UK Warning and Monitoring Organisation

ROYAL OBSERVER CORPS

STANDARD OPERATING PROCEDURE Nº 3

NRC

Issue 3 ***May 1989***

HQ Royal Observer Corps
Bentley Priory
Stanmore
Middlesex
HA7 3HH

ROYAL OBSERVER CORPS - NRC
STANDARD OPERATING PROCEDURE No.3
(ISSUE 3)

Amendment Record Card

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Amendments are to be carried out by the user of this book and are to be checked by the NRC Officer or a supervisor as detailed.

ROYAL OBSERVER CORPS - NUCLEAR REPORTING CELLS

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COMCHAN	2	HQ ROC
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PART A

FUNCTION

ROYAL OBSERVER CORPS - NUCLEAR REPORTING CELLS

FUNCTION

PRIMARY FUNCTION

1. To provide a nuclear burst plot and fallout prediction service, based on data provided by the United Kingdom Warning and Monitoring Organisation (UKWMO) for the benefit of certain Service establishments.

SECONDARY FUNCTION

2. To liaise with the parent UKWMO Group or Sector Control when further details and interpretation of the fallout plot are required by the Service establishment.

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PART B

ORGANISATION

ROYAL OBSERVER CORPS - NUCLEAR REPORTING CELLS

ORGANISATION

LOCATION

1. Nuclear Reporting Cells (NRCs), manned usually by crews of four, but in some cases five Royal Observer Corps' members, are located at certain military establishments.

PERSONNEL

2. The crews are drawn from a team of one Chief, two Leading Observers and, where the crew is four, nine Observers; where the crew is five, twelve Observers; under the direction of a Team Officer (either an Observer Officer or an Observer Lieutenant) established locally. These personnel are normally trained and administered by the Royal Observer Corps Group to which the NRC is linked.

COMMUNICATIONS

3. The NRC is provided with a uni-directional data circuit from a selected UKWMO Group or Sector Control. This data circuit is connected, in the NRC, usually to a receive-only teleprinter from which messages are received on page copy.

4. NRCs are also provided with a separate EC or PW speech circuit to their parent Control.

INFORMATION

5. The NRC will receive information in the following codes:

a. EF - Effective downwind forecasts from the Home UKWMO Sector Controls.

b. MM - Meteorological messages from all Sector Controls.

c. BB - UK nuclear burst messages from all UKWMO Controls.

d. BX - Continental nuclear burst messages from the appropriate UKWMO Sector Controls.

e. TT - Threat messages from all UKWMO Sector Controls.

f. TX - Continental threat messages from the appropriate UKWMO Sector Controls.

g. RR - Radiation Rates (DR7) from all UKWMO Controls.

h. CC - Dose Rate Situation Reports from all UKWMO Controls.

6. Additionally, the NRC will receive Communication Tests (CT) from the parent group plus information in the following codes from the parent Group's area of interest; ie, the territories of that Group and its adjacent Groups:

a. FF - First fallout times.

b. PP - Post situations OUT.

c. QQ - Post situations IN.

d. LL - First fallout bomb allocation and later arrivals (2nd, 3rd and 4th) of fallout.

e. US - FSM non operational but nuclear burst information still available.

REQUIREMENTS

7. The NRC crew working in ZULU (Greenwich Mean) time, will provide the following service to the military customer as a basic routine requirement:

a. All BB and BX by ground zero position.

b. Fall-out predictions by Hot lines.

c. The extent of fallout by reference to TT/TX messages.

d. The actual rate of fallout by reference to CC messages.

e. Detailed fallout information within the parent Group's area of interest from FF messages.

f. A tote of all BB and BX messages received to include all bombs within 50 kms of the coast from N Cape to France - Spanish border.

g. A DR 7 Plot, UK-wide from RR messages.

8. The following may be requested as an additional requirement:

a. Zone I and Zone II predictions of fallout in accordance with NATO STANAG 2103.

b. Damage estimation details for specific locations.

c. Estimated arrival times of fallout at certain locations.

d. Estimated fallout intensities at certain locations.

e. Estimated fallout intensities at other locations in the UK.

f. Actual fallout intensities at other locations in the UK.

g. Initial predictions and estimates of dose rates on Hot lines.

h. Plots for DR 24, 36, 48 etc.

Note: Lists of locations for the requirements c and d are available at respective NRCs.

CREW

9. The Royal Observer Corps' Crew (of four) will consist of the Supervisor, the Receiving Operator and two Display A Plotters. The additonal member (in the crew of five) carries out a special task in those NRCs where an extra commitment is undertaken.

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PART C

OFFICERS, CHIEF AND LEADING OBSERVERS ADMINISTRATIVE AND OPERATIONAL RESPONSIBILITIES

1. Team Officer
2. Team Head Observer
3. Team Instructor

ROYAL OBSERVER CORPS - NUCLEAR REPORTING CELLS

OFFICERS' CHIEF AND LEADING OBSERVERS' TRAINING AND ADMINISTRATIVE RESPONSIBILITIES

1. The Team Officer is responsible to the Group Commandant for:

   a. The operational efficiency of the team.

   b. The training, administration and welfare of the Observers under his command.

   c. Arranging the manning up of the Nuclear Reporting Cell (NRC), as instructed by the Group Commandant, in the event of an emergency.

   d. Ensuring that the crew procedures are carried out during training and operations according to local requirements.

2. The Team Head Observer (Chief Observer) is responsible to the Team Officer for:

   a. The operational efficiency of the team.

   b. The manning up of the NRC in the event of manning up being ordered.

   c. The preparation of duty rosters for the members of duty crews for use in an emergency.

   d. The training of the crew members by the Team Instructors and the general administration of the team.

3. The Team Instructors (Leading Observers) are responsible to the Team Officer, through the Team Head Observer, for the training of all crew members to a high standard of efficiency.

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PART D

OFFICER AND CREW DUTIES

1. Team Officer
2. Crew Supervisor
3. Receiving Operator
4. Display A Plotters (Left and Right)

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OFFICER AND CREW DUTIES

1. The Team Officer, in command of the Royal Observer Corps personnel manning the Nuclear Reporting Cell (NRC) is:

a. Responsible to the Group Controller for the provision of the agreed UKWMO service to the Service Unit Commander.

b. Responsible to the Senior Duty Officer for providing to the Service Unit NBC Officer:

(1) A detailed plot in accordance with NRC standard operating procedures or as specially requested.

(2) Other information of particular interest to the Service Unit, as detailed in separate instructions, together with information as required to assist the Service Unit NBC officer with:

(a) An interpretation of the displayed plot, and

(b) Answers to queries obtained by liaison with the Chief Warning Officer of the home group as necessary.

c. Responsible to the Group Commandant for:

(1) The provision of information on the logistic situation at the NRC.

(2) The command of all Royal Observer Corps personnel at the Service Unit.

2. The Crew Supervisor (normally, either the Chief or one of the Leading Observers) is responsible to the Team Officer for:

a. The control of the Nuclear Reporting Cell and the maintenance of operational efficiency during his tour of duty.

b. Plotting Hot line predictions of fallout.

c. Preparing initial prediction templates and wind flow charts, from effective down-wind forecasts for use on the Display A.

d. Marking predicted fallout Zones I and II and the times of arrival on the Display A.

e. Acting as Deputy Team Officer for brief periods, as required.

3. The Receiving Operator is responsible for:

a. Removing messages from the printer connected to the parent UKWMO Control.

b. Identifying and selecting certain messages, then distributing them to the Crew Supervisor, Display A Plotters, or the Nuclear Burst Tote, as appropriate.

c. Maintaining the Nuclear Burst Tote.

d. Clearing discarded messages from the positions in the NRC.

e. Assisting in the preparation of Initial Prediction Templates.

f. Carrying out the instructions of the Crew Supervisor.

4. The Display A Plotters are responsible for:

a. Back plotting nuclear burst and fallout threat data on the Display A.

b. Plotting continental nuclear burst data on the Display E.

c. Assisting in the preparation of Initial Prediction Templates.

d. Carrying out the instructions of the Crew Supervisor.

e. Plotting DR7 values from RR messages on the appropriate Display.

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PART E

OFFICERS' AND SUPERVISORS' OPERATING PROCEDURES

1. Team Officer
2. Team Supervisor

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OFFICERS' AND SUPERVISORS' OPERATING PROCEDURES

TEAM OFFICER

1. The Team Officer is to keep fully aware of the operational situation and the current needs of the Service unit and is to have a thorough knowledge of all the ROC procedures used in the Nuclear Reporting Cells (NRC).

2. The Team Officer is to make sure that available personnel are employed to the best advantage to meet the current operational situation and that changes in tasks are effected as necessary to avoid fatigue. He is to delegate the moment to moment running of manning arrangements in the NRC to the Crew Supervisor.

COMMUNICATIONS

3. The Team Officer is to be aware of the state of the land line and data equipment at all times. Whenever faults are reported he is to immediately inform British Telecom or the Service signals unit, as appropriate, of the nature of the fault and progress the repairs as necessary. In any event the parent group's Comcen Supervisor is also to be informed of any faults.

ATTACK WARNING RED

4. When the NRC receives an Attack Warning Message RED, the Team Officer is to ensure that all ROC team members in the building are alerted and that the duty crew is in position, ready to operate.

CUSTOMER QUERIES

5. Queries raised by the customer could be raised verbally or preferably, by the use of Customer Query Form (see Annex D). The Team Officer will answer queries from examination of his own displays or by reference to data in store. Questions outside his capability to answer should be referred to the Chief Warning Officer at the parent Group/Sector Control. Answers can be determined from the Display 'A' by:

a. Analysing the hot line presentation.

b. Applying the appropriate Zone I template temporarily to the display.

c. On complicated fallout patterns, applying template data onto the display itself.

d. Using dose-rate graphs E-13 for Dose-rate Predictions.

e. Using the Nuclear Weapons Effects Computer for damage estimation.

f. Using the CC data to give actual or estimated radiation intensities at specific locations.

g. Using the Radiac Calculator to give estimates of radiation intensities based on the RR plot.

FALL-OUT INFORMATION

6. First fallout, subsequent arrival times and dose-rate levels for selected locations are available from FF, LL and CC messages if the location is within the parent Group's area of interest, using the nearest Monitoring Posts for reference (CC messages are also received nationally at NRC's).

7. If the location is outside the area of interest, the information can be amplified by liaison with the Chief Warning Officer of the parent Group.

DR 7 PLOT

8. Once deposition of radio-active fallout is complete and decay has stabilised, a contoured map showing areas of high and low intensity can be drawn. Decay will normally follow the standard $T^{-1.2}$ law which is based on the compounded decay rates of the isotopes most likely to be found in the debris resulting from a nuclear explosion. However, decay may, in its early stages, depart from the standard law in certain cases; for example, sea bursts or bursts on land containing granite. After 48 hours these discrepancies disappear and the $T^{-1.2}$ law is followed by all likely combinations of isotopes.

9. Once the contour map has been produced it can be used for planning immediate post attack operations using the radiac calculator to establish future (or if necessary, past) dose-rates and doses. However, the plot produced from Monitoring Posts needs to be supplemented by readings from as many other recording points as possible before it can be used for its main purpose which is to provide the radiac history of the territory concerned. It could be used in the later post-attack phases, say at one year after attack, for planning the planting of crops and husbanding livestock and later still to assess the risk of long-term genetic effects on the population.

10. Before the plot can be drawn, all dose-rates at all Monitoring Posts in the Sector/or UK must be related to a common time. A time of seven hours after burst is used because this permits easy calculation of future or past dose-rates using the $T^{-1.2}$ law, which is also referred to as the 7/10 rule because if the time after burst is multiplied by 7, the dose-rate is divided by 10. For example, if a dose-rate is 20 rph at 2 hours after burst, then at 14 hours after burst it will be 2 rph.

11. Certain criteria must be met before DR 7s can be calculated and a plot drawn. These are:

a. The attack appears to be ended.

b. The time since the last known burst is equal to or exceeds half the time between the first and last bursts affecting the Sector/or UK.

c. There is no further threat of significant fallout likely to affect the Sector/or UK.

d. All fallout currently affecting Sector/or UK is past FOM or is expected to reach FOM shortly.

12. Once these conditions are met, establishment of the DR 7 time is simple in the case of a single or multiple bursts arriving within a few minutes. But in the event of an attack lasting over several hours the DR 7 time has to be based on a mid-point in the attack. If, for example, an attack begins at 1000 hours and

continues until 1600 hours, the six-hour period is halved and that half is added to the start time, giving a mid-point time of 1300 hours; to this is added 7 hours, giving a DR 7 time of 2000 hours.

13. The DR 7 time is decided by the Sector Controller in consultation with the Regional Government HQ Commissioner. Each Sector Controller may set a DR 7 time for his own Sector; it may, therefore, be necessary for DR 7s from other Sectors to be re-calculated before use. Normally a national DR 7 time will be agreed between Sectors.

14. DR 7s are calculated by Warning Officers from the log charts and collated into RR messages. These are provided to all NRCs as routine. Thus it is possible for all NRCs to produce a national DR 7 plot.

15. DR 7 values are to be plotted at the NRC by the Display A plotter on an overlay to the 1:625,000 map (unless other local arrangements are in force), below the post numbers, using the following colours:

0x1 to 2x9	Black (on white backed maps) or White (on transparent displays)
3x0 to 9x9	Green
10 to 29	Red
30 to 99	Blue
100 and above	Yellow

16. As soon as DR 7s have been plotted, contours of equal dose-rates can be drawn, all yellow readings being contained within a yellow line, all blue readings within a blue line etc. Seldom will there be readings of the actual value of the line and in most cases it will be necessary to draw the contour lines between readings of different colours. When the lines are being drawn, all available information should be used in order to ensure that the plot is as accurate as it can be. For example, Display 'A' will give a clear indication of the general pattern followed by the fallout, the meteorological situation is obviously relevant, the area of the plumes will vary in relation to the yields of the weapons and so on. Similarly, in a stable meteorological system it is likely that weapons of similar size will produce similar fallout patterns.

17. Contours can be developed from low values progressing inwards to high values or vice versa, from high to low; the latter method is recommended for normal use but, if difficulties are encountered, the former may be better. Except where plumes overlap and identical contours from two bursts join together, all lines should be drawn back to the burst. Contour lines should be located as accurately as possible, assessing the proper position by interpolation between readings of different values. It may be found easier in the first instance merely to draw the lines so as to separate areas of different colours; once the plot has been completed in this way the positioning of the lines can be refined by more accurate interpolation. The white or black (outer limit) line should always be positioned close to posts which have not been affected by deposition.

18. The following table shows approximate areas affected by fallout at various dose-rates in respect of bursts of four different yields:

DR7 in cGy/h	AREA IN SQUARE MILES			
	100K	500K	1M	5M
100	6.4	45	90	500
30	25	200	300	2000
10	82	450	900	5000
3	750	1100	2000	11000

From this table it can be seen that any burst of 100K or more must have a yellow contour whether or not yellow readings are displayed. If they are not, the blue contour should be drawn first and the yellow contour interpolated within it.

19. When the plot has been completed, the overlay can be placed over a topographical map of the same scale so that readings can be related to actual places. Further overlays can be produced to show the situation as it will be at a later date; where the future time is a multiple of 7, eg 2 days (49 hours) or 2 weeks (2 days x 7) the new overlay is simply a matter of tracing the original overlay. For example, to draw the H+2 days plot, the yellow 100 rph line will become the red 10 rph line, the blue 30 rph line will become the green 3 rph line but the position of the 0x1 limit line will have to be established by calculation. Where the future time is not a multiple of 7, new DRs for the time required will have to be calculated and new contour lines drawn; inevitably these new lines will fall between the original ones.

20. References

Annex N - Map Reference Systems

Annex TI - Data Codes, Messages and Definitions

Annex V - Forms and Formats

Annex Z - Description of Displays A, B, E, T and NB Totes

Annex AA - Aides Memoire - Post Control and NRC

Annex AC - Operational Logs and Diaries

Annex AF - KSR & VDU - Description and Operation Instructions including High Speed Machines

Annex AK - Provisioning of Operational Stores for the Control and NRC

Annex AM - Identification Codes (Address of Units) including Multi-Address Codes

Annex AN - Identification Codes (European)

Annex AQ - EF Map and Explanation

Annex AR - Nuclear Weapons Effects Computer No 2

Annex AS - The Radiac Calculator No 2

Annex AT - Use of Graphs E13, E14

Annex AU - IPT Guide

Annex AV - Table of Cloud Radii

Annex BD - Customer Queries

ROYAL OBSERVER CORPS - NUCLEAR REPORTING CELLS

OFFICERS' AND SUPERVISORS' OPERATING PROCEDURES

CREW SUPERVISOR

POSITION AND PRIMARY TASK

1. The Crew Supervisor is to be positioned near the front of the Display 'A' and adjacent to his message store (EF - MM - NR) and his primary task is the prediction of the arrival of fallout, by hot line, at various locations - which can be marked on the Display - which are vital to the Service customer.

MANNING

2. At all times the Crew Supervisor is to ensure that the Display 'A' is adequately manned to deal with the operational situation and that at the commencement of operations the receiving operator is in position by the printer, standing by to receive messages. The Supervisor is to arrange suitable rotation of duties during a period of duty by the crew, to avoid members becoming fatigued.

EQUIPMENT

3. The Crew Supervisor is to ensure that the Nuclear Reporting Cell is properly equipped for operations.

FALL-OUT PREDICTIONS

4. Definition. Fall-out prediction is the application of winds, either actual or forecast (for preference the latter is used at the NRC) to the products of a nuclear explosion, so as to make an estimate of the area in which hazardous fallout will be deposited.

5. Aim. The aim of the prediction is to:

   a. Provide commanders with information about the areas of operations likely to be affected by fallout from contaminated nuclear bursts.

   b. Enable warnings to be given to units of the possibility of fallout and the time of its arrival in their areas.

   c. Provide a guide to any subsequent radiological survey.

6. Predictions can only forecast a possible or likely area in which the hazard from the deposition of fallout may reach dangerous levels. NRC predictions are made by plotting the hot line (from MM or EF) by use of a protractor and windspeed proportional scale taking into account the radius of the developing cloud during the first one or two hours. Up to three hours of prediction should always be shown by this method.

7. Actual fallout fronts and subsequent predictions will be based on Threat Messages (TT, TX).

8. An alternative method of fallout prediction is that based on NATO STANAG 2103. This system requires the use of Initial Prediction Templates which in all cases define Zone I - the area of immediate operational concern (within this Zone there will be areas where exposed unprotected personnel may receive doses of 150 c/Gy, or greater, in relatively short periods of time - less than 4 hours after actual fallout arrival). Major disruptions of unit operations and casualties may occur within portions of this Zone and in some cases (depending on when fallout is predicted to reach the downwind limit of Zone I) within Zone II, the area of secondary hazard. Within this Zone the total dose received by exposed unprotected personnel is not expected to reach 150 c/Gy within a period of 4 hours after the actual arrival, but within it personnel may receive a total dose of 50 c/Gy, or greater, within the first 24 hours after the arrival of fallout. Personnel with no previous radiation exposure may be permitted to continue critical missions for as long as 4 hours after the actual arrival of fallout without incurring the 150 c/Gy emergency risk dose.

9. Outside these two Zones, exposed and unprotected personnel may receive a total dose that does not reach 50 c/Gy in the first 24 hours after the actual arrival of fallout. The total dose for an indefinite stay time should not reach 150 c/Gy.

10. The prediction Zones I and II are based on:

a. A prediction sector, the angle of which varies according to the forecast wind speed.

b. The Zone I downwind distance, which varies according to the weapon power and the forecast wind speed (the downwind distance of Zone II is double that of Zone I).

c. The forecast downwind bearing.

11. The probability of success of a fallout prediction is the probability that all significant fallout from a nuclear weapon will be contained within the predicted area. The probability level chosen will depend on the degree of confidence required. UK Armed Forces have been advised that 80% is a practical probability level. This applies for 5K to 300K yields for the period Apr-Oct the true probability will be higher than 80%. Therefore, the prediction sector angles employed are based on the 80% probability.

METEOROLOGICAL INFORMATION

12. At the commencement of operations and at 12 hourly intervals during operations, the NRC can expect to receive Effective Downwind Messages - codes EF - in four parts, each containing one forecast. These should arrive several hours before the first forecast in each message becomes valid, though depending on the time of commencement of operations, the initial message could arrive during the period of validity for either the first or second forecast. Supplementary meteorological information will be received in messages coded MM.

PORTABLE WIND FLOW CHARTS

13. An assessment of the general wind flow pattern is to be maintained on portable Wind Flow Charts and the first of these is to be produced on receipt of the initial EF. Thereafter they are to be produced in accordance with Annex AQ. The portable Wind Flow Charts are to be used as guides when:

a. Assessing hot line patterns between forecasts and areas.

b. Deciding the number of Initial Prediction Templates to be produced.

c. Choosing the appropriate Initial Prediction Template to be used on the Display 'A'.

Note: Only the charts which are currently valid are to be kept at the Display 'A'.

COMMUNICATIONS

14. All equipment and line failures reported to the Supervisor are to be notified to the Team Officer immediately for actioning.

HOT LINE PREDICTION

15. Hot line prediction of fallout is effected by means of a hot line protractor and Windspeed Proportional Scale and using a YELLOW chinagraph pencil.

16. The method of plotting initial predictions is as follows:

a. Select the hot line bearing, appropriate to the power of the weapon, by reference to MM or EF.

b. Using the hot line protractor, plot the bearing from the ground burst position by striking a line at least H+3 long (3 x wind speed).

c. Note the time of burst and the weapon yield and refer to Annex AT.

d. If the time of burst is between 30 to 59 minutes past the hour proceed as in sub paras e, f and g without taking account of the cloud radius. If the burst time is between 0 and 29 minutes past the hour mark the appropriate H+1 cloud radius downwind of the ground zero and proceed as in sub paras e, f and g.

e. Using the Windspeed Proportional Scale, plot the '0' minute time on ground zero or on the downwind limit of the cloud radius, if marked, with the windspeed lines parallel to the hot line plotted and slide the scale down until the appropriate windspeed time coincides with the hot line.

f. Note the time, in minutes, which had elapsed since the last full hour and the time of burst. Slide the scale to the left until the interpolated minute time coincides with ground zero or with the down-wind limit of the cloud radius, if marked.

g. Mark the hot line at the end of the appropriate windspeed line to indicate the first full hour time.

h. Using the protractor or scale, mark the second hour line. If no addition for cloud radius was made to the first hour time-line, add the appropriate H+1 radius to the windspeed before marking the time-line. If an addition was made, add the H+2 increment to the windspeed before plotting the time-line.

i. Using the protractor or the scale, mark the third hour line. If the H+1 radius was added to the second hour's travel, add the H+2 increment to the windspeed before plotting the time-line. If the H+2 increment was added to the second hour's travel, mark the third hour time-line using the windspeed only.

j. If any further time-lines are plotted, the windspeed only is to be used.

EXAMPLE:

With a windspeed of 30 kph the time of burst is 2020, ie 20 minutes after the previous full hour, and the first full hour mark is 2100, representing 40 minutes of travel.

17. Subsequent predictions are plotted by reference to the TT plot (the actual path of fallout) as follows:

a. Compare the initial hot line prediction with the actual TT front but make no alteration until the second hour's TT is plotted, always maintaining two hours of hot line prediction ahead of the actual front and using the windspeed only.

b. If, after plotting the second hour's TT front, the forecast needs modification, assess a revised windspeed and bearing, erase the initial prediction hot line and plot a modified hot line ahead of the actual fallout front.

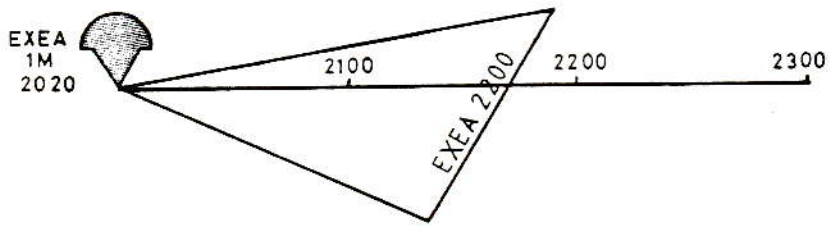
Note: The revision of windspeed and bearing should be by UK areas and not by individual plumes. Consideration in the revision should include an appreciation of the current forecast, the next forecast and current acutal data.

c. Continue to plot at least two hours of subsequent prediction ahead of the actual front, modifying again as necessary.

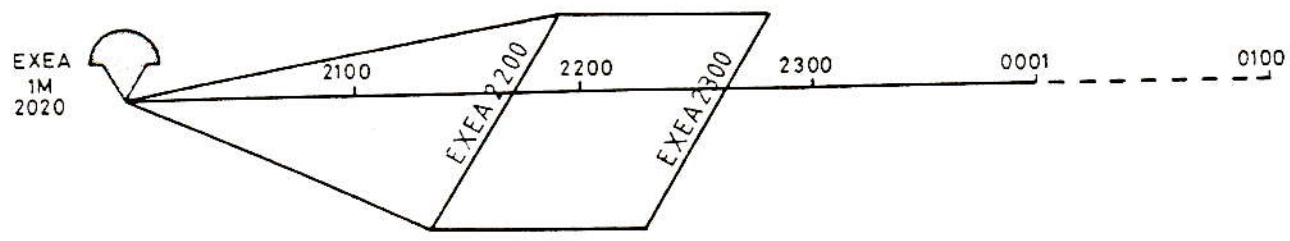
SUBSEQUENT PREDICTIONS

EXAMPLE:

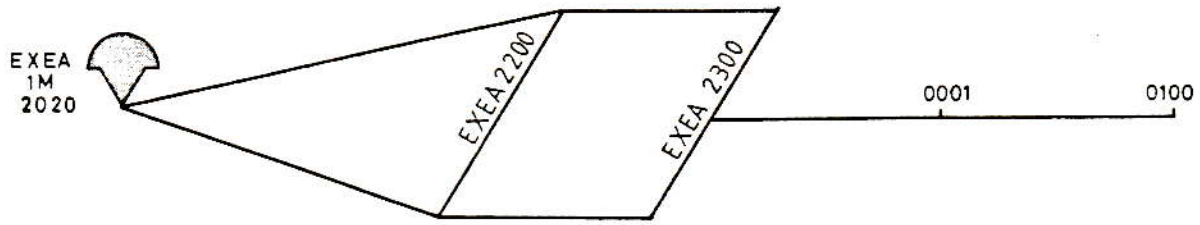
a. First hour TT plotted:



b. Second hour TT plotted:



c. Subsequent predictions after second hour TT:



18. If, as part of the additional requirement, it is necessary to plot Zone I and Zone II predictions, the Crew Supervisor is to prepare the appropriate Initial Prediction Template using the IPT Protractor.

19. A description and instruction on the use of the IPT Protractor are at Annex AU.

20. The Supervisor is to be absolutely certain that each Initial Prediction Template is marked with the number of the EF Area, date and the period of validity to which it refers. Only the templates with the current period of validity are to be used on the Display 'A'.

USE OF INITIAL PREDICTION TEMPLATES

21. If the Service customer requires only an indication of Zone prediction, this may be achieved by applying the appropriate template to the GZ of the burst without marking the Display.

22. Whenever an Initial Prediction Template becomes valid for use and in order to provide a visual indication of the general direction, the Supervisor is to take the template to the Display 'A' and:

a. Locate the mid-point of the appropriate EF Area on the Display and clean off any existing arrow.

b. Orientate the template approximately North and place the GZ point on the Initial Prediction Template over the mid-point position.

c. Adjust the Initial Prediction Template until it is correctly aligned North in relation to the Eastings.

d. Using a GREEN chinagraph pencil, mark on the Display at the two points where the 'G' (red) bearing and its reciprocal crosses the 'G' (red) ring.

e. Remove the Initial Prediction Template.

f. Draw a thick GREEN line between the two marks straddling the mid-point position and draw an arrow head indicating the downwind direction.

INITIAL PREDICTIONS

23. Where Zone predictions are required on Display 'A', the Supervisor, in order to provide an initial prediction indicating the area of immediate operational concern, is to take the Initial Prediction Template for the nearest EF Area in which the burst lies and a WHITE chinagraph pencil, then:

a. Orientate the template approximately North and place the GZ point on the Initial Prediction Template over the GZ position of the burst from which prediction is required.

b. Adjust the Initial Prediction Template until it is correctly aligned North in relation to the Eastings.

c. Mark the Display with outline of Zone I and the 1, 2 and 3 hour broken time-lines for the prediction for the appropriate power (over 1M up to 3M - RED, over 300K up to 1M - GREEN, over 30K up to 100K - BLUE) by lifting the edge of the acetate whilst holding the template firmly in position.

d. Remove the template and thicken the outlines and the 1, 2 and 3 hour broken time-lines on the Display (see Fig 1) and white Zone I adjacent to and inside the downwind distance arc (note: omit any time lines that lie within the cloud circles).

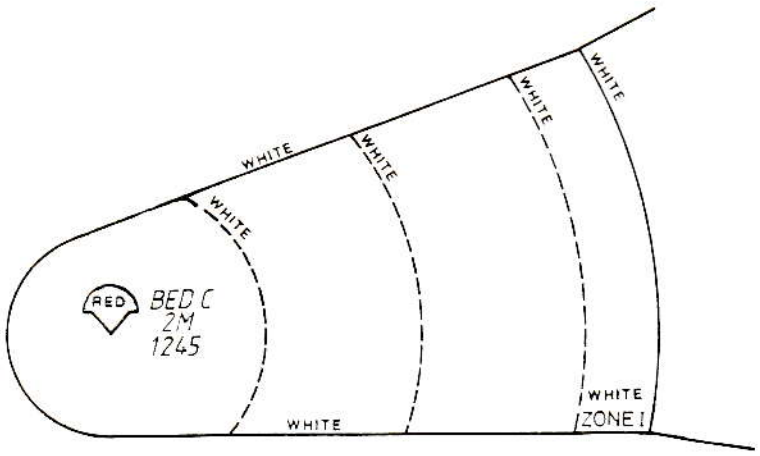


Fig 1

e. If the 3 hour broken time-line lies outside the Zone I, extend the prediction sector radii to the Zone II downwind distance and draw an arc between the two ends (see Fig 2), but if this area of prediction extends over other EF Areas, then the templates for those Areas should be used to provide the criteria upon which this further prediction is based; write Zone II adjacent to and inside the second downwind distance arc:

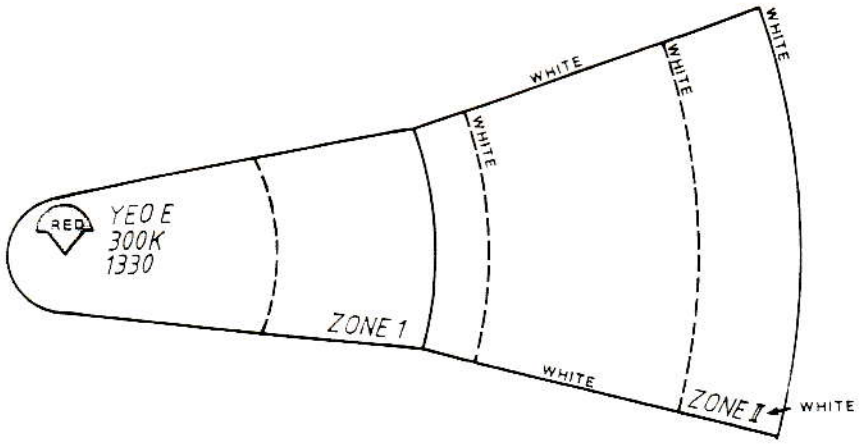


Fig 2

f. If the second template is used, place the GZ point on the Initial Prediction Template over one end of the Zone I arc on the Display 'A', adjust the Initial Prediction Template until it is correctly aligned North and mark the Display with the revised prediction sector radius and the Zone I downwind distance (see Fig 3):

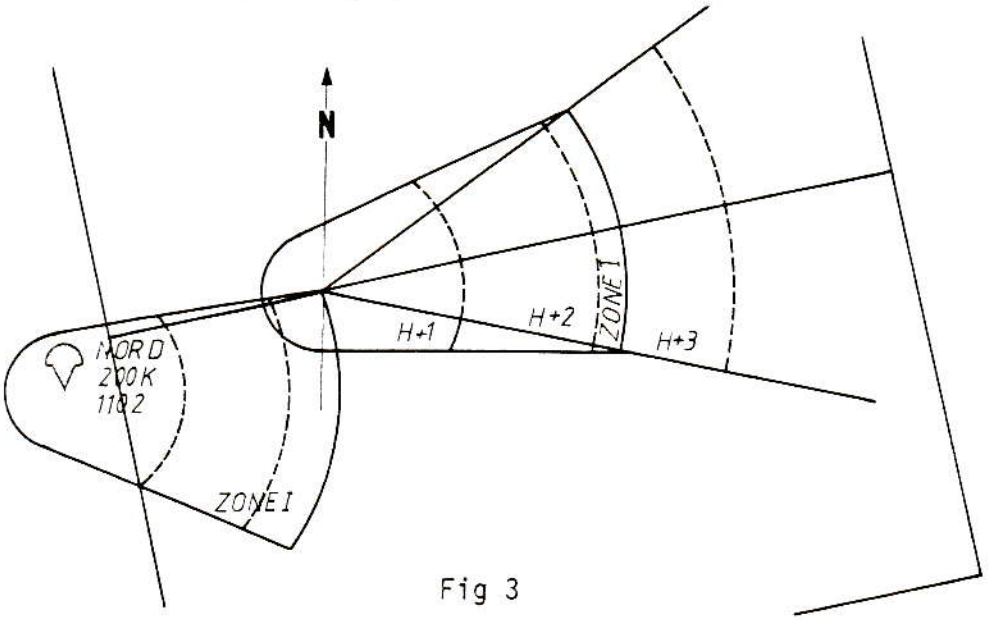


Fig 3

g. Repeat 'f' for the other end of the Zone I arc and draw an arc between the two ends of the extended prediction sector radii (see Fig 4):

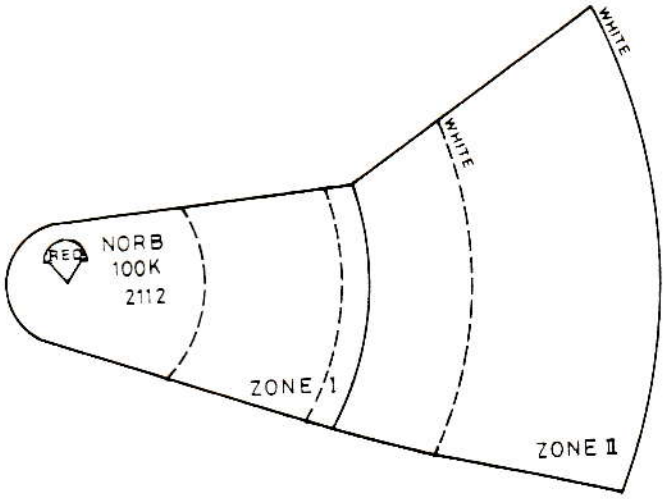


Fig 4

h. Calculate the 1, 2, 3 hour predicted times of arrival by adding to the time of burst and write these adjacent to one end of the 1, 2, 3 hour time lines respectively, but on the GZ side of the line (See Fig 5).

i. Finally, if time allows, estimate the time-line for the first likely TT to be received and mark the Display in a broken RED line - this should not be earlier than 45 minutes after the time of burst (see Fig 5):

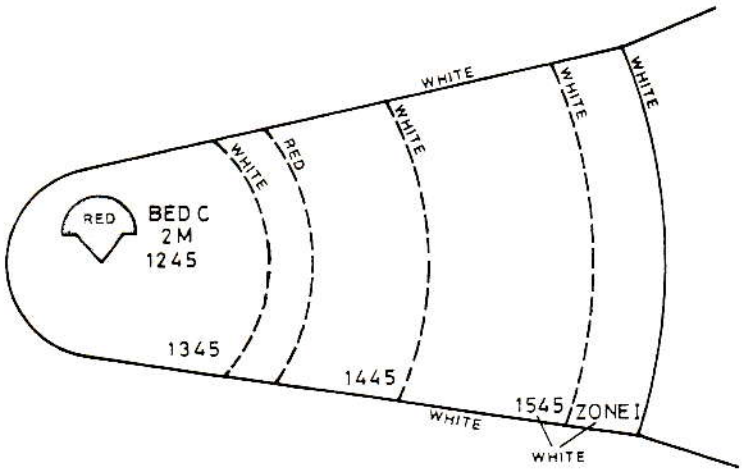


Fig 5

24. When there are several bursts from which Zone predictions are required, a template is to be appled to the burst furthest downwind and then to each successive upwind burst in turn, adding to, but not over-crossing the outlines already drawn, except that if a Zone I outline over-crosses a Zone II, the Zone I should be fully shown.

25. Ideally, there should be a minimum of one hour of predicted times of arrival on the Display, so in the event that no TT front is plotted in respect of a burst, up to 15 minutes before the time shown on the 2 hour broken time-line of the initial prediction and the burst is of particular interest to the Service customer, a 4 hour broken time-line is to be added with the appropriate time written alongside as before, again using the most suitable template as a guide. As soon as a time-line is drawn that lies outside Zone I, the prediction is to be extended to show Zone II, adding to, but not over-crossing the outlines already drawn. Broken time-lines are to be added at each successive hour, so long as no TT message is received for that burst and until the fallout is calculated to have passed out to sea.

WIND SPEEDS LESS THAN 8 KPH

26. When the current forecast wind speed is less than 8 KPH no downwind bearing will be given in the EF and a special Zone I downwind distance is provided instead of the windspeed. In these circumstances the Zone I initial prediction is assumed to take the form of a circle, of radius equal to the given downwind distance for Zone I (D ---034; F ---050; G ---079) around the GZ. The Supervisor is to place the appropriate card disc template over the Display, with the tip of the burst symbol showing centrally through the small hole and with a WHITE pencil draw the circle around the GZ while holding the disc firmly in position, Write Zone I inside the Southern edge of the circle. No time-lines are to be drawn.

SUBSEQUENT PREDICTIONS

27. Threat messages - TT (orginated on the hour by all Sector Controls at each hour following the arrival of fallout within their Sectors) will be plotted on the back of the Display 'A' by the Display 'A' Plotters, who will draw the attention of the Supervisor to each one as soon as it has been plotted.

These represent the distances actual fallout from the burst has reached at certain times and are shown as RED lines forming hourly fronts, with their ends connected back, via any previous fronts, to the GZ to form rudimentary plumes. As these rudimentary plumes are developed by successive threat messages, no account is taken of the widening of the earlier part of the plume through wind sheer, so they do not represent the total area ultimately affected by fallout.

28 The Supervisor is to use the plot of these TT fronts as the basis from which he is to originate subsequent predictions of the arrival of fallout, on the front of the Display 'A'. The subsequent prediction is to be for two hours and before clearing from the display the broken time-lines of the initial or previous prediction (the Zone I and Zone II outlines are to remain and if Zone I only has been plotted, the Zone II is to be added whenever a time-line is drawn that lies outside Zone I so that ultimately for each ground burst plotted there will be predicted Zones I and II drawn. However, it must be borne in mind that the Zones I and II are based on the 80% probability that the fallout will be contained within their boundaries, so in the event that a threat front plotted clearly shows the fallout to be partly outside a Zone side boundary and therefore is an element of the remaining 20%, the Zone should be realigned so that the TT front lies centrally within it and the Service customer advised of the change) the Supervisor is to compare the TT plot with the previous prediction to assess any possible changes in the mean wind speed and direction, which may significantly influence the application of the current EF details to the subsequent prediction. If there appears to be some significant change, make a further comparison, this time with other nearby plumes (particularly those from weapons of similar power) to assess if a trend is developing; if not, that the TT front has been correctly plotted before making the subsequent prediction.

29. In making the subsequent predictions, the Supervisor is to draw ahead of the TT front, using a YELLOW chinagraph pencil, a one hour predicted path of fallout in a solid line and a further hour in a broken line, basing these on the comparisons made, together with the current EF information relevant to the time and geographical location. Existing plumes and earlier predictions are not to be over-crossed.

30. If no significant changes have occurred to modify the EF details, the Supervisor, when the Zone I on the Display is:

a. Isolated from another, is to:

(1) Clear the broken time-lines of the initial predicition from the Display.

(2) With aid of a straight edge, draw two fine broken lines connecting the GZ to the junctions of the Zone I arc with the prediction sector radii (see Fig 6a).

(3) From the end of the TT front draw solid lines representing one hours's travel, parallel with the broken lines and extend them in broken lines for a second hour's travel.

(4) Draw the one hour solid and two hour broken time-lines parallel with the TT front.

(5) Write the appropriate time adjacent to one end of each time-line (see Fig 6b).

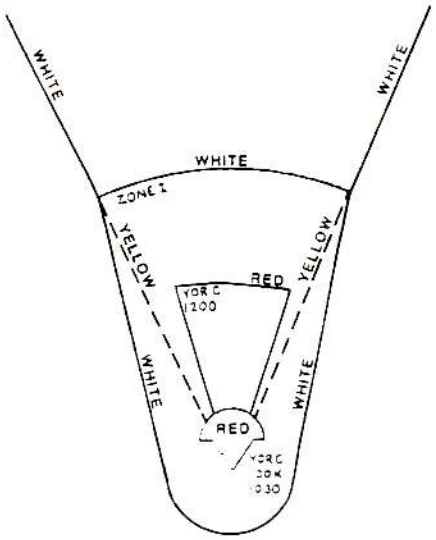


Fig 6a

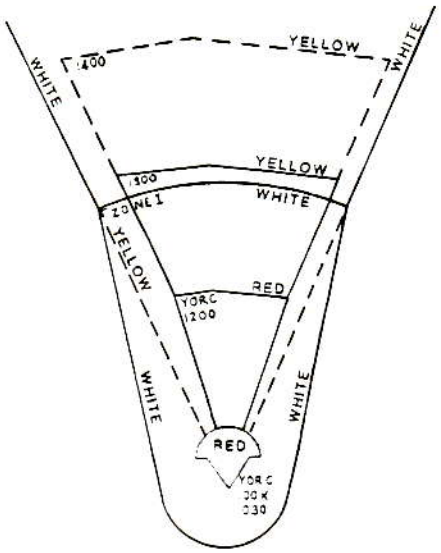


Fig 6b

b. Overlapping another, is to:

(1) Clear the broken time-lines of the initial prediction from the Display.

(2) Select the appropriate Initial Prediction Template.

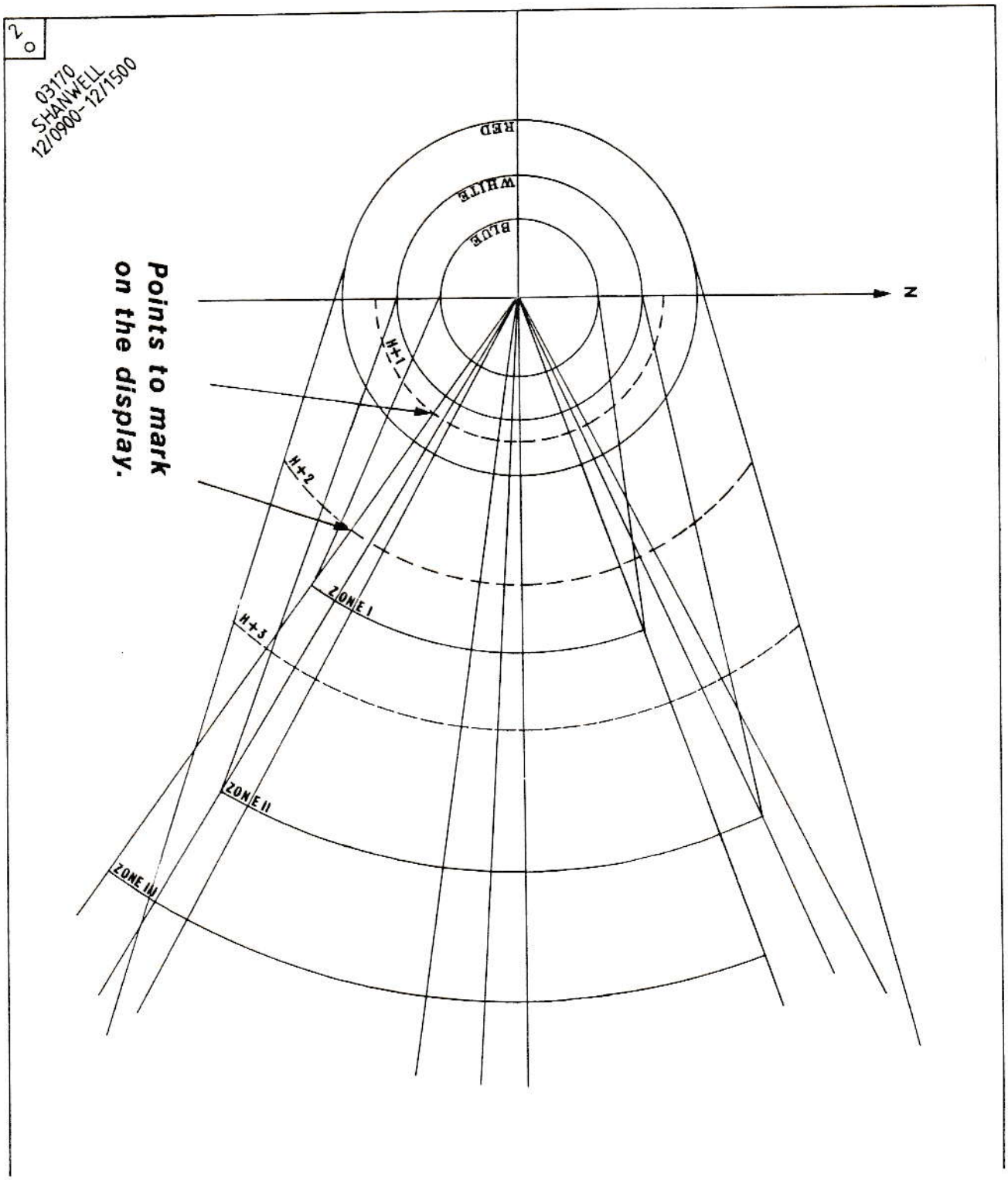
(3) Place the GZ point on the Initial Prediction Template over one end of the TT front on the Display (see Fig 7).

(4) Adjust the Initial Prediction Template until it is correctly aligned North and mark the Display with the appropriate prediction sector radius by drawing a solid line representing one hour's travel and extending this in a broken line for a second hour's travel.

(5) Repeat (3) and (4) for the other end of the TT front.

(6) Draw the one hour and two hour broken time-lines parallel with the TT front.

(7) Write the appropriate time adjacent to one end of each time-line (see Fig 7).



TRANSPARENCY

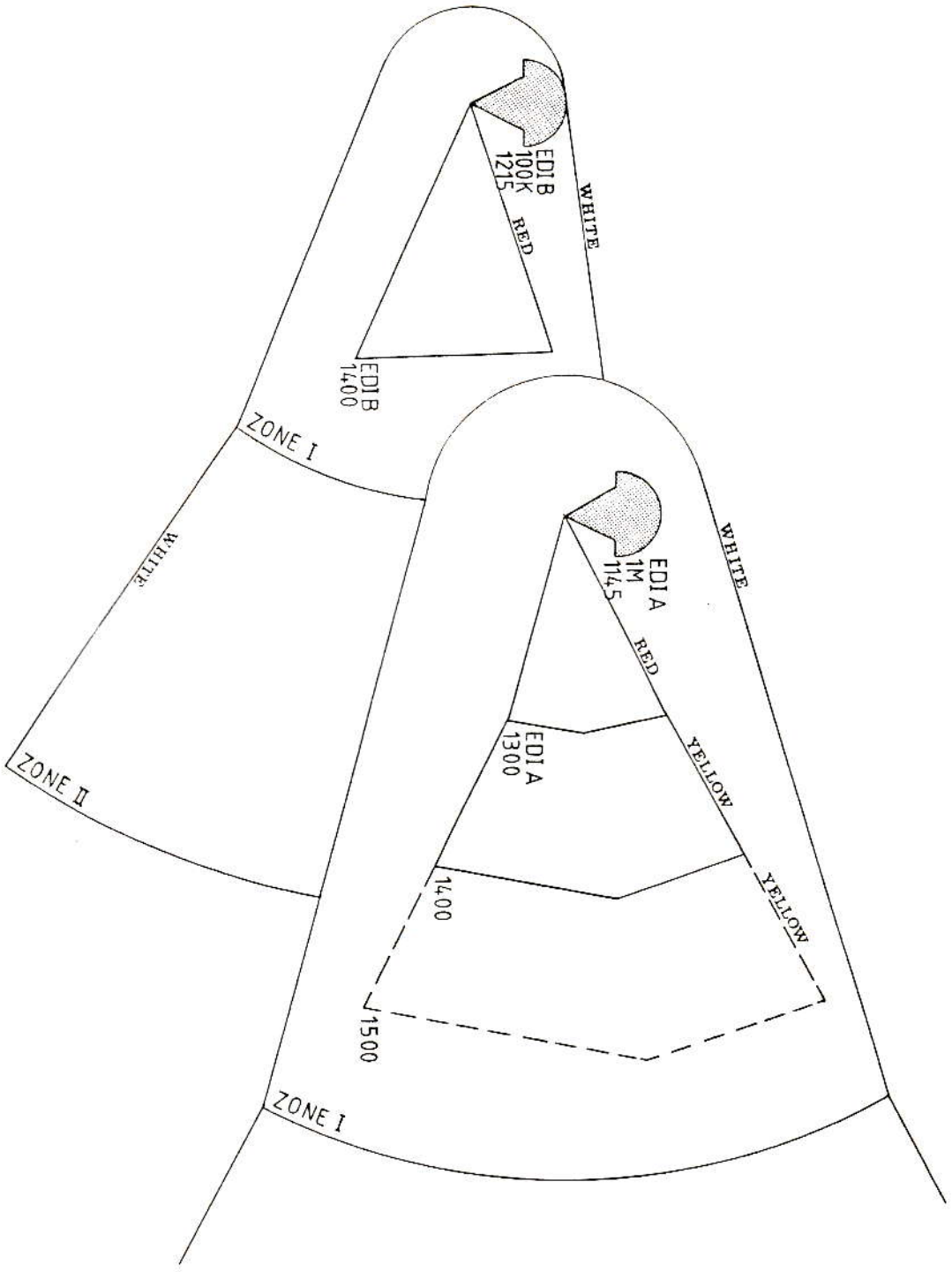

EDIB
100K
1215
RED
WHITE
EDIB
1400
ZONE I
WHITE
ZONE II
EDIA
1M
1145
RED
WHITE
EDIA
1300
YELLOW
1400
YELLOW
1500
ZONE I

Fig 7

31. If there have been significant changes in the mean wind speed or direction, either because of a changing weather pattern, or because the fallout has reached another EF Area which shows a marked difference in the wind direction, then judgement and common sense will have to be exercised in making the prediction, which will have to be extrapolation, based on the TT information and the relevant EF details (see also para 24).

32 When a TT message is received that contains a 'No Report', this will be passed to the Supervisor.

33. Again, ideally there should be a minimum of one hour prediction on the Display, so if no further TT front is plotted in respect of fallout from a burst up to 15 minutes before the time shown on the two hour time-line of the subsequent prediction and the burst is of particular interest to the Service customer, then the prediction is to be extended with a broken line for a further hour, with the appropriate time written adjacent to one end of the time-line. This process is to be repeated hourly so long as no further front is plotted for a particular burst and until the fallout front is calculated to have passed out to sea.

34. Predictions (initial and subsequent) for those bursts that are of no immediate interest to the Service customer, should be made as and when time allows and should not be discontinued until the fallout fronts have been calculated to have passed out to sea.

CONTINENTAL NUCLEAR BURSTS AND FALL-OUT INFORMATION

35. Details of Continental nuclear bursts that pose a threat to the United Kingdom will be received at the NRC and will be plotted on the Display 'E' (the Continental map).

36. Predictions of fallout arrival from the Continent will be received at the NRC in Continental threat messages - coded TX (see Annexes T1 and AN) giving the details of fronts - in a similar fashion to TT messages - each with the estimated time (hour) of arrival and will be plotted in YELLOW on the back of the Display 'A'. After each of these fronts is plotted, it will be brought to the attention of the Supervisor.

37. The Continental threat messages are originated at Sectors on receipt of information received via Continental Liaison and are based on, either estimated times of arrival (ETAs) or, actual fallout arrival times, on the Continental coast. If a TX message is issued for the former, it is likely that an amendment will be issued for the latter on receipt of the further information from the Continent. When an amendment is plotted on the back of the Display 'A' it will be identified by the letter 'A' and the message date/time written after the front time, eg 1400 A 061200.

38. When the predicted fallout from a Continental burst arrives in the UK and has been identified it will be the subject of a normal TT message.

39. If no TT message is received for a fallout front from a Continental burst, up to 15 minutes before the second hour time-line is reached, then a further hour's prediction is to be drawn on the Display, in a broken line, with the appropriate time written adjacent to one end of the time-line and repeating the process for a fourth hour, if necessary.

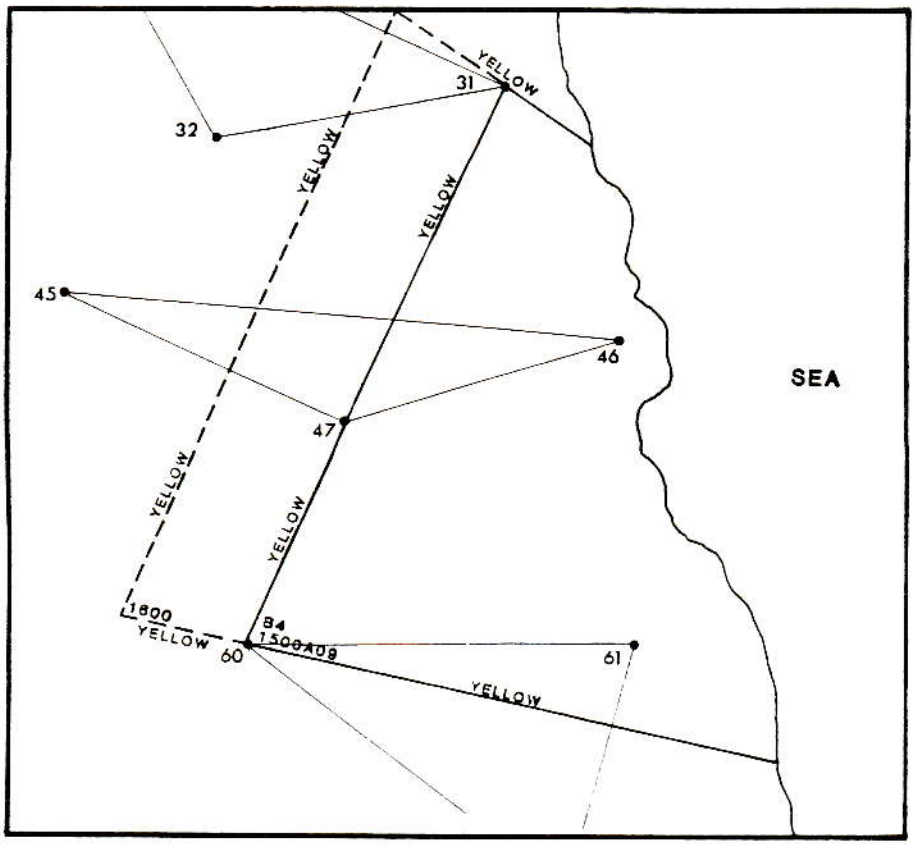


Fig 8

40. No hard and fast rule should be followed when dealing with threats of fallout from the Continent which do not arrive as predicted. Account must be taken of the distance that fallout would have to travel, unmonitored, over the sea and any possible changes in wind speed and direction. If a predicted arrival has not been detected, identified and therefore no TT message originated and received before the time of the fourth hour of a prediction based on a TX message, then the prediction may be discontinued.

41. References

Annex D - Customer Queries

Annex H - Continental Liaison

Annex N - Map Reference Systems

Annex T1 - Data Codes, Messages and Definitions

Annex V - Forms and Formats

Annex Z - Description of Displays A, B, E, T and NB Totes

Annex AA - Aides Memoire and Check Lists - Post, Control & NRC

Annex AB - Communications Logs, Totes and Fault Dockets

Annex AC - Operations Logs and Diaries

Annex AN - Identification Codes (European)

Annex AP - Table of Cloud Radii

Annex AQ - EF Map and Explanation

Annex AU - IPT Guide

ROYAL OBSERVER CORPS - NUCLEAR REPORTING CELLS

STANDARD OPERATING PROCEDURE NO 3

(ISSUE 3)

PART F

CREW OPERATING PROCEDURES

1. Receiving Operator
2. Display A Plotters

ROYAL OBSERVER CORPS - NUCLEAR REPORTING CELLS

CREW OPERATING PROCEDURE

RECEIVING OPERATOR

POSITION

1. The receiving Operator is to be positioned adjacent to the Printer connected to the selected UKWMO Control, to receive incoming messages.

PREPARATION ON INITIAL MANNING

2. On initial manning the Receiving Operator is to:

a. Ensure that the Printer has an adequate supply of paper and replenish if necessary.

b. Switch on the Printer.

c. Await the receipt of the test transmission message coded CT.

d. On removing the message from the Printer check it for correct reception by comparing it with the perfect copy of the test transmission message.

e. Report the serviceability or otherwise of the Printer to the Crew Supervisor.

f. Ensure that he has available at the Nuclear Burst Tote, a supply of small Nuclear Burst symbols (Red and Green), black chinagraph pencils and cleaning cloths.

MESSAGE HANDLING

3. From the messages removed from the Printer, the Receiving Operator is to select as follows:

a. BB, BX, TT and TX - to be taken to the Display 'A' and placed in the appropriate Display 'A' Plotter's 'IN' holder - according to the originator's identification and the distribution between the Plotters.

b. EF, MM and NR - to be taken to the Display 'A' and placed in the Crew Supervisor's holder.

c. CT (TEST) transmission - as para 2d. and e. above.

d. All other messages are to be stored until required.

e. All garbled messages received are to be passed to the Crew Supervisor.

NUCLEAR BURST TOTE

4. The Receiving Operator is to remove actioned BB, BX, TT and TX messages from the Display 'A' Plotter's 'OUT' holder - limiting the number of BB and BX messages to no more than three at one time - and action them in accordance with Annex T4.

5. Disposal of Messages

a. On completion of the necessary action on the Tote, BB and BX messages are to be stored.

b. TT and TX messages are to be stored.

INITIAL PREDICTION TEMPLATES

6. The Receiving Operator is to assist in the production of the Initial Prediction Templates, as required by the Crew Supervisor.

PRINTER FAULTS AND MAINTENANCE

7. Any mulfunctioning of the Printer or suspected landline failure is to be reported to the Crew Supervisor by the Receiving Operator.

8. References

Annex T1 - Data Codes, Messages and Definitions

Annex T4 - Sector, Group and NRC Plotting Procedures

Annex V - Forms and Formats

Annex AA - Aides Memoire - Post, Control and NRC

Annex AF - KSR and VDU - Description and Operating Instructions including High Speed Machines

Annex AK - Provisioning of Operational Stores for Control and NRC.

Annex AM - Identification Codes (Address of Units) including Multi-Address Codes

Annex AN - Identification Codes (European)

Annex AU - IPT Guide

Annex BD - Customer Queries

ROYAL OBSERVER CORPS - NUCLEAR REPORTING CELLS

CREW OPERATING PROCEDURE

DISPLAY 'A' PLOTTERS - LEFT AND RIGHT

POSITION

1. Each Display 'A' Plotter is to be positioned behind the Display 'A', facing his plotting area of the screen.

PREPARATION

2. Each Plotter, on taking over the position, is to check that there is available, yellow and red chinagraph pencils, and cleaning cloths and that the 'IN' and 'OUT' message springs are in position.

3. The Display 'A' Plotters are to have a thorough knowledge of the layout and meaning of BB, BX, TT and TX message tapes.

PLOTTING - DISPLAY 'A'

4. The Display 'A' Plotter is to remove messages from the 'IN' holder and is to plot on the back of the Display 'A':

   a. Nuclear burst data coded BB (also BX if within the area covered by the Display) in YELLOW chinagraph using the procedures in Annex T4.

   b. Fallout Threat data coded TT and TX using the procedures in Annex T4 except that TT's are plotted using RED chinagraph and TX's are plotted using YELLOW chinagraph.

5. Some TT and TX messages - particularly the latter - will contain amendments and will be identified by the abbreviation AMDT as the first item of the text. On receipt of an amendment to a TT or TX front, the Display 'A' Plotter is to clear from the Display the original front, and plot the amendment in accordance with para 4b above, then after the time, write the letter 'A' followed by the message date/time; eg, 1400 A 061330.

6. On completion of plotting a nuclear burst, a nuclear burst amendment, a TT or TX front, or a TT or TX amendment, the Display 'A' Plotter is to draw it to the attention of the Crew Supervisor, by tapping on the back of the screen with the butt of a pencil and pointing to the plotted data.

PLOTTING - DISPLAY 'E'

7. Tapes containing BX data, after any necessary action on the Display 'A', are to be taken to the Display 'E' (the Continental burst map) and the Display 'A' Plotter is to plot each burst using the procedures in Annex T4.

PLOTTING - DR 7

8. DR 7 values are to be plotted at the NRC by the Display A plotter on an overlay to the 1:625,000 map (unless other local arrangements are in force), below the post numbers, using the following colours:

0x1 to 2x9	Black (on white backed maps) or White (on transparent displays)
3x0 to 9x9	Green
10 to 29	Red
30 to 99	Blue
100 and above	Yellow

DISPOSAL OF MESSAGES

9. After all plotting action has been carried out for the data contained in a message, the message is to be placed in the Plotter's "OUT" store, with the exception of TT messages containing an 'NR' indicating a 'No Report', which are to be placed in the Crew Supervisor's holder.

INITIAL PREDICTION TEMPLATES

10. The Display 'A' Plotters are to assist in the production of the Initial Predictions Templates, as required by the Crew Supervisor.

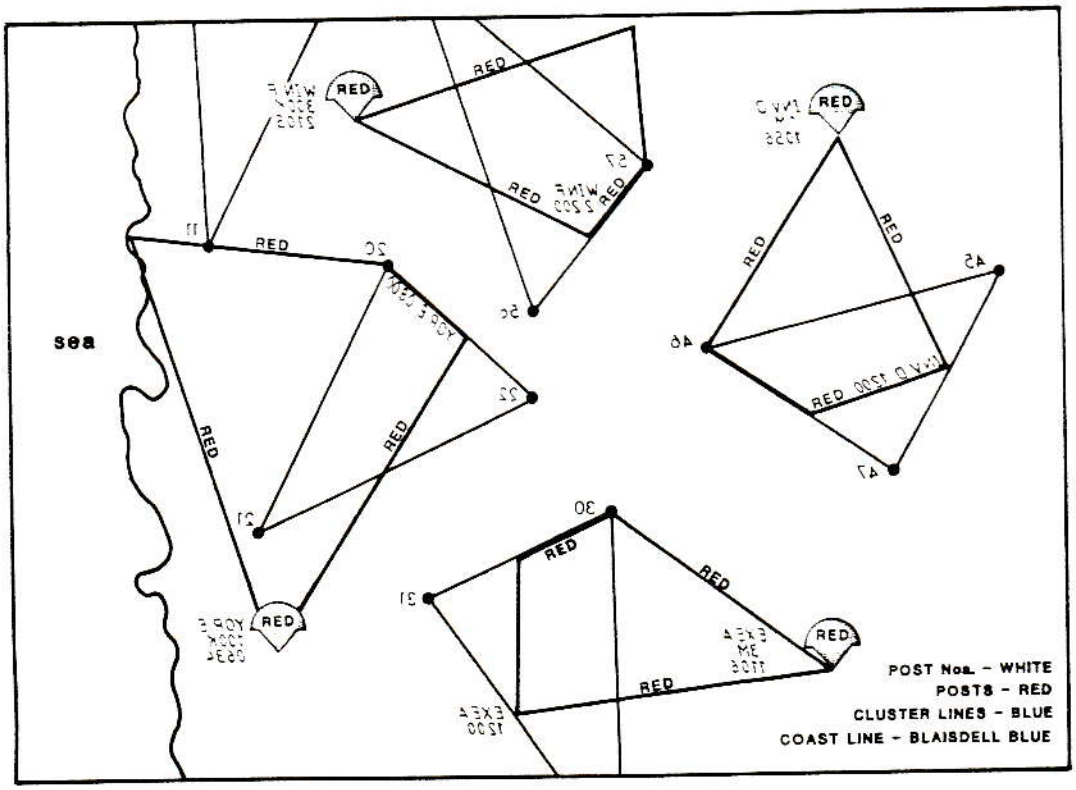


Fig 3

11. References.

Annex N - Map Reference Systems

Annex T1 - Data Codes, Messages & Definitions

Annex T4 - Sector Group and NRC Display Plotting Procedures

Annex Z - Description of Displays A, B, E, T and NB Totes

Annex AN - Identification Codes (European)

Annex AU - I P T Guide