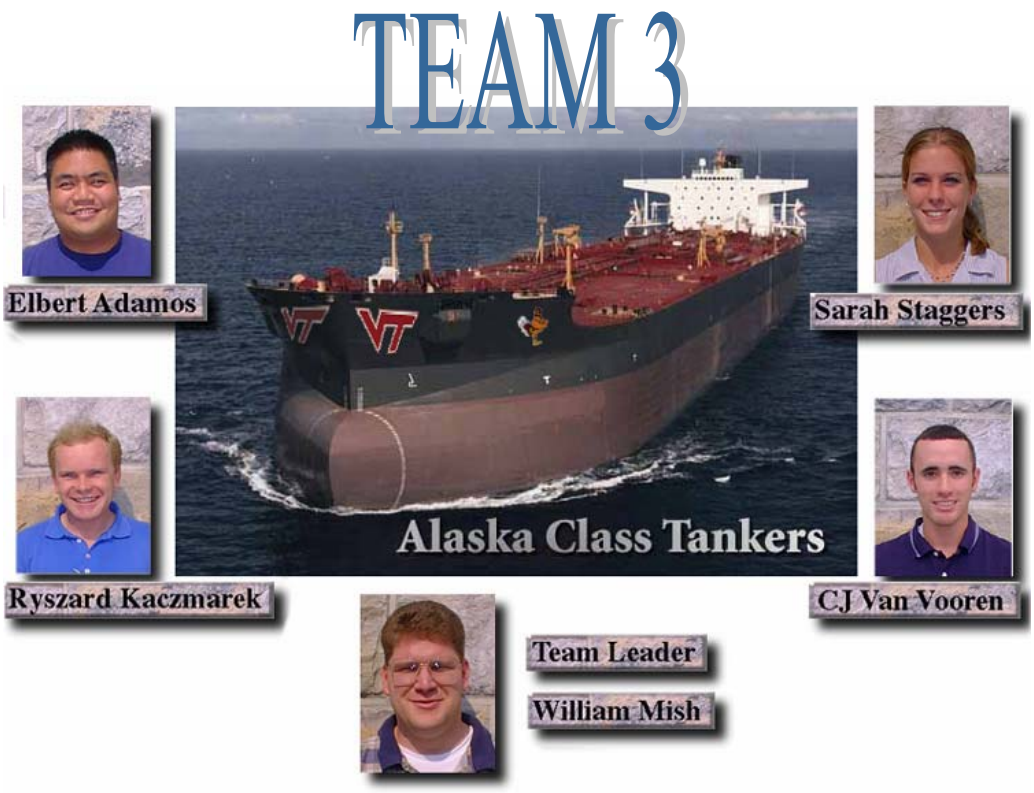
Virginia Tech
Aerospace & Ocean Engineering

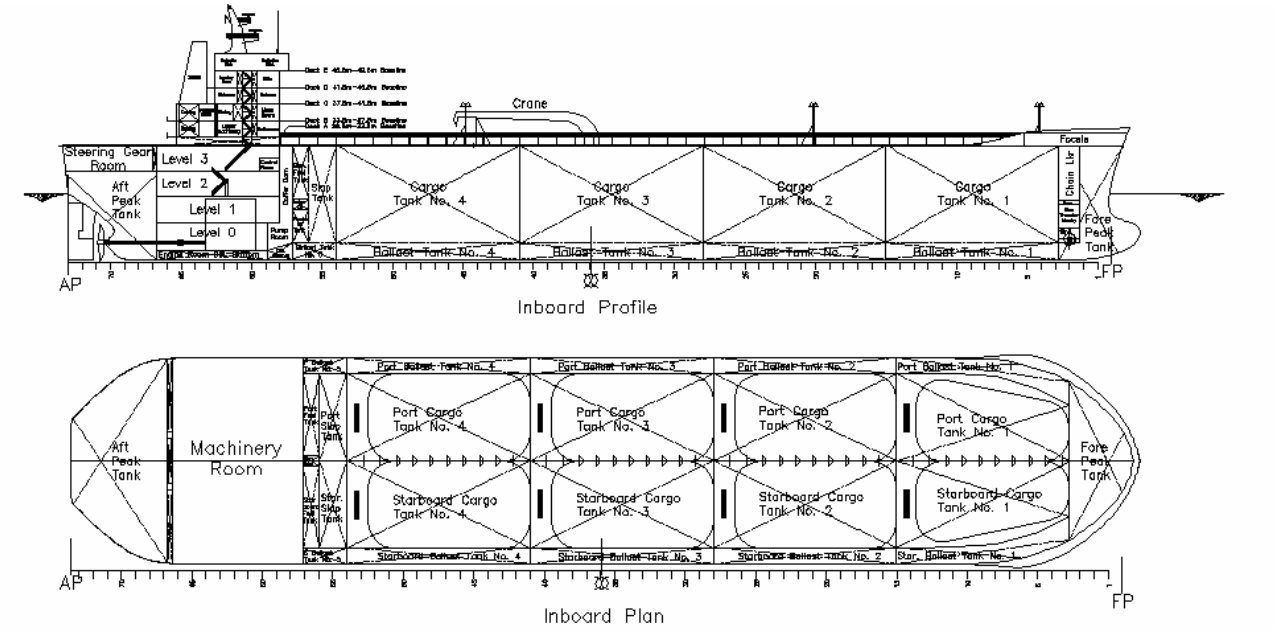
Optimum Risk Tanker Design Report

An Analytical Process for a TAPS Tanker Design



ORT LO
Ocean Engineering Design Project
AOE 4065/4066

Executive Summary



The goal of the Optimum Risk Tanker (ORT) LO is to transport oil from the Trans Alaskan Pipeline System to the Northern Pacific utilizing a design which is low in cost and low in risk. This design is achieved by analyzing the owners' requirements, defining the mission, optimizing cost and risk, and exploring various ship concepts. A Pareto Genetic Algorithm is used to identify feasible ships on a non-dominated frontier.

The LO ORT assigned to our team is one of four designs selected from the non-dominated frontier for feasibility study. It represents the low cost option. The ORT LO tanker meets all necessary requirements and regulations. The hull form is optimized for good seakeeping and fuel efficiency. The structural configuration is designed to ABS 2000 standards and is highly producible and maintainable. The propulsion system produces ample power to propel the ship efficiently and effectively. Mechanical and electrical components satisfy the requirements necessary for the vessel to perform its mission. Cargo systems ensure safe and proficient cargo storage and transfer. The ballast system allows the vessel to meet stability requirements when needed. The Manning Plan for the ORT LO tanker contains sufficient crew to operate the vessel according to Federal Regulations. The deckhouse satisfies owners' requirements for crew habitability and the navigation deck exceeds regulations for visibility. Tank arrangements are designed to optimize environmental protection and provide easy maintenance. The machinery space optimizes space arrangements of various components of cargo, propulsion, and electrical equipment. Weights for all of the vessel's components are balanced and optimized for trim and stability. Intact stability is satisfactory in all loading conditions and meets the IMO A.167 Righting Energy Criteria with a margin of safety in all cases. Damage stability criteria is satisfied for all damage cases and loading conditions. The maneuvering characteristics are exceptional for its trade and route characteristics.

Principal Characteristics	
Length Overall	258 m
Length Between Perpendiculars	251 m
Beam, Molded	49.78 m
Depth, Molded Upper Deck at side	27.5 m
Draft, Full Load	16 m
Cb	0.83
Cp	0.834
Cx	0.995
DWT	140,000
Displacement	167,983 MT
Lightship Weight	27,983 MT
Draft Design	15.8 m
Sustained Speed at Design Draft and 90% rated horsepower (Approx.)	16 Knots
Endurance Speed	15 Knots
Endurance Range	10,000 nm
100% Cargo Capacity	167,105 m³
Fuel Oil Tankage	2,935 MT
Diesel Oil Tankage	113 MT
Lube Oil Tankage	23 MT
Fresh Water tankage	236 MT
Machinery	Diesel
Rated Horsepower	30,560 hp
Number of Passengers	3
Number of Crew	20
Propeller (1) Blades	4
BCC	$112.7 mi
TOC	$198.2 mi
Risk	0.098 m³