STATEMENT FOR THE RECORD

Mr. Philip A. Teel, President
Northrop Grumman Ship Systems (NGSS)
1000 Jerry St. Pe` Highway
Pascagoula, Mississippi 39568
Tel: 228-935-7447

Testimony Before The
House Subcommittee on Coast Guard and Maritime Transportation
House Committee on Transportation and Infrastructure

TUESDAY, JANUARY 30, 2007
11:00 AM
2167 RHOB COMMITTEE ROOM

Good morning Chairman Cummings, Ranking Member LaTourette, and distinguished members of the Subcommittee.

Thank you for the opportunity to appear before you today to discuss the Deepwater Program. As you know, within the Integrated Coast Guard Systems (ICGS) structure, a joint venture established by Northrop Grumman and Lockheed Martin, Northrop Grumman Ship Systems (NGSS) is responsible for design, construction and support of all three classes of cutters; the National Security Cutter (NSC), the Offshore Patrol Cutter (OPC), the Fast Response Cutter (FRC), as well as the 110' to 123' converted Island Class Patrol Boats. References in this statement to ICGS or separately to Northrop Grumman or NGSS should be construed to mean the role of Northrop Grumman Ship Systems as part of ICGS.

At the outset, on behalf of Northrop Grumman and all of the men and women working in support of this program, I would like to thank this Subcommittee for your strong support of the Coast Guard, and of the Deepwater Program. We look forward to working closely with you and the Coast Guard to ensure the success of this important modernization. The following statement contains information that I, on behalf of Northrop Grumman, am submitting based on my current knowledge, information and belief.

Overall Deepwater Program Management: On June 25, 2002, the Deepwater Program prime contract was awarded to ICGS. As program requirements have changed since 9/11, the Deepwater prime contract has been amended accordingly to accommodate the new requirements in support of national security.

There has been an extraordinary level of transparency in program management and execution between ICGS and the Coast Guard. The Coast Guard has been involved in every aspect of the Program throughout its history. Each Deepwater asset undergoes design reviews by government and contractor technical experts at key points in the design life cycle, with questions and issues adjudicated as part of the review process. Personnel from the Coast Guard, Northrop Grumman, Lockheed Martin, various subcontractors and ICGS are co-located at production sites as well as in the Systems Integration Program Office in Arlington, Virginia. Full participation by the Coast

Guard is built into every level and function within the ICGS team. With respect to programmatic decision making, all major acquisition decisions are made by the Coast Guard, after review and approval by Coast Guard senior leadership through a series of cross-functional government teams. These include reviews by subject matter experts from Engineering and Logistics, Electronics & Communications, Human Resources, Intelligence, and the Programs & Budget Directorate at the staff and flag level. Northrop Grumman and ICGS do not make decisions in relation to what cutters and boats to buy—we make recommendations. The U.S. Coast Guard is the decision making and contracting authority, and has retained the traditional contract management functions, including the right to issue unilateral change orders, to stop or terminate work, to order or not order assets and supplies, and to accept or reject the work.

There is a lot of interest on the way forward for Deepwater and as you know the Commandant met with the CEOs of both Northrop Grumman and Lockheed Martin. The leaders used the opportunity to focus on the most important issues related to the 25-year, $24 billion acquisition program, including recent Coast Guard initiatives to strengthen program management and oversight--such as technical authority designation, use of independent (third party) assessments, and consolidation of Coast Guard acquisition activities under one directorate. The way forward is encapsulated into three objectives. (1) Capitalize on proven, first-article Deepwater successes. (2) Sustain momentum in recapitalizing the Coast Guard through the Deepwater program and (3) Resolve outstanding challenges associated with some projects within Deepwater. The senior leadership in each of our organizations is committed to meet regularly to review the progress of the program and provide executive level oversight at all times, with specific direction when warranted.

Competition is also an important component of the Deepwater team's effort to deliver "best value" to the Coast Guard. The tenet of competition within the ICGS Deepwater program plan is an open business model that invites participation and competition through the life of the program. Both contractors have a Contractor Purchasing System that is patterned after the Federal Acquisition Regulations. All Northrop Grumman purchases over $25K are individually reviewed for compliance with purchasing guidelines, and the purchasing system is audited (usually every three years) by the Defense Contract Audit Agency (DCAA). A government sponsored third party review of Deepwater acquisition practices found our statistics favorable compared to large US Navy procurement programs. In addition, competition for subcontract awards is encouraged via the annual Industry and Innovation Days where suppliers and vendors have an opportunity to provide input on new or improved products. ICGS to date has placed orders with more than 600 suppliers representing more than 41 states and maintains an active database of over 3000 potential suppliers from which it draws to host annual supplier innovation and industry days.

Patrol Boats are small naval ships, generally designed for coastal defense duties, operated by a nation's navy, coast guard or police force in marine – "blue water" - and littoral and river - "brown water" - environments. They are commonly found in various border protection roles, including anti-smuggling, anti-piracy, fisheries patrols, immigration law enforcement and rescue operations. Patrol boats usually carry a single artillery gun as main armament with a variety of lighter secondary armament such as machine guns, and are diesel-powered, with speeds generally in the 25-30 knot range. The above definition aptly describes the 49 "Island Class" 110 foot patrol boats and the 123 foot conversions under the original Deepwater proposal.

The Coast Guard's current 110 foot patrol boats were built in the 1980s and early 1990s by Bollinger Shipyards, Inc. These boats have seen extensive duty in support of the Coast Guard mission to save lives, interdict aliens and seize drugs. ICGS and its teammate, Halter Bollinger

Joint Venture (HBJV), proposed to convert the 110 foot boats to 123 foot boats as an interim measure to improve the capability and extend the life of this vessel until its FRC replacement entered operation in 2018. ICGS proposed the conversion concept as the best means to provide the Coast Guard with the necessary capability to continue to meet its mission objectives while remaining within the confines of program funding requirements. Deepwater competitors were required to propose a "system of systems" solution that did not exceed the funding limitation of $500 million per year. With new assets such as the National Security Cutter (NSC), Maritime Patrol Aircraft (MPA) and the Vertical Unmanned Air Vehicle (VUAV) being developed early in the program, it was not possible to design, develop and construct new patrol boats at program inception while keeping within annual funding limitations.

Bollinger had designed and built the original 110 foot boats and was very familiar with their construction. Bollinger was awarded a contract for 16 110 Island class boats in August 1984 and another contract for 33 more boats in 1986. The design of the 110 Island class was approximately 20 years old and was based on an existing patrol boat developed by a British firm, Vosper Thornycroft (UK) Ltd. The 110 Island Class boats were commissioned between November 1985 and 1992. Notably, after the first boats came into service, it was discovered that the 110s suffered from hull problems when operated in heavy seas. As a correctional measure, heavier bow plating was added to hulls 17 through 49 during construction and additional stiffeners were retrofitted to earlier hulls.

Under the proposed Deepwater conversion plan, HBJV added a 13 foot extension to the 110', which accommodated a stern ramp for the launch and recovery of a small boat, used primarily to support boarding and rescue operations. In addition, the conversion installed an improved pilot house, enhanced Command, Control, Communications, Computers and Intelligence, Surveillance and Reconnaissance (C4ISR) capabilities and tested, identified and renewed hull plating in areas where an ultrasonic thickness inspection indicated that the existing plating was deteriorated. The proposed approach to replacement of the hull plating was consistent with the subsequent findings of the Coast Guard's 110 WPB Service Life Extension Board, published in March 2002 before the conversions occurred, which recommended a program of systematic hull repairs, predominantly in documented problem areas, to address the hull deterioration problems that were impacting 110' WPB operational availability.

After being awarded the patrol boat conversion work, ICGS engaged in a rigorous design process that included extensive reviews with all stakeholders. These programmatic reviews included a Preliminary Design Review, a Critical Design Review and a Production Readiness Review all of which were conducted with the Coast Guard before the actual conversion work began. Leading up to each of these reviews, the evolving design, design drawings and calculations were formally presented to the Coast Guard subject matter experts in increasing detail for their review, comment and approval. During this series of reviews I am not aware that structural, buckling or deformation concerns were raised as an issue. In addition, during the conversion of the Matagorda, the American Bureau of Shipping (ABS) examined the design of the hull extension and new deckhouse and monitored key elements of the work being performed. At the conclusion of the Matagorda work, they issued a letter of approval for the conversion work and expressed no reservations with the feasibility of the conversion.

The Performance Specification requirement calls for the 123' to be capable of unrestricted operation up through sea state 3, or seas averaging less than four feet. Operation restrictions are imposed beginning at sea state four, or seas less than eight feet, where the boats are to be able to sustain limited operations, altering course or reducing speed as required to maintain a ride which

does not damage the boat or its machinery or overly fatigue the crew. The 123' is to be able to survive sea state 5, or seas averaging between eight and 13 feet, maneuvering as necessary to minimize damage or injury to the crew, and then be capable of returning to port under its own power once the seas have subsided.

In September of 2004, after all 8 hulls had entered the conversion program and the first 4 hulls had been delivered, the Matagorda was forced to conduct a high speed transit to avoid Hurricane Ivan. This operational necessity forced the Coast Guard to transit in a sea state and speed where the cutter was operating near or above the design limits of the 123' conversion. Upon arrival at their destination, the crew discovered buckling of the side shell and main deck on the starboard side near midships. An engineering tiger team was formed consisting of Coast Guard and NGSS personnel. This team was dispatched to investigate the problem where it was discovered that the Matagorda had an inherent workmanship issue in the baseline 110' that existed prior to the conversion and contributed to the hull buckling. Specifically, a hidden, unwelded aluminum deck stringer was discovered immediately beneath the area where the failure occurred. Other boats were examined, and this unwelded stringer was also found on one additional hull undergoing conversion. When modeled using finite element analysis, the stresses in the panels which failed on Matagorda were significantly higher than the stresses shown when the model was run with this stringer intact. Based on this finding, the team believed this to be the primary cause of the buckling on Matagorda, and repairs were made accordingly.

In addition, a reconstruction of the engineering analysis of the 123' structure was conducted. Based on this, it was also discovered that an early calculation overstated the strength margin for the boat. A revised calculation using a common, agreed to set of assumptions by the engineering team showed the 123' would still meet the required operations defined in the Performance Specification.

In an effort to further improve the structural integrity on the 123', three stiffener bands were installed; one at the upper edge of the side shell, one below this one and another on the edge of the main deck to increase the overall structural strength. While the finite element analysis and conventional calculations both agreed that the original hull, with the stringer under the deck intact, should be sufficient throughout the operating range of the 123', these additional stiffeners were considered to provide an added margin of strength.

In November 2004, ICGS received a contract modification that changed the arrival schedule of hulls 9-12 to TBD. Long-lead time material for four additional hulls had already been authorized and work continued on the 3 remaining hulls in process.

By March, 2005, 6 of the 123s had received the structural upgrade and had been delivered. Certain operational restrictions imposed on these boats by the Coast Guard following repairs to the Matagorda had been lifted. Then, during a transit from Key West to Savannah, GA, the Nunivak experienced hull deformation in an area aft of the new reinforcing straps. This deformation occurred in a different area from that of the Matagorda. Further, this was not an area which had indicated potential for high stresses under any conditions modeled in the earlier finite element analysis.

An outside engineering firm, Designers and Planners, was contracted by the Coast Guard to perform a more detailed finite element analysis of the 123' hull, which showed that the overall hull structure design was adequate under all expected operating conditions up to the worst operating condition modeled. The analyses were not able to replicate the deformation seen on

Nunivak. A more detailed look at specific regions on the hull showed an area with high potential for localized buckling in a section of the side shell where the original 110' hull had been constructed of exceptionally thin four-pound plate. Despite this finding, no actual failures had ever been experienced in this area on 110 or 123' WPBs. As a precaution, this thin plate was replaced with heavier plating on those cutters undergoing the Post Delivery Maintenance Availability, with plans to eventually upgrade all the boats. Lastly, a metallurgical analysis of the deck material determined that the particular grade of aluminum used on the 110s is prone to corrosion and cracking in elevated heat and marine conditions.

In July 2005, then Coast Guard Commandant Admiral Collins' written testimony before Congress outlined the twofold reason for stopping the conversion process as follows: "As the first eight 110' to 123' conversions were conducted, the Coast Guard found that the 110' WPB hulls were in much worse condition than anticipated. This extended the conversion timeline and would have increased projected costs for conversions after the first eight (the first eight were negotiated under a firm-fixed-price contract). An operational analysis of the 123' WPBs also identified high risks in meeting mission needs, particularly in the post-9/11 environment."

To date the problems associated with the 123' conversion include buckling or hull deformation and shaft and propeller alignment problems. In addition to the actions previously described, additional and substantial work has been (and continues to be) done. In addition to the repairs and reviews of structural calculations, we have continued the review process by conducting two independent finite element analyses, modeling both the original and the upgraded hull, and we completed metallurgical testing that revealed an issue in the main deck which exists on both the 123' and across the legacy 110 fleet. Extensive strain gage testing has been conducted on a 123' hull to validate the finite element model and to identify potential problem areas which the model may not show. The parent craft designer, Vosper Thornycroft, has been engaged to evaluate the 123' hull and provide recommendations. Data is being collected on shaft alignment and maintenance procedures both during the conversion and since, so that the procedures for checking and correcting alignment can be validated for both the 110' and the 123'. Elements of the 123' design, including the propellers and the SRP stern-launch system are being reexamined and validated.

We are committed and determined to identify the root cause of the structural problems. Northrop Grumman and Coast Guard engineers are currently reviewing and re-reviewing all available data on the 110' and 123' patrol boats in an effort to better understand the cause or causes of both hull buckling and shaft and propeller alignment problems. Depending on the outcome of that analysis the possible outcomes range from removing the boats from service to effecting repairs with testing followed by placing them back in service. Until all analyses are complete, it is premature to speculate on the final cause and the final way forward.

Fast Response Cutter Acceleration: Before Congress in July 2005, then Coast Guard Commandant Collins testified: "A key component of the Deepwater Program is the replacement of the Coast Guard's 110' Island Class Patrol Boat (WPB) fleet. The Island Class patrol boat is a Coast Guard multi-mission workhorse and is rapidly approaching the end of its serviceable life. Under the initial IDS proposal, the 49 110' Island Class WPBs were scheduled to undergo a conversion to 123' WPBs by 2010 as a bridging strategy. The 123' WPBs would then be replaced by the Fast Response Cutter (FRC) starting in 2018. As the first eight 110' to 123' conversions were conducted, the Coast Guard found that the 110' WPB hulls were in much worse condition than anticipated. This extended the conversion timeline and would have increased projected costs for conversions after the first eight (the first eight were negotiated under a firm-fixed-price

contract). An operational analysis of the 123 WPBs also identified high risks in meeting mission needs, particularly in the post-9/11 environment. The Coast Guard recently decided to stop the conversion project following the first eight conversions. Instead, the Coast Guard plans to advance the FRC design and construction by ten years, and is analyzing alternatives methods for extending the life of the 110-foot fleet, as discussed above."

Consistent with this testimony, the Coast Guard accelerated FRC design and construction by ten years. The expanded set of post 9-11 requirements produced a set of required capabilities that exceeded the traditional patrol boat roles filled by the 110s and 123s and other similar worldwide patrol boat fleets. A market study was conducted and concluded that none of the existing similar sized patrol boats would meet these requirements. A series of business case analyses, Total Ownership Cost (TOC) studies and preliminary design efforts showed the benefits of using a composite hull form to meet this demanding set of requirements with a potential to save over $1B in lifecycle cost. The predominate savings came from the superior service life of composites. The Design to Cost constraints restricted the vessel length to 140 feet. In order to accommodate the added capability and equipment required to meet the post 9/11 mission requirements the resultant design was wider for its length than historical and traditional patrol boat hull dimensions. Independent third party analysis by John J. McMullen and Associates (JJMA) stated: "The review team believes that the FRC does appear to meet or is capable of meeting the requirements" and acknowledges that "The FRC preliminary design represents a design solution to a challenging set of requirements." Additionally, I would like to point out that, contrary to what was reported in the press, the FRC-A did not fail a tank test – a preliminary test was conducted improperly. When this test conducted properly, the FRC-A met all requirements, as is confirmed in the final model test report.

The Coast Guard made the decision to suspend the FRC-A program, as the all composite design is now called, and focus on a parent craft solution known as the FRC-B. This decision seeks to ensure a proven solution to a lesser requirements set. This will enable the additional time required to take the FRC-A through a design spiral, and perform trade analyses to optimize performance to cost including a robust operational test program for the fully capable FRC. The Coast Guard is also performing an additional business case analysis and a technology readiness assessment to confirm viability of the composite approach.

The current patrol boat acquisition strategy includes two paths: FRC-A, mentioned above and FRC-B. FRC-B will leverage existing patrol boat designs to serve as a bridging strategy while the fully capable FRC-A is undergoing design and development. The FRC-B program will select the candidate design from a field of worldwide patrol boat providers and is expected to enter concept design later this year

I want to assure the Committee that Northrop Grumman will continue to work with the Coast Guard in satisfying its patrol boat mission requirements throughout the life of the Deepwater Program.

National Security Cutter (NSC) Structure and Cost Growth: Designed to replace aging Hamilton Class High Endurance Cutters (WHEC) that have been in service over 40 years, the National Security Cutter (NSC) is a modern, well-armed, high-performance, 421-foot, 4000-ton frigate sized naval ship, with manned and unmanned aircraft, stern-launched rigid inflatable boats and secure communications facilities. It provides the Coast Guard with enhanced post 9/11 Homeland Security and core mission capabilities (drug interdiction, search & rescue, economic zone & fisheries protection). The first of the 8 ship class (USCGC Bertholf) has been launched

and will be delivered to the Coast Guard in the fall of 2007. The second (USCGC Waesche) is also under construction and is scheduled for delivery to the Coast Guard in early 2009.

With regard to the structure, we believe the NSC meets contract requirements/specifications. The NSC design uses the same Data Design Sheet (DDS) standards used in structural design of ships since WWII. The NSC is designed to meet a 30 year service life and many of the structural items raised by the Coast Guard during the design process have been addressed and were incorporated in the Bertholf and Waesche (NSC 1 and 2) prior to production. For example, upgraded steel, thicker steel, modifications to Fashion Plates and Re-entrant Corners, and the addition of 2 longitudinal Hovgaard bulkheads to provide increased stiffness at the stern were incorporated into the design.

ICGS has full confidence in the NSC as designed and as being built, and has full confidence about the structural integrity of the NSC to be able to perform its intended missions. The issue being debated today deals with long term fatigue life related to various assumptions about operating conditions.

With regard to NSC fatigue life, even the best engineers will have different opinions. Analysis has been performed on the NSC utilizing a relatively new model developed by Naval Surface Warfare Center, Carderock Division (Carderock) utilizing two different approaches. The difference in the two approaches is whether or not the model is benchmarked by calculating the fatigue strength of proven ship designs with similar operational characteristics and hull form that has been at sea for the desired time. This enables the calculation of permissible stress levels that can be applied to test the new design. The results of these two analyses have generated a responsible dialog between the engineers which will lead to final agreement about enhancements to fatigue structure.

Northrop Grumman does not self-certify compliance with the structural requirements in the contract. The Bertholf has and will undergo a comprehensive internal and external certification process. The American Bureau of Shipbuilding (ABS) certified 14 Systems Level drawings, including structural design drawings. ABS will also certify 35 ship systems during this acceptance process. These include; Command & Control Systems, Propulsion Plant, Machinery Monitoring & Control, Fuel Systems, Anchoring Systems, and Steering Systems. During the design process, there will be a total of 46 independent third party certifications prior to or as part of the USCGC Bertholf (NSC 1) delivery process. These include; Final Aircraft Facilities, Flight Deck Status and Signaling, Navigation Systems, Interior Communications Systems, Guns and Ammunition Weapons System Safety, DoD Information Security and Accreditation, and TEMPEST. The US Navy's Board of Inspection and Survey (INSURV) will conduct the Ship's Acceptance Trials (AT) when the cutter gets underway later this year.

Cost growth has also been mentioned in the media. Two elements have led to the majority of cost growth on the NSC - increased post 9/11 requirements and the impact of Hurricane Katrina. The NSC that will be delivered to the Coast Guard this year is not the same ship that was first proposed in 1998. Today's NSC has greatly improved operational capabilities that address post 9/11 requirements including Chemical, Biological & Radiation (CBR) protection, a Sensitive Compartmented Information Facility (SCIF) and more robust aviation installations so that the NSC, in addition to its normal embarked Coast Guard aviation complement, will be able to launch, recover and operate US Navy, US Government Agency and partner nation manned and unmanned rotary wing aircraft. These enhancements have added approximately 1000 tons to the displacement, including a one third increase in electrical power systems, a tripling of air

conditioning and ventilation capacity (HVAC), the addition of 25 antennas and a 26% growth in the size of the berthing spaces.

It is true that Katrina delayed the delivery of Bertholf by several months and added cost to the program. Prior to Katrina, Bertholf was the best "first of class" ship in the 70 years that warships have been built in Pascagoula. Even taking into account Katrina, Bertholf continues to set new lead ship standards in quality and efficiency with, higher performance to standards than both the first or second Arleigh Burke Class (DDG 51) destroyer and labor utilization measures that routinely out perform other programs in our shipyard.

Much of what has been done on the NSC program is being transitioned to the rest of the shipyard to other construction programs. In addition to the specific actions as they relate to the NSC program, we are investing $57.3 million dollars of our own money in a new suite of management tools that will increase our visibility, work sequencing capability, material and engineering modeling and capacity and resource planning. These tools will enable the reduction in the number of units we construct to build the NSC. Currently we build the vessel in 45 units and integrate these sub assemblies into 29 erection lifts on the ship. The new tool set will allow us to plan and construct the vessel in less lifts, our target is 16, and as we know the less number of lifts the less cost. We are investing in our human capital, process improvement, and our facilities to reduce the cost associated with building future ships.

Thank you for this opportunity to personally update you on the progress of the Deepwater Program.

This is the end of my statement. I welcome your questions.