

Flight 1848
January 9, 2001
Voice Transcriptions*
IMPROVE

AR: This flight has a more southerly flow rather than the offshore easterly flow that we saw along the coast last time.

9:57 AM

LS: Who's up back there in the science department?

AR: That's Nick Bond today.

LS: Okay. We're at 10,000 ft. Do you want to cross that first point at 3, is that right?

DS: Just a moment he's talking to IMPROVE Control.

AR: Did you copy that Nick?

NB: What was that? Sorry.

LS: We're at 10,000 ft, Nick, and we wanted to know what you wanted at crossing altitude on that first point.

NB: Right. I'm just talking with the radar right now. I'll get back to you in just a minute.

LS: Okay.

TW: Don?

DS: Yes.

TW: I'm going to restart a node #7 instruments. I'm just going restart the 2-D right now. Actually I don't have a 2-D button, so it will blip it.

AR: The coastline comes into view here out in the distance about 30 miles. Starting to underfly some of the very heavy looking altostratus cirrus with cumuliform-like elements, kind of dissipating cumuliform-type elements. Heavy fallstreaks. No real virga underneath though. No trail with this virga.

* AR = Art Rangno, DS = Don Spurgeon, GG = Grant Gray, JR = Jerry Rhode (pilot), LS = Larry Sutherland (pilot), Nick Bond = NB, TW = Tom Wilson

NB: Hey Larry. Nick here.

LS: Go ahead.

NB: We'll start with the same starting point and ending point for that first leg and 1,000 to 2,000 ft somewhere in there would be fine. We definitely want to be below the melting level.

LS: Okay.

10:00 AM

NB: Larry, one more thing. When we get to the southwest point there and we'll be climbing up, then I'm going to be checking in with the radar for our new point to the northeast.

LS: Okay.

AR: A little bit further into this mass approaching the coast the ceiling is lower. In traditional fashion, there is some water cloud, altocumulus, ahead more or less a scattered variety right now. It appears as though the altostratus and the precip coming from that just lower into precip there as we go offshore. Very little clouds piling up over the Olympics. These slivers of altocumulus at approximately our flight level off the right wing there. On the forward video, that same type of altocumulus shows up in the forward direction. The sun's disc is now disappearing behind the heavy altostratus, although the position can still be located.

10:02 AM

AR: Temperature at 691 mbars is -8.5°C according to t-stat.

LS: Art, are you up?

AR: Affirmative.

LS: We didn't turn the heat up coming out. We were hoping we could keep that thing cool. How's that duct back there?

AR: It's cold. Actually, there doesn't seem to be anything going on in it.

LS: Okay. If you guys do get cold back there, let us know.

AR: Thanks Larry. It's always better to be too hot than too cold.

10:04 AM

AR: We're just a couple of minutes from the coastline. Looking out there's almost a step-like lowering. It seems to be shelving where the altostratus drops down all of a sudden step-like. It's maybe offshore here 10 miles where you see this first drop down. It's well below the altocumulus layer. The sun's disc is not visible now because of the thickening altostratus.

10:07 AM

NB: Hey Art. Nick here.

AR: Roger.

NB: It looks like our timing is pretty good. Wouldn't you say that there is some precip just ahead.

AR: Roger that.

10:08 AM

AR: I guess I'm a little surprised I don't see more white caps.

NB: Yes. With the winds from the south you just don't do as well as what the westerlies and especially northwesterlies.

AR: I guess not. I thought on the model they were going to forecast 30 to 40 knots here along the shore, but I guess that hasn't materialized yet or maybe it's just what you're saying. I'm noticing the Aberdeen pulp mill plume. It's going directly toward the west. There's certainly an offshore component right here.

10:09 AM

TW: Don to "chat."

10:11 AM

AR: Tom and Don, we should start picking up precip in the next minute or so. So we'll see if our probes are working.

10:12 AM

NB: Say Don or Grant, I'm looking at HVPS and I'm not sure if I'm not looking at it right, but is it just kind of temporarily paused?

DS: There's nothing for it to see out there.

NB: Right. So it just kind of hangs.

DS: Yes. It won't send a data stream until its buffers fill up out there.

10:13 AM

AR: I've kind of paralleled the bottom of that virga. So we haven't seen any precip yet. I was just looking out the forward windows here. Nothing has really reached our flight level yet as we descend. I'd say another 30 s and we should start seeing our first precipitation particles.

10:16 AM

AR: The HVPS is starting to trigger on something.

10:17 AM

GG: It's a mighty cold looking ocean down there.

LS: Art or Nick, do you a 1,000 ft on that first run or we can give you lower if you want?

NB: I think a 1,000 ft would be fine. Nothing is happening between there and the surface that I know about.

10:18 AM

AR: Is this our destination sampling level, Larry?

LS: Okay. We'll be at 1,000 ft absolute altitude above the water and we're 6 1/2 miles to go to your first point and we're starting to pick up the rain now.

AR: We're getting some nice moderate sized raindrops out there, Nick, but I haven't seen them in the HVPS yet. Oh, there's a couple. Sorry.

10:19 AM

AR: Tom, I don't even see the 2-DC giving us serious data.

TW: Are you still getting 2-DC data?

AR: Well, I have just the one strip when I started the program up.

TW: We haven't had any time to work on that actually since the last flight, so it should probably be not working as the previous flights. I have actually turned that probe off.

AR: Roger. I understand. I'll close that window then. So no 2-DC this flight. I'm waiting for something to pop up in the 1-D cloud probe. It's still resting on zero here. Does that look like it's operating, Don? Do you have laser power and all that?

DS: Yes. I'm watching it right now. I've got stuff coming.

10:20 AM

DS: The numbers aren't super high, but it's spread throughout the entire area there.

10:21 AM

AR: That sounds good. I'm looking at 1-D cloud probe total concentration, but it hasn't moved from zero.

LS: We've got about a mile to go to your first point.

TW: Art, maybe I'll bring up the histogram for you. I can double check the computation on that.

AR: I can do that.

TW: Okay.

AR: I just brought that up. I say it looks okay because down here in this kind of precip you're not going to get much in the 1-D cloud probe.

DS: I'm watching PCASP, FSSP, 1-D and the HVPS all at once. It looks good to me.

LS: We're on track fellows.

10:22 AM

AR: Still kind of flying under this sort of mammatus looking altostratus, nimbostratus really at this point, with virga and fallstreaks coming down on us. That means evaporational cooling is going on and we're getting light turbulence here as we progress further into this rainband. Coastal mountains off the left wing are clearly visible through the precip here to give you an idea that we're only on the edge of this thing. Nick, do they expect us to intercept the surface wind-shift line or is it mainly just to be out in some pre-frontal stuff like this?

10:24 AM

NB: Larry, Nick here.

LS: Go ahead.

NB: I just talked with the radar. We have a new endpoint on this leg. Essentially it's going to cut it off shorter than it was originally planned and it will be at 46°20'/125°11'.

LS: Okay. We'll put that in. Do you want to go there now?

NB: Yes. That's correct. From there we'll climb up as planned to above the freezing level.

LS: Okay.

NB: And at that point I will check in with them again during that climb to get our new northeast point.

LS: Okay.

10:25 AM

NB: Art, Nick here.

AR: Roger Nick.

NB: On this run, I presume we want it just above the freezing level, right, at maybe -0.2° to -0.5°C?

AR: Yes. That would be good. I know in KWAJEX, I don't know if you looked at the melting level, we tended to fly at about +1° or so.

NB: So do you think we should have it a little on the plus side then?

AR: That's what they were interested in is in that melting band area. They'll look at the precip and the enhancement of the radar reflectivity in that area.

NB: Right. Okay. So we'll aim for that. I noticed that on the way down at 850 it was 2°C. So we might have to go up to something like about 5,500 or something.

AR: Yes. That sounds good. Also the coastline now is just disappearing to give you an idea of how far we're in this. About 5 min ago you could see all the mountains off the left wing very clearly, but they're just about gone now.

10:28 AM

DS: Art, is there actually snow to some extent, a few snowflakes maybe?

AR: Well, I think those are splashes off that leading edge of the HVPS. That's a real problem. You get these big artifacts and they have to be excised after the fact from the data.

LS: Nick, we're only 5 miles away from your point, so we're going to need the new one pretty quick.

NB: Right. At that point, climb up to 5,500 ft.

LS: Okay. At the point we'll climb to 5,500 ft.

10:29 AM

AR: The winds look a little high indicating 50 knots now. It's a little higher than we saw earlier. I was estimating that from the sea surface probably in the area of 30 to 40 knots myself. Let me ask the pilots for an independent estimate.

DS: Art, there's actually some spray down on water down there, so it could be that high.

NB: Yes. I think the winds are actually pretty reasonable here. You should see a fair amount of shear in the situation.

AR: Yes. That's right. That's a good point. We'll just check and get an independent estimate from our esteemed pilots. Larry, do you copy? What's your estimate of the wind based on the seascape down there?

LS: On the sea, Art, it's about 140 at about 40 to 45 knots.

AR: Thanks a lot. I was estimating a little less, but I think that probably you're right.

10:30 AM

LS: Nick, we're at your point. We're going to have to orbit here until we get an IFR clearance.

NB: Okay.

10:31 AM

GG: Don, go to "chat."

AR: No sign of scud clouds in this area indicating the air is somewhat dry considering we're in light rain. Some very nimbostratus looking sky and some hints of mammatus or protuberances hanging down here and there, but certainly not as

much as we saw maybe 5 to 10 min ago. There are streamers on the water. I don't know if I've seen that before. So I think this idea that the winds are 40 to 50 knots is correct down there. Pretty nasty.

10:32 AM

AR: It didn't seem like we got to far into this thing, so I guess we are concentrating on free frontal band rather than the surface wind shift. We certainly didn't appear to see any low-level wind shift and the cloud line you'd expect for that.

10:34 AM

AR: It looks like some kind of clearing behind the tail as well. It has to be off to the northwest according to the Shadin heading. If that's the case, then it looks like we're probably visually centered pretty close to some free frontal...

LS: Nick, we need a point B here.

10:35 AM

AR: We're starting to get into some snow now, Don.

LS: Nick, are you up?

NB: Yes. I just got done talking with the radar. We have a point for you to head for and that is $46^{\circ}40'/124^{\circ}30'$. I'd also like to kind of cutoff. We're up now high enough. We're down to the -1°C level. So at about this level would be a good altitude for it.

LS: Okay. That's 5,300 ft indicated here.

NB: Yes. If anything maybe down even 100 ft or so.

LS: Okay.

NB: Art, John said he definitely wanted us in the snow than below the freezing level.

AR: Great.

NB: I definitely see that on the HVPS.

AR: Yes. Right. We're about -0.5° to -1°C , so that looks perfect. I didn't notice I have to say on the way down maybe you caught this where there was any sort of inversion on the way up. I was wondering if there was another system only higher up maybe 1,000 to 2,000 ft.

NB: Yes. I didn't have a chance to catch that.

10:37 AM

AR: I would say visually it looks like we were pretty well centered in some kind of rainband here because at that endpoint I could see lightning off to the northwest. So there is definitely some kind of thin spot at least in the cloud cover with this being kind of that preceding band that you mentioned earlier.

NB: Right. What John was saying on the radar was that we were definitely near the kind of western edge of that band and there was more precip to the west, but he wanted to concentrate on this one.

10:38 AM

LS: Nick, we're going straight to the point you gave me now.

NB: Okay. That's great. When we get out of the precip, then we lose interest of course, so at that point we'll be climbing up another 3,000 ft or so to kind of return along that track.

LS: Okay.

DS: Are you there, Art?

AR: Roger.

DS: The 1-D probe looks pretty good.

AR: Yes. I've got the histogram up now and I see particles on all the channels. I don't see any holes like we saw in the spectrum on the first two flights. So that looks great.

DS: Yes. It looks reasonable too with what's going on in the other probes. Chock one up for us Grant.

AR: I think when we go up that next 3,000 ft, we should see quite a few particles in the channels and not only that we should be calculating some concentrations in the per liter area of at least 10 per liter.

NB: Say Art, I notice we're getting down now to -1.1 or so. Should we kind of descend a little bit to kind of keep just above the freezing level?

AR: Well, we had that trace of maybe flying through any temperature discontinuities, which you could document by flying at the same level, but I think I'd hold it myself.

NB: Yes. Now I see that the temperature is kind of going up just a tad. So okay, I won't panic.

AR: Me neither.

TW: This is a layman's question. Can you tell what the temperature is by the shape of the particles on the HVPS?

AR: Sometimes but not always. It depends on what's going on above you. But yes, it's certainly one of the things you do look for and you're evaluating in these precip situations.

10:41 AM

AR: We're also getting some droplet clouds in here and the concentrations overall are fairly low, 10/cc, upper 10/cc, and along with that the clouds have a broad spectrum. That indicates that with the spectrum extending beyond 20 to 25 microns that these droplets are being rimed accreted by the falling snow here. So that's an important addition to the precip process. I say they can be, these clouds are a little thin. They don't have a liquid water content, but it can be a very important additive.

10:43 AM

LS: Nick, we're about 5 miles from the endpoint and we'll reverse and go on back to where we started if that's okay with you and maintain this altitude.

NB: Well, we'll be climbing at the endpoint up 3,000 ft. I'm going to check in with the radar then, but tentatively we'll head back to that southwest endpoint at 46°20'/125°11'.

LS: Okay.

NB: So you can kind of head straight for it rather than the little jog that we did before. That's not a big deal, but just make it a little easier on you.

LS: We'll fly the track between the two points this time.

NB: Yes. That's fine.

10:47 AM

AR: Don, can you point the radar downward?

GG: Art, the radar isn't working properly and it's arcing.

AR: It worked well on the last flight.

GG: Yes I know. It's pretty frustrating.

10:48 AM

NB: Larry, Nick here.

LS: Go ahead.

NB: If it's not too much trouble, sorry for the change here. The radar wants us to go all the way through the band. So if we could keep heading on our course and stay at this altitude until we clear it, that would be great. If it's too late, I understand.

LS: No. We can do it.

AR: I think we got up to about 6,000 ft, Nick. Do you want him to go back down?

NB: Yes. If we could get back down to about 5,000 ft.

AR: Roger. I'm starting to make out the sea surface now.

10:50 AM

AR: Gulls flying clearly visible all of a sudden here in the last minute, Mt. Rainier, Mt. St. Helens also visible. Do they want us to go any farther, Nick?

NB: Nick here. Larry?

LS: Go ahead Nick.

NB: We've cleared it now. Sorry for that little kind of jog there, but we might as well climb up to 8,000 ft. Then essentially reverse course. You can dial in an endpoint of 46°20'/124°56'.

LS: Okay. It's 126 what?

NB: It's 46° north 20'/124° west 56'.

LS: Okay. Do you want to go direct there now?

NB: Once we get up to 8,000 ft, yes.

LS: Do you want to go from this last point to that point?

NB: That's correct.

LS: Okay.

AR: Heavy line of virga with a mammatus-like structure back behind the plane. That's what we exited. The precip may only be sprinkles to the ground though. It looks as though they're mainly snow virga. We've come out onto the altostratus/nimbostratus shelf cloud now. Flying just a couple miles ahead of us as we make this turn at the endpoint. Lots of white caps down there and by looking at the water surface we can see how the wind exits from the east over there by Aberdeen/Hoquiam from the pulp mills. It then takes a sharp right turn up the coast to the north and north/northwest or northwest after...

LS: Keep me informed in the back how your heat requirements are back there.

AR: I'm still managing. The ring is getting pretty cold. You could turn it up a little bit, but I can manage.

LS: Okay. We'll bring it up some for you. Nick, did you want to be at 8,000 ft or up to 3,000 ft above the lowest level?

NB: Let's see. I think 8,000 ft would be good.

LS: Okay.

10:53 AM

AR: We've started into the virga from the over hanging shelf here. This precip definitely is not reaching the ground at this end. It looks like mainly ice cloud above us from what I can see. I don't see the disc of the sun, however, to verify that.

NB: Boy, I'm really pleased with the timing here. We're just kind of right out here at the right time.

AR: I think you're exactly right, Nick. We didn't have to go hundreds of miles to get to it. It's right here next to the radar, so that makes it even better.

10:54 AM

AR: It looks like the HVPS has died.

NB: Yes. I noticed the same thing.

DS: Stop and restart the program. It's still running on my screen.

10:56 AM

GG: You're actually seeing particles on your screen, Don?

DS: Actually it stopped at the moment.

AR: I think it's noise there.

TW: I'll take a look at it.

GG: I just hit restart.

10:57 AM

TW: Should we be seeing pretty big particles here?

AR: Right. There should be particles.

10:58 AM

AR: The temperature has climbed about a degree and a half or so since we started this heading at this level. Kind of the reverse I saw on the previous pass.

NB: Right. It was. Sometimes you have these kind of warm tongues ahead of these systems and I guess that's what we're seeing here.

AR: Did you think of that as an occluded bin because of this going on or did that also happen with the run of the mill cold front?

NB: I think it's with the run of the mill cold front. You just have that much. You know, a little bit stronger, suddenly winds, and then it's just kind of a necessity for thermal wind balance.

10:59 AM

LS: Nick, we're leaving our northeasterly point heading down to $46^{\circ}21'/124^{\circ}56'$ now.

NB: Yes. I got you.

TW: Are you getting particles now?

NB: Yes. They're coming in fine now.

GG: What did you do, Tom?

TW: I looked at the d-bar, the diagnostic data, and there was a five-fold alignment error at that point. I don't know why. I'll look at the documentation. I just tried to restart it a couple of times and it seemed to fix.

DS: Yes. I watched you do that. When I did it, it didn't seem to do anything, so I went and turned the probe off and turned it back on.

TW: So that probably fixed it.

DS: Yes.

TW: You had to cycle power. You might have to do that whenever you get a five-fold alignment error. It showed up in the diagnostics if you hit control-D.

DS: Yes. I noticed that as well.

LS: Nick, what are we going to do when we get down to the other end here in about 11 min.

NB: We'll do a climb there up to 11,000 ft and I'll be checking in with the radar. Chances are we're going to be coming back essentially to our previous turnaround point there at $46^{\circ}40'/124^{\circ}30'$.

LS: Okay.

NB: Actually if anything, we'll probably head a little bit further northeast as this band kind of moves in toward the coast.

LS: Roger.

11:01 AM

DS: Thanks for the cookies, Nick.

NB: Yes. Everybody help yourself. I had to buy them from my daughter is a Girl Scout anyway.

DS: Yes. I saw them back there and I couldn't resist their siren call. So I opened them and had a couple.

11:02 AM

DS: So Art, have you been looking at the 1-D at all?

AR: Yes.

DS: Any further comments on it? I've been watching it pretty close, but you've looked at more of the data than I have.

AR: It still looks good.

DS: I'm going to consider that one fixed unless it dies completely again.

AR: I'll give you an update in a second. I had to restart this computer to get some of my icons back.

DS: Okay.

TW: What happened, Art?

AR: I lost my 2-D and HVPS icons about the time we were restarting it we had the problem with the HVPS. So anyway, when I restarted they came back.

11:03 AM

AR: I'm beginning to think that even though my display says this 1-D cloud probe total concentration is in liters, but maybe it's per cc. Because the spectrum looks pretty good, but I'm still fluctuating between zero and one. We should be seeing actually in the 10s per cc at least in this band at this flight level.

11:06 AM

LS: Art, how is your duct doing back there? Is it getting hot?

AR: It seems to be remaining the same temperature.

LS: Is the cabin temperature okay for you guys back there?

AR: It's not bad here in the back. I'll let the other guys say something about the middle.

DS: It's comfortable back here.

LS: Okay.

TAPE 1, SIDE 1 REVERSED TO SIDE TWO

DS: Do you guys need any coffee up there?

LS: Yes. Two of them.

11:07 AM

NB: Art, Nick here.

AR: Go ahead Nick.

NB: You might be interested. Where we're dropping now is about a degree from the temperatures about 5 min ago or so. I suspect that John Locatelli's cold front aloft thing idea might be meaningful here. It's also kind of interesting that that chop was right where we kind of hit the warmest air.

AR: I'll be darned. I didn't really notice much of a chop, but I was probably paying attention to other things. I notice the wind has veered a little bit in here.

NB: Right. We're definitely dropping in temperature here. So I wouldn't be surprised if that kind of idea that it's just sort of frontal forcing aloft kind of organizing this is what's happening.

11:11 AM

AR: That old temperature has come back up again after it looked like it was really headed for a noise dive.

LS: We're at our endpoint. We're going to start our climb and we'll head back northeast bound.

NB: Sounds good, 11,000 ft on the way back. During the climb, I'll check in with John.

LS: Okay. I'll extend out here a little bit so we can get our altitude for you and hit the track coming back.

NB: Sounds good. We're still in precip, so that's fine.

11:14 AM

GG: Donald, go to "chat."

11:15 AM

NB: Larry, Nick here.

LS: Go ahead.

NB: Yes. I have a new point for you at the northeast end, 46°47'/124°11'.

LS: 46°47'/125°11' was that it?

NB: 124°11'.

LS: 124°11'.

NB: If we're still in precip if we could kind of continue through that point, there's a pretty sharp kind of leading edge to this. It should be close, but you might want to go just a minute longer or something.

LS: Okay. Give us the points again, Nick, because we were right in the turn when you gave them to us and we couldn't write.

NB: Sorry. It's 46° north 47'/124° west 11'.

LS: Okay. We got them.

11:18 AM

LS: So Nick, you want to go back to our old points and then just extent to the new ones or go direct to the new coordinates you gave us.

NB: Why don't you go direct to the new one.

LS: Okay.

AR: Indicating some counts in the FSSP, 5, 8, 3, 5. I think these are ice crystals. No sign of any icing appearing at this level other than in the back of the tail for example.

NB: I don't know if it's just my display, but the HVPS seems to have kind of stopped again.

AR: I'm getting particles back here, but they're intermittent coming in intermittent bursts.

11:19 AM

TW: If you ever notice it's stopped, you may want to hit the "end" key occasionally. I don't know why. Sometimes there's something that goes wrong where it just kind of thinks it's at the end and it's really not.

11:20 AM

AR: At this level an amorphous sky, no indications of layers above us. The sun's disc is not visible. There's a hint of droplet clouds below us, but it's just a guess.

11:25 AM

NB: Hey Larry, Nick here.

LS: Go ahead.

NB: It looks like we're getting pretty close to our endpoint, but as long as we're still in this precip I'd kind of like to just stay the same course.

LS: That's easy.

11:27 AM

AR: Yes. This is an interesting question because this shelf cloud, which was what I would call altostratus, is probably going to extent quite a way inland and while it is precipitating it never gets to the ground. Sometimes you can fly a long way and what would be seen from the ground as just a cloud, which, of course, is supposed to precipitate. So I don't know what they want.

NB: Yes. That's a good point. I wouldn't be inclined to go too far past our nominal endpoint.

AR: I was just thinking on that we'll just be able to see the ground when we get to the spot, which we're absolutely confident there's no precip to the ground.

NB: So Larry, tentatively we'll head back to that same southwest point that we had last time, which was $46^{\circ}20'/124^{\circ}56'$.

LS: Okay.

NB: After our climb to 14,000 ft.

LS: Right.

11:28 AM

NB: I'll check in with John now.

TW: Anybody care if I turn it up a couple of degrees in here?

DS: No. Go for it.

TW: Larry, is it okay if we turn up the heat a little bit.

LS: Affirm.

11:29 AM

NB: Larry, Nick here.

LS: Standby 1.

11:30 AM

LS: Go ahead Nick.

NB: If we could climb now to the 14,000 ft, we're going to get a new endpoint here and it's going to be pretty close to where we were before, but I'll find out in the next minute.

LS: Okay. We'll start our climb now and go back to this point and then standby for the next one. You did want to reverse now, Nick?

NB: Yes. That's correct. Reverse it now.

11:31 AM

AR: Nick, there was a bit of enhanced turbulence back here. Do you associate that with anything in particular. We did hit a couple of droplet clouds in there, but even on before and after the turbulence had picked up completely to now.

DS: He's talking to Center at the moment, Art.

AR: Thanks Don.

11:32 AM

AR: Larry, we are pressurized today?

LS: Affirm.

NB: Larry, Nick here.

LS: Go ahead Nick.

NB: For your southwest point, I have $46^{\circ}26'/144^{\circ}44'$ at 14,000 ft.

LS: Roger.

JR: That's $46^{\circ}26'$ N/ $144^{\circ}44'$ W.

NB: That's correct.

11:33 AM

AR: Tom, do you expect your XZ program to work these days? Tom, do you copy?

TW: Yes.

AR: Do you expect your XZ program to work these days? I tried it a couple of times and haven't been able to get a temp/dew point profile.

TW: Yes. It should. Let me take a look at it.

11:34 AM

TW: That one right there?

11:35 AM

TW: Do you want me to take a look at it on my computer?

AR: I hit draw not done.

TW: You should hit draw, but I'll let you know. I'm going to take a look at it on my machine.

AR: Nothing much is happening with the ducting warming up back here Larry. So I don't know, another problem I guess.

LS: Okay.

NB: Say Art, does it seem like there are more needles on the HVPS?

AR: I thought they were around -8°C , but I wouldn't expect them here and I'm not sure what's going on. If we had a lot of liquid water content, then you might guess that some columnar crystals are coming up from the higher temperature regimes down there. But normally in this regime with a system like this, I would expect to see some dendrites something more in the quasi-spherical range rather than these feathers. I wish we had that darn CD because then we'd be able to solve this. I'm just not sure what I'm looking at.

LS: Say Art, for some reason we're not getting any pressurization in this thing. That's probably why that duct is not hot. So the cabin is way up there. It's coming down slowly. We'll give you guys oxygen if you want it.

AR: What do you think the cabin pressure is now?

LS: Does everybody copy that the oxygen is available?

AR: What do you think the cabin pressure is now?

LS: It looks like it's up around 14,000 ft to me.

AR: Okay and that is cabin pressure. Okay. Will do Larry. We'll get those oxygen masks out. Does everybody copy? The cabin pressure is up around 14,000 ft and you should be using some oxygen.

NB: Roger that.

AR: Tom, do you copy?

11:38 AM

TW: Hello.

AR: They're having trouble with the pressurization. Our cabin pressure is at 14,000 ft, so you're going to need some oxygen. Don, did you copy?

DS: Yes.

11:39 AM

LS: We're at the northeast point heading back to the new coordinates there.

DS: This one's flow gauge just doesn't work.

11:42 AM

NB: I note that our temperature is pretty flaky.

11:43 AM

AR: Yes. We're struggling with a long-term noise problem in that temperature measurement.

LS: Our outside up here shows -8°C .

AR: Yes. We can pretty well top that I think. You should have seen it about five flights ago.

NB: Larry, you say it's -8°C just the same as the last run that was at 11,000 ft?

LS: I didn't notice what the last one was, but it's -8°C now.

NB: Thanks.

11:44 AM

LS: Art, we've caught our pressurization problem here, so it's going to start heating up on your duct back there.

AR: Yes. You got it. It's getting hot real fast.

11:45 AM

AR: Nick, what's gone wrong here with t-stat, I thought that what we were seeing was maybe something momentary, but it seems like it's gone on way too long. We had been struggling as I mentioned to solve a noise problem with that probe. The flight temperature as would be seen by the Shadin t-stat, which is about a -11°C at 591 mbars.

NB: Okay. So the reverse flow is just basically. Is there kind of an on/offset there, because sometimes it actually cycles in with a reasonable temperature? What I thought was reasonable was -13°C .

GG: Looking at the strip chart it looks as if the transducer or the amplifier up there is gone west maybe with the cold temperature. This is not our normal A to D noise problem.

AR: Yes. That's what I'm thinking too, Grant. For a long time, Nick, we had a problem when the pilots were speaking to Center there was a noise glitches because of the radio transmissions, but this does look different.

NB: So you recommend I look at the Shadin temperature then?

AR: Roger. Shadin t-stat. That's the Shadin s-temp.

NB: Art, it looks like it's really brightening up here. Do you think we're getting near the kind of western edge? I guess we're still getting a lot of ice crystals.

AR: Roger that. But that would be my assessment, Nick, that we are in that thin spot between the two bands. Of course, we're into the endpoint that they're looking at on radar.

NB: Quite close. I assume they would like to get up another 3,000 ft, right? Up to cloud top or as high as we can go, right?

AR: Roger that. Yes. A lot of times cloud top is a little misleading. The sun comes out and it's real bright. You could go thousands of feet. I'd estimate another

5,000 to 10,000 ft higher than our current flight level. That's especially true when it's all glaciated looking at the sun there is nothing but ice all the way up from this point.

11:48 AM

AR: Larry, so our cabin is pressurized now and we don't need any oxygen. Is that affirmative?

LS: That's affirm.

11:49 AM

NB: Hey Larry, Nick here.

LS: Go ahead.

NB: I see we're near our kind of endpoint and so at that point tentatively climb up to 17,000 ft and kind of head back along that same course. I'll check in with John right now.

LS: Right.

11:51 AM

DS: Art?

AR: Roger.

DS: I think I have the reverse flow fixed now.

AR: Roger. I was just noticing that it looks pretty stable now and it looks about right, although just as I say that out pops a 10° drop.

11:52 AM

AR: The sun's disc has disappeared now. I never did see any sign of liquid water cloud above though it might be hard to tell since I didn't actually see the sun disappear. But at least up until about 30 s ago, it's nothing but ice glaciated ground glass look at the sun.

DS: Yes. That's the most consistent. Those drops are more consistent with the noise problem that we've had in the past.

AR: It's probably was that Larry's talking to Center just then too.

DS: It also could be Nick talking because we've had some of those problems with this radio too.

AR: Yes. That's a good point.

11:53 AM

NB: Larry, Nick here.

LS: Go ahead Nick.

NB: I have that northeast end point for you. It's very close to where the previous one was. It's $46^{\circ}46'/124^{\circ}13'$ and again at 17,000 ft.

LS: Okay. We're out of 15,500 for 17,000 ft.

NB: I have a question for you, Larry. Does this band that's kind of moving onshore can we follow it inland a little bit or are there any restrictions on the airspace?

LS: No. We're under ATC control now. So it shouldn't make any difference to them whether we're offshore or onshore.

11:56 AM

AR: The sun's disc was disappearing for a little bit. The sun's disc is visible again. It seems to be all glaciating cloud in that path between the aircraft and the sun.

11:57 AM

LS: We're on our way, Nick.

NB: Say Art, sorry, what was that temperature that you recommend again?

AR: We just drew one at about the middle of the dendritic zone, so now we're at the top of that zone and that's a good point to be about -20° or so.

NB: Yes. But for the display purposes which one should I use?

AR: t-statr is okay right now. The Shadin.

NB: The Shadin is the flaky one, right?

AR: No. It's just not able to produce decimals, but it's okay. It usually tracks the t-statr pretty closely. The t-statr is okay right now, -19.5°C is about what the real temperature is outside. When the t-statr goes out the next line of defense for temperature is the Shadin s-temp in the list of preferences the parameter that you'd

want to show and that's from the Shadin head computer and that's the static outside temperature. Right now that temperature is indicating about -17°C , but I believe that t-stat is the closer to the true temperature outside.

12:00 NOON

AR: Larry, what do you reckon our ceiling is today?

LS: Probably 25,000 ft, Art, maybe 21,000 ft.

12:01 PM

LS: It's a lot colder today than it was out here the other day, so we'll probably be able to get some more perhaps 22,000 ft.

AR: Roger that. The sun's position continues to be visible as we complete our leg and head northeast bound from our southwest endpoint.

12:02 PM

LS: Art, if we get out in the cooler air out to the west or eastside of this front and turn the anti-ice off, we can probably climb as high as you want to go to 25,000 ft anyhow.

AR: And then go back in cloud or would that have to be in clear air.

LS: No. We can go back in cloud at that.

AR: Nick, did you copy that?

NB: That sounds good.

LS: Okay.

AR: So Nick, what level do you want him to climb up to on the next pass?

NB: I would think 20,000 ft just to keep stepping up at 3,000 ft.

AR: I think that maybe he understood that you wanted to go to 25,000 ft, but I'm not sure.

12:03 PM

LS: So Nick, here at the endpoint you want to go up to 20,000 ft and then back on the same track?

NB: That's correct.

12:04 PM

DS: Nick, I got the reverse flow temperatures fixed now.

LS: Here we go for 20,000 ft guys.

AR: And just in here in this area there is a little droplet cloud here at -20° .

NB: I'll be checking in with the radar.

12:06 PM

AR: Altocumulus clouds back there at this end of the track. I can see them going by not so much the wing as across the disc of the sun. Very close to this flight level and not much thicker than probably 100 ft or so maybe 200 ft.

TW: Hey Art.

AR: Roger.

TW: Your XY plot should work. Your config file was a little out of date and it had some incompatible stuff in there I think. Right now it's only set up to see the last 20 min. I don't know if that's how you had it before.

LS: You didn't want to continue out of the band did you, Nick?

AR: Thanks Tom. He's probably talking to the radar boys right now.

DS: Affirmative.

AR: I don't think we'll run out of this cloud at this level because there is that shelf that extended almost to Seattle and we're at the level that we will probably just stay in that the whole way.

LS: Okay. We're reversing now.

TW: It takes a while when you're further in the flight.

NB: Larry, Nick here.

LS: Go ahead.

NB: The same endpoint that we had before. I'm trying to make life easy for you, right? The $46^{\circ}26'/124^{\circ}44'$ would be a good southwest point.

LS: Roger.

NB: At 20,000 ft we'd like to keep this stack going as high as we can get and as long as we're still in ice.

LS: Okay. We'll keep climbing as long as we've got the performance to do it. If by chance we get out in clear air, we can probably get you higher.

TW: It's usually a little faster though.

12:09 PM

TW: I think it's kind of based on bandwidth too. So it's a little slow the machine especially when there's a lot of things running especially maybe the HVPS. I'm not sure. I'll have to investigate. All that weight just for that little.

AR: It's thin though. I can imagine if you tried to pull up the whole flight say from the last few hours it would be pretty...

LS: Nick, confirm you want to back to 46°26/124°44'.

NB: That's correct.

LS: Okay.

AR: After all that I'll just close the program. A little earlier in the day he's going to look a little more interesting down around 8,000 to 10,000 ft.

12:15 PM

DS: The wind directions and stuff look great. The Shadin and the other one agree.

NB: Yes. There is still sometimes kind of suspicious speed there where it seems like it's 33.4 and 36.0. There's kind of something. It's never in-between.

DS: Yes.

GG: It's usually when the roll angle changes suddenly.

DS: Yes. But right now the Shadin and all method of wind direction are about 21° apart and the Shadin is showing from magnetic north and ours is showing from true north. So that's about what I'd expect.

NB: Right. There's something in the speed. There are these kind of 2.6 meters per second sort of...

DS: Oh, in the Shadin. The Shadin is very blocky the way it does it. Ours has a much finer resolution as far as speeds.

GG: Yes. If you put it on a strip chart, you can see the difference.

DS: It's almost like a step function. It's just the way the Airdi computer does it. We can't do a darn thing about it. We're just stealing a signal from their computer.

TW: It looks like the problem got switched over to the other.

AR: Yes. You'd think I would be seeing a lot more particles if that is true in liters there. I'm guessing it must be per cc. The PCASP wouldn't see much of anything up here. It's pretty clean and those are ice crystals that are probably...

DS: Yes. They're probably shattering.

TW: What do you think about that PCASP design, I mean how it's looking on the histogram? It's like every other one kind of like the OAP used to be.

GG: I've seen them all show up Tom.

DS: I have as well.

GG: It almost looks as if there is a every burst or something. It should be hardware.

DS: Yes. I've actually calibrated it though and it looks like it's fine in the config when I've done the calibrations.

GG: It just seems funny that particles would skip steps like that.

DS: Yes.

AR: Yes. There's something wrong there.

DS: Not necessarily, Art. Like I said, I've run a calibration on the PCASP and it looked fine when I did the calibration.

AR: Right. But it would be very difficult to explain to an aerosol scientist why there are no particles in one channel and there are particles of larger and smaller sizes. It seems to alternate all the way up the spectrum. That's okay. The PCASP is of no interest in this project, so we don't have to worry about it.

12:19 PM

TW: Just as a note, the OAP and PCASP are running off the...

LS: Nick, we're starting to get into cool air up here, so we're going to be able to give you probably 23,000 ft on the way back.

NB: Okay. That would be great. But you think that's about the ceiling, right?

LS: I'm not sure. No. I think we can probably go on up higher than that with all the air that I saw.

NB: Okay. Probably we would want to do one more run then at least, if we could do 25,000 or 26,000 ft.

LS: We'll give it a try. On the end of it, we'll probably going to be in the stuff, although we might not be able to get up there until we get back down at the west end.

NB: Right. Well if that's the case, we might want to kind of interleave it here and go up to 26,000 ft and then go back down to 23,000 ft on the next southwest leg.

LS: Okay. We can try that.

DS: I'm way down here, Art. On the PCASP I see it occasionally filling in channels 0 through 10, but there's only one particle. So if you're above like 10 particles per cc, you're not going to see it.

TW: Yes. All of a sudden it seems to be working better now you know. It's hitting all the channels.

AR: Right.

NB: Say Art. Nick here. Do you think we're going to have ice at 26,000 ft if we were able to get there?

AR: Yes. The problem is we're only going to see that ice on the 1-D cloud probe the 30 to 320 microns. The HVPS is going to see very little of this stuff as you've probably noticed the particles going by have just about disappeared. They're out there and even in spite of the bright sky there is plenty of ice up here. It's just that they're very small crystals.

NB: So the question is should we bother to try to go up to 26,000 ft then?

AR: That's a question I can't answer. I would say you're not going to get anything in the HVPS even though there will be ice crystals up there. You won't see what they are on the 1-D probe. You'll get a spectra, but you won't know what the crystal habit is or whether they're irregulars or regulars or what.

NB: Right. But I would presume that spectra would still be useful.

AR: Roger. And you may discover some layering here. It looks like there is a hollow cirrus layer and then kind of a lower ice cloud that tops out and separates between that higher cirrus layer.

NB: The reason I mention it is because we might be able to climb out here at the southwest end better than we can at the northeast end. That we'd go back as high as we could go and then come back, kind of interleave it and then come back at 23,000 ft.

AR: Yes. I think that sounds like a pretty good strategy. Do what we can do. Yes. You definitely get the feel of lowering ice cloud tops here and now you can definitely make out that higher cirroform layer, which is I'd say well above 25,000 ft.

NB: Okay. So I'll see what we can do here. Thanks.

AR: Also it looks like the ice clouds are going to deepen up again on this heading maybe even merging with that higher layer. So maybe that's the beginning of the top of the second band maybe out ahead 5 min more say.

NB: So Larry, Nick here. I don't know but you must have been listening in. I guess at this endpoint I'd like to see how high you can climb. Don't burn up the engines or anything. We'll go back at something like 25,000 or 26,000 ft if you can get there. Then do the run back out here at 23,000 ft.

LS: Okay.

12:24 PM

AR: How much farther is our westerly endpoint, Nick?

NB: That point is $46^{\circ}26'/124^{\circ}44'$, so it looks maybe 20 miles or something.

AR: Roger. We're going to go through this saddle and onto these deeper clouds then. That's kind of interesting. Of course there are two bands in here.

12:25 PM

NB: Correct there, Art. It's not going to be that part of the end of the leg, sorry.

TW: If anybody is interested, on the HVPS the colors can be changed if it's hard to see. So if you don't like the green on black, you can get like yellow.

AR: Interesting.

LS: We'll be giving you some more oxygen back there for the cabin.

12:26 PM

TW: Does that mean we need to use our oxygen masks or not? You don't?

GG: What's the cabin altitude gone up to, Larry?

LS: We'll we're probably going to be up around 12,000 ft.

GG: Roger that. The cabin altitude is going to be about 12,000 ft he said.

12:27 PM

AR: It looks like we made our turn just in front of that bigger ice cloud out there to the southwest and west. We're going to fly back over it looks like the saddle again and then head into some deeper tops after that.

NB: Larry, Nick here.

LS: Go ahead.

NB: I just talked with the radar. What they would like for us to do is take one more run back toward the northeast. Then have us look into the possibilities of landing at Hoquiam and waiting for the rainband with the occluded front that's going to be coming in sometime like a couple of hours or something. The other possibility is that doing the Olympic transect the problem there is that there no precip there yet. So just the idea of landing at Hoquiam is something we'd like to investigate. One thing though that you should be aware of is that the numerical model is predicting some pretty hefty surface winds there on the order of 35 to 40 knots. So that's something for you to consider.

LS: Okay. What's going to be the direction on that wind?

NB: I'm sure that would be from the south probably a bit of an easterly component at first sifting around to southwesterly.

LS: Okay. We'll take a look at that runway to make sure we can get off in a crosswind.

AR: I know, Nick, that's a tough wind for that runway.

NB: Yes. I assume we'd want to be before the surface front and so I'd image it would be more of a south-southeast wind.

AR: Yes. That's a good point or even 140, 160, something like that, right. We can probably make that.

LS: I think we're going to have to take one more turn out here guys before we make 26,000 ft.

12:32 PM

AR: Quite a little dry slot here between these layers. They'd be higher cirrostratus and lower tops of that nimbostratus as evidenced by the fact that we're not even producing a contrail. Down there that is we see remnants of our contrail off the left wing now down in the ice clouds. So it's pretty dry up here.

NB: Art, I could barely hear you. Is that something about you think we're above stuff of interest?

AR: Well, we're certainly in that saddle region. We're on the western edge of that saddle and off in our heading dead ahead is the weaker clouds. Probably we'll get that front we're waiting for. So as we go back, it looks like we'll be flying over the saddle region and maybe at the base of this higher cirrostratus cloud. Then although it's far off in the distance I think...

END OF TAPE

Summary of UW Flight 1848

No summary given on tape.