Potential Game Changer for Close Air Support

Enhancing UAS Role in Contested Environments

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Introduction

The NATO Strategic Foresight Analysis[1] provides a projection of the world's strategic trends up to and beyond 2035. It predicts that asymmetric conflict scenarios will continue and that the need for collective defence against a peer or near-peer adversary will be increasingly likely. In addition, difficult, urbanized conflicts are also a probable challenge for the future, and both are likely to require modification of the Alliance's current Close Air Support (CAS) operations model.[2] Providing CAS to joint forces remains a crucial mission in the context of joint force operations. However, peer adversary capabilities, including the threat posed to Alliance platforms from Air Defence (AD) systems, will continue to develop and increase in lethality at a relentless pace. The period of uncontested operating environments is now replaced by the new paradigm of contested environments defended by adversary Anti-Access/Area Denial (A2/AD) capabilities.

Before CAS operations commence, decision-makers must weigh the effects of different airframe capabilities against critical and sensitive ground targets, while balancing friendly ground forces survivability. The allocated CAS airframes should meet the conditions for effective CAS, while minimizing vulnerability to sophisticated adversary AD systems. CAS operations will have to be effective in both non-peer and peer-level engagements/environments. In high-threat conflicts and dense airspace, the preferred choice for CAS will

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be multi-role 5th generation aircraft. In the aforementioned scenario, requesting dedicated CAS assets in order to effectively fulfil CAS requirements, while at the same time only being able to employ scarce, highly capable multi-role platforms in the CAS role due to issues of survivability is a dilemma.

Recent operations have demonstrated that Unmanned Aircraft Systems (UAS) can deliver precise effects in space and time and, therefore, could be utilized in close proximity to both friendly forces and, if necessary, non-combatants/civilians. This article intends to describe how UAS can support CAS missions and raises the question whether they might be the platform of choice for future CAS operations. In 2014, a JAPCC study[3] focused on the use of UAS in possible future combat environments where an adversary's defences pose a threat that could be higher than that seen in earlier military operations. Enhanced survivability options were explicitly defined, and the study presented more than 100 recommendations. Within this paper, some evaluations are made in light of this earlier study's opinions, recommendations, and lessons identified in recent military operations.

The Role of UAS in CAS Operations

UAS are already playing a critical role on the battlefield and provide distinct capabilities to the warfighter. These capabilities include Intelligence, Surveillance and Reconnaissance (ISR) and precision targeting during combat operations. UAS can loiter over suspected or known adversary strongholds, mostly in uncontested environments, to locate, monitor, and, if necessary, engage targets of opportunity for long periods. Now that more enhanced features are incorporated into UAS, such as carrying guided air-to-ground munitions, stealth features, or Electronic Warfare (EW) packages, these systems are touted as the future of air combat vehicles. Ideally, these capabilities would classify UAS as prime candidates for CAS opportunities. UAS have developed into vital CAS tools and are no longer considered solely an ISR asset.

Airspace Access

Some degree of control of the airspace over the battlefield is a prerequisite for CAS sorties to be flown in support of friendly ground troops. UAS are not traditionally

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AKINCI is the latest culmination of the company's drone development projects.

intended to operate in highly contested airspace where even localized access is impractical. However, in a situation where sending manned aircraft into contested airspace would pose a significantly higher risk, UAS may offer an alternative. While UAS still face risks from enemy defences, they may be based closer to the front lines, allowing for faster response and longer loiter times in support of ground operations while having a zero-risk level for aircrews.[4] Effective airspace control measures reduce the risk of fratricide, enhance UAS survivability, increase flexibility, and can strengthen UAS CAS operations.

A safe flight routing to their area of operations is paramount for UAS. If the adversary AD measures are significant, air support from UAS might be limited until the threat is reduced or neutralized. Modern UAS can fly in pre-planned airspace with precisely defined limits, thanks to the introduction of advanced systems and sensors such as redundant navigation and Satellite Communication (SATCOM) capabilities. New navigation and control technologies, coupled with the ability of modern UAS to carry more on-board sensors, have significantly improved UAS CAS capabilities. Additionally, improved stealth features, enhanced countermeasures capabilities,[5,6] and the ability to have buddy drones or small-sized UAS (such as Harpy)[7] to execute Suppression of Enemy Air Defences (SEAD) are extremely valuable in the modern-day battlespace. These can contribute towards achieving commanders' goals before the CAS mission even commences and be a game-changer in a close fight. Despite a payload capacity in large-sized UAS that allows for the carriage of multiple SEAD weapons, their size creates a vulnerability that may well make these missions quite challenging. Stand-off jamming and decoy drones might very well be essential enablers for use against integrated AD systems.[8]

With the above scenario, the logical solution is a hybrid UAS/manned Combined Air Operations package to give redundancy, safety in numbers, and the collective protection of assets. It would seem unlikely that, alone, UAS could be an effective substitute for manned fighters, but when the situation is dire, the alternative is to launch drones with enhanced capabilities to achieve mission objectives.

An example of this type of scenario was displayed during the Azerbaijan and Armenian conflicts, where the Azerbaijani's drone-led assault seemed to have scored a decisive victory over Armenian AD in the disputed enclave of Nagorno-Karabakh.[9,10] 'KARGU' smaller tactical kamikaze drones, designed for use against static or moving targets, were employed and with the help of the latest enhancements easily overwhelmed their targets.[11,12] Swarm UAS are relatively cheap, expendable, and designed to operate together in large numbers; forming a swarm to overwhelm the adversary's defences and achieve the desired military effect. These are thought to be the systems of choice for the most 'dull, dirty, or dangerous tasks'.[13] Effective use of UAS swarms in contested airspace will be crucial in guaranteeing the airspace access requirement, which is vital for CAS, especially by permanently neutralizing local adversary AD capabilities or, at least, for a defined period of time.

Integration

The integration of UAS into CAS operations requires detailed mission planning, including UAS operators' recommendations regarding tactical UAS situations, capabilities, and contingency procedures. Understanding UAS's unique capabilities and the current tactical situation will support achieving the desired effects. Today, since most NATO nations own modern UAS, there are minimal problems foreseen in understanding capabilities. However, addressing UAS CAS planning considerations (such as communications capabilities, payload status, contingency procedures, airspace deconfliction) is crucial for each service before operations commence. An increased emphasis on UAS Tactics, Techniques and Procedures in CAS training will further increase the existing synergy between services. A consideration, at this stage, that would also increase coordination and save time is to develop options for having interconnectivity or machine-to-machine interface in the communications network between elements in the CAS system.

Command and Control

CAS Command and Control (C2) requires a safe, dependable, and interoperable communications system

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KARGU

between aircrews, air control agencies, Joint Terminal Attack Controllers/Forward Air Controllers, ground forces, and fire support agencies. From a CAS standpoint, sensor and communications suites represent the system's heart and soul and ultimately determine whether UAS are compatible with CAS missions. On the battlefield, peer adversaries or non-state actors can specifically jam Global Positioning System (GPS) receivers and data links, having a significant negative impact on the operational use of UAS. A new generation of SATCOM features facilitates the UAS's potential role as a communications hub in the C2 network, assists with multi-domain operations, and, perhaps, reduces the likelihood of effective jamming or interference. UAS with radio relay capabilities in the different frequency bands (Ku, C band in Line of Sight [LOS] operations) can play a life-saving role, especially in contested environments. Some UAS upgrade programmes (like with the MQ-9 Block 5) are underway to enhance their communication capabilities in contested or remote environments.[14]

Other than the technological mitigations for challenged C2, the next best option might be to execute distributed control of critical air missions when needed. Creating more C2 nodes and handing over more responsibilities to subordinates via mission-type orders can help achieve a commander's intent.[15] In time-constrained and contested environments, the strike decision might need to be made closer to the source of target detection, like from a UAS, with the help of subordinate Tactical C2.

Accuracy

Firepower is the livelihood of CAS platforms, and it must retain accuracy under enemy fire. Accuracy is paramount to prevent fratricide and to limit the risk of collateral damage. The increasing array of UAS weapons is vital on the battlefield, providing a variety of options for planners. The MQ-9's laser-guided munitions and missiles, supplemented by the addition of a synthetic aperture radar to enable future GBU-38 Joint Direct Attack Munitions targeting, is a good example of fielded enhancements to modern UAS.[16] It is anticipated that new technology, such as the GBU-53B SDB II carried by UAS like the Predator C Avenger,[17,18] will have a positive impact on weapon performance with redundant built-in features like a tri-mode seeker to ensure accuracy, especially in an environment where GPS signals can be compromised.

Responsiveness and Timeliness

The responsiveness of Air Power is crucial for ground forces' survivability, and it often affects their scheme of

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The **ANKA-S** has been used by the Turkish Air Force for more than five years in critical air operations.

manoeuvre. Timely target acquisition is fundamental to effective and responsive CAS. UAS sensor capabilities are an essential factor for target acquisition to pinpoint enemy locations and to discriminate them from friendly troops and civilians. Longer loiter times over areas of interest with enhanced target acquisition capabilities can make UAS more valuable during operations. To further improve CAS responsiveness, the deployment of UAS to forward operating locations inside a friendly theatre provides for decreased response times and rapid movement into its Area of Operations with sustainable logistic support, including rearming and refuelling, increased loiter time, and the maintenance of UAS on alert status, which are all critical factors for consideration. To enable quick targeting decision-making and to allow delegation to the lowest possible level within engagement authority and accomplish effective CAS, air planners must have timely and accurate intelligence data regarding the enemy's capabilities and locations to make informed decisions.

Survivability

Defined as 'The capability of a system to avoid or withstand hostile environments',[19] Combat Survivability is the most significant parameter to consider when deciding whether a UAS role in CAS is sustainable. Although new UAS weapons and communications technologies bring enabler capabilities to the battlefield, UAS still have considerable limitations, such as the lack of stealth and reduced speed or manoeuvrability. Any UAS that heads into capably defended adversary airspace needs to be able to counter powerfully integrated surface-based AD systems, EW, combat aircraft, and Man Portable Air Defence Systems. The ability to cope with these threats will determine the attrition rate of UAS in such an environment. Enhancing the combat survivability of UAS is required to make them fit for purpose in a CAS scenario. This requirement depends on many factors such as the mission, the threat environment, the number of available UAS executing missions, payload capability, or potential alternative capabilities. Future UAS will need reduced radar cross-sections, threat detection and avoidance (active self-defence), damage tolerance, improved autonomous functionality, and redundant navigation system capabilities to survive in a contested environment. Reliable intelligence and detailed mission planning (unpredictable or variable flight paths) of the UAS operation will positively affect survivability. The combat survivability of a particular UAS will weigh heavily on the commander's decision whether to integrate it into operations. There must be a balance between combat survivability, mission performance, and reliability.

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TB2-BAYRAKTAR: More than 400,000 flight hours in Turkish Armed Forces.

Example of Tactical UAS Operation in a Contested Environment

Each conflict and its dynamics are different, and the operations in which friendly forces carry out missions must be shaped accordingly to the operations area. During Operation Spring Shield (2020), in Idlib, Syria, the airspace was highly contested, and friendly communications were heavily disrupted. Despite these unfavourable conditions, providing CAS and safety for ground troops was an urgent priority and local commanders had limited options. The best option was to access the operations area with intensive EW support (especially against high GPS jamming) and hit predetermined or dynamic targets using detailed intelligence information verified by friendly ground forces. The definitive solution was to pierce the contested airspace bubble. However, the critical question was which assets could provide the needed effects? The correct response with a timely, accurate, and massive standoff attack could be more important than to risk losing assets by entering into the denied airspace with minimal communications capability. Turkey used armed UAS as the primary element in Idlib (2020) and Libya (2019–2020).[20] Having a larger payload capacity, extended loiter time, redundant navigation features against GPS jamming, and being part of a resilient digital communications network among all services gave the satellite-linked ANKA-S a distinct advantage during the operations in Idlib. Over the battlefield, the ANKA-S flew in squadrons, which were able to 'Swarm' and overwhelm AD systems, quickly nullifying that defensive capability.[21] Based on the available options, the commander decided to send a massive coordinated UAS force rather than manned aircraft, which could be lost and the pilots killed, with the potential attrition negatively impacting the remaining friendly military capabilities. These technological and tactical developments of ANKA-S employment have improved overall combat survivability, without active or passive defences against air-to-air attacks or ground-based AD, as well as in adverse weather conditions.

Going Forward

UAS technology is rapidly maturing and becoming the multi-role superstar of future combat operations. By leveraging their endurance capability and amassed

firepower, UAS technology can provide timely and responsive CAS for operations. Detailed planning is critical to integrating UAS into CAS operations and requires a thorough understanding of the specific UAS capabilities and vulnerabilities to make sound tactical recommendations. There also exists a requirement for well-trained personnel, grounded in UAS operational concepts, to harmonize the tactics in contested environments. UAS are aptly suited for ISR and the attack of dynamic targets, and they can be critical in winning the battle by considering valid operational tactics and combat support planning. UAS need enhanced survival systems, if missions require them to operate in contested areas. However, not possessing the enhanced survivability equipment of manned aircraft and having speed and manoeuvre limitations as comparable to manned aircraft; these vulnerabilities inside contested environments are still an issue until new cutting-edge UAS technologies such as Unmanned Combat Aerial Vehicle with stealth and greater manoeuvrability will be centre stage in the battlespace.[22] The standard 'one-size-fits-all' solution will not always be available, and decision-makers should explicitly balance UAS roles during operations versus the risk of their loss in high-threat areas. Digesting lessons learned from past air campaigns in geopolitically sensitive and risky areas will be crucial to enhancing UAS survivability in future conflicts. ●

'The future is in the skies.'
Mustafa Kemal Atatürk

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