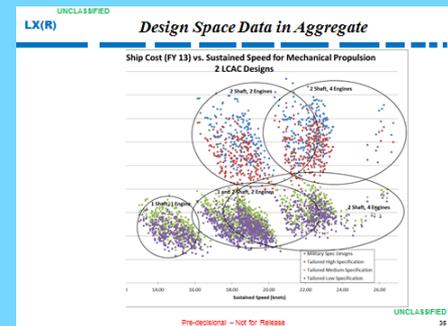
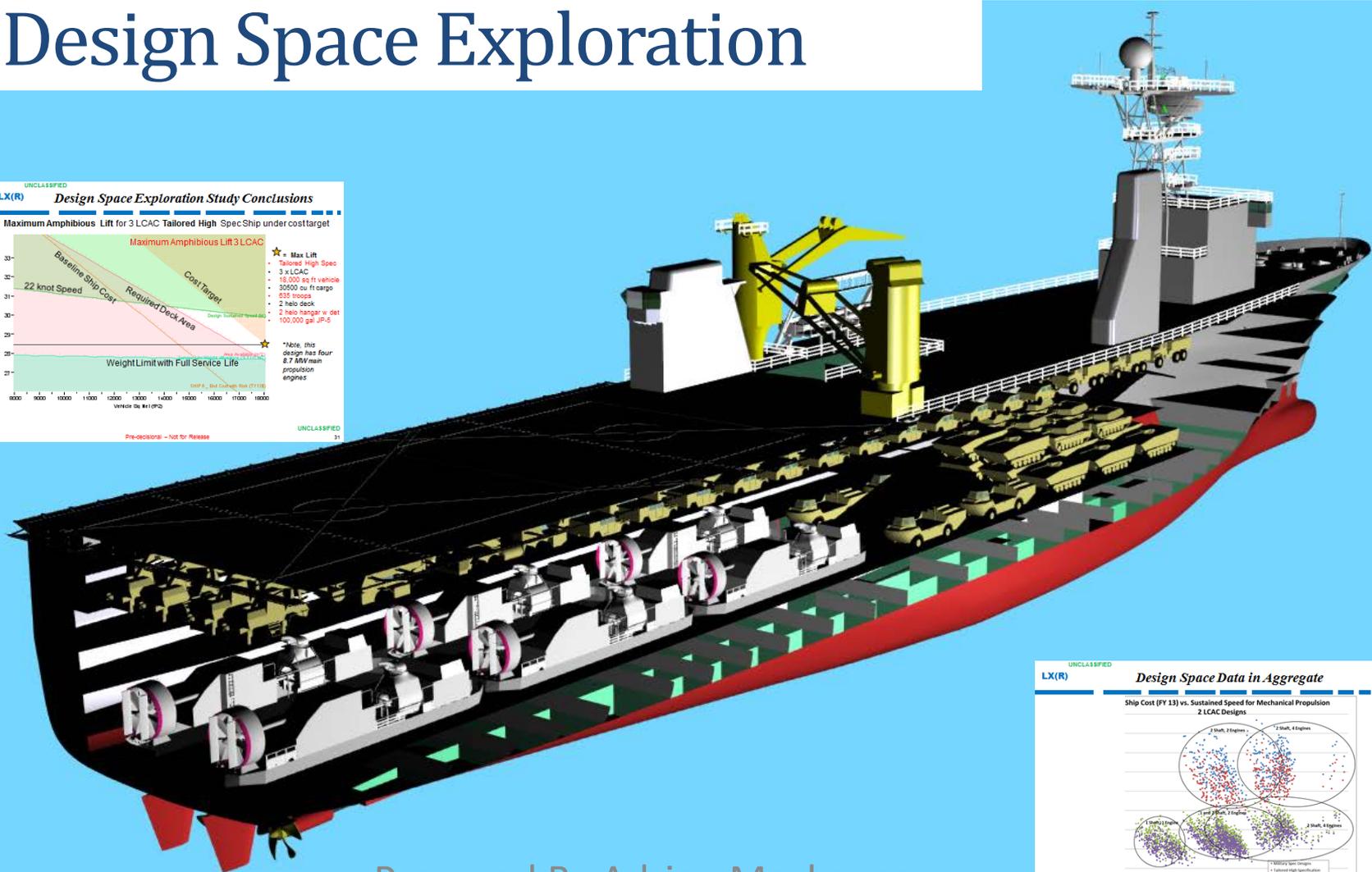
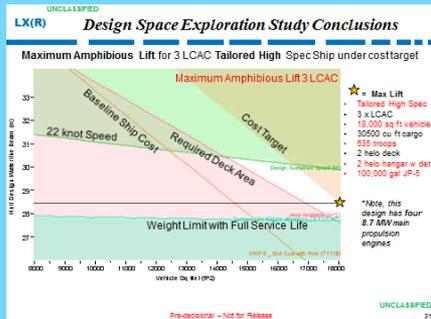


LX(R) Analysis of Alternatives Design Space Exploration



Prepared By Adrian Mackenna

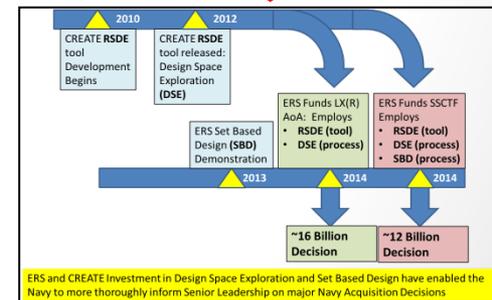
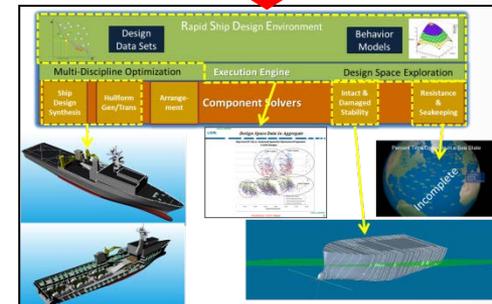
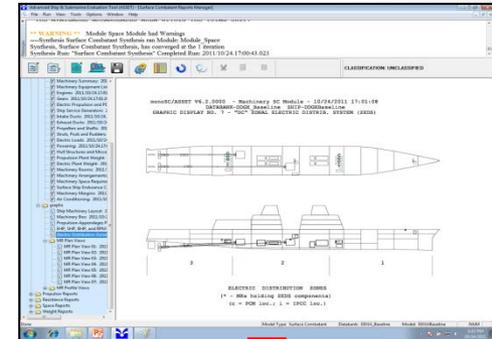
LX(R) AoA

- The Navy recently conducted the Analysis of Alternatives for the next Amphibious Assault Ship, to replace the Harpers Ferry Class Ships (LSD 41/49)
- Traditionally, the Navy develops 5 – 20 ship concept alternatives during an Analysis of Alternatives.
- During the LX(R) AoA **22,000** concept design alternatives were developed for the Navy's next amphibious assault ship.



Navy Concept Design Capability

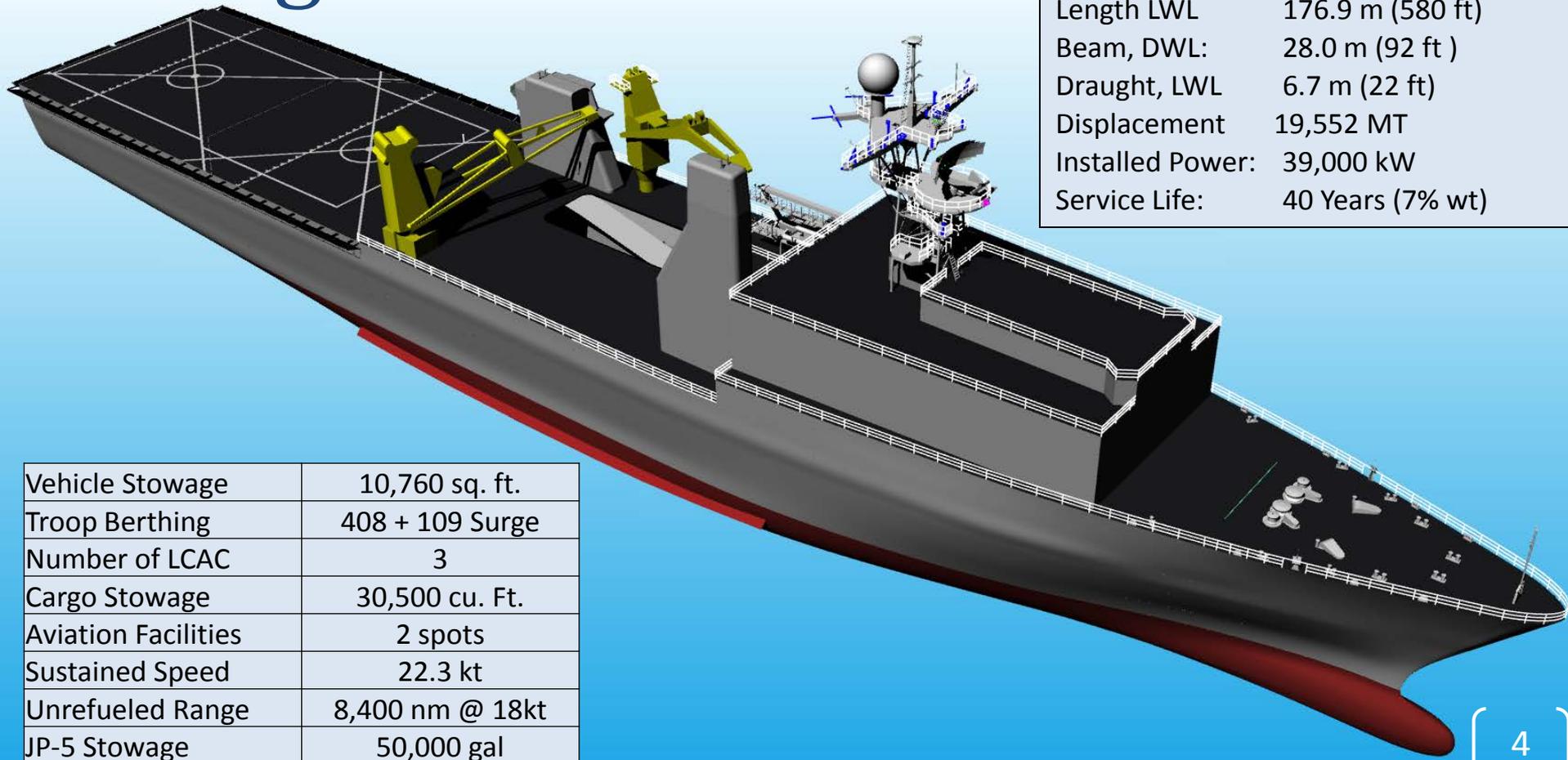
- 1980 to Present - Naval architecture software (ASSET) is built and maintained by the Naval Surface Warfare Center Carderock Division.
- 2010 to Present - CREATE program develops the Rapid Ship Design Environment (RSDE): automates the ASSET design process, enables thousands of designs to be generated in a short time.
- 2013 to Present - ERS invested in critical tool and process development that enables a revolution in the way the Navy does its Analysis of Alternatives



LSD 41/49 Equivalent Baseline Design

DIMENSIONS

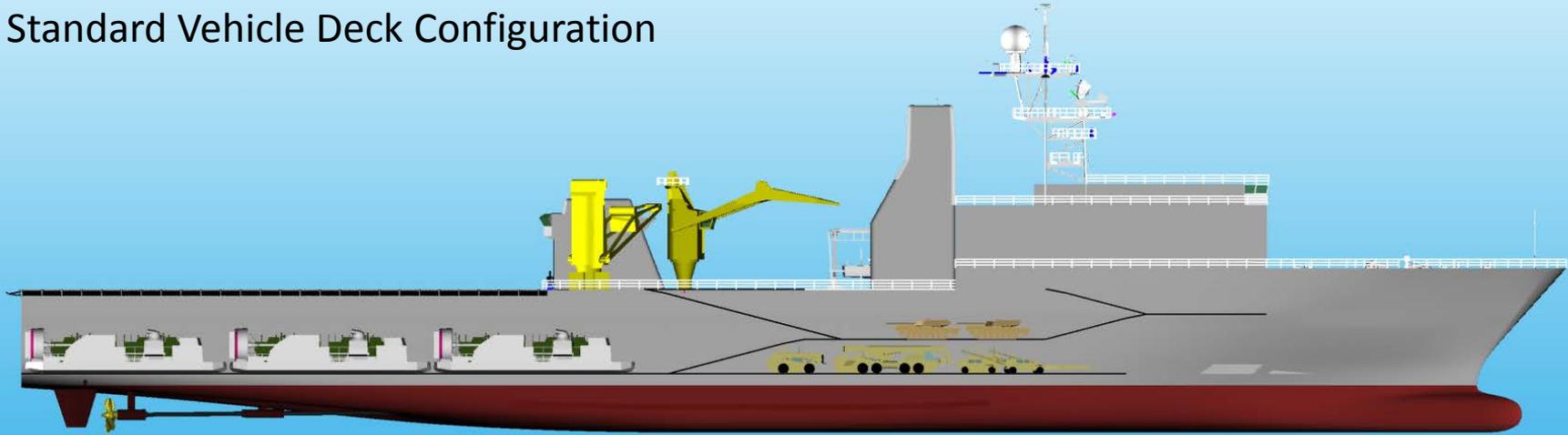
Length, Overall: 187.7 m (616 ft)
 Length LWL 176.9 m (580 ft)
 Beam, DWL: 28.0 m (92 ft)
 Draught, LWL 6.7 m (22 ft)
 Displacement 19,552 MT
 Installed Power: 39,000 kW
 Service Life: 40 Years (7% wt)



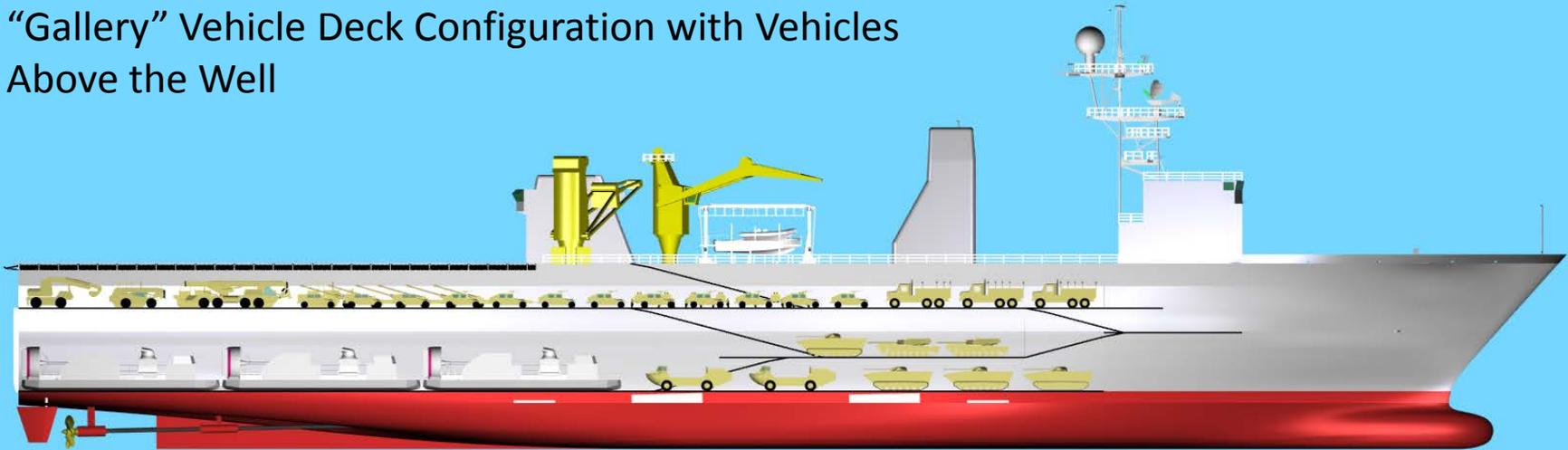
Vehicle Stowage	10,760 sq. ft.
Troop Berthing	408 + 109 Surge
Number of LCAC	3
Cargo Stowage	30,500 cu. Ft.
Aviation Facilities	2 spots
Sustained Speed	22.3 kt
Unrefueled Range	8,400 nm @ 18kt
JP-5 Stowage	50,000 gal

Alternate Configurations

Standard Vehicle Deck Configuration

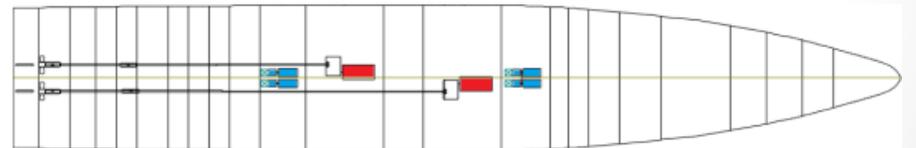
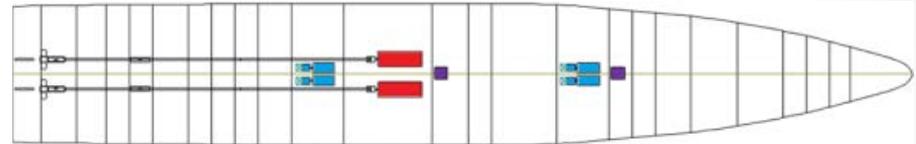


“Gallery” Vehicle Deck Configuration with Vehicles Above the Well



LX(R) AoA

- Explored 60 design parameters, all major capability trades for a new LX(R)
- Parameters such as:
 - # Landing craft
 - Vehicle capacity
 - Cargo capacity
 - Troops
 - Aviation support capability
 - Arrangement options
 - Survivability features

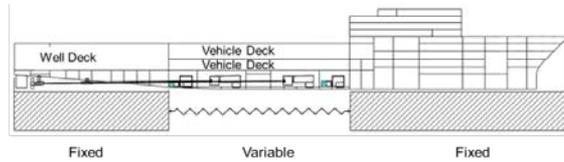


Engineering Disciplines Exercised during LX(R) Design Space Exploration

Ship Design



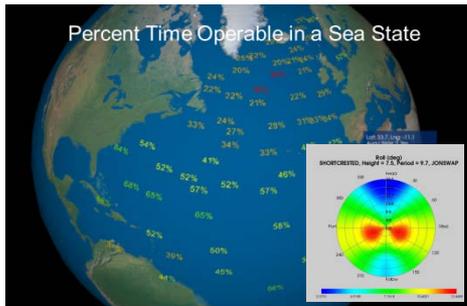
Ship Arrangement



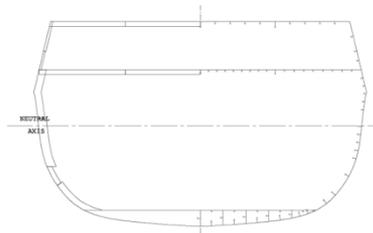
Vulnerability Analysis



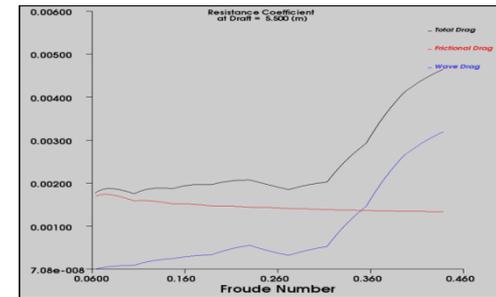
Ship Motions



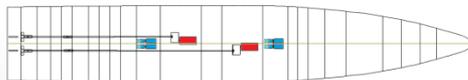
Ship Structures



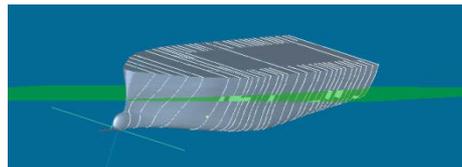
Annual fuel consumption.



Machinery Reliability.



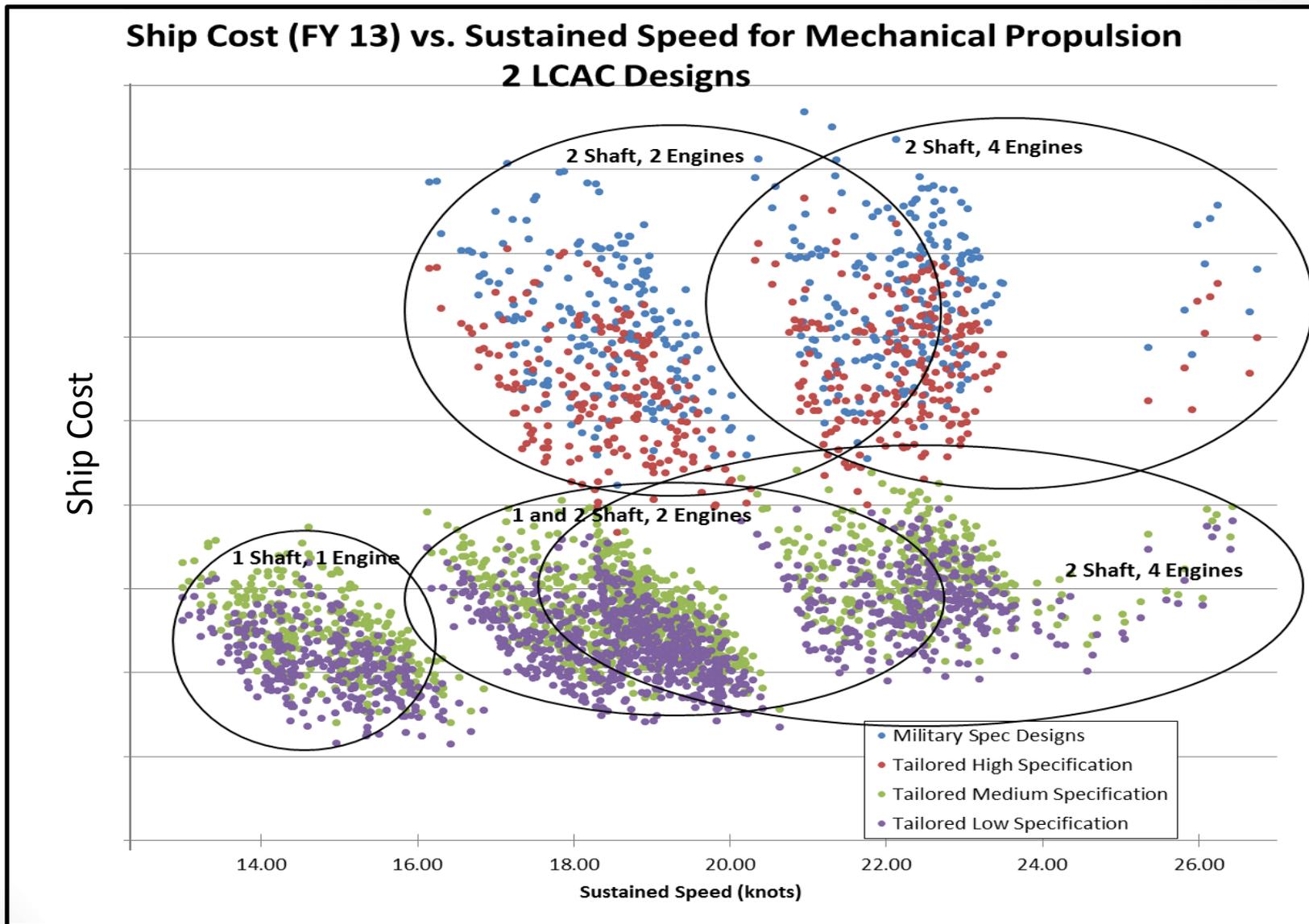
Intact & Damaged Stability



Cost – Acquisition & Lifecycle

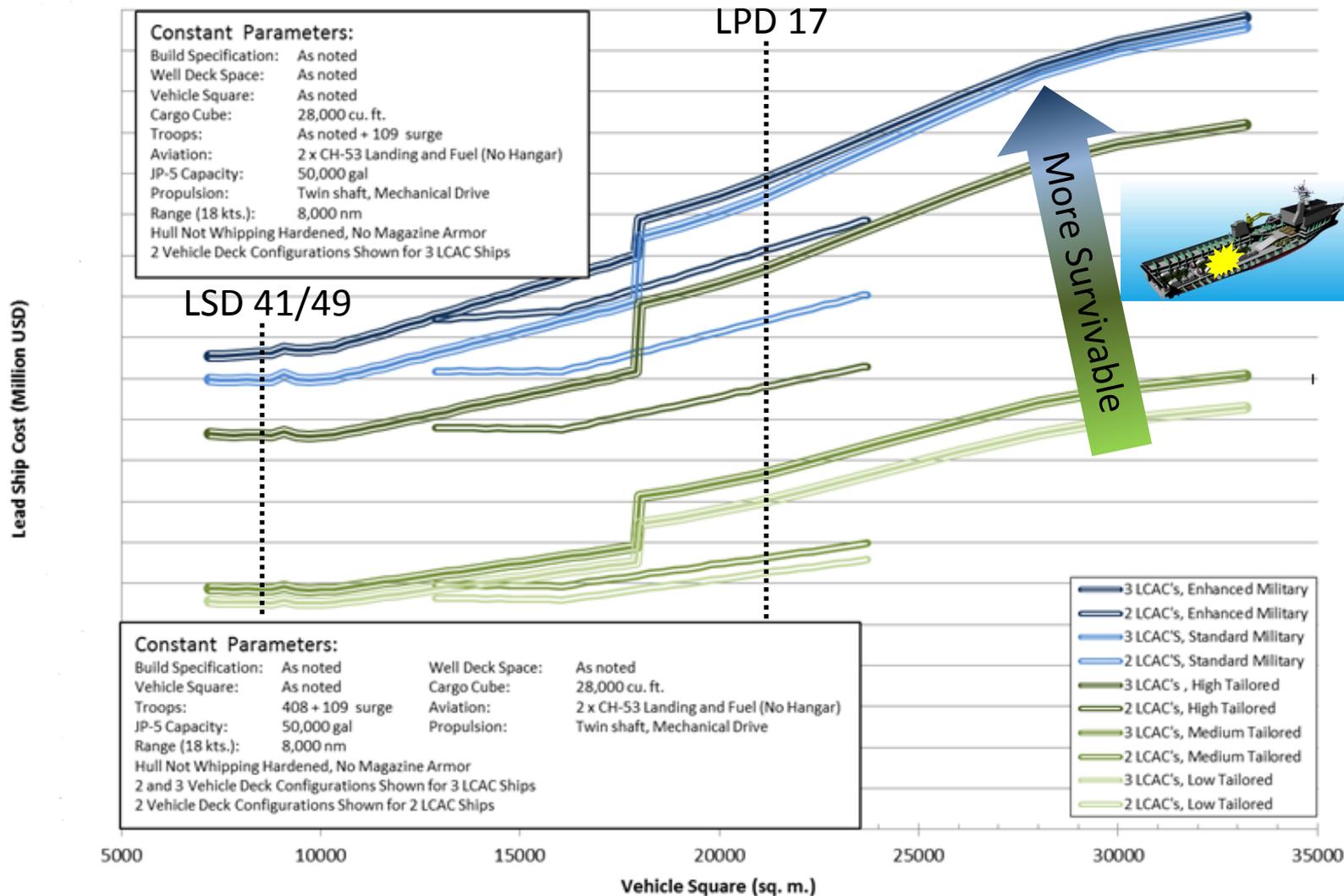
Year	Contract 1				Contract 2				Contract 3						
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Ship	LXR 1	LXR 2	LXR 3	LXR 4	LXR 5	LXR 6	LXR 7	LXR 8	LXR 9	LXR 10	LXR 11	LXR 12	LXR 13	LXR 14	LXR 15
Award	Jul-19	Apr-21	Apr-23	Apr-25	Apr-27	Apr-28	Apr-29	Apr-30	Apr-31	Apr-32	Apr-33	Apr-34	Apr-35	Apr-36	Apr-37
Delivery	Nov-26	Jan-27	Oct-28	Oct-30	Oct-32	Oct-33	Apr-34	Apr-35	Apr-36	Apr-37	Apr-38				

Design Space Data in Aggregate



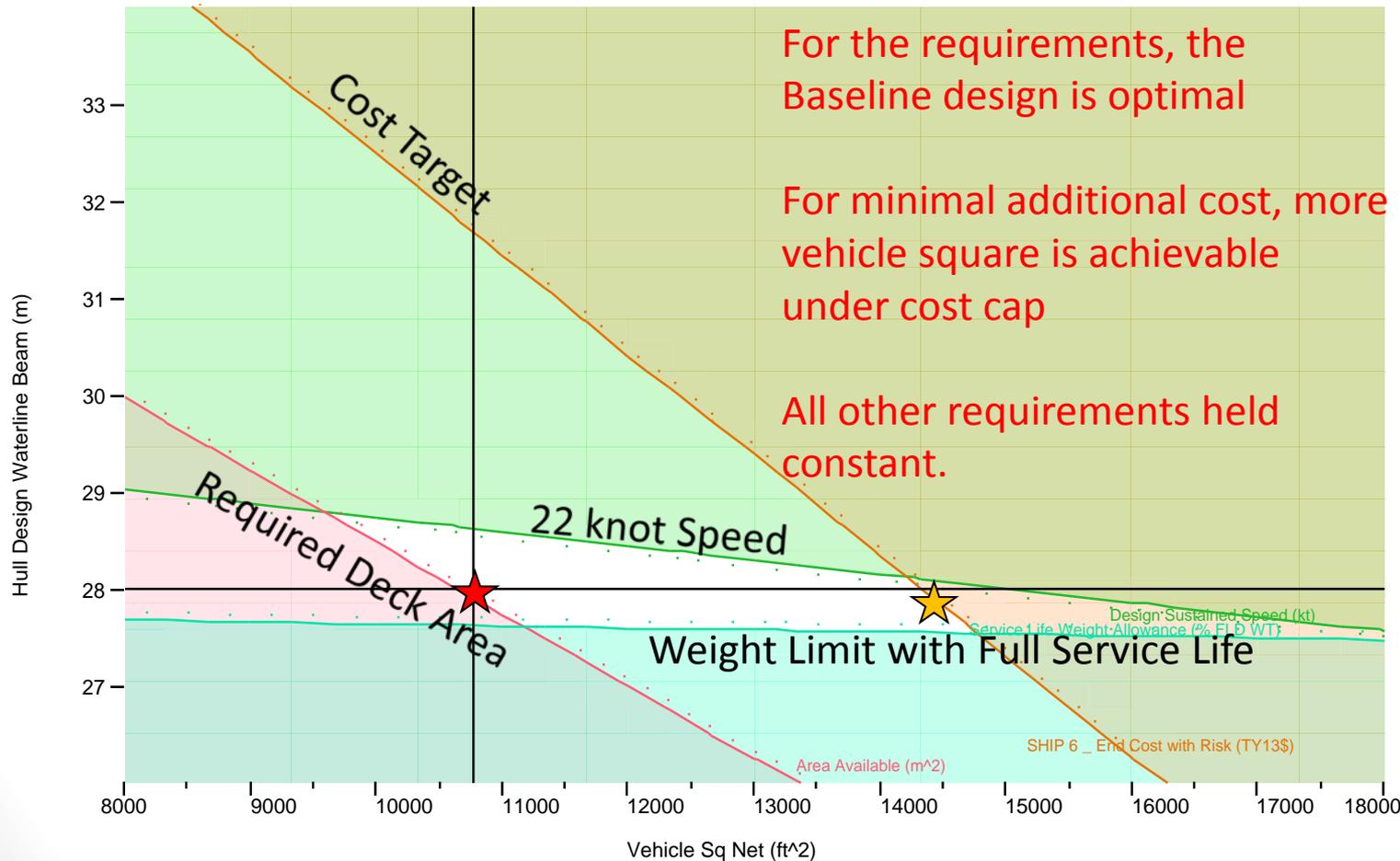
Design Space Data in Aggregate

Lead Ship Cost versus Vehicle Square



LXR AoA Design Space Exploration

Design Space Surrounding AoA Baseline LSD 41/49 Equivalent

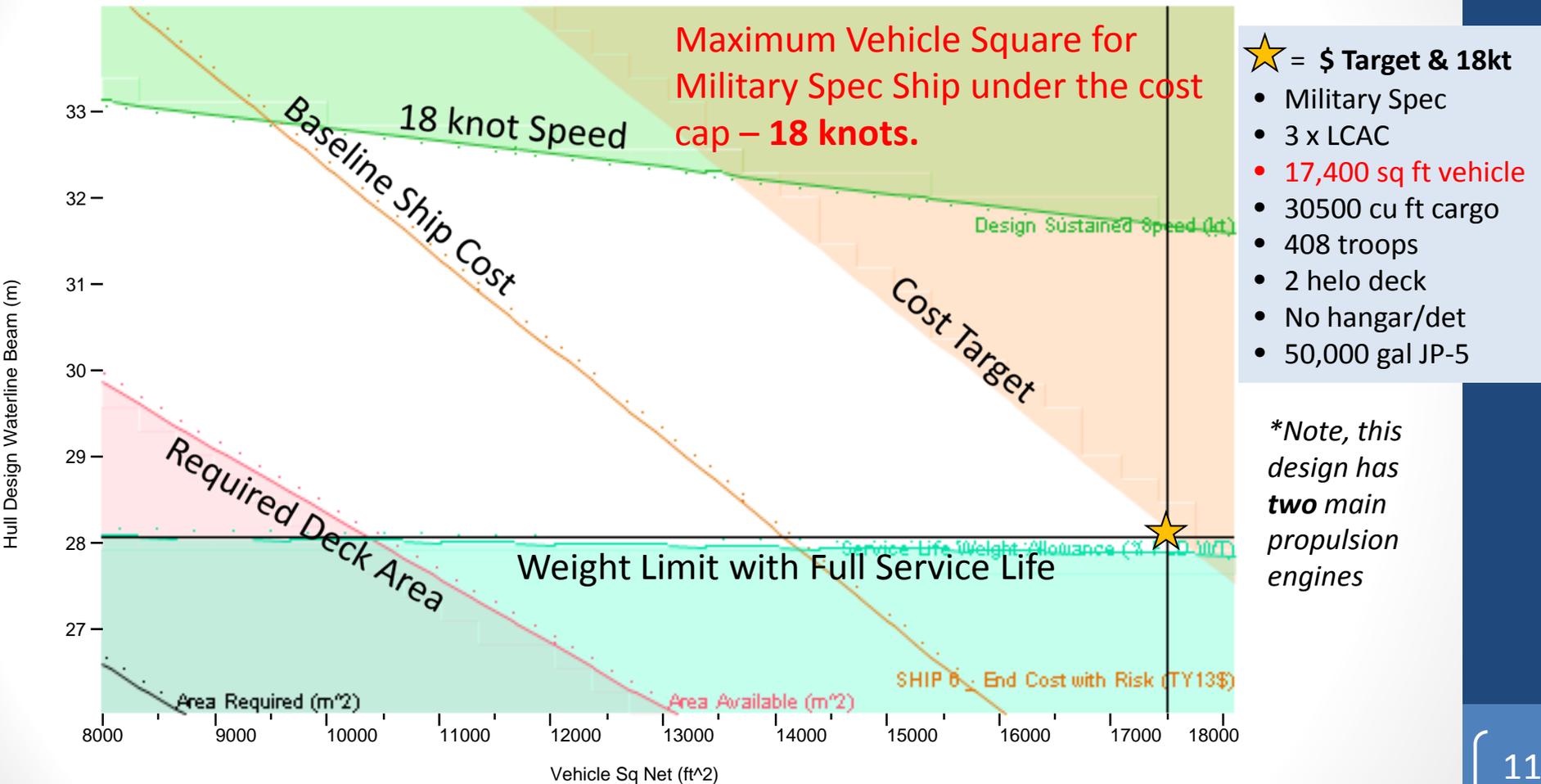


- ★ = Baseline
- Military Spec
- 3 x LCAC
- 10,760 sq ft vehicle
- 30500 cu ft cargo
- 408 troops
- 2 helo deck
- No hangar/det
- 50,000 gal JP-5

- ★ = Enhanced
- Military Spec
- 3 x LCAC
- 14,500 sq ft vehicle
- 30500 cu ft cargo
- 408 troops
- 2 helo deck
- No hangar/det
- 50,000 gal JP-5

Design Space Exploration Study Conclusions

Maximum Vehicle Square for 3 LCAC Military Spec Ship under the cost cap



ERS and CREATE Inform Navy Acquisition Decisions

