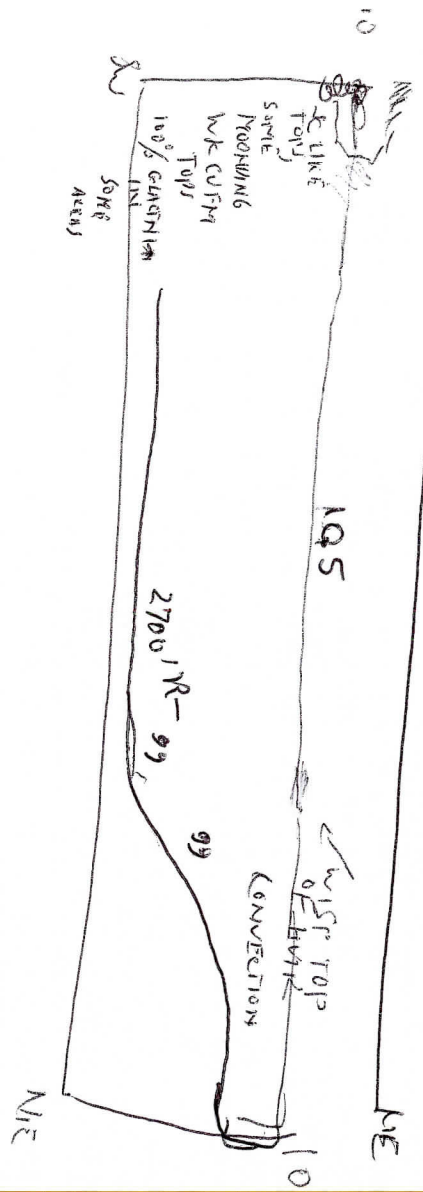
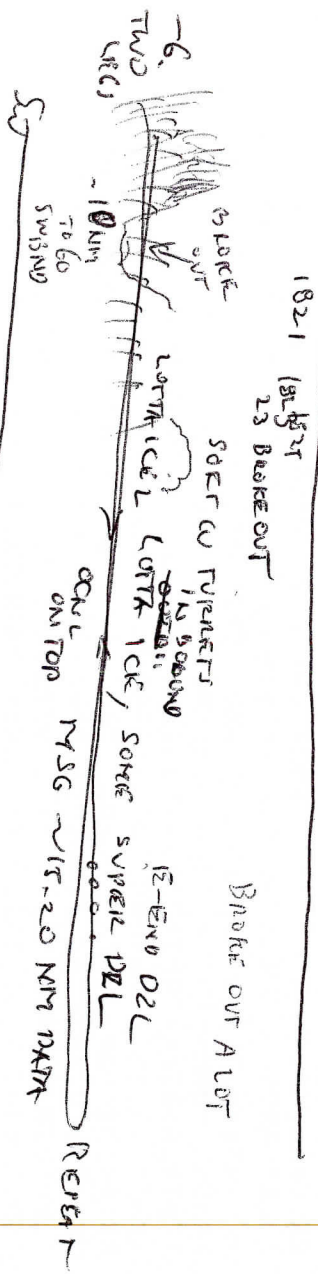
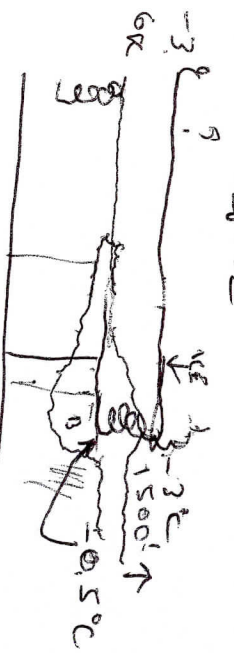
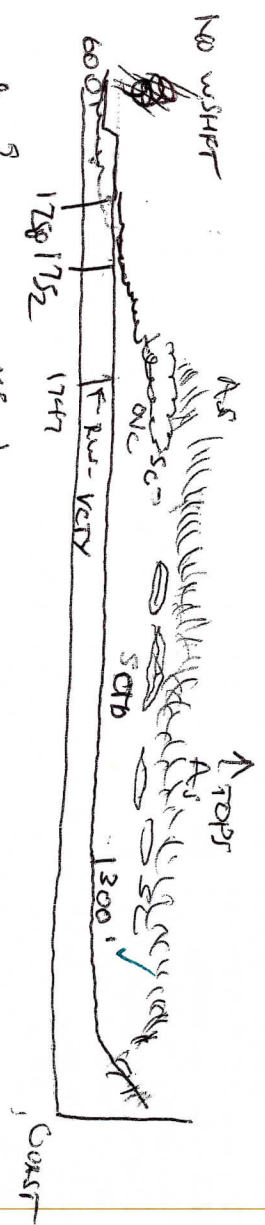
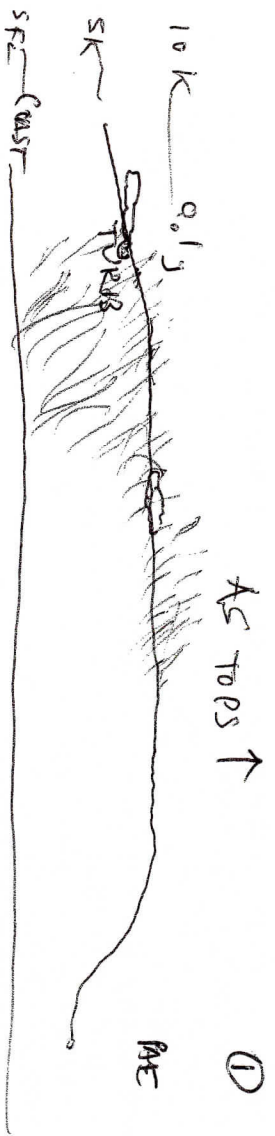


Aircraft Flight Log for the University of Washington, Cloud and Aerosol Research Group

Date 1-20-01	Flight Number 1852	Experimental Observations WEAK CHAOTIC (AS IN CLDS) (OLD FNTL BAND EXAMINED XCHT THAT FARTHEST W POINT NW SFC DID NOT ENCOUNTER URG W/SHFT AS EXPECTED. DOUBTFUL FNT CROSSED IN SW-NW LEGS UNTIL MID LVLS SAMPLED ~ 6-10KFT TOPS TALLER CONVECTION 15-20 KFT TO N-THE, XCHT IN RETURN LEG. TOPS UNDOUBTEDLY FLUCTUATED ^{ABV AIRCRAFT} AS THE SEVERAL LEGS WERE FLOWN MAKING MICROSTR. MEAS. HARD TO CORRELATE WITH OVRHD CLDS. DISADVANTAGE HERE IS THAT RADAR DATA NOT YET BEING RECORDED TIL LATE IN FLT. OVERLYG AS/AC AS/AC \oplus	
Project name IMPROVIE 3:53			
Engines on time 1635 UTC	Engines off time 2028 UTC		
Departure airport PAC	Arrival airport HQM		
Flight Scientist signature <i>Nick Bond / G. Rangno</i>			
Pilot signature <i>TC</i>			
Surface met. & visual obs. at takeoff E120 @ 50 + 0610 MVY VIBCA IN LH DIRT N-NE		<p style="writing-mode: vertical-rl; transform: rotate(180deg); position: absolute; left: 200px; top: 500px;">Clouds sampled</p> <p style="position: absolute; left: 280px; top: 420px;">Ac</p> <p style="position: absolute; left: 280px; top: 450px;">As</p> <p style="position: absolute; left: 280px; top: 480px;">Ns</p> <p style="position: absolute; left: 280px; top: 510px;">Sc</p> <p style="position: absolute; left: 280px; top: 540px;">St</p> <p style="position: absolute; left: 280px; top: 570px;">Cu</p> <p style="position: absolute; left: 280px; top: 600px;">Cb</p> <p style="position: absolute; left: 310px; top: 490px;">10.5</p> <p style="position: absolute; left: 310px; top: 540px;">8. KF</p> <p style="position: absolute; left: 310px; top: 600px;">6.5K</p> <p style="position: absolute; left: 310px; top: 650px;">5KFT</p> <p style="position: absolute; left: 310px; top: 850px;">SFC</p> <p style="position: absolute; left: 310px; top: 880px;">SW</p> <p style="position: absolute; left: 310px; top: 910px;">TURN AROUND POINT</p> <p style="position: absolute; left: 900px; top: 430px;">E TOPS CBS 12-15KFT</p> <p style="position: absolute; left: 900px; top: 610px;">6.5K</p> <p style="position: absolute; left: 900px; top: 660px;">5KFT</p> <p style="position: absolute; left: 900px; top: 850px;">SFC</p> <p style="position: absolute; left: 900px; top: 880px;">N/E</p> <p style="position: absolute; left: 470px; top: 440px;">SCUD VIRGA RCH</p> <p style="position: absolute; left: 570px; top: 440px;">LOWER CLDS FM AS/AC LVL</p> <p style="position: absolute; left: 610px; top: 470px;">BACK EDGE W/SP TOP</p> <p style="position: absolute; left: 770px; top: 450px;">PACKROBE DEEPER CONVECTION HERE (CB-LIKE) HIG TOPS N/E OF LEG</p> <p style="position: absolute; left: 410px; top: 490px;">MAINLY ON TOP</p> <p style="position: absolute; left: 400px; top: 550px;">ONLY LOWER TEMP</p> <p style="position: absolute; left: 420px; top: 570px;">X-TALS FM R-STRONG REGIME</p> <p style="position: absolute; left: 460px; top: 590px;">SOFT CU TUMBLERS VSBL COLS NEEDLES VERY HIGH ICE CONC. SOME SUPER DZL</p> <p style="position: absolute; left: 410px; top: 650px;">00 99 (TWO LEGS AT 12 DUE 7 MIN COMP/INV OUTAGE) (OUR LEG HERE) ↑ NOT TWO</p> <p style="position: absolute; left: 440px; top: 720px;">RADAR TOPS ROSE RAPIDLY HERE</p> <p style="position: absolute; left: 440px; top: 740px;">GENERALLY 1-3 KM ABV A/C DURING LOWEST PASS</p> <p style="position: absolute; left: 430px; top: 800px;">2400' ~ 1400'</p> <p style="position: absolute; left: 530px; top: 820px;">R-T 99 (MOSTLY DRIZZLE DROPS)</p>	
Research crew BOND GRAY SPURGEON RANGNO			
Equipment failure 7 MIN COMP DOWN DUE TO INV. VOLTAGE ONLY HVPS/2-1V WRITE CONFLICTS RADAR NOT RCDG TIL END OF FLT			

(ROUGH NOTES ATTACHED)



Flight 1852
January 20, 2001
Voice Transcriptions*
IMPROVE

8:52 AM-9:00 AM

Static, only faint voice, unintelligible.

9:00 AM

AR: I forgot about the CPI and looking up from my bubble position I see that it's imaging correctly.

9:01 AM

AR: The only thing I don't like about the HVPS is the images do not look spherical as a rule. They're generally oriented in the up-down direction more like columns.

NB: Hey Art, Nick here.

AR: Roger Nick.

NB: I'm kind of impressed with the precip rate out here. It seems like at least on the 2-DC probe that there are more kinds of yellow than black.

AR: Right. The particles have been getting bigger as we fly this heading, that's for sure, along with that lowering ceiling that you can see earlier. I doubt any of this is getting to the ground, but I guess we can find out with our radar in just a second.

NB: Well one thing, it must be these tops must extent up pretty high then, right?

AR: Absolutely. Because back there earlier it looked like I even saw a couple bullet rosettes, which is more in the cirriform temperature regime.

9:03 AM

NB: Yes. I don't have it displayed right now. I'm not quite sure how I do that.

DS: You won't be able to it on this project because the software we have is for DOS only right now, straight DOS, so we're have a machine back there we can do that

* AR = Art Ranguo, DS = Don Spurgeon, EC = Eric Cooper (pilot), GG = Grant Gray, LS = Larry Sutherland (pilot), NB = Nick Bond

on and after a flight we'll have to copy it over. Once we get some time, we'll write the software. We're getting information on how to talk to the QNX. Art, your mike. Make sure it's straight on your mouth and not sideways again.

AR: You know what, I was talking into the wrong mike. I've got two mikes today. I was just going to say, Nick, the radar pointed downward indicates the precip goes about a kilometer below the flight level is all.

9:05 AM

NB: Well that itself is kind of something you would hope the model would be able to do, right? You know, does it get that part right? Presumably it's the easterly winds just drying it out that's causing that.

AR: There's a storm up here though. I guess it's not surprising. The temperature seems to be increasing. It's been about a degree over the last 2 min I'd say because I was just commenting that it was -10.2°C , so I don't know if we're going through an inversion pattern or over running frontal inversion or what. Anyway it's now about 1.5°C .

9:06 AM

AR: Also as you can imagine the precip plume is lengthening toward the ground almost minute by minute here. It's now about 1.5-2 kilometers below the aircraft.

9:07 AM

AR: Continuing in kind of amorphous lack of detail. Ice cloud here looking around from the bubble. The sun's position not apparent and the ground is not visible and the echo below the plane has kind of halted about 2 kilometers below after it had lengthened there. Now it's lengthening again down toward the ground maybe. Getting very close to the ground now probably within a couple thousand feet at times.

9:08 AM

LS: Nick, are you up?

NB: Yes. I'm here.

LS: We're at 10,000 ft. I can probably get you 3,000 across from the Hoquiam VAR and departing the radar site if that's what you want to do.

NB: Yes. I would like to go right over the radar. If we could be pretty close to 3,000 ft by then, that would probably be pretty good.

LS: Okay. If it's VFR out there and we can find a hole, we can go lower, but 3,000 ft is as low as they're going to give us I think, maybe 2,000 ft, on the IFR clearance.

NB: Right. I wouldn't want to monkey around waiting to get a VFR hole or anything, but just kind of head out there at 2,000 or 3,000 ft.

LS: Roger.

9:10 AM

AR: We're getting a low disc indication on the CPI, which may indicate we've got too many old data files on there. So right now Don's taking care of that. We're getting light turbulence here as we continue to fly in precipitation. For the moment, the 2-D seems to be dead. Precipitation below the aircraft is still kind of backed off actually. It's still only about 2 kilometers below the aircraft.

NB: It looks like the 2-DC is kind of temporarily kind of quiet.

AR: Yes. Something has definitely happened. I just noticed that myself.

9:12 AM

AR: Now we're starting to get precipitation all the way to the ground and we're also starting to pick up a little liquid water cloud in here.

DS: The 2-D is back up.

AR: What happened there, Don?

DS: I'm not sure what happened. There were just some minor glitches that we've been working on between the software and the hardware.

AR: Okay. What did you have to do to get that going in case maybe I could do that or somebody in case you're not around or working on something else?

DS: I suggest you ask one of the engineers. I cycled power on the wing and, if you pull the wrong button, you shut everything off.

AR: Roger. Okay.

DS: Things get out of sync and then the card down here seems to lose track. That will soon be fixed. The next card we're getting, I got a call from Paul the other day, is coming in real soon. It's going to be set up specifically for the old 2-D probes. It will probably solve this problem.

AR: Thanks for the information.

DS: I'm restarting the SVPI. The computer crashed when I was trying to make room for the files.

AR: Okay. Good.

NB: For what it's worth, I'm going to talk to John now. So I'll be kind of out of the loop for a minute or two.

9:14 AM

AR: Turbulence has increased noticeably here in the last minute or so. I'm looking at the wind direction and I can't tell what has happened if anything. Temperature has continued to rise irregularly, now at -7.5°C at this instant.

9:16 AM

AR: Dog gone it. I'm going to take that back because now I realize we're descending. We had not quite got to Westport and I didn't realize we were descending. So that throws a fly in the ointment of the temperature going up to having any meaning.

9:17 AM

AR: Don, the 2-DC is stuck again.

DS: Part of what causes it is we're some cross-feed between the two different instruments as well in the card.

9:18 AM

AR: We're starting to pick up some more significant liquid water. Water content is up a little above a tenth here. Droplet concentrations in the 10s, mid-tens. It looks like some supercooled drops there in the 2-D imagery right now. It's stuck again. Westport just ahead. Looking up we have at the base of the precipitating layer a thin droplet cloud. It looks like we're in a vault area of precip. That is heavier precip back behind us, less precip for at least a few miles. Don, the 2-DC is stuck again. I don't know if it's condensation going on there, but that's one of the other bugaboos that we have when we're descending. I notice also that the HVPS having a considerable amount of noise in this descent. It looks like we're coming into a real one of those thin spots in the frontal band here too. Precip is heavier back behind the tail here and not much out ahead for a few miles anyway.

NB: Hey Larry, Nick here.

LS: Standby 1 Nick. We're just talking to Center and we'll be right back with you.

AR: It looks like we just went through the freezing level around 4,000 ft to 3,700 ft.

9:21 AM

LS: Okay Nick. We've got a block now from down at 1,500 ft up to 10,000 ft and we can operate from 190° through 300° radial out to 110 miles.

NB: Yes. That's great. If we could get down to 1,500 ft, it looks like the visibility is going to be pretty good there. On this low-level run, we want to try to get through the wind-shift lines. So along this 240° radial like before would be good and we won't want to go any farther west than 126°50' W, but we're just going to have to see where this wind shift is. Again we're going to have pretty good visibility here for awhile.

LS: Okay. That's the radar site just off the left wing now and we'll be over there on that track here in about 30 s.

9:23 AM

LS: Nick, I guess we're going to have to maintain 2,000 ft here until we're 10 miles out and then we can go down to 1,500 ft. Is that going to be okay?

NB: Yes. That's fine.

AR: I did wave to John Locatelli from the plane. I see southeast wind indicated by the Hoquiam pulp mill plumes and whatever else might be going on there flowing outbound here and probably 100° or so, maybe 120°.

9:24 AM

AR: It will be interesting to see if we hit some kind of turbulence out here where the easterly wind meets the more southeasterly wind as we had the other day when we landed.

NB: Well it's kind of nice that all this stuff with the CPI is when we don't have to do anything right now. There's nothing to see right here.

AR: Yes. I've been amazed at how good an actor that thing has been because during KWAJEX you constantly had to be watching it. It's a nice. I guess it would be maybe, stratocumulus undulatus ahead about 11:30 just to the left of your heading, Nick, beautiful rolls. It's just like looking at giant sea swells from upside down.

DS: It looks like it's up and running again.

AR: What was that, Don?

DS: The CPI is up and going again.

9:25 AM

AR: I'm guessing, Nick, although we were embedded in precip, we had an enhanced turbulence zone as we were descending. I'll bet you that was at the same level as that undulatus out there except that would probably almost certainly be the bottom of the frontal inversion and these are like gravity waves being created by that.

NB: Yes. That makes sense. I'm not sure. Do you think was around the freezing also?

AR: I thought it was higher than that. I'll have to think for a minute. I think it was closer to 6,000-7,000 ft. I suppose it was sloped down a bit out this way, but this is gorgeous. If you have a chance to look off the left wing and ahead at 10-11 o'clock, this is really quite a nice sight for undulatus.

9:26 AM

AR: White caps on the surface suggesting maybe 20 knots is all. They're numerous but small.

9:27 AM

AR: The liquid clouds evidenced by undulatus are in other areas of the sky other than this sort of 10 to 2 o'clock region where you can see the liquid water bases are obscured.

NB: The conversation I had with John at the radar, he definitely wanted us to get all the way to the wind-shift line if we could. He expects it not to be extended too far out to the surface, but we should see a very dramatic change in the wind direction from the southeasterlies we have now to even, I don't know, northerly even. Not real strong winds, but hopefully it will be pretty well defined.

AR: Yes. That will be interesting. We'll watch for that. Hopefully we'll have some kind of cloud signature there.

9:28 AM

NB: According to their estimates, the kind of the southwest point that we're headed toward is right in the middle of that band that they see on the radar. So I'm pretty confident that we'll run into something. For what it's worth, I'm thinking about 1,500-ft increments on this one.

AR: I might have to rethink my wind speed there on the ocean. I was indicating about 29. I noticed that our winds here at flight level 1,300 ft are no less than 40 knots or about 20 meters per second. So maybe I'll double-check with the pilots here. Larry, what's your estimate of the wind speed on the surface from the white caps and what have you?

LS: Art, the winds are about 130° at at least 20 knots.

AR: I was estimating 20 knots myself independently and I wanted to get a double-check because I noticed our wind speed here is indicating about 40 knots at this level. So there's an awful lot of shear.

LS: I think that's probably correct because I have about almost a 15° clam in there just to stay on course.

AR: Maybe I'll bump that up to 25 knots. There seems to be a little more white caps right in here than there was back there a little bit ago.

9:31 AM

LS: Art, now on my wind speed here I figure 160 at 40 knots.

AR: By golly, it doesn't get any closer than that. I've got 164 at about 36 to 40 knots. Excellent.

NB: Art, what I'm looking at here, I don't know if these are the Shadin winds are not, they're something like 170 at 30 knots. I don't know which winds you're looking at.

AR: I think I have Grant's calculation. I'll have to check and make sure we're looking at the same thing. I want to check my file to make sure I've got the right instrument.

9:34 AM

LS: Art, are we looking for a wind shift on the surface? Is that something you want to be aware of?

NB: Nick here. Yes. That's certainly something worth keeping track of. I notice they're coming around a little bit more from the south, but we should see a real distinctive one. It won't be for quite a while I would think.

LS: Nick, when we're talking direction, are we talking magnetic or true with you?

NB: I think in terms of true, whichever you prefer.

LS: Let's work in true.

9:36 AM

NB: It's getting kind of toasty in here. I don't know if you can kind of take a log off the fire or something.

LS: Yes we can.

AR: One of those metaphors. Yes it is toasty back here I'll tell you.

LS: Nick, I see 140° true on the surface.

NB: Yes. That sounds about right.

9:37 AM

AR: After fiddling around with some instrument files, I'm back up in the bubble looking around. Not much has changed as far as white caps from the surface. You have some information from Larry about wind speeds there just a minute ago. Over us we have altostratus. At near the bottom of the altostratus where the virga ends is a layer of...

NB: I say swami, I mean Art, do you see anything ahead that makes you think like there's precip in time soon?

AR: Yes. There's precip ahead. It will be maybe 5 to 10 min.

NB: It's all tight if I call you swami, right?

AR: It is.

9:38 AM

AR: Right here as I was saying at the bottom of the altostratus in the immediate area of the aircraft is a stratocumulus layer not showing much in the way of convection. Very thin probably not even 1,000 ft thick and most of the stratocumulus in the immediate area of the plane and then looking off to the horizon the clouds do mass and buildup into something that looks like it might be a rainband. Certainly there's precipitation out there and a thickening and lower of clouds and adding of layers really rather than lower and thickening so much. That would be out toward this heading and probably almost due south through southwest through northwest.

LS: I think you're getting a little bit of a shift. It went from the wind tip to about 10° ahead here in the last 3 or 4 min.

NB: Right. I see our drift angle there is kind of decreasing some. Yes.

LS: There's a stiffening on the surface.

NB: Right. But I think we should see a real dramatic one, almost 180° wind shift or so. But that could even be past our southwest point there at 126°. Larry, as we get closer to 126° if we haven't gone through the full wind shift that should be 120° or 180° even, we'll make a decision whether to proceed on the same radial.

LS: Okay. I'll have to get a clearance to go our past 120 miles.

NB: Okay. Talking to the radar they don't want us past the longitude of 126°50', but they do want us to get through this wind shift line if we can. My suspicion is that it is beyond the 126° line.

LS: Okay. We'll go out as far as 126°23' and you might want to go out another 40 outside of that?

NB: That's correct.

LS: Okay.

9:41 AM

DS: If we had a satellite link, they could watch us in real-time back at the university. That's coming off the internet via a video server that's on one of the computers in here.

AR: Yes. Won't that be something?

DS: Yes.

9:44 AM

NB: Well at flight level the winds are up to 25 meters per second, so I think this is a good sign. Certainly the model didn't have anything like this in the levels.

AR: Interesting. Yes. That is a good sign there. As I say, that darkening you see out at 2 o'clock or so is also dead ahead and we have some precip off just ahead of the left wing out about a few miles. We may see a drop or two here in just a minute or two.

LS: Nick, they can't give us a clearance past 100 out because then we're in the open oceanic air space.

NB: Okay. I read you there. We'll just have to work with that. I'm sure we'll be in precip before that point and that will just be our kind of outside edge then.

LS: Okay. It looks like another 20 miles is going to put you into precip up here.

NB: Yes. That's what Art is saying or maybe even a little sooner. It would be nice if we could get through that wind-shift line but so be it.

9:45 AM

NB: Definitely more white capping now, so it's definitely kind of picking up out here.

9:47 AM

AR: And as has been noted, the wind has picked up here at the surface. White caps are more numerous and larger. I'm estimating 30 knots now on the surface sustained. Flight level winds about 175 to 180 true at almost 50 knots, so this is pretty significant out here. Again this band of precip and lowering stratocumulus is maybe 5 more minutes ahead I'd say.

9:49 AM

AR: A little virga patch past off the left wing. I don't think we got any of it.

9:50 AM

AR: Starting to get a few raindrops in here.

NB: Yes. I can see our winds are kind of coming around a little bit more from the west now and dropping off.

9:53 AM

AR: Don, the 2-DC maybe stuck again.

DS: I just reset it. That's why you see that funny line. So I'll watch it and if it doesn't start up again, I'll reset it again.

AR: Cloud bases continuing to lower now almost down to flight level.

9:55 AM

AR: Bases of these overlying stratocumulus clouds are almost down to flight level now.

NB: Yes. I think we'll be in business right away.

9:56 AM

DS: Art, it looks like it's fine. We're starting to get a little bit of stuff coming through on the 2-DC.

AR: Roger. Great Don. Drizzle out there. I don't see any return from the radar, so the echo top is probably awfully darn close to the aircraft. There is some overlying ice cloud that's showing up, but I suspect these are all warmed-topped clouds here that are producing this drizzle. Well I'm positive.

9:57 AM

AR: Well I won't say anything. You'll be kind of keeping an eye on the 2-D.

DS: Yes.

AR: Thanks.

DS: It's going fine again. We were getting a series of HVPS records that were being cross-feed into this other application still. That one right there is an HVPS record.

AR: We're starting to nip some of the cloud bases here at +6°.

NB: Say Art, I figure we want to keep going here and not turn around at our original point of 126°, but keep going as far as we can to get into the real precip, right?

AR: Yes. That's true. That's what I would do. Having come all this way, I'd hate to miss that darn wind shift.

NB: Right. We're right now at 125.77°. Now it looks like some bigger drops are starting to show on the 2-DC.

9:59 AM

DS: Rocks going through this 2-DC.

NB: Larry, Nick here.

LS: Go ahead Nick.

NB: We'd like to continue on this course until if and when we get to the wind-shift line, so don't turn around at 126°, but just to that western-most point of our box.

LS: Okay. I've got 25 miles to go out here.

NB: Right. So we know that's kind of the magic boundary, but right now we're doing good stuff.

LS: Okay.

10:02 AM

AR: Pretty good liquid water for this flight level, 0.2, 0.25, as the cloud bases continue to lower below the aircraft. We're getting pretty close to the deck down there.

10:03 AM

NB: Yes. The bases must be pretty low here because I used to be able to see kind of the white caps and now it's totally obscured below.

AR: Right. The FSSP integrated water was just over 0.3 there, which is sort of amazing for flight level 1,200 ft. Bases in fact are +7° or something like that.

10:04 AM

NB: I'm seeing the winds starting to come around now. So maybe we're in a pretty good spot.

AR: Yes. It would be great, wouldn't it?

10:05 AM

LS: Nick, just looking through the haze in the clouds here and there, I think you've got a shift up there ahead probably it looks like it sure could be a westerly, but we've got to turn around here in about 6 miles.

NB: Okay. Yes. I copy you. That's too bad, but I understand. Let me think here a minute. Why don't we climb up to be probably something like 5,000 ft?

LS: Okay. Do you want to go back on the reverse course?

NB: That's correct.

AR: Larry, when you say you notice something, is it something on the sea surface or are you looking at maybe a clearing in the clouds ahead?

LS: No. I just went through a break in the clouds and I saw this surface that looked like it was a little bit more westerly.

NB: Yes. I saw the same thing.

AR: A little more precip here, but just maybe getting above drizzle sizes. I haven't seen a millimeter drop yet.

NB: I think we might be getting some now.

AR: Yes. Just then one filled up the whole frame. Along with that, we're getting a huge increase in the ^{turn} above the aircraft. I just spoke about that a couple of minutes ago and now it's probably 2 kilometers at least above the aircraft. You'd think that wind shift has got to be right on the doorstep here.

10:07 AM

LS: Nick, we're going out here another 5 or 6 miles.

NB: Okay. That's great. As far as you can get us, that would be great.

10:08 AM

LS: Before we climb, would you like to sneak down to cloud base so you could see the surface?

NB: Yes. That wouldn't hurt. It's certainly not far to go. Yes. That would be great.

LS: Okay. I'm going to ease her down a couple of hundred feet, Nick, and then we're going to need to climb and go back.

NB: Yes.

10:09 AM

AR: Tops have continued to increase in height above us. They are now probably approaching 3 kilometers.

LS: Nick, we're at 600 ft now on the radar altimeter.

NB: Okay. I see basically the winds are still from the south, but certainly have a westerly component in there it seems.

LS: I'm going to go ahead and start our climb now and reverse.

NB: Okay. The tentative kind of northeast point there is 46°30'/125°40'.

LS: I'll get that from you here in just a minute. ^{for a second}

AR: Yes. It looks like there's a little bit of fictional backing in there, Nick. I was reading the 170s.

NB: Yes. I'm sure that's the case. I like it during with height, so that it will be a little bit more of an easterly component toward the surface.

AR: Yes. Dog gone it. I was really looking to see that thing flop around. Rubbish.

NB: We may just be out here a little too soon.

AR: Well at least we won't have to climb far to get to cloud top.

NB: What they want us to do on this one is 1,500-ft increments. So we'll really be kind of laying down thin layers on that stack. I assume the reverse flow temp is the best one to use in trying to kind of estimate where the freezing level is.

AR: Yes.

10:12 AM

AR: We're kind of in and out of droplet cloud here. Sky is fairly bright, but the sun's position is not yet available.

LS: Nick, we're out of 4 for 5,000 ft.

NB: I'm sorry. Could you repeat that?

LS: We're out of 4,300 ft climbing to 5,000 ft.

NB: Thanks.

10:13 AM

NB: We want to get just above the freezing level and there's a chance that we might have to climb a little higher than that to something like 5,500 or 6,000 ft.

LS: Okay.

10:14 AM

LS: I've got about a +3°C up here yet. I think we need another 1,500 ft anyhow.

NB: Yes. By the ones I'm looking at our 1° to 0°, so at least another 500 ft.

LS: Okay.

AR: I wonder if this is corrected for ram affect because that's about what you would expect for the ram affect added to the ambient.

DS: Yes. Their t-stat matches our t-totr and then we have a corrected on t-stat, which is corrected from the thermometer.

AR: I was just wondering, he was indicating it was +3°C.

DS: That's about what our t-totr just the raw one uncorrected is reading.

AR: Supercool ^{er}drizzle.

NB: So what do you think, Art? I have a rev temp of right at 0°C and the other one of -0.7°C now.

AR: I think I'd climb probably to 6,000 or even 6,500 ft, so it's -1°, -2°C, in that range. Just make sure there's no temperature glitch going on because t-stat has been running a little bit cool on our flybys and our sounding comparisons.

NB: Okay. Yes. I think we could level out about 6,000 ft then Larry. So I guess we're right about there now maybe even a little past, but this is a good spot to be.

LS: I'll go back down a couple hundred feet.

AR: Right. This is a good temperature because, even though the drizzle maybe supercooled, it's just slightly below freezing because of the rain affect there, which is kind of a ___ off anyway.

10:16 AM

AR: This is interesting. It certainly indicates that it's an all warm-rain process even though it's below freezing here.

LS: How does that altitude look to you there, Nick?

NB: Yes. It looks fine. Thanks. Now for the northeast point, what I think might work out pretty well is 46°19' or so and 125°40'.

LS: Okay.

NB: But basically the track you're going on is fine.

LS: Okay.

NB: Say Art, a small derelection of duty here. Did you get the time of the end of that last low-level leg? I estimate now it was 18:10.

AR: That sounds about right. No. I did not mark that time down, but that sounds about right, maybe 12.

10:17 AM

AR: Still in cloud. I can't really make out.

NB: Boy, I don't like how bright it's getting.

AR: Right. Remember I was looking at the radar as we came into this thing and the cloud tops were going up pretty rapidly just in the last maybe 10-20 miles of that leg and before that you couldn't tell there was anything above the aircraft. So I wouldn't be surprised to see us kind of pop out or be skimming the tops here before too much longer.

10:19 AM

NB: I see our reverse flow temp is now +1°C. So I don't know if we should go up a little bit more. What do you think?

AR: I'm reading -0.8° back here on t-statr.

NB: Right.

AR: You might be Shadin t-stat is +1°. That's not probably as accurate as the t-statr. We usually track each other very closely, closer than that, but I believe the correct temperature would be about minus something.

NB: Yes. I have them both here. I just wasn't sure which one. Yes. They show 2°C difference.

10:20 AM

AR: However, you wouldn't lose anything if you did climb just to eliminate a possible discrepancy, you know, climbing another 500 ft or something just to clear all the mystery away on that.

NB: Yes. The thing is I'd like to keep them as level as possible unless we absolutely have to.

AR: Yes. I sure understand that. That's right.

10:21 AM

NB: Larry, Nick here.

LS: Go ahead.

NB: We're, of course, making much better time on this leg than the other way and tentatively we'd like to climb up an initial 1,500 ft and reverse course and again go back to the magic line.

LS: Okay. So you want to go up 1,500 ft and reverse course and go back to the point that we just departed?

NB: That's correct.

LS: Okay. Here we go.

NB: No, no, no. I'm sorry, not right now, but when we get to that endpoint that I gave to you before.

LS: Okay. That's only 8 miles away. Did you want to be on this reciprocal track or did you want to get back on the original track?

NB: Oh, they're virtually the same. Actually, in case this band is moving faster than we think it is, why don't we wait until we get to that first point I gave you and see if we've gotten out of the precip or not. Sorry to have given you conflicting sort of instructions here.

LS: Okay. So 6 miles at 125°40' west we want to climb and go back.

NB: Yes. Unless we're still in precip, then continue the course. That's just as we came out here, that's about where we hit the edge of it.

LS: Okay.

AR: Here it looks like we're at the bottom of one layer and down below I can make out with about a 75% confidence a separate layer below us. So we don't seem to be in merged conditions any more.

10:23 AM

NB: Hey Art, if you're looking for it, I'd like to try to kind of fly this line up to the point the edge of the kind of precip drizzle band or whatever. So if you see any kind of indication of clearing ahead, let me know.

AR: There's a little more precip ahead after this little vault.

LS: Nick, there's your clear sky.

NB: Right. I'm talking with Art. He mentions that there maybe a little bit more ahead. Art, do you think we should kind of continue forward to try to get this piece?

AR: I don't think so. I think it's probably just sprinkles out there and we'd probably have something more interesting back behind the tail.

NB: I agree with that. So this would be a good place to climb then, 1,500 ft, Larry, and then kind of just reverse course basically along those two tracks we've laid down.

LS: Okay.

AR: As we come around here, Nick, we're now on top of that undulatus layer that we saw before. If you look back around to 4 o'clock, you can really get a beautiful view of what looks like giant sea swells.

10:25 AM

NB: I'm going to try to raise the radar now and I'll check in with you guys in a bit.

10:26 AM

LS: Nick, there's your 1,500 ft climb.

AR: We only saw a liquid precipitation on that pass, lots of drizzle, maybe some drops getting beyond the drizzle stage size, but that was about it. No ice whatever seen at the freezing level. We've climbed into the overlying stratocumulus/stratus-looking layer in our 1,500-ft climb. We're going back through that toward the rainband and above at least one layer of stratocumulus, which one portion had undulatus-like rolls in the north-south direction.

10:28 AM

AR: Droplet concentrations in here are very low in the low 10s. They were generally running in the upper 10s in that pass at 6,000 ft and a little bit higher than that at the pass that serves around 100 maybe peaking at around 100 or so at the bottom of the frontal band.

10:29 AM

LS: Nick, just from my instruments up here, it looks like you've lost your southerly component pretty much. I'll get your wind here in a minute.

NB: Okay. So Larry, that kind of southwest point, is there any chance we can get beyond that or is that a pretty hard line?

LS: No. That's a hard line for us especially now that we're up here at 7,500 ft they've got us on radar. We can sneak by down there below the radar, but I can't do it up here.

NB: Okay, So Art, according to John, he thinks warm-rain processes are something worth doing also. From there, based on their radar estimates, they agree with us that we should be at the edge of the most interesting part of the band. So I guess since we're already out here, we ought to just keep doing this at 1,500-ft increments until we get to the top. Art, I think your mike is messed up.

10:31 AM

AR: Testing 1, 2, 3. I've gone back to the old mike attached to the headphone.

NB: Yes. That's better.

AR: The other one, which was resoldered together by Grant, must have failed again.

NB: Okay. In talking with John, he thinks the warm-rain processes are of interest and even though we're not getting any ice, or not much anyway, we should continue to do this. From the radar, actually now I'm seeing some ice on both probes, he's not surprised that we just got into the real precip at the southwest end of our leg.

AR: Yes. I did hear your communication earlier. It sounded like a good plan to me. It's shallow and you cut your leg, your height-climbs down, and you cut it down that way because you've got so little to work with.

LS: Nick, it looks like your true wind is about 180 at 30 here. It's just not as strong. It's still out of the south.

NB: Thank you.

LS: I'm screwed up on that. It is more out of the west. Let me get that again.

NB: One of the things that John recommended, and it make some sense to me, is that after we finish this stack if we could kind of descend down once again and maybe then catch the wind shift at low levels as we assume that it's moving in toward the coast.

AR: Right. I think probably one of these times at these higher levels we ought to pop out the backside. We must be pretty darn close.

NB: He thinks most of the action is to our west and further west than we can go.

AR: I see. Rubbish.

LS: The winds up here are 240 at 20 knots.

NB: Thanks Larry.

AR: That's probably magnetic. Yes. We always look forward to that big backside clearing. That's one of the nicer things about these flights.

10:36 AM

NB: It looks like we're getting some bigger particles now at times.

AR: Roger. It's still drizzle but what the heck.

10:37 AM

AR: There's an enthusiastic burst. It's got some ice in it. The radar is indicating the tops are about a kilometer above the aircraft.

10:38 AM

AR: I would have to say that I would not have guessed that much even. I would have guessed probably 500 meters or 700 meters. I'm kind of going from drop sizes here. It looks like we went into a separation zone here as there's a layer above us and a layer below us and not much precip as you see in the radar it doesn't seem to be picking much up above the aircraft now.

NB: Right. I see the 2-DC just kind of went to sleep.

LS: Nick, we've got about 8 miles until our turn point now. Do you want to climb after that?

NB: Yes. That's correct. Climb up to 9,000 ft and reverse course to our last turnaround point there where we turned around on the 6,000-ft leg.

LS: Okay.

AR: I think it was just before our turnaround point that the tops really were climbing pretty rapidly above the aircraft. So it will be interesting to see if we find that again.

10:39 AM

NB: We lost about 4 min you say?

AR: It's about 5 min now or about 15 nautical miles. I've lost track, what's our heading now?

NB: We're heading toward 060 toward the northeast.

AR: We're coming into a vault as you can see here.

10:54 AM

DS: Another thing to note is that the HYPs cards are so hot that the alarms are going off on them. It may not come back up.

AR: Don, do you think it's hotter up where you are than it has been on previous flights because back here it's actually cooler I would say where I am?

NB: Yes. I think it's pretty warm here.

LS: We're at our endpoint. Do you want to keep going, Nick?

NB: No. What I'd like to do is keep going for at least another half minute or so. I'm sorry. It was the wrong channel again. Yes. Nick here. Yes. Keep going along this course for another half minute or so until we can get the instruments going. Then chances are we'll want to repeat our reverse course and stay at this level. We lost a lot of data on this leg.

LS: Okay. Reverse course and stay at this level. Okay.

DS: The data feeds are going good and you'll probably have to restart your applications to get them to update correctly.

10:56 AM

NB: Larry, Nick here.

LS: Go ahead Nick.

NB: Yes. If we could kind of turn around and kind of reverse course and head back toward that southwest point that we...

END OF TAPE 1, SIDE 1

AR: Grant, could we have the radar in the up position.

10:59 AM

AR: One of the things that's interesting about these passes, Nick, is you remember at the freezing layer or just above the freezing level, we didn't see a single ice crystal. It was all liquid precip. Now we go up to -5° and -6° and we see tons

and tons of ice. So there's been quite a change and I'm just guessing that it's an encroachment of the higher tops as we kind of stay stationary in terms of this track and the front gets closer and closer and those deeper tops encroached on our legs.

11:01 AM

NB: I note that the 2-DC is back.

11:04 AM

NB: So Art, John recommended that we kind of work just the kind of the deep precip part of the band right near our southwest endpoint just real tight little kind of stacked back and forth. Do you have any comments there?

AR: No. It sounds reasonable to me. I'm kind of a go along kind of guy. I see we're in and out of at least one layer of cloud tops.

NB: Yes. This northeast part of it seems to be of kind of a limited interest now. We know that it's just drizzling out of it, so who cares.

AR: Roger. Some sort of semi-cumuliform buildups out there at 1 o'clock to 2 o'clock. You get a nice look now at that overlying altostratus deck too.

11:05 AM

AR: We have a smooth cloud top just ahead.

11:06 AM

AR: I couldn't tell whether it was a pileus or not on top of some rising modest turret.

11:07 AM

AR: I lost my forward view here because of the icing picking up on the bubble I have no forward view at all. Still haven't picked up much on the 2-D. We're kind of in above cloud tops, nipped a couple of wisps and we went just into kind of a smooth looking stratiform cloud just then. I didn't see anything imaging on that.

NB: I see the HVPS seems to be back.

AR: Yes. Thank you.

NB: About here might be kind of the northeast end of the region of interest I would think.

AR: Yes. I think you're absolutely right, Nick. You can see there's drops and high concentrations of ice crystals. I'm guessing that just from the frequency of the 2-D updating it must be hundreds per liter. There is still some droplet cloud around probably indicating a fairly recent origin of crystals not only from their size but the fact that there is still some liquid water around.

NB: Larry, Nick here.

LS: Go ahead Nick.

NB: We're collecting good data now and the system is back up and all that sort of good stuff. When we get to our southwest point here, I'd like to climb up to 10,500 ft and reverse course not go quite as far as we have been going, but the new northeast point would be 46°17' and about 125°45'.

LS: We'll put that in.

AR: I can't make out anything on cloud tops here what's going on just a general fog bank flight right now.

11:10 AM

AR: I saw a little tinge of blue sky off in the distance, Nick.

NB: Yes. I guess that's a good sign. John really wanted us to go back down. So as we profile up here, I guess we'll take a screaming dive to the surface. I'm not sure if there's some merit in some kind of ramps or some sort of profiling sort of maneuver that you guys like to do to get one quick shot through a system like this.

AR: Roger. The thing I couldn't tell was if there was another band out there or not. I could see some blue sky, but I wasn't sure whether it was the back edge beginning or there was something still to go. Did John offer anything about that?

NB: No. Just that he thought the band was slowly marching toward them and so that if we waited out here long enough chances are we could get through the wind shift.

AR: That certainly seems reasonable.

11:13 AM

AR: I can't see anything in the forward about 120° because of the icing here on the bubble. Clear icing I might add indicative of large drops.

11:14 AM

AR: While these clouds are generating their own ice it would appear, it does seem at this point that the altostratus did lower and was producing virga or precip into these lower clouds in this particular segment of the band. We just went through a vault and entered a new band or clump or precipitation.

11:16 AM

AR: Broke out again here at 19:15. Looking back I can see that the altostratus does impact the clouds back behind us, although it is a little questionable. I'm 90% sure it is impacting those clouds and looking ahead we're on top of stratus/stratocumulus, soft convection here and there, some weak cumuliiform turrets, and then other areas that are completely smooth indicating they are not moving at all. Actually off the left wing I see completely glaciated flat cumulonimbus-like turret in this stuff.

GG: Donald, go to "chat" for a second.

LS: Nick, did you say you wanted to go up to 10,000 ft?

NB: 10,500 ft.

LS: 10,500 ft.

11:19 AM

AR: Looking around we're on top of this kind of saddle region with altostratus extending off back behind the horizon. I do see the back edge of the altostratus some blue sky off to the west and through northwest.

NB: Say Art, Nick here.

AR: Roger Nick. I was just commenting on the top. I can see this huge clearing off to the west and northwest now, the back edge of the altostratus.

NB: Okay. We have something we're headed toward right now we're not doing anything of course, right?

AR: That's right. There are higher tops probably associated with that heavier precip we went through back there. Also, it did appear to me that some of this altostratus virga was dropping into these clouds around that point as well. I'm going to go up and take another look.

11:24 AM

AR: We could have virga from the altostratus reaching into the clouds off around 4 o'clock. A bit of haze there, it's not really much. The concentration is probably below one per liter.

NB: Art, Nick here.

AR: Roger.

NB: I'm getting a little concerned that we're kind of not doing anything very useful right now. We're pretty rapidly approaching the point where we saw the precip basically start when we were down 1,500 ft lower.

AR: Yes. You probably know that better than me. You do have these elevated tops just ahead now. I don't know. I thought maybe that was the area where the heavier precip was, but you know the plan a little better than I do. Let me go up front and I'll give you how many. I was indicating 2 min before, so we're probably only 30 s from that now if I'm anywhere near right. So let me take another look.

11:26 AM

LS: Nick, we're at our northeast point. Do you want to reverse this thing or not?

11:29 AM

DS: Standby one. I'll have him put his headset back on. Nick, the pilots just called and asked a question.

NB: Yes. Nick here. I guess tentatively I'd like for you turnaround at this point and head back down. We'll repeat that 9,000 ft-run and I'm going to talk to the radar and see what they recommend. Tentatively what we'd like to do is near the southwest point go down low again and see if the wind shift has gotten within range. I'll have to get back to you in a couple of minutes. Right now let's reverse course once you get down to 9,000 ft.

LS: Okay.

AR: I like that plan, Nick.

11:30 AM

AR: For the tape, we just skimmed just under the highest tops of this particular band that weakens. I shouldn't say weaken because now I see there's another elevated area of tops that we sort of pass on the edge of a saddle region, in a north-south or northeast-southwest band, of elevated soft cumuliform-looking tops. They're off the left wing now mostly glaciated looking I would say. We passed probably only

within a few hundred meters of the saddle region as we nipped those cloud tops. We got a little bit of a sample, but it may not be real representative of the heavier precip area that we flew under. Because what I see off to the northeast of our position is almost without doubt actually the producer of the heavier precip and ice crystals that we saw on the last two lower legs. With any luck, we'll hit something that has moved into this locale. We are flying a geographical line not following these elements, so if they're not contiguous we're going to get bad sampling or at least a sampling that's not going to correspond to the precip as we step up the ladder here and do this moving stack. Actually it's a non-moving stack.¹¹ (aircraft track)

11:32 AM

AR: Because of the icing on the forward portion of the bubble, I'm running back and forth to the front of the plane and that's why I'm not commenting on some things.

11:33 AM

NB: Larry, Nick here.

LS: Go ahead Nick.

NB: After talking with John, he would like to get a pass between the freezing level and that one low-level leg that we had before. So if we could maintain course and continue to drop down to 3,500 ft that would be good.

LS: Here we go down.

11:34 AM

LS: Nick, do you want to do a turn out here so we don't extend too far out to the west before you get started?

NB: No. This will be okay. We want in the kind of heavier part of the precip toward the southwest kind of be down low. I think we can get where we need to be in time.

LS: Okay. Does airspeed matter to you in this descent?

NB: No. I think we're okay.

LS: I'll have you down there in about 3 min.

NB: Yes. That would be plenty soon.

AR: Dropping into some of the stratiform-looking tops. I didn't see any cumuliiform tops in this particular region, but could have missed them. It's very chaotic out here in that they're mounding sort of weak looking convective tops. Mainly I noticed just off the right wing as we were descending here. The altostratus overcast, which seems to lift in the base height as you look westward, and then several levels of stratiform clouds in all this stuff. So it's very mixed up at least in that saddle region back there before we entered the particular clouds. Now we're in a steep descent. I look for some fogging on the HVPS and 2-D. We're down near the freezing level and only getting supercooled drizzle.

11:37 AM

AR: This would have corresponded to tops that were quite a bit shallower than those buildups in which I've inferred the ice came from. ^(Relative to tops - sized) Drop sizes have increased nicely downward. Broke out between layers here at TANS-alt 3,700 ft. I see lower undulating undulatus-type stratocumulus below off the right wing.

11:38 AM

LS: Nick, did you say you wanted to be at 3,500 ft?

NB: Yes. That's fine for right now. I guess we can see what's kind of fallen in from above now.

LS: Okay. I just overshot. I'll climb back there.

NB: Where you are is fine.

LS: Okay.

NB: What we'll want to do at the southwest end here is again drop down to as low as we can go to get a peak at what the winds are like down here and we'll head back then northeast at low levels until we do something else.

LS: Okay.

11:39 AM

AR: Presently overcast altostratus and at least one layer of liquid cloud. Stratocumulus just above the aircraft about 2,000 ft. I would estimate cloud bases immediately above us and below us cloud tops 2,000 ft below the aircraft. A large opening with no low clouds off the left wing and to about 11 o'clock position. Dead ahead lowering clouds and precipitation.

11:40 AM

NB: I'm kind of pleased that we kind of found where the edge of the precip was here below the freezing level. You can see that it was just at the southwest end of this leg.

AR: You're referring to that southwest end. I've got to check my headings here.

NB: Right. We're headed southwest now. We were kind of encountering kind of two levels of action so to speak. You know some of the stuff we were flying through aloft obviously wasn't getting down to the surface, but at the southwest end it definitely is.

AR: Right. I notice that we started out in that regard with that supercooled drizzle situation. I think that was because when we descended it was kind of a chaotic cloud top situation. We had to go through a saddle area of these in general where the cloud tops associated thing.

NB: So when we get to the magic point here, we're going to go down as low as possible and kind of see what the winds are. Then the question is what level to fly back toward the radar.

AR: Yes. Would we just repeat what we did before and go back up to the freezing level or a little below the freezing level?

NB: You mean right above the freezing level?

AR: Exactly.

NB: Yes. That makes sense to me. Then for what it's worth, the plan is to kind of talk to the radar and they're seeing a warm front-type rainband developing to the north of that system the low the kind of wave forming on the front to the south. They're thinking about actually having us land at Hoquiam and maybe kind of waiting a bit and then doing that one.

AR: Yes.

NB: But that's to be determined.

11:43 AM

LS: Nick, we're 5 miles to our southwest point. Do you want to drop down as close to the surface as we can get then after that?

NB: Yes. That's correct. Then kind of reverse course and kind of head back along the same radial toward the northeast, but not to fly too much at near the surface there. We would want to climb back up pretty soon to 6,000 ft and basically maintain that 6,000 ft for most of the way back toward the radar.

LS: But you do want to go down clear of clouds on this turnaround?

NB: That's correct.

LS: Okay.

11:44 AM

LS: Nick, we're going to start our turn here.

NB: Fine.

11:45 AM

AR: Don, do you copy?

DS: Go ahead.

AR: I'm as hot as I've been during this whole flight. How's your area now? Is there any danger of the computer blowing?

DS: I'm watching it, but the volts are starting to drop again. We've got to get the cabin cooled down in some fashion.

11:46 AM

AR: It looks like the wind maybe has shifted. At this elevation before, Nick, remember it was 170 to 180. Oh heck, we're turning, so never mind.

LS: Right. Just looking at the white caps I think it's kind of gone down a tad.

AR: That's right. There are not nearly as many white caps as we saw out here before. It was raging.

DS: Art, we took some covers off and it is doing better than it would be doing otherwise as far as the temperature and the inverter bay. So it's kind of holding its own. But if it gets much warmer, it's probably going to shut down again. It's around 104 to 105 volts and if it drops below 100 volts the computers will probably shut off again.

AR: Okay.

NB: So Larry and Eric, I don't know if you've been listening to our conversations, but the computers are starting to kind of complain about the heat. Larry and Eric, the

computers are starting to complain about the heat some, so if there's anything we can do about that.

LS: Okay.

DS: We'll just roll down the window here.

11:48 AM

AR: Continuing very low cloud bases, they don't portend a wind shift or frontal passage to me.

11:49 AM

LS: Nick, there's 500 ft on our radar altimeter.

NB: That's fine. We're still in basically south-southwesterly winds, so we're not at the wind shift definitely. Why don't we keep it here just for maybe a minute or two longer and get kind of a sample of what the precip is down here. Then I'd like, staying on the same course, a climb up to 6,000 ft.

LS: Okay.

NB: At that point once we get up there, I'll be talking to radar. They're right now discussing our future and in particular whether we'd basically be done for the day or whether we'd be stopping in Hoquiam.

LS: Okay.

11:50 AM

NB: It will be nice to have this kind of repeat leg to compare with whatever it was an hour and a half ago or so when we were back down here. For one thing, I know the winds have slackened.

AR: Yes. That's right Nick. That would be good to do.

11:51 AM

DS: It's starting to cool off up here a little bit and the invertors are already starting to drift up again, the voltage.

NB: So Art, do you think we've collected enough down here? I would like to get up to the freezing level again.

AR: I think so Nick.

NB: Larry, Nick here. If we could climb up to 6,000 ft at this point, that would be fine.

LS: Here we go for 6,000 ft.

11:52 AM

NB: Boy, this guy is petering out big time.

AR: Yes, really.

11:53 AM

LS: Nick, we're about 5 miles from the last northeast point you gave me.

NB: Yes. Let's continue though on this course to the northeast heading toward Westport. I'm going to check in with the radar now. Larry, Nick here. Yes. Continue on this course to the northeast and I'm going to check in with the radar. I think we've done all we can in this particular rainband and it's just a question of what next.

LS: Okay.

11:56 AM

NB: Say, is the 2-DC kind of alive or?

DS: I think it is. There's not enough big stuff out there. We're only getting up to about channel 9.

AR: I think that's correct, Nick. I don't think there's precip out there this second.

NB: I see. Maybe it's just melting off my window.

DS: That's possible. The FSSP-100 is only going up to about channel 9 and somewhere between channel 10 and channel 13 is about the beginning. It's two pixels in the 2-DC. If you get much below that, you might trigger a pixel, but it takes a long, long time to fill up the buffer. See there's one that just came through. We hit something a little bit larger.

NB: Right. I see. I'm going to be out of touch here for a bit. I'll be talking to the radar.

DS: Art, how's the temp back there now?

AR: Cooler.

DS: My voltage has come up almost 2 volts now after he turned it down.

11:57 AM

AR: Still flying in a stratocumulus deck at about 6,000 ft. The temperature about -2° to -1.5° . FSSP in the 50s or something and we had a couple of supercooled drizzle drops back there again, but nothing lately due to the thinness of this layer.

11:58 AM

AR: However, we do have a little of what looks like precip ahead coming out of the altostratus deck that was above. It's not visible now I think, but anyway it was just above the stratocumulus layer. High layer lowing ahead. It looks like precip ahead still only within the next minute.

11:59 AM

AR: As we break out, we're at the bottom of a stratocumulus layer, very thin looking. I don't see anything for sure that looks like precip.

NB: Larry, Nick here.

LS: Go ahead Nick.

NB: I was just done talking with John Locatelli. He would like us to head for Hoquiam and to land there and to refuel. It's still uncertain whether we would be flying this warm frontal rainband that seems to be forming to our south. So the question there would be once we're on the ground we'll talk to them and either go back to Paine Field or go ahead and profile this other rainband. But right now, if it's okay, they'd like for us to land at Hoquiam.

LS: Okay. We're headed for Hoquiam right now.

NB: Yes. You could go at the level of comfort and whatever you want.

LS: Okay. You're not going to be taking any measurements then on this leg?

NB: Well, we'll take measurements while we're going, but I don't think what we're doing out here now makes much difference. So you can just take the plane where you want it.

LS: Okay. We'll probably go on up to 9,000 ft to get there a little quicker.

NB: Yes. That would be good. So you guys heard the word, it's Blimpy time.

AR: All right. Maybe I'll have two this time.

DS: Would this be a good time? I want to move this onto a different inverter, so it will take some of the load off #5.

NB: Yes. We're done with the rainband of interest and we haven't done enough in this region to be meaningful, so do whatever you want.

12:01 PM

AR: As we climb, I'm looking off to the northeast to see what happened to our precip band, an area of precip. It does look like it must have been some enhanced lobe on this front because now looking off the left wing there are merged layers and precipitation off in the distance. In fact I can see something that looks like definitely elevated almost weak cumulonimbus looking top out about 10 o'clock. That's certainly the kind of stuff we were flying in before. Looking off in the downstream direction, Nick, I can see some elevated tops and almost soft *cept* cumulonimbus looking tops. That must have been the kind of stuff we were flying in below and then some kind of saddle in this sort of snakey little front that overspreads this region. Whether it ends up being the end of the line of the thing or not, that's another question, but certainly you do get the impression that we're in a weak spot in that frontal band cloud. What we were flying in below earlier in the flight is now off the left wing and out around 10 to 11 o'clock is my thought on it.

NB: Right. I think the interpretation of this one is going to be a bit of a challenge at least with the kind of multiple decks and varying clear spots and so forth.

AR: Yes. That's right. It's never easy.

12:04 PM

TO SUMMARY

DS: Well, Art, I think I solved our problem anyway because I came up over 2 amps here and I'm up to almost 113 volts now on that inverter. That's my small inverter, so we kind of kept it for things that are a little more power efficient. That one obviously isn't.

GG: That's about what it normally runs anyway, 113 something.

DS: Yes. It's a bit cooler in here, but it came up about 3 volts before I turned it over and from the temperature dropping. But 112 to 113 volts is pretty good. It must be right at the limit of that former chain at about 10 amps.

GG: Really. I'd like to note on the tape that at 11:30 LT we're recording rather crudely, but recording, radar data.

DS: The next trick is to make it displayable at a later point.

GG: Yes. Right now it's being recorded under a very strictly DOS system, so we don't have network access to it. It's a proprietary file format of pages, which we'll have to decode. Hopefully, when we get the software, we'll be able to write our own software and put it right into the system.

DS: Then you'll be able to look at it on your QNX display.

TO SUMMARY

DS: Grant, go to "chat."

TO SUMMARY

DS: Nick, when can I bring down the data system?

NB: You can do it any time you want.

DS: Okay.

12:17 PM

NB: Larry, I'm still in the flight scientist's seat. Do you want me in the back?

LS: It doesn't matter.

DS: I'm going to take the data system down now and it will be down in about 30 s or so.

GG: Radar acquisition is shut down.

NB: Don, is the time on the system there correct?

DS: It should be fairly close, although the server now is no longer passing time to anything. What time are you reading?

NB: It's showing here at 12:19:30.

DS: That's probably correct.

GG: It looks pretty good.

DS: My watch is running a little fast actually.

NB: Yes. Mine is a lot faster than I thought. No problem.

12:22 PM END OF TAPE

Summary of UW Flight 1852

12:04 PM

AR: We got a computer outage for about 7 min causing us to repeat the leg at -6°C . Lots of changes in time. We were flying a set ground pattern and it was clear that a lot of different microstructures past over that site on the different legs.

passed

12:05 PM

AR: That's my summary.

BACK TO MAIN TEXT

AR: I will enhance my summary by saying that, of the different microstructures, we saw supercooled drizzle, rain produced by the collision coalescence process, ice multiplication, ice dropping from cold clouds into separate warmer clouds, and a lot of change in time, as I mentioned, as we flew over the same ground track.

12:08 PM

NB: This is Nick Bond, flight scientist for UW flight 1852, on 20 January 2001. The goals of this flight were to profile a rainband in an inverted trough or an occluded front north of a developing low-pressure center along a frontal boundary. The maneuvers included heading out to the Westport radar and then a low-level run to the southwest at 1,500 to 500 ft. We did not hit the surface wind shift, but did see a shift from south-southeasterly winds to perhaps south-southwesterly winds. After that low-level leg, we climbed above the freezing level to 6,000 ft and did a profile stack 6,000 ft, 7,500 ft, and 9,000 ft. We had a temporary breakdown of the data system and repeated the leg at 9,000 ft. Then finally the top point at 10,500 ft, which was near the cloud tops. Then we dropped back down heading to the southwest point again at 3,500 ft. We went down and investigated whether the wind shift was at the southwest end of our track at 500 ft and finally climbed to 6,000 ft before returning to Hoquiam. This track that we did was along the 240 radial out of the Westport radar. There was drizzle on the northeast end of the section that we were working and definitely rain on the southwest end. Again, it's going to be a somewhat complicated situation to investigate in that there were some multiple cloud decks. But for the most part, the instrumentation worked successfully. Now we're heading into Hoquiam and perhaps we'll do a flight right after this in the warm front of the developing low to the south. For what it's

worth, the winds at low levels were considerably stronger than forecast by the
MM5 in its 0 Z front from the day before.