KITE PHOTOGRAPHY

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SUMMARY

Aerial photography was required this year, and use was made of the helicopter from L'Astrolabe during the unloading operation; and opportunistic use of the helicopter from the 'Steve Irwin', whose captain kindly allowed it to be used for two flights. However, helicopters are difficult to source and expensive to use, so two alternatives were considered – model helicopter and kite photography. Model helicopters are expensive and tricky to fly, and need relatively calm air, whereas kites are cheap, simple to fly and need wind – of which there is plenty at Cape Denison.

Kite photography was used extensively to take photographs during our stay, and proved useful in a number of ways which are discussed here. Some improvements in equipment and technique are suggested.

In general kite photography is an effective way to take aerial photographs, especially so in isolated areas.

KITE PHOTOGRAPHY IN RECENT YEARS

Kite photography was being done in UK about 40 years ago using steerable kites and suspended motor-driven cameras. Despite what now seems a clumsy arrangement, some good results were obtained.

It is now known as KAP (Kite Aerial Photography) and has grown phenomenally in recent years with the introduction of small, light digital cameras, and the development of rip stop nylon, nylon cord and carbon fibre. There is a large following overseas (not much in Australia), whose techniques and practice is available on the internet. I spent several weeks researching the requirements before building the equipment, and making and testing 3 kites in Tasmania. As luck would have it, the winds became light and variable in the few weeks I needed for practise and development before departure, so some of the techniques were untried until arrival at Cape Denison. Despite this the project went well, and the results exceeded my expectations, producing interesting and useful images.

THE HISTORY OF KITE PHOTOGRAPHY AT CAPE DENISON

This is not the first time kites have been used to take pictures at Cape Denison, but it is the first successful one. Both Mawsons and Blunt (Project Blizzard) tried, but failed – in the light of present experience they failed because the kites were too big and of the wrong design.

Mawson writes:

“Meanwhile, it was suggested that if a heavy kite were made and induced to fly in the continuous winds, the aerial thus provided would be sufficient to receive wireless messages. To this end, Bage and Bickerton set to work, and the first invention was a Venesta-box kite which was tried in a steady seventy-mile wind. Despite its weight,--at least ten pounds --the kite rose immediately, steadied by guys on either side, and then suddenly descended with a crash on to the glacier ice. After the third fall the kite was too battered to be of any further use. Another device, in which an empty carbide tin was employed, and still another, making use of an old propeller, shared the same fate.”
From Sir Douglas Mawson: Home of the Blizzard (the second year)

And in 1984 Blunt reports:

"Aerial Photography

As an adjunct to the surveying and photogrammetric program, it was intended to fly a calibrated 35mm remove controlled NIKON camera from a kite, so as to produce aerial photographs of the buildings and site. When control markers were placed at known locations on the ground these aerial photos could, via the sophisticated technology of the University of Melbourne's Surveying Department, be reproduced as aerial surveys. Peter Lynn of Ashburton, NZ supplied us with four 2 metre delta-wing box kites together with sundry equipment. These had been designed to fly in maximum 25 - 30 knot winds and Peter was unsure how they would react in the much colder and higher velocity winds of Cape Denison.

On our arrival the winds were insufficient to give the kites lift for testing the camera lifting apparatus we had devised. It was midway through our stay before the winds were appropriate to fly the kites. Our initial test in 35 - 40 knot winds produced an hilarious but educating failure, with one broken thumb and a smashed kite. Consequently, our experience in this new and hitherto untried environment had dampened the confidence in ourselves and the potential to successfully lift the loaned ($3500) camera equipment.

For this reason we engaged in considerable testing with the lifting of rocks and weights before we finally raised a movie camera successfully. Just as our competence had reached sufficient heights of confidence, the wind decreased to an unacceptable low. Unfortunately our other priorities by this time had become such that the conjunction of suitable winds and available time did not occur again and no further kit flights were made.

Notwithstanding the shortcomings of this program we feel the kites have great merit in their use as platforms for aerial photography, particularly in such isolated places as Cape Denison."

Blunt, William. Project Blizzard 1984 - 1985 Expedition Preliminary Report and Recommendations. April 1985.

KITES

There are numerous models of kite, but basically they fall into 3 classes. The box kites use a framework of rods to support a box-like structure, whose stability and lift depends on the shape of the box and the surface area presented to the wind. The flat kites are the traditional, (often) diamond shaped, sparred kites – again their lift and stability depends on the surface area and shape. The third type is the soft kite, having no internal stays and depending on its ability to self-inflate to its designed shape. All three types area seen at kite festivals. One of each type of kite was taken to Cape Denison.

The kites used for kite photography are single-line kites whose primary purpose is to stay aloft in one place and essentially provide a stringline to hang a camera from. There is no use for steerable kites, which are inherently unstable.

Kites cannot be flown in all winds. In general the bigger the kite, the lower the wind speed at which it flies, but the lower the speed at which it becomes uncontrollable and – eventually – overloaded (and usually crashes). Improvement in flying performance can be made by adding a tail, which, much like the keel on a yacht, stabilises some, but not all, kites.

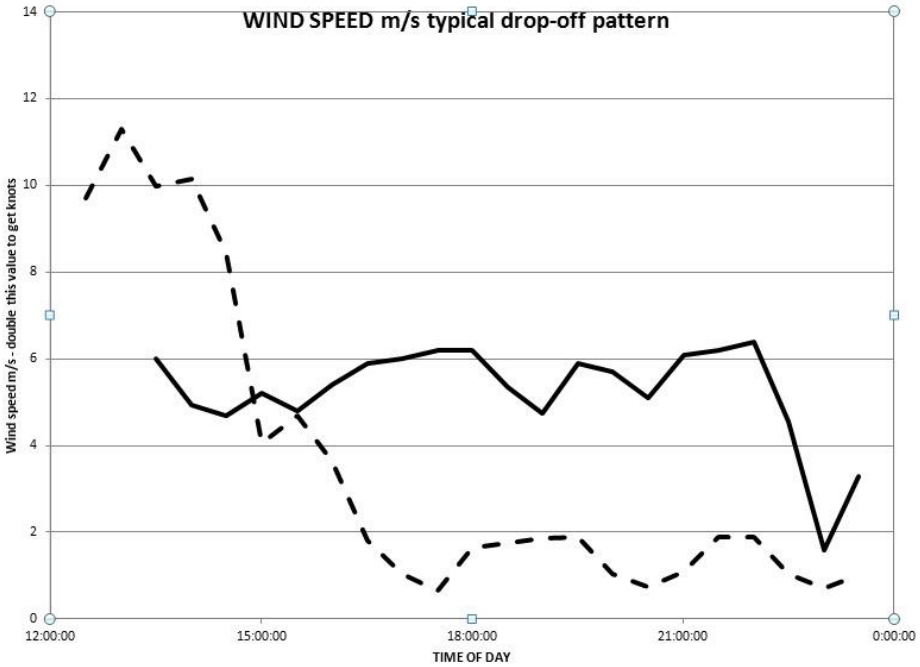
The mechanism of kite performance is not fully understood, and it is not possible to predict exactly how a kite will behave except in the simplest terms. Largely it is a matter of trial and error (and personal preference) which kites are used. There are, however, some general guidelines useful for flying kites at Cape Denison. These are discussed here.

THE WINDS AT CAPE DENISON

The wind at Cape Denison is among the strongest on earth, but the summer winds rarely go above 20 m/s (source University of Wisconsin AWS program). This speed is 40 knots, and is generally too strong to fly a kite. It must also be said that it is far too uncomfortable to be out flying a kite in that sort of wind. So generally winds around 20 knots and below are sought.

The wind is usually katabatic, coming from the Southern quarter, blowing from about midnight to midday, and dropping off in the afternoon. Two points are worth noting about this wind:

1. The wind drops off very quickly, so it pays to be out and ready (which takes at the very least half an hour) well before the drop-off comes. The typical pattern is for a strong, steady wind to exhibit brief periods of calm. This generally heralds the end of the wind, and it makes flying difficult since the kite will suddenly lose lift and drop before rising again. The following graph demonstrates the pattern:



The best thing to do under these circumstances is to be out in the strong wind (which means having the kite in the air around 10am), and to pack up when the fluky wind starts. This is not always comfortable or convenient.

2. The wind is denser (about 10%) than in temperate climes. Since the power of the wind is proportional to the square of the surface area exposed, its destructive force increases rapidly with density – much more than you would expect. So for sparred kites the change from a kite flying well to one with broken spars is only a gust which would merely cause the spars to bend and spill wind at home. For this reason I would advise against sparred kites at Cape Denison – and it is probably the reason why previous attempts were doomed to failure.

KITES USED AT CAPE DENISON

Three kites were made and tested successfully in Hobart, but only one was used. The first two were a large box-type kite and a diamond-shaped one, both of which were unsuitable at Cape Denison:

The successful kite was the flowform, or parafoil-type kite. This one was made from a design by Harald Prinzler, whose website provides an excel spreadsheet with derived measurements for a given size. The kite used was 16 square feet, which flew comfortably in winds of 15-20 knots. It would be useful to make a larger kite, say 24 sq ft for the relatively common low afternoon wind speeds.

It was made from rip stop nylon of sail maker quality, but not heavy material which is quite stiff. The kite needs to be able to flex easily. All seams were reinforced, as were the attachment points. The sewing (done by my wife Sally Hildred) was accurate to the pattern since small variations cause instability. The 3 bridle strings were 'tuned' to the same tension – any slight variation caused the kite to fly to one side. It always flew with an 18m tail made from fabric strips which gave it stability.

The mouths of the tubes were stiffened with heavy nylon fishing line, but it was found necessary to further reinforce the outer two with heavy plastic strip from cable ties. This keeps the mouths open, and stops any tendency of the kite to collapse – which it does very quickly if the mouth folds inward. A stiff mouth also makes for easy launching.

OPERATING THE KITE

The kite generates a significant pull – far more than can be comfortably handled, especially in boots with chains on ice. So it was always flown attached to the front of a quad bike using a double cleat arrangement. Even so, in high winds the bike was sometimes moved by the kite.

The kite string is anchored to the front rack of the quad bike via a double cleat on a board. The winder is the blue device seen on the left hand side of the rack, and the pulley to bring the kite down on the right.

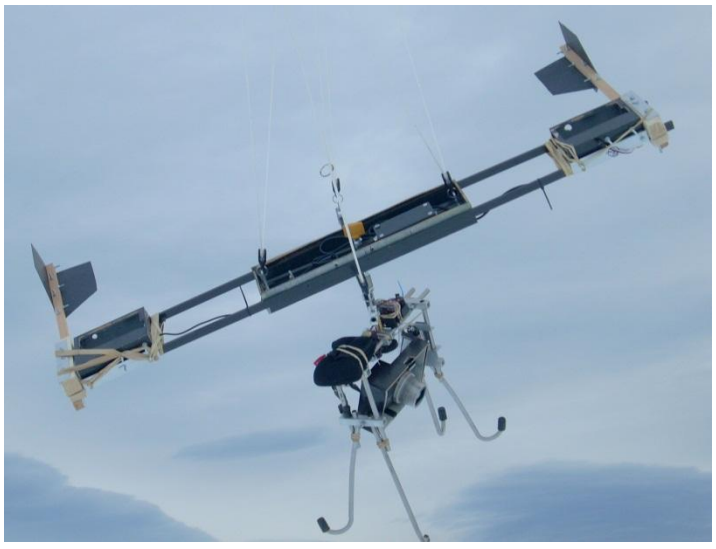
It was found preferable to run the string out to its desired length, clip the camera rig holders to the kite line, attach the tail to the kite and attach the kite to the string last. Retrieval was a reverse process – winding the line with the kite attached was impossible. The kite was always flown first to see how it performed before attaching the camera.

CAMERA RIG

The camera rig was designed to support stereo cameras with foam protective sheets around each camera. It also supported a single radio-controlled camera which could be screwed to the bottom of the stereo rig. The rig was made from carbon-fibre rod and shaped cloth, and had two tail fins for stability. The radio-controlled rig was made from thin steel tube, carbon fibre and aluminium with two servomotors. It should have been stronger and used more robust gearing. The addition of a small wireless security camera-device would have helped with aiming the camera or some clear flags visible from the ground to delineate front and back.

The rig was suspended by the Picavet method from the kite line.

The cameras used were a pair of Canon Powershot AX200IS. They performed extremely well, and were capable of taking high definition video as well as single-shots.



The camera rig consists of a C channel of carbon fibre containing triggering electronics, and two camera housings at the end of 1m carbon fibre rods. Tail fins stabilise the rig in yaw and pitch. The rig is suspended on a Picavet suspension which helps keep it vertical.

CAMERA TRIGGERING

The most effective way to take KAP photographs is to trigger the camera continuously and sort through the photos later. The camera rig tends to sway a lot, despite the fins, and there is no easy way to maintain a stable position especially in strong winds. The steerable radio-controlled rig was essential to point the camera in the right direction.

The cameras were deliberately chosen since they could take the Canon Hacker's Development Kit software (CHDK). This is a non-proprietary freely available addition which causes no change to the camera, but adds considerable functionality – in this case an intervalometer. For stereo triggering a Gentles trigger was used, coupled with Stereo Data Maker (a subset of CHDK).

USES OF KITE PHOTOGRAPHY

Artefact scatter around Mawsons Huts

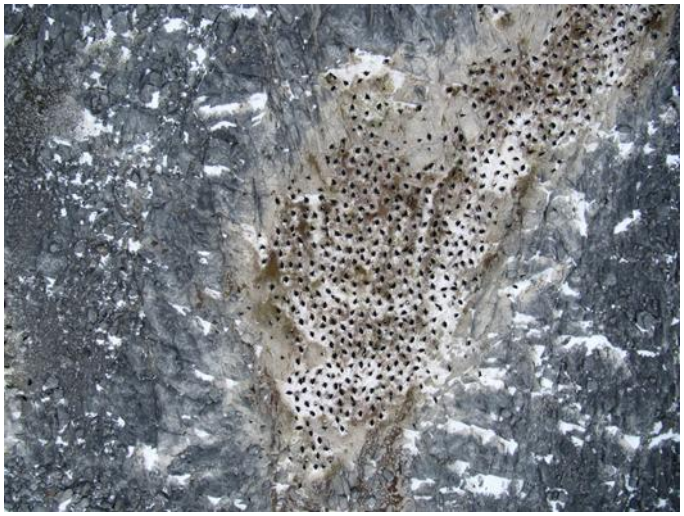
It has been difficult to demonstrate the extent and composition of the artefact scatter near Mawsons Huts. The pictures demonstrate it clearly, and are high resolution to allow detailed study.

View of Huts and Transit Hut

Mawsons Huts in the evening light.

Transit hut seen from the air shows clearly how it is anchored to the rock by a pile of boulders.

Penguin colony survey



Penguin colonies are usually counted from a helicopter or by hand on the ground. Kite photography provides a simple alternative.

Position of buried timber cache

This timber has been lost under the ice for a number of years. It was dug out again this year. An aerial photo provides a good record of its position

Identification of rock forms

Black bands of magnetite run through the rocks of Azimuth Hills. Their overall shape is not obvious from the ground, but very clear from the air.

THEN THERE ARE JUST INTERESTING PICTURES…