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HEADQUARTERS  
JOINT TASK FORCE SEVEN  
WASHINGTON 25, D.C.

27 JUL 1953  
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MRTA Nevada Proving Grounds  
1953

SUBJECT: Radiological Safety Regulations, Operation CASTLE

TO: Dr. John C. Bugher  
Director, Division of Biology and Medicine  
1901 Constitution Avenue  
Washington 25, D. C.

1. Attached hereto is Annex I and Appendix to Joint Task Force SEVEN Operation Order 1-53 in which the Operation CASTLE Radiological Safety plan and regulations are covered in detail. Operation Order 1-53 has been designed to delineate the necessary planning of all participants in the operation preparatory to the overseas phase. This order will subsequently be superseded by Operation Order 2-53 to be issued during the fall of 1953 and which will be the primary directive upon which the on-site phase of operations will be based.

2. Due to the special nature of field tests such as Operation CASTLE, it is the opinion of this headquarters that a policy of strict adherence to the radiological standards prescribed for routine work is not realistic. The intent in the attached annex is to strive for a reasonable and safe compromise considering conservation of personnel exposures, the international import of the tests and the cost aspects of delays chargeable to excessive radiological precautions.

3. It is requested that you review the attached Annex I and Appendix and provide this headquarters with your comments, suggestions and/or approval in order that the on-site operation order may reflect a set of rules mutually acceptable to all concerned.

4. A similar letter has been forwarded to the Surgeons General of the three Services.

FOR THE COMMANDER:

*Robert Chesney*  
ROBERT CHESNEY  
Major USAF

1 Incl  
Annex I and Appendix to CJTF  
SEVEN Operation Order 1-53  
(one copy)

WHEN SEPARATED FROM INCLOSURE, THIS DOCUMENT IS CLASSIFIED CONFIDENTIAL

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CLASSIFICATION CANCELLED

BY AUTHORITY OF DOE/OC, DUA Lt. G. R. /  
W. S. LAUSSEL J. DIAZ 4/6/81 NILES/AMM/TOR/WME  
APPROVED BY *W. W. Wilson* DATE 4/12/85

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

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

RADIOLOGICAL SAFETY

1. Radiological safety of all task force military and civilian is a command responsibility and radiological safety activities 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 outside of task force responsibility.
  - c. Maintain an information center (RadSafe Office) with disseminate current air and surface radexes, radiological situation maps and peripheral aerial and surface areas and such other activities may be appropriate.
  - d. Designate monitors and couriers to accompany radioactive cargo shipments on sample return aircraft, and monitor and unloading of such cargo.
3. Prior to the on-site operational phase, task group commander
  - a. Organize radiological safety units or elements within the task groups.
  - b. Require radiological safety personnel to review radiological safety procedures employed on previous operations and become familiarly acquainted with existing training measures through attend appropriate Service schools.
  - c. Require radiological safety personnel to become qualified in calibration and testing of standard RADIAC equipment.
  - d. Procure complete allowances of RADIAC equipment and specifications. The requirements of CTG 7.5 will be included in the instructions 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 operational use at the proving ground. **DOE**
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 at BIKINI):
  - a. All ground monitoring services associated with scientific data except those in conjunction with aircraft and airborne collected scientific data.

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## Radiological Safety CJTF SEVEN No. 1-53

- b. Laboratory services and technical assistance to all task groups to include:
- (1) Procurement of film badges and specified supplemental personnel radiological safety equipment.
  - (2) Laboratory services to develop and interpret film badges.
  - (3) Records of exposures from film badges. (Duplicates furnished task group commanders).
  - (4) Laboratory services for the radio-chemical analysis of 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 limitations will be maintained at BIKINI during the operational phase of that atoll.
  - (6) Monitoring the removal and packaging of radioactive materials and samples except as indicated in paragraph 4a above.
- c. Provision of radiological safety surface situation maps and briefings to the task force commander and the task groups receiving the information.
- d. Procurement and issuing of special high density goggles to designated 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, 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 radiological safety documentation only. DOE ARC
- i. Assumption of radiological safety responsibilities of TG 7.1 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 and training in the fundamental radiological safety services to be assumed by CTG 7.5 upon completion of the overseas phase of operation.
5. The Commander, TG 7.2 will prepare to perform the following:
- a. All ground monitoring services associated with ENIWETOX

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- except in those areas or activities assigned to other task groups.
- b. Provision and training of own radiological safety monitor which will be "Q" cleared for emergency monitor support of TG required.
  - c. Provision and training of own contamination personnel, 10 will be designated for emergency decontamination support of TG 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
6. The Commander, TG 7.3 will prepare to:
- a. Provide and train own radiological safety monitors, include airborne monitor for each multi-engine aircraft crew assigned 7.3.
  - b. Provide own RADIAC equipment and protective clothing.
  - c. Provide monitors and decontamination crews aboard each ship in the task group.
  - d. Provide own repair, spare parts and calibration facilities 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. Lix assistance will be furnished by CTG 7.4 if required.
  - g. Provide necessary helicopter air service for radiological 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, include airborne monitor for each multi-engine aircraft crew assigned 7.4. **DOE ARCH**
  - b. Provide own RADIAC equipment and protective clothing.
  - c. Provide own repair, spare parts and calibration facilities RADIAC equipment.

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- d. Provide primary decontamination crews and facilities for at ENIWETOK ISLAND and limited crews and facilities at the E strip.
  - e. Assist TG 7.3 in aircraft decontamination with TG 7.4, ec if required.
  - f. Provide necessary helicopter and liaison air service for gical surveys and post-shot recovery operations (monitors fu by TG 7.1).
  - g. Provide monitoring services for the removal and packagin radioactive samples or data collected by aircraft.
  - h. Provide cloud tracking aircraft for post-shot radiologic "situation data" up to radius of 500 miles in the significar rant for period of 48 hours, starting at approximately H plu 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 t ic weather reconnaissance reports to report approximate air intensities encountered on regularly established weather rec sance or cloud tracking flights.
8. The Commander, TG 7.5 will prepare to:
- a. Develop a schedule of requirements for radiological safe ices required from CTG 7.1.
  - b. Provide and train key radiological personnel for integra and training with the radiological safety organization of TC during the overseas phase of the operation. The total numbe qualifications of such personnel will be as determined neces CTG 7.5 commensurate with the assumption of responsibilities ted in 8c, below.
  - c. Assume residual task force radiological safety functions Pacific Proving Ground upon completion of the overseas phase operation. Required equipment and supplies will be made ava that time, to CTG 7.5 on a loan or sale basis from stocks pr CTG 7.1. DOE AF
9. Training. The inclusion of radiological safety organization out the task force will require two general levels of traini indoctrination and technical training. The scope of instruc in each of these levels will vary in accordance with the rec of different operational and staff levels. Basic indoctrina include primary, non-technical instruction in radiological s measures and techniques. This must be imparted to all perso the task force to enable them to perform their assigned dutt efficiently within the allowable low exposures, regardless of th sence of radioactive contaminants. Technical training will be the training of the majority of the personnel who will be re staff the task force radiological safety organizations and ]

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

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

Appendix:

I - Radiological Safety Regulations

OFFICIAL:

  
WILLIAM S. COWART, JR.  
Colonel, U.S. Air Force  
Assistant Chief of Staff, J-3

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HEADQUARTERS, Joint Task Force  
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 operation is 3.9 roentgens, gamma only, unless reduced because of previous or anticipated future exposure. All exposure to gamma radiation will be regarded as total body irradiation. MPE of 20 roentgens, gamma only, is authorized for crew members of air sampling aircraft. The maximum permissible exposures as above are applicable to a field experimental test of nuclear operations in peacetime, wherein numbers of personnel engaged in these operations have been previously exposed or will be continuously exposed to potential radiation hazards. It may become necessary from a review of personnel records to reduce the MPE for certain individuals who have participated recently in other atomic tests. Under a military situation or emergency the maximum permissible exposures as above do not apply.
  2. All atoll land and lagoon areas in or near which a detonation has taken 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 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 but greater than 10 mr/hr will be controlled areas; Personnel entering these areas will be subject to clearance by the RadSafe Officer 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 under this limitation will be designated specifically by CJTF SEVEN to unrestricted entry.
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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 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 operations.
  7. Film badges, dosimeters and protective clothing (coveralls, caps, gloves, dust respirators, etc.) as deemed necessary will be issued to personnel entering contaminated areas by appropriate

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- group RadSafe supply sections.
8. All personnel within viewing distance of an atomic detonation not supplied with protective goggles will turn away from the detonation point and close their eyes during the time of burst. 10 seconds should be allowed before looking directly at the
  9. The arrival and proposed use of radioactive sources at the Proving Ground will be reported to the Task Force Radiological Officer.
  10. All samples of radioactive material which are couriered in 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 material 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 less than 20 mr/hr.
  11. All air and surface vehicles or craft used in contaminated areas to be checked through the appropriate task group decontamination upon return from such areas.
  12. The Maximum Permissible Limits (MPLs) of contamination listed are to be regarded as advisory limits for control of contamination under average conditions, and are subject to revision by the task force commander in individually designated cases where attenuating circumstances indicate the need and justification. All readings of surface contamination are to be made with Geiger tubes, with tube walls not substantially in excess of 30 mg/cm<sup>2</sup> shield open. The surface of the probe should be held one (1) 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 personnel, with measurements made using standard equipment and techniques for such exposure. Special instances may arise after time such as in the case of an air-sea rescue within the atoll and inside the surface radex in which rescue operations will be carried out, without regard to the radiological hazard. Monitoring aboard rescue craft shall be required to determine the external actual radiation hazard experienced in order that appropriate tests may be initiated. For emergency operations, the criteria described for tactical situation (para. 13 below) will be used as a guide. For operational purposes the MPLs presented below will be considered applicable to spotty contamination provided such can be effectively isolated from personnel.
    - a. Personnel and clothing MPLs are as follows: DOE ARCHIVE

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

(2) Underclothing and body equipment such as the interna faces 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 hicles should be reduced to 7 mr/hr. The outside surfaces c should be reduced to less than 7 mr/hr, gamma only, at five six (6) inches from the surface.

c. Ship and Boat MPLs:

(1) Operational clearances, implying that contamination and special procedures are required, will normally be grante commanding officers on the technical advice of radiological staff members. In peacetime, a maximum fixed contamination 300 mr/week ordinarily will not be exceeded except for "Operational Necessity". For this operation an MPL of 600 m will be used as the upper limit for "operational necessity" otherwise specifically raised or lowered. Fixed alpha conta should not exceed 500 cpm (counts per minute) per 150 cm<sup>2</sup> of

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

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

(4) In general, boats operating in waters near shot isla shot times may become contaminated. Monitors shall be aboar boats operating after shot time, either as passengers or mem the boat crew, until such time as radiological restrictions lifted. DOE ARC

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

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

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

(7) It is desired to point out that the employment of tactical units in TG 7.3, insofar as radiological safety is concerned, is not considered routine usage within the purview of NavMed P-1 "Radiological Safety Regulations." Current revision of NavMed P-1 indicates that its provisions will not apply for special operations such as field tests and that for such operations naval personnel shall operate under regulations set forth by the task force commander. The regulations set forth herein have been designed as a reasonable safe compromise considering conservation of personnel exposure, the international import of tests and the cost aspects of shot time chargeable to excessive radiological precautions.

### d. Aircraft MPLs:

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

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

Blast (at predicted shock arrival): 0.5 p.s.i.  
Thermal (H Hour): Fabric control surfaces: 1.0 cal/cm<sup>2</sup>  
Metal control surfaces: 6.0 cal/cm<sup>2</sup>

After detonation no aircraft shall operate inside the air radex closer than 10 nautical miles from the rising or visible cloud 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 personnel radiation monitor as radiological safety monitor equipped with suitable equipment and a radex plot. This monitor shall be capable of indicating 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 trajectory 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. Copilot as an extra precaution, cover their eyes with forearm at zero exposure.

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

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	Beta or Gamma Emitter	Long-life Emitter
Water	$5 \times 10^{-3}$ uc/cc (at H-3 days)	$10^{-7}$
Air	$10^{-6}$ uc/cc	$5 \times 10^{-12}$

NOTE: In air for any 24 hour period after a shot,  $10^{-4}$  uc/cc 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 limits 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 limits. As military personnel are normally subject to only a small 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 an Armed Forces personnel will not appreciably affect their effectiveness as a fighting unit.

b. Uniform acute exposure of 100 roentgens will produce in all 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 more can be expected to render Armed Forces personnel ineffective within a few hours through a substantial incidence of nausea, weakness and prostration. Mortality produced by an acute exposure of 150 roentgens will be very low and eventual recovery of full physical fitness may be expected.

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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 command 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 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 a hazard from residual contamination. This eliminates the need for masking and consequent reduction of tactical efficiency.

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

OFFICIAL:

*W. S. Cowart Jr.*  
WILLIAM S. COWART, JR.  
Colonel, U.S. Air Force  
Assistant Chief of Staff, J-3

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

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