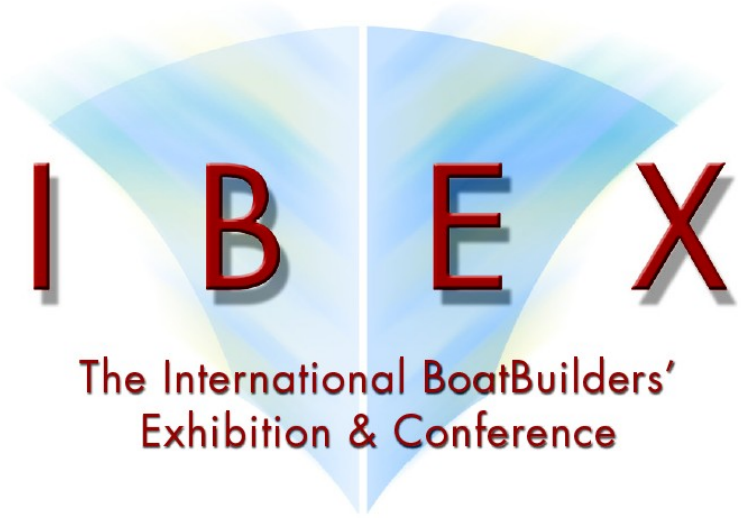
Building for the Military

Eric Greene
410-263-1348 • EGAssoc@aol.com



October 19–21, 2005
Miami Beach Convention Center, Florida

Presentation Outline

- Naval Need for Marine Composite Structures
- How Are Composite Structures and Components Introduced into the Fleet?
- Funding Mechanisms for Prototype Development
- Design of Naval Composite Structures and Components
- Validation and Qualification
- Plan for Transitioning Technology to Platform
- Example Projects

Naval Need for Marine Composite Structures

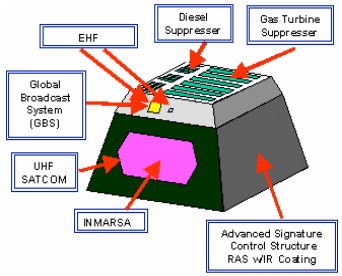
- Replace Steel Components to Eliminate Corrosion

Saltwater Spray Environment on Aircraft Carrier [OSD Corrosion Control]

- Build Lighter Structures to Increase Platform Performance

Composite Island Proposed for CVN(X) [NGNewportNews]

- Improve Stealth Characteristics and Frequency Transmission Selectivity
- Improved Combat Survivability



Low Observable Multifunction Stack Concept [ONR]

- Produce Complex Structural Parts at Reduced Cost, Especially in Quantity

Low-Cost Composite Submarine Cover Plates [GDEB]

Replace Steel Components to Eliminate Corrosion

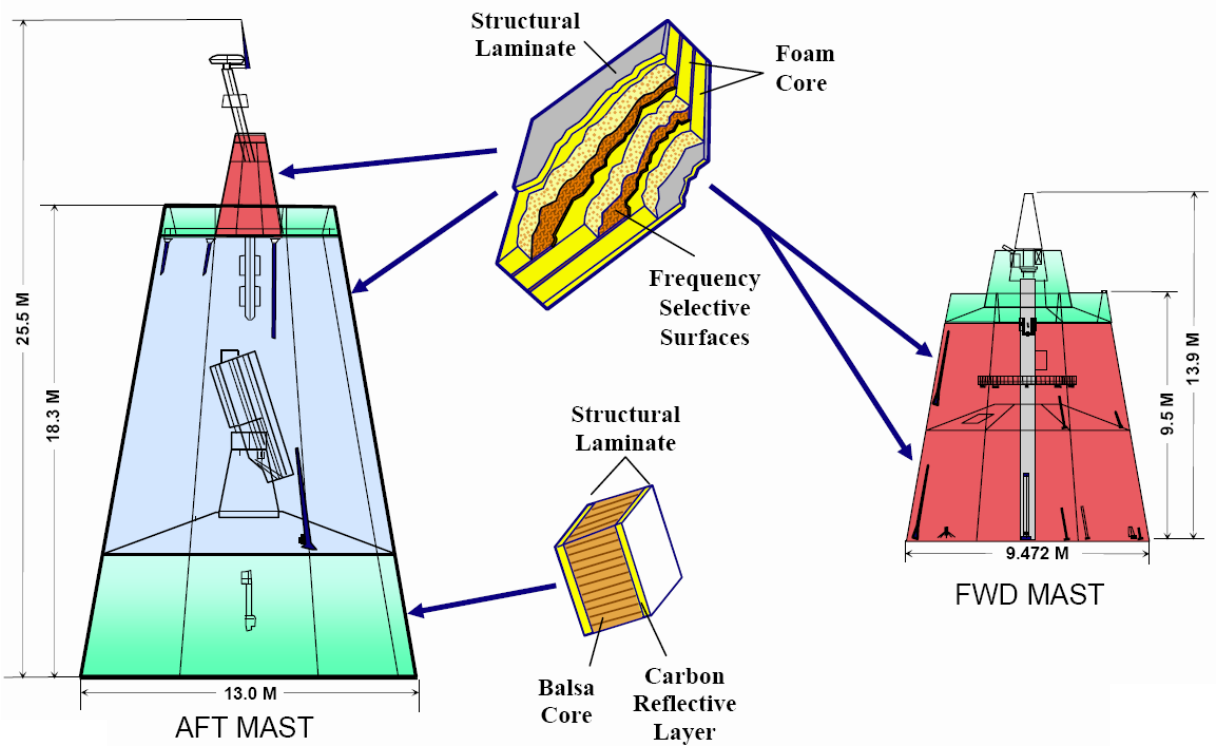
Examples of Corroded Metal Components on Navy Ships [Jeff Goldring, NAVSEA 05M3 & Author]

Build Lighter Structures to Increase Platform Performance

Composite High Speed Vessel
[Rasmussen, NSWCCD]

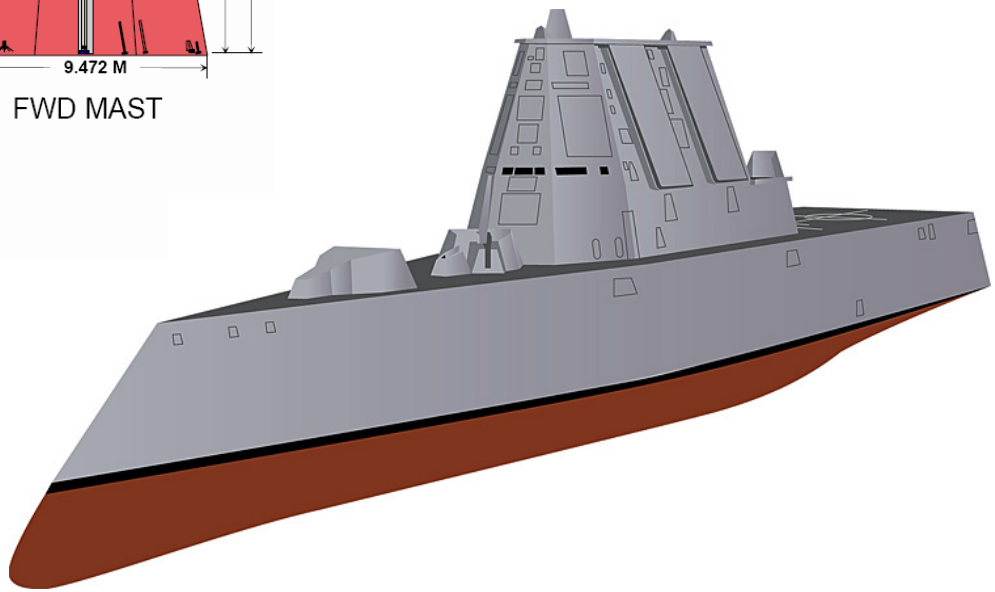
Infusion of AEM/S Panel at
NGSS [Rasmussen, NSWCCD]

Improve Stealth Characteristics and Frequency Transmission Selectivity



AEMS Features Frequency Selective Surfaces (above)

DD(X) Composite Deckhouse Designed to Reduce Ship's Radar Signature (below)

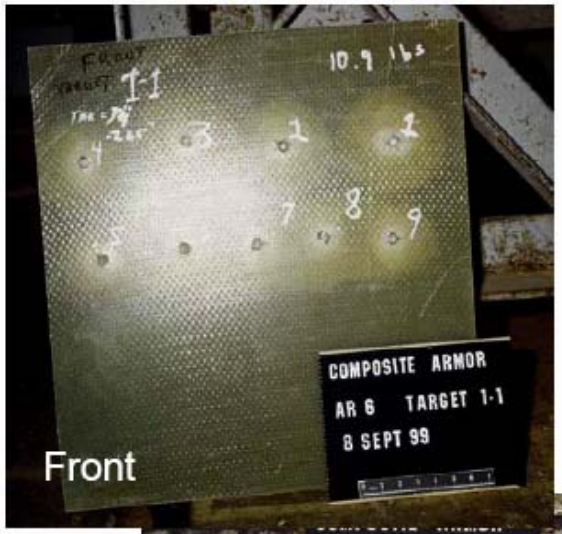


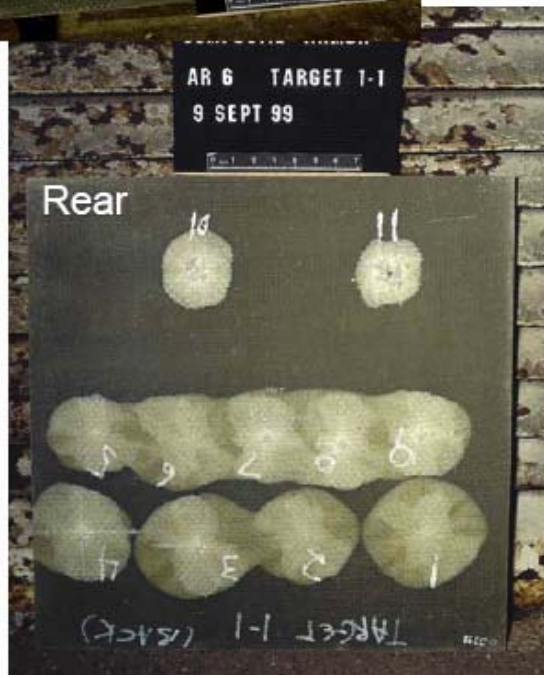
Improved Combat Survivability

Vulnerability

- Shock
- Green Seas
- Airblast
- Small caliber ballistics
- Detonation
- Fire

[Rasmussen, NSWCCD]

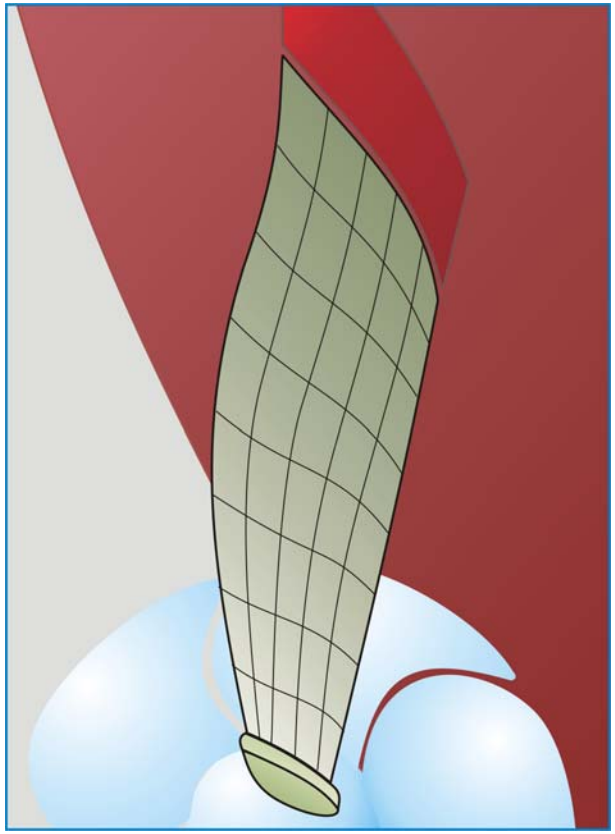




Produce Complex Structural Parts at Reduced Cost, Especially in Quantity

Composite Marine Impeller [Piet Van Dine, GD Electric Boat]

Deck Drain Insert, SPARTA, Inc.

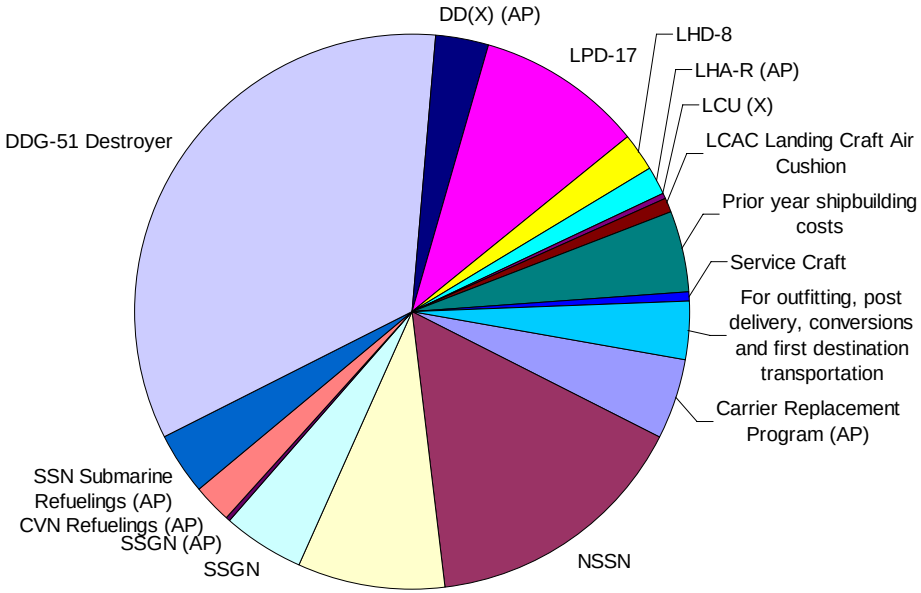


Composite Twisted Rudder, Structural Composites, Inc.

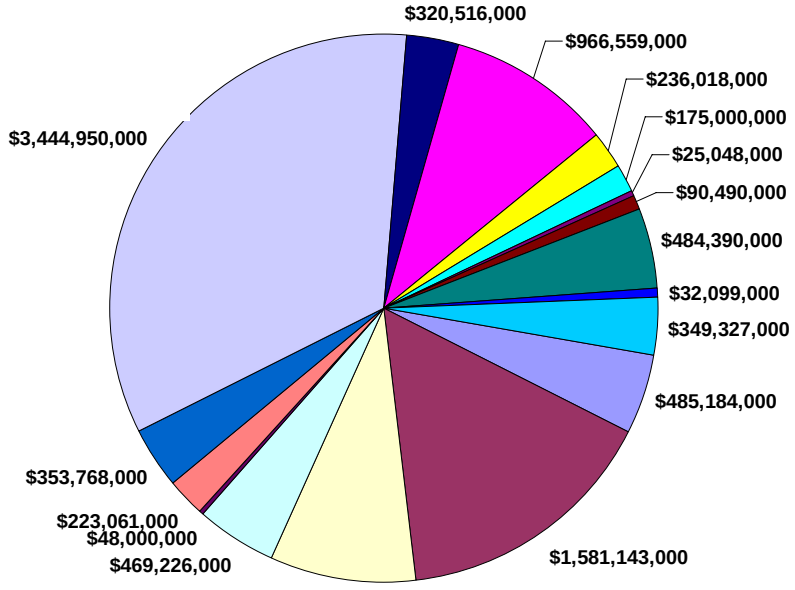
How Are Composite Structures and Components Introduced into the Fleet?

- Identify Requirement for Composites Outlined in Previous Section and Appropriate Funding Source
- Determine Appropriate U.S. Navy Design and Acceptance Criteria
- Coordinate with NAVSEA Warrant Holder, Platform Program Executive Office and Prime Contractor
- Build and Qualify Prototype
- Develop Engineering Change Procedures, Life Cycle Cost Estimates, Maintenance Procedures and Other Documentation Required for Transition to Fleet

Identify Requirement for Composites Outlined in Previous Section and Appropriate Funding Source



FY 05 Funding by Naval Platform



H.R.4613 Department of Defense Appropriations Act, 2005 (Public Print)

Determine Appropriate U.S. Navy Design and Acceptance Criteria

Material Selection Requirements, NAVSEA Technical Publication, T9074-AX-GIB-010/100	This document defines the Material Selection Requirements (MSR) that must be met by each design activity responsible for the selection of materials for ships and their systems.
ABS Naval Vessel Rules (NVR)	The NVR was recently developed by ABS & the U.S. Navy to allow the Technical Authority (U.S. Navy) to periodically update Technical Instructions for design and construction of naval vessels. The NVR covers structural aspects of Topside applications.
ABS Guide for High Speed Craft (HSC)	All structure of composite high speed craft are covered in the ABS HSC Guide
Composite Materials, Surface Ships, Topside Structural and Other Topside Applications – Fire Performance Requirements, Design Data Sheet DDS 078-1	This DDS provides the fire performance requirements for various Fiber Reinforced Plastic (FRP) composite materials used in the construction of U.S. Navy surface ship topside structures, and other topside applications.
Insulation, High Temperature Fire Protection, Thermal and Acoustic, MIL-PRF-32161	Addresses passive fire protection for steel decks and bulkheads with stiffeners. (Refer to IMO A.754 (18) for more guidance with composite divisions)
Military Standard ``Fire and Toxicity Test Methods and Qualification Procedure for Composite Material Systems Used in Hull, Machinery, and Structural Applications Inside Naval Submarines" (MIL-STD-2031(SH))	Establishes the fire and toxicity test methods, requirements, and the qualification procedure for composite materials and composite material systems to allow their use inside naval submarines.
Military Standard MIL-STD-1623 "Fire Performance Requirements and Approved Specifications for Interior Finish Materials and Furnishings"	Covers fire performance requirements for bulkhead sheathing, furniture & bedding, deck coverings, and thermal insulation.

Coordinate with NAVSEA Warrant Holder, Platform Program Executive Office and Prime Contractor

DDG-51 Destroyer

Program Office

- **PMS 400**
- **PEO Ships FT 26**

Prime Contractor

- **GD Bath Iron Works**
- **NGSS**

Deckhouse Structure Warrant Holder

- **NAVSEA 05**

Build and Qualify Prototype

NGSS Gulfport Operations hopes to Increase Labor Force to 1500 people with USCG Fast Patrol Boats and Navy Retrofit Business

[David Tortorano, *SUN HERALD*]

Divers Practice with a SEAL Delivery Vehicle (SDV)

Develop Ship Change Document Required for Transition to Fleet

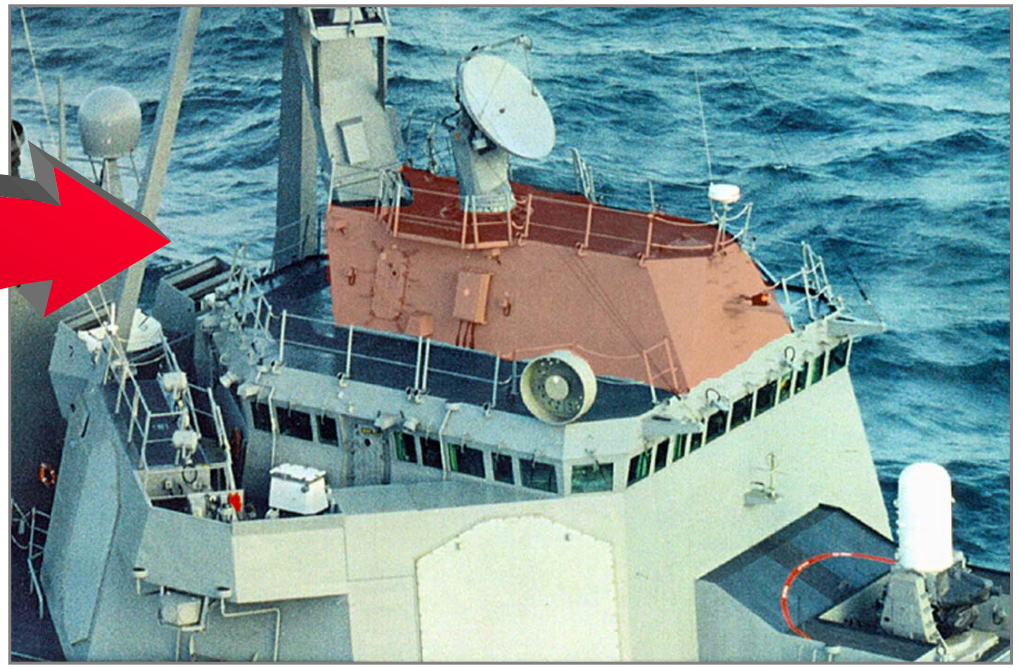
- **Clearly defined the impact to the Fleet if the SCD is not recommended for inclusion in the Modernization Plan?**
- **Provided sufficient information, including references such as test reports, etc. for the level of improvement that the ship change will provide in order to allow the TYCOM(s) to correctly assign the correct AFOM Rating Scale values to the SCD? Note: Do not attempt to create this information if you do not have it.**
- **Phase I only requires information that is known.**
- **Provided/selected names for PARM, TYCOM and Technical POCs? These can be marked TBD for submittal. However, it is better to fill them in if known.**
- **Correctly selected the appropriate Naval Capabilities in the AFOM section of the SCD?**
- **For ship changes that are envisioned to provide a sustainment of current capability, have the associated capabilities been selected and has sufficient reliability, maintainability, operational availability, logistics supportability benefit etc. been provided in the description and/or have references or links been articulated?**

http://www.fmp.navy.mil/FMPACTIVE/BusinessPolicy/FMPDocuments/shipmain.htm

Funding Mechanisms for Prototype Development

- Subcontracts with Prime Contractors
- Small Business Innovative Research (SBIR) Program
- DoD Initiatives Such as the Defense Acquisition Challenge and Force Transformations Programs
- Federal Government Procurement Opportunities via FedBizOpps.gov
- Congressional Earmarks

Subcontracts with Prime Contractors



Composite Forward Director Room Built by Consortium using ManTech Funding [Bruce Jackson, BIW]

Prime Contractors: GD BIW & NGSS

Small Business Innovative Research (SBIR) Program

- The Department of Defense (DoD) SBIR and STTR programs fund a billion dollars each year in early-stage R&D projects at small technology companies -- projects that serve a DoD need and have commercial applications.

- Small companies retain the intellectual property rights to technologies they develop under these programs.

- Funding is awarded competitively, but the process is streamlined and user-friendly.

- The SBIR Program provides up to $850,000 in early-stage R&D funding directly to small technology companies (or individual entrepreneurs who form a company)

SBIR (Continued)

NAVY

SBIR FY05.3 PROPOSAL SUBMISSION INSTRUCTIONS

The responsibility for the implementation, administration and management of the Navy SBIR program is with the Office of Naval Research (ONR). The Director of the SBIR Program is Mr. John Williams, williajr@onr.navy.mil. For general inquiries or problems with electronic submission, contact the DoD Help Desk at 1-866-724-7457 (8AM to 5PM EST). For program and administrative questions, please contact the Program Managers listed in Table 1; **do not** contact them for technical questions. For technical questions about the topic, contact the Topic Authors listed under each topic on the website before **14 September 2005.** Beginning 14 September, you must use the SITIS system (http://www.dodsbir.net/Sitis/Default.asp) listed in section 1.5c of the program solicitation to receive answers to technical questions.

TABLE 1: NAVY ACTIVITY SBIR PROGRAM MANAGERS POINTS OF CONTACT

Topic Numbers	Point of Contact	Activity	Email
N05-138 thru N05-146	Mrs. Carol Van Wyk	NAVAIR	carol.vanwyk@navy.mil
N05-147 thru N05-162	Ms. Janet Jaensch	NAVSEA	JaenschJL@navsea.navy.mil
N05-163	Dr. Peter Majumdar	ONR	majumdp@onr.navy.mil
N05-164	Mr. Joe Gaines NAVSUP		joe.gaines@navy.mil

The Navy's SBIR program is a mission-oriented program that integrates the needs and requirements of the Navy's Fleet through R&D topics that have dual-use potential, but primarily address the needs of the Navy. Companies are encouraged to submit proposals in topic areas that address the manufacturing needs of the Defense Sector. Information on the Navy SBIR Program can be found on the Navy SBIR website at **http://www.onr.navy.mil/sbir**. Additional information pertaining to the Department of the Navy's mission can be obtained by viewing the website at **http://www.navy.mil**.

All proposal submissions to the Navy SBIR Program must follow the DoD guidelines for electronic submission. It is mandatory that the **entire** technical proposal, DoD Proposal Cover Sheet, Cost Proposal, and the Company Commercialization Report be submitted electronically through the DoD SBIR Submission website at **http://www.dodsbir.net/submission**.before **6:00 a.m. EST, 14 October 2005**. A hardcopy will NOT be required. A signature by hand or electronically is not required at the time of submission. If you have any questions or problems with the electronic submission contact the DoD SBIR Helpdesk at 1-866-724-7457 (8AM to 5PM EST).

http://www.dodsbir.net/solicitation/sbir053/navy053.htm

DoD Initiatives Such as the Defense Acquisition Challenge and Force Transformations Programs

Comparative Testing Office

Advanced Systems & Concepts
Acquisition. Technology, & Logistics

Defense Acquisition Challenge (DAC) Program

Authorized by Title 10, USC, Sec 2359b, the Defense Acquisition Challenge (DAC) Program provides *increased opportunities* for the introduction of *innovative and cost-saving technologies* into DoD acquisition programs. Provides an “on-ramp” to DoD acquisition system for small and medium vendors.

Federal Government Procurement Opportunities via FedBizOpps.gov

- FedBizOpps.gov is the single government point-of-entry (GPE) for Federal government procurement opportunities over $25,000. Government buyers are able to publicize their business opportunities by posting information directly to FedBizOpps via the Internet. Through one portal - FedBizOpps (FBO) - commercial vendors seeking Federal markets for their products and services can search, monitor and retrieve opportunities solicited by the entire Federal contracting community.

- The FedBizOpps "eps.gov" domain name will be deactivated and retired effective 1 October 2005 replaced by "fbo.gov" as the primary fedbizopps domain name.

Congressional Earmarks

Typical Defense Authorization and Appropriation Request Form

Section One

Company/Organization:	Structural Composites, Inc.				
Address:	7705 Technology Drive				
City:	West Melbourne	State:	FL	Zip:	32904
Point of Contact (POC):	Eric Greene			Is POC a lobbyist?	No
Lobbyist Company/Organization (If applicable):					
Phone:	4102631348.00	E-mail:	EGAssoc@aol.com		

Section Two

Please list all dollar amounts **in thousands, with **no decimals** (e.g."3,200" not "$3.2M").*

Project:	Composite Twisted Rudder				
Proposed Funding Agency:	Research & Development, Navy				
Budget Account:	1319N RDT&E (NAVY)	Budget Line Number [from DoD exhibit O-1, P-1, or R-1]:	-2		
Line Title:	Force Protection Advanced Technology	Program Element Number:	0603123N		
Is this Program/Project funded in the President's budget request? (Yes or No):	No	If yes, amount:	$0	**(in thousands of $, no decimals)**	
Additional funding (above the pending President's budget) you are requesting:	**$1,000**	**(in thousands of $, no decimals)**			
Is the project in a Service Chief's Unfunded Priority or Unfunded Requirements List? (Yes or No):	No				
If Yes, Ranking:		Amount:	$0	**(in thousands of $, no decimals)**	

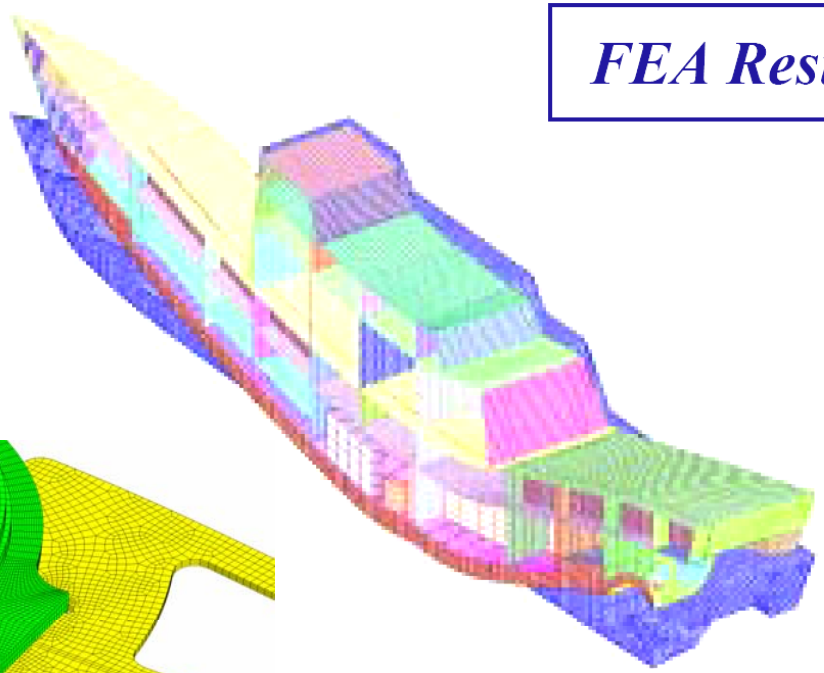
Design of Naval Composite Structures and Components

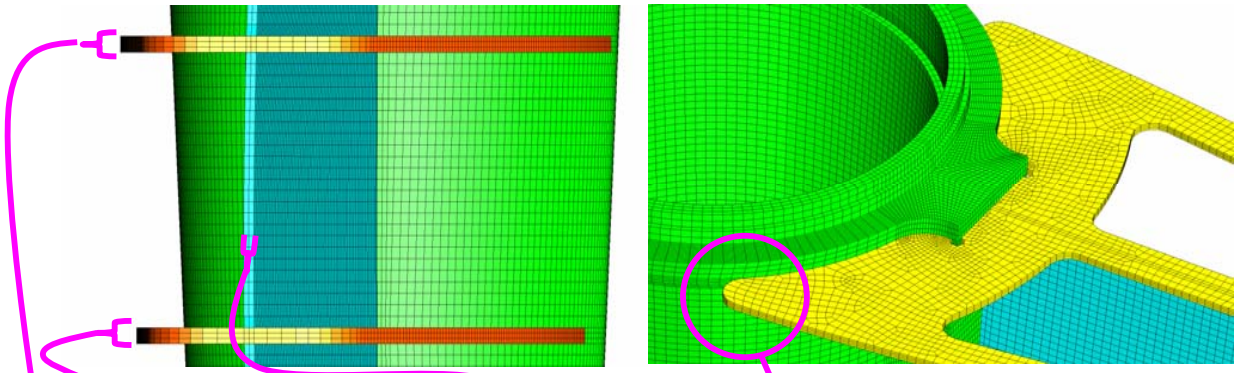
- Use “First Principles” Methodology
- Design for Performance Equal or Better than Metallic Counterparts
- Use Military Design Documents for Composites
- Use Military Platform - or Component - Specific Design Documents
- Use Commercial Design Methods and Documents

Use “First Principles” Methodology

FEA Models of Composite High Speed Vessel (right) and Composite Twisted Rudder (below)

FEA Results





3 Elements Thru-Thickness Element for Horizontal Plates

2 Elements Thru-Thickness Element for Vertical Plates

Rounded Plate Edges as per Drawings

Design for Performance Equal or Better than Metallic Counterparts

Mark V Special Operations Craft

DSRV

11 Meter Rigid Hulled Inflatable Boat (RHIB)

Inshore Boat Unit Seventeen (IBU 17) patrol the waters of Apra Harbor, Guam

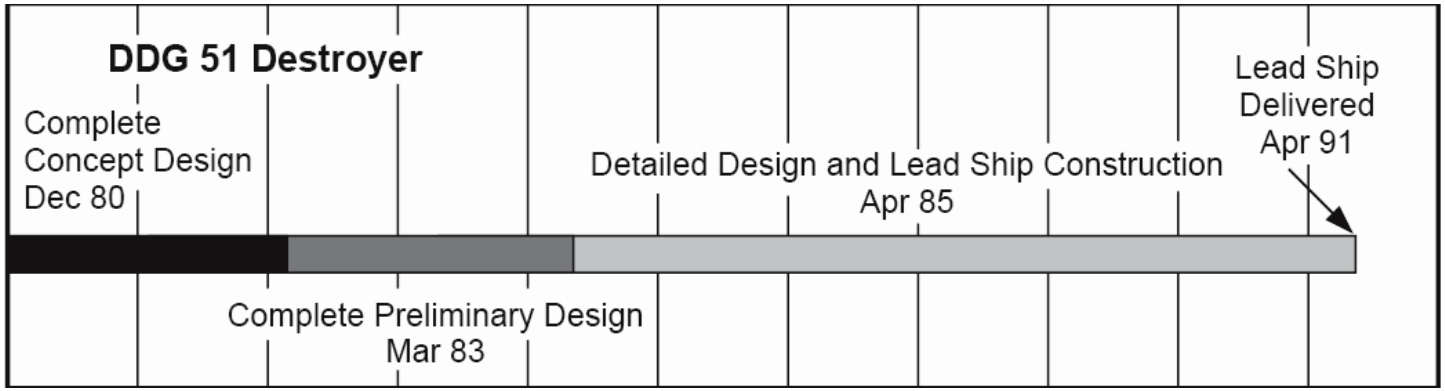
Norwegian guided missile partol craft SKJOLD (P 690) underway

Use Military Design Documents for Composites

ABS GUIDE FOR BUILDING AND CLASSING NAVAL VESSELS 2004

1 General

This chapter applies to all ships that are constructed entirely out of composite materials. This chapter can also be applied to portions of the vessel (such as a composite deckhouse on a steel ship) that are constructed out of composite materials regardless of the size of the part. This Chapter is to be applied in conjunction with other chapters and sections in the Rules. In particular this Chapter is to be used along with the material and fabrication requirements for composites provided in section 8-1-7 and 8-3-4 respectively. In general, the loading criteria shall be as defined in 1-3.



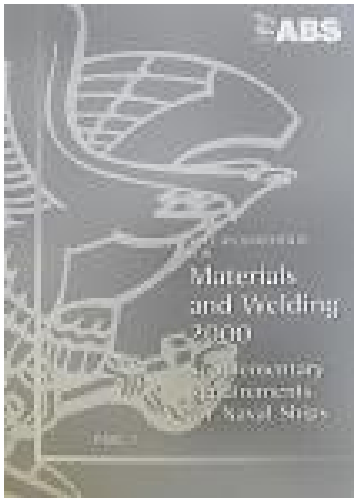
Length of Time From Concept to Launching

Use Military Platform or Component Specific Design Documents

FFG Fast Frigate

Air Intake Grate

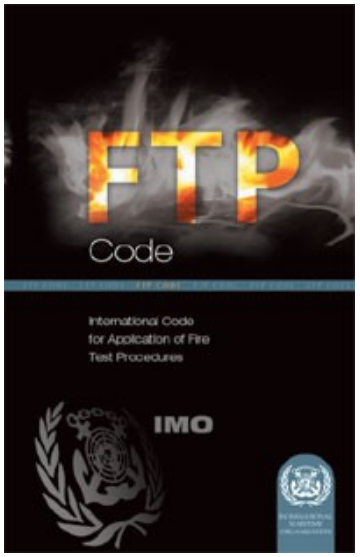
Use Commercial Design Methods and Documents



ABS

RULES FOR

MATERIALS AND WELDING
2005



International Code for Application of Fire Test Procedures

List of fire tests for resistance to fire:

Part 3:	"A", "B" and "F" class divisions (IMO Res.A.754) with additional tests for thermal radiation and requirements for testing of continuous "B" class divisions.
Part 4:	Fire door control systems.
Part 11:	Test for fire-restricting divisions for high speed craft, IMO Res. MCS.45(65), amendment

Validation and Qualification

- Establish Appropriate Navy Program Office and Warrant Holder Personnel
- Develop Requirements Matrix Showing Plan for Satisfying Program Goals
- Develop Required Test Plan(s)
- Conduct and Document Tests

Establish Appropriate Navy Program Office and Warrant Holder Personnel

Aircraft Carriers - PEO CV
RADM Dennis Dwyer/Brian Persons (SES)

CVN	Nuclear Powered Aircraft Carriers
CV	Conventional Aircraft Carriers
CVX	Future Aircraft Carriers

Submarines - PEO SUB
RADM John Butler/Richard McNammara (SES)

SSBN	Ohio Class Ballistic Missile Submarines
SSN 21	Seawolf Attack Submarine
SSN	Los Angeles Class Attack Submarines

U.S.SOCOM - NSW
CAPT J. Rowland Huss

Mk V	Mark V Special Operations Craft
NSW RIB	11-meter Rigid Inflatable Boat
SDV	SEAL Delivery Vehicle
ASDS	Advanced SEAL Delivery System

Ships - PEO SHIPS
RADM Charles Hamilton/Art Divens (SES) & Alan Weyman (SES)

DD(X)	Family of Surface Combatants
LCS	Littoral Combat Ship
CG	Guided Missile Cruisers - Conversion
DDG	Arleigh Burke Class Destroyers
DD	Spruance Class Destroyers

Ships - PEO SHIPS (cont'd)

FFG	Oliver Hazard Perry Class Frigates
LPD 17	LPD 17 Class Amphibious Transports, Dock
LHD	Wasp Class Helicopter/Dock Landing Ships
LHA(R)	Tarawa Class Amphibious Assault Ships
LPH	Iwo Jima Class Amphibious Assault Helicopter Carriers
LPD 17	LPD 17 Class Amphibious Transports, Dock
LPD	Austin Class Amphibious Transports, Dock
LSD 41	Whidbey Island Class Dock Landing Ships
LSD 49	Harpers Ferry Class Dock Landing Ships
LCAC	LCAC 1 Class Minor Landing Craft
AOE	Fast Combat Support Ships
T-AKR 300	Bob Hope Class Large Med Speed Roll-on Sealift Ships
T-AO	Henry J. Kaiser Class Replenishment Oilers
JCC(X)	Future Command Ship
T-AKE	Combat Logistics Force
T-AOE(X)	Fast Combat Support Ship
MPF(F)	Maritime Prepositioning Force
HSV	High Speed Vessel
MHC	Osprey Class Coastal Minehunters
MCM	Avenger Class Oceangoing Minesweeper/Minehunters
PC-1	Cyclone Class Patrol Boats

Develop Requirements Matrix Showing Plan for Satisfying Program Goals

Metric	Target	Status
Ship Life Survivability	30 years	Benchmarked by life commercial infrastructure fabricated with this resin system – 30 years+
Form, Fit, & Function	Similar	Designed to accommodate all existing equipment, future equipment changes, installation using existing shipbuilder practices
MK 82 Foundation Flatness	5 mils	Hard tool for outer mold line, machined steel seating ring for MK 82 equipment
Weight Reduction	15 %, 3,000 lbs.	25.5%, 4,838 lbs.
Cost	NTE 110%, $715K	Using $40/hr labor rate (boat builder rates), $667K acquisition cost. Tooling provided by program.
RCS Reduction, IR& Magnetic Sig.	10 dB Comparable	10 dB achieved Achieved
Fire Performance	UL1709	30 min. at 2000°F Achieved – Tested Sep 99
EMP EMI	50 KV 60 dB mod.	Testing on-going. Baseline coupons performing as expected.
Shock	Defined by NAVSEA	Analysis approved. Survived Full-Scale Shock Test
Nuclear Airblast	Defined by NAVSEA	Analysis approved. No test scheduled.
All others	Misc.	Modal analysis, ultrasonic inspection, laser shearography, coin tap, impact, and water tightness testing planned for Aug 00. All analysis is approved by NAVSEA.

Requirements Matrix Developed for Composite Forward Director Room

Develop Required Test Plan(s)

EMI Shielding

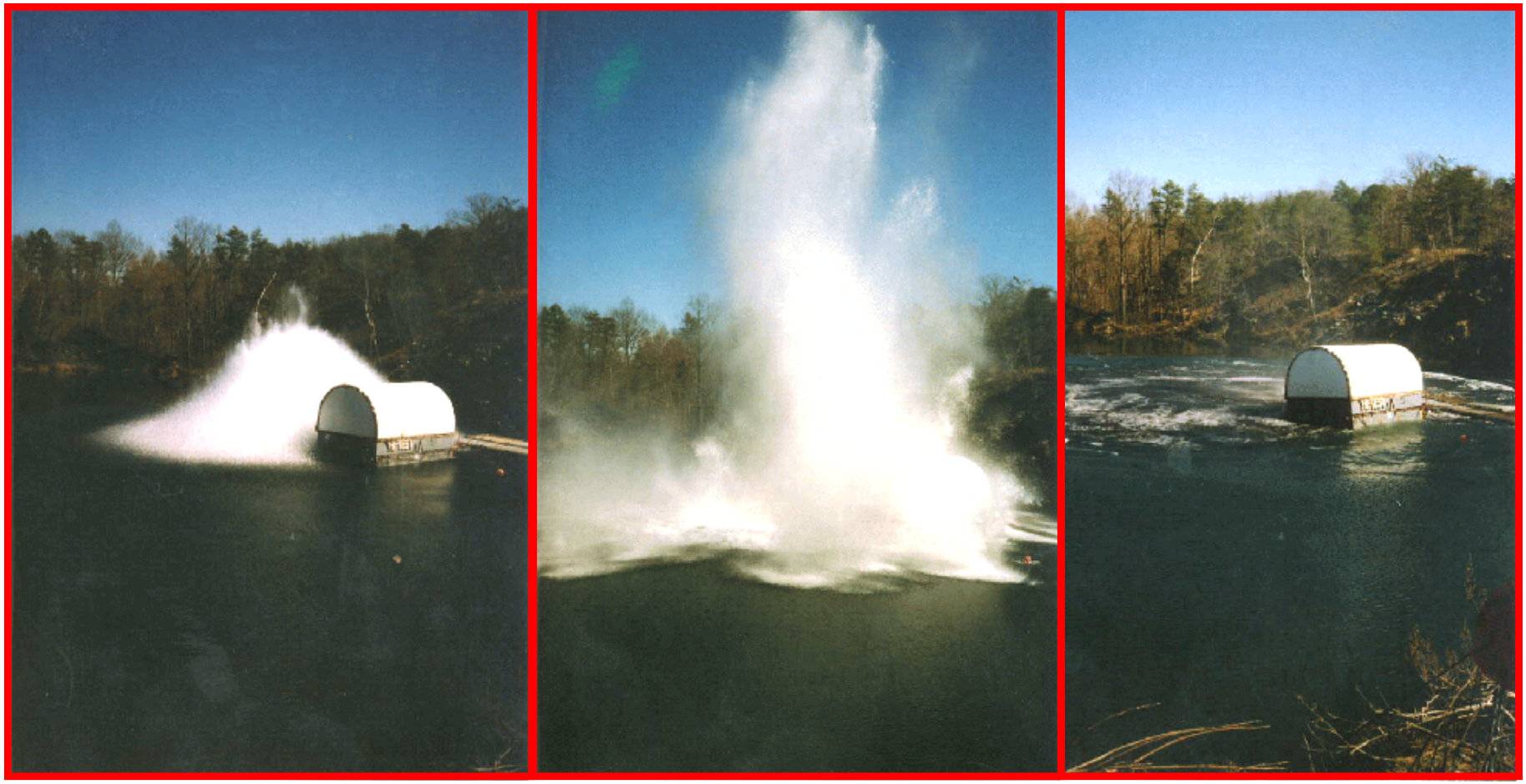
Flectron Copper coated fiber layer

- Design by Northrop Grumman
- Testing by NSWC-Dahlgren
- Base line of steel ship unit
- Lab testing of panels
- Field testing of structure

EMI Testing

Flectron Installation

Conduct and Document Tests



Shock Test by Hi-Test Laboratories

Plan for Transitioning Technology to Platform

- Is Platform New Construction or will Application be Retrofitted?
- Develop Ship Change Document
- Develop Required Test Plan(s)
- Conduct and Document Tests

Submarine & Carrier Insertion Opportunities

General Dynamics Marine Systems - Electric Boat (Groton CT)			
Vessel		Contract Value, $M	Estimated Delivery Date
SSN	775	$1,050	30-Jun-05
SSN	776	$1,050	18-Dec-06
SSN	777	$1,050	17-Dec-07
SSBN	726	$120	15-Nov-05
SSBN	727	$120	1-Oct-06
SSBN	728	$120	2007
SSBN	729	$120	2008
SSN	778	$1,448	16-Apr-09
SSN	779	$1,448	16-Apr-10
SSN	780	$1,448	14-Apr-11
SSN	781	$1,448	16-Apr-12
SSN	782	$1,448	16-Apr-13
SSN	783	$1,448	14-Apr-14
SSN	784	~$1,800	TBD
SSN	785	~$1,800	TBD

Northrop Grumman Newport News Shipbuilding (Newport News VA)			
Vessel		Contract Value, $M	Estimated Delivery Date
CVN	77	$3,830	15-Mar-08
SSN	775	$1,050	30-Jun-05
SSN	776	$1,050	18-Dec-06
SSN	777	$1,050	17-Dec-07
SSN	778	$1,448	TBD
SSN	779	$1,448	TBD
SSN	780	$1,448	TBD
SSN	781	$1,448	TBD
SSN	782	$1,448	TBD
SSN	783	$1,448	Oct-13
SSN	784	~$1,800	TBD
SSN	785	~$1,800	Oct-14

Data Source: Tim Colton
tim@coltoncompany.com

Surface Ship Insertion Opportunities

Northrop Grumman Ship Systems (New Orleans LA and Pascagoula MS)			
Vessel		Contract Value, $M	Estimated Delivery Date
DDG	97	$330	31-Jan-05
DDG	98	$330	8-Aug-05
DDG	100	$338	27-Feb-06
DDG	103		16-Apr-07
DDG	105	$402	31-Mar-08
DDG	107	$477	23-Mar-09
DDG	110	$470	30-Jun-10
LHD	8	$1,370	31-May-07
LPD	17	$641	16-Dec-04
LPD	18	$391	15-Dec-05
LPD	19	$492	3-Mar-06
LPD	20	$477	4-Sep-06
LPD	21	$817	30-Jul-07
LPD	22		
LPD	23		
LPD	24		
LPD	25		
LPD	26		
LPD	27		
LPD	28		

General Dynamics Marine Systems - Bath Iron Works (Bath ME)			
Vessel		Contract Value, $M	Estimated Delivery Date
DDG	96	$365	10-Jun-05
DDG	99	$367	6-Jan-06
DDG	101	$367	25-Aug-06
DDG	102	$464	16-Mar-07
DDG	104		9-Nov-07
DDG	106	$409	6-Jun-08
DDG	108	$485	16-Jan-09
DDG	109	$525	14-Aug-09
DDG	111	$489	30-May-10
DDG	112		TBD

General Dynamics Marine - Bath Iron Works/Austal USA (Bath ME/Mobile AL)			
Vessel		Contract Value, $M	Estimated Delivery Date
LCS		$268	
LCS		$268	

Data Source: Tim Colton
tim@coltoncompany.com

Surface Ship Insertion Opportunities (cont'd)

General Dynamics Marine Systems - NASSCO (San Diego CA)		
Vessel	Contract Value, $M	Estimated Delivery Date
T-AKE 1	$407	17-May-05
T-AKE 2	$302	13-Dec-05
T-AKE 3	$291	23-May-06
T-AKE 4	$288	19-Dec-06
T-AKE 5	$289	1-May-07
T-AKE 6	$289	31-Jul-07
T-AKE 7	$293	1-May-08
T-AKE 8	$293	31-Jul-08
T-AKE 9		2009
T-AKE 10		2009
T-AKE 11		2010
T-AKE 12		2010

Knight & Carver (San Diego CA)		
Vessel	Contract Value, $M	Estimated Delivery Date
SES	$6	2005

Lockheed Martin/Bollinger Shipyards/Marinette Marine (Moorestown NJ/Lockport LA/Marinette WI)		
Vessel	Contract Value, $M	Estimated Delivery Date
LCS	$188	Dec-06
LCS	$212	

Nichols Brother Boatbuilders (Whidbey Island WA)		
Vessel	Contract Value, $M	Estimated Delivery Date
HSV		

Example Projects

- Large Hull Structure
- Deckhouse Structure
- Advanced Enclosed Mast System
- Submarine Components
- Fairwaters
- Composite Twisted Rudder
- Pumps
- Ventilation Ducts
- Stanchions
- Special Forces Small Craft
- Electrical Boxes

Large Hull Structure

CHSV Demonstrator & USCG Fast Response Cutter, NGSS

Realized Project Benefits

- ONR Composite High Speed Vessel (CHSV) Bow Demonstrator used to Refine Infusion Methods for 300-foot USCG Hulls
- Flat Panel Tools up to 60′ x 104′
- Outfitted Modular Construction Demonstrated

Drivers for Composite Construction

- Increased Ship Life
- Reduced Maintenance Costs
- Increased Speed/Reduced Fuel Consumption
- Improved Stealth and Survivability

Manufacturer

Northrop Grumman Ship Systems
Dan Culleton, VP Gulfport Operations
228-896-8114

Navy POC

ONR HM&E, Code 334
USCG Deepwater Project

Deckhouse Structure

Realized Project Benefits

- Nominally 40m x 15m x 18m
- Carbon/Vinyl-Ester balsa core sandwich construction (~ 500 tons)
- Integrated Apertures
- Low RCS and IR signatures
- Integrated, Multi-function Mast

Drivers for Composite Construction

- To provide as small a signature as possible to other ships, phased array radar antennas will be incorporated into the DD(X)'s composite superstructure.
- Potential for weight savings high in the ship's structure improves stability
- Reduced maintenance

Manufacturer

Northrop Grumman Ship Systems
Dan Culleton, VP Gulfport Operations
228-896-8114

Navy POC

NSWCCD, Code 6501
Dr. Gene Camponeschi
301-227-5816
Eugene.Camponeschi@navy.mil

Advanced Enclosed Mast System

LPD-17 Masts, NGSS

Realized Project Benefits

- Prototype Installed on DDS 968 *USS Arthur W. Radford* Endured Ship Collision
- AEMS Baseline Design for LPD-17 Class Ships
- Improved Production Infusion Processes Developed

Drivers for Composite Construction

- Signature Control
  - –Radar Frequency
  - –Infrared
  - –Magnetic
  - –Visual
  - –Electro-optic
- Reduced and Easier Structure and Radar Maintenance

Manufacturer

Northrop Grumman Ship Systems
Dan Culleton, VP Gulfport Operations
228-896-8114

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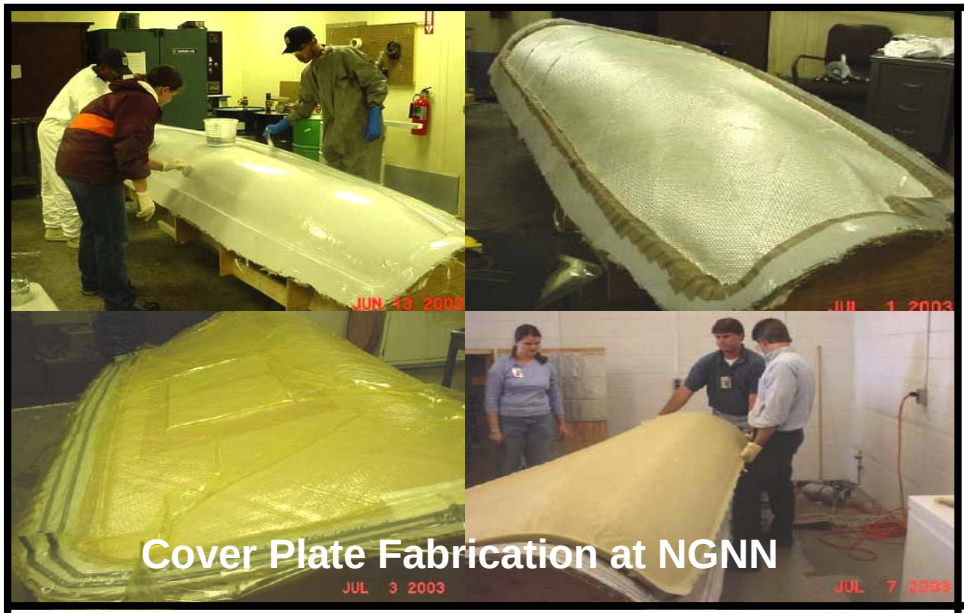
Submarine Components – Cover Plates



Cover Plate Fabrication at NGNN

Realized Project Benefits

- Assume no changes or minimal changes to existing structure.
- Cost Savings = 13.0 to 1.0 composite versus steel
- Schedule Savings = 5.0 to 1.0 composite versus steel

Drivers for Composite Construction

- Many VIRGINIA Class cover plates are manufactured out of steel
- Covers must be individually fitted to the as-fabricated structure
- Considerable hand labor required– Current manufacturing process very costly

Manufacturer

GD Electric Boat/NG Newport News
Dr. Jeffrey Hall, Principal Investigator
860-433-7300
jhall@ebmail.gdeb.com

Navy POC

ONR/Navy MANTECH/NSRP
John Carney
703-696-0352
carneyj@onr.navy.mil

Fairwaters

Backfit of Composite Fairwaters on DDG-56, NAVSEA 05M3

Realized Project Benefits

- Air boxes always reseal for composite but always leak with metal
- Carrier cost to buy composite $44K, to buy metal $350K (Installation cost higher for composite than metal)

Drivers for Composite Construction

- Shaft bearings and zincs can be inspected and serviced by divers waterborne while metal (CuNi) requires docking
- High cost to remove and reassemble metal fairwaters

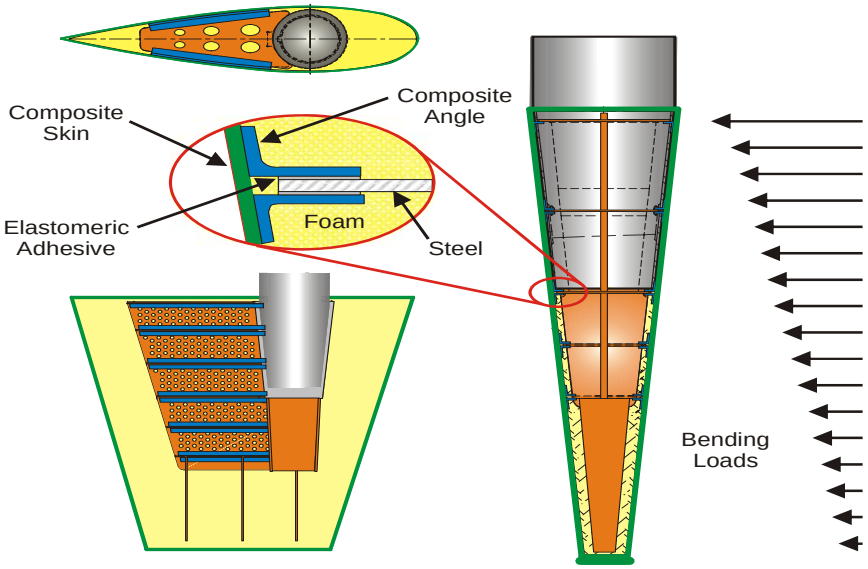
Manufacturer

Marine Design & Concepts
849 Keith Lane
Owings, MD 20736

Navy POC

NSWC-Carderock 654
Mike Bergen
301-227-5057
michael.d.bergen@navy.mil

Composite Twisted Rudder



Realized Project Benefits

- Lower cost rudders for surface combatants
- Improved survivability in corrosion and shock environment
- Potential for reduced component weight
- Improved fuel efficiency

Drivers for Composite Construction

- Severe cavitation erosion on DDG-51 class rudders
- Twisted rudder developed to delay onset of cavitation on rudder
- Steel twisted rudder difficult and costly to build
- Coatings don't adhere to steel twisted rudder

Manufacturer

Structural Composites, Inc
Eric Greene, Principal Investigator
420-263-1348

Navy POC

NAVSEA 05M3
Jeff Goldring
202-781-3840
Jeffrey.Goldring@navy.mil

Pumps

Composite Pump Installed on CG-48 & Worn Metal Impeller, NAVSEA 05M3

Realized Project Benefits

- 2 pumps logged 38,000 and 44,000 hours in 8 years
- 1 failure of one pump in 10 years caused by catastrophic motor bearing failure
- Can be completely rebuilt in place in 1 hour by ships force
- Parts cost $8,272

Drivers for Composite Construction

- Metal pumps on the other CG 47 Class ships fail every 1.47 years
- Must be rigged off the ship for pump shop rebuild – 688 man-hours average
- Parts cost $18,500

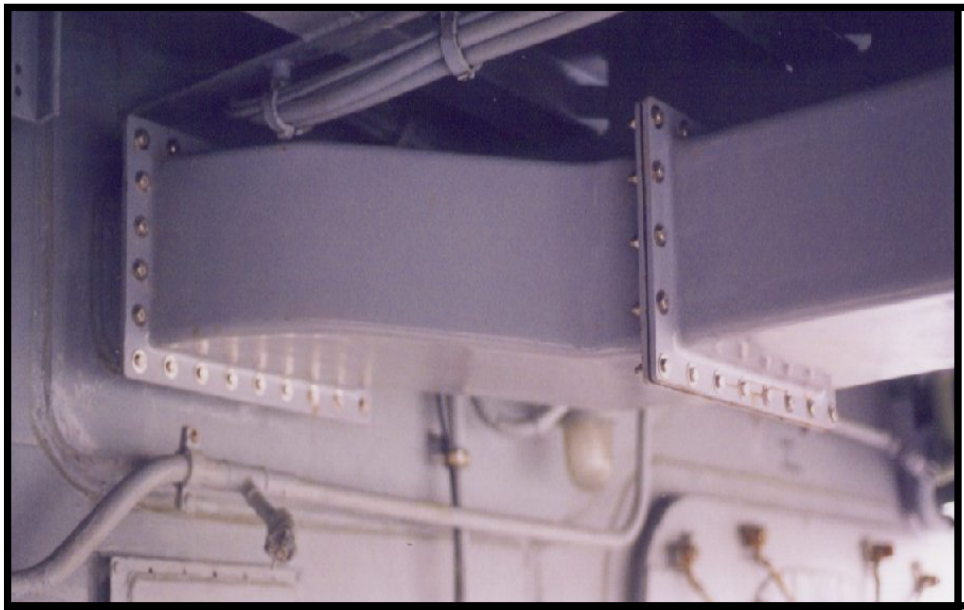
Manufacturer

Sims Pump Valve Co. Inc.
1314 Park Avenue
Hoboken, NJ 07030

Navy POC

NSWC-Philly 9232
Bob Coceano
215-897-9794
robert.coceano@navy.mil

Ventilation Ducts



Realized Project Benefits
- Fire Resistant Design
- Corrosion Resistance
- Shock Resistant

Drivers for Composite Construction
- Maintenance/Replacement Cost
- Weight
- Shock Resistance
- Performance in Fires

Manufacturer

Structural Composites
7705 Technology Drive
West Melbourne, FL

Navy POC

Dr. Gene Camponeschi
NSWCCD Code 65
301-227-5816
Eugene.Camponeschi@navy.mil

Stanchions

Safety Stanchions Around Aircraft Elevator on CV-75 & Testing of Composite Stanchion, NAVSEA 05M3

Realized Project Benefits

- Composite stanchion acquisition cost ½ stainless steel
- Stanchion life 5 years versus 3 yrs for stainless steel
- 20 year life-cycle cost < 10% of stainless steel

Drivers for Composite Construction

- Stanchions easily damaged by motorized vehicles
- Stainless steel stanchions difficult and costly to replace
- Glass rod/polyurethane resin option shown to be very durable

Manufacturer

KaZak Composites, Inc.
32 Cummings Park
Woburn, MA 01801

Navy POC

NSWC-Carderock 654
Mike Bergen
301-227-5057
michael.d.bergen@navy.mil

Special Forces Small Craft

Realized Project Benefits

- Smoother Ride for Passengers
- Increased Vehicle Life
- Reduced Hull Acquisition Costs

Drivers for Composite Construction

- Shock mitigation
- Reduced maintenance
- Improved survivability
- Increased stealth

Manufacturer

Maine Marine Manufacturing
Steve Von Voght
207-633-4194
svonvogt@hodgdonyachts.com

Navy POC

Office of Naval Research, Code 334
Dr. Jim King, Program Officer

Electrical Boxes

Realized Project Benefits

- Installation
  - Metal $140
  - Composite $166
- Maintenance 20 years
  - Metal $7,042
  - Composite $2,707
- Acquisition
  - Metal $60
  - Composite $200

Drivers for Composite Construction

- Survivability
- Maintenance Costs
- Material: ULTEM 2300 (GE) 30% glass fiber filled

Manufacturer

Glenair Inc.,
Glendale, California

Navy POC

NSWC-Carderock 654
Mike Bergen
301-227-5057
michael.d.bergen@navy.mil