U.S. Coast Guard Marine Board Investigation ICO the sinking of SS El Faro held in Jacksonville, Florida held

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CAPT Neubauer: Good morning. This hearing will come to order. Today is May 17th, 2016 and the time is 9:01. We're continuing at the Prime F. Osborn Convention Center in Jacksonville, Florida. I am Captain Jason Neubauer, of the United States Coast Guard, Chief of the Coast Guard Office of Investigations and analysis, Washington D.C. I'm the Chairman of the Coast Guard Marine Board of Investigation and the presiding officer over these proceedings. The Commandant of the Coast Guard has convened this board under the authority of Title 46, United States Code, Section 6301 and Title 46 Code of Federal Regulations Part IV to investigate the circumstances surrounding the sinking of the SS El Faro with the loss of 33 lives on October 1st, 2015 while transiting East of the Bahamas. I am conducting the investigation under the rules in 46 C.F.R. Part IV. The investigation will determine as closely as possible the factors that contributed to the incident so that proper recommendations for the prevention of similar casualties may be made. Whether there is evidence that any act of misconduct, inattention to duty, negligence or willful violation of the law on the part of any licensed or certificated person contributed to the casualty, and whether there is evidence that any Coast Guard personnel or any representative or employee of any other Government agency or any other person cause or contributed to the casualty. I have previously determined that the following organizations or individuals are parties in interest to the investigation. Tote Incorporated, ABS, Herbert Engineering Corporation and Mrs.

Teresa Davidson as next of kin for Captain Michael Davidson, Master of the SS El Faro. These parties have a direct interest in the investigation and have demonstrated the potential for contributing significantly to the completeness of the investigation or otherwise enhancing the safety of life and property at sea through participation as party in interest. All parties in interest have a statutory right to employ counsel to represent them, to cross-examine witnesses and have witnesses called on their behalf.

I will examine all witnesses at this formal hearing under oath or affirmation and witnesses will be subject to Federal laws and penalties governing false official statements. Witnesses who are not parties in interest may be advised by their counsel concerning their rights. However, such counsel may not examine or cross-examine other witnesses or otherwise participate.

These proceedings are open to the public and to the media. I ask for the cooperation of all persons present to minimize any disruptive influence on the proceedings in general and on the witnesses in particular. Please turn your cell phones or other electronic devices off or to silent or vibrate mode. Please minimize entry or departure into the hearing room except during periods of recess. Flash photography will be permitted during this opening statement and during recess periods. The members of the press are of course welcome and an area has been set aside for your use during the proceedings. The news media may question witnesses concerning the testimony that they have given after I have released them from these proceedings. I ask that such interviews be conducted outside of this room. Since the date of the casualty the NTSB and Coast Guard have conducted substantial evidence collection activities and some of that previously collected evidence will be considered during these hearings. Should any

person have or believe that he or she has information not brought forward, but which might be of direct significance, that person is urged to bring that information to my attention by emailing elfaro@uscg.mil. The Coast Guard relies on strong partnerships to execute its missions. And this Marine Board of Investigation is no exception. The NTSB, provided a representative for this hearing. Mr. Tom Roth-Roffy, seated to my left is the Investigator in Charge for the NTSB investigation. Mr. Roth-Roffy, would you like to make a brief statement?

Mr. Roth-Roffy: Yes, sir. Good morning Captain. I am Thomas Roth-Roffy, Investigator in Charge for the National Transportation Safety Board's investigation of this accident. The safety board is an independent Federal agency, which under the independent safety board act of 1974 is required to determine the cause or probable cause of this accident, issue a report of facts, conditions and circumstances related to it and to make recommendations for measures to prevent similar accidents. The safety board has joined this hearing to avoid duplicating the development of facts. Nevertheless, I do wish to point out that this does not preclude the safety board from developing additional information separately from these proceedings if that becomes necessary. At the conclusion of these hearing the safety board will analyze the facts of the accident and determine a probable cause independently of the Coast Guard. At a future date a separate report of the safety board's investigation will be issued that will include our official determination of the probable cause of this accident. If appropriate the safety board will issue recommendations to correct safety problems discovered during this investigation. These recommendations may be made in advance of the report. Thank you.

CAPT Neubauer: Thank you. Before we begin I have a statement to read from the previous proceedings. Throughout the hearing to date the MBI has been referencing the safety management system or SMS operations manual for vessels revision 21, which has a published date of August 2015. Tote has clarified that despite the August 2015 date, revision 21 had not been promulgated on the El Faro at the time of the accident voyage. Therefore, going forward we will use or refer to revision 20 of the SMS dated April 2014 ensuring that the Ops memos that were issued between April 2014 and October 2015 are incorporated into that version. Does that satisfy Tote's concern on that matter?

Tote Inc: Yes, sir.

CAPT Neubauer: We will now call our first witness of the day. Captain Jack Hearn if you could come forward please.

LCDR Yemma: Good morning, Captain.

WIT: Good morning.

LCDR Yemma: Raise your right hand please. Sir, a false statement given to an agency of the United States is punishable by a fine and or imprisonment under 18 United State Code Section 1001, knowing this do you solemnly swear that the testimony you're about to give will be the truth, the whole truth and nothing but the truth, so help you God?

WIT: Yes, sir.

LCDR Yemma: Thank you. You can be seated, sir. Sir, if you could press the button on your microphone there.

WIT: Red light?

LCDR Yemma: Yep. Please start by stating your full name and spelling your last name for the record?

WIT: My name is John N. Hearn, H-E-A-R-N. I go by Jack Hearn

LCDR Yemma: Thank you, Captain. And can you describe for the board your current employment and your position?

WIT: Currently I'm employed by Delaware Bay Pilots as a vessel traffic information service watch officer. I'm also Executive Director of the American Professional Mariners Association. But that's a voluntary position.

LCDR Yemma: Thank you. Can you also describe some of your prior relevant maritime experience?

WIT: I went to sea for 40 years. I was Master for 25 of those 40 years. I graduated at the U.S. Merchant Marine Academy.

LCDR Yemma: And what was your highest level of education completed?

WIT: I had some graduate school, some professional training through my career and Bachelor of Science Degree in Marine Transportation.

LCDR Yemma: Thank you Captain. The board will have questions for you now.

WIT: Yes, sir, thank you.

CAPT Neubauer: Mr. Fawcett.

Mr. Fawcett: Thank you Captain. Good morning Captain Hearn.

WIT: Good morning, sir.

Mr. Fawcett: For the benefit of the transcribers could you please move the microphone just a little bit closer. That will be very helpful.

WIT: Of course.

Mr. Fawcett: Thank you, sir. So all of my questions will relate to the time frame immediately leading up over the course of time to the accident day which was October 1st – October 1st, 2015 unless we specify otherwise. Also when referring to your testimony Sea Star Line has eventually – it has gone through a number of different names and it eventually has become the Tote entity that we know today. So they're linked together so you know I may sometimes refer to Tote, but I may be actually referring to Sea Star Line. So if you need to make clarification please do that.

WIT: Thank you. Yes, sir.

Mr. Fawcett: So we'll cover a couple of topics. And the way this works is after I finish asking questions in general we'll pass it to the board. We'll move to the NTSB and then the parties in interest will have follow up question opportunities and they will move on to the next topic. At any time you would like to take a break please tell us and we will take a break if necessary, ok?

WIT: Yes, sir, thank you.

Mr. Fawcett: So the first topic I would like to talk about is a general overview of working at Sea Star Lines, Tote, when you were Master. But before I go there could you elaborate on your maritime career, the types of vessels you worked on and the positions you held if you would, sir?

WIT: My career started as an ordinary seaman on tug boats. I went to U.S. Merchant Marine Academy training. There was a number of ships I was on in training, tankers and general cargo vessels. But from there I graduated in 1979 and immediately went to sea on tankers, the VLCC's and Coast Wise tankers. I did that for about 5 years. I moved from the tankers to Naval Auxiliary ships, crane, what they crane ships. Worked

in amphibious operations, the Navy for about 2 years. Then in 1986 I moved – I was employed by Tote on the West Coast. I worked out there for 20 years on the Alaska run. Starting as Chief Mate and within 3 years I was sailing as Master out there. So I had 17 years as Master on the Alaska run. A few times during those periods I moved to other voyages. There was a war in 1990 I was in the Sealift operations there. And in 2003 I was also on a ship that chartered and did Sealift operations to support the Gulf War in 2003. I moved from Tote on the West Coast to Sea Star in 2007 and stayed with Sea Star until I retired in 2015. Well excuse me I left the ship in 2013, I retired, took my pension in 2015. I was Master for 25 years of my full career. Most of my experience and expertise is with ro-ro cargo like the Tote ships and the Sea Star ships. And I was involved with innovation on those ships for many years and the changes. Especially learning some of the lessons you would in violent weather that you would encounter in the Gulf of Alaska.

Mr. Fawcett: So you had mentioned an abbreviation VLCC, that's very large crude carriers, is that correct, sir?

WIT: Yes, sir, that's correct.

Mr. Fawcett: All right. So how did you actually get the job with Sea Star Lines?

WIT: I transferred from Tote up on the West Coast, it was the same corporate family. And the ship that became the El Faro was the Northern Lights, the ship I had worked on when I was on Tote on the West Coast. And a position opened up on that ship. A friend of mine retired and I asked if I could transfer to that ship again and I did.

Mr. Fawcett: So when you worked for Sea Star Line who did you directly report to within the shore side management?

WIT: When I started working for Sea Star, most direct reporting was to Steve Tornello [sic] was the operations manager. After a year or two it – William Wisenborn, Bill Wisenborn took over that position and I reported to him directly.

Mr. Fawcett: And just for the sake of comparison, when you left Sea Star Line was there a different organizational structure, a different person that you reported to?

WIT: It had changed and it was a little more vague when I left. The operations department had reduced to just one person, Don Matthews. There was a man named Mr. Wagstaff was operations and terminal operations. He was just transitioning into operations there. I also spoke to Lee Peterson who was running engineering for the company. And the West Coast engineering staff at Tote had taken over a lot of operations. But I wouldn't report to them, but I would usually report first to the people in Jacksonville.

Mr. Fawcett: So if you would take some time to elaborate on the marine operations manager and what that person would have done for you to provide support for the ship's operation.

WIT: Marine operations manager would be the person that would give you operational directive voyage orders, planning, scheduling, expectations of the ship on the voyage. Whether it's a short term voyage or a long term period of time depending on what the subject was really because it could be a number of subjects with the ship including maintenance, operations, personnel, training of personnel to improve them. Regulatory compliance with the Coast Guard and interstate and Federal compliance. Communications and other functions with the safety management system. At that time the companies were split and Inter Ocean American Shipping did a lot of our SMS

functions, training and there might be some coordination with him on those types of things also with the other things.

Mr. Fawcett: So was it – was it clearly understood that the marine operations manager, who that was at any given time? In other words if the marine operations manager went on vacation did you know who the alternate was or the relief so that you could be in contact with somebody shore side?

WIT: There would be two ways to transition if there was someone that was not available. The company had an email address for operations and it went to a number of people. So if someone was not available the other person knew we would receive those same messages and would pick up. So I might not even know that the other person was not available. They would manage themselves. But the communications that came from the ship to that general address would go to a number of people and be directed to all of them that was on that address. And they managed that function ashore.

Mr. Fawcett: Okay. So you had mentioned a couple of gentlemen that fulfilled the role as marine operations manager and then you mentioned Don Matthews. Was Don Matthews capable of providing the same level of support for operation that the marine managers could?

WIT: No.

Mr. Fawcett: And why would you say that?

WIT: Don had not worked in those capacities long enough. He had – he was a good person to work with, I liked working with Don and he was very good at disseminating the information. You would get an answer if he did not have it. But he didn't have the

marine background to speak on that same level of voyage experience, operational experience with the ship. Especially off shore. When it came to shore side operations Don knew exactly who to go to inside the terminal and within the management system. That's basically how his function would help quite a bit. But when it came to experience with the ships and the length of experience that Sea Star had operated the ships Don had not been there that long either to – at least my experience with Don was that he could not give me good operational experience or help or advice.

Mr. Fawcett: Now the marine operation manager when you had the opportunity to deal with them, did they deal with just the ships on the Jacksonville run to Puerto Rico or did they span the Alaskan trade?

WIT: In Sea Star the marine operations personnel only worked with the Puerto Rican run. But they did – the ship had been chartered overseas, we were doing a number of voyages to the Mideast and they also managed those functions. And I was the Master on the ship of those voyages.

Mr. Fawcett: Outside like in the bigger Sea Star Lines picture and their umbrella companies, whether it's Totem Ocean Express, was there somebody above them that sort of looked at Sea Star Line globally in their operations and ensured that the safe and efficient marine operation above the marine manager?

WIT: I believe that the company at that time when I was working with them there was a number of people in the senior levels that looked at the entire scope of purpose of the ship, mission of the ship, the mission of the company and they coordinated all of that. When I reported directly to the operations managers I would rely and expect them to move that information up the chain if it was pertinent to those people at their meetings

or at their corporate level. And I know that the companies did trade personnel between coasts and we also had operations at, at the time I worked there, in New Jersey and they shared information, discussed things across the board. You know that was at their level. And it would go to whatever level they felt it was important to reach.

Mr. Fawcett: Okay. This shift where the position of the marine operations manager ceased to exist as you described it, do you know when that date was where they shifted over where Mr. Matthews took over the shore side support of your operations?

WIT: Not specifically any more. I would say roughly 11 or 12, 2011 or 2012. But without looking at records and things like that it would be hard to remember exact date when people – when personnel left the company and it was just reduced to Lee Peterson and Don Matthews over at Sea Star Lines in Jacksonville.

Mr. Fawcett: And was this part of a corporate reorganization or restructuring?

WIT: That's my understanding, yes.

Mr. Fawcett: And in the different lines of questioning related to ship board operations there may be more questions about the role of marine operations manager, so I'll leave it there and move on.

WIT: Yes, sir.

Mr. Fawcett: But would you expect, in general, that the marine operations manager would be apprised of your route and your intentions on a voyage?

WIT: That is policy, yes.

Mr. Fawcett: And where would I find that policy at that time?

WIT: At the time I worked there that was in the safety management system. You kept – you always advised the company of any change in route, any change in destination, any

change in the ETA especially so that they could manage operations at the next port. If there was any critical need of the ship depending on those changes you advised them and they would coordinate events in the next port or reporting and get things ready to keep the ship running smoothly and efficiently. That was a lot of their function. And my function was to keep them advised of that.

Mr. Fawcett: So looking at the safety management system, like I say we'll delve into details later, but it says that you're going to advise the company of changes in course. Now that – I mean you're not going to advise them of a minor course change, but what would that implication – what would be the implications of that for you as Master?

WIT: A change of course would probably really mean a change of route and the original voyage plan. And it could mean anything from security issues which have happened, especially foreign voyage, but locally or regionally it would mean a deviation due to weather conditions. Or I had one voyage where it was a military operation going on and they detoured the ship away and it delayed the ship. So you would keep them advised of any situation like that. Once again changing ETA, changing operations and let the company know what the ship was up against so that they were aware of where you were taking the ship and what you would be doing with it. Even if it was a relatively routine thing you would put it in the position reporting system so that the company was aware of some of the changes.

Mr. Fawcett: So in previous testimony we've heard it described that the typical route from Jacksonville to San Juan back and forth has been described as the Atlantic route. When you got ready during your time with Sea Star Line when the operations managers were in place, were you expected to communicate with them as to the route you were

taking before you departed? In other words whether you were going to take the Atlantic route, whether you were going to take an alternate route on a voyage?

WIT: The routine route was the off shore route outside the Bahama Islands and most direct and voyage efficient route. And there would not be any communication if that was the routine. If you change from the routine and that's where the policy would step in you would advise them. And if it was a change that you recommended based on other functions of the voyage, for example repairs or weather conditions or things that you thought would be favorable, it would be a discussion and a joint decision because you just don't change from the routine without advising and sometimes getting advice from the company about, you know the need for the mission of the voyage. I'm can give examples of course. For example repairs. And if you're going on the off shore route, it's winter voyage there's sea swell that could cause disruption to the repair work and the safety of those repair work – or the efficiency of it, I would recommend going in the inside route which was calmer and better weather. If the company had parameters or thoughts that was not efficient they wanted the ship to get down there, things I would not know about, they would let me know and we would have a mutual discussion and decision about what was the best way to complete the expectations of the ship and voyage. That's how decisions were made.

Mr. Fawcett: And like I said on various specific topics we'll talk more about that.

WIT: Yes, sir.

Mr. Fawcett: So explain if you would your leadership style as Master of the El Faro.

WIT: Well I try to incorporate bridge resource management skills, the law, the regulatory compliance, the company's safety management system into all of my style.

Of course then the other expectations that evolved through the years, social expectations of fairness. And being situationally aware of all of that. Which is a balancing job because tasks and expectations have increased over the years. I have a 25 year career as Master so that's changed quite a bit. I think my style was fair. It was dutiful. I try not to get distracted by too many things that I could stay on the big picture and keep situational awareness of not only the voyage, but the conditions of the voyage and the expectations of the ship through the voyage from point to point so that I was aware of planning. In fact I tried to keep the long term view including even seasonally from my year to year what I could do to do the best I could for that ship. Manage repairs, maintenance through seasons so you get the most effective and efficient use out of it. The number one job right after safety of the voyage is efficiency and economy. And to get the most commercial benefit out of the voyage because it's a commercial operation and that's the expectation and purpose of the company.

Mr. Fawcett: All right. So you've described your personal leadership style. How did – during the time where the marine operations managers were in – under employment in the scheme of things, how did they – how did Sea Star Line evaluate your competency as Master?

WIT: There was an evaluation process and well I worked with them every day basically by basic communication. Saw them quite often in port. The Sea Star Line operation went from a company office dock to a company dock so you saw the mangers routinely on board the ship and you work with them closely. And they had an evaluation process that was documented. I only went through one evaluation that I recall. But that's how it's done.

Mr. Fawcett: And the people that evaluated your competency were they other deck officers with deck experience, or were – who would they be?

WIT: Evaluation that I remember seeing was Captain Rogers was the Deck Officer and Master's licensed and in operations at Inter Ocean American Shipping in New Jersey. I worked directly with him and for him. And then on the engineering and operation side was Jim Coleman and Lee Peterson with Sea Star Line. They were both experienced engineers and ship's officers also.

Mr. Fawcett: Could a licensed deck officer effectively perform an evaluation on your competence?

WIT: I would hope so.

Mr. Fawcett: So what was your personal style when it came to bridge watch keeping? And what you expected of deck officers.

WIT: I spent most of my time on the bridge. That's an important part of the ship's voyage is to keep it safe, keep from, basically we can't hit anything which meant underwater as well as on the surface. And a lot of that time was spent talking to those officers. I would believe I was mentoring them, coaching them, being aware of what they were doing, the conditions of the voyage. Even of the watch. There could be periods of time looking ahead where they would encounter traffic, weather, navigational hazards and we would discuss those issues routinely even watch to watch. And then I left night orders anticipating any of those conditions. Sometimes they were very routine, sometimes it was specific because the voyage or the conditions had changed to evening fishing traffic, things like that. So nothing was taken for granted. And it was

discussed routinely. I enjoyed working with the deck officers, I spent a lot of time with them.

Mr. Fawcett: And while you were working for Tote who conducted the evaluations of deck officers?

WIT: The Captain did the evaluation for deck officers on the ship.

Mr. Fawcett: And what was the required frequency?

WIT: Basically every tour.

Mr. Fawcett: And then when you conducted the evaluations of these deck officers, who had sort of a final sign off? Did someone ashore take a look at those evaluations and determine – I know there's a category on the evaluation about rehiring, I'm not sure if that's the exact term, but whether they came back to the ship? Who outside the ship reviewed the evaluations?

WIT: My recollection is that all the evaluations were submitted at the – when I left the ship when we call turnover or change of Master they would be packaged and mailed into the company's personnel management office. And either the Personnel Manager or someone in that staff would review them and file them.

Mr. Fawcett: Did they ever give you feedback as to your evaluations?

WIT: Possibly. I don't remember anything specifically that an individual, but it's possible.

Mr. Fawcett: Let's say I was serving under your command and you checked the box that you didn't recommend rehiring, what would you expect the company to do after they receive that evaluation?

WIT: I wouldn't have an expectation. If they felt it was necessary to discuss it with me I would be prepared for that. But I didn't have expectations of personnel. Not that I recall.

Mr. Fawcett: You didn't have?

WIT: No, sir.

Mr. Fawcett: In the very broad sense what was your view of the Master's role regarding cargo lashing, security and stability? We'll get into the details later, but your overview of how you conducted the Master's role with regard to that.

WIT: Well you rely on the Chief Mate, it's his primary function is to take care of the cargo, the deck maintenance. My job really was to look for the extraordinary situations that might go beyond the routine that would help him identify anything that's critical. And that's something that I know I spent a lot of time with the Chief Mates discussing anything that might be a hazard or an obstruction to the routine of the voyage, or safety of the voyage, or the personnel working. Whether it was hazardous cargo or we carried – we carried cows and horses on the ship so there might be – just keeping the ship clean and sanitary. Those were all routines that I would be more involved with them because it was something that was a more difficult function and created more – it involved more of the ship to stay safe. If it was a routine that was weather oriented I tried to be much more aware of the weather situation for not only the voyage, but the long term period of time and give Chief Mates an overview what was coming so they didn't have to rely on looking at the weather alone and keeping track of voyage expectations and safety. So I work with them on a broader sense to look for anything extraordinary that would go beyond the routine scope and give them support that way.

Mr. Fawcett: So looking – looking at the reliance on Chief Mates, if you had a new Chief Mate join who hadn't spent time on the El Faro, the El Yunque or in the case of the El Morro when she ran, how long would it take you as Master to bring them up to speed as to the peculiar characteristics of the, and I don't mean peculiar but on the unique characteristics of the El Faro and that type ship with that type of cargo?

WIT: Well everybody's different. And it would – so it's difficult to give an exact timeline. Based on their previous education and experience. But I would – honestly it's a year or two before a guy really gets the routine down of voyage experience, weather experience, seasonal experience and expectations. So they would have to learn quite a bit of it from their own personal experience. I would augment it and help them to understand that. But it would be a minimum of a year before a brand new Chief Mate would have enough hands on deck experience to understand what he was up against out there.

Mr. Fawcett: And that includes people that have served as Chief Mate on other types of vessels? When you say brand new you're not talking about a guy who just got his license? You're talking about an experienced Chief Mate that comes to the El Faro, is that correct?

WIT: Well, sir, once again, everybody's different. And no, it's not just a brand new Chief Mate, it could be somebody coming from a different ship or an experienced officer that's groomed up from the ranks. That's the best resource of officer because he already has hands on experience with the ship, knows the routine, the cargo so there's less range of information for him to learn. If they come from deck cargo operations they already know how to work with longshoreman and the expectations of that kind of thing.

If they've come from tankers then they don't have that background. They can pick it up quickly if it's a – if they have a college education they might be better with the computer systems and the regulatory side of things. But if they've come up through the ranks and the hawse pipe, they might have a much better anticipation of deck maintenance and cargo work. And it's balanced when they're learning, and like I said everybody's different when they do that so you can't really pin a timeline for an individual to become a good officer. But the minimum expectation I would think would be about a year. Because they would need to go through seasons and go through operations for quite a while before they start getting a relationship with the ship, the crew, personnel they are working with ashore and how they get the most out of everything. And including myself so we get a good working relationship going. It takes time. It's not something that happens immediately.

Mr. Fawcett: Would your oversight of the new reporting Chief Mate be increased if you were in a Caribbean hurricane season?

WIT: Absolutely.

Mr. Fawcett: And we'll revisit weather topics aside. But what's your operating philosophy as Master when it comes to the engineering crew, the Chief Engineer, the oilers, officers down in the engine room and the operation of the plant? What's your philosophy on that as Master?

WIT: Well you heavily rely on the engineers of course. That's a separate profession on the ship. They have a lot to do, it's technical work, it's sometimes – especially on that Sea Star class, the Ponce class or the steam ships. It's hot and difficult work. The most important thing I can do is create a good working relationship with them. And

balance a trust so I understand what they're up against. And day to day, week to week, voyage to voyage and seasonally. Because we also coordinate work not only on the propulsion system and the habitability of the ship, but also repair structures and coordination, what kind of work is going on. Because the ship needs repair maintenance and a lot of the engineering staff will either take care of that, do it themselves. Some of it falls under the responsibility and supervision of the Chief Engineer himself. And I would say that after the bridge I spent most of my time talking to the Chief Engineers on the ship.

Mr. Fawcett: So you mentioned bridge resource management. So under the practice that you had on board the El Faro and the other ships, what was bridge resource management like? What was your concept like? And did it include the engineering department as part of the process for bridge resource management?

WIT: Well for me bridge resource management was using every resource, not just the bridge and the equipment on the bridge, personnel and getting the most out of them and helping them understand what my expectations or needs would be. Including the pilot that you may bring on board. But also the engine room and engine room staff. You do rely on them and have to coordinate with them and understand what they're up against in the engine room. A lot of it is hands on work that they have to do and coordinate it. And you want to give them a warning of time on what you're going to expect and need so that they can be prepared and not someplace else in the engine room. Because you can't of course see them. They're remote. The same thing with the crew of the ship and what you're doing with them. Whether it's coming into port, different evolutions that you go through for the ship coming in and out of port, getting – going through rough

weather. And the same thing with office staff. If you need some support from them you may coordinate it with them also. So you asked about engine room but then you broadened it, and I guess I broadened my answer a little bit.

Mr. Fawcett: So you have considerable Alaskan experience. So looking at the time when the marine operations manager was utilized to support shipboard operations, did the Alaskan run from Tacoma to Alaska run, did they provide the same level of support for shipboard operations that the Jacksonville operation, marine managers provided?

WIT: My experience with the company through the years I worked there was quite a bit more – mostly quite a bit more support on the Alaska run than on the Sea Star run.

Mr. Fawcett: And in which particular ways?

WIT: For a long time – well it changed. It was a smaller staff originally in Alaska, on the Alaska run. It increased to get more support for the ships. When I transitioned to Sea Star there was a large staff and it was good support, in fact I would say equivalent. But then it decreased and during my time with Sea Star.

Mr. Fawcett: And what went away?

WIT: Personnel. There was more personnel. There was a small staff at Tote in the Alaska run. That staff increased and there was more support and backup support and depth of knowledge with all those different people working there. And when I went to Sea Star there was a broad depth of personnel working in the company. Quite similar to what we had on the West Coast and I was used to that type of group of staff helping the ship on a routine operation. But that staff had been reduced in Jacksonville to 2 people basically. And they were augmented by personnel on the west coast.

Mr. Fawcett: So as Master of the El Faro when you take command of a ship do you assess the particular vulnerabilities of the ships that you command?

WIT: Absolutely.

Mr. Fawcett: So looking at a few topics and we'll just talk to them – about them in general. We'll revisit them elsewhere. Looking at the El Faro what were her vulnerabilities with respect to the design, construction and watertight integrity?

WIT: That's – this is a broad scope, a big target to discuss. Watertight integrity is the simplest one to answer immediately. The watertight integrity, with that class of ship there are large cargo doors at the tank top level which is below the waterline on the 3rd deck level which is barely above, typically above the waterline. And then on the 2nd deck also. These watertight doors are large enough for a tractor trailer vehicle to drive through. They're – that's a vulnerability because if you do take water into the holds those gaskets have to be tight and prevent water from moving into the next cargo hold. That's a hazard, that's a sea keeping hazard. The other vulnerability you have watertight integrity on that class of ship is the manhole hatches that are on the 2nd deck. That's another wear and tear item. Those are used frequently, constantly and again the gaskets get dried out. It's a maintenance item. And sometimes they get forgotten because they're off to the side. But those are your immediate watertight integrity issues. Of course you're always looking to preserve the hull and protect the structure of the ship. That's a key function. The ships are getting older. So that would be a concern always to look at. If you can visual observation is difficult on a ship like that because it's – you can't tell how thick steel is by looking at it. The structure itself and the ship – the ships were excellent ships, I enjoyed working on them. They handled

well, they maneuvered well. They did well in the rough sea. And they maneuvered well in port. So they were easy to – no I shouldn't say easy, but they were reliable and good to work with. So I think the hull was well designed, the ship was well designed. There were no visibility problems from the bridge of the ship when you were maneuvering, you could always see where you were going and what your concerns might be in handling it in close quarters situations around traffic or docking and berthing it. The Sea Star ships when you talk about structure they were ro-cons. So the containers were on the upper decks. And with a heavy load of cargo they would be a tender ship as opposed to a stiffer ship in the Alaska service. They had a higher GM. So and a tender ship is a little bit more of a different animal to handle especially in rough weather and other conditions. But for the most part they were good ships that way too.

Mr. Fawcett: And we'll revisit some of that later. But can you tell me about the – the potential vulnerabilities of the ship in terms of the engineering plant, steering systems, propulsion system?

WIT: My experience with the ship of vulnerable – excuse me, the vulnerability of the steam ship typically are most common problem would be boiler integrity. The boilers – it's a high pressure steam, high temperature system that wears out and needs repair and maintenance quite frequently. That's something you have to watch. It can happen unexpectedly with a boiler. Where a tube will let go and the engineers have to respond quickly to preserve propulsion. That was our most common difficulty with the plant. The second issue around the propulsion system was typically the condensers. We had trouble with them for quite a while, but that reliability improved toward the end of the service with my experience with the ships. They had gotten a lot of the – technology

improved, services had improved and preventative maintenance had improved where we knew what to do to keep the ships online. So the reliability was good there. The generating system, the electrical generating system was fairly good. Something could happen. Once again some technology had improved to monitor those systems so you could see it. The – another vulnerability with the operating system like that is the personnel. Having experienced people. If you don't have quite the experienced people that know the system, know the plant and know how to handle something that might fall out of the routine, or if it's something that you need done that you might not know they have the skill level to manage, you have to get personnel down there. So it's not as much a vulnerability, but it could be if it's an emergency and they have to handle it for you.

Mr. Fawcett: Do you recall during your time on the El Faro if there were procedures or checklists to restore the plant for different casualties?

WIT: There's certainly procedures to restore the plant. The – if you're restoring the plant, depending on the casualty, depending on the situation, there's probably not a lot of opportunity to go to a checklist for the engineering staff. The Chief Engineer would have to know the system and know what the problems are. If you go through a checklist and you try to go step by step it might preclude him from looking at the cause, the real cause. The very first – very first question that an engineer will use ask when they go to respond to a casualty or problem in the engine room is what's the last thing you touched, talking to the engineer on watch. Because it could be something that he caused. Or the last thing – the last alarm he heard or the last sound that he heard so that they could go right to the most recent indication of why that plant was lost. That

would be the first step in getting a solution because it's a complex system and they have to understand what they're after and they want to get the system back on as quickly as possible. So the checklist – if you went by a checklist you would start – you would really if you had a problem you might be starting in the middle of the checklist. So they would have to go to the problem itself first and then work their way from there. And of course an engineer would be able to handle that answer much better.

Mr. Fawcett: So in general could you give us your philosophy on – command philosophy on conducting drills and training?

WIT: Yes. Well drills were policy and something you did – there was a schedule for them or plan, corporate plan for them. The priority for me was always to preserve the best safety that I could see with – let me put it this way. The priority was where their greatest risk would be. If it was rough weather seas and of course there's things to look at there. If it's a ship that has a vulnerability like fire, of course you're looking at the fire. And then what kind of fire are you trying to prevent. Whether it's – or try to fight or deal with could be a cargo system or an engineering system. You want the skill level to come up there. If your crew has limitations and say a new crew of the ship you just met, I've increased drills to as many as several times a week with some of those voyages especially a ship that I didn't know any of the crew. When I worked for the company we broke out a couple ships with the maritime administration. There's so many limitations and so many expectations it's quite broad because your scope of emergencies on a ship can go from medical to fire to flooding, grounding and propulsion systems. So that sometimes you have to – you move your training to just a few parts – segments at a staff and how they will react to it. You don't incorporate the entire ship's crew.

Sometimes I focused on just the steward department with the galley fire sometimes. The bridge group with just communication emergencies so we could respond. So it's extensive and it can take a lot of your time. And after my bridge resource management and engineering training I probably looked at my vulnerabilities with the ship whatever they might be. Of course the voyage mission was right there with it. But you're always looking for what is your greatest risk and what could hurt the ship and the mission of keeping the ship safe so she can make her next voyage and keep commerce going for the company.

Mr. Fawcett: So I want to focus on just one shipboard emergency situation. In the hearing – in the first hearing we heard a recounting of a person missing at muster and the efforts that were taken at sea to locate the person and determine the status of the individual. If you were at sea and you had a muster at a life boat drill or something and couldn't find a particular crew member, what steps would you take?

WIT: We train for that. It's one of the more common things you do. And I actually design my station bill, the station bill that I prefer to use with that step in mind immediately so that you could muster the personnel and there was an expectation of – with the persons at the mustering locations of a head count. So you didn't have to know who it was you just knew immediately by head count that someone was missing. And then you could refer to the list very quickly that were kept at the mustering location, who was missing so you could respond and look at the most immediate places you would expect that person to be. Because it's an important thing depending on the emergency how you're going to react once you have your personnel together.

Mr. Fawcett: Okay. So you're at sea and you cannot locate an individual at the muster point. What would you do next?

WIT: Depends on the emergency of course and the urgency of the situation. But if it's a training situation you start working on making sure people understand how to look for people and you probably would keep a squad or use a squad to look for them first. Not just send the whole ship out there lose and then have to re-muster.

Mr. Fawcett: At some point would you consider the potential for man overboard?

WIT: Of course.

Mr. Fawcett: And what would you do. Well if we had man overboard you would react to that. And then there will be a man – I mean we're talking about drills and training here. But you would step to man overboard, protocols, get people in look out positions, turn the ship or you could simulate turning the ship to the man overboard. The situation there you would set an alarm on the bridge, or I should say there's a man overboard alarm on most GPS devices. Get the position, the last position of the ship. Start your search from that position and backtrack along the route. Looking for that. Reduce speed, get the engineering staff ready so in case you have to maneuver the engines and get the ship slowed down, which you will. And have the helmsman prepare in hand steering, of extra bridge watch, binoculars out, people on the bow. It's an all hands evolution. Someone could be in distress in the water and you want to get to them as quickly as possible.

Mr. Fawcett: So have you had occasion to have ship riders aboard the vessel that don't speak the English language.

WIT: Yes, sir.

Mr. Fawcett: And how did you deal with them from a safety and orientation point of view?

WIT: They're given an orientation immediate on board. Make sure that they understand the basics of life saving equipment that they're issued. And typically there's an interpreter or one person that's a primary contact to keep them together. And we usually bring them to the mustering location so that they know exactly where to go. Even if they are not with each other. They know where to go in an emergency and what that general alarm sounds like so they know how to respond to that emergency and what their expectation is. If it's a person that – if it's only one person or two persons and it could be, sometimes we might bring them right to the bridge so that their with the – with me in the emergency and we will take care of them from there. If it's a large group of people they would go, typically with the crew and so there's several people that can help them. You know manage the situation from there.

Mr. Fawcett: And how would you take them to the next step? In other words should an actual emergency occur and they have to board the boat or board the rafts, how would you accommodate the language difficulty based on the fact that you had non-English speakers or?

WIT: You use – well you have your interpreter and your person and then you have other crew members with them that can show them if they don't understand. Typically that would be – you would rely very heavily on the steward department, some of the other persons that did not have critical emergency skills and tasks. Then you would augment – taking care of other people with the personnel that were available.

Mr. Fawcett: Would you consider part of bridge resource management to accommodate like in a big picture the needs of the non-English speakers so that should an emergency arrived – arise they know exactly what to do and what's expected of them?

WIT: Hopefully you're prepared for that ahead of time with the orientation and the mustering directions so they know how to react. The bridge management system once you get into an emergency or steps to an emergency, they're coordinating everything with the expectation that other crew members are doing their job. There's – the communication is coming back from them if it's a remote location whether it's a fire or a life boat situation, if you can't see it directly in that ship you could look right down and see what was going on at the life boat. You would try to confirm if you could that they had everybody in position and ready to go. And if there was a problem then you would deal with it separately.

Mr. Fawcett: Thank you.

WIT: You're welcome, sir.

Mr. Fawcett: Was there ever within the Sea Star organization a duty officer that you were able to contact for maritime matters?

WIT: The Operations Manager would be the first person I would think of for something like that.

Mr. Fawcett: Looking at the experience that you've had working for Sea Star line, during Hurricane Joaquin Captain Davidson sent an email ashore about his route and intentions for Joaquin and he posed a question on the return voyage where he talked about going a different route on the return. So it was some time, time might be a little

bit in dispute whether it was 4 or 5 or 6 hours until someone at Tote responded, would that be typical in your experience when you worked for Sea Star Line that there would be that gap in time before that type of message was responded to?

WIT: It would not be unusual depending on the hours and the business hours of – sometimes it could be even longer. Depending on if there was no urgency something like that, he was coming on a return voyage so there was time for him to get a decision on that. There could have been – you would expect them to – if there's a discussion going on or other communications ashore regarding your request or the information you gave them there could be a gap in time.

Mr. Fawcett: So how often when you worked at Sea Star Line did you communicate ashore with the SAT phone?

WIT: It depended. I wouldn't hesitate to use the satellite phone. At least every voyage. Or I shouldn't say every voyage, but every tour which was a 10 week set of voyages. It was a voyage every week roundtrip. If it was a matter of discussion at a lot of times it was around engineering and we would be in communication with them, or repair or scheduling. It was easier to discuss by phone I would say. It was routine to go at least every month, you know to be on the phone.

Mr. Fawcett: Is there any prohibition to using the SAT phone to communicate ashore? Any limitations on it?

WIT: No, sir.

Mr. Fawcett: On the Puerto Rican run?

WIT: No, sir.

Mr. Fawcett: I just have a couple of more questions and I'll wrap up this section. Could you just in general describe your interaction as Master of the El Faro with ABS surveyors?

WIT: It was good. I tried to meet them every time they were on board. But sometimes they didn't need to meet the Master. And if they didn't I didn't get involved with them. I would just be available for them. They were good to work with

Mr. Fawcett: How about your interaction with Coast Guard inspectors during your service as Master of the El Faro?

WIT: The same.

Mr. Fawcett: And then just my final question, when the marine operations managers were in position, were the lines of authority between you and ashore clear and unambiguous?

WIT: Yes.

Mr. Fawcett: Later on when the transition occurred where you are now reporting to Mr. Matthews, would you say the same of the lines of authority?

WIT: It was more difficult because the transition was going to the West Coast and it was a transition period so I think things were changing and it wasn't quite clear. Mr. Wagstaff was stepping in to operations, but I don't know if he was yet up to speed on ship operations completely to handle things. So when it was disseminated to the operations group I wasn't always sure exactly who was making the final decisions. It depends on who they felt had the most experience with it or a person that was closer to be able to handle and respond.

Mr. Fawcett: Thank you very much, sir. That's the end of my questions for this round.

WIT: Yes, sir, you're welcome.

CAPT Neubauer: Captain Hearn we're about to transition to use a different line on stability and cargo securing. We've been going for an hour, would you like to take a break and we'll get back into it.

WIT: I'm fine if you want to continue.

CAPT Neubauer: Okay. All right we'll keep going then, sir. The next line is on stability. Sir, I would like to talk about the stability that you experienced while doing the Jacksonville to Puerto Rico run on that class.

WIT: Yes, sir.

CAPT Neubauer: Now did you – were you the Master of both the El Faro and the El Morro for that run?

WIT: Yes.

CAPT Neubauer: And were you working for Tote around the time frame that the Horizon Lines went out of business for that run?

WIT: Yes.

CAPT Neubauer: And did you notice any differences in the cargo load outs at that time, sir?

WIT: Cargo was increasing, cargo volume and tonnage increased. We were picking up the available cargo that was – that we could fit on the ship.

CAPT Neubauer: Would you say that the loads started to go to full load at that point?

WIT: We were going to full loads.

CAPT Neubauer: And when the transition occurred was there a designated GM safety margin that used?

WIT: There was.

CAPT Neubauer: And what was that margin?

WIT: We – as we, a little bit of an explanation there on that margin. The minimum GM is calculated, but several of the Masters had discussed that I know, I was involved, that the ship was very tender and it was a change in ship handling. It's something concerning when a ship rights itself more slow then when it typically would right itself. And we felt more comfortable having a margin above the minimum GM requirement on arrival in San Juan. So we determined that in all good conditions .5 above the minimum GM required for safe passage was acceptable. That we would arrive with about 2 ½, .25, .3 above, still with good GM.

CAPT Neubauer: Do you remember the Masters that were involved in that discussion?

WIT: Yes. I'm pretty sure that Pete Villacamp [sic] and myself, I know I was very involved with it. And it could have been Silo Convolo [sic] at the time, although I think he had already left the company. I would expect Mike Richey and possible Captain Loftfield.

CAPT Neubauer: Was there any company managers involved in that process, sir?

WIT: Bill Wisenborn [sic].

CAPT Neubauer: You said there was some concern voiced ahead of that meeting, was that due to the vessel at the end of the voyage in Puerto Rico?

WIT: Yes.

CAPT Neubauer: Can you describe some of the conditions you experienced?

WIT: What I was observing with the ship was a very slow return, it was a – the ship was becoming even more tender on arrival then when it was when it left. You could even

feel the ship list, I shouldn't say list, but lean over as she rolled from a rudder command alone, let alone rolling with a heavy swell. And because it was slow to right itself you could feel the ship respond more difficultly. And there's always a concern that she's not going to right herself adequately for other conditions. So we felt it important to build in a safety margin in case any other conditions changed during the voyage. That you needed that safety margin to preserve the stability of the ship. And for the routine voyage we had decided that decimal 5, .5 foot above the minimum safe GM would be adequate.

CAPT Neubauer: When you experienced that heel due to the rudder commands, what kind of wind and weather were you in at that time?

WIT: Negligible really.

CAPT Neubauer: Before using a .5 foot minimum departure margin what margin is generally used?

WIT: There was no policy on it before that. We had not been experiencing these heavy loads and full capacity loads so it was a new experience for the company. At least in my experience with them.

CAPT Neubauer: Would – are you aware of any departures that occurred right at the required GM?

WIT: No.

CAPT Neubauer: Captain, did you have the ability to check your stability calculations while underway?

WIT: Yes I did.

CAPT Neubauer: Was that frequently done?

WIT: Every voyage.

CAPT Neubauer: And when did you – when would you generally check the GM underway?

WIT: Almost immediately after departure from port. The Chief Mate would get the report, generate a printout report and post it on my door. And once the ship was underway and clear of port I would then go down and take a look at it. If there was any concerns he would bring it up to the bridge and sometimes he would bring it up to the bridge anyway to let me know.

CAPT Neubauer: Did you ever check it in route after you were underway for a few days?

WIT: Yes, often.

CAPT Neubauer: Did you ever get a changed loading report from shore after getting underway?

WIT: Not that I recall. It could have happened, but I don't recall anything.

CAPT Neubauer: Did you actively get involved with reviewing the stability load outs prior to departure?

WIT: Prior to departure, if it was – if there was a concern, it may be something that was brought to our attention. Anything that was a concern that's brought to my attention I would get involved with.

CAPT Neubauer: Did you feel you had enough time from the end of loading to when you got underway to adequately review the stability?

WIT: Yes. The routine of the ship is to expedite time and efficiency. So there was an expectation of trust among the officers and the management system that everything

would fall in line correctly. And if it did not then it's the kind of thing that we would have to correct so that we could maintain that efficiency of operation.

CAPT Neubauer: You mentioned that you have a lot experience on the Northern Lights ----

WIT: Yes, sir.

CAPT Neubauer: In Alaska. And that there was a difference in the vessel when it was converted to con-ro.

WIT: Yes, sir.

CAPT Neubauer: Handling-wise. Did you ever hear any concerns voiced from Tote management during the conversion process for the Northern Lights to El Faro for con-ro service?

WIT: No, sir. But I have to correct, add, that I was not with the Northern Lights at the time of conversion. I was on the West Coast with another ship. When I came to the El Faro the ship had already been converted from the Northern Lights.

CAPT Neubauer: Did you ever hear from any safety managers shore side of any concerns with the stability for the vessel after the conversion?

WIT: No, sir.

CAPT Neubauer: Were you aware of a potential flooding hazard from the vent ducts that supply the cargo holds and engine room on the El Faro?

WIT: No.

CAPT Neubauer: Thank you Captain. At this time I'm going to pass the questioning to Mr. Kucharski.

Mr. Kucharski: Good morning Captain Hearn. Mike Kucharski, NTSB.

WIT: Good morning, sir.

Mr. Kucharski: Captain Neubauer with your permission I would like to go back to the initial line of questions and ask general questions.

CAPT Neubauer: Of course.

Mr. Kucharski: Captain Hearn, so – so I guess I'm crystal clear and everyone's crystal clear on your experience with the Tote vessels, you mentioned you were Master on the Tote vessels, this is the Ponce Class vessels we're talking about, correct?

WIT: Yes, sir.

Mr. Kucharski: And the ro-ro service on the Alaska service, was that roll on, roll off?

WIT: Yes, sir, completely. To the upper decks it was completely roll on, roll off.

Mr. Kucharski: And which vessels did you have experience on?

WIT: All of them. The Westward Venture, Great Land and Northern Lights in Alaska. And I did serve on all three ships for Sea Star in Puerto Rico.

Mr. Kucharski: Okay. So you served on the ro-ro vessels as Master in the Alaska run prior to the draft marks being changed when it was in a ro-ro service and then you went over to Sea Star and were those vessels all in the con-ro containers with the rolling cargo?

WIT: Yes, sir. The Sea Star conversion was a ro-con with containers on the upper decks and not ro-ro completely.

Mr. Kucharski: And when you mentioned you went to the Persian Gulf, I'm sorry, correction, the Mideast, what vessels was that on?

WIT: I was Master of the Northern Lights on a voyage and then I – and then after it was converted to the El Faro which is a ro-con class, I was Master of that ship. So I've done both types of vessels to the Mideast.

Mr. Kucharski: To the Mideast? Both types, both ro-ro and?

WIT: Ro-con.

Mr. Kucharski: Ro-con. So the – to build on what Captain Neubauer was asking about the way the vessels handled or the stability margins, can you comment on that the differences from when it was in ro-ro service to con-ro?

WIT: Well depending on how the ship was loaded of course also. The – there was two stability issues with the ro-ro class ship where it was a lighter load. The stress was typically a concern, not a limiting factor. The ships would get very close to a 90 and even exceed it, or close to 100 percent margin on stress. But you did not have a GM problem with that ship in either direction. They were – you didn't have to worry about your margins there at all. They were good. You had good stability, the ship was a little stiffer, so it would react quicker and right itself faster. The concern there of course is cargo and personnel, the stress factors on them. The acceleration of course are greater and quicker. The ro-con type ship especially if it's a heavily loaded ship is more tender and slow reacting to right itself. It's – and because they were carrying heavier tonnage they were slower. So you had a ship that just by tonnage it would react slower and manage slower in a close quarters situation, docking, berthing situation and a sea keeping situation. So those are the key points. But the ro-con did not have the stress limitation. You didn't have to worry about stress. But the added tonnage in the mid-body of the ship she was not stressed.

Mr. Kucharski: Do you remember what your stability margins in a fully loaded condition were on the, when they were in the ro-ro configuration going to Alaska?

WIT: I recall around 6 foot GM and I think it could be as much as 12 foot GM South bound with real light loads. But it's been quite a while since I took them on that run.

Mr. Kucharski: Okay. So you're saying that was excess GM or is that ----

WIT: No that would be about the GM number. The required GM was probably around 3 ½ feet, 4 feet.

Mr. Kucharski: So on the loaded North bound in Alaska if she had – the vessel had 6 foot GM ----

WIT: That's what I remember, sir.

Mr. Kucharski: And 3 ½ so it had about 2 ½ feet of excess GM?

WIT: Correct. If you want to call it excess, but margin above ----

Mr. Kucharski: Margin.

WIT: Minimum.

Mr. Kucharski: Captain Neubauer do we want to continue on stability questions?

CAPT Neubauer: Yes.

Mr. Kucharski: Captain Hearn was there any angle of heel which you would be concerned about after it was converted, the Northern Lights to El Faro to the containers on deck? Was there any angle of heel that you would be concerned about as far as for cargo breaking lose?

WIT: Yes. You're always concerned when you start to roll the ship and heel. But once you get to about 15 degrees things can start moving a little quicker and stress the lashings. The cargo is relying on the lashings almost completely to stay in position.

And you don't want to exceed, start exceeding that or getting close to the limits. Cargo can stay in position even at 30 degree rolls. And the roll period is a factor in your concern if it's fast or slow. A tender ship tends to hangover slower to react and respond upright, become back upright. When it's slow like that it hangs on those lashings and gives more opportunity for the cargo to shift or move. When it's faster, if it's very fast acceleration forces are greater and break the lashing. So it's a concern either way. You don't know what – depending on the type of cargo or the cargo concern I usually try to be concerned about my weakest cargo lashing or my weakest cargo – my greatest cargo concern what it might be, whatever limiting factor and if I can keep the ship steady for that cargo then the rest of the cargo is usually safe enough to stay in position. Typically it would be the ro-ro cargo down below decks on the second deck. That's the highest area of center – above the center of gravity for them. And they had the fewer lashing points to block cargo, the containerized cargo on the upper decks was very reliable. And you could observe it visually from the bridge. Even at night we would flip on the deck lights and if you saw cargo moving you might recognize that you have lose lashings or lashings that have moved and you can go out and make a correction.

Mr. Kucharski: Captain we'll revisit cargo lashings in a little bit.

WIT: Yes, sir.

Mr. Kucharski: On the stability line was there any sea state and or wind state you would try to avoid on the El Yunque, the El Morro and the El Faro? You were Master on all three of those vessels, is that correct?

WIT: Yes, sir. Depending on direction, if it was on your beam of course it's a greater concern then head on or even on your stern. But once you get to the sea state 7, you're

starting to get near gale force conditions. And sea conditions, depending on the fetch the ocean distance where that swell – there could be a developing swell along with it that might be greater than sea state 7 seas. So you have swell with it. And that could bring your bigger problems. Especially on that run you didn't always have a rough sea state, but you could have ocean swell that was greater than the sea state conditions. And that would be your first concern or something you would watch. And I would say that, you know once you start taking beam seas at 15 feet, 10 to 15 feet you have to be careful with your ship. But the ship will tell you. She'll start moving and rolling.

Mr. Kucharski: And just concentrating on stability, would that what you just described for 7 sea state of 10 to 15 foot on the beam, would that be a concern for stability?

WIT: Everything's a concern for stability once you start moving the ship from her upright position. If things change or move within the ship or something could change and that could change your stability factors. So you're always concerned about every little – every detail of the ship and you want to preserve the original stability and the original position of the ship as long as possible. Not only for cargo equipment, but personnel, efficiency of the voyage, maintenance, the work that's being done, people are working around other components. Things that are hot, tools, steam lines in the galley, guys are moving equipment they could get hurt. So you want to keep the ship as stable as possible for the personnel living on board.

Mr. Kucharski: During your time as Master for Sea Star only, from Sea Star, correction, from Sea Star onto the new management at – from Sea Star to Tote if you will, was there any discussion of sea state conditions or wind conditions to avoid on those vessels with the Tote personnel or the Sea Star personnel shore side?

WIT: Not that I recall, sir.

Mr. Kucharski: Can you tell us what wind heel means to you?

WIT: What it means to me is the reaction of the ship to the wind that would force a ship to have a – almost a permanent angle and heel over from simply the wind forces alone.

Mr. Kucharski: Did you experience wind heel going back on the ro-ro ships up in Alaska?

WIT: Rarely.

Mr. Kucharski: I'm sorry your answer was rarely?

WIT: Rarely. Yeah it might be a very temporary wind heel that would buffet the ship a little bit, but I would say it would be negligible.

Mr. Kucharski: Okay. Now compare that to the ships on the Puerto Rican run after they were converted to containers also.

WIT: Umm huh. I really think it's, if it did have a wind heel it was hard to determine from the difference with the swell. And if it was a wind heel or a wind force that wasn't sufficient enough to push the ship over a little bit it would be negligible a degree or two and you couldn't measure it or discern it from the swell condition and the other forces that were moving the ship.

Mr. Kucharski: Were you aware of any wind heel calculations that were performed on the con-ro?

WIT: It's hard to remember entirely the stability manual and the stability information for the ship. I haven't seen it for quite a long time now. But I – and I've looked at a lot of stability manuals since – some of my recall is mixed with those conditions. But if it was in there I would have looked at it. But my experience with it was it was not a serious

factor for me to consider when I was managing the ship with other – other – other issues.

Mr. Kucharski: How about in CargoMax the loading computer? Do you recollect seeing any wind treatment in there?

WIT: I don't. Yeah there was a calculation and a figure on the side.

Mr. Kucharski: Were you aware of any particular down flooding points along the hull of the vessel after, either before or after the conversion?

WIT: On the inside of the side shell or outside?

Mr. Kucharski: Outside of the side shell down – well were you aware of any down flooding points either inside the shell or outside the shell?

WIT: Well inside the side shell of course the manholes and the watertight doors, the cargo doors that we discussed earlier. The number 1 and number 2 watertight doors. And there were man doors inside those also. There were two others, you can call them scuttles, but they were watertight doors into the machinery space 1 aft of the superstructure. That was also an emergency escape for the engineers that went all the way down to the stern tube. And the second one was aft on the fantail that went down into the steering gear area. And then there were scuttles along the side shell near the side shell on the side of the ship that went into the cargo holds.

Mr. Kucharski: Okay. You were aware of the down flooding points on the exterior of the ship that went into the cargo holds?

WIT: The only area that water could ingress into the cargo holds from the side shell would be the ventilation trunks that I can recall.

Mr. Kucharski: Did you ever see any calculations or any reference to that in the stability manual?

WIT: I don't recall it.

Mr. Kucharski: Captain Neubauer I don't know if you want me to continue as far as securing and down flooding areas?

CAPT Neubauer: Let's do the stability down flooding. And we'll do cargo securing next round.

Mr. Kucharski: Okay. Securing the vessel as far as closures go.

CAPT Neubauer: Yes, let's continue with stability and then we'll do a break.

Mr. Kucharski: Captain Hearn did the company have any policy for closing of watertight doors and hatches?

WIT: Well the policy is regulatory. Regulatory compliance. All the watertight doors and hatches had to be secured prior to leaving for sea. They were inspected before leaving for sea. And it was documented and logged that it was secured. And if it was opened at sea for any reason it was also logged and kept a record of.

Mr. Kucharski: Were the watertight, the scuttle, are those watertight closures?

WIT: Yes, sir.

Mr. Kucharski: Were those opened and closed at sea?

WIT: They were opened and closed at sea.

Mr. Kucharski: For what purpose?

WIT: Maintenance and checking of cargo.

Mr. Kucharski: Were those logged during your time when they were opened?

WIT: No they were not. That was not considered a cargo door. So it was – but it was an ingress into the cargo spaces and it was a routine to inspect those at night to make sure that they were – in case somebody left them open they would be secured again.

Mr. Kucharski: And who inspected those?

WIT: Typically the Boatswain would make a round when he finished working in the evenings.

Mr. Kucharski: Did he report to anybody that they were all dogged or closed?

WIT: It became a routine. I know on the Alaska run we did. On the Puerto Rico run it should have been a routine for the Boatswain to check into the bridge, but I don't recall them doing it very well on that run.

Mr. Kucharski: The dampers on the outside of the hull forward.

WIT: Yes, sir.

Mr. Kucharski: Were those fire dampers?

WIT: Yes.

Mr. Kucharski: Were they normally opened or closed at sea?

WIT: Typically they would be open.

Mr. Kucharski: And why were they left open?

WIT: Natural ventilation to the cargo spaces and because those spaces were vehicle spaces, you wanted some air to get into the area.

Mr. Kucharski: Did you ever close those?

WIT: They were closed routinely to make sure that they could close, but they were fire dampers. They were closed at least and inspected every month to make sure they were operating correctly. I don't recall ordering them closed for any other – any reason.

Even if we did have some sea spray in the area it was negligible amount of water that came through.

Mr. Kucharski: Thank you Captain.

WIT: Yes, sir, you're welcome.

Mr. Kucharski: No further along that line.

CAPT Neubauer: Mr. Roth-Roffy.

Mr. Roth-Roffy: Tom Roth-Roffy, NTSB.

WIT: Yes, sir.

Mr. Roth-Roffy: Good afternoon Captain Hearn.

WIT: Good morning, sir.

Mr. Roth-Roffy: Sorry, good morning. I would like to revisit the GM margin issue that was previously addressed by other panel members.

WIT: Yes, sir.

Mr. Roth-Roffy: You mentioned that when the vessel started carrying heavier loads on the Puerto Rican run that there was some concerns or issues with tenderness of the vessel and that there was some internal discussions about increasing the GM margins. Do you recall at what GM levels you experienced these tenderness conditions on the vessel?

WIT: Well it was less than 4 feet, I think around 3 ½ to 3, I think it was 3 ½ feet. I'm trying to remember the numbers without a reference. It wasn't necessarily the GM, while I looked at it and found that the margin was close, but it was the ship itself that was indicating a tender ship which was a difference experience in the GM. And looking at that margin I immediately recognized also of course that we had to preserve that

margin of safety. And looking at the fuel burn that we had to make sure that we could do it in a routine voyage that we had an extra margin to maintain, good stability for the ship. Required stability for the ship on arrival in port. We, over a number of voyages determined that .5 was adequate minimum.

Mr. Roth-Roffy: So the trim and stability and the CargoMax had the limits specified, is that correct?

WIT: Yes.

Mr. Roth-Roffy: Presumably, or could you discuss what your understanding is of that limit that if you approach the limit would the vessel maintain adequate stability or was that the absolute limit at which you should never go below?

WIT: No, sir. You would still have positive stability if you went below that required GM. Because the ship was tender it was, and a mariner has a natural concern when you upright yourself, the ship uprights slowly. You want the ship upright. So we had discussed it and we wanted a margin of safety built in so that's how we came to that number. But you still had, even if you went below the required GM the ship still would l have positive stability until the center of gravity met the metacenter and then of course you would not have positive stability and she could quite possibly would roll over. But there was plenty – it was several feet. And that factor is quite large to destabilize the ship, you know it's for several feet. So you have some margin there.

Mr. Roth-Roffy: So that GM limit there was still a measure of safety or conservative ---

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WIT: Yes, sir, that's calculated by the Naval Architects in the system and you have to preserve.

Mr. Roth-Roffy: So when you experienced these tender conditions on the vessel you didn't have any concerns that the – there was any errors or problems with the stability calculations expressed in the T&S booklet or CargoMax?

WIT: I trusted them.

Mr. Roth-Roffy: Regarding the stability margins, was it your practice or the company's practice to adjust the margins, the GM margins for different weather conditions? For example if you anticipated heavy weather during a voyage. Would you consider increasing even beyond the .5 margin?

WIT: If we had a limitation like that and there was concern, it would be something that would be heavily discussed with the company. Because it's a – it was a tight margin. And it was at the time we considered it, a .5 it was something we wanted for good weather, routine voyage conditions. So if it was going to go past or change from those original expectations it would be – it will be something that should be discussed among management because it would change the load and the cargo, the ability to carry cargo. And if there was a compromise there of how we would manage the voyage and keep the ship in a safe condition for the voyage.

Mr. Roth-Roffy: So if you were departing Jacksonville anticipating meeting heavy weather conditions you would consider increasing that GM margin above .5 is what I'm understanding. What level would you seek?

WIT: The answer to that is yes. And I might even – I would, shooting from the hip here without an opportunity to calculate it which I think we would try to do, even if it meant taking another hour to discuss it which we had the full load and knew exactly what we were dealing with, with the ship. I wouldn't hesitate to discuss with operations that we

need to go a different route or to take some cargo off and go for about a foot to double that number. And at least preserve a stronger margin knowing that we could have – we could lose some of that margin, that safety margin to get to the required GM with known factors such as free surface effect.

Mr. Roth-Roffy: Thank you Captain. That's all I have.

WIT: Yes, sir.

CAPT Neubauer: Captain Hearn we've been going for 90 minutes. Let's take a 15 minute break and we'll pass the line of questioning to the parties in interest next. And the hearing is now recessed and will reconvene at 1045.

The hearing recessed at 1031, 17 May 2016

The hearing was called to order at 1049, 17 May 2016

CAPT Neubauer: The hearing is now back in session. At this time we'll go to the parties in interest to continue on the line of questioning. Tote, please.

Tote Inc: Thank you Captain. Captain when did you leave your employment with Tote Services? I just want to make sure that's clear.

WIT: The summer of 2013.

Tote Inc: Okay, thank you. When you were working on the Alaska run and Jacksonville, who was your employer?

WIT: Inter Ocean American Shipping. It could have been at that time Inter Ocean, they've changed names. IOT, IUM.

Tote Inc: And Inter Ocean became Tote Services, correct?

WIT: That's correct, sir.

Tote Inc: And so you never worked for Sea Star or Totem Ocean Trailer, correct?

WIT: I did some work for Tote directly as a pilot in Alaska. First Class pilot just briefly to fill in for one of the pilots that took a leave of absence. And I – but I don't recall ever working for Sea Star directly.

Tote Inc: Okay, thank you. There was some discussion about the impact of Horizon Lines going out of business and how that purportedly increased the amount of cargo being carried on the ship. And I think you said you left in the summer of 2013.

WIT: That's correct, sir.

Tote Inc: And are you aware that Horizon Lines last sailing was in December of 2014?

WIT: No, not aware, I wasn't there at the time.

Tote Inc: Okay, thank you.

CAPT Neubauer: ABS do you have any questions?

ABS: No questions.

CAPT Neubauer: Mrs. Davidson do you have any questions?

Ms. Davidson: No questions.

CAPT Neubauer: Herbert Engineering do you have any questions?

HEC: No questions.

CAPT Neubauer: All right. At this time we'll go to a new line of questioning. I'm sorry there is a couple more follow ups. Commander Denning.

CDR Denning: Good morning Captain. Just a few follow ups on that last line of questioning.

WIT: Yes, sir.

CDR Denning: And then we'll move on to another line. You mentioned specifically some folks, you know operations management folks within the company who you relied

on for advice. Can you tell us a little bit more about their background and specifically why you trusted that particular advice?

WIT: The first person that comes to mind with Sea Star it was Bill Wisenborn [sic], the Operations Manager. He had been with the company and I believe since the beginning, meaning when they started Sea Star service with the El Yunque and the El Morro. He was a Kings Point graduate. He had some sea experience, but he had a lot of voyage experience working with the other ship Masters and the operation itself so that some of the experiences that were encountered by other ships and other Masters were passed on to him. And if I had a conversation sometimes he would reference things that he had learned from them.

CDR Denning: Can you give us a few examples maybe of some of the conversations you had or advice you sought and some of the input he gave you as a vessel Master?

WIT: Yeah voyage planning, route. We were looking – I was looking for opportunities to pick up current or make the voyage more efficiently so that we could reduce fuel costs and fuel burning through fuel efficiency. And we talked about that quite a bit. But in talking to him I found that it was really a, almost a difficult thing to find. You know there was not a seasonal experience at any of the Captain on the run had learned, and he confirmed that for me. So that's an example, but.

CDR Denning: And – sorry.

WIT: That was just an example of what he did for me.

CDR Denning: And when you say seasonal experienced, is that weather related? Is that what you mean by that?

WIT: Yes, but when I say season I mean the winter season compared to the summer season. Sometimes currents change. And along with weather conditions change. And you might have a summer current that you wouldn't have in the winter time and you could take advantage of.

CDR Denning: So currents. And was he – did he provide guidance or advice to you specifically regarding weather avoidance as well?

WIT: He has. And it was something that we had discussed. In fact when I first went there we – I was on the run to the Mideast and sometimes we couldn't get a reliable weather information. Mid-Atlantic and across and he sent weather reports to us, or the office would, the staff under him. And he was very good in discussing opportunities for other weather systems. In fact we purchased the weather system to give us more reliable weather information on that run. And that system was used later for all the ships.

CDR Denning: And what systems were those?

WIT: I think it was called Bon Voyage.

CDR Denning: Which is the system that was – that we've heard a lot of testimony about and was – has been on these vessels for some time, correct?

WIT: I guess it has now. I used it and it was very good weather reporting, it was a little different than the National Weather Service weather reporting and it gave you color and information that you could visualize a little quicker and discuss. And weather is important to a ship. You watch it all the time.

CDR Denning: Do you recall approximately when that system was purchased?

WIT: Probably 2008.

CDR Denning: And to the best of your knowledge has there ever been a time when Bon Voyage has not been employed on the vessels since – from that point until the time you left?

WIT: No I think we had at least the weather information from it.

CDR Denning: So can you tell me how often you would reach back to either Mr. Wisenborn [sic] or someone else in operations for – to seek advice on the topics you just mentioned?

WIT: It was always on my list of things to do. If there was a subject developing whether it was maintenance or operationally related it was an opportunity to – because sometimes they were not available to visit and conversations are difficult unless it's a person to person, so it was an advantage to have someone to discuss these things with and so I looked for those opportunities. And if I had a list of items to go over with them that I missed one week I would catch them the next week if I had that opportunity.

CDR Denning: You mentioned when Mr. Fawcett was leading the questions earlier on, you said at one point the operations folks in the office had reduced to two. Do you remember a time frame when that occurred and how that transition went?

WIT: Not completely. I think around '11 or '12, but I'm not sure.

CDR Denning: Then you mentioned that at times those – who – those that were left would sometimes be augmented by people on the West Coast. How did that process work? The augmentation process.

WIT: Well that was managed by them. And I would be answering for them if I understood it. So they sent people when they felt they needed to or the communications was done there with them. I would imagine that they, it's hard for me

to remember now, but I think they were probably involved in the operations or engineering general information emails and communications that came from the ship where it was forwarded from – directly from the person in Jacksonville here dealing with them completely. So that network was built into the communications for the company. And if there was a person assigned to a responsibility, that came from the West Coast also to help manage it.

CDR Denning: And when you say the West Coast can you recall who was consulted on the West Coast?

WIT: Well the senior managers that, I would imagine made decisions on who would be assigned for the work to get done or they would handle it themselves. It would be either Cliff Hill or Phil Morrell.

CDR Denning: And who did they work for at that particular time?

WIT: Tote.

CDR Denning: When you say Tote it's challenging to a certain extent with parent companies and subsidiary companies.

WIT: Tote on the West Coast on the Alaska run, that service out there. I don't know the name of that company off hand. But it was called Tote back then.

CDR Denning: So would that be Totem Ocean Trailer Express?

WIT: Yes, sir.

CDR Denning: When you were describing the process by which the Masters of the vessels got together and determined the .5 GM margin you specifically mentioned Bill Wisenborn [sic] as a person from the company that took part in those conversations. What input did he provide to those particular discussions?

WIT: Well because we couldn't get together the conversations happened with Bill as the contact point and the management point. He would discuss it with the Captains as he visited the ships to discuss, you know something that was changing and something that we should build a safe parameter around. So he was the lead officer of it, the manager representing the company of course. And if he thought he needed to take it to another level that was his responsibility. And he coordinated the discussions with other Masters directly.

CDR Denning: Did you feel like he was supportive of the desire to create that margin?

WIT: Yes.

CDR Denning: So did you sense any resistance or push back from him personally?

WIT: No.

CDR Denning: Did he relay to you any resistance or push back from the rest of the organization?

WIT: No it was a responsible – I had a feeling of a responsible management, culture.

CDR Denning: I just want to clarify one answer, question and answer. Captain Neubauer asked you whether you would check, you know CargoMax paperwork while underway several days in. And I just want to clarify for the record your answer was often. Did that mean you would continually recheck it? In other words you had already, or was that the first time you would check it, days in?

WIT: No, I would check it immediately on start of the voyage. And I kept it posted over my desk. So it was right there in front of me. It was something that I would look at regularly. It was a very routine document to have posted there, but it was right there if I needed it immediately.

CDR Denning: When you were asked about the – you spoke about the boilers and you mentioned they needed frequent maintenance. A phrase you used you said sometimes the tubes would let go. Can you describe what you meant by that?

WIT: A boiler tube letting go would be a rupture in the boiler tube and you would lose water in the boiler. You would essentially lose the boiler. And there was another boiler down there. I don't want to speak for engineers and an engineer procedure to preserve propulsion, but letting go would mean that that boiler tube blew out and had a structural – a failure.

CDR Denning: And then my final question when you were discussing wind heel and specifically in light of the conversion from ro-ro to ro-con. Is some of that wind heel, the increased wind heel that you would experience was that due to the additional sail area of the containers on deck? Was that ----

WIT: That's what I would anticipate, sir.

CDR Denning: Thank you. That concludes my questions Captain.

WIT: Yes, sir.

CAPT Neubauer: Commander Odom.

CDR Odom: Good morning Captain.

WIT: Good morning, sir.

CDR Odom: So I know you don't want to speak too much for engineering, but I just have a few more engineering related questions I would like to ----

WIT: Of course.

CDR Odom: Specific to weather was there ever any other issues that caused propulsion issues like lube oil sloshing in the sumps that you're aware of? Or sediment in the fuel and clogging the filters? Did that ever become an issue?

WIT: We're talking about engineering and weather conditions?

CDR Odom: Yes, sir.

WIT: Yes. Fuel is a concern. The rougher the weather the more possibility that sludge, because fuel – some of the sludge settles to the bottom of the tanks. And in rough weather or movement with the ship that sludge mixes with the oil as it would and it gets into the strainers. And the strainers need to be cleaned more frequently. It's a difficult messy process and if the ship's moving at the same time it's a problem for them. Even though it's heated. So that's a concern. Another concern with rough weather is the steam lines and around the steam plant. They're moving, they're hanging on what they call hangers. But if a hanger breaks or heavy steam lines with superheated steam under high pressure it's a danger for the personnel down there. You're concerned about the steam line breaking, fracturing, moving away and letting go or a gasket letting go and it can hurt an individual that's nearby severely, but it can also fill the engine room space up with steam and it's difficult to breath.

CDR Odom: Did you have hangers let go while you were onboard the ships?

WIT: I've had steam lines fracture.

CDR Odom: And what about the lube oil sloshing, was that ever an issue?

WIT: Not that I recall. The lube oil itself is usually – I don't remember losing lube oil or having a problem with the lube oil system.

CDR Odom: Thank you. And what about – did prop cavitation ever become an issue in heavy seas?

WIT: It's an issue. It's something you would be concerned about, I wouldn't say cavitation, but vibration if the propeller comes out of the water. Which happens in rougher heavy swell, rough sea or a heavy swell. And you can feel that vibration. The propeller system hangs on struts. So it's, on that class of ship it's not only outside of the hull the stern tube is outside of the hull. And it's vulnerable to damage. And the lubrication system to it is vulnerable also. And the seals are vulnerable. You want to preserve that and protect it. Not only protect the machinery itself for voyage reliability but also damage in a storm. So it's – it can be a concern.

CDR Odom: Can you describe some mitigating measures that you would take to manage that?

WIT: Well if you're slamming your stern which is the concern which means that the water – the stern of the ship comes out of the water and then settles into the next troth of a wave with the force and the tonnage of the – the weight of the ship itself, it slams and it's a pounding of the entire ship. You have to imagine 30,000 tons pounding at once. It's heavy and you can feel it through the entire ship. That's – could be catastrophic to machinery itself back there. And that's the concern and the damage that can happen. What you do if your stern is slamming is typically the first thing you try to do is I would get the ship into a head sea and ride it – you know ride better and slow down, reduce speed. So speed is a factor if you can – if it will manage the weather enough.

CDR Odom: And did it ever become an issue? Did the weather ever become so rough that water entering the stacks, or coming down through the stacks would affect the boilers and their performance?

WIT: No, sir.

CDR Odom: Thank you. Also we've heard that they have the capability when you lose power in the engine room to back feed from the emergency generator to the engine room for the purpose of restarting the boilers. Were you ever on board whenever that was done?

WIT: Yes.

CDR Odom: Is that – how long does that take for them to align that system up and get power back to the engine room?

WIT: It depends on the problems you're dealing with. And that can complicate the situation not knowing what the problem might be. Another factor is the experience of your personnel and how well skilled they are in understanding those steps and procedures. If they're not experienced with it you have to communicate with them and take steps – measures to make them understand so they know how to move along with it. Because it's a – there's a trick to it and the Chief Engineer would be managing it.

CDR Odom: So was that something that was routinely – a procedure or was it something that they train to the engineers or they would practice it at some point to teach the engineers how to do that and line it up?

WIT: There was no training that I recall for something like that. Although the engineers learned all the systems through their experience with the ship. Some of it would be routinely done if there was expected maintenance on the ship. And they would get that

experience and learn it so that if you had well experienced engineers they would know immediately these procedures. That's what they do. They learn these procedures and get to know them very well. If it's a first time for someone then they would have to be learning it as they go. But the Chief Engineer would be very familiar with it. The First Engineer would typically be very familiar of these steps and procedures. But once again if there's a complication to the machinery system or systems they're giving them a hard time that they're dealing with then they're managing that at the same time and that makes it complicated in those steps. You know the issues have been broadened for them.

CDR Odom: So if, going back to blowing a tube on a boiler or if you were in a situation where you went down to one boiler, how would that effect your maneuvering of the ship and the performance of the ship?

WIT: Ship on one boiler you don't have quite the steam power so you're going to go slower in propulsion. And in reaction within maneuverability you have a slower response to the system.

CDR Odom: Thank you. Based on the time that you worked on the ships, I'd like to shift gears a little bit and go to the regulatory process a little bit.

WIT: Yes, sir.

CDR Odom: When you first started on the ships they were fully inspected by the Coast Guard and they held a certificate of inspection that was completely managed by the Coast Guard. And in the late '90's I think your ship enrolled in the alternate compliance program. Are you familiar with that?

WIT: Yes, sir.

CDR Odom: So can you kind of talk a little bit and describe some of the differences from before the alternate compliance program and whenever your ship was fully inspected by the Coast Guard and the shift over to the alternate compliance program and the survey process and then the Coast Guard taking a step back and only doing exams on your vessel?

WIT: I can. This could be a lengthy discussion really because there's a lot going on there with the changes. When you had a full Coast Guard inspection and Coast Guard officers came on board there may be several officers and typically would be more than one. They had areas of expertise. Sometimes different Coast Guard officers would come. It would take, depending on the plan and the operation of the ship if you're in a shipyard and you had lay time and period the Coast Guard would stay right on board with you and work. It was typically a 2 or 3 days evolution of tests, procedures and inspections. And they had a book of material – of information that they would go check and look at. And different officers on the ship would show them around and prove the systems or give – or help them with the inspection so they could find their way around quicker, make it more efficient. When that transitioned to the American Bureau of Shipping inspection it was very similar including the period opportunity. The ABS surveyors were sometimes more experienced personnel. They were – it wouldn't be unusual to see them know the ship or the class of ship from other experiences. They also had a broader and longer length of service and experience typically because they were not serving in the Coast Guard. So they were older people that had seen more things. And equally good to work with and sincere in their duties. But – and they had sometimes – sometimes with the ABS they did not have quite the range of experiences

because they would have engineers inspecting deck operations and things like that. So they might not know it as well. But they would – you would try to develop a good relationship with them so there was some trust that you were showing them the right thing, not trying to show something improper and get away with it.

CDR Odom: Do you feel like the equipment on the ship received an equal level of attention and inspection under the two programs?

WIT: Yes.

CDR Odom: Okay. What about the ACP program was started? Do you feel like the Coast Guard officers you were dealing with at that point further, or had less experience or their knowledge base of the ships was affected by that program?

WIT: Depending on the inspection or the situation. Most of the Coast Guard officers that I met after were still very experienced and knowledgeable of ships and they knew what they were looking at. And good to work with. They were busy so it was difficult for them to spend – they didn't spend as much time with the ships, they came on board and took care of business and left.

CDR Odom: Thank you. Shifting gears a little bit to the audit process. For conducting the SMC audits and doing internal audits, what level of audit do you feel like ABS does on the ships when they came on board and did the audits for the safety management systems? Do you feel they were effective?

WIT: What's the SMC?

CDR Odom: Safety management certificate.

WIT: Okay. Thank you. And what was the rest of the question then on that?

CDR Odom: The level of external audit that you received from ABS, do you think it was thorough and do you think it effectively improved the safety management system whenever they came and did the audit?

WIT: There's always room for improvement and learning. And that's part of the purpose of the system to find things that are deficient and make a corrective action. It was – but at the same time the safety management system had lifted the bar on safety and expectations of the ship. So it was in many ways becoming safer. The – and in many ways, because it touched the lives of the personnel working within the ship and the requirements of the company to comply and it had to be proven. So that more attention was paid to compliance with these systems and it certainly, it almost changed the culture of ships and personnel working on them to a safer level.

CDR Odom: Were you – did you ever participate in the internal audits done by the company?

WIT: Yes.

CDR Odom: And how – can you describe those to us and how they improved safety?

WIT: They were intense. We would try to be prepared for them. They were scheduled. But it's nothing – something you can prepare for quickly. You have to be in compliance through the year because the records were kept through the year and their job was to look for deficiencies or where we were falling short of the expectations. It would be intense because a lot of times it was done at the same time the routine voyage was being made so these ships had a lot of work to do when they were in port. Sometimes it would take several weeks to accomplish all of the tasks that they wanted to accomplish or all the inspections or surveys. Or discussions with people, the interviews with

personnel that they wanted accomplish. If they weren't available they would have to come back and complete it later. But it was for the most part accomplished what they wanted to do and again it may result in corrective actions. In which sometimes you felt you were doing a good job and it was frustrating because it was even nit picky it got to small details of what was required. But that's how they were accomplishing total compliance and to the best possible compliance with the system.

CDR Odom: Thank you. One other question. Going back to the evaluations that were performed by the company on the Masters of the vessels. How would you feel about a Port Engineer or a person with an engineering background specificly evaluating you as the Master of the vessel?

WIT: I would have no problem with that.

CDR Odom: Thank you very much.

WIT: Yes, sir.

CAPT Neubauer: Mr. Fawcett.

Mr. Fawcett: Good morning again Captain Hearn.

WIT: Good morning, sir.

Mr. Fawcett: I'm going to shift focus to weather, weather planning and weather operations. So looking at the El Faro could the seas board the ship when you were underway in such a way that they could damage cargo?

WIT: My voyages with the El Faro in rough weather were rare. I had some sea come on board the ship possibly on a cross Atlantic voyage. I don't recall any heavy sea coming on board that ship on the coastal voyage down to Puerto Rico.

Mr. Fawcett: In Alaska did they have a practice of voiding cargo areas to prevent damage to cargo from shipping seas?

WIT: Yes.

Mr. Fawcett: And I understand the ships were configured different that way in that time, correct?

WIT: Not below deck. The second deck was very similar, almost identical basically. There was a little bit of a change in configuration with hole openings or ramp openings on the starboard side, but really not much. And – but the cargo loading was a little different for the San Juan run compared to Alaska, Alaska had – Tote had – did not have the ro-con configurations so cargo space was at a premium and we were running full loads. If we were running full loads you might void certain areas that could get damaged especially in the winter time. But on the Puerto Rico run with Sea Star you did not really have that limitation typically and you could load cargo wherever you wanted.

Mr. Fawcett: So we had talked about weather advisement services provided to the vessel and you had mentioned Bon Voyage weather service that had been installed on the vessel sometime approximately 2008. Was there any discussion at any time about adding the weather routing subscription service to the package?

WIT: It was discussed, yes.

Mr. Fawcett: Could you elaborate?

WIT: Yes I can. It was discussed with Bill when we first bought the service and we, and Bill Wisenborn [sic], we decided to just go with a weather information first to see how reliable it was and how it compared to the National Weather Service. And it was a

good system. Voyage planning and routing most of the Masters had quite a bit of experience with voyage planning and routing on the runs, including myself. And I've had voyage routing services with the United States Navy making recommendations and sometimes they're not a reliable as the observer as the ship, you know when you're on the ship itself observing the situation and conditions. You have a lot more experience locally with the conditions and the opportunities for re-routing your ship compared to someone at a remote location. And most of us felt more comfortable than – making the decision ourselves with all the information we could get. And you may have more information than just what Bon Voyage had to make a determination.

Mr. Fawcett: So did the availability of information change after the reorganization of Sea Star Lines in the 2013 time frame? In other words you spoke about Mr. Wisenborn [sic] and the marine operations managers. Once that position was vacated or no longer in the organizational structure did you have as much weather information at your disposal?

WIT: We had the same. Weather and it was more weather information than I ever had previously in my career as a Master. On the run to Puerto Rico the ships had in the Northern segment of the voyage satellite TV to watch the weather channel. We also had enough coastal information that you could get weather information from NAVTEX which is a VHF system on the ship. You had the high seas forecast that came in by SAT-C and VH, or excuse me by medium frequency radio. And you had the Bon Voyage. And we had internet on that ship. And internet email which could give you an immediate on demand update on weather reporting. So if there was any new map

coming out you didn't have to wait to get it immediately. So you had extensive and quite a bit of weather information.

Mr. Fawcett: So the internet access when you're speaking of immediate on demand weather updates, are you speaking about usable feature of the BVS weather suite or are you talking about plain old internet like all of us have where we can access the National Hurricane Center?

WIT: We did not have access to internet itself. We had access to the internet systems to get weather. Bon voyage was one and the other was the National Weather Service where you sent an email to the National Weather Service with codes of weather reports that you wanted and you would get an email reply and data transfer with those weather maps transferred to your ship so you could print out, or observe them on your screen the weather and the most recent report from the National Weather Service. And the same thing with Bon Voyage.

Mr. Fawcett: Would that be what we describe as the FTP system, the file transfer protocol?

WIT: That's what I – I think that's correct. It's hard to remember all that now.

Mr. Fawcett: Understand. But you could get that on demand? Did you have any specific instructions to your ship's officers about when they were at sea and adverse weather was anticipated what your expectations were to them in terms of accessing all this different weather?

WIT: Yes. Well in my standing orders there were directions for just rough weather. And any communications and anytime I anticipated something like that it would be an active discussion and possibly in my night officers also to notify me of any changes in

conditions. Or if a weather report came in of course you would want to know if something had changed that was not expected. You would – and we watched long range on hurricanes also so we were planning them. And typically with the Second Mates that I work with everywhere we also plotted hurricane season and hurricane systems across the Atlantic. So we were kind of early warning watching what was going on with those systems even if they were all the way over in Africa. So we had a long rang expectation of what could possibly happen.

Mr. Fawcett: In alignment with what you just explained, how did you take into account the, they call them spaghetti models, they are the various predicted tracks from all the different models, were you able to take a look at the unpredictability of a particular storm and from that plan your actions?

WIT: Yes. Well every storm can be unpredictable and you have to anticipate some of that. And today's weather reporting is so good that you do get some advanced notice even if – because you can get immediate updates or fairly immediate updates based on their information, that's their function they do quite well of getting it out there sometimes every six hours. That's your most recent information to make a decision on. So you get that information, you watch for it and if it's a hazard to your ship especially a hurricane storm or in the Gulf of Alaska they don't call them hurricanes but they're intense storms or weather fronts, you're monitoring that as continuously as possible. Along with your own ship position relative to that – that system. For example the – you're watching your barometric pressure and how close you are to that storm to see if everything is checking out. You just don't do it alone on watching the weather. You're watching, you're monitoring your ship in relation to that storm and system.

Mr. Fawcett: And are you relying on the feedback from your ship's officers in terms of a team to gather their concerns, their ideas, their inputs for reducing the risk of or consequences from encountering a hurricane?

WIT: Always. It's part of the bridge resource management system and structure. Yes.

Mr. Fawcett: So just a clarification. You mentioned observe and you talked about the weather. At the time you were aboard did the anemometer or anemometers work properly?

WIT: It's hard to recall. They have worked and not worked through the years because it's a rugged device but they – and they encounter, they're constantly encountering the weather. So they can fall into unreliability at different times and it's something you can't just completely rely on.

Mr. Fawcett: Would your expectations be that as Master if you uncovered the fact that one of your anemometers was not, either out of calibration, out of directional alignment or the speed was not proper or correct, would it be fixed?

WIT: We would submit it for it to be fixed, yes.

Mr. Fawcett: And how would you do that?

WIT: There's a management procedure for submitting for a repair and you would follow that. Whether it was – sometimes it might be a repair that you put through with the Port Engineer or Operations Manager and they would hire somebody to do that. Or if it was ordering parts to install that would be part of the purchasing system and you would order another anemometer and then we would get it installed. Either we could do it our self or if it was too technical they would hire somebody to do it technically for us.

Mr. Fawcett: So if a Mate, you know notified you as the Master at 1400 hey it looks like the anemometer blew off the ship or didn't work properly ----

WIT: Yes.

Mr. Fawcett: How soon would you get that condition rectified?

WIT: Our response would be immediate to put it in to the process of about getting it repaired. Like everything it goes into a system of management and it's by internet and electronic. And it would take, depending on the level of damage to it, it might – we sometimes carried spare anemometers on board the ship and you can get it repaired fairly quickly. But otherwise the ordering process might take a period of time. And then depending on the voyage conditions it might take a period of time to get one on board.

Mr. Fawcett: And while you were aboard the ship did you estimate wind speed or did you log it as observed? And I'm talking about for external release to NOAA as part of the voluntary weather reporting program.

WIT: Well the different officers would do it differently depending on their skill level. Many of them relied on the anemometer and they would – typically you're watching the wind all the time if you're in a position. That's their job up there to observe conditions as well as traffic and other – that's the watch officer's job. They would use – they should use everything available to them. Many times in routine conditions wind speeds less than 7, 6, they're very close in their observation and they may not use the anemometer to verify it and validate it. It's – but at night it's difficult to see and you don't have visibility and they may solely rely on the anemometer. But they should rely on both.

Mr. Fawcett: And so as Master of the ship in terms of encountering hurricanes and intensification of weather conditions, would in periods of darkness, low visibility, would

an anemometer be, a working anemometer be a tool that you relied on to, you know, tell if the hurricane was intensifying to certain levels?

WIT: If it was – if it had shown good reliability up to that point, yes.

Mr. Fawcett: Okay. So were you on board the El Faro as Master during Hurricane Sandy?

WIT: Yes, sir.

Mr. Fawcett: I'm going to ask that an Exhibit 150 be put up which contains two slides. And just to give you an idea to refresh your recollections it shows some of the information from Hurricane Sandy. There were countless weather products developed for Hurricane Sandy. What I would like you to do if you would, sir, is take a moment to think about Hurricane Sandy and talk to us about how you approach a hurricane such as Sandy with respect to the navigation of your ship to ensure the safety of the vessel.

WIT: Hurricane Sandy was a very large system. And all hurricanes have potential to become very large in intensity and in range. One of the most serious concerns I have especially around, what I would call a tight weather system, because it's a hurricane, it's a low pressure system moving along an area is – is to stay outside of the scope of the hurricane itself or the influence of the storm system itself so you can keep voyage reliability, sea keeping reliability of the ship so you can get away from it. If you get into the grip of the storm where you start losing speed or you're maneuvering your ship into the sea to preserve – to protect other things that we talked about, slamming the stern, and we've talked about keeping the cargo on board if you roll too heavily. You can get trapped into fighting the conditions and the storm will move closer and closer to you. That's a dangerous – so keeping away from that system enough that you can make

good speed and run from the hurricane center is always one of my – the key factor really in my determination of what to do. Hurricane Sandy was a large size and it had done a lot of damage in Cuba. It was – there was a concern that it was going to go close to the United States, it looked like that. And really the only option I had for the ship was to go out into the Atlantic and across – cross that storm and then head South where I could keep good weather conditions around the ship to make good speed and to have the ability to out run the storms. Hurricanes are typically slow moving systems, 8 to 15 knots typically. That ship had the ability to make 20 knots. So I could continue to open up sea room from the influence of the storm and avoid getting too close where I would have to deal with the storm conditions and then possibly get caught by the storm.

Mr. Fawcett: So looking at a hurricane such as Sandy, what would be your concerns for the winds generated and affecting your vessel? Just keep it to the winds for the moment.

WIT: Well wind speeds of 7 knots, force 7 or less you can make good speed. With those wind speeds at force 7 and above you're going to have stronger seas very rapidly. I would probably, knowing that I'm out running a hurricane probably go a level or two down to like force 5, because it's a weather prediction and it could be wrong and it's certainly going to change. Because you're working with old information immediately when you get a forecast and weather information. You have to give yourself a margin there also of safety and anticipate that these conditions are going to change and increase for the worse. So your precautions are stronger to stay away from the system.

Mr. Fawcett: So for the general public you mentioned force 7. Can you give an approximate wind speed so that the public can understand what velocity you're talking about?

WIT: 30 to 33 knots of wind.

Mr. Fawcett: And how about force 5?

WIT: 25 knots of wind.

Mr. Fawcett: Okay. So now looking at the sea effects of a hurricane such as Sandy, what are your principal concerns for the preserving and protecting the ship and its crew?

WIT: I'm a little bit confused on the question.

Mr. Fawcett: Well the seas. When you look at a hurricane chart, if I put up another that had more specific information it would talk about the significant sea height that's generated by the movement of a hurricane. Can you talk about what your – what the sea height concerns are for you as Master?

WIT: Yes. The – well a hurricane is a slow moving system and that's also a big danger for the ship. If you get into the grip of a hurricane it's because it's moving slow you're going to be encountering heavy seas of any magnitude whether it's force 1 or force 4 for a longer period of time than other storm systems, say a front that's moving through quite rapidly. And my experience with the ships is once you start fighting the weather for a 12 hour period or longer cargo lashings start coming lose, people started getting fatigued, mistakes start getting made on the ship and you want to stay away from those, fight weather systems, those dangers. The longer you're in a storm the worse it is for the ship. If it's over – if it's up to 24 hours you're certainly going to have cargo damage.

Cargo's going to start breaking lose, you can't send people out in those conditions because it's a hazard for personnel to go out there and deal with, you know the moving objects on the ship. The cargo is heavy. It can crush a person. There's water on deck. It's a hazard for them also and there may be electrical hazards out there as well. So you want to stay out of the grip and the slow motion of that storm, because once you get in it you're in it and you're in it until that storm moves away from you. You can't – you probably can't run from the storm because you're also fighting the seas and trying to protect the ship itself in the sea state that you're in. So you're vulnerable.

Mr. Fawcett: So you mentioned, you know a hurricane is a slow moving system. So in a hurricane such as Hurricane Sandy if the forward speed of the hurricane markedly reduced so that it went from 8 knots forward speed to almost stalled, as a Master of a ship such as the El Faro what would be your principal concern?

WIT: Well a hurricane that stalls is now very unreliable and may change in any direction. And my comprehension of it is that it may also intensify and grow. Not only in intensity but size where it could reach out further away. So you would want a wider margin from that system. And that's where you start to rely on weather projections and projections of intensity and scope or range or reach of that storm system so that you can stay out of it in case it starts to move again in your direction. So you can continue to keep that voyage reliability and safety of that ability to move away from that system. Run from that storm.

Mr. Fawcett: So when approaching a system such as this, what would be your concerns about while you're on the voyage the proximity of Islands along the route?

Would they be protection to you? Could they be a danger to you? What are your thoughts on that?

WIT: Well there's – I know on this voyage here the Islands you have a great barrier right there inside of the Bahama banks and the Bahama Islands. The ocean swells are – don't reach through as strong. You have less fetch. You won't – probably won't have this gray state and height. You are limited in your opportunity to go in certain directions. If you get too close to an Island you would be even worried about getting pushed in towards land or you could damage the ship and make it – it's a very dangerous situation to be – not to have sea maneuvering room around the storm. So you want to keep that sea keeping ability, that maneuverability for the ship. You want to preserve that. But there's an advantage, that's not an uncommon technique to use land to get on the other side of an Island to protect your ship from the intensity of a storm or a system. And it's common there also to go inside the Bahama Islands if the storm's on the outside. Or if the hurricane is on the inside like Sandy was, inside of the Bahama chain, then you're going to probably have to go off shore or find an alternate route to get away from that storm system.

Mr. Fawcett: As a seafarer what would be the danger of a lee shore?

WIT: What do you mean by that question, sir?

Mr. Fawcett: Well in other words would you put yourself in a situation in a storm like Sandy to have the storm off shore of you with the Islands in lee of the storm and in the lee of you ship? In other words you between the ship – you between the storm and the Islands.

WIT: Again what I mentioned earlier then that you're getting too close to land, you have less maneuverability and you may find yourself trapped where your ship is close to the Islands. One of the problems with a ship and a storm system is you're really navigating the ship around the weather itself to protect the ship from pounding, from pitching, from heavy rolling, from slamming, from losing cargo and all those conditions and damaging the ship, the structures around the ship, the personnel. You have to preserve that. More sea room helps you. If you're in close to land it's a danger. And the other problem you have is you – once you get in the grip of the storm you can't turn away from a navigational hazard like an Island or a Shoal. But if you're close to that you may have to make a decision that you've got to turn the ship or manage the ship around that other hazards so that you don't have the ship create a hazard for you, a danger for you where you're dealing with a storm and you end up running into land.

Mr. Fawcett: So you mentioned the slow moving storm and I asked you about the reduction in speed of a tropical system. As a Master if you see a storm pick up velocity and move along at the 18 to 20 knot speed, what does that mean to you as a Master?

WIT: It usually means, especially a hurricane system that it's weakening.

Mr. Fawcett: And does that – how do you change what you're doing as Master should you see a hurricane pick up its speed rapidly?

WIT: Of course it depends on where I am and the forecast and the other information I can get. It's not just that condition that you're dealing with. And your position around that system depends on what you may do. So there's some variable in there to – could change, the answer to that question. But you monitor it, you're going to do the same factors. You're going to stay away from the storm center in case things change. You're

going to look for the best position to get that ship into an area where you continue to make voyage distance and speed from the hazards of the storm. And if it's moving fast towards you you're going to make the decision based on the predictions that you've got and the information you've got now.

Mr. Fawcett: We're going to move into other weather topics and weather related operations, but the storm avoidance is such an important topic that I would like to ask members of the board, on this particular topic if they have any other questions or perhaps the NTSB.

CAPT Neubauer: Captain I just want to follow up on one issue. If you encountered an unpredictable or slow moving storm in fairly close proximity to your vessel while underway, what would be your primary means of weather information that you would use to monitor real time?

WIT: When I was with the ship it would be Bon Voyage and the National Weather Service would be the two most frequent maps and information I could get.

CAPT Neubauer: And how – how would you get the National Weather Service information?

WIT: There is a code system that you would email into the National Weather Service and the codes would provide a weather map. And there's different codes for different maps. You can look at the list, type the code in and it would respond with a data of transfer of that map and you could print it out and look at it.

CAPT Neubauer: What was the typical response time, understanding that you could initiate an email from the vessel to get a response in that system?

WIT: Minutes. You're transmission would go out almost immediately. Some of those – some of those messages I kept prepared and I would just cut and paste, cut and paste basically and get it right out. The transmission was immediate. I would, my recollection is minutes in response, 5 to 10 minutes.

CAPT Neubauer: And would that give you typically the vessel, or I'm sorry the storm cones and predicted routes?

WIT: Yes it would. Depending on what you asked. You had different weather maps and systems you could ask for. Sea state, wind speed, position of the storm, predictions, forecasts, 24 hour forecast, 48 hour forecast. In a storm system or a dangerous situation you would get all of them because you want all the information you can get to help make a decision. And where you want to avoid, you know the areas you may want to avoid. So you're getting as much information as you can.

CAPT Neubauer: Would you use the SAT-Cinformation?

WIT: I would use everything, sir.

CAPT Neubauer: At this time does NTSB have any weather related questions? Mr. Kucharski.

Mr. Kucharski: Thank you Captain Neubauer. And Captain Hearn back to this FTP system, how did you learn about that system?

WIT: I don't recall off hand. It was a new system for me. I was very pleased to see it compared to early days when we worked in Alaska with – mostly relying on barometric pressure and old weather maps that came by radio fax. Once we got email systems on there, electronic data transfer that were strong enough to receive that data then National Weather Service may have had it out sooner. I had done other voyage –

voyages for the – under Navy charter. I may have learned it from there. But I – in fact probably it came from either someone in the company that mentioned we could do this service or another officer that had experience with it from where I learned it from. I don't recall.

Mr. Kucharski: Was there any company guidance on use of the service or recommendation to use it?

WIT: I don't recall that either.

Mr. Kucharski: Did you find it was easy to use, easy syntax?

WIT: Yes. It was a little difficult to understand the weather maps and you may have a trial and error. Like many things with technology until you learn what maps were most useful for you.

Mr. Kucharski: Do you know of any other Captains or officers within the Tote fleet that use the service?

WIT: I think all of them used it. It was a common discussion of weather systems like that. We shared information quite often. And the other officers were aware of it also on the ship because the maps would go to the bridge and we would discuss, you know that.

Mr. Kucharski: And could you share any feedback that you heard about the system?

WIT: Oh you're talking about the National Weather Service or the Bon Voyage?

Mr. Kucharski: FTP system.

WIT: FTP, it was good. It was a good improvement as information that we had not had. And it was outstanding.

Mr. Kucharski: Was there – along your route did you get satellite TV along the route?

WIT: Those ships had satellite TV service until – for about the 1st day out of Puerto Rico. Or excuse me out of Jacksonville South. So it was in the Northern section of the voyage.

Mr. Kucharski: Any reason it wasn't on the Southern section of the voyage?

WIT: There was a separate financial package to purchase and we didn't buy that package.

Mr. Kucharski: Was there any discussion on the use of a weather routing service on the Puerto Rico run especially during the hurricane season?

WIT: I don't know about a discussion specific for the hurricane season. Discussions were about the same as I recall and mentioned earlier. That most of the Master felt with their experience and knowledge of the ships and the run that they could and would feel more comfortable weather routing with all the other information they got than to rely solely on a weather routing system. So the cost may have been a factor in discussion, but I don't remember it being purchased.

Mr. Kucharski: You mentioned cost. Do you have any idea what the cost was?

WIT: No, sir.

Mr. Kucharski: I would just like to revisit something you said about going off shore, you know to gain more sea room in relationship to Mr. Fawcett's question about lee shore.

WIT: Yes.

Mr. Kucharski: Did you ever use the Northwest Providence Channel or the Old Bahamas Channel to avoid weather?

WIT: Probably. I don't remember a specific voyage, but I may have. And I do not remember detouring through there for weather. But I may have.

Mr. Kucharski: So would you be able to opine at all about use of a channel as far as sheltering the ship from heavy sea conditions?

WIT: Yes. I have done that. But the decision was made before the voyage started. And it was to – because we knew we had heavy swell from winter storms in the Atlantic that we used the Old Bahama Channel route and the Straits of Florida.

Mr. Kucharski: Back to the anemometer you mentioned about there was a process if you had to get something fixed you could send in a form for it.

WIT: Yes, sir.

Mr. Kucharski: Were you aware of any maintenance actually done on the anemometers?

WIT: It was difficult to do maintenance to the anemometers they were typically on a large or a tall mast or a pipe extending high above personnel and away from the superstructure as far as possible or towards the edge where it would be a hazard to get up there and do it or to lower it. So they typically were on their own to survive. You know the elements until they finally broke and then we would replace them.

Mr. Kucharski: Did the ship carry a spare anemometer so you could just swap them out?

WIT: I know that carried spare anemometers because there was a couple times where they were becoming unreliable and we had back-ups. Especially on the Alaska run. I don't remember a spare anemometer on the – with Sea Star. We may have had one or they may have kept one in the – because those ships were in the same ports every

week. They could have had some spares in a warehouse ashore where there was a spare available. But not on the ship.

Mr. Kucharski: Were you aware of the anemometers ever being calibrated?

WIT: No. The only – but I say no by scientifically, but we would compare the anemometer to the visual observation and that's how you would know when it was not coming reliable.

Mr. Kucharski: You mentioned earlier I believe it was when Mr. Fawcett was asking you about being out in very rough weather, talk about heavy winds in excess of force 7, big sea states.

WIT: Yes, sir.

Mr. Kucharski: Could you a little bit elaborate on – is it easy or is difficult to determine wind direction and speed when you get above those conditions especially in dark?

WIT: In the dark you have to rely on other tools that are available to you. If you don't have visual observation, and you may have some limited visual observation where you can turn the flood lights on the ship and see spray coming across the deck or the bow of the ship to see it locally as well as possible. The other tool that would be typically used if the – is the anemometer. And I would use the radar quite often. You would turn the radar range down to about a mile and a half range scale, possibly less, .75 and you could see the hull of the ship on the radar scale. And you would have to turn the anti-clutter down so that you squelch out a lot of the heavy sea state and you would be able to pick up a swell return. And you would see the body of the ship, but you would also see waves coming towards the ship from whatever direction. And the other indication as you squelch down in those situations was the sea return itself. Which may be

different than the swell return. The sea state is wind driven, which may be different than the swell and you would – that may be stronger and further out from the ship and you could put your vector on that so that you could see the sea state relative to your ship and then you can make a determination of the wind direction there. The speed would be more difficult. Many times what we would do, and I would do is look at the weather maps that I had and the barometric pressure, knowing the barometric pressure that I was at and the location relative to the storm and try to assume at least that the wind speeds were about the same as what they were reporting in the weather map.

Mr. Kucharski: Did you find them at odds sometimes or to be differences on what you were seeing on the weather map?

WIT: Yes.

Mr. Kucharski: Along the, sort of along the weather line, was there a process, a natural process in place at Tote for the Master to discuss use of weather tracks, or heavy weather routing? For you to discuss that with anyone at shore side on a regular basis if heavy weather was expected?

WIT: Yes. Again policy. Any time you take the ship off of a route, the routine, you have to consult the company and let them know what you're doing. So you would advise them. Even if it was a warning ahead of schedule that there's weather out there, it might not be a storm or hurricane, it may just be heavy swell that's creating less fuel efficiency, more cargo lashing requirements and possibly a delay in arrival. You would try to predict that and take the precautions needed and advise them so that if something did come up on the voyage they were already aware that you had concerns.

Mr. Kucharski: And this process was it more you advising the company or was it a dialogue as far as the use of that weather route and concerns on, you know distances or anything like that?

WIT: It would depend. If you did not have the opportunity to discuss anything with anybody it may be in your departure plan. That there may be a concern. So there was a remarks section in the departure plan that you could put weather information in there or concerns about the voyage. And that was not uncommon to let them know. Or it may be a separate person that you would identify and let them know ahead of time.

Mr. Kucharski: But no scheduled type of phone call where it went in you contacted?

WIT: Nothing scheduled because it was out of the routine.

Mr. Kucharski: How about heavy weather checklist? Are there any heavy weather checklist that either you used, the company used?

WIT: I don't remember a heavy weather checklist. But there were heavy weather conditions I mentioned earlier. They were in my standing orders. There was also heavy weather parameters written into the operations manual for the company. And then heavy weather conditions would often depend on voyage conditions and that would become part of your voyage plan, what you were trying to preserve. It could be cargo issues and concerns, it could be machinery issues and concerns. All of them. So part of the process of dealing with heavy weather expanded to dealing with each department head and what their concerns and conditions might be around the heavy weather that was anticipated included the steward and the personnel on board the ship. You know including meal planning. As simply as that they wouldn't be baking a turkey if they knew that we were going to have rough weather, they would go to cheese sandwiches. But

the engineers may hold off or expedite repairs or maintenance so that they knew that they were prepared for rough weather. So it was voyage planning, more difficult than having a checklist it was a plan and work to do. And you tried to use all of your skills that you had to make good decisions and prepare for that. And take any precautions if you needed to be ready.

Mr. Kucharski: You mentioned your standing orders. Can we copy – do you have copy of your standing orders that we could uh ----

WIT: I'm sure there's a copy at home.

Mr. Kucharski: On the topic of heavy weather, have you had any formal heavy weather training?

WIT: No. Well it depends on what you're talking about with heavy weather. I had meteorology in college to understand weather conditions and – so that type of training I had. There was study material for preparing to license and become a Master that you had to prepare for and study. The – but with ship handling and sea keeping it was mentoring on the ship and with the other officers that you dealt with. And that came from experience working with others. Including men that you didn't work with but had been on the voyage before or had other experiences and you would – if you had good relationships with officers that you had met, contact them and asked them how they managed. You know some of the same conditions. And there was – it would be sea stories basically of what they did and what they encountered that may help you make wiser and better decisions later on.

Mr. Kucharski: Did you attend any advanced ship handling courses?

WIT: I did.

Mr. Kucharski: Was heavy weather ship handling included in those courses?

WIT: No. There may have been weather conditions, but they were close quarter ship handling for berthing, operations in close quarters around – in port and harbor.

Mr. Kucharski: How about any weather routing, either as a component of any meteorological course or weather course that you attended?

WIT: The only weather routing training I would have had would have been the college training around hurricanes that we discussed and observing hurricanes and the conditions that you would try to avoid. And that's a standard. And it's self-study from there.

Mr. Kucharski: Captain that's – I conclude on weather related questions.

CAPT Neubauer: Mr. Roth-Roffy.

Mr. Roth-Roffy: Good morning, sir. Tom Roth-Roffy, NTSB.

WIT: Yes, sir.

Mr. Roth-Roffy: Just a couple follow up questions on related to weather. You mentioned some of your training and experience dealing with weather observations and weather avoidance. I would just like to probe a little bit more on where you believe your best information – that has served you the best in dealing with severe weather conditions. Does it come early in your career through the university or do you believe that the later experience you had was more significant or important to your skills as a weather observer?

WIT: There's no replacing experience. I've probably been through at least 200 storm systems, maybe more. And I don't know how many hurricanes, I've avoided or dealt with where you don't encounter into the storm, but your doing what you can not to

encounter. Including other storms at sea or conditions experience helps you in two way. Number one how to deal with it if you're in it and how to respect it to avoid it.

Mr. Roth-Roffy: So if I'm understanding you then you think the experience that you've had in being in storms is what has been more beneficial to your ability and your skill level?

WIT: Yes, sir. There's no replacing it.

Mr. Roth-Roffy: And you've mentioned a few times that you would use all available weather information in making your decisions on how to respond. Just curious about the – all the various information that you do receive if you ever experience conflicts in the information and how you would go about resolving conflicts and which information you would rely on?

WIT: Umm you do see conflicts. Of course there's forecasts and a forecast you have to recognize that it's – that it may be fallible based on other models. And there's been conflicts sometimes within the same weather service system, the National Weather Service where they not necessarily predict something, but they predict changes that you did not anticipate. And the next weather map comes out different and it's a concern because it's not what you were anticipating. That's where you have to rely on your own visual observations and where you are in relation to the storm and stick to some of the basics that you have and knowledge to make a good decision. But you can have unreliable information. Another reason for building precautions into decisions. And I try to be prepared for unreliable information because they are forecast.

Mr. Roth-Roffy: And specifically regarding the BVS on board system and the National Weather Service information, were those two weather sources of information consistent largely or were they often inconsistent?

WIT: My experience with them was that they were very close. And the Bon Voyage system is a little easier to use because they use more technology and color with their system and a little bit of – there's a couple tools built into the system that you can use to identify where your ship will be compared to the storm system or the weather that you're encountering so you can predict and do voyage planning around it yourself. The National Weather Service system of course is just weather information. And that's what I was used to working with where you would put in on the chart, map it out yourself. So the tools that came in with it helped expedite your decision.

Mr. Roth-Roffy: Thanks very much. That's all I have.

WIT: Yes, sir.

CAPT Neubauer: At this time I would like to go to the parties in interest. Tote do you have any questions?

Tote Inc: Captain when you were sailing on the Puerto Rico trade who was the Designated Person?

WIT: Harry Rogers.

Tote Inc: And did you communicate with him frequently?

WIT: Yes.

Tote Inc: And on what types of issues?

WIT: Safety management systems, security, training. Sometimes maintenance, and sometime general operations of the ships themselves.

Tote Inc: Thank you, sir. No further question.

CAPT Neubauer: ABS?

ABS: Good afternoon Captain. My name is Jerry White I represent ABS.

WIT: Yes, sir.

ABS: Captain can you remind us or tell us again how long you served as Master aboard the El Faro?

WIT: I went to the El Faro at, I remember election was 2007 and I left the ship – while the ship laid up in 2009 I was on it until – I did a hitch or a 10 week tour on the El Yunque, I went back to the ship in April of 2010. And I stayed with the ship until the summer of 2011. And I went back to the ship for a 3 week period in 2012. Excuse me 3 month period of tour.

ABS: And you served as Master aboard her during that Hurricane Sandy?

WIT: Yes, sir. But Hurricane Sandy may have been the El Morro.

ABS: Could you tell us what the maximum wind was that you experienced on the El Morro when you were avoiding Hurricane Sandy?

WIT: Less than force 5.

ABS: And force 5 indicated it was approximately ----

WIT: 25 knots.

ABS: 25 knots.

WIT: Yes.

ABS: Do you recall the maximum seas that you encountered with Hurricane Sandy?

WIT: Well we didn't get very close to Hurricane Sandy. I avoided it directly, but it was – I probably – I would imagine I recall about a 10 foot swell, 10 to 12 foot swell.

ABS: And do you recall what the maximum roll of the vessel was?

WIT: No. Probably 10 degrees or less.

ABS: As far as the El Faro, sir, in a loaded condition can you give us your recollection as to the maximum GM you would sail?

WIT: In a loaded condition?

ABS: Yes, sir.

WIT: My recollection of a safe GM I think was around 3.8, but I can't recall off hand because you know I relied on the records and what they would give us.

ABS: Sitting here today though do you recall what the maximum GM you would have sailed with in a loaded condition?

WIT: I don't understand what you mean by the maximum GM.

ABS: You indicated there were parameters that you would take into account and determine what a margin for safety would be incorporated in the GM, correct?

WIT: Umm huh, yes.

ABS: My question is based on that margin, the safety and based on your experience aboard the El Faro do you recall what the maximum GM was in a loaded condition that you ever sailed?

WIT: I think you're talking about the margin above the required GM.

ABS: I understand the maximum, the margin, but the question what's the maximum margin, what's the maximum GM in a loaded condition.

WIT: The decision to check out stability or to look at stability is based on the minimum GM. I don't understand what you mean by maximum GM.

ABS: My question directed more to a loaded condition and your experience aboard the El Faro as to what GM you expected in a loaded condition departing Jacksonville.

WIT: What ----

ABS: So with regard to that, do you recall what the maximum GM would have been that you sailed with?

WIT: Oh the – you know I can't tell you because I – without looking at all those records and there could have been over a couple of years different GM's that we had above the minimum required.

ABS: Yes, sir.

WIT: Now I understand what you're asking. And I don't recall. Probably I would say 4 or 5 feet, but that's almost a guess that I would recall, but I don't remember.

ABS: But based on your discussions at the company and with the Masters you felt and considered a GM margin of .5 would be a reasonable margin?

WIT: Above the minimum required, yes. That was from voyage experience.

ABS: And based on your time aboard the El Faro can you tell us what the worst sea conditions that you experienced aboard as far as maximum roll or prevailing seas?

WIT: Umm, I took the ship through a couple of storms on a Trans-Atlantic voyage. Would you like to know about those because it's a little bit different than the Puerto Rico run?

ABS: That's okay. On a Trans-Atlantic voyage do you, did you experience a maximum roll and maximum prevailing seas?

WIT: Yes. Rolls above 25 degrees, between 20, about 25 degrees, maybe a few reached 30. Wind conditions exceeding 50 knots. Seas 20 to 25 feet. Possibly a few 30 footers in there.

ABS: Did you ever sail aboard the El Faro and experienced a 100 knot wind?

WIT: I've experienced 100 knot winds on the Northern Lights, the same ship, the same class but it was in Alaska. But not when it was the El Faro class.

ABS: Thank you. Nothing further.

WIT: Yes, sir.

CAPT Neubauer: Mrs. Davidson?

Ms. Davidson: Yes Captain, thank you. Captain Hearn my name is William Bennett and I represent Teresa Davidson.

WIT: Yes, sir.

Ms. Davidson: I do want to go back to the storms in the Trans-Atlantic. You had mentioned that you experienced winds in excess of 50 knots.

WIT: Yes.

Ms. Davidson: In excess of 60?

WIT: Possibly briefly. Gusts certainly.

Ms. Davidson: And that would be a force 10?

WIT: Yes.

Ms. Davidson: Tropical storm conditions?

WIT: Yes.

Ms. Davidson: And when you sailed in Alaska you had mentioned you had experienced 100 knot winds.

WIT: Yes.

Ms. Davidson: That's a hurricane force wind?

WIT: They're well above hurricane force.

Ms. Davidson: And you spent 25 years as the Master of vessels, correct?

WIT: Yes, sir.

Ms. Davidson: And you've done everything in your power to avoid storms, correct?

WIT: Well you do everything you can to avoid a storm system, but of course you're on a ship at sea. So you can encounter it.

Ms. Davidson: But you do everything you can?

WIT: Yes.

Ms. Davidson: And despite ----

WIT: Well that depends. You know everything you can. There's maybe things that you – that's a wide question.

Ms. Davidson: And while despite your diligence and your testimony here today about your storm avoidance you did get caught up in several storms and that happens, correct?

WIT: It happens.

Ms. Davidson: Because you rely on forecasts that may be wrong, correct?

WIT: You relay on forecasts that may be wrong.

Ms. Davidson: Thank you, sir. No further questions.

CAPT Neubauer: Herbert Engineering?

HEC: No questions.

CAPT Neubauer: Captain I just have a couple questions based on those questions that were just asked. On the Trans-Atlantic voyage where you encountered the heavy weather, do you remember – were you transiting full load? And was – also was the vessel a ro-con at the time?

WIT: She was a ro-con. One voyage was fully loaded. I don't know if it was one of the voyages where I encountered the heavy weather. We did have a full and down voyage going across the Trans-Atlantic. So I can't compare apples to apples on that one perfectly. But there was two rough storms that I encountered in those. Actually three that I – one was a hurricane system that we avoid and we ran with. And then there were two storms that hit me off of Gibraltar.

CAPT Neubauer: And, sir, when you had the meeting and decided on the .5 GM margin did you press to get that into policy?

WIT: No, sir. I pressed just to get a good and responsible decision and approval from the company to have that margin as reliable for us so that we didn't have to ask for it every time.

CAPT Neubauer: Was there ever a discussion that that should be brought into company policy?

WIT: I don't recall it.

CAPT Neubauer: Captain at this time we still have another line of questioning. But we're at the lunchtime hour. I would like to recess until 1:15 and reconvene. Are you available to come back at that time, sir?

WIT: I am, sir.

CAPT Neubauer: The hearing is now recessed and will reconvene at 1:15.

The hearing recessed at 1209, 17 May 2016

The hearing was called to order at 1316, 17 May 2016

CAPT Neubauer: The hearing is now back in session. Captain Hearn you're reminded that you remain under oath from this morning.

WIT: Yes, sir.

CAPT Neubauer: We're now going to start up with our last line of questioning, sir. That would be focused on cargo securing and some other general items. But this will be the last round.

WIT: Yes, sir, thank you.

CAPT Neubauer: Mr. Fawcett.

Mr. Fawcett: Sir, Captain Hearn I have a couple follow up questions that we didn't get to in the weather. Briefly can you tell the dir – using the direction of the wind can you tell where the center of a tropical system lies?

WIT: By ballast law is something you would use if you look at wind it would be, unless I've got this all turned around, you got to the right and somewhat behind you. Yes, you can tell where the center low is. And it's something we would do.

Mr. Fawcett: Okay. Turning to the – and we talked about it briefly with the voyage plan.

WIT: Yes, sir.

Mr. Fawcett: If I went aboard the El Faro when you were in command is the voyage plan something you could hand me?

WIT: Yes. You would – there was a specific voyage plan, the route and some of the details of planning and information that we would need at our fingertip, frequencies we

used to contact other people, the route, the distances, locations. Other elements of the voyage plan may be able to be handed to you depending on what your question was and were about, because the work done on a ship is not just a voyage plan itself, but the work being done during the voyage. Which is to me as Master part of my plan to complete the voyage and the mission of the ship, but it's not part of the document in the voyage plan that's up on the bridge. Like I said it depends on how you scope that out or you know how you would want to narrow or broaden your request on that question.

Mr. Fawcett: Okay. So on a – when you worked for Tote or Sea Star Lines the departure message has a place where the Master signs that they have reviewed and approved the voyage plan. Did that exist when you worked for them?

WIT: I believe it did, yes, sir.

Mr. Fawcett: Okay. So in the navigational voyage plan that they asked you to approve there, was it unique to each voyage?

WIT: It was routine. It was always unique to the voyage. But many voyage plans especially going to Puerto Rico were routine and identical to the previous voyage plan. Except for departure times and schedules.

Mr. Fawcett: Would they be stored in a binder or some other ----

WIT: We stored them in a binder and also electronically.

Mr. Fawcett: And how would those voyage plans change if the tropical weather was out in the Caribbean that may influence the movement on the ship?

WIT: Many times it may start with the routine, but if it had to be changed it would be documented and remarked and identified in the voyage plan. Or an update to the voyage plan.

Mr. Fawcett: So if a voyage was 185 South or 145 North, whatever the voyage number was, that would be unique to the voyage plan in the binder?

WIT: The identification of the voyage plan would be unique to the voyage number. The date of course is important because it's what happened on that day. And if it changed during the day there may be an update. Those voyage plans were reported routinely at noon everyday which was an imposition but it might be done in the morning. But you could send in an alteration or a change to a voyage plan or conditions of the voyage at any time.

Mr. Fawcett: And would all navigation watch officers be required to review and in some way indicate that they understood the voyage plan?

WIT: Yes.

Mr. Fawcett: And you mentioned just a moment ago that the typical scheme under today, I'm not sure if it's today, but leading up to the accident voyage date, was the ship would report its position once daily at noon upon departure and on arrival. Were there more frequent reports than that?

WIT: Only the position of the ship, the route of the ship and the routine voyage plan, no. Any changes, yes. And as immediate as possible. And then there was other conditions and voyage parameters that may be reported and usually immediately such as a change in propulsion or conditions in the engine room or the cargo that we would communicate to the company.

Mr. Fawcett: At any time that you served as Master for Sea Star Line or the various iterations of Tote, did they ever communicate with the ship instructions to slow down,

speed up, change course, or avoid weather or manage the voyage in any way shape or form?

WIT: The voyage management from the company was normally focused on efficiency for fuel and safety. So those – and those were – even though they would be routine parameters if there as a question about it we may discuss it or we could do something to improve efficiency. If there was a concern about a hazard or a difficulty with our arrivals, for example coming into a port that I was unfamiliar with, daylight might be safer than a night time arrival. That would be communicated and I would make decisions with them on that if there was no other requirement that would prohibit me from going for a safer time, I would ask for it.

Mr. Fawcett: Okay. So going back to my question. You mentioned the company communicating with you about perhaps daylight arrival. Did the company ever tell you to slow down because of port closures or for economy like for example you talked about efficiency like stevedore times so there wouldn't be overtime in a port, anything like that?

WIT: Yes. They would communicate. They would be aware of conditions in a port. A port closure for example and would communicate that to the ship.

Mr. Fawcett: Any other times that come to mind related to speed up, slow down, or routing that they told you to take to manage the voyage of the vessel?

WIT: It would be voyage orders. And it would normally be around arrival scheduling. If I could make an earlier arrival to do so. If it was a later arrival for whatever condition may be, cargo planning or if there was prohibiting safe navigation they would advise me and we would, you know respond immediately to that direction.

Mr. Fawcett: You mentioned that the internal audit process was a fairly lengthy process, usually conducted in port where they talked to the ship's officers, they validated the equipment on the ship and so forth. We're talking about the internal audit process. After the restructuring of Tote did that change in terms of the amount of time or level of detail invested in the internal audit process?

WIT: Not to my recollection.

Mr. Fawcett: Thank you very much Captain.

WIT: Yes, sir.

CAPT Neubauer: Mr. Kucharski.

Mr. Kucharski: Mike Kucharski, NTSB. Good afternoon Captain Hearn.

WIT: Good afternoon, sir.

Mr. Kucharski: Before I go into some cargo questions and securing of cargo there are a couple of places I – jump a little bit here, but one has to do somewhat with stability. And would you mind looking at Exhibit 195, they're photographs.

WIT: Yes, sir.

Mr. Kucharski: It says hold 3 vent openings – vent openings, do you see that? Okay. The ----

WIT: I see the vent openings, yes.

Tote Inc: Sir, can we, excuse me. We're referring to Exhibit 195?

Mr. Kucharski: Correct.

Tote Inc: We were informed that those exhibits would not be used today and we did not have those printed out because we were given those assurances.

CAPT Neubauer: That is true. So we will – can you ask these questions without referring to the pictures?

Mr. Kucharski: Sure. Captain Hearn on the vent trunks that went into the cargo holds, on the second deck there are manholes with a number of bolts, I don't know maybe about 20 bolts, do you know where I'm talking about?

WIT: Yes, sir.

Mr. Kucharski: Access plates to go into those vents.

WIT: Yes, sir.

Mr. Kucharski: Have you in your time on those vessels, let's concentrate on the El Faro first, do you recollect those inspection plates being opened?

WIT: Yes.

Mr. Kucharski: Great. Could you tell us what you saw inside of that?

WIT: The fire damper arrangement was inside of them. And a void trunk for ventilation.

Mr. Kucharski: Are there any baffles inside of there?

WIT: Inside of there, no real baffle that I can recall. There would be the flooring and the structural members, but nothing that would – a baffle.

Mr. Kucharski: And what was the condition of the inside of the trunk and the area surrounding it, the metal?

WIT: Fair. It was surface rust, some dirt and debris because it was an unmaintained space. It was normally bolted strongly closed and difficult to get into. They were only opened for repair mostly and possibly some maintenance or inspections.

Mr. Kucharski: Were they opened at all, you said inspections, were they opened to inspect? What did they inspect or what did the inspector inspect?

WIT: There may have been an inspection where they were opened, not a routine basis, but for a shipyard period. Not at sea.

Mr. Kucharski: Were those in the planned maintenance system, opening them up and inspecting them?

WIT: Well certainly to operate the dampers was planned maintenance and routine and done monthly if not more frequently. And the repairs were made to them almost immediately. The – I don't recall any other planned maintenance in the system. But the Chief Engineer would be responsible for all the planned maintenance programs.

Mr. Kucharski: How about if there's rust or any maintenance to be done? Who would take care of that?

WIT: If it was surface rust on the outside or the inside and what was found the deck department would take care of it. And if it was structural enough to do a welding repair the Chief Engineer would resume responsibility.

Mr. Kucharski: I have a couple questions on training.

WIT: Yes, sir.

Mr. Kucharski: Did you have any formal training on the use of the CargoMax?

WIT: Not that I recall.

Mr. Kucharski: Do you recollect any of your officers, your Chief Mates that had any training on the use of the CargoMax?

WIT: Not that I'm – not that I recall.

Mr. Kucharski: What is your most recent stability training that you've had? Let's say up until when you left the – left Tote which was August 2013, is that correct?

WIT: Yes, sir. Training. I studied for my Master's license and I obtained that in 1984. Most of it was self-study.

Mr. Kucharski: How about securing of cargo? When did the cargo securing manual go into effect about, do you recollect?

WIT: Well, sir, the cargo securing system or systems transitioned over the years. When I arrived on the El Faro there already had been a cargo securing manual issued to the ship. That was there. And of course I read that, studied it and that's something you familiarize yourself sometimes when you need and sometimes if you have the time to review it.

Mr. Kucharski: So no formal training, it was just review of the cargo securing manual?

WIT: No formal training.

Mr. Kucharski: Captain Neubauer I can go into cargo related if you would like to at this time?

CAPT Neubauer: Yes, sir.

Mr. Kucharski: Captain Hearn would you say that except for the addition of the fructose tanks that the basic stow positions and cargo securing methods on the roll on roll off decks, second and deck below were basically the same as when they were – when it was in ro-ro configuration?

WIT: Yes.

Mr. Kucharski: Were the ship's roll on roll off decks full pretty much Northbound, Southbound, and I'm not talking about with loaded trailers, just with trailers both Northbound and Southbound on the Puerto Rican run?

WIT: My recollection is typically full or nearly full Southbound to San Juan and there may be more open stows on the Northbound run.

Mr. Kucharski: Was there maintenance performed on the permanent cargo securing devices while the vessel was underway?

WIT: If there was any maintenance or any deficiency in the – oh excuse me, did you say permanent?

Mr. Kucharski: Permanent.

WIT: That you mean fixed?

Mr. Kucharski: Fixed.

WIT: Fixed to the ship, yes underway the crew members would clear the D-rings and make sure they were free to use and possibly clean the area which would include the deck buttons so that there was no debris or anything that would prohibit using them for stowage when you put a ROLOC box back on them. So if they could they kept the areas as clean as they could.

Mr. Kucharski: So were the stows voided so they could do the work on the deck area?

WIT: Not unless it was needed. Normally we would try to work around that area.

Mr. Kucharski: Was this maintenance ever entered into any planned maintenance system or anything like?

WIT: It was a routine maintenance to keep the area clean and to work on the lashings. The Chief Mates knew that. And they would sometimes increase that maintenance because it was needed and they would identify it as a problem. So it was more of a on as needed basis recognizing that they work with it daily.

Mr. Kucharski: So as far as the permanent or fixed securing devices that's what my question dealt with specifically. Was that ----

WIT: And my answer was on that. Thinking of the D-rings and the deck buttons.

Mr. Kucharski: And that was ----

WIT: [In audible].

Mr. Kucharski: Kept – put something in the planned maintenance system?

WIT: I didn't work with the planned maintenance system so I didn't deal with it directly. That would be the Chief Mate or the Chief Engineer. I was in discussions with it, but it was not a function that I dealt with directly and I don't know if that specific item is specifically identified in the planned maintenance.

Mr. Kucharski: Specific questions on lashing of cargo. Was it easy or were you able to keep all the proper lashing angles with the trailers on the ro-ro deck when they're packed in so tightly together?

WIT: It's difficult.

Mr. Kucharski: So were the angles, required angles, were they – were you able to maintain them?

WIT: We – on a voyage by voyage basis we would maintain them if we needed to when I was Master. The – it's a lot of work to move lashings if they're put on incorrectly, but just that they're on the trailer is a big help because you only have to move it or shift it to a better correct angle. Sometimes the lashers, the longshoreman may put it in the wrong – wrong way and my crew would have to go out and fix that. And we wouldn't do that if it was a routine good weather voyage on the Puerto Rico run.

Mr. Kucharski: Was a heavy weather or hurricane lashing profile in use every voyage?

WIT: To Puerto Rico?

Mr. Kucharski: To Puerto Rico.

WIT: No, sir.

Mr. Kucharski: Please look at Exhibit 40, Appendix 17, it should be in about page 137.

WIT: I'm sorry the page numbers I'm seeing are by chapter I think, or section and page number. What am I looking at? Cargo securing manual.

Mr. Kucharski: It's Appendix 17.

WIT: Section 17?

Mr. Kucharski: It's called Appendix 17 it's at the end of the – towards the end of the cargo securing manual. It's called Appendix 17 the advanced calculation method for non-standardized cargo.

WIT: I'm not sure where I am here.

LCDR Yemma: What was the page number again?

Mr. Kucharski: 137 by PDF.

WIT: Thank you. Page 137 by PDF. I got it. Advanced calculation method for non-standardized cargo.

Mr. Kucharski: Correct. There's approximately 10 or 15 pages for the advance calculation for transverse tipping, for transverse sliding, safety factors, balance of forces and moments. Have you seen this form before?

WIT: I don't recall if I've seen it or not.

Mr. Kucharski: Have you ever seen anyone on the ships perform this calculation?

WIT: Which calc – there's – I see several pages.

Mr. Kucharski: The advanced calc – advanced calculation.

WIT: Of these forms, no. I've never seen anybody do it.

Mr. Kucharski: Please look at Exhibit 40 page 102. I'm sorry, Exhibit 40 page 102.

WIT: Umm I think I've got a page 102 by – in the lower corner I think. I have the top of the page devices, auto lashing, trailer lashing.

Mr. Kucharski: Yeah it has a ----

WIT: And a ROLOC box.

Mr. Kucharski: It has a picture – has pictures specifically I think it's called Exhibit 40, I'm sorry it's P7 on there, on this like a diagram.

WIT: Yes, sir.

Mr. Kucharski: The tensioners.

WIT: Yes.

Mr. Kucharski: Okay. The barrel tensioners, is that what you would call them?

WIT: Yes, sir.

Mr. Kucharski: Do they use those to secure the lashings on the El Faro on the ro-ro deck?

WIT: Yes.

Mr. Kucharski: How were they tensioned?

WIT: With a ratchet.

Mr. Kucharski: Was there any measurement to see what the actual tension on them was?

WIT: There was no measurement and no way to measure. It was hand tight. But you know through force with the ratchet which would be tight as a steel bar.

Mr. Kucharski: Were you aware of any manufacturer's requirement on the specification to tighten them?

WIT: I think that they were ratchet driven devices, but they recommended not using a cheater bar or an additional bar to overtighten the device. That's all I can recall though.

Mr. Kucharski: The same Exhibit 40, page 37 Section 6.2.

WIT: Of page 37?

Mr. Kucharski: Yes please.

WIT: Yes, sir.

Mr. Kucharski: And it's, that section is entitled securing wheeled vehicles to the ship.

WIT: Yes.

Mr. Kucharski: And the following page number 8, item number 8.

WIT: Yes.

Mr. Kucharski: It reads pad eyes and luggage structural members of a cargo are often better securing points that may be found on the trailers.

WIT: Yes.

Mr. Kucharski: Did you feel they were sufficient points on the trailers?

WIT: It's rare on a normal commercial tractor trailer to find a securing point at the forward end and sometimes even at the after end that's very strong. There may be a securing or lashing point, but it's rare. And Tote Service Alaska many of the shippers were familiar with the more rugged cargo voyage and they had modified some of their tractor trailers and vans to have securing points built into them. But on the East Coast it's rare to see something like that. Or to find a routine van to have some other securing point that would help for marine service.

Mr. Kucharski: Would you please look at Exhibit 42, page 130. Title of the exhibit is Tote lashing manual.

WIT: Typical stack weights and pounds.

Mr. Kucharski: Exhibit 42, page ----

WIT: Oh I'm sorry. I'm on the wrong exhibit.

Mr. Kucharski: Okay. Take your time. Jumping around a little bit. Page 130.

WIT: I see the – a photograph.

Mr. Kucharski: Yes. Could you tell us what we're looking at?

WIT: It's a little blurry. It looks like the undercarriage of a standard cargo van with a slip hook or a grab hook into the undercarriage frame.

Mr. Kucharski: Into the trailer?

WIT: Of the trailer.

Mr. Kucharski: Is this something that you would typically see as lashing?

WIT: Yes.

Mr. Kucharski: Captain Hearn I want to talk about the buttons.

WIT: Yes, sir.

Mr. Kucharski: On the ship where the ROLOC boxes were secured to, is that correct?

WIT: Yes, sir.

Mr. Kucharski: When you're on the Alaskan run, let me back off on that question. Was it difficult to determine if that button was working properly?

WIT: The difficulty with the button arrangement pin, and the pin in the – from the ROLOC box into the button was – it was difficult to observe it that it was a secure, perfectly secured device. Because the pin from the ROLOC box that was being

inserted into the deck button could be torqued in the wrong direction. It was suspended by a spring that could be twisted and you could torque it correctly or incorrectly to lock into the device. So you would not know if it was incorrectly secured in the device that way. It may also be difficult to observe that the lashing was tight enough for working. Because it would be hand tight, but you would have to physically go down and shake it and we would typically just pound it with a maul to make sure that it was tight.

Mr. Kucharski: So how did you know that the button was operating properly?

WIT: Well the first indication the button was operating properly was if the lashing was in the button. If it was not in the button then of course you've got a problem there. The other indication would be if you could see a physical defect or damage on the button itself visually from the outside. You would not be able to inspect the inside visually at all. There was a tool for it that – that's some of your difficulties with that arrangement.

Mr. Kucharski: So visually, let me rephrase that. Would it be important to be able to look inside if you could inside of that button to see if the parts were working properly in there or properly attached?

WIT: That wasn't a convenient thing to do and it was impossible to do visually.

Mr. Kucharski: Was there anything that was done on the Alaska run to go ahead and test those buttons?

WIT: There was a testing tool that we used to measure the clearances inside to make sure that there was no wear or tear or damage or obstructions inside the button so we knew they were in good operating condition.

Mr. Kucharski: And was that carried through then on the Puerto Rican run?

WIT: It was on the El Faro when I was aboard because the tool was on the ship. It was in the Boatswain's locker.

Mr. Kucharski: So there was a formal program to go ahead and test those up until the time you were on there?

WIT: I made sure it was done because I was involved with it. So you can call that formal because it would be a direction from me.

Mr. Kucharski: Captain thank you. Captain Neubauer, Captain Hearn I'm finished with my line of questions. Thank you.

CAPT Neubauer: Captain Hearn I just have a couple questions in regards to the safety management system.

WIT: Yes, sir.

CAPT Neubauer: For the – specific for the Jacksonville to Puerto Rico run. Did you personally conduct safety rounds on the El Faro and El Morro while conducting that run?

WIT: What was the second part of your statement?

CAPT Neubauer: I was wondering if you personally conducted safety rounds on the vessels in that service, Jacksonville to Puerto Rico.

WIT: Yes.

CAPT Neubauer: And if you found a safety issue during your rounds, did that ever occur?

WIT: Yes. That's a broad perspective of things because everything is a safety issue for a ship. But yes, that's correct.

CAPT Neubauer: What types of safety discrepancies would you report to shore?

WIT: Anything structural, watertight integrity, certainly anything that could hurt personnel including hazardous material cargo and things like that. Anything that was safety and structural or a large project or damage to the ship or damaging. Also life saving and fire fighting were concerns because you wanted to keep them in the best condition possible. If it was a small hazard that we could manage ourselves on the ship which could be a routine hazard I may not report that to the company. Although there was a safety meeting every month and many safety items, if it was a near miss, we had near miss reporting or other parameters that I could incorporate that into the lessons learned for the voyage and for the crew it would make it into the safety meeting also and be reported to the company.

CAPT Neubauer: Did you ever have any problems on either the El Morro or El Faro with the primary life saving equipment including the davits?

WIT: The El Morro had a problem with some of the survival suits, were not well maintained and they were in poor condition and we had to replace them. And there may have been some problems with the El Morro life boats. I know we had to do some repairs to the releasing gear on the life boats for the El Morro. And the propeller was in very poor condition, the shafting of the motorized life – I think it was the motorized boat. It could have been the Fleming gear boat, but it was in poor condition. We had to replace that also when I was Captain on the ship. Without looking at records, I mean some of these are routine inspections and I don't recall them because it's part of the normal operating parameters to find difficulties and maintain the ship and correct them. The falls themselves on the construction – the operation of them were normally in good condition that I recall.

CAPT Neubauer: When you did have an issue to report to shore how was the response from the company?

WIT: Normally good.

CAPT Neubauer: Did you ever sense a change in the level of service for your safety concerns over time?

WIT: My last year with the El Morro it was more difficult to get changes – corrections made to some of the systems and repairs.

CAPT Neubauer: Was that in the 2013 time frame, sir?

WIT: 2012 or ’13, yes.

CAPT Neubauer: Can you give an example of any reports that you presented to the company where you did not get good service back?

WIT: The most difficult one was when I first joined the ship within 24 hours we found some holes in the cargo spaces on the second deck and the company – there was a reluctance to report this to the Coast Guard.

CAPT Neubauer: When you say a reluctance who in the company did you report to and who did you get push back from?

WIT: I reported to Lee Peterson, he contacted Cliff Hill on the West Coast. And Cliff flew a Port Engineer out to the ship in San Juan and the Port Engineer was given responsibility to report it to the Coast Guard. And we showed him the – the Chief Engineer, I think the Chief Engineer showed him the damaged area and we anticipated that he would report it to the Coast Guard.

CAPT Neubauer: Was the damaged area a part of the watertight envelope on the vessel?

WIT: Yes, sir.

CAPT Neubauer: And could you continue on what happened from that point on, sir?

WIT: Well the Port Engineer did not report it to the Coast Guard. And I was disappointed of course because it was regulatory and part of my responsibility. Excuse me, I contacted the Designated Person which was Harry Rogers, he wrote an email to the company urging them to report the damaged area to the Coast Guard and American Bureau of Shipping so that they were aware of the damage and the repair for it. By the time we were in Jacksonville the Coast Guard was on board and the American Bureau of Shipping was on board and the company was on board and they came to look at the area.

CAPT Neubauer: So the vessel made one Northbound trip with that – with the deck area damaged?

WIT: Yes.

CAPT Neubauer: Was the problem corrected in Jacksonville?

WIT: Corrective action was taken and a plan was put in place to make corrections to it under ABS and Coast Guard supervision.

CAPT Neubauer: Did you ever sense any ramifications to you from taking that action, sir?

WIT: It was a more strained relationship with me and the Port Engineers.

CAPT Neubauer: Can you talk about the end of your time with it was Sea Star Line at the time, sir?

WIT: Yes, sir. What do you mean by that?

CAPT Neubauer: What happened to you from an employment standpoint? Did you quit from the company or were you terminated?

WIT: I left the company, it was unplanned. The year on the El Morro was a difficult one as we discussed. There was an incident on the ship with crew members and I felt, well I'll put it this way, the company came on board following that incident, weeks following that incident, and a Vice President from the company and he asked me to resign or I would be terminated. And I – and if I resigned they gave me the opportunity to – they would help me find other employment. I said that I would resign and try to work with them. I wrote to the President of the company the following morning and withdrew my resignation and asked for an investigation. But they responded with termination. I'm a contract employee through the union, the union picked up the process for grievance. And through a year and a half it was never resolved. And – but the company made me an offer to resolve the opportunity to expunge any record of it and part ways which I accepted.

CAPT Neubauer: Did you ever discuss that situation with other Masters that were employed at the time?

WIT: Captain Davidson was on board the day that that happened. The same conditions were given to Captain Villacamp [sic], the Captain opposite me. I didn't discuss it with any other Captain.

CAPT Neubauer: Did you discuss it with Captain Davidson what was happening?

WIT: I had turned over to Captain Davidson when he came on board the ship. In fact I asked to have him come up to the ship and I showed him all that I could within the hour or so that I had left and tried to help him. I gave him my phone number to call me

afterwards, said if you had any questions I could help him with, and he did call me twice with some small questions and that was it.

CAPT Neubauer: Did you feel part of your termination was due to the fact that you were pointing out safety concerns on the El Morro?

WIT: I really – I don't know why it happened.

CAPT Neubauer: Do you think – was there any conversations with Captain Davidson or any other Master where it was brought up that they were concerned about what happened to your employment status?

WIT: Not with me.

CAPT Neubauer: Are you aware of any concerns throughout the company of what happened to your employment status?

WIT: I was not in touch with anybody from the ships again, so I don't know if they had concerns. There's always a rumor mill and there's always things to be discussed that would possibly influence or weigh upon them because they were present. Several of the officers that was on the El Morro transferred to the El Faro and we had worked together for a period of time. Some of them I knew longer.

CAPT Neubauer: Thank you Captain. Those are all the questions I have at this time. I would like to go to the parties in interest. Tote.

Tote Inc: No questions, sir.

CAPT Neubauer: ABS do you have any questions?

ABS: No questions.

CAPT Neubauer: Mrs. Davidson do you have any questions?

Ms. Davidson: No, sir.

CAPT Neubauer: And Herbert Engineering do you have any questions?

HEC: Yes, sir, we do. Captain I'm Spencer Schilling with Herbert Engineering. And I just had a quick question on active roll period. And just to quantify a little bit the tenderness of the vessel or the stiffness. Did you have a chance to quantify the roll period in any of your operating GM's by measuring the roll period?

WIT: Did I time it do you mean? I did time it but more out of professional interest with the students. Not necessarily because I was concerned. And I may have, I don't recall it because it can be. And it might be something to verify, you know the calculation that you receive. But I don't recall double checking with a visual observation. Only that we trusted the calculations that we had and it seemed to be close enough to be concerned that we found. We looked for solutions to give more safety measures to the voyage and that's what we did.

HEC: Okay, thanks. The – so but there was a noticeable difference in the actual roll period between say departure and arrival that you noticed because you mentioned it – it seemed a little more tender on arrival?

WIT: Well it felt more tender to me. And as you became sensitive to it you would look for it at all times because it was a new condition. I have been so long with that class of ship that when we started carrying the larger heavier loads it was a noticeable difference. And that's when we got – we looked into all of the conditions in the load conditions, the calculations and where we stood to make sure that we could preserve that safety factor.

HEC: Thank you very much.

WIT: Yes, sir.

CAPT Neubauer: At this time are there any final questions for Captain Hearn? Commander Denning.

CDR Denning: Captain just a few quick follow up questions. You mentioned a tool that had been used to test the buttons on board the ship.

WIT: Yes, sir.

CDR Denning: Was that tool something that was provided by a particular manufacturer?

WIT: No, sir. It was – the tool was used a pin, a brand new pin from the manufacture and it was only extended on a T-bar so that we could use the correct measurements and expectations of the ROLOC box device. But it was simple so that we could go around very quickly and check several hundred buttons to make sure that they were in good condition.

CDR Denning: So is it correct to say that it was something that was developed on board that ship?

WIT: It was developed on the ship by one of the Chief Mates.

CDR Denning: Was it only used on board that ship or was there a procedure to use something similar on other ships?

WIT: In the Alaska service all the ships had that device and used it routinely.

CDR Denning: Which would have included the Northern Lights at the time?

WIT: The Northern Lights, Westward Venture and the Great Land, that's correct.

CDR Denning: And are you aware of whether it was also used when the vessels came to the Puerto Rican run?

WIT: I don't know if the El Yunque or the El Morro had it. I don't recall seeing it on those ships. When I was on the El Morro there were other issues to deal with that were, to me more important and I never got around to that device in using it. I would have. But I'm not aware of it. But I do know it was on the El Morro, or excuse me the El Faro.

CDR Denning: At least as of the time that you departed?

WIT: I think it was there on the time I departed, yes.

CDR Denning: Did it ever reveal any damage – about how frequently did it show damage that needed to be repaired?

WIT: It was becoming rare. There were damaged buttons. I think one of the last times it was used I used it, to be quite honest. I was in layup in 2009 and inspected the ship you know myself, almost everything around it.

CDR Denning: And then final couple of questions. Did you ever on the Alaskan run, specific to the second deck, I know it was ro-ro cargo above decks as well before the conversion to ro-con, did you ever – did any of the cargo on the ro-ro decks on second deck or below ever break free on the Alaskan run?

WIT: On the Alaska run it was not uncommon to have damage and cargo breaking free.

CDR Denning: Did you ever have similar issues on the Puerto Rican run?

WIT: No.

CDR Denning: That's because the weather was more calm?

WIT: Normally the weather was not only more calm, but also if you did have – the voyages that I had where you had any motion or sea motion it was manageable by

ship's heading and ship direction. So you could reduce the impact of ocean waves on the ship by just turn the ship a little bit and taking that edge off.

CDR Denning: Thank you Captain. And then just my final question would be lashing is a very important issue with cargo securing in particular. Are there any questions that we haven't asked you that you might think might be a concern on these vessels?

WIT: No.

CDR Denning: Thank you Captain.

WIT: Yes, sir.

CAPT Neubauer: Mr. Kucharski.

Mr. Kucharski: Thank you Captain. Captain Hearn one last question.

WIT: Yes, sir.

Mr. Kucharski: Did you see a change in the experience level of the senior personnel on board those ships, on the Puerto Rican run from when you started there to when you left?

WIT: When I first transferred to Sea Star there was a tremendous amount of experience on those ships. All the Captains were senior, had been there from the beginning 10 years, more experience on that specific run. Many of the engineers same thing. Well experienced, if they were new to their capacity they still had plenty of background in the company moving up through the ranks which was pretty common. And they carried – so they knew not only their new job but they knew their previous jobs before them to help other people. So there was a good mentoring program on there. By the time I was leaving that was changing. So there was less experience on the ships and that does make a difference.

Mr. Kucharski: Was that both deck and engine?

WIT: Both deck and engine.

Mr. Kucharski: Would that cause you any concern if you were in heavy weather or had some kind of big problems going on?

WIT: Absolutely. Absolutely in all directions depending on the person and what they were doing, with the Chief Mate, Second Mate, even the Third Mate, being able to help observe things on deck whether they would recognize lose cargo or not. And engineering if you're in rough weather and you have to make course changes or speed changes and it can very fast and difficult especially with the weather, you would normally get all your – all personnel down there for some of the maneuvers. They may not – and with experience in rough weather especially they – an experienced person may recognize problems much quicker and be able to react or get help down there soon enough to make a difference and that can be a critical component. It's a critical operation to be in rough weather.

Mr. Kucharski: Have you actually been in situations of where you've lost a plant or something?

WIT: I've lost a plant, not in rough weather. I've been in many critical situations with rough weather.

Mr. Kucharski: Thank you Captain.

WIT: Okay. Yes, sir.

CAPT Neubauer: Mr. Roth-Roffy.

Mr. Roth-Roffy: Good afternoon.

WIT: Yes, sir.

Mr. Roth-Roffy: Tom Roth-Roffy, NTSB. Captain we understand from previous testimony that there was perhaps a flooding event in one of the holds and some associated listing perhaps. Do you have any experience with any incidents in your experience on these class of vessels you know with flooding events or listing or any such sort of events that you perhaps shed some light on?

WIT: Yes, sir. I was the Chief Mate on the Westward Venture and we had significant flooding in number 3 hold. Probably around 1987 or 8.

Mr. Roth-Roffy: And could you please in much detail as you can provide a description of that event? The events leading up to it, you know the findings and the resolution that you were all able to take from that event.

WIT: Yes, sir. I was – I lean towards actually 1986 or 7, early '87 I was Chief Mate. I was new to the ships and I was on watch. It was around I would say 5 O'clock in the morning or 6, I noticed a list to starboard of a few degrees that – and the ship was staying to that in that direction while we were rolling in heavy seas. I reported it to the Chief Engineer at breakfast and he thought maybe it was a – they needed to move some fuel but at that moment the Boatswain came and said we had a lot of water in number 3 hold. I went down to number 3 hold and we had 8 to 10 foot of water on the starboard side rolling, moving, but it was basically on the starboard side but it was moving across to the other side of the hold wall, so. And it also transferred from number 3 hold into number 2A hold and into number 2 hold. The water had gone through the watertight doors.

Mr. Roth-Roffy: So the water – water had transferred through a cargo hold?

WIT: Yes, sir.

Mr. Roth-Roffy: That was ----

WIT: That's correct.

Mr. Roth-Roffy: That had been rated for watertight integrity?

WIT: Yes, it did. It leaked through.

Mr. Roth-Roffy: Did – were you able to determine how the leak or where that leak had occurred on that door?

WIT: At the time there were two theories. One that the hatch was left open or had popped open, and the other one was the possibility that water came in through the bilge system, the fixed bilge system which is a system to pump water out. And they could have been pumping water out and left it unsecured was a theory that water had backed in through the ship, the ship's system.

Mr. Roth-Roffy: And how was that water eventually removed from the ship and how long did that evolution take?

WIT: It was difficult. We had to go into the water, the First Engineer and I did it. And we went into the rose box which is a very narrow small deep well with the suction line into it and we had to clear it of small paint chips and rust and debris. Small scale that had jammed up and obstructed the ability to suck the water out of it and dewater the hold. So it took, by hand, hours and we probably didn't dewater that hold for about 8 to 12 hours. It took quite a while. It was a battle.

Mr. Roth-Roffy: And what was the vessel movements during that period? Was it rolling or did it just assume a permanent list?

WIT: No it was rolling, we were in rough weather. And it was difficult and violent to actually to work in those conditions because we were getting washed over. One guy

would have to hold the other guy to keep him from getting hurt while we were trying to clear out the rose box. It was an urgent situation. But the ship was not taking on more water, or at least we didn't think we were, and we weren't. So that was just hard work and difficult.

Mr. Roth-Roffy: Sir, do you recall if there was ever an investigation by the company on this event and any lessons learned within the fleet?

WIT: There were lessons learned on the watertight integrity of the watertight doors. And the hatches to double check and make sure they were secured. We knew better to keep a good eye on the watertight integrity of the watertight doors to keep them maintained and manage them and inspect them. But that's one of your most difficult jobs is managing those big gaskets in those jobs. It's a hard thing to do. But it can be [in audible] work.

Mr. Roth-Roffy: And if you recall what was the maximum angle of list that was experienced during that event?

WIT: Approximately 3 to 5 degrees.

Mr. Roth-Roffy: And one final question, sir. Do you recall if there was some type of safety bullet or alert or some sort of a documentation of that incident that was shared with the other vessels in the fleet?

WIT: I don't remember that now, sir. It's 20 years ago now.

Mr. Roth-Roffy: Thank you Captain.

WIT: You're welcome, sir.

CAPT Neubauer: Captain are those large gaskets for those cargo doors, do you remember those being maintained well for the Puerto Rico run?

WIT: It's difficult to remember because I was not always with the ship in the shipyard to see, and I wasn't present for those testing opportunities. My understanding was that they were managed and of course there was supervising and the testing would be required by the ABS to manage that. The Chief Mate would be present, but it may be somebody else that would manage it. I wasn't in the shipyard periods. And normally you couldn't do those test unless you were in an IO period when you weren't working cargo. And I transferred from ship to ship several times to the El Yunque and back to the El Morro over to the El Faro. So it was possibly I missed it completely. I don't remember any problems with them. But I don't remember being present for any maintenance or inspections.

CAPT Neubauer: Captain did you spend any time with the vessels while they were laid up? Specifically the El Faro.

WIT: Yes I did.

CAPT Neubauer: What is your opinion on how the vessel was maintained while laid up?

WIT: The first time I was laid up with the ship was in Baltimore. And there was a crew of, it started with about 6 or 7 men, we reduced to 4 and we had a very specific maintenance program, under company direction to rotate machinery, manage and maintain all of the records, move all the doors, keep the spaces clean. And then we were also doing an awful lot of work actually on corrosion prevention and maintenance of the steel, steel preservation. And the engineers were doing a tremendous amount of work equally to the boiler systems, the valves, not only inspecting them and operating, but they were taking them apart, repacking them and putting them back together again.

Things like that. And then there was a lot of welding and repair work going on like that if it could be managed by the few of us that were there. And some of it was because we could do it with a few guys, just get them together, do it and then break it down to another man. After that period the ship went into an unmanned lay up so there was no maintenance done to the ship.

CAPT Neubauer: Do you know how long that unmanned layup lasted for?

WIT: The first period we laid up the ship I think in August of 2011 and she reactivated for 3 months in 2012. And then I never saw the ship again. I laid the ship up after those 3 months in 2012. I don't know when the ship reactivated or what her maintenance was after I left the company in the middle of 2013.

CAPT Neubauer: Thank you Captain. Mr. Kucharski.

Mr. Kucharski: Captain one follow on question. You were talking about the Westward Venture you went down, the vessel had 8 foot of water in the hold and you went into the rose boxes there.

WIT: Yes, sir.

Mr. Kucharski: On the El Faro where would the rose boxes – do you remember where they were located? Were they inboard, were they outboard, where aboard the ship?

WIT: Port and starboard aft. I would estimate about 20 feet inboard from the side shell.

Mr. Kucharski: Okay. Thank you.

WIT: Yes, sir.

CAPT Neubauer: Are there any final questions for Captain Hearn? Mr. Roth-Roffy.

Mr. Roth-Roffy: I apologize Captain.

WIT: Not at all, sir. Anytime.

Mr. Roth-Roffy: During that event you described previously accumulation of 8 feet of water was the vessel fitted with bilge alarms that perhaps could have indicated the presence of water in the hold?

WIT: At that time they were not. Those alarms were installed on the ships later. There was an alarm in the engine room for that.

Mr. Roth-Roffy: Okay. And on the El Faro was that vessel – did they have bilge alarms in each of the holds or and where were they located?

WIT: My recollection is that they were in the holds, aft in each hold. And that the alarm was in the engine room.

Mr. Roth-Roffy: Thank you Captain.

WIT: Yes, sir.

CAPT Neubauer: Are there any final questions for Captain?

Tote Inc: No, sir.

ABS: No, sir.

Ms. Davidson: No, sir.

HEC: Yes. A follow up question Captain. I – you were asked about the flooding of hold 3 of the Westward Venture, correct?

WIT: Pardon me? Can you repeat that?

HEC: You were asked questions about flooding in hold 3.

WIT: Yes.

HEC: 8 to 10 feet of water.

WIT: Yes.

HEC: I don't believe anyone asked you if there was ever a determination of the source of the ingress of that water.

WIT: We discussed it. Maybe I wasn't clear. It was two possibilities, one was the manhole above on second deck, because it was rough weather. And the other possibility was the bilge system, it was not secured properly when – if they had pumped bilges before. And those were the two possibilities, but we never resolved what the problem was.

HEC: Thank you. That was unclear, thank you.

WIT: Thank you.

CAPT Neubauer: Tote?

Tote Inc: Sir, could we just take a brief 5 minute break and decide on if we have any more questions?

CAPT Neubauer: Yes. The hearing will recess and reconvene at 2:20.

The hearing recessed at 1413, 17 May 2016

The hearing was called to order at 1422, 17 May 2016

CAPT Neubauer: The hearing is now back in session. Tote would you like to ask questions?

Tote Inc: Tote has no questions, sir. I believe Captain Davidson's counsel has some questions.

CAPT Neubauer: Mrs. Davidson.

Ms. Davidson: Yes, thank you Captain. Captain Hearn I want to discuss with you two issues. One is about crew experience.

WIT: Yes, sir.

Ms. Davidson: Are you aware that sitting here today that on the El Faro on it's voyage it actually had two Masters aboard her? Are you aware of that?

WIT: Well, sir, I know Steve Schultz, I guess he had a Masters license. I wasn't aware ----

Ms. Davidson: And he had spent 7 years on the Ponce Class vessels, correct?

WIT: I don't know, sir.

Ms. Davidson: He was a Chief Mate on the Ponce Class vessels for 7 years, correct?

WIT: I don't know, sir. Because I only met Steve once we worked for 2 weeks on the El Morro.

Ms. Davidson: So you have no knowledge about his experience?

WIT: No I have some knowledge, but I don't know exactly his knowledge.

Ms. Davidson: Okay. What about the Chief Engineers? Do you have knowledge about their experience?

WIT: Some, yes.

Ms. Davidson: Do you know that there were two Chief Engineers on the El Faro during its last voyage?

WIT: Well Jeff Mathias had a Chief Engineers license and I had sailed with Jeff. And Rich Pusatere was a Chief Engineer. And I had a – had been sailing first with me, you know I was on the El Morro.

Ms. Davidson: They were both very experienced Chief Engineers weren't they?

WIT: No.

Ms. Davidson: Sir, you were terminated weren't you?

WIT: No, they tried to terminate me it went to arbitration.

Ms. Davidson: Weren't you given a letter on July 15th, 2013 which states, Dear Captain Hearn, quote recently the U.S. Customs and Border Protection arrested El Morro crew members for smuggling 43 kilos of illegal drugs by the vessel. Do you recall that letter?

WIT: Not completely because you're only reading part of it.

Ms. Davidson: Do you want me to read the full?

WIT: No.

Ms. Davidson: I didn't think so. I have no further questions for this witness.

CAPT Neubauer: Are there any further questions for Captain Hearn?

ABS: No questions.

CAPT Neubauer: Captain Hearn do you have anything that you would like to say to the board at this point?

WIT: Thank you, sir, no.

CAPT Neubauer: Captain Hearn you are now released as a witness at this Marine Board of Investigation. Thank you for your testimony and cooperation. I know it was a long session. If I later determine that this board needs additional information from you I will contact you through your counsel. Or I'll contact you directly. If you have any questions about this investigation you may contact the Marine Board Recorder, Lieutenant Commander Damian Yemma. The hearing is now recessed and we'll reconvene at 2:30. And before – actually before we recess, do any of the PII's have any concerns with the testimony provided by Captain Hearn?

Tote Inc: No, sir.

ABS: No, sir.

HEC: No, sir.

Ms. Davidson: I question the reliability, but I have no concerns.

CAPT Neubauer: Yes, sir. Noted on the record. All right we'll now recess and reconvene at 2:30 with Mr. James Franklin, the Branch Chief, Hurricane Special Unit – Hurricane Specialist Unit National Hurricane Center.

The hearing recessed at 1426, 17 May 2016

The hearing was called to order at 1438, 17 May 2016

CAPT Neubauer: The hearing is now back in session. The board will now hear from Mr. James Franklin, Branch Chief Hurricane Specialist Unit, National Hurricane Center.

LCDR Yemma: Mr. Franklin would you please stand and raise your right hand? Sir, a false statement given to an agency of the United States is punishable by a fine and or imprisonment under 18 United State Code Section 1001, knowing this do you solemnly swear that the testimony you're about to give will be the truth, the whole truth and nothing but the truth, so help you God?

WIT: Yes I do.

LCDR Yemma: Thank you, sir. Be seated please. Sir, can you start by stating your full name and spelling your last name for the record?

WIT: James Lewis Franklin, F-R-A-N-K-L-I-N.

LCDR Yemma: And counsel can you also state your name and spell your last name for the record please?

COUNSEL: Michael A. Cannon, C-A-N-N-O-N, Office of General Counsel, United States Department of Commerce.

LCDR Yemma: Thank you, sir. And Mr. Franklin can you state your place of employment and your current position please?

WIT: National Hurricane Center, I'm the Branch Chief of the Hurricane Specialist Unit.

LCDR Yemma: Can you describe some of your general responsibilities in that position?

WIT: I'm basically in charge of forecast operations for the hurricane side of NHC's operations. Supervise the hurricane specialist who are the hurricane forecasters.

LCDR Yemma: And can you also describe some of your prior relevant work experience please?

WIT: I was a hurricane forecaster, hurricane specialist at NHC for 10 years or so before becoming a branch chief. Prior to that I flew research missions for NOAA into hurricanes for 17 years on the P3 aircraft as a researcher.

LCDR Yemma: Thank you, sir. And what is your highest level of education completed?

WIT: Master of Science in Meteorology from MIT.

LCDR Yemma: Thank you. The board will have questions for you now.

CAPT Neubauer: Lieutenant Comerford.

LT Comerford: Good afternoon Mr. Franklin. All of my questions today are going to be related to the time frame prior to the loss of the crew in the El Faro unless otherwise noted. Mr. Franklin we will explore these broad topics: function, roles and responsibility of the National Hurricane Center. The National Hurricane Center's methods of forecasting tropical cyclones, the day to day operations of the hurricane specialist during a hurricane, the genesis and forecasting of Hurricane Joaquin and all seas or

practices regarding public notification of forecasting analysis and forecaster input for the forecast. After we finish the initial Coast Guard questions for these broad topics the NTSB and the parties in interest will conduct questions in that area before we move on to other broad topic areas. Please let me know if you would like to take a break at any point during your testimony.

COUNSEL: Lieutenant one question. So basically we're going to go through say all the responsibilities of the National Hurricane Center, you ask all the questions then the parties will ask questions and then go to the next topic, is that's how it's going to go?

LT Comerford: Yes.

COUNSEL: All right, thank you.

CAPT Neubauer: Lieutenant Comerford could you speak a little closer to the microphone?

LT Comerford: The first topic area I would like to explore is the function and roles and responsibility of the National Hurricane Center. Mr. Franklin what is the National Hurricane Center and what does it do?

WIT: The National Hurricane Center is part of the National Weather Service, part of NOAA. It's our to forecast, mine in particular, forecast the formation evolution of tropical disturbances in the Atlantic and the Eastern North Pacific. We are responsible for forecasting tropical cyclones after they develop, track intensity, size and forecast. We have responsibility for coastal warnings in the United States and for Haiti. And for providing forecast guidance to the other countries of the Atlantic and the Eastern North Pacific.

LT Comerford: In your own words what's the – what is the mission of the National Hurricane Center?

WIT: We actually have a mission statement, which I'm not sure I can recall off the top of my head, but it is to keep our users safe from tropical cyclones the quickest way of raising it.

LT Comerford: Mr. Franklin, can you discuss the individual offices and branches that make up the National Hurricane Center?

WIT: Sure. We have three branches, two operational branches minus the hurricane specialist unit, we do the forecasting disturbances that have potential to become tropical cyclones and then forecast for the tropical cyclones after they form. The tropical analysis and forecast branch is the other operational branch at NHC and they do marine forecasting year round. Then there is a third branch, the technology and science branch which does operationally oriented development. They keep the trains running. And then we have the front office which would not be one of those three branches, but.

LT Comerford: You quickly mentioned your position at the hurricane specialist unit. Can you go in more depth on what your duties are on a day to day basis?

WIT: I put together the operational shift schedule for the hurricane forecasters. Supervise forecast operations during the season. During an event either myself or a director, Doctor McNab [sic] or Deputy Director Doctor Ed Ratherford [sic] will do many briefings for it might be FEMA, it might be affected States, other leadership briefings for NOAA folks, media interviews during an event. But largely my role is to supervise the forecast process.

LT Comerford: With the understanding that the individuals on the hurricane specialist unit have very diverse backgrounds, in general what are some of the qualifications of hurricane specialist in the hurricane specialist unit?

WIT: Well they all will have either a bachelors or masters or PHD in meteorology or closely related field. Many of the hurricane specialist previously worked in the tropical analysis and forecast branch as marine forecasters. A number of them came through there. A couple of us came from the research side of meteorology as I did. All of us pretty much became interested in hurricanes as a young kid. And have had a lifelong interest in hurricanes.

LT Comerford: The hurricane specialist unit is made up of, in general there is a specialist, senior hurricane specialist and a hurricane specialist. What's the difference between the senior and a regular hurricane specialist?

WIT: The hurricane specialist we have four hurricane specialist are GS-13 positions and we have 6 senior hurricane specialist those are GS-14 forecaster positions. The duties are largely similar although there is some differentiation of duties between the two. When, well warning, coastal warnings are in effect those systems are almost always worked by the senior hurricane specialist. It's the senior hurricane specialist who will handle higher level briefings, major media briefings. The senior hurricane specialist are responsible for the daily tasking of Air Force and NOAA reconnaissances flights. But both the GS-13 and 14 forecasters have similar responsibilities on the forecast floor when it comes to actually making hurricane forecast or forecast for disturbances that are threatening to develop.

LT Comerford: You mention it before, but again can you describe the geographic area of responsibility for the hurricane specialist unit?

WIT: Yes. So we have the entirety of the North Atlantic Ocean and then the Eastern North Pacific to the East of 140 degrees longitude.

LT Comerford: And the – can you discuss what each branch of the National Hurricane Center is responsible for producing with regards to products intended for the general public, specifically ships at sea?

WIT: The, well the HSU, my unit has a number of products relating to tropical cyclones. We have a public advisory which is a plain language non-technical text product that talks about the tropical cyclone forecast in a general way out to about 48 hours. We have a tropical cyclone discussion which is 2 or 3 or 4 paragraphs with each tropical cyclone advisory that provides forecast rational, why we did what we did, what are we seeing with the models for example. Although that's intended primary for media meteorologist and emergency managers, it's become pretty popular with the general public as well. A forecast advisory which is a formatted listing of the actual 5 day tropical cyclone forecast. And then there's a suite of graphics that go along with that. There is a wind speed probability product which lists both in text and graphical form the chances at any particular location on the map experiencing tropical storm force winds, 50 knot winds or hurricane force winds out to 5 days. Those are the primary products at the hurricane specialist unit. The TAFB, tropical analysis and forecast branch products I'm not as familiar with. There are a few that I can speak about briefly. The off shore waters forecast, a text product is a product which would include any marine tropical storm or hurricane warnings issued by TAFB. The high seas forecast out of TAFB is

again it's a semi-formatted text product which is basically a largely a repackaging of the HSU's forecast and the marine advisory, forecast advisory. It's repackaged in a different form into which they add additional information on waves and sea conditions which we don't do over on the HSU side. Some tropical weather discussion, another product of TAFB which is more a – of a synopsis of current weather across their area of responsibility. And they also have recently added a set of gridded forecast products. Gridded forecast sea state wind and various atmospheric parameters.

LT Comerford: That concludes my first topic of discussion. Captain in the interest of time request to move on to the next topic.

CAPT Neubauer: Let's move on.

LT Comerford: All right. Mr. Franklin, the next topic we'll be discussing will be the methods of forecasting tropical cyclones. Please describe the steps involved in producing the official tropical cyclone track and intensity forecast including who's involved in the decision making.

WIT: Okay. It's a largely a 3 hour forecast cycle. So for the advisory package that would come out at 11 a.m. for example, and we have 4 of these a day every six hours. The process would begin at 8 a.m. roughly. Typically for a tropical cyclone that was threatening land we would have scheduled an aircraft to go in there shortly before 8 a.m., 7:30 or so. The aircraft would locate the center of the tropical cyclone. It would try and find the strongest winds, minimum pressure, give us a picture of how broad the wind field is. The first 10 or 15 minutes or so of that 3 hour forecast cycle is then spent by the hurricane specialist analyzing the data that come in from the reconnaissance aircraft, anything else that may be available from ships, looking at the satellite imagery,

any other observations and preparing what we call the compute which is basically our analysis of the current location, current motion, current intensity, current pressure and the size of the wind field. That initial analysis information is then used to initialize a number of numerical models that are run. The – normally by about – in addition TAFB one of their functions is to provide us with a satellite based analysis of the location and the intensity of the tropical cyclone using something called the Dvorak technique. That's basically an ink blot test for tropical cyclones. You look at a picture and you can estimate the strength of the cyclone that way. So that's part of the information that comes in during that first – first period. By 8:30, 8:45 or so we now have received our – the set of model guidance back. And the next hour, hour and 15 minutes is spent making forecasts. So we forecast the track, the tropical cyclone out to 5 days. The intensity out to 5 days. The size out to 72 hours. And in doing that the forecaster will not only look at the various tracks that are coming from the American models he will be looking at various fields, three dimensional fields coming from a variety of models to try and understand why the various models are doing what they're doing. We have a set of intensity guidance models as well that come in. And by 10 O'clock the forecast needs to be complete. We have a conference call at 10 O'clock, one hour prior to advisory release with various other offices in the National Weather Service, local weather forecast offices would be on there, the Navy, a number of offices in the Navy, DOD will be on there. The weather prediction center in College Park. Storm prediction center on there and we discuss the forecast. If it is a – if there's watches and warnings in effect with land base hazards going on then we'll have discussions with WPC. They are the rainfall experts and so they will provide us some information for use in a public advisory

on rainfall. We'll discuss with storm predication center any statements we may want to make on the tornado threat. We will coordinate with another – there's another group by the way in the technology and science branch – science branch at HC, the storm surge unit is located inside of TSB and they will provide the hurricane specialist guidance on what we might want to say about storm surge. That conference call takes about, can take, I remember a horrible one taking about 25 minutes trying to discuss warnings. But normally it's 5 or 10 minutes. And then so by 10 after a quarter after the hurricane specialist then turns his attention to actually preparing the advisory products. So the public advisory is maybe 2/3rds preformatted for us and you know there's a template and we'll go in and fill that in. The discussion is written from scratch each time. So that's 2, 3, or 4 paragraphs of why we're doing what we're doing. The other products are largely generated automatically based on the forecast that we made. And if all goes well by 11 O'clock that's all kicked out.

LT Comerford: Sir, can you explain what the ensemble average product is?

WIT: Sure. So we have a number of forecast models that we use. Some of them you might be familiar with the names. We had the GFS which is the National Weather Service global model. We have the European Center for medium range weather forecast, UCWF which is a global weather forecast model that provides us tracks. The Navy has a model, the UK office has a model. Canadian meteorological service has a model. Japanese has a model. And there are – there are a couple other regional hurricane models the GFDL and the [in audible]. It's a pretty powerful rule in meteorology that a consensus of relatively independent and strong performing models routinely out performs even the best individual model. So for the last 15, 20 years or so

we have formally computed what's known as a consensus. Which is an average of some grouping of those models. And there are several consensusie [sic], consensuses that we form. And the model consensus is very often a starting point for where we would start thinking about where the forecast should go. It's on the only thing, we have our previous forecast that's also very important that I expect you're going to ask me about. But the model consensus is traditionally the best performing model year after year. It's a way of – it's a way of compensating errors, generally get washed out when you do that averaging processing.

LT Comerford: Does the consensus, sorry, does the consensuses change from year to year? Is it a different flavor every year?

WIT: We evaluate it every year. Over the past several years it has remained pretty fixed. We're actually adding a new model to the consensus this year, which is the first time I think that we've done that in several. It's been pretty stable over the last 3 or 4. The primary consensus would have the GFDL, it would have the HWARF of the European, it would have the GFS and the UK MEP. Those are the 5, we're adding a 6th this year. This is a Navy model called COAPPS TC. That's going to be added to consensus this year. Each off season we do a variant sensitive verification. And part of that verification effort is to look at whether we need to make changes to that primary consensus. Excuse me. A few years ago we dropped the Navy NOGAPS out of the consensus because it had performed poorly over a decade or so. And so we can do test. We can go back and look and see whether the consensus would be improved by adding this model and subtracting this model and so on. That's part of the off season analysis that we do.

LT Comerford: You've been talking ad nauseum about the different models that are available. Roughly speaking about how many models are there available?

WIT: I've only been up here for a few minutes. There are – there are about a half – there's about a half dozen primary models. There may be another half dozen lesser models, either they're based on simpler physics or they're older and have, you know fallen out of favor. There are all kinds of simple aids in the decks that we make available on the public FTPC site that range from something no more complicated than taking the current motion and extrapolating it out 5 days in time so you just have this one straight track. To very sophisticated models like the GFS or the European. But about a half dozen primary track models and about 4 or 5 primary intensity models.

LT Comerford: I would like to draw your attention to Exhibit 149, page 5.

WIT: Okay.

LT Comerford: This exhibit shows the National Hurricane Center's model summaries. On page 5 the document addresses early and late models. In your own words could you describe what is meant by an early and late model?

WIT: Sure. The – when we sit down to make the forecast that's going to go out at 11 a.m. like I just talked about, we, as I said at the very beginning of that process at 8 a.m. we analyze the location, strength, size, motion of the storm and I mentioned earlier that we then use that information to initialize the models. So that information along with all kinds of other observations collected around 8 O'clock, the balloon launces for example, the [in audible], all the way up to 8 O'clock, but the model won't actually run until 2 or 3 hours later. So there's a data collection period. So the 8 a.m. run of the GFS for example or the 8 a.m. run of the European model for example doesn't come back to the

forecaster until about 1 in the afternoon. So that's obviously too late to use for the 11 a.m. advisory and that's why we call that a late model. It's too late for us to make use of. So what we do is we go back 6 hours and we take the run of the GFS or the HWAR for the GFDL, any of these dynamical models that take a long time to run, we would go back to the one coming from 2 in the morning. And we use that forecast because it was available around 7 in the morning. And it was early enough to be used. And we have a process for making an adjustment to that 6 hour old run of the model to ensure that it's starting off from where we said the storm was going to be at 8 O'clock. So the model starts at 2 a.m., makes a 6 hour forecast, it may already have a – they would already be off by 6 hours, both the track and the intensity could be off by then. We basically, you can think of it as picking the model forecast off the map, sliding it 6 hours in time and plunking it down on the spot where the storm actually was at 8 a.m. And that's what we call the interpolated or early version of the previous run of that model. So whenever we're working with the GFS or the European or any of those models we're really always working from the one that was either 6 hours old 12 hours old. And that's the distinction between early and late.

LT Comerford: In your analogy of interpolate, is that a computer doing that program or is it a hurricane specialist physically plotting it on chart? So computer or man?

WIT: It's a computer, yeah, it's a program. A computer program that does that.

LT Comerford: There's a couple of different organizations you talked about developing these models. Maybe European's, Japan, Canada. What are they doing in general to develop those models or run the models over the course of the period? What are they doing?

WIT: Not sure I understand the question.

LT Comerford: In other words, how are they processing the data to deliver to the National Hurricane Center? Is it a large super computer model, or is it a lineup of forecasters in the background? Please describe a little bit about ----

WIT: Oh, okay. Yeah, it's – I mean it's all an automated procedure. It's basically the running of a global numerical weather prediction model. It involves the accumulation of observations, which is why that occurs over a several hour period. Then there's a process called data simulation which is a way of taking those observations and putting them into a form that you can start the model running. You basically have to create an initial depiction of the state of the atmosphere specifying pressure everywhere, temperature everywhere, humidity everywhere, all of the various parameters so that you – the model then can take the equations of motion that govern motions in the atmosphere and calculate forward from that initial prediction. So there are some very complicated software that takes in all the observations, it knows a lot about the various error characteristics of all of the different observations. Produces a snapshot if you will of the initial state of the atmosphere which then gets used to set the model off in motion. It runs an hour or two later we start getting the information back, both in the form of three dimensional fields of pressure, temperature, wind, whatever and the various tracks of the tropical cyclone in that model. So it's a, you know there aren't people doing this. There are people who have worked for years developing the techniques to do data simulation and develop the physics that make up the various models. But the process is automated at the end stage.

LT Comerford: Are all these models weighted evenly in the consensus?

WIT: In the, yes and no. We have what we call – we have equally weighted consensus, we have a couple of things where we attempt to look at past performance of the various models and make corrections for biases. And that would applying different weights. There's a model called the Florida State super ensemble for example which is what we call a bias correcting consensus or bias corrective ensemble. We've also explored in the past couple of years doing things like creating a consensus where we double weight the European model or we double weight the European and the GFS model because we know that those two tend to outperform the others. But we also have the simple equally weighted consensus models as well. We have both.

LT Comerford: Let me – official forecast for tracking intensity is generated or issued to the public. Can that be different than the consensus?

WIT: It will almost always be different from the consensus. Not generally by a lot because the consensus is usually where we start out thinking. But we also have to consider what our previous forecast was. We have by philosophy for decades we've had a philosophy of making only incremental changes to our forecast from one advisory to the next. If there is a rapid change in the model guidance such that the new consensus is very far off our old official forecast that might be a situation where we would come part way to the new consensus but we might be some distance away from it. So how far or not we're away from the consensus might depend on, again how big a model change there's been, our assessment of the reliability of any particular outlier that goes into the consensus. Sometimes we can look at a collection of models that are very different and we can identify a reason why one model might be very different and then either believe it or weight it or discount it. So it would be a combination of those

subjective judgements plus simply a reflection of how much has the guidance changed since last time.

LT Comerford: In your perspective what value does the hurricane specialist provide to adjusting an official forecast?

WIT: Say that again please.

LT Comerford: Sorry let me correct myself. So the official forecast is slightly adjusted from the consensus. What part does the hurricane specialist have in that regard or what process is he following? What value does he put into the modifications and adjustments to the consensus for the official forecast?

WIT: A couple of things with touching on there. Number one it's gotten harder and harder for the human forecaster to outperform the track models over the years. The track models have been getting better and better. Track forecast accuracy now, the errors are about half of what they were 10 or 15 years ago. There's been a lot of improvement there. And that's not really because the forecaster is getting smarter, but it's because the computers are getting faster and the observations in the atmosphere are more dense and the models are getting better. So for track forecasting the primary role of the forecaster, if we can, again to identify a model that seems to be out to lunch or seems to really have a good handle on it, but more often than not the role in track is to ensure consistency in the forecast maintaining continuity with what we had before. Ensuring that we are not radically changing our advice every 6 hours going one direction at 11 O'clock and off and threatening some other area at 5 in the afternoon and then back to where we were before there. So that's – in some sense it's a little bit mechanical on the track side. It's different on the intensity side. The intensity forecast

models are not nearly as advanced as the track forecast models are. And it's quite common for the forecaster to add value over any of the guidance that we have for intensity. So the forecaster plays more of a role in shaping the official forecast and moving away from the guidance, from the model guidance for intensity. Because we can see things sometimes that the models cannot in terms of structure and intensity.

LT Comerford: During a watch how many hurricane specialist are on duty running the forecast and how long is each specialist watch?

WIT: You mean shift? Forecast shift?

LT Comerford: Yeah.

WIT: Okay, sorry. Watch has another meaning to us. So we normally staff 2 forecasters at a time. There's a senior hurricane specialist and a hurricane specialist on. I'll work a hand full of shifts in the unit as well. So for some of those I would take the place of the senior hurricane specialist. But we also have a couple of other folks in the building, our science and operations officer and we also have a Navy officer there who worked routine shifts as a hurricane specialist in the unit. But it's 2 at a time in most cases. There are 3 shifts a day. And the day shift tends to be a little bit longer because they have responsibility for the 11 a.m. advisory package and the 5 p.m. advisory package. Whereas the other two shifts have only responsibility for a single advisory package. When there is more weather going on than can be handled by 2 we will staff up and add an additional person or an additional 2 if necessary. Because we're responsible for both the Atlantic and East Pacific and we could have as many as 5 active tropical cyclones going on at a time. Plus disturbances that we're also making internal forecast for as well.

LT Comerford: When you increase staffing is it primarily for the number of tropical cyclone events or disturbances?

WIT: Either the number or the severity of the event. So a major U.S. land falling hurricane for an example generates a tremendous amount of incoming phone calls, media inquiries, briefings and the like. So even if we only had two systems going on and so you had one person working and the other person working the other, the pressure paws at other demands on the forecaster's time might be such that we would put somebody else on just to answer the phone for an example. Or help monitor data or other things so two forecasters could work. So it's very much workload specific. You know what's the briefing load, what is the – now in general each forecaster is expected to be able to do two advisory packages at once. So during that 8 a.am. to 11 a.m. period he might – everything that I described to you earlier he might have to do twice if he's working two storms at a time. I remember one shift where I actually had to do 3 at once. Which was not fun.

LT Comerford: You stated for you may up the number of people on watch for U.S. major hurricanes hitting U.S. land. Does that apply to any other countries?

WIT: It's driven by the amount of really incoming traffic. So for a major U.S. event that's where the number of needed briefings gets larger or the number of phone calls. We had a super major land falling event for Mexico last year, Patricia, the strongest storm ever that we observed in either of our basins and yet it generated very little media attention because it was Mexico. At least to the Hurricane Center. So you know it's not that we're picking out the United States, it's driven by the amount of work that is – that we're having to do for those kinds of events.

LT Comerford: For Hurricane Joaquin leading up to the time of 01 October, do you recall if the staffing was normal or had been increased?

WIT: I don't recall. Well certainly early on staffing was normal. As it was approaching the Bahamas I would actually have to look and see whether we ever staffed up for that. There were no U.S. watches or warnings ever for Joaquin. And the other thing I don't recall is how many other systems we had going at that time. So I would have to look at the schedule to see how many folks were on at the time.

CAPT Neubauer: Sir, would we be able to get that data later from you?

WIT: Sorry? Oh.

CAPT Neubauer: Would we be able to get the numbers later, at a later time?

WIT: Yes, I have all the old schedules and I can go back and look and see who was on.

CAPT Neubauer: Thank you.

LT Comerford: Mr. Franklin, when the shift changes is there a procedure that the specialist follow to transition the shift between the daytime, nighttime, etc.?

WIT: There's normally a short briefing between the incoming and outgoing forecaster. Beginning last year or maybe very late the previous year we started keeping an electronic shift log at the Hurricane Center and that's actually become very helpful in sort of minimizing the need for a lengthy briefing because of events that occur on shift gets captured in a log. But in general there's a discussion that will occur between the incoming and outgoing forecaster.

LT Comerford: During that discussion can you describe some of the information that talked – or discussed between the off going and on coming?

WIT: It would – it would mainly be a discussion of what – what the forecaster was seeing in terms of the satellite imagery, what were the subjective nature, I mean we don't talk about really what the models show because we – the next guy can look at that. But any subjective insights that the forecaster might have had. Anything that maybe he wished he had done differently during the shift, oh I wish I would have noticed this or since the advisory has gone out I've seen this particular trend occurring in the satellite imagery. So it's largely the intangibles that would get discussed. If he had come to some opinion about the validity of a particular model he would relay that. Now some of that is in the tropical cyclone discussion. You know that's the place where we tell everybody what we think about the various models. But you know sometimes in the rush of getting that product out not everything goes into the discussions. So any subjective insights will get passed along with the briefing. There would also be discussions of any equipment that wasn't working properly or any other issues that might have arisen during the shift for example.

LT Comerford: That concludes my questions for this topic. I now turn it over to the board members.

CAPT Neubauer: Does the NTSB have any questions?

Mr. Richards: Just a few. Good afternoon Mr. Franklin.

WIT: Good afternoon.

Mr. Richards: Just for clarification does TAFB issue warnings?

WIT: TAFB issues marine warnings. So there's something called a marine hurricane warning which would appear in the off shore waters forecast. They will issue gale warnings as well.

Mr. Richards: And the hurricane specialist unit issues watches and warnings as well, correct?

WIT: The hurricane specialist unit issues coastal warnings for the coastal strip of the United States. We also make, and for Haiti. We also make recommendations on coastal warnings for all the other countries of the Caribbean and Central America, Canada, Bermuda, Azores and whatnot. But the actual warnings for all of those foreign countries are decisions made by the respective countries based on our forecast and hopefully our recommendations.

Mr. Richards: Okay. Would you say that between the products issued by the hurricane special unit and TAFB that these products have different intended audiences?

WIT: Sure. TAFB products are primarily intended for the marine audience. Ours are more geared towards emergency management, towards media, towards the general public.

Mr. Richards: Do you incorporate any information from TAFB into the products that the hurricane specialist unit issues?

WIT: TAFB contributes in a number of ways. I mentioned that they do the Dvorak analysis for us which is a very important part of how we estimate storm strength. Particularly for those storms in which we do not have aircraft reconnaissance. We only have aircraft reconnaissance in about 1/3rd of all the Atlantic advisories. And almost none of the Eastern North Pacific advisories. So their Dvorak analysis are very important there. They also provide us the estimated 12 foot seas which is a parameter in the forecast advisory coming out of the HSU. Those are generally – those are generated by TAFB.

Mr. Richards: One last question. And likewise does TAFB incorporate information that your unit produces – generates in their products that they issue to marines?

WIT: Yes. They – so our official 5 day forecast basically gets translated into the high seas forecast coming out of TAFB. The analysis information would appear in their weather discussion. Which is not so much a forecast product as it is an overview. That's a what's happening now kind of product. And similarly the forecast that would be generated by the HSU would appear in there in their high seas and be the basis for the warnings that appear in their off shore waters. The entirety of the National Weather Service is obligated to use the tropical cyclone forecast from the National Hurricane Center. So the local weather forecast office is, for example, would be basing their local products on the official NHC forecast, so. So our forecast, the HSU forecast has tremendous reach through various parts of the weather service. Not just TAFB.

Mr. Richards: That's all for now. Thank you.

CAPT Neubauer: Mr. Roth-Roffy.

Mr. Roth-Roffy: Good afternoon. Tom Roth-Roffy, NTSB. Just a few questions, sir. Could you briefly describe the reasons why some of the models have forecasting errors and why some models are better than others?

WIT: Well models have different levels of complexity to them. And a model is basically an attempt to take a very complex physical system that involves thermodynamics, it involves fluid, mechanics, it involves energy transfer from the ocean to the atmosphere and a whole lot of physics. And various models will make different complexities of assumptions about how those processes work. Models may have different resolutions. And by that I mean the ability of a model to depict either a very fine scale features in the

atmosphere or a poor resolution model would only be able to depict the coarser scale, larger scale features that might be there. Different models will use different sources of data. Certain types of observations are used in some models and not in others. The method of, I mentioned data simulation earlier. Each modeling center has a different technique that they will use to turn those observations into a picture of the initial state of the atmosphere. And so even the initial depiction before even the model gets cranking on calculation number 1 will be different because of how each model uses observations. Those are a few.

Mr. Roth-Roffy: And the second part of the question, why are some models better than others? Did you cover that in your first response?

WIT: Well higher resolution models all else being equal will tend to out perform poorer resolution models. Models with more sophisticated physics will often, but not always out perform models with simpler physics. It is often pretty complex to balance, for example you can increase the resolution of a model, but if you don't have appropriate data to then depict all of this detail that you're asking the model to produce, then having additional resolution might not help you. But it goes to the complexity of the physics. It goes to the speed of the computer that you're running on. It goes to the data that you're using. It can all lead to either good forecast or poor forecast.

Mr. Roth-Roffy: And that was my next questions. Regarding the speed of the computer, would you say that's a limitation of the amount of time that it takes to process the inputs and generate an output from these models?

WIT: Sure. As, you know as computers have gotten faster, I mean normally the first thing that happens anytime a modeling center gets a faster computer is they work to

increase the resolution of the model so they can cram more computations in that same amount of time period. It's generally time management. We know that for that model that's going to start running at 8 in the morning, you know it needs, or well actually it starts more like 11 in the morning, you know it needs to finish it's run at, you know within an hour, hour and a half. So as the computers get faster you now can see finer and finer detail and you work on making the model faster. So now I lost track of your question, I'm sorry.

Mr. Roth-Roffy: No I was just curious about the limitations of the processing of these models and whether or not the horsepower of these computers that we have are limitation that impact that?

WIT: Yes. So they're designed to do as much as they can given the resources that they have and finish by an appropriate time.

Mr. Roth-Roffy: And can you describe the history of improvements in the U.S. at computing power to process the forecast models?

WIT: Not in terms of numbers. There are – there have been, in fact I think just last week there was an upgrade of the GFS for example made possible by you know a computer upgrade. And they've been coming you know every few years. But I don't have the numbers on teraflops or that.

Mr. Roth-Roffy: Is funding for upgrades and computer capability, has that been an issue for you? Sorry I'll finish the question. Has that been a challenge for the National Hurricane Center to provide the timely or rapid forecast?

COUNSEL: I'm sorry but my client's not in a position to discuss funding, sir.

Mr. Roth-Roffy: Understood.

COUNSEL: Thank you very much.

Mr. Roth-Roffy: Around the time of the Hurricane Joaquin, were there any equipment problems? Any constraints on the center's ability to provide quality forecast? For example a satellite, availability of satellites, aircraft or other computing systems?

WIT: Not that I recall. I don't recall any outages or issues that caused us any difficulties.

Mr. Roth-Roffy: We've heard some information about other companies that take your output products and develop a different product. Do you have any knowledge of these sorts of things? For example the Bon Voyage system and others. You know what – how you added these service providers provide to the customer.

WIT: I'm not familiar with that particular company or actually probably anybody's because I'm usually pretty busy trying to get our products out. So I'm not seeing what other folks are doing.

Mr. Roth-Roffy: So you don't do any type of benchmarking on the sorts of weather information that's provided to mariners for example?

WIT: By others?

Mr. Roth-Roffy: In a way that you could perhaps improve roll product.

WIT: No I'm not familiar with what other people are doing. Now we have extensive verification of our own products to help us improve our own products. But we don't verify anybody else's. Now occasionally someone will come to us and say we've got this really great something or another and then we may look into it and evaluate it. Or we might become aware of something. But in general we're not out there to see what private sector is providing to their customers.

Mr. Roth-Roffy: And you mentioned during a forecast cycle the different models are weighted, either equally weighted or you over weight some models. During the forecast cycle do you dynamically shift the weight if you see that a particular model is behaving, in this particular cycle, better than them?

WIT: It wouldn't be – yes and no. We have experimented at various times over the past few years with something called the roll your own consensus. Which is an attempt by the forecaster to you know look at the guidance, okay, here's model X out to sea I don't believe it, let's create a consensus without that particular model. And we generally found that our ability to improve upon the standard consensus models was pretty limited. Last time I think we seriously did that was 3 or 4 years ago. Now that's done in an informal way with every forecast cycle. Every forecast cycle we are looking at the consensus whether it be an evenly weighted one or a biased corrected one. And then trying to look at all of the other clues that are available to us and move from that. So that is what you just described in a less formal way.

Mr. Roth-Roffy: Thank you very much. That's all I have. Captain.

CAPT Neubauer: Good afternoon Mr. Franklin. Sir, I just have couple additional questions along the same lines as Mr. Roth-Roffy just asked. I'm curious how long the 6 hour forecasting cycle has been in place. Do you have an idea how long that's been established?

WIT: I believe that goes back, certainly goes back into the 60's I would say. A long, long time.

CAPT Neubauer: Sir, and my questions is, as computers become more advanced, has there ever been discussion at the National Hurricane Center or the National Weather Service about increasing the frequency of that forecasting cycle?

WIT: No. A number of things would have to happen for that to happen and none of which I see happening anytime soon. Number one you – the radison [sic] network for example is only twice a day, it's 12 hours. And the global radison [sic] network is a pretty important part still of the data that goes into the numerical models now. You know satellites are certainly providing much more data than they used to and that happens fairly continuously. But the – all of the major global models that underpin our forecast are run on a 6 hour cycle. And – now except the European model which is still on a 12 hour cycle. So you know if we were going to consider going to something more frequently than that there would have to be a pretty fundamental change in the way that the world's modeling centers operate. And I'm not sure there's much pressure to redo a forecast that may be going out to two weeks every 3 hours for example. Now that doesn't stop us from issuing an advisory in between regular advisories and we do that whenever we need to. It's called a special advisory. If something has change significantly, maybe the storm has intensified more rapidly than we estimated 2 or 3 hours ago and the current forecast that's out there is obsolete or overtaken by events, then we'll issue a special advisory. We can do that at any time in the forecast cycle. So we do it already on an as needed basis.

CAPT Neubauer: When you issue a special advisory does that include a forecast track?

WIT: Yes. It's the same collection of products as the regular advisory. Forecast track, intensity, size, full sweep of text products, full sweep of graphical products.

CAPT Neubauer: Thank you. At this time I would like to go to the parties in interest for any questions. Mr. Richards.

Mr. Richards: Sorry just to clarify. When you're talking about issuing a forecast track with a special advisory, is that a new forecast track or is that a reissuance of the previous forecast track?

WIT: It might be one or the other. If the reason for the special advisory is that out thinking about the track has changed significantly then it would be a new track. More often than not though it's for to update the intensity forecast. It's pretty rare that in the space of a few hours we would see a need to radically change a track forecast. But it's unfortunately not all that uncommon because intensity forecasting is harder than track forecasting that we have to reissue a forecast to update the intensity. So it's more common for intensity.

Mr. Richards: Thank you. Thank you, Captain.

CAPT Neubauer: At this time I'll go to the parties in interest. Tote, do you have any questions?

Tote Inc: No, sir.

CAPT Neubauer: ABS?

ABS: No, sir.

CAPT Neubauer: Mrs. Davidson?

Ms. Davidson: Yes, Captain. Thank you. Sir, is there a difference, my name is Bill Bennett I represent Teresa Davidson. Mr. Franklin, is there a difference between a special advisory and an advisory?

WIT: Yes. A special advisory is what I was just discussing. So if we issue a – the regular advisory goes out every 6 hours, 11 a.m., 11 p.m., 5 a.m., 5 p.m. If we need to update that forecast in between, again generally it might be because a storm has strengthened much more rapidly than we expected. Then we would issue a special advisory package.

Ms. Davidson: And is that titled special advisory?

WIT: Yes. Yes, special advisory is in the header of the product.

Ms. Davidson: With respect to data collection, when does your office get notice of a storm that they want to track?

WIT: We are constantly, well we're on shift now. We started our shifts on May 15th. The East Pacific hurricane season starts on May 15th. We have forecasters on shift from May 15th to November 30th. And TAFB by the way is there all the time even when my unit is not. So it's the forecasters job to figure out when there is a system that needs monitoring.

Ms. Davidson: And what source – sources are they referring to? Is it a satellite, is it information from other parties? How does your office know that there is a tropical depression or a tropical storm building?

WIT: That would be primarily through satellite. There are – satellite imagery and a variety of satellite based observations.

Ms. Davidson: And then at what point and time would your office send a plane to do some reconnaissance?

WIT: So the reconnaissance aircraft do a number of different types of missions. I think when we have a disturbance that we think may be forming into a tropical cyclone we will schedule what's called an invest mission. And there is a limited geographical area that the aircraft have. Basically anything that's a potential threat to land that's West of about 52 degrees West in the Atlantic Basin, so that's a little bit East of the Lessor Antilles. Once it gets within range there we will schedule an invest mission and that decision would be based on what we're seeing in the satellite imagery. A plane will go out there, they will fly at very low levels. They'll fly to 1000 feet or 600 feet so that they can measure the winds near the surface. And that would usually be the way we would determine, for systems close to land anyway, whether a tropical cyclone had formed.

Ms. Davidson: Is there a practice and procedure on how many passages a plane would make?

WIT: What they generally do on an invest mission is fly a box pattern. The idea is to try and identify that the system has a fully closed circulation and then it has a center of circulation. So they're not doing passes through it, they're basically flying around it to narrow down the area where a center might be. Once we have a well defined center then the type of patterns that the airplanes fly is different and they make repeated passes through the center.

Ms. Davidson: Typically when you have a well defined center is the system a tropical storm or a tropical depression?

WIT: So having a well defined center is one of the prerequisites for a system to be classified as a tropical cyclone. A tropical cyclone includes depressions, storms and hurricanes. That's the generic term for all three. If a system does not have a well defined center then it is a disturbance of some type, but would not be a tropical cyclone.

Ms. Davidson: And how's the aircraft collecting data, the wind, the direction, etc.?

WIT: The aircraft – well in the old days when I was flying it was inertia navigation systems. I am not sure precisely what advances in aircraft technology have occurred since I got out of the aircraft business. I know that I am more familiar with some of the other instrumentation on the plane. But that would generally not be used for this particular purpose. The aircraft can measure wind speed, it can measure wind direction, it can measure temperature, it can measure dew point temperature. It has instruments that – a step frequency microwave radiometer that measures surface wind, speed, not direction. It released dropsonde which is little instrumented packages on parachutes that have a GPS chip in them. The sonde falls on the wind so it reports back pressure, temperature and humidity as it falls from flight level to the surface. Exactly how an aircraft measures wind though I would defer to an aircraft expert.

Ms. Davidson: And with respect to Hurricane Joaquin, or Tropical Storm Joaquin, did you have any involvement?

WIT: I was supervising operations during most of that storm.

Ms. Davidson: And with respect to Joaquin that storm didn't have tropical origins, right? It came out of the Canary Island?

WIT: Yes. It formed – there are a number of different kinds of disturbances which tropical cyclones can form. Many of them form from tropical waves that move off the

West Coast of Africa at low latitudes and develop. Tropical cyclones can form from the cold fronts typically in the Gulf of Mexico or Caribbean Sea. Or they can form as Joaquin did from areas of low pressure in the upper atmosphere and that was the origin of Joaquin.

Ms. Davidson: I'm referring to Exhibit 197 and page 7.

WIT: Okay.

Ms. Davidson: And under Hurricane Joaquin in that first sentence it talks about it's formation as tropical origins and then it says, quote which is rare for a major hurricane. Do you see that?

WIT: Yes.

Ms. Davidson: And did the models that you were speaking about take into consideration these sorts of anomalies?

WIT: The model is initialized with a representation of the current state of the atmosphere. So it would – it would reflect as best the model and the data simulation system can reflect the reality of that situation. So yes.

Ms. Davidson: Does any of the models take into consideration the origin of the hurricane whether it's tropical or otherwise?

WIT: Again because the model is initialized with a current depiction of the temperature field everywhere, the wind field everywhere, the humidity field everywhere again as best we can measure it, so a model that would initialized with the precursor disturbance for Joaquin for example would show a weak area of low pressure in the upper part of the atmosphere that would more or less accurately reflect what was going on. So again the answer is yes.

Ms. Davidson: Well you mentioned earlier that in your modeling it takes into consideration energy absorbent, correct?

WIT: One of the physics in most of these models would be the energy exchange between the ocean and the atmosphere, that's what I was talking about.

Ms. Davidson: And you will agree with me that a tropical origin hurricane the water temperature is a lot warmer than if the hurricane or tropical storm was created out of the Canary Islands, correct?

WIT: Well Joaquin didn't form near the Canary Islands. The originating disturbance formed near the Canary Islands. Joaquin formed a week or longer later when it was over, you know different water. So wherever the system evolves one of the physically processes that is involved is energy transport from the ocean. In some systems it's more important than others clearly.

Ms. Davidson: So the location of the formation of the storm is important for modeling?

WIT: The environment in which a storm forms and the accuracy in which that is represented in a model is important, yes.

Ms. Davidson: And Joaquin formed in a location which was vastly different than the majority of the hurricanes that you follow, i.e. it was not a storm that had tropical origins, correct?

WIT: Umm yes. It's origin was somewhat unusual.

Ms. Davidson: Thank you very much.

CAPT Neubauer: For the record I just want to identify that Exhibit 197 is the National Hurricane Center annual summary of the 2015 Atlantic season. At this time, oh I'm sorry, does Herbert Engineering have any questions?

HEC: No questions.

CAPT Neubauer: At this time I would like to take a 10 minute recess. The hearing is recessed until a 4:05.

The hearing recessed at 1554, 17 May 2016

The hearing was called to order at 1606, 17 May 2016

CAPT Neubauer: The hearing is now back in session. Before we begin with a new line of questioning we a couple of just follow ups from the board. Commander Denning.

CDR Denning: Good afternoon, sir. Just a couple quick follow ups. You mentioned – you were talking about the track models and that they're continually improving getting better and better each year. Quick question on that topic. You mentioned one of the reasons was because the observations are getting quote unquote more dense was your word. Does that mean simply more of the observations? If I were to look at a photo, a map I would see more input? Or what does more dense mean?

WIT: Well both more in quantity and quality or type. As the number of satellites have increased, now I'm really talking about going back 20 years, either a number of satellite observations of the environment of tropical cyclones now that we didn't have before. Looking at things like you can get winds from the motion of water vapor. You can track water vapor in the environment and get winds out of that and use that information. You can look at radiation of various frequencies. Or there are a number of satellites can measure what we call radiances. And we've learned how to incorporate that kind of information in numerical models. So – and as the resolution of the various satellites has improved that's where you get more dense observations more frequent. So it's not only the density but it's also the type and the quality that has improved over time. And our

ability to use the various types. Some of these satellite observations are not, radiation for example is not your typical wind – wind observation. And it was customary in the 80's and 90's for example to try to turn everything into a radicand a weather balloon type of observation. And so one of the things that got better was our ability to use these different kinds of satellite observations in their raw form more natural form. So just being able to use them more effectively increased too. So it's a combination of various things including density.

CDR Denning: So do the track models rely primarily on satellite data? Or are there other sensors that were used?

WIT: Oh there are all kinds of sensors. But the importance of the satellite observations has really skyrocketed in the last decade. It used to be – it used to be that the radicand or the weather balloon network was the primary mechanism. And now it would certainly be the case that satellite based observations are the primary input to these global models. But there are other things too. We'll send airplanes out there to fly into the environment to tropical cyclones too and release – take special soundings for example in particular cases. So – and you have ocean observations. You have all kinds of different observations.

CDR Denning: Can you describe the ocean observations for us in more detail?

WIT: Well there are buoy observations of temperature. We know of course that hurricanes are essentially heat engines and they get their energy from the ocean. So knowing what the sea surface temperature is and the depth of the warm, where it's not just the sea surface temperature, but how much warm water there is below the surface as well is important. Satellite altimeters for example can measure very small

fluctuations in the height of the sea surface which you can relate to heat content for example. That would be very important in some areas like the Gulf of Mexico which as a very interesting sort of temperature. It's less important in other areas. But that would be one.

CDR Denning: So the buoy operations is that solely temperature?

WIT: No. The buoys also measure pressure and temperature. And – but they're fairly widely spaced so you have to be a little bit fortunate for a buoy observation for example to help us decide whether a tropical wave has become a tropical depression. It would have to be in the right place usually. We're using other things for that. But buoys measure, you know wave height and swell and all of those things.

CDR Denning: Do you also use observations from ships that are transiting that report to the National Weather Service?

WIT: Yes. They're often very important for estimating the size of the tropical cyclone. Again it's more important for storms that we don't have reconnaissance aircraft flying in. When a storm is close to land we have an aircraft, that's our number one data source because we can pretty much direct the plane wherever we want it to go within reason. And so they can get us what we need. But for those storms where we don't have reconnaissance aircraft if we have a ship, you know a ship might give us as West wind that would tell us that a tropical wave has closed off the circulation. So we might issue advisories of the system based on a ship observation. Or it might help us establish the 34 knot, the tropical storm force wind radiant for example. We don't get too many ship observations in the core of hurricanes.

CDR Denning: Thank you, sir. Mr. Fawcett will have some questions now.

Mr. Fawcett: Good afternoon, sir. Keith Fawcett, U.S. Coast Guard.

WIT: Afternoon.

Mr. Fawcett: So earlier in your testimony you talked about the policy of inter – incremental adjustments based on the models and you also said that the models have gotten better over time, is that correct?

WIT: Yes they have.

Mr. Fawcett: Have you departed at any time from those – as policy, those incremental adjustments to your forecast?

WIT: As policy? Not as policy, but there are certainly occasions where you have to make a fairly radical change in a forecast. When you have a situation where there's a very large model spread for example, and I mean I think some of the forecast for Joaquin probably exhibited that sort of after the time of interest here. But in the case of Joaquin for example you have one model, the European Center model which was initially, well initially it agreed with all the others that Joaquin was going to remain weak and move West and Northwest and fall apart within a couple of days. But it was the first for example that showed a more Southwest motion towards the Central Bahamas. It was an outlier for several days. Eventually all the guidance came in line and in those kinds of situations you sometimes get forced to make larger changes to a forecast than you would like to when two very different eventualities get narrowed down and you finally decide on one. That doesn't happen very often. Usually our changes are modest from cycle to cycle.

Mr. Fawcett: So taking as an example the European model, are they in a sense pure? In other words that the data that flows in to collect and build the model, are they pure

and that they just use the data? Or do the people that design the model make them conservative in nature? For example the European model.

WIT: The model is just a representation of certain – the basic physical equations that govern atmospheric motion are the same regardless of whether it's the European Center doing the implementation or the National Weather Service doing the implementation. There's – there may be different levels of complexity or accuracy in how some of those processes get represented in the various models and there are certainly differences in how, you know which types of observations can be used as input to the various models. But I can't think of anything that would inherently make one model more conservative than another. Those kinds of changes might make a model more accurate than another on average. But the changes in the European from cycle to cycle I wouldn't say are particularly different then the changes that we would see in the GFS or any of the other major ones.

Mr. Fawcett: And the reason I ask that questions is that, you know people basically drive the decisions to make – the decisions to decide what inputs go into a particular model, that's correct?

WIT: In terms of inputs you would be talking about how physics might get implemented or which data might get input?

Mr. Fawcett: Yes. In other words the European, I mean why do we have the European model? In other words we have the U.S. based models, you talked about the Navy model, the Europeans have decided to construct their own model based on a variety of inputs that may or may not be available to you as the National Hurricane Center.

WIT: If there are inputs, now you're talking about data I presume.

Mr. Fawcett: Correct.

WIT: I'm not aware of any inputs they have that we're not seeing. Maybe there are some. Data usually flows pretty freely from center to center. So if they have certain kinds of observations that nobody else has I'm unaware of them.

Mr. Fawcett: So why would their model differ from a model that might be created by the hurricane center or the Navy for example?

WIT: Well the hurricane center doesn't create models, but it would be the National Centers for Environmental Prediction up in College Park. They would be different because, again when you have to translate some of the physical equations that govern say heat transport from the ocean to the atmosphere there's no necessarily unique way to do that. There may be multiple ways of approaching that problem from a science standpoint. Or there may be certain kinds of satellite observations that the ECMW, the Europeans are comfortable with in putting into their model because maybe they've done experiments to show that it improves their model. But those observations haven't been shown to be helpful in the GFS for example. So there are a whole host of decisions that would get made by people about how the model is going to be run, what data are going to be use, how the data are going to be used that could all feed into the accuracy and performance of the model.

Mr. Fawcett: When you describe the incremental approach to changes, would you say that the National Hurricane Center takes a conservative approach to weather prediction?

WIT: I would say that we try and make – that continuity from one forecast to the next is a fundamental part of our forecast philosophy. Social Scientist have told us for decades

that one of the key ways to get people to take action is to give them a consistent message. That when people get contradictory messages it causes them to hesitate and not take action. And partly for that reason, but also partly because if you look at these models for any length of time you will see them from one cycle to the next swing by 3 or 400 miles in one direction at noon and then swing back 2 or 300 miles in the other direction at 6 hours later. So we learned that we can't provide our customers with consistent messaging if we react to every twist and turn in the numerical guidance. So yes we think it's very important to try and provide a consistent message in our forecasting. It's relatively easy to get folks attention when you introduce a threat to an area. When you take the threat away and people start turning their attention to something else, it's very hard to get it back again. So that's another reason why we don't like to have forecast that go back and forth, windshield wipering is the term that we use to describe that bad aspect of a forecast. But yes that's fundamental to how we operate.

Mr. Fawcett: Is that defined in some kind of guidance or policy within your organization?

WIT: It's so fundamental that I'm not even sure it's written down. In all of our outreach presentations that we give to media and emergency managers we certainly teach it to them in explaining how we operate. I was looking in our station duty manual last night actually in anticipation of a question like this. And it's – continuity is mentioned really only in passing as a reminder, it's so deeply engrained in everything that we do that it's almost an unwritten rule. We do have some training materials for new forecasters that

were written after I came to NHC and it's possible in some of those materials that kind of instruction is there. But it's just basically what we teach when we bring somebody on.

Mr. Fawcett: So behind that message of continuity and consistency for you as a forecaster hurricanes remain highly unpredictable?

WIT: I think track has gotten far more predictable than it was 10 years or 20 years ago. I mentioned earlier that our average track error now is about half of what it was 10 or 15 years ago. So the predictability for track has improved greatly. Our average 5 day track error is just a little over 200 nautical miles. I think that's a pretty good degree of predictability. Now not every storm is forecast with that level of accuracy. Some far more than that. But taken as a whole I think there's a great degree of predictability for tropical cyclone track. There's less predictability for intensity. That remains a harder problem for us. Particularly rapid intensification is very difficult for us to anticipate. So it would vary depending on which parameter we're talking about.

Mr. Fawcett: Thank you, sir.

CAPT Neubauer: At this time we'll start the next line of questioning. Lieutenant Comerford.

LT Comerford: Mr. Franklin, the next topic we'll focus on is the genesis of forecasting of Joaquin. We've been talking about it in brief here, but we'll go a little bit more in length, the depth on it. You had mentioned the 2015 North Atlantic tropical cyclone season report. In your own words how would you characterize the over 2015 tropical Atlantic season?

WIT: Well it was certainly below average in terms of activity. There were fewer tropical storms than average, fewer hurricanes than average, fewer major hurricanes than

average. We have measure that we use it's called ACE, it basically accumulates the square of the wind speed basically for each 6 hours of the tropical cyclones life. And by that measure 2015 was only about 2/3^{rds} as active as a typical year. The basin as a whole was unfavorable for tropical cyclone development in 2015 for a couple of reasons. Number one there was an El Nino event ongoing in 2015. And El Nino events in the Pacific tend to increase the strength of the upper level westerly winds over the tropical Atlantic and upper level westerly winds in the tropical Atlantic to tear storms apart and prevent tropical waves from developing into tropical cyclones. So that was ongoing in the Western part of the basin. And then we also had over most of the Atlantic for much of the season a very large scale sinking motion that was occurring in the Atlantic. And that tends to dry out the atmosphere, it makes it hostile to the development of thunderstorms and it's – you know that's the way hurricanes get their energy released is through – through thunderstorms. So there were a number of storms, but they almost all in 2015 encountered some sort of unfavorable conditions that led them to weakening or falling apart.

LT Comerford: Can you discuss the number of Cat 3 and Cat 4 hurricanes of the 2015 season in relationship to other El Nino years? How did they compare for the number of major hurricanes?

WIT: Well we had 2 major hurricanes in 2015 which is below the climatology of 3. I do not have in front of me the statistics for other El Nino years. Certainly there's been El Nino years that were more hostile than 2015 where activity was really shut down much more so. In 2015 – in some El Nino years you have the upper level westerly's that just blast all the way across the tropical Atlantic. In 2015 that was not quite the case. The

Western part of the basin, the Caribbean and the area in the vicinity of the Lessor Antilles did have these upper level westerly. So you saw storms like Erika for example dissipate on it's Western progression into the Caribbean. Or Danny which was I guess the other major hurricane of the year other than Joaquin completely fall apart. In the Eastern part of the basin though those upper level westerly's did not extend so you know we had 11 storms in 2015 which is only 1 below normal. So in that sense it was sort of like a half of an El Nino I guess.

LT Comerford: Specifically in relationship to Hurricane Joaquin, how did the observed track compare to other storm's behaviors in an El Nino year?

WIT: I don't know the answer to that question. You know we've got folks in the office who have an encyclopedic memory of every track of every storm they every worked. I am not one of those people. Certainly the Southward motion of Joaquin is unusual. One of the features of El Nino years though is that you often have more development in the middle latitudes. In 2015 you did have high shear in the deep tropics, conditions were somewhat more favorable further to the North of that including the area where Joaquin formed. And when you do have mid-latitude formations, storms that form from upper lows for example, and you get out of the deep tropics then you can get some weird or unusual looping kinds of tracks. So without going back and refreshing my memory on specific years I would say that the kind of behavior that you saw in Joaquin was probably a little more typical of those kinds of seasons where the activity tends to shift more Northward. Which would include many El Nino years.

LT Comerford: And El Nino year aside, how would you characterize the actual track and intensity of Hurricane Joaquin for the location of genesis and the time of year that it formed?

WIT: It's rare for storms to take a Southward component of motion. It's particularly rare in sort of the heart of hurricane season. That sort of behavior is more common as you get towards the tail end of the season in particular as the genesis areas tend to show up further North. But having that Southward motion is unusual. Having a storm strengthen when it's moving Southward is even more unusual. Southward moving storms rarely strengthen in the way that we saw with Joaquin. Normally the kinds of conditions that would lead to Southward moving storms are normally associated with higher levels of vertical wind shear. They might also tend to be more associated with dryer environmental air because of their location relative to the surrounding ridge that might be driving them Southward. So it was unusual in many, many ways.

LT Comerford: As a supervisor for Joaquin can you discuss or explain your specific roles during the actual event of Hurricane Joaquin?

WIT: Umm sure. The forecasters are making the forecast. As the supervisor I'm not generally getting involved with you know where they're going to place the forecast track or what intensity they're going to choose. I will on occasion get involved with that. But that's pretty rare. The forecasters are the ones who are looking at the data most closely, looking at the models most closely. And so they get the latitude to make the forecast. If there's some sort of – if they're maybe breaking the norm in terms of continuity or something like that I might get involved, but that's pretty rare. My involvement in the forecast process comes in more for decisions of watches and

warnings. And often in decisions about when we're going to start writing advisories on a storm. When we might upgrade a storm to a hurricane or a depression to a storm, some of those decisions can be sensitive and or subject to some judgement. So I'm trying to ensure that similar standards get applied across the unit when those kinds of decisions are being made. One other thing that happened in Joaquin that I was involved with was the communication of some of the forecast uncertainties. There had been a previous storm last year, Erika in which you know we were forecasting a hurricane to be over or near Florida at the 5 day time period and it triggered a media hype of immense proportions. Out of – definitely more than was warranted given the uncertainties that were involved. And after that event we got some criticism for losing the message, or not being in adequate control of the message and sort of letting the media run off with this terrible threat that was coming to Florida. So one of the things that we did in Joaquin after that was to introduce into the tropical cyclone discussion a bulleted list of key messages. And it was an attempt to basically hand feed what we thought the key points were to our media partners so they would know where to go. All of that information was always in our discussions but we made it very easy to find, key message 1, 2, 3, 4. So and folks actually gave us a lot of great feedback after that, that boy that was really helpful. So I was writing a lot of those during Joaquin. Now in that case it was mostly about potential impacts in the United States that we were trying to get a hold of the message. It was sort of after the warnings that had gone out for the Bahamas. But there was a lot of interest in the potential impacts of the United States, so. So I play a pretty strong role in how our products get messaged. But not so much in the actual forecast itself.

LT Comerford: So when you reference including forecaster uncertainty in the tropical cyclone discussion, just for clarification, is that the AWEB Center TCDAT TSAT, TCDAT?

WIT: Yes, the tropical cyclone discussion.

LT Comerford: Is the forecaster uncertainty publicized in any other formats?

WIT: In the forecast advisory which is that coded product there are some average errors for days 4 and 5 that appear within the body of that particular message. Those are just average errors. They're not situationally specific. But it's the tropical cyclone discussion that really is our only place where we can express either confidence or lack of confidence in a forecast.

LT Comerford: You also discussed interjecting on the forecast product on rare occasions. Do you recall doing that for Hurricane Joaquin in any case?

WIT: Not specifically. I do recall working closely with the dayshift forecaster as we were seeing Joaquin take tracks further to the South of our forecast for several cycles in a row. And there were discussions about how far we should be moving a particular forecast. But I don't believe at the end of any of those discussions that I dictated a forecast. I think in each of those cases the forecaster made the decision after we had talked about it. I won't say that there wasn't one, but I don't remember doing that during Joaquin.

LT Comerford: And also in our previous discussion you had mentioned that you had the phone conference or the meeting an hour prior to the forecast is released. And typically these are brief in nature and every once in a while they extend longer. Do you recall if any of these meetings for Joaquin were extended meetings?

WIT: I do not recall, but I would strongly doubt it because again what typically causes those calls to go on at length is when we have a discussion about where to place U.S. watches and warnings. And since that was never at issue here I strongly suspect that all of those discussions were relatively brief. What would have taken the most time there would have been discussion with WPC about how much rainfall to call for in the Bahamas. But those discussions are rarely lengthy.

LT Comerford: In your own words could you discuss the overall challenges of forecasting Joaquin's intensity?

WIT: I'm sorry, forecasting Joaquin's intensity?

LT Comerford: Yes. The intensity of the storm.

WIT: Sure. The – when there's a lot of wind shear and maybe I should define what that is. Wind shear refers to a sit – wind shear refers to the difference in wind flow in the lower part of the atmosphere relative to the upper part of the atmosphere. So if the winds are blowing in roughly the same direction at roughly the same speed as you go from the bottom of the hurricane to the top, then we say that's a low wind shear environment. If there's high wind shear then either the wind speed is very different or more commonly the wind direction at the top is blowing very differently than wind direction at the bottom. We know that when there's a lot of wind shear that it's pretty easy to predict the behavior of a tropical cyclone. The thunderstorms gets ripped off, the storm becomes shallow, it tends to weaken, it tends to move with the lower layer of flow. We also have a pretty good handle on things when the wind shear is very low. When the wind shear is very low there's an opportunity for the storm to hold together vertically if the moisture is right and the underlying sea surface is right, then you know

we can get lots of intensification. The – one of our biggest challenges is trying to sort out what's going to happen at intermediate levels of shear. When you have the thunderstorm activity and the tropical cyclone is trying to keep the storm vertically coherent, wind shear is trying to tear it apart and the forecaster has to decide based on the guidance that he has which of those two competing factors is going to win. And in those situations the – getting the intensity forecast right and getting the track forecast right really go hand and hand. If you don't get the intensity right you're probably not going to get the track right because the storm is now going to be steered by a flow at a different layer of the atmosphere. So that was certainly the problem in the first few forecast for Joaquin where we were expecting very high levels of shear. We expected that the storm was not going to handle that shear very well and basically become very shallow and move off to the West and Northwest in the shallow flow. Joaquin didn't corporate with that particular line of thinking. It for whatever reason and to this day can't really tell you why it did so, but that storm was particularly resistant to the wind shear. Now maybe we – maybe there was less shear out there than we thought. Or perhaps there was something about the dynamics of that particular storm that allowed it to resist. But that was the basic challenge in trying to figure out how that storm was going to respond to the shear that was being imposed on it. And that effected both the intensity forecast and the track forecast.

LT Comerford: And real quick what you define as a rapid intensification event for a hurricane?

WIT: The standard definition of that is a 30 knot increase of winds in 24 hours. That's the standard definition of rapid intensification.

LT Comerford: Was that observed for Hurricane Joaquin?

WIT: Yes.

LT Comerford: If the rapid intensification event was forecasted, that the intensity was more accurately forecasted would that have, in your opinion significantly improved the forecast track, the track forecast for the National Hurricane Center?

WIT: The two forecast are tied together. The track forecast that we were making had an implicit assumption of what we were expecting by way of intensity. If we had a different – if we would have come to a different conclusion about the intensity we would have had to forecast a different track. It would not have made any sense to forecast, for example a rapidly intensifying storm moving West or Northwest into the face of upper level Northwesterly winds. So yes this was definitely a case where the two forecast were linked and failing to get one caused a problem for the other and getting one would have helped us with the other.

LT Comerford: I would like to turn your attention to Exhibit 147. While you're getting it out this will be the tropical cyclone report for Hurricane Joaquin published by the National Hurricane Center. And we'll be looking at page 22.

WIT: Okay.

LT Comerford: On page 22 there's a table showing the forecasted track error for Joaquin on a periodic basis. This track error is labeled in nautical miles. For the time period leading up to October 1st how would you, in your own words characterize the accuracy of the National Hurricane Center official forecast for Joaquin?

WIT: We must be looking at something different. The table I'm looking at on page 22 is a summary of the forecast accuracy for the entire lifetime of Joaquin.

LT Comerford: Yes. And I was – because the table is for the entire period. I was wondering if you could address the accuracy leading up to October 1st. And we'll come back to the table here through this line of questioning.

WIT: Oh okay. I have some numbers. The initial forecast for Joaquin had errors that were much larger than normal. So for example the 3 day forecast that would have verified the morning of October 1st had a track error it was 500 and some miles. Let's see I have it exactly in my notes. It was 536 miles. So the 3 day forecast verifying it at 8 a.m. October 1st. That's an extraordinarily large area. That's really about 1 in 100 type of track error. The 48 hour track forecast that verified at the same time had an error of 180 miles and that's something like a 90 or 95th percentile of error. So it's certainly a very large error. By the time one day it was a 62 mile error, the 1 day forecast was verified at 8 a.m. and that's more in line, at least close to what the average was. So the earlier forecast, track forecast had errors that were much larger than normal for us. The same was true with the intensity errors. The 3 day intensity error that verified at that time was 80 knots too low. The 2 day forecast that verified at that time was 60 knots too low. And the 1 day was 30 knots too low. So the forecast called for a relatively weak system, the initial forecast called for a relatively weak system to head off to the West and Northwest and this instead it moved West Southward and Southward and strengthened.

LT Comerford: In the table in the exhibit, page 22 of the tropical cyclone report for Hurricane Joaquin, is the European model, the EMXI model? Is that the European model?

WIT: Yes.

LT Comerford: Okay. Just confirming. The 5 day 120 hour error going through the entire course of the storm was approximately 177 nautical miles roughly. How does that compare to the European's model accuracy before October 1st?

WIT: The – that would – that would – that number would be an optimistic assessment of the European model's performance prior to October 1st. The first two forecasts from the European Center model after Joaquin became a tropical cyclone, became a Tropical Depression were in line with all the others. So the first two European Center model forecasts also went off to the West and Northwest. And so it had some very high errors for those first couple of forecasts. Now the following day it was the first to show the Southwestern motion. So from that point onward it was performing significantly better than the others. But a good part of what you see in that table has to do with an excellent job that the European Center did on the approach to Bermuda later in the forecast period.

LT Comerford: Looking at these errors that are published in the overall time period for Joaquin, would you describe the European model as still being the most accurate model for this hurricane's unusual movement? Specifically for track.

WIT: For Joaquin it had – the European model had by far the best performance over the lifetime of the storm. For this, you know for this particular storm. That's not always the case. But it was the case for Joaquin.

LT Comerford: Now turning to intensity which model would you, in your opinion provides the best accuracy for intensity forecasting?

WIT: Just like for track we don't rely on a single model for track we generally rely on a consensus, because you know sometimes the European is not going to be the best

model. I can recall a case for Debbie a couple of years ago where it was the worst model. It was an outlier, it was the worst model. So the consensus is very important for track. And it's even more important I think for intensity because we have 4, 4 intensity models of two very, very different types. Two of our intensity models are what we call dynamical models in the sense they are based on the equation of motion that govern motions of the atmosphere. And the other two are statistical models. And they don't know anything about the physics or the atmosphere but they simply look at past behavior what other storms did in similar situations. So the consensus of those two very different independent approaches for intensity is very, very powerful and we rely on that a lot. There is no – I can't point to any one of the four main intensity models and say that this is – nobody relies on any one of the 4 intensity models in the same way as forecasters tend to like to look at the European Center or the GFS.

LT Comerford: Thanks, sir. Just for clarification. Are all these track error based off of the best track from the post storm analysis?

WIT: Yes. After the storm we construct what's called the best track and we look at all the available data and create what becomes the official history of the tropical cyclone. And once that's done then all the forecast errors are computed, including our own, relative to that best track.

LT Comerford: In the interest of time I'm going to bridge over to the next sub-topic addressing a little bit more on some policies and how they relate to Hurricane Joaquin. If you could – if I could draw your attention to Exhibit 159. While you're getting it out ----

COUNSEL: Excuse me. Could we take a break for just a couple of seconds?

LT Comerford: Yeah.

COUNSEL: To confer, thank you.

CAPT Neubauer: Sir, the hearing will now recess and reconvene at 5 O'clock.

The hearing recessed at 1653, 17 May 2016

The hearing was called to order at 1701, 17 May 2016

CAPT Neubauer: The hearing is now back in session. Mr. Comerford can you continue with the line of questioning please?

LT Comerford: Mr. Franklin where we left off we were going to visit Exhibit 159. Exhibit, while you're getting it out, Exhibit 159 is a collection – is a collection of the graphical forecast advisories for Hurricane Joaquin. And it includes the advis – forecast advisories and the intermediate advisories. And we're going to focus on page 11 to 12. Page 11 shows the graphical forecast advisory on Wednesday, September 30th of 2015 at 5 a.m. Eastern Daylight Savings Time – Eastern Daylight Time. This would be advisory 10.

WIT: Okay, I'm there.

LT Comerford: Page 12 shows the intermediate advisory 10a. This was time stamped 8 a.m. Eastern Daylight Time on Wednesday, September 30th of 2015. First of all for the record is the AWHIPS header for the textural product related to this forecast advisory specifically the normal forecast advisory 10 that the AWHIPS header be TCPAT or T-C-P-A-T? Or correction ----

WIT: TCM.

LT Comerford: TCM, correction.

WIT: TCMAT.

LT Comerford: Yeah, okay. So TCMAT. And on page 12 just for the record is the intermediate advisory the TCPAT, T-C-P-A-T?

WIT: Correct.

LT Comerford: The – on page 12 the intermediate advisory the forecasted position of Hurricane Joaquin, or correction, the current information for Hurricane Joaquin as been updated has the track been updated from the 5 a.m. forecast advisory on page 11?

WIT: No. The only thing that gets updated on an intermediate advisory is the current position of the storm. The next forecast track would be released 3 hours after that time.

LT Comerford: And again the primary reason that this isn't – this is not updated is the availability and timeliness of the models being released to the National Hurricane Center?

WIT: About why we operate on a 6 hourly cycle as opposed to a 3 hour hourly cycle in other words?

LT Comerford: Yes.

WIT: Yes. Now we – we don't get a new set of guidance, models every 6 hours. We get new guidance, I'm sorry, we don't get new guidance every 3 hours, we get new guidance every 6. We can issue a special as I've said and as you know if we feel that the track that's out there is sufficiently inaccurate to warrant something sooner.

LT Comerford: What is the purpose and when is an intermediate advisory initiated? When do they become part of the product schedule?

WIT: Once coastal warnings are in effect either for the U.S. or any of the other countries we move to intermediate advisories.

LT Comerford: So the primary customer or primary focus of the intermediate advisories is to land based persons?

WIT: Yeah, the purpose of the intermediate advisory is to provide more frequent updates once watches and warning are in effect for land.

LT Comerford: Returning to a bit of your discussion on the windshield wiper effect. Do you recall if this had any impact on the forecast for Hurricane Joaquin?

WIT: The philosophy sure. It played a pretty significant – significant role. We had a very extreme divergence spread in the model guidance after the first two advisories. Initially everything was in agreement and totally wrong. But after we got to the second day we started to see a very big split in the guidance with the European model heading Southwest and basically everything else continuing off to the West, not showing a threat to the United States. Once you're in that situation it can be tempting to want to make a decision on an outlier forecast or any one of the particular guidance models that you might have. But we know from experience that if we react to an outlier model, in this case that would have been the ECMWF or even if we had kind of gone all the way to our right most model guidance. But the odds are pretty high that we're going to have to change that forecast in another direction subsequently. Just you know having seen the way these models behave over the years. So the desire to not risk moving all the way to one end of the forecast guidance envelope and then perhaps having to make a radical adjustment in the other direction was a very strong factor in our stepping the forecast South bit by bit. You know advisory by advisory.

LT Comerford: You discussed earlier that there was one point where you had met with another forecaster about how far you would shift regarding the repeated track Southwest of this storm. Do you remember when that was, what day or what shift?

WIT: I can probably figure that out if you give me a moment. It would have been Wednesday the 30th.

LT Comerford: Thank you. After this discussion did the practice of avoiding the windshield wiper effect, was that minimized after the – as extreme in the consensus to what the forecast track was in your recollection?

WIT: Can you try that again? I didn't quite get it.

LT Comerford: To rephrase the question, after that discussion do you recall if the forecasters following at that time continued to avoid the windshield wiper effect in the same sense before that point? Did it decrease in it's amount of impact of the official forecast?

WIT: No I don't think so. We continued to make pretty incremental steps down. We discussed whether we should make larger adjustments Southward. And as I recall the forecaster was inclined to sort of follow sort of the typical kinds of adjustments that we would make in stepping the forecasts out. We talked about making larger changes.

LT Comerford: Would you say that this practice of stepping the forecast, is it primarily focused on land based customers of concerns of coastal watches?

WIT: That's an interesting question. And not one that I've really thought about very much. We certainly hear about complaints or feedback, gripes, nasty tweets and the like from land based customers, media in particular are not shy about going on the air and telling us when they think we've done something wrong. And we don't get as much

feedback directly from the marine community. It's possible that TAFB get some of that feedback, but it doesn't normally come directly to us. But we really have the same constraints in the handling of forecast that are entirely marine events. As we do for land based events. We don't make large changes even for systems that are forecast to remain entirely at sea. So I would say that there might be – there might be a little bit of, you know in the back of our minds that we know we're going to hear about it more from the land customers, but the philosophy doesn't appreciably change I don't believe. Even for storms that are only forecasted to be at sea.

LT Comerford: So for the hurricane specialist working the forecasting would they be more sensitive to that perspective during this practice for land based customers?

WIT: They might. But it would be something I think around the fringes. I mean I know that when we have a storm, I mean I can remember conversations about storms that are, where our 5 day point is sitting over Florida and were very near Florida and we will agonize over 30 mile change in a 5 day forecast position. If it means something that's going to be over the Peninsula in Florida as opposed to just off the Peninsula of Florida and we would not have those kinds of conversations for a storm totally at sea. Whether that – so there could be around the fringes perhaps slightly more wiggle room or room to modify a forecast for storms that are not effecting land. But I think the difference would be pretty small.

LT Comerford: In your opinion with that information would the tropical Atlantic forecasting branch or TAFB primarily be focused on marine customers in their products?

WIT: I'm sorry I lost the question.

LT Comerford: Would TAFB, the tropical Atlantic forecast – sorry, tropical analysis forecasting branch, are they primarily focused on marine customers in their products?

WIT: Yes, yes. But they would use the, in the case of a tropical cyclone forecast they're bound by our forecast.

LT Comerford: So the TAFB would publish the forecasted track and intensity as it is that comes from the hurricane specialist unit?

WIT: Correct. The weather – National Weather service only has one tropical cyclone forecast.

LT Comerford: Thank you Mr. Franklin. I only have one other broad question. Is there anything that you feel or believe could help the National Hurricane Center in it's forecasters to improve forecasting on your day to day operations?

WIT: Um can you repeat the question?

LT Comerford: Sure. Is there anything that – is there anything that you feel or believe could help the National Hurricane Center specifically that hurricane specialist unit in helping it's forecasters to develop the tropical cyclone forecasts?

WIT: There's tons of things that could help. And it would go from improved basic understanding of how tropical cyclones behave. In particular the physical problem that we were dealing with in Joaquin was how was this particular tropical cyclone going to respond to shear that was not too strong and not too weak but somewhere in the middle. No meteorologist would ever turn down more observations. There's a lot of what we do where we have to make some educated guesses. We can only estimate for example the intensity of a tropical cyclone to within about 10 percent. We tell you it's a 100 knot hurricane it could easily be 110, it could easily be 90. That's the inherent

uncertainty in our ability to estimate. Our uncertainty in estimating the size of a tropical cyclone is only good, take the tropical storm force winds for example. That's probably only good to within 25 percent. So we certainly could have better analysis of tropical cyclones with more data. You know I'm not going to talk about prioritizing those needs against all of the other needs that every other Federal agency has. But we could certainly benefit from improved physical understanding how the tropical cyclones worked and improved observations. We know because we've seen it over the past two decades that as computers get faster and the models get better we made improvements in track. And we've actually started to see now just in the past 3 or 4 years improvements in intensity forecasts. We still have a long way to go to the intensity forecast right. Joaquin's a real good example of how far we still have to go. But overall the intensity errors are now starting to come down because of some of the efforts that have been made in models like the HWARF model, which did poorly for Joaquin by the way. But it has been doing much better over the past few years. So yes there are all kinds of things from the modeling, from computers, to observations to basic research that would help us do better.

LT Comerford: Thank you Mr. Franklin. At this time I'll turn it over to the board.

CAPT Neubauer: Mr. Franklin I have a follow up question on Exhibit 159 page 12. I think it should be already open.

WIT: Oh unless that's it on the screen.

CAPT Neubauer: It is displayed on the screen.

WIT: Okay.

CAPT Neubauer: Sir, this is the intermediate advisory 10a issued at 8 a.m. on September 30th for Hurricane Joaquin. My question is how would the user that the track line hasn't been updated but the current information has?

WIT: The user would probably have to be aware of the fact that we issue forecast every 6 hours. There would be no way just from looking at this to know that the forecast was issued at 5 a.m. I don't think – well a careful reader, a very careful reader would know that the forecast positions that are labeled there 2 a.m. Saturday, 2 a.m. Sunday, 2 a.m. Monday had not changed from the previous graphic. But it would – I think it would take a fairly astute reader to figure that out.

CAPT Neubauer: Yes, sir. If the user was looking graphically the next hurricane position appears to be off to the Northwest. But if they read the text the movement is clearly labeled Southwest at 6 mile per hour.

WIT: And that would – that looks odd, I concede.

CAPT Neubauer: Sir. Mr. Franklin, do you know what the max rapid intensification actual number was for Hurricane Joaquin for a 24 hour period? I think 30 knots is your standard for a hurricane being labeled like that. But I was wondering if you know how fast it actually intensified?

WIT: I can get that to you pretty quickly. The tropical cyclone report which is one of the exhibits here has a table of the intensity every 6 hours. And it looks like I believe I see a 45 knot increase from 12Z on the 30th to 12Z on the 1st, 70 to 115 knots. At least by quick eye that looks to me like it was the highest number.

CAPT Neubauer: Yes, sir. So you said 45 knots total?

WIT: Yes.

CAPT Neubauer: Thank you. Can you give the page you just referenced, sir?

WIT: Page 11 of the tropical cyclone report for Joaquin. Table 1.

CAPT Neubauer: And that rapid intensification occurred around the 30th of September, 1 October time frame?

WIT: That particular period of rapid intensification, that particular 24 hour period started at 1200 UTC on the 30th. But rapid intensification was already underway by that point. That was just the fastest 24 hour change.

CAPT Neubauer: There was additional intensification.

HEC: Captain Neubauer.

WIT: Exhibit 147.

HEC: Thank you.

CAPT Neubauer: Are there any, before we go to the parties in interest does the board members have any further questions for Mr. Franklin? Mr. Richards.

Mr. Richards: Sir, what's the difference between an intermediate advisory and a special advisory package?

WIT: Intermediate advisory is a release of the public advisory only. It's not accompanied by a new forecast. It is a more limited release meant to be given half way through the regular advisories when coastal watches and warnings are in effect. The special advisory is a issuance of every part of the advisory package, every text product, every graphic that is issued when some important change to the storm needs to be communicated before it's next scheduled release of the regular advisory.

Mr. Richards: Thank you. Was there a special advisory package issued for Joaquin prior to October 2nd?

WIT: I would have to look.

Mr. Richards: Do you have that information in front of you?

WIT: It appears there were none prior to 11 a.m. October 1st, which is the set of advisories I have here.

Mr. Richards: Thank you. Are there other individual products aside from the intermediate advisory that the National Hurricane Center, your unit, the hurricane specialist unit can and do issue in between the 6 hourly forecast advisory products?

WIT: Yes. There's one other product called the tropical cyclone update which is a short statement that is used, not to change a forecast, but simply to provide an update of some significance in between regularly scheduled advisories. And there are a number of reasons why we might send out an update. We could issue a, and they're called TCU's, we might issue a TCU to upgrade a tropical storm to a hurricane for example, the status of a tropical cyclone has changed. To mark a landfall, that's basically for the media's benefit. Because they're always calling us when did it make landfall and how strong was it. So we'll issue TCU's for that. Normally if the intensity is changing rapidly it generally means that out forecast has become obsolete and in that case we generally do a special advisory rather than a TCU. Another reason to issue a TCU would be to announce the raising of watches and warnings by a foreign government. We can't U.S. watches and warnings on a TCU but we can for international watches and warnings.

Mr. Richards: You may not be familiar with this in your position, but let me ask. Are you – are you or your forecasters familiar with how – what products NOAA disseminates to parties like INMARSAT for distribution on SAT-C or to the U.S. Coast Guard or high frequency broadcast? Is that something you're familiar with?

WIT: I am not and I suspect most of my forecasters are not.

Mr. Richards: Okay. So it's fair to say that those types of considerations don't factor into determination of what products may be issued in between the 6 hourly forecast advisories, is that a fair statement?

WIT: The only case that I can think of where that is – comes into play is the requirement that, you know we can't raise U.S. watches and warnings without putting out a full advisory package. And I believe the original rational for that was that some customers only got the forecast advisory, what used to be called the marine advisory. And coastal watches and warnings are contained in that product. That was a policy that goes back since before I came to the Hurricane Center. That's the only case that I can think of off the top of my head where dissemination considerations effected what we could do and what product.

Mr. Richards: Okay, thank you. Just one more question. Going back to best track which you defined for Lieutenant Comerford, if you were to compare the after the fact best track as determined by the National Hurricane Center and compare those positions with the center positions of a storm that are issued through the forecast advisories, would you expect those to be identical?

WIT: They're rarely identical. The real time positions are based on all of our real time estimates, the positions, the intensity, the size, are based on information that we had up to the point at which we made them. When we do the best track analysis we have the luxury of knowing what came afterwards. And knowing what came afterwards often colors the interpretation of the data that you had when you made the estimate to begin with. So there are always changes to the final best track relative to the operational

estimates. For position if you plot the operational positions they tend to be a little bit jumpy particularly in cases where we don't have an aircraft there and we may have a more uncertain estimate of where the storm really was. There is some smoothing that goes on in the creation of the best track. There's some science reasons for not trying to depict every little wobble that a hurricane might undergo in a – the best track is basically a 6 hourly time series. And there's a sort of a nasty statistical thing that can happen called aliasing when you try and represent too small of scale of motion in a time series. And so in the best track we are trying to only show scales of motion that are commencement with a 6 hourly time series. We cannot show – the storm makes a loop over a 3 or 4 hour period, there's no way we can represent that in a 6 hourly best track and we don't try. So they will be different.

Mr. Richards: Thank you. And one last question. This is just a clarification from earlier, excuse me. You were – you brought up NCEP, National Center for Environment Prediction, just to clarify, NCEP when we're talking about domestic global models these are, such as GFS, these are run at NCEP not at the National Hurricane Center, is that correct?

WIT: That's correct.

Mr. Richards: Thank you Captain.

CAPT Neubauer: Mr. Fawcett.

Mr. Fawcett: Mr. Franklin just a couple of follow up questions. Within in your office where you work do you have any idea where either vessels are or concentrations of vessels are on the high seas at any given time?

WIT: We see ship observations plotted on our display. So if a ship is reporting an observation we will see that. If a ship is not reporting weather observations then I think it's extremely unlikely that any of the hurricane forecasters would know about it.

Mr. Fawcett: In your experience do you recall seeing the El Faro on your display?

WIT: I have no recollection of seeing it on the display. I'm not sure I would even know it if I saw it by call sign.

Mr. Fawcett: So they use call signs, correct?

WIT: Yes. So what we see on the display would be the ship observation and then we would see the four character call sign.

Mr. Fawcett: On the – during the time of Joaquin did you see any ships in close proximity to the movement of the center of the eye of Joaquin?

WIT: I have no recollection of seeing any. The forecasters who worked on shift might, but I don't.

Mr. Fawcett: Is it possible to get archive captures of the display of where the weather models are for the reporting ships at sea?

WIT: You're talking about an archive of ship observations.

Mr. Fawcett: Correct.

WIT: The only archive of ship observations that we have would be those ships that reported winds in excess of 34 knots. That is an archive that we keep and it's actually – there's a table of that in the tropical cyclone report.

Mr. Fawcett: Okay. So there's no graphical product that we could advance and retard to graphically see where vessels were around the time of Joaquin?

WIT: We have – we keep – we archive a lot of data and we can replay some of it. I believe the ship data is part of the archive that we keep for display purposes, apart from this text archive that I just talked about. It would probably be possible to reload those data and look for a particular call sign if we knew what to look for.

Mr. Fawcett: Yeah, we'll follow up on that if necessary. Just finally, my final question is how, and particular for mariners using one of your products, how do you warn the marine about the unpredictability of tropical cyclones?

WIT: The off shore waters of forecast that's issued by TAFB has marine hurricane warnings in it. It did for Joaquin. We have on our web page a section on forecast verification. It's been there for quite a while and the purpose of that page is to allow all users to see what our forecast accuracy is and is not. So that's available to everyone. We advertise it in most of our external engagements which are at least in my unit are not primarily geared towards mariners. They're primarily geared towards the emergency management community and the media. TAFB has their own outreach effort that I'm not familiar with the details of. So I couldn't tell you how they attempt to communicate forecast uncertainty. But certainly our verification page would be available to anybody.

Mr. Fawcett: Thank you very much, sir.

CAPT Neubauer: Commander Denning.

CDR Denning: Sir, just a few follow ups.

WIT: Can I – can I elaborate on that?

CAPT Neubauer: Yes, sir.

WIT: Just a little bit. Again it's not really directly to mariners specifically, but anytime we have an opportunity to talk to users maybe the number one message that we're always trying to convey is what forecast uncertainty is. I've got a slide on that verification page that shows you know what percentage of the time the track error is bigger than some distance. The entire distribution of our forecast error is out there. We update that every year. For anybody who's making a decision we want people to know what the problems with our forecast are and what the uncertainties are. So it's a major part of what we do. We designed a whole product suite to deal with that question. The wind speed probabilities, I mentioned it seems like days ago now, but that's to get people away from looking at the forecast cone diagram that we were just looking at which has a very deterministic looking forecast that says the hurricane is going to be here in 3 days and 4 day and 5 days. So we developed a wind speed probability product which is a graphic that shows what are the odds, of you can point to any point on the map. What are the odds of having hurricane force winds at this particular spot in the next 5 days or 3 days or 2 days? What are the chances you will encounter tropical storm force at this particular location? It's an extremely valuable product because it takes – it takes the attention away from the track forecast and explicitly considers what our historical errors are and what are the odds of experiencing these conditions at what could be great distances away from our forecast track. So we design products with that kind of thing in mind. Again not specifically for mariners, but for all users.

Mr. Fawcett: Thank you, sir.

CAPT Neubauer: Commander Denning.

CDR Denning: Sir, during Captain Hearns, or during Captain Hearns testimony earlier today he mentioned a product that he uses called FTP mail. Are you familiar with that particular product?

WIT: I am not.

CDR Denning: And my last question is back to Exhibit 59 if you wouldn't mind pulling that back up one last time.

WIT: 59?

CDR Denning: 159. It's also on your screen.

WIT: Oh okay.

CDR Denning: So you don't have to flip to it if you don't need to. So if you wouldn't mind turning to page 7 just for a different graphic than the one we've been discussing, the white cone is that commonly referred to as the cone of uncertainty?

WIT: Yes. But both parts of the cone, the white part and the hatched are collectedly. The white part is the 3 day forecast and the hatched part is the 5 day.

CDR Denning: So referring to that cone and it's border, there's a black border around the cone. Just wanted to point that out on one slide and then we're going to refer back to the one we were talking about earlier.

CAPT Neubauer: Just to clarify it was a black border around the 3 day portion of the cone.

CDR Denning: Around the 3 day cone.

WIT: Correct.

CDR Denning: And then just to double back on Captain Neubauer's question earlier on page 12, slide 12, he referred to the positions, and I just want to point out that the cone,

the black border around the cone also appears to move in a Northwesterly direction. Does that add to the uncertainty to the end user that in addition to, if you toggle between page 11 and page 12 he cone itself changes, could that give the impression to a user that the forecast has also changed?

WIT: I'm looking at page 11 and page 12.

CDR Denning: So 11 is advisory 10.

WIT: Yes.

CDR Denning: 12 is advisory 10a.

WIT: Yes.

CDR Denning: The cone remains consistent with the exception of after the position moves the cone appears to move in the Northwesterly direction. Giving the appearance that that's an updated forecast.

WIT: The cone looks the same to me except for the initial positon. So I'm not quite sure.

CDR Denning: That's what I'm getting at. The initial cone ----

WIT: Okay. The portion of the cone that's drawn from the advisory position.

CDR Denning: That very, very small sliver of the ----

WIT: Right.

CDR Denning: That's what I'm getting at. Doesn't that – wouldn't that be a little bit more – even more misleading? Because it gives the impression that the forecast has been updated even though it hasn't.

CAPT Neubauer: Sir, can you give an opinion on that?

WIT: I think an unwary user might look at the intermediate cone and assume that everything had changed. With or without that little motion of the initial point. I'm not sure that changes that potential misinterpretation of it. But that's a misinterpretation that's certainly possible.

CDR Denning: Thank you.

CAPT Neubauer: Mr. Richard.

Mr. Richards: Sir, are you familiar with a mariner's 1, 2, 3 rule?

WIT: Somewhat.

Mr. Richards: Okay. Is that a – does the National Hurricane Center issue a graphical product based on the mariner's 1, 2, 3 rule?

WIT: It's about to discontinue that product.

Mr. Richards: Okay.

WIT: I'm sure of the exact date, I believe in June or July. A new technique is going to be use to replace that. But I believe as of my speaking right now that it is still in place.

Mr. Richards: Okay. Are you aware of how, I'm trying to get a sense of perhaps what the new technique is? What is provided to the user as opposed to traditional the graphic for the mariner's 1, 2, 3 rule? Do you have the insight on that?

WIT: Sure I can describe the differences between the two procedures.

Mr. Richards: Briefly.

WIT: So the mariner's 1, 2, 3 rule basically involves taking the forecast area of tropical storm force winds and applying a certain amount of buffer to that. 100 miles of buffer at day 1, 200 miles of buffer at day 2 and 300 miles of buffer at day 3. So it highlights an area that is supposed to be dangerous. And it was based on errors that were common

to our forecast back in the 1990's, I think that was when the rule was developed. As forecast track errors have come down over the years that area tended to overstate the area that was at risk for tropical storm force winds. And so beginning next month or July, again I'm not sure of the exact date TAFB is going to be using instead an area that is based on the wind speed probability product that I just talked about. So we take the official forecast and there are a thousand alternate tracks that are drawn about that based on our historical errors and we compute the area that has, and now I'm not sure I've got the detail, but I believe there are two areas that are going to be displayed. One showing the 50 percent likelihood of tropical storm force winds, in other words highlighting the likely area. And then a lower threshold which, if I recall is something like 10 or 20 percent which is meant to display the area where tropical storm winds are possible.

Mr. Richards: Is this new product intended for mariners specifically?

WIT: It's a TAFB product so yes.

Mr. Richards: Was the movement away from the product that graphically, you know the mariner's 1, 2, 3 rule to this new product was that based on user feedback?

WIT: I don't know. Somebody in HUCOG [sic] would be the one to know what kind of feedback they got. Sometimes we make changes based just because we know that something isn't correct anymore.

Mr. Richards: Okay.

WIT: And the errors that were going into the 1,2,3 rule were too big on average. But I don't know whether there was feedback on that or not.

Mr. Richards: I understand you don't ----

WIT: I don't know if that was externally forced for internally driven, that particular change.

Mr. Richards: Thank you.

CAPT Neubauer: At this time we'll go to the parties in interest. Tote do you have any questions?

Tote Inc: Just a couple, sir. Mr. Franklin thank you for your testimony. Can you turn to page, or Exhibit 152 in your exhibits? And it's page 30.

WIT: Okay.

'**Tote Inc:** And this is Joaquin discussion number 13. Do you see that?

WIT: Yes, sir.

Tote Inc: And what is a discussion number? What do these – why are these published?

WIT: Why is this product issued?

Tote Inc: Yes.

WIT: This is meant to provide users with information on how we came to make the forecast that we came to. It is an opportunity for the forecaster to explain the rationale behind the forecast, talk about his level of confidence, or lack of confidence in the forecast. In fact that's really the only place, I think I said earlier, where the forecaster has the opportunity to express uncertainty. It's also an opportunity for us to get any key messages that we want the media to pick up on or emergency managers to pick up on. To the point where a little later on in this storm we made it explicit by numbering them in this particular product. It's the forecaster talking to his users.

Tote Inc: Thank you. If you would if you would look down at around 9 lines down the first paragraph and it says "note".

WIT: Yes I see that.

Tote Inc: And could you just read that sentence please?

WIT: It says, note communication problems have delayed the public release of the Air Force Reconnaissance data.

Tote Inc: And this was issued at 11 p.m. on September 30th?

WIT: Yes.

Tote Inc: Okay. Do you know anything about that?

WIT: That particular communications issue?

Tote Inc: Yes.

WIT: Not off hand. I know that in general sometimes there are issues in, well the data comes from the aircraft via satellite link. They are then quality controlled by some Air Force civilian folks at the Hurricane Center. And they are then transmitted out. If some technical glitch arises in the outward transmission of those data then there could be a delay in the posting, public posting of those observations. That happens from time to time.

Tote Inc: In this particular instance do you know how long that delay would have been?

WIT: I do not. Not without researching it.

Tote Inc: Our information indicates that the vessel was receiving SAT-C weather but there was a gap in the receipt of that SAT-C information for 4 hours approximately from midnight to 4 a.m. Is it possible that this communication delay would have been something that would have resulted in that sort of gap to help explain that?

WIT: I don't know what kind of data goes over SAT-C, but I can tell you that the kind of information that we're talking about here would be the flight level observations from the reconnaissance aircraft.

Tote Inc: Okay. So but if there's a delay in information coming from the reconnaissance aircraft would that necessarily result in a delay from INMARSAT broadcasting the SAT-C weather to vessels?

WIT: I don't know what SAT-C is. So I can't say. As far as I know the only broadcast of the reconnaissance data is – I don't know whether those data go over SAT-C. These are the raw observations from the reconnaissance aircraft. They're not a product of the Hurricane Center.

Tote Inc: Are you aware of any delays from your office of issuing a forecast due to problems of any kind?

WIT: For Joaquin?

Tote Inc: Yes.

WIT: No I'm not.

Tote Inc: Thank you.

CAPT Neubauer: ABS?

ABS: No questions.

CAPT Neubauer: Mrs. Davidson?

Ms. Davidson: No questions.

CAPT Neubauer: Herbert Engineering?

HEC: No questions.

CAPT Neubauer: Are there any final questions at this time? Mr. Franklin you are now released as a witness at this Marine Board of Investigation. Thank you for your testimony and cooperation. If I later determine that this board needs additional information from you I will contact you through your counsel. If you have any questions about this investigation you may contact the Marine Board Recorder, Lieutenant Commander Damian Yemma. At this time do any of the PII's have any issues with the testimony provided?

Tote Inc: No, sir.

Ms. Davidson: No, sir.

ABS: No, sir.

HEC: No, sir.

CAPT Neubauer: The hearing will now recess and reconvene at 9 a.m. tomorrow morning.

The hearing adjourned at 1753, 17 May 2016.