Zones & SOW Functional Area(s) supported: All; 3.1, 3.2, 3.3	**Contract # and Value:** FC-5245-C; $300,000	**Company:** George G. Sharp, Inc.	**DOC:** On going **GOVT POC:** R. Takla (212)487-5694

Specific Experience: Sharp is providing turn-key ship procurement services, including contract design, procurement support, plan review, and construction inspection services to the New York City Department of Transportation for the purpose of obtaining a new three-vessel class of passenger-vehicle ferry for the Manhattan to Staten Island route. The total value of this procurement is $120M. These vessels will be among the highest passenger capacity under U.S. flag, each carrying approximately 4400 passengers and 30 vehicles across one of the world's busiest waterways.

Sharp's services include naval architecture and marine engineering, specification and drawing development, proposal review, design comparisons, safety studies, regulatory compliance verification, systems analysis, system performance determinations, and analysis of new technologies. Naval architecture tasks include the development of general arrangements, stability and weight studies, hydrodynamic analysis, and structural drawings, including the midship section. Sharp uses computer-aided-design, computer modeling, and finite-element analysis for this work. Sharp developed the Hull Form and model testing procedures, selected the model testing basin and oversaw the model testing for this design. These tests, conducted in Sweden, helped determine hull resistance, propulsion requirements, and sea keeping capabilities. The structural design was developed with full consideration and analysis of racking loads and hull vibrations. The structural design also provided inputs to the weight estimates and interface data for major machinery, equipment and systems. Marine engineering analysis included power requirement determinations and comparative studies of different power sources and propulsion means, such as comparing conventional direct drive to diesel electric drive, right-angle ("Z") drive, and Voith-Schneider propulsion. Based on the powering performance estimates and the operation profile, a propulsion system trade-off study was conducted to determine the optimum reliable cost-effective propulsion system, considering life cycle cost considerations of each system in areas such as manning, maintenance, training, reliability, control systems, space requirements, and operational efficiency. A parametric study was performed to determine the optimum propeller characteristics, which lead to the selection of the desired RPM, diameter, pitch ratio, number of blades and blade area ratio. Sharp conducted arrangement studies that established the general layout of major machinery, equipment and systems to meet the performance requirements. Electric system design was initiated by an electric plant load analysis. Inputs to the analysis included electric power requirements for main propulsion machinery, auxiliaries, equipment, hotel, mooring and communications.

Several special studies were conducted in support of this design. Lifesaving requirements and fire protection arrangements were determined by an engineering risk analysis, which provided a performance-based alternative to the prescriptive standards provided in the regulations. The USCG cited the lifesaving equipment risk analysis as a "best practice" during public meetings on their new lifesaving rules (46 CFR Subchapter W). The final report contained recommendations regarding the appropriate level of primary lifesaving equipment based on risk, as well as recommendations for additional Human Systems Integration measures such as, safety policy review, crew training, and using both on-board safety systems and external resources during emergency situations, reducing the requirement for hardware and consequent cost and high weight. A critical concern in the lifesaving equipment risk analysis is fire safety, survivability, and passenger evacuation. Another research task performed for this contract was an evaluation of alternative fuels to meet national goals for both energy security and clean air. Sharp conducted a preliminary design investigation into the feasibility of using compressed natural gas as a propulsion fuel for its new ferry from multiple perspectives, including impacts on passenger safety, vessel design, and port infrastructure. Logistics, capital investment, fuel availability, fuel properties, fuel storage, refueling operations, regulatory compliance, training, maintenance, and the unique engineering aspects of the technology were important factors.