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MEN OR ROBOT: WHO WILL BE THE WAR HEROES OF THE FUTURE?

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Exercise Solo Flight

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EXERCISE *SOLO FLIGHT* – EXERCICE *SOLO FLIGHT*

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OTL E. Ernst

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INTRODUCTION

The employment of unmanned platforms in the military over the last decade has increased.

Throughout all services the use of unmanned military equipment becomes more and more popular. While historically the use of animals were favoured, new technology, especially in the information technologic field, improved the capability of robots.

This “Solo Flight” will focus on the unmanned weapons systems used in the air domain in the roles of Command and Control (C2) and Supression of Enemy Air Defense (SEAD). It will concentrate on the capabilities of today and the capabilities of the future until 2025. The commonly known expression “drones” is better explained using the definition Unmanned Aerial Vehicle (UAV) or Unmanned Aircraft System (UAS). Both definitions are basically describing an aircraft without a human pilot on board.

The first part of the paper will illustrate the current employment of the Airborne Warning and Control System (AWACS) and the Airborne Battlefield Command and Control Center (ABCCC) Lockheed EC-130 as two examples of Command and Control Platform in contemporary conflicts, followed by US Air Force platforms in the classical role of a SEAD platform. The second part will discuss future platforms for both above mentioned roles, which are under development, followed by a comparison of manned against unmanned platform with special focus on costs and performance. The final part will handle the legal aspect of the usage of unmanned platforms.

My thesis to the whole complex is: In the last 20 years unmanned weapons systems took over more and more functions on the battlefield. Especially in the air domain, the percentage of unmanned aerial vehicles involved in air campaigns, increased. Beside the lower costs, the usage of UAV will also decrease the danger for own casualties in an armed conflict. I argue that the air

war in the year 2025 will be in majority taken over by UAV which are controlled in a limited scale from inside the battlefield, heavily relying on support from outside the battlefield or even use artificial-intelligence to accomplish given task. The participation of “old-style” manned aircraft will be reduced to niche capabilities or air forces with less developed fleets for political reasons (coalition building to enhance legitimacy). My essay will not be concentrated on platforms only, but also on the purpose of the platform.

Contemporary Command and Control Platforms

Command and Control is used in different meanings throughout the military. In the air domain it is commonly agreed that Command is the “The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission.”¹

In the air domain the primary platform to exercise Command and Control is the Boeing 707. From the 68 aircrafts built between 1977 and 1992, the United States Air Force is holding 31 (from the original 32 – one was lost in a crash) and will upgrade 24 of them to the newest Block 40/45 standard while at the same time retiring seven to “avoid upgrade costs and harvest out-of-production components”.²

The NATO E-3A Component had originally 18 aircraft assigned, lost one during a crash and retired one in 2015 to save the costs for a expensive Depot Level Maintenance, while reclaiming critical spare parts – the cost factor will be discussed later in this essay.

¹ Dictionary of Military and Associated Terms. US Department of Defense 2005

² Drew, James.” Boeing E-3G makes Middle East combat debut “. Flight Global Magazine (Washington 2015)

A smaller amount of Boeing 707 AWACS can be found in the Royal Air Force, in the French Air Force and in the Royal Saudi Air Force.

While the role of the AWACS in the current Ukraine conflict up to current date is to “enhance the recognised Air and Maritime picture”³ over the Black Sea and the adjacent region, the history of the accomplished missions in the Command and Control function is quite long.

Starting in 1983 with the support of “Operation Urgent Fury” in Grenada to coordinate Navy A-7 Corsairs, Marine AH-1 Cobra attack helicopters and Air Force C-130 in the support roles for Land Forces, followed 6 years later by the coordination of the Air Forces (appr. 300 aircraft in different roles) during “Operation Just Cause” in Panama to depose the dictator Manuel Norriega. Following the invasion of Kuwait, the AWACS played a vital role in the “Operation Desert Storm” where it commanded the air portion of the battlefield and controlled in over 7000h combat hours over 20000 air refueling sorties giving away gas to more than 60000 receiving aircrafts. During the conflict of the split up of Yugoslavia in the 90s, AWACS aircraft flew in their command and control role more than 10000h followed by another 30000h in support of the Global War on Terrorisim in the aftermath of the September 2001 attacks in the US. All these hours were flown as it was pretty obvious that a “contested airspace needs a strong command and control capability”⁴

A second valuable platform was the EC-130E ABCCC which was retired in 2002, after being in the service for 34 years, from the US Air Force to reduce the overall costs. The platform consisted of a modified C-130 “ Hercules” designed to carry an ABCCC Capsules to provide in

³ www.shape.nato.int

⁴ Stieglitz, Klaus-Peter. NATO AWACS Component Commander in a Press Conference 24th Mar 1999 in Geilenkirchen/ Germany

their primary mission “flexibility in the overall control of tactical air resources”.⁵ This mission was taken over by the AWACS after the decommissioning of the ABCCC fleet.

The history shows clearly that Airborne Command and Control platforms play a vital role in the last 40 years. The operators on board of the platform are accomplishing the mission with the support of the platform.

Suppression of Enemy Air Defenses (SEAD)

To understand the development from manned to unmanned systems, we need to take a look on the history of SEAD. SEAD is defined as” That activity which neutralizes, destroys, or temporarily degrades surface-based enemy air defenses by destructive and/or disruptive means”.⁶

The idea of the SEAD was founded in World War II as the German Air Force was trying to destroy Great Britain’s Chain Home⁷ radar stations.

Prior to the Vietnam War, SEAD was an undefined mission; although attempts to destroy enemy air defense sites were undertaken, they were done so on an individual aircraft basis and in relation to specific targets or operations rather than as part of an overall strategy or doctrine of defense suppression. World War II changed the approach to SEAD. Understanding the importance of Germany’s radar sites, the Allies directed attacks against these installations and introduced new technology to counteract the effects of radar-directed anti-air artillery (AAA). Bombing missions were also carried out to accomplish the physical destruction of AAA sites. At the same time in the Pacific, the Allies were concerned over the large number of Japanese radar sites located on the home island. To overcome this concern, the B-29 and the B-24 were fitted

⁵ www.globalsecurity.org

⁶ Dictionary of Military and Associated Terms. US Department of Defense 2005

⁷ Chain Home was the codename for the ring of coastal early warning radar stations built by the Royal Air Force before and during World War II to detect and track aircraft.

with radar-homing devices to locate and identify radar transmissions. The findings were passed to follow-on mission, which then destroyed the targets.

The Vietnam war saw the evolution of what would become known as SEAD over the course of the conflict. In 1965 the US Air Force lost 15% of their aircrafts due to the first Integrated Air Defense System (IADS) established by the North Vietnam Army.

Further development during the Korean War and the Vietnam War led to the most popular SEAD platform, the “Wild Weasel V”, an F-4G built on the platform of an F-4E capable of holding specialized detection equipment paired with the AGM-88 High-speed Anti-Radiation Missile (HARM). Currently the US Air Force is holding EA-18G “Growler”, F-16CJ “Fighting Falcons” and EA-6B “Prowler” in their inventory to work in the SEAD role.

The future of Command and Control platforms

In 2003 the US Air Force was searching for a platform to be designed to combine the roles of the AWACS, the ABCCC and also the JSTARS to one platform. Northrop Grumman, together with Boeing and Raytheon, was awarded a \$215 million dollar contract to produce a prototype of a theatre-wide airborne combat command and control centre. The program name was MC2A which was an acronym for Multi Sensor Command and Control Aircraft. Initial studies foresaw an unmanned version, based on the Boeing 767, to incorporate air- and ground search radars into the platform enabling the control of other unmanned combat air vehicles and considering making it to the central command authority for all air, land, and sea forces in an area of operation. Interference amongst the sensors, paired with insufficient power generation, changed the program to split into three different airframes/platforms. The then planned platform to replace the AWACS capability was manned again to overcome bandwidth problems to enable the

operator of the mission system on the ground to accomplish his task – so basically the whole program turned out to be a simple, but expensive, replacement of an existing platform without gaining any additional benefit. Throughout the world, there seems to be no initiative anymore to replace the AWACS with an unmanned platform.

Lt Gen Denis Mercier sees the future of Command and Control in his article for the Air & Space Power Journal in 2012 as “...by 2025 we may begin to conduct continuous area surveillance with great accuracy and a proper refresh rate from satellites”.⁸ This would also enable higher commands to access the data in real time and exercise command and control over assets – a gap which is currently filled by the AWACS. General Mercier even went a step further by stating.” If the accuracy of intelligence obtained through satellites becomes widespread, transmitting from space in real time over a given area would represent a true breakthrough in terms of surveillance capabilities”.⁹ And this seems to be the way ahead for the future of Command and Control platforms – they will become obsolete as soon as the technical development finds a solution of overcoming the limited bandwidth in data exchange between satellites and the “customer” at the frontline. This is concordant with the lack of interest of to replace the AWACS fleet beyond 2035.

Suppression of Enemy Air Defenses

While the main focus to take over the SEAD role in the US AIR Force is on the F-35A, there also different opinions on the way ahead.

The Defense Advanced Research Projects Agency (DARPA) is an agency of the U.S.

Department of Defense responsible for the development of emerging technologies for use by the

⁸ Mercier, Denis in Air &Space Power Journal May-June 2012 :21

⁹ Ibid : 22

military. The company is commonly acknowledged as the Pentagon's main research arm is currently working on a project which is called "Aircraft carriers in the sky" and "Gremlins". The "Aircraft carriers in the sky"- program is about to launch a competition for proposals to build a large aircraft, similar to a C-130, that could carry and distribute aerial drones across a large area.¹⁰ The DARPA program manager Dan Patt sees the future in this field in "we want to find ways to make smaller aircraft more effective, and one promising idea is enabling existing large aircraft, with minimal modification, to become aircraft carriers in the sky". The US Air Force is naming this type of cooperation the "blended approach" In combination with the "Gremlins" program, a system which "... would be deployed with a mixture of mission payloads capable of generating a variety of effects in a distributed and coordinated manner, providing U.S. forces with improved operational flexibility at a lower cost than is possible with conventional, monolithic platforms".¹¹

The combination of both systems would allow the US Air Force to deliver effects on the battlefield in a robust, responsive and affordable manner.¹² The collected "Gremlins" would be used for an average of 20 missions before being replaced by new ones. It is expected that the mission and maintenance costs for the "Air Carriers" and the "Gremlins" are significant lower than for conventional platforms.

DARPA foresees to have a constructive model in place within the next four years.

Comparison manned versus unmanned aerial vehicles

¹⁰ <http://www.defensetech.org/2014/11/12/pentagon-wants-to-build-aircraft-carriers-in-the-sky> last accessed 6 May 2016

¹¹ <http://www.darpa.mil/news-events/2016-03-31>

¹² <http://www.darpa.mil/news-events/2016-03-31>

There are many pros and cons concerning the usage of unmanned aerial. I will focus on the costs as a financial factor, but also on the “costs” of bringing life to danger. The first costs in the present time, when all countries are reducing their budgets for the military, is a strong argument to gain political support for development in this domain – being less expensive with the same effects, will be supported by the politics and the society. The “costs of own lives” is a factor, which is getting more and more important to gain political and social support for an operation, either at the beginning or in the sustainment of.

Costs

The NATO AWACS program is currently using a 375 million CA-\$ yearly budget operating 16 modified Boeing 707. The aircrafts will remain in service until 2035 and it is predicted that while the maintenance costs will stay stable, the spare parts will be more difficult to obtain and will be more expensive. The program costs are currently shared by 15 different NATO nations, which decreases the costs for a particular nation. At the same time, every modification or upgrade needs to be approved by the participating nations.

The MC2A program was stopped completely in 2007. The split into three different platforms did not “survive” the reductions in the US Air Force budget for 2007.

Due to the unavailability of alternatives (especially an unmanned version), we cannot judge if there is currently a cheaper way to conduct command and control on the battlefield. In the future with the gap filling satellite technology, which will bridge the gap from command centers direct to the executing platform, the costs to keep an AWACS program running can be assigned in a more efficient way.

This is completely different in the comparison of the costs of manned and unmanned SEAD platforms. The unit costs for a F-16CJ “Fighting Falcon” is approximately 30US\$ million, while the EA-18G “Growler” costs 68US\$ million and the EA-6B “Prowler” around 50US\$ million. The next generation of SEAD platform in the US Air Force will be partly accomplished by the F-35As with a single unit cost of 127US\$ million. The costs of the “Gremlins” will be around US\$ 200 thousand, which equals to 10.000 US\$ per flight. To achieve a comparable number with the F-35 would mean to fly around 12.700 missions with a single aircraft.

Performance

Several characteristics of UASs can make C2 particularly challenging. UAS communication links are more critical than those required for manned systems. In the event of a loss of communication, a manned aircraft will normally continue its mission and return afterwards to home base. UAS are usually programmed to abort their mission and return home base. For them a continuous connectivity to their command centre is vital.¹³

Compliance with Airspace Control Order is critical. Unlike manned aircraft, UASs cannot typically “see and avoid” other aircraft. Additionally, UASs generally have small radar and signal signatures, and may not have identification, friend or foe capability or simply do not want to emit any data for covert operations.

Depending on the type of the UASs and the planned mission, planners need to consider not just the weather at the home base and the target area, they need to pay attention also to the weather between the UASs and the control location, either the Line of Sight-UAS or the satellite (as a

¹³ DoD US, Joint Publication 3-30, Command and Control of Joint Air Operations, 10 February 2014.75

relay station) and the UAS. Therefore the advantage of the duration of flight of an UAV might be counterbalanced by unfavorable weather and climate conditions.

Legal aspect

At present time there is no national or international law which is covering the legal perspective to guide or regulate the usage of autonomous flying unmanned aerial vehicle. Taking Germany as an example, unmanned aerial vehicles are treated according to the rules which are also valid for model aeroplane. There are also limitations for the flying height, the location of flights, a limitation for the maximum weight, the permissible noise and the need for an insurance.

Battlefield and Combatant

Operators of drones or unmanned aerial vehicles are legal combatants as long as they are belonging to any kind of military forces. As such it would be lawful for an adversary to fight against this operators. Recent reports of the Los Angeles Times in December of 2015 discovered that the US Air Force is employing civilian contractors to control Drones in Combat Air Patrols. Here is where the situation is conflicting with the Law of Armed Conflict. While the US Air Force is insisting on, that the civilian contractors are not involved in actual combat, critics see the contractor being involved in the “kill-chain”. Another challenge with the change from manned to unmanned aerial vehicles is the definition of the war zone. A pilot sitting in his aircraft bombing the enemy is inside the war zone and a legitimate combatant for the time being. The drone operator thousands of miles away is working under the same conditions and is at the same time extending the battlefield in reality up to his working position.

Conclusion

The battlefield of the future will see some significant changes. The technical development to more capable unmanned aerial vehicles with distinct capabilities to an incomparable lower price will trigger the appetite to change or adjust current Air Force fleets throughout the world to increase the number of unmanned aerial vehicles. Shrinking defense budgets will support this change. While in the SEAD role it is out of question that the future missions of manned aircraft like the “Prowler”, The “Fighting Falcon” and the “Growler” will slowly be taken over by UAVs to reduce the risk for man and machine, the future of the AWACS in the command and control role will remain with the manned platforms due to lack of alternatives. But also the AWACS program will not survive the near future. At present time the AWACS seems to be without any alternative on the battlefield in the command and control role, but the next generation of satellites combined with an improved data exchange capability close to real-time, might be bringing the very expensive AWACS to an earlier end than 2035. Therefore my thesis of a unmanned aerial vehicles taking over the battlefield of tomorrow’s war, is only limited valid. The proportion will change over the next decade, but there will be still manned aircraft playing a vital role on the battlefield.

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