Digital air-ground integration, the future is here

By CPT Jared Cox

For some time now, air and ground forces have sought a way to improve digital air-ground integration—working toward a fully integrated digital battlefield. Both forces recognize the importance of streamlining such a vital linkage; however, a disconnect between the services still remains. The Army can see digital ground positional data, but not air positions; simultaneously, the Air Force can see the digital air picture, but not the digital ground picture. With all this in mind, the question many ask is, “When will the services bridge the gap and make true digital air-ground integration a reality?” Well, the question now has been answered, the gap has been bridged, and true digital air-ground integration is now a reality.

Today, the Army’s Enhanced Position Location Reporting System and Land Warrior-based brigades together with the Air Force’s Situational Awareness Data Link fighter squadrons can enter a common, brigade-based ground network and truly have one, integrated, common operating picture. This gives both services the ability to see all network users accurately, both air and ground, and additionally the ability to pass targets digitally from ground to air and vice versa.

Air Force systems. To understand fully what this means, we need to take a look at what each service requires to be fully digitally integrated and still meet its operational requirements. On the Air Force side, there are two main digital situational awareness systems. The first is LINK-16 which is managed by ground and air-based gateways, positioned at strategic points to ensure aircraft are fed information from friendly and enemy assets. Link-16 is managed by ground and air-based gateways, positioned at strategic points to ensure aircraft are fed information from friendly and enemy assets. Link-16 is common to F-15s, F-16s, F-18s and most other aircraft in the Air Force. The second system is Situational Awareness Data Link. This system uses a radio that is identical to an Enhanced Position Location Reporting System radio and software generated from a single compatible baseline. It gives non-LINK-16 aircraft the ability to pass friendly locations to LINK-16 aircraft via the LINK-16 gateway. The two main aircraft that use this system are A-10Cs and F-16s. From an air-to-air perspective, the LINK-16 gateways have a Situational Awareness Data Link radio located with them, which allows LINK-16 and Situational Awareness Data Link aircraft to see one another digitally. However, Situational Awareness Data Link is the only system at this time that fully integrates with the Army’s Enhanced Position Location Reporting System network.

Army systems. As for the Army side, we will look at 5th Stryker Brigade Combat Team, 2nd Infantry Division, from Fort Lewis, Wash., as our model. 5th SBCT’s main systems that integrate with the Situational Awareness Data Link are the Enhanced Position Location Reporting System, Land Warrior and the Air Defense Systems Integrator. The Air Defense Systems Integrator is the most critical component. It constantly receives and transmits LINK-16 data to and from any LINK-16 platform that is operating in the Air and Missile Defense System Integrator’s ‘range.’ The Air Defense Systems Integrator is located in the brigade tactical operations center and is used for airspace deconfliction.

Land Warrior is linked into the Enhanced Position Location Reporting System network by virtue of the Enhanced Position Location Reporting System micro-light radio that a Soldier wears. His positional data is forwarded to the network by a networked Land Warrior gateway, then to an Enhanced Position Location Reporting System radio inside the vehicle. Once inside the Enhanced Position Location Reporting System network, that information is passed to all the other network participants.

Integration. To join both systems is fairly simple. For the Situational Awareness Data Link-equipped aircraft, the Enhanced Position Location Reporting System network, the simply have to change a few settings in the cockpit—the frequency map, guard channel, ground key, logical channel number one, and logical channel number two. The first three settings allow the Situational Awareness Data Link-equipped aircraft to receive positional data from the Enhanced Position Location Reporting System network. The fourth, fifth, and sixth settings determine which brigade and battalion data the aircraft sees and allows the aircraft to transmit its positional data to the Enhanced Position Location Reporting System network.

The last piece of the puzzle is the need to establish a unit reference number for the aircraft. The Enhanced Position Location Reporting System radios are linked to the Army’s Force XXI Battle Command Brigade and below. This system is the user interface that displays the position report from the Enhanced Position Location Reporting System radio on a map or image. The Force XXI Battle Command Brigade and below needs the unit reference number to display the position report of the aircraft. The Situational Awareness Data Link system does not have a unit reference number assigned to it, although it has the ability to input this number. Once the Force XXI Battle Command Brigade and below has the aircraft unit reference number, the icons for the aircraft are displayed. The specific frequency map, guard channel and guard key settings are set by the Air Defense Systems Integrator computer and are unique to each brigade.

Once these settings are synchronized, complete positional data flow between all users of the network is feasible. In other words, the Land Warrior-equipped Soldier can see a Situational Awareness Data Link-equipped aircraft as an icon on his helmet mounted display, while an A-10C can display an Enhanced Position Location Reporting System-equipped vehicle as a friendly “x” in his heads up display, Tactical Awareness Display and targeting pod.

Through the Air Defense Systems Integrator computer, the air defense airspace management cell can input targets and then pass these digital targets to the Situational Awareness Data Link aircraft. All the while, the Air Defense Systems Integrator system can receive targets from Situational Awareness Data Link-equipped aircraft; the Air Defense Systems Integrator operator then inputs them into the Air and Missile Defense Work Station and Tactical Airspace Integration System. From here, the Army and Missile Defense Work Station and Tactical Airspace Integration System send the target to the brigade Advanced Field Artillery Tactical Data System.

At this point, the brigade Advanced Field Artillery Tactical Data System sends the target to the battalion Advanced Field Artillery Tactical Data System. When the target goes from brigade to battalion, the target also is published on the Enhanced Position Location Reporting System/Land Warrior/Force XXI Battle Command Brigade and below systems. Additionally, because the aircraft and the Air Defense Systems Integrator join the

The testing. The digital network mentioned above was tested at the National Training Center in Fort Irwin, Calif., in Feb. 2009, using the Stryker-equipped 5th SBCT; F-16B30 fighters from the 100th Fighter Squadron, Tuskegee, Ala.; and A-10C fighters from the 422nd Test and Evaluation Squadron, Nellis Air Force Base, Ala. This testing was completed as part of the 5th SBCT’s mission readiness exercise for the unit’s deployment to Afghanistan in support of Operation Enduring Freedom.

During the two week scenario, pilots from both squadrons were able to join the Enhanced Position Location Reporting System network and receive digital targets passed to them from the Air Defense Systems Integrator computer. Simultaneously, the Enhanced Position Location Reporting System network was able to receive all positional data from the Situational Awareness Data Link-equipped aircraft.

The significance of this technology cannot be overstated — each Land Warrior Soldier and Enhanced Position Location Reporting System-equipped vehicle is capable of viewing aircraft icons on their interface screens in real time, while pilots now know for certain, the exact location of friendly forces.

The way ahead. What is the next step for this new digital connectivity? Obviously, the answer to this question is to verify this technology and capability during combat operations, which is exactly what 5th SBCT will be doing in summer 2010 (the system is currently in use in OEF). The technology discussed in this article will give units an unmatched situational awareness, reducing the instances of fratricide and the time it takes to deconflict airspace for indirect fire and close air support. Having said this, this new digital capability will not replace voice communications or established close air support procedures, but clearly will aid in the efficiency and effectiveness of situational awareness. Digital integration allows aircraft to reduce the amount of time it takes for target talk-on and the effective release of live munitions, ground units to clear airspace quicker and to deliver indirect munitions on target and for the relentless combination of air-ground fires in an unprecedented, coordinated manner. It also further improves the protection of friendly forces from fratricide.

Stryker brigades are designed to see first, understand first, act first, engage decisively and re-engage at will. The use of this new digital connectivity enables the brigade’s ability to do just that — be first on the battlefield. In today’s contemporary operating environment, agility is a must, to say the least. By providing an air-ground precision that is unmatched, the overall agility and lethality of both ground and air forces alike is enhanced significantly. Additionally, the linkage of Situational Awareness Data Link and Enhanced Position Location Reporting System permits the ground force commander to control larger areas of battle space with fewer forces, yet mass forces and effects at key points rapidly — a situation which is all too common to in today’s contemporary operating environment. This advent of digital air-ground integration will be imperative to 5th SBCT in the months to come as they conduct operations in Afghanistan.

NATO forces also have been buying and equipping their forces with Enhanced Position Location Reporting System radios as well, another factor that makes this a very potent system. Current and future conflicts may have an ever increasing number of coalition and NATO forces involved, and unfortunately we have witnessed the tragic consequences of misidentification between forces already. Using this technology to enhance situational awareness further among ground and air forces from NATO and coalition forces will give commanders a new combat multiplier. Additionally, by networking these systems, one may be able to reduce the required number of combined NATO or coalition forces. In a networked system, intelligence will be passed faster, forces will be massed more effectively and the enemy will be placed in a position of distinct disadvantage.

If digital air-ground integration is a reality today, imagine what the future could hold based upon collaboration between the Army and the Air Force; the improvements could be exponential. Tomorrow we could see the ability to transmit digital images and video feeds from Land Warrior Soldiers and Enhanced Position Location Reporting System-equipped vehicles to aircraft and vice versa; the ability of Land Warrior Soldiers and Enhanced Position Location Reporting System-equipped vehicles to receive pod feed from aircraft orbiting overhead; and the ability to pass targets back and forth from all users in the network, not just between the Air Defense Systems Integrator and the aircraft. Additionally, the improvements could include the Navy, Marine Corps and Coast Guard units as well. Each service currently has a small pool of Enhanced Position Location Reporting System radios; so the potential for true connectivity among all the services at the tactical level clearly is feasible.

As a result of this new integration capability, the lethality of 5th SBCT is increased several fold. The brigade is more combined arms capable than before. The ability to employ the Anti-Tank Guided Missile Stryker with the Mobile Gun System, engaging a target in support of the infantry, then to have precisely delivered ordnance from aircraft with enhanced, real time situational awareness is unprecedented. 5th SBCT has outpaced the network-centric capability planned for in the Future Combat Systems programs.

Today’s leaders now must determine the best method to employ this new capability and what the future holds as far as collaboration and integration. The men and women of our Army and Air Force must integrate new tactics, techniques and procedures into our standard operating procedures to make this technology truly a combat multiplier. This same group will be responsible for teaching our NATO and coalition counterparts. The responsibility of passing on lessons learned clearly rests upon our shoulders. To have never used this capability or shared it with our fellow nations would be a true travesty. The future of digitally integrated air and ground combat units is here.

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