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Annex I to CJTF SEVEN Operation Order No. 1-53

HEADQUARTERS, Joint Task Force SEVEN
 Washington 25, D. C.
 20 June 1953, 1600 R

RADIOLOGICAL SAFETY

1. Radiological safety of all task force military and civilian personnel is a command responsibility and radiological safety activities will be performed through normal command channels.
2. The Commander, Joint Task Force SEVEN will:
 - a. Specify the measures necessary to insure the radiological safety of task force personnel and furnish technical advisory assistance to task group radiological safety officers.
 - b. Inform CINCPAC of radiological hazards which may exist in areas outside of task force responsibility.
 - c. Maintain an information center (RadSafe Office) with displays of current air and surface radexes, radiological situation maps of atolls and peripheral aerial and surface areas and such other allied data as may be appropriate.
 - d. Designate monitors and couriers to accompany radioactive and special cargo shipments on sample return aircraft, and monitor loading and unloading of such cargo.
3. Prior to the on-site operational phase, task group commanders will:
 - a. Organize radiological safety units or elements within their task groups.
 - b. Require radiological safety personnel to review radiological safety procedures employed on previous operations and become thoroughly acquainted with existing training measures through attendance at appropriate Service schools.
 - c. Require radiological safety personnel to become qualified in the calibration and testing of standard RADIAC equipment.
 - d. Procure complete allowances of RADIAC equipment and special clothing. The requirements of CTG 7.5 will be included in the allowances for CTG 7.1 for necessary issue to TG 7.5 personnel during the operational phase and for subsequent loan or sale to CTG 7.5 for post-operational use at the proving ground.
4. The Commander, TG 7.1, having major technical radiological safety unit, will prepare to perform the following radiological safety services at ENIWETOK and BIKINI ATOLLS (using space provided by CTG 7.3 at BIKINI):
 - a. All ground monitoring services associated with scientific missions except those in conjunction with aircraft and airborne collection of scientific data.

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- b. Laboratory services and technical assistance to all task groups, to include:
- (1) Procurement of film badges and specified supplementary items of personnel radiological safety equipment.
 - (2) Laboratory services to develop and interpret film badges.
 - (3) Records of exposures from film badges. (Duplicates will be furnished task group commanders).
 - (4) Laboratory services for the radio-chemical analysis of water samples.
 - (5) Provision of primary facilities at PARRY ISLAND radiological safety building for calibration, repair and maintenance of instruments and storage of spare parts of RADIAC equipment. Similar limited facilities will be maintained at BIKINI during the operational phase at that atoll.
 - (6) Monitoring the removal and packaging of radioactive sources and samples except as indicated in paragraph 4a above.
- c. Provision of radiological safety surface situation maps after shot times to the task force commander and the the task groups requiring the information.
- d. Procurement and issuing of special high density goggles to specified personnel of the task force.
- e. Procurement of radiological safety clothing as necessary for TG 7.1, TG 7.5 and specified recovery personnel.
- f. Provision of technical personnel to inspect radiologically contaminated items for all task groups and certify destruction, disposal, or unserviceability of such items as required.
- g. Provision of personnel and equipment decontamination facilities for RadSafe survey and recovery operations.
- h. Limited fall-out studies within the Pacific Proving Ground for radiological safety documentation only.
- i. Assumption of radiological safety responsibilities of TG 7.5 during the overseas phase of operation.
- j. The integration within TG 7.1 of key radiological safety personnel made available by CTG 7.5. Such personnel will assist CTG 7.1 during the operational phase and will be assigned duties amenable to training in the fundamental radiological safety services to be assumed by CTG 7.5 upon completion of the overseas phase of the operation.
5. The Commander, TG 7.2 will prepare to perform the following:
- a. All ground monitoring services associated with ENIWETOK ISLAND,

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- except in those areas or activities assigned to other task groups.
- b. Provision and training of own radiological safety monitors, 50 of which will be "Q" cleared for emergency monitor support of TG 7.1 if required.
 - c. Provision and training of own contamination personnel, 10 of which will be designated for emergency decontamination support of TG 7.1 if required.
 - d. Provision of own RADIAC equipment and protective clothing.
 - e. Provision of own repair, spare parts and calibration facilities for RADIAC equipment.
 - f. Provision of contaminated clothing laundry facilities for TG 7.4.
6. The Commander, TG 7.3 will prepare to:
- a. Provide and train own radiological safety monitors, including one airborne monitor for each multi-engine aircraft crew assigned to TG 7.3.
 - b. Provide own RADIAC equipment and protective clothing.
 - c. Provide monitors and decontamination crews aboard each ship within the task group.
 - d. Provide own repair, spare parts and calibration facilities for RADIAC equipment.
 - e. While task force is embarked, provide space for use of the radiological safety unit of TG 7.1.
 - f. Provide decontamination facilities for own aircraft. Limited assistance will be furnished by CTG 7.4 if required.
 - g. Provide necessary helicopter air service for radiological surveys and post-shot recovery operations (monitors furnished by TG 7.1).
 - h. Collect lagoon water samples.
 - i. Provide water spray equipment aboard all vessels likely to be in the fall-out area.
7. The Commander, TG 7.4 will prepare to:
- a. Provide and train own radiological safety monitors, including one airborne monitor for each multi-engine aircraft crew assigned to TG 7.4.
 - b. Provide own RADIAC equipment and protective clothing.
 - c. Provide own repair, spare parts and calibration facilities for RADIAC equipment.

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- d. Provide primary decontamination crews and facilities for aircraft at ENIWETOK ISLAND and limited crews and facilities at the BIKINI airstrip.
 - e. Assist TG 7.3 in aircraft decontamination with TG 7.4 equipment, if required.
 - f. Provide necessary helicopter and liaison air service for radiological surveys and post-shot recovery operations (monitors furnished by TG 7.1).
 - g. Provide monitoring services for the removal and packaging of radioactive samples or data collected by aircraft.
 - h. Provide cloud tracking aircraft for post-shot radiological safety "situation data" up to radius of 500 miles in the significant quadrant for period of 48 hours, starting at approximately H plus 6 hours for each shot. (See para. 2c(3) of Annex J).
 - i. Promulgate the air radex for each shot.
 - j. Establish a simple code to be used in conjunction with the periodic weather reconnaissance reports to report approximate air radiation intensities encountered on regularly established weather reconnaissance or cloud tracking flights.
8. The Commander, TG 7.5 will prepare to:
- a. Develop a schedule of requirements for radiological safety services required from CTG 7.1.
 - b. Provide and train key radiological personnel for integration into and training with the radiological safety organization of TG 7.1 during the overseas phase of the operation. The total number and qualifications of such personnel will be as determined necessary by CTG 7.5 commensurate with the assumption of responsibilities indicated in 8c, below.
 - c. Assume residual task force radiological safety functions at the Pacific Proving Ground upon completion of the overseas phase of the operation. Required equipment and supplies will be made available at that time, to CTG 7.5 on a loan or sale basis from stocks provided by CTG 7.1.
9. Training. The inclusion of radiological safety organizations throughout the task force will require two general levels of training; basic indoctrination and technical training. The scope of instruction within each of these levels will vary in accordance with the requirements of different operational and staff levels. Basic indoctrination will include primary, non-technical instruction in radiological safety measures and techniques. This must be imparted to all personnel of the task force to enable them to perform their assigned duties efficiently within the allowable low exposures, regardless of the presence of radioactive contaminants. Technical training will include the training of the majority of the personnel who will be required to staff the task force radiological safety organizations and perform

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the technical operations involved. This will be accomplished through the utilization of existing Service courses and establishment of suitable courses at task group level. This instruction will be designed to train radiological defense monitors, decontamination personnel and radiological instrument repairman.

P. W. CLARKSON
Major General, U.S. Army
Commander

Appendix:

I - Radiological Safety Regulations

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HEADQUARTERS, Joint Task Force SEVEN
Washington 25, D. C.
20 June 1953, 1600 R

Appendix to Annex I
Radiological Safety, CJTF SEVEN Operation Order No. 1-53

RADIOLOGICAL SAFETY REGULATIONS

1. The Maximum Permissible Exposure (MPE) for personnel involved in this operation is 3.9 roentgens, gamma only, unless reduced because of previous or anticipated future exposure. All exposure to external gamma radiation will be regarded as total body irradiation. Special MPE of 20 roentgens, gamma only, is authorized for crew members of air sampling aircraft. The maximum permissible exposures as stated above are applicable to a field experimental test of nuclear devices in peacetime, wherein numbers of personnel engaged in these tests have been previously exposed or will be continuously exposed to potential radiation hazards. It may become necessary from a study of personnel records to reduce the MPE for certain individuals who have participated recently in other atomic tests. Under a military tactical situation or emergency the maximum permissible exposures above do not apply.
2. All atoll land and lagoon areas in or near which a detonation takes place will be considered contaminated until cleared for operations by the task force commander. Entry to and exit from contaminated areas will be via RadSafe check points only.
3. Contaminated land areas of intensities greater than 100 mr/hr will be delineated as such; Personnel entering these areas must be accompanied by a monitor and will be subject to clearances by the RadSafe Officer, TG 7.1. RadSafe clothing and equipment will be issued to the personnel.
4. Contaminated land areas of intensities less than 100 mr/hr and greater than 10 mr/hr will be controlled areas; Personnel entering these areas will be subject to clearance by the RadSafe Officer of TG 7.1. Monitors will not be required for entry into these controlled areas.
5. Contaminated land areas of intensities less than 10 mr/hr will be considered unrestricted from a RadSafe viewpoint. Areas coming within this limitation will be designated specifically by CJTF SEVEN prior to unrestricted entry.
6. RadSafe monitors assigned to individuals or groups working in contaminated areas or with contaminated equipment during recovery operations will act in an advisory capacity to keep the recovery party leader informed of radiation intensities at all times. The recovery party leader is expected to accept this advice and act accordingly. It is the responsibility of both the leader and the members of the recovery party to adhere to the limits established in these regulations.
7. Film badges, dosimeters and protective clothing (coveralls, booties, caps, gloves, dust respirators, etc.) as deemed necessary will be issued to personnel entering contaminated areas by appropriate task

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group RadSafe supply sections.

8. All personnel within viewing distance of an atomic detonation who are not supplied with protective goggles will turn away from the detonation point and close their eyes during the time of burst. At least 10 seconds should be allowed before looking directly at the burst.
9. The arrival and proposed use of radioactive sources at the Pacific Proving Ground will be reported to the Task Force Radiological Safety Officer.
10. All samples of radioactive material which are couriered in aircraft will be packaged and loaded so as to reduce radiation to a minimum. The RadSafe Officer of TG 7.4 will have a survey made of the package to determine if adequate precautions have been taken. The following criteria will determine space and packaging requirements:
 - a. Prior exposure of aircraft and courier personnel.
 - b. Anticipated future exposures on trip.
 - c. Length of time of exposure on trip.
 - d. In all cases, crew members will be limited to exposure rates of less than 20 mr/hr.
11. All air and surface vehicles or craft used in contaminated areas will be checked through the appropriate task group decontamination section upon return from such areas.
12. The Maximum Permissible Limits (MPLs) of contamination listed herein are to be regarded as advisory limits for control of contamination under average conditions, and are subject to revision by waiver from the task force commander in individually designated cases when extenuating circumstances indicate the need and justification therefor. All readings of surface contamination are to be made with Geiger counters, with tube walls not substantially in excess of 30 mg/cm² with shield open. The surface of the probe should be held one (1) inch to two (2) inches from the surface that is under observation unless otherwise specified. In all cases other than emergency or tactical situations the ultimate criteria will be limited by the authorized MPEs for personnel, with measurements made using standard equipment and techniques for such exposure. Special instances may arise after shot time such as in the case of an air-sea rescue within the atoll lagoon and inside the surface radex in which rescue operations will be carried out, without regard to the radiological hazard. Monitors aboard rescue craft shall be required to determine the extent of the actual radiation hazard experienced in order that appropriate medical tests may be initiated. For emergency operations, the criteria prescribed for tactical situation (para. 13 below) will be used as a guide. For operational purposes the MPLs presented below will not be considered applicable to spotty contamination provided such areas can be effectively isolated from personnel.
 - a. Personnel and clothing MPLs are as follows:

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(1) Skin readings should not be more than 1 mr/hr. Complete decontamination by bathing will be utilized for readings in excess of this level. Beta radiation exposure to the hands should not exceed 30.0 rep/week.

(2) Underclothing and body equipment such as the internal surfaces of respirators should be reduced to 2 mr/hr.

(3) Outer clothing should be reduced to 7mr/hr.

b. Vehicle MPLs: The interior surfaces of occupied sections of vehicles should be reduced to 7 mr/hr. The outside surfaces of vehicles should be reduced to less than 7 mr/hr, gamma only, at five (5) or six (6) inches from the surface.

c. Ship and Boat MPLs:

(1) Operational clearances, implying that contamination exists and special procedures are required, will normally be granted by commanding officers on the technical advice of radiological defense staff members. In peacetime, a maximum fixed contamination level of 300 mr/week ordinarily will not be exceeded except for "Operational Necessity". For this operation an MPL of 600 mr/week will be used as the upper limit for "operational necessity" unless otherwise specifically raised or lowered. Fixed alpha contamination should not exceed 500 cpm (counts per minute) per 150 cm² of area.

(2) For ships and boats operating in contaminated waters, reasonable allowances will be made to differentiate between the relative contribution to the total flux from fixed contamination and that due to "shine" from contaminated waters. For this operation it will be assumed that not more than ten percent of the radiation flux entering the vessel through the sides is due to contamination which will remain fixed on the vessel upon reentry to uncontaminated waters. Ships and boats encountering levels of contamination greater than determined by the above will request special instructions.

(3) Final clearances, normally granted by commanding officers, will be given upon completion of the operation provided no point of contamination is greater than 15 mr/day (beta and gamma) and no detectable alpha exists.

(4) In general, boats operating in waters near shot islands after shot times may become contaminated. Monitors shall be aboard all boats operating after shot time, either as passengers or members of the boat crew, until such time as radiological restrictions are lifted.

(5) No ships with personnel shall be permitted inside the 1.5 p.s.i line unless specifically directed otherwise. Bearings of danger from immediate radioactive fall-out for ship operations will be established by CJTF SEVEN on the basis of forecast wind directions at the intended time of detonation. This danger section will be designated as surface radex. All ships of the task force shall be required to remain outside the surface radex - danger bearing, radial limitation and time restriction. However, if ships are directed tactically

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into the surface radex, movement of ships shall be governed by tactical exposure guides.

(6) Individuals on board ships of the task force shall be protected collectively from hazards of blast, heat and radioactivity by movement of the ships.

(7) It is desired to point out that the employment of the ships and units in TG 7.3, insofar as radiological safety is concerned, is not considered routine usage within the purview of NavMed P-1325, "Radiological Safety Regulations." Current revision of NavMed P-1325 indicates that its provisions will not apply for special operations such as field tests and that for such operations naval personnel will operate under regulations set forth by the task force commander. The regulations set forth herein have been designed as a reasonable and safe compromise considering conservation of personnel exposures, the international import of tests and the cost aspects of shot delays chargeable to excessive radiological precautions.

d. Aircraft MPLs:

(1) The interior surfaces of occupied sections of aircraft should be reduced to 7 mr/hr.

(2) No aircraft in the air at H Hour will be at slant ranges from ground zero less than as determined by the following effects unless specifically directed otherwise. (Based on maximum predicted yield and 20 mile visibility):

Blast (at predicted shock arrival): 0.5 p.s.i.
Thermal (H Hour): Fabric control surfaces: 1.0 cal/cm²
Metal control surfaces: 6.0 cal/cm²

After detonation no aircraft shall operate inside the air radex or closer than 10 nautical miles from the rising or visible cloud unless specifically directed otherwise. If a tactical or emergency situation arises where aircraft must enter the air radex, tactical exposure allowance shall apply.

(3) All multi-engine task force aircraft in the air at H Hour within 100 miles of the detonation point shall carry a person designated as radiological safety monitor equipped with suitable RADIAC equipment and a radex plot. This monitor shall be capable of calculating allowable exposures under both tactical and operational conditions.

(4) All persons in aircraft at shot time, or at subsequent times when engaged in operations in or near the cloud or radex track, shall wear film badges.

(5) Pilots and copilots of aircraft in the air at shot time shall use modified all-purpose .1 density filter goggles. Copilots should, as an extra precaution, cover their eyes with forearm at zero hour.

e. In air and water the following continuous levels of radioactivity are considered safe from the viewpoint of personnel drinking and breathing: (uc = microcurie).

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	<u>Beta or Gamma Emitter</u>	<u>Long-lived Alpha Emitters</u>
Water	5×10^{-3} uc/cc (at H-3 days)	10^{-7} uc/cc
Air	10^{-6} uc/cc	5×10^{-12} uc/cc

NOTE: In air for any 24 hour period after a shot, 10^{-4} uc/cc of which particles less than 5 microns shall not exceed 10^{-6} uc/cc).

13. All radiological safety operations for Operation CASTLE will be considered as routine and will comply with permissible radiological exposures for routine work, except "special operations" which must be specifically designated by CJTF SEVEN. In tactical situations the military commander must make the decision regarding allowable exposures. As military personnel are normally subject to only random exposure, health hazards are at a minimum. Current Department of Defense information on exposure to gamma radiation in tactical situations is indicated below:

- a. Uniform acute (immediate) exposure of 50 roentgens to a group of Armed Forces personnel will not appreciably affect their efficiency as a fighting unit.
- b. Uniform acute exposure of 100 roentgens will produce in occasional individuals nausea and vomiting, but not to an extent that will render Armed Forces personnel ineffective as fighting units. Personnel receiving an acute radiation exposure of 100 or more roentgens should be given a period of rest and individual evaluation as soon as possible.
- c. Uniform acute exposure of approximately 150 roentgens or greater can be expected to render Armed Forces personnel ineffective as troops within a few hours through a substantial incidence of nausea, vomiting, weakness and prostration. Mortality produced by an acute exposure of 150 roentgens will be very low and eventual recovery of physical fitness may be expected.
- d. Field commanders should, therefore, assume that if substantial numbers of their men receive acute radiation exposures substantially above 100 roentgens there is a grave risk that their commands will rapidly become ineffective as fighting units.
- e. Internal radiation hazards caused by entry of radioactive substances through the mouth, through the lungs or through cuts or wounds do not exist after an air burst. Internal hazards following a contaminating surface explosion may be avoided if ordinary precautions are taken. Only under unusual circumstances will there be internal hazard from residual contamination. This eliminates the necessity for masking and consequent reduction of tactical efficiency.

14. This appendix has been designed for reduced security classification in order to facilitate wide dissemination.

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