C. MICHAEL FOALE (Session 2)
July 7, 1998
Interviewers: Rebecca Wright, Carol Butler, Mark Davison

Foale: [*After the collision, the biggest priority was to re-establish the power that was available from the existing solar arrays on the base block and on what we called Module D, which is Kvant-2*] and get the station powered up. The way we did that, over that thirty-hour period and then going on into the next week, was to basically allow the batteries--these are just large lead accumulators that are in the base block, just in front of the commander's and port engineers' cabins, take those out from behind the panels, disconnect all the cables, which are very heavy, and then move those batteries to the other module, Module D, to recharge them. So that way we got the toilet running.

We'd take batteries from Module D back to the base block. We were also switching out batteries from the module Priroda, which was not powered, and the module Krystall, which also was not powered. All of this involved, because of the very extensive overloading of the station with general equipment over the many years, involved us having to continually move, totally rearrange the module that we were getting the batteries from, because we had to get to the panels behind which the batteries lay. And that occupied our time for about a week, I would say, after the collision.

During that time frame, the one experiment I had that was running--and we powered up again after the thirty hours or so--was the greenhouse and also the beetle experiment, and those two--actually, it turned out the greenhouse is powered off base block power, anyway, from the mode, and this is kind of a surprise to everybody, I think, on the ground, even to me, that that was the source. So it didn't lose power much longer than it took to get power back on the base block.

The beetle experiment was the only other experiment I had really continually in the flight, and that was in Priroda. It was without power for thirty hours, but sometime in there I moved the beetles from the Priroda block module to the area near the greenhouse and Krystall, and that was the configuration for both of those experiments for the rest of my increment. They were being powered off the base block, even though the modules themselves were unpowered. The nice thing about the Krystall having the greenhouse on its own being powered off the base block was that it provided light in that module, because that module had no lights, of course. No module that's unpowered has lights. And that made it just slightly easier to, for example, pull out batteries out of that area or whatever.

About a week after the collision, proposals came up from the ground as to what we thought of doing an internal EVA using Orlon DMA suits to go into the Spektr module and establish basically an adapter in the hatch interface there, in the hatchway, to allow the power that we had disconnected in sealing off the Spektr module to be--it once again established into the base block power supply system from the Spektr solar arrays. Well, the Spektr solar arrays, there are four of them. One of them had been severely

damaged by the collision. The other three potentially could provide power, and the ground was feverishly coming up with basically a power adapter plug that was built into a hatch that could carry this power from the Spektr module across the interface, through the node, and into the base block.

In that subsequent week we did a lot of work with spacesuits, just pushing them through the hatchways to see whether they would fit. The other concern in that whole question process with the ground was, during the EVA of two people going into Spektr, what would the third person do? It was going to be me at that point. Where would I go? Pretty quickly it became apparent that I was going to have to be in the Soyuz module while they did this EVA internally. That was discussed, and we did a lot of discussion as a crew. The ground came up a number of times, led by Sergei Krikolov at that time, asking us about the practicality of using these suits inside the node and then going into the Spektr module and, in contingencies, going into the Soyuz if we couldn't repressurize the node after the EVA, what we call an IVA, actually, but in a spacesuit.

That kind of went on for about two weeks, and there was some preparation of suits during that time frame, two Orlon DMA suits. Vasily and Sasha did the best suit fit checks in those suits. Vasily had already done one EVA in an Orlon AM suit but not in a DNA on that particular increment, so they both had to do a new series of fit checks in those suits. Vasily also, in that time frame, moved all of the life support equipment for the spacesuits from the airlock in front, too, which is a powered module, and moved that and was going to come up with ways of anchoring it in the node so that they could use it to do this EVA. I should say that there was a lot of misgivings from Vasily especially as to exactly how this EVA was going to go, how it would be done.

Within three weeks, I think, another Progress came up, and that was Progress 235, I guess, I think. 234 hit us, right? The 235 came up. From a human point of view, there was one or two videos and things for me to look at from my family. There was a replacement hard drive for my laptop so that I could do some stuff, and chocolate and stuff, but also there were some EVA tools that were sent up to try and help with this internal IVA.

Once we had the Progress docked, the most important item in that Progress was this interface adapter that the Russians had built so quickly to go into the Spektr hatchway as well as another piece of equipment which was sent up, which I want to mention just because it was such a huge headache for us and was totally inappropriate for the situation. There was some contract that had been agreed to by Energia long ago to send up a huge experiment called MAPS. It's an item that's about the size of a desk, but roughly cylindrical form that just, within a centimeter, passes through a hatchway if the hatchway has no cables. Well, they hadn't reckoned on all the cables that we had there, and so I remember we wasted maybe

two days planning and trying to transfer this particular--and it's full of ammonia, is the point, which is a pretty noxious chemical.

We had to transfer it--they were trying to get it to the docking adapter, I think, was the ultimate goal. No. They wanted to get it to the airlock to take it outside for some reason, but we couldn't see any way. This was a classic, classic case of engineers not thinking hard about what the current configuration is on the station, because this thing was not going to fit past all of the gyrodynes that had subsequently been installed in the Module D, the [unclear] where the airlock was. So we told the ground there was no way, without taking down the gyrodynes, which are critical to the station flying at that point, in Module [unclear] Two to get it to the airlock. And so, as sort of, "Oh, what are we going to do with this thing? It's in the way. It's in the Progress. The Progress is going to have to be de-orbited," we had to get it out of there. We didn't want to have it in the base block.

So we spent roughly a day taking down hardware and taking it all the way through the Krystall module to the docking adapter, which the Shuttle only goes to. This then occupied for the rest of Phase One the docking adapter and has never been used. It is a total lemon. But the Russians have been paid, I think, by--and it's an American company or German company that owns this. It's not a NASA project. It's a private deal, either with Boeing or with the Germans or something, but this experiment obviously earned the Russians some money to launch it. They launched it and fulfilled their contract, but it was just a massive headache for the crew. We wasted a lot of time on that in this same time frame because we had to unload the Progress to get all the other things to the EVA that we were going to do to connect up the Spektr power.

About this time, the commander had a medical condition that brought into question his doing the EVA, so I then was put forward for the EVA. I think about the third or fourth week, I started entering into flight preparation for the EVA. I was being asked questions by our people from the MOS team in TSUP, what I thought I could do, what I needed in terms of training, and I basically, just on the fly, would come up with--basically I felt that I should be in the suit twice, once for a fitting, and second for a practice move-around, then do the real EVA into Spektr module. I think the Russians were pushing me a little bit to try and do it with just one pressurized suit run including the fitting so that they would conserve on the oxygen that would be used up in that test.

But that was all going very smoothly, I thought, and it was while the Flight engineer Sasha Lazutkin was late in the evening one day with a large list of cables, like 100 cables, that he had to disconnect, that passed through the base block hatchway into the mode then lead into Kvant Two, which connected the gyrodynes, which control the altitude of the station. All these cables were going to have to be

disconnected for the EVA day, because all those hatches had to be closed in the node, but these cables, meanwhile, are performing critical functions as part of the station's scheme to keep it in attitude. It was like two days before the planned EVA, he disconnected one cable out of sequence. And this is a long, long list. And this caused the station to have a guidance and control failure.

So then we went into a big slow tumble out of attitude as the gyrodynes spun down. As they spin down and break, the [unclear] in the gyrodyne gets transferred to the station. The station has to spin off in an arbitrary way. That put us into a very heavy power-down mostly because of the ground misconfiguration. The ground didn't spot how bad this particular error was. So we spent probably an orbit or more with everything powered up when we should have been powered down. This was actually a worse power-down situation than after the collision, and the trouble was it was late at night for us when we were to be in bed. It was like one o'clock in the morning when this happened. We should have been to bed anyway, but the pressure to work was so heavy.

The end result of that was, there were times when we learned something very important that's only recently come to light, that the Soyuz, when it's connected to the station power system, requires power from the station to go back to its internal batteries. That's not to say the batteries aren't good. The batteries are good on the Soyuz, but while it's switched over to the station, it needs power from the station to switch back, and because the station was totally powered down in the night passes, we learned about this very fact because, just as we had gone into darkness while we still had some power from the solar arrays but we had no battery power from the station side, the ground had said, "Try and use the Soyuz to talk to us," and it was as we went into the night that we realized we couldn't power up the Soyuz because we had no power from the station side. That was a fairly fundamental lesson, I think, that the Russians are aware of and they see it as a flaw in the scheme of things.

I mention this because there have been a lot of reports in the press about, oh, it was impossible for the crew at one point to ever undock the Soyuz and come home. Well, that was true for a moment. For the time that we were in darkness, that was true, but the rotation and the orientation of the station was such that when we came into sunlight thirteen minutes later, enough power came on the station that we could then go and switch the Soyuz back over to its own internal power.

Anyway, as a result of that power-down and tumble, the ground lost faith, I think, in a lot of things. They realized that they were driving too hard. I don't know where this decision really came from, but from a crew point of view, we were told the EVA to connect up the Spektr power would be performed by the next Russian crew, and this kind of took the burden--and they also moved up the launch, I think, of the next Russian crew a week. No, they shortened the stay of the overlap, and they canceled the flight of

the Frenchman who was meant to be coming up. The whole pressure of the previous three weeks was all geared to trying to reestablish configuration so the Frenchman could come up on time and therefore earn the Russians a bit more money in that regard, but that was agreed by the French, I think, more than anyone else, to delay that flight of that person, Leopold Aharts.

The next two weeks before the next crew came up were pretty quiet. The [unclear] packing. I did my greenhouse work. I did some Earth observations, actually. I did quite a lot of Earth ops and learned to change the camera mags on the Hasselblad pretty well.

When the next crew, the Mir 24 crew, came up, we had tried to get the station into pretty good shape for them and to hand over. Sasha Lazutkin had spent a lot of time trying to get handover items ready, to tell the next crew where everything was, what the things were, and I had spent a lot of time with him doing that. I also--fifty percent of my time was spent just mopping up water. It was like cave diving, going into dark module with full-length suit on--I mean the flight suit on to protect myself from the course of water and mop up the water, either with underwear or used clothes or a form of water sucker that goes into an air bag. But all those problems were a separate debrief topic, but basically mopping up water in space is very tricky because you always get bubbles in with the water that you're sucking up, so you waste the volume that you put the water into, and then you have this big problem of trying to separate, either by spinning or whirling your bag, trying to get the water to go to one end and the air to the other and then squeeze the bags so most of the air comes out, but you always end up mixing it up by the time you've done this. That was really my major activity at that time, was mostly water clean-up. This is all from condensation.

At some point the Russians told us that we had about seven tons of water missing. Some of that probably was not on the station, but a large part of it was. Some of it maybe had already left in previous Progresses. Once the Russian crew, the [unclear] crew, came up, the handover went very smoothly. The two crews overlapped only by a week. I rapidly got to know my new crew, and I learned basically when my commander arrived, Anatoly Soloviev, I was going to do an EVA with him in about three weeks to go and look at the exterior Spektr to see what damage had occurred and to try and find the leak in the hull. They had on board with them in the Soyuz a whole set of scaffolding and poles, etc. That weighed about 300 pounds, but could be assembled on the exterior of the Spektr module attached to various hot points there so that we could build up a framework on which to work and then execute repairs. I was quite interested in that, excited in that.

Wright: Had you met this crew at all before, or was this your first meeting?

Foale: No, this was the first crew I'd actually trained with, and I had trained with them for about a total of twelve, eighteen hours, maybe, in Star City, no more than that, in the December month of 1996, and so I sort of knew them fairly well. However, I knew my Mir 23 crew much better socially before flight, although I'd never trained with them, because they had been in the U.S. while I was training here on experiments.

Once the Mir 23 crew left, we very rapidly had to go into an operational phase whereby we had to move the Soyuz that had docked on to Kvant One, which brought up the Mir 24 crew and was occupying the post that the Progress normally occupies. We had to move that around the station to the place where the Mir 23 crew had just vacated with their Soyuz, which is on the node. The reason for that was twofold; one was because of thermal condition of the station, but two was we could have that Soyuz there so they could do the CVA and then use the Soyuz as a means to get this crew that's doing the EVA out of there if they can't repressurize the station in the event of a failure.

So, for that reason, like the day after Vasily and Sasha left, we rapidly powered down the station into a kind of housekeeping mode. I got a call only a few hours beforehand that they wanted to do this photo survey during the flyaround of the Spektr module. Again, this is a pretty unusual thing for them to do. You don't train for it, but I then went to a lot of effort to try and come up with the various camera schemes, video and film, and practiced getting into the so-called suit so that I could exit out of my seat, which is to the right of the commander, go over him while he's flying, and not kick him, and squeeze up through the small hatch to go into the what we call the BO, the living volume [unclear]. We haven't got a good word for it. It's called the living quarters on the Soyuz, anyway, into the upper volume and then use the window in the blister there to do photography while Anatoly flew around. I was quite pleased to be doing it. It was going to be a great view for me. The others weren't going to get a view like that, but I was very worried that I would mess up the whole thing because it had such little preparation. But that was my role, and we practiced it very carefully before we undocked. I practiced opening up the hatch while we all strapped down in there and then getting up without kicking Anatoly in the face in the suit, and when we undocked, we flew around.

I did exactly what we planned, and we got some very good video and stills of the damage as we flew basically 180 degrees around the station over twenty-five minutes or so. About five minutes before the redocking, I was told to come back down from where I was floating up in the living area, come feet first, not kick Anatoly in the head, and swing to the side and get that hatch closed again for the docking. Then we redocked, and that was the first time that I'd left the station basically in, you know, three months, three and a half months.

After redocking on the node at this point, we then had the Kvant One free, and the next day--it was the next day, this was like day three of Mir 24--we then had to set up the TORO [phonetic] system. That's the system that was used to control manually the Progress docking that took part in the collision. We had to set up the Toro system again to allow for the Progress that had been undocked, 235, to come and redock and occupy that port on Kvant One, again for thermal reasons, to keep the station cool in that region.

And so the next day the Progress came in, and it was very interesting. That was kind of the first sign that we were going to have these computer attitude control error problems, because it was as the Progress came up from the Earth, background of the Earth from about two kilometers, it came in pretty well using the KURS system automatic, but because the station then had a computer failure at about two or three hundred feet, the KURS system no longer would work on the Progress. So Anatoly was told by the ground to go manual, using the TORO. And this was only, you know, a twist of fate, because that was exactly what had put us in the whole collision situation beforehand. But Anatoly was told to do this right when the Progress had already basically nulled all of its closing rates. So it had a pretty stable configuration as it was coming in on its own axis.

It was very pleasing to see the Anatoly was given a chance--he was very pleased to do this--to dock this vehicle from about two or three hundred feet, and he docked it successfully manually, using the TORO. I should add that the TORO, the TV screen, did have a momentary dropout of about twenty feet, but it only lasted about ten seconds. Vasily had experienced one on his penultimate TORO docking attempt that lasted like thirty seconds, and that's where they aborted the docking attempt and pushed it to the side and it didn't hit. That was when Jerry Linenger was present. When Vasily did the collision, we also had a data dropout for about five, ten seconds. We also had then a shorter one when Anatoly did it. So what I'm telling you now is there is a problem in this com link somewhat close in that causes a dropout in the image.

Anyway, that docking was successful. We got the Progress basically opened up again, and we then hunkered down basically to prepare for this EVA, Anatoly and I, and this was going to be in the Orlon M suit, the new suit that Jerry Linenger had used with Vasily one time prior. Anatoly was a new commander, and Pavel was an unflown engineers. They were trying to get to grips with the rest of the station, and there were failures going on like Electron had to be periodically switched out, switched in. I know Anatoly had to work on the toilet urine reclamation system in Kvant Two for a lot of the time. I carried on my water-mopping-up duties, but one of the things I did specifically was to assemble this scaffolding that we were going to take outside with us, and it takes up the length of this conference table, maybe, but I had just enough room in the base block if I cleared stuff out to put it all together and label it.

So over the next week or so, Anatoly and I formed a plan as to how we were going to carry all this

stuff out, because we didn't have any carrier for it. We had to come up with this ourselves, and we worked out ways using Velcro that was sent up, to Velcro it down and put it in order so that we could carry it out.

Anatoly also progressively started to check out the Orlon M suits, and I helped him to a limited fashion in the final stages of the suit preparation. He would gather together all the oxygen bottles, the CO_2 scrubber, etc., and only we had to do servicing, like cleaning out bubbles out of the water coolant system or actually doing electrical check-outs, would get involved with Anatoly on that.

About three weeks into the flight, like September 6th or something of Mir 24, we did the EVA. EVA is a whole topic on its own, but the most notable thing about the EVA for me was, I had the role of opening the hatch and closing the hatch. I was the last person in the Mir Program to close the hatch successfully. I don't know if that's significant or not. I've talked to Pavel about it since then, because the hatch has been broken ever since.

The EVA itself, I consider fairly straightforward. I translated using three tethers, always have two tethers at any one time attached to the structure as I translated from the Kvant module, which was diametrically opposed to the Spektr module. I translated outside the Kvant Two module, which is the airlock, up onto the EVA cranes called the Strella. I then attached some of this scaffolding to that while Anatoly came out of the airlock and followed me, and Anatoly then waited while I translated to the base of the Strella crane, which is about sixty feet. Anatoly freed the other end of the crane, and I then cranked this crane over with Anatoly on the end of it through 180 degrees to the other side of the station to Spektr, delivering Anatoly to the far end of Spektr so he could start his inspection and excavation of the insulation there.

I then basically sat at the base of the crane for most of the EVA, which lasted for six hours, moving him left, right, up a bit, down a bit, using the two handles on the crane. Once or twice I would translate to Anatoly actually at the work site and hold his feet while he would try and dig in inside underneath the insulation. He was using a raisin knife to basically cut away at the insulation. We had a camera with us called Gleesa, and Gleesa was a fisheye camera that had a tape recorder, a fitted recorder built into a hermetically sealed box, and we used that to take photographs--I mean video, basically--underneath the insulation, which was pretty good. It showed the hull to be undamaged in that area even though the exterior panels were buckled and bent there and some of support was bent. Gleesa also was on by accident, actually, as it turned out, but it took some great video of the whole Mir scene, because it was basically hanging from Anatoly, with beautiful views of the Mir against the Earth with this camera. That's in file here at Building Eight if anyone ever wants to look at it, under NASA Five Video.

We didn't find the hole, as I said. We were meant also to establish a cap on the outside of the base

block for a vacuum valve that would allow subsequent removal of the base block, a CO_2 scrubbing system called Vosduk from the Kvant module. We didn't have enough time to do that because the excavation took too long. We ended up not establishing the scaffolding outside, so we ended up leaving the scaffolding tied off on the end of Spektr, some of which has been used since then, but not much.

The only part of the Phase One program we had out there was a dosimeter, an external dosimeter array called the Benton dosimeter, and I pulled that in just before we ingressed the airlock. Ingressing the airlock was interesting in that the O-rings on the airlock looked totally intact. There was no damage there. To me, the airlock hatch looked in good condition. The mechanism opened really well when I opened it up. It was interesting, when I opened the airlock, it opens outwards, and it sort of pulled me out a little bit with the residual air pressure. Even though it said zero on the gauge, it was just enough to pull me out, and that's kind of interesting. Closing the airlock, I did note some resistance in closing the airlock at the first few turns of the wheel. The ground was in a hurry to get us inside and finish up, because we were past our EVA time. But I asked to wait because I wasn't sure of the feel of this lock. It turned out that there's a little what they call a switch [unclear]. It's a little lever that controls the direction of the closing of the hatch or opening of the hatch. I had not moved the lever totally to the closed position, and I just felt it get stiff a little bit, so I opened up the big wheel that closes the hatch all the way open again with this lever in the open position and then moved it hard past a stop, a resistance stop, to a closed position, and it felt better that time, and then I closed it and it felt much smoother. I mention all this in detail because this procedure may have caused the same problem in the subsequent closing of the hatch that bent the mechanism. The hatch closed nicely, and we repressed.

From the EVA onwards, we basically were in a--oh, I've missed out one whole thing here. In between times--that was three weeks after the Mir 24 crew arrived, we did the external EVA, there was the internal EVA by the Mir 24 crew to go into Spektr. Now, that was an interesting exercise on its own. Basically, all the cables were dismantled correctly, the station was in a stable mode when we did the IVA. I had practiced with the commander how to operate the various valves between the Soyuz reentry module and the living module and also the node, so a succession of hatches, two hatches, so that in the event of the crew having entered the Spektr module, coming back out of the Spektr module, not being able to close that hatch, which is a vacuum there, then the only place the crew could go would be into the Soyuz. The interesting thing about that IVA was that the backup plan was, if they can't repress the airlock for whatever reason--and it was considered that this was probably the biggest risk we had--the only place they could go would be into the Soyuz living area, but that hatch doesn't open from the node side where the guys were. So there had to be some way that that hatch could be opened for them.

So what we did was I entered into the Soyuz, I went into the reentry module, closed both hatches, and there was air on both sides of the hatch. They, in their suits, in the node, depressed. They found that as they depressed down to about half an atmosphere, I then opened up my reentry module hatch going from [unclear] up into the BO--that's the living volume--transferred to the hatch going into the node, between the Soyuz and the node, and I opened that hatch, but not opened it because the pressure on my side was so much greater and that was holding it closed, but I opened the docks totally. So it was now a free hatch. The only thing holding it closed was the pressure in Soyuz against the lower pressure in the node.

I then went back into the Soyuz reentry module, and there's only just room for me, really, to kind of float across the seats there, close my hatch there, and I was in radio com with them there, and they then continued the depressurization of the node. The way they were depressurizing the node was they were opening a hole in the hatch that goes to Spektr, and Spektr has vacuum in it because it's got a hole in it. So the air would go from the node into Spektr, and Spektr would kind of fall down rather slowly. The depressurization of the node was still pretty fast, which tells us that we have a pretty big hole in Spektr, nonetheless, probably a half-inch-size hole.

During that depress, the Flight engineer started moving his--what happened? There were two mistakes made. There was one--I don't quite remember it. I don't remember the first one, but the second, which was pretty notable, was that the [unclear] engineer went round about vacuum so that he'd move his hand and he could feel air moving out of the glove past his hand, and his suit wasn't pressurizing. So it was clear that he had a glove leak, because the glove clips on with clips. This is the old suit, not the new suit, so it has only three dogs holding the glove on, as opposed to four. And so both Anatoly and I, we both told him to stop moving his hand. He stopped moving his hand.

This demonstrated an interesting difference between our programs, in that the ground immediately just said, "Well, okay. Repressurize." They repressed to a breathable atmosphere, about half an atmosphere, using station air, not the Soyuz air, from the base block side up through that hatchway. So we're wasting air each time we do this. Then Anatoly got out of his suit on his own, but it's a rear-entry suit, you can open the door, got out of his suit, and he got a spare glove they already had placed in there--very well prepared--and he just stuck that on Pavel's wrist, changed the glove out, and he got back in his suit, closed himself up on his own, and continued the depress right back down to vacuum. That's a big difference. I think if that had happened with Shuttle, we would never have done the EVA that day. We'd have gone through agonies of reviewing the glove leak and all the rest, but Russians said, "Hey, go and get another glove, put it on him, and it'll work."

They did a fairly successful connect-up of all the cables bar one, I think, in Spektr, and they found

two items of interest to me: my laptop computer and some photographs, and that was about it, and, I think, a camera for the greenhouse. We put all that stuff back. They closed the hatch, repressed the node using station air, and I finally was able to come on out, and we didn't have to use any of the back-up schemes whereby if they couldn't repress the node, I'd have had to evacuate the air out of the living volume of the Soyuz, using some commands I have in the command module. They would have then had to open that undogged hatch, just pushed on it and come in, tried to get themselves past the docking mechanism and into the living volume, and then close that hatch, and actually close it, and then I would have allowed air to go in from my section of the Soyuz into their section of the Soyuz, assuming all the valves are closed, and then they could get out of that suit. We also had a spare air pack. We call it a "portable oxygen supply" right at the front. Yes, it's portable. It's two large oxygen bottles. That was also in that area to give them extra air supply to pressurize that module in that case. Didn't have to do that, though. But it was a well-thought-out plan, I think, by the Russians for that contingency.

That was the IVA. The IVA was successful to the extent that it allowed two solar arrays of the four inspected to be connected up, and it also allowed the third one to be half connected up. This substantially increased the power on the station so that there was the potential to power up pretty quickly the module Krystall totally, and this was just the beginning of the drying-out of the station, where finally we could start drying it out. The water, as I say, had collected on all the cold modules in Priroda and in Krystall especially.

What else? A disappointment in that IVA was that the power connection of the solar arrays on Spektr to the main bus of the base block was successful. However, the voltage was not quite high enough in the Spektr module to operate the solar array-seeking mechanism that allows the solar arrays on the Spektr module to seek the sun and rotate. So this meant that initially after the IVA, the solar arrays were not in a good position to get solar energy on them to power the station. So initially we didn't have that power. It was during my EVA outside that Anatoly specifically rotated the solar arrays with a pole, a boat hook, and they moved fairly easily--they're magnetic, but they move fairly easily--so that they would be positioned at a forty-five degree angle to the X-axis of the station, which is the base block, and that would then allow the station to fly in a pretty optimal attitude whereby the sun would illuminate those arrays and the other arrays of the station complex and basically kind of get at least 50 percent of the energy they'd hoped to get for the station.

Because of that, though, we didn't go into repowering Priroda, repowering Krystall after the IVA. We had to wait until after the EVA, where we had repositioned those arrays, to even start repowering the station up. And so I always had the hope that I was going to repower Priroda, I'd do some of the

experiments they had there, but that was forever delayed because we never had enough power.

After the EVA, like September 6th, 7th, then it was only a month or so before I was due to come home, three weeks before Shuttle docking, and we started to seriously start to mop up all the water, and my job was mostly pack and mop up water behind all of the panels in Krystall and Priroda and progressively dry out those modules. And we're talking about balls of water that are a cubic meter in size, immersing some of the electronic equipment. But we did that progress, and we put warm air ducts from the base block, which is always very hot, about ninety-five degrees, and we take the air from there and try and blow it into these really cold modules that are down in the forties. Initially you would actually build up more moisture because you're putting warm, moist air into cold air, but slowly the module would sort of dry up, and once we had the module basically dry, and it wasn't as dry as the ground really wanted it, but we'd report it dry, we then powered up those modules. Well, the ground actually put the power on, taking power from the solar arrays of Spektr to power up those modules.

We first powered up the Krystall, and it dried out fairly nicely, and then the last week before docking [unclear] 86, we finally dried up Priroda enough to power-on Priroda, and that was an amazing thing for me, to see finally all the stations that I could get to, at least, was powered-up finally. And then the final area we had to dry out, which was the hardest, was the docking module where this big thing called MAPS, this big bomb, ammonia bomb, was, the size of a table, you know, and very awkward to deal with. That was sitting in there along with all our food canisters. It was kind of our attic, basically. We then had to try and dry that area out, and that was the hardest and last place that we dried out before [unclear] 86 came.

The packing, I don't think, really deserved any special note. I packed up a lot of experiments that were available to me from Priroda, many of which I hadn't really use fully. C-gel was one, Mim was another. I packed up the greenhouse experiment, but left most of the hardware for subsequent use by--it's never going to be used again, but the hope was it was going to be used in the future by a Russian crew.

Really, from that point onwards, [unclear] 86 docked, and I would say at that point my debrief becomes an [unclear] 86 crew debrief.

Dave Wolf's impressions, I'll let him talk about, but I was very aware that Dave--no one would know what they were getting into coming on board. I didn't feel that the conditions were unsafe to your existence there, in that always the Soyuz had my highest confidence. I felt the Soyuz was a very reliable piece of hardware in that you could always get to the Soyuz quickly, within a few minutes, and close the hatch. We made that even faster after the collision so we could do it in about three minutes, I think. We just prepared better and left it better prepared in general. I always felt that a crew member could be on

board the Mir, and it's certainly a degree of hardship, but basically safe, where their life wasn't severely threatened.

But on the other hand, I knew that Dave didn't know how hard this place was in terms of the moisture, the water build-ups, and the general clutter, having to always move things around on the station. And in particular, I knew he didn't know much about how to handle the station when it was unpowered, when it had lost control. But, you know, lucky for them, him and Andy, that only happened like once, I think, during David's time, maybe twice, and I think only happened once during Andy's time, just before he came back, actually. So really, the station took a turn for the better after I left. [Laughter]

Wright: Well, maybe we should stop there for today then.

Foale: Yes.

Wright: We thank you for your next input, and if you have time, we would like to at least come back for another--

Foale: Well, what I'd like to do is--I've basically given you pretty much a synopsis of the whole flight. If there are any areas that come up now with the others and you want to come back with me, I think that's what you should do.

Wright: I would like to, because you've given us a good overview, and there's certain things we'd like you just to give your perceptions of.

Foale: Good. All right. All right.

Wright: That's what we'd like to do for the next time through.

Foale: I don't know if I covered exercise in the previous one, but there are areas now that are under hot discussion at the moment. Exercise is one of them. Sleep compartments is another. Crew habitability. But I've given you more of the story of the flight, as opposed to debrief specific functions.

Wright: Yes, and we have in your debriefs that--Charlie Brown sent those to us.

Foale: See, there you're going to get more detail on that stuff.

Wright: And then this last time that we come back, if you'll give us one more hour, what we'd like to do is we'll have some specific topics, and you can just give us your perceptions and then anything else you'd like to add at the end.

Foale: All right.

Wright: Thanks.

Davison: When you were on your EVA, for those six hours manning the crank, were you consumed by your job or did you do any sightseeing while you were . . .?

Foale: Oh, I had almost--I had 80 percent sightseeing to do. It was great.

Wright: Those are the types of things that we want to come back and get from you.

Foale: That was just a fantastic experience.

Davison: Your feelings with the crew changing and adaptability and just was there tension or was there--just those types of things so we can get how you really feel. So the next time will be kind of a free-for-all.

Foale: Good.

[End of interview]