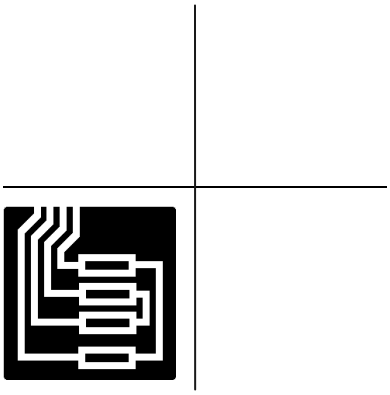
Grumman EA-6 Prowler Series

Outlook

- Funding has fluctuated over the last several years
- EA-18G Growler entering service

Note: Icon indicates area of current and potential retrofit/modernization activity



Orientation

Description. Twin-engine electronic warfare aircraft; EA-6A accommodated crew of two, while EA-6B accommodates crew of four.

Current Status. EA-6B production ended in 1991.

Total Produced. Grumman produced a total of 21 EA-6A and 170 EA-6B aircraft. In addition, six A-6As were converted to the EA-6A configuration.

Application. Electronic warfare platform.

Price Range. FY89 unit cost of EA-6B, $47.7 million.

Contractors

Prime

Northrop Grumman Corp	http://www.northropgrumman.com, 2980 Fairview Park Dr, Falls Church, VA 22042 United States, Tel: + 1 (703) 280-2900, Email: onewebmaster@ngc.com, Prime

Comprehensive information on Contractors can be found in Forecast International's "International Contractors" series. For a detailed description, go to www.forecastinternational.com (see Products & Samples/Governments & Industries) or call + 1 (203) 426-0800.

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

(EA-6B)

	Metric	U.S.
Dimensions		

Grumman EA-6 Prowler Series

	Metric	U.S.
Length	18.24 m	59.83 ft
Height	4.90 m	16.08 ft
Wingspan	16.15 m	53.0 ft
Weight		
Max TOW	27,896 kg	61,500 lb
Performance		
Max speed at SL	987 kmph	533 kt
Combat ceiling (a)	11,580 m	38,000 ft
Range (max external fuel)	3,252 km	1,756 nm
Propulsion		
Two Pratt & Whitney J52-P-408 turbojets		
Thrust (each)	49.8 kN	11,200 lbst

Armament
Originally none. Currently capable of carrying High-Speed Anti-Radiation Missiles (HARMs).

(a) With five ECM pods.

U.S. Navy EA-6B Prowler

Source: U.S. Navy

Program Review

Background. Grumman was selected as the winner of a U.S. Navy competition in December 1957 for production of a long-range, low-level tactical strike aircraft. The first A-6A flew in April 1960, and the initial production A-6As were delivered in 1963. The A-6E made its first flight in February 1970, and first squadron deployment of this type occurred in 1972. Grumman received a development contract for the EA-6B in 1966, flew a prototype EA-6B in May 1968, and began deliveries in January 1971.

The EA-6B Prowler tactical jamming system joined the fleet in January 1971. The Prowler's primary mission is to protect fleet surface units and aircraft by jamming enemy radars and communications. Secondary missions include electronic surveillance, anti-ship missile defense, and surface and air radar operator ECCM (electronic counter-countermeasures) training.

A derivative of the two-place A-6 Intruder, the EA-6B has been lengthened to accommodate a four-place cockpit. Other distinguishing features include a pod-shaped antenna fairing atop the vertical fin, more powerful J52-P-408 engines, and a strengthened airframe structure.

The EA-6B's ALQ-99 jams with 10 times the power of previous systems. Five integrally powered pods with a total of 10 jamming transmitters can be carried on the EA-6B. Each pod covers one of seven frequency bands, and the Prowler can carry any mix of pods or fuel tanks, depending on the mission.

Sensitive surveillance receivers in the tailfin pod are capable of detecting radars at long ranges. Emitter information is fed to a central digital computer that processes the signals for display and recording. Detection, identification, direction finding, and jammer-set-on sequence may be performed automatically or by crew manual assist.

The EA-6B was actually manufactured in several versions. The aircraft progressed from the Standard configuration of 1971 to Expanded Capability (EXCAP), Improved Capability I (ICAP I), ICAP II, ICAP II Block 82, and ICAP II Block 86. All ICAP I aircraft were upgraded to the ICAP II standard, which featured improved computer-generated jamming techniques. Included in the ICAP II upgrade was installation of the ASN-123 signal data converter/digital display group and the ASN-130 inertial navigation system, as well as replacement of the AYA-6 computer with the Navy-standard AYK-14 computer. The ICAP II upgrade also included incorporation of cooperative countermeasures and Band 7 frequency extension. The upgrade program was completed in 1991.

In 1993, the U.S. Navy canceled its plans to remanufacture a total of 102 existing EA-6B aircraft into the Advanced Capability (ADVCAP) configuration. This decision was driven by a combination of threat changes and the high cost of the program ($7.3 billion).

Variants

EA-6A. Initial EA-6 version. Acquired by U.S. Marine Corps. Total of 27 built, including six A-6As converted to EA-6A configuration. Prototype first flown in 1963.

EA-6B. Final production version (see **Program Review**). The U.S. Navy received the last of 170 EA-6Bs in 1991.

Funding

The U.S. Navy maintains a line item in its procurement budget for EA-6 modifications.

U.S. FUNDING

	FY12 QTY	FY12 AMT	FY13 QTY	FY13 AMT	FY14 QTY	FY14 AMT	FY15 (Req) QTY	FY15 (Req) AMT
EA-6 Mods	-	22.5	-	25.3	-	17.5	-	11.0

All $ are in millions.

Includes OCO funding.

Milestones

Month	Year	Major Development
Dec	1957	A-6 wins U.S. Navy design competition
Apr	1960	First flight of A-6A
	1963	EA-6A prototype first flight
May	1968	Initial flight of EA-6B
Jun	1980	First flight of ICAP II version of EA-6B
Jul	1991	Final EA-6B delivery

Grumman EA-6 Prowler Series

Month	Year	Major Development
	1993	U.S. Navy EA-6B ADVCAP program canceled

Worldwide Distribution/Inventories

Operator	Designation	Quantity	Average Age
United States Marines	EA-6B	20	34.00
United States Navy	EA-6B	87	34.63

Identified Retrofit & Modernization Contractors

Airframe

Carleton Life Support Systems Inc	http://www.cobham.com, 2734 Hickory Grove Rd, Davenport, IA 52804 United States, Tel: + 1 (563) 383-6000, Fax: + 1 (563) 383-6430, (Retrofit)
Northrop Grumman Aerospace Systems	http://www.as.northropgrumman.com, 600 Grumman Rd W, Bethpage, NY 11714 United States, Tel: + 1 (516) 346-2142, (Wing Center Section Replacement; Modification; Engineering)

Electronics

Northrop Grumman Aerospace Systems	http://www.as.northropgrumman.com, 600 Grumman Rd W, Bethpage, NY 11714 United States, Tel: + 1 (516) 346-2142, (Multifunction Information Distribution System (MIDS) Development)
Rockwell Collins	http://www.rockwellcollins.com, 3200 E Renner Rd, Richardson, TX 75083 United States, Tel: + 1 (214) 705-0000, Fax: + 1 (214) 705-3398, Email: collins@rockwellcollins.com, (Radio Replacement)

Opportunities

The U.S. Navy plans to keep the EA-6B in service until the 2015-2017 timeframe. After the U.S. Navy retired the EF-111, EA-6 deployment was increased to prevent a capability gap. Now that the EA-18G is entering service, the EA-6 is being drawn down.

The EA-6 proved invaluable during the asymmetrical conflicts in Afghanistan and Iraq, as its jamming systems could block a number of popular IED remote triggers, such as garage door openers and cell phones.

AIRFRAME

Structural Improvement. This omnibus U.S. Navy operational and safety improvement program covered EA-6B structural modifications and EA-6B-peculiar avionics modifications arising from testing and/or deficiencies. The following items were included in the program:

1. Structural improvement modifications were performed, including fixes for areas found to be deficient during aircraft fatigue tests.
2. Wing center sections were replaced because of cracking due to stress corrosion, or because the wing fatigue life limit had been reached. The new wing center section kits were produced by Northrop Grumman.
3. The EA-6B previously measured Fatigue Life Expenditure using a simple Counting Accelerometer Group. The factors of increasing age required a more accurate measure of FLE. Included excess A-6E Structural Data Recording Systems, with minor modifications.
4. The ASN-172, a combined INS/GPS, replaced the ASN-130A.

5. New outer wing panels built by Northrop Grumman replaced outer wing panels that had reached their fatigue life limit.
6. A Mission Reprogramming Unit program involved replacing tape-driven devices in the mission computer with PCMCIA cards that are more reliable and maintainable.
7. A commercial off-the-shelf PowerPC processor was added to the EA-6B's AYK-14, XN-11/CP-2357.
8. The GRUAE7 ejection seat utilized in the EA-6B uses standard British hardware. This hardware is replaced 100 percent during depot rework and 224-day "O" level maintenance. Aircrews are reporting increased fatigue resulting from extended time in the cockpit due to the physical positioning of personnel. According to the service, materials used during seat overhaul could be of an improved quality. In addition, the Navy says that the ejection seat sequencing system is an electromechanical design that would be improved by changing to a digital time-delay system. The service took up both of these actions.
9. A Digital Flight Control System program involves adapting an existing digital flight control computer (DFCC) and digital control panel to replace the air navigational computer and control panel currently fitted on the EA-6B. The replacement DFCS was configured to ensure that only the minimum number of aircraft changes would be required. This effort was intended to eliminate the problem of spurious inputs to flight control systems. The work was performed by BAE Systems.
10. EA-6B primary flight control surfaces were upgraded, including inboard slats, rudders, outboard flaps, and horizontal stabilizers. Phosphoric acid anodized honeycomb core technology was utilized, improving operational availability of the flight control surfaces by 60 percent.
11. Aircraft wiring was upgraded.
12. Hydraulic system improvements were made, including upgrades to the hydraulic actuators and hydraulic reservoir.
13. The program included installation of the BAE Systems USQ-113(V)3 radio countermeasures set into the EA-6B. The USQ-113(V)3 system is an upgrade of the USQ-113(V)2 Phase I system and provides improved mission capability for the EA-6B.
14. The program included connectivity measures.

The structural upgrade program concluded in 2008.

EA-6B ADVCAP Airframe Improvements. As part of the U.S. Navy's now-canceled EA-6B Advanced Capability (ADVCAP) upgrade, the Vehicle Enhancement Program (VEP) was intended to address structural improvements to increase the aircraft's maneuverability. Gradual increases in the EA-6B's

gross weight and wing loading had reduced the aircraft's stall-maneuver margin to less than half that of the A-6E. The chief aim of the Maneuvering Improvement Program, an integral part of the overall VEP, was to improve the maximum usable cruise lift of the aircraft. The modifications would also have improved takeoff and landing performance.

The modifications were to include the addition of small triangular glove strakes forward of the inboard wing/fuselage juncture and the extension of the tailfin by 0.5 meters (18 in). The wing was to be recontoured, and the wingtip speed brakes were to be modified to function as ailerons.

Other airframe modifications for ADVCAP were to include two additional outer wing stores stations, an onboard oxygen generating system, an enhanced environmental cooling system (ECS), and an anti-skid system. The first flight of an EA-6B with VEP modifications took place in June 1992. For other ADVCAP modifications, see the Propulsion and Electronics sections, below.

PROPULSION

J52-P-409. Under contract to the U.S. Navy, Pratt & Whitney had been developing the J52-P-409 to replace the EA-6B's J52-P-408 engine. The new engine was part of the now-canceled ADVCAP configuration. The improved engine, also known as the PW1212, provides higher performance, improved fuel economy, and enhanced durability. New features include an improved low-pressure turbine, an increased-capacity fuel pump, modified fuel control, and an upgrade of the high-pressure turbine. It can deliver 53.4 kN (12,000 lbst), and provides 20 percent faster engine acceleration, increased mission range and time on station, and stall-free operation throughout the EA-6B's flight envelope. The upgrade also provides an increase in service life of more than 20 years. The -408 can be upgraded to the -409 configuration through kit modification.

Final funding for this item was budgeted in FY07 and no further funds have been requested, though the program is still approximately $100,000 away from completion.

ELECTRONICS

ALQ-99 Jamming Pod Upgrade. The ALQ-99 Pod upgrade was funded at a total of $15 million in the FY11 through FY13 period, exclusively with Overseas Contingency Operations (OCO) funding. This is not to be confused with the similarly titled ALQ-99 Pods line item, which funded initial transmitter installation at a total of $1.1 billion through FY11.

The universal exciter (UE) is an important element of the ALQ-99 tactical jamming system. The exciters provide the ALQ-99 with the ability to counter threats across a wide range of frequency bands. They generate jamming signals for the various transmitters that are also carried in the jamming pods.

The universal exciter upgrade (UEU) provides a 30 percent improvement in reliability compared to the current UE. The upgrade also increases maintainability, improves performance, and eliminates multiple configurations.

The ALQ-99 system was produced by AIL Systems, since acquired by EDO Corp. In June 1992, AIL received a $25.1 million contract from the U.S. Navy for seven upgraded UE kit prototypes, integrated logistics support planning and management, and technical data for the EA-6B's ALQ-99 system.

In 1996, the Navy awarded a $54.3 million contract to AIL for 94 UE upgrades, integrated logistics support equipment, and interim spares. In September 1998, the service awarded AIL a $34.8 million contract for the procurement of 78 UEU units, including interim spares and technical data.

In October 1998, the Navy awarded AIL a $7.6 million contract modification to exercise an option for the procurement of 20 UEU units and associated technical data.

In July 1999, AIL received a $25.6 million contract from the Navy for the procurement of 50 UEU units, including parts and technical data.

In October 1999, the Navy awarded AIL a $52.3 million contract modification to exercise an option for the production of 135 UE upgrades.

The program also included procurement of a low-band transmitter and a Band 9/10 transmitter to provide expanded jamming capability against early warning/acquisition radars and fire control radars, respectively.

A modified ALQ-99 extended high-band radome is required for compatibility with the Band 9/10 transmitter. This radome incorporates unique sections of the radome composite structure to prevent damage by impinging energy radiation from the Band 9/10.

EA-6B/ALQ-99 transmitters and support equipment previously used Coolanol as the dielectric coolant required to dissipate heat from, and prevent arcing of, high-voltage power supplies. Coolanol costs more than $300 per gallon, is a known carcinogen, and must be handled as a hazardous material. Given that the EA-6B was the sole remaining user of Coolanol 35, its future

availability was in doubt. The replacement coolant for Coolanol is polyalphaolefin (PAO), which costs less than $25 per gallon and is non-hazardous. PAO is widely used by other U.S. military platforms and systems.

In addition, the equipment has to be converted in order to be compatible with the Consolidated Automated Support System (CASS) High Power Device Test System (HPDTS) modification. The HPDTS will allow CASS to test ALQ-99 transmitters, thereby eliminating the requirements for the EA-6B-peculiar Transmitter Test Station (TTS). The cooling system of the HPDTS only supports PAO; thus, all units tested with it must use PAO as their coolant.

ALQ-99 transmitters require modification in order to utilize PAO, because the polymer-based material currently used as high-voltage lead insulation and wire harness identification markers dissolves when exposed to PAO. This material needs to be replaced with an improved material that, through testing, has been identified as impervious to PAO.

The ALQ-99 Pods program also includes various modifications required to improve reliability, maintainability, and availability; enhance mission capability; resolve obsolescence issues; and correct deficiencies found in testing or in the field. In addition, the program includes the acquisition of certain new support equipment and the modification of other support equipment.

With the service entry of the EA-18G, the program was expanded to ensure that the new platform had a forward-fit capability, including ALQ-99 integration by way of a compatible EA-18G Extended Low Band Radome (GELBR). While the EA-6 itself may no longer be a high enough priority to support such an expensive program, the EA-18G definitely is. Due to this shifting focus, the program is now listed under its own line item as AEA Systems, and future funding beyond the $15 million noted above is focused primarily on the EA-18G. While we are attempting to cover only the EA-6 units in our forecast, the official financial plan refers to the program as an ALQ-99 modification, as there is little change to the rest of either aircraft.

On the Prowl

Block 89A Upgrade. In 1995, Northrop Grumman received a $33.5 million contract from the U.S. Navy to participate in the upgrade of four EA-6Bs to a baseline Block 89A configuration. The Block 89A program involves the installation of navigation, communications, and aircraft systems, as well as upgraded AYK-14 computer hardware.

The first Block 89A EA-6B validation aircraft made its initial flight in June 1997. Northrop Grumman is producing modification kits for the program.

The Block 89A program currently involves six separate modification efforts:

1. The Rockwell Collins ARC-210 UHF/VHF radio is replacing the EA-6B's ARC-182 radio.
2. In 1995, as part of a tri-service program, the U.S. Air Force awarded an initial $5.4 million contract to Litton's Guidance & Control Systems division (now part of Northrop Grumman) to supply LN-100G navigation systems for U.S. Navy EA-6B and F/A-18 aircraft. The LN-100G embedded global positioning system/inertial navigation system (EGI) combines laser gyro technology with a GPS receiver in a single lightweight unit. The initial contract covered the first 12 EGI systems to serve as test units for the two aircraft. Eventually, more than 2,000 systems could be purchased for use by the Navy.
3. The Block 89A program includes full integration of the Electronic Flight Instrumentation System, the Control Display Navigation Unit, and the Digital Signal Data Converter.
4. The AYK-14 computer will be upgraded with very high-speed integrated circuit technology.
5. The TSQ-142 mission planning system is being modified.
6. Additional miscellaneous procurement of avionics is required for the Block 89A and Block 82/89 programs, such as ARC-199 radios. In addition, all EA-6Bs will undergo a night-vision-device upgrade that will include provision of AVS-9 night vision goggles, display and lighting modifications, and electrical/structural changes.

In an earlier effort conducted under the Block 89A program, 20 Block 82 EA-6Bs were upgraded to the Block 89 standard configuration. In February 1997, Northrop Grumman received a $59.3 million contract from the Navy to upgrade the 20 aircraft to Block 89. In January 1999, the company redelivered the initial upgraded aircraft to the Navy.

This program received final funding in FY07 and has now been completed.

ICAP III Jamming Upgrade. The U.S. Navy funded a further EA-6B modification program called ICAP III, though the program's funding has been unstable since FY08, likely due to the service entry of the EA-18G, which is intended to replace the Prowler. According to FY15 documentation, a total of 32 aircraft received the

Grumman EA-6 Prowler Series

upgrade through FY12. The Navy may add more aircraft as funding allows, but despite a recovering global economy, funding is still limited and the Pentagon may prioritize programs for aircraft with a longer remaining service life. The program is currently valued at an estimated $523.9 million, though this figure will rise if aircraft are added. At present, it covers only an assortment of minor related avionics, support, and training modifications.

The program provides the EA-6B with a reactive tactical jamming system to counter frequency-agile radars. ICAP III also includes new displays, controls, and software, as well as changes to how the aircraft utilizes these resources to improve jamming speed and performance.

In March 1998, the Navy awarded a $144.2 million contract to Northrop Grumman for ICAP III engineering and manufacturing development.

Northrop Grumman modified two EA-6Bs to the ICAP III standard to serve as test aircraft for the program. The first ICAP III EA-6B made its initial flight in November 2001. It was joined in flight testing by the second modified EA-6B in June 2002.

In June 2003, Northrop Grumman received a $91.8 million contract from the Navy to begin low-rate initial production. Under this contract, the company is modifying 10 EA-6Bs to the ICAP III configuration. The Navy received its first ICAP III EA-6B in March 2005.

In early 2006, the U.S. Navy awarded Northrop Grumman a sole-source, indefinite delivery/indefinite quantity contract for full-rate production in FY06 of four Lot II ALQ-218 Tactical Jamming System Receivers, one partial system, and spares under the ICAP III program. The first kits were to be delivered in 2008, with deliveries to be completed by September 2009. The Navy has a minimum requirement for 21 ICAP III Prowlers, and has already received 10 Lot I aircraft.

Northrop Grumman subsequently received a $22 million delivery order from the U.S. Navy in September 2006 for spare ICAP III systems. The order was in addition to the initial $73 million contract. The spare systems were to be completed by December 2009.

In October 2006, the U.S. Navy awarded Northrop Grumman a $2.7 million contract for software development related to the ICAP III system for the EA-6B. The ICAP III Block 3 software was enhanced to improve the aircraft's warfighting capabilities and was delivered in 2007. The new software will be incorporated into all future upgraded aircraft.

For the ICAP III program, Northrop Grumman is teamed with BAE Systems, which provides color display systems.

Multifunction Information Distribution System (MIDS) Upgrade. This U.S. Navy program covers integration of required flight systems and Link 16 into the EA-6B. The program includes installation of the Multifunction Information Distribution System (MIDS) Low Volume Terminal and an intercockpit communications system (ICS), as well as other modifications.

In June 2001, the Navy awarded Northrop Grumman a $9.7 million contract for systems and software development for incorporation of MIDS on the EA-6B. In September 2002, the service awarded Northrop Grumman a $16.1 million contract for further development work.

The Navy's second squadron equipped with MIDS became operational during summer 2006 and completed technical evaluations shortly thereafter.

The program last received funding in FY07. Although another $22.1 million would be required for completion, this was not allocated in the FY08 budget request.

ADVCAP Upgrade. The U.S. Navy EA-6B electronic warfare aircraft has undergone a series of evolutionary developments. The standard aircraft was followed by the Expanded Capability (EXCAP), Improved Capability I (ICAP I), and ICAP II configurations. The next configuration was to be the Advanced Capability standard, with the Navy planning to remanufacture a total of 102 EA-6Bs to the ADVCAP standard, also known as Block 91. In 1993, however, the Navy canceled the ADVCAP program.

The ADVCAP program was intended to provide increased frequency coverage and deal with issues relating to signal complexity and pulse density. Under the ADVCAP effort, improvements to the EA-6B's tactical jamming system were to include incorporation of a detection/processing system called the Receiver Processor Group. The RPG was designated OR-62(XN-1)/ALQ-99(V).

The ADVCAP RPG was to provide broadband-frequency coverage and precision parameter measurements for emitter identification, classification, and location. Previously established signals would be continuously tracked and updated in the system's active

emitter file. In addition, the system would act as a radar warning receiver. It was to provide audio and visual alerts to the EA-6B crew and analyze threats to determine the most effective countermeasures. Litton Amecom had been developing the RPG under subcontract to Grumman. Amecom delivered the first engineering development model (EDM) of the RPG to Grumman in 1988.

Another part of the ADVCAP upgrade was the Sanders ALQ-149 countermeasures set. The ALQ-149 was to use the existing ALQ-99 Band 1 (VHF/UHF) transmitter together with a new Band 2-3 (approximately 0.1-0.5 GHz) unit and exciter. This system was to be used to detect, identify, evaluate, and jam hostile communications signals and long-range early warning radar systems. It was to include acquisition, analysis, direction finding, and central processing subsystems. Carried within the fuselage of the EA-6B, the system was to include all necessary antennas, receivers, signal recognizers, computers, and controls.

Sanders completed delivery of seven ALQ-149 EDMs to the Navy in 1988. The company's contract included options for the production of up to 95 sets.

Block 91-configured aircraft were to include other changes such as installation of a refractometer, a Standard Automatic Flight Control System, a disc-based recorder/onboard program loader, two additional ALE-39 chaff/flare dispensers, and an updated ARN-118 tactical airborne navigation (TACAN) system. The full Block 91 configuration was also to include the AIP modifications detailed below.

Avionics Improvement Program. In July 1990, Grumman was awarded a $115 million contract from the U.S. Navy to manage the Avionics Improvement Program for the EA-6B. The AIP involved the incorporation of ADVCAP and VEP improvements, with additional Block 91 enhancements to improve crew interaction with the RPG/ALQ-149 combination and to achieve commonality with other naval aircraft. As discussed above, however, the Block 91 program was canceled by the Navy in 1993.

The AIP upgrade was to include installation of the Standard Attitude Heading Reference System, a GPS receiver, head-up displays, dual AYK-14 computers, the ASN-139 inertial navigation system, radar, and radios.

Grumman EA-6 Prowler Series

FI's Opportunity Outlook

ELECTRONICS													
			High Confidence				Good Confidence			Less Confidence			
Status		**Thru 2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**Total**
Estimated Potential Candidates	**75**	**ICAP III Jamming Upgrade** <> EA-6 B <> United States <> Navy											
Planned/In Progress		**32**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Speculative			**0**	**7**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**