I O W A

R A D E F

P L A N

COPY

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A. ASSUMPTIONS:

1. Enemy Nuclear Attack

An attack on the nation, with nuclear weapons detonated in this state and adjoining states, could result in serious radioactive fallout contamination of broad areas and, to minimize casualties and speed recovery, would require optimum use of shelters and supporting countermeasures based upon measured radiation rates and total exposures of personnel.

2. Major Nuclear Disaster

Comprehensive safety regulations are applied in the handling of nuclear materials and in the operation of plants and equipment for the release of nuclear energy. Experience to date warrants confidence that the outstanding safety record will continue. However, the remote possibility of a catastrophic accident is still present.

B. MISSION:

1. The pre-emergency mission of the State - Radiological Defense Service--is the development of capabilities in State and local government for:

(a) The rapid detection, measurement, reporting, plotting, analysis, and evaluation of fallout contamination during the early period after attack.

(b) Fallout decontamination.

(c) Staff support to the director and other staff members in the technical aspects of radiological defense.

2. For the post-attack period, the mission is:

(a) The collection, evaluation, and dissemination of information relating to radiological hazards.

(b) Forecasting of probable areas of contamination and fallout arrival time to state agencies and local governments through established channels based on evaluation of collected information.

(c) Providing the radiological staff assistance needed for planning and directing the support of local governments.

(d) To act as a central point in the state for the summarization of radiological conditions for transmission to the Regional Office and as appropriate to local government, adjoining states, and other state agencies.

(e) To obtain data needed for planning and execution of specific recovery operations.

4. To coordinate and direct the exposure control and decontamination measures in the State EOC.

C. ORGANIZATION

1. The Radef organization, staffing, and line of succession for emergency operations are outlined in Appendix 1, "Organization for Emergency Radef Operations."

D. EXECUTION

Basic concepts of Radef Operations, task assignments, emergency actions, and coordinating instructions are in consonance with Part EXECUTION, Civil Defense TAB, of the State Emergency Operations Plan.

Concepts of Radef Operations and task assignments by level of government are outlined below.

1. State Civil Defense

Plan and implement state-wide Radef capabilities including:

(a) Assisting local government to develop capabilities indicated above.

(b) Establishing monitoring and reporting capabilities at state installations providing appropriate monitoring station dispersal.

(c) Administering state portions of Federal Assistance Programs for developing state and local Radef capabilities.

(d) Establishing, with federal assistance, state-wide programs for inspection, maintenance, and calibration of radiological instruments.

(e) Administering state programs and State Civil Defense portions of federal programs for training Radef personnel.

(f) Coordinating state Radef operations with those of Federal agencies having state-wide Radef assignments and

assisting with the coordination of local aspects of civil defense, military, and other Federal agency Radef operations.

(g.) Developing a trained State EOC Emergency Radef Operations staff to perform the following tasks:

(1.) Receipt, evaluation, and dissemination of UF data, NUDET reports, selected Radef-monitoring data from adjoining states, local and other civilian, federal and military sources.

(2.) Preparation and dissemination of radiological warning to the general public.

(3.) Preparation and summary reports of fallout arrival and representative radiation intensities across the state for transmission to lower and higher civil defense echelons, adjoining jurisdictions, and elements of Federal agencies (including military having state-wide CD assignments.).

3. Local Governments:

Assisted by state will:

(a.) Develop capability to monitor within public shelters to assure optimum use of the best protected areas; provide records of individual radiation exposures for use in post-shelter radiation control; provide monitoring capability for evaluating hazards of emergency missions outside of shelter.

(b.) Establish a system of monitoring stations to serve as dispersed centers for "on station" and mobile monitoring and reporting. Radiological data reported by these monitors provides the basis for decisions on shelter stay, the need for remedial movement or decontamination, and planning and executing recovery operations both before and after general release from shelter to the extent feasible monitoring stations will be established in public shelters.

(c.) Establish a trained EOC staff capable of planning, implementing, and directing the local portion of the Radef system; in emergency, the receipt, analysis, display, and evaluation of radiological data; reporting selected data to adjacent jurisdictions and higher civil defense levels; and providing staff support to the local director for planning and directing emergency operations.

(d.) Coordinate the application of existing skills and equipment to establish a decontamination capability and, in emergency, determine the need for and effectiveness of decontamination operations.

(e.) Coordinate Radef plans and operations with those of local, military, and other Federal installations having Radef assignments.

(f.) Providing assistance in coping with nuclear incidents as requested by proper civil defense authority.

E. EMERGENCY ACTIONS

1. The Radef staff will be alerted, its actions modified, and/or terminated in accordance with provisions of the basic plan and applicable directives.

2. Detailed time-phased procedures for emergency operations (SOP) are presented in Appendix 2, "SOP for Radef Operations".

F. COORDINATION

Coordination with other elements of state and local governments will be in consonance with the basic plan.

G. COMMUNICATIONS

Communications requirements are in consonance with the communications annex. Reporting requirements are in consonance with operational reporting, Appendix 3, "Reporting Procedures", and FG-E-5.5, "Radiological Reporting Procedures".

1. Control

Refer to basic Emergency Operations Plan.

2. Communications

Refer to Communications annex.

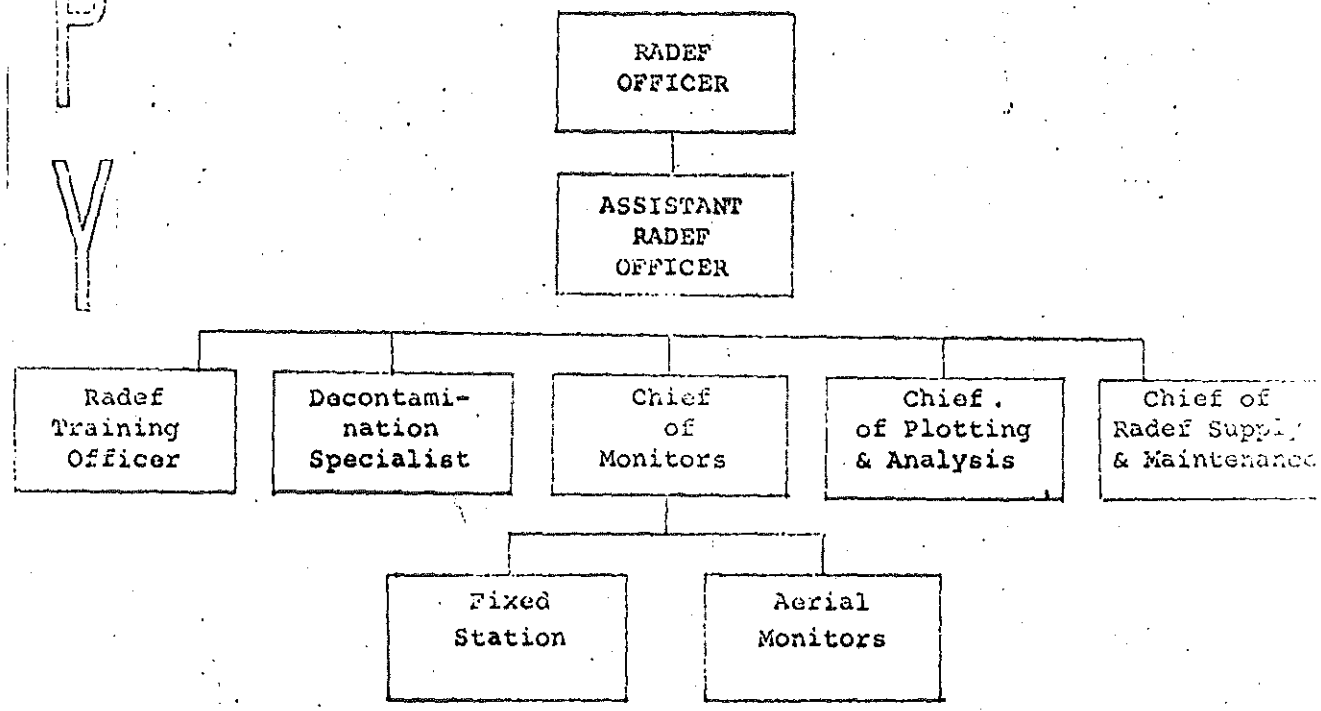
APPENDIX 1 - Organization for Emergency Radef Operations

A. MISSION

To provide capability for radiological monitoring and reporting; analysis, presentation, and evaluation of data; and technical staff support as a basis for (a) the control of radiation exposures of persons performing civil defense operations and (b) the direction of activities of the populace to minimize fallout radiation hazards resulting from nuclear weapons attack.

B. ORGANIZATION

1. Table of Organization



2. Staff

a. Radef Officer.

b. Assistant Radef Officer.

c. Radef Training Officer.

d. Chief of Plotting and Analysis.

e. Chief of Monitoring.

f. Decontamination Specialist.

g. Chief of Radef Supply and Maintenance.

C. EXECUTION AND OPERATIONAL RESPONSIBILITIES

1. Readiness Development Period

a. Organize and staff the emergency Radef service at the EOC.

b. Develop the planned operational capability through:

(1.) Recruitment and training of personnel.

(2.) Requests for radiological equipment.

(3.) Maintenance of personnel rosters.

(4.) Liaison with other civil defense elements.

c. Establish monitoring capability at selected locations.

d. Coordinate training and operational capability of other civil defense services performing monitoring functions.

e. Evaluate and perfect capability through tests and exercises by the various elements of government.

f. Provide authoritative public information to PIO on hazards of nuclear attack and protective measures.

g. In coordination with communications, provide for adequate communications for all Radef functions.

h. Prepare SOP's for:

(1.) Supply.

(2.) EOC Radiological Service Staff procedures.

(3.) Decontamination procedures.

(4.) Fixed monitoring station procedures.

(5.) Community shelter monitoring procedures.

2. Period of Extreme International Tension.

a. Place personnel on alert.

b. Perform operational check and users maintenance for equipment.

c. Disperse equipment not previously distributed for operational purposes.

d. Activate Radef Service at EOC with key personnel.

e. Maintain and plot UF data on current basis.

f. Supply UF wind vector plots for use by the EOC staff.

g. Check Radef Service supplies.

h. Check communications capabilities specifically assigned to Radef.

i. Prepare public information material for release through established channels.

3. At Warning That Attack is Imminent or Has Begun

a. Complete staffing of all radiological defense

installations in accordance with directives based on civil defense plan, or take protective action and report to duty stations.

b. Complete actions listed under "Period of Extreme International Tension," if required.

c. If no such warning was received, give the following priority:

(1.) Alert Personnel.

(2.) Staff Radef Service at EOC.

(3.) Prepare UP wind vector plots.

4. Post-Attack Period

In accordance with SOP's for:

(a.) Periods of high radiation hazard.

(b.) Operational recovery period.

(c.) Transition to near normal recovery periods.

RADEF PLAN

APPENDIX 2 - SOP for Radef Operations

A. The Radef staff will be alerted, its actions modified, and/or terminated in accordance with provisions of the basic plan and appropriate directives.

B. PRE-ATTACK ACTIONS

1. Emergency Radef actions are divided into two categories:

(a) Category 1 actions, which are predicated upon the Radef support to the over-all state mission; and

(b) Category 2 actions, which are predicated upon the internal security and welfare of the State EOC and its operating staff.

2. Category 1 actions (in support of State Operations) begin in CIVCON 3 or equivalent when:

(a) Radef Officers will begin to plot UF data for possible targets in State once each twelve hours.

1. UF will be from the 0341 and 1541 ZULU report.

2. The data from Rawin Stations located at Omaha, Nebraska, and St. Cloud, Minnesota.

3. A "streamline" over-lay showing wind direction and velocity in miles per hour will be prepared daily.

4. A forecast will be furnished based on current attack assumptions for the use of the command group, graphically presenting the areas of potential fallout contamination and the estimated time between the assumed detonation(s) and the arrival of fallout.

3. Upon declaration of CIVCON 2, or equivalent, Radef will take the following category 1 (in support of State Operations) actions:

(a) Will prepare overlay of streamlines from UF data once each six hours.

(b) Be continuously prepared to relocate Radef Operations to the state alternate protected area.

4. Category 2 actions (in support of State internal security) begin in CIVCON 4, or equivalent, when:

(a) All Radef instruments will be checked and prepared for release to the designated internal security staff.

(b) Upon declaration of CIVCON 3, or equivalent, refresher briefings for the security staff on the use of Radef instruments, monitoring techniques, and decontamination procedures will be conducted.

(c) Under CIVCON 3, dosimeters will be distributed to all members of EOC cadre staff.

(d.) Under CIVCON 2, or equivalent, dosimeters will be issued to internal security staff to complete the distribution to other emergency staff members.

(e.) Under CIVCON 2, monitoring instruments will be released to internal security staff.

(f.) Radef staff will supervise, furnish exposure control procedures, and guidance on monitoring techniques and decontamination procedures to the internal security staff throughout its pre-attack operations.

3. Post-Attack Actions

(a.) (Category 1 actions) Continually evaluate and graphically show development of State fallout condition from incoming intelligence.

(1.) Prepare fallout arrival times for dissemination to jurisdictions downwind of reported fallout, showing the probable arrival time in different geographic areas.

(2.) Continuously prepare NUDET locations and fallout predictions for the use of the intelligence office for:

(a.) Immediate attack analysis of the State for report to State agencies, Region Six, and local governments.

(b.) State preparation of "Daily Situation Summary" for State agencies, Region Six, and local governments.

(c) Receive, evaluate, and summarize Radef intelligence and report it to State agencies, Region Six, and local governments as required by established reporting procedures.

(3) Advise and assist local governments in the use of any of the following countermeasures against fallout:

(a) Shelter.

(b) Exposure.

(c) Remedial movements, and/or

(d) Decontamination.

(4) Consult with representatives (Radef) of USDA, Military, University, and Industry on effects of attack situation in their special areas.

(5) Keep informed of possible assistance which can be provided by Field Offices of AEC, DHEW, and others.

(6) Maintain Liaison with professional Health Physicists, to reinforce Radef technical capability in the State.

b. (Category 2 Actions) Continually evalute "monitored data" received from the Internal Security Staff.

(1) Prepare and maintain exposure records for all state EOC personnel.

(2) Report accumulated exposure dose of EOC personnel through the intelligence officer to the Command Group.

(3) Prepare daily situation report of State Headquarters for Command Group.

(4) Prepare graphs and tables of predicted accumulated personnel dose for the guidance of EOC personnel.

(5) Furnish continuous guidance to the intelligence officer on radiation exposure levels in the EOC to include:

(a) Criteria for emergency missions outside the State EOC protected area.

(b) The use of any Radef countermeasures, such as, selective use of EOC areas providing greater protection factor, regulated exposure control, remedial movement and decontamination.

RADEF PLAN

APPENDIX 3 - Radef Reporting Procedures

A. REPORTS REQUIRED

1. All Radiological reports will be forwarded in conformity with current instructions. This will include both the channeling of reports and the time and number of reports required.

a. Reports will be channeled from RAMONT stations to collecting points within the County/Municipal CD area and from County/Municipal CD EOC or collecting point to the District EOC for transmission to the State EOC in control.

b. The below listed reports will be prepared and forwarded according to current instructions.

(1) Readiness Reports (RAMONT Station to Co. EOC).

(2) Flash Reports (through chain of communication to State EOC).

(3) Dose-Rate Reports (through chain of communication to State EOC).

2. The content and format of the listed reports will be as follows:

(a) Readiness Report

Each monitoring station and selected public shelter

will submit to the local EOC one operational readiness report as soon as at least one monitor has reported for duty, batteries have been inserted in the instruments, and instruments have been found ready for use. The message will be brief, prefaced by the monitoring stations call letter or number previously assigned by the County Radef Officer, and followed by the single word "operational." This message will be transmitted to the local EOC in accordance with local communications SOP.

(b) Flash Reports

One Flash Report will be made immediately by the monitor to the local EOC when the radiation intensity initially reaches or exceeds 0.5 r/hr. The message will be brief and include the time of observation in local time, the stations preassigned designator, and the single word "fallout."

(c) Dose-Rate Reports

After the Flash Report, monitoring stations (some of them located at selected public shelters) will measure the outside, unsheltered dose-rate at least once every three (3) hours for the subsequent twenty-four (24) hours and report this dose-rate information to the local EOC. The three-hour reports will be based on monitoring observations taken at 0300Z, 0600Z, 0900Z,

1200Z, 1500Z, 1800Z, 2100Z, and 2400Z. (See time conversion chart reproduced in Handbook for Radiological Monitors, Chapter 9 and Appendix 9 of this plan.) From 24 hours through 48 hours after the Flash Reports, monitors will report dose-rate information to the EOC at least once each six hours, based upon fallout observations taken at 0300Z, 0900Z, 1500Z, and 2100Z. After 48 hours, Dose-Rate Reports will be transmitted to the EOC once daily, based upon observations taken at 0300Z. The Dose-Rate Report will be brief and concise and include the time of observation the station designator followed by the actual Dose-Rate Report in r/hr.

(d) Radiation Dose Reports

A report of the outside, unsheltered, accumulated radiation dose will be forwarded once daily to the local EOC based upon the dosimetric measurements made at 0300Z each day after fallout arrives. This report, verbal or written, may be appended to the Dose-Rate Report. The word "dose" is included in the message to separate the dose-rate from the dose and reduce the possibility of confusion.

B. REPORTS FROM DISTRICT EOC TO STATE

1. Flash Reports

When first reported from local EOC to District EOC.

2. Dose Rate Reports

a. Dose Rate Reports will be submitted from District to State EOC as a minimum of each 12 hours for the first 48 hours after the Flash Report. The dose rate reports will be based upon fallout observations taken at 0?00Z and 1500Z. Reports may be requested at more frequent times by the State Radef Officer if needed.

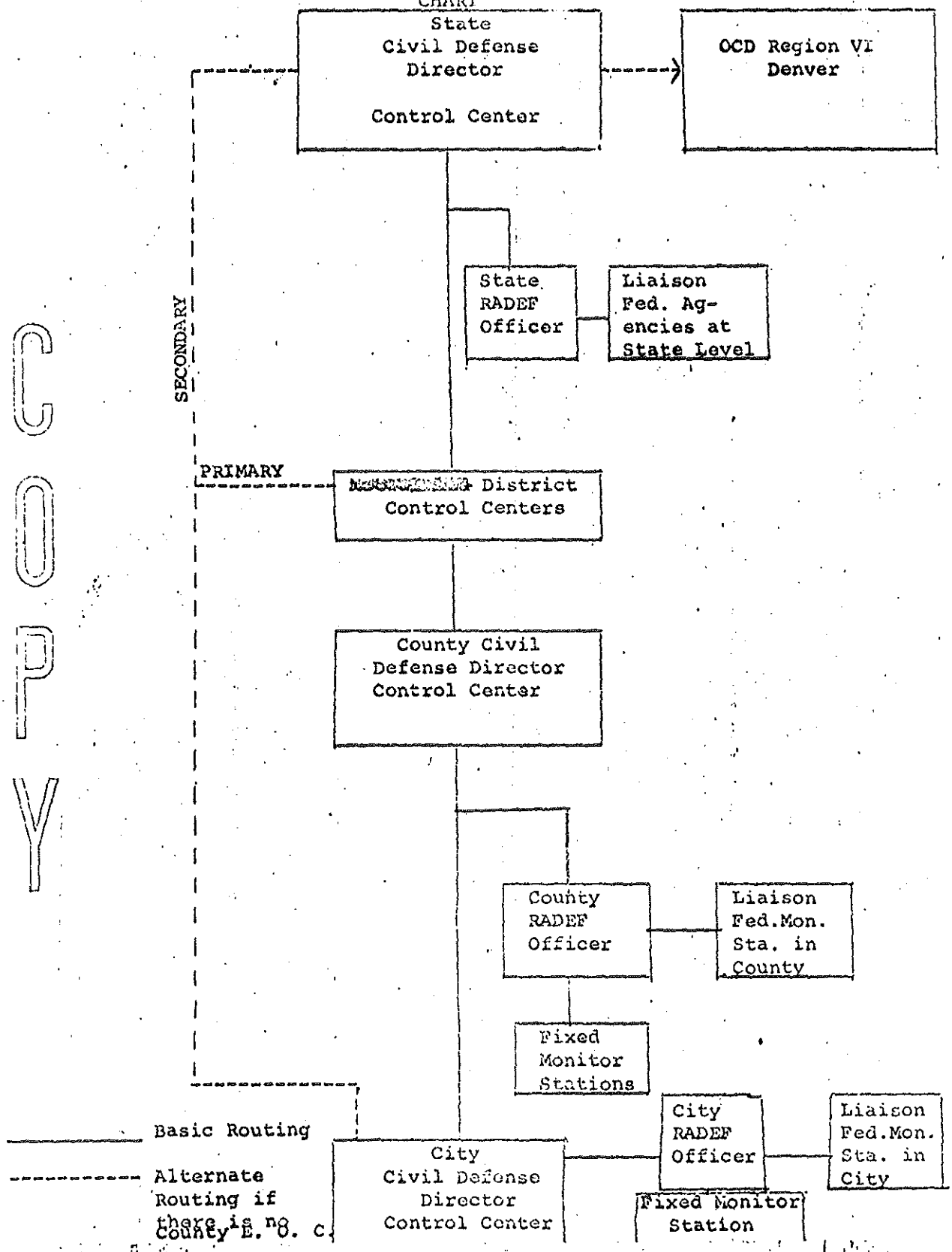
C. REPORTS FROM STATE EOC TO OCD REGIONAL LEVEL

1. During the first 12 hours after attack, the State Radef Officer shall forward to Region Six one Radef Situation Summary Report, indicating the spread of fallout across the State. The report will be brief and condensed, and will reflect the conditions at either 0300 or 1500 GMT, whichever occurs first after significant spread of fallout within the State.

2. The State Radef Officer shall forward to Region Six collectives of dose rate reports from the political subdivisions. Two sets of dose rate collectives will be forwarded during the first 24 hours. These reports will be based upon fallout observations taken at 0300Z and 1500Z. After the first 24 hours post-attack, a dose rate collective will be forwarded once daily, based upon the 0300Z observations.

RADIOLOGICAL DEFENSE CHANNELS CONTROL, COORDINATION AND REPORT

CHART



D. REPORTING SEQUENCE

1. County directors will devise a system of identifying their monitor stations and scheduling their reporting sequence. Reports of dose-rates must be scheduled to prevent over-loading of communications networks. Scheduling the reports will expedite the time required to relay the information from the observer to the National level.

Situation--During the first 24 hours subsequent to a nuclear detonation, dose-rate reports will be submitted to the County EOC's every three hours, commencing on 0300Z, 0600Z, 0900 Z, 1200Z, 1500Z, 1800Z, 2100Z, or 2400Z, whichever time the Flash Report most nearly coincides. Let us say the Flash Report was reported at 0830Z. That means the Dose-Rate Report is due at 0900Z and should be in to the County EOC in the shortest time possible so that the County Director's staff can begin plotting and evaluating the information. The County Director's staff can call for as many reports as needed to evaluate their own particular situation but should forward to their respective District EOC only one average dose-rate for the city or town in their county that appears in Appendix 3b. (More precise data concerning a particular county will be at the state's request.) The County EOC will use their county number for their one average dose-rate transmission to the District EOC.

(Situation continued) County EOC's should plan to transmit dose-rate information forward to their respective District EOC 30 minutes after the mandatory reporting time. As a minimum, County EOC's will submit Dose-Rate Reports representative of the fallout situation across their respective local areas each 12 hours during the first 48 hours subsequent to the Flash Report. The Dose-Rate Reports will be based upon fallout observations taken at 0300Z and 1500Z. Considering our 0830Z Flash Report in the example above, the county would submit a Dose-Rate Report for the 1500Z observation. The 1500Z observation will be forwarded by the County EOC to their respective District EOC (see ~~Appendix~~ page 3/a ~~3a~~). Example would be as follows: Lyon-Osceola-Cherokee-Dickinson-Emmet-Sioux-O'Brien-Clay-Palo Alto-Plymouth-Buena Vista-Woodbury-Ida-Monona counties would all report to District EOC number 5, located at Sioux City. The representative city for Lyon County is Rock Rapids, Osceola County is Sibley, Dickinson County is Spirit Lake, and so on. The Dose-Rate Reports should be for each of these centrally located areas. Counties can report in any order depending upon who has the available information first. The 1500Z report to Sioux City could go accordingly: County ~~1-40~~ 11-40r/hr, County ~~2-30~~ 10-30r/hr, County ~~3-20~~ 9-20r/hr. Each county reporting the average dose-rate for that observation for their respective

cities. If a county has no radiation readings above .5r/hr., their county number will be followed by a zero. For example, Dickinson County, City of Spirit Lake, does not have a reading above .5r/hr--the report would be County 3-0 ~~3-0r~~/hr.

2. The District EOC's will serve as a relay point for county messages to the State level. The District EOC reports should be reported to the State no later than one hour after the mandatory reporting time or one-half hour after receiving them from the counties. Reports are to be based on observations at 0300Z and 1500Z so the District EOC should send reports no later than 0400Z and 1600Z. Reports from Distric EOC's can be relayed in any order.

3. See the State Communications Annex for type system used in reporting Radef information.

4. The State shall forward to the appropriate OCD regional level collectives of Dose-Rate Reports from the political jurisdiction. During the first 24 hours post-attack, two sets of Dose-rate collectives will be transmitted, based upon fallout observations taken at 0300Z and 1500Z. The State shall forward these Dose-Rate Reports to OCD Region no later than one hour and thirty minutes after the mandatory reporting time. An 0300Z observation should be at regional level by 0430Z and a 1500Z observation should arrive at Region by 1630Z.

5. All Flash Reports should be forwarded to the State through channels as soon as possible after the observation. This report is of the highest precedence and should not be treated as a scheduled report. For purposes of clarification, "flash" refers to message priority. A Flash Report is initiated when the radiation level gets to .5r/hr and is also initiated when reporting NUDETS (nuclear detonations). Local officials experiencing or observing a nuclear detonation (NUDET) should report the occurrence immediately to the State EOC via channels. The State, in turn, will forward NUDET reports to OCD Region pending analysis to determine actual ground zero or estimated yield. Data to be reported are:

(a) Date and time of detonation. (State will forward time of report in Greenwich Mean Time.)

(1) Authorities in each locality should report the time of NUDET occurrences in local time and so indicate; for example, June 16, 1:30 p.m., CST.

(b) Estimated ground zero.

(1) The ground zero location should be indicated: First, by the name of the community or military base closest to where the NUDET occurred; and second, by direction and distance from a well-known landmark.

(c) Type of burst (air, surface, water, etc.).

(1) Type of burst should be indicated in clear language by the words "surface", "air", "water", or "unknown".

(d) Estimated yield.

(1) Estimated yield should be indicated by small (under one megaton), medium (one megaton to five megatons), or large (over five megatons).

(e) Name and location of reporting office.

(1) Name and location of reporting office is the location of the report originator.

The following is a sample of NUDET message as sent by the observer:

> NUDET, June 16, 1:30 p.m. CST, Cedar Rapids, North Marion Area, surface, large, Iowa City EOC.

E. METHOD OF DETERMINING LOCATION AND SIZE OF WEAPON

1. Determining location of nuclear detonation (direction and sound method).

A method of determining the approximate location of a detonation after the direction of the "flash" phenomena has been ascertained, i.e., in terms of the eight primary compass points (N, NE, E, SE, S, SW, W, NW), is by means of sound. Since sound travels in air at the rate of about 12 miles per minute, an individual can estimate the distance by using the

data in Table 1. It is assumed, of course, that the individual will look at a time piece until he hears the detonation. From the approximate direction and the estimated distance, the position of ground zero can be estimated.

2. Determining location of a nuclear detonation (Flash Method).

An approximate location of ground zero (GZ) may be obtained by a process referred to as triangulation. The procedure involves the following:

(a) Obtain "flash" information (direction from where flash was observed in terms of the eight primary compass points) from at least three reporting points. The reporting points should be located within the range of 50 to 100 miles from the detonation site.

(b) Plot the reporting points on a suitable scaled map, showing the locations of the reporting points.

(c) On the map, draw for each reporting point a line toward the direction from where the flash was observed based on the eight primary compass points, with a length based on the time between the initial flash and arrival of the sound of the detonation.

(d) These lines will end near the location of ground zero and may be rotated slightly to point accurately at ground zero.

TABLE #1

Distance Sound Travels at Sea Level

Formula: Sound travels approximately -

0.2 miles in 1 second
1.0 miles in 5 seconds
12.0 miles in 60 seconds (1 minute)

Time and Distance Sound will have traveled from time of sighting of flash

Time (minutes)	Distance (miles)
1	12
2	24
3	36
4	48
5	60
6	72
7	84
8	96
9	108
10	120
11	132
12	144
13	156
14	168
15	180

3. Estimate of Yield of Nuclear Weapon

The length of time the flash lasts will determine the approximate yield of the weapon. By looking at your watch or by counting when you first see the flash, for the duration of the flash, the total number of seconds the flash lasts will give you the approximate yield of the bomb. Refer to the chart below.

DO NOT LOOK DIRECTLY AT THE FLASH.

Method of Estimating Approximate Size of Weapon by Length of Time of Flash

Air or Surface Burst

Weapon Size	Length of Time of Flash (seconds)
0.1 MT	7
0.2 MT	9
0.4 MT	13
0.5 MT	15
0.8 MT	19
1 MT	24
2 MT	30
3 MT	36
4 MT	42
5 MT	47
6 MT	52
8 MT	60
10 MT	67
15 MT	81
20 MT	95
50 MT	151
100 MT	213

APPENDIX 3b

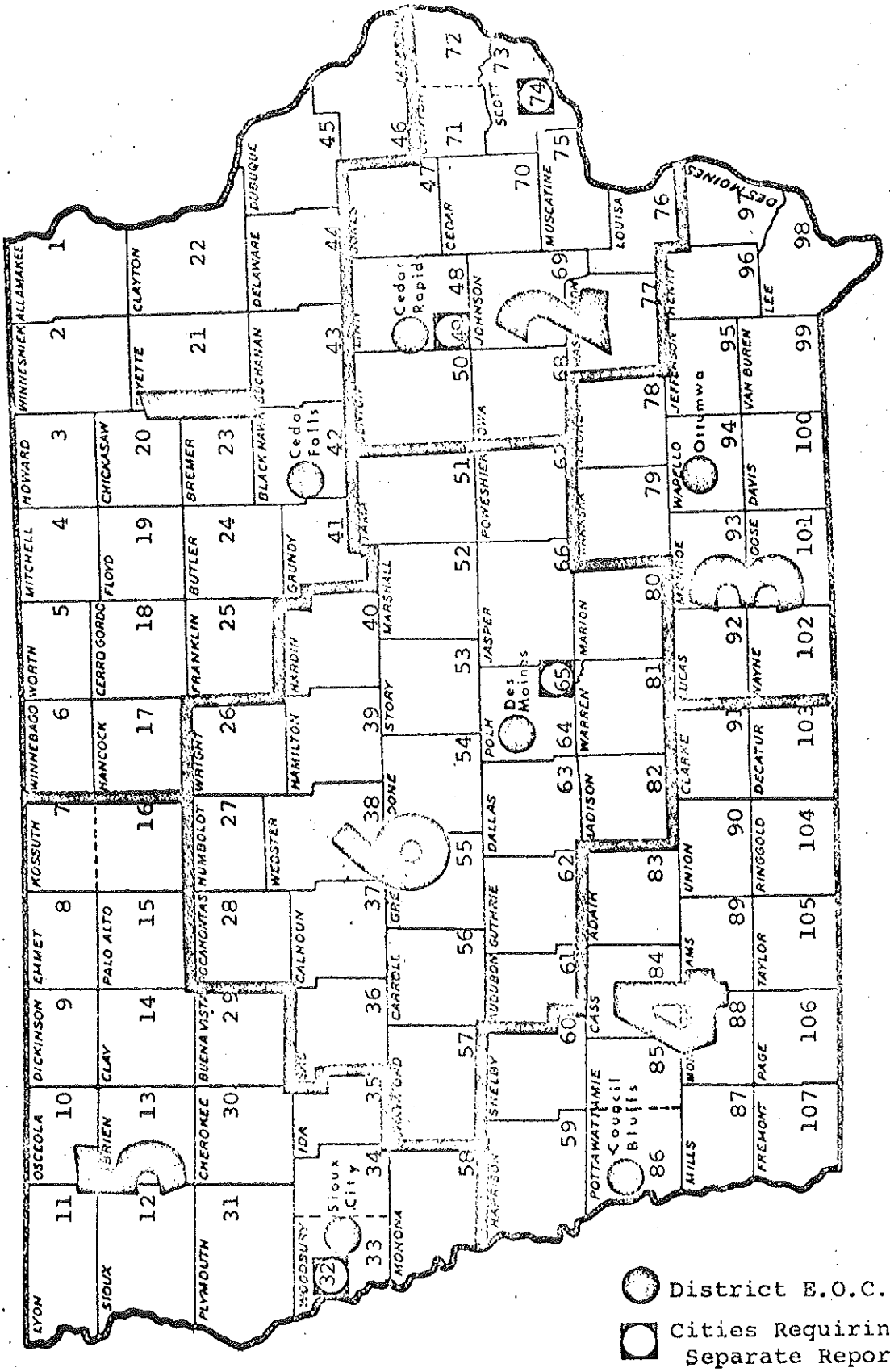
ASSIGNED COUNTY NUMBER DESIGNATIONS FOR COUNTY REPORTING OF FALLOUT INFORMATION
Representative Location Included

Number	County or City	Representative Location
1	Allamakee	Waukon
2	Winneshiek	Decorah
3	Howard	Cresco
4	Mitchell	Osage
5	Worth	Northwood
6	Winnebago	Forest City
7	Kossuth - northern half	Gerled
8	Emmet	Estherville
9	Dickinson	Spirit Lake
10	Osceola	Sibley
11	Lyon	Rock Rapids
12	Sioux	Orange City
13	O'Brien	Primghar
14	Clay	Spencer
15	Palo Alto	Emmetsburg
16	Kossuth - southern half	Algona
17	Hancock	Garner
18	Cerro Gordo	Mason City
19	Floyd	Charles City
20	Chickasaw	New Hampton
21	Fayette	West Union
22	Clayton	Elkader
23	Bremer	Waverly
24	Butler	Allison
25	Franklin	Hampton
26	Wright	Clarion
27	Humboldt	Dakota City
28	Pocahontas	Pocahontas
29	Buena Vista	Storm Lake
30	Cherokee	Cherokee
31	Plymouth	Le Mars
32	City of Sioux City	Sioux City
33	Woodbury - western half	Bronson
34	Woodbury - eastern half	Anthon
35	Ida	Ida Grove
36	Sac	Sac City
37	Calhoun	Rockwell City
38	Webster	Fort Dodge
39	Hamilton	Webster City
40	Hardin	Eldora

41	Grundy	Grundy Center
42	Black Hawk	Waterloo
43	Buchanan	Independence
44	Delaware	Manchester
45	Dubuque	Dubuque
46	Jackson	Maquoketa
47	Jones	Anamosa
48	Linn	Central City
49	City of Cedar Rapids	Cedar Rapids
50	Benton	Vinton
51	Tama	Toledo
52	Marshall	Marshalltown
53	Story	Nevada
54	Boone	Boone
55	Greene	Jefferson
56	Carroll	Carroll
57	Crawford	Denison
58	Monona	Onawa
59	Harrison	Logan
60	Shelby	Harlan
61	Audubon	Audubon
62	Guthrie	Guthrie Center
63	Dallas	Adel
64	Polk	Ankeny
65	City of Des Moines	Des Moines
66	Jasper	Newton
67	Poweshiek	Montezuma
68	Iowa	Marengo
69	Johnson	Iowa City
70	Cedar	Tipton
71	Clinton - western half	De Witt
72	Clinton - eastern half	Clinton
73	Scott	Long Grove
74	City of Davenport	Davenport
75	Muscatine	Muscatine
76	Louisa	Wapello
77	Washington	Washington
78	Keokuk	Sigourney
79	Mahaska	Oskaloosa
80	Marion	Knoxville
81	Warren	Indianola
82	Madison	Winterset
83	Adair	Greenfield
84	Cass	Atlantic
85	Pottawattamie - eastern half	Oakland
86	Pottawattamie - western half	Council Bluffs
87	Mills	Glenwood
88	Montgomery	Red Oak
89	Adams	Corning

90	Union	Creston
91	Clarke	Osceola
92	Lucas	Chariton
93	Monroe	Albia
94	Wapello	Ottumwa
95	Jefferson	Fairfield
96	Henry	Mt. Pleasant
97	Des Moines	Burlington
98	Lee	Ft. Madison
99	Van Buren	Keosauqua
100	Davis	Bloomfield
101	Appanoose	Centerville
102	Wayne	Corydon
103	Decatur	Leon
104	Ringgold	Mt. Ayr
105	Taylor	Bedford
106	Page	Clarinda
107	Fremont	Sidney

DISTRICT E.O.C.'S AND NUMBERING SYSTEM



RADEF PLAN

APPENDIX 4 - Monitor Station Operation

A. Upon warning, all monitor station personnel will report to the monitor station and take the following actions.

1. Install batteries in the instruments and check for operability--then turn instruments off.

2. Charge and issue dosimeters to monitor station personnel.

3. Check communications by reporting monitor station manned and ready.

Telephone (name) (number)
or _____
or _____

4. Check food and water supplies. Replenish if required and can be accomplished within (15-30) minutes.

5. Improve radiation protection of monitor station as planned. (Fill window wells, sandbag walls, etc.)

6. Place vehicles under cover to avoid contamination.

7. Turn CDV-700 on and check background radiation (.02 -.04 mr/hr) level for one minute every 15 minutes. When background radiation level begins to increase, turn CDV-700 off. Check outside, unsheltered radiation dose-rate with CDV-710 or 715 every five minutes until level reaches 0.5 r/hr.

8. When outside, unsheltered radiation dose-rate reaches 0.5 r/hr, send Flash Report.

9. Keep accurate exposure records on all monitor station personnel.

B. Radiation dose-rate readings should be made as follows:

(1) Conserve battery life by turning instrument on only when making a reading. NOTE: The CDV-715, CDV-710, and CDV-720 require a three-minute warm-up period before reading is made.

(2) Establish a fixed position of the instrument in use inside the station and all readings are made at the same point.

(3) Establish a fixed position outside the station in a clear, flat area, away from buildings if possible, and make all outside readings at the same point.

(4) When the first reading is made, the monitor notes the reading on the instrument at the chosen location inside the shelter. He then goes outside to the preplanned position and reads the same instrument as soon as possible (not more than two minutes) after reading it inside the shelter. The ratio of the outside, unsheltered reading to the inside reading should be used as a multiplying factor to estimate future outside readings thus eliminating the necessity for going outside for each reading and reducing the monitor's exposure dosage. NOTE: The <u>outside, unsheltered</u> reading is reported.

(5) This procedure must be repeated at least once each six hours during the first few days to assure the multiplying factor is correct. This is necessary since the energy (penetrating ability) of the radiation changes with time during this period.

C. When the outside, unsheltered dose-rate is 25 r/hr or less, each reading should be made outside at the same location.

D. Avoid contact with contaminated surfaces; do not stir up dust or disturb fine debris. Avoid bringing contamination into monitor station by leaving shoes and contaminated clothing outside.

E. Give reports to local EOC's according to the procedure outlined in Appendix 3. Reports should be given with the aid of a Radiological Reporting Log format, such as the example--Appendix 4a.

STATION _____ RADIOLOGICAL REPORTING LOG REPORTED TO _____

Flash report (0.5 r/hr. or more)	1st hr. thru 24th hr. [3] (every 3 hours)	25th hr. thru 48th hr. [3] (every 6 hours)	After 48th hr. [3] _____[1] (daily at 0300Z)
Date _____ Time _____ Dose Rate _____ r/hr Time sent to control center _____ Note: Flash report of fall-out will be made as soon as dose rate reaches 0.5 r/hr. Report as follows: 1. _____ (Time of Observ.) 2. _____ (Location) 3. Fallout _____	Date _____ Time / Dose Rate 1. _____ r/hr 2. _____ 3. _____ 4. _____ 5. _____ 6. _____ 7. _____ 8. _____ Take observations at _____[1] _____[1] _____[1] 0300Z 0600Z 0900Z _____[1] _____[1] _____[1] 1200Z 1500Z 1800Z _____[1] _____[1] 2100Z 2400Z [2]Total dose to _____[1] _____r 0300Z	Date _____ Time / Dose Rate 1. _____ r/hr 2. _____ 3. _____ 4. _____ Take observations at _____[1] _____[1] _____[1] 0300Z 0900Z 2100Z _____[1] 2100Z [2]Total dose to _____[1] _____r 0300Z If at any time following a period of decay, the dose rate increases materially, file a special report and start new program of observations.	Date / Dose Rate r/hr / Total dose [2] r _____

Report dose rates as follows: 1. _____ Time 2. _____ Location 3. _____ Dose Rate

4. _____ Dose to _____[1] 0300Z

1. Enter local time from next page.
2. Total dose read from dosimeter - Cumulative from arrival of fallout.
3. After flash report.

RADEF PLAN

APPENDIX 5 - Decontamination

A. GENERAL

1. Radiological decontamination is the reduction or removal of contaminating radioactive material from a structure, area, object, or person. Radioactivity cannot be destroyed; but in the event of nuclear attack, the fallout radiation hazard could be reduced:

(a) By removing radioactive particles from a contaminated surface and safely disposing of them;

(b) By covering the contaminated surface with shielding material, such as earth, or;

(c) By isolating a contaminated object and waiting for the radiation from it to decrease through the process of radioactive decay.

2. Decontamination may be partial or complete. Partial decontamination usually involves the rapid, partial removal or covering of contamination to reduce the radiation dose-rate as quickly as practicable and to a point where priority work can be accomplished with reasonable safety. Complete decontamination would be accomplished subsequently as required

to further reduce the radiation hazard. Its employment would be based on the relative importance of the contaminated areas or objects and on other considerations, such as, man-hours required, resources available, and alternative possible solutions. Primarily, decontamination will be employed to permit earlier reactivation of vital facilities. To a limited degree, it may be used to improve the protection of some population groups.

B. DECONTAMINATION PROCEDURES

1. Decontamination of personnel and their clothing would be the responsibility of the various operational services, such as fire departments, police departments, decontamination of themselves and their families.

a. When clothing is dry, personnel contaminated should remove hats and outer garments, shake or brush them vigorously, stamp feet to dislodge loose materials from the shoes, and then put on the outer garments again. This procedure should be carried out away from the monitoring location. Ordinarily, brushing will remove most of the contaminated material from shoes and clothing and often may reduce the contamination to or below the permissible level. It is important to brush or shake from the upwind side of the contaminated item. Under rainy conditions, the outer clothing should be removed before entering the sheltered area.

b. If it is determined contamination levels of the outer clothing required additional decontamination after monitoring within the shelter, the outer clothing should be removed and stored in an isolated location within the structure but outside the shelter area. Contaminated wet clothing should be stored similarly.

c. Wash, brush, or wipe thoroughly exposed portions of the body, such as the skin and hair, being careful not to injure the skin. If sufficient quantities of water are available, persons should bathe, giving particular attention to skin areas that had not been covered by clothing.

2. State and local public agencies assisted by radiological defense personnel will be responsible for the decontamination of food and water.

a. The following guidance is provided for individuals and groups who need to use food which may have been contaminated with fallout. Before opening a food package, the package should be wiped or washed if contamination is suspected. Caution should be taken when wiping or washing outer containers to avoid contaminating the food itself. When possible, the package surface should be monitored with a radiation detection instrument before removing the food as a check on the effectiveness of the decontamination procedure.

Meats and dairy products that are wrapped or are kept within closed showcases or refrigerators should be free from contamination. Fallout on unpackaged meat and other food items could present a difficult salvage problem. Fresh meat could be decontaminated by trimming the outer layers with a sharp knife. The knife should be wiped or washed frequently to prevent contaminating the incised surfaces.

Fruits and vegetables harvested from fallout zones in the first month post-attack may require decontamination before they can be used for food. Decontaminate fruits and vegetables by washing the exposed parts thoroughly to remove fallout particles, and, if necessary, peeling, paring, or removing the outer layer in such a way as to avoid contamination of the inner parts. It should be possible to decontaminate some fruits (such as apples, peaches, pears) and vegetables (such as carrots, squash, and potatoes) by washing and/or paring. This type of decontamination can be applied to many food items.

b. Animals should be put under cover before fallout arrives, and should not be fed contaminated food and water if uncontaminated food and water are available. If the animals are suspected of being externally contaminated, they should be washed thoroughly before being processed into food.

Even when animals have received sufficient radiation to cause later sickness or death, there will be a short period (one to ten days following exposure, depending on the dose) when the animals may not show any symptoms of injury or other effects of radiation. If the animals are needed for food, they can be slaughtered during this time without undue radiation exposure to the worker; and if no other disease or abnormality would cause unwholesomeness, the meat would be safe for use as food.

3. Several devices for treating relatively small quantities of water under emergency conditions have been tested. Most of them use ion exchange or absorption for removal of radioactive contaminants.

a. Small commercial ion exchange units containing either single or mixed-bed resins designed to produce softened or demineralized water could be used to remove radioactive particles from water. Many of them have an indicator which changes the color of the resins to indicate the depletion of the resins' capacity. Tests of these units have indicated removals of over 97 per cent of all radioactive materials.

b. Emergency water treatment units consisting of a column or flower pot, containing (1) a screen to cover

the bottom of the pot or column with two or three sheets of paper tissue or cloth over the screen; (2) two or three inches of subsoil, humus, and clay; and (3) an additional two to three inches of small rocks on top have been tested for removal of radioactive materials from water. This type of emergency water treatment unit will remove over 90 per cent of all radioactive materials.

c. Although tank-type home water softeners are usually found in areas supplied by well water, which would not require decontamination, they are capable of removing up to 99 per cent of all radioactive materials and are especially affective in the removal of Strontium 90 and Cesium 137.

4. Decontamination of vehicles and equipment of the various operational services, such as fire departments, police departments, and decontamination teams, will be the responsibility of the various services aided by radiological defense services. Individuals will be responsible for decontamination of their own vehicles and equipment in accordance with instructions of local government.

a. The simplest and most obvious method for partial decontamination of vehicles and equipment is by water hosing. Quick car washing facilities are excellent for more thorough decontamination. Special precautions

should be used when vehicles and equipment are brought in for maintenance. The malfunctioning part of the vehicle or equipment should be thoroughly decontaminated to protect maintenance personnel from radiation burns. Hosing should not be used on upholstery or other porous surfaces on the interior of vehicles, as the water would penetrate and carry the contamination deeper into the material. The interior of vehicles can be decontaminated by brushing or vacuum cleaning. Procedures for decontaminating interiors of vehicles by vacuum cleaning are similar to those used on the interior of structures.

b. A decontamination station set up at a control point adjacent to the staging area would be the best place for decontaminating vehicles and equipment. A paved area would be desirable so that it could be hosed off after the equipment is decontaminated. Monitoring should follow the application of each decontamination method.

RADEF PLAN

APPENDIX 6 - Guidance for Independent Operations

A. GENERAL

1. All monitors receive technical direction and guidance from the local Radef Officer or other qualified Civil Defense personnel. However, under the conditions of nuclear attack, communications with the control center could be disrupted at any time during the shelter period. When communications with the assigned control center are disrupted, an effort shall be made to contact a neighboring shelter or fallout monitoring station through which Radef advice and guidance could be relayed.

2. When the dose-rates inside and outside of the shelter or fallout monitoring station are known, use the following as a guide for permissible activities. This guidance is based on observations made on large groups of people and therefore should be used with caution when dealing with small groups. This guidance is not conclusive.

If the outside dose-rate has fallen to:

Less than 0.5 r/hr.	No special precautions are necessary for operational activities. Keep fallout from contaminating people. Sleep in the shelter.

0.5 to 2 r/hr.	Outdoor activity (up to a few hours per day) is acceptable for essential purposes, such as fire-fighting, police action, rescue, repair, securing necessary food, water, medicine and blankets, important communication, disposal of waste, exercise and obtaining fresh air. Eat, sleep, and carry on all other activities in the best available shelter.
2 to 10 r/hr.	Periods of less than an hour per day of outdoor activity are acceptable for the most essential purposes. Shelter occupants should rotate outdoor tasks to distribute exposures. Outdoor activities of children should be limited to 10 to 15 minutes per day. Activities, such as repair or exercise, may take place in less than optimum shelter.
10 to 100 r/hr.	Time outside of the shelter should be held to a few minutes and limited to those few activities that cannot be postponed. All people should remain in the best available shelter no matter how uncomfortable.
Greater than 100r/hr.	Outdoor activity of more than a few minutes may result in sickness or death. Occasions which might call for outside activity are (1) risk of death or serious injury in present shelter from fire, collapse, thirst, etc. and (2) present shelter is greatly inadequate--might result in fatality--and better shelter is known to be only a few minutes away.

B. EXPOSURE CRITERIA

1. Keep exposure of shelterees as low as practicable. With a good shelter in most fallout areas, it should be possible to keep exposure doses below 100r during the first two weeks. Keep the total exposure of personnel on emergency missions below 200r during the first month of operations. Keep additional exposures to less than 25 r/week for the next five months.

2. If a person becomes ill from exposure to radiation, he should be placed under the care of a physician or medical technician, if possible. In the post-attack situation, medical care may be very limited. Care consists primarily of keeping the patient comfortable and in bed. Keep the patient clean and isolated from infectious diseases. The ill person should have liquids to replace the body fluids lost as a result of vomiting and diarrhea as soon as he can tolerate them. Nourishing foods should be given the patient since they are needed for recovery.

Beta burns are treated in the same manner as burns resulting from heat. If possible, allow a physician or medical technician to treat the beta burns.

RADEF PLAN

Appendix 7 - Fallout Prediction-Data and Procedures

A. Fallout wind data is given on teletype in the following form:

(1) UF 33 311541

OMA 11411 21313 41317 61317 81313

UF designates fallout data

33 means circuit of collection

31 is the date of the current month

1541 is 1541 Greenwhich time or 0941 CST, the time of the teletyping.

OMA is the code of Omaha, Nebraska

In the code numbers, hddss--

The first figure, h, is the height above sea level in 10,000 feet units.

The next two figures, dd, are direction toward which fallout goes (clockwise for 0 or 360 a month) in 10° units. The distance is measured from the forward edge of the mushroom cloud, rather than from ground zero. Fallout begins in one hour at 1/3 this distance; in six hours at twice this distance, (etc.).

(2) Example of UF Code Breakdown, hddss

OMA	11411	21313	41317	61317	81313
Height in ft.	10,000	20,000	40,000	60,000	80,000
Direction	140°	130°	130°	130°	130°
Distance in miles beyond forward edge of cloud, where fallout begins in 3 hours	110	130	170	170	130

B. PREDICTING FALLOUT AREA

1. Draw a North-South line on a map of the area through the known or assumed ground zero location. This line must be parallel to the meridian of longitude nearest to ground zero. Use UF message from the nearest Rawin Station. Using a protractor, compass card, or template, draw a line from ground zero in the direction and for the distance to scale shown for each level as indicated in the UF message. Connect the ends of each point with a broken line. The enclosed area is forecast to be affected by fallout during the first three hours after detonation at the assumed ground zero.

2. To allow for geometry of the cloud, the above enclosed area should be modified accordingly. With megaton-sized weapons, it is assumed that:

(a) The heavier area of fallout will extend 15 miles or less upwind and crosswind of ground zero.

(b) The ten and twenty thousand foot vectors representing fallout from the stem portion of the mushroom cloud should be expanded by about ten miles.

(c) The forty, sixty, and eighty thousand foot vectors representing fallout from the head portion of the mushroom cloud should be expanded by about twenty miles.

The following routine is suggested to account approximately for the above dimensional affect.

(a) Swing an arc of 15 mile radius around ground zero.

(b) Swing an arc of 10 mile radius around the 10 and 20 thousand foot end points.

(c) Swing area of 20 mile radius around the 40, 60, and 80 thousand foot end points.

(d) Connect the outer periphery of these arcs with a solid line.

(e) The area enclosed by the heavy solid line is the area expected to be affected by the fallout during the first three hours with approximate modification for nuclear cloud geometry.

3. The completed map should appear as in Figure #1. More detailed information for kiloton-sized weapons and other times of arrival can be found in Appendix 6 to Chapter 5, Part E, of the Federal Civil Defense Guide.

4. Upon receipt of upper air fallout data, the State Civil Defense Office will disseminate this information to the

counties by using a conference call. Data from Circuit 33 only will be issued.

Appendix 7

CONSOLIDATED FALLOUT PLOT OF KILOTON AND MEGATON WEAPONS

Note that for weapons up to:

400 KT, Plot only A, B, and C.
500 KT to 900 KT, Plot only A, B, C and D.
1 MT and higher, Plot A, B, C, D and E.

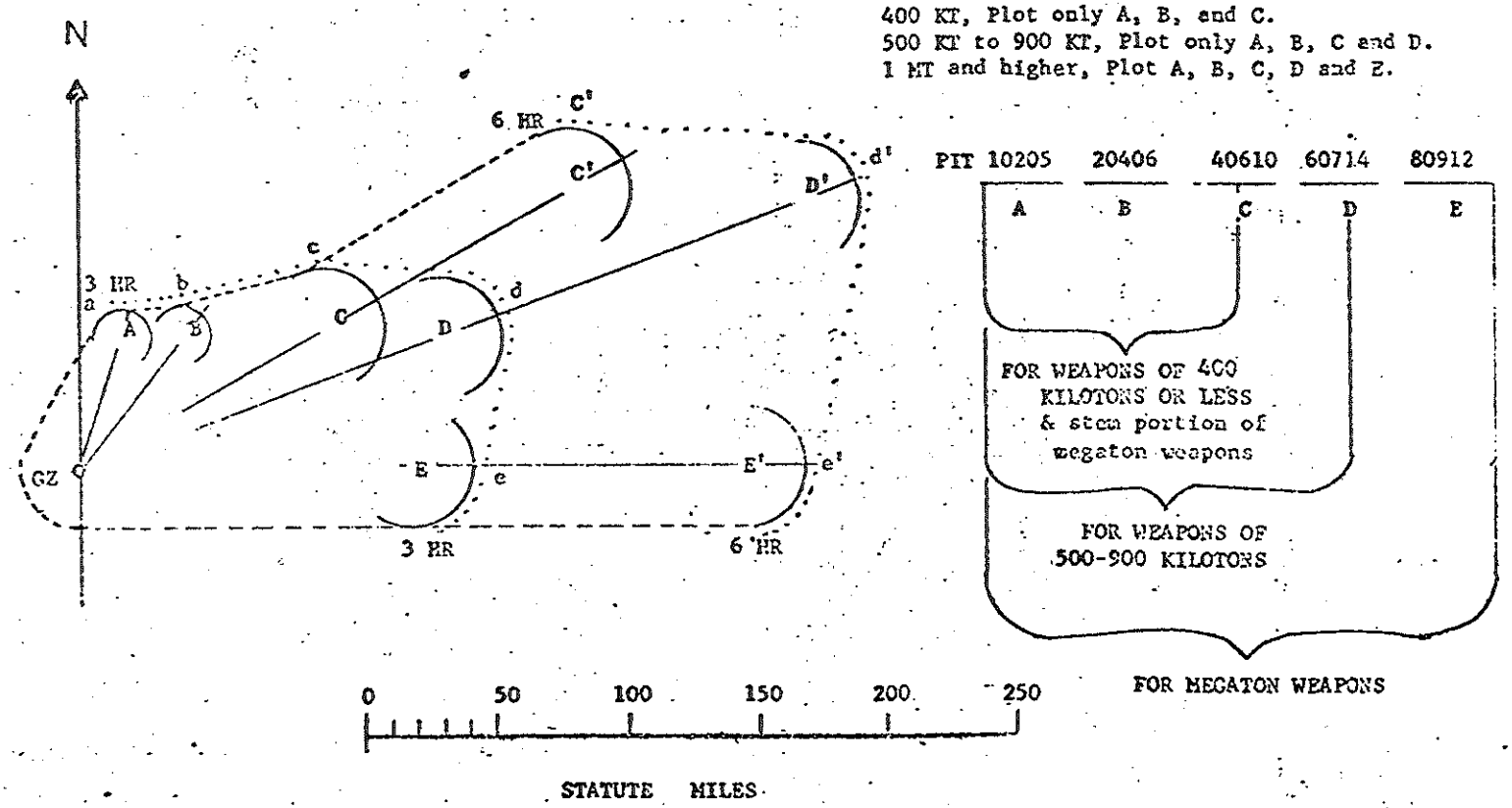


Figure #1- Fallout area forecast plot extended to the 6-hour isochrone. For extension beyond 6 hours, only the 60,000 ft. level (D) and the 80,000 ft. level (E) are emphasized (bomb yields over 500 KT or 1 MT respectively).

RADEF PLAN

APPENDIX 8 - Aerial Monitoring

A. THE MONITORING SYSTEM--GENERAL

1. Radiological fallout information obtained by monitoring stations supplemented by surface mobile monitoring will, in most areas, give adequate information for planning for survival, remedial movement, and recovery of fixed facilities.

2. Aerial radiological survey can be of great value when monitoring stations are inoperative or incapable of supplying necessary information, or when high radiation contamination precludes mobile teams from operating. Aerial radiological survey allows flexibility for operating from areas of low contamination to areas of high exposure rates and allows for survey from a height of several hundred feet with low exposure to the monitoring personnel. This method of monitoring is of particular value in survey of large areas, such as agricultural lands, survey of transportation routes, and early monitoring of areas surrounding essential facilities. Aerial monitoring done in conjunction with early damage assessment missions may also be of significant value for indicating general fallout conditions for use in planning operations.

B. AERIAL MONITORING

1. Caution must be taken to delay the flight until fallout is complete in order to avoid contamination of personnel and equipment by flying through the unsettled fallout.

2. The approximate yield of the bomb can be determined by visual observation from an aircraft at the area of destruction.

YIELD FROM BOMB MT	DIAMETER OF DESTRUCTION AREA 5 PSI OVER PRESSURE IN MILES
.02	1.2
.05	1.7
.1	2.3
.3	3.6
1	5.9
2	8
5	13
10	17
20	23
50	33
100	46

3. Estimating the height above actual ground is somewhat difficult using barometric altimeters, largely due to the fact that most flight charts show ground contours in 500 ft. intervals. Flights should be planned to cover the fallout in dogleg patterns with about ninety degrees between the two legs, crossing the fallout in directions about forty-five degrees to the axis, the first flight being directly over ground zero and including an estimate of the total destruction diameter. Since flying is faster than fallout, two legs usually complete a flight. Flights will normally be planned at Wing Headquarters level. Height of the flight

should be adjusted so that readings in the plane do not exceed 10 r/hr. and are usually much lower, around 1 r/hr. Readings are corrected to ground level and for shielding by the plan before transmitting to local headquarters. The half value layer of air for mixed fission products is 200 feet. The Table of Conversion Factors for Aerial Monitoring can be used for this conversion. Results are reported as in ground monitoring. More attention must be given to the description of the location at which readings are made.

HEIGHT ABOVE GROUND IN FEET	FACTORS USED TO MULTIPLY READINGS FOR GROUND LEVEL
200	4
400	7
600	12
800	18
1000	30
1200	42

Specific aerial monitoring operations are outlined in the "Handbook for Aerial Radiological Monitors" FG-E-5.9.

RADEF PLAN

APPENDIX 9 - General Information

A. The following is an example of an individual dose-rate record.

RADIATION EXPOSURE RECORD

NAME_____
ADDRESS_____
SOC. NO._____

DATES OF EXPOSURES	DAILY EXPO-SURE	TOTAL EXPO-SURE	REMARKS
9-6-67	5mr	5mr	
9-7-67	8mr	13mr	
9-8-67	10mr	23mr	

B. Proposed maximum activity levels for drinking water in period "Immediately" following bomb blast.

Time water is to be consumed	Safe		Acceptable Risk	
	Curies	mr/hr from 3 oz. sample in 4 oz. tin	Curies per cc	mr/hr from 3 oz. sample in 4 oz. tin
beta 10 days	3.5×10^{-9}	0.4 mr/hr	9×10^{-8}	12 mr/hr
gamma 30 days	1.1×10^{-9}	0.13 mr/hr	3×10^{-8}	4 mr/hr
alpha 10 days	2×10^{-10}		5×10^{-9}	
30days	6.7×10^{-11}		1.7×10^{-9}	

TIME CONVERSION CHART

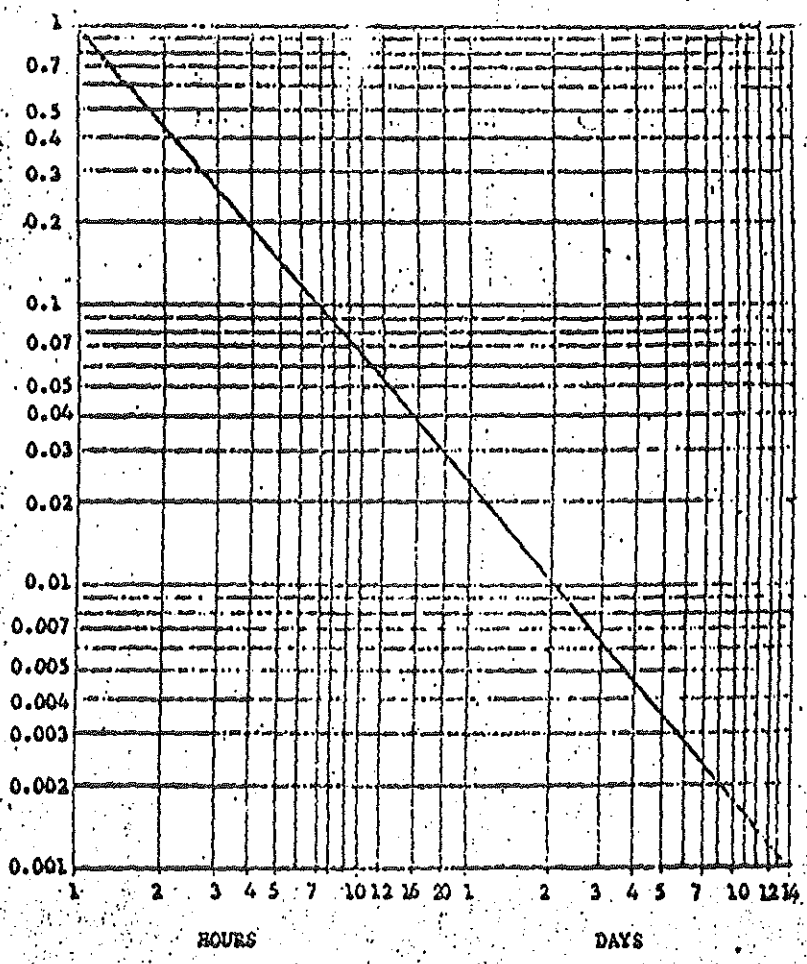
	Eastern Daylight	Eastern Standard or Central Daylight	Central Standard or Mountain Daylight	Mountain Standard or Pacific Daylight	Pacific Daylight
	2100*	2000*	1900*	1800*	1700*
	2200*	2100*	2000*	1900*	1800*
	2300*	2200*	2100*	2000*	1900*
0400	2400*	2300*	2200*	2100*	2000*
0500	0100	2400*	2300*	2200*	2100*
0600	0200	0100	2400*	2300*	2200*
0700	0300	0200	0100	2400*	2300*
0800	0400	0300	0200	0100	2400*
0900	0500	0400	0300	0200	0100
1000	0600	0500	0400	0300	0200
1100	0700	0600	0500	0400	0300
1200	0800	0700	0600	0500	0400
1300	0900	0800	0700	0600	0500
1400	1000	0900	0800	0700	0600
1500	1100	1000	0900	0800	0700
1600	1200	1100	1000	0900	0800
1700	1300	1200	1100	1000	0900
1800	1400	1300	1200	1100	1000
1900	1500	1400	1300	1200	1100
2000	1600	1500	1400	1300	1200
2100	1700	1600	1500	1400	1300
2200	1800	1700	1600	1500	1400
2300	1900	1800	1700	1600	1500
2400	2000	1900	1800	1700	1600

* Add 1 day to the local Calendar date for equivalent date in GMT.

Example: Observed Central Standard Time is 10:00 PM (2200 CST) on the 14th day of the month (142200 CST). Expressed as GMT, that time would be 0400Z on the 15th day of the month (150400Z).

DECAY R CHART

IDEALIZED WAY NER DECAY CHART



4-1

CONVERSIONS FOR DECAY OF MIXED FISSION PRODUCTS USING THE WIGNER DECAY CHART

1. To convert from r/hr at 1 hr to r/hr at any time up to 14 days.

   Carry a vertical line from the time on the base-line to the diagonal line. Follow the intersection over horizontally to the vertical coordinate to read the factor.

   Multiply r/hr at 1 hr by this factor to get r/hr at later hour.

   Example: 50 r/hr at 1 hr. What is the expected r/hr at 3 days? Factor is 0.0065.

   50 x 0.0065 = 0.325 r/hr at 3 days

2. To convert from r/hr at any time up to 14 days back to r/hr at 1 hour.

   Carry a vertical line from the time on the base-line to the diagonal line. Follow the intersection over horizontally to the vertical coordinate to read the factor.

   Divide r/hr at given time by this factor to get r/hr at 1 hour.

   Example: 3.7 r/hr at 14 hrs after burst. What was r/hr at 1 hr? Approximate 14 hrs between the given 12 and 16 hours. Intersection with diagonal line is at approximately 0.045.

   3.7/0.045 = 82 r per hour at 1 hour.

RADEF PLAN

APPENDIX 10 - Chemical and Biological Warfare

A. GENERAL

1. Although the major portion of this plan deals with a nuclear disaster, we must dedicate a portion of the plan to the possible employment of chemical and biological agents in warfare. The devastating effects of toxic chemicals and biological organisms can equal or exceed those of a nuclear detonation. Potentially an equal number of people can be neutralized or killed.

2. Due to the flexibility involved in deploying agents, they can be used in a large scale attack or during a small covert action. Every available means must be utilized to remain alert in the means of detection and protection against the use of chemical and biological agents. Chemical and biological agents can be readily produced and stored. Their delivery can be easily handled in a variety of ways.

3. Even though a biological or chemical attack is not considered a first line warfare tactic, we feel a brief explanation of their effects and measures of protection would be warranted. A basic understanding of chemical and biological

warfare is eminent in order to protect yourself in your assigned disaster duty.

B. CHEMICAL

1. Chemical warfare is the deliberate use of toxic chemicals to cause injury, debilitation, or death in humans. It also includes use of certain materials to render material unusable, to provide concealment or to inflict damage (notably fires), or contaminate food and water. Use of these compounds produce clinical signs, symptoms, and effects that are as a rule alien to health service personnel. There is a dire need for these personnel to become familiar with the concepts, the agents, their actions and effects, the dissemination and the treatment relative to the use of chemical agents.

2. The exact agent that may be used cannot be predicted; some of the probable ones are as follows:

(a) Choking (lung irritant gas). Phosgene is the primary agent; it induces pulmonary edema. Death may result from anoxia. This gas can be seen and is easily negated by the use of a protective mask.

(b) Vesicant (mustard gas). Vesicant gases act by producing vesiculation with characteristic vesicles and burns on the skin; the result is similar if inhaled; the effects in this case will result in respiratory death. The mode of injury is not yet thoroughly understood; it appears to involve a cellular response similar

to that produced by radiation.

(c) Blood (cyanide gas). Cyanide gases interfere with the oxygen transfer in blood. Cyanides are easily detected and recognized. A protective mask will offer adequate protection.

(d) Tear and Screening Gas. These compounds will not produce casualties unless in very high concentrations. They are normally classified as irritants. A use is not anticipated of tear gas unless as a riot control agent.

(e) Vomiting Gas. These gases are not considered a threat because of the ease of protection against them. They will not produce death, except under unusual circumstances. A typical vomiting gas would be adamsite. A mixture with nerve or mustard gas is the chief use of a vomiting gas; this combination induces a person to remove his protective mask to vomit, thusly receiving more of a concentrated dosage of nerve or vesicant agents.

(f) Nerve Gas. This group of gases has the most potential as a warfare agent. A typical example is Tabun, which is one of the most toxic gases known--producing death in a few minutes from inhalation of a small amount, or death or incapacitation from a few drops on the skin. These act by destroying the enzyme cholinesterase, leading to an accumulation of acetylcholine. Abnormal amounts of acetylcholine will produce the following clinical effects: nausea, vomiting, diarrhea, cramps, sweating, increased salivation, increased

bronchial secretions, brady cardia, bronchial constriction, weakness, paralysis, convulsions, and fasiculation.

3. With the exception of the nerve gases, it is not possible for the various chemical agents to be laid down in effective concentration without detection. Such an attack can be readily and visually observed and countermeasures taken. If visual detection should fail, some reliance could be placed on odor or bodily effects such as pain or tearing of the eyes, dimming of the vision, skin irritation, slobbering, coughing, sneezing, choking, etc. Automatic and other physical devices have thus far proven unsuccessful or impractical for field usage. Certain chemical agent detector kits are adequate for the detection of almost all known gases. They can be used in the event of a suspected attack and do give, more or less, after-the-fact information if the agent is present. A chemical agent detector kit is a detector and is not a measure of concentration.

4. Protection against gas is achieved through proper impervious clothing and an adequate mask. In addition, a hood might be desirable, as well as medical kits containing material effective against the vesicants, BAL for the eyes, atropine for nerve gases and amyl nitrite capsules for blood gas poisoning. Artificial respiration as a first-aid measure is also very important.

a. The treatment for mustard gas poisoning includes:

(1) Water rinse of the eyes followed by intraocular application of BAL ointment with closed lid massage for one minute. Cleanse and apply BAL ointment to the areas around the eyes. This procedure should be followed up with intermittent instillation of 30% sodium sulfacetamide solution.

(2) For severe eye cases, follow the procedure above and also use morphine or local pontecaine for pain. BAL should be used three times a day.

(3) For contamination of the skin, apply anti-gas ointment; later, when the skin has reddened, cleanse with soap and water. Calamine will control the itching. Usual analgesics can be used for pain. Large blisters should be incised at the margins and covered with vaseline and gauze.

(4) Depending upon severity, alkaline gargles, codeine for cough, steam inhalations, antibiotics and oxygen can be used for respiratory contamination.

b. The treatment for nerve gas poison includes:

(1) Put on gas mask at first evidence.

(2) Put 2% homatropine into the eyes.

(3) Contaminated skin should be washed.

(4) Administer 2mg. atropine, intramuscular, every 10-15 minutes, depending on severity, until a dry mouth is obtained of up to 24 mg.

(5) More severe cases may require oxygen, artificial respiration, endotracheal suction, paraldehyde or Pentothal.

C. BIOLOGICAL

1. Biological warfare against human beings is the deliberate use of disease-producing micro-organisms, their toxins, or the poisons produced by higher animals or plants to cause illness, death, or panic. Micro-organisms that might be used as BW agents may include pathogenic bacteria, fungi, rickettsias, viruses, and protozoa. An enemy would probably try to disseminate BW materials in air, water, food, or drink. He might conceivably consider other routes that would permit the BW agent to reach the oral or respiratory tracts, or to penetrate the skin.

2. Some of the likely agents that may be used are as follows:

(a) Bacterial Group: Anthrax, Cholera, Shigella Dysenteriae, Plague, Brucella, and Tularemia.

(b) Viral Group: Yellow Fever, Influenza, and Venezuelan Equine Encephalomyelitis.

(c) Rickettsial Group: Typhus, Rocky Mountain Spotted Fever, "Q" Fever, and Psittacosis.

(d) Mycotic Group: Coccidiomycosis and Histoplasmosis.

3. Clinical management of these diseases would be the responsibility of trained health service personnel.

4. Due to the highly classified nature of research conducted in this field, methods of dissemination are largely hypothetical. Certain feasible types of dissemination are as follows:

(a) Certain agents are delivered with bombs or shells, usually as an aerosol, powder or slurry. The bombs and shells can be dispersed by standard artillery pieces, dropped by aircraft, or fired from surface ships or submarines. A major covert threat is the dissemination of sprays or aerosols by fog generators operating from vehicular or other gasoline engine exhaust systems.

(b) Certain agents may be dusted onto mail and receive wide dissemination. Since a saboteur will stop at nothing, the avenues for his action are numerous.

(c) Certain micro-organisms are readily spread by such contaminated insects as fleas, lice, flies, and mosquitoes. If a breeding ground was sabotaged with a deadly micro-organism, the dispersion would be over a large area. Animals, such as rodents, swine, cats, dogs, and parrots, may also serve as suitable carriers. Humans may also be used as carriers; the idea of primary individual infection rather than reliance on epidemics.

(d) Other forms of delivery may be balloons, darts, guided missiles, booby traps and many other unusual vehicles.

(e) There are limitations and disadvantages to all delivery methods and/or the respective agent. Stability, storage, retroactivity, particle size, infectivity, fragility, system accuracy and weather are but a few.

5. The first indication of a BW attack would probably be the symptomatic appearance of the disease in the population. Man himself becomes the best detector. The Health Service should be alerted to any unusual rise or appearance of an entity, particularly if at several areas or involving relatively large numbers. Because of the inherent nature of the agents, detection is difficult and time-consuming and requires special procedure and interpretation by trained personnel. Field sampling of gross specimens, wet and dry swabs, and aerosol impacts, with subsequent laboratory analysis, is the recommended procedure.

6. Protection can be achieved through preparation for the attack, self-aid, individual protection, collective protection, and recovery.

a. The vulnerability of an area will form the basis for preparedness--the better prepared, alert and aware, the less the vulnerability.

b. Self-aid takes place only when one recognizes contamination. Self-aid consists of thorough body cleansing, disinfection of wounds, and changing clothes.

c. Individual protection encompasses maintenance of health through hygiene and active and passive immunity, as well as devices, such as special clothing, masks, and decontamination.

d. Collective protection entails shelters, sanitation and decontamination, epidemic control, and protection of food and water supplies.

7. Even under disaster conditions, consideration must be given to accumulation of information on the occurrence of disease, particularly among the uninjured surviving population. Sampling of water for bacteriological quality can be accomplished rather rapidly under disaster conditions using the membrane filter technique. Sanitary and industrial hygiene engineers and preventive medicine personnel should be prepared to accomplish the necessary tests in the post-disaster recovery phase.

8. Biological effects are always a threat, they need not be set aside during normal peacetime. Biological effects can result from floods, tornadoes, etc.