

DARPA Tech 2004

Dr. Mike Francis J-UCAS Program Office Director

Good afternoon!

Being back on this stage reminds me of a classic quote attributed to the great Yogi Berra – “It’s déjà vu all over again”. You see, the last time I was at a *DarpaTech* conference, I was managing it! The year was 1996 and my last as a program manager at DARPA. In addition to emceeding the event which we had just renamed *ARPAtech*, I had the privilege of introducing the audience to a new concept called the Unmanned Combat Air Vehicle, or UCAV. You can understand why Yogi’s comment is so apropos.

A few months ago, I returned to DARPA from a five year stint with industry, and today I am excited to have the opportunity to introduce you to the agency’s newest program. It’s called the Joint Unmanned Combat Air Systems Program – or J-UCAS, and it is the largest unmanned systems development ever undertaken by the Department of Defense. At DARPA, it is not only a program, it is an entire office.

J-UCAS is based on an intriguing premise: *that a collection of unmanned, weaponized, high performance aircraft, operating together in dangerous hostile airspace, and fed by information from a variety of other battlefield sources, has*

all of the trappings of the network-centric combat environment necessary to emulate the nation's larger defense vision and strategy.

Our vision is one of a versatile combat capability able to address a variety of the most dangerous missions on a global scale. We want to advance an unmanned capability that augments the manned force in the most difficult combat situations, creates operational synergy, and provides the kind of leverage that result in true force amplification.

The network-based architecture and *operating system* software that underpin J-UCAS will enable unique functionality for multi-vehicle collaboration ... for high levels of autonomy ... and for flexible human intervention, well beyond today's state-of-the-art for UAVs. Coupled with the enhanced situation awareness that derives from shared information made available by J-UCAS and other platforms, the system will dynamically reconfigure and adapt to the threat even as the battle unfolds. The system honors both sides of Dr. Tether's equation for technological surprise, in that it is intended to provide very predictable battlefield effects, and very unpredictable tactics for our adversaries to decipher.

And finally, our vision is for an affordable System of Systems ... one that uses a Common System Architecture and Operating System that we will be describing later, along with compatible air vehicles and reduced support costs.

So what exactly is a Joint Unmanned Air Combat System?

First and foremost, it is more than another unmanned air combat vehicle or even a collection of them. The vehicle portion of J-UCAS, which we call the UCAV, is merely the host around which the system is built. UCAVs are technologically advanced aircraft, to be sure, but the soul of J-UCAS lies in the command & control, sensor and weapons systems that enable their operation, individually and collectively. We will be describing some of those systems, and we will be inviting you to contribute ideas for new technologies and new capabilities that can help turn our vision into reality.

How is it that DARPA finds itself in the unique role as its own transition-agent ... migrating these unique unmanned air vehicle technologies directly to service applications?

The origins of J-UCAS can be found in DARPA's extensive heritage in combat systems development, and also in this agency's continuous robust investments in information technology capabilities over many decades.

The seminal program for J-UCAS, however, was the Uninhabited Tactical Aircraft – UTA, a 1994 DARPA initiative which featured low cost, small air vehicles that would later be known as Unmanned Combat Air Vehicles, or UCAVs that I described earlier. DARPA's early work focused on unusual ways to use groups of UAVs collaborating to provide innovative methods to attack ground targets in

high threat areas. At the time, our forces had access to another highly capable unmanned system – the cruise missile – but DARPA wanted to see if there was a more affordable way of undertaking that task that also provided more mission versatility in the process. The UTA project was effective at building a case for the feasibility and credibility behind the concept now known as J-UCAS.

That original concept attracted considerable attention. By mid-1997, the Air Force and DARPA formed a joint Unmanned Combat Air Vehicle Advanced Technology Demonstration Program. Subsequently, the Navy and DARPA crafted a companion UCAV program. The remnants of these efforts provide the foundations for what we now call J-UCAS.

Although putting DARPA in the lead of a large scale, network-based, unmanned systems development program may surprise some, this agency is in fact the logical choice to do the work.

Many of the technologies required to advance J-UCAS were started at DARPA over the years. These technologies range from low-cost, compact, high speed computing ... to advanced, digital wireless communications ... to smart algorithms that border on true artificial intelligence ... to integrated combat capabilities such as provided by DARPA's TTNT and AMSTE Programs. And these are all to be integrated into a network of high performance air vehicles that collectively enable the improved situational awareness, precision targeting,

improved survivability and other attributes necessary to succeed in perhaps the most dangerous threat environment ever created ... that defined by modern air defense systems.

DARPA's legacy of developing key information technologies and work on unmanned vehicles is strong and ongoing.

Now, obviously, we wouldn't be DARPA if we were not willing to explore the "far side" and adopt some unusual and unorthodox approaches in pursuit of our vision.

But let there be no misunderstanding about our mission: In housing J-UCAS within DARPA, the Secretary was explicit in his direction to us. With a projected investment of over four billion dollars over the next five years, DARPA will demonstrate the feasibility and flexibility of an extremely sophisticated, highly coordinated, synchronized network of unmanned platforms.

We are further directed to enable the conduct of a joint operational assessment of these capabilities that should take place before the end of the decade. The operational assessment will focus on the missions and operational concepts invoked by the military services -- specifically the Air Force -- and the Navy in a way that it facilitates an early decision by the services on how to evolve the capabilities of the J-UCAS system.

And finally, we have been directed to maintain a competitive environment for the program.

Because J-UCAS is a single program, our office structure has more of a traditional development program 'flavor' than a typical DARPA office. We concentrate on integrating our technical and business expertise and collaborating with the Services to provide the highly integrated solution that J-UCAS requires. It is my pleasure to introduce to you the "charter members" of the DARPA J-UCAS team.

CAPTAIN Ralph Alderson is the Deputy Program Director for the X-45 program at Boeing that includes both the Navy and Air Force variants of that system.

CAPTAIN Alderson's Deputy Program Manager for X-45 is Mr. Randy Brown who hails from the Air Force Aeronautical Systems Center in Dayton, Ohio, at Wright Patterson Air Force Base.

Colonel select Paul Waugh, an Air Force Officer, is in charge of the Northrop Grumman X-47 program. As a Deputy Program Director, he is assisted by Mr. John Kinzer, formerly of ONR, who is the X-47 Deputy Program Manager.

The Common Systems Organization is headed by Mr. Marc Pitarys, again as the Deputy Program Director for Common Systems and Technologies. He is

assisted by LCDR Bob Severinghaus from the Navy. Marc joins us from the Air Force Research Laboratory, where he's been involved in common systems development for the UCAV and the J-UCAS program since its inception. This highly capable team and an outstanding supporting cast are essential to our success in this ambitious program.

One last, important note -- we are in the process of hiring a Chief Technical Officer, who will be responsible for some of the most advanced technologies that Col Waugh will talk about in his closing presentation.

We are excited about this new "DARPA Challenge," and look forward to working with you in the coming months as DARPA pursues a unique new role as its own agent for the transition of exciting new technologies to actual military application.

Thank you.

Let me now turn over the dais over to CAPTAIN Alderson to walk you through the most visible element of the J-UCAS story – the air vehicles.