

10CFR and Aviation: New NRC Regulations Impact Service of Legacy Instruments

BY GEORGE WILHELMSEN

Thinking about aircraft of the past, some AEA members can remember the use of radium, a radioactive silvery element used to coat instrument faces to make them glow in the dark without external lighting.

In the area where I live, Luminous Dial was close by and was responsible for coating many of these instruments and indicators used in military and non-military aircraft. The company also turned into an EPA Superfund site years after it closed, leaving radioactive "hot spots" all over the area where the former factory was located.

The coating process included the incorporation of radium, a radioactive element emitting relatively harmless alpha particles, which can be shielded by a piece of paper, and dangerous gamma rays, which require more shielding, and typically were mixed with a phosphor. As the radium emitted its radiation, the phosphor glowed, giving the desired ability to read the instruments at night without lighting.

Unfortunately, the hazards of being in proximity to radium weren't understood, and while it proved a boon for night bombing and the war effort, its use has been largely abandoned for decades. However, this abandonment has not eliminated the plethora of radium-laced instruments existing in the field, both in flying condition and as paperweights on the desks of countless pilots and ex-crewmembers.

While the phosphor has long since lost its glow, the radium is still decaying. With a half-life (the amount of

time it takes an atom to decay to half its value) of 1,599 years, the radium will continue to provide a low dose of radiation exposure to anyone in proximity to one of these legacy devices.

NRC Involvement, New Regulation

The regulations governing aircraft are found largely within the FAA and FCC matrix, with most shops also falling under the provisions of 29CFR and OSHA regulations. Based on the discovery of a large cache of this legacy instrument in the warehouse of a California instrument firm, which subsequently was declared an EPA Superfund site for remediation, along with other issues associated with medical and accelerator products, the EPA compelled the Nuclear Regulatory Commission to develop regulations to control these devices.

Your regulatory affairs staff at the AEA was involved and engaged in this rulemaking process. As a result of its efforts, the regulations are simple to comply with for a majority of shops. Shops working on such legacy instrument in the past should make sure they do not have an issue that could cause an increase in cancer risks for their employees, as well as new rules to incorporate into their shop manuals to ensure they stay within the new regulations.

These new regulations went into effect Nov. 30, 2007.

Here are the sections of the new regulation in 10CFR31.12, along with interpretations of what they mean:

a) A general license is hereby issued to any person to acquire, receive, possess, use or transfer with the provisions of paragraphs (b), (c) and (d) of this section, radium-226 contained in the following products manufactured prior to Nov. 30, 2007:

1 and 2) These sections apply to radium-filled antiquities and clock faces/hands, and are not included.

3) Luminous items installed in air, marine or land vehicles.

Section (a)(3) applies to products inside air, marine or land vehicles. There is no limit to the number of devices that can be installed in such vehicles.

4) All other luminous products, provided no more than 100 items are used or stored at the same location at any one time.

Section (a)(4) provides the basis for a shop having instruments on hand. If a shop has instruments and/or other radium devices on hand in excess of 100 items, the shop must reduce the number of devices to less than 100 to stay within the limits for holding a general (no-cost) license. The AEA has worked with the NRC to ensure this is assessed at a particular location — such as if you have an East Coast branch and West Coast branch, each gets to have no more than 100 items, not 100 items between the two branches. From the perspective of the regulator, having 100 items in one building and 100 items in another building at the same address is considered having them at the same location and would be a violation requir-

ing a license other than general.

Two specific licenses are available for items in excess of 100 in the Schedule of Fees:

- 3.R.1 allows possession of items containing radium-226 identified in 10CFR31.12, which exceed the number of items or limits up to 10 times for a \$590 application fee and a \$2,100 annual fee.

- 3.R.2 allows exceeding 10 times the number allowed in 10CFR31.12 for a \$1,400 application fee and a \$2,700 annual fee.

Neither of these licenses allows your shop to perform any work on such instruments.

b) Persons who acquire, receive, possess, use or transfer byproduct material under the general license issued in paragraph (a) of this section are exempt from the provisions of 10 CFR Parts 19, 20 and 21 and § 30.50 and 30.51 of this chapter, to the extent that the receipt, possession, use or transfer of byproduct material is within the terms of the general license; provided, however, that this exemption shall not be deemed to apply to any such person specifically licensed under this chapter.

This is very important as it eliminates the reporting and red tape usually associated with the possession of such items. However, if your shop is licensed by the NRC to handle and work on such instruments, this provision does not apply to the licensed shop.

c) Any person who acquires, receives, possesses, uses or transfers byproduct material in accordance with the general license in paragraph (a) of this section:

1) Shall notify the NRC should there be any indication of possible damage to the product so that it appears it could result in a loss of the radioactive material. A report containing a brief description of the event, and the reme-

dial action taken, must be furnished to the Director of the Office of Federal and State Materials and Environmental Management Programs, U.S. Nuclear Regulatory Commission, Washington, D.C., 20555-0001 within 30 days.

Contamination is the spread of radioactive material in an area where it is not desired. The vernacular used in nuclear power when an area is contaminated is “crapped up.” The NRC is concerned about the spread of contamination due to breached devices. Thus, the NRC is requiring a written report within 30 days of the discovery of any indication of damage where it could result in a loss of radioactive material.

Because radium breaks down to radon, a cracked case or glass on an instrument could cause a loss of radioactive (gaseous) material resulting in airborne contamination, and it must be reported. The remedial action taken should be sufficient to contain any contamination, and it includes placing the instrument in a sealed container, such as a can or bucket with a sealed lid, properly immobilized to ensure further damage does not occur, and transferring the damaged equipment to a licensed facility for repair or a licensed facility for disposal. It is not acceptable to the NRC for you to repair such devices to eliminate the leak — this is specifically prohibited under the general license. You could transfer the device, appropriately immobilized to prevent the spread of contamination, to a licensed repair facility.

2) Shall not abandon products containing radium-226. The product and any radioactive material from the product may only be disposed of according to § 20.2008 of this chapter or by transfer to a person authorized by a specific license to receive the radium-226 in the product or as otherwise approved by the NRC.

The NRC wants to ensure radium-226 instruments are not allowed into

general waste streams or are walked away from. This regulation requires the product be disposed of at a licensed radioactive waste facility. Several years ago, a cobalt-filled radiation therapy machine was improperly abandoned in a garbage dump and resulted in the deaths of dozens of villagers in Mexico who had broke the machine open and rubbed the glowing metal on their body.

3) Shall not export products containing radium-226 except in accordance with Part 110 of this chapter.

This is written clearly: It prohibits the export of any radium-226 instrument unless you are specifically licensed to export such instruments. This is a new restriction to prevent U.S. shops from exchanging such instruments with non-U.S. entities unless licensed.

4) Shall dispose of products containing radium-226 at a disposal facility authorized to dispose of radioactive material in accordance with any federal or state solid or hazardous waste law, including the Solid Waste Disposal Act, as authorized under the Energy Policy Act of 2005, by transfer to a person authorized to receive radium-226 by a specific license issued under Part 30 of this chapter, or equivalent regulations of an agreement state, or as otherwise approved by the NRC.

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5) Shall respond to written requests from the NRC to provide information relating to the general license within 30 calendar days of the date of the request, or other time specified in the request. If the general licensee cannot provide the requested information within the allotted time, it shall, within that same time period, request a longer period to supply the informa-

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tion by providing the Director of the Office of Federal and State Materials and Environmental Management Programs, by an appropriate method listed in § 30.6(a) of this chapter, a written justification for the request.

The NRC likes reports. While not within the regulation, having experience with the NRC allows me to provide you with some insight regarding what a typical inspector is looking for. To ensure the NRC you have your inventory under control and, thus, have demonstrated your shop does not warrant time-consuming inspections, you'll need to:

- Know what you have on hand, which includes a description of each item and any model and serial numbers, allowing each item to be tracked. If a device does not have this information, the shop should create a tracking system and append the information. This can be as simple as "Radium-226 Artificial Horizon, Item No. 1" and so on, with each item uniquely tagged and identified, allowing it to be tracked. A picture or pictures tagged to the inventory number, along with a trackable storage location, will help demonstrate the proper control.

- Keep a log of all transactions of such instrument, tracking each item as it enters and noting the condition of the item on receipt, as well as all sales of such items and the location to which it was shipped.

- Account for everything moving in or out of inventory.

- Perform an annual inventory and verify the items on hand match your inventory. If a discrepancy is identified, it needs to be investigated and resolved. If the discrepancy is unable to be resolved, it needs to be reported to the NRC and might result in a violation.

- The NRC is accustomed to having license holders with procedures to

control such material. Having a written procedure to define this process and following the procedure help to ensure the NRC you have the situation under control.

While this section allows a shop more time to file a report, the written justification needs to be valid to the NRC. For example, "We currently are busy installing X on a deadline," or "Our records are not in order," generally are not accepted by the NRC and might result in a special inspection team arriving at your doorstep, the cost of which likely would be charged to your business.

d) The general license in paragraph (a) of this section does not authorize the manufacture, assembly, disassembly, repair or import of products containing radium-226, except that timepieces may be disassembled and repaired.

This means, unless you are licensed by the NRC at a cost of the application fee of \$4,600 and an annual fee of \$8,400, your shop cannot open or repair any radium-containing instrument. This includes the entire instrument, not just the faceplate, indicating needle or glass. This same section prohibits the import of any such instrument unless specifically licensed, which means your shop cannot receive such instruments from non-U.S. entities without being in violation of your general license.

Regarding NRC fees, 10CFR171.16(c) does offer the ability for licensees to qualify as a "small entity," with resulting lower fees. This requires the applying firm to file the appropriate certification Form 526, which can be accessed from the NRC website at www.nrc.gov, along with the payment of each annual fee.

For cases in which your business is not involved in manufacturing and has sales of between \$350,000 and \$6.5 million a year, your annual license fee to work on the instrument could be as

low as \$2,300. If your revenue is less than \$350,000, the annual license fee would be \$500.

Similarly, for manufacturers or educational facilities with an average of 500 employees or less, the annual license fee would be \$2,300. For manufacturers or educational with less than 35 employees the license fee would be \$500.

Form 226 must be filed each year for the renewal of these licenses to maintain these lower rates. Failure to file the necessary Form 226 can result in your shop being assessed the full amount in the regulation by the NRC.

While timepieces are allowed to be disassembled and repaired, unless your shop is skilled, equipped, and has the correct procedures and work practices in place to handle contaminated equipment, our advice is to not take such actions — the potential liability for spreading contamination in your shop and potentially allowing its ingestion by your staff is too great.

Categorizing Your Existing Inventory

If you are like many shops, you might have accumulated one to hundreds of these devices. Of particular concern are associations with collections, such as the EAA or local museums, which fall under this regulation but might not recognize it.

In any event, you need to figure out which of these instruments potentially contain radium-226 and which ones do not, and thus are not included in this regulation.

The following screening approach can be used to streamline the process:

- If an instrument was produced after 1980, it has a high probability of being free of radium-226. Segregate these instruments from other instruments that might contain radium-226 to maintain proper control.

- If an instrument was produced between 1960 and 1980, it is suspect.

Unless manuals are available clearly describing the materials used, a professional radiation technician should be contracted to survey the instruments and tag any suspect items or those confirmed as containing radioactive material for inventory purposes. Similarly, any instrument that can screen out as clean can be moved to the instruments in the clean category for general distribution.

- Instruments produced prior to 1960 have the same actions as those produced between 1960 and 1980. However, because they were produced in a time period during which the use of radium-226 was accepted, segregate them and label them as potentially containing radium-226 until confirmed otherwise.

Because radium-226 is a gamma emitter, it will clearly show through the instrument glass and casing if tested by a qualified radiation technician using a Geiger-Mueller meter. Skilled personnel are available on a contract basis from a variety of firms serving the existing nuclear power industry; they also can provide you with someone who is skilled and knowledgeable regarding radiation and contamination concerns.

Other Things to Look For

One of the biggest risks in a shop is what is sitting on the back shelves in your storeroom. If your shop existed prior to the 1960s or has accepted any military surplus, you could have a container of radium-226-laced paint on your shelves — although it is unlikely having such a container would exceed the exemption criteria for the general license by several orders of magnitude.

A review of your inventory is warranted. If you find unmarked suspect containers, rather than opening them, contact a contract radiation protection technician to survey the containers.

If you are unable to locate such a

technician, try this simple test: Purchase a roll of 12-exposure, 400-speed film for each suspect can, then tape a roll to each can. Label each roll and each can so they can be tracked. Separate any cans in this test from other suspect cans by 10 feet, as distance is an effective shield. Leave the roll of film in place for at least a week, then get the film developed. If the film comes back anything but black (gamma rays will cause white speckles or will bleach the film white in cases where a significant radiation source is present), you have found a problem.

If such material is found, it needs to be isolated from all personnel immediately, roped off and labeled as “Radioactive Material.” A contract radiation technician should be brought in and the material surveyed to ensure you properly label the storage area as required by regulations and to assist in preparing the material for shipment for disposal. Once categorized by a radiation protection professional, you likely will need to promptly report the problem to the NRC.

The best suggestion for disposition would be to contact a licensed special waste hauler and pay the necessary fees to have the material documented and disposed of in a NRC-licensed facility.

Past Work on Legacy Instruments

If your shop has worked on this type of legacy instrument in the past, you should have a contract technician perform a radiological survey of your shop workspaces to ensure your shop does not have small piles of radium-226 contamination creating dangerous “point sources” of exposure for your employees.

If such spots are found, a qualified radiation technician can clean them up properly, and they must be disposed of in a NRC-licensed disposal facility.

Consider changes that have been

made to your shop when you request a survey. You might have added a building or moved the workspace. Check both the old and the new areas to ensure you have accurately assessed the potential threat. Vacuum cleaners and air handling units can concentrate airborne materials into a point source. If you have used such ventilation systems or clean-up systems, they need to be surveyed as well to ensure they are not contaminated.

The AEA has worked hard to ensure the new regulation is as friendly to the average avionics shop as is reasonably possible. The savvy shop manager should take action promptly to understand the scope of the issue, engage professional assistance, and get in compliance with the new regulation. Remember, 10CFR31.12 isn't just a good idea — it's the law.

The NRC does impose civil penalties and personal penalties upon entities not in compliance with NRC regulations. When you speak to or correspond with NRC personnel, you need to be honest and truthful; if you are not, you risk running afoul of 10CFR50.9, “Completeness and Accuracy of Information,” which can incur from the above penalties.

About the author: In addition to a background in electronics and writing for various aviation magazines, George Wilhelmsen is the engineering rapid response manager at Exelon's LaSalle generating station. He has 25 years experience in the nuclear power industry and working in radiologically controlled areas, as well as experience reading and understanding NRC regulations. □

If you have comments or questions about this article, send e-mails to avionicsnews@aea.net.

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