STS RECORDATION ORAL HISTORY PROJECT
EDITED ORAL HISTORY TRANSCRIPT

JOSEPH P. CHAPUT
INTERVIEWED BY REBECCA WRIGHT
KENNEDY SPACE CENTER, FLORIDA – JULY 13, 2011

WRIGHT: Today is July 13, 2011. This interview is being conducted with Joe Chaput, who was the marine operations manager and skipper of the *Liberty Star*, at the Kennedy Space Center in Florida, as part of the NASA STS Recordation Oral History Project. Interviewer is Rebecca Wright.

Thank you for taking your time this afternoon and spending it with me to talk about this project.

CHAPUT: Thank you.

WRIGHT: If you would, could you please start by giving me a brief overview of how you got involved in this part of the [Space] Shuttle operations?

CHAPUT: I went to college at the United States Merchant Marine Academy in Kings Point, New York, with the intention of sailing actually tankers my whole life. I was sure that I was going to be sailing on a tanker for the rest of my life.

I grew up in Chicago [Illinois], and did a lot of fishing with my dad on Lake Michigan. I saw the lakers (Great Lakes' ships) go by, and I said, "Boy, there's where I want to be." I ended up going to Kings Point and graduating with a license and did a stint in the Gulf [of Mexico]

with the supply boats. They were offshore oil supply vessels. Then I worked for Military Sealift Command. In Port Canaveral [Florida] there is a vessel called the USS *Range Sentinel*. It's a tracking vessel that would track the submarine-launched ballistic missiles. That ship had a fair amount of port time, and I would see these white vessels with the blue stripes going through the port, and I'd say, "Boy, there's a job."

I met a lady, fell in love and wanted to settle down. At that time I was sailing ten months a year, and realized that I couldn't really keep any sort of a relationship with anyone, and found out a little bit more about these retrieval ships. This was back in 1985. Lucky for me, I was at the right time, right place as they were crewing-up for a third vessel called the Motor Vessel *Independence*. At that time, the Air Force was considering starting a SLC-6 [Space Launch Complex] program out of Vandenberg [Air Force Base, California], and they had built all the components including bringing a third vessel online that was going to support the recovery of both SRBs [Solid Rocket Boosters] in the Pacific. I was hired as crew of that vessel.

This was in May of 1985, and as time progressed, we were bringing the ship up to speed and I was learning the recovery process. I was hired as what they called the lead AB, which meant you were a mate at sea, and the deck supervisor for the recovery operations for each of the missions.

The launch rate back then was a lot. I'm not sure what we did in 1985, but it was probably six or seven launches that year, and then on January 28, 1986, it was the STS 51-L [*Challenger*] or the twenty-fifth space launch. Previously, we were doing the [SRB] recoveries with the *Independence* and the *Liberty [Star]* or the *Independence* and the *Freedom* [*Star*] because we were trying to get some time in on that third vessel. Because this was the twenty-

fifth mission, NASA wanted to have a photo opportunity of both the *Liberty Star* and *Freedom Star* coming in with the hardware, they elected to keep the *Independence* at the dock.

On the twenty-eighth of January when the mishap occurred with *Challenger*, it was the first launch, actually one of the only few launches that I ever saw on land until my current position of marine operations manager. After the mishap, all three vessels joined with a host of other vessels in the *Challenger* recovery.

The *Independence* was built with a big flat deck. It's a little longer and a little wider than the *Liberty Star* and *Freedom Star*. The *Liberty* and *Freedom* were actually towing an array as part of a giant grid. It was the largest marine salvage in history, the recovery of the *Challenger*. The ships would steer gridlines and find targets from side-scanning sonar. The *Independence* would be dispatched to those areas. We would launch an ROV, which is a remote operated vehicle. It's a little remote-controlled submersible that had sonar on it, and it would hone in on the debris. The camera would show whether it's flight hardware or if it's something else. If it is flight hardware, then we had divers that would jump over the side, tie it on [to our crane] and ultimately we'd bring that hardware on deck.

We would only come into port when the back deck was full. We'd be out for a week or so, be in for four hours or such, and then turn around and go right back out. So we actually spent a lot of time at sea. We anchored over 350 times from January 28th all the way through basically Thanksgiving. That was when we ended that.

An interesting point for me is I got married on December 21st, so that first honeymoon year was actually delayed to our second year, because I barely saw my new bride that first year at all. At a couple points, we were all, of course, twenty-five years younger, and so all the wives would get together and they'd make Care Packages for us and send them out, cookies and

coolers full of stuff. Obviously there's no alcohol on any of the ships anytime, but we could get away with an occasional rum cake that was actually probably a little bit more soaked than it probably should have been, but that was about it. There was a lot of camaraderie, a lot of the people that pulled together, and we made the best of a really hard time.

WRIGHT: Before you get too far on that, can I ask you to go back? I know it's a hard morning to have to bring back. But if you were watching the launch, can you give me a few details of where you were from the launch and then got dispatched to go?

CHAPUT: I was on the bridge wing of the *Independence*, but it was sitting here at the hangar, and I'm watching the launch through the binoculars, and there was no doubt what happened. There was no question. I don't know if it was just one of those things, or if it really was the case, but the cloud and debris just seemed to hang there all day. Typically after a launch, you see the Ekman spiral of the contrail, and that kind of blows away. This really seemed to linger all day.

I was home, and the whole community was absolutely devastated. It was almost like you could hear a pin drop throughout all Bravard County. My wife and I just went out to the mall that night just to walk around and get out of the house a little bit, stop watching the news, and it was just like everybody's dog had just died. You know what I mean? Everybody was just very sullen.

I worked for Morton-Thiokol, and people who had never heard of the company now heard of it because the company basically took the fault of the joint failure which ultimately caused the problem. People who had never heard of the company before all of a sudden were very keen on it. I remember my wife actually getting some nasty [comments] when she'd write a

check or something, or wear a baseball cap [with the company logo] or something like that, they said, "Oh, I've heard of you guys. You're the ones who killed the astronauts." It was more than just people being quiet; there was actually bitterness and frustration.

Things were handled very, very quietly. It was a hard time. But like everything else, time heals, and we got back on track and moved on. Then almost three years later, we had STS-26, and that was a resounding success, and at that point, too, we also broke our point where we've come back with over one billion dollars of flight hardware recovered from sea, and that was kind of a nice milestone to make.

As time went on, we just grew with the program, and we did different things. The launch rate backed off a little bit, so we found ourselves just basically minding our own business, doing the retrievals, doing the training missions and that kind of thing.

In 1994, Hurricane Gilbert came up the east coast of Florida, and an External Tank [ET] was being transported by the barge *Poseidon*. The seas were rough and they were [transiting] along the coast. A tug of opportunity, chartered by [NASA] Marshall [Space Flight Center, Huntsville, Alabama], rolled so much that it stirred up the dirt in the fuel and they lost their engines. The barge and the tug were going to go aground right there at Fort Pierce [Florida].

They called us, and at that time we had no capability to support. The seas were large. As it turns out, the *Cherry Valley*, which was a Keystone tanker, was transiting the area, and actually a classmate of mine is the captain. He rendered assistance and ultimately because of a number of delays and a number of hassles that he was getting from his home office, and from the tug company and other representatives, he claimed salvage on the barge and the tug. He didn't even know what was in the cargo, and it turned out it to be an External Tank. At that time the

settlement was the largest U.S. maritime salvage in history, but what that did for us is that Marshall turned over the responsibility of towing the External Tank barge to us.

We refitted our vessels and got new tow winches. In 1996, we got responsibility, and just right around in there—I'm sorry about the date, but it's the late nineties—we began towing the External Tank barge. That became part of our duty, and that was a great job. The flight rate was such that we could still accommodate the towing and still do the recoveries, and that was great.

We regularly made the tow—it's about 960 nautical miles from here to the Michoud Assembly Facility [New Orleans, Louisiana], known as MAF, where the External Tank is built. We started developing friends and partners back and forth. The seagoing community is pretty friendly. Then, ultimately, in 1999 we got another barge, the *Pegasus*, which was a brand-new barge for ET delivery. That was a big thing for us because we ended up spending a lot of time in New Orleans back and forth, and new barge was actually a big enhancement to our job.

In 2001, the manager of marine operations retired, and I had been the captain of the *Liberty Star* for eleven years. I was asked to replace him, so I came up to the hangar. The flight rate was slowing down. We were down to four to five launches, and so we had some extra time. We cultivated a relationship with an entity of NOAA, the National Oceanographic and Atmospheric Administration, to support some of their efforts. NOAA is a great group of people that are focused on the environment and focused on education, but they have relatively no money, relatively no funding. To provide a marine asset for them was huge. NOAA and NASA actually had what they called the Link Symposium. It was an agreement to share assets in support of education and the environment. This was a really good thing, and we started supporting contracts with them.

That was a great addition to us because our dive team got to dive with some of the great NOAA divers, some legends in the diving world. We look at sending a capsule to the Moon and getting out, and that's a huge accomplishment. On a much smaller scale and actually with very little visibility, these guys have been going down to 300, 400 feet of water, locking out of these manned submersibles, going and doing their research, climbing back into their submersible, and then going through the decompression process and then coming back up to the surface, and doing that all on a shoestring budget, with minimal oversight and just supported by basic science. So these guys are really something. It was a win-win for us. They were getting a lot of help for things they couldn't have done without NASA's help, and we were also benefiting by brushing shoulders with these guys and coming out a little bit better ahead.

WRIGHT: Part of that incentive was initiated by you, wasn't it?

CHAPUT: Yes.

WRIGHT: Can you give us the background and maybe a project you worked on together?

CHAPUT: The culture before was pretty much that we had to run the show, "You do it our way or the highway," that kind of a thing. NASA had some justification for that. It was their vessels. They were exposing their vessels to risk. We had gotten called before to support, but we would lay down very tough ground rules that NOAA could not support.

When I came into the office, we [marine operations] wanted to make this work, so we took the time and we did the safety analyses. We did the risk exposures. We took the time to

look at hazardous operations and really break them down and saying, "Okay. How can we minimize the risk and how can we do this?" So ultimately just from breaking down each of those obstacles, it began to work, and it began to work really well.

So now, we're still supporting the flight hardware, we're still doing the launch rate, we're still delivering the tanks, but we're also conducting classes for sixth-graders around the country while one of the ships is offshore. Kids are calling in from a school in Idaho to see about some crustacean that they saw in a video web-casted from the ship. It's very cool and it's all what NASA's all about, and this is just another sharing of a public asset, so there was no profit. Our company played ball very well, and the NASA local here was great. JSC [NASA Johnson Space Center, Houston, Texas] had to get in with the contracts, because the ships are still owned by JSC, so everybody had to buy in. The first couple of contracts that we did took a lot of work, but then after a while it just made sense to everybody and things just started to work really well.

Then came the Navy. There's an acoustic field off of Port Everglades the Naval Surface Warfare Center operates, and they heard about our vessels. First, a little background:

The American Bureau of Shipping [ABS] is the quality for the American Merchant Marine. I know there are a lot of terms, but basically the ABS has a checklist and an inspection list where they determine if your vessel is seaworthy or not. When we go to the shipyard, which we're required to, at their schedule twice every five years plus or minus six months, we know what we have to get done. There are the obvious things that are broken that we need to get fixed. There's the hull paint job and all that, but they'll tell us, "Okay, at this shipyard you need to pull the shafts and you need to do this and you need to do that," and they'll inspect it and check it off. By us following their rules, the vessels are certified as being seaworthy, and that's the way the

whole commercial world of shipping works everywhere. If you can't get that letter, no one will insure you. That's the big motivation.

Anyway, we got a system called dynamic positioning. Dynamic positioning [DP] is a system where all of your navigation gear gets linked to all of your maneuvering gear: our thrusters, our main engines. It's all tied into a pre-programmable system and a joystick. You can virtually plug in where you want to go and how you want to get there, and it just follows it. What it really allows us to do is hold station over the same piece of Earth at any sort of current at any sort of aspect.

And you say, well, so what? Well, the big thing about that is that when you're offshore dancing around flight hardware in the middle of the night when the frustum is coming at you and the SRB is bouncing in front of you and you've got loose parachutes off your stern, you really need the nimbleness, if that's a word, to go ahead and maneuver around that hardware.

When the Navy found out we had the DP system, they wanted us, and since then we've done a whole host of contracts. On Monday we start our twenty-fourth contract with the Navy. The really cool thing about that is that it's another sharing of a public asset for a public good, and because they pay for the time, it offsets some of the expense to NASA.

The sun is in the western sky for the Shuttle Program, and we realized that if we were going to continue, we are going to have really exploit these ships in a public way to keep them valuable and cost-effective for NASA. In the meantime, we're still doing the booster recovery. We're still delivering the ET. Now we're doing NOAA contracts and we're doing Navy contracts.

There's an underwater research habitat off of Key Largo [Florida] called *Aquarius*. NASA trains their astronauts once a year called Project NEEMO, which is an acronym for

NASA's Extreme Environmental Mission Operations. They're another great group of scientists and divers that provide an underwater habitat where people saturate at depth for up to sixteen days. It is right along the reef about five miles offshore at Key Largo. The advantage of *Aquarius* is that compared to an average diver who can go down 60 feet and spend an hour there and then come back up, these guys, because they're saturated at 60 feet, they can spend weeks down there and perform long-term research and environmental monitoring and all sorts of science.

NASA likes it because they can say, "Okay, guys, this is the surface of Mars," and they can plug in any sort of gravity that they want, because they just have to either add buoyancy or reduce buoyancy to their suits. They can test all sorts of equipment. You've got a lot more room than the Neutral Buoyancy Lab [Laboratory, Sonny Carter Training Facility, Houston, Texas]; you've got basically a wide-open field of whatever you want to do, drive rovers, whatever. We began supporting them, which has been a real plus, because every time our divers go down and train with them, they win because they get stuff done, but we win, too, because they're topnotch people to work with.

So now we're all getting older. We're all getting grayer. I'm making excuses when I see early videos with myself on board. I say that's my younger brother—younger, thinner brother. I just calculated it the other day, the average person in marine ops [operations] has been here for over eighteen years. That's the average. Really, the only time we lose anybody, except for the end of the program, has been for retirement. We haven't really had too many people, maybe one or two, that have actually moved on to some other job.

WRIGHT: So when they get here, they want to stay for a while.

CHAPUT: It's a great job. There are very few jobs in the maritime industry that you can go out and be a sailor and do what you were trained to do and do what you love to do, yet still see your kids grow up and maintain some sort of a relationship at home. It's really been great. Plus, the work that you do is very cool. The Shuttle Program, working with flight hardware, those guys over at MAF, it's just all been a great run. Plus all the side contracts.

WRIGHT: How big is the biggest staff you've had?

CHAPUT: Back before 2000, we had probably in the seventies. Then when the company separated just marine ops, forty-three is the typical staff. Now things have been consolidated toward the end of the program, SRB disassembly rejoined us, and so we're back up to fifty-five.

I need to talk about SRB disassembly real quick. We do five things at marine operations. We recover the boosters for the Space Shuttle. We deliver the external tank from its point of manufacture to KSC. The third thing we do is that all of our guys, all of our seamen, are aerospace techs [technicians]. When the ship is at the dock, they become disassembly technicians, and some of our guys will take leadership roles in the disassembly process of the solid rocket boosters. We have the majority of the labor for the disassembly process of the SRBs.

Then the fourth thing we do is we maintain all of our own equipment in-house. It's a great model when the crane operator is the same guy that maintains the crane. That whole mentality of ownership gets carried to a new level when all of the equipment is operated by the same people that have to maintain it. When something happens at sea, they know, "Oh, gee,

remember what happened. I've got to go fix this, "or, "I've got to go fix that," and it really works well. The reliability of the equipment is phenomenal, especially considering the environment.

After the [Space Shuttle] *Columbia* [STS-107] incident happened and there was a debris issue that was the fault, the Ascent Debris Radar Working Group, ADRWG, found and developed a radar. Its brand name is Weibel, and it's a phased-array flat-panel Doppler radar, and it is phenomenal for detecting debris. They needed us to put these on the back deck of the ships along with all the retrieval hardware and go out and track the launches, because they needed the point of view from offshore.

There is a big C-band radar up at a place called NCAR [National Center for Atmospheric Research]. It's north of the [Kennedy] Space Center about a fifteen-minute drive. With the C-band radar there, and an X-band radar on each of the vessels, the ADRWG is able to triangulate the entire launch and recreate it. If there is any debris that came off, it would be tracked, isolated, identified, and they could play it all back. We had both ships modified to supply power to it and build a mount on each ship

For Shuttle launches, NASA elected not to put one on both ships. We put one on the *Liberty Star*, which is down range at SRB impact position. Then NASA charters an Army LCU [Landing Craft Utility] for the second radar, because it's shallow and it's near the port. This makes the third part of the triangle. We track the debris of the hardware. This has actually lent itself into the COTS [Commercial Orbital Transportation Services] Program post-Shuttle, because during the design, development, testing, and engineering of the new launches, the range needs flight profiles. There are certain stresses, fluctuations and flextures, we call it, that are

easily visible by a Doppler radar but aren't so easily visible by the others. So there is a use for these radars and for the vessels, in that sense, post-Shuttle.

That's where we are today. We are at the point where we're showing that there is a need for the vessels to continue for the radar tracking, for supporting of the NEEMO down at *Aquarius*, and for the development of the Orion capsule. We've already done a series of tests with that. Now that everything that flies doesn't have wings, things are going to end up in the water on purpose or not, and they need to be recovered and retrieved.

Once again, the cool thing about our contracts that is we've developed relationships with other government agencies where we can pay for ourselves. NASA can still use these assets for virtually no cost and have them at their disposal for half the year and then they'll just turn them over and the ships will be put to work for other government agencies and pay for themselves.

WRIGHT: Have you already started doing testing or are you just in design and development with the Orion?

CHAPUT: We've had two PORT, which is an acronym for Post Orion Recovery Test. We've done PORT 1, PORT 2, and actually today they're practicing with another capsule to right them. There are three different ways that the capsule could settle in water. There's the right way, which is Stable 1; a very uncomfortable way, which is Stable 2 with its apex down; and then Stable 3 is on its side. They're developing a bunch of procedures to get it from Stable 2 to Stable 1 position, and tomorrow they're actually going to put on a demonstration down at the port. *Freedom Star* is supporting that right now as we speak, so there is motion. They are also

working on the Orion capsule launch abort system from the pad. When that occurs, it'll end up in the ocean, and we're hoping to recover that.

There are other contracts as well. There's the IXV [Intermediate Experimental Vehicle, European Space Agency] that's coming up in 2014, so there is work that we're hoping to continue to support, and also the development of the COTS Programs. We'll see where that ends up. Right now money is such a driver, and risk exposure is such a driver. I'm very certain we can pay for ourselves without NASA's help. But still, the climate is so tough for these NASA management types to take a shot on it, I don't know how it's going to—our fate's uncertain.

WRIGHT: You just have to be given a chance.

CHAPUT: Right.

WRIGHT: It's quite a difference of where your culture has been moving over the last five years, compared to the first twenty years that you've been here. Let's, if you don't mind, just break it down. You mentioned that when you first started, there were three vessels. Tell me about the changes in the vessels themselves. I have to assume that *Independence* is somewhere else now, or what have you done with her?

CHAPUT: The *Independence* was built in 1985. I was hired for her. She was just brought out of the yard, and it was a newer design. It was 200 foot instead of 176, and 40 feet wide instead of 37 like these girls are, and more of a Gulf supply profile, carried 28 people instead of 24. Nice vessel, lots of room, very, very nice, a little slower, but owned and bought by the Air Force

because that whole Vandenberg deal was an Air Force effort. After *Challenger*, they decided they didn't want to get into the Shuttle business, so when they scrubbed that whole program, they just took that vessel and gave it to the Navy.

The vessel is still running. We still keep in contact with the contractors that are operating that, and sometimes we'll get a Navy contract and we'll send it to them, and vice versa, if there's something on the West Coast, we'll send it to them. We have a friendly relationship with those people. But, yes, it was a nice vessel.

There are some really unique things here—if somebody would say, well, what's the best thing, is it the ships or what? It's definitely the people. We've got some people that have been here—we've all grown up together, but there isn't anything they can't do. They're divers. They're welders. They're crane operators. They're boat handlers. They're just phenomenal. There isn't a single job person—when we stand to go through the trimming process, basically the very first RIF [reduction in force] that we had for trimming down, if you only did one job, then you were gone. Then we went, if you only did two jobs, you're gone. So now everybody that's left does at least three jobs. [laughs]

WRIGHT: Versatile.

CHAPUT: Yes. It's amazing, a good group of people, like I said. When you work with someone for a while, you might know their name and their spouse and where they live and all that stuff, but we've all been through every kid's birthday party and graduation. Through the highs and lows of life, we've shared it all with them. The departure that's going to occur here on the

twenty-third is particularly tough, because it's the cream of the cream that's left, and there's so much talent walking out the door, it's hard.

WRIGHT: Did all that talent walk in the door, or were your teams trained to cross-train as they came through these years?

CHAPUT: A little of both. There wasn't anybody who came in that wasn't molded by the program. We had some dynamic people that have joined us, and they've gotten better. The example is like the captain on the *Freedom Star* right now. We hired him when he was nineteen. I want to say he's about forty-four right now, so he spent most of his life on the ship. We hired him as a nineteen-year-old punk with long hair, and now he's the captain of the ship. But he's one of those guys who's just hung in there and done a great job and been through it all.

I'll tell you, it's one thing to work with someone, and then it's another thing when I know that I'm alive today because someone along the line watched out for me from behind, and I know that there are other people that are alive today because I've watched their back. When the seas are rough, the weather's bad, there are failures.

We had a problem with the plating on the *Liberty*. In the late seventies, there was a run of bad steel that had too much magnesium or something, and they were developing wormholes. Twice on the *Liberty* we've actually breached the hull, where we've actually sprung a leak, so to speak.

The chief engineer had to worm his way through the pipes to get down in there to be the Dutch boy to plug the hole. Obviously, it was with a damage-control plug. We've all gone to damage control and firefighting school. He was doing what he was trained to do. But it's one

thing to have that happen and you know exactly what to do, and it's the other thing where it says, "Oh, yeah, well, we should have done that." We have a contingent of divers, so they're over the side and welded up a cap. At no time was the vessel ever at risk, but these guys are willing to throw themselves into the fire for it. It's a pretty amazing group of people.

WRIGHT: You didn't start out the skipper of the *Liberty Star*.

CHAPUT: No, I started out as the deck supervisor, lead AB on the *Independence*, then I moved to second mate on the *Freedom Star*, then chief mate on *Liberty Star*, then captain on *Liberty Star*, and now where I'm at here. So, yes, I worked up the steps.

WRIGHT: I guess that was a good thing you were able to retain that position, although you took on a management hat as well.

CHAPUT: Well, I wanted to stay current. Just about anybody who is leaving here is going to go back and sail on their license, and there's a demand, especially for the caliber that these guys are. Your typical vessel, you'll have the guy who's the captain, he's got a captain's license, and then the mate's got a mate's ticket, and the AB's got an AB ticket. We're to the point where we're down to the ABs and they all have master's tickets. They're very overqualified, mostly, in the legal sense, for their jobs, so once they have to go out in the industry, you're going to be away from home, but you're going to get a job.

WRIGHT: Tell me about your first retrieval of the SRBs on your first mission out.

CHAPUT: Well, it's pretty amazing, and it still is, even the last one. There isn't a whole lot of difference between my first and the last except I know what I can call it now, and I didn't then. But the experience is still the same. You're standing off the splashdown positions. The guys at the range give us an MSP; it's a mission support position. Basically it's six and a half miles away from the splashdown site. When the boosters come down, you hear two double sonic booms, and they land, which is still six miles away, but it seems very close. Over the life of the program, we've had them land twenty miles away and we've had them come inside three miles before. It's spectacular. You see the separation. You see the boosters tumble. You see the drogue chutes stop the tumbling, then the frustums come off, and then you see the main parachutes deploy, and they're all staged before they're fully blossomed.

Then right before the boosters hit the water, there's a linear-shaped charge that fires off the nozzle extension, and the boosters slap down in the water about sixty miles an hour. They lie on their side for about fifteen minutes, and then stand up about two-thirds underwater. About a third of the boosters are above water. We race over there once we're told that the S&As [safe and arm device], the Command Destruct System, is safe, the safe and arm device is ready. Then we go ahead and head into the area.

We do a surface assessment, take video and everything before we touch anything, and then, likewise, we throw the divers in the water and they go down and video and take stills of everything before we touch it. The purpose of that is it's very important during the post-flight assessment to whether it's something we've caused or if it's an in-flight anomaly [IFA]. Obviously, the fleet gets grounded if there's an IFA. Early in the program they tried to blame

everything on us, because that's an easy explanation. "Oh, they dinged it with the ship," you know, that kind of a thing.

Then we send in the divers again. They take off the parachutes. We bring in parachute one at a time on big reels, and then go over to the drogue, the frustum, the nose cap of the booster, recover that, put that on deck. Then the divers put in a DOP, it's a diver-operated plug. It's this big plug. It's 1,400 pounds, but just slightly buoyant in the water. That's been a whole evolutionary process in-house, the development and improvement, so that they swim it down about 110 feet and they stick it in the aft skirt and lock it in place with hydraulic arms. We pump air to it, and the air displaces the water and it brings the booster back up to the surface, and connect the tow and come on home, which sounds like a really easy operation, but it takes a lot longer than what I just said.

WRIGHT: Weather must have a lot of impact on what you do.

CHAPUT: Yes, everything.

WRIGHT: How do you prepare and deal for what you're going to find?

CHAPUT: Well, over time we've learned that the weakest part, our Achilles' heel of the program, is whether we can launch and recover boats safely. We don't have divers jump off the ship. We have to launch a smaller boat, and these are SOLAS [Safety of Life at Sea] boats. These are phenomenal boats, but because the ship bounces and these little boats bounce a lot more, it's

very dynamic, and if we can't safely launch and recover a boat, then that's when we say it's too rough to work.

STS 51-L, the *Challenger*, they were unable to make it to station because it was too rough, but I don't think there was any other time that the ships were in weather that was so bad that we couldn't get out there. We leave twenty-four hours prior to launch, and so there's ample time to get on station, but the seas were so nasty that they couldn't get on station. That was the only time that's ever happened. We have been held back in port before, but that was an administrative decision.

WRIGHT: When both of the ships are out, tell me the procedure of knowing who goes to where and to which one. I'm always curious, do the boosters have names?

CHAPUT: Yes, they do. There's a right hand and a left hand. The right hand doesn't have a stripe, and the left hand has the stripe around the forward skirt. So that's a good question. *Freedom* always gets the left hand and *Liberty* always gets the right hand. There's no reason for that, except one has to do one and one has to do the other, so it's just the way it fell.

WRIGHT: Is it a parallel operation, or is it independent of each other?

CHAPUT: It's an operation where they're doing their recovery, we're doing ours, and that's it. We keep in contact, and if somebody gets hurt or if there's an issue or something, the one vessel will help the other. But all in all, it's two independent operations.

WRIGHT: Since you have been here, again, before *Challenger*, did you always do all the filming and the photos for documentation, or did that come along through the process?

CHAPUT: That came along pretty much when I became manager, but give some credit to the photo industry, the underwater photography has gotten so good and so cheap. With the system that we use right now for underwater HD [high definition] filming of the DOP insertion and all the videos that you see is less than 500 bucks with the housing. It's a recreational camera with an underwater housing. The whole package is under $500. In the past, that equipment would have been cost-prohibitive.

I remember National Geographic came onboard when HD first came out, and they came down the locks with us and were taking video with these giant cameras. The thing is sitting on the guy's shoulder. The little Flips [Video camera] now that the guys are using. The camera itself is only about 125 bucks, and the housing is a couple hundred dollars, and that's it. It's just phenomenal, so that's really helped.

We've taken those things with media being so friendly, the media chip, that we just pop it out of the camera and put it right into the TV, and then do an assessment of the dive. Our lessons learned are so much better now because the ease of the documentation.

Plus, right now when the ships are sailing, we have seven cameras onboard on different parts of the deck, so the entire voyage is filmed on a DVD [digital video disc], all the cameras on all decks. So if someone got hurt or if there's a problem or an incident, whatever, we could just drop back to it. You have it on film.

WRIGHT: It's yet one more training level for your crew, that they get trained on photography as well?

CHAPUT: Yes, but that's a pretty much a passion of most of us. The guys that do it for us are the guys that love it the most. If you look at their own personal computer, you'll see, "Oh, this was our dive," and then right after it's, "Oh, look, here's a dive of my kid doing this," and, "Oh, look, here's our wedding." [laughter] No, it's not asking them a lot to do that kind of thing.

WRIGHT: I know a lot of people think of the SRB retrieval, but they don't think so much about the parachutes. They're almost like the hidden mystery of how do you wield something in so massive. Can you give us some insight to that?

CHAPUT: It's pretty neat. The parachutes are packed in the PRF, Parachute Recovery Refurbishment facility, Terry [C.] McGugin is the manager there, and they do a phenomenal job of packing them. The parachutes, I believe, are 165 feet in diameter, and they are the largest cargo parachutes in the world. They just about double in weight when they're wet, and I think it's right around 4,000 pounds when we recover them.

Now, throughout the program, it's changed many different ways. At the beginning, they used to be connected and the divers would have to detach them. There was a link forty feet down that the divers would have to hang onto and disconnect. Then we got to the point where they had a sensor where once the booster hit the water, there was a sensor that would trigger a charge, and the parachutes would literally get blown off. They had their own floats, and they would float, so when you approached the hardware, you'd have the booster ,the frustum, and

three parachutes floating on their own. So you just had to go over and recover them. At that point, we could do that whole recovery process in less than four hours. If the parachutes weren't fouled, it was really a great, easy thing. Now it's a lot harder.

At STS-63, and there were actually flights before that, too, we had strong crosswinds in the splashdown area, and when the rocket came down, the aft skirt hit the water, parachutes blew off, and then there was nothing to stop the booster from slapping down on the water. The parachutes used to dampen that fall. We had brought in a couple banana-shaped boosters from the slap-down damage, and then STS-63, both of the forward skirts were destroyed. Actually, *Freedom*'s on the left hand actually broke in two. Ours was just cracked, had a big hole in it. So then the program decided, "Okay, guys, we're going to have to come up with another plan, and we're going to leave these parachutes attached."

Now if everything goes well, the parachutes, when they hit the water have things called SWARs, saltwater activated release, that cut the risers, which is the thing that connects the parachute to the booster, and then they're just retained by a couple Kevlar lines. The divers just have to go in, tie floats to the parachutes, cut the Kevlar lines, and they float free.

I have to say, though, that there have been times, especially when it's calm, where the parachutes drape over the booster, that the divers are really at risk, because they're trying to free these parachutes and they are in an entanglement nightmare. We have videos of the divers swimming, and they are inside underwater at depth a really tough scenario to work in, especially with the booster surging.

So what do we do? We fix it the way NASA does it. You take a problem by the horns. We designed a dive program after NOAA's, because they have a great dive program, and we took the ball and ran with it. We have a safety diver who goes in before everybody else, who has

no other job but just to watch everybody else, and he has underwater communications with the ship. They're not wired. It's an ultrasonic communication system. Then the divers swim down in pairs or groups. Sometimes we'll even have two safety divers down. This last dive we did, we had two safety divers down watching the whole operation, making sure nobody gets into trouble.

The end result of that, along with a couple of other enhancements, is that we have a world-class dive program. "World-class" is one of those terms that are overused. In our world with diving, it's actually quantified, meaning less than three in 10,000 dives, the incident rate. That's world-class, and that's where we're at. There aren't that many world-class dive groups out there, and so we're very proud of that. That's a huge accomplishment by NASA and by us. They've allowed us to do it right.

The guys go through great training. Every one of our divers, even these old guys like me—have to pass a physical training test four times a year, every three months, and it's the same test as the entrance exam to the Navy dive program. Obviously the manager of the dive program doesn't get a whole lot of Christmas cards, but he is doing them a big favor and they know that. These guys, they're in shape. We don't age-rate it or anything because the job doesn't change. In certain applications you can understand why they do that, but not in ours.

We also dive with enriched air. I don't know if you're a diver, but there are a couple things that you try to avoid. When you go down, the concentration of air mixture is increased, and you're breathing more air and you're breathing more nitrogen, and you are at greater risk to get the bends. That's when you stay down too long at pressure, and that's generally mostly caused by the nitrogen, so if you can reduce the nitrogen mixture, you're less likely to get bent. The easy way to fix that, once again brought to us by NOAA, is you oxygen enrich your air. So

you up your percentage of air. That allows you to stay down longer at certain depths, and it is physiologically safer for you.

At the other end of the spectrum is that if you stay down and you have too much air, oxygen is a chemical, and you'll actually burn your lungs and go into convulsions. Oxygen toxicity is another thing to avoid.

Like every other thing, you try stay in the middle. We enrich our air to twenty-six percent, so we get the physiological advantage of the reduction of the bends risk, yet we don't get into the threshold where we're worried about oxygen toxicity at our working depths. This is another application where we've done a little bit of homework and improved our diving.

Then the last thing, of course, is that both vessels have hyperbaric chambers, which is huge, and that's what they need from us at *Aquarius*. There's a cool thing about having a chamber with diver accidents. If you do get bent or you do have an embolism the chamber gives quick results, and it's usually a 100 percent fix right away. If you can get that person to the chamber, generally the cure is quick and it's permanent and it's a great thing. That's been huge part of our dive program that we're very proud of as well.

WRIGHT: What are the risks when they have night launches?

CHAPUT: Well, early, early, early in the program we used to dive at night, but it's so hard to keep track of the divers. You would think if you put enough Cyalumes [chemiluminescent material] on the guys, you'll be able to see them. In a dynamic environment, it's just not worth the payoff, so we stopped diving at night. We stopped diving the booster recovery at night. We'll approach the hardware, we have good searchlights on the ship, and we'll just hold station

and keep an eye and track the hardware until daylight, and then we'll begin operations just like normal there.

WRIGHT: Have you ever had any people want to help, good boaters who see your operations and decide they're going to come in and help you do your job?

CHAPUT: Early in the program we had Russian trawlers that were tracking us all the way to the International Line. They would be out there in our splashdown area. They would track us early in the program, but that kind of went away. We're 135 nautical miles offshore, so there aren't a lot of recreational boats out there. We'll have some long-line fishermen, the freighters go through, the tankers and container ships, but generally there aren't a whole lot of people there, so we haven't really had that issue.

Early in the program, there were a lot more sharks. We would always see sharks during the dives, and now they're pretty much fished out. It's rare that we come across the black-tipped sharks. It's a shame, because everybody's got their role, and they've been really exploited. So we don't see sharks that much. We've had a few incidents where sharks have gotten a little too friendly. There's one case where a guy [diver], he came out of the water, and it was just like right out of a cartoon, where he got right out of the water, right into the boat, almost like he didn't even—he just got right in there. Larry, the guy who was running the dive program, he was drinking a Coke. He saw it [the shark] and he threw the can and he hit the shark right on the nose. The shark had followed him all the way up. [laughs] We've had a couple cases like that, but, no, nothing reportable, no injuries or anything like that.

During *Challenger*, I really gained a lot of respect for the divers, because they dove every day on the *Independence*, and they were so relaxed underwater. They would go down, and the ROV had previously found and identified a piece of hardware. They'd swim down, and sure enough, there were some stingrays out there that were six feet across, with a barb the size of a pencil. These are big things. Those guys just lifted up the rays, reached under, grab the hardware and let go, just no [fear].

We have done the salvages for all the rockets. Unfortunately we did it for *Challenger*, but we've done it for Titan, Atlas, the Delta with the GOES [Geostationary Operational Environmental Satellite], and the *Pegasus* as well.

We were doing salvage for the Atlas Centaur. I was running the small boat with a Loran, and we were told there was a piece of debris in our location. One of the divers, Walt, I was with, went over the side. The recall system is you rev the motor if you want them to come back up to the surface. There's a sport fisherman coming right down on us. I'm sitting there and I'm revving that motor and [demonstrates noise], and he's not coming up. Finally, I had to move; otherwise he would have gone right over us.

About five, ten minutes later, Walt comes up to the surface. "Walt, I was going nuts. I was revving the motor. Why didn't you come up?"

He says, "Oh, yeah, I saw him. I just laid on my back, and it just went right over." [laughs] These guys have no pulse, no heartbeat. They're very, very comfortable with just about anything you throw at them.

WRIGHT: Then, like you said, they're so versatile that when they are literally on shore, they're able to do things and want to learn more.

CHAPUT: Oh, absolutely, yes. They're doers. They're not sitters.

WRIGHT: How does that cross over to your barge transportation? If we could talk about that for a few minutes.

CHAPUT: Sure. For the ship's crew, there is nothing nicer than, "All right, let's go to New Orleans," and you go around the [Florida] Keys and you cross. Sometimes in the middle of the Gulf it gets nasty, but, all in all, you've got the rigs. There's so much going on in the Gulf. I really miss doing that.

WRIGHT: The water's pretty.

CHAPUT: Yes. Everything is nice about that. Then once you get in there, Michoud's only twenty minutes from New Orleans, so there's a lot to do. That was a good thing.

WRIGHT: You had to do some modifications to the ships?

CHAPUT: We went with the naval architect who still has the plans for the ship, so the same group that designed the ship initially converted it to handle a bigger tow. We put an H-Bit, it looks like a big H, on the back deck, and that basically provides the thimble for the wire to go through and the tow point puts the load on the vessel where you want it for towing this barge. We got our pilotage for the Mississippi River Gulf outlet, which we used all the way up until [Hurricane]

Katrina. After Hurricane Katrina, it's closed and now we have to go to Gulfport [Mississippi] and use small tugs to bring it over from Gulfport to MAF. But, yes, that was nothing but a plus for us. Loved that.

WRIGHT: So you actually took ownership of the ET.

CHAPUT: We signed for it out there, yes.

WRIGHT: Then once it got on the *Pegasus*, it was yours.

CHAPUT: Right. After it was finally loaded, we'd go around and make sure everything is tight, everything is good, and then we sign for it. It was an 1149 [form], and that transferred the responsibility over from the manufacturer, which was Lockheed Martin [Corporation], to USA [United Space Alliance].

WRIGHT: When you got it here, tell me about the route back.

CHAPUT: We come around the [Gulf] coast, we come up the East Coast, and if the weather was nice, if it was agreeable, we would come into the port and two inland tugs would be waiting for us. Then one of our guys here is a river pilot, and he would bring the barge all the way up to the VAB [turning] basin, where it would be ready for offload. If the weather was nice, we'd do that all in one day. Otherwise, we can tow the barge in just about any kind of weather, but going up

the Banana River, because there's so much windage on the barge, it's easy to get blown out of the channel. So the weather has to be less than 15 knots for us to go up the river.

WRIGHT: Do you have plans for the barge as well in your future?

CHAPUT: We have. Right now I think the only need is to be transferring hardware between the different Centers. There's a bunch of engine components to bring to [NASA] Stennis [Space Center, Mississippi]. I think there's some hardware that they want to bring to MAF, but ultimately I think the barge is going to stay at Stennis until SLS [Space Launch System] or whenever they need it.

WRIGHT: Because it's a very unique piece of equipment?

CHAPUT: It is. The barge has a couple of special things about it. It's covered, which isn't that common, and then it also has a pretty amazing ballast system, so that you could load it up in any way, and there are enough tanks across to balance it. You can have your entire load at one end or the other and still balance it out by the ballast. Even ballasted, it can still make shallow river runs and tow it offshore. It's a versatile piece of equipment.

Another thing about it is that it appears that the main part of SLS is going to be much bigger than a standard ET, because they're going to be putting the main engines on the bottom of it. The great thing about barges is it's like a big piece of butter. You can just cut it and stretch it and add more and put it back. That happens in industry all the time. You can cut it down the length and spread it and make it wider. It's just a big piece of clay. So it'll be handy for them.

WRIGHT: I guess you and your crew and the ET were all very up close and personal on that barge on that trip.

CHAPUT: Oh, yes. We started manning the barge, because there are a couple times that it helped, and it's our guys anyway. When it was being towed by a tug of opportunity, they used to have it manned, but then it got cost-prohibitive. Well, it doesn't really cost anything with us because it's just another crewman on the barge, so it was not a factor to really talk about.

We started manning the barge. There are four people on the barge when we tow the ET, and they keep an eye out and there's always somebody up. In the event that we break tow, which we've never done, or anything like that, or if there's a fire or whatever, we have somebody immediately there to address it, versus looking back there and saying, "Gee, looks like there's smoke coming out of the barge." Especially considering the cargo aboard.

I remember one time I was signing for one of the tanks, and they roll up the costs. There's a dollar value on that 1149, and they're somewhere, depending, 80 million dollars, whatever. And the first time I signed it, I thought I was pretty impressive. I just signed for something that's 80 million dollars. One of the times, it was one of the tanks, and I was out there signing for it, it was 37 million dollars. I said, "I'm not signing this one."

And these guys from Lockheed, and they said, "Why not? Why not?"

I said, "The last one was 80 million. This is 37. There's something wrong with this one. You're not getting it past me." And they look at me, and I said, "Guys, I'm kidding. I'm going to sign it. It's okay." [laughter]

WRIGHT: "You're only giving me half."

CHAPUT: Yes. No humor at all. They're just looking to transfer.

WRIGHT: It's literally a big project coming in, wasn't it?

CHAPUT: Yes.

WRIGHT: What are your other thoughts about what makes your team so unique? You are, there's no one else that does what you do. From what you've been telling me, too, you've been pretty much in a process of evolution ever since you came here.

CHAPUT: Absolutely. There's a lot of creativity, and left alone, if you fertilize the environment enough, great things are going to happen. These guys are great. I keep bragging about our people, but on these Navy contracts, we pick up a junction box or a sensor and an acoustic array that's in 500 feet of water offshore. There's a current and the captain's holding the vessel in the current, and he might have to be doing this for hours. They're splicing fiber optic cable. Well, on these contracts now, our guys are doing that. Because we have four deck crew that go along with the ship, more and more they're turning over their work to us because they can. Here's a guy who's a crane operator, he's a diver, he's a welder, and now he's splicing fiber optic cables for the Navy.

It's the same way with the running ROVs for NOAA. We set up the controls in the deck workshop where they've got all their equipment, and I go down there, and one of our guys is

flying it. "Come on, you guys." They're just doers and they're capable, and it's amazing. I'm sure you guys have seen that at JSC too. It's a shame there's so many phenomenal people walking out the door. It's tough.

WRIGHT: What is the greatest concern you have when your crew is out, as far as hazard and risk?

CHAPUT: The sea is unforgiving, and I learned that I don't have a sixth sense. There are some people that say, "You know, it just doesn't feel right. We shouldn't do it," and it turns out they're right. I don't have that. I'll wake up in the morning thinking we're going to have the best trip ever, and we'll get slammed, or vice versa, I'll say, "Man, I just don't feel good. I don't think we should be going out," and it turns out to be the best trip ever. I don't have that ability, so I've just learned to be cautious all the time.

It's easy to get complacent, but, boy, the minute you do, it's going to come bite you. Just because the situations look bright now, you can't ever afford to cut corners, especially with the diving. You can break laws, but you're never going to break the law of physics. You've got to do the right thing all the time.

WRIGHT: I imagine you have lots of procedures and routine training, things that whenever you get ready to go out. Could you share what your process is?

CHAPUT: When the ship gets under way, it's pretty much routine ops. The captain keeps the ship running twenty-four hours a day, and he's got night orders and he's got a standard, pretty much industry standard. If you walked on any vessel, it's pretty much the same.

Now, the diving and all of our ops, we have pretask briefings, and there's enough of a casualness about the pretask briefings that if someone has a question, they're going to speak up, or if it sounds stupid, they're going to say, "That sounds stupid." There's no hesitancy on either side. Everybody has a pretty good picture of what's going on, and everybody watches everybody else's back.

On the deck ops, there'll be three different-colored hats on the back deck. You'll have the group of guys bringing on the parachutes, and they're all wearing white hardhats. There'll be a red hat, and that's the guy in charge. Then there's a green hat. The green hat has no other job but just to make sure nobody gets tangled in the parachutes or something goes wrong, just standing by, just watching the whole operation, making sure nobody gets hurt.

When we implemented that, which was probably eight years ago, we got a lot of resistance because the guys were working hard on deck anyway, and there's not any more room for any more passengers. So you're taking somebody out of the work to stand by and do nothing else, but now everybody's bought into it. It's the right thing to do.

WRIGHT: Sounds like you don't ever run out of things to do.

CHAPUT: No, we don't. We're hustling all the time, but that's what we like. My focus is to just keep it propagating. NASA's got a great asset, and I'm sure they have assets all over the place that are great, but I'm going to do my best to make sure this one keeps going.

WRIGHT: By the end of the month, how large of a staff will you have?

CHAPUT: Oh, we're down to twenty, and the deal is now we're supposed to maintain both vessels and have a crew to operate one at a time. That's where we're at. And maintain our divability and all that stuff too. These guys are really busy, but it's heartbreaking to see the talent go. It's not a name or it's not a number that's walking out the door. It's that guy who's married to this person, who has these kids that are at this school, and that one's going to get married. I mean, these are all—

WRIGHT: Like a family moving away.

CHAPUT: Yes, it is. It's just like that.

WRIGHT: Well, I wish you the best. Is there something else that we might not have covered that you can think of, that you want people to know about your operations? I guess you might have already covered it, but when you are out on the retrieval for the SRBs, we talked about the parachute risks, but are there also risk of other explosives that are on the boosters?

CHAPUT: Yes, the SWARs, that saltwater-activated release, sometimes those don't blow, and there's a risk of them going, but it's pretty much self-contained. There's hydrazine gas, but that is water-soluble, so that's not generally a risk for the divers. Most hazards are physical hazards,

sharp edges of the phenolic nozzle as it's surging. More things that you will see, not things that you can't see.

WRIGHT: The other one is kind of an odd question, but I know that during the *Columbia* recovery that the Navy was a big asset in helping to salvage, especially in Toledo Bend Reservoir [between Texas and Louisiana]. I know they employed a number of divers. Were you involved in the recovery of that as well?

CHAPUT: I have comments, but you'd have to turn off your machine. [laughter]

WRIGHT: Okay, I think we answered that question.

CHAPUT: No. We offered and, just like it is today, the political climate at that point was so high that they wanted to leave it with the supervisor of salvage with the Navy. We had a bunch of our people walking the fields, but they opted not to use us for the diving.

WRIGHT: I guess the only other divers that I know off the top of my head are the ones at the NBL [Neutral Buoyancy Laboratory]. Do you have any communication?

CHAPUT: It's funny, because we've never worked for the same company. The divers there, I think they're [Raytheon Technical Services Company], and we're USA. I know our guys have actually gone out and dove in the NBL for certain projects, because it was built here and they wanted the consistency of the same divers out there. Certainly no hard feelings, and I've got a

lot of respect for them. It's funny that our paths have crossed more at *Aquarius*, training the astronauts, than they have at the NBL.

WRIGHT: Of course, one's a very controlled environment and one, like you said, is—

CHAPUT: One is wide open.

WRIGHT: Boy, that's a good description of the sea.

Well, I thank you for your time.

CHAPUT: Thank you very much for coming out.

WRIGHT: Your information is just great, and I'll look forward to learning more. Thank you.

CHAPUT: Thank you very much.

[End of interview]