

TECHNOLOGY

MUNITION GRAHAM WARWICK / WASHINGTON DC

# Extending wing uses smart materials

MBDA's Active Diamond Back design aimed at emerging requirement for munitions that can loiter over battlefield

Weapons manufacturer MBDA is preparing for windtunnel tests of an airframe design for a persistent loitering munition that draws on experience with its Diamond Back range-extending wing kit for the Joint Direct Attack Munition and Small Diameter Bomb. The Active Diamond Back (ADB) design is a deployable joined tandem wing with variable aspect ratio and "artificial-muscle" flight controls.

The airframe design is aimed at an emerging requirement for munitions that can loiter over the battlefield, says Hank O'Shea, ADB programme manager with MBDA's Westlake Village, California operation. The company is working with the US Air Force Research Laboratory, which has also supported efforts by Boeing to flight-test a persistent munition technology demonstrator under the Area Dominator programme.

Windtunnel tests are scheduled

for May-June, and are due to be followed by flight tests late this year or early next. Windtunnel testing will involve a 1/3rd-scale model of a 3.7m (12ft)-span, 45kg (100lb) munition with more than 24h endurance.

For compressed carriage on a fighter's weapons racks, the ADB's upper and lower wings fold to lie

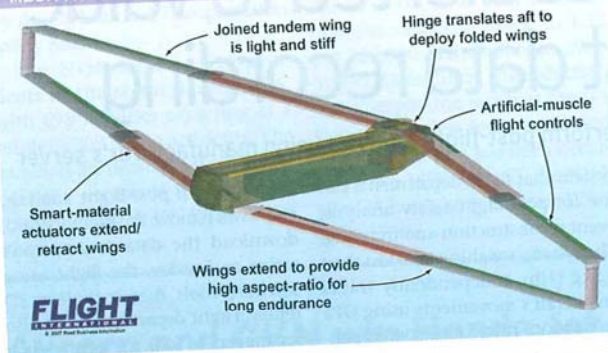
along the top and bottom of the munition body. After release, the upper hinge translates aft, deploying the joined tandem wing. The wing panels then extend to double the aspect-ratio for low drag and long endurance. The vertical surfaces joining the wing tips provide a lightweight, flutter-resistant structure.

To avoid complex and heavy mechanical linkages, MBDA plans to use embedded smart-material actuators for both flight control and to extend and retract the wings. The flight controls will use electro-active polymer "artificial muscle" actuators - materials that expand when electrically stimulated, smoothly deforming the wing.

"We will have a self-contained set of flight controls in the wings, with no linkages that have to accommodate the folding and extending," says O'Shea. "It will also free up space in the fuselage for fuel."

The initial design concept used another type of smart-material actuator, a hybrid shape-memory composite and elastomer, to extend the wings non-reversibly. But O'Shea says studies show there may be value in being able to retract the wings once they have been extended and the company looking at reversible approaches

MBDA ACTIVE DIAMOND BACK



TESTING

## Boeing opts for vacuum crack sensor

Australia's Structural Monitoring Systems (SMS) has achieved a breakthrough with its Comparative Vacuum Monitoring (CVM) system, with Boeing agreeing to include the crack-detection technology in its common methods non-destructive testing manual, writes Emma Kelly.

This means CVM crack-detecting sensor technology is available as a validated means for performing in-situ structural integrity inspections on Boeing aircraft; for addressing crack detection inspections in future service bulletins; and as an alternative means of compliance for existing inspections.

SMS also has an agreement with Airbus that will see CVM technology used on existing and new aircraft (*Flight International*, 14-20 June 2005).

POWERPLANTS GUY NORRIS / PHOENIX

# Honeywell bases its turbine engine strategy on two-pronged approach

Honeywell is sketching out a small/mid-power turbine engine strategy for light single and twin commercial and military helicopters, as well as unmanned air vehicles, around a two-pronged approach based on technology from the Small Heavy Fuel Engine (SHFE) demonstrator, and a growth derivative of its latest turboshaft dubbed the HTS900X.

The exact path is still evolving, and depends on the given application and power required within the 500-1,500shp (370-1,120kW) range, says Honeywell technical sales director Rick Buchanan, adding: "We just don't know yet."

The HTS900X will be based on the HTS900, the -2 version of which is due for certification in the third quarter, infused with technology from the SHFE demonstrator. The 900X could be available from 2010-11, while the current timing

for applications based around the SHFE itself is from 2013.

"The SHFE is a great science and technology programme and may morph itself into the -900X," says Buchanan, who says the "SHFE is working on getting technology to TRL6 [technology readiness level 6, or pre-full-scale development], and in the longer term we could develop SHFE itself into a next-generation engine."

Honeywell completed the first full-engine test of the SHFE demonstrator in Phoenix, Arizona in late February. Two previous tests in September 2005 and October 2006 focused on the core engine, including assembly, starting and operating functions as well as aerodynamic and mechanical mapping.

The SHFE programme began in 2003 and is a 46-month, \$46 million equal partnership between Honeywell and the US Army to

demonstrate technology for 5 1,500shp engines with 50% high power-to-weight ratio, increased turbine temperatures and reduced noise and emissions over tod engines (*Flight International*, February-5 March).

"We're aiming at applications like light commercial twins UAVs, as its low weight and makes it very good for these," Buchanan. Strategic decision to be taken include choosing most suitable architecture. "Now the HTS900 has a single-turbine stage, while the SHFE dual-power turbine," he says.

The SHFE otherwise has several features with the high power HTS900-2-1D under development for Bell's ARH-70 reconnaissance helicopter, as dual centrifugal-compressor stages and a single-stage pressure turbine.