WEAPONS EFFECTS AND SHIP/SUBMARINE SURVIVABILITY
AUGUST 6 – 10, 2018

LECTURER-IN-CHARGE: Mr. Brian Beechener, Branch Head, Vulnerability Assessment Branch, NSWC Carderock Division

TUITION: $2080

DAILY CLASS ROUTINE:

Monday: Classroom facility opens at 0730 and will be secured at 1700. Class begins at 0800 and ends at 1700 with a 1 hour break for lunch. Optional ice breaker at Muddy Charles after class.

Tuesday: Classroom facility opens at 0730 and will be secured at 1700. Class begins at 0800 and ends at 1700 with a 1 hour break for lunch.

Wednesday: Classroom facility opens at 0730 and will be secured at 1700. Class begins at 0800 and ends at 1700 with a 1 hour break for lunch.

Thursday: Classroom facility opens at 0730 and will be secured at 1700. Class begins at 0800 and ends at 1700 with a 1 hour break for lunch.

Friday: Classroom facility opens at 0730 and will be secured at 1200. Class begins at 0800 and ends at 1200.

COURSE DESCRIPTION AND OBJECTIVE: The objective of this course is to provide an overview of technical principles and concepts underlying (1) the damaging effects of weapons on ship and submarine structures and equipment, and (2) the protective features that can be incorporated to mitigate these effects in ship and submarine design.

Weapons explosion phenomena and damaging effects will be discussed for most types of weapons ranging from small arms, through conventional high-explosive anti-ship and anti-submarine weapons to weapons of mass destruction. Emphasis will be on the mechanical effects of conventional weapons phenomena. Protective features such as armor, ballistic protection, torpedo side protection, equipment shock hardening, improved compartment and equipment arrangements, and hull strengthening will be discussed.

The subject material will be presented to give the student an overall comprehension of how ship and submarine systems consider weapons effects in the ship design process, including examples from recent acquisition programs. The intent is not to teach the intricate design details of armor, shock hardening, etc., but to introduce the subject and bring the concepts together as a whole. There will be opportunity for student participation in informal discussions and classroom work problems.
The following topics will be covered:

- Explosion Phenomena
- Damage Mechanisms
- Destroyer Sized Ships - Weapons Damage and Protection Features
- Large Ships - Weapons Damage and Protective Features
- Submarines - Weapons Damage and Protective Features

**LECTURERS**

Mr. Andrew Nuss  
Technical Staff, Survivability and Weapons Effects Division, NSWCCD

Dr. E. Thomas Moyer  
Senior Research Scientist, Survivability Modeling and Simulation, NSWCCD

Mr. Mike Miraglia  
Project Engineer, Hull Response & Protection Branch, NSWCCD

Mr. Eric Walzer  
Branch Head, Hull Response & Protection Branch, NSWCCD

Mr. Steven E. Rutgerson  
Senior Project Engineer, Underwater Explosions R&D Branch, NSWCCD

Mr. Manik Anand  
Project Engineer, Vulnerability Assessment Branch, NSWCCD

Mr. Owen McGarity  
Project Engineer, Vulnerability Assessment Branch, NSWCCD

Dr. Bradley Klenow  
Project Engineer, Underwater Explosions R&D Branch, NSWCCD

**Special Note:** This course contains material governed by Distribution Statement D. Distribution is authorized to the Department of Defense and U.S. DoD contractors only. Other requests shall be referred to NAVSEA 05P1 via the Lecturer-in-Charge, Mr. Brian Beechener (brian.beechener@navy.mil; 301.227.4075)

**LOCATION:** Classes will be held in the Hill Building, Building NE-80, Room 1409 at One Hampshire, Cambridge, MA. The classroom is adjacent to MIT's main campus at The Charles Stark Draper Laboratory. An interactive MIT campus map is available on-line at [http://whereis.mit.edu/](http://whereis.mit.edu/).

**COURSE ELIGIBILITY AND CLASSIFICATION:** Applicants are expected to have mature technical backgrounds which, either through experience or education is at least equivalent to graduate education. This course is classified SECRET/NORFORN. It is open to active-duty U.S. military, U.S. government employees, and U.S. civilian contractor personnel with U.S. government sponsorship. It is NOT open to foreign nationals. A SECRET security clearance is required. A current U.S. Government ID or current Passport will be required each day to obtain a badge for classroom access. The course is limited to 36 students. Students with appropriate clearances that are outside of DoD must apply by 30 April 2017 to allow time for “need to know” to be established and approval received through appropriate channels.
APPLICATION AND TUITION PAYMENT: Course enrollment is limited. Seats are reserved in order of receipt of complete applications with “confirmation of enrollment” upon receipt of payment or obligation of funding through your training coordinator (SF-182).

Note: If course demand is high, we reserve the right to release any unconfirmed enrollments in order to provide a wait-listed student an opportunity to attend. Nominally will do so three weeks before course start date. However, we will make every effort to notify you beforehand and request your intentions.

Flexible payment options, including:
   1) Wire transfer
   2) Credit card (VISA, MasterCard, Discover Card, American Express)
   3) Check

Please see detailed directions on our website for application and payment. http://web.mit.edu/2n/profsum/

It is helpful if you send the name of your training coordinator and/or the person who will be making the payment to profsum@mit.edu and keep us informed about when we can expect the payment. If there are any questions, anyone may contact Mary Mullowney at (617) 324-2237 or by e-mail at profsum@mit.edu

In advance of payment, a signed SF182 form obligating funds is accepted to confirm enrollment. Full payment is due MIT before completion of the course.

CANCELLATION: Cancellations within ONE (1) week of the first day of the course will be subject to a $100.00 charge. Substitution by another applicant will be allowed provided an application is received and their security clearance is processed by Draper Laboratory.

ACCOMMODATIONS: Course tuition DOES NOT include accommodations. Each student must arrange his or her own transportation and hotel accommodations. Hotel space in Cambridge is very limited during the summer, so early advance reservations are strongly recommended. We have reserved a small block of rooms at the government rate at a local hotel which is located a short walking distance from the classroom and provides convenient access to the MBTA Red Line at the Kendall/MIT station. We will send you information about our hotel block when we confirm enrollment in the course. The hotel will release the hold on any unclaimed rooms FOUR (4) weeks prior to the first day of the course. Car rental is neither necessary nor recommended.

STUDENT ATTIRE: Business casual. Students are advised to bring a sweatshirt, sweater or jacket in the event that the classroom is cold.

REFRESHMENTS: Continental breakfast will be provided in the morning and a light snack each afternoon. Lunch will be provided on those days when working lunches/guest speakers are scheduled.
**POINT OF CONTACT:** If you have any questions, please contact Mary Mullowney at (617) 324-2237 or by e-mail to profsum@mit.edu.

**EMERGENCY CONTACT INFORMATION:** During class, students can be contacted by leaving a message at (617) 258-3431 or by e-mail at mmorgenstern@draper.com.

**PORTABLE ELECTRONIC DEVICES:** This course is CLASSIFIED. The classroom will be managed as a CLOSED AREA at all times during the period of instruction. Among other restrictions, this means that no recording devices or other electronic devices will be allowed into the room unless prior arrangements have been made. Such arrangements must be made at least three weeks prior to the first day of class. Personal electronic equipment must be left outside the classroom. The area will be guarded, but will NOT be locked. Please keep this in mind when deciding what to bring with you and what to leave in your hotel room. Examples of personal electronic equipment that are NOT allowed in the classroom: laptops, PDAs, iPods, calculators, wireless fitness trackers (such as Fitbit, Basis Peak, or Jawbone Up), cell phones, cameras, and flash drive memory sticks. NOTE that this is not an all-inclusive list. If you have a Portable Electronic Device not listed here, do not hesitate to ask Draper Security prior to bringing the device inside the classroom.

If you require a medical assist electronic device, arrangements can be made to allow these in the classroom. Please contact Draper at (617) 258-3431 or mmorgenstern@draper.com at least three weeks prior to the first day of class.

**VISIT REQUESTS:** JPAS is the preferred method for passing visit requests. The JPAS SMO is 519934. The “Reason for Visit” (Pro-Summer Course), “POC” (Mark Morgenstern), “POC Phone” (617) 258-3431, along with the dates of your course (NOT for a year), will be needed to process your JPAS visit. Visits should be processed at least five (5) working days prior to the start of your course to ensure adequate processing time.

If your clearance cannot be sent via JPAS, a Visit Authorization Letter (VAL) will need to be faxed to The Charles Stark Draper Laboratory, Inc.

**NOTE:** The VAL should be sent on your letterhead to include name, address and telephone number of the commercial or government entity (CAGE Code), certification of the level of the facility clearance, full name of course attendee, SSN, citizenship, date and place of birth, dates of visit for your course (NOT for a year), the purpose of the meeting (Pro-Summer Course), your Draper point of contact (Mark Morgenstern, 617-258-3431) and your clearance information. Please specify if you are a student or an instructor.

The Charles Stark Draper Laboratory, Inc.
555 Technology Square
Cambridge, MA 02139-3563
Attn: Kristin Meyer, Room 2194
JPAS SMO: 519934
Fax: (617) 258-2000
If you need to check on status of your visit request, call Draper security personnel: Kristin Meyer at (617) 258-3613.

Professional Summer Internet Web Site: http://web.mit.edu/2n/