SSC Project Recommendation for FY 2019

Risk-based Structural Life Management System

1.0 OBJECTIVE.

1.1 The objective of the project is to develop a practical methodology and procedure for implementing risk in structural life management of ship structures.

2.0 BACKGROUND.

2.1 The total ownership cost of ship structural systems is greatly influenced by the cost of design, operation, and maintenance. Ship owners and operators are burdened by these costs throughout the life of the vessel. As a result, the U.S. maritime industry is constantly seeking new methods to improve and hence reduce ownership costs. Probabilistic risk based approaches have been identified as suitable methods for making decisions on systems with inherent uncertainties, because they rationally account for the uncertainties in the system. For complex systems such as ship structures, these methods can be used to manage the system, assess existing practices, regulations and standards, and to develop new ones that are cost effective to owners, operators and the society at large. The methods provide a systematic and quantitative approach for assessing the probabilities of failure (POF), consequences of failure and the associated risks for components, subsystems or systems to enable risk-informed decisions on structural life management. The probabilities of failures that consider the failure modes such as buckling, corrosion, fatigue and crack for ship structural components including the hull girder and stiffened panels have been calculated using structural reliability methodologies (NEJ, 2002). Structural reliability methodologies that account for uncertainties have been developed and applied to ship structural systems such as hull girders and stiffened panels. The prevalent probabilistic based strategies have generally focused on reliability approaches, in which only the POF of the systems has been accounted for. Consequences of failure and associated risks have not been considered. The current proposal will focus on both the probabilities of failure and associated consequences.

2.2 The proposal is focused on research and development of risk-based structural life management for ships, to reduce total ownership costs. Probabilistic based qualitative and quantitative risk measures and ranking and screening schemes need to be developed and applied to structural life management of ship structures. In addition, a decision tree framework that incorporates risk and comparative cost models for optimal selection of operation and maintenance schedules to reduce total ownership cost, need to be incorporated.

3.0 REQUIREMENTS.

3.1 The project shall be conducted in one phase and the methodology shall be demonstrated on a commercial and a naval vessel.

3.2 Tasks.

3.2.1 The Contractor shall review studies on structural reliabilities of ship structural systems identifying the major components, failure modes and models and also studies on consequences and cost of failure of ship structural life.

3.2.2 The Contractor shall develop suitable risk measures, based on estimates of failure probability and failure consequences that can be applied to manage the structural life of ships.

3.2.3 The Contractor shall develop cost measures applicable to structural life management of ships

3.2.4 The Contractor shall develop practical procedures for mapping the risk measures of systems, subsystems and components to the overall structural life of the ship.

3.2.5 The Contractor shall formulate risk-based decision schemes for combining the cost and risk measures to rank and optimize the criticality of systems, sub-systems and components.

3.2.6 The Contractor shall formulate and demonstrate practical approaches for utilizing the optimized cost and risk measures to plan operations, such as inspection, monitoring, maintenance and repair of the ship structural systems

3.2.7 The contractor shall demonstrate methodology on both commercial and naval vessels.

3.3 Project Timeline in months.

Task #	2	4	6	8	10	12	14	16	18	20	22	24
3.2.1	X	X										
3.2.2			X	X	X	X						
3.2.3					X	X	X	X				
3.2.4						X	X	X	X	X	X	
3.2.5	X	X	X	X	X	X	X	X	X	X	X	X
3.2.6								X	X	X	X	X
3.2.7								X	X	X	X	X

4.0 GOVERNMENT FURNISHED INFORMATION.

4.1 Standards for the Preparation and Publication of SSC Technical Reports.

5.0 DELIVERY REQUIREMENTS. (Identify the deliverables of the project).

5.1 The Contractor shall provide quarterly progress reports to the Project Technical Committee, the Ship Structure Committee Executive Director, and the Contract Specialist.

5.2 The Contractor shall provide one progress review meeting with the Project Technical Committee.

5.3 The Contractor shall provide a print ready master final report and an electronic copy, including the above deliverables, formatted as per the SSC Report Style Manual as posted on the website http://www.shipstructure.org.

6.0 PERIOD OF PERFORMANCE.

6.1 Project Initiation Date: date of award.

6.2 Project Completion Date: *24* months from the date of award.

7.0 GOVERNMENT ESTIMATE. These contractor direct costs are based on previous project participation expenses.

7.1 Project Duration: *24* months.

7.2 Total Estimate: $150,000

7.3 The Independent Government Cost Estimate is attached as enclosure (*x*).

8.0 REFERENCES.

8.1 Naval Engineers Journal Special Issue on Reliability Methods, Spring, 2002

9.0 SUGGESTED CONTRACTING STRATEGY.

9.1 Contracting strategy.
GSA Schedule of BMA Engineering: GS23F0007M
https://www.gsaadvantage.gov/ref_text/GS23F0007M/0OK7P0.36PUI9_GS-23F-0007M_SIPTEXTFILEGSASCHEDULE20150429.PDF

NOTE:

- Please do not submit any proprietary information in this outline. This will be posted on the SSC Website regardless if the project is selected to be funded.