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Formation of the US Navy's Munitions Reaction Evaluation Board (MREB)

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ABSTRACT

Since the implementation of the US Navy Insensitive Munitions (IM) Program in 1984, the Navy has established several official IM boards. The purpose of the boards is to review and evaluate reactions when munitions are subjected to a prescribed IM test series of adverse stimuli that munitions may experience during potential life cycle accidents/incidents. These boards were initially established to support design and development engineers at Department of Navy (DON) laboratories. The Ordnance Hazards Evaluation Board (OHEB) at Naval Air Warfare Center China Lake, the Insensitive Munitions Review Board (IMRB) at Naval Surface Warfare Center Dahlgren, and the more recently established IM board at Naval Surface Warfare Center Crane support both the NAVAIR and NAVSEA weapons and ordnance design communities.

During the last couple of years, the Naval Air and Naval Sea Systems Commands, NAVAIR and NAVSEA, created an overarching partnership between and among their various weapons and ordnance design, development, engineering, and testing laboratories called the Naval Energetics Enterprise (NEE). The goal of the NEE is to reduce competition and to increase coordination, cooperation, and teaming between these various Naval activities. To ensure consistency in IM evaluations and recommendations, streamline the review process, and promote a unified Navy position; the Naval Ordnance Safety and Security Activity (NOSSA) and the NEE Executive Leadership Board chartered a team to consolidate the three existing IM boards to form one official IM board for the Navy.

This paper describes the process for consolidating the existing boards and establishing the new single Navy IM board including mission, objectives, philosophies, and responsibilities. More importantly, the paper describes the

process and results whereby expert members from the existing IM boards, in collaboration with the NOSSA, and specifically it's Insensitive Munitions Office (IMO), are coming together to form a single Navy Munition Reaction Evaluation Board (MREB).

Introduction

The United States Navy is establishing a Munitions Reaction Evaluation Board (MREB) to harmonize the evaluation and ranking of Insensitive Munitions (IM) related test results. Currently three independent Navy boards review and evaluate munition reactions when exposed to various unplanned stimuli such as heat, shock and impact. This paper describes the process for consolidating existing boards, and defines the Boards mission, objectives, philosophies, and responsibilities. Expert members from the existing IM boards, in collaboration with the NOSSA IMO representatives, will form the new IM technical review board.

Background

Beginning in the mid 1960's there were several aircraft carrier incidents that involved on deck fires and ammunition failures resulting in loss of life and material. These documented explosive incidents at various munitions storage areas greatly hindered theater operations. It was evident from these incidents that the Navy desperately needed munitions that would fulfill their performance, readiness and operational requirements on demand, but reduced reaction violence and subsequent collateral damage when subjected to unplanned stimuli: heat, shock or impact. It was following these incidents that the Insensitive Munitions program was established.

Evolution of Large Scale IM Testing

The Navy Weapon Requirement (WR) -50 "Naval Weapons Requirements – Warhead Safety Tests, Minimum for Air, Surface and Underwater Launched Weapons" established large scale warhead vulnerability test requirements in 1964. This document established the minimum safety test requirements for non-nuclear warheads which utilize conventional high explosives and specified the procedures used to demonstrate an acceptable degree of warhead safety. This was the first document that contained test procedures and passing criteria for fast cook-off (FCO) and slow cook-off (SCO) and bullet impact (BI).

In 1982, these requirements evolved into the establishment of Department of Defense (DoD) Standard 2105 for the Navy. DOD-STD-2105 "Hazard Assessment Tests for Navy Non-Nuclear Ordnance" would now include "all" Navy non-nuclear ordnance other than just warheads per WR-50. This standard better defined the FCO, SCO and BI tests and added the basic or "core" safety

tests of 28-day temperature and humidity (T&H), vibration, 4-day (T&H) and 12-meter drop. However, there were no pass/fail criteria included in the standard.

In 1984, the Chief of Naval Operations established Navy IM policy and program. NAVSEA was directed to develop, publish and maintain IM technical requirements. In 1985, NAVSEA published these requirements in NAVSEAINST 8010.5 "Technical Requirements for Insensitive Munitions". The instruction requires that "all U.S. Navy and Marine Corps conventional munitions used or stored aboard Navy ships, without regard to the source of design or manufacture, must be subjected to IM testing conducted in accordance with test requirements and passing criteria."

In 1991, the IM technical requirements were included in MIL-STD-2105A "Hazard Assessment Tests for Non-Nuclear Munitions". This version of the standard maintained the tests from 2105 but separated the basic safety testing from IM testing. This version also added tests for Fragment Impact (FI), Sympathetic Detonation (SD), Shaped Charge Jet (SCJ) impact and Spall Impact (SI). Pass/fail criteria and levels of reaction violence were included.

In 1994, MIL-STD-2105B superceded MIL-STD-2105A with refinements to some of the test requirements became the standard accepted by all Services.

In 1995, NATO established IM policy and technical requirements with promulgation of NATO Standardization Agreements (STANAG) 4439, "Policy for Introduction, Assessment and Testing for Insensitive Munitions (MURAT)" and Allied Ordnance Publications (AOP) 39, "Guidance on the Development, Assessment and Testing of Insensitive Munitions (MURAT)."

In 2003, MIL-STD-2105C superceded 2105B by incorporating the NATO IM technical requirements in the form of IM test STANAGs and AOP 39. This version of the standard still included the basic safety tests but now references individual STANAGs for each IM test and the applicable STANAG and AOP for pass/fail criteria. The IM STANAGs harmonize with Hazard Classification test requirements reducing the amount of testing thus lowering the cost and number of required test assets.

Navy IM Technical Review Boards

In the mid 1980's large scale IM testing began to get extremely sophisticated with data acquisition instrumentation requirements and the associated time and cost to conduct a single test. Due to the complexity of test setups, test item configurations, instrumentation requirements and evaluation of test results it was evident that a technical review by those in the IM technical community was required. This was especially true in order to reach consensus on the reaction level of tested munitions against the pass/fail criteria and reaction type definitions.

IM issues have received increasing attention within DoD. This likely will continue for many years. Weapon programs are now required to undergo intense scrutiny by headquarters level panels. Within the Navy, these reviews are in addition to the required Weapon System Explosives Safety Review Board (WSESRB) evaluation and specifically address IM issues. Internal reviews must be conducted on munitions programs to ensure compliance with technical standards and consistency in their interpretation are achieved and to certify pass/fail results for munitions tested or evaluated by the DON Warfare Centers. Standardized criteria must be applied to munitions during internal reviews prior to presentations to external review boards.

To support this need for technical review, the Navy has established several official IM review boards at the sites where tests are conducted. The purpose of the boards is to review and evaluate reactions when munitions are subjected to a prescribed IM test series of adverse stimuli that munitions may experience during potential life cycle accidents/incidents. These boards were initially established to support design and development engineers at Department of Navy laboratories. The first board established in the late 1980's was the Ordnance Hazards Evaluation Board (OHEB) at Naval Air Warfare Center, Weapons Division, China Lake followed in the early 1990's by the Insensitive Munitions Review Board (IMRB) at Naval Surface Warfare Center/Dahlgren Division, and more recently in 2003 the IMRB board at Naval Surface Warfare Center/Crane Division. All boards support both the NAVAIR and NAVSEA weapons and ordnance design communities.

Unified Navy Position

During the last few years, the Naval Air and Naval Sea Systems Commands, NAVAIR and NAVSEA, created the NEE to establish an overarching partnership between and among their various weapons and ordnance design, development, engineering, and testing laboratories. The goal of the NEE is to reduce competition and to increase coordination, cooperation, and teaming among participating Naval activities.

To ensure consistency in IM evaluations and recommendations, streamline the review process, and promote a unified Navy position; the NOSSA and the NEE Executive Leadership Board chartered a team to consolidate the three existing IM boards to form one official IM board for the Navy. A team comprised of the three existing review boards and the IMO was tasked with determining the feasibility of having a single IM review board, identifying membership, developing operating procedures and documentation management. Upon successful review and subsequent recommendations a new operating instruction establishing the MREB with appropriate policies and procedures will be developed for approval.

MREB Duties and Responsibilities

The main goals of establishing the MREB are to provide a unified Navy position of munition reaction levels, consistent IM test evaluations, and improve the review process.

The MREB, like its OHEB and IMRB predecessors, will provide guidance and recommendations for optimal test design and procedures for IM testing as part of ordnance hazard assessment. This will provide consistent evaluation and rating of IM test results to the requirements of NAVSEAINST 8010.5. In accordance with MIL-STD-2105, the MREB will evaluate munition reactions in accordance with STANAG 4439 and AOP-39.

All munition test results that are to be scored for IM compliance will be reviewed and evaluated by the MREB. If deviation from MIL-STD-2105 test requirements is required, such as harmonizing IM tests with Hazard Classification test requirements to reduce use of assets and test costs, test plans must be reviewed by the MREB before testing. A test plan review and MREB concurrence before testing eliminates the possibility of a test being ruled invalid.

Other munition assessments not for score, such as engineering tests to develop an IM mitigation method, may be reviewed at the discretion of the MREB. These reviews keep the MREB apprised of current IM technology and provide to the presenter the benefit of the Board's advice and suggestions.

Membership/Chairmanship

The overarching coordination of the MREB is under the leadership and sponsorship of the NOSSA, specifically the IMO. Each MREB participating activity will have a local Chairperson and Vice Chairperson nominated by the appropriate Department/Directorate Head and approved by NOSSA. One of these Chairpersons will be assigned by the NOSSA IMO as a Lead Chairperson for a predetermined length of time.

The MREB review process will consist of a chairman, voting members and an Executive Secretary. The meeting may also include non-voting members as invited participants on a case-by-case basis.

Voting members of the MREB shall include individuals with expertise related to munitions development and IM requirements, ordnance technology and IM test and evaluation. Potential members will be nominated in writing by their parent organization.

Executive secretaries will be appointed by the Chairpersons to coordinate MREB meetings at their respective locations. The Executive Secretary will also be

responsible for compiling meeting minutes, summarizing the Board's findings and distributing of the minutes and findings for review and approval.

The MREB can appoint technical specialists, at the discretion of the chairman, as ad-hoc non-voting members as advisors as required.

The Board will convene at the activity where the tests were conducted. When testing is not conducted at government activity, the sponsoring program must coordinate with the NOSSA IMO, to select the appropriate meeting location. Attendance by the full membership at each meeting is encouraged, either in person or by teleconference, so that judgments are consistently rendered independent of the meeting location, program, sponsor or test activity.

Meetings and Procedures

The MREB will meet as required to conduct business and will maintain meeting records. However, meetings shall not be called to order without a quorum. Although consensus is preferred, rulings can be made on a 2/3 majority vote. If a 2/3 majority does not exist for a ruling, then the Chairperson will assign representatives in conjunction with technical experts to develop majority and minority opinions for MREB deliberations. The three Chairpersons will review the test data and opinions and the designated Lead Chairperson will issue a ruling to the NOSSA IMO.

A quorum is determined by having at least six MREB members present and at least five MREB members present at the same location. The goal is to have representation from each site, however at least one of the MREB members must be from a location where the meeting is not being held. This requirement may be waived upon agreement of the three Chairpersons. A Chairperson or a Vice Chairperson also must be present.

Programs will arrange meetings with the host activity. The Chairperson will notify all of scheduled meetings within four weeks prior to assembly. Briefing material and all supporting documentation must be received by the membership two weeks prior to the meeting being held.

The proceedings and findings of the MREB will be documented as "MREB Meeting Minutes." The minutes will be signed by the designated chairperson and become the official MREB and Navy position for IM compliance with NAVSEAINST 8010.5B and MIL-STD-2105 requirements.

Summary

Large scale test and evaluation in accordance with IM technical requirements is the culmination of development and system integration of IM technology to reduce munitions reaction violence and collateral damage when exposed to unplanned stimuli. It is therefore imperative that a thorough and consistent evaluation of these test results be made to allow for a comprehensive comparative assessment across developing activities of the vulnerability of munitions during transportation, storage, and operation use. To reach this goal the US Navy is consolidating current IM test review processes into a single evaluation board to achieve uniformity in the review process. The MREB will allow for better collaboration among technical experts from multiple disciplines permitting a more comprehensive assessment of progress in achieving an IM compliant munitions inventory.