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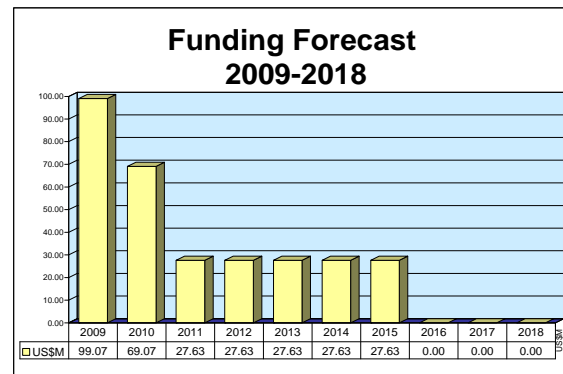
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Battlefield Airborne Communications Node (BACN)

Outlook

- According to USAF FY10 RDT&E budget estimates (submitted May 2009), the Objective Gateway (OG) program will be terminated in 2010
- BACN was at the top of the USAF \$1.9 billion list of unfunded priorities
- In June 2009, Northrop Grumman was awarded \$276 million toward the rapid fielding and support of the BACN system



Orientation

Description. The Battlefield Airborne Communications Node (BACN) is a forward-deployed airborne communications relay and network-centric information server that allows real-time information exchanges among many military, federal, and commercial communications systems.

Sponsor

U.S. Air Force

653rd Electronic Systems Group (ELSG)

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Status. BACN is in production. BACN is considered a risk-reduction demonstration effort for the Tactical Airborne Objective Gateway (OG).

Application. The BACN is designed for a variety of manned and unmanned aircraft. The U.S. Air Force has tested the BACN payload on NASA's WB-57 high-altitude aircraft, which served as a surrogate for the USAF RQ-4 Global Hawk UAV. The BACN payload has also been installed on a Global Express business jet.

Contractors

Prime

Northrop Grumman Network Communications Division

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Battlefield Airborne Communications Node (BACN)

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Technical Data

Design Features. The Battlefield Airborne Communications Node (BACN) is a forward-deployed airborne communications relay and network-centric information server that allows real-time information exchanges among many military, federal and commercial communications systems. The BACN is designed to provide critical voice communications and real-time video surveillance and imagery to warfighters and first responders in airborne and ground units and at command centers. BACN provides voice relay and bridging between tactical and cellular voice systems. It also acts as an airborne server that permits data storage and sharing for disadvantaged users while providing increased situational awareness by correlating tactical and strategic air pictures.

BACN provides high-speed Internet protocol (IP)-based airborne network infrastructure that supports the seamless movement of imagery, video, voice and digital messages between disparate tactical data and IP-networks. The waveforms supported include the Single-Channel Ground and Airborne Radio System (SINCGARS), Demand Assigned Multiple Access

(DAMA) technology, the Enhanced Position Location Reporting System (EPLRS), the Situational Awareness Data Link (SADL), Link 16, and IP-based networking connectivity using Tactical Targeting Network Technology (TTNT), Tactical Common Data Link (TCDL), and 802.1-pound waveforms.

Northrop Grumman reports that BACN employs a revolutionary digital-message transformation capability developed by the company for the Joint Forces Command: the joint translator/forwarder (JXF).

Operational Characteristics. The BACN will be operational on manned and unmanned aircraft that operate optimally at extremely high altitudes.

BACN provides voice relay and bridging among various tactical and cellular voice systems, and will be employed for military and civil applications. Its cell phone-to-radio bridging capability, for example, would allow Special Forces personnel with a cell phone to call directly into a fighter cockpit for targeting information or enable firefighters to communicate with the National Guard during a civil emergency or natural disaster.

Variants/Upgrades

There are no known BACN variants at this time.

Program Review

Background. The concept of employing gateways in a battlefield network is not new. The USAF has had a long-standing requirement for new-generation radios and datalinks that can talk to older-generation hardware. One of the first programs of this type was the DARPA Airborne Communications Node (ACN) program of 1998. The program was later enlarged and renamed the Adaptive Joint C⁴ISR Node (AJCN).

The Air Force participated in both these programs, but then decided to initiate a new program called the Objective Gateway (OG). The OG is a family of airborne and ground-based gateways intended to meet battlefield needs. The family is believed to include strategic and tactical airborne, ground-fixed and maritime variants.

Contract Award

In April 2005, the Defense Microelectronics Activity in McClellan, California, awarded Northrop Grumman a \$25.7 million contract to develop an aerospace networking payload composed of IP-based radios, software-defined radios, a Gateway Manager, and Advanced Information Architecture (AIA). Work under this 17-month contract was performed under the Advanced Technology Support Program, which is designed to give the U.S. government access to a broad range of technologies, capabilities, and expertise that it can rapidly apply to improve the operational readiness of fielded Defense Department systems.

The Northrop Grumman team included the NASA Johnson Space Center, Raytheon Solipsys, L-3 Communications, Vanu Inc, Rockwell Collins, and ViaSat. Raytheon reported that the total value of all contract options for Raytheon Solipsys was \$650,000.

Battlefield Airborne Communications Node (BACN)

Northrop Grumman named the payload the Battlefield Airborne Communications Node (BACN). This program is considered a risk-reduction/demonstration effort for the Tactical Airborne OG. U.S. Air Force RDT&E budget documents released in February 2008 also tie the BACN effort to the OG program. The documents included a funding line item for "Objective Gateway development and test, including BACN and RAIDER demonstrations and incremental OG development."

Flight Tests and JEFX 2006

The USAF and Northrop Grumman conducted BACN flight tests in December 2005 at the U.S. Marine Corps Air Station Miramar in San Diego. The BACN gateway system payload was carried by a NASA WB-57 Canberra aircraft, which was selected because of its high-altitude flight capabilities. The tests included radio communications between the airborne and ground systems and confirmed the communications capabilities required of the BACN system. Northrop Grumman reported that the flight tests were successful.

BACN underwent its first major test at the U.S. Joint Expeditionary Force Experiment (JEFX) 2006 held at Nellis AFB, Nevada. The JEFX exercise is designed to execute the air and space component of war by combining operators and systems from all air assets and coalition forces to form one integrated system.

During JEFX 2006, the BACN payload was mounted on a WB-57 aircraft, which served as a surrogate for the USAF RQ-4 Global Hawk UAV. The BACN established a live network on the test range. Northrop Grumman reported that at JEFX, BACN successfully demonstrated many "first operational capabilities," including simultaneous direct dissemination of data from Joint Surveillance Target Attack Radar System (JSTARS) aircraft to disadvantaged users – such as Marines in the field – and global dissimulation to warfighters via its information broker technology.

BACN Useful for Disaster Response

In July 2006, the Joint Operations Field Training Exercise allowed the Aircraft Group from Marine Corps Air Station Miramar and the Los Angeles County police, fire, and sheriff departments to simulate and test how they would jointly respond to an 8.0 magnitude earthquake in San Diego. During the exercise, the BACN was mounted on a NASA WB-57 aircraft.

Rewards for Good Performance

The U.S. Department of Defense awarded Northrop Grumman a second contract in October 2006. The BACN Spiral Technical Phase II was a 16-month, \$25 million contract for continuing program development. The award funded the development of new capabilities, hardware miniaturization, migration to new platforms, and the addition of a communications relay capability for the F-22.

According to Air Force officials, the BACN was being installed on a Gulfstream GV-01, a testbed platform owned by Northrop Grumman. Meanwhile, engineers were working on reducing the payload's size, weight, and power requirements enough so that it could be installed on a UAV, probably the Global Hawk.

The USAF announced in October 2006 that the BACN's gateway service would be expanded to include the F-22A Intra-Flight Data Link (IFDL), a low-probability-of-intercept channel reserved for transmissions with other F-22s only. F-22 aircraft can communicate with each other through the F-22 IFDL.

JEFX 2008 – Information Distributed

Flight International disclosed in May 2008 that the USAF was close to launching its OG system to bridge the gap between disparate datalinks and introduce the F-22 fighter to the battlefield network. Meanwhile, Northrop Grumman reported the first successful real-time download and distribution of sensor information from an F-22 to F-15 and F-16 aircraft during JEFX 2008. The company used a combination of BACN, the F-22 IFDL, and Link 16, the U.S. military primary datalink system. The BACN received selected F-22 sensor data and translated it into the standard tactical datalink format before distributing it to F-15s, F-16s, and ground-based operations centers at Nellis AFB, Nevada, and Langley AFB, Virginia. No modifications of the F-22 hardware or software were required, and the BACN did not compromise any of the stealthy characteristics of the F-22 aircraft. BACN's voice bridging subsystem created a connection between the F-22 pilots on tactical radios and the Air Operations Center on Voice over Internet Protocol (VoIP) telephone.

During JEFX 2008, BACN was installed on a Global Express business jet and the NASA-owned WB 57 Canberra. *Flight International* speculated that the Bombardier Global Express XRS business jet was a leading candidate for the OG Increment 1 Program.

Battlefield Airborne Communications Node (BACN)

Funding

FUNDING, U.S. AIR FORCE

	FY08 AMT	FY09 QTY
RDT&E (U.S. Air Force)		
PE#0207434F Link 16 Support and Sustainment 5262 Family of Gateways		
Gateways OG Development & Test, including BACN and RAIDER	95.041	84.207

All \$ are in millions.

Source: U.S. Air Force FY09 Budget Estimates, February 2008, RDT&E, Budget Activities 4-6

Contracts/Orders & Options

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Northrop Grumman	25.7	Apr 2005 – A 17-month contract to develop an aerospace networking payload composed of IP-based radios, Gateway Manager, software-defined radios, and Advanced Information Architecture (AIA). Contract will be managed by an "airborne executive processor." The Defense Microelectronics Activity in McClellan, CA, awarded the contract under its Advanced Technology Support Program.
Northrop Grumman	32.6	Oct 2006 – A 16-month contract for continuing BACN program development. The award will fund the addition of new capabilities, miniaturization of BACN hardware, migration of the system to new platforms, and addition of a communications relay capability for the F-22. The Defense Microelectronics Activity in McClellan, CA, awarded the contract under its Advanced Technology Support Program.
Northrop Grumman	276	Jun 2009 – CPFF contract to provide for the rapid fielding and support of the BACN system. Contractor will install the BACN in three Bombardier BD-700 Global Express aircraft for immediate fielding and will install the BACN system into two Global Hawk Block 20 UAVs for sustained deployment through 2015. The system was developed under a DoD Defense Microelectronics Activity (#H94003-04-D-005) as part of the Interim Gateway Program. 653rd ELSG/PK Hanscom AFB, MA, is the contracting agency. (FA8726-09-C-0010)

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Apr	2005	Contract awarded to Northrop Grumman to develop an aerospace networking payload
Mid-Dec	2005	Northrop Grumman name the payload the Battlefield Airborne Communications Node
Dec	2005	BACN flight tests conducted at the U.S. Marine Corps Air Station Miramar in San Diego.
Apr	2006	BACN demonstrates many "first operational capabilities" at JEFX 2006
Jul	2006	BACN participates in the Joint (military and civilian) Operations Field Training Exercise
Oct	2006	Northrop Grumman awarded BACN Spiral Technical Phase II contract
Apr	2008	BACN enables F-22 data download to F15/F16 aircraft during JEFX 2008
	2008	BACN contract award anticipated
May	2009	According to USAF FY10 RDT&E budget estimates, the Objective Gateway (OG) program will be terminated in 2010
Jun	2009	BACN contract for immediate BD-700 fielding and installing on three Global Hawk UAVs
	2015	End of Northrop Grumman BACN contract

Battlefield Airborne Communications Node (BACN)

Worldwide Distribution/Inventories

Currently, BACN is a U.S. program.

Forecast Rationale

Communications Capability Required

A USAF RDT&E budget document released in February 2008 included funding for "BACN and RAIDER demonstrations and incremental OG development" in FY08 and FY09. The document shows funding for the BACN effort continuing through FY13. BACN contracts were expected to be awarded in late FY08 and early FY10. At the time, Air Force sources stated that an initial spiral of OG capability was planned for late FY08. Next, OG payload development and risk-reduction efforts would continue through FY10. Finally, OG payload integration into platforms with full OG capability was expected to take place in FY12/FY13. *Flight International* reported in May 2008 that Northrop Grumman expects the USAF to select the BACN software suite as the core of the OG system.

Terminated

According to USAF FY10 RDT&E budget estimates (submitted May 2009), the Objective Gateway (OG) program will be terminated in 2010.

A \$180 million requirement related to BACN was at the top of the \$1.9 billion USAF Unfunded Priorities list, according to *Inside Defense*. The \$180 million would pay for operating the current BD-700 BACN CENTCOM aircraft and the leasing and operating of two additional BD-700 Global Express aircraft outfitted with the BACN payload.

\$276 Million Contract

In June 2009, the U.S. Department of Defense revealed that the USAF was awarding Northrop Grumman \$276 million for the rapid fielding and support of the BACN system. Under this contract action, Northrop Grumman will install the BACN in three Bombardier BD-700 Global Express aircraft for immediate fielding and will install the BACN system into two Global Hawk Bloc 20

UAVs for sustained deployment through 2015. The action fills "an urgent and compelling requirement" for enhanced communications capability for Overseas Contingency Operations (OCO).

According to officials at Hanscom Air Force Base, BACN's payload contains a number of different radios and waveforms including VHF-FM, VHF-AM, UHF-AM, UHF-SATCOM, SINCGARS, HAVEQUICK I/II, SADL, EPLRS, Link 16, and Common Datalink terminals. SINCGARS is the Single Channel Ground and Airborne Radio, SADL is the Situation Awareness Data Link, and EPLRS is the Enhanced Position Location Reporting System. All of the radios are linked together through a central computer called the Gateway Manager. From the ground station, the BACN payload operator remotely updates the Gateway Manager to select, tune, and tie radios together.

The BD-700s fly at approximately 40,000 feet and can stay airborne for more than eight consecutive hours. The BD-700 BACN capability is planned as a short-term solution until the Global Hawk Block 20 can be upgraded with the BACN capability. The Air Force is projecting that the Global Hawk Block 20 capability will be available for deployment in FY11.

BACN Funded for Now

With the most recent contract, BACN was funded above the amount requested on the USAF Unfunded Priorities list. This new funding supports the program until 2015. BACN fills "an urgent and compelling requirement for enhanced communications capability for Overseas Contingency Operations (OCO)." Due to this requirement, it seems unlikely that funding will be cut unless it is replaced by different technology that fulfills the same mission.

Battlefield Airborne Communications Node (BACN)

Ten-Year Outlook

ESTIMATED CALENDAR YEAR RDT&E FUNDING (in millions \$)												
Designation or Program		High Confidence				Good Confidence			Speculative			
	Thru 2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Northrop Grumman Network Communications Division												
BACN Budgeted Funding <> United States <> Air Force												
	25.00	30.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	30.00
Total	25.00	30.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	30.00
ESTIMATED CALENDAR YEAR COMMINGLED FUNDING (in millions \$)												
Designation or Program		High Confidence				Good Confidence			Speculative			
	Thru 2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
BACN <> United States <> Air Force <> BD-700 Global Express, Global Hawk UAV												
	.00	69.07	69.07	27.63	27.63	27.63	27.63	27.63	.00	.00	.00	276.28
Total	.00	69.07	69.07	27.63	27.63	27.63	27.63	27.63	.00	.00	.00	276.28