

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

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| Date 12/05/00 | Flight Number 1842 | Main Goals of Flight TEST OF STATE PARAMS - NO LOW/PAID GLOS XPTD; WILL COMPARE WITH 00/06/JTC |
| Project name IMPROVE Test 3101 | | ^{OR} LAUNCH OF UIL (RELEASE TIME ~2310 UTC). XPT TO TRACK TO ~PT 500 MB 2. CK "FLYABILITY" OF PROPOSED IMPROVE RESEARCH AREA - CHECKING MILITARY ACTY AND COMMUNICATIONS WHEN WORKING IN IMPROVE RESEARCH AREA. |
| Engines on time 2234 <small>1937 LST</small> | Engines off time 0135 <small>1725</small> | |
| Departure airport PAE | Arrival airport PAE | 3. Which of the Main Goals were Essentially Accomplished? 1. TEST/CALIB OF STATE PARAMS SUCCESSFUL. DID HAVE A UIL RAWIN LAUNCH - THOUGH NOT SEEN. RH PARAMS (OPHIR & CHILLED MIRROR) IN OUTSTANDING AGREEMENT. SAME OLD PROBLEMS WITH ROSEMOUNT TEMP & TAS, TOO HIGH, TOO LOW RESPECTIVELY. 2. CONDUCTED GS-TAS CHECK BY FLYING BETWEEN TWO POINTS A KNOWN DISTANCE APART (JUST PRIOR TO PROFILE WITH RAWIN) - 2330-2350 UTC 3. CONDUCTED ADDITIONAL CROSS CROSS WIND/DOWNWIND LEGS AT TOP OF RAWIN PROFILE TO PROVIDE ADDITIONAL CLUES FOR WIND REPROBS. <small>(in mid pt)</small> 4. REVERSED FROM LEFT BANK TO RIGHT BANK TURN AND BACK TO LEFT BANK Other Accomplishments TURNS IN VERTICAL PROFILE TO AGAIN CHECK EFFECT ON WIND PARAMS. |
| Flight Scientist signature A. Rangno | | |
| Pilot signature | | |
| Surface met. & visual obs. | | |
| a) At takeoff 1-@ VSBY 100+ NM LET NALCY WIND | | Clouds sampled in flight Ac As Ns Sc St Cu Cb |
| b) In flight AS ABOVE | | |
| c) On landing AS ABOVE | | |
| Research crew HOBBS WILSON GRANT SPURGEON RANGNO | Equipment failures 2-DC OUT FOR REPAIR AT BMT A/C INTERCOM AT A'S PEN DARK UP ROSEMOUNT TEMP TOO HIGH NO TURB. NO BAT | Additional Comments on Flight LOTS OF SMALL PLUMES VISIBLE, ONE MODERATE SIZED PLUME EXTENDED FROM NR COAST VERTY UIL FOR MANY MILES OFFSHORE CALM IN LEE OF OLYMPICS HIGHLY WBL IN NR GASSY WTR OFFSHORE COAST |

Flight 1842
December 5, 2000
Voice Transcriptions*
IMPROVE (Flight testing)

AR: I was saying that I forgot to bring that map of the IMPROVE flight zone.

PH: I've got it. I've got it in my bag. Actually I brought two copies for pilots, which I haven't given them.

AR: Would you like me to pass it forward when they get up out of this zone.

PH: I'll dig it out. It's in my bag. Are we still signing on here with like phobbs, carg2000?

AR: That's what I did on the last flight. Excuse me. I didn't have a computer. Tom actually got the computer up, so I don't know what he signed in as. Tom, do you copy?

PH: Will that become carg2001 next year.

TW: I was to remember it every millennium actually.

PH: All right.

DS: That's probably a good way of doing it. We don't have to remember a new one every year then.

2:44 PM

AR: What's going on. Get in the bubble and look around and see if I see any clouds anyway.

2:46 PM

DS: Testing.

TW: Don?

2:47 PM

AR: Larry, do you copy?

* AR = Art Rangno, DS = Don Spurgeon, GG = Grant Gray, LS = Larry Sutherland (pilot), PH = Peter Hobbs, TW = Tom Wilson, Zan Sutherland = ZS

2:48 PM

AR: Zan, do you copy?

PH: I can hear you, Art. Are you on "all?"

AR: That's affirmative.

DS: Are you there, Tom?

2:49 PM

PH: Larry or Zan, can you hear me?

LS: Okay, Peter. I'm with you, go ahead.

PH: Just checking that we've got good communications. I can hear you clearly.

LS: We'll be down off Hoquiam there in about 25 min I suppose, 20 min.

PH: Okay. I'm going to bring up to you that map showing the area we will be flying off the coast and I'll leave a couple of copies with you.

LS: Okay.

AR: Testing 1, 2, 3. Can you copy me now, Larry or Zan?

LS: Got you now, Art.

2:50 PM

AR: Can you turn the heat down? I can hardly touch this ducting back here it's that hot.

LS: Okay. I'll turn it down manually.

2:51 PM

AR: In the back of the bubble here, looking out at thin broken cirrus. Estimated height above 25,000 ft. There are little clouds far off the horizon toward the north. Actually I should mention while I'm talking I got a different headset and microphone. We'll have to see if Debbie will be able to comprehend us a little better. It's a very, very clear day in Puget Sound. The city of Seattle is extremely clearly visible, no sign of smog in that area. Off to the south, however, the smog and smoke buildup and there are some flash fires in the vicinity toward Shelton

and out toward Olympia and beyond. So they're kind of mucking things up as well as the urban plume I think is forming downwind of Seattle. We have northerly winds today, so as I look to the south toward Mt. Rainer, well below Mt. Rainer entrapped in the first thousand to a few thousand foot layers of thin, thin smog (garbled) 100 miles or better.

PH: Art, you're still on "all?" Larry?

LS: Go ahead, Peter.

PH: That map I just showed you, let's head for Westport and we should see at Westport on the coast a very big mushroom-like radar. That's our research radar and I want to spot it and get a photograph of it from the air.

LS: So what altitude do you want to be over there, Peter?

PH: Let's come down to 3,000 ft when we're at Westport.

LS: Okay.

PH: We can be just off the coast.

AR: Thanks, Peter. I was on "science" and I thought I had turned it to "record," of course, for that little weather note, which I was going to go on and blab a little more. I'm reminded, as I look out at a couple of the slash burns out there, that when I flew...

LS: How's that temperature back there now, is it cooling off?

AR: I'd have to say that the duct is not cooling off. I remember the other day when you turned it down it went down almost instantly in temperature, but it's still up there. You can barely touch it. Peter, I was saying that when we flew down to San Francisco flying over western Oregon, I was really amazed at the number of slash burns out there. It looked like South Africa to be honest. I just couldn't believe it because the day before there had been an inch of rain and I would say that in the (garbled) of slash burn fires with thick plumes. I think if you look dead ahead and a little bit toward 11 o'clock you can see again it's very smoky out toward the western part of the state.

PH: Were they mainly in Oregon or Washington those slash burns?

AR: I would say they began in the southwest part of Washington, but they are very numerous in Oregon. I have to say I have no idea the amount. There are maybe a couple dozen.

PH: Can you hear me, Art?

AR: I can hear you now.

PH: That's interesting that time of the year. You think those are slash burns not agricultural burns?

AR: With the mountains and hills, it didn't seem to be with any of the flatland farming.

PH: Next summer we'll probably have a small program here based out of Seattle with Larry mainly in charge. He wants to look at emissions of mercury from biomass burning. It looks as if mercury emissions from biomass burning are a major source of mercury in the atmosphere, more than from power plants.

AR: Wow! That could be important.

PH: Yes, it's quite a surprise. I don't know where the mercury comes from if it's just resuspended or whether it comes from the field. I don't know.

AR: Another thing about these fires is there is no black smoke in any of them. It was all white smoldering-type fires. I mean I would have seen black smoke if somebody was trying to light it with some carbon-based fuel of some kind.

PH: I'm looking at the PVM now. It's absolutely zero as is the JW. I don't know if they're switched on, but they're both reading zero. The DMT liquid water is reading 0.016 in clear air.

AR: Things sound pretty good. If they're quite that sounds real good.

PH: Yes, I don't know if they're switched on or not. Temperature and dewpoint look okay. Getting some spikes on the T-stat both positive and negative. Big noise spikes on T-stat.

AR: I wonder if that's T-stat just out of curiosity.

PH: Yes, it is T-stat. I should have said T-stat.

AR: I was just talking to Grant about those just before we took off here, if there is any solution to that, because that's really our best temperature measurement right now.

PH: Occasional spikes also on the Ophir. The Ophir is agreeing very well with the Cambridge.

2:57 PM

PH: Tom?

TW: Yes.

PH: Can you tell me if the PVM liquid water and JW liquid water instruments are switched on?

TW: PVM is switched on.

LS: Art, how do you read me now? Are you cooling down a bit?

AR: I copy you fine, Larry. It's still pretty hot. I can't tell if there's been any change.

PH: Did you say the PVM is switched off?

TW: On. It's on and I'll double check with the DMT. I think it's on.

PH: The DMT looks as if it's on, what about the JW?

TW: I'll double check with that too? I'm pretty sure that's on still unless there's a new switch I don't know about.

2:58 PM

TW: All three are on.

PH: So PVM, DMT and JW liquid water contents were all switched on. Flying in clear air. What about the FSSP, is the FSSP liquid water off at the moment?

AR: The FSSP liquid water was too high on the last flight now and I believe it was due to computational problems because the droplet concentrations were about 3 times more than you would have expected in the clouds we sampled.

PH: Didn't we get a FSSP liquid water reading?

AR: Yes, we did. It was just high.

PH: I'm not seeing that on my display for some reason.

TW: Yes, all those should be on.

PH: Tom, could you add FSSP liquid water to my display here?

TW: To the text output?

PH: Yes.

LS: Art, I popped that circuit breaker on that heater. Is it cooling now?

AR: Well, it's just as hot as it's always been, but maybe it will cool off in a few minutes. I will get back to you on that.

3:00 PM

PH: Larry, when we follow the balloon up, I want to try to climb to about 18,000 ft.

LS: That should be no problem today, Peter, in this cold air.

3:01 PM

AR: Peter, I notice the wind direction and speed actually look realistic unless they're frozen, 350 at 5.1 meters/s. That would be exactly what was predicted for this time.

PH: Good. I don't have that readout here.

AR: Just pedaling down the text here. It hasn't changed in the last minute. That wouldn't be expected for real data, so I'll have to keep an eye on it.

PH: Tom?

3:02 PM

PH: Tom?

3:03 PM

TW: Hello.

PH: I want to give you, when we land, a little map, so you can add a couple of more locations on the Washington coast here and put a circle in for our research area that we'll be using. It will be useful.

TW: Okay.

PH: I'll give you a map showing it. We'll show the location where the radar is on the coast and then a circle centered on that going out over the ocean.

TW: I'll see if I can do that. That might be tricky, but I think we can do it.

3:04 PM

AR: Tom, do you copy?

3:06 PM

AR: There's static temperature. It's having the same problem as usual. It's reading ~19.5°, T-statr about 6.5°, and the Shadin static temperature, which I've only recently learned about, is rounded off to 7°, only shown in whole integers, but it is showing excellent agreement with T-statr. So we've got two pretty good temperatures except the one only reading in whole integers that is the Shadin static temperature. Peter, off the right wing is one of the types of burns that I saw over Oregon. That would be one of the smaller ones, but there are dozens of these things if you could see on that date of November 27.

PH: I see it. We're going to have some time on the coast here, Art, to do that run you want to do between points to check our winds, so once we've located the radar and I've got a photograph of that we could then do a run along the coast or somewhere there.

AR: Roger. I understand. There are a lot of little plumes coming off I guess it's the Point Brown area. I don't know what they are. Probably residence plumes of some kind. At any rate there are a lot of little smoke plumes and there is quite a massing of shallow plume out there off about 1 to 2 o'clock. They're burning their trash today or something. Larry, do you copy?

LS: Go ahead.

AR: You know we did that run for checking our ground speed the other day and it turned out we didn't have our GPS and so you have it up there, but we didn't record it is what happened and so could we do that again?

LS: Okay. We have to get setup. I'll tell you what, when we run up to wait for the balloon, can we do it then?

AR: You bet. Any time at your leisure.

LS: Brief me again how you want to do it, Art. Do you want to go over it and then back over it again?

AR: Now this is the balloon now we're talking about?

LS: No, for your ground speed track.

AR: I think what we did is we take two endpoints that are about 20 miles apart and then if you could call out the time you think we're over it that would be good.

LS: And you want to go back over it again to neutralize the wind, don't you?

AR: Affirmative. Up once and down once like we did the other day.

3:11 PM

LS: Peter, I'm about 5 or 6 miles now from the site if you want to take a look.

PH: If you run along the coast from south to north that will put it off my window.

LS: And 3,000 ft is where you want to be?

PH: Yes, to start with anyway. Let's see if we can spot the radar and then we'll see how close we can get to it. It depends on if we're going to be disturbing anyone down there.

LS: We shouldn't be just offshore.

3:12 PM

PH: We'll put Westport in and then maybe these points.

TK: Okay.

PH: Something like that would be very useful.

TK: Yes, I can do that definitely.

PH: I'll make a copy of this for you.

TK: Great. I should be in in the morning.

LS: Peter, what are we looking for on that radar site?

PH: It would be pretty close to the coast on the side or just near the sand. It's a big mushroom looking like structure. A big radar antenna on top of a column.

LS: Okay.

3:14 PM

PH: You've got the lat/long there at least to the nearest minute.

LS: Affirmative.

AR: Larry, the ducting back here is still hot as blazes.

LS: Okay, Art.

AR: In fact I think it's a little hotter since we got down to a lower elevation.

LS: Okay.

3:15 PM

AR: We're flying along the coast northbound just about a few hundred meters west of the surf breakline and there are no white caps out here. This easterly flow, which can be told from the mini-little plumes almost invisible here in the local area, but when you're further away you can see them. An east wind maybe a few knots.

LS: Peter, there it is. It looks like right up there at the north end by the bay.

PH: I don't see it yet.

LS: You see right there at the sand right there where the base starts.

AR: It looks like it's on stilts.

LS: Two o'clock low.

PH: Yes, I got it. Let's go in a bit lower.

LS: Okay. Peter, I'm going to depressurize here for a little while and see if I can cool this down.

PH: It's getting pretty warm back here.

LS: Okay.

3:17 PM

PH: I don't want to disturb these homes too much, so let's come in low off the coast.

LS: Okay, Peter. There's nobody living out that way. We can come right down the beach at 500 ft if we want to.

PH: Let's do that. I don't want to get these people here on the coast stirred up. They're probably stirred up already by having that radar there.

LS: Okay.

AR: We have a few white caps there by the radar and the inlet. The outflow for the river and estimating may be 10 to 15 knots by the radar.

PH: It's going to be pretty convenient working out here I think. I'll be nearby in case of any emergencies.

3:19 PM

PH: Larry, as we come past if you can dip your wing like you're doing now, then I'll get my shot.

AR: Seem to be a boundary layer here.

LS: We'll do when we get by the site. As soon as we go by we'll start a right turn. That will orient us for a good shot for you.

AR: 1,000 mb here and just as we descended into that lowest layer we're getting some turbulent bumps, and it looks like the top of the smog layer here looking out toward the east.

3:21 PM

AR: No clouds visible anywhere except for the thin patchy cirrus now. It's probably thin broken and somewhat enhanced by old contrails. Now we're entering an area where there are many more white caps.

LS: Peter, it's up there about a mile ahead of us now on the right.

AR: Estimating 15 to 20 knots here. I believe that's due to perspective of the increasing number of white caps. We're about a mile southwest of the radar.

3:22 PM

LS: Did you get a photo?

PH: Yes, I did Larry. Thank you.

LS: Peter, what's next here?

PH: Let's go up the coast a bit in our shaded area on that diagram I gave you and just climb up to 10,000 ft.

LS: Okay.

3:23 PM

GG: Are any of you fellow getting overly warm?

PH: Yes, it's too warm.

GG: Larry, this is Grant. Is there any way of cutting the heat back?

LS: I'm trying everything I can, Grant. I've got the heater off and depressurized.

GG: Thank you sir.

LS: We're going up to 10,000 ft. That will cool it off.

GG: Roger that.

AR: Temperature increased about 3° here in the last 30 s.

3:24 PM

PH: Larry, which air traffic control are you talking to? Are you talking to the Navy?

LS: No body is controlling down here right now, Peter. Seattle Center controls this area out here and I called them and they said nobody is out here after 2 o'clock.

PH: Okay. The Navy people should now recognize IMPROVE. I did make contact with the group there and they didn't anticipate many problems because they're not doing too much flying out here these days because of lack of fuel.

LS: Okay. Let me know when it starts cooling off back here would you, Art?

PH: Art, we're just going off the coast and climbing a bit to cool off, but I handed over to you and Larry to do a run between any points if you want to before we head to Quillaute. I mean we could run from Westport, for example, to Quillaute if that's far enough.

AR: Roger. What we would do is go up and then back to neutralize any wind effects. We could do a north-south, which would be perpendicular to the winds today, north-south I'd say up the coast and then back down.

PH: We could do that and climb to 10,000 ft and then do that.

AR: Roger.

PH: Got to watch the time here. It's coming up to half past three.

AR: Roger that.

3:27 PM

PH: I'm reading a constant wind direction here. It's not changing at all of 144.22 from magnetic north, but it seems to be stuck.

AR: Yes, the wind speed you can see is outrageous, 50 knots, 45 knots. It should be about 15 to 20 knots today at this level. It should be pretty much out of due east. Then as you go up above 10,000 it shifts to the north, true north, from the true north at about 15 to 25 knots.

3:28 PM

AR: If you look at the Shadin wind direction and Shadin wind speed, the parameters with those names at least on this text readout, it's indicating something that's believable. It's indicating 360° from magnetic north at about 10 meters/sec. We have two wind speeds today. Larry, I guess I've been talking to you a little bit too much here. Sorry about that. When we get out here a ways we want to pick those two endpoints and do that run and we want to go pretty much north/south. We're supposed to have an east wind today at 10,000 ft, so when you get up to 10,000 ft if you want to pick a spot and then run north/south about a 20-mile leg. By the way that will take us about that's 40 nautical miles roughly, nautical miles a minute, so we've got about 13 to 15 min for that. Is that what you'd estimate?

LS: Art, I was off the air for most of that. I'm going to pick up a couple of points for you. North and south about 20 miles apart and I'll tell you when we get started on our run.

AR: Roger that. My estimate is that it will still leave us time to get down to Quillaute at about 4:10 or so.

LS: Should have, yes.

3:30 PM

AR: The boys down there at Quillaute are aware we're coming, so they may like last time hang on until they see that old orange-tipped wing go by. Peter, how far out did you want to go to check things?

PH: This is far enough.

AR: Not very far right now, probably only 10 miles or so.

PH: It's more important to get our wind and make sure we're back at Quillaute on time. We're at 10,000 ft now. I'll leave it in your hands, Art.

AR: Roger. I understand.

3:32 PM

AR: I guess we can do this north/south run at almost any time now. Larry, did you copy? We can do that north/south run at almost any time now.

LS: Got to give me time to get set up here, Art.

AR: No problem. Continuing excellent tracking of the two dewpoint temperatures and the resulting relative humidities. That's nice news.

3:33 PM

LS: Art, is it cooling down back there at all?

AR: Negative. You can hardly keep your hand on it it's still that hot.

LS: We're depressurized now. There shouldn't be any heat coming out at all.

AR: There's still hot air coming out of the vent holes and as I say the ducting here is still almost too hot to touch, but maybe it will take a few more minutes.

LS: Okay.

AR: May be it's the deicing heat coming through here?

LS: No it's not.

AR: I didn't think so really.

3:35 PM

TW: I've noticed the true airspeeds of the Shadin and the Rosemount seem to be correlating pretty well, but it might be because we're not going very high.

AR: I think in the past there has been a difference and maybe that's been fixed. Did anybody work on it.

TW: I'm trying to think of anything. I mean T-stat is a factor in it, but I think we determined that T-stat was a very small factor. Are you showing Shadin airspeed, because I converted Taz back, Taz-b to Taz rather than Taz-Shadin, so now they're pretty far off. I was just looking a little while ago. The higher we get the further they get off.

AR: Roger. We're seeing the same thing we were seeing all along here. In SAFARI there was the usual 10-15 knot difference at about 10,000 ft.

TW: Is there something wrong like within it. Do we need to put a factor of altitude in it or is that a patch or is it something that we really need to take into account.

AR: That is what Grant was thinking and I think maybe it was the best thought that there is a correction factor in there because we looked at the hardware. We looked for marks, maybe clogging the inlet, something to effect the Rosemount true airspeed, but we couldn't really find anything. So then Grant came up with a thought that maybe there's a correction factor that isn't being applied, but why that would change suddenly I don't know why that would be.

TW: I've known this throughout the equations and translation from the old system to the new. We can take another true airspeed computation, but I think the biggest computation is calculating the heat air. I think the equation from the heat air is not more than maybe a degree or 2.

LS: Art, we're about 1 min now from our point and I'll give you a mark and I'll a time myself.

AR: Thanks Larry.

3:37 PM

AR: Understand, Tom, I think Grant probably has not gotten back to that since he's got back from vacation, so that's something still to come. I think Grant was going to look into that correction factor a little more, but I think with his occupation with the radar and so forth he just hasn't gotten back to it.

LS: Mark now, Art.

AR: Roger. Mark now.

PH: We're doing a run along the coast from north to south/south to north as a wind check measurements.

AR: That was about 23:37:35 UTC.

3:39 PM

LS: Art, get ready here. Still about 20 s.

AR: Roger.

3:44 PM

LS: Art, we passed it, so we're going to make this a 22-mile leg.

AR: Roger, I understand 22 miles.

LS: Mark right now, Art.

AR: Marking the time now, 23:44:01 UTC.

3:45 PM

PH: I finally got a wind direction and a wind speed up here. The wind speed is oscillating between about 35 knots to 45 knots, which is not correct, and the wind direction is reading -141° . Actually, it's oscillating about between 145° and 150° from magnetic north.

AR: Larry, how are we fixed for time in getting back to Quillaute at surface level say about 4:05.

LS: It's going to be close at 4:05, Art, but we'll be ready at 4:10 because I thought that was what you wanted.

AR: Roger. Why don't you give me instead of doing a whole 22 miles, why don't you just give me 5 min in the reciprocal from this point you just gave.

LS: Okay.

AR: Are you comfortable doing a touch-and-go down there at this time. Normally we get a few hundred feet above the ground I think the last couple of times. A little bit better to get as low as we can.

LS: Yes, we can go down like a touch-and-go, but we won't touch down.

PH: Art, after we finish our Quillaute sounding, we might get Larry to do his circle and give us a wind fix from that as well.

AR: Roger, Peter. That's probably a good idea. Something else we used to do and we didn't do it on the last couple, we would go to the mandatory levels and do a crossing pattern kind of a butterfly downwind and perpendicular to the wind at 850 and 700 and 500 ft. Of course, I don't know if we have time for that. That would be checking the mandatory level winds.

PH: Let's do that. Let's do whatever you need to do to try to at least get these state parameters fixed on this flight since we're not able to do much more.

AR: Roger. I have to say that the GPS arrived wind speeds here the one that you were reading out, they're not reliable. But the ones that are derived from the Shadin air computer look pretty good, although it's dropped out here in the last couple of minutes, but I've been really impressed with the accuracy of that.

PH: Maybe we should go with that. If we record that in everything instead of our own.

AR: Roger. I'm not sure what the difference is, because I would have guessed that it came from the same GPS angles, so I'm just not exactly clear on it. But that's the one thing that it did show and I think it was real.

LS: Standby for a mark here, Art.

AR: Standing by.

LS: Mark.

AR: 23:47:50 UTC. We're at our northern endpoint and heading south for 5 mins on the reciprocal.

PH: I think you should talk to Grant about that and decide between you what we're going to use and just stick with that if it seems good. Just make sure it's all recorded.

AR: Roger that. I was going to say we're getting nice easterly flow with responsible values 5 to 15 knots. The thing I thought was real as we went northbound. That would have put us in the lee of the Olympics at 700 mb and it looked like the wind speeds were dropping off as actually you'd expect. Unfortunately, it meant we might have been a little confounded by the high terrain just upwind of us. Of course, just as I was getting excited about those Shadin wind directions, we're now indicating something quite different going southbound we're indicating 290, which is not correct. About the right speed, about 15 knots, but 290 is clearly out to lunch. We got maybe sucked in there believing those 070050 wind directions on the northbound leg.

TW: Has it been stuck at 290 for awhile? Because sometimes it takes a while to recover out of a turn.

AR: You know that's what I was waiting to happen. I thought maybe that was it. It was at 300 and it was kind of stuck and now it's a little bit stuck at 290.

TW: Give it some time too. I know it's been a while now. We've been going straight for a couple of minutes, but sometimes it takes a while to recover on that thing.

PH: Tom?

TW: Yes.

PH: The times are not right I don't think, at least on my readout here. It's reading 23:30. It's 3:51 on my watch.

LS: Art, could we call this off at about another 5 miles and head for Quillaute.

AR: That sounds good to me, Larry. I think we'll have enough data.

LS: Just do a 10-mile leg?

AR: I think we can recover something. It looks like it stabilized after the Shadin wind direction is not looking good, but it's that point in time to stabilize.

LS: Here's 10 miles right now if you want to take it.

AR: Let's do it. Let's head off to Quillaute.

LS: Here we go to Quillaute.

TW: That time on the left is the time at that end of the chart and that time is at the right in UTC.

3:52 PM

AR: Peter, do you have a set time that you want to be back at Paine Field?

PH: No set time.

AR: Normally in the past we would climb at a fairly slow rate to get a good flight, 300 ft per minute, but that takes some time to get up there. Of course, on a day like this there's not much change going on so that's probably not a problem.

LS: Art, we're going to be at Quillaute at 3 min after.

AR: Sounds perfect, Larry. Thanks.

PH: Let's just do it right, Art, we might as well get it done today.

LS: How do you want to get set up for that? Do you want a low pass down the runway westbound?

AR: That would be fine. Whatever you're comfortable with, westbound, eastbound, it wouldn't make any difference. Today we'd like to climb at 300 ft/min. We'd like to get a good bit for our instruments and that means of course the balloon will leave us behind, but in stable ready conditions that shouldn't be a problem.

3:54 PM

LS: Art, do you want to put the weather balloon on the right side or the left side on the flight. Peter's on the right.

AR: I don't think he's too interested in taking a photo or anything, so it won't make any difference. Whatever's convenient for you.

3:55 PM

AR: I can really see the blocking effect of the Olympics and the water down there. It's lightly rippled water and back behind us, I don't know if you noticed it Larry, but there is lots of rippled sea and a few white caps. Looking behind, I don't know if you can, but you can see that column of stronger winds back there and then this knife edge of much calmer winds as indicated by that water texture.

LS: Yes, I see that.

3:57 PM

PH: Larry, we need to Bob working on this heating system. It's still pretty warm back here.

LS: I've done everything I can, Peter.

PH: You'll let him know about the problem?

LS: For sure.

3:58 PM

AR: It makes us feel we're back in KWALJEX again.

PH: I want to bring up the strip chart displays of the liquid water parameters. How do I do that?

TW: Do you mean the x-y plot or the strip chart like that?

PH: Like this. I want to just see if there's any noise on them basically.

TW: Let me see here. Did you have one set up before or not? No.

PH: I don't think so. I'm not sure.

TW: I'll set up one for you. I still haven't had a chance to get the interface done for that, so I'll set up your file to do that.

AR: Of course, Larry, we want to be as close to research speed as we can for as long as we can.

LS: Okay.

AR: Also a note as we've dropped down here now all three static temperatures are reading almost the same thing. T-stair is a little bit lower than the others, but notice that the Rosemount static temperature is no longer 11° or 12° higher than the other temperatures.

PH: When we fly off the coast in January/February, we want to be at research speed as much as possible every time in case we forget to remind you, Larry and Zan.

4:01 PM

AR: Larry, since we're going to be behind the balloon anyway, I don't care, in fact it's just as well if we don't wait around, just do touch-and-go and begin your 300 ft/min climb.

LS: Art, we're not going to touch down. I don't know what the weight-bearing capacity on that runway is, but we'll go down real low for you.

AR: Roger. I was just sort of paraphrasing because you had told me that before. Thanks. Peter, here's another one of those slash burn plumes off 1 o'clock kind of filling up that valley over there just over this rise in the foreground.

PH: Yes, I can see the valley. I wondered where it was coming from.

AR: You can see the source dead ahead. You probably can't see it, but when we come around you might see it. I thought I saw one there.

PH: I see it now.

4:02 PM

PH: In fact there's another one much smaller about 2 o'clock now.

LS: Peter, we're going to be passing down the runway here in about another minute.

PH: Okay.

AR: There must be 10 or 12 little sources of smoke down there. I don't know if that's wood-burning stoves from houses in some cases and slash burns or factories or a puff of a little something. I don't know. It's sure having quite an effect.

PH: Yes.

4:03 PM

AR: It looks like this stratified haze is just about on the deck, so we'll probably see quite an inversion when we get down right on the bottom. It's going to be close whether we actually get in it depending on exactly how low Larry goes here. There's some kind of surface inversion.

4:04 PM

LS: Art, I didn't see anybody out there at the balloon.

AR: No, I didn't either.

LS: We'll make another pass there.

AR: Go ahead and begin your climb. I don't think there's any point in doing another pass.

LS: Okay.

AR: I did see a person standing out there, but he wasn't by the shed.

LS: So you just want to circle the field out here in the climb, Art?

AR: Roger. You can just drift with the wind. That would be great. It's not real important because we're just not going to see that much change in the weather, the temperature structure as we stay relatively close to the site.

LS: Okay.

PH: I'm looking for strip chart.

LS: Now what rate of climb did you want, Art?

AR: 300 ft/min.

LS: 300 ft, okay.

AR: We're going to go a little slower than we did the last time.

PH: Looking at the strip chart recording here of the liquid water parameters, the only one that's noisy is the DMT, which is noisy from about 0 up to 0.15 grams per cubic meter. The rest of them, the JW, the FSSP and the PVM are very quite, 0 in clear air.

4:06 PM

LS: Art, how high are we going to climb on this, up to 18,000 ft?

AR: Right. That's what we had planned unless Peter has a different idea.

PH: No, that's fine, 18,000 ft.

LS: Art, is it my mistake or am I starting to feel some cool air.

AR: By golly, Larry, something's happened.

PH: Yes, it is cooler.

LS: I don't know what it was.

AR: Maybe there's a mouse in there somewhere and he blew out.

4:07 PM

AR: The ducting is beginning to act like a computer. We'll let's restart it and see if that fixes it.

4:08 PM

AR: Did you do something just then because now it's starting to get hot again back here, the ducting that is?

LS: Yes, I turned the cabin compressor back on, Art, because we've got to pressurize if we're going that high.

AR: Roger. I understand.

PH: Getting very noisy readings on the radiometers, both UV and visible, looking up and down. I don't know if it's because of all the banking and maneuvering we're doing, but it looks very noisy. We'll have to see what they look like in a straight horizontal flight.

4:09 PM

GG: Tom, are you on "science?" Go to "chat" for a second.

4:14 PM

AR: Larry, when we top this profile off up around 18,000 ft or so, I'd like to do four 2-min legs north-south one each, and east-west one each.

ZS: Okay. Four legs north-south and east-west once each.

AR: Well, I probably didn't say that correctly. One leg going north, one leg going south, and then one leg going east and then one leg going west.

ZS: Okay. We'll figure that out.

AR: A total of four 2-min legs. Thanks.

4:15 PM

LS: Art, I was off there trying to get the center. Why don't you tell me what you want again?

AR: Yes, I passed it along to Zan. When we get to the top of the profile, we want to do four 2-min legs, one each going northbound, one southbound, one eastbound, one westbound. Then we can terminate and head for Paine.

LS: Does that have to be on a track or can we just fly headings on that?

AR: You can fly headings on that as long as we go roughly what would be perpendicular and parallel to the wind actually, but it doesn't have to be exact. We just need some more wind data at different azimuths.

LS: So when we get to 18,000 ft, I'll do a wind circle and find out what the wind is and we'll get a perpendicular and a parallel to the wind.

AR: That would be great.

4:17 PM

AR: I haven't seen the balloon go off. Have you guys up front seen anything.

LS: Negative.

PH: I hope this is not the date that they don't release the balloon.

AR: Yes, wouldn't that be something.

4:21 PM

AR: Larry, just to check all sorts of wild ideas, can we bank to the right on the rest of the way up?

LS: Sure.

4:22 PM

PH: Is Grant on the headset?

4:23 PM

AR: He's putting it on.

GG: Go ahead.

PH: Are you going to be ready with the radar early next week?

GG: We don't have a way of digitizing it right now.

PH: But if you get it on board, could you get some sort of display just to see if it's working?

GG: We're doing that right now.

PH: Oh, the radar's on board now?

GG: It's on board and we saw the ground, some sea flutter.

PH: I didn't realize that. What about the radios, will they be ready to go in a few days?

GG: Yes, they'll be ready to go by the next test flight next week.

PH: I'd better go back and take a look at the radar then.

AR: Peter, out there about 2 o'clock is another one of those plumes. Look how much stuff that one is putting out.

4:24 PM

LS: Art, can we make this up to 17,500 ft?

AR: I'm sorry. Go ahead Larry.

LS: We're going to need clearance if we go above 18,000 ft.

AR: I guess that's okay.

4:26 PM

AR: Peter, do you copy? Larry, as it gets dark if you feel better moving a little upwind, side wind from the balloon track, why that would be fine too.

LS: I think we'll be all right, Art.

AR: If it hasn't been launched it will catch up with us.

LS: We'll swing out a little bit to the north. Can I go back into a left turn?

AR: Yes, if you like. If that feels more comfortable for you.

LS: That will get us up north.

AR: I understand. Yes. Good thinking.

4:27 PM

AR: Peter, if you can look out at 2 o'clock, you can see one of the heavier plumes today down low and at the north end of this leg.

4:29 PM

PH: The noise on the liquid water DMT in clear air is occasionally going up to 0.3 grams per cubic meter quite regularly now.

4:31 PM

AR: Peter, it was a nice shot of that plume down there now at 2 o'clock low.

PH: Yes. Nice one going out over the ocean.

AR: Isn't that a nice photo.

PH: It would be a good study.

AR: Yes, you bet. I just wonder what would burn on the west side this time of the year? It hasn't been that dry. I mean it's not like summer.

PH: Have you seen the balloon.

AR: It's a negative. I've not seen it and we've moved a little bit off wind just in case it goes up because of the lighting and we don't want to be circling in its trajectory. It will catch up to us if it hasn't been launched, if it's on its way.

4:32 PM

PH: Art, as soon as you get your squawk list out for this flight we'll have a meeting and set some priorities on what to look at and try to improve.

AR: Roger. So far I think everything is looking pretty good. That includes the missing element the cloud microstructure probes. I'm pretty happy with the Shadin static temperature and T-stat and dewpoint.

PH: We're not happy with the winds.

AR: We're not happy with the winds, except again the Shadin winds have come around to look something reasonable, but as I say when we did that reciprocal they certainly went on its ear then.

LS: How's your duct back there now, Art?

AR: It's cool to the touch by the way.

LS: Yes. I can feel the cool air up here now.

AR: Is that just the effect of the outside temperature getting lowering or did something happen?

LS: I don't know.

AR: Because it went away really rapidly probably within the last 5 min I'd say.

LS: It's got to be the (garbled) to run.

PH: It's about 0°C out there now.

4:34 PM

PH: How's everything with the plane, Larry?

LS: Except for that heat everything is working well.

PH: That's good news.

LS: It's just minor things that need to be worked on I guess.

4:37 PM

PH: Tom, can you hear me? I'm assuming that, except for this yellow one, all the rest are just bang on the zero line here.

TW: I'm pretty sure. What we can do is lower that limit to like -2.

PH: DMT is still pretty noisy. I think it's gotten worse as the flight as gone on.

TW: It almost looks like the higher we've got, I guess it's getting better now though. I don't know what happened.

PH: I can see the green there and the red I think they're all red. They're all on the zero line.

TW: Yes.

PH: This is what we're seeing here.

TW: Right. I have a feeling that green is probably on the second highest, so you don't even see the blue and the red.

PH: Your test is going to be when we fly in clouds to see what noise we get and whether we've found this calibration problem with the PVM. Grant was saying he's found a factor of 5 or something.

RW: Right.

PH: But that's not quite as much as we were looking for.

RW: Right. I think for some reason we had gotten rid of that factor of 5 like about flight 1806 when we were doing SAFARI test flights for some reason. I'm going to look back in my notes and see if there is something on that flight that made us do that.

4:39 PM

PH: What's your roll angle, Larry?

LS: 22.

PH: I've got about 20.5 here.

AR: Off the right wing and 1 to 2 o'clock you can really get a good idea of the eddy or the lull in the winds behind the Olympics. Out there where the dark water is where the wind picks up again you see exactly where it goes say about 1:30 right now that lighter wind zone.

PH: Yes, that was a very nice depiction of that.

AR: Here coming off the right wing now is the air streaking out of the Strait of Juan de Fuca and leaving the dark streak off the right wing.

4:40 PM

PH: See what Art's saying there, the water here is slightly different from the darker water out there showing the difference in the wind?

TW: Yes.

PH: That smoke plume.

4:41 PM

PH: As we've increased in altitude here the noise on the DMT has fallen off considerably. It's now running about 0.05 to 0.09 instead of being up in the sort of 0.1, 0.2, 0.3 as it was when we were down near 10,000 ft.

4:42 PM

AR: Larry, after being cool for some time, the duct is beginning to warm up pretty rapidly right now.

LS: Okay.

PH: I don't know about that balloon, Art.

AR: Yes, I'm a little worried although there have been times we've done this and I'm guessing maybe he was a few minutes early. It only takes 3 to 4 min and we were down low it probably would have been out of sight for us. I did look around for it, but I didn't look around as hard as I sometimes do. So it's possible I missed it. It's something in the back of your mind that you're hoping you didn't pick the one day out of 365 they didn't get it off.

PH: When we get to 18,000 ft is there anything else that we should do?

AR: We're not going to be able to get to 18,000 ft. Larry tells me he's got to file an IFR flight plan. That's going to take some time and so we're going to go to 17,500 ft and do these little maneuvers and I can't think of anything else. That should top it off. That's where the winds will be strongest and we'll have a chance of nailing down the wind situation a little better. Down lower it's pretty light and so we'll do those maneuvers and that should wrap things up.

GG: What time do you estimate we'll get back, Art?

PH: Once we've done those maneuvers, we'll be heading straight back.

AR: That's affirmative.

PH: I think we can make half past 5, can't we Art?

AR: I was going to guess a little bit later than that, but I'll check with Larry.

PH: By the way, Art, of course in IMPROVE we're going to want to climb as high as we can, sometimes well above 20,000 ft. So we should be prepared for that.

AR: Roger. We'll probably have to climb a little faster than this I presume.

PH: Yes.

AR: Larry, once we hit 17,500 ft and we do those maneuvers, I was going to ask about what would our ETA be back to Paine Field?

LS: Standby one.

GG: I wouldn't worry about it, Art, except that I've got a dinner engagement tonight.

AR: Roger. I understand Grant. Also, Larry, I don't know if you're manipulating controls up there, but after that brief period of warming I could sense it as it was happening the ducting has now gotten as cold as it's been at any time during the flight.

LS: I've selected a couple of temps around here, so we're learning something about it.

4:45 PM

LS: I guess the main thing we should learn, Art, is that we need to come prepared for hot or cold in the back on these flights.

AR: Yes, I'm bringing my shorts next time.

PH: The noise on the DMT has fallen off steadily as we've climbed. I think the maximum noise was probably down near 8 or 9 at 10,000 ft. It's fallen off steadily since then as we've climbed up toward 18,000 ft.

AR: Another mystery.

PH: Could it be related to the temperature in the cabin?

LS: Art, the winds I got here in the climb are about 320 at about 8 knots. So we're going to give you four 2-min legs and we're going to give you the first one on a 320 heading right into the wind and we'll 82 60 back the other way. If you want to do it on the same track, we'll just do a 180 I suppose would probably be the best way.

AR: Roger. I understand Larry. We're at 17,500 ft then. Yes, I see on TANS-alt. I just brought it up.

LS: I'll give you a mark when we're on our 320 heading into the wind.

PH: For the last minute we just picked up some more noise on the DMT. It's shooting up now to 0.4. It certainly switched in there when I was telling Art that it was falling off to very low values. It's come back again.

4:47 PM

LS: Art, start it now.

AR: Starting our run here for winds at 0047 about 00. I'm "back estimating" here a bit. No sign of blurb. Sun is over the horizon. Continuing a few isolated cirrus clouds now coverage is thin. Most of the clouds have drifted off to the south and broken. We have a couple of it would be like cirrocumulus lenticularis and those are over Vancouver Island or downwind a little from Vancouver Island.

PH: After 2 mins of noise on the DMT, it has now gone back to close to zero.

4:49 PM

LS: Art, we're going to do a 180 for you and I'll give you another mark for 2 mins.

4:50 PM

GG: Tom, are you on?

TW: Yes I am.

GG: Art just noted that the Shadin data is not coming through. I was wondering if you could restart the Shadin task.

TW: Okay.

GG: Thank you kindly.

PH: It's still very noisy signals on the pyranometers and the UV radiometers.

TW: We're actually still getting Shadin. What particular value aren't you getting?

GG: Art's display was stuck. Maybe I just ought to restart his text display.

TW: Okay.

AR: That sounds good.

LS: Art, you can mark it now.

AR: Roger. Marking now, 005030 starting our reverse leg.

LS: Art, we're going to be home about 5:30.

AR: Peter, you got it right on the button.

PH: Yes.

AR: Good call.

PH: Well, I promised Grant, what could I do?

AR: I just passed the word along to him.

PH: It's funny this noise on the DMT. It is now essentially 0. About 5 min ago and then about 2 min ago it went up to about 0.4 grams per cubic meter.

4:52 PM

AR: Larry, here's Art with a duct report. It's warmed up now after being cold there, so I guess this is in response to some other manipulations you've made.

LS: Yes, I turned the heat up a little bit. I thought you were probably starting to get cold back there.

AR: That's affirmative. The problem has been solved then?

LS: I don't know. I can't figure it out.

4:53 PM

PH: I'm wondering if there is some correlation here with when Larry speaks on the mike.

LS: Mark 2 min, Art. We're going to do a 90° turn to the right and I'll give you another mark.

AR: Roger. I understand. Marking 2 min.

PH: In the last minute there has been some chat on the intercom and the DMT is quit noisy.

AR: 005230 is the end of that leg, UTC of course.

4:54 PM

PH: Remember, Art, we want Larry to do his circle and give us a wind measurement off the intercom.

AR: Yes, he did do that.

LS: Mark, Art.

AR: Marking now.

PH: Did he record the wind on the intercom?

AR: That's affirmative, 320 at 8 knots.

PH: Is that 320 magnetic?

AR: I'll double check. I'm almost positive it's magnetic. Larry, that 320, earlier when you gave me the wind that was 320 magnetic, correct?

LS: Affirmative.

4:55 PM

AR: Right now the Shadin air computer is indicating 330 magnetic at 15 meters per second. That looks pretty good.

LS: Mark, Art, and we'll give you another mark when we're on the reciprocal.

AR: Roger. Marking now, 05528 UTC for end of leg.

4:56 PM

LS: Art, you can mark it now.

AR: Roger. Marking now, reciprocal eastbound more or less, 005700, began eastbound leg.

4:58 PM

PH: I've just got into some noise on the DMT there with no communications taking place.

4:59 PM

LS: Art, there's your 10 min. We're going to head for Paine now.

AR: Roger. I understand in a few minutes and of course you can accelerate to go home speed. Thank you.

LS: Here we go.

5:00 PM

AR: Just as I say the Shadin air computer winds look good on our reverse leg there we are getting 210 at 5 knots, which is totally out to lunch again. No way. However, on the westbound track it looked just about like what the models were predicting for that level, 335-350 true at about 25 knots. I don't know. Just as I was finishing up there we got 340 at 7.7 meters per sec. We'll have to check that out later under closer analysis and see why that happened. It's looking good this second.

5:01 PM

PH: Tom, on the radiometers, does up now indicate radiation coming upwards or does up refer to me radiometer on the top of the plane?

TW: Radiation going upwards.

PH: So up means it's the measurement made by the radiometer on the bottom of the plane?

TW: Right.

AR: The pyranometer had a little dirt on it I should mention. There was some water spots I noticed before I got on the plane.

5:02 PM

PH: All those radiometers seem much noisier than they were in SAFARI, so they need to be looked at and probably all of them cleaned.

AR: Since we're on our way home, Peter, would you like to offer a few thoughts on the flight.

PH: This was a test flight primarily to check out our state parameter measurements both against the radiosonde. We didn't see the balloon, but we hope there was one. Climbed up to 17,500 ft and did various maneuvers and got some wind measurements also from the pilot to check against. No cloud penetrations at all,

all clear air, so we can't check out the main bunch of instruments that we need for IMPROVE. We did see that the liquid water measurements from the PVM and the JW and the FSSP are solid at zero in clear air, but the DMT has a lot of noise on it, very variable noise that would interfere with any good measurements. That's about all I think, Art.

- AR: Roger. Not a real interesting flight in some respects, but I think we've made some big advances here just with what you were saying with the lack of noise in the PVM and the JW and so forth. I think that represents a big advance and we have our Shadin static temperature and T-stat looking pretty close all day. We still have the same problem with the Rosemount static temperature. That seems to be altitude dependent where at higher elevations typically the temperatures will be as much as 12 to 13 degrees higher, the Rosemount that is, higher than say T-stat early in the flight and then later in the flight this difference seems to diminish for unknown reasons. For example right now we're only running about 7°.
- Rosemount static temperature is running about 7° or 8° higher than T-stat. So continuing mysteries there. At sea level we might have noticed, I think I mentioned it on the tape, but all three temperatures were almost the same when we were about to do our quasi-touch and go at Quillaute. The big one that's still lacking is the winds, although at times we had what seemed to be reliable winds from the Shadin air computer and there were other times when it was in doubt and we'll have to look at that a little closely and see if there is something that jumps out that might be causing that. We did a few different things on the flight than we have done. We did four legs up at the top of our profile here over Quillaute to try to get a little more feel for what might be wrong with the winds and we went up to the top and did that...(END OF SIDE 1, TAPE 1)...down lower and off shore we did a run over to known GPS points to try and also look on the wind situation by getting our time between the points and doing some hand calculations of ground speed and checked our progress on the ground. So we hope we'll come up with a couple of clues here that will help us with our winds. Other than that a meteorologically quite day. High pressure ridge over head extending deep into the atmosphere and a very shallow surface inversion clamping the smoke, the isolated plume.

LS: Peter? Can you tell the difference in the props back there?

PH: From what point of view, Larry?

LS: Just the sound. It's much more harmonic back there.

PH: It certainly is, yes, much nicer. What did they do?

LS: We just finally got the prop control fixed so we sync them now.

PH: Good.

AR: I'll second that. It looks like we have the props running correctly.

PH: Did you finish, Art? You were saying something about the met situation.

AR: Finish what? I'm joking actually. I was just going to say that the dome of high pressure we have over us that blob of warm air that it represents has clamped down the several slash burns and other types of plumes down below us to a few hundred feet. Actually, when we did our touch and go, it looked like we had only just gotten into a surface inversion. Briefly when we passed by the radar, we actually dipped down into that cooler air that's only about 500 ft deep or so that represents the surface inversion and the cooler outflowing air from the continent today. Another interesting thing is we got a nice visual kind of laid out before us the calm area in the lee of the Olympics today from the texture of the ocean surface out there. It was very undisturbed and not glassy but at least much brighter looking than the windier areas were the water was ruffled and appeared dark all around this say downwind of Quillaute. I think the inversion was about 5°C by the way as we passed by the radar tower there was about a 5°C increase in temperature as we climbed out of that offshore flowing cooler air.

PH: I just want to add a couple of things. The radar was on board today. No clouds or precip to look at and no digitizer to record the data, but at least it's on board and Grant was keeping an eye on it. So we hope to have it up on the next flight and we hope to get into some clouds and precip also on the next flight. The second thing is coming back to these radiometers, not that they're particularly important for IMPROVE, but even though it is pretty dark now, the sun has essentially set, I'm still getting up and down readings on the UV. But on the visible and near-IR, the up and down readings have gone essentially to 0, so it should do.

5:11 PM

TW: Grant to "chat."

5:12 PM

PH: Art?

AR: Roger.

PH: I don't think there's any point in having another test flight until we get some clouds and precip in. So I'm going to leave it to you to keep an eye on things and give people a couple of day's warning before the next test flight.

AR: Roger. I understand. That could be as soon as Friday. I noticed the models were accelerating the shortwave that comes by from Saturday to more like Friday afternoon. We could have some clouds then, but what do you think?

PH: Friday would be okay if there is something around.

5:13 PM

AR: Kind of a nice view from the bubble back here if anybody wants to steep back for a moment and look at the city lights. I'm certainly willing to give it up.

5:18 PM

PH: Throughout the flight we've had excellent agreement between the dewpoint from the Cambridge and the Ophir.

5:20 PM

DS: Tom, are you there?

TW: Here.

DS: Is the heater still on the probes?

TW: No, it's off. I mean the lights not on.

DS: That means it's out. That means all the systems are working correctly.

TW: I'm not going to touch it, right?

DS: No, you can leave it on.

TW: Okay. I'm going to turn off the liquid waters here in about 10 s.

DS: Okay.

5:21 PM

PH: We've got to hit the cloud physics stuff really hard in the next 2 weeks. That's top priority now.

5:22 PM

PH: Can you hear me, Art? I said we've got to hit that cloud physics stuff really hard in the next 2 weeks. It's top priority in the next 2 weeks. Hit the Christmas period, you know, and we'll be back from Christmas and before we know we'll be in the program. So we've just got to get it checked out in the next 2 weeks. Decide what's working, what's not and whether we've got what we need.

AR: Absolutely. Yes, it's beginning to be real crunch time.

DS: Do you both feel fairly comfortable with this trip we worked today?

AR: Yes, I think the winds, as Peter mentioned, were the only big one that we'd really like to have. Everything else, of course, T-stat continues to confound us, but everything else looks pretty good.

PH: Yes, it's mainly the cloud physics stuff that we have to zero in on now. So we'll be looking for clouds and rain.

DS: Yes. Tom?

TW: Yes.

DS: When we're talking what does the level indicators on our recorder look like? Is it way up in the red or is it down low or?

TW: We're red lining all the time.

DS: All the way up to the top?

TW: All the way.

DS: That's probably part of the problem with the recording. We're saturating the thing.

GG: Do we have a recorder where we can play back some experimental tapes there at the hangar?

DS: Yes we do I think. I think the one we used in Africa is out there at the hangar right now.

GG: We need something to test them.

TW: We have that boom box don't we, that I always listen to the music with?

DS: Yes that would work too. Let's start making a few recordings and we've got to get our levels and stuff adjusted so it sounds reasonable.

PH: You'll be taking the tape back and the video to the Lab, Art?

AR: Probably not tonight. I'll bring it in tomorrow morning I think.

PH: Okay.

AR: I'm going to go straight home. You're not going to go by the Lab. I know you hate to go down that way.

PH: No, I'll go home 405.

DS: I should have brought a parachute.

PH: Why?

DS: I live on the other side of the Sound.

PH: Yes.

AR: That would be a good one.

DS: Incoming.

PH: Dropping in for dinner.

DS: Precisely.

PH: The plane is much quieter at least with my headset on.

DS: We've gotten some of the silence insulation back in again. Even the thin stuff makes quite a difference.

AR: Good to know. My wife thinks my hearing is going.

PH: Are you going to put the lining back in or not?

DS: We're definitely talking about doing that, yes.

AR: Tom, do you copy?

TW: Hello.

AR: What's your schedule? You're going home after the flight, right?

TW: Yes, I'm going to be at the UW tomorrow morning probably for a half a day at least.

PH: I can take them and bring them in tomorrow morning.

AR: Peter's coming in tomorrow because he's got to load the flight up before I can analyze it. But to be honest, I'm talking about him going back tonight and then I would work up my squawk sheet tonight or come in at 5:00 in the morning. We

bagged it because we were thinking you'd probably be teaching and probably wouldn't want a meeting until 10:30 anyway and by then I'd have the squawk sheet anyway.

PH: Yes, I am teaching until 10:30.

AR: I was predicting that I would be able to get you that squawk sheet by 10:30 and we could have that meeting.

PH: It's my last class tomorrow morning except for the final exam next week.

DS: Are we going to have a meeting tomorrow?

AR: Yes, I'm expecting we'll have a meeting, but it would be probably ... (END OF TAPE)