PATHFINDER
AIR POWER DEVELOPMENT CENTRE BULLETIN

Issue 47, June 2006

BATTLESPACE SUPERIORITY IN THE FUTURE

In previous issues of *Pathfinder* the critical elements that create battlespace superiority have been identified as Intelligence, Surveillance and Reconnaissance (ISR); Command and Control (C2); and engagement. Even into the future this remains valid, but improved capabilities in both quality and quantity will be required to counter an adversary that adopts asymmetric, guerilla or insurgent warfare. In particular the ISR system will need to significantly improve its ability to monitor an adversary in complex environments. These environments have historically hidden an adversary from observation and include jungle, forested and urban terrain. The research programs that are designed to deliver the necessary capabilities have already commenced.

The American Defense Advanced Research Projects Agency (DARPA) is leading this research effort and has a number of projects underway. One project is called Combat zones That See (CTS) and aims to employ thousands of mobile phone-like cameras spread over large areas of a city to detect, identify and track all movement—human and vehicular. The CTS will be capable of reading licence plates and recognising individual humans. Further reduction in size of these sensors to the size of a grain of sand is the aim of another proposal called Smart Dust. DARPA's VisiBuilding program has already fielded handheld sensors that can 'see' through concrete into a building and locate humans, weapons and other materials. Work is in progress to develop this technology further and produce an airborne system that will monitor larger areas from greater range. Finally, the Human ID at a Distance program seeks to develop the means to identify people at distances of a few hundred metres. The comprehensive information that would be available from an ISR system fielding these types of capabilities is being referred to as 'military omniscience'.

A CTS Sensor

Developments are also being made in airborne sensors that could see through other natural barriers. Millimetre wavelength radar has demonstrated an ability to penetrate jungles and forests to detect vehicles and people beneath the canopy. Other sensors have demonstrated abilities in penetrating the earth to detect underground caves and tunnel systems.

Linking these sensors to allow their data to be collected, monitored and assessed to form a cohesive picture and its further dissemination will become a key role for air and/or space platforms. Large airships that operate between the air and space environments, an area called near space (above 60,000 feet and below 100 kilometres), offer distinct advantages over traditional platforms. It is envisioned that these airships would be able to operate at very high altitudes providing the required connectivity while remaining on station for periods of a year or longer at a significantly lower cost than needed for satellite coverage. High altitude assets will make ISR data available over wide areas to users that will include the C2 system as well as other engagement nodes in near real-time.

Connected in this way, the C2 system will have the ISR information to carry out time-sensitive-targeting (TST). Engagement systems that execute TST will benefit from the development of weapon systems that will increase the range of situations where air power can be applied.

A weapon being developed is the Small Diameter Bomb (SDB). This weapon weighs about 250 pounds, allowing an average tactical strike aircraft to carry eight of them instead of four 500-pound bombs. The smaller warhead permits its use closer to friendly forces, and a single aircraft can be used to attack a number of targets. Using GPS guidance SDB has demonstrated an accuracy of about one metre

when employed against targets at ranges greater than 80 kilometres.

SDB hits its target

Another weapon being developed is the Very Small Bomb (VSB). This will weigh only about 50 pounds (about the size of a single 155 millimetre artillery shell) allowing the carriage of 36 VSBs and attacks against many more targets. Precision will be the same as for SDB with a maximum engagement range of about 20 kilometres. The smaller warhead will cause less collateral damage.

Perhaps the ultimate weapon that can be envisaged at this time will be the Airborne Tactical Laser (ATL). Carried aboard an aircraft like the JSF, ATL will be powered by a generator driven by the airflow around the aircraft. With this power source there is theoretically no limit to the number of engagements that can be undertaken while the aircraft is airborne. As ATL will be a speed-of-light weapon there will hardly be any delay between weapon initiation and impact. ATL will be precise and produce no appreciable blast.

Future Uninhabited Aerial Vehicles (UAV) and Uninhabited Combat Air Vehicles (UCAV) will provide air power with increased persistence. When combined with the weapons described above, an 'omniscient' ISR system and effective network communications, they could change the concept of how the battlespace is dominated. With UAVs and UCAVs persistently positioned in the area of operations they could, in the future, be programmed to automatically suggest weapons solutions to hostile targets identified on the network as a result of ISR or human detection. The suggested weapon solution would only require clearance by the C2 system to allow execution. This will mean that air attacks could be *suggested* to commanders rather than being *initiated* by them. Timeliness of attack would be optimised and TST could be fully implemented against all adversaries.

The future will deliver significant improvements to each of the critical elements that provide battlespace superiority. The amount and quality of ISR data will steadily improve until it approaches 'military omniscience'. Air and space power will provide the connectivity across a whole force for the dissemination of ISR data and analysis. The C2 system will have near real-time access to this information and will be enabled to control TST. Air engagement systems will be enabled to rapidly carry out TST tasking and will be armed with weapons that increase the flexibility of air power application. In the future battlespace superiority will be delivered by real-time TST with precision and with no collateral damage.

- Technological changes will increase ISR pervasiveness
- Air and space communications will enable TST
- New weapons will increase the flexibility of air power application
- Battlespace superiority will extend to cover all adversaries

I think it is well for the man in the street to realise that there is no power on earth that can prevent him from being bombed.

– Stanley Baldwin
speech in House on Commons, 1931

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