J.RADIOANAL.NUCL.CHEM.,LETTERS 146 (3) 145-149 (1990)

ANALYTICALLY SPEAKING

The column of our corresponding editor

W. S. LYON

CONSULTANT
OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE 37831, USA

THE TNA BOMB DETECTOR

Will the thermal neutron activation (TNA) bomb detection method bomb out? No! say the commercial purveyors of TNA machines, which are even now being installed in selected airports in the USA and abroad. Yes! say certain consultants to the Federal Aviation Administration, the technique is too slow, too costly and too lacking in sensitivity. Recent trial runs seem to support both views. Conflicting results seem not unusual to persons working in applied science but are disconcerting to the lay public. Not to mention lawmakers in the USA who have watched the FAA spend some $45 million over the past ten years for development of TNA and other technology. Readers of THIS JOURNAL are certainly as competent as any to analyze the situation concerning NAA applications to security in aviation, so let's look at the problem.

---

*Research sponsored by the Office of Energy Research, U.S. Department of Energy, under contract DE-AC05-840R21400 with Martin Marietta Energy Systems, Inc.

Elsevier Sequoia S. A., Lausanne
Akadémiai Kiadó, Budapest

Many 'old-timers' can remember the excitement of NAA applications that was generated some 30 or so years ago. The AEC's Division of Isotope Development (DID) was strongly pushing all kinds of uses for radioelements and NAA. At that time suggestions were made as to how NAA could be used to trace the source of explosives (usually dynamite) used in airplane and other bombings. The idea of adding a trace element (different for each manufacturer) was brought up, but since the same idea had been broached for practically every other item that might be used in a criminal activity-paper, ink, lead for bullets, powder used in ammunition, etc.) - the procedure died aborning.

In the '80's, and now the '90's, the problem becomes even more difficult. So called plastic explosives seem to be the main weapon used by terrorists in bombings. Commonly used explosives are RDX and PETN, both organic compounds containing nitrate. It is nitrogen that the TNA method attempts to measure.

The TNA detector is used to search for bomb material in baggage. The machine contains a ^{252}Cf source and an array of detectors. Baggage is passed in front of the neutron source where nitrogen is activated and an array of 80 NaI detectors look for the 10.8 MeV γ-ray indicative of nitrogen. Initial requirement was that the machine detect bombs of at least 2.5 pounds (1.13 kg). A secondary inspection, X-ray Enhanced Neutron Interrogation (XENA) has been ordered by FAA to be a part of the TNA system. XENA superimposes an X-ray image over the TNA one and looks for additional parts such as batteries and detonaters. About 10 bags per minute can be examined. At the sensitivity setting outlined above the machine has a 95% success rate. What this means in the real world of baggage testing was stated in a letter to