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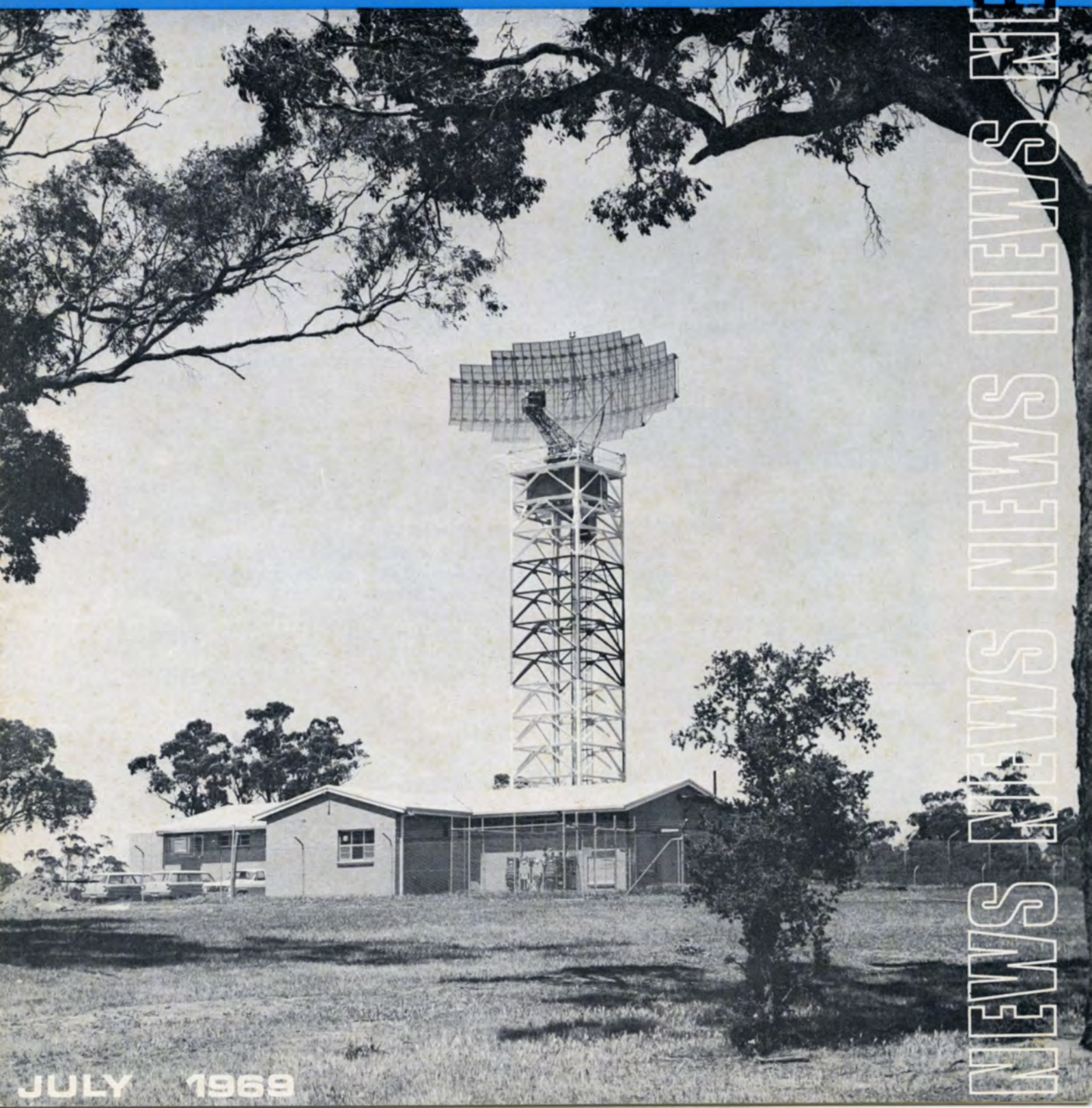
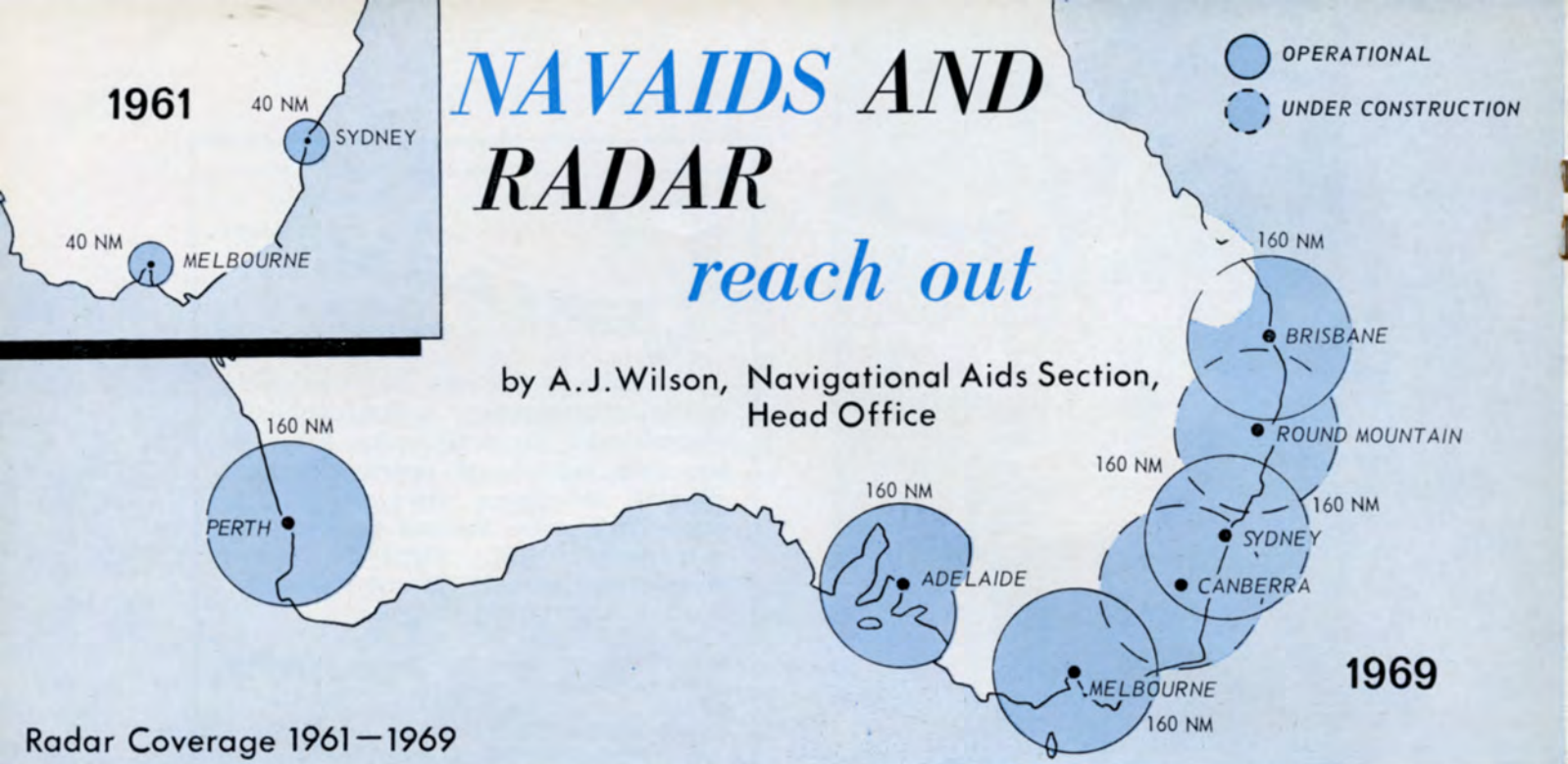


JULY 1969

NAVAIDS AND RADAR reach out

by A.J.Wilson, Navigational Aids Section, Head Office



Radar Coverage 1961—1969

The radar scanner has become a common feature on the horizon of our capital city airports in this decade. The need for radar and the expansion of our navaid system has arisen from the rapid growth in the aviation industry.

Since 1961 the number of regular public transport aircraft has grown from 116 to 215. The total number of aircraft listed on the Australian register has more than doubled from 1,502 to 3,474. Passenger miles per annum for domestic services have risen by 85%. Aircraft movements at Sydney and Melbourne have risen by about 35%. And the average journey speed from terminal to terminal for the fastest aircraft type in service has increased from 300-mph to over 430-mph for domestic operations.

This high speed and high capacity air traffic is guarded by a $10,000,000 navaid and radar network. Prominent in the expansion of the navaid system has been the installation of twenty-five of the internationally accepted VHF Omni Range (VOR). Ten of the original Visual-Aural Range (VAR) installations have already been replaced, and ultimately VOR's will replace most of the remaining twenty-four VAR's now in operation. The VOR's great advantage is that it defines radial tracks in all directions whereas the VAR defines only two tracks roughly at right angles.

The Non-Directional Beacon (NDB) system, which in conjunction with the airborne radio compass enables an aircraft to fly to a beacon, has been expanded by the introduction of ninety transistorised installations. The number of NDB's has more than doubled to 235 since 1960.

Distance Measuring Equipment (DME) beacons which give a continuous distance indication to the pilot have steadily grown from 66 to 92 and a further considerable increase is intended using recently developed transistorised beacons now being manufactured in Sydney. DME channel capacity has been extended from 12 to 48 and a new feature called 'Rate of Closure' has been developed for the airborne unit to facilitate homing on DME beacons. Domestic DME beacons which transmit on 224 mcs cannot be used by international aircraft equipped with 1,000 mcs international DME. These international aircraft will be provided

with additional navaid assistance by four international DME beacons now installed in conjunction with the VOR system.

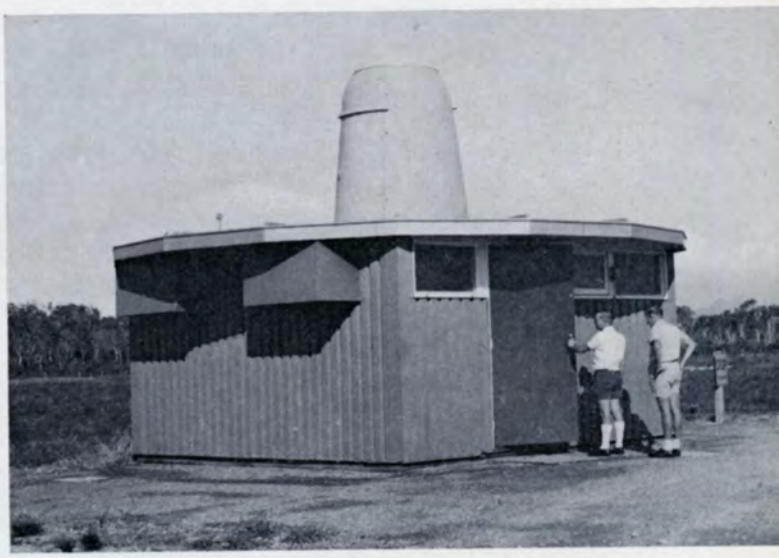
The number of Instrument Landing Systems (ILS) installed stands at fourteen and further facilities are planned. Two of these facilities, recently installed at Sydney and Melbourne are transistorised precision ILS equipment, with the performance necessary to provide high quality guidance signals for aircraft approaches down to a decision height of 100 feet. If required in the future, the equipment is capable of further development which should enable it to meet the exacting requirements for automatic landing guidance signals.

Before 1960 the VAR-NDB-DME system of air navigation served also as the source of data for the air traffic controller. The controller's knowledge of aircraft position was updated by voice communication with the pilot. This 'procedure' method of control has been replaced in the most congested air traffic areas, by radar control. In the new ATC system, an independent source of data is provided by the 160 nautical mile range radars installed at Sydney, Melbourne, Brisbane, Adelaide and Perth. Near full radar coverage of the busiest airways will be provided with the completion of installations now in progress at Canberra and Round Mountain. Presentation of the traffic pattern has been facilitated at Sydney and Melbourne by television displays. Similar control centres are proposed at all capital city airports.

When completed in the early 1970's, the radar will cover all major terminal areas and airways over an area of some 600,000 square miles. The busy trunk routes along Australia's east coast will be covered from 160 nautical miles north of Brisbane to 160 nautical miles south-west of Melbourne and, with a small gap to 160 nautical miles west of Adelaide.

What lies in store in the future? In the field of radar control the present two dimensional plan view of the traffic will be extended to a 'three dimensional' view by the addition of Secondary Surveillance Radar (SSR) to the primary radar system. SSR will provide Air Traffic Control displays with continuous altitude and identification labelling of all transponder equipped aircraft.

Left: the familiar aerial of a DME.
Below: the not so familiar VOR.



SSR will supply the basic data for progressive automation of the air traffic control system.

Navigational aids generally will continue to increase to provide pilot guidance in expanding areas of the continent and New Guinea. Instrument Landing Systems will ultimately provide fully automatic landings to touch-down and along the runway, regardless of runway visibility.•

A radar television display.

D.C.A. SPEAKS

Two recent symposiums held in Australia, one on engineering, the other on general aviation, were notable for the contributions made by speakers from the Department.

The first, held in Sydney in May, was the Twelfth annual convention of the Australian Institute of Radio and Electronics Engineers. Of 106 papers presented at the convention, five were from D.C.A.:

W. G. Feige (D.C.A., ATS Station, Cooby Creek)—*Some engineering aspects of the VHF repeater on board the Applications Technology Satellites (ATS) and experiments relating to aviation.*

W. N. Roebuck (Airworthiness Branch)—*Critical analysis of reliability predictions based on aircraft electronic equipment.*

H. B. O'Keefe (Navigational Aids Section)—*The development of a system for aircraft homing and orbiting based on DME.*

J. J. Richards and R. C. Davies (Navigational Aids Section)—*Improved instrument landing equipment at Australian airports.*

W. G. Willoughby and F. B. Partridge (Navigational Aids Section)—*Calibration and testing of instrument landing systems.*

A general aviation symposium held in June at the Royal Victorian Aero Club, Moorabbin Airport, was opened by the Director-General of Civil Aviation, Sir Donald Anderson, CBE. Five of the eight speakers at the one day symposium were from D.C.A.:

Ian R. Johnston (Training and Psychology Section)—*Experimental findings and theoretical aspects of pilot training.*

F. O. Knudsen (Flying Operations Branch)—*Practical flying training, past and present.*

R. M. Diamond (Airworthiness Branch)—*The light aircraft: airworthiness standards.*

Dr J. C. Lane (Aviation Medicine Branch)—*Safety in the air: medical aspects.*

I. M. Leslie (Air Safety Investigation Branch)—*Safety and the Aeroplane.*•