Radiation Detection Equipment

An Arms Control Verification Tool

Product No. 211P

This pamphlet was prepared for the Defense Treaty Inspection Readiness Program (DTIRP) to promote ***Readiness Through Awareness*** throughout the Department of Defense (DoD) and defense contractor community. The pamphlet is intended to assist facility Commanders, security officers and treaty implementers with identifying the purposes, obligations and potential security impacts of arms control treaties and agreements.

For the latest information on New START treaty implementation, see the New START Treaty Synopsis http://dtirp.dtra.mil/TIC/synopses/start.aspx, the New START Treaty Texts and Fact Sheets http://dtirp.dtra.mil/TIC/treatyinfo/start.aspx, and the Nuclear Corner http://dtirp.dtra.mil/NC/nc.aspx on the DTIRP Website at http://dtirp.dtra.mil.

Additional copies of this pamphlet can be requested and downloaded from the Products page on the DTIRP Website http://dtirp.dtra.mil/Products/Products.aspx#NewStart and by contacting the DTIRP Outreach Program by phone at 1-800-419-2899 or by email dtirpoutreach@dtra.mil.

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INTRODUCTION

Experience has shown that the use of radiation detection equipment (RDE) provides treaty partners with a high degree of confidence in the inspection team's ability to verify treaty compliance. It has also shown that the rigorous procedures established for using RDE allow in-country escorts and site personnel to ensure facility safety and security.

When these procedures are combined with managed access techniques and appropriate security countermeasures, treaty implementers are effectively able to both demonstrate compliance while also protecting national security and confidential business information.

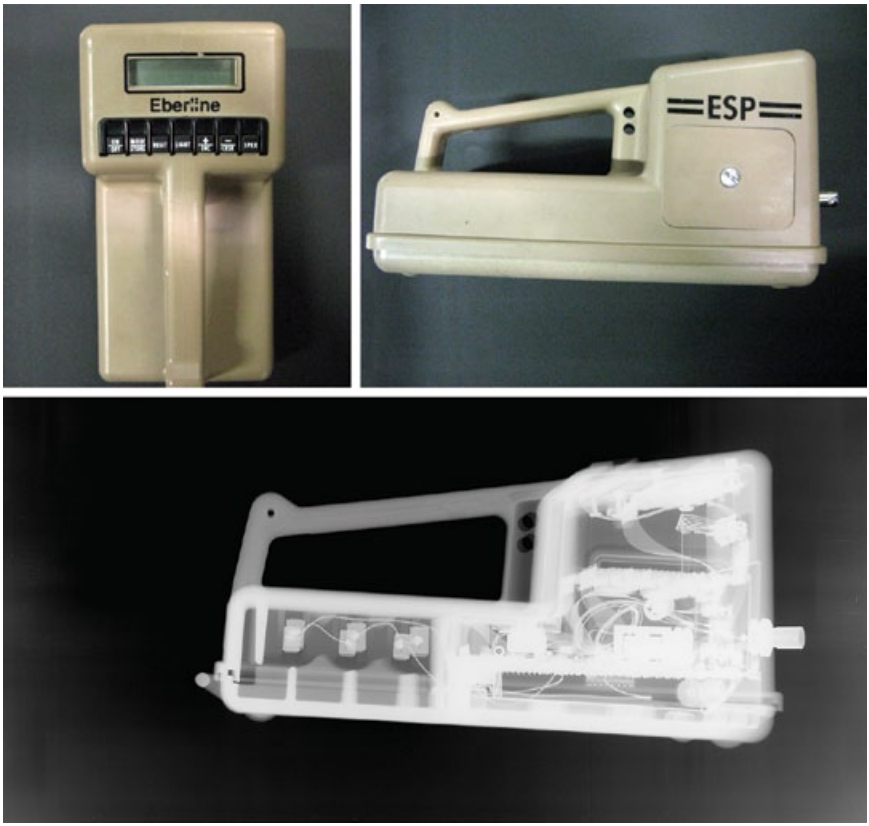
The United States and Russia have had RDE sets in place since 1995 for the purpose of taking radiation measurements during on-site inspection activities. This equipment was first used under the Intermediate-Range Nuclear Forces (INF) Treaty. RDE was also used under the Strategic Arms Reduction Treaty (START) that expired on December 5, 2009. Currently, RDE is approved for use under the new START treaty (New START) that entered into force on February 5, 2011.

This pamphlet describes RDE and some of the procedures for using this equipment. The pamphlet also describes the procedures for approving RDE for use in the United States and for ensuring it is safe to operate at U.S. facilities.

WHAT IS RDE?

Radiation detection equipment (RDE), as defined in the context of this pamphlet, is equipment that is designed to detect the presence, or confirm the absence, of radioactive materials. RDE accomplishes this task by counting the number of neutrons emitted from decaying radioactive materials – specifically uranium and plutonium.

The U.S. RDE set was designed by Sandia National Laboratories and consists of a custom-built neutron detector plus commercial off-the-shelf components. It is "simple" in the sense that it is designed to accomplish one specific purpose – to count neutrons – and requires little maintenance.



Modified U.S. Eberline ESP-2 Electronic Counters

RDE Use Under INF

RDE was originally developed for the use of U.S. inspectors during on-site inspection activities conducted to verify compliance with the Intermediate-Range Nuclear Forces (INF) Treaty. Specifically, this equipment was developed to help U.S. inspectors verify the elimination of Soviet SS-20 [RT-21M] missiles at converted missile bases.

SS-20 [RT-21M] missile on mobile launcher

Under INF it was agreed that all SS-20 missiles and their operating bases were to be eliminated. However, the Soviet Union indicated during treaty negotiations that it intended to convert some SS-20 operating bases to SS-25 [RS-12M] inter-continental ballistic missile (ICBM) bases instead of eliminating them. The challenge for the United States was to verify that no SS-20 missiles remained at the converted bases.

This verification challenge was enhanced because the canisters used for SS-25 ICBMs were large enough to contain an SS-20 missile and both types of missiles utilized a sealed launch canister mounted on a mobile launcher. A significant difference was that SS-25 ICBM's contained a single warhead whereas SS-20 missiles were capable of carrying three warheads.

Initially the United States argued that U.S. inspectors should be allowed to view inside an SS-25 launch canister to confirm that an SS-20 missile was not present. The Soviet Union was firmly opposed to this approach. After further negotiations,

the Soviet Union agreed to allow U.S. inspectors to use RDE to measure the neutron flux (the number of neutrons per square centimeter) emanating from a launch canister.

A launch canister with a missile containing a single warhead (SS-25) would emit a different number and pattern of neutrons than a launch canister containing a missile with three warheads (SS-20). A U.S. inspection team using RDE to examine a canister declared to contain an SS-25 missile could compare its measurements against a set of benchmark radiation measurements to confirm that the canister did not contain an SS-20.

BENCHMARK MEASUREMENTS

In July 1989, the United States conducted a number of special inspections on SS-20 and SS-25 missiles to establish benchmark neutron flux measurements. U.S. inspectors transported three sets of RDE to Moscow. As agreed in previous negotiations, the Soviet Union selected one of the RDE sets to purchase. The United States stored one set in Moscow and transported one set to the inspection site where it was used to take the benchmark measurements.

Approximately 100 measurements were taken on each of two randomly selected mobile launchers containing an SS-20 missile and two randomly selected mobile launchers containing an SS-25 missile. Over 80 measurements were taken on a 4 x 4 meter horizontal plane, a ½-meter below each launch canister.

Measurements were also taken at ½-meter intervals along the top of the launch canister and along a vertical line to the left front side of the launch canister, no closer than ½-meter from the canister. This RDE benchmark measurement data was confirmed on site by the Soviet escorts and became the standard against which all subsequent radiation measurements were compared.

INF TREATY OPERATIONS

Under INF, only the United States used RDE during on-site inspection activities. In the Soviet Union and its successor states, U.S. inspection teams followed all regulations required to ensure that a low-level radioactive calibration source was stored and transported in a safe and secure manner.

When RDE was used during inspection activities, it was used to determine whether there were indications that an SS-20 missile system was present at a former SS-20 missile operating base that had been converted for a missile system "not subject to the treaty" (the SS-25). Radiation measurements were taken at up to ten points in the 4 x 4-meter horizontal plane and at up to four points along the top of the canister for each of the nine SS-25 ICBMs stored at the base (see Image 1).

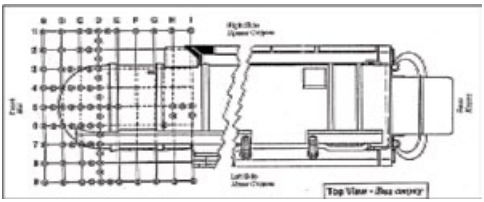


Image 1: **Grid positions for horizontal measurements**

With experience, U.S. inspectors and Russian escorts were able to reduce the amount of time required to complete all 14 measurements on an SS-25 from more than three hours to about 1½ hours. Russian escorts participated in the radiation measurement process by positioning the detector at the locations specified by the U.S. inspection team and by calculating and recording the neutron flux data at each measurement point.

After completing each measurement the two Parties compared the results with the RDE benchmark measurement for that point on an SS-25 ICBM. After all 14 measurements were completed, the missile was considered to be a missile "not subject to the treaty" if none of the data differed by more than 50 percent from the respective benchmark data. If the data for any point "busted flux" (differed by more than 50 percent), Russian escorts agreed to open the launch canister and to allow U.S. inspectors to visually confirm that the missile was not an SS-20.

After the radiation measurements for all nine launch canisters were completed, the U.S. inspectors also had the right to randomly select one launch canister and to ask the Russian escorts to open it for visual inspection. This provision was added to increase confidence in the inspection process and could be utilized regardless of the outcome of the RDE measurements.

Between 1989 and June 1996, the United States used RDE to help verify compliance with the INF Treaty during 27 inspections. No SS-20 missiles were found. In addition to the randomly selected SS-25 launch canisters opened

during each inspection, four canisters were opened at two SS-25 missile bases due to "busting flux." It was found that the reason these radiation measurements differed from the benchmark by more than 50 percent was because there were no warheads on those SS-25 ICBMs.

Russian Mobile ICBM Base (SS-25 [RS-12M or 12M2])

Beginning in July 1996, U.S. inspectors no longer encountered SS-25 launchers or ICBMs at SS-25 bases converted from former SS-20 operating bases. The mobile launchers were routinely on field exercises. Although U.S. inspection teams were prepared to use RDE from 1996 until inspections ended under INF on June 1, 2001, there was never again an opportunity to use RDE under this treaty.

RDE Use Under START

The Strategic Arms Reduction Treaty (START) between Russia and the United States entered into force on December 5, 1994. START included provisions allowing RDE use for purposes of detecting the presence of nuclear material in the following two situations:

- to confirm the absence of long-range nuclear air-launched cruise missiles (LRNA's) during an inspection of a weapons storage area at an airbase used for heavy bombers (HBs) not equipped for LRNA's; and
- during a reentry vehicle (RV) inspection (RVOSI), to determine whether an object in the front section of an ICBM or submarine-launched ballistic missile (SLBM) declared to be non-nuclear, was, in fact, non-nuclear.

Although START entered into force in December 1994, the United States and Russia did not agree on procedures for RDE use until September 1995. The delay was due in part to a difference of opinion about the type of RDE to be used. Recognizing that both Parties were familiar with the RDE used under INF and that both Parties had confidence in its capabilities for detecting only the presence of radiation, and nothing more, the Parties agreed to use the same set of RDE used under INF. Unlike INF, no benchmark measurements were taken.

Since the Russian RDE set was developed from an American RDE system, the Russian RDE was capable of using the same calibration source as the U.S. RDE set in the event Russian inspectors chose to exercise their right to use RDE in the United States.

The On-Site Inspection Agency (OSIA, forerunner of the Defense Threat Reduction Agency's (DTRA) On-site Inspection Directorate) developed the procedures for using the Russian RDE in the United States. OSIA also trained U.S. escorts to transport the low-level radioactive calibration source to the inspection site and to store it securely while the inspection team was at the site. These procedures were in accordance with Nuclear Regulatory Commission (NRC) and Department of Defense (DoD) regulations.

Before the Russian RDE was approved for use in the United States, U.S. Technical Equipment Inspection (TEI) technicians examined it in the presence of Russian inspectors. During this operations test, the RDE was partially disassembled, examined, photographed, reassembled and tested to ensure that it operated properly and could not perform functions unrelated to the treaty.

Russian RDE undergoing an operations test at the U.S. Technical Equipment Inspection (TEI) facility

RDE USE UNDER NEW START

Similar to its predecessors, the New Strategic Arms Reduction Treaty (New START or NST) also contains provisions for the use of radiation detection equipment (RDE). This treaty between the United States and Russia entered into force on February 5, 2011. On-site inspection activities began approximately 60 days later, in April 2011.

Under New START, the treaty's extensive verification regime enables the Parties to conduct two types of on-site inspections – Type One inspections and Type Two inspections. According to treaty provisions, RDE may only be used during Type One inspections and only for the purpose of demonstrating to the inspectors that the following objects, declared by a member of the inspected Party's in-country escort team to be non-nuclear objects, are, in fact, non-nuclear:

- an object located on the front section of a deployed intercontinental ballistic missile (ICBM) or submarine launched ballistic missile (SLBM); or
- an object located on or in a designated heavy bomber (HB).

New START also established the Bilateral Consultative Commission (BCC) as the forum where the Parties meet at least twice each year to discuss and resolve questions concerning treaty compliance. Within this forum, the Parties may agree to use RDE provided by the inspected Party. If no such agreement is reached, the Parties will use the RDE provided by the inspecting Party.

Components of the U.S. Radiation Detection Equipment (RDE) set under New START

Examinations, Operability Checks and Storage

Each Party may examine and check the operability of RDE sets stored at the point of entry (POE) in order to be certain of the equipment's operability and the validity of its readings. The procedures for these examinations and operability checks, as well as for storing RDE sets at the POEs associated with inspection sites where RDE may be used, are specified in Part 5, Section VI of the Inspection Annex to the treaty Protocol and are summarized below.

RDE PROVIDED BY THE INSPECTED PARTY

First Examination and Operability Check

If agreement is reached in the BCC on using RDE provided by the inspected Party, the inspecting Party will have an opportunity to examine each item prior to the first inspection during which such RDE is used. The purpose of this initial examination is to enable the inspecting Party to be certain of the RDE's operability and the validity of its readings.

The inspected Party will provide one item of each model of its RDE to the inspecting Party, for examination or purchase, along with documentation describing the equipment's physical principles and operational design features. No later than 30 days after receiving these items, the inspecting Party is obliged to inform the inspected Party whether it agrees that such RDE may be used.

Initial POE Storage, Examination and Operability Checks

After the inspected Party is informed that its own RDE may be used for inspections conducted on its territory, the inspected Party will store at least one set, but no more than three sets, of RDE at each of its POEs associated with sites where RDE may be used. Representatives of the inspecting Party will then have an opportunity, in the presence of representatives of the inspected Party, to examine each RDE set and to conduct operability checks.

The inspected Party will provide a neutron radiation source for the examination, if requested, and the inspecting Party will be able to use individual dosimeters, or other agreed items, to ascertain that the source is emitting neutrons. The inspecting Party will be permitted to partially disassemble the RDE and to examine it using a variety of non-damaging methods. The examination must not impair the capabilities of the RDE to perform its functions connected with the purposes of Type One inspections.

After completing this examination, the inspecting Party will seal the RDE cases with its unique tamper-proof seals and the inspected Party will store the RDE in tamper-proof containers located inside a secure structure or room. Spare batteries and rechargeable batteries brought to the POE by the in-country escort for the RDE sets stored there, are subject to viewing by the inspectors.

Examination and Selection for Use during an Inspection

When an inspection team arrives at the POE, the inspectors may examine the tamper-proof containers in which the RDE is stored and may select one or more sets of RDE to confirm operability. The inspectors may also confirm the operability of each neutron detector in an RDE set and place the neutron detector in an agreed location. The maximum time limit for these activities is four hours and all activities are conducted in the presence of the in-country escort.

Most operability checks are conducted without the use of a neutron radiation source. A neutron radiation source may only be used once every two years to confirm the stability of the neutron detector and electronic counter.

The procedures for confirming operability without using a neutron radiation source involve taking measurements of background radiation. The inspectors begin by taking two measurements of the background radiation. They then calculate the average of these two values.

- If the difference between the two measurements is less than, or equal to, 30 percent of the average value, the RDE is considered to be operable.
- If the difference between the first two measurements is greater than 30 percent of the average value, a third measurement is taken.

This third measurement and the earlier measurement closest to it in value are used to calculate a new average.

- If the difference between these two measurements is less than, or equal to, 30 percent of the newly calculated average, the RDE is considered to be operable.
- If the difference between these two measurements is greater than 30 percent of the newly calculated average, the RDE is considered to be inoperable and cannot be used during the inspection. The average of all three measurements is then recorded as the average background radiation value.

When the inspectors are able to determine that the RDE containers have not been tampered with and are able to confirm that at least one set of RDE stored inside is operable, such an RDE set can be used during the inspection. At the discretion of the in-country escort, several sets of RDE from among those stored at the POE may be used during the inspection provided the inspectors were also able to confirm the operability of those additional sets.

- If none of the RDE sets stored at the POE are found to be operable, provided there are no signs that the RDE containers have been tampered with, the inspection will continue without the use of RDE. This fact will be recorded in the inspection activity report.

- If all of the RDE containers have been tampered with, as determined by the inspectors or the in-country escort, the inspectors may choose to examine one or all of the RDE sets stored inside to confirm operability. For this purpose, the time for designating the inspection site and the type of inspection will be delayed for up to 12 hours, if necessary, and as required for the inspectors to complete their examination and operability checks, and for the in-country escort to confirm the operability of such RDE.

RDE PROVIDED BY THE INSPECTING PARTY

If agreement is not reached in the BCC on using RDE provided by the inspected Party, the Parties will use RDE provided by the inspecting Party. Prior to the first inspection during which such RDE is used, the inspected Party will have an opportunity to examine each item to be certain the equipment is safe to operate on its territory.

The inspecting Party will provide one item of each model of its RDE (except the calibration source) to the inspected Party, for examination or purchase, along with documentation describing the equipment's physical principles and operational design features. No later than 30 days after receiving these items, the inspected Party is obliged to inform the inspecting Party whether it agrees that such RDE may be used.

Initial POE Storage, Examination and Operability Checks

After the inspecting Party is informed that its RDE may be used during inspections, the inspecting Party will bring at least one set, but no more than three sets, of RDE to each of the inspected Party's POEs associated with Type One

inspection sites where RDE may be used. Until this permission is given by the inspected Party, the inspecting Party may not bring any RDE to a POE on the territory of the inspected Party.

Each set of RDE will be subject to examination by representatives of the inspected Party in the presence of representatives from the inspecting Party. The inspected Party will be permitted to partially disassemble the RDE and to examine it using a variety of non-damaging methods.

The examination may not impair the capabilities of the RDE to perform its functions connected with the purposes of Type One inspections. The inspected Party is obliged to complete the examination within eight hours after the RDE arrives at the location at the POE where the procedures for examining inspection equipment are carried out. In the United States, there are two such locations: the Technical Equipment Inspection (TEI) facility near the east coast POE in Dulles, Virginia; and the TEI facility near the west coast POE in San Francisco, California.

After the examination is completed, and before departing the POE, the inspecting Party may confirm the RDE's operability and seal the RDE cases with its unique tamper-proof seals. The RDE will be stored inside tamper-proof containers provided by the inspecting Party. These will be located inside a secure structure or room.

To maintain the RDE's operability, the inspectors may bring equipment items with them when they arrive at the POE. The inspectors may bring calibration sources that are part of the RDE sets stored at the POE, spare batteries, rechargeable batteries, and an additional set of RDE. The inspectors may also remove and replace inoperable RDE. All such equipment is subject to examination by the inspected Party.

Examination and Selection for Use during an Inspection

When an inspection team arrives at the POE, the inspectors may examine the tamper-proof containers in which the RDE is stored. The inspectors may also examine and confirm the operability of the RDE stored inside. The maximum time limit for these activities is four hours and all such activities are conducted in the presence of the in-country escort.

The inspection team may select one set of RDE for use during the inspection. The operability of the selected RDE set will be confirmed at the POE immediately after the other inspection equipment has been examined.

- If the containers of at least one set of RDE stored at the POE have not been tampered with, and the inspectors are able to confirm the operability of the RDE inside, this set of RDE will be used during the inspection.
- If all of the RDE containers stored at the POE have been tampered with, and the inspectors brought an additional set of RDE with them, the inspectors may select this additional RDE set for use during the inspection.
- If none of the RDE containers stored at the POE show signs of being tampered with, any items of RDE found to be inoperable will be removed by the inspectors when they department the territory of the inspected Party.

RDE sets not used during the inspection will be stored at the POE inside tamper-proof containers provided by the inspecting Party. These containers will be located inside a secure structure or room.

If the inspectors brought an additional set of RDE that is not used during the inspection, this RDE set will also be securely stored at the POE inside tamper-proof containers. The inspectors will remove the additional RDE set after the inspection is completed and will take it with them when they depart the territory of the inspected Party.

Components of the Russian RDE set

Type One Inspections

During Type One inspections, the in-country escort may use RDE to demonstrate to the inspectors that certain objects declared to be non-nuclear objects, are, in fact, non-nuclear. These "inspected objects" may either be located on the front section of a deployed ICBM or SLBM, or in or on a designated HB. Throughout the inspection, the inspectors will observe the use of RDE.

After arriving at the site and before RDE is used to take measurements, the inspectors will confirm that at least one neutron detector from the RDE set is operable. If the inspectors are unable to confirm the operability of any of the neutron detectors, this fact will be recorded in the inspection activity report and the inspection will continue without using RDE.

Confirming operability includes having the in-country escort take measurements of the neutron radiation level of an object designated by the inspection team. It also includes measuring the background radiation level no less than 50 meters away from the front section of a deployed ICBM or SLBM, or from an HB.

INSPECTING DEPLOYED ICBMS OR SLBMS

To demonstrate that an "inspected object" located on the front section of a deployed ICBM or SLBM is, in fact, a non-nuclear object, the in-country escort may use RDE during a Type One inspection.

Preparing to Take Radiation Measurements

To take the necessary radiation measurements, the in-country escort may choose either to place the inspected object at least 50 meters away from the front section of the ICBM or SLBM, or to take the measurements while the object is located on the front section.

If the RDE is to be used while the inspected object remains on the front section, the in-country escort may use special shields to prevent neutrons from a reentry vehicle (RV) from striking the neutron detector. These shields may not block the inspected object from the neutron detector. Alternatively, the in-country escort may remove the RV(s) from the front section to a distance no less than 50 meters away from the front section.

The process of removing the inspected object from the front section and moving it to a "specially allocated site" where the radiation measurements are to be taken is carried out outside the view of the inspectors. The process of removing one or more RVs from the front section is also carried out outside the view of the inspectors, but, in both circumstances, these activities will be conducted in a manner that permits the inspectors to be certain that the inspected object is the same inspected object identified for radiation measurement.

For example, before the inspected object or RV(s) are removed from the front section, the inspectors will be allowed to view the specially allocated site where the radiation measurements will be taken. This will enable the inspectors to see that the site does not contain other objects similar to the inspected object. Then, throughout the process of removing the inspected object or RV(s), the inspectors may, at their choice, either observe all exits from the allocated site to ensure that no objects similar to the inspected object are delivered, or the inspectors may choose to seal all exits with their unique seals.

Taking Radiation Measurements

When the inspected object is in place and the in-country escort is ready to use the RDE to take radiation measurements, the inspectors may select the point on the inspected object where the radiation measurements are to be taken. To document this event, a description of the inspected object, in the form of a diagram, is recorded in the inspection activity report.

The in-country escort will position the neutron detector in a location specified by the inspectors, provided it is no closer than seven centimeters and no farther than two meters away from the surface of the inspected object. The neutron detector will be positioned at the same level as the measurement point and the sensitive surface of the neutron detector will face the measurement point on the inspected object.

The in-country escort will then take two measurements of the neutron radiation level. The average of the two measurements is recorded in the inspection activity report. If the average is less than or equal to the comparison number, the inspected object is determined to be, in fact, a non-nuclear object. If the average is greater than the comparison number, this fact is also recorded in the inspection activity report.

INSPECTING DEPLOYED HBS

To demonstrate that an "inspected object" located on or in a designated HB is, in fact, a non-nuclear object, the in-country escort may use RDE during a Type One inspection. If, during an inspection of a designated HB, it is necessary to take radiation measurements of several inspected objects located on or in an HB, the inspection team leader and a member of the in-country escort may agree to take radiation measurements of several inspected objects simultaneously.

Preparing to Take Radiation Measurements

To take the necessary radiation measurements, the in-country escort may choose either to place the inspected object at least 50 meters away from the HB, or to take the measurements while the object is located on the HB.

If the RDE is to be used while the inspected object remains on the HB, the in-country escort may use special shields to prevent neutrons from nuclear armaments located on the HB from striking the neutron detector. These shields may not block the inspected object from the neutron detector.

The process of removing the inspected object from the HB and moving it to a "specially allocated site" where the radiation measurements are to be taken is carried out outside the view of the inspectors. This process is also conducted in a manner that permits the inspectors to be certain that the inspected object is the same inspected object identified for radiation measurement.

For example, before the inspected object is removed from the HB, the inspectors will be allowed to view the specially allocated site where the radiation measurements will be taken. This will enable the inspectors to see that the site does not contain other objects similar to the inspected object. Then, throughout the process of removing the inspected object from the HB, the inspectors may, at their choice, either observe all exits from the allocated site to ensure that no objects similar to the inspected object are delivered, or the inspectors may choose to seal all exits with their unique seals.

Taking Radiation Measurements

Before taking radiation measurements of an inspected object removed from an HB, the in-country escort may cover the object with an individual soft cover that is incapable of masking the object's neutron radiation level. Containers are not permitted during these procedures.

When the inspected object is in place and the in-country escort is ready to use the RDE to take radiation measurements, the inspectors may select the point on the inspected object where the radiation measurements are to be taken. To document this event, a description of the inspected object, in the form of a diagram, is recorded in the inspection activity report.

The in-country escort will position the neutron detector in a location specified by the inspectors, provided it is no closer than seven centimeters and no farther than two meters away from the surface of the inspected object. The neutron detector will be positioned at the same level as the measurement point and the sensitive surface of the neutron detector will face the measurement point on the inspected object.

The in-country escort will then take two measurements of the neutron radiation level. The average of the two measurements is recorded in the inspection activity report. If the average is less than or equal to the comparison number, the inspected object is determined to be, in fact, a non-nuclear object. If the average is greater than the comparison number, this fact is also recorded in the inspection activity report.

Timer-Counter from the Russian RDE Set

List of Allowable RDE

Below is the list of RDE allowed for each Party under the New START treaty. The number beginning each item description is the quantity allowed per RDE set. Differences between the U.S. and Russian RDE sets are denoted by the *underlined italicized* text.

United States of America	Russian Federation
Quantity and Item description	**Quantity and Item description**
2 Neutron detectors, including preamplifiers with signal and power cables, counting time from 5 to 150 seconds, *Helium-3 system custom-built by Sandia National Laboratories*	2 Neutron detectors, including preamplifiers with signal and power cables, counting time from 5 to 150 seconds
2 Electronic counters, *modified Eberline ESP-2*, with instruction manual	2 Electronic counters with instruction manual
10 Plastic bags for weather protection	10 Plastic bags for weather protection
1 Americium-241-Lithium neutron source for calibration, emitting approximately 3000 neutrons per second, pre-calibrated by the inspecting Party	1 Americium-241-Lithium or *Curium-244* neutron source for calibration, emitting approximately 3000 neutrons per second, pre-calibrated by the inspecting Party
1 Toolkit	1 Toolkit
30 Spare batteries, miscellaneous sizes	30 Spare batteries, miscellaneous sizes
1 Stand for neutron detector	1 Stand for neutron detector
2 Measuring tapes	2 Measuring tapes
2 Battery-powered lights	2 Battery-powered lights
3 Programmable calculators, with instruction manual	2 Programmable calculators, with instruction manual
2 Thermometers	2 Thermometers
1 Stand for calibration source	1 Stand for calibration source
4 Instruction manuals, two copies in English and two copies in Russian	4 Instruction manuals, two copies in English and two copies in Russian
	2 Network Adapters
	1 Charging stand
	2 RS-232 cables
	2 RS-232 USB UPORT 1110 transformers
	2 Equipment bags
	2 Service software on CD

CONCLUSION

One of the most significant challenges for in-country escorts during on-site inspection activities is limiting the inspection team's ability to collect information beyond the purposes of the inspection. The procedures for examining, confirming operability, and using RDE are intended to assist in-country escorts with ensuring facility safety and security. Equally important, these procedures are designed to enable the inspectors to have confidence in their ability to verify treaty compliance.

The United States and Russia have used RDE in the past to verify compliance with the INF treaty and with the first START treaty, which expired on December 5, 2009. The two Parties may again use RDE under the New START treaty, which entered into force on February 5, 2011.

For More Information

New START treaty provisions relating to the use of RDE are found in the treaty text in the following locations:

- Treaty Text, Article III
- Inspection Annex (IA) Part 5 Section II (list of RDE)
- IA Part 5, Section VI (using RDE)
- IA Part 6, Section II (inspecting RVs on deployed ICBMs and SLBMs)
- IA Part 6, Section VI (inspecting deployed HBs)
- IA Part 9, Eighth Agreed Statement

To request assistance from the DTIRP Outreach Program or to obtain more information about arms control security and treaty implementation:

- Call the DTIRP Outreach Program at 1-800-419-2899
- Send an email to dtirpoutreach@dtra.mil

A broad range of additional information and materials are also available on the DTIRP website http://dtirp.dtra.mil:

- Products on New START: http://dtirp.dtra.mil/Products/Products.aspx#NewStart:
- New START treaty text and fact sheets: http://dtirp.dtra.mil/TIC/treatyinfo/start.aspx;
- New START treaty synopsis: http://dtirp.dtra.mil/TIC/synopses/start.aspx

LIST OF ABBREVIATIONS

BCC	Bilateral Consultative Commission
DoD	Department of Defense
DTIRP	Defense Treaty Inspection Readiness Program
DTRA	Defense Threat Reduction Agency
HB	Heavy bomber
ICBM	Intercontinental Ballistic Missile
INF	Intermediate-Range Nuclear Forces Treaty
LRNA	Long-Range Nuclear Air-Launched Cruise Missiles
New START	New Strategic Arms Reduction Treaty (NST)
NRC	Nuclear Regulatory Commission
NST	New Strategic Arms Reduction Treaty (New START)
POE	Point of entry
RDE	Radiation detection equipment
RV	Reentry vehicle
RVOSI	Reentry vehicle on-site inspection
SLBM	Submarine Launched Ballistic Missile
START	Strategic Arms Reduction Treaty
TEI	Technical equipment inspection

RELATED MATERIALS

To request copies of the products listed below, contact the DTIRP Outreach Program by phone at 1-800-419-2899 or by email at dtirpoutreach@dtra.mil. Visit the DTIRP Website at http://dtirp.dtra.mil to view, print or request DTIRP products.

DTIRP Website

Home page: http://dtirp.dtra.mil
Treaty Information Center: http://dtirp.dtra.mil/TIC/tic.aspx
Products: http://dtirp.dtra.mil/Products/Products.aspx
Nuclear Corner: http://dtirp.dtra.mil/NC/nc.aspx
Bi-Weekly Treaty Review: http://dtirp.dtra.mil/DTIRP/bwtr.aspx

CDs

Arms Control Treaties – A Reference Guide (407C)
New START – Automated Search Tool (234C)
The Arms Control OPSEC Process (930C)

Pamphlets

The Arms Control Inspector (406P)
Arms Control Agreements Synopses (408P)
Quick Reference Guide to Arms Control Inspection Timelines (410P)
Guide to Policy and Implementation Organizations (411P)
Arms Control Abbreviations and Acronyms (946P)
Arms Control Security: Challenges and Countermeasures (934P)
Arms Control OPSEC – Preparing U.S. Facilities for On-Site Inspections (943P)
DTIRP Arms Control Outreach Catalog (907P)

Articles and Bulletins

The New START Treaty (232A)
Comparing New START, SORT and START (236A)
The Risk of Inadvertent Technology Transfer (915A)
Counterintelligence and Arms Control (918A)
Arms Control Security Countermeasure Considerations (931A)
Importance of Conducting a Security Self-Assessment (935A)

Videos

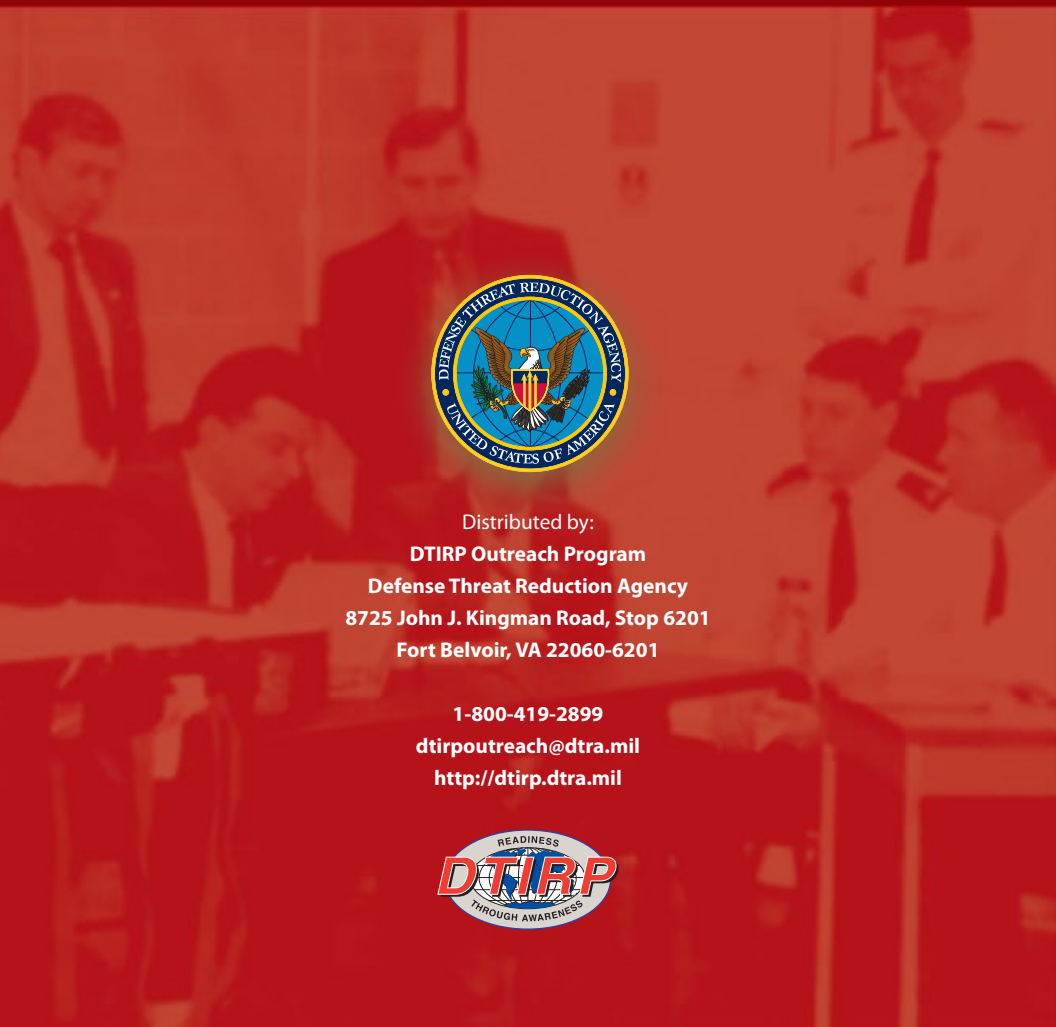
Verification Provisions – Point and Counterpoint (936W)
The TEI Process (950W)
Site Vulnerability Assessments (951W)

Brochures

DTIRP Brochure (911M)
Why TEI? (954T)

NOTES

Product No. 211P



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