSSP counts are in the small channels, which goes along with an icing. That's typical of heavy icing impacting the measurements from our limited experience with that.

TW: He's on the radio.

AR: I understand. I'll just leave that for the tape then. It looks like true airspeed has gone bad.

TW: It has?

AR: Well, correction. It looks like something. The 2-D images, at least some of them, are kind of stretched out like streakers. Sometimes that is when the feed to the 2-D is off. Is that the default, 125 meters per second or something, Tom?

TW: We're right on the cusp right now, so it shouldn't be more than just a spec off.

9:22 PM

AR: Now is a record for the Pilewskie. That thing is sticking out maybe over an inch toward the upwind direction, the icing, the piece of ice here.

TW: It's coming off pretty hard on the front of the plane here.

AR: Yes, I think I'll stay out of the bubble for a minute. It looks like the FSSP is back and showing excellent agreement again with the PVM. Hollow columns in the Hallett-Mossop temperature zone.

PH: Larry?

LS: Go ahead, Peter.

PH: I'm going to give you a new lat/long, 44°22.9'/123°43.6'.

LS: Okay, 44°22.9'/123°43.6'.

PH: Yes, and that will be our easterly point. We'll be heading due west from there and let's start out at 7,000 ft. I'll get a westerly lat/long for you as soon as I can. From the point I gave you, just head due west.

LS: Okay. Peter, we're level at 9,000 ft here now and we're just on top of the layer and I think we're going to maintain and remain on top. So maybe we ought to stay here for awhile.

PH: Okay. Temperature here is about -5°C , but we have got rid of a lot of the ice that was on the airplane.

LS: I'm showing my temperature up here is 0°C , Peter.

AR: Ours are corrected for ram. Also we have that additional correction due to the rawinsonde calibration, which makes it another degree of so.

PH: What's your best estimate of the temperature, Art?

AR: I think it's at -5°C just about what it says. We're seeing a lot of Hallett-Mossop type crystals, needles, hollow columns and that kind of thing. We were in some droplet cloud back there.

TW: It looks like our t-totr is about 0°C .

AR: Yes, I think that's probably what he's looking at.

PH: Larry?

LS: Yes, go ahead.

PH: You're getting the ram pressure increasing the temperature there. The actual air temperature is more like -5°C .

LS: Okay. I can see it melting out front though.

PH: Yes, because the ram air is helping that. That's okay. We've melted off the icing on the airframe. So on that east to west run, we'll just adjust it to put ourselves in cloud somewhere near this altitude.

LS: Okay.

PH: Art, you can get into the game on that once we get to our easterly point we'll be heading west toward the front and we'll adjust the altitude to put us in cloud.

AR: Roger, Peter.

PH: Are you in contact with the P-3, Larry?

LS: Not at this time.

PH: You might want to establish contact because they're flying on the coast out toward where we'll be heading. I don't know their altitude.

LS: Okay.

9:27 PM

PH: Is your radar working, Larry?

LS: It's sweeping, Peter, but we're not really receiving anything.

9:28 PM

PH: You'll probably see quite a bit of icing on your radar cover.

AR: As Larry mentioned, we are in between layers just at cloud top of a lower solid stratocumulus layer and an ice fall over us that's coming down to this level and then the two seem to merge directly off the right wing. Off the left there is increasing separation, that would be toward the east, which makes sense with the frontal.

PH: Getting some virga just back there.

AR: The frontal boundary off to the right wing.

PH: And a clear slot here. Some fallout from the cloud overhead.

9:30 PM

PH: Winds look reasonable. Larry, how long until our starting point?

9:31 PM

LS: Okay, Peter. We're going down to 7,000 ft to get rid of some more of this ice.

PH: Okay. How long until our starting point?

LS: Hang on one. About 20 min.

PH: Thank you. Just approached.

LS: Make it 18 min.

AR: Picking up light turbulence as we descended into the lower stratiform layer. We're still just about at cloud top though and tops are shred-like, which suggest to me a bit of turbulence and wind shear. We haven't lost any of this ice on the Pilewskie rod here at least that I can tell.

9:33 PM

AR: The freezing level is going to be closer to 5,000 ft. It was 7,000 ft the wild guess I made.

9:35 PM

AR: The first static temperature is about -2.5°C , so we should start seeing some serious melt off here shortly.

PH: Larry?

LS: Go ahead, Peter.

PH: I have a westerly point for you to head for once we get to our easterly point.

LS: Go ahead.

PH: $44^{\circ}22.6'/124^{\circ}28.4'$ and we'd like to do that at 7,000 ft.

LS: 44°22.6' and 124°28.4', and you want that at 7,000 ft. We're at 6,000 ft now, Peter. We'll see if we can get rid of some more of this ice and then we'll climb back up.

PH: Yes, right. Now if we head west, we'll probably go through the front, so we have to be cautious there. Then we'll climb up successively, you know, as we head back east we'll climb to 9,000 ft and we'll step up in 2,000 ft intervals going backward and forward, east-west.

LS: Okay.

PH: I'll give you the updates on the new lat/longs.

LS: Okay.

AR: You might check with the boys down there where the front is because we just had a windshift here on our way down now at west-southwest, which to me might indicate that we went through the front with that little bit of enhanced liquid water back there.

PH: I'll check.

9:37 PM

AR: Along with that, the temperature is starting to go back down again as we've gone on this heading. I've noticed we've dropped in elevation a little bit, but the temperature is certainly dropping.

PH: Now the front is still about 10 miles offshore.

AR: Well two things happened, the wind direction changed as you can see there, remember you just looked at it, and the temperature is dropping as we fly level in this direction at 850 mb or so or 800.

PH: I think they've got a pretty good fix on the radar on the narrow cold frontal rainband being just offshore. We may just have gone through a prefrontal band.

AR: Roger. That must be what it is.

PH: Larry?

LS: Yes, Peter.

PH: The main cold front band is about 10 miles off the coast and the westerly point I gave you should take us just beyond the back edge of that.

LS: Okay.

PH: We're going to be off the coast on that westerly point.

AR: The ice has gone off the Pilewskie rod and off the top of the tail.

PH: No problems from Air Traffic Control on this unexpected track, Larry?

LS: No.

PH: Very good. Let me know when we get to our easterly point and we're starting to head west.

LS: Roger.

9:39 PM

PH: Nice images on the 2-D.

AR: It's been working pretty nicely here for quite a few minutes.

PH: Good liquid water measurements from the FSSP and the PVM. The only thing we're missing is the CPI.

VS: And the CN-2.

9:40 PM

PH: Mainly column crystals here.

AR: Still flying between layers here. I was down looking at the computer for a while to see how this came about. Looking back it looks like we were in a merged situation now definitely a tinge of blue above us.

PH: Also variations in crystal types of a small spatial distances here. We're now more into rimed and graupel-type particles.

AR: Blue sky visible back there behind the right wing. A little different top situation than we've had.

PH: This run we're going to go through this narrow cold front rainband, Art, which is just approaching the coast. They put us at an altitude above where the main turbulence and wind shear should be, but we've got to be a bit careful there.

AR: Roger. I'm looking for something out there. I see the wind has come around even more. I just say 270 to 280 now. Maybe there's a double windshift of some type. Maybe 320 offshore and 270 in here.

9:43 PM

AR: Now 285° azimuth in the wind.

LS: Hello Peter.

PH: Yes.

LS: I still see a little bit of ice out there on the radar. Are you okay on your instruments?

PH: Yes, our instruments are good.

LS: Okay. I'd asked for 5,000 ft, but I'll cancel that.

PH: Just beginning to see the icing on my window beginning to get a bit slippery, start to slip off.

LS: Okay.

9:44 PM

PH: What's the t-tot here, Art?

AR: Our static temperature is -3.5° .

PH: And the total?

AR: It would be about $+0^{\circ}$. I don't have it up on my computer.

PH: I don't either.

TW: t-tot is 2.3° , 2.4° .

PH: Yes, it's melting things but rather slowly.

AR: Yes, there's no ice on the airframe that I can see except on the ray dome out there off the right wing.

PH: Right.

AR: And, as with your bubble, there's a little bit here on the bubble in the back.

PH: Larry?

9:45 PM

PH: Larry?

LS: Yes, Peter.

PH: There's no icing on the airframe. The only icing is on your ray dome.

LS: Okay.

PH: Remember, Larry, as we head west, we are going to pass through a fairly well defined cold frontal band. It's going to maybe be a bit bumpy.

LS: Okay.

9:46 PM

PH: J-W spikes do occur generally where there is some liquid water. They're just way off scale too high.

9:47 PM

LS: Peter, we're climbing to 7,000 ft now and we're going to do a little reversal here to get on the track. We're just coming onto it now. I'll tell you when we leave our point going to the west there.

PH: Okay. Did you make contact with the P-3?

LS: No, but I think we're going to try one more time.

9:48 PM

AR: Just for the record on that southwest heading at about 5,500 ft, we do see a temperature drop of about a degree and then a leveling, along with that a windshift at flight level about 810 mb or a little above 850 mb surface. The wind direction came from about 220 to 270 to 280.

LS: Peter, no contact on the UHF with NOAA.

PH: I'll see if I can contact them.

9:49 PM

LS: Peter, we're on the track. We're about 2 miles to the east of it. When we cross it I'll give you a mark.

9:50 PM

PH: Larry?

LS: Go ahead, Peter.

PH: I just contacted the P-3. They're going to be running north-south tracks. At the moment they're at 6,000. They're going to request a drop to 5,000 ft. I've asked the pilot to try to contact you.

LS: Okay. You might tell him, Peter, that we're just getting nothing but a lot of static on our UHF. I don't know whether the antenna is iced up or what the problem is. Why don't you have him try UHF frequency, get that frequency for us? I'm sorry, a VHF frequency.

PH: Okay. You want to know what our frequency is?

LS: That's right. We're on the track now and it's 31 miles up from that westerly point.

PH: Okay.

9:51 PM

AR: We're flying in an amorphous situation. No cloud detail visible what so ever, mainly precipitation.

PH: Just starting our first east-west track heading out towards the coast at 7,000 ft. We should be intercepting the front near the coast.

AR: The particles look like rimed dendritic forms and every once in a while some hollow columns and amorphous particles that are not readily identifiable, maybe a needle. It looked like a needle just then. Our static reverse flow -4.5 , which is prime for the Hallett-Mossop phenomenon, and I hope this will also result in a minimization of the icing that we encounter in this leg.

9:53 PM

PH: Ken. Hello Ken or Zan.

AR: The particles look much less rimed now. The time 21:54:25.

PH: Art, would you ask Larry to come back and see me.

AR: Will do.

PH: Ken?

9:54 PM

PH: Just approaching the coast.

9:57 PM

PH: Ken?

KM: Go.

PH: They're trying to contact you on 123.95.

9:58 PM

AR: Got a couple of enormous aggregates back there. They're probably 2 inches in diameter I would say in the HVPS.

PH: We should be going through the front just about here. Getting a bit bumpy.

AR: I'll look for something. The temperature has been steadily decreasing along this track, Peter, and the wind has remained at 270°, which on the way down here was more like 220°. There must be another windshift out there, you know, maybe it's kind of like I mentioned before maybe it will come around 320° or 310°, you know, as we come across this thing.

PH: I'm going to talk to the radar again.

9:59 PM

KM: Peter, where do you want to go when we get out to this westerly point?

TW: He's on the radio.

10:01 PM

AR: During this period, at least in the last few seconds, indicating unrimed crystals. The sky does seem to be darkening a bit in this direction of heading west. Also, beginning about 2 min ago, the temperature increased about half a degree.

10:02 PM

KM: Peter?

TW: He's still on the radio.

10:03 PM

AR: One thing that has happened is the wind direction has veered more to 280° now. It has been running 270°, pretty steady at about 50 knots. Now at 280° at about 40 knots, 19 meters per second. We're in a straight line.

PH: The NOAA P-3 reported that the windshift is well ahead of the frontal rainband, so that would explain some of the observations.

KM: Say Peter?

PH: Yes.

KM: We're just about at our point just off the coast. What would you like us to do now?

PH: When you get to your point, you can just do a reciprocal and go back to the same easterly point that we started out from on this leg, but we'll be climbing steadily to 9,000 ft.

KM: Okay. That's a point that's not on or established east-west track?

PH: I'll give you the easterly point to head back to.

KM: Okay.

PH: 44°22.9'/123°43.6'.

KM: Okay.

PH: And we'll be climbing to 9,000 ft.

10:05 PM

AR: Peter, in the last 2 or 3 min the wind has gone from a steady 270°. You can see it coming around at 290° now approximately.

PH: Right.

AR: Something is out here.

PH: Yes. Did you notice any increase in precip as we crossed the coast?

AR: Did I notice any what?

PH: Increase in precip.

AR: I didn't notice when we were at the coast. But there were a number of huge aggregates, which I commented on. I think you were on the radio. It was someplace near there.

PH: I think most of the activity on this front is probably beneath us and we're not planning on going below 7,000 ft.

10:06 PM

PH: The wind is now around near 340°.

AR: I think that may be because he's turning.

PH: Yes.

AR: We'll have to wait until he gets out of the turn.

PH: We just completed our first east to west track through the cold front as it comes into the coast. We're now going to be going back to the east, the same easterly point that we came from, and we'll be climbing to 9,000 ft.

10:07 PM

AR: We didn't pick up any icing on this leg either and no appreciable liquid water content.

PH: Right. This front has just progressively slowed down. I can see why Cliff was trying to slow everything down on the aircraft.

AR: Certainly got a bit of a complicated structure too with that windshift. I guess the P-3 saw it too way out ahead of this point.

PH: Yes, they saw the main windshift ahead of the main rainband.

AR: There are some big aggregates out here again, on the HVPS especially.

PH: Yes, I haven't seen anything that big on the HVPS.

AR: There's one. Did you see that one?

PH: Yes.

10:08 PM

AR: It's great to see the HVPS working so well on this flight too.

KM: Peter, what rate of climb do you want?

PH: Just climb steadily so you end up at about 9,000 ft at your easterly point.

KM: Just climb steady so we end up at 9,000 ft at the easterly point, 31 miles.

PH: Right.

10:09 PM

PH: Big aggregates again. We're heading back toward the east now.

10:10 PM

PH: We'll be climbing out of 7,000 ft up to 9,000 ft. Ken?

KM: Go.

PH: Did you manage to make contact with the P-3?

KM: Yes, we did.

PH: They're going to be well below us from now on.

AR: No sign of cloud top here, continuing gray and profuse. There was no sign of any, that I could tell anyway, any particular microstructural change when the windshift began to occur. Possibly the aggregates were a little bit bigger in that turnaround point if anything, I thought, but I wasn't watching every second. It's something to look for later and they don't appear to be rimed. This is at 22:12:10.

10:12 PM

AR: I'm thinking this might be a wind shear zone, Peter. Below this level when we came this way, the winds were 280°, 270°, and now they're 260°, so we're probably in that frontal zone aloft possibly. If that's the case, then the temperature should be; well of course we're climbing, so that's going to nullify what I was going to say. I'm quite confident this turbulence is due to that frontal zone, that wind shear.

10:13 PM

PH: Yes, it's just about right. It's just off the coast.

AR: Yes, the winds continuing to back giving further evidence that we're some kind of frontal boundary aloft.

10:14 PM

AR: In fact the temperature has remained the same or climbed maybe a tenth or so in the last minute or two. You would think the surface position would be well out in the Willamette Valley if it's a normal frontal situation. I wonder if it's one of these occasional ones we see where the shallow portion comes through first, a couple thousand feet thick, and then it kind of slopes back.

KM: Peter, where are you going to want to go when we reach this next point. We're 3 min out.

PH: I think you're further out than that aren't you, Ken, from the easterly point? Your easterly point was $44^{\circ}22.9'/123^{\circ}43.6'$.

KM: That's correct.

PH: And we're only 3 min out from that? Okay. Then after you reach that point, we'll head back to our previously westerly point and we can climb to 11,000 ft on that leg back.

10:15 PM

AR: And looking around from the bubble still can't make anything out. It just seems to be precipitation, no icing has accumulated yet.

10:17 PM

PH: Ken?

KM: Go.

PH: On the leg back to the west, let's keep at 9,000 ft, steady 9,000, and I'll give you a new westerly point.

KM: Okay. When do you want us to turn for the new westerly point, as soon as we reverse here?

PH: As soon as you get to the easterly point.

KM: Ready to copy.

PH: I'm going to give you the new westerly point then. It's the same latitude as we had before, but it was 44°22.6'. The longitude will be 124°10.6'.

KM: 44°22.6' and 124°10.6'.

PH: That's correct. We'll go back at 9,000 ft.

10:18 PM

AR: The Sun's disc is visible back behind the tail.

10:19 PM

AR: And that was visible through droplet cloud layers up there and precipitation between those droplet clouds and the plane. Ophir dew point appears to have noise spikes in it that goes from a reasonable -8 or so to -28. The Cambridge on the other hand is holding pretty constant at around -6.8. Turn here at 9,000, TANS-alt 8637. Our temperature is -8.3, -8.2, reverse temperature, and we'll watch that for any glitches on the way back. That is any real changes do to a frontal surface being intercepted.

10:21 PM

PH: So we're just doing our turn at the easterly point and we'll be heading back to the west at 9,000 ft, a good steady 9,000 ft. The tops of this system are probably not very high.

AR: A little shallower at our eastern turnaround point anyway. I was able to make out the disc of the Sun back there briefly toward the southwest.

PH: Yes, the radar tops are not much above 11,000 ft.

AR: In this area?

PH: Well on this east-west track over the front.

10:22 PM

AR: There's the Sun's disc again off around 10 o'clock, mainly looking at it through ice and snow with the rest droplet clouds up there above the aircraft.

10:23 PM

PH: Just near the top of the Hallet-Mossop zone here.

10:24 PM

AR: The Sun's disc has disappeared now.

PH: Are you sure CNC-2 is not working? I'm getting some sort of readout from it here.

VS: The instrument is showing filling. It's not showing any numbers.

PH: Showing what?

VS: It says filling.

AR: That's the error message. It's supposed to be there when the instrument runs out of liquid and Tom corrected that situation. Before we weren't reading that error message to tell us it had run out.

PH: It seems to be working.

10:25 PM

PH: I notice we're getting some spikes on the PVM, anomalous spikes fairly frequently.

AR: A little turbulence.

PH: A few miles east of the coast turbulence was picked up.

AR: I don't see those spikes in the PVM. Maybe I've got the wrong color up here. I see them in the J-W and the DMT.

PH: See them in the blue about 15 to 20 min ago?

KM: Peter, we're about 4 min out of this westerly point. Do you know where we'll go then?

PH: I'll get a new point, standby. Got a new point. Standby, Ken.

10:27 PM

AR: Conditions remain unchanged. The Sun's disc is no longer visible and the sky is moderately dark and there is no cloud detail visible in the way of layers, shred clouds or anything else going by. We continue to have a little turbulence here as we approach the frontal zone aloft. Currently winds still 240° at about 18 meters per second. We have not seen a windshift and the temperature remains between -7.5° and -8°.

PH: Ken?

KM: Go.

PH: Our new easterly point will be 44°22.9'/123°30.3'.

KM: 44°22.9'/123°13.3'.

PH: 30.3', 30.3 right. We'll be climbing to 11,000 ft.

KM: Okay, that last one is 123°30.3'.

PH: Correct. Climb steadily to 11,000 ft.

10:29 PM

AR: We've had a windshift here from about 240° to 255°, 260°. It would be within the last minute. The temperature has dropped a few tenths is all, even just a couple of tenths. Definite windshift here.

PH: Yes, just off the coast.

10:30 PM

PH: The speed that this is moving in, or the lack of it, probably means that after we finish these profiles we'll probably land and wait for it to move into the Cascades.

AR: Roger. They're not getting any precip out of it yet or are they waiting for this particular band to go through?

PH: I'm not sure if they're getting precip in the Santiam Pass yet, maybe they are.

AR: It's not important.

10:31 PM

AR: I was just thinking in the back of my mind...

END TAPE SIDE 1

PH: Thanks, Ken.

AR: As the precip breaks out in the mountains there way ahead of what you're looking at say back here and I wouldn't be surprised today if they weren't watching this rainband and then suddenly the clouds begin deepening up, orographic cloud you

know develops and deepens up rapidly and then suddenly they're in the midst of it just within an hour or two as the echoes develop over the mountains.

PH: Right. We do want to sample both the prefrontal, the frontal and the postfrontal, but to do all that I think we're still going to have to land.

AR: Roger that. This is a tricky one.

10:32 PM

AR: I think this is somewhere in the same area we saw these bit aggregates before as I notice a couple of big ones there go through the HVPS here a few seconds ago.

10:34 PM

AR: It looks like we're back on the other side of the windshift. The winds have come back to 240° or so, 255° out there approaching the west endpoint.

10:36 PM

AR: Again getting a little enhanced turbulence here.

PH: Ken?

KM: Go.

PH: How long do we have to fly now before we could land in Oregon? Are we able to land now or do we need to use up some more fuel?

KM: No, we could land now.

PH: We'll probably do that after we finish working this current back and forth because the precip hasn't moved into Santiam Pass yet.

10:37 PM

KM: Peter, we're 4 min out of this easterly point, where next?

10:39 PM

PH: Ken?

KM: Go.

PH: Our new westerly point.

KM: Go ahead.

PH: 44°22.6', which is the same as it was before, and 123°58.2'.

KM: 44°22.6'/123°58.2'.

PH: Correct, and we'll be going back at level of 11,000 ft.

KM: Okay. That will be a little further west than the last. Okay, I've got it.

10:40 PM

PH: The pattern is progressively moving eastward.

AR: Conditions remaining unchanged. No Sun disc visible. No sign of any particular cloud structure. It's all pretty diffuse. We're flying in light to moderate snow and generally the crystal aggregates here are unrimed. Before too long, I presume, the Sun's disc will be visible as we head toward our east endpoint. 22:41:35.

10:41 PM

KM: When we turn we'll be at 11,000 ft, won't we Peter?

TW: He's on the radio right now.

10:42 PM

KM: This return leg was going to be at 11,000 ft, wasn't it Peter?

10:44 PM

AR: Yes, I'm sure that's what it was, Ken. I'll speak up for Peter.

KM: Okay, thank you.

PH: What was that, I was on the other radio?

AR: He wanted to know the flight level.

PH: It's back at 11,000 ft.

KM: Say again.

PH: Back at 11,000 ft, to the west at 11,000 ft.

AR: Peter, do you think we're at cloud top at 11,000 ft? You were saying earlier they thought the tops were at 11,000 ft. You can see they're quite a bit higher than that. I'm estimating probably 3,000 to 5,000 ft more.

PH: Yes. I think they were a little surprised at that, but they just don't see cloud top.

AR: Right. I suspect this is one of these water top situations. That's why it probably looks deeper than it really is, is my guess.

PH: The precip is now at Sweet Home where the radar is, but nothing in the pass yet.

10:45 PM

PH: Ken?

KM: Go.

PH: What is the minimum altitude you can fly on our westerly track, that is the minimum altitude over the Oregon coastal range?

KM: We can find out.

AR: Starting to pick up some of those drizzle drops again. There's a trace of icing, however, thus far.

KM: It should be 6,000 ft, Peter.

PH: 6,000 ft.

KM: Do you want to go to 6,000 ft?

PH: No, keep it at 11,000 ft.

AR: No evidence of cloud top here. Nothing seems to have changed looking vertically upward and around in the bubble.

10:47 PM

VS: Peter, are you thinking of doing a CCN spectra?

10:48 PM

AR: Crystals appear to be largely unrimed. It did look like some short hollow columns there. I haven't seen a region of what appeared to be a few drizzle drops since I mentioned them a while back, 22:48:48 is the time of this comment. It looks capped columns back there.

10:49 PM

AR: I'd say reverse flow static and Rosemount static are pretty much exactly the same on this flight, which is pretty good. When we are near the freezing level, say -3° or -2° , we did have small crystals that showed no sign of melting so I feel pretty confident that those temperatures are pretty much on the money. Ophir dew point is bouncing around about -7° to -12° a little bit again. That's too high. The Cambridge dew point is a little bit too high. It's running around -10 compared to an ambient temperature of about -11° .

10:50 PM

PH: Ken.

KM: Go.

PH: A new easterly point.

KM: Go ahead.

PH: $44^{\circ}22.6'/123^{\circ}23.5'$.

KM: $44^{\circ}22.6'/123^{\circ}23.5'$.

PH: Correct, and we'll be climbing steadily to 13,000 ft.

10:51 PM

AR: It remains dark, no cloud detail, and light snow. We've not picked up any icing beyond the little trace I described earlier when we had what appeared to be a few drizzle drops, a little pocket of drizzle drops.

10:52 PM

PH: Big aggregates again here. Much liquid water here in the last 7 min, lots of crystals.

AR: Yes, we haven't picked up any icing since we started working this whole frontal system out here. Just a trace there about 5 min ago or so there were some drizzle drops that went by in an extremely tiny pocket.

10:54 PM

AR: It could probably be that same area right in here, Peter, that we hit a little liquid water and there were a couple of drizzle drops at least from the 2-D it looked like drizzle drops.

PH: Where we hit the turbulence?

AR: I don't remember whether there was turbulence or not. We haven't gone through the windshift line yet.

PH: There is goes there.

AR: Are we turning or is that my imagination?

PH: He may have started his turn. He must be turning.

AR: Yes.

10:55 PM

PH: We're just starting our turn at our westerly point. We'll be heading back to the east and climbing steadily to 13,000 ft. These tracks should take us through the upper part of the cold front.

10:56 PM

PH: Larry?

LS: Standby, Peter.

11:01 PM

LS: Go ahead, Peter.

PH: Our new easterly point.

LS: Go ahead.

PH: Sorry, our new westerly point, 44°22.6'/123°39.2'.

LS: 44°22.6'/123°39.2'.

PH: Correct, and we'll be going back at 13,000 ft back to the west.

LS: Okay.

PH: Now, Larry, if we were to land at Eugene say, at the end of this flight, can you tell me how much longer we have on station?

LS: You mean if we originate another flight how long can we stay up?

PH: No, if we just continue this flight, how long can we stay up, you know, doing our research here before we land in Eugene to refuel?

LS: Hang on one.

AR: Continuing on as before, diffuse, dark gray sky, no sign of tops. I believe that's because of a water topped layer that is reflecting more of the sunlight than an ice only layer would. I guessing when we get on top of this we will not have an ice top, but that still remains to be seen as we plod on here climbing up now at 12,200 ft approaching our east endpoint.

LS: Peter, we probably have an hour and 45 min to 2 h out here.

PH: We've done 2 ½ h already, so only another 2 h if we were to land in Eugene?

LS: Hang on. 2 ½ h.

PH: Thank you.

11:04 PM

AR: We're getting some oversized aggregates here in the last minute or so that I've been looking. On the 2-D they seem to be completely unrimed, rather dry looking critters of the dendritic type, very feathery, lots of detail including open spaces in the aggregates.

11:06 PM

PH: Larry?

LS: Go ahead, Peter.

PH: What we anticipate doing here is to do a few more these tracks. Hopefully by the time we get up to 15,000 or 16,000 ft we'll be seeing cloud tops. It is getting a bit brighter here now, isn't it?

LS: It sure is, Peter. The Center has got us on a vector now before we go back on track.

PH: Okay. Then, if we manage to get near cloud top on these tracks say in the next half hour or 45 min, then we'll go into land and refuel in Eugene, have a quick a

turnaround as we can and then start the second part of our mission, which will be the profiles over Santiam Pass.

LS: Okay.

AR: The Sun's disc is almost visible. It did brighten up. Now we're heading into...

PH: Larry?

LS: Go ahead.

PH: Have they allowed you to go back now?

LS: Standby one. Peter, we're in a left turn back over our easterly point before packing out to the west.

PH: Very good, and that will be 13,000 ft.

LS: We're at 13,000 ft now.

11:10 PM

PH: Large aggregates here again.

AR: Continuing diffuse, I haven't seen any sign of higher layer cloud per say. Still having oversized aggregates in here at our east endpoint. We're just about there after making the turn. No appreciable icing has occurred since the moment half an hour ago or so when drizzle drops were encountered. That was 45 min ago.

11:11 PM

LS: Peter, we need another point. We're going to be at the west end here in another two min.

11:13 PM

PH: Larry.

LS: Go ahead.

PH: When we do our reciprocal and start heading back east, the easterly point will be the same as the last one. I can give that to you again if you want it.

LS: No, I think I have it here. Thanks.

PH: Okay.

11:14 PM

LS: Peter, why don't you give me those coordinates for the east point there.

PH: Okay. 44°22.6'/123°23.5'.

LS: Okay, thanks.

11:15 PM

PH: Larry, so we're going to be climbing to 15,000 ft on this leg, right?

LS: Say that again, Peter.

PH: We're going to be climbing to 15,000 ft on this leg.

LS: Hang on.

PH: You're about 13,000 ft, aren't you?

LS: Affirm.

PH: So let's just climb steadily to 15,000 ft as we head toward our easterly point.

LS: Okay. That easterly point is not too far off there.

PH: Okay. We don't want to climb too rapidly. Just extend it to the east a bit so we don't climb more than 1,000 ft per minute.

LS: Okay.

11:19 PM

PH: Any sign of cloud top, Art?

AR: No, I really haven't seen anything, Peter. The east endpoint at the same spot you mentioned some brightening. That was about as close as we got.

PH: So for the tape, we're just on our turn at our westerly point. We're heading back to the east. We'll be climbing to 15,000 ft.

11:20 PM

LS: Peter, what are we going to do out to the west for the coordinate?

TW: He's on the radio right now.

11:21 PM

AR: A little thin spot above the right wing now.

PH: Larry?

LS: Go ahead, Peter.

PH: Let's continue this leg heading toward the east and let's just keep climbing steadily as we head east until we're about roughly due north of Eugene and then we'll see where that puts us with respect to cloud top. Then at that point we can head south to land and refuel in Eugene.

LS: Okay.

TO SUMMARY

PH: Let me just talk to Larry a moment, Art.

AR: Roger.

PH: Larry, let's continue the climb to 17,000 ft on this heading. It's brightening up a bit, isn't it?

AR: Roger, Peter. I still think it's going to be a one of those liquid top cases, so it can look really dark even though, you know, we're not that far from cloud. So I think if we pound it out it would be worth it.

LS: Peter, we're at 17,000 ft now and I think I'm starting to see some top, do you want to continue to climb?

PH: Yes, let's continue to climb and head east.

AR: That would be a shame not to get to the top after all this pounding out down below.

PH: I just don't want to eat too much into the flight time today in case they hold me to 8 hr.

AR: Roger. Now you can see off the right. Wow, this is great! Yes, a liquid top.

PH: We just broke out.

LS: We're on top, Peter. Do you want to go up a little bit more?

PH: No, I think that does it, Larry. We just broke out nicely. You can head back into land at Eugene. We'll want to do a quick turnaround in Eugene.

LS: Okay.

AR: We've popped out a little bit of the side there, Peter, probably tops behind us may run 2,000 ft above the aircraft.

11:29 PM

AR: Droplet concentrations running in the mid-30's to 40's. Cloud top temperature looks like its running around -22° for the liquid top and we're starting to pick up a little more icing here but rather a slow accumulation rate.

11:30 PM

AR: We appear to have descended into some heavier cloud here. Lower bases than maybe what we saw higher up like that line of elevated tops that I referred to when we exited "the side" when the pilot was noting a clearing.

11:33 PM

PH: Larry?

AR: It looks like some drizzle drops.

PH: Larry.

AR: It's 11:34:00, a possible drizzle drop.

PH: Getting some liquid water here, which we haven't seen before for a while.

AR: That's exactly right and we're picking up some icing fast. There were some drizzle drops out there.

11:34 PM

PH: So we're going to be turning around quickly on the ground, won't be wasting any time, probably won't be time for any meals.

11:35 PM

PH: Larry?

TO SUMMARY

11:38 PM

PH: Let's keep the computer on as long as we can on this approach.

AR: You'd think we'd be going right through the front someplace on the way down.

VS: Peter, do you think we'll be able to do a CCN spectra on the second flight?

PH: I plan to if we get through to that part of the flight. As you know, it's always done at the end there with that profile that takes us out following the terrain out to the west.

VS: All right, great.

11:39 PM

AR: Wind direction 280°, 290°, that indicates that it's passed this point. We've been flying pretty straight here for the last minute or two.

PH: The 2-D has given up the ghost I think.

AR: I feel this is condensation in there now. We came down pretty fast.

PH: Yes, we did. I hope we can get rid of that.

11:40 PM

PH: Condensation is due to the warm air that we encounter as we come down and countering cold surfaces.

AR: That's right.

PH: Picking up steady rain here now. Is the HVPS working? Just triggered.

AR: It's been working all along here.

PH: Just taking a while to trigger though.

AR: Not on my display.

PH: What, every few seconds?

AR: Negative, it's continuous particles.

PH: On mine it's just every few seconds.

TW: It could be based on the settings for your particular application.

AR: We had a windshift there back to 190° maybe within the last minute.

PH: We've changed our track again. They're heading back toward the northwest.

AR: At the beginning of that at about 4,500 ft we had a northwest wind and then when we went down I suspect we're getting into the channeled wind between the coast range and the Cascades now though.

11:42 PM

PH: It's coming around, head south again. Do you think that 2-D probe will dry out before we start collecting data again, Art, or should we try to get some warm air in there on the ground?

AR: It probably wouldn't hurt if we had an air, like a blow dryer, but normally it would come back to life as we take off and the air goes by.

PH: That's what I was thinking. A nice hair dryer would clean it out.

AR: Maybe we should carry one on the flights.

PH: Portable, battery operated. I think we're on approach.

TW: I think I'd better start shutting down here soon.

AR: Right, that's what I'm doing right now.

11:44 PM

END OF TAPE

Summary of UW Flight 1897

11:23 PM

PH: I'm going to give a quick summary of the first flight of today. It wasn't quite what we expected. We were heading out to do our standard profile over Santiam Pass. But because the front was moving in slower than predicted, we ended up doing east to west tracks through the cold front as it came onto the Oregon coast and inland starting at 7,000 ft and moving steadily upward to where we are now, which is at 15,000 ft with the P-3 below us mapping out the airflow.

- LS: Peter, the Center has us on vector so we'll probably be going a little bit south maybe not on our track.
- PH: Okay. I understand based on the radar and satellite observations and so on it was a pretty well-defined nice cold front maybe fairly narrow. It should be moving into the Santiam Pass area in the next few hours so the second flight today we hope to do our standard profile over the Oregon Cascades. As far as instruments go everything seemed to be working fairly well.
- LS: Peter, we're climbing to 17,000 ft and we're out at 15,500 ft. We'll be climbing about 500 ft per minute if that's okay.
- PH: That's okay. Didn't have the CPI on board, but the other cloud physics instruments worked except for the J-W. We're not sure if we got any CN measurements. I think the CCN was working okay. It looks as if from my trace of the CNC-2 that it was working okay up until about 5 min ago.
- VS: That's correct. The CNC-2 was working okay until about 5 min ago. When it was working it showed particles in concentrations of about 200 particles per centimeter cubed. CCN during the entire flight was working okay and it was showing concentrations between 20 and 30 numbers per cc.
- PH: Good. Art, would you like to give a summary?
- AR: Yes. I thought the PMS 2-D imagery worked the best of any flight previously. It has not gone down. HVPS also worked probably the best of any flight, just a brief outage.

As far as the weather goes, it's going to be a little bit complicated. From our observations flying down at 810 mbar when we were down around that level about 5,500 to 6,000 ft, we encountered a windshift and a temperature drop well ahead of where the front was supposed to be. It was supposed to be offshore and this was actually on the eastside of the coast range that that happened on just the last couple of minutes for our ferry flight. Then as we flew westbound we encountered another windshift from about 270° to 290°, something in that category, out offshore where the front was apparently located via radar. So it will make an interesting case. Generally no icing in all these legs except for a trace all the way up to our present flight level, which is coming up on TANS-alt about 6,000 ft. That probably was a little unexpected from this vantage point. I thought we would hit some ice in this particular frontal system because of the strength of it looking on the satellite imagery this morning. So really the only icing was picked up in the middle levels en route to the research area where the icing was protruding over an inch from the top of the Pilewskie rod.

BACK TO MAIN TRANSCRIPT

11:35 PM

PH: Vidal, did you want to put any summary on the tape?

VS: Just want to mention that the CCN was working pretty well. The counts were pretty stable between 20 to 30 number per cc. The CN was working mostly all the flight, but CN-2 was working before the flight showing 200 particles per centimeter cubed, but we're still having that problem with the CN-1 and we need to check the pipe.

PH: Right. As long as we have one CN counter then that's okay. Did you look at the PMS 1-D probe today, Art?

AR: Yes I did.

PH: Did it look okay?

AR: As far as I could tell, it didn't look too bad. The peak of the spectra was not out at the larger size channels that we had been seeing before.