

ECHO ON THE LINE -

ADF joins WGS for NCW forces

■ Trevor J Thomas/EL SEGUNDO

The Minister for Defence, Dr Brendan Nelson, confirmed 3 October that Australia would spend \$927 million of the roughly \$1 to 1.5 billion budgeted for phase 4 of Joint Project 2008 entering into a partnership with the United States, to substantially increase the Australian Defence Force's (ADF) satellite-based communications capability.

Under the said partnership arrangement, Dr Nelson advised Australia would fund the last of six Boeing 702-series satellites (plus associated ground infrastructure) making up the currently under construction Wideband Global Satellite Communications (WGS) constellation, also formerly known as the Wideband 'Gap-filler' Satellite system.

The WGS series was originally designed to augment and eventually replace (with a claimed '10-fold' increase in telecommunications capacity), the Defense Satellite Communication (DISCUS) system constellation, as well as the Global Broadcast Service function currently provided by the US Navy's 'Ultra High Frequency Follow-On' satellites. Further, full establishment of the new WGS constellation was aimed at reducing the US government's reliance on commercial satellite communications (SATCOM) services.

Full establishment of the WGS constellation, therefore, is expected to provide US war-fighters with a quantum leap in communications on the road to an even more capable Transformational Satellite (TSAT) communications system (see below), itself designed to enable US forces to make a substantive shift into the era of Network Centric Warfare (NCW), and expectations that the achievement of information superiority will deliver a new force multiplier. WGS satellites are being built to a technical formula that ensures compat-



Key Points

- **The Federal Government is to spend \$927m buying** one of six satellites (and associated ground infrastructure) currently being built by Boeing to resource the United States Air Force's Wideband Global Satellite (WGS) communications constellation.
- **Australia is to nominally fund the last** of the six WGS satellites (originally the reserve), which is understood to have had difficulty being funded by the Congress due to proposals to advance a follow-on system to the gap-filling role of the WGS.
- **Access to the WGS satellite constellation** from 2013 is expected to provide a major boost to ADF aspirations to transform itself into a Network Centric Warfare-based organisation, as detailed in the 2007 update of the NCW 'Roadmap'.
- **By leveraging the complete constellation of six** WGS satellites, Australian military planners anticipate the system will be able to comfortably handle the ADF's burgeoning communications requirements out to at least 2024.

ibility with existing X-band and Global Broadcast Service Ka-band ground terminals, with each of the (now six) satellites being constructed by Boeing at its El Segundo (California) facilities, and in two capability growth configurations.

Key features include eighteen reconfigurable coverage areas, and the ability to broadcast or multicast transmissions into the various coverage areas and connect users between any and all coverage areas, even when oper-

ating on different frequency bands.

According to Dr Nelson, the ADF "will start using the satellite system in 2008, and we'll progressively ramp up our usage of it through 2012-2013." Access to the WGS system, he added, "would enable us to connect (the air warfare destroyers and amphibious ships) to our Super Hornets, our Joint Strike Fighters, our 'Abrams' tanks and our military operations on land, across the region and across the world."

Three Block I WGS satellites have already been built, however, subsequent US Air Force (USAF) orders (satellites 4-6) are to be constructed in a Block II configuration that will incorporate a radio frequency bypass capability designed to support additional bandwidth now required by the proliferation of airborne intelligence, surveillance and reconnaissance platforms. In Australian terms, such capability has specific application to the multi-mission unmanned aerial system (MUAS) currently under consideration via phase 1B of project Air 7000.

Dr Nelson further states that access to the new WGS constellation "would build on the ADF's ability to conduct multiple and simultaneous military operations independently or as part of a coalition force. Secure and reliable satellite communications will be available to deployed forces, operational command and Australian headquarters. WGS also will allow the ADF to realise the full potential of NCW within the next decade."

The provision of high capacity SATCOMs is a key enabling feature of the six Network Centric Warfare domains (maritime; land; aerospace; information, surveillance & reconnaissance; joint force; and networked coalition) detailed in the March 2007 Update of Defence's NCW 'Roadmap', which was released at the Avalon air show in March.

At its peak, the Joint Force Domain (bringing together all elements of the ADF's warfighting capability), envisages - with new military satellite communications capability - the ADF being able to achieve: a networked deployable Joint Task Force Headquarters in 2012; a networked Joint Task Force in 2014; and a networked Australian Defence Force by 2016.

Phase 4 of Joint Project 2008 was accordingly marked down in the 'Roadmap' to deliver such capability from early-2013 through to late-2015, in a manner broadly

consistent with the dates cited in the Minister's announcement, and anticipated to "comfortably handle the increase in ADF communications requirements over this time, and out to at least 2024."

Achieving full operational WGS capability by 2013 also will coincide with the predicted capability drawdown of the current (2003-launched), and now Singapore Government-owned SingTel/Optus C1 satellite, which is to be maintained in parallel with the new WGS through to the end of its life in 2012-2013. Defence currently has four military payloads (global broadcast, UHF, X-band and Ka-band) on the Optus C-1 satellite.

The WGS deal will first have to be put to the US Congress for approval (which requires a 30-day notification period), after which Dr Nelson said he would finalise the arrangement by signing a government-to-government Memorandum of Understanding, which will now have to be considered by whichever political party forms government after 24 November. In response to the WGS announcement, the Opposition Spokesperson for Defence, Joel Fitzgibbon said Labor "welcomes the move to enhance the ADF's satellite communications capability, and fully supports the proposed cooperation with the US in the WGS communications constellation."

Speaking to media after the formal announcement, Dr Nelson talked up the value of the WGS deal, saying if there was a failure of one of the satellites in the constellation, "Australia will then be able to use about 10% of the capacity that we're buying into across the other five satellites." He added that through working with the USAF, "we also get the confidence of the US military experience with satellites."

The Minister noted that four of the six WGS satellites will be focused predominantly over: the Australian region, the Indian Ocean, the Pacific Ocean and Southeast Asia (ie: 'our area of paramount interest'). He further confirmed the balance of funds provided for advancing phase 4 of Joint Project 2008, would go

towards the later acquisition of "an Ultra High Frequency (UHF) satellite capability around 2009," under a subsequent phase 5 of the project, and set to support smaller ground units and selected aircraft.

Boeing confirmed 11 October that the first (of five) Wideband Global SATCOM (WGS) satellites being built for the USAF was successfully launched by a United Launch Alliance 'Atlas V' vehicle from 'Cape Canaveral' Air Force Base, in Florida.

Following a nominal 45-minute flight, the launch vehicle's upper stage deployed the spacecraft, and a ground station in Dongara (Australia) received the satellite's first signals 47 minutes later. Boeing controllers in El Segundo, subsequently confirmed the satellite was healthy. Following a series of orbital manoeuvres and in-orbit testing, the satellite is expected to begin Air Force service during the first quarter of 2008.

Pitched against the WGS approach, was a Thales Australia offer (understood to have been requested by the Defence Materiel Organisation for competitive evaluation purposes), and involving the provision of high-bandwidth SATCOMs leveraging off an 8 August US\$1.66b United Arab Emirates (UAE) contract to EADS Astrium and Thales Alenia Space for its 'Yahsat' satellite system - designed to fulfil SATCOM requirements for both the UAE Government and commercial customers across the Middle East, Africa, Europe and South West Asia.

Thales Australia proposed that by leveraging the 'Yahsat' system for the ADF, it could achieve considerable cost savings to deliver a complete system for US\$800m. The 'Yahsat' solution comprised two large satellites based on 'Eurostar 3000' platforms. The communication payload will comprise 14 C-band, 20 Ku-band and 21 Ka-band transponders with resistance to jamming and other flexibility.

In-orbit delivery of the two 'Yahsat' satellites (lift-off mass of 5,930kg, and a total payload power of 10.9kW), would take place in 34 and 38 months respec-

tively after contract signing. The offering also included a satellite mission and network control system, protected or unprotected modems, two connection stations in C-, Ku- and Ka-band, and 65 ground user terminals of all sizes, fixed or transportable over land, air and sea. Full system acceptance review (with one satellite in position) was planned in 39 months, and the estimated operational satellite life is 15 years after launch.

Set to follow the WGS is the Transformational Satellite (TSAT) constellation, a major element in achieving a secure (ie: nuclear conflict 'protected'), high-capacity global communications network serving the US Department of Defense, NASA and the Intelligence Community. TSAT is specifically positioned as an enabler of NCW, and the ability of defence and intelligence professionals to make rapid decisions based on integrated, comprehensive information. A number of industry consortiums are currently progressing definition study contracts, with the USAF anticipated to award a contract by the end of 2007.

To this effect, the Lockheed Martin Northrop Grumman team stated 12 October it was "the first" to successfully complete the last in a series of verification tests of its Next Generation Processor Router (NGPR), performed during the Risk Reduction and System Definition (RR&SD) phase of the TSAT Space Segment. The 'spiral tests' are said to have demonstrated additional NGPR functions and performance beyond those conducted in previous demonstrations, and met all test criteria with 100% success.

The NGPR spiral test is the end of a four-year, risk reduction plan, developed in partnership with the MILSATCOM Systems Wing at the US Air Force Space & Missile Systems Center. As noted, TSAT is expected to succeed the current WGS series of satellites, and provide extremely high data rate connectivity to thousands of mobile terminals connected in an Internet Protocol (IP) network, thus enabling information-intensive, network-centric warfare of the future.

Boeing similarly reported 10 August it had demonstrated that its TSAT communications system space segment hardware and software could function in simulated operational environments, achieving Technology Readiness Level-6 (TRL-6) for payload, antenna, information assurance and gateway technologies.

Critical components reaching TRL-6 level or greater were said to include: the TSAT laser communications system's telescope; next-generation processor router technology; the communications-on-the-move antenna; and bandwidth allocation & protected waveform technologies. Boeing's industry team for TSAT consists of: Cisco Systems, Hughes, IBM, Harris Corp, Ball Aerospace & Technologies Corp, LGS Innovations, Raytheon, General Dynamics C4S, L-3 Communications, BBN Technologies, EMS Technologies and SAIC.

In a related development, the Communications Systems Business Area of Overwatch Systems LLC was awarded in September 2006 a US\$2.3m follow-on contract by EADS Astrium to build seven additional X/Ka shipboard antennas for the RAN's Advanced Satcom Terrestrial Infrastructure (ASTIS) program (JP 2008).

The follow-on contract was in addition to an initial contract for eight antenna systems due for completion in July, and sought to utilise Overwatch's patented multi-band feed/lens technology to exploit Optus satellite capability for simultaneous X and Ka transmit and receive.

At the time, the company also stated the technology proposed to be provided to Australia had potential for US applications, such as the Wideband Gapfiller Satellite (X/Ka) program. Subsequent to the Government's WGS announcements, it is expected the four remaining RAN FFG-7 frigates and its eight 'Anzac'-class frigates will now be modified to use the WGS system. The project Sea 4000 air warfare destroyers and two Joint Project 2048 amphibious ships will have WGS connectivity built in from scratch.