

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

AN INTERVIEW WITH LOUIS W. UCCELLINI
FOR THE
NWS HERITAGE PROGRAM
ORAL HISTORY COLLECTION

INTERVIEW CONDUCTED BY
GREG ROMANO
MARY FAIRBANKS

COLUMBIA, MARYLAND
9 JULY 2021

TRANSCRIPT EDITED BY
GREG ROMANO

Greg Romano: All right, here we go. This is an oral history interview with Dr. Louis W. Uccellini, director of the National Weather Service. The interview is taking place on Friday, July 9, 2021. The interviewers are Greg Romano and Mary Fairbanks. It's a remote interview with Louis and Mary in Columbia, Maryland, and Greg in Buckeye, Arizona.

Louis, to get us started, we wanted to follow up on our discussion from session one about working at MOD, and I believe you wanted to talk a little bit about the mission of MOD and what you were -- why you stayed, essentially.

Louis Uccellini: Yeah, thank you. And yeah, in the last interview, I -- I mentioned that one of the main reasons I wanted to go over to the Meteorological Operations Division was they -- the notional aspect of understanding more about the operations in a forecast office in the National Weather Service so it would lend itself to the work I was doing in the R2O arena. That coming from the research community, writing lots of papers that had a focus on particular cases, not only from the point of view of increased understanding, but contributing to the forecast, that that was the main reason for taking that leap. And then, of course -- just the whole notional aspect that all of my research started with operational data. I've always been interested in the forecast aspect of different things that happened in terms of storms that affected me when I was young [and], impressionable. I always thought, how did they forecast that, or why did the forecast go wrong? I mean -- this was all part of my general interest in meteorology, even as I came in.

But an interesting thing happened of note, being part of the Goddard Contingent, the Goddard Space Flight Center Contingent that came over to NMC. And -- and in this case, running the operational division caused some consternation amongst people who were there. So there were some bumps in the road that we had to sort of get over, as we -- we spun up in terms of feeling accepted. But one of the aspects of it is that we did come to believe, not just me, but other people who came in from Goddard, that this was the environment we wanted to be in. And a very important part of that was brought to me -- was first noted to me by Mary desJardins who came over to the Meteorological Operation Division shortly after I did to help build up the -- what I would call the digital basis for how we would operate out of there. But we -- we were reflecting on why we felt better coming to work there at -- in the Weather Service in -- in NMC. And she just -- you know, almost blurted out -- "it's the mission!" Where we're doing something that we believe in. And that must have been just below the surface with me, but I hadn't heard anybody articulate it so straightforwardly as Mary did. And it -- it has made me reflect on that a number of times, not only during that time of that conversation, which was in the early '90s -- 1990s -- but since then.

And I -- let me give you some background. When we were at Goddard, we were very excited about being in a new lab. It certainly is an exciting place to be because you can -- in a sense, define the kinds of things that -- that you want to work on, and -- and contribute to the larger laboratory. And from a research perspective, having leaders like Dave Atlas and Joanne Simpson, you have the freedom. They want you to be the scientist first and then -- you know, bring the mission -- the -- the projects, the flight missions to that science, which is what we did with VAS (VISSR Atmospheric Sounder), and to a certain extent, with the Total Ozone Mapping

System (TOMS) that Arlin Krueger brought to our attention. So -- but we were also seeing that people are asking questions about why are we doing all this meteorological research at NASA, we're always being questioned on the kinds of case studies we were doing, writing the book on the northeast snowstorms, which, in a sense, was providing a synoptic climatology for that type of system that I -- I can tell you today that -- that there's a NASA project -- that has some roots in that climatology.

But the point is, we were being questioned. And -- and one time, we got questioned by the new inspector general. The inspector general was created under -- under Carter, as president, and they got -- they got themselves positioned with the different agencies. I think it was the mid '80s, we started getting visits from the inspector general. And there were people raising questions about why would -- why this laboratory in NASA, why we were doing the research we were doing. We were -- again, all excited, and -- and certainly about doing the research, and certainly felt that our leadership team at Goddard Space Flight Center was -- was supportive. But to get [to] that question, it makes you wonder, it just makes you wonder.

And when you come over to the Weather Service and you come to realize -- to provide the observations, forecasts, and warnings in weather and climate for the protection of life and property, that you are the only agency that has the word forecast or prediction in your mission statement, and that mission statement is embraced by the laws that authorize the Weather Service is -- is -- is something to think about. I mean you're doing this work because you're meeting the mission of that agency. And it still involves a research component, a technology component, but it has this operational component that connects you to the second half of the mission statement for the protection of life and property. So I would say that it -- this wasn't a thought process that I think we had -- at least I didn't have it as I came over. But it certainly is something that kept the staying power.

Because, as I worked my way through the -- up through the organization, it went beyond the initial reasoning from my internal perspective to understand operations. So I -- I would do a better job in articulating research to operations that this is an important aspect of where you wind up, or where you want to wind up. Being an organization that's addressing a mission that you really believe in. And, oh by the way, so does the country, when all is said and done. So the thing is, that was an important part that I didn't really cover the last time. And I think that provides a basis for understanding why I -- I stayed with it, in terms of the Weather Service. That mission statement was incredibly important; and also the modernization.

You know, I was enticed about -- by reading about the modernization. I was certainly swayed by listening to Ron McPherson at that cyclone workshop out in Monterey in the late 1980s. I wanted to be part of that too, which was, by the way, a big part of the research, and technology advanced research, and technology advances into operations. I said this is the time to be part of the Weather Service. But the modernization is over, it's the mission that has kept me going. And it's something that I now emphasize to the new hires, of course, when I'm there, that -- and I give advice to people in universities. If you're going into an organization, understand their mission because that's -- that's what's going to keep you there, when all is said and done, at

least I believe -- I believe so.

GR: Well, I would certainly agree with that. I think Mary and I, even though we are not -- I am not a meteorologist -- Mary is, but she's not involved day to day. We're still supporting the mission and that's certainly a reason why I think we're all at the National Weather Service.

You mentioned, Louis, about the modernization, and I think in one of our earlier discussions, you mentioned that one of the corollary issues that you had to deal with was that NMC then was not included in the MAR. And then that played into the drive -- your drive at MOD for tech improvements. Can you go into a little more detail on that?

LU: One of the ironic aspects of coming over to NMC when we did, and for those of us that were motivated to do so, as part of our interest in the modernization, was that the national centers weren't officially part of the modernization. So, one of the first things that I discovered, and this was through Tony Sievers. Now Tony Sievers was there as the branch chief -- I think it was a branch, it's like a technique development branch -- he was the branch head there. And I knew of Tony at the University of Wisconsin, we briefly overlapped. As I was leaving, he was starting up his master's degree under Lyle Horn, as a professor that I really admired in that department. And so, in one of the first meetings that I had with Tony Sievers and Tony Mostek, who was a contractor for the Severe Storms Branch, and worked with me extensively on VAS actually came over to MOD before I did. And so, he -- the two Tonys, Tony Mosek and Tony Sievers were sitting with me. And they were going over the nature of the technology on the fourth floor of the World Weather Building, which is where MOD operated out of -- laid out the stark picture of it being entirely an analog-type system, as I described in the last interview. And that we were not part of AWIPS (Advanced Weather Information Processing System), this whole AWIPS thing, which was the core of the modernization that -- and would bring all of the digital capabilities -- and the radar data, and other observations needed for the forecast capabilities in a local office, and -- and especially for the warning capabilities. Having this rapid ability to -- to decide on a warning and issue that warning was -- it was sort of a fundamental basis of the AWIPS system.

The AWIPS system could not account for the products that were being developed in a National Center and it. It got written out -- in these -- these [project] books that were developed for AWIPS, in terms of what the requirements were for AWIPS. And basically, how those requirements would be addressed. So, it was just this stack of books, I mean it took up a whole bookshelf. And Tony pulled one of those out and pointed right to it that -- NMC was written out, that these requirements do not apply to the National Centers.

Now there are reasons for that, in -- in the sense that the requirements for a local office in having that ability to rapidly put a warning out was tied directly into the reasons -- one of the goals of the MAR, which was to extend tornado forecast lead time, the tornado warning lead times to 10 minutes. So, with NEXRAD being able to see signatures that could lend themselves to a tornadic circulation developing, we're training meteorologists to be able to use that signal, differentiate those that would hit the ground, and then put a warning out before it hits the ground

because that would give you extra lead time. Up to that time, you had to see a tornado on the ground before you would issue a warning. So -- so that was a big deal for the whole modernization. You have a very focused area that the WFO is responsible for, you have radar coverage for that, you have a system that downloads all kinds of data for you to basically focus on these short-term mesoscale-type features to get those warnings out.

Well, what are you going to do with a National Center that has a domain space from basically the middle of the Pacific to the middle of the Atlantic for surface analysis? What are you going to do for all the other products and services it's putting out, with respect to the short term forecast for aviation purposes -- the fronts and weather, the extended forecast of 48, 60 hours? These are large domain spaces, and -- they don't have that clock -- ticking on you to get -- get something out. But they do have a regularly scheduled aspect. It's a whole different concept of operations, basically. So, that meant that we weren't in AWIPS, which has a downside, because it means that whatever the centers are providing or producing, those products may or may not get into AWIPS.

And you say, well, what do you mean, may not? Well, guess what didn't get into AWIPS? Surface analysis. So, here we have this whole group of people doing surface analysis that gets on a fax machine but doesn't necessarily get an -- it wasn't on AFOS either, by the way -- wasn't in the AFOS that preceded it. So, we have these kinds of disconnects.

The other thing that was different in MOD was very clear was that the graphic products that -- that the forecasters develop are maps, they're not digital sets of numbers, they're not a warning with a polygon. It's -- it's an analysis on the maps, themselves. Like where's the QPF going to be -- the zero line, the 0.25, the half inch -- I mean all these are drawn on a map. And then you can derive things from that map. They derive -- they're verification scores -- by these isopleths. So the point is, that's a different way of operating than what was going on in the forecast office.

You know, they put out a forecast discussion, they put out a specific forecast within a short amount of words and numbers. But not necessarily putting out a graphical product, so that was different. So what that -- in a way -- allowed us to do is come up with a National Centers AWIPS system that was geared towards the requirements that those National Centers had. And of course, my interest in -- in working with Tony, and then bringing Mary over, and Mary brought together a pretty -- pretty impressive group of people, like Scott Jacobs, like Keith -- Keith Brill Steve Schotz -- I mean these are all people that really are known within the Weather Service in this digital era now, all got their start under Mary.

The other thing that was interesting was that there was no UNIX at all, at all in the building. And -- and the AWIPS system wasn't a UNIX system either. We came out of NASA, we interacted with other science agencies at NASA, everything was UNIX, everything was going UNIX. The University of Wisconsin, which I came out of, space science and engineering, said I had their McIDAS system for -- for processing satellite data, they had a unique operating system, they weren't UNIX. And, oh, by the way, if you were to bring all these different systems onto the floor, each one of them would have cost tens to hundreds of thousands of dollars to operate, just to

operate those systems on the floor. And then if you wanted software developed that was unique to your floor, that was extra money.

So, we made a decision there at -- in MOD, while working with Art Wick and several others in what was the Automation Division, that we would have to go UNIX and stop buying into these proprietary type systems that would allow us to do the graphics. We needed an open-based system that brought all the data together, allowed our folks to analyze the maps, analyze the data, overlay in -- the imagery, like the satellite imagery with whatever we -- overlay prior analysis with the current data so that you weren't starting from scratch, and you could adjust. That's how we got the surface data -- surface analysis back. That allowed us to do it. We made the case and it worked, and it could work in real time, and that was what we call the N-AWIPS System, the National Center AWIPS Systems. And we were able to justify its -- its need and its cost. When I became the NCEP director later on, at the end of the century, essentially, in 1999, we brought this system together for all the National Centers. And this is what allowed us to start collaborating among the National Centers. And I -- I'll leave it at that because -- there was some stuff now, coming out of that, some of the products and services coming out, that the AWIPS System could access the AWIPS 2, went over to a -- a UNIX approach, open source. But it didn't have the -- the one thing that we didn't do with the N-WIPS System is adopt all of the GEMPAK application software, and all of the diagnostic tools, and equations that were checked by Ralph Peterson and Keith Brill. And if you want only two people to check your equations and -- and the software representations of those equations, like Theta-E -- there's so many different versions that they -- if you want the one that really is truest to the derivations of these equations, those were the two people you'd want. And Ralph had come over from our branch at Goddard Space Flight Center into the development division, and then which became the environmental modeling center. And Keith, of course, came into MOD, and -- and those two went through each one of these equations, and then worked the graphics, and worked at draw capability with Paul Kocin, who was one of the best surface analysts I think in the world. Being the person to see if he could actually make it work within a workstation environment, in which he did. There's a paper written on that. This was kind of interesting, we -- a number of us were interested in the modernization, and -- and we found ourselves -- from a technology perspective -- cut out from the market, but it allowed us to develop the software that was actually needed in centers that had graphical products that they had to get out. They had to develop, draw, and be able to disseminate. So, it -- it worked -- it worked really well.

The other thing that's really interesting about this N-AWIPS System was the fact that we did it in UNIX, we could hook up with COMET, we could hook up with the Unidata group. We -- out in Boulder for software, they were looking for software packages they could support the university community. This was a UCAR program, a Unidata. And Comet was looking for these kinds of capabilities to be able to train -- especially the SOO's -- the SOO Training Course, in terms of analyzing and diagnosing with these types of very powerful diagnostic equations. That software package got distributed to over 70 universities in the country. And what happened was with Steve Schotz, sort of managing this in Mary's shop, we would get the software out within their synoptic -- they'd use it in their synoptic classes. And come back and say -- this equation or this diagnostic or this diagnostic package, is -- which was developed in our synoptic lab within the

GEMPAK, and AWIPS' framework is pretty good. We got a lot of students working this, you might be interested in this. Or we found an error in your -- we found an error in your diagnostic code. As good as you folks think you are, we found this error, or we found a way of extending it. I mean it was all done very collaboratively. And we actually had every 6 months, we had an update to N-AWIPS, we built a very -- because we were open system, the way that Mary and Steve Schotz managed this, they could compile the changes, check the changes out, and get them into the next version, and have a very rapid turnaround on this. So, we were getting updates from various universities, synoptic labs, or people who had just done a research paper with it. And that allowed us to more rapidly update the system, so that's a very important part of this. And -- and the last thing I'll note, I -- I've -- I mentioned Scott Jacobs, Mary would put out job announcements of civil servant job announcements, and then the con-- the supporting contractor -- would put out announcements for contract opportunities. And within a line in there - - you know, GEMPAK experience -- you know, was preferred. And we were getting job applicants from various universities that [said] I've got two years of GEMPAK experience, here are the things that I've been able to do, all that. People were coming into Mary's group, whether they were in the civil servant corps, or the contract support group, that had GEMPAK experience and N-AWIPS experience before they even spent one day on the floor. You talk about having an accelerant in a group, it was phenomenal.

So it turned out to -- it turned out to be okay. I mean there was some consternation at headquarters about it. But the fact is, we -- like I said, I walked into an organization in which the new marine group couldn't get its products out -- that was a problem. And now we've -- the develop -- I mean people are -- are going to develop their products, they're going to draw their products on -- on systems that are proprietary, and it's going to cost us a lot more money to get these out, which we were not getting the budget for. By the way, it was all coming out of hide. This -- it was pretty clear that we had to go this route from a -- from a money perspective, and from a system perspective that would give us open source, and actually connected us with a larger community in a way that I think other -- other parts of the Weather Service were aspiring to, at the time.

Mary Fairbanks: So, I think we're going to -- if it's okay, Greg, I'm going to take this next question, kind of switch gears, and talk about March 1993, the storm of the century. That occurred during your time at MOD. For listener context, walk us through the meteorology and the characteristics of the storm that made it so memorable. I mean this is a question for me, I -- I want to hear all about it. And then also, the forecasting challenges and the successes that were achieved by the Weather Service for this storm.

LU: Right. So, can you cut this for just a minute? I want to go downstairs and get a book to -- to start answering this question.

[BRIEF BREAK]

GR: And we're back.

LU: Okay, thank you for allowing that interruption, because I wanted to run down and get this book, *Braving the Elements: The Stormy History of American Weather* (by David Laskin). It was actually my first, I would say, my first interaction with the history of weather in this country. And it's certainly now that we're trying to sort of unravel the history of the Weather Service, this might be something we need to look at more carefully. But one of the things that happened with the storm in March of '93 was that it wound up as a whole chapter in this book. And this is where, you know, I first met David Laskin who is the author of this book. He came and visited the World Weather Building and was going to spend -- he spent time with various people in the building, was going to spend about a half hour with me. We wound up talking for about two or three hours on this storm. And the reason is that it was clearly a defining moment for the Weather Service.

And what I mean by that, and we'll get into a bit more of the details of this, but this was a storm in which the models were picking up, especially what was called the medium range forecast model, which was run out to five days, so out five days in advance. That weekend in March of '93 it started picking up on a big storm that would form off the East Coast by Friday of that week. So come in on Monday, which is now four days before Friday, and it's still picking up on that storm very consistently. Some of the extended applications of these model runs for the six- to ten-day forecast, even in that timeframe, people are starting to say, what is this model picking up on? So sure enough, we come in on Monday morning and the first thing I get is part of the, I get a morning, short morning brief on what's happening on the floor both administratively and meteorologically. The lead forecasters are talking about this model picking up on a big storm.

Now, as we went to day four, it wasn't exactly in the same spot as it was in day five leading in, but it was still a big storm. Day three was a big storm. And we decided that we had to pay attention to this and start -- there was always a hesitancy to predict a big event in the medium range. But here we are, we're looking at something that from run to run that we got to start talking about. So in that middle part of the week, we did start highlighting the potential for a major storm on the East Coast by the weekend, by late Friday and into Saturday. And when we got to day three, we were putting a -- a big storm on the East Coast on the maps, not pulling any punches. That this was going to be a major storm, if not of historic proportions. Once we started doing that, I got a phone call, for example, from Bob Ryan, who I didn't know well. I knew of him, of course, from watching him on television here. He wanted to be assured that we were sure we knew what we were doing because the models at this point had a sordid history of hits and misses on storms. There's the storm of 1979, the President's Day storm, that the models missed completely. But if you looked at this storm from February of '78 that hit New England, there was some indication in the baroclinic models at the time that it was hitting the amplifying trough in the upper atmosphere and putting a low out there off the coast of Long Island three days in advance. And some people used that to start talking about that storm two or one day in advance as a big storm.

This was the first time, though, that we were getting it into our products and discussions at days five and four and then really bringing it on day three. As we went to day two and day one, of course, then the regional models were picking up on it, and also picking up on a big storm off the East Coast. If I remember correctly, some of the other models, of course we had the UK

model at the time. We had access to the UK model and the European model. And they were not as robust. I think one of them maybe had it going out, further out to sea. There was clearly uncertainty here. But it was run to run consistency on the MRF that kind of locked in that we absolutely needed to talk about this storm. So we did. And we were producing maps ... and discussions off the forecast floor by late Wednesday into Thursday for the weekend that were talking about this storm in terms of historic proportions, in terms of the depth of the low and the amount of snowfall that would come from this.

What was remarkable to us being inside the forecast was that people started making decisions on it. The New York Turnpike Authority announced that it was going to close the turnpike on Friday night given the amount of snow that we were, we were forecasting three to four feet of snow up in upstate New York along the mountains. And then you had states like Virginia, I believe it was Virginia. States up the chain of the Appalachian Mountains declaring states of emergency even before the snow fell. Paul [Kocin] and I highlighted this storm as one of the prediction successes in the monograph. There were blizzard warnings in areas here into the Carolinas, along the mountain chains especially, that were 36 hours in advance. Unheard of. That was, and we went to storm watches more generally, 30, 36 hours in advance. And we verified it. There was immediately along the coast, there was a turnover to rain and sleet. But in the metropolitan areas, very heavy snows turned over to sleet and ice. It never went totally liquid. And then just in the northwest suburbs of Washington, for example, Baltimore, all the way up to Philadelphia, snowfalls of 30 to 36 inches of snow.

So, it was declared an incredible success. The reason it was a defining moment was that it was only in the late-80s and early-90s that the research community was saying that the changes in the models that had been made in the mid-80s to late-80s who are actually allowing us some level of confidence and regularity to predict cyclogenesis -- intense, rapid cyclogenesis -- cyclones that would actually produce big snows, two and then three days in advance. And in fact, by the early 90s, I think Richard Grumm and Fred Sanders who were writing these papers, sort of tracking the performance of the models, were stating that -- I think Rich Grumm was like, if the global models are saying they'll be a cyclone at day three the chances are good that you're going to verify on day three.

Remember now up until this time, the late-80s, early-90s, it was very hard to get a forecaster to put, if we put an L on a map, there's only one or two isobars around it that were expanded over an area to give themselves some leeway on this. There was not a lot of confidence in predicting these types of intense storms even one day in advance, much less two or three days in advance. So the people in MOD were writing these papers. Rich Grumm was in the technique development group. Wes Junker was one part of this. He was one of the lead forecasters. They were giving confidence to the forecasters to be able to look two or three days out. Seeing something go out to five days and then stepping towards a system with more confidence and then actually making that forecast, putting it all out on the line. This is the first time it was done. And it brought a lot of attention to how we did this. So that's why Laskin spent the whole chapter on just this storm. And I talked about this as a defining moment, and he used that quote in the book. I believe it is a defining moment in our ability to predict these types of extreme events

further out in time and do it in a way that people pay attention to it.

One of the other things that happened here besides states declaring emergencies and closing roads down, Boston actually canceled the St. Patrick's Day parade. In other words, they canceled the parade before the first flake of snow hit. Now imagine if that forecast didn't work out what the reaction in Boston would have been. There's a headline in the Boston Herald that I'm looking at here, Brace Yourself. And it gives a whole -- sort of a cookbook of what's going to happen.. This is what's going to happen in the middle and the western part of the state of Massachusetts. What's going to happen closer to Boston -- snow. Again, you got that mix along the coast kind of thing. But the strong winds, the hurricane force winds that were associated with this. So it was really remarkable.

Now, was it a perfect forecast? No. I mean one of the aspects of this is that this low literally bombed out, dropped, pressure falls were incredible in the Gulf of Mexico. This low spun up in the Gulf of Mexico. In other words, the development phase of this didn't happen along the East Coast the way the models indicated it would. It was already rapidly developing in the Gulf of Mexico.

Why is this important? Well first of all, that brought the snow further south. Birmingham, Alabama, Northern Alabama area got close to 14 inches of snow. The surge that was associated with this development in Northern Florida killed people. There was a storm surge associated with this now rapidly developing low in the Gulf of Mexico that created a surge along the Florida coast in Northwestern Florida that killed people. That was not forecast. Having this develop so far south drove the cold air and the strong winds with the front and knocked out the sugarcane crop of Cuba. So this rapid intensification that far south, I think it was the deepest low recorded that was non-tropical in nature along the Gulf Coast. So those kinds of things are meant -- were important for the people in Florida, along the Gulf Coast, Cuba. We didn't have that as part of our forecast.

So there's a part, there are pluses and minuses here. The blizzard itself and its track up the East Coast, that was -- it got a lot of people's attention. And it was that that brought the attention to the forecast process. The ability of numerical models to do this was really demonstrated to the American people. And I believe that that was sort of the defining moment in that and set the stage for others in the media to start using -- here's what the numerical models are doing, etcetera, etcetera. Pushing the forecast out beyond day three, four and five, now started gaining some traction, a lot of confidence in this big hit in advance.

And in a sense we haven't looked back. It wasn't a smooth ride after this storm. We did fairly well in the 1996 storm as well, the January '96 storm, which was a major snowstorm, a blizzard up and down the East Coast. But then you had the surprise snowstorm of 2000 where even the day before we didn't have a watch out for Washington D.C. and we ended up getting, 15, 16, 17, 18 inches of snow out of it. So clearly, we went ahead, come back, go ahead, come back, but this gave us visibility. And I'm talking about for the meteorological community, not just for the Weather Service, in terms of starting to believe the models when it's saying something's going

to happen in days three, four and five involving major cyclogenesis.

And then also, in parallel with this by the way, we started seeing over the middle of the ocean -- remember we were spinning up the marine section. They're doing forecasts out to five days in advance because a ship needs time if it's going to make a change, you can't tell it the day before and expect it to miss these storms. You have to start outlooking these things. We saw quite regularly that these intense cyclones, the primary systems, the secondary and even the tertiary development could be predicted three, four, five days in advance. So when I started writing the reviews, review chapters, for the Bergen conference celebrating the anniversary of the Bergen School, I wrote a historical review paper on the improvements in forecasting. And showed us from the point of view of this superstorm of 1993, but also with Joe Sienkiewicz as a co-author, what we were doing in terms of forecasting over the open oceans, which was really quite remarkable. And then we, and the Sanders "tribute" paper that we did in [2008]. One of these named symposiums in the AMS, and the AMS published a book on that. We have a chapter in there updating the forecast capabilities. And being able to hit the hurricane force winds, for example, in these oceanic storms. It all really started, the confidence in doing this, in creating this historical vector of a sense, started with the March superstorm.

GR: Louis, a quick follow up. You mentioned the media starting to focus on the models, and particularly, Bob Ryan who at that point was the meteorologist for WRCT-TV in Washington D.C., the NBC affiliate there. How were the media characterizing this, and were they early on it? And what other reactions did you get from Bob and others?. Because I know this sort of really predates our much greater focus on working with the media as partners.

LU: Yes. So first of all, we started getting calls for interviews. And CBS was very -- CBS national news actually set up an interview on the floor that I did that showed up on the nightly news. The news for that Friday night. They came in on Friday morning for that. And then on subsequent storms, if we started advertising a storm one or two or three days in advance, they would want an interview earlier, okay. And then MSNBC, the cable news networks were starting to set up. And they would, we had them set up for updates. They kept a live camera going on the floor, a camera crew on the floor that would do an update. This started after this storm.

I think one of the biggest -- there were two national shows that I can remember very clearly. There was one called How Do They Do That? And they would have special segments on things that happened. Well, they did a segment on how we predicted this storm. And that was very, that was an interesting thing to actually watch and how they brought that forward. The other thing is that National Geographic did a special on this blizzard called The Superstorm or the Storm of the Century. They credited me with that term, this storm of the century. Before the century was over, by the way, in which I was very careful not to call it the storm of the century. Other people would call it, and I would say, that it was the superstorm. It was the most intense storm. It actually had the lowest pressure off the North Carolina coast, too, of all the nor'easters. I mean this thing really was an incredible storm. But that National Geographic is -- I still got the tape. They sold the tapes at that time. But clearly, it was an incredibly produced show. And it captured not only the adventure of the storm itself from people down South all the way on up,

but the forecast, the ability to forecast this. But it was David Laskin's book that came out some time later, a couple years after he got this published, and had this chapter on that. And it was, it was pretty clear that this storm would be looked at as a turning point.

Now, with respect to our interest in this, one of the fortunate things that happened for me was the week after this storm was the first modernization meeting that Joe Friday was having with all the MICs. He had the whole management team out at Boulder. And I remember very clearly two things from that meeting. One was, now I'm, -- I'm a senior, one of the senior employees here, SES [Senior Executive Service] within the Weather Service. So I'm there. Everybody was there. And so it was the first time that the modernization was actually being rolled out. This is the way we're moving it forward. And there's the restructuring. This is how we're handling the hiring of people because we're now hiring people with degrees. There wasn't a requirement for degreed meteorologists before. There were requirements for met techs, right, because again, you're moving lots of paper around. Now people with degrees got hired, but you know, this built the requirements. So all this stuff was being laid out. And so I felt fortunate being in the room and really getting the best understanding of the modernization than I could have had and having this meeting.

The second thing was Hallgren, Dick Hallgren was there as the prior director of the Weather Service. I had gotten to know him mostly through his position as the Executive Director of the AMS. I had a number of interactions with him. In fact, our work on the first monograph on Northeast storms -- Paul Kocin and I -- this so-called "White Book" that came out in '99. I'm sorry, 1991. He was really encouraging. He is a new executive director and was really encouraging us on that book. He saw me on the first day of the Boulder conference. I'm walking into the back of the big room, and he's sitting in the back. And he goes Louis, come here, I need to talk to you. And so I went over to him, and he says you've got to write that up. You've got to write up the storm that just happened and the forecast for it. So he was the one who planted the seeds for the three papers that came out of that tap on the shoulder. The first paper was on the analysis of the storm. Paul Kocin is the lead author on that. The forecast that occurred on MOD is described in the second paper. And in the third paper were the model forecasts, and that was Pete Kaplan out of, at the time, the Development Division. So those three papers wound up being published in BAMS (*Bulletin of the American Meteorological Society*). And that, really then provided, I thought, a really good science basis and service description of what happened. And people certainly latched onto that as, hey they can do this, we can do this.

So you started seeing increasing interest in the media which was really brought home, I believe, in the local area. And I'll mention Bob Ryan again in 1996 when he saw the forecast for the -- and this, you can check in with Bob on this, and he'd be worth an interview on this alone. But he saw the forecast for the January 1996 storm. And saw that we again were going all in for this storm over the weekend, and on Friday evening, when the NGM came up with about 18 inches of snow for D.C. for this storm, and we were going in on it. Andy Stern on Saturday morning wound up doing a press conference that said this storm will be measured in feet not in inches. I'm not sure exactly how that was cleared, but it was still verified and still very proud of it. The point is that Bob actually convinced his producer to put people into motel rooms around

Washington D.C., and he is the first one, the first station, you know, you got that station WRC, to do that on Sunday morning, all day Sunday, live remotes of the storm as it was crushing D.C. And that's how Bob wound up with his big studio for the next season. Because they are obviously, they took the whole ratings award for that whole day into the next day. So the point is clearly, there was increasing confidence in doing this based on what, not only what we did but what the modeling did. But the models did what the forecasters did in going out with these models but what the larger enterprise was doing. So the turning point was the March '93 storm. No question in my mind.

GR: Fantastic. So a year later, Louis, you became the director of the National Weather Services Office of Meteorology at Weather Services headquarters. I understand from a previous discussion you and I have had that there's an interesting story about how that all came about. You want to walk us through that one?

LU: Yeah. Well first of all, I mentioned being called by Ron (McPherson) to do the strategic plan to lead the team for the strategic plan for NCEP based on the framework he was laying out which was pretty solid. And clearly, this was part of the bringing NMC and now NCEP into the modernized Weather Service. In a different way, but bringing it in. And Ron was very pleased with the work that the team did and that we did and how I'd led that team to get it to that point. So he must have been talking with Joe Friday in that regard, unbeknownst to me. Joe's the head of the Weather Service. And then this storm, the fact that this happened in '93, and we made it work. In fact, we made it work, we got a lot of attention by Ron Brown, Secretary of Commerce, who wanted -- we had to give him a special briefing on the Friday before. Because we got everybody spun up, including the Secretary of Commerce. And then there was a group that went down and briefed the secretary. One of them was Paul Kocin, and there was a modeler, it might have been Pete, I'm not sure who else went. But I know Paul went from MOD. And a funny story there was that I heard from Joe Friday after the briefing. Ron Brown was, after they briefed him and they ended the briefing with the satellite loop, and there was no storm there. This was Friday morning that they briefed him, and he goes where is it? And they said it's going to develop. It's going to develop in the next 24 hours. And he goes, you are doing a forecast on something that's not there yet? And so in a way, that's an amazing question, but it's also, I think, bringing home the fact about the nervousness people must have felt that we're predicting something that states are declaring an emergency for and are going to shut down cities that come to this. And it's not on the map yet. And it worked. We made it work. And MOD got a lot of attention. NMC got a lot of attention. The National Weather Service got a lot of attention for making that happen.

So, a position was opening in the Office of Meteorology reporting directly to Joe. It's one of the main positions. It deals with the policy, all the policies of the forecast and services across all the service areas are in the Office of Meteorology. And working the transition from a hybrid set of Offices of the Weather Service Forecast Offices and Weather Service Offices that are more locally distributed. And then compressing those into the 122 WFOs, Weather Forecast Offices, so you have a more uniform, was really the big step that was. So from a strategic perspective, from a forecast restructuring effort, there was a lot of work that needed to be done.

Now, the Office of Meteorology actually didn't have a direct role in the restructuring of the Weather Service. There was a program office, a modernization program office, that did that. But then, again, you got a lot of policy aspects that have to be redone, a lot of things that were going to happen in the Forecast Office that weren't happening now, like the SOO Program and the WCMS, all those had to be created now. So I got asked to come down to headquarters through Ron McPherson. And I was -- the way Ron told me -- he says Joe Friday would like you to try this out and then see what you want to do. So, I go down there and start a 90-day tryout, which I really looked at as a tryout. I was still trying to keep up with what was going on back at MOD. Jim Hoke became the acting division chief while I was down at headquarters. But I had every intention of going back. I was going to use this experience to figure out how best to work the NCEP offices because now we've got this strategic plan that's going to be accepted. NCEP is going to have to be restructured. That's what I thought I'd be going back to. I'm going to all these briefings on the various programs that our OM is overseeing, the public program, aviation, marine, severe weather. There's a hurricane program, all of these programs. And there's a big problem they've got me working on with the GOES satellite that is going to be delayed. What happens if we don't get the new GOES satellite and the older satellites are no longer available? What's going to happen? So we had to go through a so-called "no GOES" planning process. And I kept on emphasizing we've got to be optimistic. Let's go through a "yes GOES" planning process. We had to do both of these at the same time.

So all of this stuff is percolating, and I got a call from Joe about three or four weeks into this. And he goes, well when in the hell are you going to sign up, or something like that. You know, it was sort of like when are you going to do this? And I say, well I thought I was going to assess and come back and you'd... He goes, no, I want you to do this. I want you to start doing this right now. So I made the joke that I thought I was being volunteered. I was actually "voluntold" to do this. And it's important because, quite frankly, looking back on it, I wasn't ready for a headquarters job just the same way I wasn't really ready for the MOD job. I did not have experience in a headquarters. I didn't have that at NASA. And I had very little interaction with headquarters in my four and a half years at MOD because I just worked through first Bill Bonner and then Ron McPherson and Jim Howcroft who was the deputy, who made it very clear you worked through him. So saying that I had experience to take over the Office of Meteorology, I looked back on it and said there was a lot of on-the-job learning there that needed to be had.

It became clear to me that there were clear weaknesses in the whole headquarters setup that the budget process didn't map into the office system themselves. So for example, in the Office of Meteorology, I had a lot of policy responsibilities. But I didn't have the budget authorities that went with those. We were basically told what our budget was. The regions could get money just by going directly to the budget officer up on the 18th floor. Well that doesn't really help if you're trying to get policies to be followed more uniformly by the RDs (Regional Directors) that they're getting the money or they have money asks or being granted independent of you. So things like that were problematic, but you know, we had a service division. We actually had a science division, and we made that work. Just in terms of managing the day to day services, working with the transition office that reported directly to Lou Boezi, one of the deputies up to Joe. So

that kind of thing was worked through the modernization. And then the day to day stuff and some of the science activities was worked through the other deputy, Susan Zevin. And there were issues there which ultimately blew up in the late 90s. I won't go into that here.

But the point is that it made it hard for us, but we just stuck to the script. I mean, we've got to clearly work these service areas out. You had really good people in OM like Don Wernley. I remember him explicitly, emphasizing in his services branch that we are the best weather service in the world, and we've got to make sure these services are working and are getting out. And as we transition with the Transition Program Office that we don't miss a beat in that regard. And then in the science area, we had people like Richard Pryswarty and then I hired Greg Mandt to lead the science advances and the technology advances that were associated with the forecasters doing their jobs. And that included how they access and get the models and things like that. Which we had big issues with. So the thing is, we did our job there. And I learned a lot. I learned about how headquarters can work and it was, again, a part of the learning process that I thank Joe for, having the confidence that we could make this work.

And I have to tell you that it really got me immersed in the modernization in ways that were now just right there in front of you, even though the program office was handling parts of the transition. As examples, You had Doug Sargeant's shop handling the ASOS (Automated Surface Observation System) and the AWIPS. You had Walt Telezetski handling the NEXRADs. Man, I didn't miss their meetings. I mean clearly, they're important to the way the forecast offices were operated. We did the training for these offices that were spinning up. We oversaw that. And I was like, wow, talk about a very detailed stepwise plan for getting all this to come together and then being part of that was quite an eye-opening learning experience. And I really admired the people who were pulling this off, the ones I just named, were really phenomenal actually in making this happen, in bringing the modernization up to the finish line was what we were doing, in that four and a half years at OM. I was glad to be part of that team.

GR: Louis, in an oral history we did with Joe Friday last year, he basically went through and explained that his primary job with relation to the MAR was to realize Dick Hallgren's vision. So he really set himself up as really the one who had to take the slings and arrows, if you will, on the modernization, both the good, the bad, and the ugly. And you were at headquarters when he was reassigned, as they say. And in the oral history that Joe did with us, he indicated that this was due to the budget pressures placed on the agencies as a result of the MAR. I'm curious what your perspective was on that whole situation, what did you learn from that experience, and how has it helped you in your subsequent positions as NCEP director and then director of the National Weather Service.

LU: Well, Joe doesn't give himself enough credit. I know. I give Dick Hallgren and the team that he assembled all the credit for the vision and the planning process for the modernization. Quite frankly, if you didn't have that combination of Hallgren and then Joe Friday, when the private sector started rising up in the mid to late 90s with the idea of taking over the weather service, not just working with us ... if we hadn't gone through the modernization, we'd be out of business.

I'm absolutely convinced about that. So in a very real way, realizing the complete overhaul that was needed to bring in the new technology, bring in degreed meteorologists and hydrologists and relocate the offices to get maximum use of those technologies like NEXRAD was remarkable, really remarkable. And if Joe wants to give Hallgren all the credit for that, I'm not going to argue with Joe Friday ever. But I think Dick Hallgren would point to his team. And if you listen to the oral history that Doug Sargeant did, he gives a phenomenal step two of that, of the team and how they interacted.

So Joe takes over, and I believe he took over just as I was coming into the Weather Service, so the late 80s, sometime in the late 80s. I never really worked under Dick Hallgren, although again, Dick, when he calls you up, whether I was the MOD director or the OM director, you listen to Dick Hallgren. He's telling you what to do. So the thing is, Joe had to sell the modernization. Joe had to bring that through the knothole of the budget process that we call the appropriation process to get the budget for it. We're talking big money. The entire modernization cost about \$4 billion. This is not small change. So he had to bring this forward through that budget process. He had to deal with the fact that the union wasn't in favor of the modernization because there were forecast offices being closed. There were Weather Service offices being closed and new offices being created. But the fact is, there was a net decrease of offices by about let's say hundreds, in fact, over 100. There were about 1,000 positions that were lost. To get that \$4 billion, that's why they had to automate the surface data collection through ASOS because we couldn't afford the people in every one of these small airports. There was a lot of selling that had to happen. And quite frankly, there was the big question: is NEXRAD going to work on a national basis? Are you going to get all of the data through those comms lines to the forecaster's fingertips to get you a 10 minute, to meet that 10 minute criteria (for tornado warnings)? That whole modernization was going to be measured by getting warnings, getting tornado warnings out to 10 minutes. And I believe the flash flood warning was in that also. He had to get that out to 45 minutes or something. He had to make that work. So you got to sell the programs over a period of years. You got to go through an assessment period, and you got to show that it works. And the union is not on your side. All that's happening.

I gave a speech, I gave a talk to the union. Greg, you helped work that. The year before it was Joe. And we read his speech, and he was quite open about the fact that you might like what you've got now. But it was, it was a tough row to hoe because he had to be on the Hill defending this modernization every step of the way. And I admired him for what he did. So I always look at it as that combination of people that made that, that brought that modernization over the finish line. You had Hallgren and his team planning. You had Joe with basically the same team, but there were changes occurring like I came on board and others. But that team was pretty solid in that modernization drive. Then you had to actually get it done. And Joe almost got it to the finish line, and there were budget disagreements, and I was there when that happened. I got a little insight on that. And then you had Jack Kelly bringing it over the finish line. And that's having it declared over. And now, since that happened, we've had a number of academy reviews and reports declaring the modernization a major success. So when I, I have a personal feeling about it saving the Weather Service at a time when there was great pressure on them from the private sector, especially. But you get the academy reports all the way up to 2012, I think it was one

after another. This is a major success in what it set out to do. It accomplished what it set out to do. So I give him a lot of credit for that. He deserves it.

GR: And your takeaways from that experience working with Joe, how has that helped you in subsequent years?

LU: Well, Joe would, Joe could be very direct. He could be very forceful. But he wasn't that way all the time. He picked his places rightfully so. He, I believe, was under enormous pressure in selling the modernization every step of the way. And you know, you get the big programs for the technology issues that, or the technology systems, that needed to be developed and then implemented. They have a time on them, and there were delays, so we had to, had to deal with that. And then you get to the people part, it's the give-back part. We were losing 1,000 positions. And there were some budget needs there. And Joe's analysis, from his budget office, was that they were 40-something million dollars short. And by '98, by '97 actually, there were, there's this budget discrepancy. And that's where they hit a third rail essentially, and the team hit a third rail. Jack Kelly was asked to do a review by the Secretary of Commerce. If you look at that review, he basically says there's 40-something million dollars short, right about the number Joe was saying. But you know, so you can say it wasn't fair. But the fact is now they had to find a new Weather Service director, and they, and the Secretary of Commerce tapped on Jack's shoulder and said okay, here's your 47 million, here's your plan, your findings and all this, and make it work. So Jack was a different kind of leader. I worked under Jack for a year, you know, still as the OM director. He was a different kind of leader. He could be very forceful, very brusque ... in some respects, hurtful. Joe was never like that. If Joe got mad at you, he got mad at you inside the office with the door closed. So I saw a range of ways of operating. But the tenacity of following the plan, the need for the plan, and following that plan, and bringing the budget to that plan, I saw firsthand under Joe Friday. And for better or worse, whether the budget process was clean, whether it was set up to articulate the actual needs that he was pointing to, whether he had a headquarter structure ... I felt like I was, that the OM was disenfranchised in a very real way that we weren't part of the budget process, so it was hard to get the regions to come in line with whatever policy aspects we were working towards. That also sat in my head for when I took over the Weather Service.

But the point is, I had Joanne Simpson as a boss, in Goddard Space Flight Center. First thing she did was a plan, a vision and a plan. Here's a vision for the severe storms branch. You folks work the plan. Follow through. I get in with Ron McPherson in MOD, and we worked the plan not only for MOD but now worked the larger vision and plan for NCEP and got a follow through on that. And he started that follow-through process. And then to see that with Joe Friday. I guess it was, like, three years total that I worked for him before he was asked to step aside. He worked at OAR for a while before he left NOAA. Again, they had the vision, yes, and they had a plan. He had to follow through on that plan, and that follow through included selling it, and keeping it going and dealing with the perturbations and the bumps in the road. Being able to navigate that was an eye-opening experience for me. It was absolutely amazing that we got to the finish line.

GR: Excellent. I think in terms of following through with our plan, I think we will hold, we will hold it there. And in our next session, we're going to pick it up when you're moving to NCEP where I'm sure we'll talk a little bit more about following through on the vision and plan that you worked with Ron McPherson. So, with that, I thank you for your time today. I'm going to stop the recording here.

[SESSION ENDS]