- defending critical bases of operations, starting with the US homeland, and defeating weapons of mass destruction and their means of delivery;
- projecting/sustaining power in distant anti-access and area-denial environments;
- denying the enemy sanctuary by developing capabilities for persistent surveillance, tracking and rapid engagement;
- leveraging information technology and innovative network-centric concepts to link up joint forces;
- protecting information systems from attack;
- maintaining unhindered access to space, and protecting US space capabilities from enemy attack.

The US Air Force, emboldened by the recent action in Afghanistan, defines as transformational anything that brings about a fundamental change. Gen Daniel Leaf, USAF director of operational requirements, says that for an enemy surface-to-air missile (SAM) operator or fighter pilot, facing a transformational weapon would be "akin to the first batter on night one of the World Series stepping up to the plate and facing a 130mph pitcher, versus 100mph, and, before the first ball is pitched, having the lights turned out".

If baseball is the game, then the USAF's star pitcher is without doubt the Lockheed Martin/Boeing F-22 Raptor. Rumsfeld is taking a critical look at air force plans to order 339 of the stealth fighters by 2010 at nearly $100 million a piece, while reviewing three other services' pet projects, notably the US Army's Boeing Sikorsky RAH-66 Comanche, the US Marine Corps' Bell Boeing V-22 Osprey and the US Navy's CVN(X) aircraft carrier. Accordingly, the USAF and industry are sparing no effort in portraying the F-22 as the poster child for transformation.

With Rumsfeld questioning whether all 339 fighters are required, proponents have sought to make a case for the F-22 as a multi-role integral player in the USAF's Global Strike Task Force – not simply a replacement for the Boeing F-15C Eagle air superiority fighter. Near-term "anti-access" arena capabilities will include the ability to drop the 450kg (1,000lb) Boeing Joint Direct Attack Munition (JDAM) and the planned 115kg Small Diameter Bomb and enhancement to the fighter's Northrop Grumman APG-77 electronically scanned active array radar to include a synthetic aperture ground imaging mode and other air-to-surface functionality.

Class of its own

This capability, combined with the F-22's low-observability design characteristics for enhanced survivability and the ability to "supercruise" at around Mach 1.6 without afterburner, puts the fighter in a class essentially by itself, with little or nothing else to challenge it. "The F-22 will bring about major change," says Leaf. "For enemy SAMs and fighter pilots trained to deal with transonic threats, they will see less, and things will happen faster – that will be transformational."

"Enemy pilots trained to deal with transonic threats will see less, and things will happen faster – that will be transformational"

GEN DANIEL LEAF, USAF DIRECTOR OF OPERATIONAL REQUIREMENTS

With the number of Rockwell B-1B bombers shrinking, the building of more Northrop Grumman B-2s a financial non-starter and the eventual need to replace the F-15E and Lockheed Martin F-117, Lockheed Martin has been funding its own study of a proposed two-seat FB-22 version. The "Strike Raptor" concept would incorporate: a fuselage plug to enlarge the belly internal weapon bays; a redesigned delta wing for increased fuel volume and no horizontal stabiliser; and possibly new or uprated Pratt & Whitney F119 engines. The USAF, although interested, remains focused on getting the F-22 ready for operational service by the end of 2005.

Another major F-22 transformation selling point is its advanced integrated avionics, which present the pilot with time-critical target data fused from onboard and remote sensors. The fighter will plug into a network-centric architecture linking manned and unmanned airborne systems, as well as terrestrial and space-based assets. The aim is to find, fix track, target, engage and assess kill chain, and to accelerate the process towards what air force secretary James Roche has described as an era of "instantaneous attack".

Transformation in this respect is not confined to future platforms such as F-22 and the Lockheed Martin F-35 Joint Strike Fighter, but to putting the links in place that will leverage off the capabilities of even legacy assets. The Afghanistan conflict has demonstrated that the latest in unmanned air vehicle (UAV)-based surveillance capabilities, such as that fielded by the General Atomics RQ-1A Predator, can feed directly to a Vietnam-era Lockheed Martin AC-130 gunship looking for ground targets. Afghanistan in this respect has been a fertile proving ground.

"We see perfect examples of transformation every day now. The sort of thing I'm talking about is the sight of Staff Sgt X of air force special operations riding a horse in Afghanistan with a laptop and a set of laser goggles, providing guidance for

A Sensor Craft UAV would be an arm of the manned and unmanned ISR fleet

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