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*ONR Innovative Naval Prototype  
Transformable Craft (T-Craft)*

*SEABASING SYMPOSIUM 2009  
QUANTICO, VA*

*30 September 2009*

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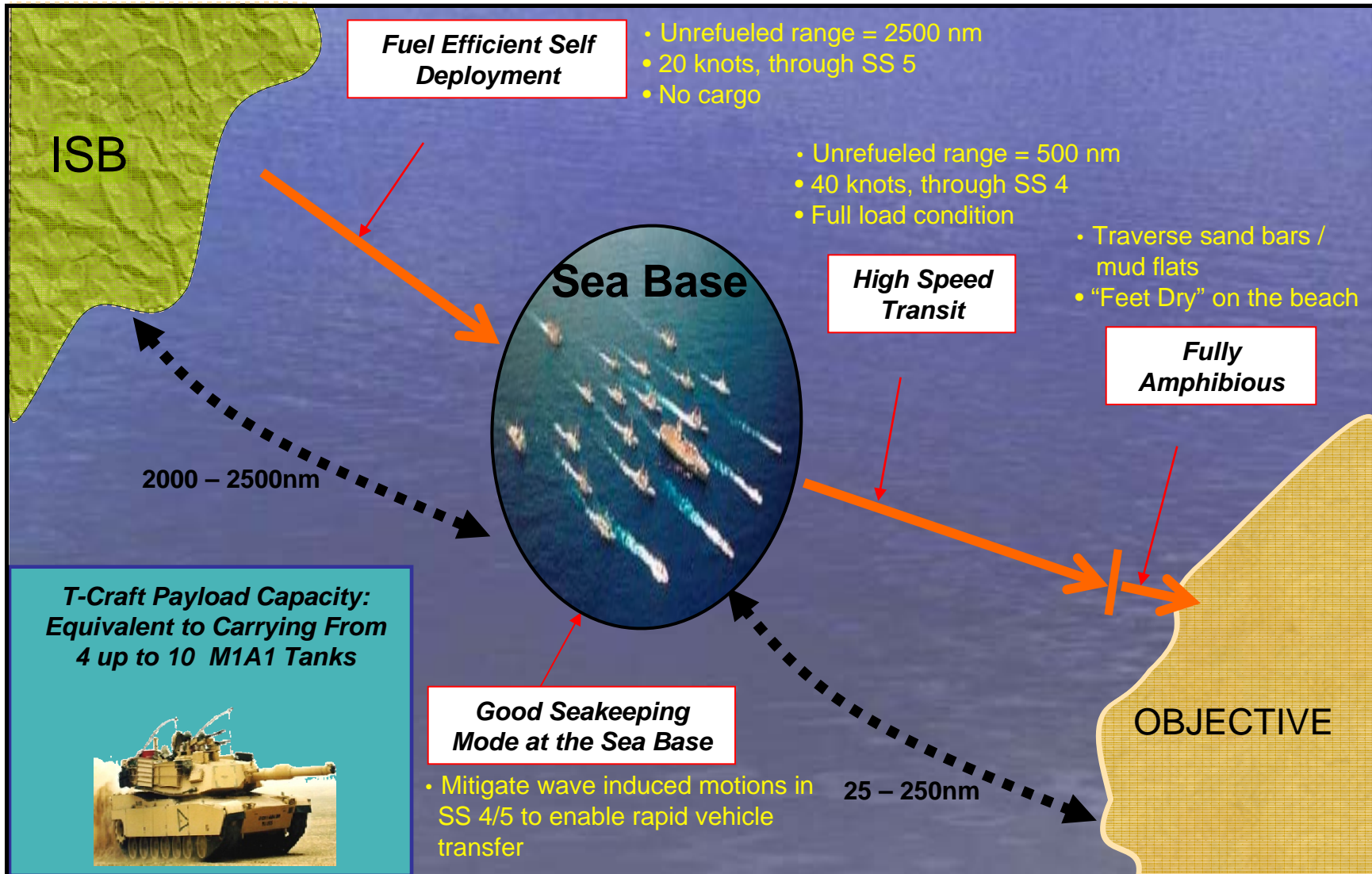
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# T-Craft Prototype Demonstration

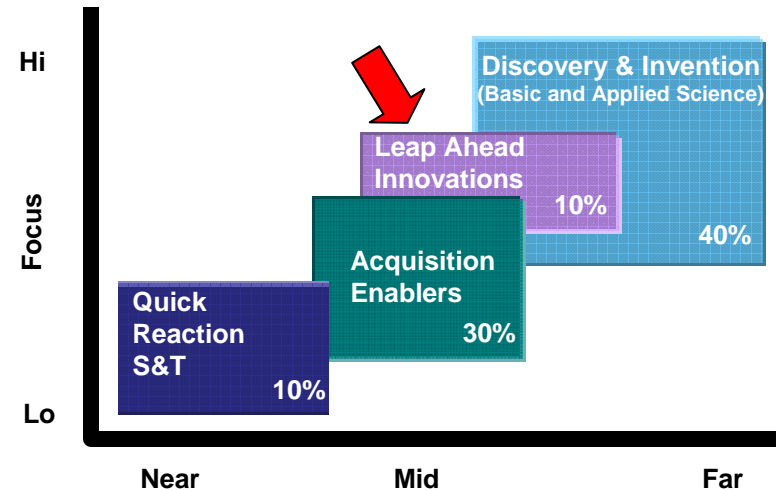
## BAA 05-020



# Innovative Naval Prototypes

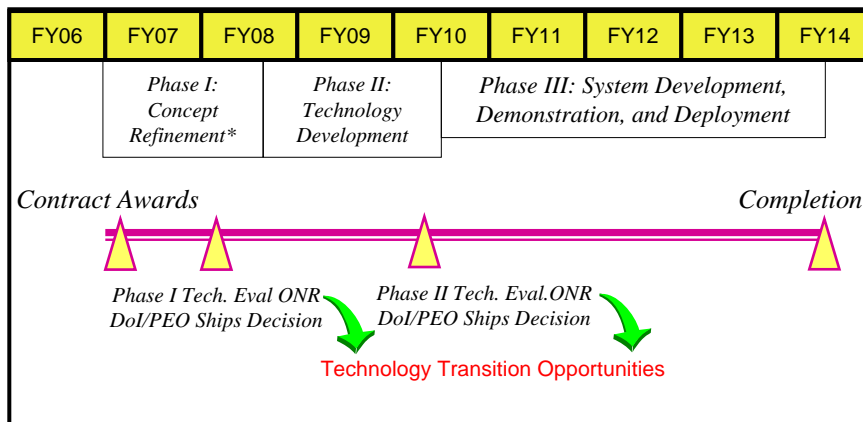
- High Risk/High Payoff
- Game Changing Technology
- Investments are planned for transition within 4 to 8 years
- Leverages previously untapped Discovery and Invention (D&I) investments
  - Forcing function on the basic and applied research community
- A primary goal of INPs is to move the risk from acquisition (\$B) back to S&T (\$M)
- Accepts higher technological risk than FNCs
- Significant high level interest (Executive Steering Committees from SECNAV, OPNAV, SYSCOM and S&T communities)
- Approved by the S&T Corporate Board
  - Assistant Secretary of the Navy (Research, Development & Acquisition), Vice Chief of Naval Operations, Assistant Commandant of the Marine Corps

## ONR S&T Portfolio Balance



Innovative Naval Prototypes and Swampworks Projects are High Risk/High Payoff Game Changers

## T-Craft Program Plan



Phase I	Phase II	Phase III
Identification of technologies	Concept down select	Final down select
Preliminary prototype design	Technology development	Detailed design
Technology risk assessment	T-Craft contract design	Prototype demonstrator construction
9 month period of performance*	Model testing	Test and trials
	24 month period of performance	4 year period of performance

## DoN S&T Guidance

Innovative Naval Prototypes (INPs). ...Investments should be planned with the critical mass to achieve a level of maturity suitable for **transition within 4- 8 years**. Programs in this category may be disruptive technologies that, for reasons of high risk or radical departure from established requirements and concepts of operation, are unlikely to survive without top leadership endorsement...

**... development of significantly enhanced enabling and long-term capabilities for the Joint Sea Base and Ship-to-Objective-Maneuver...**

## Core Management Team

- A team approach has been utilized to provide overall management of the T-Craft program. This approach has relied upon a small team of subject matter experts to maintain corporate knowledge of the program while pulling in additional expertise when needed (e.g. Phase I Technical Evaluation, Quarterly Progress Review (QPR) meetings)

Core Management Team Members		
Ms. Kelly Cooper	ONR	SBE INP Program Officer / Naval Architecture
Mr. Walt Beverly	NSWC PC (ONR)	T-Craft Program Deputy
Mr. Jason Chang	NAVSEA 05D4	Ship Design Manager / Naval Architecture
Mr. Matt Zahn	CSC	Deputy Ship Design Manager (SDM Designate)
Mr. Dave Widhalm	NSWC-CD	Deputy Ship Design Manager Designate
Mr. Steven Ouimette	NSWC CD	SME Team Technical Lead / Ship Design & Integration
Dr. Colen Kennell	NSWC CD	Naval Architecture
Dr. Al Skolnick	Independent Consultant	Surface Effect Ships / Program Management Expertise
Mr. Robert Wilson	Independent Consultant	Surface Effect Ships / CONOPS
Mr. Mike Crowley	Fulcrum Corporation	Program Coordination and Support / CONOPS

Addresses CNR guidance to manage INP portfolio with the rigor of Acquisition Programs



# The Persistent Ten Year High Speed, High Capacity Landing Craft Gap

<p>“The Navy should investigate the design and development of a <u>high-speed, high Capacity landing craft</u> to complement the landing craft (air cushion) (LCAC)”</p>	<p>1999</p>	<p>Naval Expeditionary Logistics Enabling Operational Maneuver From the Sea Naval Studies Board</p>
<p>“New developments in high-speed vessels, <u>high-speed lighterage</u>, vertical lift assets, <u>landing craft</u>, ... will enable phased at sea arrival and assembly of additional forces. ”</p>	<p>2003</p>	<p>Naval Operating Concept for Joint Operations (NOC) USN &amp; USMC</p>
<p>“Regardless of the level of Sea Base capability ultimately selected, several programs are common and critical to all implementation levels and should be emphasized. ... these programs are as follows: 1. High-speed connector development, including the study of a <u>self-deploying, beachable, high-speed connector</u> 2. Landing craft air cushion X development; ... 4. Sea State 4 operating capability...”</p>	<p>2005</p>	<p>Sea Basing, Ensuring Joint Access from the Sea Naval Studies Board</p>
<p>“... a successful T-Craft design might significantly alter amphibious methodology.” “Ongoing initiatives include the development of littoral combat ships (LCS), <u>high-speed inter- and intra theater connectors, enhanced connectors</u>, ...</p>	<p>2009</p>	<p>Amphibious Operations in the 21st Century MCCDC</p>

# T-Craft Merges Three Unique Ship Concepts



Catamaran Concept  
Each high L/B ratio hull provides good powering & motions in a seaway



ACV Concept  
ACV cushion and skirt system enables amphibious operations



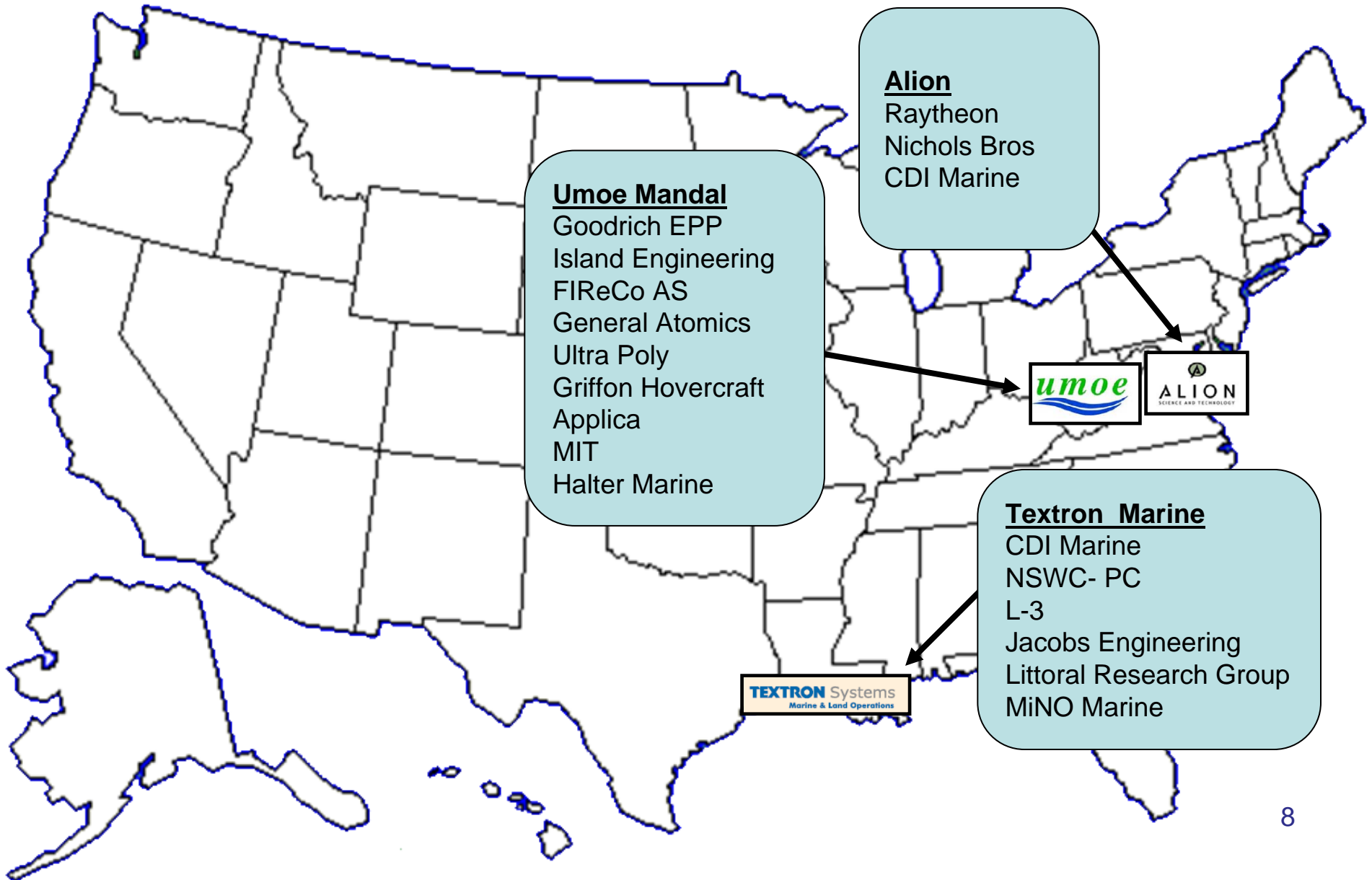
**T-Craft**



SES Concept  
SES cushion provides low wetted area for high-speed powering & motions control



# Phase II Performers



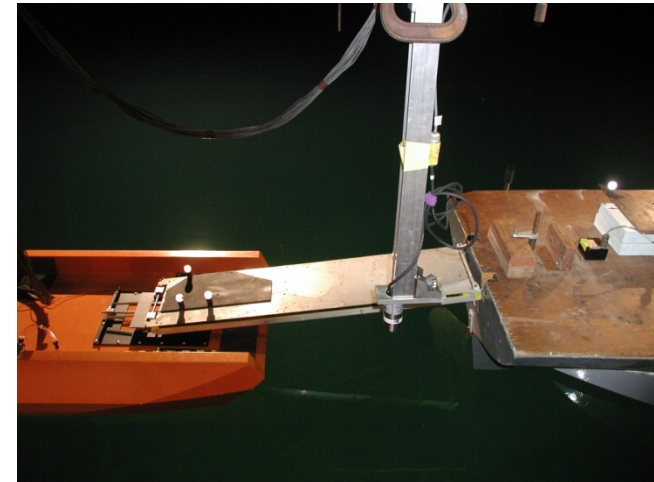
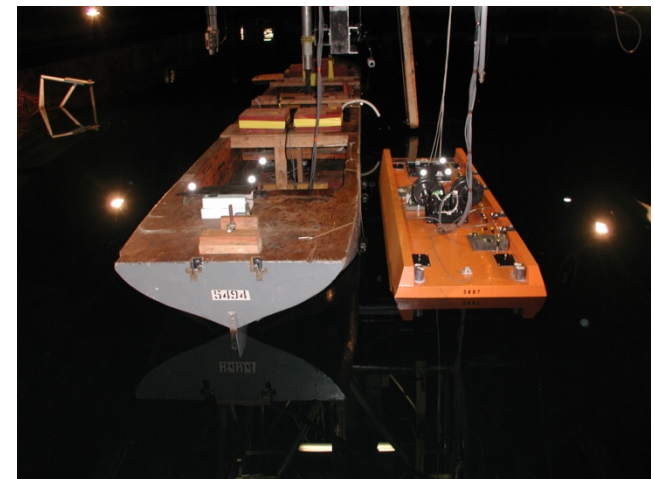
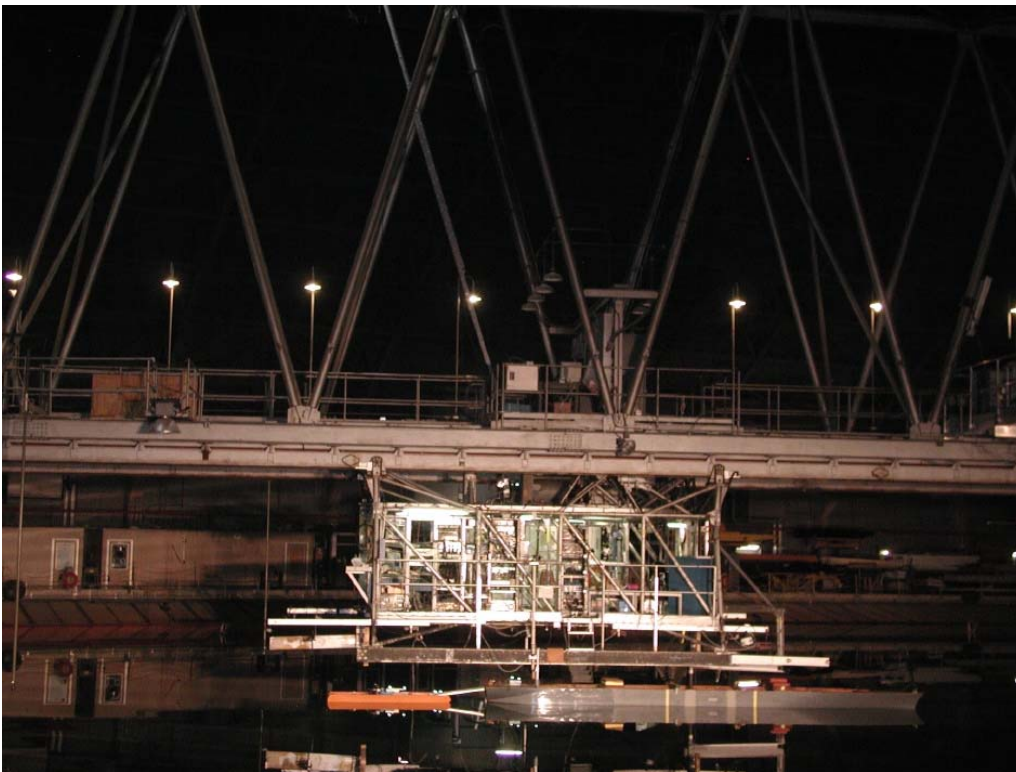
## *Technical Challenges*

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- ONR has a high degree of confidence that the proposed T-Craft concepts will meet or exceed threshold values of speed, range, and payload established in the BAA 05-020
- Two technical challenges remain that are critical to the successful demonstration and operation of T-Craft:
  - Cargo Transfer in NATO Sea State 4
  - Retractable side skirts and bow/stern seal geometries that allow the T-Craft to achieve full amphibious capability

## T-Craft Model Testing

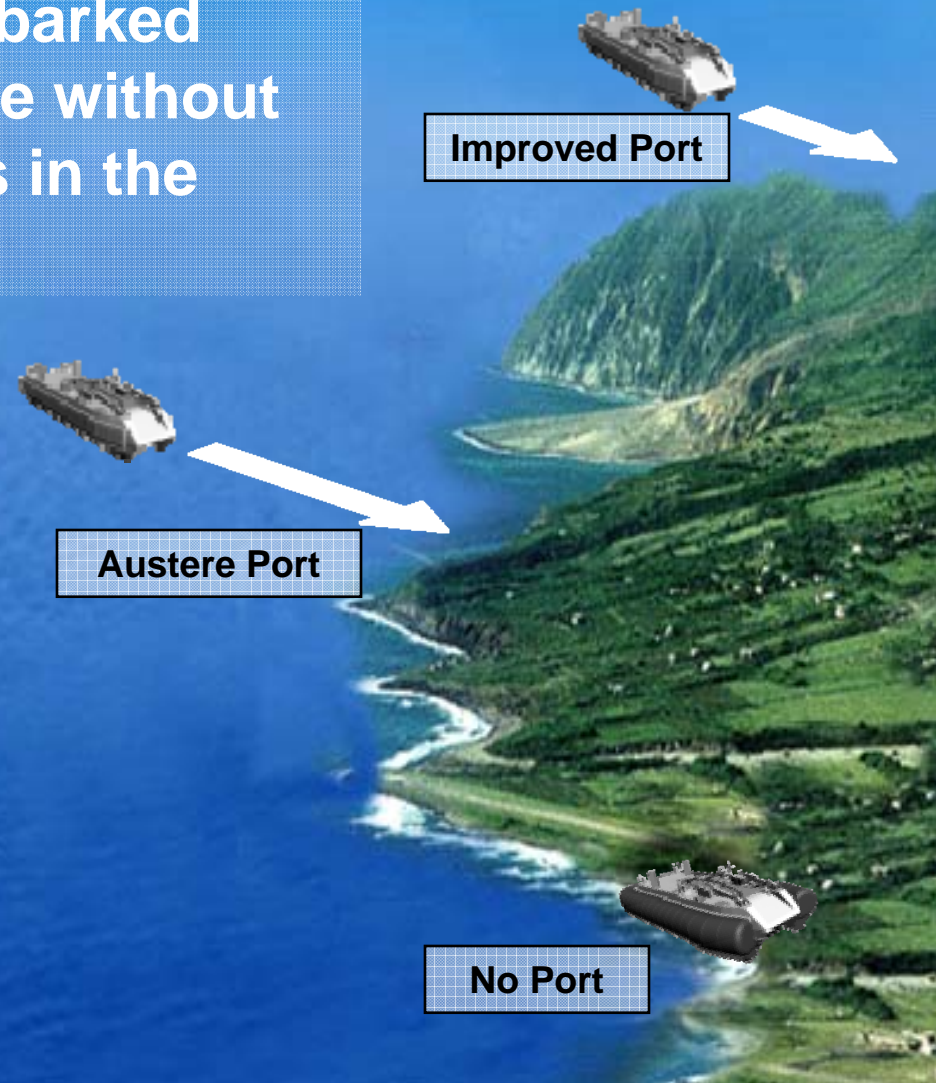
- Seakeeping tests in FY08 to characterize the relative motions and vessel control forces required for cargo transfer
  - Tool validation
- Additional tests to measure loads and accelerations upcoming in FY10.



## *T-Craft Vision and Impact*

**Vision:** T-Craft will enable embarked forces to project power ashore without reliance on ports and airfields in the objective area.

**Impact:** T-Craft provides the amphibious capability, cargo capacity, and speed that has wide applicability across the full range of military operations.



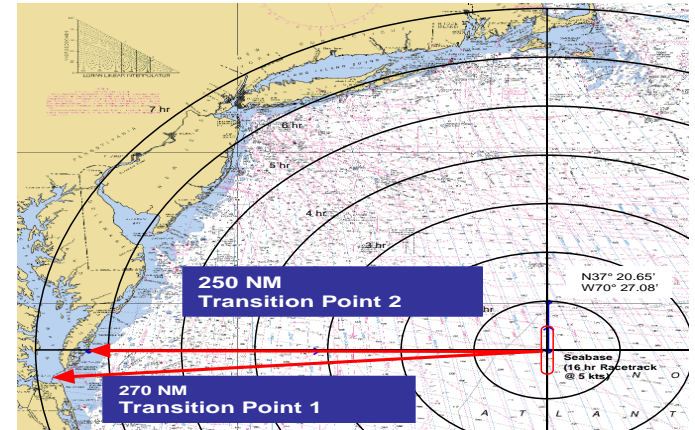
# T-Craft CONOPS

- ▶ T-Craft will enable US Naval Forces to provide a distributed, persistent, sea-based presence throughout the arc of instability to expand U.S. influence without the increased destabilization that can be the unintended consequence of a heavy footprint ashore.
- ▶ T-Craft enhances the ability to rapidly deploy Marine Expeditionary Units in a modular fashion by delivering intact units or new formations focused on specific tasks.

## T-Craft High Speed Operational Reach

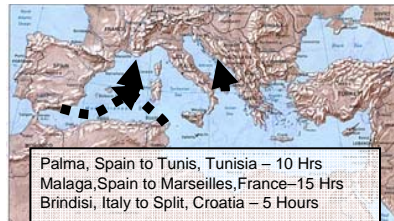
### SCENARIO

- Full deployment training mission
- 270 NM transit from position east of Norfolk to ACV transition point approximately 1000 meters off beach
- Surface Effect Ship (SES) mode
- One 3 person watch section
- Minimum speed – 40 Kts
- Through Sea State 4
- Total time – 6.75 hrs
- Cargo – 500LT Full Load



Approximately 6 hours at 40 knots to anywhere on the mid Atlantic seaboard – Cape Cod to Cape Hatteras

## T-Craft Worldwide Fast Response



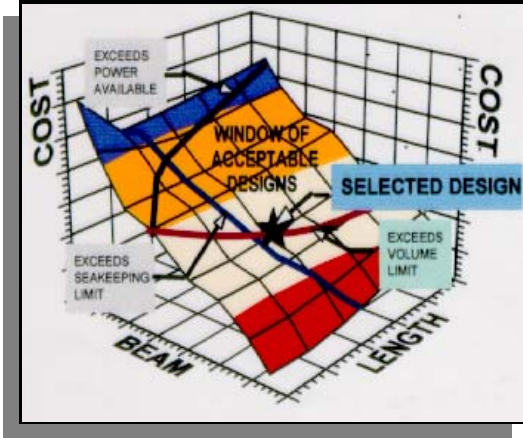
## T-Craft Intact Combat Unit Delivery (Single Load Out)

Force Package Options					
Capability / Package	Total Items	Total Ft2	Total Weight	Remarks	Unrefueled Range NM
LAR Company W/Logistics	31	5349	334 l/t		950
Tank Platoon	6	2255	340 l/t		900
Artillery LWM777	40	6501	259 l/t		2500
1 DOS for #1 SEA Peacekeeping	15	6501	307 l/t	***	850
Patriot		4107	238 l/t		1500
Mechanized Rifle Company	28	6827	547 l/t *	474 lt **	300
Logistics Resupply	Variable	Useable	300 l/t		875
Medical Unit	3	699	67 l/t		3000
ELINT	4	2633	80.5 l/t		2750

Notes: \* Based on all Bradley vehicles  
\*\* Based on the mixture listed.  
\*\* Operational Logistics in the Future Sea Force ASNE Day 2006 Paper

# T-Craft / SES Concept Scalability

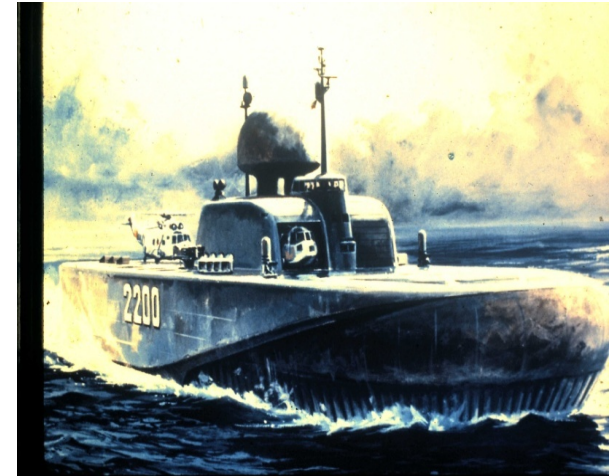
SES Parametric Analysis  
Capability Developed in the  
1970s and continually updated



SES 100 A&B



Textron 3KSES Design

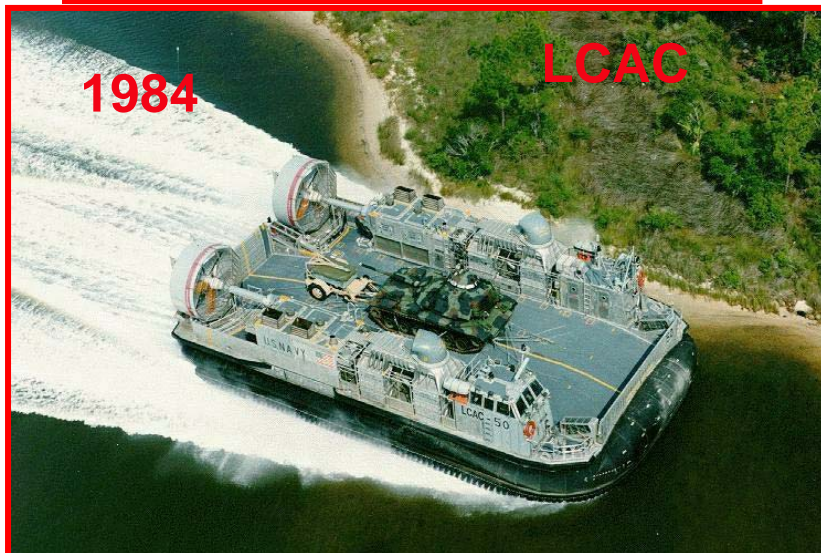
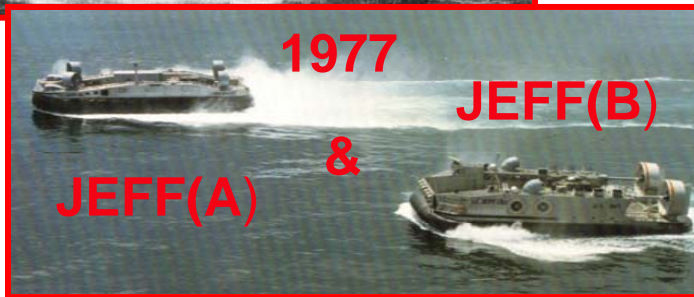
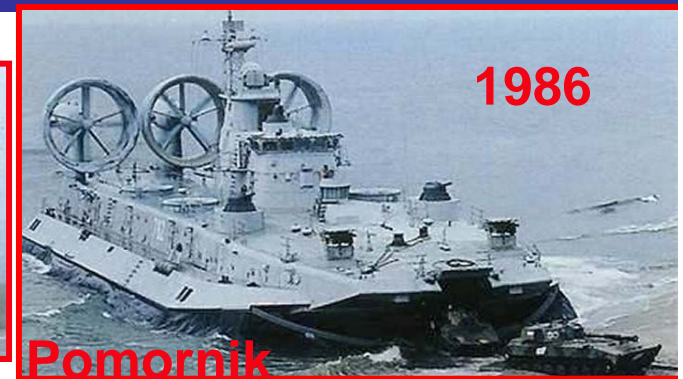


T-CRAFT



- Studies have been initiated to examine the effect of vessel size on speed and cargo capacity capabilities
- Minimum size will be limited by equipment and structural weight
- Possible smaller vessel for riverine operations may be attainable
- Key component of T-Craft is flexibility: Large open cargo area allows for modularization of equipment

# T-Craft / ACV Concept Experience



- Over 450 military/commercial/experimental craft built in last 50 years (does not include sport/personal watercraft)
- Most successful military ACV is LCAC. 91 built by two vendors. Japanese bought additional six from Textron and South Koreans are building clones successfully.
- Thousands of hours accumulated on commercial ferries worldwide
- Technology and design techniques well established
- Key component of T-Craft is flexibility: ability to deploy ACV skirts and go over shallows/mud flats to deliver cargo feet dry

# *SUMMARY*

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- T-Craft concept is a Game-Changer
  - High risk/high payoff
  - Develop concept to TRL 6
- INPs are meant to complement and enable future programs
  - Technology development for future programs
  - Provide supplementary capability to close gaps more completely
- Concept design is scalable to operator / user community needs
- Staying engaged with potential users
  - Understand requirements, and
  - Plan effective demonstrations