Digitally Aided Close Air Support (DACAS) capability gaps have been closed in the last few years. Greater emphasis on a total solution between the Pilot and the Joint Terminal Air Controller (JTAC) can be seen by all services and international forces that maximize current capabilities and equipment. A solution needs to enhance capabilities available to the JTAC and Pilot while being rugged enough to withstand the rigors of combat operations in harsh environments as well as being operationally foot-mobile. It also must exceed the expectations of the JTAC so they will actually carry and use it and the system must assist the pilot in providing effects safely and accurately. But what constitutes the right solution that will work in permissive as well as denied environments?

In our assessment the answer is in the integration of the Modular Tactical System (MTS) from Black Diamond Advanced Technologies (BDAT) with the JTAC to bridge gaps by sharing the critical information without task saturating either party. The Modular Tactical System (MTS) is currently in use by US and International JTACs who require a wearable and ultra-rugged solution for dismounted operations. The MTS is a combat enabler for Tactical Communications Control, Situational Awareness, Blue Force Tracking, and Precision Strike that funnels control and information to a common display on a wearable system. The MTS provides a highly-capable solution for dismounted operations that works with radios and receivers from a variety of manufactures. It will seamlessly integrate the radios, video down link receivers, targeting software and equipment into a cohesive solution. The MTS can be used with gloves and in extreme operating conditions (i.e. water-immersion and blowing dust). The MTS is unique in that it is designed to allow the Operator to do his job on the move.

The MTS also serves as a power distribution manager for radios and receivers which allows use of a single common battery to power the entire system. In many cases spares of both the MBITR and 152 batteries must be carried. Moving to a common battery provides the added benefits of reducing type and number of spare batteries that are carried.

Current Equipment and Capabilities:
The JTAC in contact resorts to the equipment he has available which typically includes a DAGR connected to the Laser Range Finder (LRF), Garmin Foretrex and a paper map. The JTAC uses the equipment to build a 9-line of the target to be passed by voice to the plane and then begins the “talk on” which can often take over 10 minutes to gain a high level of confidence that the Pilot and the JTAC are indeed talking about the same target. The challenge for the JTAC is there are extremely valuable capabilities in the battlespace they are not tying into that provides both the Pilot and JTAC team as well as the GFC critical information from an SA and Precision targeting standpoint that go unused as there hasn’t been equipment on the ground fusing all the pieces together to make use of the information which effect decisions on the ground and in the aircraft (AC). This includes Situational Awareness Data Link (SADL), Video Downlink (VDL), Targeting Software, Current Imagery, LRF integration and Data Comms. The lack of these capabilities directly impact SA for the JTAC. This ultimately manifests itself in a lack of precise targeting, speed, and accuracy of which Fires can be employed. Relatively few JTAC/TACP’s have a solution they can employ today that will provide the additional capabilities that further define and shape the battlespace. If these capabilities were employed and you could safely take that 10 minutes safely down to 90 seconds, it becomes a huge force multiplier for the element in contact who need effects now, not 10 minutes from now.
As we look at Air/Land Integration, the pilot needs to be in the loop of digital information. Picture the landscape of north-eastern Afghanistan. It is a vast area with large mountains (12-22k foot peaks) and is plagued by extreme weather. The current system or process for attack requires the pilot to be “craniums down” for extended periods of time. Doing that in a single-seat plane like the A-10, below the weather and in the Hindu Kush at night can be a recipe for disaster. Therefore the pilot is going to mitigate his craniums down time buy constantly looking back outside. This slows the kill chain since it takes him longer to get target coordinates into the system before he can even start to get the talk-on. This area is where the fight is. This is similar to other fights that will be in the future. The setting may not have mountains or terrain but they will have mountains of air defense systems. Again requiring the pilot to maximize SA and probably push the aircraft into the low altitude environment leaving little opportunities for craniums down time. The right tools with the JTAC help the pilot with these challenges.

One of the strengths of the MTS is it is largely using equipment the JTAC is carrying or has access to today, but that radios, ISR receivers, PLRF, Targeting SW and integrating the capabilities of all products into a common suite and the synergy becomes the strength of the MTS platform. It also keeps the costs down, as the JTAC community is not being required to purchase new compatible radios or other devices.

The MTS helps bridge these gaps by providing the following integration:

1. MTS ties together the LRF, targeting software, hand-held ISR receiver and radios allowing the JTAC to effectively capture, store and share time-sensitive information with the pilot.
2. The MTS does not limit the JTAC in running the targeting software of their choice.
3. Software tools such as the “App Config” from BDAT get the JTAC in the fight quickly by opening programs and tiling them exactly the way the JTAC set them up during pre-mission planning.
4. NVG mode gets the JTAC in the fight during night operations without blooming the operator.
5. The MTS is radios and receivers agnostic. It supports the most common radios from a variety of manufactures to include the Harris (152 and 117F/G) and Thales (MBITR and MBITR II) as well as supporting mesh radios that are gaining acceptance (Persistent System Wave Relay). Radios can be controlled via the MTS virtual radio KDU software that frees the JTAC from manually having to access the radio for control in addition to supporting EPLRS radios using the SADL gateway.
6. MTS is open architecture solution that will support data comms across multiple networks via a variety of wave-forms to include VMF, HPW, and ANW2.

Another aspect of the ground picture that must be considered is power and power management. The focus of any system should be to reduce the weight on the operator while increasing combat capabilities. The MTS is able to provide power distribution eliminates the logistical burden and feasibly allows the JTAC to carry and utilize all devices. The MTS will daisy chain power from a single common power source (i.e. 5590) to power multiple receivers and radios. Dismounted operations in austere environments pose a tremendous logistics burden when considering the number and types of batteries that are employed on today’s battlefield. Often the MBITR and AN/PRC-152 radio are carried… which use different batteries of which spares need to carried for both. By powering multiple devices from one common battery (e.g., 5590) the MTS helps reduce this logistics burden and lessens the operators “dynamic weight”. Simply put, the MTS allows fewer battery types to be carried thus reducing weight over a period of time for dismounted operations.
Targeting:
Making the JTAC quicker and more accurate in acquiring target location greatly increases overall mission success. In current use the JTAC is still using techniques for targeting similar to tactics used in Vietnam. With a digitally aided JTAC the targeting process is reduced dramatically, allowing the JTAC to produce a 9 line within seconds, that is much more accurate than current techniques. This also allows the JTAC to spend critical time to increase the pilots SA on the target instead of that critical time used just to develop required 9-line to conduct CAS. This greatly enhances the ground forces survivability by reducing time it takes to get rounds on target as well as greatly increases the ability for a first round strike and disrupting the enemy forces.

Machine to machine interface increases two primary functions in the CAS kill chain. First it increases SA with reliable information passage. Once the JTAC plots the target location he can “Zap” it to any aircraft on station. The reliability of information increases since there is only one point of error probable. That is the initial plot of the target location. There are currently about 4 probable errors with the human interface. In the non-digitally aided environment, the probable errors include but are not limited to initial plot of the target location (JTAC), Plot of friendly location (JTAC/GFC), pilot receiving the info correctly (JTAC and Pilot) and finally entering the info into the jet properly (Pilot).

The second function that is improved in the CAS kill chain is the craniums down time for the pilot. Passing the information digitally allows for more heads-up time and the ability to glance down, perform a few switch functions and look back up to avoid terrain. This increases flight safety. In today’s fight there is a huge emphasis on the flight safety portion of operations. If an aircraft crashes, most other viable assets in the area are pulled to support the recovery of the aircraft and pilot. These are the same assets that are providing CAS. Since a single asset can only be used for one thing at a time the recovery will take precedence and the ground forces needing CAS will lose their assets. This puts more lives in jeopardy.

The MTS helps address these issues between the JTAC and Pilot by mitigating the pilots heads-down time by correctly and rapidly pushing the critical information to the plane. The kill chain speeds up when integrating the PLRF to the MTS for the target laze, the GPS or DAGR (for current position) into a targeting software and use the radio for data comms with the plane as well as an EPLRS radio that will push the radios position to the HUD of the plane. Metadata also becomes useful for the JTAC by increasing his SA and de-conflicting with increased accuracy. This allows the Operator to effectively capture, store and share time-sensitive information with the pilot. The Modular Tactical System (MTS) is an open architecture solution and will support data comms via a variety of waveforms to include VMF, HPW, and ANW2 as well as support EPLRS radios using the SADL gateway.

Digitally aided CAS provides the information that is easily passed digitally and is pertinent to the attack. Nothing more. A balance should be reached between voice and data. The only real info that the pilot wants digitally is target elevation, location and friendly position (and all friendlies, not just the JTAC). With that information passed quickly via J or K series messages, voice comms can fill in the rest of the information, such as target talk on, weaponry negotiations and amplifying remarks. By incorporating the MTS it provides a true DACAS solution. The information the JTAC needs is readily available which will allow him to rapidly and accurately access information to be passed over voice or data. Full Digital Targeting versus Digitally Aided targeting is a smart decision, but not in a CAS environment, full digital targeting should be for direct targeting or aerial interdiction. Trying to do EVERYTHING via data puts the pilot back into the same situation as all voice. They need to look down and take their eyes off of the target area and terrain. The problem is that technology will start to drive tactics rather than the opposite. With the advances in combat aircraft today, being able to just look outside and see the friendly location, target location and still see the environment. Heads-up Displays (HUDs), Helmet mounted devices (HMDs) and advanced targeting pods also help provide valuable information. This information needs to be SHARED and not just generated. Tying in the JTAC to the aircraft as a complete system. Both sharing information and becoming one integrated team and system will allow for faster, more accurate, target prosecution. Therefore, shortening the kill chain. Bottom line, employment of the MTS can provide the pilot with a tactical edge in supporting the JTAC.
JTAC digital connectivity with Air:
The JTAC can benefit greatly as the increases of technology in terms of ISR, VDL, Communications, and digital mapping have brought a lot of tools to the JTAC/GFC to provide much more situational awareness. These upgrades in technology increase the ability of the JTAC to make quicker more accurate decisions as well as recommendations making the ground force much more effective and lethal. While all these peripherals/capabilities have continually increased the technology the soldier uses to capitalize on these capabilities hasn’t. The JTAC has a different device or computer to control each device, increasing the weight and logistical burden in terms of power etc. making it impossible for the JTAC to utilize all the information that is available for use to the JTAC.

The MTS overcomes these challenges by funneling control and information to a common display on a wearable system. The MTS provides a highly capable solution for dismounted operations that seamlessly integrates radios, video down link receivers, UAS/UGV control and targeting equipment as well as SW and peripherals. The JTAC needs to be able to view all information (Video Downlink, Mapping, Communications, friendly locations etc.) on a single platform in order to merge the information and make better assessments and recommendations to the GFC. With the addition of the MTS, the JTAC has the ability to consolidate all information available on a single common platform.

Variable Message Format (VMF):
VMF can be used to pass the 9-line digitally to the plane. By using software which includes GRG’s on a battle map and dropping points of interest, this process to generate a 9-line off a new developing threat can be much more streamlined, less time-consuming and much more accurate. We all learned long division in school, but we use a calculator today is it’s faster and more accurate. The same principle applies here. This allows the JTAC to stay in the fight and reduce “heads down” time manipulating information to generate a 9-line. If nothing else, using software that will create or display the threat grid is valuable even if the 9-line is passed VOX. The real key to the solution is generating a timely and correct grid for the target.

Situational Awareness Data Link (SADL):
In areas where a SADL gateway is in place, this data transfer gives instant SA to the pilot. One of the most valuable benefits of the JTAC using an ELPRS radio is the advantage of having the radios position and the targets pushed to the pilots HUD. This reduces the workload in the cockpit as the pilot has the position of the radio always in front of them. Instead of using voice communications to increase this SA, the JTAC can send the coordinates, info, or data directly to the AC. This allows critical time to be spent increasing the SA of the target area and other variables and not spent on acquiring that SA through a long drawn-out talk on.

Video Down Link (VDL):
With a hand-held ISR Receiver such as the L-3 SIR TacROVER, Coastal Defense MVR IV/VI, Harris 7800T and Rockwell Collins StrikeHawk the JTAC can capture the video being pushed from an aircraft (typically Sniper or Lightening pod) or UAS that allows for greater SA on the ground and de-confliction with the Air.
**Metadata:**
Provides JTAC with information and connectivity that increase overall SA of the air picture as well as de-confliction with the pilot. This gives the JTAC SA on the PLI from the Aircraft and what the sensor is pointed at. This can be very important in a non description environment where it may be impossible to verify if the JTAC and the pilot are looking at the same thing by only looking at the video feed. This data can be received from any aircraft with a later model Pod. Lightening and Sniper Pods would be examples.

The MTS supports VMF, SADL, VDL and Metadata capabilities by integrating the all the pieces that need to be tied together to make it work for the dismounted JTAC.

The MTS provides the flexibility to push the info developed on the ground and get it to the pilot. A useful aspect is the integration with Harris SA whereas friendlies will populate into FalconView, giving the JTAC the accurate information at a glance. Multiple targets can be easily tracked given the icons.

We often talk about how to make the kill chain faster. It is easy to make it very fast, even in a non-digital environment. JTAC passes grid and the pilot just drops a JDAM on that grid. The A-10 community has proven they have the capability to do that, but it often comes at an unacceptable cost, resulting in a fratricide incident or CIVCAS. All the speed comes at a cost. That cost is safety. It does no good to go and kill in 45 seconds but we kill the very individuals we were trying to protect. Digitally aided CAS allows for that risk or cost to be mitigated. Through accurate and timely information passage, the kill chain can be shortened while still maintaining a high level of safety and reducing the chance of fratricide.

**Summary:**
Where does the Modular Tactical System (MTS) fit in and solve the problems noted above? The first and foremost is that the JTAC will actually use it. A system that was influenced in design by the very individuals that will be using it down range gives it immediate credibility. That credibility transfers direct to trust and usage in the system. All of the other capable systems on the market right now have one major design flaw, The JTAC will not take it with him when he needs it most, which is the dismounted, close-in fight. The MTS is also very capable to meet and exceed the capabilities of today’s CAS team with seamless integration of multiple communication, ISR and power supply system’s being brought into a one-stop shopping solution for the individual that has limited time for pulling components in and out of a pack.

Digitally aided CAS is the way forward. MTS is a solution to finally get DACAS on the battle-field. Once the community begins to truly field the correct hardware and software combination, it is imperative that DACAS become a training requirement for both the pilots and the JTACs, similar to type 1 controls. If the pilot and JTAC both are not comfortable and proficient with the DACAS systems, they will not use it in combat operations. Therefore it is an epic failure if the greatest system and integration is built around the pilot and JTAC as a team, but not used when the lives of an element in contact are on the line.