Short Note

Specifications for Modern Geophysical Surveys

The February meeting of the ASEG discussed the setting up of guidelines for geophysical contract specifications. It is felt that such guidelines will assist people commissioning surveys to specify exactly what is required of the contractor at the time of requesting quotations. From the contractor's point of view the guidelines should help to prevent misunderstandings and to keep specifications consistent with his client's requirements at the minimum risk to his staff.

To be specifically useful these guidelines will have to be written up for each type of survey. A major division exists between the petroleum and mining industries and each tool has its own specific requirements. It is regarded as a long term aim to produce "standard" contracts for various types of geophysical work for the benefit of those who choose to use them.

A start was made by outlining the essential points which should be covered in specifications for a generalised airborne survey. This outline was discussed and modified by consensus at the meeting mentioned above. Because the meeting was almost entirely constituted from the mining industry, the guidelines are no doubt coloured by that brush. The author has added numerical values to make the guidelines more useful. These numbers are drawn mainly from experience with airborne magnetics, chosen as the most common type of survey.

The meeting also set up working groups to prepare more specific guidelines for specifications in airborne magnetics, radiometrics, EM surveys and in down-hole surveys. A short discussion on procedures in calling tenders and letting contracts will be written up separately, as will a note on standards for digital data in geophysics.

Guidelines for airborne geophysical survey specifications

1. *Information spacing*
   a. Separation of flight lines and tolerances:
   In general infill lines should be flown where the separation between flight lines exceeds 1.5 times the defined separation for a distance of 5 km or more, or where adjacent lines cross.
   b. Separation of tie-lines:
   This is normally defined so that 5% to 20% of the total survey distance is assigned to tie lines. The closer tie lines are required where fine contouring of the data is an ultimate objective.
   c. Spacing of data along lines:
   The choice of flight line spacing and along-line spacing are related. Without special reason it is pointless to have the ratio greater than 10 to 1. About 6 to 1 is normal. In the processing stage this is sometimes reduced to 3 to 1 or less, in order to cut computer costs by using a larger data mesh. The resultant loss of detail is not always desirable.
   d. Altitude of sensor (or terrain clearance):
   The choice of altitude is also related to the line spacing. The normal ratio of line spacing to terrain clearance is about 3 to 1. It gains little to specify a lower altitude than 100 metres at line spacings in excess of 500 metres and the lower altitude increases the risk to the operators. Ratios as high as 40 to 1 have been used in regionl work, but the data really constitute a set of discrete profiles. They are heavily filtered if regional contouring is required.

2. *Navigation and flight path recovery specification*
   a. Navigation aids:
   The navigation specification is partly covered by the flight line spacing tolerances in Section 1 (a). In general it is felt that contracts should specify tolerances required and that the decision on how best to achieve them be left to the contractor. Nevertheless in the area of navigation there is a case at times for specifying the use of some types of navigation aids (Doppler, radar range equipment etc).

   The aids facilitate the flying of straight lines and improve knowledge of the flight path between photo control points. In some cases the navigation aid data are recorded as an alternative to photo-recovery. A tracking camera is always used as a back-up positioning device, except over the sea.
   b. Flight path recovery:
   Precision required in flight path positioning and maximum distance between control points.
   c. Tie-line crossover control:
   Maximum distance between tie-line crossovers and the nearest control points (on both tie-line and traverse).

d. Scale and type of final flight path plan:
Photo mosaic, rectilinear line plan, orthophoto etc.

3. *Geophysical data specification*

a. Precision of data:
For each channel of information, airborne and ground, instrumental precision required.

b. Noise levels:
The maximum instrumental noise tolerable, usually specified as peak to peak envelope and maximum ambient noise levels tolerable (e.g. diurnal gradient).

c. Analogue records:
Chart scales (sensitivity and speed) and minimum acceptable chart widths for each analogue record required, airborne and ground.

4. *Digital record*

Digital data often include both geophysical and navigational information and so are treated as a separate category. Recommendations on standards for digital records are being prepared separately.

a. Content of digital record:
List of information required on tape and number of digits in each.

b. Labelling requirements:

c. Format of final tapes.

5. *Calibration specification*

a. Type and frequency of periodical calibrations (e.g. magnetic compensation offset test, altimeter calibrations etc.):
Indicate if a digital record is required.

b. Type of daily calibrations required, usually before and after operations:
For all types of surveys it is an advantage to have a test line in this category. Such a line is of value in the data processing stage if problems arise. This line should be at least 5 km long over flat terrain and flown down a road or fence to aid precise navigation. There should be enough fringing detail to enable precise relocation of points along line. The line may contain an anomaly, but there should be at least 5 km free of steep gradients. It should be flown each time in the same direction at the same ground-speed and recorded as survey data in digital and analogue form.

Data processing requirements need not be specified at the time of requesting a quotation for acquisition of data, but the requirements should be consistent with the specifications for geophysical data and navigation. It is pointless for example to request magnetics contoured to 2 nT unless the data have a noise envelope less than 1nT and the data are recorded to 0.5 nT or better. Such fine contouring also requires well controlled tie-line intersections so that the levelling process can be carried out to a sufficient degree of precision.

Likewise it is pointless to request contour plans at 1:10 000 unless the navigation specification positions all points on the flight line to better than ±30 metres (3 mm on the plan).

While special problems require special solutions it is hoped that these guidelines will be useful for much of the survey work in the mineral industry pending more detailed guidelines for specific types of surveys.

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ASEG - NEWS

The Silver Anniversary Meeting of the European Association of Exploration Geophysicists

The meeting was held from June 1-4, 1976, at The Netherlands Congress Centre, The Hague, Holland.

The proceedings commenced with a welcome address by the Burgomaster of The Hague, F.G.L.L. Schols, followed by an address by the Minister of Economic Affairs, H.E. R.F.M. Lubbers, who spoke on "The Need for constructing an integrated energy policy for all members of the E.E.C.". H.R.H. Prince Claus of The Netherlands then performed the official opening.

The afternoon began with addresses by the President of the S.E.G., R.B. Rice,and by R. Bortfeld, President of the E.A.E.G.

Beginning the technical program were the two invited lectures by V. Baranov and O. Koefoed; these were entitled, respectively, "Calcul des courbes de sondage ēlectriques ā l'aide des fonctions d'ēchantillonage", and "Progress in the direct interpretation of resistivity soundings : an algorithm".

The following day, two concurrent series of contributed papers began. The current popularity of the seismic method was reflected by the fact that the lectures within this discipline continuously occupied one lecture hall for the duration of the meeting.

The organization of lectures was generally satisfactory, although a few shortcomings were noted. These included: chairmen absent at scheduled starting times; poor relative location of microphone and overhead projector, and incorrect order and orientation of slides. A regrettable, but understandable, difficulty was that of communication, often hindered by broad European accents superimposed on the official language of English.

Lecture presentation and content were of a reasonable standard, with a few sad exceptions: rehearsal and prior communication with the organizers could well have produced better results. A few papers were noted for their particularly high standard.

Throughout the four days of the meeting frequent coffee breaks and a well-organized social program provided valuable opportunities for informal communication — undoubtedly many participants would have benefitted as much from the resulting discussions as from the technical program.

A promising development within the meeting was a move to promote both professional and social contact between geophysicists interested in the field of groundwater. A separate report on this meeting follows.