

# ARCHIVED REPORT

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## AJCN (Adaptive Joint C4ISR Node)

### Outlook

- U.S. Department of Defense wrapped up AJCN Advanced Concepts Technology Demonstration (ACTD) program in FY07
- It's currently unclear what direction DoD will take program now that ACTD is finished
- DoD did not ask for additional funding for the AJCN program in FY09 budget

### Orientation

**Description.** A DARPA, U.S. Army, U.S. Air Force, and U.S. Joint Forces Command program to develop a multimission, multifunction/reconfigurable C<sup>4</sup>ISR payload that offers communications relay, signals intelligence, and electronic warfare/information operations for airborne platforms. System would be scalable for air-, ground-, and sea-based applications.

**Status.** Funds were appropriated for the AJCN program until FY07.

**Application.** The U.S. has tested AJCN payloads on Hunter UAVs and RC-135 aircraft.

#### Sponsor

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USA  
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### Contractors

#### Prime

**BAE Systems Electronics & Integrated Solutions**

<http://www.baesystems.com/Businesses/EIS/>, 65 Spit Brook Rd, Nashua, NH 03061-0868 United States, Tel: + 1 (603) 885-4321, Fax: + 1 (603) 885-2772, Prime (Research)

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AJCN (Adaptive Joint C<sup>4</sup>ISR Node)

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## Technical Data

	<u>Metric</u>	<u>U.S.</u>
<b>Dimensions</b>		
Volume	2.8 - 3.6cu m	100 - 130 cu ft
<b>Weight</b>		
Initial requirement	227 kg	500 lb
<b>Characteristics</b>		
Frequency	20 MHz to 3 GHz	
Power	5-9.7 kW	
Features		
Interoperable with	SINGARS (10-20 user pairs) UHF LOS/HAVE QUICK (10-20 user pairs) JTRS EPLRS (1-3 channels) Link 16 (1 channel) TWR (MSE) (2-4 channels) Cellular/PCS-like voice/data (50-200 calls) FCS-low band TIBS	
Functions	Communications relay/range extension (100-150 mi) Any-on-Any radio interface Surrogate UHF SATCOM (10-20 user pairs) High-Speed Infrastructure Access (10-45 Mbps) Tactical Battlefield Multi-cast (64 kbps-1.544 Mbps) Internet-like Data Networking (400-600 users) Alpha-Numeric Paging (500 K addresses) SIGINT Electronic attack	

**Design Features.** The original Airborne Communications Node (ACN – Adaptive C<sup>4</sup>ISR Node) was a DARPA-funded effort to develop an autonomous communications payload providing assured in-theater communications, out-of-theater reachback connectivity, and signals intelligence (SIGINT). The Adaptive Joint C<sup>4</sup>ISR Node (AJCN), development of which began in 2002, is a multifunction C<sup>4</sup>ISR payload based on a modular, scalable architecture. The AJCN would offer reconfigurable communications, SIGINT, and electronic warfare/information operations.

The system would be scalable, with the baseline a modular, software-programmable radio terminal carried by an unmanned air vehicle (UAV), helicopter, or manned aircraft. It would ensure seamless communication between the various armed services' dissimilar radios.

Although the primary application of the effort was airborne platforms (both manned and unmanned), the node could also be used on ground and sea platforms.

The payload would enable users of dissimilar radios to communicate via software-programmable waveforms, and reconfigurable hardware and processing components.

The payload incorporates Joint Tactical Radio System (JTRS) software waveforms to provide both voice and data interoperability between different waveforms. The payload would also be able to perform other RF missions simultaneously, including SIGINT and electronic warfare/information operations.

At a minimum, the AJCN would support or perform the following functions:

- Separate and simultaneous communications, SIGINT, and electronic attack, including detection, direction finding, automatic signal recognition, and the ability to copy at least three narrowband and two wideband signals while processing at least five communications (or electronic attack) channels.

- Communications – SINCGARS, HAVE QUICK, EPLRS, JTRS wideband networking waveform, surrogate UHF SATCOM, Link 16, PCS or PCS-like, FCS-C low-band waveform, intelligence broadcasts (e.g., TIBS), and crosslink(s).
- Information operations message translation (e.g., Link 16/VMF).
- Payload control – executed via an RF link from the ground dynamic resource configuration.
- In-flight reconfiguration of mission allocation (communications/SIGINT/electronic attack).

AJCN is also set up for use over a broadband network.

Under the AJCN program, airborne payloads were integrated on two manned platforms – the RC-12 and KC-135. This effort began in the first quarter of FY03, with flight demonstrations taking place during the second quarter of FY05.

The core chassis would contain a processor, storage unit, and power supply. The system would be sized by adding cards to an extension chassis.

## AJCN (Adaptive Joint C<sup>4</sup>ISR Node)

**Operational Characteristics.** The key to successful operation is dissimilar radio interoperability, with SIGINT as an added function, using the same hardware and handling the receiver outputs differently. In practice, commanders would be able to tailor their radio frequency assets as the mission changes simply by installing new software.

Uses would be driven by service requirements. The system would support in-theater communications without the need for creating infrastructure first. AJCN would provide instant communications capability for existing military radios on the ground, at sea, or in the air, and be upgradeable to accommodate future communications systems.

AJCN would be platform-agnostic. Altitude gives airborne systems an advantage in sending and receiving communications, and one tactical package could be a small system that fits a Shadow 200 or similar UAV. The theater package would be larger, and fit on a CH-53 or Predator. A strategic package would fit tankers, Global Hawk UAVs, or Aerostats. Larger platforms would make larger apertures possible and reduce some of the likelihood of co-site interference.

## Variants/Upgrades

Some of the technology from AJCN can be applied to communications relay systems being developed for first responders and local governments. In 2005, BAE Systems demonstrated its First InterComm™ system for emergency teams in Amherst, New Hampshire. The First InterComm system automatically creates a temporary, incident-area network (IAN) using digital

technology, which is ideal for firefighters, rescue workers, police, and others that respond to situations ranging from local emergencies to major catastrophes. Every agency equipped with the system in the area can communicate without a major equipment upgrade, despite using radios with different frequencies and waveforms.

## Program Review

### *AJCN to Be Multimission System*

Phase I of the AJCN program began in 1998 when (then) TRW, (then) Sanders, and Raytheon developed the initial operational concept. Phase II began in May 2000, and at the end of FY02, BAE Systems and Raytheon were working toward a proof-of-concept, end-to-end lab system demonstration. During Phase II, the system became multifunctional, and it was decided to make it scalable to UAV applications. At the same time, planners found that a SIGINT capability could be added by using the same receiving equipment to perform communications relay and signals intercept. In 2001, U.S. Air Force Chief of Staff General John Jumper indicated that he intended to use the devices on tankers, since they were loitering in the area of battle anyway.

In December 2002, BAE Systems was named the Advanced Concept Technology Demonstration (ACTD) prime contractor for the program. It was to design, build, and deliver four flyable payloads for testing on the Army's Hunter UAV (two units) and USAF KC-135 or RC-135 aircraft (two units). The multimission software framework would combine the SIGINT Diamond Software Product Family™ and the Joint Tactical Radio System (JTRS) framework. BAE would oversee management and systems engineering, leading the signals intelligence, electronic attack, and systems integration effort.

For the flight tests, Army officials flew five separate AJCN missions, collecting technical data on the performance of the Interference Cancellation Subsystem (ICS), in addition to assessing antenna and communications interoperability.

## AJCN (Adaptive Joint C<sup>4</sup>ISR Node)

### *AJCN Completes Successful IJMUA*

AJCN completed a successful Interim Joint Military Utility Assessment by the end of March 2004. The flight tests were conducted on a C-27 Sherpa and began in January 2004 at Ft. Huachuca Electronic Proving Grounds. They showed that the system could deliver secure communications, intelligence, and important combat data across battlefields quickly and easily. The tests demonstrated the utility of the AJCN payload's ability to serve simultaneously as a communications relay and SIGINT platform and Electronic Warfare Information Operations (EW/IO) system. The report was delivered before the March 31, 2004, due date.

In the future, the U.S. Army AJCN program plans to develop a prototype payload and demonstrate its functional capability, install the prototype payload on an Army aircraft, and conduct flight demonstrations. Designers addressed top-level metrics by performing an initial capability demonstration of four functional areas: communications, signals intelligence, electronic war-

fare, and information operations. An Initial Joint Military Utility Assessment (IJMUA) was performed during the flight testing.

In FY05, designers matured payload functionalities and completed payload integration. They installed payloads and antennas on the Air Force's Paul Revere aircraft and two Army Hunter UAVs, and conducted flight tests to verify operation of the payload and AJCN network at the first JMUA exercise.

### *Completion of AJCN Program*

Plans for the AJCN in FY06 included preparing the JMUA report, conducting Extended User Evaluation (EUE) exercises, and preparing for termination of the program. In FY07, the EUE was completed, and the Defense Department finalized the recommendations for Doctrine, Organization, Training, Materiel, Logistics, Personnel, and Facilities to complete the program. FY07 was the last year of the AJCN Advanced Concepts Technology Development (ACTD) program.

## Funding

	U.S. FUNDING							
	FY06 <u>QTY</u>	FY06 <u>AMT</u>	FY07 <u>QTY</u>	FY07 <u>AMT</u>	FY08 <u>QTY</u>	FY08 <u>AMT</u>	FY09 <u>QTY</u>	FY09 <u>AMT</u>
<b>RDT&amp;E (U.S. Defense Wide)</b>								
PE#0603750D8Z								
AJCN	-	0.8	-	0.8	-	-	-	-
<b>RDT&amp;E (U.S. Air Force)</b>								
PE#0207423F								
5084 AJCN	-	2.46	-	0.98	-	-	-	-

All \$ are in millions.

Source: FY08 U.S. Budget Documents

## Contracts/Orders & Options

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
BAE Systems	3.9	Nov 2002 – Increment of a \$59,977,817 modification to another transaction related to a prototype agreement for the Adaptive Joint C <sup>4</sup> ISR Node Advanced Concept Technology Demonstration. Completed November 2007. (DARPA contract MDA972-00-9-0009)

## Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	FY01	Technical development, detailed laboratory testing and simulation
	FY02	SDR, system concept design
Apr	2002	DARPA RFI released
May	2002	RFI White Paper responses due

AJCN (Adaptive Joint C<sup>4</sup>ISR Node)

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	FY02	Validation of multimission functionality (communications, SIGINT, EW) in an end-to-end laboratory system demonstration
Nov	2002	BAE Systems selected as ACTD prime contractor
1Q	FY03	ACTD, RR jointly sponsor flight demonstration of multimission scalable capabilities
	FY03-05	Building/integration of payload
	FY05	First JMUA completed
	FY05	ACTD completed
	FY06	Second JMUA
	FY07	Planned program completion

## Worldwide Distribution/Inventories

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This is a **U.S.**-only program.

## Forecast Rationale

### *Program Completed*

The U.S. Department of Defense has wrapped up the AJCN Advanced Concepts Technology Demonstration (ACTD) program, and has not asked for any additional funding for the program in the FY09 budget request. The technology developed under the program could still play an important role in future battlefields. However, it is currently unclear what direction the DoD will take the program now that the ACTD is finished. Neither the U.S. government nor the prime contractor, BAE

Systems, has been forthcoming with information about plans for the program.

What is certain is that the DoD is not asking for any money from Congress for this program. It can therefore be concluded that the program is completed. While it could be restarted again in the future, it is more likely that technology developed under this program will be used for other programs. Barring any further developments, this report will be archived in 2009.

## Ten-Year Outlook

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The U.S. Department of Defense did not ask for additional funding for the AJCN program in the FY09 budget. Barring any further developments, this report will be archived in 2009.

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