Executive Summary

The Littoral Transport Vessel (LTV) is a high-speed troop transportation craft designed to increase individual Marine combat effectiveness upon arrival to shore by reducing the ship-to-shore transit's time duration and improving the overall ride quality. While the Assault Amphibious Vehicles (AAV) play a main role in these operations by providing ship-to-shore transportation, significant passenger fatigue is incurred during these transits. AAVs also lack shore-to-shore transit capability which significantly reduces their overall utility. Plans are underway to replace the AAV with the Amphibious Combat Vehicle (ACV) throughout the next decade, but this upgrade will only provide marginal improvements. There are also other ships capable of transporting troops within this same operational space (such as the LCU 1700 and LCAC), but these vessels are mainly used for transporting heavy equipment due to their large size and robust structure. Therefore, a faster ship focused on safe personnel transportation and increased range which could be used during initial insertions would fill an operational gap in the USMC' littoral combat capabilities.

To allow for maximum design exploration freedom, the only sponsor requirement was that the LTV must safely transports Marines from ship-to-shore while maintaining individual Marine's combat effectiveness. As a result, the design team began by conducting stakeholder interviews and researching into both existing technology and the overall operational space. From this investigation, the project's CONOPs, customer requirements, derived requirements and assumptions were all defined to scope the project. Equipped with this scope, a system-level concept exploration was performed using a set-based design approach for each aspect of the LTV's design to determine the best overall solution. From this process, LTV was designed as a high-speed, hard-chine planing monohull.

Tools available within MIT's ship design repository were not well-fit for the resultant vessel's size and hull-structure. Consequently, the design tradespace was created using a MATLAB® script developed within this project and based on an established industry design methodology for planing vessels. This script generated different hull geometries and powering configurations, and from this tradespace, a single hull variant was selected and further constructed using CAD modeling software. Using this model, final arrangements were established, and hydrostatics, seakeeping, and stability analyses were performed. Lastly, a cost model was developed using open-source tools from the University of Michigan, and this model was further validated by planing hull industry partners.

In conclusion, the LTV is a feasible, cost-effective solution which would fill a current operational gap within the USMC's amphibious community and introduce shore-to-shore transit capability. A 12 nm transit would be reduced to approximately 30 minutes, and the LTV could support a variety of

configurations including up to 86 passengers and/or 67,400 lbs of cargo through the use of removable seats. The LTV also met all seakeeping and stability requirements necessary to ensure optimal combat effectiveness for troops upon reaching shore. LTV provides an excellent combination of cost and capability, and this vessel would enable the USMC to successfully meet future challenges in the littoral operational space. For these reasons, LTV is recommended for further study and consideration.

LTV Specifications			
Parameter	**Quantity**	**Parameter**	**Quantity**
Length Overall (ft)	106.5	Shaft Horsepower (HP)	6,459
Length Between Perpendiculars (ft)	96.83	Brake Horsepower (HP)	6,693
Beam Overall (ft)	21.21	Installed Electrical Power (ekW)	198
Length/Beam Ratio	5.02	Prime Mover	2 x MTU 12V 4000 M93L
Lightship Displacement (lbs)	179,601	Propulsor	2 x Hamilton HM721
Full Load Displacement (lbs)	260,517	Transmission Gearbox	2 x ZF 7600, light duty
Full Load Draft (ft)	4.4	Electric Generator	2 x Caterpillar C4.4
Depth (ft)	9.54	Fuel Capacity (lbs)	11,237
Total Height (ft)	16.12	Water Capacity (gal)	1500
Projected Chine Length (ft)	95.85	Passenger Capacity	86
Chine Beam (ft)	19.52	Cargo Capacity (lbs)	67,400
Deadrise (deg)	12.5	Vertical Acceleration (at Sustained Speed)	0.6g's at LCG
Trim (deg)	2	Sea State	4
Hull Material	Aluminum, 5000 Series	SWH (ft)	8.2
Sustained Speed (kts)	35	Armament (# mounts for crew-served weapons)	2
Max Speed (kts)	40	Crew Size	2-3
Endurance Range (nm)	245	Project Cost (2021 FY$)	11-17 Million