

DIVISION OF NATIONAL MAPPING

TOPOGRAPHIC INSTRUCTIONS

PART 1 : SURVEY

SECTION 7 : AERODIST

INSTRUCTION 1 : AERODIST RECONNAISSANCE, STATION MARKING AND ASSOCIATED GROUND SURVEYS

PART 1 - SELECTION OF AERODIST STATION SITE :

1. An aerodist station site should be selected as near as practicable within 3 miles of the geographic co-ordinates of the proposed grid intersection for 0°30' quadrilaterals and within 5 miles of the geographic co-ordinates of the proposed grid intersection for one degree quadrilaterals.
2. Contact the owner of the property BEFORE ANY WORK IS COMMENCED. If it is necessary to clear timber, restrict felling of trees to a minimum and secure verbal AUTHORITY FROM THE OWNER, as discreetly as possible. Any felled timber which might constitute an unsightly view, particularly as seen from a homestead or traveled way on a property should be further sawn and stacked as cord wood.
3. It is preferable that a station should be selected along a road, near a fence, and well clear of formed surfaces. This site should be away from obvious future road deviations. At the same time it should be remembered to choose a site where less clearing of timber is required.
4. If it is necessary to place a station in an open paddock away from fences, an additional concrete station with reference marks (see paragraph 5, part 2) is to be established.
5. Where land is only partially surveyed for cadastral purposes, the surveyor is to use discretion in the establishment of the additional station, hereinafter referred to as the satellite station, wherever it is anticipated that agricultural improvement of the land is possible. Site selection should aim at keeping satellite stations to a minimum.
6. The satellite station will :-
 - (a) Have a unique number, not consecutive with the number of the station to be used for aerodist observations.
 - (b) Be placed on a safe and permanent position on a road.
 - (c) Be connected by tellurometer or taped traverse on an astronomic azimuth.
7. At all times station location is to be considered in the light of maximum permanency, appearance and facility of future location.
8. Where all other requirements in the location of an aerodist station site have been met, the site should be selected within RC; lateral overlap photography, and preferably appearing on 3 photographs in each of the adjacent flight strips.

PART 2 - GENERAL :

1. The monumentation of the aerodist station is to conform, with due regard to ground surface conditions, to the specifications as illustrated in appendices "A" and "B".
2. Every effort should be made to use good quality screened angulated gravel and sand. In certain areas it may be found necessary to carry a supply of these materials in the vehicle from a source of good supply. For example : from road dumps or shire council depots, by arrangement.
3. After making use of the metal formwork device, the concrete structure is to be neatly trowelled off, to provide a smooth surface to conform with the shape as shown in appendices "A" and "B". At this stage, while the concrete is still soft, dies of the appropriate letters and numbers for the station are to be placed in accordance with appendix "C". These dies are to be removed after the surface has been trowelled again. To ensure a hard surface dry cement should be finely sprinkled on the finished surface.
4. When the concrete surface is partially dry, "Boncote" (a mixture for whitening and coating concrete surfaces) is to be painted on the structure with a flexible paint brush. Adequate supplies of Boncote are to be carried where not available locally.

5. Reference marks should be 3 steel star pickets (fence droppers) each of approximately 1.5 metres in length driven flush with the ground. The tops of these pickets should be centre punched or otherwise suitably marked for exact reference measurements. Normally, the pickets should be placed approximately on a circle of radius 6 metres the centre of which is the aerodist station and approximately equidistant from each other. Reference marks should, where possible, be placed in positions where least likely to be disturbed, for example, under fences. Any permanent structures (bore casings, concrete bridges, large concrete culverts, etc.,) should be accurately connected to the aerodist station. Also connections of reasonable distances, should be made to corner fenceposts and distinct angles in fence lines. For a sketch of reference marks as might occur, see appendix "D".
6. There are not to be any intervening hills, trees, buildings or other objects which have an elevation angle of greater than $1^{\circ}30'$ within 5° each side of a ray from the aerodist station being established to all adjacent stations. These latter stations could be another aerodist station, an existing trigonometric station, State control station, etc.
7. All bearings are to be referred to the local astronomic meridian by astronomic observations at the time of establishment of the station. In the case of traverses of more than one leg, a final azimuth observation is to be made as a check on the bearings of the traverse.
8. All taped distances are to be measured and recorded in METRES and 1/100ths of metres. Any distances measured which are not parts of figures capable of mathematical checks, should be remeasured in reverse directions to the original measurements. Tellurometer measurements are to comply with normal operating procedures.
9. The reference object for the astronomic observation should, where possible, be at least 500 metres from the aerodist station. This object should be capable of being easily found and observed in future operations. It should be of as permanent quality as possible. A mark on the painted blaze of a solid, conspicuous tree would be satisfactory.
10. The photo reference point for the aerodist station is to be connected by azimuth and distance to the station by direct measurements. Where possible this distance should be less than 30 metres. Other identifiable reference points on the photo should be located, connected and recorded in the field notes. (See Topographic Survey Instructions Part 1, Sec. 2, Instruction 3).
11. All field notes are to be recorded in the field and are to be written in a neat manner, using water-proof ink, in the field-book.
12. Where 3rd order, Railway, Main-Road Authority or higher orders of levelling control exist within approximately five miles of the aerodist station, staff levelling techniques should be employed to 3rd order standards. The reduced level and datum (when available) of the Bench Mark used, as well as its full description and number, should be recorded.
13. It must always be borne in mind that staff levelling techniques are to be used in preference to barometric levelling. However, where level control as outlined in paragraph 12, only exists at distances greater than approximately five miles from the aerodist station, barometric techniques, using mechanism barometers only, are to be employed. Where weather conditions are adverse, particularly when obvious local weather front conditions exist, barometric traverses are to be postponed until the weather becomes more stable. In any case all weather conditions are to be fully recorded.
14. The barometers (mechanism type) used should be calibrated before and after the commencement of the field season, with frequent checks during the season against mercury barometers at post-offices or airports. Psychrometer readings should be taken each time a barometric reading is recorded, both at the base and remote barometer stations. Normal barometric precautions should be taken, in order to secure accurate results. A second barometric traverse is to be run in each case, on a different day to the original barometric traverse.
15. Control Record cards are to be completed in accordance with Topographic Survey Instructions Part 1, Sec. 2, Instruction 2. Particular reference must be made to alterations to existing access and condition of existing stations.
16. Terrestrial photography is to include :
 - (a) Make, Type and Number of Camera;
 - (b) Film Number;
 - (c) Film Exposure Number;
 - (d) Location of Camera;
 - (e) Direction and Object being photographed;
 - (f) Details of Camera Settings.

A full 360° of view is to be exposed from the aerodist station, the camera being held by the photographer on top of the truck-cabin platform where possible. The photography may take several frames, but care should be exercised not to omit any direction from the station. A photo, or more if necessary, should be taken of the station

itself, to clearly show the station number. Any photography should be made to help identify the station or illustrate any useful information.

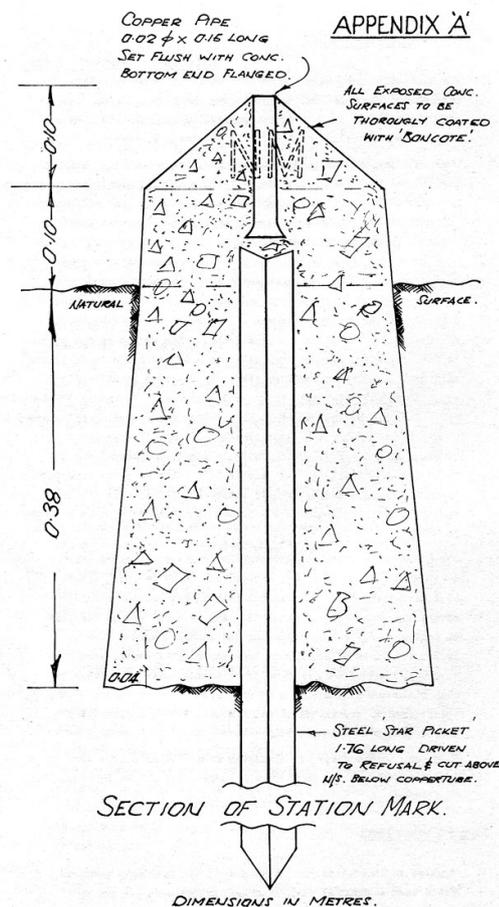
17. Aerodist station numbers should proceed in consecutive order. No numbers are to be omitted or repeated. The only occasion when aerodist stations are not to be consecutive in number is when one of them is a satellite station. See paragraph 6, part 1.
18. When communicating to headquarters concerning a newly established aerodist station, one should forward its number, approximate latitude and longitude. This information should be included in the usual Monday morning telegram to headquarters to enable the office to chart the progress of the ground marking.

PART 3 - ACCESS :

1. Access descriptions and diagrams for stations are to include any alternative routes which are practicable. Six copies of the access, in foolscap size, have to eventually be made available to following parties. Speedometer readings are to be recorded of all salient and recognizable features, which would materially assist in the location of a station. Directions of roads, tracks, etc., leading off another road should be defined by approximate bearings, for example : "Proceed at mileage 0.7 North-Easterly along said track" and not "turn left at mileage 0.7 at said track". This is quite important in the case where several ridges intersect, for example : "follow a ridge bearing approximate 20° to the top" and not "follow a ridge to the top".
2. Creek crossings, fences, cattle-grids, sign-posts, gates, tanks, dams, windmills, homesteads, air-strips, forks in road, intersections, bridges; in short, all helpful information should be accurately and carefully recorded. Any omitted feature can lead to confusion for others following the access diagram. The successive times of arrival at more important features should be recorded, because this enables those coming later to be able to plan their operations with more precision. The condition of the roads, tracks, creeks, etc., with respect to weather conditions should be noted where possible.
3. Where any access notes are available from another source or previous National Mapping surveys, these notes are to be brought up to date.

PART 4 - FIELD BOOKS

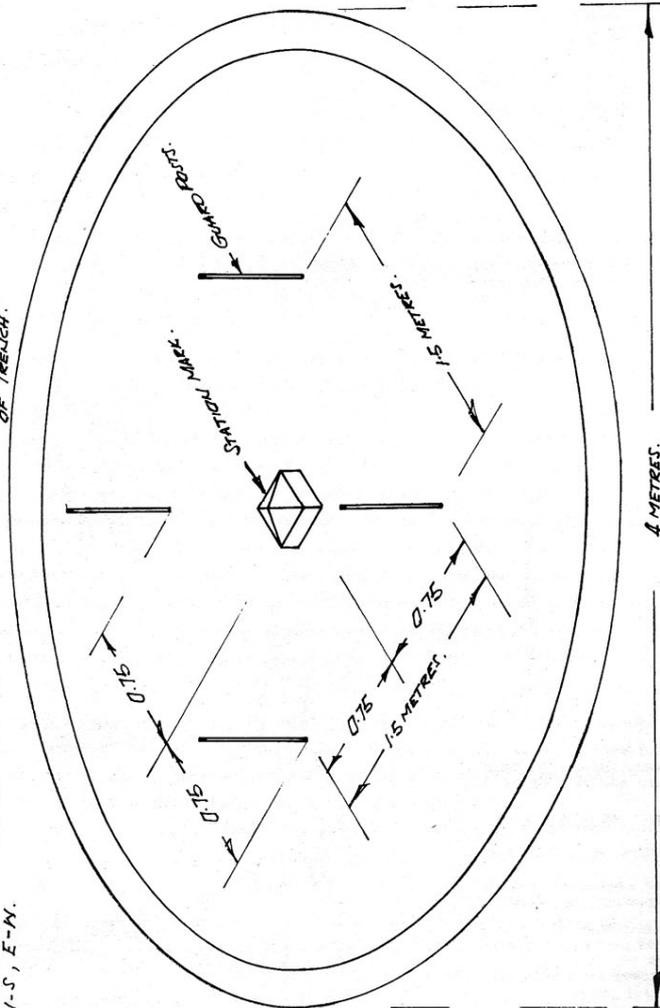
1. A guide to completion of information in the specially prepared field book - AERODIST STATION ESTABLISEMENT – is set out in Appendix "E".



APPENDIX 'B'

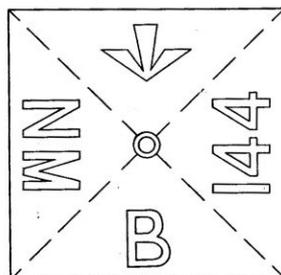
A CIRCULAR TRENCH 4 METRES IN DIAMETER 0.3 METRES WIDE X 0.3 METRES DEEP IS TO BE DUG FOR PHOTO IDENT. PURPOSES. IT IS IMPORTANT FOR TRENCH TO BE CONCENTRIC WITH STATION MARK. SOIL IS TO BE EVENLY SPREAD OUTSIDE OF TRENCH.

GUARD POSTS ARE 0.06 ϕ X 1.06 LONG OF G.I. TO BE SET IN CONCRETE & PAINTED BLUE. THE POSTS ARE TO BE PLACED EQUIDISTANT FROM STATION MARK & WHERE POSSIBLE THE SIDES OF THE SQUARE FORMED ARE TO BE ORIENTED N-S, E-W.



SKETCH OF STATION LAYOUT.
DIMENSIONS IN METRES.

APPENDIX 'C'

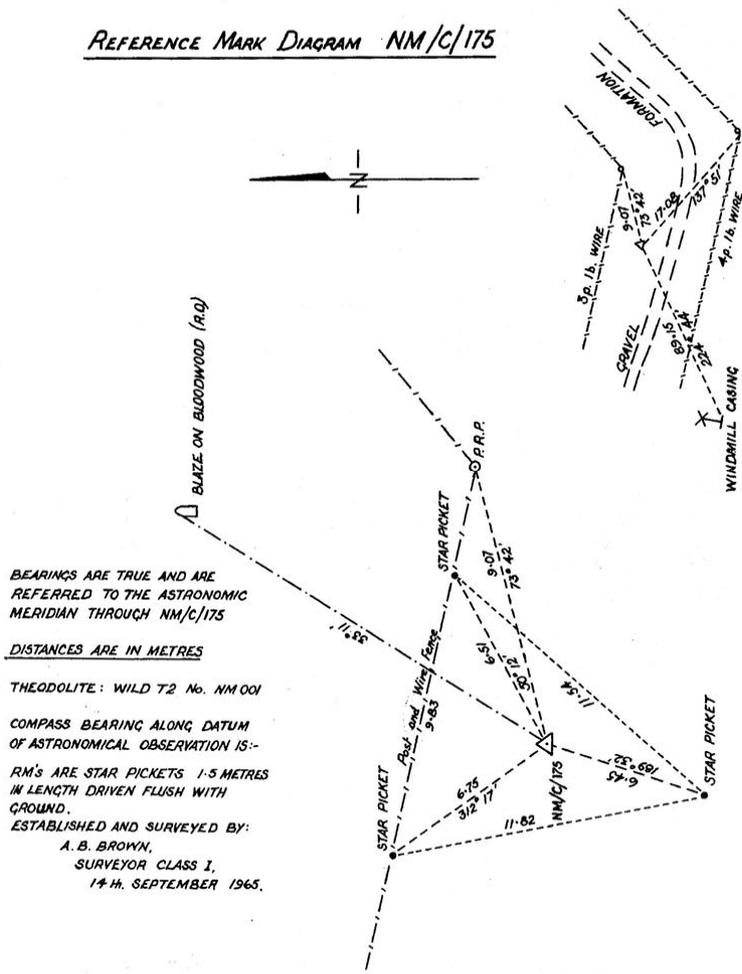


PLAN OF
AERODIST STATION MARK

SHOWING LAYOUT OF REFERENCE LETTERING

APPENDIX 'D'

REFERENCE MARK DIAGRAM NM/C/175



Appendix E.

AERODIST STATION ESTABLISHMENT FIELD BOOK.

GUIDE TO FIELD NOTES :

1. All field notes are to be recorded in the field and must be in ink.
2. On the front cover of the field book letter the number or the name of the station, the date of the operation and the name of the surveyor in charge of the party.
3. Carefully index all the particulars of the station on the index page. Where 3rd order levelling procedures are employed instead of barometric heighting, note on the index page the number of the level book used, as a cross reference.
4. Page 1: This page deals with the horizontal and vertical angles, which are to read by a theodolite from the occupied station to other stations of the aerodist network. It is mandatory that the horizontal directions to the appropriate aerodist or triangulation stations are to be set out and recorded as true bearings. These bearings are scaled from a topographic map by means of a protractor and set out in the field with the theodolite previously oriented on the local astronomic meridian. The vertical clearance angles are also read with the theodolite; the true bearings and vertical clearance angles are to be lettered in diagrammatic form against the appropriate ray to the distant stations. The type of horizon encountered in each case should also be noted, for example, "Trees, rock cliff, top of earth dam, railway embankment, low horizon, etc".

5. Pages 2 and 3: On page 2 insert the appropriate letter and number(s) on the diagram of the concrete mould, also see Appendix 'C'. Page 3 should have the dimensions of the ground marking suitably inserted, these should conform where physically possible with the dimensions shown on Appendix 'B'. The annulus constructed should be adequately described, for example, "circle of painted white stones" or "Circular trench"; these dimensions should also be as shown in Appendix 'B'.
6. Page 4: Is self-explanatory. Always enter the magnetic bearing from the station to the Reference Object (R.O.). Note a description of the R.O. used and if necessary, give a detailed drawing of the physical appearance of the Reference Object. The actual direction of the sun relative to the reference line would also improve the diagram, as a check against errors.
7. Page 5: Is a tabular page for recording the astronomical observation, which in most cases will be a sun observation. H.C.R. and V.C.R. respectively mean horizontal circle reading and vertical circle reading. The apparent position of the sun, with respect to the cross-hairs should be shown in the quadrant column. The recorder should call out to the observer, immediately prior to each pointing on the sun, the quadrant which the sun has to occupy. The meteorological data to be recorded consists of the pressure of the atmosphere in millibars and the air (shade) temperature in degrees centigrade. It is important to realize that the date of the operations shown on this is to be carefully recorded.
8. Page 7: The reference mark diagram. The position of these marks should be indicated to scale, relative to each other and to the station mark, as an approximate check against errors of measurement. The dimensions can be conveniently lettered along each course.
9. Page 8: Is to be used for any traversing from the aerodist station to the photo reference point. It is essentially ruled for tabular entries.
10. Page 9: Is for the diagram of the photo reference point, which should be enhanced by connections to several other points readily identifiable in the photograph. These could be sketched in a plane table style to create an illustration of the general topography, to facilitate identification of the "spot" by others, who might be later examining the particular photograph. Complete the columns showing all the necessary information to identify the photographs used viz., area, run, original and duplicate print No.
11. Page 11: Is self-explanatory. The direction towards the object being photographed should be a true bearing and should be so indicated. For example: "45° True".
12. Page 12: Is to show a diagram for the reference bench mark. This should illustrate the necessary information to easily locate the bench mark, both on the ground and to facilitate a search of the appropriate records, in order to ascertain its value on the standard datum.
13. Pages 13 and 14: Are for the first and second barometric height measurements respectively. For detailed instructions of the methods to be employed see the general instructions for aerodist ground marking. It will be noted that there is only one pair of columns for temperature recordings (wet and dry bulbs). However, only one pair is necessary because, excepting when the base and mobile barometers are together, the barometers will be separately read each time at a different station and hence there will be a separate line for each barometer's reading.

It is on this same line for the appropriate barometer and its station that the relevant temperatures are recorded. If there is any index error between the psychrometers employed this should be noted at the bottom of each of the two pages. Reduction of barometric measurements are to be made on the prescribed form.
14. Pages 16 and 17: Are for the log of the access speedo traverse. The number plate of the vehicle used should be recorded. The actual mileage of the speedometer (or odometer) should be written into the first column. The second column can be used as either the uncorrected or the corrected mileage. The third column is to be used for the corrected mileage, with the final mileage at the aerodist station. This column may have to indicate that the mileages are to be "read up". This in effect necessitates the figure 0.00 miles to be written against some well-known place or landmark, for example "Wilcannia Post Office" or "Mile Peg Cobar 159 Wilcannia 6, Route 32". The speedo error (which should be written as a percentage error) can be deduced from road-side mile posts' mileages that have been entered in the first column or other appropriate calibration mileage posts.
15. The remainder of the pages have no headings or ruled columns and are to be used as required. One particular use is to illustrate the access diagram and to write the access description. For such a diagram a North point should be inserted, wherever necessary to facilitate the reading of the diagram.



Completed Aerodist station with Jenny & Vassil

COURTESY: Laurie McLean