



DESIGN OF HIGH PERFORMANCE MARINE CRAFT FROM A HUMAN FACTORS PERSPECTIVE

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AIM AND OBJECTIVES OF PROJECT

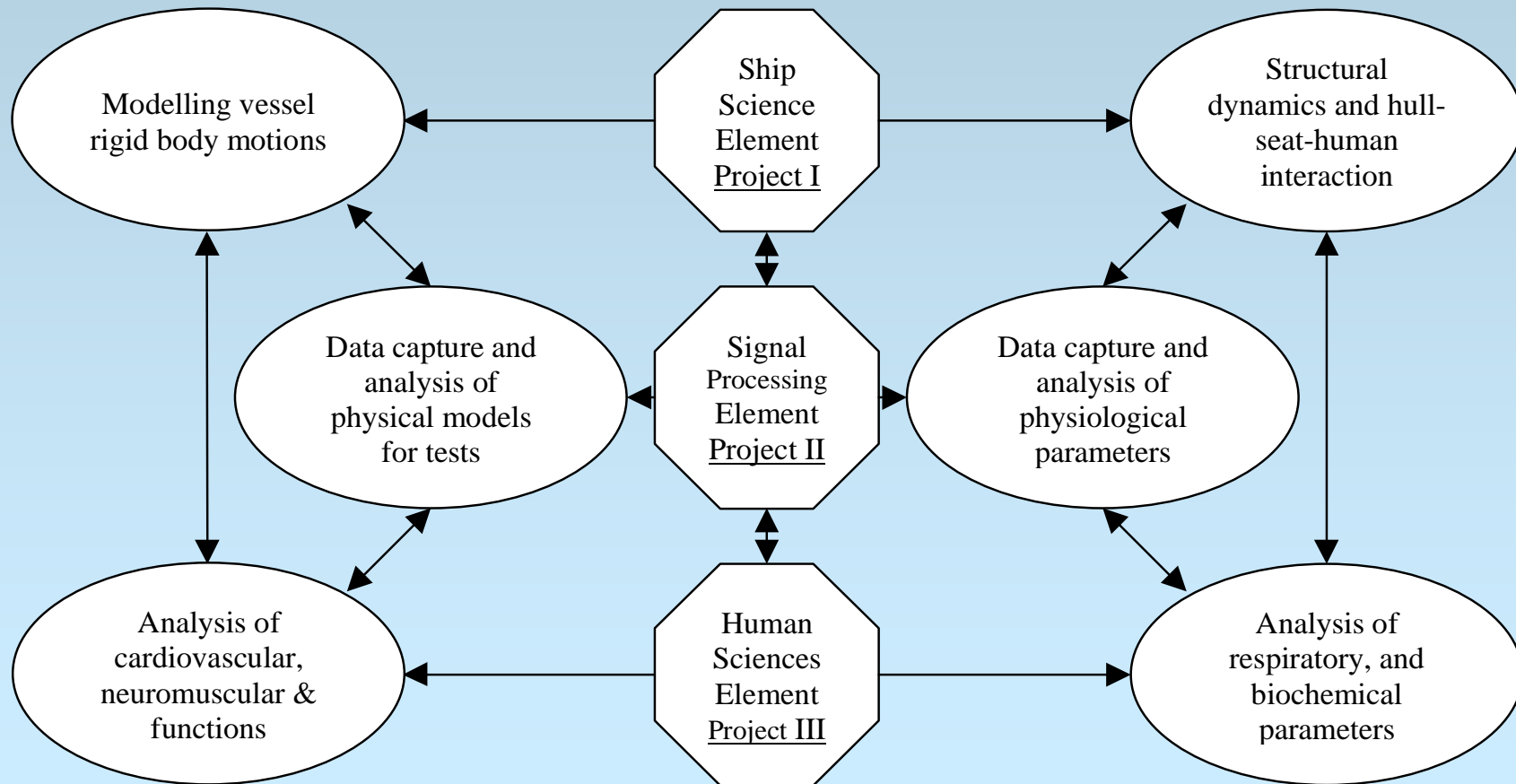
The overall aim of this project is to devise a procedure for the systematic inclusion of human factors in the design of high performance marine vessels. Specific objectives are:

- a) To develop a design procedure for high speed planing craft and very slender vessels, mathematically modelled such that it accounts for the physical modelling of the water-boat-structure interaction;
- b) To synthesise an approach that accounts for the crews' performance capabilities & providing a suitable craft-crew interface, through a biodynamics approach;

AIM AND OBJECTIVES OF PROJECT (CONT.)

- c) To develop models for the analysis of crew/operator performance through quantitative physiological parameters;
- d) To combine the vessel design, human performance criteria model and the human body & boat-human interface model to investigate the effects of variations of vessel design variables on human performance, through numerical simulations and experiments
- e) To demonstrate the application of the combined model of item (d) to typical cases of practical boat/crew situations.

PROJECT OVERVIEW



SHIP SCIENCE ELEMENT

The aim of this segment of the work is to develop a ship design procedure, mathematically modelled such that it accounts for the physical characterisation of the water-vessel-seat-human body interaction. The objectives to achieve this are three-fold:

- To characterise the environmental excitation that high speed planing and very slender craft are likely to experience;
- To develop linkages between principal design particulars of a high speed craft (such as vessel geometry and mass distribution related variables) and rigid body motion through vessel operational characteristics (such as speed, heading to waves, wave frequency, amplitude, etc.);
- To establish the elastic dynamic response of the vessel taking account of structural topology and material composition.



SIGNAL PROCESSING ELEMENT

The main aim of this segment of the work is provide a coherent strategy for signal acquisition, processing and data management throughout the different areas of experimentation and theoretical modeling. Specific aims are:

- To measure vessel hull motion and vibration as a basis for characterizing the structural and environmental dynamics
- To analyse the physiological responses in order to determine key parameters which can characterize human response and performance in such a hazardous operational environment such as the turbulent ocean

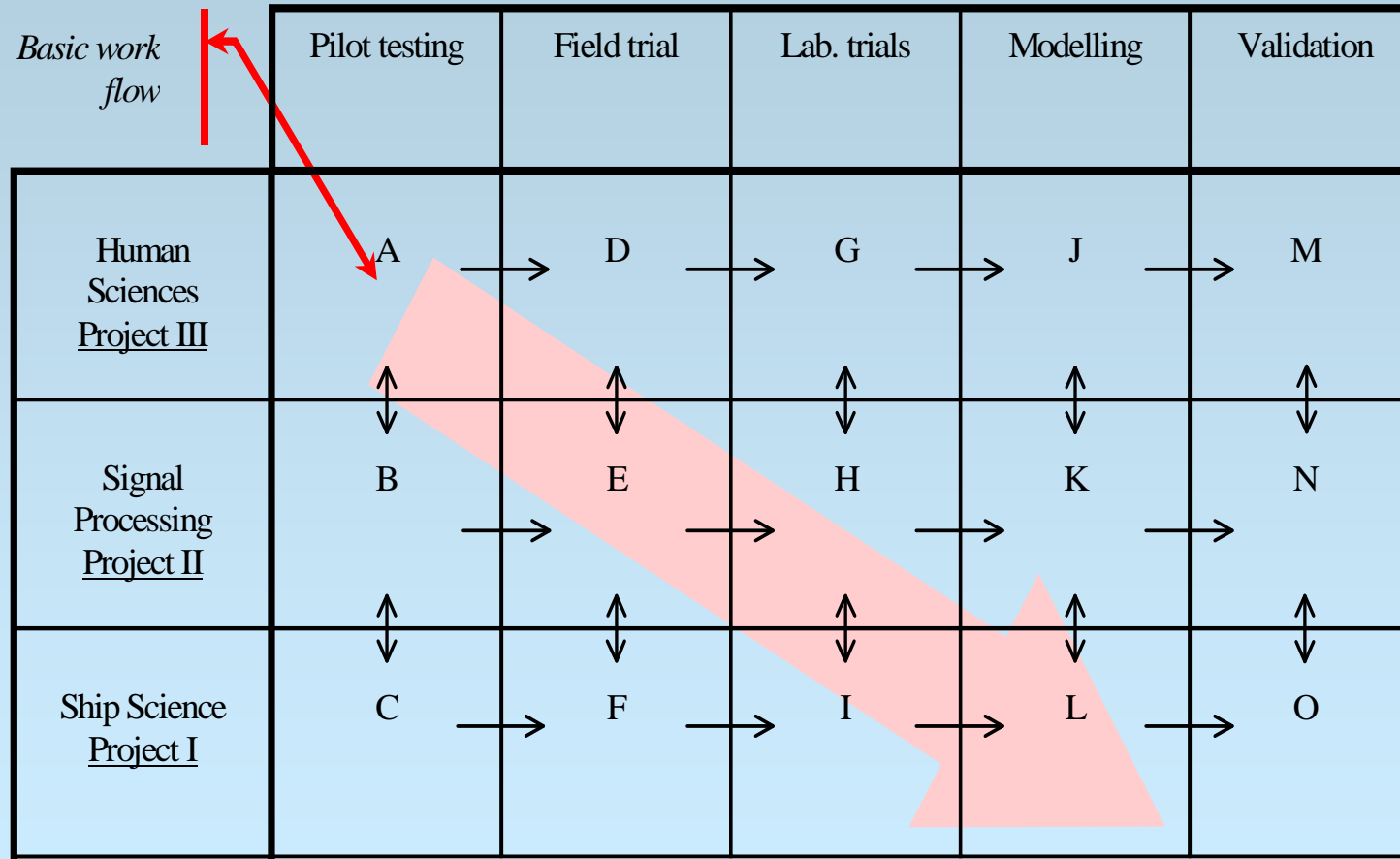


HUMAN SCIENCES ELEMENT

The aim of this segment is to analyse the response of the human body in the craft. The objectives to achieve this are:

- Investigate human physiological and biomechanical responses to transits on the open water and to compare these with shore based recordings, initial open water responses and post-exposure measures;
- Measure psychological responses before and after exposure to the marine craft transits;
- Investigate the feasibility of accurately reproducing the specified [RDI] environment within a laboratory, using the on water human responses to transits as a critical parameter;
- Utilize the knowledge gained of the human responses to compare different seat designs for use in high performance craft;
- Establish potential fatigue mitigation strategies to minimize crew performance degradation;
- Make recommendations of design factors which will reduce the stress of transits in high performance craft and optimise post-transit task performance.

METHODOLOGY





DELIVERABLES – SHIP SCIENCE

- Ship design algorithm linking vessel motion characteristics with principal particulars
- Assessment of the relative influence of different design variables on vessel, structure and seat performance
- Procedures for practical design implementation of the above models



DELIVERABLES – SIGNAL PROCESSING

- Guidelines for signal acquisition and processing of ship motion and physiological response data for biodynamic modeling in the harsh ocean environment
- Models of biomechanical and physiological responses accessible to ship designers



DELIVERABLES – HUMAN SCIENCES

- Quantitative and qualitative data on the human responses to high speed craft motions; pre, during and post transits.
- Quantitative and qualitative data on the potential effect of physical coping strategies and shock mitigation technologies.
- Human factors related design recommendations for input into high speed craft design parameters.



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