

*In this Military and RTCA issue...*

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## Professional Development

### Designing to Meet Military and RTCA EMC Standards Seminar and Workshop

July 21-22 & 25-26, 2005

Hilton Hotel and Conference Center, Northbrook, IL  
Just 20 minutes from O'Hare Airport

We are introducing a new EMC seminar on Military and RTCA standards, testing, and design. The seminar includes an introduction to the requirements, demonstrations of testing, videos, and in-depth discussions of the design considerations needed to meet the standards.

**The seminar will cover:**

- \* Mil Std 461, 462 & 464, and RTCA DO-160 Standards
- \* The basics of EMC/EMI
- \* Details on the tests and how they are performed
- \* Product design to meet the requirements



**Who should attend:**

- \* System and equipment design, development, project and test engineers
- \* Technical managers and technicians working with military or commercial avionics, land based equipment, systems and modules
- \* Those involved in the development of specifications and test plans dealing with EMC requirements

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## News from the Lab

### D.L.S. Expands Capabilities for Mil Std & RTCA/DO-160 200 V/m to 40 GHz

D.L.S. has continued to expand Mil Std 461 and RTCA testing capabilities to meet your requirements. The goal of this article is to update or inform you as to the services we can provide your company.



D.L.S.'s 30,000 sq. ft. headquarters in Wheeling, Illinois

D.L.S. Electronic Systems, Inc. is a key supplier of EMC testing for many test programs and is able to meet your Mil Std & Commercial Avionics testing needs, whether they are DoD, Mil Std 461 A-E or RTCA/DO-160 C-E.

We have over 30,000 square feet dedicated to military, avionics, and other EMC testing. Also, D.L.S. is just 20 minutes from O'Hare International Airport, easily accessible from all cities in North America.

Products we test include, but are not limited to:

**DoD Military/Aerospace Supplier Ref. OKP98:**

- |                |                  |
|----------------|------------------|
| E <sup>3</sup> | Radar            |
| Avionics       | Vehicles         |
| Communication  | Guidance Systems |
| Weapon Systems | Surveillance     |

**RTCA for Commercial Aircraft:**

- |               |                         |
|---------------|-------------------------|
| Avionics      | Passenger Entertainment |
| Communication | Flight Controls         |
| Management    | Instrumentation         |
| Navigation    | Identification          |

Three of our five Military/RTCA test rooms are 36' x 25' x 20' and were built specifically to meet the latest requirements of both standards. They are among the largest military/avionics test rooms available. We have oversized access doors to accommodate extra large products.

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## Seminar and Workshop

(Continued from page 1)

When you leave this seminar, you should be ready to lead a design team with a high degree of confidence that your products will meet the EMC/EMI requirements of Mil Std 461, 462 & 464 and RTCA DO-160. A certificate of PDH credit will be issued to all participants.

### Instructors:



Elya B. Joffe, VP of Engineering at K.T.M. Project Engineering, Kfar-Sava, Israel, is an IEEE EMC Distinguished Lecturer and a member of the Board of Directors of the IEEE EMC Society. He has over 20 years experience in government and industry in EMCE<sup>3</sup> and electronic systems and platforms, specializing in aircraft and aerospace. He is actively involved in the EMC design of commercial and defense systems, from circuit to full platforms, working in various fields such as NEMP and lightning protection design and numerical modeling for solution of EMC problems.



Jack Prawica, Senior EMC Engineer, is manager of the EMC testing laboratories for D.L.S. Electronic Systems Inc. in Wheeling, IL. In his 13 years of EMC testing and problem solving experience, he has developed test procedures, dealt with the daily hands-on testing operations, and solved many EMC/EMI problems.

This program is being coordinated by Donald L. Sweeney who has offered classes in the Chicago area to over 2000 engineers during the past 20 years. The class is sponsored by D.L.S. Electronic Systems Inc., one of the largest Mil Std 461, 464 and RTCA testing laboratories in the world.

**For more information, please call 847-537-6400  
or visit us on the web at [www.dlsemc.com/class201.htm](http://www.dlsemc.com/class201.htm)**

## Lab News

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High power loads, auxiliary equipment and noisy mechanical drives are often required to test large systems. Since D.L.S. is concerned about the work environment, we have built 11' x 20' x 12' annex sound-reduction rooms. These annex rooms allow for remote mechanical power to be brought in via a noise-controlled annex, without exposing the personnel to high-level audio noise.



Large test chamber with auxiliary cooled shield room and noise controlled annex.

We have also added 6' x 6' x 7' RF shield rooms for auxiliary loads and support equipment. All annex rooms allow the support equipment to be cooled in an area separate from the main chamber, allowing airflow of up to 15,000 cubic feet per minute (cfm). D.L.S.'s entire facility is air-conditioned to create an ideal work environment.

Heat can be transferred using our Ethylene Glycol distribution system, which is available to the test rooms and is cooled by a 120,000 BTU/h chiller (10 tons).

Many large systems require large amounts of AC power. Our facility has 2000 Amps supplying up to 480 Volts, 3-phase, 60 Hz. We also have 400 Hz at 60 kW.

**For more information on Mil Std 461 and RTCA testing, go to [www.dlsemc.com/test461.htm](http://www.dlsemc.com/test461.htm)**



Entry doors are 6' x 7' and can easily be made into 8' x 8'



AC power entry at D.L.S. facility



Agilent 4411B spectrum analyzers

## Standards Update

### RTCA DO-160E

#### Summary of EMC Changes

In March, Honeywell hosted an RTCA SC-135 meeting in Glendale, Arizona to discuss changes for the next revision, RTCA/DO-160F, which is expected to be finalized in late 2007. DO-160E was finalized and approved as of December 2004. Josh Bakk, a D.L.S. EMC test engineer with expertise in RTCA, attended the meeting and has summarized for you some of the changes now in effect with RTCA/DO-160E.

#### *Section 15: Magnetic Effect*

All cables, including power leads, are now to be grouped into one bundle and routed along the east-west axis of the compass, as is the EUT. The EUT must now be rotated, while keeping the cable bundle on the east-west line through the pivot of the magnet, to produce maximum magnetic deflection. A field uniformity test, with the EUT removed, must now be performed when the compass is moved toward the EUT, rather than the EUT moved toward the compass. The compass may not deflect more than 0.5 degrees when moved along the planned path toward the vacant EUT location. Depending on the complexity of the EUT, test plans may require tailoring.

#### *Section 16: Power Input*

DO-160 changed Power Input more than any other section – there now are more requirements and categories. The additional AC categories distinguish between constant and variable frequency systems. DC categories distinguish the DC sources between transformer-rectifier units, engine driven alternator/rectifiers, DC generators with significant battery capacity and all other types of aircraft electrical systems. These changes first appeared in DO-160D, Change No. 2.

#### *Section 17: Voltage Spike*

Section 17 has not changed in Revision E.

#### *Section 18: Audio Frequency Conducted Susceptibility*

The number of categories has jumped from four to nine for Section 18 of DO-160E with the same approach as Section 16. The power limit has increased from 30W to 100W. Testing to the new Section 18 will take much longer due to the 30 frequencies per decade, 60 seconds per frequency requirement. Thermal damage and other heating effects occurring only after some time has driven this 60-second requirement. Be aware of this when being quoted DO-160E testing and avoid a lab that quotes impossibly fast Section 18 test times.

#### *Section 19: Induced Signal Susceptibility*

Section 19 has been changed in DO-160E to take the EUT primary power supply installation into account. There are now 12 categories, three for each of the four categories in DO-160D, representing the three possible primary

power situations: constant frequency (including dc), narrow frequency range & wide frequency range. No levels were increased, but the narrow and wide frequency categories extend the frequency range tested for three of the four Section 19 tests; Section 19.3.4 remains unchanged. Also, frequency scan rates are now defined at 30 frequencies per decade at 10 seconds each or 5 minutes per decade continuous sweep, so 19.3.2 and 19.3.3 test times will be increased.

#### *Section 20: RF Susceptibility (Radiated and Conducted)*

Section 20 was the subject of many changes from D to E, most of which were first established in DO-160D, Change No.1. Categories A through L were added so the test level would be based on the expected level of aircraft attenuation at the EUT installation location and the appropriate HIRF environment. The RS reverberation chamber alternate procedure now does not allow mode stirred (continuous tuner rotation) operation. Mode tuned (stepped tuner rotation) operation is now the only reverberation chamber method allowed.

#### *Section 21: Emission of RF Energy*

The only changes made to Section 21 are the replacement of the log spiral antenna with the double-ridged horn and the modification of the Category H radiated emissions curve.

#### *Section 22: Lightning Induced Transient Susceptibility*

Multiple burst and multiple stroke cable bundle injection has been added to DO-160 and first appeared in DO-160D, Change No. 3. More clarity relating to pin injection and single stroke cable bundle injection have also been added but the basic procedures and levels for these methods have not changed. Pin injection with power applied to the EUT will now be required more often. Only EUT with “only passive components” are exempt.

#### *Section 25: ESD*

Section 25 has not changed in Revision E.

#### *Summary*

The changes we have seen are sometimes subtle and sometimes they have a major effect on the testing requirements. Please review the changes described and confirm you are ready for them when you go for testing. We will continue to see changes to RTCA DO-160 when the special committee-135 finds that changes become necessary to insure the safety of aviation. One piece of news announced is there will no longer be changes released for a given letter revision of DO-160 but a new letter version will be issued. DO-160F will be next, expected late 2007. It is important to keep on top of these changes to insure products you design will meet the new requirements and that we continue to test to the latest requirements. If you keep in touch with D.L.S. by faxing page 4 with your return address, we will try and keep you abreast of changes as we become aware of them. Please contact D.L.S. for how we can help you meet your RTCA/DO-160 testing needs.

D.L.S. Electronic Systems, Inc  
1250 Peterson Drive  
Wheeling, IL 60090  
847-537-6400 www.dlsemc.com

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*Special Military & RTCA Edition of*

# **DLS NEWS** & views

To help keep you better informed  
EMC, Safety, Radio

**DLS NEWS**  
& views

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## Welcome to our special edition of **DLS News & Views for Military and Commercial Aviation**

Our goal in this edition is to inform you about new developments in the area of Mil Std 461 & RTCA testing and standards and how D.L.S. is striving to meet your testing needs. Josh Bakk, D.L.S. test engineer, attended the most recent meeting of the RTCA/DO-160 Standard Committee 135 and shares some of the insights he gained.

We have continued to expand our facilities in Wheeling and Genoa City in order to stay ahead of the curve in our testing capabilities. We can now test to 200 V/m to 40 GHz.

We are also very excited to introduce, for the first time ever in July, an EMC Design Seminar/Workshop specifically for Mil Std and RTCA.

We sincerely hope you enjoy and gain knowledge from this newsletter.



*Don*

Donald L. Sweeney  
President

P.S. If you would like to receive future editions of our newsletter, please fax this page with your address to 847-537-6488.