

**DETACHMENT (A SECTION)  
1<sup>ST</sup> TOPOGRAPHICAL SURVEY TROOP  
STANDING OPERATING PROCEDURE (PROV)**

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**ANNEX M — Detachment (A Section), 1st Topographical Survey Troop — Standing Operating Procedure (Prov)**

One of thirteen annexes (A–M) to “War in Vietnam: A Surveyor’s Story”, by Lieutenant Colonel Robert Francis Skitch (Retd), 1934–2026 — Officer Commanding, Detachment 1st Topographical Survey Troop, Nui Dat, 1966–67.

Scanned and transcribed from the original documents. The complete four-part memoir, and the wider Skitch family archive:

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1<sup>ST</sup> TOPOGRAPHICAL SURVEY TROOP

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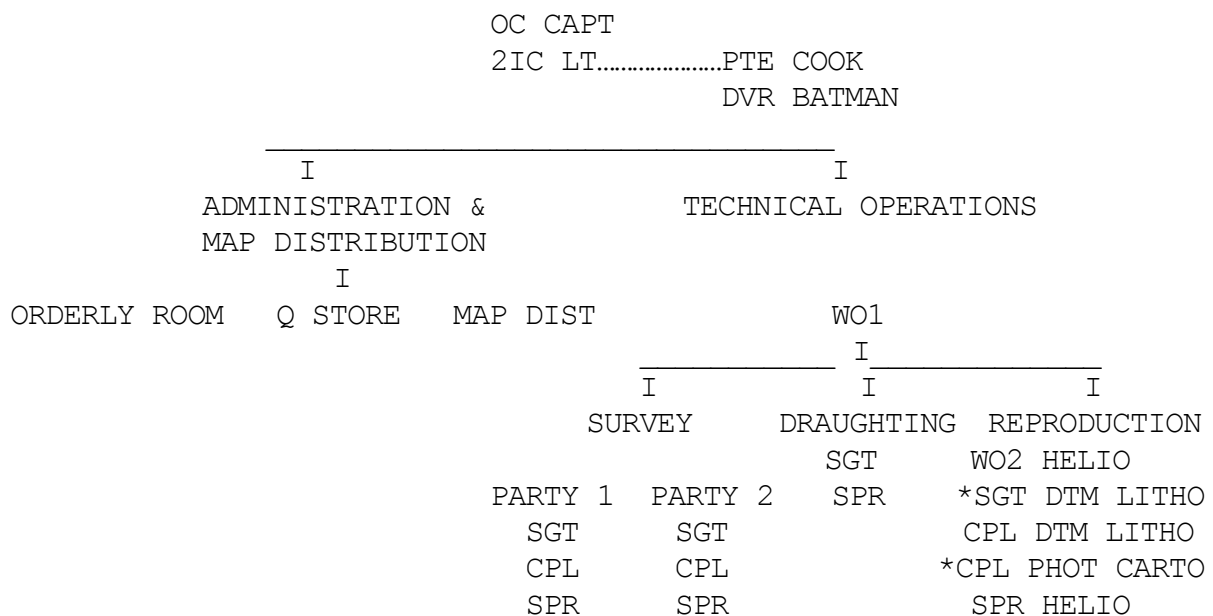
PART 1  
ORGANISATION, ROLE & STAFF CONTROL

Internal Organisation

1. The following organisation is suggested as being workable and should normally be followed. It is based upon the proposed establishment amendment dated 5 Dec 66 from D Mil Svy to DSD.

STRENGTH

OFFICERS     2  
ORS            19



\*Restriction that would apply where total strength is held at 17 all ranks in accordance with TWE 11/14/1 (TW)

Role

2. To provide survey and limited mapping facilities to the Task Force.

Characteristics

3. Det (A Sect) of 1 Topo Svy Tp can undertake field surveys, produce large scale maps, overprint existing maps and distribute

maps.  
Tasks

4. The following tasks are to be carried out:
  - a. Establish and extend survey control in the operational area as a basis for the theatre grid and the co-ordination of fire control.
  - b. Compile large scale maps to supplement existing maps.
  - c. Produce map enlargements and sketch maps.
  - d. Print limited numbers of maps and carry out overprints to existing maps.
  - c. Hold limited numbers of maps and distribute these to Task Force units.
  - e. The Officer Commanding the Det (Sect) advises the Task Force Commander and staff on all survey and mapping matters.

Duties

5. The duties of the Det (Sect) personnel are as follows:
  - a. Officer Commanding.
    - (1) To exercise full administrative, technical and productive control of the Det (Sect).
    - (2) To advise the Commander 1 ATF on all survey and mapping matters.
  - b. Second in Command.
    - (1) To assist the OC in carrying out his duties with particular reference to the administrative functions of the Det.
    - (2) To deputise for the OC in any period in which the OC is absent.
    - (3) To be responsible for the security of information and documentation.
  - c. W01 Surveyor Topographical.
    - (1) To assist in the planning of all technical tasks of a surveying, photogrammetric and draughting nature

with the OC or 2IC.

(2) To supervise the detailed planning of tasks with the NCOs and I/C of the survey and draughting elements the unit.

(3) To carry out limited administrative and regimental duties as Troop Sergeant Major.

NOTE. The WO1 Surveyor Topographical would carry out normal technical duties of a survey compilation nature in addition to the specific tasks outlined above.

d. WO2 Helioworker (Silk Screen)

(1) To be directly responsible to the OC for the operation and production control of the Silk Screen Printing equipment and Dyeline equipment.

(2) The control and maintenance of adequate reserves of all expendable stores required in silk screen printing. This will necessarily include the timely notification of depleting stock levels.

e. Sgts Surveyor Topographical.

(1) To plan and supervise the detailed operations of the survey parties in field survey operations.

(2) To carry out map compilation duties as directed by the WO1 Surveyor Topographical.

f. Sgt Draughtsman (Litho).

(1) To supervise and carryout re-touching of silk screen stencils and photo negatives.

g. Sgt Draughtsman (Carto).

(1) To supervise and carry out tasks of a purely drawing nature allocated to the draughting element by the WO1 Surveyor Topographical.

h. Cpl Surveyor (Topo).

(1) To assist the Sgt Svyr Topo in the detailed planning and supervision of field survey operations

(2) To carry out map compilation duties as directed by the WO1 Surveyor Topographical.

- i. Sprs Surveyor Topographical.
  - (1) To carry out field survey, map compilation and photo inspection duties as directed by the WO1 Surveyor Topographical.
- j. Cpl Photographer (Carto).
  - (1) To operate the camera and photographic equipment of the unit on tasks as directed by the WO1 Surveyor Topographical.
- k. Cpl Draughtsman (Litho).
  - (1) To carry out re-touching of silk screen stencils and photo negatives as directed.
  - (2) To assist in general and topographic draughting as directed.
- l. Sprs Surveyor Topo.
  - (1) To carry out field survey, map compilation and photo inspection duties as directed by the WO1 Surveyor Topographical.
- m. Sprs Draughtsman Topo.
  - (1) To carry out draughting duties as directed by the Sgt Draughtsman.
- n. Spr Helioworker.
  - (1) To assist in the operation of the silk screen printing equipment.
- o. S/Sgt CQMS.
  - (1) The overall supervision of all Q functions in the unit, including:
    - (a) Receipt and issue of all stores and equipment.
    - (b) Receipt and issue of maps.
    - (c) Maintenance of map stock records.
- p. Cpl Clerk (GD).
  - (1) To carry out all 'A' functions of the unit including the following:

(a) The compilation and submission of all periodic returns.

(b) The maintenance of the unit correspondence filing system.

p. Cpl/Spr Storeman Tech.

(1) To carry out Q duties as directed by the CQMS in relation to:

(a) The receipt and issue of stores and equipment.

(b) The maintenance of a neat and tidy Q Store.

(c) Receipt and issue of maps.

(d) The maintenance of an orderly and efficient map store.

(e) Collection and processing of unit laundry.

q. Spr Driver-Batman.

(1) To carry out driving duties as required.

(2) To carry out batman duties as required.

(3) To be responsible to the CQMS for the fuelling and maintenance of vehicles and the maintenance of vehicle records.

r. Pte Cook.

(1) To carry out cooking duties as directed.

#### Allocation within the Task Force

6. Det (A Sect) of 1 Topo Svy Tp is allocated to a Task Force. It is a sub-unit of HQ 1ATF and is under command of HQ 1ATF. Det (A Sect) 1 Topo Svy Tp bears a relationship to HQ Coy 1ATF similar to that between an independent unit and an area command. Det (A Sect) 1 Topo Svy Tp retains responsibility for the following aspects of its administration:

a. Discipline. OC Det (A Sect) 1 Topo Svy Tp is appointed by Comd 1ATF to exercise the power of a Commanding Officer in accordance with AMR 238 (8) in relation to all NCO's and private soldiers of Det (A Sect) 1 Topo Svy Tp and can impose the punishments set

out as follows:

(1) In the case of an offence committed by a non-commissioned officer:

- (a) Reprimand, or
- (b) Admonition.

(2) In the case of an offence committed by a private soldier, one or more of the following sentences:

- (a) A fine not exceeding \$10.
- (b) Confinement to barracks not exceeding seven days.
- (c) Extra guards or picquets.
- (d) Admonition.

b. Personal administration - Det (A Sect) 1 Topo Svy Tp carries out all aspects of administration applied to its own members; in particular, that pertaining to:

- (1) Promotion.
- (2) Raising of PORs and Confidential Reports.
- (3) Administration of Paludrin.
- (4) Maintenance of Company Roll Book and routine administrative parades.
- (5) Submissions or returns both periodic and occasional.

The following aspects of administration are specifically tied to HQ Coy HQ 1 ATF:

- (6) Pay is drawn from a sub-sub imprest on HQ Coy.
- (7) Orders and instructions from HQ 1ATF may be promulgated by HQ Coy to Det (A Sect) 1 Topo Svy Tp.
- (8) All inwards correspondence from both HQ 1ATF registry and SDS is routed via HQ Coy.
- (9) Personal mail inwards and outwards passes via the HQ Coy Postal Orderly.

- (10) Amenities - allocation is via HQ Coy.
- (11) R&R / R&C - allocation from HQ Coy.
- (12) Weekly parade states are submitted to HQ Coy.
- b. Det (A Sect) 1 Topo Svy Tp receives an ASCO rebate and operates a Unit Trust Account for handling this and other funds.
- c. Defence - OC HQ Coy, HQ 1 ATF is responsible for the coordination of defence within the HQ 1 ATF area. Det (A Sect) 1 Topo Svy Tp is included in the overall defence plan.
- d. Q Management and Administration.
  - (1) General - Det (A Sect) 1 Topo Svy Tp maintains its own Q Account. The account number allocated is 2593.
  - (2) The Det(A Sect) Q Account is used to:
    - (a) Maintain unit equipment.
    - (b) Obtain on block scales such stores as are required to maintain a unit base camp.
    - (c) Obtain all such expense stores as are necessary for the technical function of the unit.
  - (3) Clothing and ordinary expense stores are obtained from the HQ Coy HQ 1ATF store.
  - (4) Rationing - Det (A Sect) 1 Topo Svy Tp is rationed by HQ Coy and for this purpose a daily ration strength return is submitted before 0900. The Private cook on Det (A Sect) 1 Topo Svy Tp strength will normally be employed on cooking duties in the HQ Coy kitchen.
  - (5) Accommodation - Det (A Sect) 1 Topo Svy Tp occupies an area of ground within the limits of HQ 1 ATF. In this sense, HQ Coy is the 'property holder' and exercises control over the external improvements of the area.

## PART II

### TECHNICAL PROCEDURES

#### Staff Direction

1. Det (A Sect) 1 Topo Svy Tp comes under GS02 Int (Int 1) for routine staff direction. The responsibilities of GS02 Int to Det (A Sect) 1 Topo Svy Tp are:
  - a. Vetting of all requests for survey assistance from units.
  - b. Allocation of work priorities on operational tasks.
  - c. Representation on behalf of Det (A Sect) 1 Topo Svy Tp at Staff level on Task Force Headquarters.
  - d. Provision of sufficient advance information on forthcoming operations to allow the general planning and commencement of operational overprints, photoplots and large scale maps for the support of the operation.
  - e. To initiate the provision of infantry protection as required for field survey in insecure or disputed areas.

#### Control Surveys

2. The responsibility of Det (A Sect) 1 Topo Svy Tp in the provision of control survey is:
  - a. To provide 3rd order control points within and around the 1st ATF TAOR of sufficient density to allow simple connexions to be made from these points to the battery centres of fire support bases established in direct support of operations.
  - b. To assist the Task Force Artillery surveyors in extending this control to the near vicinity of the battery centres, where such assistance is requested, in the form of equipment or technical advice.
  - c. To provide photo control points for large scale mapping or map revision as determined by OC Det(A Sect) 1 Topo Svy Tp.
3. The following considerations apply:
  - a. For ease of establishment and ease of subsequent re-occupation, the basic 3rd order control points should be in either secure areas or areas easily secured.

- b. Where possible each new basic control point should be fixed from two previously determined points by a combination of tellurometer and angle observations so that three additional quantities are measured independently on each triangle so formed.
- c. All observations and measurements are to be carried out to normal RA Svy 3rd order specifications. These are summarized in Annex A to this instruction (*not included*).
- d. Chain and theodolite traverses will conform to the RA Svy 3rd order specifications as stated in the RA Svy Manual of 3rd Order Traverse. Chain and theodolite traverses will be closed where possible either onto the start point or onto another station independently established. Where this is not possible, a Sun Azimuth will be observed on the closing line and all distances will be chained and check-chained independently.
- e. When observing traverse angles whether on chain and theodolite traverses or tellurometer traverses, half the number of arcs will be observed using the backsight as RO and the remaining half with the foresight as RO. The summation of the two angles observed must fall on either side of 360 degrees within the allowable range of the set.

#### Cantonment Surveys

4. Det (A Sect) 1 Topo Svy Tp carries responsibility for maintaining an up to date detailed Cantonment Survey of the 1 ATF Base Area or any sub base area. With the concurrence of HQ 1 ATF, Det (A Sect) 1 Topo Svy Tp will maintain a similar detailed survey plan of the 1 ALSG area at VUNG TAU, and this will be kept current when operational mapping tasks permit. The following considerations apply:

- a. The scale should be sufficiently large to permit the plotting of permanent buildings to scale and true to shape. A convenient scale has been found to be 1:2,000 or 1:2,500.

- a.
  - b. The contour interval should show the general shape of the ground sufficiently well to permit the planning of main scheme drainage. A contour interval of 2 metres has been found to be satisfactory in the Task Force Base Area.
- b.
  - c. Contours should be accurate to within one half a contour interval.

5. The essential ingredients of a Cantonment Survey are:

- a. A general frame work of 4th order control stations at intervals of about 2000 metres throughout the area. At least 3 such stations should be established.
  - b. A closed 3rd order traverse, permanently marked, within the outer perimeter, and surrounding the inner perimeter, to carry both horizontal and vertical position.
  - c. Tacheometric traverses semi-permanently marked subdividing the 3rd order traverse into areas of about 500 metres square, starting and finishing on 3rd order traverse stations. Further tacheometric loop traverses should be extended from the 3rd order traverse to include the outer perimeter. These should carry both horizontal and vertical position.
  - d. Detail, both horizontal and vertical filled in from combined plane table and tacheometric survey, using the former to carry azimuth and maintain a continuous plot, and the latter for distance.
  - e. The availability of vertical air photography at a suitable scale to permit a photogrammetric solution will allow a reduction in the requirement for tacheometric control traverses and detailed field survey. A photo scale of 1:5,000 has been found adequate for the reproduction of a 1:2,500 plot.
6. A useful by-product of the cantonment survey is a further plot at 1:5000 published as a standard map showing all permanent buildings, road plan and physical detail. This can then become the base map for the overprinting of tactical areas and defences or any other information of a tactical or engineering nature.

#### Application of Photogrammetry

7. Photogrammetry is employed by Det(A Sect)1 Topo Svy Tp to:
- a. Produce large scale maps of village areas or other areas of specific interest, to supplement the existing map.
  - b. Revise and up-date existing maps by:
    - (1) Increasing track information.
    - (2) Adding and where necessary eliminating buildings.
    - (3) Improving the drainage pattern and adding detail to the existing streams and rivers.
    - (4) Improving vegetation boundaries and classification.

c. Provide detail in the compilation of cantonment survey plans.

d. Extend artillery control by the block adjustment of consecutive runs of homogeneous photography and reading out the additional easily identifiable points for future battery positions or calibration points. This is a concept yet to be developed.

8. Det (A Sect) 1 Topo Svy Tp carries the following equipments for photogrammetric work:

- |                                    |       |
|------------------------------------|-------|
| a. Stereotopes                     | Qty 2 |
| b. Old Delft Scanning Stereoscopes | Qty 2 |
| c. Walch Sketchmaster              | Qty 1 |

Also Casella pocket stereoscopes and Universal Stereoscopes.

9. Limitations - The application of photogrammetry within the Det (A Sect) is limited by the following considerations:

- a. Current equipment does not permit block adjustment of any form and only graphical strip adjustments.
- b. Available photography is generally not flown to mapping specifications and may be entirely unsuitable for mapping purposes.
- c. Tactical considerations usually prevent the establishment of ground control. In such cases control has to be scaled from the L7014 1:50,000 Series.

10. Large scale maps of village areas fall into the following categories:

- a. Map enlargements extensively edited from direct photo inspection and proportional scaling from oblique photography.
- b. Photo plots from split vertical (oblique) photography, plotted stereoscopically on the Stereotope, accepting the distortions inherent in the tilted photography. Maximum adjustment on the Stereotope rectiputers will minimise tilts up to 13 degrees obliquity. Approximate scale is obtained by comparison with the standard map and the Stereotope pantograph is adjusted to an even decimal scale.
- c. Strip adjustment of consecutive runs of vertical air photography, using scaled points from the standard 1:50000

map as ground control. Plotting may be graphical or stereoscopic on the Stereotope. Detail may be field checked.

d. Strip adjustment of consecutive runs of vertical air photography using photo identified ground control. Plotting may be graphical or stereoscopic on the Stereotope. Detail may be field checked.

11. Plotting should normally be carried out stereoscopically on the Stereotope even when only planimetric detail is sought.

12. Map Revision - Additional track and building detail can be obtained from the various types of intelligence photography and transferred by direct inspection to the Pictomap (Photomap) series, In this way, any type of intelligence photography regardless of scale, format or tilt characteristics can be used. This detail can then be further transferred from the Picto Series to the 1:25,000 Enlargement Series correcting where possible for variations between Picto positions and standard map position. Overprint traces may be prepared for the 1:25,000 enlargement series. All photo inspection should be carried out stereoscopically using either Casella pocket stereoscopes or the Old Delft scanning stereoscope.

### Reproduction

13. Det (A Sect) 1 Topo Svy Tp has the following reproduction facilities:

- (1) Dyeline direct positive printing.
- (2) Silk Screen Printing.
- (3) Camera reproduction (reserved)

a. Reproduction facilities offered by Det (A Sect) 1 Topo Svy Tp is limited to the reproduction of maps, map overprints, map overlays and other drawings of a map like character. Expense stores associated with all forms of reproduction are scaled to meet the stated mapping and survey role of the Det (A Sect). The application of the reproductive capability to tasks of a GD nature not associated with maps and survey is a misuse of this capability.

14. 'Dyeline' direct positive printing produces a positive image on either an opaque or translucent light sensitive paper from a positive transparency.

15 The limitations of dyeline reproduction are:

a. The photo sensitive paper is dimensionally unstable and

may stretch 2½% of its overall dimensions.

b. Dyeline paper is not durable.

c. The dyeline process is strictly single colour - viz, a black lined image on a brown-white background.

d. For large numbers of copies (eg in excess of 50) the process is slow.

16. The dyeline process has the following advantages:

a. Simplicity of operation.

b. The sheet size is restricted in one direction only since the reproduction process is of a continuous nature on a roll of light sensitive paper.

c. The dyeline machine is available for immediate use without any special preparation.

17. Silk Screen printing is a stencil process where an image is produced on a sheet of paper or other material by applying ink to the stencil when in contact with the paper. An outline description of the process is given in Annex X (*not prepared at the time of this SOP*).

18. Silk Screen Printing has the following limitations:

a. Requires highly trained and experienced tradesmen to obtain results.

b. Draughting for the production of silk screen stencils needs to be of good quality in opaque black drawing ink on a dimensionally stable drawing medium.

c. Upwards to 4 hours may be needed for stencil preparation before a single print is obtained. The process is therefore not economical in time when less than 20 copies are required.

19. The Silk Screen process has the following advantages:

a. Printing can be carried out in any colour desired.

b. Printing can be carried out in two or more colours, however, the time factor is a direct multiple of the number of colours used.

c. Printing can be carried out on any medium; paper, plastic, talc, tracing paper.

d. Once the stencil is made the printing rate is 150 impressions per hour. Therefore an optimum number of copies ranges from 100 to 400.

e. Overprinting of existing map series can be carried out.

20 - 21 Camera Reproduction - Reserved.

### Draughting

22 Det (A Sect) 1 Topo Svy Tp has two topographical draughtsmen on establishment. In addition to those, two lithographic draughtsmen are provided for photographic re-touching and these may have some general draughting capability. The surveyors on establishment may also have some general draughting capability. This, however, is usually limited to the preparation of compilation work sheets, survey records and is not usually adequate for direct reproduction other than dyeline. In every cases the draughting capability of Det (A Sect) 1 Topo Svy Tp is limited to draughting associated with survey and mapping and is misused when applied on other tasks of a GD nature.

### Registration

23. Registration is the most significant draughting problem and the following sub-paras are intended to provide an analysis of this problem.

a. Most draughting tasks carried out by the Det (A Sect) are required to register in detail against the detail of a standard map or some other map product. The registration may take the form of a direct overprint onto a standard map or an overlay keyed in to a standard map. Factors causing lack of registration are:-

- (1) inaccurate draughting,
- (2) expansion or contraction of the printing mediums,
- (3) expansion or contraction of the draughting mediums.

b. Thus lack of registration may occur between the draughting process and the printing process due to:

- (1) Movement of the draughting medium during or after draughting,
- (2) Movement of the printing medium before printing or between successive colour overprints.

c. Overlays are usually reproduced as opaque dyeline

copies. Lack of registration in this case is usually caused by expansion of the dyeline paper after printing. It is impossible to prevent this from happening, however, its effect can be minimised by the construction of a standard grid on the original trace, so that errors in registration can be meaned out square by square, when transferring the overlay detail to the map in subsequent use.

d. Lack of registration in draughting applied to silkscreen printing can be minimized by constantly applying the following principles:

- (1) Only dimensional stable draughting mediums should be used.

- (2) The base map used for the production of an overprint drawing must be from the same stock as that to be used for the actual overprinting.

- (3) Upon overlaying the base map with the draughting mediums, registration marks should be marked at approx 8" intervals (10,000 metre marks at 1:50,000), to cover the entire area of the overprint.

- (4) Any line draughting required on the face of the base map should be carried out at this stage - after the marking of the registration marks. Then working between each set of four registration marks, the detail on the map traced onto the draughting medium.