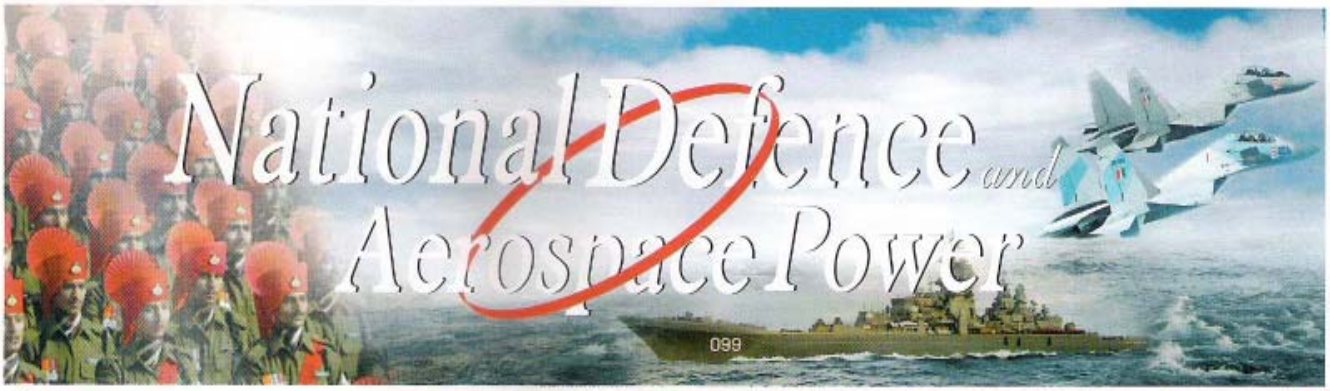

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AIR SEA BATTLE AND THE X-47B

Arjun Subramanian P
Associate Fellow, Centre for Air Power Studies, New Delhi

The United States recently conducted the first ever carrier launch of a low-observable Unmanned Combat Aerial Vehicle (UCAV)- the X-47B from the USS George H.W. Bush.[1]This is a milestone in aviation history for it is the first carrier based launch of an unmanned stealth combat UAV. More importantly, it is capable of autonomous operation without significant human intervention. X-47B is a computer-controlled unmanned aircraft system that takes off, flies a pre-programmed mission, and then returns to base in response to mouse clicks from its mission operator. The mission operator monitors the X-47B air vehicle's operation, but does not actively "fly" it via remote control as is the case for other unmanned systems currently in operation.[2] This experimental platform if deployed will have a considerable impact on the military balance between US and its potential adversaries as it comes as one effective instrument among others in the Air Sea Battle (ASB) concept which attempts to preserve U.S ability to project power and maintain freedom of action in the global commons and contested environments. Once the deployment version of this technology is operational, it will take the Air Sea Battle concept a step closer towards realisation.

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The Air Sea Battle concept is the military component of the larger US policy of 'Pivoting' to Asia. Arguably, the US 'Asia Pivot' is a major policy shift driven by the rapid rise of China.[3] The challenge posed by China to the US dominance in the region alarmed Washington to begin reorienting its resources from other priorities across the world to this region. Unlike other regions where only the Chinese political and economic influence is growing, in East Asia it is coupled with China's military might threatening the ability of the US armed forces to project power in this part of the region. As part of the US policy of 'Asian Pivot', the US Navy will shift sixty percent of its forces to the Asia Pacific region.[4]The US armed forces have since the time of the World War II have grown to become an expeditionary war fighting force in which the US Navy plays the primary role. Since then, the US has placed its aircraft carriers at the centre of its war fighting concept.

For the last couple of decades China has been developing asymmetric capabilities as part of its Anti-Access and Area Denial (A2/AD) strategy to challenge US ability to project power.ItsA2/AD capability rests on highly capable land attack ballistic and cruise missiles, aircraft with stand-off strike capability, shore-based; ship-based anti-ship cruise missiles, a large submarine force assisted by improving networked-surveillance - architecture which includes advanced radars, satellites and highly capable air defence systems. Its anti-ship cruise missiles are a mix of Russian and indigenously produced (based on Russian ASCM) missiles. Cruise missiles like the SS-N-22 and SS-N-27 are specifically designed to strike aircraft carriers and other large ships. These missiles have a combination of very high supersonic terminal velocity, ability to perform complex terminal manoeuvres, low trajectory and very high accuracy enabled by terminal active homing sensors which could potentially defeat any ship borne defences. These potent missiles are fitted in China's destroyers, missile boats and submarines and can even be delivered by air which increases the sanitised area.The Chinese are also developing the Anti-

Ship Ballistic Missile (ASBM), which is being developed to target carriers at longer distances. All these developments forced the US Navy to a certain extent rethink the centrality of carrier in future operations. The carrier centric battle concept has some drawbacks when employed against the PLA's A2/AD strategy, particularly due to the limitations of its air wing, which primarily consists of the F/A-18 aircraft having an unrefueled combat radius of 1472km[5]with external fuel tanks. This becomes a handicap for the Carrier Battle Group (CBG) as it becomes vulnerable to Chinese missile attacks as the carrier has to position itself close to the Chinese shore within hostile waters for its air wing to reach its target area. The F/A-18 has a large Radar Cross Section (RCS) and hence is it is not capable of surviving in hostile airspace defended by advanced SAMs deployed by China. In addition to this the available US airbases around China are becoming increasingly vulnerable to Chinese ballistic and cruise missile strikes and air attacks making them less reliable.

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Looking For a Solution

The United States is working out a number of technology-based solutions as part of its Air Sea Battle concept to overcome the challenges presented by China. It was realised that one solution to this problem lies in developing and deploying platforms with longer range to avoid the dependence on theatre airbases and the ability to survive in hostile airspace for sufficient duration i.e., longer On-Station Time (OST) to hit targets of opportunity like mobile systems as the Chinese surface-to-surface missile and SAM units are mobile which are likely to be the primary targets during the initial hours of any military operation along with command and control systems. Northrop Grumman was tasked with developing the Next Generation Long-Range Strike System (NGRLS).[6]This system will have the above mentioned capability i.e., stealth, sufficient On Station Time and longer range reducing the dependence on theatre air bases and carriers. But some drawbacks associated with this system would be the reduced number of sorties due to the long range operation of the aircraft and pilot fatigue. The reduced number of sorties would bite on the operation intensity, which would be required, particularly, during the initial phase of a conflict.

Some US Navy officials are also saying the unthinkable - that the navy should rely less on carriers. The most extreme solution is to build fewer carriers and more destroyers and rely on cruise missiles fired from surface ships and submarines, instead of smart bombs dropped by carrier aircrafts.[7] This is a workable concept except for the enormous number of cruise missiles that have to be deployed and the very high cost involved. The drawback in all cruise missiles has always been economic – the fraction of warhead weight to total weapon weight has typically been less than 50%, while the cost of these weapons has been of the order of 50 times or greater than guided bombs. Complex guidance and propulsion systems have been the main cost drivers. While the US has repeatedly performed large scale bombardments using upto several hundred weapons per bombing campaign, the cost proved unsustainable even for the US budget[8]as a single missile costs $ 1.5 million.[9]

Another programme towards addressing this problem was to build a tailless, strike fighter-sized unmanned aircraft which was awarded to Northrop Grumman in 2007 as part of the U.S. Navy's Unmanned Combat Air System Carrier Demonstration (UCAS-D) programme.[10] This aircraft will be used to demonstrate the first carrier based launches and recoveries by an autonomous, low-observable-relevant unmanned aircraft. A successful UCAS-D flight test programme, including a series of successful carrier-based launches and recoveries, will help set the stage for the development of a more permanent, carrier-based fleet of unmanned aircraft.[11] Recently, a successful launch and touch-down of the UCAV was demonstrated from the USS George H.W Bush. This marks the beginning of an era of unmanned carrier borne combat aircraft sorties. However, manned carrier borne fighter sorties are sure to stay at least for a couple of decades more. TheX-47B which is under testing is a bomber aircraft designed to deliver guided bombs on targets; the sensor package indicates that it is entirely a precision bomber plane. Hence for air-to-air combat, manned fighters will continue to be used until a strong necessity arises for unmanned air-to-air combat. Moreover, compared

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to other programmes, this solution is comparatively cheaper and can be used on the existing aircraft carriers.

A Step Closer Towards Implementing Air Sea Battle Concept

The X-47B has a an unrefueled radius of action of around 1000 nm and also has autonomous mid-air refuelling capability which enables the Carrier Battle Group to operate from a considerably safe distance from the Chinese shores. This will permit the refuelling tankers also to operate and refuel the UCAV from a safe distance. The UCAS-D will feature both probe-and-drogue of the US Navy and boom-receptacle mechanisms of the USAF for autonomous air refuelling.[12] This gives the UCAV extended radius of action and coupled with the reduced RCS enables the aircraft to perform deep strike bombing missions in hostile airspace. The longer range and better endurance permits the carrier to generate high sortie rates. It is also capable of withstanding radiation levels that would kill a human pilot and destroy a regular jet's electronics: in addition to conventional bombs, successors to this test plane could be equipped to carry a High-Power Microwave (HPM), a device that emits a burst of radiation that would fry a tech-savvy enemy's power grids, knocking out everything connected to it, including computer networks that connect satellites, ships and precision-guided missiles.[13]It is to be noted that in 2012 the US had successfully tested a HPM weapon.

One drawback with this aircraft is its low payload capacity of4100lb. To address this shortfall, the UCAV might have been optimised to carry the GBU-39 and GBU-53/B Small Diameter Bomb (SDB), which has very low Circular Error Probable (CEP), the ability to hit a moving target and penetrate hardened targets thereby reducing the Over the Target (OTH) requirement.

One drawback with this aircraft is its low payload capacity of4100lb. To address this shortfall, the UCAV might have been optimised to carry the GBU-39 and GBU-53/B Small Diameter Bomb (SDB), which has very low Circular Error Probable (CEP), the ability to hit a moving target and penetrate hardened targets thereby reducing the Over the Target (OTH) requirement. Moreover, more sorties can be generated to compensate for the low payload as it will be launched from aircraft carrier comparatively close to the target area than other long range system which has to operate from land bases from far off bases. However, it is prudent to expect that the US carriers will employ a hi-low mix of X-47B variants and F/A-18's. The X-47B could be assigned the initial sorties with the task of kicking the door open by performing Supression of Enemy Air Defence (SEAD), Destruction of Enemy Air Defence (DEAD) operations and performing maritime strike roles to clear PLAN missile carriers and other key maritime surveillance nodes in the Chinese C4ISR permitting the carriers to close in towards the shore enabling the use of shorter range non-stealth aircrafts. Nevertheless, sorties of the stealth UCAV will also have to be launched in conjunction with other non-stealth aircraft missions throughout the campaign as the Chinese SAM units are mobile and will perform shoot-and-scoot to increase their own unit's survivability. Mobile SAM units when used with good tactics are hard to suppress or destroy. During the air campaign of Kosovo in 1999, the Serbs applied brilliant tactics to evade attacks from allied aircrafts. The Serbs kept their SAMs defensively dispersed and operating in an emission-control mode, prompting concern that they meant to draw NATO aircraft down to lower altitudes for easier engagement. Before the initial strikes, there were reports of a large-scale dispersal of SA-3 and SA-6 batteries from nearly all of the known garrisons. The understandable reluctance of enemy SAM operators to emit and thus render themselves cooperative targets made them much harder to find and attack, forcing allied aircrews to remain constantly alert to the radar-guided SAM threat through- out the war.[14] Since the X-47B will have mid-air refuelling capability it has the advantage of extended on-station time (OST) permitting it to take out pop up air defence system targets to clear the corridor for the incoming strike from non-stealth aircraft strike packages.

It can be expected that the primary role of this UCAV could be to kick the door open by suppressing enemy air defence and anti-ship missile units and clear the way for other non-stealthy platforms to begin operation.

Conclusion

The introduction of carrier based long-range unmanned stealth combat UCAV reduces the necessity for theatre air bases around the enemy country on which the US campaigns have so far depended for maintaining high intense sortie rates. This development will also retain the role and position of aircraft carriers in

future US military campaigns. Moreover, it also comes as a cost effective solution compared to other projects of similar kind. This UCAV addresses the two main problems in penetrating the Chinese bastion: anti-ship capability and the advanced air defence network which includes potent SAM systems such as the SA-10s and SA-20s. It can be expected that the primary role of this UCAV could be to kick the door open by suppressing enemy air defence and anti-ship missile units and clear the way for other non-stealthy platforms to begin operation. This technology-based solution comes as one of the effective tools in the Air Sea Battle concept, which aims at ensuring freedom of operation in severely restricted environments.

Notes

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Centre for Air Power Studies
P-284, Arjan Path, Subroto Park, New Delhi 110010
Tel: +91 11 25699130/32, Fax: +91 11 25682533

Editor: Dr Shalini Chawla e-mail: shaluchawla@yahoo.com