

PATHFINDER

AIR POWER DEVELOPMENT CENTRE BULLETIN



Issue 130, March 2010

THE RAAF EXPERIENCE OF SIMULATORS & SIMULATION

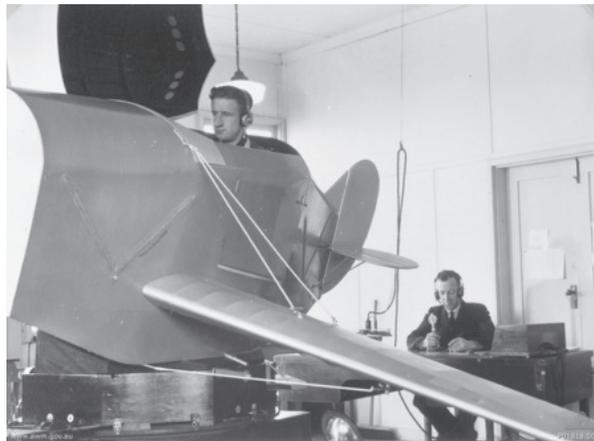
In recent years, a steady stream of new simulators and simulation capability have been introduced into the Air Force, with operational flight trainers, mission simulators, and mission support systems for the C-130J, C-17, KC-30 and the Wedgetail aircraft platforms. Now, the Service is looking at a Visual Environment Maintenance Trainer for the F/A-18 Super Hornet. These acquisitions are often represented as ‘bold steps into the future’, but in reality they are merely the latest manifestations of a policy which the RAAF has been following for over 70 years.

Simulators have played an important role in RAAF training since the mid-1930s. Flight training has always been an inherently dangerous activity. During the first decades of the RAAF’s existence, deaths and serious injuries as a result of training accidents exacted a heavy toll on both trainee pilots and instructors. By 1930, when the RAAF had exhausted the stocks of war-surplus aircraft donated to Australia by the RAF, the continuing loss of aircraft destroyed or damaged during training also imposed considerable financial costs on the small inter-war Air Force.

As the RAAF acquired more advanced aircraft, flying training courses became longer and more demanding. Conversion courses onto new aircraft types also placed considerable burdens on both squadron personnel and expensive operational airframes. One solution that alleviated some of these problems was the introduction in 1938 of the RAAF’s first flight simulator—the Link Trainer, named after its American inventor Edwin Link. This electro-mechanical device allowed pilots to practice their instrument flying skills on the ground and was allocated the number A13 in the RAAF system of aircraft numbering. During World War II, an additional 140 Link Trainers were purchased to equip the flying training schools set up in Australia to train pilots for the Empire Air Training Scheme. Further advances in design allowed post-

war Link Trainers to simulate jet-speeds and continued to provide valuable training for aircrew until 1971.

The responsibility of training the huge number of aircrews for large bomber aircraft in World War II prompted the RAAF to acquire three Celestial Navigation Trainers (CNT) in 1944. These trainers enabled an entire crew of pilot, navigator, bomb aimer and wireless operator to fly simulated bombing missions under a range of conditions. Images projected onto the ceiling and floor of the CNT room allowed navigators to practice fixing the aircraft’s position and enabled the bomb-aimer to track the aircraft to the target. Only the CNT installed at RAAF Base East Sale reached full training capability, which it maintained until 1957 when it was superseded by other ground-based navigation trainers.



The Link Trainer

The RAAF’s first true flight simulator, which could emulate a flight in an operational aircraft, was acquired for the Avon Sabre. The second was the C-130A Hercules simulator, acquired in 1960 to train crews in the procedures for this complex new-generation aircraft. After this, the acquisition of a flight simulator became a standard component of

new aircraft projects such as the Mirage, P-3 Orion (both B and C models), C-130E, F-111C and all later operational aircraft.

The flight simulators purchased in the 1960s were not the full-motion simulators with wrap-around, computer-generated day visual systems that are common today. These simulators had no motion and no visual displays so they could not simulate takeoffs, landings or any other part of the mission requiring a visual component. They simulated flight in cloud conditions, by day or night. Within these limitations, however, these simulators were excellent for allowing crews to practice flying in instrument conditions, to practice dealing with aircraft emergencies and to develop crew coordination skills. They were also particularly valuable in familiarising new crew

members with the cockpit and controls of increasingly complex aircraft. Simulators allowed all of this to be achieved at no risk to safety and at a low monetary cost.

Although simulators are commonly associated with aircrew training, they have frequently been used in training many other trade groups in the RAAF. For example, in the late 1970s, an electro-mechanical ‘audio-visual trainer’ was designed and built at the School of Air Traffic Control at East Sale for the training of air traffic controllers in tower procedures. This trainer used lights on a large board to simulate the locations of aircraft in an airfield circuit area. In 1987, the RAAF’s first digital air traffic control radar simulator was used in the training of radar controllers. And in a world-first, an Australian designed ‘visual tower simulator’, installed at East Sale, used computer generated graphics to produce a realistic visual environment for the training of tower controllers.

As RAAF aircraft became more complex, the training of technicians on each aircraft type also took longer. Classroom simulators which diagrammatically showed how an aircraft system operated greatly improved the efficiency of this training. At first, these were electro-mechanical simulators, but later digital versions proved more effective and more reliable. With each improvement in simulation came a corresponding increase in the efficiency of the training conducted and a lowering of the cost.

While the reduction of training costs was a major factor in developing simulators in the past, advances in simulation technology in recent years have produced simulators that are capable of more than just ‘flying’ a mission. Networking simulators in different locations has allowed aircrew of different services and nations to train together without the time and logistical costs of deploying forces long distances for exercises. Full-mission capable simulators also allow the rapid development of new tactics, techniques and procedures (TTP).

The recent introduction of Uninhabited Aerial Systems (UAS) into the order of battle has further blurred the line between simulation and reality. Perhaps the only real difference between simulated rehearsals of an UAS mission and the real mission is the outcome—the weapon release or the intelligence gathered. However, both rehearsals and the actual mission are very likely to need the same level of proficiency.



The F-35 Joint Strike Fighter (JSF) Simulator

While many of the simulators of the past might not appear much more than procedural trainers capable of generating very little or no sense of reality, they were leading edge systems in their day. Most significantly, they produced remarkable improvements in the safety and efficiency of RAAF training. They gave the RAAF the experience and confidence in simulators that led to the active pursuit of even greater simulation capability. As the use of simulators and their capacity to simulate diverse and complex situations and environments increases, they will remain integral to the RAAF’s ability to generate air power into the future—much as they have done over for last 70 years.

- *The RAAF has a 70-year history of using simulators in the generation of air power.*
- *New generation simulators represent opportunities for improved air and space capability.*
- *Exploiting simulation in the future, as the RAAF has done in the past, will lead to even greater professional mastery of air power.*

‘Simulators and simulation provide valuable means of developing the skilled personnel to operate and support new technologies.’

AAP 1000-D—The Air Power Manual



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