A Nullarbor Exploration Project

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Abstract

Areas of sometimes one, two or three hundred square kilometres were suspected to be untouched by any existing tracks, and to contain no known features. During previous survey expeditions the idea grew from thinking about known caves at and beyond the tree line, to studying such an area in some small primitive way so as to ascertain whether there might be some matters of interest. Consequently a solo three day walk was undertaken, and about ten small features were found, some being small caves. At the same time it became evident that the method would be futile for anything more than a minute sample of the whole plain.

Discussion led to the acquisition of a conventional triaxis aircraft. Methods and processes were developed for efficient data collection both in the air and on the ground. In time further work produced verification of the validity of the processes.

Annual results since 2000 have varied but a firm commitment is producing results. There is no one aim other than to document what is there, though other aims may emerge in time, also serendipitously. Documentation is itself a major part of the daily expedition, while some characteristics are emerging from the data and experience gained.

Introduction

Our aim has been to examine large areas of the Nullarbor Plain, particularly those not often frequented, and to document all that is found.

Background

Years of experience gained by many people, including not only cavers, has led to a common acceptance that many blowholes and caves do exist, and can be found anywhere on the plain. However detail about such a commonly accepted belief has been sketchy at best, with little firm information as to location, frequency of occurrence, evenness of distribution or type of feature, and documentation has been sparse. Moreover the focus has, at times, been to discover new sporting caves, with little interest in documenting the many other features seen in the process.

Figure 1 *Flightstar in the air*

Ken's own experience started with several visits to see known caves. While interesting, nevertheless no further knowledge was added. Surveying became the new focus, with some ten years spent mainly on one cave, Thampanna, 6N206. It was during this period that an awareness developed concerning several large areas, some in excess of a thousand square kilometres, where no visible tracks existed and no features were known.

In 1999 an initial exploratory solo walk of three days was undertaken in an area south of Old Homestead Cave, 6N83, and during this some nine small caves were found. A GPS was carried, but was still in the "randomly inaccurate" mode and the greatest finding was that the method was limited. At one time, two small entrances 11m apart were impossible to see from each other's entrance. Saltbush! There had to be a better way.

By 2000 a small aircraft had been acquired (Fig. 1). A simple single seat viewing platform, with conventional wing, tail and rudder, little weight and lots of power, *Flightstar* was adaptable to the conditions common on the bare plain, but effective methods were, as yet, far from developed. Simply securing the aircraft during high winds and storms called for a radical approach to aerodynamics. Nevertheless a simple form of grid search was initiated, a primitive recording method devised, and America very kindly removed the "GPS randomiser" giving us position accuracy of a few metres instead of a hundred or more. We were set to begin!

Figure 2 *Ken is ready to record features*

Methods

Equipment carried on the aircraft is simple and minimal: a notepad fixed to the right knee, a GPS in bracket on the left knee (Fig. 2), three pencils in a clip within easy reach, an antenna for the GPS, sundry spares, rations and water, distress flare, and a device to raise a storm in Canberra if rescue became a priority. Cameras are definitely not carried except for a dedicated mission: the pilot is already managing an aircraft, a fastidious engine, varying wind conditions en route, location and search pattern, precision marking of locations, and enigmatically cryptic notes with the fourth hand. Enough is definitely enough! Ground reports show an increased accuracy over the years, and there is now a justified confidence that very little is missed. While the bare use of human eyes may sound too simple, we are confident that the eye is so controlled by its "on-board computer" that the developed "software" far outclasses any non human equipment currently available. Some of the development is definable, but there do seem to be factors involved that are not easily understood. Many times Ken has made ground visits simply to compare with the aerial view. The basic classifications judged from the air are mainly **Holes**: small to large; **Entrances**: where this appears to be the case; **Dolines**: shallow to deep, wide to small; **Rockholes**: places where water is visible, or appears to be possible; **Villages**: points where several animal tracks meet; and other sightings as the need arises, so that every detail detected is recorded, even if it is unlikely that all points can be inspected by a ground party.

Some points are not visited. This may be simply due to lack of time, but may be because of the sheer distance involved, the isolation of just one feature, the proliferation of tyre shredding bluebush, or the possibility of marking the surface unnecessarily for little purpose. Whereas initially we placed our annual search areas, around a thousand square kilometres, in adjoining positions, now we prefer to sample areas more widely representative.

How a feature search is organised and the results processed

Prior to the trip

- CEGSA issues the VSA a block of cave numbers (N numbers).
- The year's search area and base camp sites are selected (Fig. 3).
- Information sought on any existing (known) features from the CEGSA records and other sources.
- Permits applied for e.g. S.A. Nullarbor areas require a scientific permit from the relevant state government department in Adelaide. We have now had permits yearly for several years. Decisions as to what other information might be needed to collect data for and appropriate sample collecting requests added to the permit application. Liaison with Parks SA organised.
- Expedition logistics, equipment, transport, fuel, water, participants, communal catering, risk management organised. These tasks are shared.

Search methods and documentation

- Once we are all set up in camp, Ken (our pilot), plots the day's search pattern and enters this search pattern as a route into his GPS. A new route is made for each new search pattern. Ken will fly along these daily routes (Fig. 4). As a part of risk management for the expedition, copies of the intended route for the day are available in camp.
- As the route passes over or near any karst or other features Ken "marks" these on his GPS and writes the basic details of the feature into a flight log book.

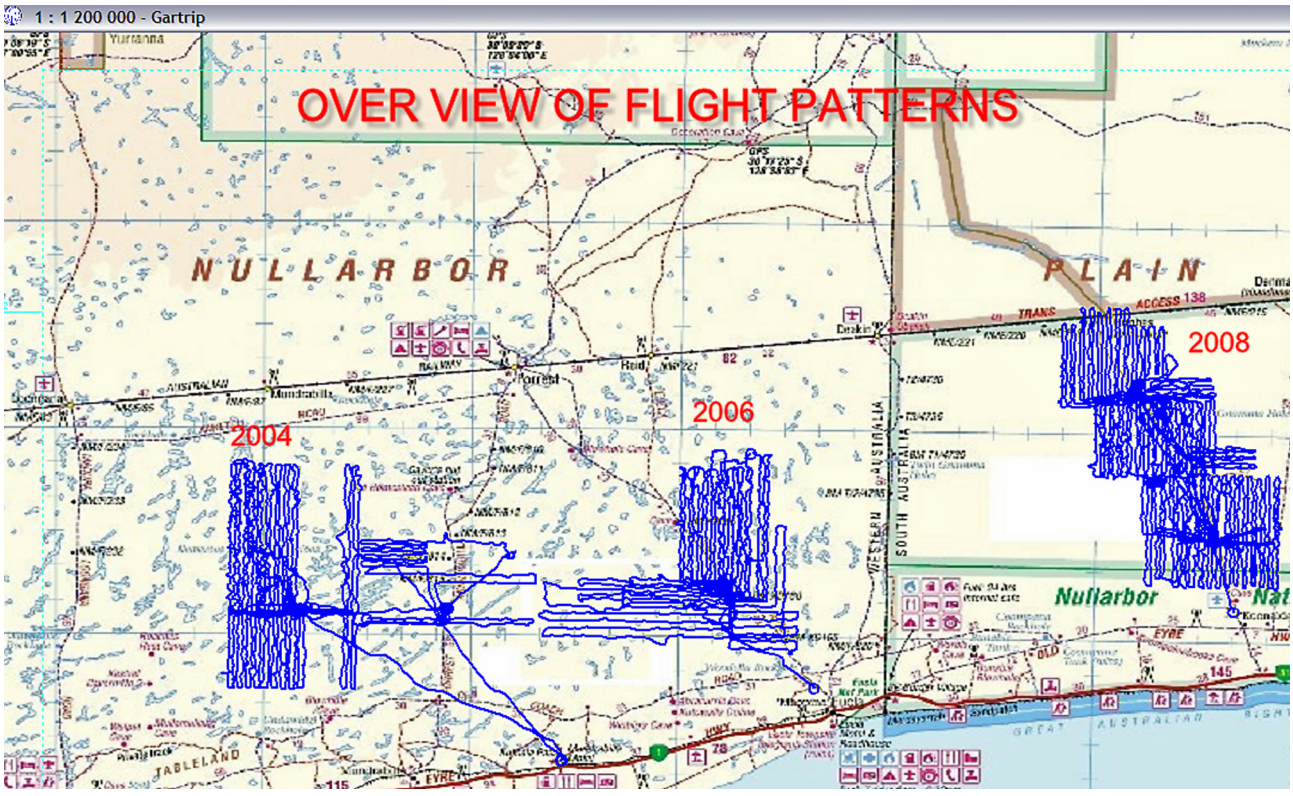


Figure 3 *Overview of flight paths showing areas searched. This information is used in conjunction with track information to choose each year's search area.*

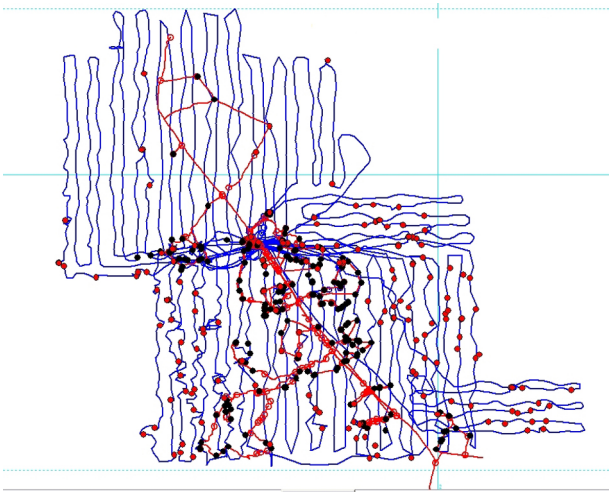


Figure 4 *Overview of flight tracks and surface tracks. Not all are shown.*

• On return to camp Ken edits his flight log by assigning a "K" number to each of the GPS marks. Thus WP 001 of the first flight will be assigned K nnnn, (n) being the next highest K number above the previous flight's K numbers. (e.g. in year A, the K numbers may finish at K 1234; the next year's K numbers will start at K 1235). This edited information is called "Ken's Raw Data". Ken then passes his GPS and flight log book to the data team.

• Using the Gartrip program, Ken's GPS is down loaded. Both WPs and the actual flight tracks are saved and archived as Ken's raw data. Each flight's raw data will be retained unedited in file.

• A copy of the raw data is then used as the source for editing in Gartrip. The basic WP numbers are replaced with a K number and a short description is entered into the edited WP. The WP position information is not changed. This data is now called "Processed Data' and is filed ready for loading each day into the expedition members' GPS units.

• The field teams organise the areas to be checked, who is going where and with whom, what transport (4WD plus walking, walking only, motorbikes) is being used for each party and what gear might be needed. Ground parties go out for most of the day. Information as to where the ground parties are going to search is put on the "where are you" board. Risk management actions are organised. Parties are expected back in camp by dark.

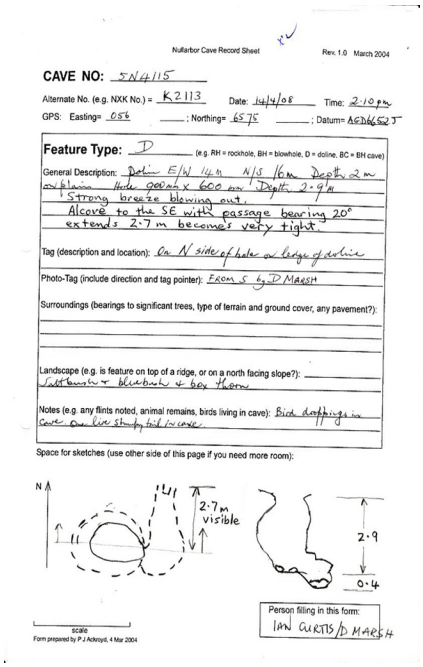
• A standard cave reporting form is used by the field teams (Fig. 5). On-site information of the feature, mapping information and the more accurate ground tested GPS location are entered on the form. If the feature warrants it, an N number is allocated and tagged on the feature. No tags have been attached after 2011; we now rely on GPS position and have dropped the 5 designation using just N nnnn. Area and feature images are taken.

• Each evening the processed data and any GPS tracks are collected ready for printing in an information sheet or many sheets known as the *Morning Herald* (Fig. 6). All (including updated) WPs and tracks are printed over a calibrated map of our annual search area. The *Herald* also lists the K number locations and comments. Later as more information flows in, the K numbers are updated to N numbers and the positions are refined by field corrections. This data is archived in day files and a copy is used for later modification with new day's field data.

• The *Herald* is a daily progressive record of the expedition's finds, results, tracks and where we have been or not. It is therefore a valuable planning aid. Occasionally the A4 size page print does not show all features clearly so detailed print outs can be provided on request to help sort out confusing areas.

• To check the actual ground coverage, the pilot has extra print outs which show his actual flight paths over the search area.

• The completed cave report forms are collected by the data team each evening. Copy of the WP lists in Gartrip is updated with the new field reports and refined GPS locations and altitude. Where appropriate the K numbers are replaced with N numbers, or if the feature had no prior K number, the N number and details are recorded and noted



Nullarbor Cave Record Sheet Rev. 1.0 March 2004

CAVE NO: 5N4115

Alternate No. (e.g. NXK No.) = K2113 Date: 14/4/08 Time: 2.10pm

GPS: Easting= 0656 ; Northing= 6575 ; Datum= AGD66 52 J

Feature Type: D (e.g. RH = rockhole, BH = blowhole, D = doline, BC = BH cave)

General Description: Doline E/W 14m N/S 16m Depth 2m on plain. Hole 900mm x 600mm Depth 2.9m Strong breeze blowing out. Alcove to the SE with passage bearing 20° extends 2.7m becomes very tight

Tag (description and location): On N side of hole on ledge of doline

Photo-Tag (include direction and tag pointer): From S by D Marsh

Surroundings (bearings to significant trees, type of terrain and ground cover, any pavement?):

Landscape (e.g. is feature on top of a ridge, or on a north facing slope?):

Notes (e.g. any flints noted, animal remains, birds living in cave): Bird droppings in cave. One live stumpy tail lizard.

Space for sketches (use other side of this page if you need more room):

Figure 5 *Standard Field report form*

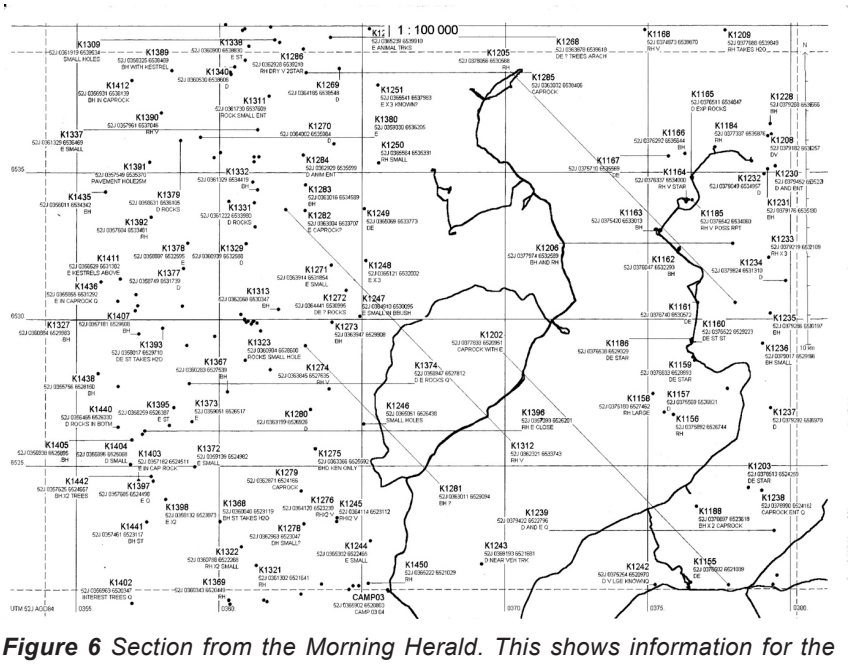


Figure 6 *Section from the Morning Herald. This shows information for the "ground truth" crews to check.*

as having no K number. If the K feature is of no significance, i.e. a rabbit hole or shadow or bush, the feature is recorded as K nnnnV The V indicates the K feature was visited but not numbered. V or visited features may be imaged and re-GPS'd for records. A K number that is not located is simply recorded as "not found".

- The entire GPS track data is down-loaded from each member's GPS each day. This data is archived in the individual members GPS file folders. These tracks are then added to an existing working file thus building up the coverage map.
- After each flight, Ken returns with the results and the data process is repeated. Each step in the original data is archived. Copies are used for editing each day, the edited day copies are also archived. Copies of the edited day data are combined to give progressive result information. Hopefully data is not lost with this process and queries or errors in data entry etc can be traced back to the source data.
- The new *Herald* is printed each day and GPSs are updated with the latest progressive data. The report forms are filed for yet more processing back at home. So each day the information cycle builds up.

Follow up back in Melbourne

- Back home, all of the cave report form information is entered into an Excel hyper-linked spread sheet. The archived data, cave area and tag images, scans of the original cave report forms and cave maps are also entered into the spreadsheet.
- Maps are drawn up and lodged with VSA records.
- Updated documentation is submitted to CEGSA for inclusion in the database.
- The spread sheet and other additional information and summaries are sent to Parks South Australia and a report submitted to the department that issued the permit.
- The whole exercise starts again for the following year.

Discussion and Conclusions

In the past, discoveries were primarily the result of checking along the tracks and the use of aerial photographs, which picked up the larger dolines. This resulted in exploration bias as the concentration of known caves has been predominantly near tracks. Although new caves are still found by this method, the use of the ultralight aircraft has resulted in a much wider area explored and documented. The ultralight flies closer to the ground and is able to identify smaller entrances than aerial photographs.

The potential for analysis of the distribution of cave and significant karst features is significant. When combined with Google Earth and satellite imagery analysis, some interesting patterns of cave distribution may be identifiable.

The aerial reconnaissance is supported by cavers who 'ground truth' the GPS locations. If a site has a feature this is surveyed and documented (numbered, described, surface photographed). Sometimes the GPS sites are "fake" i.e. bushes, shadows, and at other times extra entrances are found and documented. The data is submitted to CEGSA for inclusion in the main database. Some hundreds of blowholes and caves have been added to the database over the past 10 years.

The expedition varies in numbers between 10 to 16 people. The best number has been found to be about 12. The expedition logistics has developed into a pattern (Fig. 7), which suits the main participants, and people wanting to join need to contact the organisers very early in the year. Support from VSA has been gratefully received and the group now has participants from a number of ASF clubs.

We are into our tenth year, the group is fairly constant, we have new wing fabric, and about 95 years should complete the job.

(Photographs are from the authors.)

Figure 7 *View of 2008 camp*