System Safety News Notes

Brought To You As A Service Of The MICOM Safety Office

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In an effort to keep the Developer community informed of system safety related news, the MICOM Safety Office is planning to periodically issue "System Safety News Notes" covering timely and useful topics. Typical subjects will include guidelines for safe design, new regulations, "hot" items, accident trends, checklists, and special problem areas.

Since plans are to continue the distribution of "System Safety News Notes" on a regular basis, retention of this newsletter for future reference is recommended.

Test Safety Release Versus Safety Confirmation

All too often the terms *Safety Release* and *Safety Confirmation* are used interchangeably, and consequently, incorrectly. The *SAFETY RELEASE* is a formal document issued by the Test and Evaluation Command (TECOM) which allows soldiers to train, operate, test, and evaluate specific pieces of hardware in a controlled environment. It is issued to a user or technical test organization before any hands-on training, use, test, or maintenance by the troops. It is a stand alone document which indicates under what conditions the system is safe for use and maintenance by typical troops. The conditions imposed on the use of the system are the result of identified hazards, previous testing, inspections, and system safety analyses. Operational limits and precautions are included. Safety Releases are required during developmental and operational testing of a new or modified system, but can be required at other times also (production testing and bid sample testing). The release is for soldiers to use equipment during testing; it is not for the equipment itself.

To obtain a Safety Release, the requestor is required to furnish a current Safety Assessment Report (SAR) to TECOM 60 days prior to the start of the test (including technical demonstrations, technical tests (TTs), and user tests (UTs). These items along with a safety inspection of the system form the basis for information contained in the release. *(Continued on page 2)*

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The *SAFETY CONFIRMATION* is a separate document that provides the materiel developer with the test agency's safety findings and conclusions, and states whether the specified safety requirements tested have been met.

It is written by the test agency after testing has been completed and the safety findings evaluated. This document is used (along with others) in developing the MICOM Safety Office's position (Safety Assessment/Safety and Health Data Sheet) for a Milestone Decision or Materiel Release. The actual safety document in the Milestone Decision or Materiel Release package is usually generated by the Safety Office in conjunction with the project office.

Both the *Safety Release* and the S*afety Confirmation* are potential "showstoppers" if not available at the required time. The key to successful application of safety management is to ensure that they are planned for and requested well in advance of their need.

Point of contact in the MICOM Safety Office for additional information is Mr. Kevin Woodsinger, 842-8633.

Electrical Safety

Developments In System Grounding

There are many threats to modern battle field weapons, some of which come from our own environment. They are electrical in nature; i.e. lightning, electromagnetic pulse, static electricity and electrical short circuits. Ground rods have been employed for hundreds of years to help protect against some of these threats. One of the earliest uses was to protect a 300 foot high Venetian tower that was destroyed by lightning repeatedly between 1388 and 1762. A down conductor and ground rod provided the needed protection.

Modern weapon systems can be much more sensitive to electrical threats than the stone tower was, and yet can ill afford the restrictions of a classical eight foot long driven ground rod. Mobility requirements and unpredictable terrain can make installing and removing ground rods difficult-to-impossible. Just ask someone who had to do it in the hardpack of Kuwait.

The first step in designing an equipment grounding system is the determination of whether the system must be grounded at all. Recent trends, such as internally powered single-vehicle systems and the use of fiber optic cables for inter-vehicle connections, sometimes can eliminate the need for a ground rod at all.

While each system is unique, and individual threats and electrical configurations must be considered, the following adaptation of a CECOM developed table (Table 1) can serve as a guide for the initial determination of whether an earth ground is required for electrical protection. As you will see, many of our emerging applications may not have to suffer the penalties of an earth ground requirement. Note that additional considerations may apply if ordnance is involved and not fully protected by a "Faraday Shield".

Within the Redstone Arsenal community, we are lucky to have an excellent resource for all Electromagnetic Effects issues. The Electromagnetic Effects Branch of TECOM's Redstone Technical Test Center (876-6386) can provide detailed design and test guidance concerning all electromagnetic effects questions. The MICOM Safety Office can also provide guidance on personnel and equipment safety issues related to grounding.

What if your system does require an earth ground but has a frequent movement requirement? Emerging technologies may provide relief from the burden of driven ground rods. In a future issue of System Safety News Notes we will describe two of these: the Surface Wire Grounding System and the Surface Grounding Device. *(Continued on page 3)*

SYSTEM CONFIGURATION	EARTH GROUND REQUIRED?
On-board generator, no connection to other equipment	NO
External AC power, generator or commercial power	YES
On-board generator, electrical connection to other equipment	YES
On-board generator, fiber optic connection to other equipment	NO
Any system with antenna mast	YES
Multiple systems located within 8 ft. of each other, even if not connected	YES

Table 1

Point of contact in the MICOM Safety Office for additional information is Mr. John Frost, 842-8634.

Missile Development

MANRATING

Manrating is a term that is frequently misused and misunderstood in the MICOM community. Many project offices and contractors will declare their system "manrated" after the first manned test. Within the MICOM community, manrating is defined as the process of assuring that a weapon system is safe for manned use in an operational environment. Manrating has three basic goals:

1) To ensure that operators/crew are not subjected to unacceptable hazards during normal system operation.

2) To ensure that the system design minimizes the effects of component/system failures on the operator/crew.

3) To provide the materiel developer and operational testers sufficient data to safely conduct test programs.

Manrating must be integrated into the development process in order to be both time and cost effective. Manrating requirements should be included as soon as practical in the system design process. It is also essential to assure that manrating tests are planned for during the proposal process and integrated into the system test plans to assure that adequate test assets are available, and that the manrating test schedule supports program milestones.

The documentation for manrating will vary depending on the type of system and the hazards it poses to the operator/crew. Formal manrating plans are required for the types of systems listed in Table 2, but any type of system can benefit from an organized approach to manrating. Manrating efforts should be tailored to the individual system based upon lessons learned from previous systems, the design maturity of specific components, and the proximity of the operators/crew to the hazards. For example, the development of a new shoulder fired antitank missile would require an extensive manrating effort, while the addition of a new warhead to the same missile after fielding would require a significantly smaller manrating effort.

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FORMAL MANRATING

★ Shoulder launched rockets and missiles.

★ Vehicle (including aircraft) launched rockets and missiles for which the vehicle cannot protect operator/crew from effects of failures.

★ Other types of systems that pose significant risk to operators/crew.

Table 2

The responsibility for ensuring that manrating is accomplished rests with the materiel developer project office. This effort is supported primarily by the Safety Office and the Research, Engineering and Development Center (RDEC). The primary responsibilities for each organization are as follows:

✓ Safety Office - Sets manrating policy, provides design and test guidance to materiel developers, and monitors the status of the manrating effort.

✓ Materiel Developer (Project Office)- Ensures that manrating requirements are integrated into the design and testing of the system under development, a formal manrating program is in place when required, and the system is safe for its intended use.

✓ RDEC - Provides guidance and assistance in specific technical areas, such as rocket motor or warhead design and testing.

The exact responsibilities are explained in greater detail in MICOM-R 385-10, Manrating.

Manrating is not limited just to missile systems. New technologies, such as unmanned vehicles, must also be certified safe for testing and fielding. The same process developed for missiles can be adapted for use with these other types of systems. The manrating process is necessary for developing and ensuring safe use of all fieldable military systems.

The point of contact in the MICOM Safety Office for additional information is Mr. William Pottratz, 842-8641.

ASK SAFETY

Do you have a question regarding system safety policy, procedures, or design? We are looking for questions from folks like you. Please send your questions to AMSMI-SF (ATTN: Ask Safety), phone 842-8633 or email to WOODSINGER-SF@redstone.army.mil.