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OPERATIONS OF THE 1957 CANNING BASIN PARTY

by

J. J. VEEVERS.

RECORDS 1957/90

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INTRODUCTION

The 1957 Canning Basin Party was required to carry out a geological and gravity-meter survey of the central and south-eastern parts of the Canning Basin, Western Australia, and to determine by means of astrofixes the latitude and longitude of pre-selected points within the area.

The central and south-eastern parts of the Canning Basin lie entirely within the Great Sandy Desert. The desert is covered by spinifex and low scrub, but in normal seasons its surface is waterless; fixed parallel longitudinal (seif) sand dunes ranging in height from ten to one hundred feet with the majority about 20 feet, cross the desert from east to west almost unbroken and are separated by flat sand-covered corridors. In places rocky outcrops appear through the sand and, though most are lower than one hundred feet, their rarity makes them conspicuous. Drainage is absent and when water accumulates for short periods after rain, some claypans and salt pans become lakes. Except for the vegetation, sand dunes, claypans, salt pans, and rocky outcrops the desert is featureless and a more monotonous landscape could barely be imagined.

Methods of traversing this kind of country in land vehicles were developed in 1954, 1955, and 1956, when the Canning Basin Party and various Wapet parties surveyed those parts of the Canning Basin that lie on the margin of the Great Sandy Desert. For the reasons given below the use of land vehicles in those parts of the desert that remained to be mapped was considered unsatisfactory. In the place of land vehicles a Bristol Sycamore helicopter, on charter from Australian National Airways Pty. Ltd., satisfactorily provided the party with transport in the desert.

Before the survey began, the R.A.A.F. dropped four thousand gallons of helicopter fuel by parachute at four points from which helicopter operations were later conducted.

This report deals with the operational aspects only of the party's activities. Scientific results will be published separately in the form of geological-gravity maps, and a geological report.

The members of the party were - J.J. Veevers, geologist and party-leader, S. Waterlander, geophysicist, E.J. Caspers, surveyor (Division of National Mapping), D.M. Holyman, senior pilot, A.N.A., J.T. Ferguson, pilot, A.N.A., L. Taylor, engineer, A.N.A., S.R. Hair, field assistant, R. Hay, field assistant, and W.B. Deegenkamp, cook.

Transport was provided by one Bristol Sycamore helicopter, two Landrovers, and one 3-ton Commer truck.

Planning:

1. Initially three different methods of completing the mapping were compared: by helicopter, by land vehicles modified for desert use, and by modified land vehicles supplied by air drops. For the following reasons the helicopter was considered to be the most efficient: first, the total cost by each of the three methods considered was very much the same. Secondly, with the helicopter, the field work could be done by one geologist in three months whereas by the other methods the work could continue for three years and two geologists would be engaged; and thirdly, more effective and complete coverage could be obtained by the use of the helicopter, not only of the geology, but also for gravity readings by the geophysicist and astrofixes by the Surveyor who would be members of the party.
2. The plan to use a helicopter was adopted and arrangements were made to charter a Bristol Sycamore helicopter from Australian National Airways Pty. Ltd. At the outset a charter of 400 hours was considered (over one hundred hours of which would be reserved for positioning fuel) but when the co-operation of the R.A.A.F. in dropping fuel by parachute was ensured, this figure was reduced to 315 hours.
3. Aerial photographs of the central and south-eastern parts of the Canning Basin were examined by J.N. Casey and A.T. Wells for outcrops and other features of interest. The positions of features were transferred from the 1:50,000 photographs to 4-mile mosaics and thence to a map with scale 1" to 20 miles. From this map bases and traverses were chosen.
4. Well 48 (Godfrey Tank) in the north, and Giles Meteorological Station in the south were chosen as supply-bases. Well 48 and Giles are situated at the end of motor-vehicle tracks; Well 48 is connected to Billiluna Station (100 miles south of Halls Creek), and Giles to Alice Springs. Three helicopter outbases were chosen: one situated 120 miles west of Well 48 (Footprint Flat), another at Well 40, and a third in Barons Range, about 100 miles north of Giles.
5. A plan of operations, based on the technical advice supplied by A.N.A., was drawn up. The plan provided for twenty-one geological and gravity-meter traverses, and fifteen astrofix traverses. The helicopter would take part in the airdrop operation in which its specific part would be to locate the dropped drums, and recover and return parachutes and harnesses from the outbases for repeated use in the operation. At the completion of the airdrop operation the helicopter would carry the three A.N.A. men, myself, and 800 lb. of spare parts southward from Well 48 to the proposed Barons Range outbase, and then the surveyor, geophysicist, cook, and equipment northward from Giles to the Barons Range outbase. Scientific flying would then start, the traverses being flown from each outbase in turn, and the final traverses would be flown from Well 48.
6. Arrangements were made for the R.A.A.F. to make a DC3 transport aircraft available for the airdrop operation. An estimated 80 hours' flying would be required and the DC3 would operate from Halls Creek and Billiluna aerodromes.

7. A plan for rescuing members of the party in the event of helicopter breakdown away from base was prepared and necessary arrangements made. A copy of the plan is given in Appendix A.

Revision of plans.

Owing to unforeseeable circumstances, three parts of the operational plan had to be revised.

1. Heavy unseasonable rain over a belt of country including Billiluna Station and The Granites, Northern Territory, fell a fortnight before party operations were due to start. The track between Billiluna Homestead and Well 48 was consequently impassable for three weeks and during this time the helicopter operated from Billiluna Homestead. So that the helicopter could carry out its part in the airdrop operation, fuel (airdropped by the R.A.A.F.) and equipment (carried by the helicopter) were dumped at Well 48.

2. Plans for establishing a helicopter outbase in Barons Range were cancelled in view of the experience in desert flying accrued during the airdrop operation. Several factors, the long flying distances involved, the lack of aerial photographs covering the MacDonald 4-mile Sheet (on which Barons Range is thought to be situated), and the weight of helicopter spares greatly in excess of the estimated weight, led to this decision.

3. We were advised that the weight of necessary spares and equipment required at each helicopter base should not exceed 800 lb. When the spares arrived at Billiluna it was found that their weight was about 1500 lb. The transport of the excess weight of spares from outbase to outbase would seriously reduce the flying hours reserved for scientific flying. An alternative arrangement was looked for, and the following arrangement was adopted.

Members of the party not flying in the helicopter on traverse remained at Well 48 basecamp which was provided with spares and equipment required in servicing the helicopter. Working under the Department of Civil Aviation's restriction that the helicopter must be serviced after every ten hours flying, we were able to use seven out of every ten hours in flying scientific traverses from the outbases. The remaining three hours in each servicing cycle were spent in carrying the geologist, geophysicist, and surveyor, and necessary equipment between Well 48 and the outbases.

Diary of party activities

1957

March 18, - approval given by Minister for hire of helicopter

May 29, - field assistants Hay and Hair arrived at Derby, started loading stores into vehicles.

June 6 - having left stores at Billiluna Homestead, assistants travelled in truck via Halls Creek to The Granites, Northern Territory, with fuel for the helicopter.

- June 13 - assistants reported that their return from The Granites to Billiluna delayed by rain. (A narrow belt of country which included Billiluna and The Granites received heavy unseasonable falls of rain - during the twenty-four hours of June 13, Billiluna recorded $5\frac{1}{2}$ " of rain, about half its average annual rainfall).
- June 26 - helicopter arrived Halls Creek from Sydney, six days behind schedule. The R.A.A.F. DC3 arrived on the same day.
- June 27 - helicopter flew Halls Creek to Billiluna. DC3, operating from Halls Creek aerodrome, dropped four 44-gallon drums of fuel at Well 48; later in the day the DC3 landed at Billiluna aerodrome with helicopter spare parts.
(total position- ing Sydney - Billiluna 37 hrs. 10 min.)
- June 28 - DC3 dropped ten drums at Well 40. Helicopter forced back by head winds on journey to Well 40, returned parachutes and harnesses from drums at Well 48 to Billiluna. Helicopter made return flight from Billiluna to Well 48 with stores.
(helicopter charge time 6 hrs.30 mins).
- June 29 - DC3 dropped additional eight drums at Well 48. Helicopter made two flights with supplies to Well 48, and returned with harnesses.
(charge time 5.45)
- June 30 - DC3 dropped ten drums at Well 40 in morning, and 10 drums at Footprint Flat in afternoon. Helicopter returned harnesses to Billiluna.
(6.40)
- July 1 - field assistants abandoned attempts to return direct from The Granites to Halls Creek, and started on way back via Alice Springs. DC3 dropped ten drums at Footprint Flat. Helicopter flew Well 40, returned with harnesses.
(6.25)
- July 2 - DC3 dropped ten drums at Well 40 in morning, and ten drums at Footprint Flat in afternoon. Helicopter returned harnesses from Footprint Flat.
(6.05)
- July 3 - DC3 dropped ten drums at Hawes Hills, a subsidiary dump 90 miles south-east of Well 40, and continued southward to Giles; DC3 returned to Billiluna with geophysicist, surveyor, cook, and equipment. At Billiluna, starboard motor of DC3 failed and helicopter flew Halls Creek, returned with R.A.A.F. engineer who repaired motor. DC3 returned Halls Creek.
(3.00)
- July 4 - DC3 made last drop (nine drums at Footprint Flat, five at Well 40), and returned to Canberra.
- July 7 - guided by Mr. Len Brown, manager of Billiluna, Waterlander, Caspers and I drove Landrovers through flooded country to Well 48.
- July 9 - main load of stores carried by truck from Billiluna to Well 48. Helicopter made return flight Billiluna to Well 48 with spares.
(3.10)
- July 10 - helicopter made two return flights with spares.
(5.45)
- July 11 - helicopter made two return flights and a final single flight with spares.
(7.05)

- (0.25) July 12 - Waterlander and I trained in use of helicopter net.
- (4.10) July 15 - Waterlander and I flew W48 to Well 40, measuring gravity en route. Camp set up at Well 40. Pilot returned Well 48.
- (5.45) July 16 - helicopter flew Well 48 to Well 40. Traversed west of Well 40 along Percival Lakes.
- (6.50) July 17 - traversed south-west from Well 40. Helicopter returned Well 48.
- (6.15) July 18 - helicopter W48 to W40. Traversed south-east to Hawes Hills, flew 30 miles south-east to dump fuel but unable to find pre-selected point. Returned Hawes Hills, set out again for fuel point which this time was found. Returned Well 40.
- (6.50) July 19 - Well 40 to Hawes Hill, traversed to north-east, tied gravity survey with 1956. Returned Well 40. Helicopter returned Well 48.
- (1.45) July 20 - helicopter arrived Well 40 in afternoon.
- (9.30) July 21 - traversed south-east to Hawes Hills, thence north-east to Wilson Cliffs and returned to Well 40. Waterlander and I returned to Well 48, measured gravity along Canning Stock Route.
- (2.50) July 22 - we returned to Well 40 via Lake Isabella, Forebank Hills, and Helena Spring area.
- (6.30) July 23 - Well 40 to Hawes Hills, thence south-east to Dover Range. Returned Well 40.
- (3.35) July 24 - helicopter flew Well 40 to Well 48, returned Well 40 in afternoon.
- (8.00) July 25 - Well 40 to Hawes Hills, traversed to south-east on Ryan Sheet, return Well 40.
- (4.40) July 26 - Waterlander and I returned to Well 48. Caspers flew Well 40 and thence south-east to astrofix 128.
- (2.20) July 27 - Caspers returned Well 40, positioned fuel along traverse to be flown later, remained Well 40 to do astrofix.
- (1,35) July 28 - helicopter returned Well 48 with load of harnesses and parachutes.
- (3.25) July 29 - Caspers flew to astrofix 130 via Well 40 but unable to do astrofix owing cloudy weather.
- July 30 - astrofix observations made.
- (5.55) July 31 - two fuel positioning flights made from Well 40. Helicopter returned Well 48.
- (6.10) August 1 - Waterlander measured gravity on return supply flight Well 48 to Footprint Flat.
- (3.05) August 2 - Caspers flew Well 48 via Well 40 to astrofix 131.
- (3.10) August 3 - helicopter returned Well 48.

- (2.45) August 4 - flight to astrofix 132.
- (5.50) August 5 - helicopter returned via Well 40 to Well 48 with native woman and boy who were taken on to Balgo Mission. Helicopter returned to Well 48.
- (5.45) August 6 - Waterlander and I travelled to Footprint Flat. Helicopter made return flight with supplies.
- (8.05) August 7 - helicopter left me at an outcrop (Casey Peaks) six miles east of Footprint Flat, then took Waterlander on return gravity and supply flight to Well 40; helicopter returned via Footprint Flat to Well 48.
- (6.40) August 8 - helicopter flew W48 to Footprint Flat. Traversed north-east of Footprint Flat, returned in time to position fuel 60 miles west of Footprint Flat for later traverse.
- (5.05) August 9 - fuel positioned 45 miles south-east of Footprint Flat. We did gravity traverse south-east of Footprint Flat on way back to Well 48.
- (7.05) August 10 - Waterlander and I flew to Footprint Flat. Waterlander measured gravity on three fuel positioning flights.
- (7.25) August 11 - traversed south-west of Footprint Flat, returned to Well 48, measuring gravity at Well 47.
- (2.55) August 12 - Caspers flew to astrofix 133.
- (2.55) August 13 - Caspers returned to Well 48.
- (2.10) August 15 - Caspers flew to Footprint Flat, thence north to astrofix 134.
- (3.45) August 16 - Caspers returned to Well 48.
- (4.05) August 19 - Waterlander and I flew to Footprint Flat, dumped fuel 60 miles west.
- (8.45) August 20 - traversed west of Footprint Flat. Helicopter returned W48.
- (7.55) August 21 - helicopter flew Well 48 to Footprint Flat, traversed north Footprint Flat, tied gravity work onto Wapet's grid.
- (7.30) August 22 - positioned fuel 45 miles south-east of Footprint Flat; traversed south of Footprint Flat along Percival Lakes thence north-east to Well 48.
- (5.50) August 24 - short reconnaissance over Minnie Range. Caspers flew via Footprint Flat to astrofix 135.
- (4.20) August 25 - helicopter returned to Well 48.
- (8.05) August 26 - Waterlander and I traversed northwards from Well 48 to Margaret River Downs and Bohemia Downs.
- (6.30) August 27 - Waterlander and I traversed south-east of Well 48.
- (34.50) August 28 - helicopter left Well 48 on its return to Melbourne
- September 1 - party left Well 48 on return to Perth.
- Sept. 3 - helicopter arrived Melbourne.
- Sept. 17 - party arrived Perth.

Work carried out.

The work carried out by the party is shown on the accompanying map. In figures, the party's achievements are :

- 27 outcrop observations longer than 10 minutes,
- 31 outcrop observations no longer than ten minutes,
- 232 gravity stations,
- 9 astrofix stations.

Six of the twenty-one proposed geological and gravity-meter traverses, and eight of the proposed fifteen astrofix traverses were not flown. Of these, three geological and four astrofix traverses were planned to have radiated from the proposed outbase in Barons Range which, as mentioned above, could not be used owing mainly to the lack of the aerial photographs. In the field we found that the remaining geological traverses and three of the four remaining astrofix traverses did not need to be flown. Only one proposed astrofix traverse was abandoned owing to insufficient fuel.

All things considered (among others the adverse winds, unknown terrain, and our unavoidable inexperience in this kind of operation), it is remarkable that the work accomplished corresponds so closely with that planned.

A short extension of nearly fifteen hours to the original estimate of 315 hours hire was required to compensate for part of the adverse effect of winds.

The total number of charter hours, 328.15, may be divided into the following parts:

positioning Sydney-Billiluna, Well 48 - Melbourne	71.50
airdrop operation	34.25
carrying stores, fuel	65.00
scientific (effective) flying	157.15

Thus nearly half the charter hours were spent on scientific flying which is a favourable result for an operation of this kind. Despite the not altogether favourable weather we were able to make almost continuous use of the helicopter which was idle for only 12 of the total hire period of 77 days.

Airdrop Operation.

The results of the airdrop operation are given below:

Airdrop point	number of 44 gallon drums.		
	dropped	found	fuel recovered
Well 48	12	12	12
Well 40	35	32	32
Footprint Flat	39	38	35
Hawes Hills	10	10	9
TOTALS	96	92	88

The recovery of all air-dropped fuel exceeded 90%.

In the braided sand-dune country around Well 40 three drums remained undiscovered; as compensation against the three last drums, these found at Well 40 were all intact. On the harder surface of Footprint Flat, a gravel-strewn claypan, where all but one of the drums were found, three were squashed and the remainder, though intact, were more or less dented.

The normal 44-gallon avgas drum contains a 3-gallon vapour gap which allows sudden movement of the gasoline within the drum on impact. To eliminate this movement which can force off the bung, the drums were filled to the top. Each airdropped 44-gallon drum thus contained 47 gallons of avgas. Incidentally, contamination of the avgas by water, "breathed in" during the night, is inappreciable in full drums.

Operating from Halls Creek aerodrome, the DC3 was able to carry ten drums at a time to Well 40, Footprint Flat, or Hawes Hill. The drums were dropped singly at an interval of about three minutes from a height of 500 feet. Navigating by means of 4-mile mosaics, the R.A.A.F. had no difficulty in finding the dropping points.

Apart from returning harnesses, the helicopter co-operated only once with the DC3 in the airdrop operation. A strong wind was blowing at the time of the operation and there was danger that the drums, one of which fell without the parachute opening, would fall on the helicopter and its crew.

The Bristol Sycamore Mark IV helicopter as a survey aircraft.

Performance data (judged from operations in Canning Basin.)

Average effective speed	60 mph (statute)
Average effective fuel consumption (100 octane avgas)	25 gallons/hour.
Fuel capacity	89 gallons, weighing about 630 lb.
Range with full tanks (allowing one hour's reserve)	150 miles (2 hr. 30 min.)
All-up-weight	5400 lb.
Set weight (empty wt. + pilot + emergency rations + oil + misc. fittings)	4500 lb.
Gross payload	900 lb.
Net payload (with full tanks)	270 lb.

The helicopter was used for three different purposes during the survey:

- (a) to transport the geologist and geophysicist with their equipment on geological and gravity-meter traverses;
- (b) to transport the surveyor and his equipment on astrofix traverses;
- (c) as a supply aircraft.

Conditions on geological and gravity-meter traverses

The net payload is composed of the following items:

geologist	170 lb.
geophysicist	170 lb.
spare battery	50 lb.
equipment	30 lb.
<u>TOTAL</u>	<u>420 lb.</u>

With this net payload the helicopter can carry 480 lb. (nearly 70 gallons) of fuel which gives an endurance (allowing one hour's reserve) of nearly two hours, equivalent in still air to 120 miles.

We were able to fly traverses exceeding 120 miles in length by dumping from the helicopter small quantities of fuel (between 10 and 30 gallons) along parts of the traverse 30 to 60 miles from the outbase. The longest traverse flown by this method was 260 miles long.

On an average each reading of the Worden gravity-meter took six minutes; the Askania barometer was read at the same time. During this period the engine was kept running but at lower revolutions than when the helicopter was flying. The engine was never idled during gravity readings as this would have caused the sparking plugs to oil up.

Where practicable, gravity stations were located near rock exposures so that brief geological investigations (not exceeding ten minutes in duration) could be made.

On the ground, the amount of fuel consumed by the slow-running engine became excessive after ten minutes; thus stops longer than ten minutes required the engine to be shut down. From the start of discussions in Canberra, A.N.A. made it clear that stopping the engine in inaccessible country away from the servicing base is unsafe owing to the possibility of a failure in restarting the engine. Nevertheless A.N.A. agreed to stop the engine away from the servicing base on the understanding that the Bureau would accept full responsibility for all necessary consequent search and rescue. Although the Bureau accepted this condition, in the field the pilots were nevertheless reluctant to stop the engine. They detailed the number of mishaps which could occur when starting the engine and dwelt tediously on the likelihood of failure in restarting the engine. In particular, repeated reference was made to the risk of fire involved when the engine is started on a rundown battery and this argument was used in trying to dissuade me from requesting shutdowns. During our talks in Canberra no reference was made to the risk of fire; nor then was the idea of stopping the engine away from base categorically opposed.

Airline companies should realise the importance of supplying the charterer with detailed, accurate information about the performance of the aircraft at the earliest stage of planning. The withholding of information in the office, followed by its release in the field, must reduce the charterer's confidence in the company.

A practical measure resulting from our numerous discussions in the field was the making of the rule that shutdowns should be spaced at least 25 miles apart to allow the battery to recharge.

Traverses were planned with these considerations in mind and the engine was stopped only where necessary. These places were localities that warranted extended geological study, astrofix positions, and fuelling points. Even so, I was often refused shutdowns owing to one or more of the following circumstances: unsatisfactory condition of battery; low reserve of fuel; uncertain weather conditions; and insufficient daylight.

On the average, suitable flying conditions prevailed from 6.30 a.m. to 4.30 p.m., that is, for ten hours every day. Except for the few traverses flown from Well 48, however, we were unable to spend ten hours per day on scientific work owing to another rule imposed in the field, viz., that pilots would not remain at outbases longer than one night. Regardless of the dubious merits of the rule (it was intended to be a precaution against pilot fatigue), scientific work was reduced by at least two hours every day, two hours being the time required to fuel the aircraft and fly it from outbase to Well 48, or vice versa. In this way, the pilot left Well 48 in the newly serviced helicopter at 6.30 a.m., arrived at the outbase at 8.00 a.m., fuelled the aircraft, and was ready for takeoff on a scientific traverse by about 8.45 a.m. The rest of the day until 4.30 p.m. was available for flying on traverse and making ground observations. The pilot slept the night at the outbase where a tent, stretcher, sleeping-bag, blankets, pillow and well-cooked meals were provided. Although an early (6.30 am) start was made the next day, we were obliged to return to the outbase no later than 2.30 p.m. so that the pilot could return to Well 48 before nightfall.

On a long traverse the maximum allowable time of eight hours would, on the average, be made up of :-

flying	4 hours
refuelling	1 hour
gravity- readings	1 hour

balance of time available for shutdowns at outcrop -	2 hours
---	---------

On the average, two shutdowns were allowed on each traverse and consequently the average time available at an important exposure was one hour. Within this period was included the time spent in walking between the helicopter and the outcrop, and between adjacent outcrops. This inflexible time limit hindered the accumulation of detailed data and materially reduced the chances of finding fossils.

The geophysicist was more or less free from the frustrating restrictions imposed on the geologist. Sufficient time was allowed for the geophysicist to read the gravity-meter and barometer to the desired accuracy; most traverses were linked together into a well-knit whole; and in the east, north-west, and north-east ties were made with other gravity surveys.

Conditions on astrofix traverses

Items in the net payload were:

surveyor	170 lb.
spare battery ..	50 lb.
equipment (incl. portable radio and 12 volt battery)	150 lb.
bedding for two men	30 lb.
<u>TOTAL</u>	<u>400</u>

The helicopter radio was equipped with a crystal for receiving time signals from Washington, U.S.A., but reception on this frequency was poor and the surveyor carried a 12-volt battery and a portable wireless with alternative frequencies to make sure of satisfactory reception. It was not possible to run this radio from the 24 - volt helicopter battery.

With a net payload of 400 lb the helicopter had a range of nearly 120 miles. Traverses longer than 120 miles were flown with fuel supplied from intermediate fuel dumps.

Again the 'one-night' rule applied. As it happened the sky was clear for all observations and the rule did not impede the astrofix work. Had the stars been obscured by cloud, however, the return flight from the astrofix position via the outbase to Well 48 would have been wasted. The surveyor's observations were booked satisfactorily by the pilot.

The helicopter as a supply aircraft.

The outbases at Well 40 and Footprint Flat were supplied with equipment and stores by the helicopter. Water was plentiful at Well 40, but water had to be flown by helicopter to Footprint Flat.

The net payload on flights between Well 48 and the outbases was 400 lb. One flight was adequate to carry most items required at the outbase. Whatever items could not be included in the first flight were brought to the outbases when the helicopter returned after being serviced at Well 48.

As mentioned above, small amounts of fuel were dumped along traverses longer than 120 miles. Amounts not exceeding 30 gallons were carried in 44-gallon drums which were unloaded onto the ground from the helicopter by the passenger while the pilot remained at the controls.

Navigation.

Proposed traverse lines were marked in blue-coloured pencil on mosaics (scale 4 miles to 1 inch) and aerial photographs (1:50,000), and the overlap between adjoining photos was clearly marked in yellow-coloured pencil; coloured pencil was used also in numbering the photos in sequence. These measures were taken to avoid delay in reading the photos while in flight.

On traverse the photos were held down firmly by rubber-bands to a hinged wooden frame. The passenger sitting next to the pilot navigated by the photos and the second passenger or the pilot independently plotted the course on the 4-mile mosaic. The linear sand-dunes which trend east-north-east

across the desert form patterns which from a height of 1500 feet are readily identified on the photos. Over closely spaced braided dunes, navigation was difficult, however, and on several occasions we had to climb to 3000 feet to find our position.

Only once did poor navigation force us to return to base without having achieved our objective.

Fatigue.

Under the conditions encountered in the desert, the helicopter gave the passengers a smooth flight except when strong turbulent winds caused the helicopter to pitch and toss. During the first flight or two the noise and vibration caused us some discomfort but this soon disappeared.

The two pilots alternated in flying geological and gravity-meter traverses; one pilot flew the helicopter for about ten hours in a period of two days while the other pilot stayed at the Well 48 basecamp.

All the astrofix flights were piloted by Mr. Ferguson.

Camping arrangements.

As members of the party, the three A.N.A. men were supplied with accommodation and meals in the basecamp. The only charge was the cost of food, borne equally by all members of the party. The Bureau provided a comfortable though not luxurious basecamp but two of the A.N.A. men were dissatisfied with conditions in camp.

Airline company pilots who are called on to fly helicopters, or any other charter aircraft, must realise that a low payload necessarily reduces the number of facilities available at a helicopter-base compared with a surface-supplied camp, and that only the minimum necessary for protection can be provided. Personnel who are unwilling or unable to "rough it" for the period of the charter should not be engaged on this kind of work since their attitude may adversely affect the morale and efficiency of the whole party.

Communications

The helicopter communicated by radio with the Department of Civil Aviation, Wyndham, the basecamp at Well 48, and the Royal Flying Doctor Service station at Derby. Except for the breakdown in the receiver during the last week of operations the helicopter radio gave good service. At every takeoff and landing, and every hour while flying the pilot reported our position to D.C.A. Wyndham. The A.N.A. engineer kept a listening watch on the D.C.A. frequency at Well 48 (where the A.N.A. ground-set was installed) and plotted the helicopter's position. The pilot could also communicate with Well 48 on A.N.A.'s company frequency.

Communications between the outbase and Well 48 were provided by a Traeger portable transceiver which operated on the R.F.D.S. network. Another transceiver was carried by the assistants on their journeys by truck between Well 48 and Halls Creek.

Airworthiness

Even when fully laden the Sycamore is capable of vertical flight without any movement of translation. We were thus able to land and take-off without having to clear a path (as is normally required for the Hiller helicopter). Although I spent over 100 hours in the helicopter I never tired of marvelling at the firm control maintained by the pilot. There was never a moment when the helicopter could be said to be out of control and this gave the passengers a very desirable feeling of confidence in the aircraft.

Weather.

After the initial falls of rain on June 13, the weather remained wet and cloudy for nearly six weeks. During the first twenty days of scientific operations, the Well 48 area received about two inches of rain, distributed as follows: -

July 8	10/10	cloud, cool
" 9 to 14	10/10	" " light rain.
" 15	10/10	" " 70 points of rain.
" 16	10/10	" " light rain.
" 17	4/10	" temperature rose to 77°F.
" 18	10/10	" cool 100 points of rain.
" 19	10/10	" cool, light rain.
" 20, 21		clear sky, no rain.
" 22	10/10	cloud, cool, 20 points of rain.
" 23		clear sky, no rain.
" 24	10/10	cloud, no rain.
" 25 - 27		clear sky, no rain.

After this period the rain gave way to dominantly easterly winds which blew more or less continuously for the rest of the operation. On the ground, wind velocities of 20 mph were frequent, and at Well 48 winds with gusts of 40 mph caused postponement of operations for several days in August.

Emergency Landing Grounds.

Footprint Flat (20°32', 124°42'), a gravel-strewn claypan 500 yards long and 200 yards wide, was judged by the pilots to be suitable as an emergency landing ground for light aircraft. The Flat is dotted with small gum-trees but a straight path runs among the trees over the entire length.

The claypan lying to the west of Elizabeth Hills (22°48', 127°59') is flat and firm; since it is 1,000 yards long, 500 yards wide, and is free of obstructions, it would make a good emergency landing ground.

Footprint Flat and the claypan at Elizabeth Hills were the only likely emergency landing grounds which we were able to examine thoroughly. Doubtless the desert contains other areas which would be suitable for this purpose; according to Ernestine Hill in "Walkabout" (1953) a military aircraft landed at Lake Tobin in 1942; the type of the aircraft is not mentioned but it must have been at least of medium weight since it carried stores and sixteen men.

Natives

The party encountered several natives at Well 40. Two of the natives were sick and they were taken by helicopter to Balgo Hills Pallottine Mission. A full account of the matter is presented here to correct some of the fanciful reports published in the press.

On 2nd August, Mr. E.J. Caspers, surveyor, and First-officer J.T. Ferguson made a flight from Well 48 via Well 40 to Astrofix 131. While fuelling the aircraft at Well 40, they sighted a crowd of 30 to 40 natives coming towards them across the dunes. With them the natives carried a sick piccaninny and an old man. I may mention here that we had made contact with smaller groups of natives at Well 40 a week before.

Using sign language the natives indicated that apart from their customary desire for food they would like their two invalids taken to hospital. Caspers and Ferguson were impressed by the poor condition of the invalids and on the 5 pm radio schedule with basecamp that day asked my approval as Charterer, and Captain Holyman's as operator, to bring in the sick pair on their return to Well 48 the following day. We agreed without hesitation but Captain Holyman made the reservation that a clearance against liability would have to be granted by the competent authority to A.N.A. before A.N.A. could accept the natives as passengers. At this point, Broome Aeradio joined in the schedule and promised to get a decision from the Department of Native Welfare.

Approval from Native Welfare together with their gratitude in advance came the following morning. However, when Caspers and Ferguson returned that morning (3rd August) to Well 40, the invalids were not to be seen and Caspers and Ferguson had to return alone to Well 48.

On their return (on 5th August) to Well 48 from Astrofix 132 via Well 40 (for fuelling) Mr. Caspers and First-Officer Ferguson found among the natives at Well 40 a boy aged about 12, and a woman, aged 25 to 30, both in poor condition. The other natives at Well 40 were in fair condition. Acting on my earlier instructions, Caspers and Ferguson took the two natives on board, an action commended by the natives, and returned as planned to Well 48.

The boy was in an advanced stage of malnutrition and his temperature was high. The woman had open wounds on the thigh and chest. Owing to rain, road conditions between Well 48 and Balgo Mission, the nearest place where medical attention was available, were uncertain and I had no alternative but to order a special flight from Well 48 to Balgo.

Subsequently the natives were taken by road from Balgo to Halls Creek Hospital, and then flown to Derby Hospital.

On Wednesday 7th August, Mr. Waterlander and Captain Holyman made a flight in the helicopter from Footprint Flat to Well 40. On this flight, which was part of the original plan, gravity was measured between the two outbases and the heavy fuel pump and remaining stores were taken from Well 40 to Footprint Flat. A small quantity of food was distributed among the few natives who had remained at Well 40. These natives were all in good condition.

It appears that the two natives brought to Balgo were simply unable to fend themselves for food and hence fell ill. Most natives seen at Well 40 were in good to fair condition.

The flight from Footprint Flat to Well 40 on August 7th was the last flight to Well 40.

Barely a day passed that we did not see smokes caused by the natives burning off the spinifex in their search for food. Other signs of natives were soaks dug in claypans, and footprints on saltpans and claypans. More lasting signs were seen in the painted caves at Picture Hill and Yarrana Heights.

New Geographical Names

In the course of the survey the party came across several hitherto unnamed features which warranted naming on account of their prominence. A list of the new names, the position of the features, and the derivation of the names has been submitted to the Surveyor-General of Western Australia for official approval. Appendix B is a copy of this list. Until official approval of these names is received they must be considered provisional. The new names appear also on the attached map.

Conclusions

1. The Bristol Sycamore helicopter proved to be a satisfactory vehicle for gravity-meter and astrofix work in the central and southeastern parts (Great Sandy Desert) of the Canning Basin.
2. The helicopter was not entirely satisfactory as a vehicle for geological work owing to the risks involved in stopping the engine away from base. Most of these risks would have been avoided had it been possible to equip the helicopter with a hand-starting mechanism.
3. The airdrop operation was successful. Recovery of the fuel dropped by parachute exceeded 90%.
4. Co-operation between members of the party and the helicopter crew was satisfactory but even closer co-operation would have been achieved had all members of the crew been happy to live under normal camping conditions.

APPENDIX A.

Plans for rescuing members of Canning Basin Party in the event of helicopter breakdown.

1. On each flight, 4-mile mosaics of the area being traversed will be carried in the helicopter.
2. A duplicate set of mosaics marked identically to those carried in the helicopter will be kept in the outbase from which the helicopter is operating. At hourly intervals the pilot will radio the helicopter's position to the outbase. The outbase will have a daily schedule with Well 48.
3. Complete sets of mosaics will be left with the party's two assistants at Well 48 (operating 9QN), and with Connellans, Alice Springs.
4. In the event of helicopter breakdown, the following plan is to be put into operation;
 - (a) (i) If the helicopter's radio is still effective; the pilot will radio the position to the outbase on the hourly schedule;
 - (ii) If the helicopter radio is broken down: the outbase, after having failed to receive any radio signals from the helicopter, and if the helicopter does not arrive back at the outbase six hours of daylight after estimated time of return (e.g., if helicopter is due back to outbase at 6 p.m. July 1st, and it does not appear by 1 p.m. the next day, July 2nd), the outbase members of the party will estimate the part of the traverse over which the helicopter will be grounded.
 - (b) The outbase will communicate by radio with Connellans, Alice Springs, who will be requested to search the area (with the aid of mosaics) in which the helicopter is situated, and throw out supplies of water (carried in car inner-tubes) and food, thus succouring the pilot and passengers until land rescue is effected.
 - (c)(i) If the helicopter is in an area within the limits of 150 miles west of, and 100 miles south of Well 48, the two field assistants will prepare the two modified Landrovers for the rescue by filling all tanks, installing spare drums of water, installing the transceiver, and carrying on one of the Rovers a 44-gallon drum of petrol. The assistants will proceed in the estimated direction of the helicopter until either a rescue is made, or, until a little less than half their petrol has been used in which event both Landrovers must turn back to Well 48. On no account will the Landrovers separate. The Landrovers will maintain frequent radio communication with the R.F.D.S. network.
 - (ii) If the helicopter comes down in an area situated further than 150 miles west of, and 100 miles south of Well 48;
 - (a) if the area is situated 100 miles from Giles or within 150 miles west of, and 100 miles south of Lake Mackay, B.M.R. vehicles (modified for desert use) from Alice Springs, or from the Georgina Party, will carry out the rescue operation with the support of R.A.A.F. airdrops. Copies of mosaics could be taken from Connellans whose set could be replaced by the one in Well 48;
 - (b) if area situated on McLarty Hills or Joanna Springs 4-mile sheets, WAPET could be requested to attempt a rescue, using their own mosaics;

((c) (ii) continued)

(c) if the area situated in Sahara or Ural Sheets, or on western parts of Percival, Wilson or Ryan Sheets, it would be necessary to have rescue attempted by helicopter (Navy) with airdrop support.

- Notes:
1. Helicopter equipped with first aid kit, and 30 lbs. emergency rations, including water and food, to be shared among two or three men.
 2. The plan would be co-ordinated by the Chief Geologist, Canberra.

APPENDIX B.

NEW GEOGRAPHICAL NAMES IN THE CENTRAL PART OF
THE CANNING BASIN, WESTERN AUSTRALIA.

Compiled by J.J. Veevers.

CORNISH 4 - MILE SHEET

GRAVITY LAKES : four large claypans 8 miles south-west of Well 45 on the Canning Stock Route (20°51'S 126°05'E). A gravity-station was made by the side of one of the claypans.

CROSSLAND 4 - MILE SHEET

CLAPP RIDGE : 20 feet-high sandstone ridge at 19°52', 124°58'; after F.G. Clapp, who in 1925 collected fossils from the McLarty Hills which he reached by tractor from Broome.

DUMMER 4 - MILE SHEET

CASEY PEAKS : five 30 feet-high sandstone peaks situated 6 miles east of Footprint Flat (20°31', 124°47'); after J.N. Casey, member of the Bureau of Mineral Resources Canning Basin Party 1954 and 1955.

FOOTPRINT FLAT : gravel-strewn claypan with a few trees at centre of ironstone plain (20°32', 124°42'); after the numerous tracks left by natives. In an emergency, Footprint Flat could be used as a landing ground by light aircraft.

GWENNETH LAKES : chain of claypans extending from 21°00', 124°33' to 21°00', 124°49'; after Mrs. Gwenneth Holyman, of Melbourne.

PRESCOTT LAKES : chain of claypans extending from 20°43', 125°05' to 20°47', 125°11'; after R.A. Prescott, member of Terry's 1925 Expedition, which visited Dummer Range.

STONEAXE CAVE : 20 feet long cave in ferruginized Sandstone (20°04', 125°15'); contains native implements.

TINA SPRING : travertine spring, probably of intermittent flow, near several claypans at 20°09', 125°11'; after Mrs. Tina Waterlander, of Melbourne.

HELENA 4 - MILE SHEET

FAREWELL LAKES : two large claypans eight miles south of Thornton Flat (21°15', 127°08'); seen on the last flight of the Survey.

(HELENA ⁴⁻MILE SHEET Cont.)

THORNTON FLAT : Saltbush flat, three miles long, one mile across, with a rubbly outcrop of Sandstone (21°06', 127°08'); after G. Thornton, Director of the Royal Flying Doctor Service base-station, Derby.

JOANNA SPRING 4 - MILE SHEET

BATTLEMENT ROCKS : 70 feet-high sandstone peak with angular profile (20°07', 123°18').

GRABOWSKY RANGE : chain of numerous small conical hills extending from 20°17', 123°03' to 20°29', 123°08'; after I.H. Grabowsky, Planning and Development Manager of Australian National Airways Pty.Ltd.

TRAVES CLIFFS : 50 feet-high Sandstone breakaways at 20°28', 124°22'; after D.M. Traves, leader of the 1954 Bureau of Mineral Resources Canning Basin Party.

TURKEY PLACE : 70 feet-high conical hill in Grabowsky Range (20°24', 123°03'); a wild turkey was seen at this place.

YARRANA HEIGHTS : Small sandstone hills and breakaways, some caves adorned by native paintings (20°05', 123°25'); after the helicopter used in the Survey.

PERCIVAL 4 - MILE SHEET

SHOESMITH CLIFFS : 30 feet-high Sandstone cliffs near southeastern edge of Percival Lakes (21°30', 125°20'); after one of the two drovers who lost their lives in 1911 when attacked by natives at Well 37.

THOMPSON KNOLLS : area of low Sandstone outcrops at edge of one of the Percival Lakes (21°22', 125°02'); after one of the two drovers who lost their lives in 1911 when attacked by natives at Well 37.

RYAN 4 - MILE SHEET

CORROBOREE VALLEY : shallow valley in soft white slates south of a 150 feet-high quartzite ridge (23°10', 127°23'); the valley-floor is crossed by lines of pebbles which outline various native ceremonial areas. It is likely that this valley was chosen as a ceremonial area on account of the abundant supply of clay (not seen elsewhere in the central part of Canning Basin) which the natives could use as a ceremonial paint.

(RYAN 4 - MILE SHEET (Cont.))

JOLLY PEAKS : 40 feet-high Sandstone peaks between 23°10', 127°05' and 23°11', 127°09'; after E.E. Jolly, a member of Terry's 1925 Expedition.

SAHARA 4 - MILE SHEET

BREMNER PEAK : 50 feet-high conical Sandstone Hill north of the western part of Percival Lakes (21°26', 124°18'); after C.St.J. Bremner who, in 1941, made an aerial reconnaissance of the southern margin of the Canning Basin for Caltex (Aust). Pty.Ltd.

PICTURE HILL : 50 feet-high siltstone breakaway situated north-east of Lake Woolomber (21°41', 123°50'); the breakaway contains small caves decorated with native pictures.

URAL 4 - MILE SHEET

KIDSON BLUFF : 100 feet-high Sandstone breakaway about 4 miles south of Well 35 (22°16', 125°03'); after E. Kidson, who, in 1914, carried out a magnetic survey along the Canning Stock Route.

REEVES KNOLL : 50 feet-high Sandstone breakaway 16 miles north-east of Well 37 (22°02', 125°39'); after F. Reeves, who made an extensive survey of the Canning Basin during 1947 and 1948 for Vacuum Oil Company.

WEBB 4 - MILE SHEET

ELIZABETH HILLS : two 100 feet-high Sandstone hills surrounded by claypans at 22°48', 127°59'; after the fiancée of J. Ferguson, pilot.

BIRTHDAY HILL : Solitary 200 foot high flat-topped hill in the Dover Range (22°57', 128°08'); visited on the day of birth of Tom, son of John Veevers.

WILSON 4 - MILE SHEET

CONTENTION HEIGHTS : 80 feet-high ironstone-capped Sandstone hills and breakaway extending from 23°02', 126°44' to 22°53', 126°53'; name refers to difference of opinion between pilot and passengers when this area was visited.

HAWES HILL : low ironstone hills dissected by dry water-courses (22°35', 126°46'); after L. Hawes, who captained the R.A.A.F. DC3 used in the airdrop operation during June and July, 1957.

WILSON - 4 MILE SHEET (Cont.)

- REDKNAP MOUND : mass of white sandstone exposed at 22°14', 126°17'; after M. Redknap, member of Terry's 1925 expedition.
- SUFFICIENCY KNOB : rise of ferruginized sandstone at 22°23', 127°29'.
- TERRY RANGE : north-running breakaway range between 23°05', 126°25' and 22°53', 126°25'; after Michael Terry, leader of several expeditions of exploration in Western Australia and Northern Territory.
- TOP-UP RISE : rocky rise at 22°47', 127°10'; a refuelling point for the helicopter.
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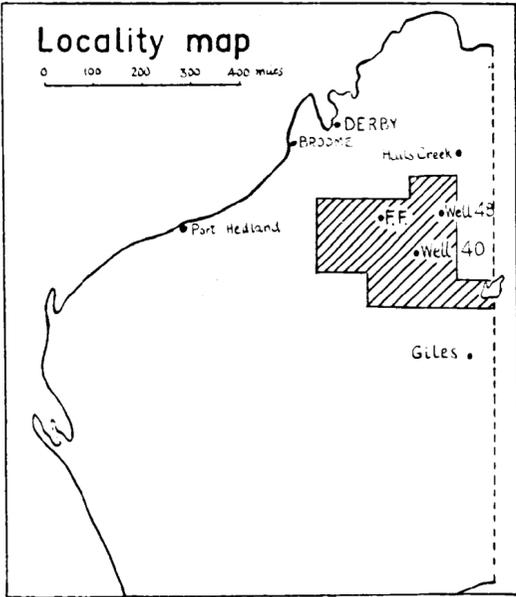
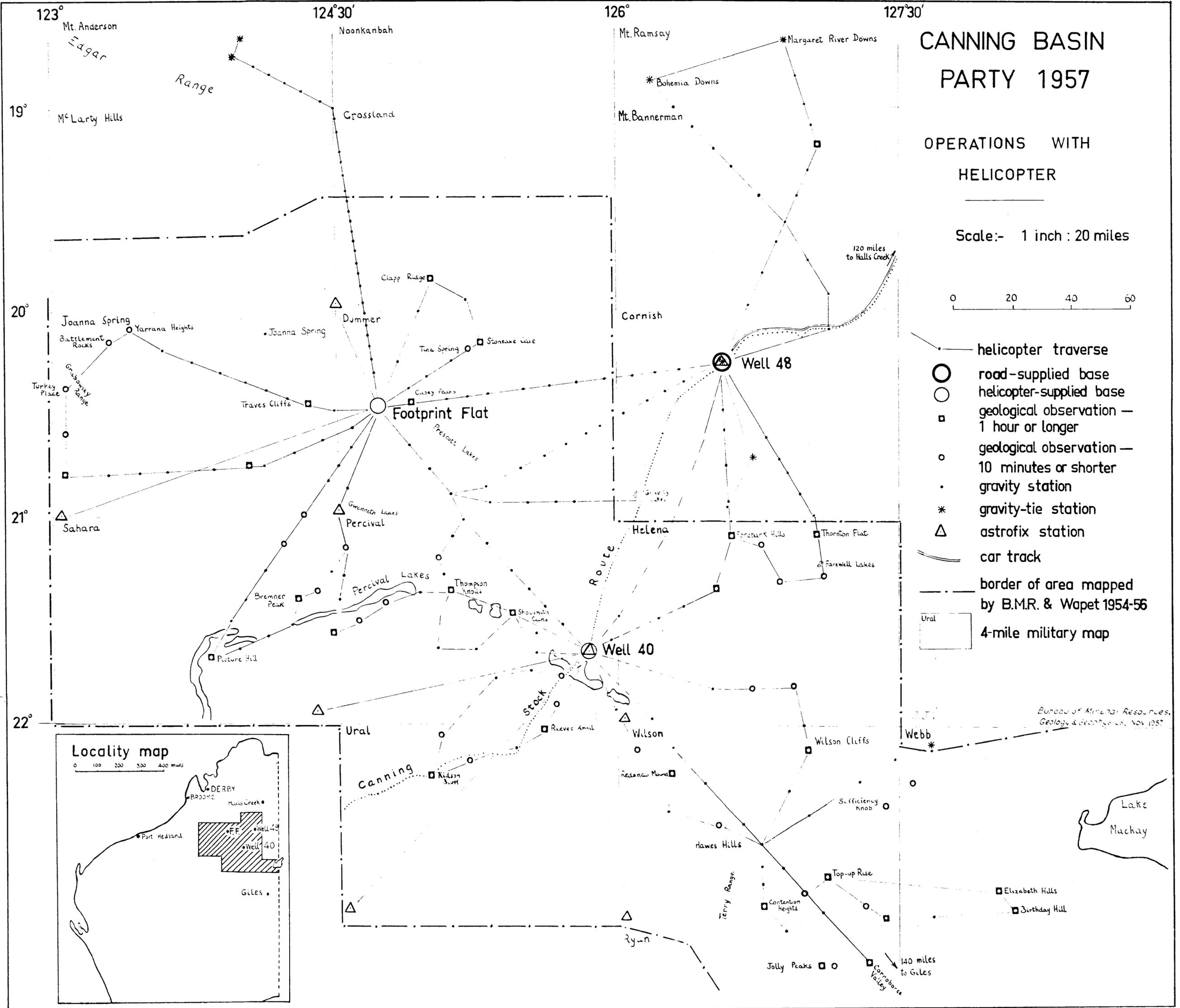
CANNING BASIN PARTY 1957

OPERATIONS WITH
HELICOPTER

Scale:- 1 inch : 20 miles



- helicopter traverse
- road-supplied base
- helicopter-supplied base
- geological observation — 1 hour or longer
- geological observation — 10 minutes or shorter
- gravity station
- gravity-tie station
- astrofix station
- car track
- border of area mapped by B.M.R. & Wapet 1954-56
- 4-mile military map



Bureau of Mineral Resources,
Geology & Geophysics, Nov. 1957

Lake
Mackay

Webb *

140 miles
to Giles