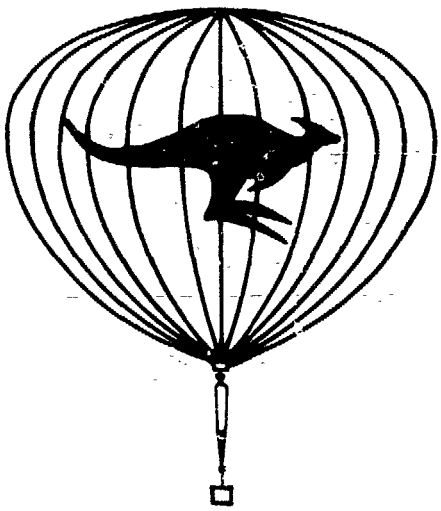
BALLOON LAUNCHING STATION

Mildura, Victoria

DEPARTMENT OF
SCIENCE
Policy and Programming

DEPARTMENT OF
MANUFACTURING INDUSTRY
Management and Operation

HIBAL



The Australian Scientific Balloon Launching Activity (HIBAL). Over 600 flights have been conducted since 1960 from Mildura, Parkes, Waikerie, Longreach and Alice Springs.

THE HIBAL TEAM

Paul Oats	Station Director
Don Scott	Flight Leader
Joe Sabolich	Electronics Section Leader
Wally Keir	Administrative Officer
Peter Rae	Electronics Technician
Trevor Gill	Mechanic
Bob Gregor) Collin Gledhill)	Drivers and Launch Crew
Julie Dodge	Girl Friday
Alan Mathews) Tony Mathews)	Tracking Pilots

HIBAL CUSTOMERS

United States Atomic Energy Commission	Project Hibal 1960-1974
NASA Goddard Space Flight Center	D. Kniffen
Office of Naval Research	C. Fichtel
	W. Martin
Adelaide University	P. Davison
Case Western Reserve University	G. M. Frye
Imperial College London	R. K. Sood
Massachusetts Institute of Technology	W. H. G. Lewin
Melbourne University	V. D. Hopper
	J. A. Thomas
	L. Arnold
Rice University	J. Haymes
University College London	R. Jennings
University of Minnesota	W. Webber
University of Rochester	M. Kaplon
University of Wyoming/Melbourne University	D. J. Hoffman/J. Laby

HITCH-HIKE CUSTOMERS

Adelaide University	P. Davison
CSIRO Division of Atmospheric Physics	G. Pearman
	P. Hyson
CSIRO Division of Cloud Physics	K. Bigg
University of Wyoming/Melbourne University	D. J. Hoffman/J. Laby
Wireless Institute of Australia	P. Williams

BALLOON LAUNCHING STATION, MILDURA

INTRODUCTION

The Mildura Balloon Launching Station was established in 1960 by the Department of Supply (now the Department of Manufacturing Industry) on behalf of the United States Atomic Energy Commission (USAEC) to determine the content of radioactive material in the upper atmosphere over Australia. This activity was part of a worldwide program, necessary in the interests of health and safety, and to collate data on the long-term effect of nuclear explosions. The results are freely available and were distributed through the United Nations. This is believed to have been the only service of its kind. In Australia the project was named HIBAL.

The first Australian flight for the USAEC took place on 17 December 1960, a modest ascent to only 13.4 km and a float period at that altitude of only 20 minutes. Subsequently flights were made at the rate of about 35 a year to altitudes as high as 41 km with float periods of up to 4 hours.

From 1966 the Department of Supply and the USAEC jointly began to encourage universities and scientific organisations, such as the Australian Commonwealth Scientific and Industrial Research Organisation, to use the facilities available at Mildura. Many Australian scientific experiments were carried "hitch-hike" on USAEC flights, or special flights were provided for scientific purposes. The policy of seeking greater use of the Mildura facilities continued, and special flights for Australian and American universities and other scientific organisations were made at the rate of about 15 a year until 1973. "Hitch-hike" packages numbered about 50 each year. In 1973 USAEC gave notice of discontinuing its program after May 1974.

In April 1974 it was decided that the station would be kept operational for scientists, at least until June 1975, before which date the future need for the station would be assessed. Under the new arrangement the Department of Science is responsible for policy and programming, and the Department of Manufacturing Industry is continuing to manage and operate the station. A "business as usual" sign was greeted with enthusiasm by Australian and overseas scientists, and the flight order book received immediate entries for 26 flights in the first year and 9 tentative bookings for the following year. To stress the continuity of the Australian balloon launching activity it was decided to retain the name HIBAL to describe the activity.

Balloon technology is improving steadily in the attainment of higher altitudes, greater reliability and longer duration flights. A few years ago the most commonly used large balloon was of less than 300 000 cu m capacity which would carry a payload of about 300 kg to a height of up to 40 km. Today there are balloons of up to 1 300 000 cu m capacity which can carry heavier payloads to a height of 46 km.

STATION LOCATION AND LAYOUT

The Station is situated on Mildura Airport. This location was selected for its climate, geographical position, and for the availability of civil airport and meteorological services. The terrain surrounding the airport is flat with only a few low trees.

The ground-based electronic equipment has command, radar and telemetry systems and provides voice communication with both the recovery aircraft and vehicles. The equipment is housed in the HIBAL building at Mildura (see page 8) which also has a workshop and facilities for

the assembly of scientific payloads.

STAFFING THE STATION

The Station is manned by technical and administrative staff of the Department of Manufacturing Industry and is supported by contract pilots for tracking and recovery, the Bureau of Meteorology and the Departmental Stores and Transport Branch. Operational responsibility is vested in the Station Director who is a Departmental engineer.

CO-OPERATING AGENCIES

The decision to launch a balloon depends on a close appraisal of wind speeds at ground level and high altitudes and weather predictions for the likely recovery areas. Officers of the Bureau of Meteorology provide information and advice, and the Station Director determines whether conditions are suitable and estimates the balloon's probable flight path.

Close co-operation between the Department of Manufacturing Industry and the Air Transport Group of the Department of Transport (formerly Department of Civil Aviation) has evolved balloon flight procedures which are not unduly restrictive but ensure that no undue hazards are presented to aviation.

Should unexpected winds cause a balloon to drift close to civil airlanes or populated regions, the balloon is cut down prematurely by radio command. No balloon is launched if wind measurements indicate that it will become a hazard.

BALLOON LAUNCHING EQUIPMENT

Some appreciation of the difficulties of handling a balloon can be obtained from the fact that it is made of a plastic film as little as 20 micro-metres thick, which is quite susceptible to tearing. When fully inflated and at altitudes, a balloon of 300 000 cu m capacity is about 80 m in

HIBAL LAUNCH TRUCK

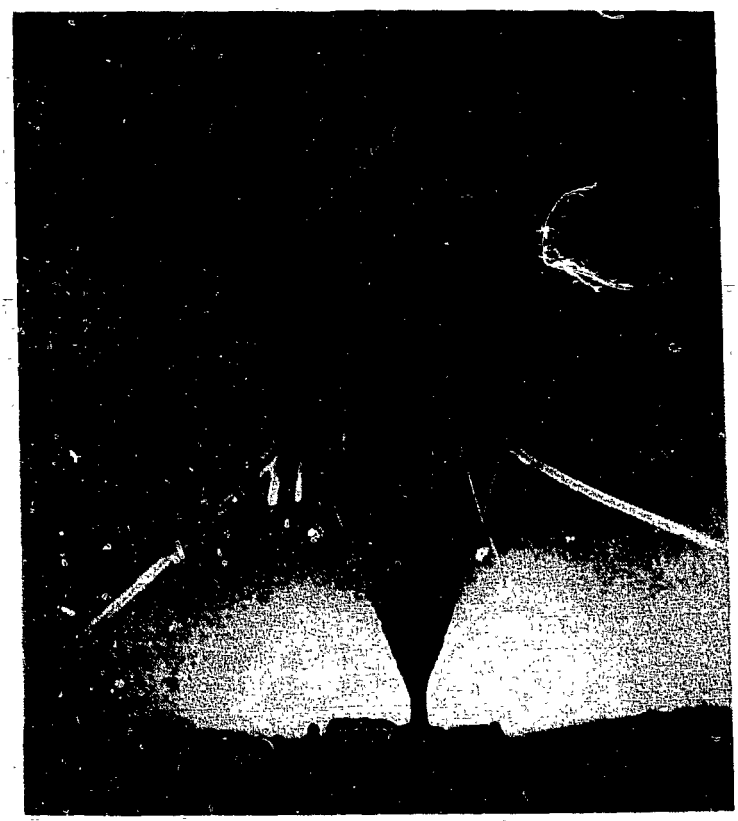
diameter and some 100 m high. If spread on the ground, the balloon material would cover more than 20 000 sq m.

The balloon-launching equipment consists of heavy trucks each fitted with a gantry to support the payload, launch trailers to restrain the balloon until the moment of release, semi-trailers to carry helium cylinders and four-wheel drive vehicles fitted with trailers and equipment for recovery.

LAUNCH

Inflation is a carefully controlled but hurried operation using helium, an inert gas twice as heavy as hydrogen but still very much lighter than air. Released slowly from high-pressure cylinders through special control valves, the helium fills the end of the balloon, which floats, restrained by a horizontal roller on the launch trailer. The filled end of the balloon is referred to as "the bubble".

The balloon's ascent begins when the horizontal roller is released at one end and allowed to hinge upward. The bubble rises very rapidly since it is virtually unloaded and inflated sufficiently to lift the remainder of the balloon and the payload, which are arranged as shown on page 7. As the uninflated part of the balloon is picked up, the rate of ascent of the bubble is moderated. When the balloon is extended vertically above the payload the latter is released and the entire flight train becomes airborne. Some rapid manoeuvring of the launch truck after



"BUBBLE" INFLATED FOR LAUNCH

release of the bubble may be required to achieve a satisfactory launch. Ground level winds should ideally be slight and steady to avoid buffeting the bubble during inflation and to carry the payload away from the launch truck at payload release. The ever-present threat of wind changes is the reason for a hurried inflation and also calls for well-developed team work to minimise the time span from the start of inflation to launch.

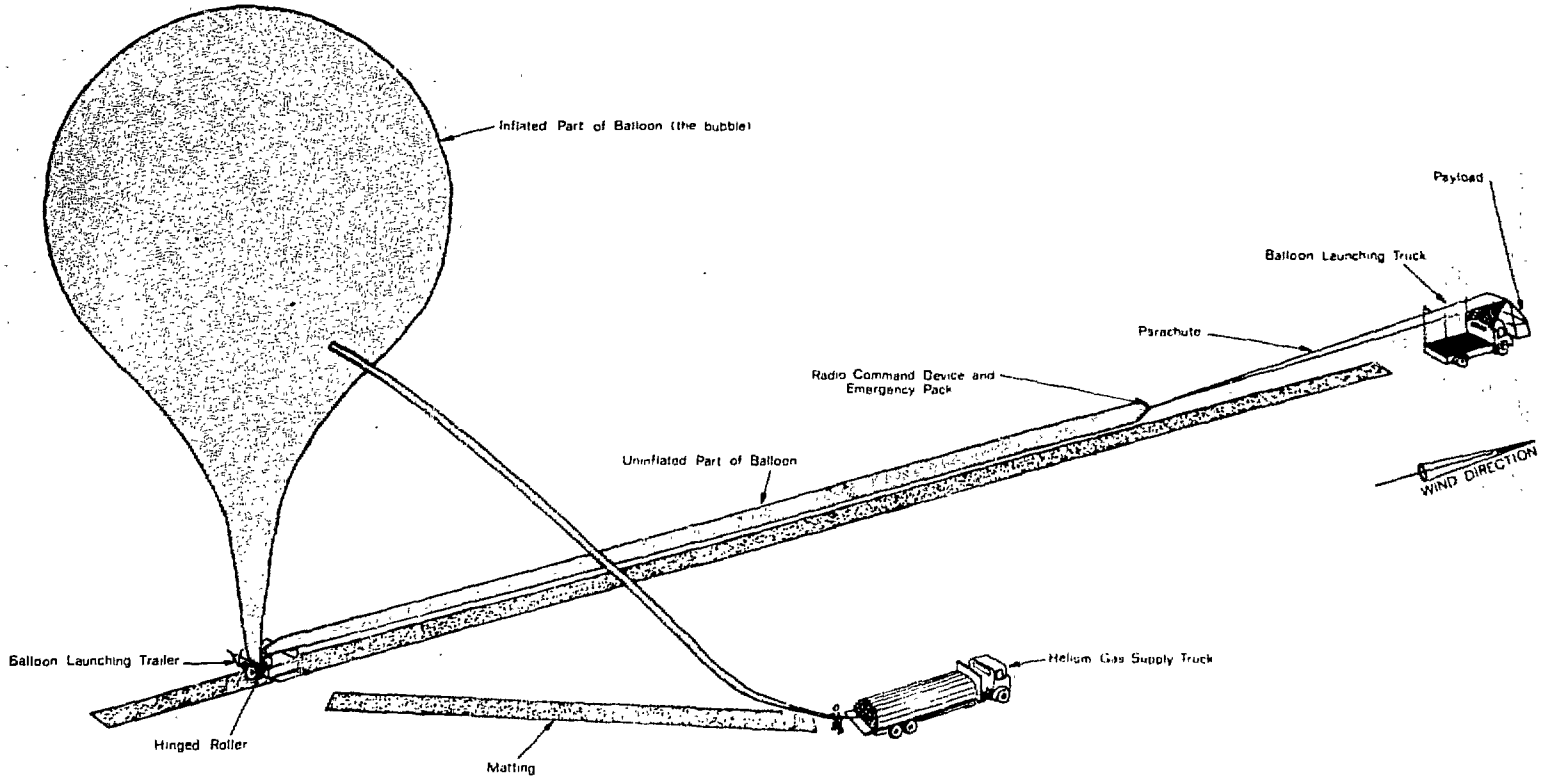
Detailed checking of instrumentation and other equipment is carried out before deploying on the launch field. Launching is usually carried out at dawn when winds are often light and to ensure maximum daylight hours for tracking and recovery of the payload and parachute. As well as the scientific experimental payload, all balloons carry control mechanisms, communication equipment, and a parachute to bring the instrument load safely back to ground.

To end a flight, the parachute and its attached payload are cut free of the balloon by an explosive device fired by radio command. To avoid leaving the balloon floating derelict, a rip-cord – attached to the parachute – tears a specially constructed panel from the balloon which is destroyed and falls quickly.

TRACKING AND RECOVERY

A specially equipped light aircraft, and pilots experienced in balloon operations, are on full-time charter to the station, to track balloons and to co-operate with the recovery teams. Radar tracking of the balloons is also provided by the Bureau of Meteorology, using weather radars, and by the HIBAL launch crew, using equipment based on the RAVEN "TRAC" system specially designed for balloon tracking.

At cut-down, the pilot – who is in voice communication with the ground station and recovery team – directs the recovery vehicles along the shortest practicable route to the point of impact of the payload and parachute.



LAUNCH FIELD OPERATIONS

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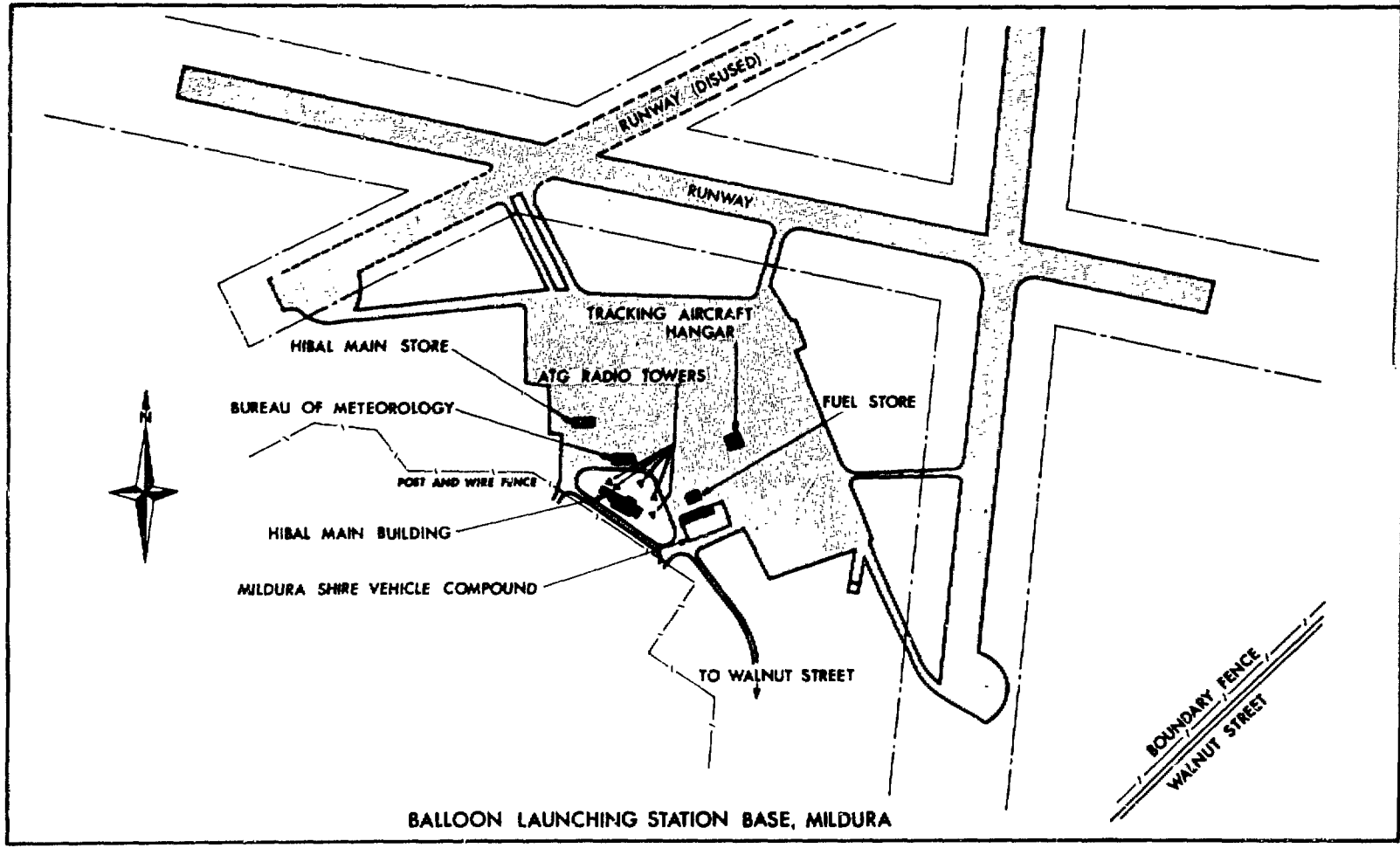

BALLOON LAUNCHING STATION BASE, MILDURA