
Naval Surface Warfare Center
Crane
NAVSEA
WARFARE CENTERS
CRANE
Ballistic Shield
Documentation Direction
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3/15/2011
Joint Special Operations Response Department
Harnessing the Power of Technology for the Warfighter

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Need Arises

- **USS Cole**
  - October 12, 2000
  - No force protection equipment, plans, or training
  - Killed 17 injured 39
- **Anti-Pirate patrols in Gulf of Aden and Indian Ocean**
  - Late 2007, US Navy began stepping up anti-piracy efforts when received permission to enter Somali territorial waters.
  - Jan 2009, the US Navy in conjunction with 20 other nations formed the international anti-piracy fleet, Task Force 151.

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Need Arises

- **Iran posturing in the Hormuz Strait**
  - **Iranian Navy consists primarily of small patrol boats.**
  - **Feb. of 2007, began an increase in probing of Iraqi territorial waters**
  - **March of 2007, held 15 British Marines and Sailors hostage for a short time**
  - **January 2008, five Iranian patrol boats took aggressive action and "maneuvered within 500 yards of our ships"**

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Need Arises

- These missions require tracking and engagement of relatively small boats.
- The distances to the vessels are typically short range.
- The primary weapons employed are crew-served weapons.
- Placing sailors on the gunwales with crew-served weapons to engage a small craft bearing automatic weapons requires protection

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History

- **Desert Shield/Storm**
  - Ballistic shields were installed on selected ships at the crew served weapons stations while serving in the Persian Gulf in support of Operation Desert Shield/Storm.
  - Simple laminated Kevlar panels.
  - Represented current technology at the time
- **Return to the Gulf**
  - In 2003 CGs and DDG received shields for operations in the Gulf.
  - Initially, Desert Shield/Storm armor brought out of storage and reissues.
  - Some new design, but no development with respect to environment, installation constrains, or even threat level completed.

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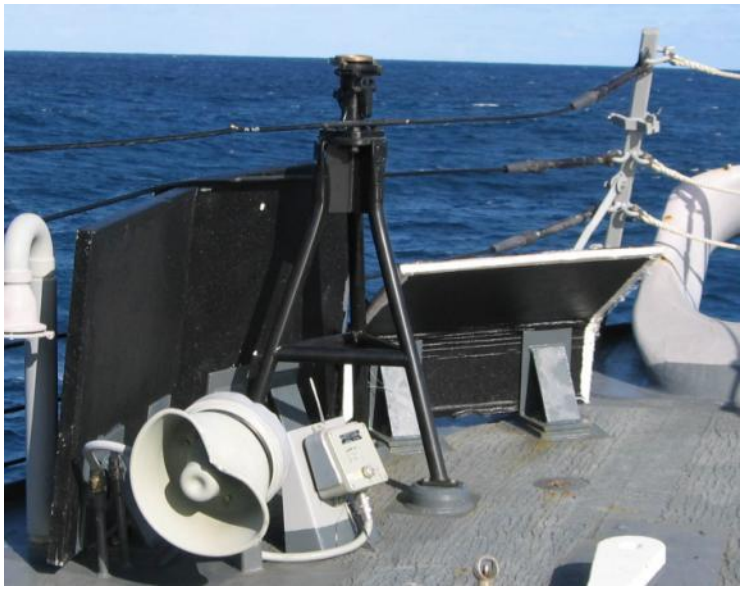
History

- **Degradation and replacement efforts**
  - **Feb 2007, SEA06 AT/FP TWH email to OPNAV, FFC, CNSF urging shield resolution (i.e. life cycle support)**
  - **2008 USS Barry realizes a need for replacement of degraded shields and sources own shield.**
  - **New shields not authorized, but life cycle support not in place for replacement or upgrade.**
  - **Dec 2008 – CNSF sends Crew Served Weapon Mount Ballistic Shield Requirements letter to Deputy CNO**



Objectives

- This project will develop the requirements document and subsequently the performance specification that will be used to purchase shipboard ballistic shields.
- This project will improve the ability of all Navy combatant surface ships to meet AT/FP threats through the use of ballistic shields that meet requirements.
- Improved ballistic shields will reduce the risk of loss of life. Current ballistic shields insufficiently protect ship's personnel and equipment against documented fleet requirement. Loss of life safety risk exists with currently fielded ballistic shields.
- Standardization of ballistic shield requirements is expected to reduce overall fleet lifecycle cost.
- Performance spec will lead to a common ballistic shield product. There is currently no ballistic shield commonality across ship classes.
- Formalized performance specs will allow industry the ability to develop innovate and off the shelf solutions.

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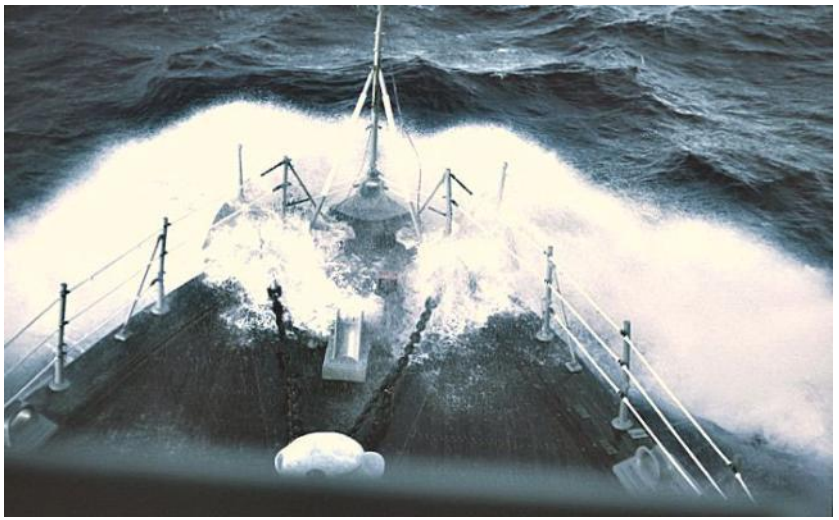
Approach

- **Two document approach.**
  - **MIL-PRF document identifying issues unique to the installation and usage of the ballistic shields on naval vessels.**
  - **MIL-STD document addressing the majority of possible threat rounds both NATO and WARSPACT. It will provide comprehensive testing, qualification, and classification standards adaptable to all future Naval Ballistic Protection needs.**



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MIL-PRF-XX613

- **Don't limit innovation**
  - **Does not specify materials**
  - **Does not specify mounting methodology**
- **Encourage all solutions**
  - **Covers special considerations for permanent, semi-permanent, and removable designs.**

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MIL-PRF-XX613

- **Provisions unique to stationary and removable shields.**
  - **Stationary Shields**
    - **Sea State Survivability**
    - **RF Signature**
    - **RF Reflectivity**
  - **Removable Shields**
    - **Two Man Portable (Weight, etc.)**
    - **Portability Provisions (Handles, etc)**
    - **Ease of Installation (Markings, Time to assemble, special tools, etc.)**
    - **Passage Way and Hatch compatible (Dimensional limits, etc.)**

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MIL-PRF-XX613

- **Document all considerations and constraints**
  - **Includes**
    - **Material Handling**
    - **Coatings**
    - **Environmental Testing**
    - **Ship Unique Issues (Green water loading, vibrations, etc.)**
    - **Flight Operations**
    - **Storage Provisions**
    - **Ship's Operations**

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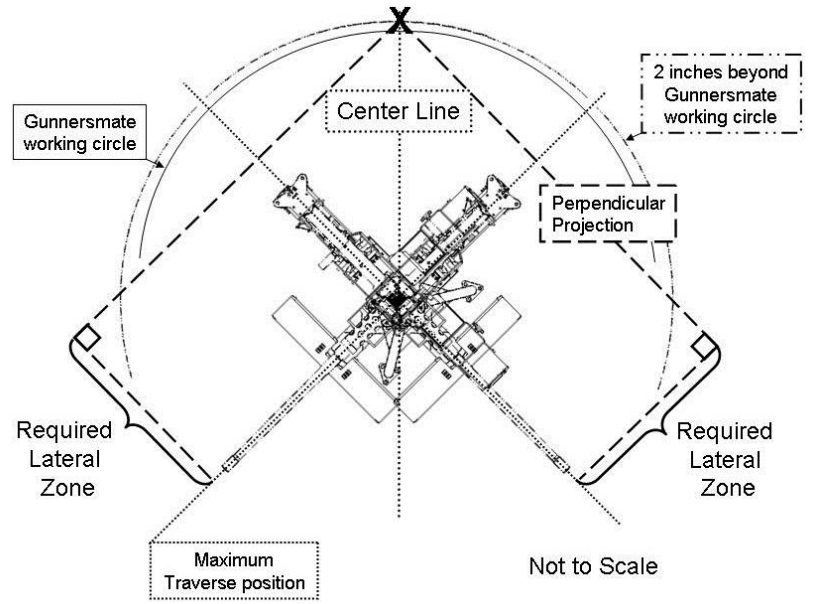
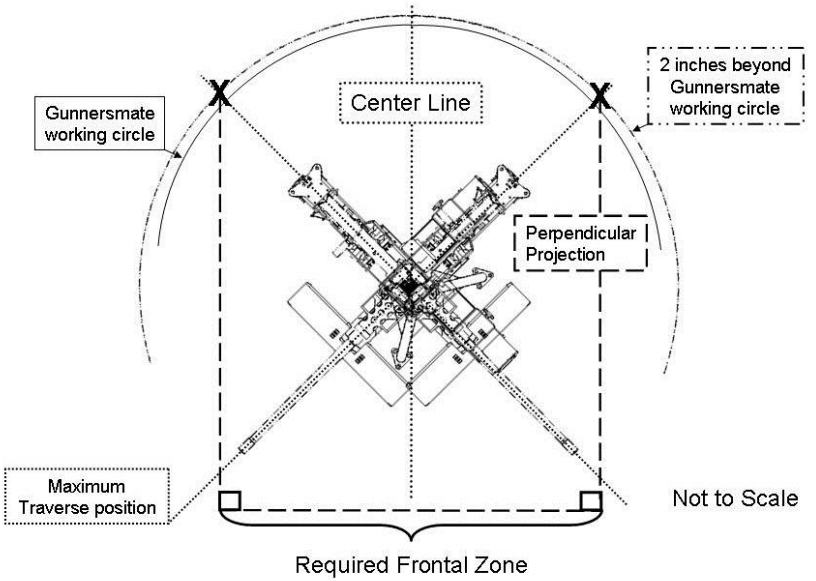
MIL-PRF-XX613

- **Open to all ship classes**
  - **Dimensions are determined by the lateral traversing limits based on installation and the gunners working circle dimensions.**
  - **Height is measured based on the user**
    - **48” from bottom of user’s feet.**
  - **Weapon cut out is determined by the weapon mount.**





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NIJ 0101.06 and 0108.01

- **NIJ pros/cons**
  - **Pros**
    - **Excellent and comprehensive procedures for body armor applications**
  - **Cons**
    - **Limited round sizes; not very many military rounds**
    - **Ambiguous multi-shot placement criteria.**

Caliber	Round	Weapon	NIJ 0101_06
9 x 19	(9 mm; .40 S&W)	M9	IIA
	(9 mm; .357 Magnum)	Colt Python	II
11 x 41	(.357 SIG; .44 Magnum)	S & W Model 29	IIIA
7.62 x 39	Type PS	AK-47	
	API BZ M43		
5.45 x 39	5N7	AK-74	
5.56 x 45	M855	M16	
7.62 x 51	M80, M59	FN FAL	III
	AP M61		
7.62 x 63	M2	M1 Garand	
	AP M2		IV
7.62 x 54R	SOVIET, TYPE LPS	PKM	
	Type B32	Dragonuv	
12.7 x 108	12.7mm API&T, B32	DShK	
12.7 x 99	M2 Ball	M2 BMG	
	M2 AP		
14.5 x 114	14.5mm API-B32	KPV	
	14.5mm API-BS-41		
20 x 102	M75	M61 Vulcan	
	APT-M95		
	AP-T M602 (HVAP-T DM-43)		
23 x 152	23mm API-T BZT	2A14	
25 x 137	APDS-T M791	M242	
30mm	30 x 113mm	M230	
	30 x 165mm	GSh-30-1	
	30 x 173mm	GAU-8	

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EN 1063

- **EN 1063 pros/cons**
  - **Pros**
    - **Good multi-shot placement methodology**
    - **Included military significant rounds**
  - **Cons**
    - **No Warsaw Pact weapons**
    - **Limited threat size.**

Caliber	Round	Weapon	EN 1063
9 x 19	(9 mm; .40 S&W)	M9	EN BR2
	(9 mm; .357 Magnum)	Colt Python	EN BR3
11 x 41	(.357 SIG; .44 Magnum)	S & W Model 29	EN BR4
7.62 x 39	Type PS	AK-47	
	API BZ M43		
5.45 x 39	5N7	AK-74	
5.56 x 45	M855	M16	EN BR5
7.62 x 51	M80, M59	FN FAL	EN BR6
	AP M61		EN BR7
7.62 x 63	M2	M1 Garand	
	AP M2		
7.62 x 54R	SOVIET, TYPE LPS	PKM Dragonuv	
	Type B32		
12.7 x 108	12.7mm API&T, B32	DShK	
12.7 x 99	M2 Ball	M2 BMG	
	M2 AP		
14.5 x 114	14.5mm API-B32	KPV	
	14.5mm API-BS-41		
20 x 102	M75	M61 Vulcan	
	APT-M95		
	AP-T M602 (HVAP-T DM-43)		
23 x 152	23mm API-T BZT	2A14	
25 x 137	APDS-T M791	M242	
30mm	30 x 113mm	M230	
	30 x 165mm	GSh-30-1	
	30 x 173mm	GAU-8	

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MIL-STD-662

- **662 pros/cons**
  - **Pros**
    - **Excellent for categorizing the material properties of the armor**
  - **Cons**
    - **Doesn't give yes or no**
    - **Allows 'gaming' of test by providing for obliquity and offset distance from muzzle**
    - **Without defined levels, difficult to develop off the shelf materials**

MIL-STD-X618

- **Reviewed the majority of armor related standards and specs**
  - **EN 1063**
  - **NIJ 0101_06**
  - **NIJ 0108_01**
  - **MIL-STD-662F V50 Ballistic Test for Armor**
  - **STANAG 4569**
  - **MIL-DTL-46100E Armor Plate Steel Wrought High Hardness**
  - **MIL-PRF-46103E Armor Lightweight Composite**
  - **MIL-PRF-46108C Armor Transparent**
  - **ATPD 2352P Transparent Armor Purchase Specification**
  - **MIL-B-29604(1) Body Armor Hard Small Arms Protective**
  - **MIL-DTL-46063H Armor Plate Aluminum Alloy, 7039**
  - **MIL-DTL-46077G Armor Plate Titanium Alloy Weldable**

MIL-STD-X618

- **Selected best practices from among all reviewed documents**
- **Massaged given info**
- **Filled in gaps and loopholes**
  - **Current Standards primarily NATO rounds only.**
  - **Special considerations for tiled solutions**
  - **No obliquity allowances**
  - **Based on advertised muzzle velocity of given threat**
  - **Designed to easily cross-reference between threat round, common weapons, and ballistic properties.**

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MIL-STD-X618

- **Don’t limit innovation**
  - **Does not specify materials**
    - **Encourages new chemical compositions of existing armor materials.**
- **Encourage all solutions**
  - **Allows for single shot or double**
  - **Allows for ball round or armor piercing**

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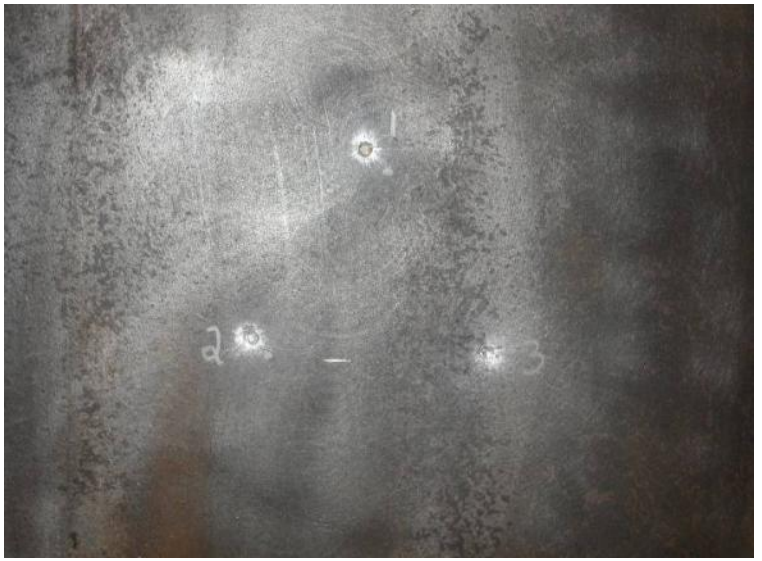
MIL-STD-X618

- **Transparent and opaque**
  - **Allows transparent and opaque.**
  - **Provides small changes based on typical usage**
    - **Thinner witness plate for transparent**



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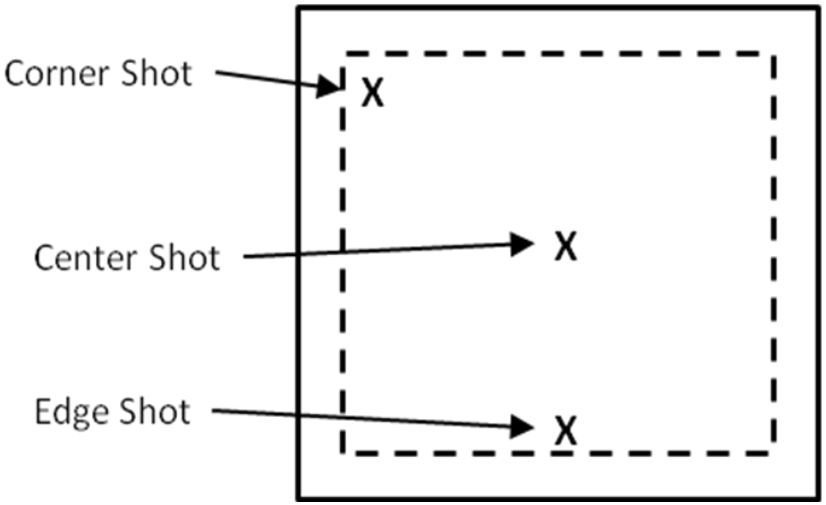
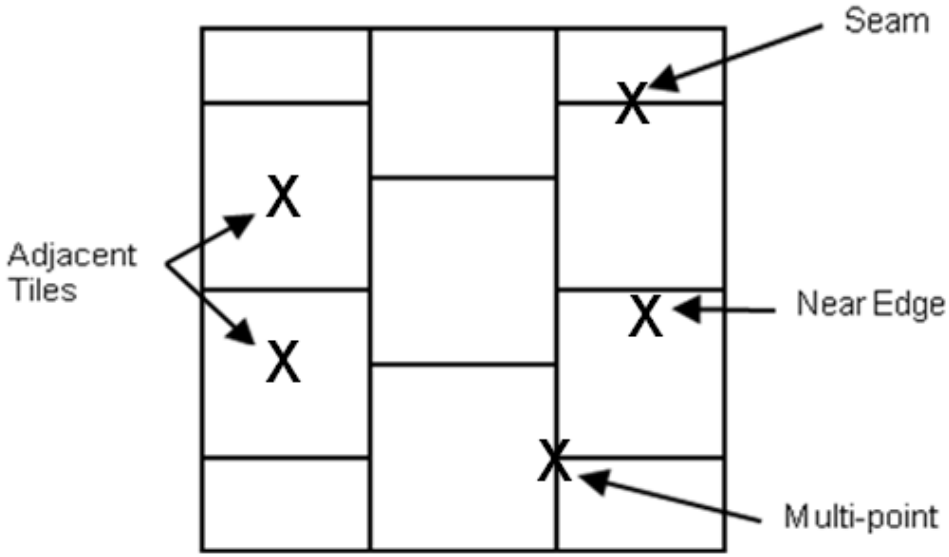
MIL-STD-X618

- **More specific shot placement**
  - **Multiple required locations for all coupons**
  - **Special considerations for tiled coupons**





MIL-STD-X618

MIL-STD-X618			Threat Information			Existing Standards			
Type	Class		Caliber	Round	Weapon	NIJ 0101_06	UL 752	NATO STANAG 4569	EuroNorm EN 1063
I	A		9 x 19	9mm FMJ RN M882	M9	IIA	1,6		EN BR2
		B		9mm FMJ RN	Colt Python	II	2		EN BR3
II	A		11 x 41	.357 SIG FMJ FN AA19	S & W Model 29	IIIA	3		EN BR4
III	A		7.62 x 39	Type PS	AK-47				
		B		API BZ M43				Level 2	
IV	A		5.45 x 39	5N7	AK-74				
		B		7N22 AP					
V	A		5.56 x 45	M855	M16		7	Level 1	EN BR5
		B		AP M993					
VI	A		7.62 x 63	M2	M1 Garand		4		
		B		AP M2		IV	9		
VII	A		7.62 x 51	M80, M59	FN FAL	III	5,8	Level 1	EN BR6
		B		AP M61				Level 3	EN BR7
VIII	A		7.62 x 54R	SOVIET, TYPE LPS	PKM				
		B		Type B32	Dragonuv			Level 3	
IX		B	12.7 x 108	12.7mm API&T, B32	DShK				
X	A		12.7 x 99	M33	M2 BMG		10		
		B		M263					
XI	A		14.5 x 114	14.5mm API-B32	KPV			Level 4	
		B		14.5mm API-BS-41					
XII	A		20 x 102	M75	M61 Vulcan				
		B		APT-M95					
XIII		B	23 x 152	23mm API-T BZT	2A14				
XIV		B	25 x 137	APDS-T M791	M242			Level 5	
XV		B	30mm	M789 HEDP	M230				
XVI		B	30mm	30 x 165mm BT	GSh-30-1				

High-Lighted selections represent Warsaw Pact weapons

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Where Are We Now?

- MIL-PRF-XX613 and MIL-STD-X618 are in the Government Industry Review process.
- Both documents are slated to be signed and published in late March 2011.
- Following the signing of the documents, an SBIR will be released to encourage development of initial designs.
- The SBIR will bridge the gap until the funding request, currently in POM cycle, is approved allowing shields to be fielded on DDGs, FGs, and CGs.

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Where Are We Now?

- **NSWC Crane has created a Ballistic Test Group to provide the required government certification for the Navy.**
  - **Ballistic shots up to and including 30mm**
  - **Explosive blasts up to 500lbs**
    - **EFPs up to 10lbs**
    - **A 50lbs facility is being constructed.**

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Questions?