NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
VOICES ORAL HISTORY ARCHIVES

IN PARTNERSHIP WITH
NOAA HERITAGE AND THE NATIONAL WEATHER SERVICE

AN INTERVIEW WITH DR. ELBERT "JOE" FRIDAY
FOR THE
NOAA 50th ORAL HISTORY PROJECT

INTERVIEW CONDUCTED BY
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EDMOND, OKLAHOMA
NOVEMBER 2, 2020

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Molly Graham: This is an oral history interview with Dr. Joe Friday for the NOAA 50th Oral History Project. The interview is taking place on Monday, November 2, 2020. The interviewer is Molly Graham. It's a remote interview with Dr. Friday in Edmond, Oklahoma, and I'm in Scarborough, Maine. We've gone over this before, but I wanted to get a sense of how folks at the National Weather Service adapted to the MAR [Modernization and Associated Restructuring]. Not too long before you arrived, the Weather Service became part of NOAA [National Oceanic and Atmospheric Administration]. So I was curious if there were lessons learned in terms of that restructuring in 1970.

Joe Friday: In 1970, I was in the Air Force during that time period. I was not involved in the broader meteorological community at that time. So I did not have any kind of close relationship with anything that the National Weather Service, or Weather Bureau before it, was doing. I mean, I knew of its existence. I certainly used its products, along with the Air Force products as well. But as far as understanding how the workings of the organization occurred, I was not aware of it at that time. Just very broadly, nothing specific. So I can't really give you much information on that. I will tell you that the first implementation of a computerized network was the AFOS, Automation of [Field] Operations and Services, which occurred before the MAR. That was the movement that we had in the late '70s, early '80s, to replace basically the old sixty-word-a-minute teletype service around the country. Everything at that time was basically done on teletype, transmitted with paper tape and the like. AFOS was the first time that we had introduced a networked computer system in the National Weather Service. As a matter of fact, it was one of the very early ones in all of the government. We were kind of breaking ground at that time with the type of technology that was going in. Quite frankly, there were a large number of employees in the Weather Service that did not like that at all. There were people that said, "I'm not going to have a computer telling me what to do. I've been used to typing out my forecast on a keyboard, basically a typewriter, making a punch paper tape, and then transmitting it to wherever it needed to go around the country." AFOS was, like I said, a networked computer system, one of the very earliest ones in operational use and a very broad expansion of that. When I first came on board, AFOS was being implemented completely across the weather service. I still remember visiting one office that shall remain nameless, and having the head of the office come up to me and say, "You understand operations. You've been in the Air Force all this time, and you understand operations. Surely, you're not going to make us use this piece of equipment." [laughter] My response to him was – I said, "Well, I'm not that familiar with it yet. I've just come on board, but it seems to me like we all need to go in that direction." Because at that time, every office was virtually independent of each other and many of them had different ways of doing things. They had different formats for their products and services. With the technology moving along as fast as it was, it was necessary to get some sort of uniformity to be able to pass information around the various elements of the National Weather Service so that people could understand what was going on. We needed to have a standardized forecast package. We needed to have continuity between offices. Another thing was happening at that time, too, which made it kind of important that we do that. Television was coming along and making great changes in the way they did things. The Weather Channel was being developed. As a matter of fact, I remember I was deputy director at the time when John Coleman, who founded the Weather Channel, came to me one day and said, "Joe, I need your help. I'm putting together a twenty-four-hour-a-day, seven-day-a-week weather channel, and we need to get the National Weather Service information as rapidly possible so that we can distribute it across the

entire country." Now that had some very strong appeal to me because it was one way of getting our information out to the public. So it might do more good than just simply the messages that we were sending out at that time, that were used by radio and television reporters to pass on information, but a twenty-four-hour-a-day Weather Channel would give that information some broad visibility. But at the same time, the first thing I asked him, "John, what are you smoking? Do you think that that will possibly be a useful or money-making type of thing?" It shows my business acumen. The Weather Channel was subsequently sold a few years ago to NBC for several billion dollars, and I didn't think it would attract the customers that it did. But in fact, it did. People are fascinated with weather. What happened was, is that people would use that almost as their background activity in their home. It would always be on. John's original view was that he wanted a situation so that anybody in the country could turn on the television and within five or six minutes, find out what information they needed to know for their local area, what was going on, what the forecast was, and what the outlook was for the next week or so. So that's the way he designed it, and so all of our products flowed into that. We received credit for that. There was credit for the fact that we were displaying that information. So it was useful on both sides. But in order to do that, we needed to have some consistency on what we did as well, not only for our own implementation of AFOS but to be able to interface with such things as the Weather Channel, at AP [Associated Press] – UPI [United Press International] at the time, which was also in existence, as well [as] be able to interface with these national networks so that we could get the information out. That was a significant change, where the National Weather Service stations were no longer totally independent, but it was a dependent network working together, making a much stronger organization than had existed before. When the new technology was being developed for the MAR, the radar program, there was some concern of many of the people that had grown up with the WSR-57s [Weather Surveillance Radar - 1957] and the WSR-74s, which was the implementation on the NEXRAD [Next-Generation Radar] program, that the new Doppler technology would confuse things so much that they wouldn't be able to handle that effectively. There were some that were really concerned about whether or not they wanted to be around when that kind of technology came on board. That's one of the reasons we started a major training program for forecasters. We wanted to make sure that everybody in the office was trained on that program before the radar came on board so that it wouldn't be a mysterious thing to them. We took over, as I mentioned before, a major hotel in Norman, Oklahoma, for two or three years and literally ran every forecaster through that program. It was a three or four-week program depending on which job they had. It worked very successfully because people, instead of being afraid of it, they wanted it to come faster. They wanted it to be there faster than we were able to get it in many of the places. The AWIPS [Advanced Weather Interactive Processing System] system that integrated all of the data into one workstation or a pair of workstations was well-received because, by that time, everyone had been used to the AFOS system, and AWIPS was an order of magnitude or probably two orders of magnitude more capable than the AFOS system. So before, they had paper maps presenting the wind flow and the temperature fields, then they had a different piece of hardware that displayed the satellite information, and they still had a different piece of hardware that displayed the radar information. So they had all of these sets of hardware and all the paper maps to try to integrate in their mind as they're going through the forecast process. The forecast process is a fascinating one. You got to be able to understand what the atmosphere is doing right now, and then you've got to be able to take a look at all of the various data sources to get the type of clues necessary that you can understand how that atmosphere will evolve into the future. Our computer models

do a very good job, but they're not perfect. But with the radar programs and the satellite programs, the information for what's going to happen over the next ten to twelve to twenty-four hours is very dependent on the data that is available from those systems that are seeing the atmosphere incomplete. Even the finest computer models now still represent the atmosphere by a series of grid points; they're spaced across the globe. Whereas if you're looking at a satellite picture, you're seeing the entire continuum across the globe or radar picture the same way. You're seeing the entire atmosphere, not just sampling it at a certain number of points, but seeing the entire atmosphere. So it's much more information necessary for the shorter range forecasts.

MG: I want to spend a little bit of time talking about any challenges you encountered over these years. In my notes, I have a reference to some problems with the ASOS [Automated Surface Observing System], and that this part of the MAR was suspended for some time around 1993.

JF: I'm not sure exactly which one you're talking about. We did have some problems with ASOS in the fact that it's not a human eye, and to be able to identify precisely what's happening in the atmosphere is something that we wanted to be able to do with the Automated Surface Observing System, ASOS. Now, ASOS had no problems at all with identifying temperature and wind, and humidity. But when it came to identifying a cloud amount, and cloud height, and so forth, this was a more difficult problem. It's fascinating. If you look up at the sky on a summer afternoon with a lot of the puffy cumulus elements around, just the little white fluffs of clouds around, you can look up at the sky under some situations and say, "Boy, that's really heavy sky cover." It really isn't. The sky is mostly clear. It's just that the human eye interprets that as more cloud cover than there really is. If you were to take a photograph of that and actually measure the amount that's covered by clouds, it would be considerably less than what a person would estimate. But the very fact that the automated system didn't yield the same results as the human observer, that threw a bias into the system, something that forecasters and operators were used to how the human worked, but not used to how the machine works. In some cases, the machine was more precise. The other thing that was difficult to do was to kind of indicate, not just overhead, but what was going on all around. The ASOS system basically looked at what was going on overhead. It would measure cloud amounts by basically keeping track of how often it saw something moving overhead. It depended on the fact that the clouds, in general, would be moving. So you could integrate that amount of time that you saw cloud versus not saw the cloud and give the approximate cloud cover. But there were frequent cases, particularly determined by local meteorological effects, in which you might have a cloud bank off to one side that would never pass overhead. Yet, the overall sky might be forty percent cloud covered at the time. This was very important for aviation. It was not possible to solve all of those problems, and we made various compromises to do that – working with the FAA [Federal Aviation Administration], working with the engineers to try to do a better job of computing that. The system that we have today makes some compromises. For example, it might say clear below a certain amount. There still may be high clouds that it doesn't see. So there are some understandings along those lines that are always there. So it's not a perfect system. On the other hand, tests that were run by the Air Force on Cape Cod, if I remember correctly, showed that it actually did a better job overall than the human being did as far as consistently measuring what was going on. You could always find a problem here and there, but day in and day out, the ASOS system never left home in the morning with a hangover. It never left home after having a fight with its wife or anything of that nature. It went to work all the time, it stayed on the job, it

made its measurements according to the algorithms that it had, and it was very reproducible. Human observers sometimes don't do quite the right thing, and they might take shortcuts. When I was serving in Southeast Asia, in a location which shall remain nameless, I had an observer from the local government doing the weather observations at the Air Force base because it was a combined national base between our country and theirs. They did the weather observations, and we did the forecast. We had one gentleman that liked to go to work at night. He always worked the midnight shift. He'd go on at midnight and get off at eight o'clock in the morning. He'd go to work at night, and the first thing he would do – remember I said the paper tapes that we used to punch that data on? He would punch up eight hours' worth of paper tape observations, hand them to the air traffic controller, and bribe them to go ahead and, once an hour, put the next one on the machine so that it would go out. Then he would sit around and have a drink, and usually not do anything else during the shift except get drunk and kind of pass out. A little side story – when we discovered this, the next month, his boss, who was a major in the local service Air Force, came by and asked how things were going. I said, "Well, pretty good, major. We have one small problem," and I named the individual. I described what was going on. He said, "Oh my god, Colonel. That's terrible. I'll have him shot in the morning." I suggested that perhaps if you told him that the next time he did that, you would have a shot, that it might be much more of a motivator than to actually just go ahead and shoot him. That's what he ended up doing, and I had a very good observer for the rest of the time that I spent in that country. Fascinating things happen sometimes.

MG: In looking back, are there other challenges you encountered that we haven't talked about yet?

JF: Oh, there was always a problem of "not in my backyard," and that's with all sorts of things, whether it's a radar system, whether it's a heavily trafficked activity or something of that nature. When we started the modernization and restructuring, we made a conscious decision that we were going to be good neighbors, that we were going to follow all of the environmental regulations, all of the various zoning codes, everything else, and work with the local authorities to do the right thing. We were not going to use eminent domain and take over territory to do that. We worked with the Army Corps of Engineers to acquire property for us and with an engineering firm that would go out and look for property that would be satisfactory for the radars. One of the pieces of property we had was radar for our office out in Southern California. For a hundred years, I think, we leased a spot on top of a mountain, which overlooked Los Angeles, near Ojai, California. That office would then serve all of the Los Angeles County area. So this was on a mountaintop. This mountaintop was just loaded with radio transmitters and microwave transmitters and television transmitters. But there was room enough for us to have a radar there, and we were operating at a frequency that would not interfere with the other pieces of equipment that were on site. So we leased that spot. One of the difficulties that occurred is that – and we went through; we notified the community what we were going to be doing. But one of the things that occurred between the time that we leased the spot, and about a year and a half later, when we started to install the radar, was that Larry Hagman, the actor, bought a spot on an adjacent mountain top about three miles away on the next mountain, the next ridge over. One morning, on Thanksgiving, actually, we were involved in putting up the tower for the Ojai radar. I'm told that Mr. Hagman looked out of his window, saw that, and said, "What the heck is that?" – or probably used other words. When he was told what it was, he went absolutely nuts.

He was an interesting gentleman on what he was concerned about. He was afraid of microwave energy. He wouldn't use a cell phone. He didn't use a microwave in his house. Although he had cirrhosis of the liver from excessive alcohol consumption, and he ended up dying from that in the long term. But he immediately filed a suit against us for radiation hazards. A friend of his organized a group of people in the local community called MARK, Mothers Against Radiating Kids, and it turned out to be a real public relations nightmare. Now, as I said, we had already gone through all the procedures. We had presented the plans to the city fathers before we got the buy off on the installation. They were happy to have it in the area. But this caused some problems. We were sued in local court for violating some of the various standards. We won. It went to the appeals court. We won. He appealed to the US Supreme Court for an injunction against us, and the US Supreme Court said, "Go away. Don't bother us with this stuff. You guys have done everything you need to do." But he then proceeded to the court of public opinion to try to get it taken care of. I ended up appearing on the Montel Williams show, [laughter] trying to defend the action. The head of the organization that had done Mothers Against Raiding Kids was on the show with me, tearfully crying about all the damage that we would be doing, and I had to defend the action. It was an interesting time. Somewhere there, I've got the VHS tape on that, but I don't want to look at it again. We ended up putting that in. We had other opposition to that; some of it caused by actions that were totally uncontrollable. The first shovel full of dirt that was returned for the office that was going to support the Kansas City area struck an undocumented Indian burial ground. This was right after the movie *Poltergeist* came out. We decided that we probably didn't want to build on top of that. And we had done the survey already. We had looked for those sorts of things when we did the architectural and historical surveys for all the sites, and we did that for every site that we did. We did a NEPA, the National Environmental Protection Act, report for every site that we did. That's why I said we wanted to be good neighbors. We didn't want to take shortcuts and cause anybody to be concerned about us taking shortcuts. So we did all of those things, and in this particular case, we moved to another location. When we got ready to put in the Melbourne facility in Melbourne, Florida, to support the space shuttle operations, the first thing that happened is we identified the fact that there were gopher tortoises on the property that we had bought. Gopher tortoises are an endangered species in Florida. I don't know too much about them other than the fact that Florida allows you to move them. In other words, you can take them and move them to a different area, and that's satisfactory. You satisfied your needs. So we did. We hired the gopher tortoise moving agency or whoever it was, and they moved the tortoises away. Then, a few days later, they came back. Now whether or not there were people that brought them back to give more business, I don't know. I never say that. But we ended up having to actually construct the fence around that – not just a routine fence, but it had to actually go about three or four feet into the ground because otherwise, they would have just tunneled under it. We couldn't operate in the area with them. So we had our site there with no gopher tortoises, and they moved in right next to us, which was fine as long as they weren't on our property. We had several instances like that, which were kind of humorous. At the same time, every one of those things cost us a lot of money. It cost us more to take care of mitigating those efforts. But all in all, we had a good team that continued to work on those issues and continued to tackle them one at a time. I'd get a phone call in the morning saying, "You'll never guess what happened at such and such a site." And I would just dread to have the answer. But we always knew that there were ways around things, and we'd continue to work at it. So those were challenges. The biggest challenge was the fact that, as I had mentioned to you earlier, we were

closing an awful lot of facilities. People that had lived in the same community for a very long time were going to be uprooted as a result of that. I understand that. I spent a great deal of time traveling in the Air Force, so I understood what it was like to be moved and having to move the kids out of school and all of this. But we tried to accommodate people as much as we could by giving them the option of making a preference statement as to which place they would like to go. We also, as I mentioned before, tried to provide the education for them to change their status from technicians to meteorologists where possible, and we had that happen to a couple of hundred people. So, all in all, we were trying to be as accommodating as we could, but we realized even with that, there were going to be problems. But, all in all, after it was all done, we got pretty good marks on how we'd handled things. I mean, we weren't perfect. We made mistakes. But on the other hand, in the end, we accomplished what we set out to do. In the end, the results really sustain that. We went from – when I first came into the National Weather Service, the average lead time for a tornado warning was minus two minutes. "What you just saw was a tornado." By the time we had that system in place around the country, the average lead time today runs around twelve to fifteen minutes, which gives you plenty of time to take necessary preparedness types of activities. A tornado is a very short-lived thing. It can form very rapidly and dissipate very rapidly. So to be able to get, on average, twelve to fifteen minutes is phenomenal. Because some of them form and dissipate almost immediately. Fortunately, those are the kind that doesn't do much damage. So the proof is more or less in the outcome, and I think all of us that were working on that – and at the time, we were pulling our hair out over all sorts of issues. But on the other hand, looking at it in retrospect, I'm glad we did it. I said at the time, if I knew it was going to be this much trouble, I don't know if we'd have started it. But we would have because it needed to be done.

MG: It sounds like the project management aspects of this endeavor were overwhelming. In my research, I was getting confused with just the acronyms involved. So how did you manage a project of this scale and complexity?

JF: One of the things that we did right off the bat when we started this program was to generate a dual deputy position in the National Weather Service. We had a deputy for operations to keep the train running; then we had a deputy for modernization to change out every part of the train while it's running. That was one of the things that made it a success. Lou Boezi, who was the deputy for modernization, was an engineer that really understood project management, program management. He had the capability of integrating all of those things in his mind and getting people to understand what needed to be done. And to use the necessary tools necessary to keep track of it all. He had a good staff of people. We had people at all levels of the organization that were devoted to this and did a spectacular job. We had a communications team that was necessary as well to explain to people what was going on, people both inside the government as well as outside the government. Another interesting thing, the Ojai situation with Mr. Hagman had a lot of other things that occurred as a result of that. During the phase that he was trying to use all kinds of public opinion and political pressure to get us to change that location of that radar, I got a call [from] Senator [Ted] Stevens' office. He said, "I want to talk to you about Larry Hagman's concern." I thought, "Oh, boy." Senator Stevens was from Alaska. Of course, Larry Hagman lived in Southern California. So I go in to talk to the senator. In the corner of the senator's office is a huge surfboard, standing up there. He said, "I don't know if you know it or not, but I'm a personal friend of Larry Hagman. We used to surf a lot together. I thought to

myself, "Oh, boy, here we go." I started to say, "Yes, sir." He said, "You know, he's really concerned about that radar." I said, "I understand that, sir. I've tried to explain to him that, as far as the physical factors that he's concerned about, as far as the health aspects, we exceed all the standards. By the time the signal gets to his area, there is such a low amount of energy there that it's not going to cause any problems." He said, "Well, he probably doesn't understand that. Now, I understand you're going to be putting one of these radars up in Alaska, up in my neck of the woods, Sitka, Alaska." I said, "Yes, sir, that's essential to cover that southern portion of the area for weather forecasting." He said, "I want you to get up there and tell these people what it's all about and make sure that you don't have this kind of nonsense going on." He used other words that were more colorful. "That we don't have this kind of nonsense going on up there," he said, "I want that radar in, and I want it in fast. I want to make sure it doesn't cause these kinds of problems." So I sent my communications team up there, and they worked out a program that did manage to communicate with all of the locals, and the locals were very happy to have the radar, and it's been working wonderfully ever since we did not have that. Oh, one of the things that he said, he said, "A lot of these people in Southern California around Hagman's area actually come up to Sitka during the summer. They could probably cause trouble. So I want you to get up there and make sure this doesn't happen." So it turned out that we had a very good supporter in Senator Stevens as supposed to somebody that was going to tell us to move the radar. So communications were essential, internal and external. We originally had a lot of people in the National Weather Service that weren't sure we could pull this off. But by the time that we pulled all the management team together to actually demonstrate the prototypes and the equipment, when they left that one week conference that we had in Boulder, Colorado, there was more pressure for us to move faster than there was to move slower, which was a good idea. That was a good thing to have happened. It was, looking back, just an absolutely fascinating time. Once a month at the NOAA status conference, we would have our charts up to show how many radars had gone in, how many AFOS systems had gone in, what the budgets were looking like, how many facilities were in, and all that. It was a constantly moving time and kept us busy, but it was exciting. It was exciting for everything. I remember stopping in at an office in Denver one time. I had a little time before I was supposed to catch an airplane flight back to Washington. So I stopped in at the local Denver office while it was still down at Stapleton [International] Airport. I went in, and the chief forecaster that was on duty opened the door for me. He said, "I didn't expect to see you here." I said, "Well, I had some time." He said, "Well, I'm glad you're here. Just one thing I want to say. I worked for you guys for thirty-some-odd years. Now, with everything that's going on, it's really fun coming into the office." That was coming from somebody that had been with us for thirty-five years, that had seen everything happen, grow up and all that. That was really rewarding to have that happen. That was a good testimonial from somebody that really enjoyed what he was doing now.

MG: Yes, that's great feedback. You've talked about the MAR's involvement in the academic community. Did the COMET [Cooperative Program for Operational Meteorology, Education, and Training] program grow out of these efforts?

JF: The COMET program was aimed at trying to make sure that we were able to provide our forecasters with the latest science of mesoscale meteorology. So the COMET program was designed to train our science and operation officers and to help them be able to understand the latest in science and technology associated with small scale forecasting. So we've pulled

together the best experts around the country for doing that. The program itself was established as a cooperative effort between the National Weather Service and UCAR, the University Corporation for Atmospheric Research, as opposed to NCAR [National Center for Atmospheric Research]. There's a technical difference between those two, and the guys would be upset if I said the wrong one. Their job, literally, was to help train us to bring together the academic community resources to train the National Weather Service. It was interesting getting started with that. There were people in the academic community that didn't want to turn into a training program for the Weather Bureau. That was their words. There were people in the Weather Bureau/National Weather Service that said, "We don't need these academics to tell us what to do. We can handle this ourselves." But after the program had been put together for a while and under the leadership of Bill Bonner, who was the first person to head that program – and he came out of the academic community. He had been deputy director of the Weather Service before I took that position, and he had been the head of the National Meteorological Center [NMC], which is now NCEP [National Centers for Environmental Prediction], as well. So he was an ideal person because he really understood both sides of that. He understood both the academic and operational communities. So he managed to bridge that gap. It has turned into a program that not only provided the input for the Weather Service modernization, but the educational material that they have assembled is now used in eighty-some-odd countries around the world to help train their own meteorologists. It's used by universities as a part of the educational packages that they can put together for coursework. It has done more than I ever dreamed it could do, being a really major educational capability. It's almost our (Kahn?) Academy, if you would, to be able to provide information. Every time there's new technology coming on board, whether it's a new satellite system, or a new capability for the radar by dual-polarization, for example, or something of that nature, they're there before to try to get the latest information in the hands of the forecasters so that they're ready for it when it arrives. It has been extremely useful that way. Training had always been a problem in the National Weather Service. We had a training center that took care of a lot of the engineering aspects of things, maintenance of radars, maintenance of equipment, and all of that it did. It took care of some other aspects of forecasting as well and other operations. But COMET filled that need of bringing the latest of science in and making sure that there was a mechanism of getting it out to everybody at the time, and it's still going on. Originally, it was expecting that COMET would be there through the modernization and restructuring phase. But its ability to provide information and continue to provide information has made it essential. It was originally funded by the National Weather Service and by the military so that it would satisfy both of those needs. It wasn't just the National Weather Service. It was really a total package for the United States government forecasting capability.

MG: You just mentioned NCEP. They had a restructuring in the mid-90s as well. I was curious about how they changed structurally and its impact on the agency.

JF: The National Meteorological Center was the original organization there. Actually, it started out called JNWP, the Joint Numerical Weather Prediction capability in Andrews Air Force Base. It started out as a program between the Air Force, the Navy, and the National Weather Service to start using computers and forecast modeling. Because it was very expensive to have a computer in the first place and so all three agencies started to work together and started that program. In fairly short order--and I won't go into the details--there was a little pride of uniform and all of

that with it. But in very short order, the military decided that they needed to really do their own thing. So they could have more of a mission-oriented capability than what the National Weather Service needed, [inaudible], for example. So the Navy went out to basically what became Fleet Numerical [Meteorology and Oceanography Center], out in Monterey, California. The Air Force went to the Air Force Global Weather Center in Omaha, Nebraska, [at] Offutt Air Force Base in Omaha, Nebraska. Then the National Weather Service went to Suitland, Maryland, for the National Meteorological Center. So each one of them ran their own particular computer and their own particular models aimed at their needs, their specific mission needs. For example, when I was in the Air Force, I worked at the Air Force Global Weather Center for two different assignments. I knew that operation. I'd also worked on TDY [temporary duty travel], on temporary duty at the National Weather Service National Meteorological Center, using their computer during the time that they weren't using them at night. I'd go on at midnight and use their computer there to check out some of our programs that we were developing in the Air Force. But NMC was concentrating on the weather programs alone. Ron McPherson, who was my deputy for operations for a while and then later became the director of what would become NCEP, had a vision of making this the environmental forecasting capability for all of NOAA – so not just the weather but also the ocean side of the house, the space weather, the solar forecasting, if you would. So what occurred organizationally was basically – it didn't quite occur as smoothly as we hoped it would. But what occurred was really a unified prediction capability for all of NOAA. So the National Weather Service was supporting that. We had the solar forecasting capability. We had aviation forecasting. We had marine forecasting. We had all of those capabilities under the leadership of the head of NCEP. As a result of that, we were really able to justify and obtain more powerful computing capability to satisfy all of those needs. By having all of those operators using that same computing facility, we were able to be more efficient using it than we would have several different computers that could all be separate. We'd had several different computers, none of which would have the capability of the one that we had at NCEP, for example. So there were a lot of advantages to doing that. I think that's been a very successful transition and operation, just as I think the whole modernization and restructuring has been very successful as far as delivering overall programs are concerned.

MG: I kept seeing reference to "the troika" in my reading. Can you say what that was and who comprised it?

JF: Troika means three. It's a Russian word for three, triad, troika, all of that. It comes really from a lot of different areas that a three-legged stool is much more stable than a four-legged or two-legged stool – obviously, two-legged stool. But there was a troika that ran the NEXRAD program. That troika was the National Weather Service, the Air Force Air Weather Service, and FAA. All three of us had major, major components associated with that program. That was one of the – we had multiple triads. We had multiple troikas. Probably the one that had as much to do with it as anything was the head of the National Weather Service, the head of OAR, the Office of [Oceanic] and Atmospheric Research, and the Office of NESDIS [National Environmental Satellite, Data, and Information Service], the satellite program. So the three of us would meet and decide what we needed to do next as far as this overall thing is concerned. That troika had almost legendary capabilities. Frankly, a lot more capabilities than – we were given credit for a lot more capabilities than we really had. But we did make things work, and that was an important part of it. Each one of us controlled a fair amount of resources. It didn't take much

to kind of steer some of the resources to try to answer questions that really needed to be answered. The troika met aperiodically. We tried to meet a couple of times a year. Sometimes we met more often than that if we had additional problems, sometimes less frequently, depending on what was going on. But we would meet probably a couple of times a year and get together and say, "Okay, here's what the lay of the land is right now. Here are our major problems." There were always budget issues because we never had as much money as we felt we needed. We probably had as much money as we really needed, but we never felt that we had that much money. That's always the case, I think, in programs; you'd always like to have more. But that program was very effective in being able to cooperate across the board. The National Ocean Service was an interesting player in this whole thing. Sometimes they wanted to get involved, and sometimes they didn't. When we were putting together NCEP, the original offer to National Ocean Service was that the ocean forecasting capability would be under their direction since they primarily had the responsibility for that. It would be under their direction for the oceanographic forecasting capability. Even though it would be under National Weather Service NCEP, the head of the ocean support unit would be from the National Ocean Service, and they would provide a certain number of people. The original game plan was – we had already worked it out with the Navy – that we will be collocated with the Navy facility out in Monterey. That fell through when a change occurred at the head of National Ocean Service, and the new person decided that he didn't want to give up those numbers of personnel. That's unfortunate because I think that would have been a very effective organization, linking in the Navy capabilities and the NOAA National Ocean Service capabilities and the National Weather Service capabilities [inaudible] for forecasting the total ocean environment, not just the waves and the wind, not just the oceanographic components, but also the meteorological components as well. That's probably an area that could still be worked on, but I'm not sure what priority it has in anybody's mind these days.

MG: What upgrades or major changes are you aware of since the MAR?

JF: Well, the MAR was designed to be expanded upon. Pardon my English. It's terrible ending sentences with prepositions. But it was designed to be expandable. That's much better. The radar, for example, was designed so that it could have later incorporated upgrades to all of its processing capability, upgrades to the way it handled the data, and upgrades to where it'd be dual-polarization so that [if] the radar signal went out, it wasn't just a single signal, but it was multiple signals, some vertically-oriented, some horizontally-oriented so that you could take a look at the structure and detailed structure of cloud droplets and rain. Indeed, those things have occurred. We put in better processing capability. We put in better dual-polarization, which allows us to do a much better job on ice forecasting and precipitation forecasting. AWIPS, of course, was designed to be totally modular so that it could be – they're basically mini-computers, a network there, of that. ASOS is designed – I forget what the number is. I think it's designed to have a total of thirty-six different inputs, so if you want to do measurements of soil moisture, that can be added. If you want to do different types of measurements, that can be added for climatological purposes or for other purposes as well. So that was the way it was designed from the beginning, and several of those improvements have been made in the interim. The one thing I'm most concerned about now is the fact that the radar program itself is WSR-88D. The design is 1988. Even though it's been improved upon quite a bit of times, it still has one flaw that is limiting, and that's the fact that it's got a three-thousand-pound antenna rotating at five RPM

[revolutions per minute] inside that radome. That antenna is huge; it's twenty-four feet across. The bearings wear out. They just physically wear out after a while. They have to be replaced at a tremendous cost. New technology has come along since then that have radars that don't have to move. The phased array radar that the military used for identification of incoming bad guys, missiles, aircraft, and the like has been shown to be capable of detecting clouds as well as the regular radars can. It's a more expensive system, but at the same time, it's one that can probably last a lot longer because it has no moving parts. We have done quite a bit of development work in the actual application of that phased array radar capability at Norman, Oklahoma, at the National Severe Storms Laboratory. There's been quite a bit of development going on there along that line. Eventually, the WSR-88D, the NEXRAD radar, is going to have to be replaced. I think that's probably a logical one to do it with because it can satisfy a lot of needs. The program right now that they're working on is called MPAR, [Multifunction] Phased Array Radar, which would satisfy the needs of the FAA as far as keeping track of aircraft operations – the Weather Service and the FAA as far as forecasting operations and hazardous weather identification operations are concerned. It even satisfies other things to do. For example, Homeland Security, as far as infiltration across borders and things of that nature. It can do all of these things because it does them electronically. It doesn't have to move an antenna around. It's constantly scanning the sky, whereas it takes us five minutes to totally scan the sky with the NEXRAD radar. It takes about thirty seconds to do that with the MPAR. Remember, I said that tornadoes are very short-lived sometimes. Sometimes a tornado can form and dissipate almost during that one five-minute scanning time for the current radar system. It's hard for one to form and dissipate within a thirty-second scan. So you can keep track of new development. You can get a better start on understanding what's going on, and you can do all those things with much higher fidelity than you can with our present system. It's more expensive, as it usually happens when you make major increases. But already, the work that's going on in a research capacity shows that we can do a better job of forecasting and a better job of warning with that phased array system. The question is, when are we going to be able to afford to do it? Because eventually, the NEXRAD system is going to wear out. I don't know that it will be quite as dramatic as when we had to go to Russia to buy vacuum tubes for the old WSR-57, but we may not be able to buy the parts to keep that antenna turning, and if the antenna doesn't turn, it doesn't work.

MG: I was curious about what other stories stand out to you from this time period? One you included in the materials you sent was an interesting conversation you had with Congressman John Traficant. Did you want to share that?

JF: As I said, I got a chance to meet a lot of members of Congress because we were closing a lot of offices. And we had a letter signed by thirty-eight members of the House of Representatives to the Secretary of Commerce, complaining about the fact that we're going to be closing weather offices in their districts. They were concerned that they would lose weather support as a result. Now, remember, I'd said earlier that the legislation required us to prove there would be no degradation of service before we could ever close that. But as frequently happens with government regulations and the way they're actually executed, the members of Congress weren't sure that we were going to live up to that agreement, even though it was stated in the legislation that we had to. So they complained to the Secretary of Commerce. We wrote a letter back to all twenty-nine of the members that signed it for the secretary signature, and he signed a letter,

stating that the legislation required no degradation of service, the technology being developed was showing that it would be able to meet that requirement and that Dr. Friday would personally come to see you, each and everyone, and give you periodic updates on the progress that was being made toward the modernization and keep you totally informed. We wanted a totally transparent modernization. So at the appropriate time, I had made appointments to talk to every one of these members; either I talked to them or Lou Boezi, my deputy for modernization, had talked to them. But I went in to see one Mr. John Traficant from Cleveland, Ohio. Mr. Traficant came in. I was sitting, waiting to see him. He said, "Are you here to see me?" I said, "Yes, sir." He said, "Go on in. I'll be in in a minute." So I went in. I sat down at the desk in front of him. He came in, plopped down at his desk. He said, "Who the hell are you?" I said, "I'm Joe Friday. I'm the director of the National Weather Service. This is my legislative assistant," and so forth. He said, "What the hell do you want?" I said, "Sir, you may not recall, but about three months ago, you cosigned a letter with twenty-eight of your colleagues to the Secretary of Commerce, complaining about the fact that we were going to be closing an office in your district." He said, "Oh, yeah. You can't close our office in Cleveland. All kinds of people are going to die if you do that. You just can't close it." I said, "Well, sir. As the Secretary said, we're required by law," and I named the law that he had agreed to, "that there will be no degradation of services. We had to prove that there's no degradation of services. I'm here to give you an update on that capability now with some data that we have from other offices on how good the systems are, and all of this." I'm going to be candid. I'm going to tell you exactly what he said, and you can edit whatever you want to out of this in the future. He said, "Okay, but you know, all I ever get from you administration guys is just bullshit - bullshit, bullshit, bullshit. That's all I ever get from you." He said, "I don't want that. If that's all you do – if all you do is give me bullshit, you're going to get cancer, and your dick's going to fall off." With a straight face, without even flinching, I said, "Sir, I'm just here to give you the facts. Let me just give you the facts here and go over the details." I did that. I told him what was going to happen. After I had given him the explanation of what was going on, he called in his press secretary, and he dictated a release that said, "I have met today with Dr. Friday, the Director of the National Weather Service, because of my concern about the weather office in Cleveland. I have seen the work that they are doing. I have been assured by Dr. Friday that that office will not be closed until the adjacent office" – he was from Youngstown, Ohio; that was where the office was – "until the office in Cleveland can show that it can produce as good or better information. From the information I've seen today, I think they will be able to do it. But I will keep on top of this, and I will make sure that Dr. Friday delivers what he's promised." That was a perfectly good press statement. It was about as good as we could expect. When we got ready to leave, my legislative assistant, who was brand new to the job and this was one of the first visits that he had going on with me, he said, "Wow. How do I write that up?" I said, "Well, if I were you, I would just say that Mr. Traficant was his usual colorful self, but he understands what we're doing."

MG: Your response to Mr. Traficant was an homage to your namesake, Joe Friday. So this might be an opportunity to explain how you got that nickname.

JF: I was a fourteen-year-old kid out in San Rafael, California. Dad had just been assigned to Hamilton Air Force Base, which is now in Novato, California, in Marin County. I was a fourteen-year-old kid when *Dragnet* came on the air on television. With the last name of Friday, there was no way that I was not going to be saddled with that nickname of Joe. As a matter of

fact, even though it's my father's name, I like it much better than my real name. So I just kind of adopted it since that time. The problem now, Molly, is that many people have no idea what that's about. So I will get official documents made out to "Joseph Friday" or something of that nature because they just assume that's my real name. I tell people, and they say, "Oh, never heard of it." [laughter] So I can start to tell my age now.

MG: Well, your legacy will live on through this oral history, and hopefully, the nickname as well.

JF: [laughter] Thank you.

MG: I want to talk now about the end of the MAR, your reassignment, and how all of that unfolded.

JF: That was a difficult time, but let's see if I can do it as accurately as I possibly can. Remember, I said that we had to prove that there was no degradation of services before we close an office. The budget was tight. It always was, as I indicated. There were always budget issues. In order to meet the new budget, I can't remember exactly what year it was – it must have been about '95. In order to meet the new budget, we had been directed to take some relatively drastic actions as far as staff is concerned and as far as operations are concerned. I basically took the position, "I can't do that. There is no way I can satisfy the requirements of the law for no degradation of services and close the offices that you have indicated. We are not there yet. We'll be there in a year. I'll be able to prove there's no degradation of services now. But you're asking me to start closing these offices, just to close the offices, not to make the transition in the MAR." I was in Geneva, Switzerland, at the time, at a World Meteorological Organization meeting. Apparently, things got really hot and heavy back in the States, and I was called back and came back. In a very short order, I reaffirmed this position that had been taken by my deputies, the fact that we could not obey those orders without violating the law, and I reaffirmed it. The next day, I was called in and told that I was being reassigned to the head of OAR. Curiously enough, that was the job that I really wanted all along. But I didn't want to leave the modernization to do it. We were having problems at the time with the final development of AWIPS, as far as the cost overrun and the budget was concerned. I knew we were going to be successful, but I also knew it was going to take a little more time than they really wanted [to be] done. There was no way that we could meet the needs of the law and so forth. I had been shorted in the budget about forty-two-and-a-half million dollars. I was told I had to absorb it. That's when we basically drew a line in the sand and said, "We can't absorb it." So I was replaced. At the same time, a panel was put together under the leadership of Jack Kelly, retired Air Force brigadier general, who had been the head of the Air Weather Service for a while. I had served with Jack in Vietnam. He was a briefer. I ran the weather center there. He briefed the MACV [Military Assistance Command, Vietnam], the general in charge of operations in Vietnam, with our products. So he came in to take a look at the budget to see exactly what we needed. I can't remember exactly how long the study took. About six weeks, I think. But I was reassigned as head of OAR, and I took that job seriously. Like I said, it was a job that I thought was ideal, and kind of followed on from the type of thing I had been doing when I was in the Pentagon before I came to the National Weather Service in the first place – managing the research activities. Of course, I was vitally interested in the research activities that were

supporting the National Weather Service. We'd been working very closely. I was a part of the troika, so I had known exactly what was going on. The head of OAR had subsequently passed away from a heart attack. So I knew that the job was open. I had joked one day to the head of NOAA, I said, "Don't fill that job. I may want it." Well, he took me seriously on it, I guess. I hadn't thought about it until just then, about that connection. Jack went ahead and did his study, and he showed that no, I was wrong. I didn't need forty-two-and-a-half million dollars. I was short forty-two million dollars. When that was briefed to the Secretary of Commerce by the study, and they briefed the press because there was a lot of press interest in this whole thing – I think I'm the only one in a long time that had two or three pages on the federal diary page of *The Washington Post* on my reassignment. I called it firing, but it was really a reassignment. The only difference was I had to walk another fifty yards from the subway stop to get to my new office – same position, same pay, same level, same job title, except it was OAR instead of National Weather Service. Assistant Administrator was the job title. So it was a lateral assignment. At the press conference, a reporter from the AP [Associated Press] was there. He said, "Well, doesn't that vindicate Dr. Friday?" The Secretary of Commerce sputtered around, and he said, "No, no. There were a lot of other things." [The reporter] said, "Well, do you want to discuss them?" He said, "No, we're not discussing that. We're just talking about moving on with the Weather Service." So it was fascinating. I was asked by several colleagues, both internal in the Weather Service and external from Weather Service and other parts of NOAA and other parts of the government – it was suggested that I sue the government to get my job back. I said, "No, you can't do that. That would cause more disruption. It's already a bad enough situation as it is now. We don't need to cause more disruption along that line." What we need to do is to get behind the new director of the Weather Service and move out and get the rest of the modernization done, and get on with our work. I said, "You can't go back and put this shell back together again." So I stayed at OAR for a year. I enjoyed every bit of what I was doing there – fascinating work, very good people. I had my own ideas of how things should run. I kind of shook things up a bit. But at the same time, we made a lot of progress. Then the staff director for the board of Atmospheric Sciences and Climate at the National Academies of Science retired, and that job became vacant. That doesn't become vacant, but about once every five or six years. So I applied for that and was selected for that. I served a year. I served seventeen years at the National Weather Service, one year at OAR, and then five years at the National Academy of Sciences before I retired from that. I'm sorry. My voice has just about had it.

MG: We can stop for today. I think I'm getting towards the end. There were a couple of follow-up questions I wanted to ask, about your life after NOAA, and as a professor. I feel like we have one more session in us. We could save it for the next time.

JF: Why don't we save it for one more session then? I think that might be the best thing to do.

MG: Okay. I really appreciate you spending all this time with me. This has been so enjoyable for me.

JF: Well, it's been enjoyable for me too. I'm reliving things that I have forgotten about in some cases. You reminded me of some things.

MG: I think we have one more hour in us, and then we can proceed to the next steps.

JF: Okay, very good.

MG: Again, I appreciate it. I will send you some dates and look forward to the next time we can chat.

JF: Okay, very good. Thank you.

MG: Thank you so much.

JF: Have a great day.

MG: You too. Bye.
----------END OF INTERVIEW----------
Reviewed by Molly Graham 11/15/2020
Reviewed by Joe Friday 12/3/2020
Reviewed by Molly Graham 12/19/2020