CENTRE for AEROSPACE & SECURITY STUDIES

# Hybrid Character of Aerospace Power

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***Working Paper***

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## Abstract

*Although the term 'hybrid' has grown incredibly popular, the field of aerospace power is where its true meaning may be found. Strategists were quickly drawn to using the air as a military medium as a result of the development of air power. The race to reach the stars then began, and today it is thought that whoever has control of the air and space will have a strategic edge over the adversary. In this regard, it is also imperative to note the importance of Intelligence, Surveillance, and Reconnaissance (ISR), human intelligence, integration, and hybrid warfare in enhancing aerospace power. This Working Paper, based on secondary sources, explores the hybrid use of aerospace power to put oneself in an advantageous position over the enemy in any future confrontation, notably in the Indo-Pak scenario.*

**Keywords:** Pakistan, India, Aerospace Power, Pakistan Air Force.

## Introduction

Air, space, and the combination of air and space power are all aspects of aerospace power,[1] while, air power is 'the ability to do something in or through the air, and as the air covers the whole air space, aircraft can go anywhere on the planet.'[2] The addition of space in air power is aerospace power.[3] The term hybrid means 'a mixed character, composed of different elements.'[4] So, one can define the hybrid character of aerospace power as having characteristics beneficial for both civilian and military purposes. Though there are many distinct features of aerospace power, some of them are explained in detail to define aerospace power's hybrid character. It combines features of the air and space medium.

For instance, the air medium is characterised by its ability to provide elevation above the Earth's surface, allowing freedom of motion and from barriers. In addition to that, due to weather conditions, it does not support continuous presence in the air, which is a drawback. It carries economic value as well and states have a sovereign right over their airspace.[5] Space medium has its distinct characteristics such as it provides freedom beyond the Earth's surface within the expanse of space. It provides sovereignty to space vehicles. It has several non-military uses that provide economic benefits.[6]

This *Working Paper* attempts to highlight the significance of hybrid characteristics of aerospace power by briefly going through its features to gain dominance over the other state. The paper will also briefly look into the role of Intelligence, Surveillance, and reconnaissance (ISR), human intelligence and hybrid warfare and how states employ these tools in an operational environment. In this regard, a case study of India and Pakistan will further help to understand the topic under discussion. The study used qualitative methods of research and secondary sources were used as a reference.

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1 Clayton K.S. Chun, *Aerospace Power in the Twenty-First Century* (Colorado: Air University Press, 2010).
2 Ibid.
3 Alec M. Robinson, *Distinguishing Space Power from Air Power: Implications for the Space Force Debate,* report (Alabama: Air University, 1998), https://spp.fas.org/eprint/98-239.pdf.
4 *Collins English Dictionary*, s.v. "hybrid."
5 Robinson, *Distinguishing Space Power from Air Power*.
6 Robinson, *Distinguishing Space Power from Air Power*.

## Aerospace Domain

The characteristics of the aerospace medium and how its hybrid character can be beneficial for the states include:

1. Flexibility
2. Speed and Range
3. Freedom of Action

### 1. Flexibility

One of the distinguishing characteristics of an aerospace power is its ability to operate in multidimensional domains.[7] Considering it from the military perspective, aerospace power possesses innate adaptability that allows it to plan freely during a crisis. For example, a state can plan an attack on an opponent at one location, respond quickly to a threat at another location, or return to a base other than the one from which it launched.[8] Due to its ability to adapt quickly to changing situations during wartime scenarios, it can be deployed in several ways. Flexibility allows aerospace to exploit mass and manoeuvre simultaneously.

### 2. Speed & Range

With aircraft and space systems development, modern military operations have extended to a critical component, i.e., speed. This is an added advantage that aerospace power has. Land forces face a challenge here to respond to rapidly changing conditions when it comes to difficult terrains such as mountains and rivers. The level of difficulty eventually slows down their speed and decreases range. On the other hand, aircraft and space systems can perform multiple missions in the time that takes land and possibly naval forces as well to accomplish a single mission. Therefore, aerospace forces are swift, and this characteristic is a corollary of the reactivity of aerospace power to situations. For instance, in 2019, during Operation Swift Retort, Pakistan Air Force (PAF) shot down an Indian fighter aircraft the moment it crossed the Pakistani border. It required precision with speed and accuracy to shoot down an

7 Chun, *Aerospace Power in the Twenty-First Century*, 4.
8 Ibid.

aircraft in a matter of seconds. So, speed and precision are the two most important elements of aerospace power, which allow freedom of action.

### 3. Freedom of Action

Greater speed and range open up additional possibilities and opportunities for executing operations, offering more freedom. The freedom of action allows an aerospace power to pick from a number of missions. Because of the large number of targets that can be attacked, it has a broader scope. On the other hand, land forces are often required to attack opposing forces one by one on a front. This limitation could suffocate ground operations and, as a result, the entire plan as a whole. Due to this freedom of action aerospace power is in an advantageous position and can achieve a wide variety of objectives in a short period.

## Characteristics of Hybrid Aerospace Power

In the technology-driven world, the duration of armed conflict between states is shrinking and states are more concerned about achieving their political objectives and strategic effects in a short period. Here aerospace power due to its flexibility, accuracy, and availability in a short period makes it a weapon of first choice.

Aerospace power has an innate hybrid nature in its application. An aerospace force offers a wide range of alternatives and possibilities that aircraft and space systems can assist in both peaceful and crisis situations in the civil and military spheres. Militarily, this force application may range from achieving air superiority over the enemy to the use of weapons, or keeping an eye through Intelligence, Surveillance and Reconnaissance (ISR), secure communication, early warning, and situational awareness on the battlefield. Civilian uses involve several applications, such as maintaining communication, weather forecast, relief missions etc. The use of air and space forces is widespread, but they can also work together to complete a single mission.

Aerospace forces can also quickly focus a state's operations against a single target or a group of targets while bearing in mind resource scarcity. A state can have an overwhelming force against an adversary in one situation and shift quickly against another enemy location within minutes due to the speed, range, and flexibility of aerospace forces. However, because aerospace operations need to be adaptable, the state needs to be able to swiftly alter an intended course of action or respond to unforeseen circumstances. The ability to carry out activities, alter plans, and use aerospace power will determine whether the situation is favourable.

The pace and course of events can also be influenced by aerospace power. Aerospace forces can be deployed to strike enemy positions and provoke or shape the enemy's response. If the goal is to influence an adversary's reaction, he'll need split-second coordination of activities and decisions to counterbalance the opposing forces' actions.[9]

The fast-paced nature of operations necessitates quick decision-making. Accurate information is an essential requirement for the quick action and flexible application of

[9] Chun, *Aerospace Power in the Twenty-First Century*, 5.

force. An aerospace power must be able to collect, analyse, and integrate data in order to make successful decisions. Here, the challenge is that it may be required to choose between carrying out scheduled missions or assisting in another action such as of the land or naval forces. It should be based on an assessment of objectives against the potential benefits of pursuing an alternate requirement.

Military leaders demand a head start in any military battle when they combine swift logistical ability at relatively extended ranges with speed. Geospatial intelligence and satellite communication, along with precise real-time data, make an enormously crucial component of desired air power.

### 1. Role of ISR

In conventional warfare, the use of air power in ground attacks becomes critical because military commanders want a sense of battlespace, or an understanding of the operating environment in order to assess potential threats. This also entails laying out strategies, deploying forces, and conducting operations in the given environment.[10] To collect this information, one needs a well-organised and huge data set about the network. No single sensor or approach can offer all of the necessary information. However, at all levels of conflict, 'layered' ISR, which is a distinguishing feature of aerospace power, can resolve this problem.

In recent years, the ISR sector has been dominated by aerospace powers using Unmanned Aerial Vehicles (UAVs). Because of their enhanced situational awareness, precision, reconnaissance capability, and endurance, the UAVs can provide these for extended periods. Airborne assets have a longer range than ground systems, making them superior for providing protected intelligence to land forces as well. Airborne Early Warning and Combat Systems (AEW&CS) are an example of systems that give in-depth knowledge to not just air forces but also land and marine forces.

### 2. Role of Human Intelligence

Human intelligence (HUMINT) is the oldest means of acquiring information. With the passage of time and technological advancements, HUMINT's scope is narrowing in terms of speed, flexibility, and data gathering. It can provide crucial cuing in the event

[10] Johnny R. Jones n.d., *Air Power*, report (Alabama: Air University), https://www.airuniversity.af.edu/Portals/10/ASPJ/journals/Chronicles/jjones.pdf.

of a disagreement using a mix of ISR. Its efficient employment during counterinsurgency (COIN) operations can be considered an integral aspect of the layered structure. This not only assists in verification of the information gathered but also adds details about operational plans as well.[11]

After being tipped by a HUMINT source, reinforced by Signals intelligence (SIGINT) intercept, and then tracked by hours of airborne ISR, the fighter aircraft can move in for the strike. This collaborative and cross-disciplinary effort demonstrates that no entity can function effectively in isolation.[12] During COIN operations in Swat and North Waziristan Agency, the PAF made considerable use of similar strategies and attained success.

**Figure 1: Use of Human-Intelligence in Aerial Operations**


***Source:*** Michael W. Isherwood, "Airpower for Hybrid War," *Airforce Magazine*, October, 2009, https://www.airforcemag.com/PDF/MagazineArchive/Documents/2009/October%202009/1009hybrid.pdf.

## 3. Role of Manoeuvring Capability

An aerospace power has a manoeuvre advantage that defines its hybrid character. This advantage in striking enemies cannot be quantified solely in terms of the tons of weapons used. It is the manoeuvring capability that is important and effective over ground forces. The continuous presence against hostile targets near friendly forces requires a high-level of integration due to proximity to the enemy forces. Here, Close Air Support (CAS) greatly reduces the threat. Besides their defence, CAS aircraft

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11 David J. Clark, *The Vital Role of Intelligence in Counterinsurgency Operations, USAWC Strategy Research Project*, report, (Pennsylvania: U.S. Army War College, 2006), https://apps.dtic.mil/sti/pdfs/ADA448457.pdf.

12 Michael W. Isherwood, "Airpower for Hybrid War," *Airforce Magazine*, October, 2009, https://www.airforcemag.com/PDF/MagazineArchive/Documents/2009/October%202009/1009hybrid.pdf.

provides column cover for ground forces as they advance; and the manoeuvring capability of an aircraft gives it an added advantage during air-to-air combat.[13]

## 4. Role of Integration

The large number of military and non-military groups engaging in the hybrid campaign necessitates the integration of their plans and actions. Given their diverse activities, this synchronization and collaboration can be difficult; yet the nature of the task necessitates that the collective effort is focused. With vast experience linking and controlling groups over long distances, an aerospace power can satisfy this specific need.

The unity of effort is enabled through space-based communications and cutting-edge Information Technology (IT) and planning tools. While all warfighting elements rely on these resources, aerospace power is unique in that sense as it employs such extensive and interconnected networks regularly. Next comes the element of integrating networks to bring all forces in unison, air, land, naval, and civil government. Aerospace power provides a network to unify all actors and provides an effective platform for joint operations from planning to coordination and execution phase.[14]

Given the unpredictability and uncertainty of hybrid battlespace, to enhance the effectiveness and efficiency of the battlefield forces, additional tools are required. Aerospace power allows such tools in the form of secure communication, early warning, and situational awareness to integrate all distributed resources, units, and capabilities.[15] In the case of conventional war, the role of the air force becomes increasingly important when it comes to ground attacks to minimise collateral damage.[16]

The use of aerospace mediums during warfare enables the military forces to collaborate effectively for joint operations. Since small wars are time-sensitive, aerospace power provide quick, short, flexible, and effective responses alone or with

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13 Grover E. Meyers, *Aerospace Power: The Case for Indivisible Application* (Alabama: Air University Press, 1986), https://www.airuniversity.af.edu/Portals/10/AUPress/Books/B_0015_MYERS_AEROSPACE_POWER.pdf.

14 Isherwood, “Airpower for Hybrid War.”

15 Ibid.

16 S. Alalawi, *Airpower Necessity in Hybrid Warfare*, report (Toronto: Canadian Forces College, 2017), https://www.cfc.forces.gc.ca/259/290/402/305/alalawi.pdf.

other forces combined keeping the surprise element intact. Attacking the centre of gravity of the enemy forces can change the entire course of the war and according to Sun Tzu 'Those who are skilled in producing surprises will win.'[17]

## 5. Use in Hybrid Warfare

With the advent of Fifth Generation Warfare, hybrid warfare has gained an advantage over any other mode of warfare. Aerospace power has the capability to support hybrid warfare due to its overlapping characteristics. Some of them are discussed in Table 1:

**Table 1: Characteristics of Hybrid Warfare & Aerospace Power**

| Characteristics | Hybrid Warfare | Aerospace Power |
|---|---|---|
| **Level** | Tactical, operational & strategic | Tactical, operational & strategic |
| **Use of Military Operations** | Conventional & non-conventional | Conventional & non-conventional |
| **Engagement** | Protracted or short | Short & quick |
| **Speed** | Can be varied | Can be varied |
| **Flexibility** | Flexible & adapts quickly | Flexible & adapts quickly |
| **Freedom of Action** | Yes | Yes |
| **Manoeuverability** | Manoeuverable | Manoeuverable |
| **Type of Action** | Overt & covert | Overt & covert |
| **Period of Action** | Short- & long-term, ongoing | Short- & long-term, ongoing |

*Source:* Authors' compilation.

After going through a detailed analysis of how states employ various tools to dominate each other in aerospace domain, it is important to discuss it in particular reference to a real scenario and for that, India and Pakistan offer a useful case study.

[17] Adrian J Boas, "On the Element of Surprise," *Adrianjboas*, September 18, 2018, https://www.adrianjboas.com/post/on-the-element-of-surprise.

## Indo-Pak Scenario

In various instances, India and Pakistan have put each other to the test in terms of maximising the use of aerospace power. Both air forces bought their equipment from advanced countries. However, in recent years, the two countries have begun to develop their capabilities, albeit with the assistance of more developed allies.[18]

India has signed several agreements with its ally, the United States (US), to further enhance its aerospace power. India became major defence partner of the US and hence eligible to receive dual-use technologies under Strategic Trade Authorization tier 1 status in 2016. Both countries expanded their defence cooperation and signed a number of agreements such as Logistics Exchange Memorandum of Agreement (LEMOA) in 2016,[19] Communications, Compatibility and Security Agreement (COMCASA) in 2018,[20] and the Industrial Security Agreement (ISA) in 2019.[21] In October 2020, India signed the Basic Exchange and Cooperation Agreement (BECA)[22] in anticipation of its possible benefits. India and the US have expanded their relationship under BECA to include the cooperative use of aerospace power in its actual hybrid form. In April 2022, they signed an agreement on space situational awareness to advance their cooperation in space and cyberspace.[23] It took 18 years for Washington and New Delhi to sign the four different agreements of strategic nature commonly known as 'Foundational Pacts'.[24] India is projected to benefit immensely

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18 Zia Ul Haque Shamsi, "Hybrid Character of Aerospace Power," *Centre for Aerospace & Security Studies*, July 12, 2021, https://casstt.com/post/Hybrid%20Character%20of%20Aerospace%20Power/405.

19 Ministry of External Affairs, "Brief on India-U.S. Relations," Government of India, https://www.mea.gov.in/Portal/ForeignRelation/India_US_brief.pdf.

20 Press Information Bureau, "Joint Statement on the Inaugural India-U.S 2+2 Ministerial Dialogue," Ministry of Defence, Government of India, September 6, 2018, https://pib.gov.in/newsite/PrintRelease.aspx?relid=183300.

21 Ministry of Defense, "India and US to set-up Joint Working Group in Defence Industrial Security," Government of India, October 1, 2021, https://pib.gov.in/PressReleasePage.aspx?PRID=1759911; and, U.S Department of State, "U.S. Security Cooperation With India," January 20, 2021, https://www.state.gov/u-s-security-cooperation-with-india/#:~:text=U.S.%2DIndia%20defense%20trade%20cooperation,(ISA)%20now%20in%20place.

22 Ministry of External Affairs, "Documents announced during the 3rd India - US 2+2 Ministerial Dialogue," Government of India, October 27, 2020, https://mea.gov.in/bilateral-documents.htm?dtl/33143/Documents+announced+during+the+3rd+India++US+2432+Ministerial+Dialogue.

23 Park Si-soo, "US, India Agree to Cooperate on Space Situational Awareness," *Spacenews*, April 12, 2022, https://spacenews.com/us-india-agree-to-cooperate-on-space-situational-awareness/.

24 Misbah Mukhtar, "India-US Military Agreement: BECA and its Implications for the Region," (paper, Institute of Strategic Studies Islamabad, Islamabad), November 17, 2020, https://issi.org.pk/wp-content/uploads/2020/11/IB_Misbah_Nov_17_2020.pdf.

under BECA, from surveillance to satellite guiding and space intelligence to real-time terminal information. Moreover, the Indian Air Force (IAF) stands to benefit the most from the technology sharing agreements with the US, since they will provide the IAF advantage in real-time.[25] BECA has taken this cooperation a step further by giving India real-time access to American geospatial intelligence, which will help improve the precision of automated systems and other weaponry, such as Unmanned Combat Aerial Vehicles (UCAVs). Both countries can also share high-resolution satellite photos as a result of this agreement. Furthermore, because India is attempting to build its Geographic Information (GI) Policy, BECA is critical because it will help India achieve its national GI Policy objectives.[26]

As the BECA was signed after the realization of the lack of geospatial information capability against the Chinese in Ladakh during India's standoff with China in 2020, India's Chief of Defence Staff, General Bipin Rawat, has asserted that India is ready for a two-front war.[27] Rawat's assurance reflects the US support under the BECA regarding real-time intelligence, surveillance, and communication, allowing IAF to have a better understanding of the situation.[28] The General Security of Military Information Agreement (GSOMIA) signed in 2002 had the same purpose.[29] Due to their expanded scope, such agreements would reinforce the hybrid character of aerospace power. The IAF would be able to improve its interoperability with the UN and NATO's aerospace powers. This would enable IAF pilots to prepare better for future engagements with the PAF. Hence, anticipating tougher battles with India, Pakistan needs to be better equipped for the future.

Pakistan will be compelled to take precautions to prevent the IAF from using hybrid aerospace power against its interests while closely watching Indo-US agreements for any potential strategic imbalance in the region. Given that it has access to reliable intelligence and real-time guidance for both its manned and unmanned aerial platforms, the IAF would not be compelled to conduct strikes akin to those in Balakot. Instead, it would prepare to use its aerospace force against a variety of targets both

25 Shamsi, "Hybrid Character of Aerospace Power."
26 Mukhtar, "India-US Military Agreement: BECA and its Implications for the Region."
27 "India ready to Handle 2-Front Threat: Bipin Rawat", *Hindustan Times*, September 4, 2020, https://www.hindustantimes.com/india-news/india-ready-to-handle-2-front-threat-rawat/story5BqDAVRrHeVX679ok4LviO.html.
28 Shamsi, "Hybrid Character of Aerospace Power."
29 Mukhtar, "India-US Military Agreement: BECA and its Implications for the Region."

inside Pakistan and along the Line of Control (LoC) in a multi-level, multi-platform, multi-directional, and hybrid operation.[30] Furthermore, with increased precision due to the frequency with which satellite navigational data is updated, the IAF would be able to plan strikes against deeper targets in Pakistan. Not only that but India's much-improved aerospace strength is expected to be used as a political instrument as well as a key component of warfare. A well-thought-out media strategy may be used to justify the use of force against Pakistan. The main aim of this propaganda warfare could be to damage Pakistan's position at the international level. However, it would not be limited to this, as this could also escalate the conflict between the two countries in domains other than the traditional warfare such as hybrid and non-contact.

30 Shamsi, "Hybrid Character of Aerospace Power," Centre for Aerospace & Security Studies.

## Options for Pakistan

Considering the complex scenarios shaping the Indo-Pakistan security environment in the future, it is high time that Pakistan develops its capabilities to meet such challenges. But there are a number of bottlenecks. Indigenous aircraft and related advanced technology require a huge investment of time and money. The sophisticated equipment is dependent on extensive Research and Development (R&D) in many fields. These initiatives will need financing, research resources, industrial production, and other assets with multiple applications. It is not economically viable for Pakistan to invest a huge chunk of its resources in strengthening its aerospace power, though Pakistan Air Force has taken an initiative in the form of National Aerospace Science & Technology Park (NASTP) to provide desired impetus to country's self-reliance programmes and promoting research and development in the field of aerospace by connecting industry, academia and think tanks. The project is in nascent stages and will take time to become operational and contribute to the country's growing needs in aerospace industry and technology. Meanwhile, Pakistan has to take other measures to effectively defend against its eastern neighbour with the limited resources it has.

A country must decide whether or not to spend its limited, valuable resources to build or preserve its aerospace capabilities. If a country cannot or will not do so, it risks having a technologically obsolete air force, putting its military forces and, ultimately, the country at risk. Because of the resources required, aerospace forces compete with land and naval forces for limited funds and manpower.

Considering the above rationale, Pakistan in March 2022, acquired J-10C fighter aircraft from China to update its fighter fleet and in order to keep parity with India in this domain. After the Balakot strikes and later Indian acquisition of Rafael, Pakistan needed an aircraft at par to balance this strategic equation. Secondly, in order to maintain conventional symmetry in the region, J-10C is equipped with PL-15, a Beyond Visual Range (BVR) missile that is considered to be an equivalent of Meteor and the Missile d'Interception, de Combat et d'Auto-défense (MICA) on Indian Rafael fighter aircraft.[31]

[31] Airforce Technology, "Pakistan Officially Inducts Chinese-Built J-10C Fighter Jets," March 14, 2022, https://www.airforce-technology.com/news/pakistan-inducts-j-10c-fighter-jets/.

India's agreements with the US regarding situational awareness, intelligence cooperation and navigational support create an issue of strategic stability in South Asia, which is of paramount concern and has serious repercussions for Pakistan as well. After the Indo-US agreement on BECA, it was reported that Pakistan and China signed a pact on intelligence sharing in December 2020. The purpose of this military intelligence deal is to track the movement of Indian forces across the border and on the LoC.[32] This deal will strengthen Pakistan's position during a war-like scenario in the future and will be able to counter Indian capabilities acquired post-US agreements to some extent.

After the latest agreement on space situational awareness between India and the US, Pakistan needs to engage China to discuss its implications for both nations and explore avenues for a comprehensive military defence agreement between the two sides. Pakistan should also focus on reinvigorating its space agency Space & Upper Atmosphere Research Commission (SUPARCO) to explore ideas to cope with future challenges. In this regard, Pakistan can also look into the possibility of future cooperation with China to modernise its space agency.

Finally, considering the challenges, Pakistan should make a concerted effort to enhance its R&D in ISR capabilities. Here, NASTP can play an important role in the longer run. The Government of Pakistan (GoP) is not in a position to buy expensive technologies from other countries. Beijing being the only hope for Islamabad has its limitations, hence, it is prudent for Pakistan to build indigenous technologies or in collaboration with China, as it did in the case of the JF-17 Thunder fighter aircraft.

Besides all that, it is imperative to train the human resource to meet the future challenges. Advanced training programmes should be designed to upgrade the level of human resource. The future battles cannot be fought without the active involvement of trained and educated human resource that is well-aware of the battlespace it is operating and to design the timely response options and employment strategies to cater existing and future challenges.

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[32] Smriti Chaudhary, "Pakistan, China Counter US, India BECA Pact with Military Intelligence Deal," *Eurasian Times*, December 21, 2020, https://eurasiantimes.com/pakistan-china-counters-us-india-beca-pact-with-military-intelligence-deal/.

## Conclusion

Modern warfare has multiple facets and aerospace is one important component of it without which future battles will not be contested. Realising this, countries are collaborating in the aerospace domain for their mutual benefit. India is one such state that has signed a number of agreements with the US. Implications of such agreements will be on China and largely on Pakistan. Due to scarcity of resources, Pakistan has limited options to counter, however, with assistance from its strategic partner China, it can overcome such challenges. With the advancement of technology, Pakistan should prepare itself for such situations in future and, therefore, R&D in the defence and technology sectors is a key. The importance of aerospace is growing in response to the shifting geopolitical landscape, and the outcome of any future conflict between India and Pakistan - however minor - will depend on wise application of the hybrid nature of aerospace power.

## ABOUT THE AUTHORS

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