JINDALEE – NOWHERE TO HIDE

“Today has been one of the most exciting days of my life, for you have shown me the weapon with which we will defeat the Nazis”.

—Winston Churchill, June 1939, after viewing a demonstration of radar in operation

From Exmouth in the west to Cairns in the east, Australia’s northern coastline extends nearly 15,000 kilometres. Before the introduction of the Jindalee Operational Radar Network (JORN), persistent surveillance of Australia’s northern approaches was inconceivable. However, with impetus from technology, innovation and a succession of far-sighted Government decisions the impossible became reality and today the ‘air-sea gap’ to Australia’s north is under constant watch.

In World War II, the Japanese operating with technology far less capable than available today, demonstrated that major maritime and air operations could be mounted against the Australian continent. From bases in Java, Timor, Ambon, West Papua, Papua New Guinea and the Solomon Islands the Australian mainland was attacked with little warning and with great effect.

For the next 40 years there was very limited capability available to enable a persistent awareness of activities across the approaches to the North. Australia’s resource base is insufficient to support the large number of air, maritime or space surveillance platforms that would be required to constantly monitor the northern approaches. An innovative solution was required to provide the persistent wide area surveillance necessary to make the self-reliant defence of Australia a successful strategy.

Australia’s involvement in long-range persistent surveillance began in the early 1950’s. The work was led by John Strath, a high frequency (HF) and ionospheric research scientist who had worked on Britain’s World War II ‘Chain Home’ radar system; arguably the technology that enabled the ‘few’ to get the drop on Germany’s ‘many’ during the Battle of Britain. After the war Strath led an Australian team to build a radar capable of detecting aircraft at ranges of up to 800kms. However, Strath realised that reliable detection required a much larger and more powerful emitter than what was available at the time. Work on the project stopped around 1955 and experimentation with HF radar began to take a different focus.

Australian interest in HF radar was revived in November of 1970, when the Minister of Defence approved Phase 1 of a HF studies program known as Geebung. Geebung confirmed the operational and technical viability of refracting HF signals off the ionosphere to conduct long-range surveillance. Project Jindalee commenced in 1974 with the construction of a prototype Over the Horizon Radar (OTHR) system at Mount Everard and Harts Range, near Alice Springs. The first successful aircraft detection occurred in 1976. Cabinet approved a second stage in May 1978, with the purpose of constructing a “new and improved” OTHR next to the prototype site. The first successful detection of a surface vessel occurred in 1983.

The ‘Defence of Australia’ approach and policy of self-reliance that arose from the 1986 Dibb Report, and the 1987 Defence White paper, significantly altered Australia’s Defence policy and provided a further stimulus to OTHR investment. The era of “Forward
Defence” ended and the self-reliance approach shaped Defence’s strategy, planning and operations. Defence of Australia required the Australian Defence Force (ADF) to monitor activity and defend Australian interests in the northern ‘air-sea gap’. This necessitated surveillance of the very long lines of communication that connect Australia to its major trading partners and allies. A constant and detailed awareness of air and sea activity throughout the northern approaches was vital to the Defence of Australia concept.

The Government approved Dibb recommendations for further development of the Jindalee OTHR. Four decades of research had proven that HF radar could detect aircraft (even those at low altitude), and maritime vessels at ranges up to 3,000 kilometres from the transmitting station. For the first time, technical capabilities and government intent combined to make persistent wide area surveillance of the air-sea gap a real possibility.

The 1987 White Paper committed Australia to developing two additional HF radars at Laverton (WA) and Longreach (QLD), to link with the Alice Springs radar. Currently control of all radars is centralised through Number 1 Radar Surveillance Unit (RSU) in Edinburgh. JORN track data is fed to the Regional Operations Centre (ROC) at RAAF Williamtown for correlation with other sensors. OTHR tracks form part of Australia’s Recognised Air Picture (RAP) and are disseminated to Defence and Government agencies via terrestrial communications and datalinks. The system was fully realised in 2003.

While the Jindalee radar has proven to be an excellent surveillance radar, ionospheric conditions can affect its operational performance, and it does not have the accuracy required to act as a targeting radar. Its value lies in its ability to act as a “trip-wire” to cue other capabilities such as the Wedgetail and Orion aircraft or Navy’s ships and submarines to carry out focussed surveillance and interception operations. Jindalee acts as a force multiplier for other Australian Defence Force (ADF) and Government capabilities, making it a truly strategic national asset.

While the most common application of Jindalee’s capabilities is in the general detection of air and maritime traffic, the radar also provides other services to the ADF. For example, JORN could establish a surveillance ‘bubble’ around an Amphibious Task Group to detect any potential air or surface threats. JORN can alert the Task Group to a threat well before the Task Group’s organic surveillance and tracking systems could detect it. Additionally, JORN can monitor specific airfields and ports to establish a normal pattern of movement profile that can then be used to identify abnormal activity in a given area.

Since the 1950s, successive governments, scientists and Defence administrators have recognised the potential of HF radar. Bold vision, sustained investment and technical commitment have transitioned Jindalee from a concept, to an experiment, and finally to a state-of-the-art, world-leading surveillance capability. JORN is an essential element of Australian air power and is critical to the continued security of Australian national interests and its National Maritime Strategy.

Key Points

- JORN is an essential element of Australian air power and is critical to the continued security of Australian national interests and its National Maritime Strategy.
- Technological developments, scientific innovation and government support combined to develop a state-of-the-art, world leading surveillance capability.
- Jindalee acts as a force multiplier for other ADF and Government capabilities, making it a truly strategic national asset.