

# JPALS developer considers land-based civil applications

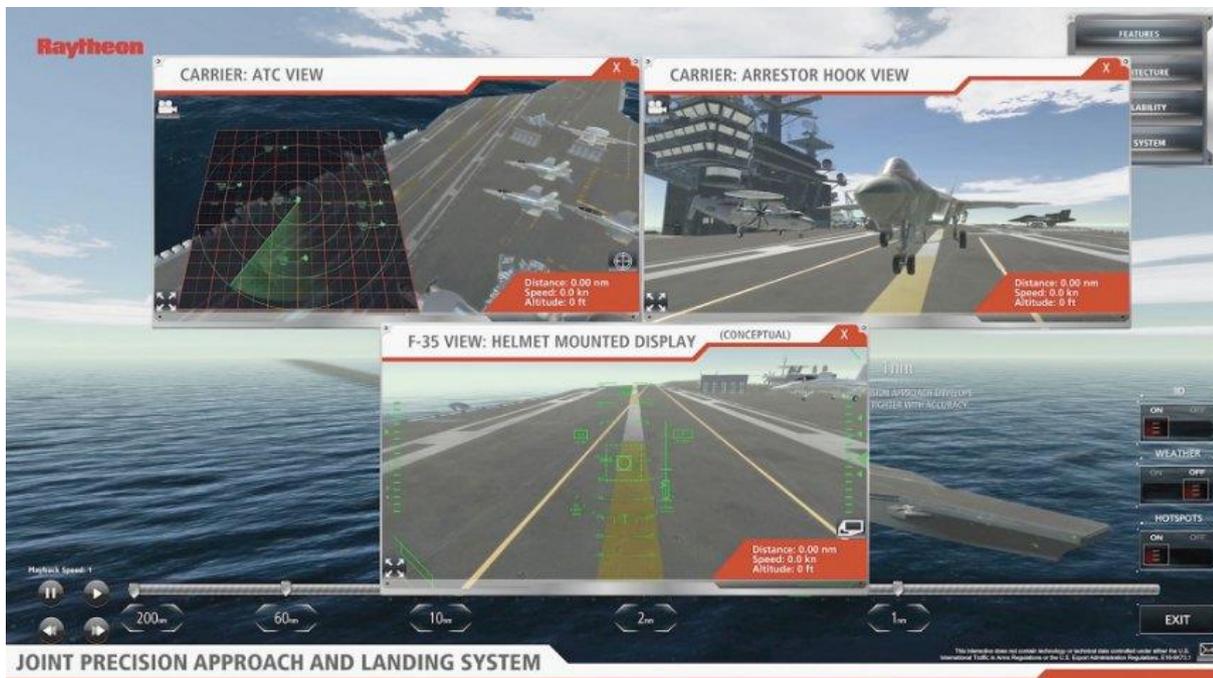
Jane's Airport Review

**Fruition draws closer for the US Navy, but mainland ATC could also benefit in future. Ben Vogel reports**

While the US Navy (USN) is on course to declare an Initial Operating Capability (IOC) in 2019 for the aircraft carrier-based Joint Precision Approach and Landing System (JPALS), officials from prime contractor Raytheon have indicated to *Jane's* that they are also exploring land-based civilian and military applications for the technology.

Raytheon developed JPALS in partnership with the USN - the Naval Air Traffic Management Systems Program Office (PMA-213) in Naval Air Systems Command (NAVAIR) - to provide landing guidance on carriers in rough seas (up to Sea State 5). The ship-based augmentation system is designed to support approaches and landings on any aircraft carrier in adverse weather conditions, by day or at night, with a vertical accuracy of 20 cm.

However, JPALS is more than just a landing system, as the USN also intends it to replace all shipborne systems for tactical air navigation, air traffic control, and airspace surveillance. The system also includes an auto-land capability, primarily geared towards unmanned aerial vehicle (UAV) operations but available for manned aircraft if the pilot is incapacitated or visibility is limited.



JPALS concept display, as seen at World ATM Congress 2017. (Raytheon)

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According to the NAVAIR website, the USN aims to roll out 22 JPALS installations, with the IOC in 2019 followed by Full Operational Capability (FOC) in 2030. In a series of successful live trial

flights, beginning in November 2013, USN McDonnell Douglas F/A-18C Hornets from Strike Aircraft Test Squadron VX-23 carried out more than 60 'touch-and-go' landings on an aircraft carrier, USS *Theodore Roosevelt* . Hornets were guided by JPALS to a hands-off-the-stick three-wire landing to within approximately 20 cm accuracy. "We had 38 consecutive landings in which we did better than the 20 cm requirement," Maselli added.



*One of the F/A-18C Hornets involved in JPALS test flights on USS Theodore Roosevelt, pictured in November 2013. JPALS prime contractor Raytheon is eyeing possible land-based applications for JPALS - for civilian as well as military users. (USN/Mass Communication Specialist Seaman Brian Flood)*

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In future, it may be possible to use knowledge gained from naval JPALS to land-based applications, possibly even for civilian ATC as an alternative to GBAS precision landing at airports. Here, Raytheon would blend its experience on GPS-related air navigation programmes for civil aviation (such as GAGAN in India and WAAS in the United States).

"The concept behind land-based JPALS is for a single installation to operate approaches and landings for all runways in all directions, in a 20-mile radius," Maselli explained to *Jane's* during World ATM Congress in March 2017.

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At an airport, JPALS could be installed further away from the runway than GBAS or ILS. "It can go on the tower if the user wants it to," Maselli noted.

This is some way in the future: there are no plans yet to obtain FAA approval for JPALS deployment at civilian airports, and Maselli foresees adoption by the USAF and other military users in the nearer term. "We're looking for a snowball effect after JPALS is certified for the USN," he

explained. Other uses for JPALS under consideration include a deployable version for humanitarian disaster relief or contingency use, which could be set up within 90 minutes.

So far, the system is only configured to function with the F-35. Raytheon is in discussions with other manufacturers to see if JPALS can be broadened to cover other platforms; Maselli mentioned the importance of engaging the manufacturers of "heavy hitters" such as the General Dynamics F-16 Fighting Falcon, the F-18 (see above), and the Bell Boeing V-22 Osprey.

"After that we can look further to using JPALS with larger aircraft such as the [Boeing] C-17 [Globemaster III]," he added. In the longer term, Raytheon also aims to export JPALS for use by US allies - the usual ITAR regulations permitting.

### **HOW JPALS WORKS**

At 200 n miles range from its destination, an aircraft (equipped with the avionics to receive the JPALS signal) begins to receive range and bearing data via GPS - acting, in effect, like a tactical air navigation (TACAN) system that takes into account the movement of the ship on which it will land.- At 60 n miles, the aircraft automatically connects to the shipboard JPALS (installed in a simple four-cabinet redundant configuration), beginning two-way GPS data transmission between carrier and aircraft, based on a military-grade, highly encrypted data link.- At 10 n miles the volume of JPALS data increases and precision surveillance with high-accuracy differential GPS enables third-wire landings to within 20 cm vertical accuracy. "We're giving pilots sufficient confidence to implement their mission," explained Bob Delorge, vice-president of transportation and support services at Raytheon Intelligence, Information, and Services. He described JPALS as a cone into which the aircraft flies, with the point of the cone being the third wire arrestor on the deck of the aircraft carrier. System integrity is essential.

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### **INDUSTRY TIMELINE**

Raytheon had led the industry effort on JPALS since 2008, when it received a USD232.8 million system development and demonstration contract from the USN. A USD52 million extension, awarded in August 2015, supported further testing and analysis in support of the autoland capability. That must have come as a relief to Raytheon and its subcontractors, after JPALS suffered a setback in 2014, when it was revealed that the programme had breached a congressionally imposed cost-growth cap. This put the brakes on the US JPALS effort, and prompted the UK Royal Navy to look elsewhere for a landing system on its Queen Elizabeth-class aircraft carriers. Most recently, in October 2016 the USN awarded Raytheon on USD255 million contract to develop a production model of JPALS. If options are exercised, the deal is worth USD270 million.

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