COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORDS 1960 No. 106

DAVENPORT RANGE AIRBORNE RADIOMETRIC FOLLOW-UP SURVEY, N.T. 1957.

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ABSTRACT

Several radioactive anomalies, detected in 1956 during a high-level survey of the Davenport Range area with a DC.3 aircraft, were further investigated radiometrically from an Auster aircraft flying at low level. This report describes the low-level Auster survey.

The object of the survey was to determine whether investigation of the anomalies by ground parties is warranted. Analysis of the results indicates that in some of the areas ground investigations should be undertaken.

1. INTRODUCTION

The survey was first commenced in July 1956, when a DC3 magnetic and radiometric survey was in progress in the Davenport Range area (see Bureau Map No. G281-4). The intention was to follow up the DC.3 radiometric results as soon as they became available. However, this was found to be impracticable as the preliminary nature of the interpretation and positioning of anomalies made it difficult to locate the anomalies during low-level flying. Consequently, the follow-up work was suspended and recommenced in July 1957, after reduction of the DC.3 survey results had been completed and the anomalies had been positioned more accurately from vertical photos.

The 1957 survey took three weeks to complete and operations were based on the airstrip at Murray Downs. The officers who took part were :-

J.M. Mulder, geophysicist-in-charge

A.F.S. Young, assistant geophysicist

W.C. Gerula, draftsman.

The aircraft, an Auster Autocar (VH-GVC) chartered from Southern Airlines Pty.Ltd., was piloted by Mr. D. Elford.

2. EQUIPMENT

The scintillograph used on this survey consisted of a Chalk River detector head and a ratemeter designed and built in the Bureau's workshops. The instrument was coupled to an Esterline-Angus recording millammeter. The detecting elements consisted of two thallium-activated sodium iodide crystals which were each optically coupled to a photomultiplier tube. The output of these tubes was fed to a ratemeter which produced a current proportional to the count rate. This current was registered on the recording milliammeter, and represented the intensity of gamma radiation at the detecting crystals.

3. OPERATIONS

The DC.3 anomalies investigated by this follow-up survey had been plotted on aerial photographs and on photo-mosaics at a scale of 1 in. = 1 mile. A grid of parallel flight lines was flown over each position at 200 ft above ground level, and at an indicated airspeed of 75 to 80 knots. Flight line spacing was kept closely to 5 lines per mile and the length of each line averaged 2 miles. Two lines were flown exactly over the actual anomaly position, one in the direction of the grid and the additional one on a heading close to that at which the DC.3 had flown. The pattern of gridding gave a ground coverage of 50 per cent, which was considered adequate for this survey.

Flight lines were plotted on the aerial photographs during flight by the observer, and notes were taken on the geological environment in which each anomaly occurred. The position of each anomaly was plotted on the photographs by observing the maximum count rate on a remote control unit and

noting the corresponding position on the ground. After a flight the plotted position of each anomaly was checked against the flight line record, and adjustments made if necessary. The final accuracy of positioning is considered to be within 50 yds.

The response and sensitivity of the scintillograph were checked with a small standard source at the beginning and end of each flight. This source was held at a fixed distance from the detector while the aircraft was flown at 2000 ft above the ground. Radiation received from the ground at this height is negligible and the recorded count rate is almost entirely due to cosmic radiation. The increase in count rate due to the source therefore provided a check on the performance of the scintillograph.

4. METHOD OF INTERPRETATION

The selection of anomalies was made on the amplitude and shape of the anomaly, and on the geological environment. However, as the geology was often obscured by soil, some anomalies were selected and interpreted on geophysical evidence alone.

The anomalies marked on the map are only those which were

(a) over twice background count, and

(b) less than 6 seconds at half rise; i.e. the flying time between points half way up and half way down the anomaly curve is less than 6 seconds, which is equivalent to about 800 ft of flight line.

5. SURVEY RESULTS

Ninety-four DC.3 anomalies were re-flown. Only 59 of these were detected; the rest could not be located. Of the 59 anomalies detected, six were considered to warrant further investigation. The remaining 53 are "broad" rather than "sharp" anomalies; they are considered to be caused by large exposures of only slightly radioactive rock, or to an unusual configuration of slightly radioactive rock, resulting from the high relief of the terrain.

The six anomalies referred to above are now considered; the numbers are those shown on Plate 1:

No.1. Anomaly occurs in the Warramanga group of Lower Proterozoic age. The terrain around it is flat without outcrops. The area appears to be accessible during the dry season.

No.2. Anomaly occurs in outcropping rocks of the Hatches Creek group. The area is not accessible by vehicle.

No.3. Anomaly occurs on the side of a ridge. Outcropping rocks near it belong to the Hatches Creek group of Lower Proterozoic age. It is unlikely that the area could be reached by vehicle.

No.4. Anomaly occurs probably in the Hatches Creek group of Upper Proterozoic age. It appears from aerial observations that the area could be reached by vehicle during the dry season.

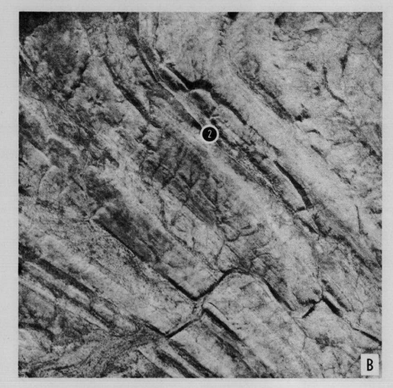
No.5. Anomaly occurs close to or on the contact zone between igneous extrusive rocks and the Hatches Creek group in a wide creek bed near, or on the side of, a small hill. It is unlikely that the area could be reached by vehicle.

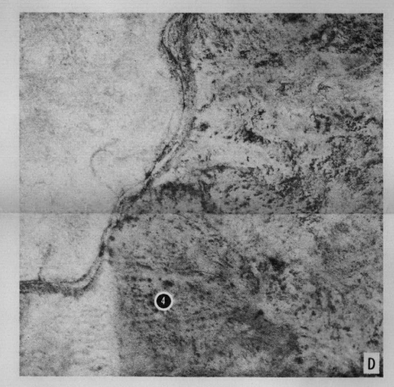
No.6. Anomaly occurs in exposed rocks on or near the contact zone between igneous extrusive rocks and the Hatches Creek group. The area does not appear to be accessible by vehicle.

6. CONCLUSIONS

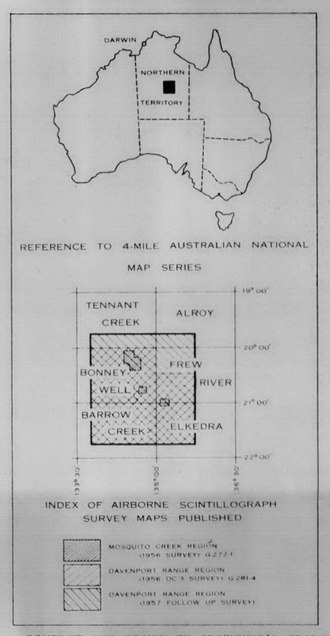
The anomalies selected for this follow-up survey were taken from the records of a previous aerial survey conducted at 500 ft above ground level.

Many of these anomalies produced intensities of low order over a large area and are considered to be of no economic importance. The remaining anomalies are shown on Plate 1, and were published in this form in May 1959. No known investigation of the anomalies on the ground has yet taken place. It is recommended that a ground investigation be made to assess their importance.





LOCATION DIAGRAM



MAP DATA

PROJECTION: TRANSVERSE MERCATOR. AUSTRALIAN SERIES

DETAIL: PLANIMETRIC DETAIL WAS COMPILED FROM CONTROLLED SLOTTED TEMPLATE ASSEMBLIES OF TENNANT CREEK, BARROW CREEK AND FREW RIVER BY DIVISION OF NATIONAL MAPPING AND FROM SLOTTED TEMPLATE ASSEMBLIES OF PART OF BONNEY WELL AND ELKEDRA BY GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RELIABILITY: RELIABLE

NOTE: IMPERFECTIONS ON AIR PHOTO MAPS ARE DUE TO FAULTS ON ORIGINAL NEGATIVES.

COMPILED AND DRAWN BY GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS, DEPARTMENT OF NATIONAL DEVELOPMENT, MELBOURNE

NORTHERN TERRITORY

DAVENPORT RANGE REGION

MAP SHOWING

RADIOMETRIC ANOMALIES

DETECTED BY AIRBORNE SCINTILLOGRAPH

JULY, 1957

APPROXIMATE SCALE OF PHOTO MAPS

MILES 1 0 1 2 3 MILES

SCALE OF PLANIMETRIC MAP

MILES 8 4 0 8 16 24 32 MILES

LEGEND

TOPOGRAPHICAL DATA

- RIVER OR CREEK
- RAILWAY
- HIGHWAY
- ROAD
- TRACK
- TELEGRAPH LINE
- FENCE
- AERODROME OR LANDING GROUND
- TOWN
- HOMESTEAD
- SHED OR HUT
- TRIG. STATION
- MINE
- STATE BOUNDARY

SCINTILLOGRAPH DATA

- (5) ANOMALY (ANOMALIES ARE NUMBERED FOR REFERENCE ONLY)
- LIMIT OF THE 1956 AIRBORNE SURVEY

EXPLANATORY NOTES

This map shows the results of a low level airborne scintillograph survey carried out to investigate further the anomalies recorded by a previous high level survey by a DC-3 aircraft.

The airborne scintillograph records continuously the intensity of gamma radiation from the ground over which the aircraft flies. This radiation is due to the presence of the naturally occurring radioactive elements, radium and thorium and their decay products, and to a lesser extent potassium.

The scintillograph was carried in an Auster aircraft which was flown at an average altitude of 200 feet above the ground. The scintillograph effectively scanned a strip of ground approximately 500 feet wide.

The gamma-ray intensity over an area may show considerable variations, depending on the geology and topography of the area. Anomalies of gamma-ray intensity have been plotted on the map where the intensity showed a significant and localised increase.

The map shows the position and grouping of the anomalies. To assist in making investigations on the ground, all the anomalies have been reproduced singly or in small groups on aerial photographs. The positioning of these anomalies is considered to be accurate to within 150 feet.

The higher intensities recorded by the scintillograph are not necessarily due to the presence of uranium deposits. Some of the higher intensities may be due to igneous rocks, which contain a slightly higher concentration of the radioactive elements, uranium, thorium and potassium, than other rocks. No claim is made that all, or even any, of the higher intensities correspond to uranium deposits of economic significance, but it is possible that some do.

It should be noted that it is virtually only the radioactivity of the surface of the ground that has been recorded, because the radiation from any buried deposit is substantially reduced by a few inches of soil or rock cover.