

SPACE & BEYOND

The First Aviation & Aerospace Chronicle in Bangladesh
An AAUB Publication

Our Mathematical Space

Space
The Ultimate Frontier for Human Progress

Air Chief Marshal
Hasan Mahmood Khan,
Chief Of Air Staff



“Propelling Bangladesh to the Forefront of the Global Tech Frontier.”
Interview with the Vice Chancellor, AAUB

SpaceX Achieves Historic Starship Flight
IATA Projects \$1 Trillion Revenue in 2025

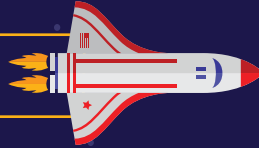
Astro-Strategy for Aerospace Superiority
A Bright Red Dot

Visualizing The Race To

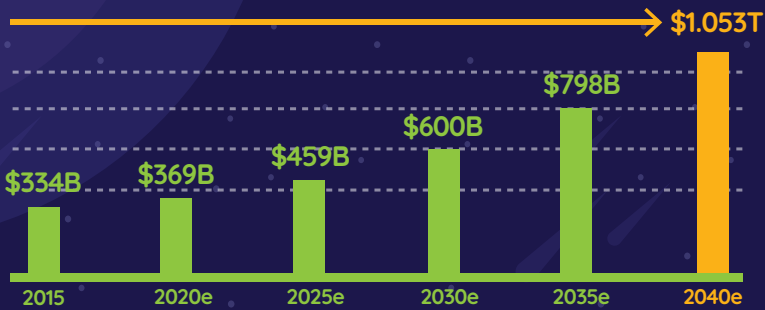
INVEST IN SPACE

The space industry is exploring new heights with innovative products and services that improve life on Earth, and beyond.

The global space industry may jump light years ahead within the next few decades.



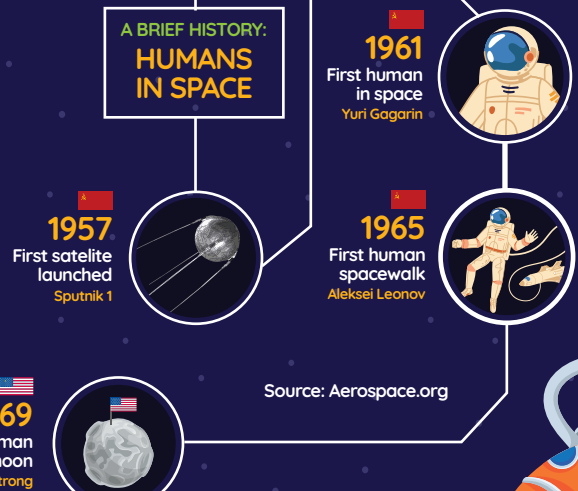
THE ECONOMY OF SPACE: PROJECTED GROWTH



Sources: Morgan Stanley, Haver Analytics.

Space has long been the final frontier of exploration & opportunity — how far have we come?

A BRIEF HISTORY: HUMANS IN SPACE



Source: Aerospace.org

HUMANS AND OUTER SPACE

Humans have been fascinated with space for millennia, using the stars to navigate, keep time, and stay connected to each other.

For the last 60 years, humans have also been traveling to space, and pushing the technological boundaries each time.



THE TECHNOLOGY WE SEND TO SPACE...

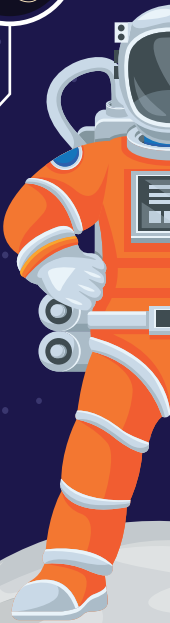
REUSABLE ROCKETS
For cheaper travel and production.

ADVANCED SATELLITES
Lower cost, higher bandwidth, greater global coverage.



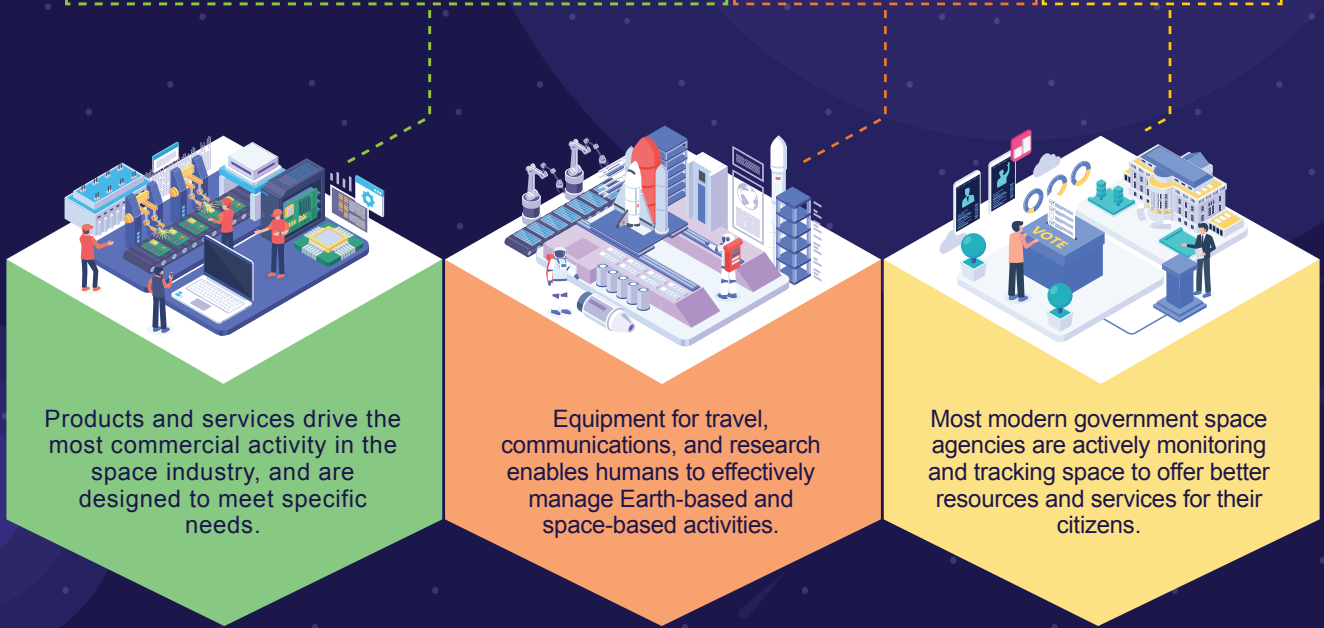
....CHANGED LIFE ON EARTH.

In turn, this fuels innovation on Earth, and boosts our space activity.



THREE MAJOR SECTORS DOMINATE THE SPACE ECONOMY TODAY

Global Share of Space Economy



Source: Space Foundation

WHO ARE THE MAJOR PLAYERS?

SPACEX
Developing spacecraft to take humans to Mars.

BLUE ORIGIN
Working to shift heavy industry off-planet.

Virgin GALACTIC
First commercial space tourism flights.

NEW SPACE STARTUPS

Much of the growth in the space industry has come from the private sector. According to Goldman Sachs, \$15.5B has been spent on new space startups since 2000.



INVESTORS WHO HAVE SPENT OVER \$1B ON SPACE STARTUPS

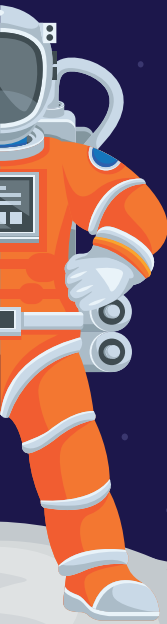
JEFF BEZOS -----> BLUE ORIGIN

Google Fidelity -----> SPACEX

SoftBank -----> OneWeb

The space economy is being fueled by commercial activity. Public and private sectors alike are working together to bring down costs and increase global access to space.

For the first time since our journey to the stars began, outer space is within our reach.



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BEACON



Space: The Ultimate Frontier for Human Progress

Chief of Air Staff

Air Chief Marshal Hasan Mahmood Khan, BBP, OSP, GUP, nswc, psc, GD(P)

The blend of drone technology with space systems has unlocked unprecedented opportunities in surveillance, reconnaissance, and logistics. High-altitude pseudo satellites (HAPS), operating in the stratosphere, serve as an innovative bridge between ground-based stations and satellites.

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ASTRO POLITICS

Astro-Strategy for Aerospace Superiority

The ongoing competition for space weapons and dual-use technologies has gotten intense in recent years. This has led to increasing interest in the militarisation and weaponization of space.



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CENTRAL THEME

Our Mathematical Space

Without mind and its intelligence, Space has no real existence. The beauty of Mathematics is that it is capable of giving meaning to objects that occupy Space for their existence. While objects belong to physical reality, the realm of Space is that of metaphysical reality.

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RENDEZVOUS



Propelling Bangladesh to the Forefront of the Global Tech Frontier

Air Vice Marshal A K M Manirul Bahar, OSP, BSP, ndc, hdmc, afwc, psc, ADWC

The future of AAUB is both ambitious and inspiring. Our plans are centred on expanding our research capabilities, fostering international collaborations, and continuing to invest in world-class infrastructure and faculty development.

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SYNERGY

The Story Behind Bangladesh's First-Ever Cube Satellite Balloon Testing

To test the automated tracking system, a cross Yagi antenna was also designed. The tracking system corrects the azimuth and elevation as the satellite passes over the head.

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SCI-FI

A Bright Red Dot

After 36 hours in the shuttle, Watanabe finally took a look outside. It was all dark and unbelievably quiet. They have travelled 100 million km already. So, they are in a middle spot between Earth and Mars.

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29 How the Mi'raj Transcends Time and Space

To know the answer to this question, first of all, we need to understand time dilation. According to scientist Einstein, time is not absolute; that is, time depends on relative speed and gravity in various ways.

36 Investigating the Truth behind Aviation Safety

Modern technology plays a crucial role in aircraft accident investigations. Beyond the traditional black boxes, tools like 3D simulations and drones are now commonly used to help recreate the accident and understand the accident site in great detail.

38 Re-entry Capsules: The Portal to Space Discovery

As humanity ventures deeper into space, the success of human exploration beyond Earth will depend heavily on the safety, reusability, and development of re-entry technologies.

Editor's Word

*Soar high, seek beyond,
never cease to explore!*

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PROBING

From Orbit to Opportunity: Fuelling Global Growth

One of the most impactful contributions of the space sector is the development and deployment of satellite technology. Satellites enable essential services such as global positioning systems (GPS), meteorological forecasting, and telecommunications.

Warm congratulations on the big day of Aviation and Aerospace University Bangladesh (AAUB), the sole specialised public university on aviation and aerospace in the country, as it celebrates its 6th Raising Day with due joy and self-worth.

To add more to this momentous juncture, we invite you to check out the latest edition of Space and Beyond, the pioneering aviation and aerospace chronicle in Bangladesh from AAUB, chronicling its remarkable journey while offering a broad overview of the aviation industry at home and abroad over the past few years.

Our literary odyssey begins with a thought-provoking note from the Chief of Air Staff of the Bangladesh Air Force. The note quite wonderfully underscores the challenges and opportunities within the rapidly changing aviation and aerospace landscape in addition to offering an invaluable insight into the future of this frontier.

Space, as we all know, has long intrigued human curiosity, forever tempting us to decode its mysteries. Mathematics, the foundation of this quest, is the key to understanding its very fabric. In Our Mathematical Space, Air Vice Marshal Dr. Mahmud Hussain (Retd) masterfully explores the beauty and power of mathematics, illustrating its fundamental role in shaping our perception of the universe.

An exclusive interview with AAUB's Vice Chancellor outlines the university's strategic vision—underlining its success stories while emphasizing research advancements, international collaborations, and investments in state-of-the-art infrastructure with the goal of elevating Bangladesh to a leading position in the global aerospace sector.

An interesting feature to note in the aerospace domain, which is primarily ruled by the leading world powers, is that as space exploration progresses, geopolitical competition heats up. Astro-Strategy for Aerospace Superiority offers for the readers a precise analysis of Astro politics and the growing militarisation of space, providing a critical perspective on the forces shaping aerospace advancements in the 21st century.

Visit our news section and stay informed about the key developments in the global aviation and aerospace sector and insights into major industry players, including the most recent achievements and major events at AAUB, and how they are reinforcing its commitment to research and innovation.

As we move forward on another year of growth, we extend our deepest gratitude to the faculty, researchers, students, and industry experts who have remained our constant source of inspiration. Thanks to their spirit of expanding and exploring, AAUB remains steadfast in its mission to push the boundaries of knowledge and innovation, solidifying Bangladesh's presence in the global market for aerospace.

In the end, a special note of appreciation goes to the Chief of Air Staff and the Vice Chancellor for their constant support and guidance. We are equally grateful to our writers, contributors, and the team of designers for their diligence in bringing this edition to life.

Thanking you,

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SPACE: THE ULTIMATE FRONTIER FOR HUMAN PROGRESS

Air Chief Marshal Hasan Mahmood Khan

BBP, OSP, GUP, nswc, psc, GD(P)

In today's world, space represents the pinnacle of human ambition and creativity. Because of rapid advancements in areas such as space exploration, satellite technology, and artificial intelligence, this domain has emerged as a critical front for scientific developments and global strategy. Understanding how these elements interact is critical for those working in aviation and aerospace as well as students interested in pursuing careers in these fields. It is crucial for boosting a nation's technological power and safeguarding its security in a world that is becoming more interconnected and competitive.

The Dawn of Space Warfare

What was once the subject of science fiction has today become an indisputable reality: the dawn of space warfare. The term 'Sky' or 'heavens' interchanges with a peace and serenity, though space is no more a peaceful frontier. With the introduction of 'satellite bodyguards' and 'hunter killers,' it has enough ASAT weapons. Today they are capable of destroying ICBMs, whereas the space-based laser can disrupt or even destroy enemy satellites and can intercept high-speed aerial objects. Nations are exposing their ability to destroy others' satellites not only with ASAT systems but also by launching ground-based missiles.

But this zeal that has made the space a contested battleground is not merely devoted to military causes. The economic expansion and national developments are closely connected with satellites working more on communication rather than intelligence gathering. The satellite at the exosphere up beyond 1000 km aids the airplane navigation that cannot fly above the troposphere, maximum 18 km. The civilian infrastructures are key beholders in space development and scientific research on habitations, too. If satellite communication is disrupted, the global financial network and supply chains will have serious setbacks. The disaster response mechanism will be jeopardized. It has invoked space architectures to be more buoyant and robust.

Merging Drone Technology and Space Systems

In the field of geospatial intelligence, drone technology is proven to be more accurate than satellite imagery systems, which, of course, offer larger area capture in a single pass. This calls for a combination of drone technology and space systems.

These are high-altitude pseudo-satellites (HAPS) that operate in the stratosphere but serve as a bridge between the earth station and the satellite. Then areas of surveillance, logistics, and signals have been aptly empowered with these arrangements.

(Ref: University of Kent at Canterbury on 2022-02-28)

These drones are equipped with AI-powered sensors; they are extremely useful for working on difficult terrain. They are not really for making battles between warring parties; rather, they benefit mankind. Earthquakes, wildfires, or floods require continuous operations, quicker humanitarian response, and real-time mapping, which all are provided by these drones. Drone integrations with space are a signature aspect of human resilience and flexibility.

AI Working for the Space Industry

Meanwhile, Artificial Intelligence (AI) has brought about a paradigm shift in space operations and exploration. The military is the prime beneficiary here: orbital platform maintenance and autonomous spacecraft navigation have given rise to a hybrid aerospace power. AI driven systems has superb edge in advance satellite data analysis capabilities through machine learning algorithm. It also benefits the civilian affairs global trends in urbanization. It aids the decision-making process more objectively than that of OODA.

Nevertheless. Such utilization of AI brought out ethical questions and raised strategic concerns. Autonomous systems can malfunction; they will bear serious risk of escalation and unexpected repercussions. Agreements amongst the superpowers are not the only solution in order to legitimate it; rather, there should have been an integrated failsafe mechanism inbuilt.

National Progress Through Space Collaboration

Inventions and innovations in the field of space exploration have an impact on a country's economic prosperity. First world countries have made an edge over others by making enormous investments in space programs those include renewable energy,

“ As the future developments of space unfold before us, the aviation and aerospace community must rise to meet its pertinent challenges and opportunities. The next generation of aviation professionals bears the obligation for crafting innovative solutions that integrate security, sustainability, and exploration. ”

disaster forecasting and air navigation. This effort will have a collective benefit that will lessen the requirement of fossil fuels by space-based solar power.

Space has not only opened up geopolitical contests but also widened the door to collaboration in diplomatic ties and peaceful coexistence. The end of the Cold War era led to such research and development between the superpowers that the International Space Station (ISS) was launched far beyond the thermosphere.

Empowering the Next Generation

As the future developments of space unfold before us, the aviation and aerospace community must rise to meet its pertinent challenges and opportunities. The next generation of aviation professionals bears the obligation for

crafting innovative solutions that integrate security, sustainability, and exploration.

Prudent investment in the transformative potential of space technologies definitely can pave the way for a resilient and thriving global future.

Conclusion

A comprehensive and forward-looking approach is indispensable to fully harness the advantages of space warfare, drone technology, and artificial intelligence. The risks are significant; however, the rewards are unparalleled. Space offers humanity the chance to transcend its limitations and secure its place among the stars. In this search, we are here to ascend beyond the clouds, reaching for infinity, driven by the spirit of pursuit and progress. Our destination is boundless—the infinite expanse of space. 🌌



“PROPELLING BANGLADESH TO THE FOREFRONT OF THE GLOBAL TECH FRONTIER”

Air Vice Marshal A K M Manirul Bahar

OSP, BSP, ndc, hdmc, afwc, psc, ADWC

Vice Chancellor, AAUB

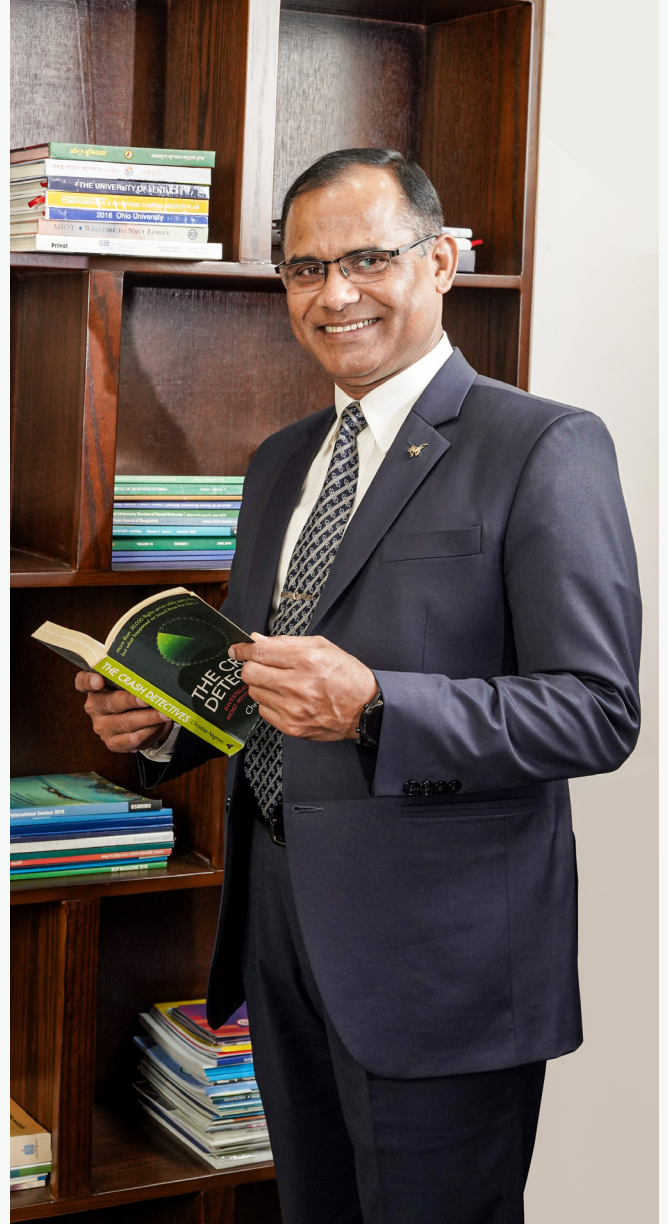
Space & Beyond: You have been at the helm of the university for some time marked by remarkable achievements. Could you elaborate on the vision that has underpinned these accomplishments?

Vice Chancellor: At AAUB, our vision transcends conventional academic goals; it is rooted in creating a dynamic future that is innovative, sustainable and transformative. Our core philosophy is to empower students not only to think critically but also to pioneer solutions for the multifaceted challenges of tomorrow. We have anchored this vision in three pillars: cutting-edge technology, experiential learning and a relentless culture of innovation. By fostering an ecosystem that encourages creativity and problem-solving, we have achieved milestones that many would consider ambitious, yet there are reflection of our firm commitment to excellence. These accomplishments symbolise our determination to bridge the gap between academia and the real-world needs of society.

Space & Beyond: Among AAUB's achievements, the design and deployment of drones for emergency medical support in flood-affected areas stands out. Could you delve deeper into the significance of this project?

Vice Chancellor: This initiative is a powerful illustration of how technology can be harnessed to address critical humanitarian challenges. Floods are a perennial issue in Bangladesh, devastating communities and severing access to vital resources. The deployment of drones in such scenarios epitomises our commitment to creating practical solutions for pressing societal issues.

These drones are designed to navigate inaccessible terrains with precision, enabling the rapid delivery of essential medical supplies



“ By fostering an ecosystem that encourages creativity and problem-solving, we have achieved milestones that many would consider ambitious, yet they are a reflection of our firm commitment to excellence. ”

to remote, flood-stricken regions. Their potential to save lives during emergencies is monumental. However, their significance extends beyond their technological sophistication. They symbolise a broader ethos of blending innovation with compassion—a hallmark of AAUB's mission.

By undertaking such projects, we aim to redefine the role of academia in society, proving that cutting-edge research can tangibly transform lives. This initiative also highlights how innovation can transform lives and reinforce our role as a forward-thinking institution with a mission to serve humanity.

Space & Beyond: AAUB's collaboration with the Bangladesh Air Force to develop and test basic trainer aircraft is another notable achievement. How does this partnership contribute to the University's mission?

Vice Chancellor: This collaboration is a shining example of academia and industry working synergistically to address national priorities. The successful development and testing of two basic trainer aircraft underscore our engineering excellence and ability to deliver indigenous solutions tailored to local needs.

Beyond the technical milestone, this partnership has profound academic and societal implications. It provides our students with unparalleled opportunities to engage in real-world projects, gaining hands-on experience that bridges the gap between theory and practice. During the aircraft's design and testing phases, students applied their academic knowledge to solve complex engineering challenges, cultivating skills that are invaluable to the aerospace industry.

On a broader scale, this achievement reduces our reliance on imports, bolsters the national aviation sector and positions Bangladesh as a potential hub for aerospace innovation. It is a testament to what can be achieved when academia and industry collaborate with a shared vision of progress and self-reliance.



Photo
The Bangladesh Air Force's indigenous BBT-2 basic training aircraft

Space & Beyond: AAUB achieved remarkable success by securing 3rd position in the International KIBO Robotic Challenge in Japan and 1st position in the Vertical Flight Society Competition in the USA. What strategies do you employ to foster such outstanding achievements?

Vice Chancellor: These achievements reflect our unwavering dedication to fostering a culture of excellence, creativity, and collaboration. Competitions like the KIBO Robotic Challenge provide a unique platform for students to engage with cutting-edge technology, solving space-related challenges that test their programming and robotics skills.

At AAUB, we prioritise nurturing talent by offering access to world-class mentors, advanced facilities, and an environment that encourages innovation. These resources, combined with the



“ Ensuring seamless communication across all levels of the university is a priority I hold deeply. Clear, open and accessible communication channels are vital for fostering trust, transparency and engagement within any institution. ”

ABOUT

Airborne Phoenix, a conceptual Unmanned Aerial System(UAS) developed by the 3rd year undergrad students of Aeronautical Engineering (Aerospace), AAUB at the VFS 41st annual student design competition. Key Features of Airborne Phoenix are:

- Capable of reaching speeds of 160 km/h with an endurance of 13.5 hours of nonstop flight.
- Powered by cutting-edge PEM technology hydrogen fuel cells, serving as the primary energy source.
- NACA 63-412 airfoil shaped fuselage for streamlined flow.
- NOTAR system to reduce noise levels, improve control and yaw control.
- Coaxial rotor system for stability and high hover performance.
- H-shaped tail section with pusher propeller to ensure maximum stability in gusty situation and faster speed.
- Additionally attached streamlined payload section for easier controllability over payload, designed in such a way that it produce the least amount of drag.

THE TEAM

Asst. Professor Zaid Bin Akbari Azeel (FACULTY ADVISOR)

Dr. Hassan Elmaghrabi (Director of the Department, Department of Aeronautical Engineering/Aerospace)

Team Members: EMMANUEL, ABU ALI, ABU BAKR, ABU ALI AZIZ (TEAM LEAD), NURUL HUDA, NURUL HUDA, NURUL HUDA, NURUL HUDA, NURUL HUDA, NURUL HUDA.

ABOUT THE COMPETITION

The Vertical Flight Society's annual Student Design Competition challenges students to design a vertical lift aircraft that meets specified requirements. It offers a practical exercise for engineering students at both graduate and undergraduate levels worldwide, fostering a strong interest in vertical flight technology.

NACA 63-412 AIRFOIL

Velocity Streamline of NACA 63-412. Pressure Contour of NACA 63-412.

AIRCRAFT

THE AIRBORNE PHOENIX (NACA 63-412 AIRFOIL DRAPED BASE)

PRESS RELEASE

Place	University (Undergraduate)	City, Country	Student Team
1st	University of Kentucky	Alexandria, Georgia, USA	Aviation
2nd	Texas University of Dallas	The Netherlands	Vertical
3rd	University of Maryland	College Park, Maryland, USA	AVS
4th	University of Illinois Urbana-Champaign	Urbana, Illinois, USA	Vertical Phoenix

Photo
A visual recap of Team AAUB claiming victory in the highly regarded Vertical Flight Society Competition in the USA.

passion and determination of our students, form the foundation of our success. Winning the Vertical Flight Society Competition further exemplifies our ability to excel across diverse disciplines.

These accolades inspire not only our students but also the broader academic community, proving that with the right support and vision, excellence knows no boundaries.

Space & Beyond: How does AAUB ensure its academic programmes remain relevant and future-proof in an ever-changing world?

Vice Chancellor: Academic relevance is achieved through continuous innovation, strategic partnerships and a commitment to adapting to global trends. At AAUB, we regularly evaluate our programmes to ensure alignment with industry demands and emerging fields, such as artificial intelligence, sustainable technology, and UAV systems.

By collaborating with international universities and industry leaders, we provide our students with access to global opportunities and cutting-edge technology. Furthermore, we actively incorporate feedback from stakeholders, including students, faculty and industry experts to refine our curriculum. This iterative approach ensures our graduates are equipped with the skills and knowledge needed to thrive in a rapidly evolving world.

Space & Beyond: How do you inspire and lead faculty and staff in realising your vision for the university?

Vice Chancellor: Inspiring the faculty and staff begins with establishing a shared vision that resonates with our collective purpose and aspiration. I believe that leadership is about fostering a sense of community where everyone feels empowered, respected, and integral to the university's mission. To this end, I prioritise

creating an inclusive environment that values diverse perspectives and encourages collaboration.

Regular open forums, leadership retreats, and cross-departmental workshops serve as platforms for exchanging ideas and developing strategies. These initiatives not only enhance team cohesion but also instil a sense of ownership and pride in our collective achievements. Recognising and celebrating accomplishments, whether through awards, acknowledgment at university events, or highlighting contributions in internal communications, further motivates our faculty and staff to strive for excellence.

By aligning individual aspirations with institutional goals, we collectively transform our vision into tangible, meaningful outcomes that benefit students, the academic community, and society at large.

Space & Beyond: How do you make sure there is good communication at all levels of the university?

Vice Chancellor: Ensuring seamless communication across all levels of the university is a priority I hold deeply. Clear, open and accessible communication channels are vital for fostering trust, transparency, and engagement within any institution. I focus on cultivating an environment where faculty, staff and students feel encouraged to share their perspectives, ideas and concerns without hesitation.

To achieve this, we have adopted innovative solutions, including digital collaboration platforms, robust intranet systems and real-time feedback mechanisms. These tools ensure that everyone stays informed and can participate in

“ Our strategic vision includes the creation of specialised research centres focusing on areas such as unmanned aerial systems, sustainable aviation technologies and advanced propulsion systems. By aligning our efforts with global industry trends, we aim to drive cutting-edge innovation that addresses pressing challenges from reducing carbon emissions to enhancing safety and efficiency in aviation. ”

decision-making processes. Moreover, we have institutionalised regular meetings, such as faculty councils, departmental briefings and town halls, to keep everyone aligned with the university's goals and activities.

Space & Beyond: Lastly, what are AAUB's plans for the future? How do you anticipate the university's role in shaping the aerospace and aviation sector of tomorrow?

Vice Chancellor: The future of AAUB is both ambitious and inspiring. Our plans are centred on expanding our research capabilities, fostering

international collaborations and continuing to invest in world-class infrastructure and faculty development. We are committed to establishing AAUB as a global leader in aerospace and aviation innovation, bridging academic excellence with real-world impact.

Our strategic vision includes the creation of specialised research centres focusing on areas such as unmanned aerial systems, sustainable aviation technologies and advanced propulsion systems. By aligning our efforts with global industry trends, we aim to drive cutting-edge innovation that addresses pressing challenges from reducing

carbon emissions to enhancing safety and efficiency in aviation.

Furthermore, we are strengthening our partnerships with global universities, aviation firms and space agencies to provide students and faculty with unparalleled exposure and opportunities. These collaborations will enable us to cultivate a new generation of aerospace professionals fully prepared to lead the industry forward.

In shaping the aerospace and aviation sectors of tomorrow, we see our role not just as educators but as pioneers-driving progress through research, innovation and a commitment to excellence. Together, we are building a legacy of resilience, progress and global leadership that will empower future generations to reach new frontiers. This will aptly contribute to national development as well.

Space & Beyond: Thank you for your time and for sharing these inspiring insights.

Vice Chancellor: Thank you as well. It has been an absolute pleasure to share my thoughts with the readers of Space & Beyond. Together, let us explore the boundless opportunities ahead, and together let us work for a progressive Bangladesh. 🇧🇩

Photo
Vice Chancellor AVM A K M Manirul Bahar received ANO (AW) Part 147 AMTO certification from CAAB Chairman AVM Muhammad Mafidur Rahman at a certificate award ceremony held at the CAAB Headquarters



Central Theme

OUR MATHEMATICAL SPACE

Air Vice Marshal Dr Mahmud Hussain (Retd)
Distinguished Expert, AAUB

The universe cannot be read until we have learnt the language and become familiar with the characters in which it is written. It is written in mathematical language, and the letters are triangles, circles, and other geometrical figures, without which means it is humanly impossible to comprehend a single word."

- Galileo Galilei (1564 - 1642)

Greeks were, perhaps, the first of the natural philosophers to think of space as a scientific inquiry. Plato's Dialogue is filled with ideas about Space that illustrate how much the imagination of Space was provoked by the necessity of the reality of its existence as independent of our lives. There is Space that we do not see, but it has a reality without which matter cannot

survive on its own. It is the habitat of matter. Matter and Space are independent realities of our physical world. Space provides us with the model of the Universe. Is Space only the inevitable construct of our mind, without which the knowledge of the world cannot be conceived? The answer is probably an emphatic yes. Therefore, to Plato and

other ancient philosophers, Space had an epistemic (knowledge) value in being the determinant of many truths.

In the dialogue between Plato and Timaeus, Plato conjectured that Space has no qualities of its own. It is a pure medium within which objects exist and processes take place. In order for Space to have a cognitive place in human thinking, it had

Euclid started his intellectual inquiry by posing definitions to geometric figures, and thereby solidifying our conception of Space.



Photo
Plato and Timaeus seen in this imaginary photograph deeply engrossed in discussing the nature of the Universe

to be conceived of as consisting of forms. Forms cannot exist in a vacuum. They are needed to be expressed in terms of their understanding in our mental operation. Our mental activity evolves from experience but does not necessarily consist of experience. All a priori truths are processed through mental ingenuity, which later become part of our faculty of knowledge.

The philosophers had to invent a technique to comprehend and illustrate Space as it suited their scientific rigour. The best option provided to them was the means of mathematics. The earliest philosophers were lovers of geometry—a branch of mathematics. Euclid was perhaps the pioneer among the primus inter pares to introduce a system to train and educate our minds to grasp the wonderful subtleties of Space in the spectrum of the human quest for knowledge. His masterpiece, *The Elements*, remains the fundamental building block for imposing structure on our mathematical universe.

Euclid started his intellectual inquiry by posing definitions to geometric figures, and thereby solidifying our conception of Space. But what is most subtle and unique is that he begins the definition of his first instinct called Point by giving it the nous of

non-being. A Point has no dimension. Then he proceeds to add up points to make a Line, straight or curved. How a dimensionless entity could become a one-dimensional Line was the Euclidean originality of creative imagination. The shortest distance between two dimensionless points is a straight line. Thus, distance is the mathematical identity of spatial reality. If there are two separate points, the distance between them is the Space expressed in terms of numbers and their units, such as a feet, b miles, etc. Thus, numbers became the character clause to Space and its value.

But the forms of one-dimensional Space were needed to be enclosed to save them from the extension ad infinitum on the surface of the earth upon which man

walked. Once Lines were closed, new forms were defined as triangle, quadrangle, hexagonal, and so on. Many two-dimensional spaces could be created by permutations and combinations of Lines. But each different figure in two-dimensional graphic representation on the X and Y axes needed one more vertical dimension named the Z-axis to give the form a perfect shape evolving from mathematical imagination. Thus, we live in a three-dimensional Space whose origin is in the thought of Mathematics.

Thus, Mathematics proved that there is Space no matter how evasive and complex its concepts are. Space exists not as an independent entity. Without mind and its intelligence, Space has no real existence. The beauty of Mathematics is that it is capable of giving meaning to objects that occupy Space for their existence. While objects belong to physical reality, the realm of Space is that of metaphysical reality.

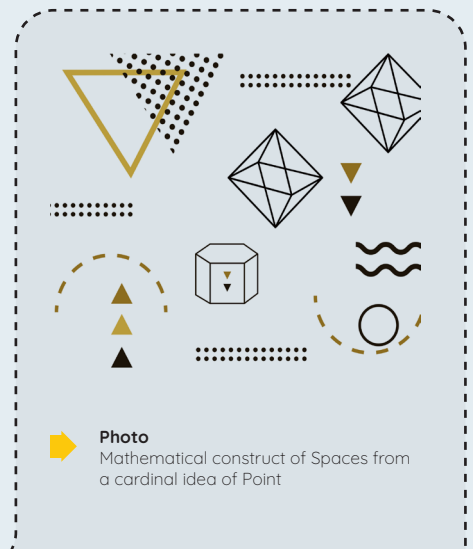


Photo
Mathematical construct of Spaces from a cardinal idea of Point

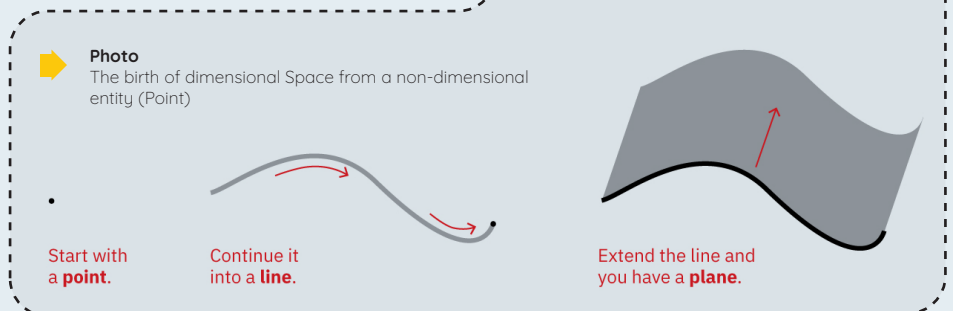


Photo
The birth of dimensional Space from a non-dimensional entity (Point)

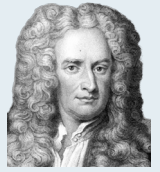
Start with a **point**.

Continue it into a **line**.

Extend the line and you have a **plane**.

Central Theme

Newton's idea of **Force between two bodies** engendered the **notion of Gravity**. His Gravity was a mathematical force that existed within the norms of equation perpetuated through the **medium of Space**.



Space not only contains objects, but it also allows for the motion of unseen substances. Force is an excellent example that it needs Space for its operation. Newton's law of attraction between celestial objects permeates through Space. But the idea of objects having the power of attraction and repulsion through Space could not have been operationalised without his mathematical equation. His equation makes it clear that the Force between two objects depends on their masses and the inverse square of the distance between them—greater is the distance, lesser is the force, and vice versa. His mathematical construct is universally known as the Law of Gravitation. Newton's equation has a beauty and a majestic feeling that hard realities are capable of interpretation through simple means of mathematical conjectures. It is not known if Newton had heard of al-Khwarizmi, the 9th-century Muslim mathematician known as the Father of Algebra. Algebra involves the operation of Equation that enabled Newton to establish the magnitude of Gravitational Force, and the nature of Space through the variables of mass and distance.

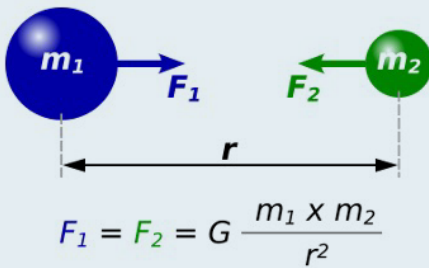


Photo
Space making possible the two objects to operate through their masses at a distance

Newton's idea of Force between two bodies engendered the notion of Gravity. His Gravity was a mathematical force that existed within the norms of equation perpetuated through the medium of Space. It was Einstein who observed Gravity as something different from a Force and looked upon it as a manifestation of Geometry, reminding us of the old Greek philosophers' notion of attributing truth to our discrete form of imagination.

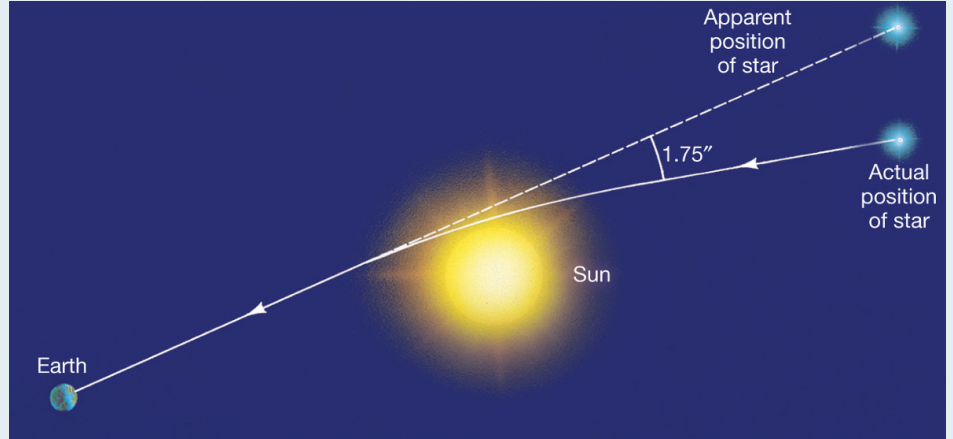


Photo
Einstein's Gravity and the bending of Light near the Sun

In Einstein's Gravity, one more element was introduced with Space, and it was Time. Together, they formed the idea of Spacetime. Einstein always thought of Space and Time as a one-entity thing. Though he introduced Time as a fourth-dimensional concept, his Time was inextricably connected with Space. In Einstein's theory, Gravitation is a display of curved Space-time instead of a force propagated between bodies as mathematicised by Newton. Both Newton and Einstein believed in the fictitiousness of Gravity. But their fiction assumed the role of fact with the help of their mathematical tools. Einstein's force resulted from the curvature of the universal Space because when a body accelerates in free fall, it follows the curved contours of the Space where Time is distorted (Space-Time distortion) due to mass and energy.

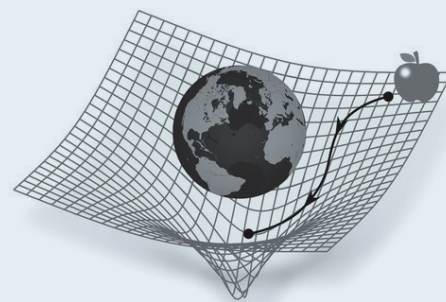


Photo
Spacetime, Curvature and Gravity

Einstein needed to explain the distortion of Spacetime with Mathematics for proof. His theory took the support of Geodesic. A geodesic is a path that an object will naturally follow in curved Spacetime meaning that there are no external forces. Einstein's principle makes Light the most significant factor in our idea about Space. Light has a velocity, and it is constant. This constancy of Light's motion enables Gravity to bend its path in Space.

The Mathematical form of Einstein's Gravity is highly complex and is meant for advanced Mathematical Physicists. While Newton's equation was happy with three variables, Einstein's Spacetime Gravity Curvature requires eight variables.

$$R_{\mu\nu} - \frac{1}{2}R g_{\mu\nu} + \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$$

Photo
Mathematical form of Einstein's Gravity

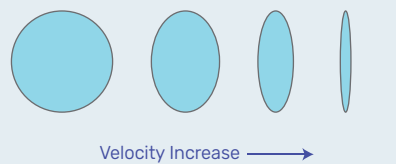
Einstein's mathematical form of Gravity is known as Einstein's Field Equation. The equation looks simply complex, but in reality, it is quite complex because this is not just one equation; rather, it is a set of 10 different and unique equations. The most mind-boggling aspect of the equation is the introduction of the speed of light to the fourth power. It means that

“ Anything that is not physically visible but imposes upon our imagination requires the calling of Mathematics whose intelligence as a universal intellect is capable of exploring its mystery. The subtle content of Einstein’s Spacetime concept is that we cannot think of Space without its twin brother, Time. As light travels through space at a constant speed of c , and consumes time t , Space will experience expansion of its life. On the other hand, if Space expands and makes light to follow it, time will also experience expansion of its life. ”

Light has a role to play in determining the curvature of Spacetime. But such deep discovery about the understanding of Space would not be possible without Mathematical aids such as metric tensor. We know that Tensors are simply mathematical objects that can be used to describe physical properties. Thus, Space becomes a manifestation of our universe, knowable only through Mathematics.

Anything that is not physically visible but imposes upon our imagination requires the calling of Mathematics whose intelligence as a universal intellect is capable of exploring its mystery. The subtle content of Einstein’s Spacetime concept is that we cannot think of Space without its twin brother, Time. As light travels through space at a constant speed of c , and consumes time t , Space will experience expansion of its life. On the other hand, if Space expands and makes light to follow it, time will also experience expansion of its life. Life, which is the cause of the origin of our Universe, cannot simply exist without the co-existence of Space and Time as a single mathematical object. This comes as counterintuitive when an object travels close to the speed of light; its length reduces such that when it attains the

speed of light, c , the object loses its two-dimensional entity because of having contracted to zero under the spell of the following mathematical equation.



$$L = L_0 \sqrt{1 - \frac{v^2}{c^2}}$$

▶ Photo
Length Contraction in Space

Thus, we see that the speed of light can play around with the size and shape of objects because ‘Space allows Light the freedom of manoeuvre.’ The speed of light is an extraordinary phenomenon in our spatial world. The Planck Length is the smallest unit of length, but it takes its value from the operation of three physical constants: the Speed of Light (3×10^8 m/s), the Planck Constant (6.63×10^{-34} Js), and the Gravitational Constant (6.63×10^{-11}

$\text{m}^3\text{kg}^{-1}\text{s}^{-2}$). These constants are mathematical numbers and make a tremendous contribution to fortifying the idea about Space in both infinitesimally small and infinitely large distances.

In conclusion, we can say that we cannot get a sense of the Space without the intervention of Mathematics. Mathematics is beautiful, and the great mathematician GH Hardy says, “There is no place for ugly Mathematics”. Mathematics is omnipresent in Space. It is used everywhere from Earth to the outermost galaxies. Astronauts use it every day, and so do the students and teachers of Space Science. Astronomy and Astrophysics explore Space, and Mathematics is there to take our imagination to Infinity and Beyond. Every aspect of space travel uses Mathematics. Inside spaceships, astronauts routinely measure their height to study the effects of zero gravity, which extends and stretches their spine. This makes them taller when in outer space. To understand the size and mass of planets, their gravitational forces, and how to use acceleration and deceleration for rockets to explore space are just some examples of Mathematics being used by rocket engineers, astrophysicists, and astronauts. How wonderful is that !!!

ASTRO-STRATEGY FOR AEROSPACE SUPERIORITY

Air Commodore Muhammad Mushtaqur Rahman
BSP, BPP, ndc, afwc, psc, M Phil¹

“And we pried into the secrets of heaven; but we found it filled with stern guards and flaming fires. We used, indeed, to sit there in (hidden) stations, to (steal) a hearing; but any who listen now will find a flaming fire watching him in ambush.”

- (Al Qur'an, 72:8-9)

¹The Author is the Dean of Aerospace Management Faculty of Aerospace and Aviation University Bangladesh.



The term 'Star War' was no more a science-fiction movie title, rather in March 1983, both [Time](#) and [Newsweek](#) had cover stories that referred to their President Ronald Regan's initiative.

Prelude

The environment of space not only delivers battles and technologies but also has the potential for fresh competitions of hegemony within. The ongoing competition for space weapons and dual-use technologies, which has gotten particularly intense in recent years. That invokes security researchers' increasing interest in the militarization and weaponization of space. Thereby the studies of aerospace must look for the prime utility of the satellites, both in higher and lower orbits, and the nature of circumterrestrial space. In this percept, astrophysics is important for setting satellites where they are to be considered not only with rocket propulsion and gravitational trade-off but also through considering lunar stability, orbit, uses, and motion.

The Geopolitics of Space

Upon the USSR's launching of Sputnik in 1957, the then-Democrat leader of the USA Senate, Lyndon B. Johnson, who later became US President (1963-1969), was persuading the Republican government to go into space in the US Senate. In response, President Eisenhower, who was Army Chief of Staff (1945-1948) and the first supreme commander of NATO (1951-1952), found safer, cozier spaces on the land. He had responded to Johnson saying, "Lyndon Johnson can keep his head in the stars if he wants. I'm going to keep my feet on the ground." In counter response to 'army man' Eisenhower, a historic comment of Johnson, "Control of space means control of the world," had made the

American succumb to his choice, and the nation had to enact the 'National Aeronautics and Space Act of 1958', and NASA came into being immediately. These stories are lucidly described in *The Washington Post* (October 10, 1957, p.A14) and *The New York Times* (November 23, 1957, p.7).

According to Collins Heartland theory of mid-21st Century (AFWC, ST-6, 2013), certain chock points in the space will allow

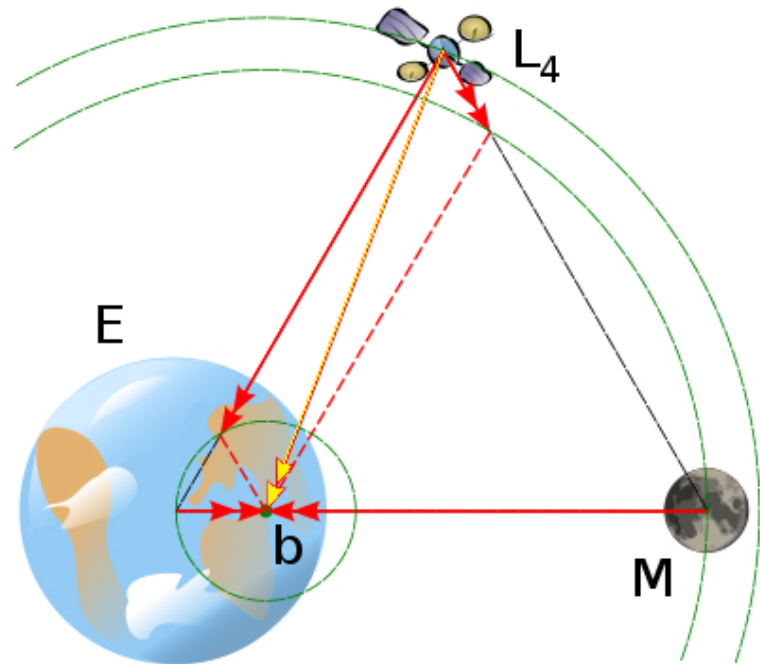


Figure 01
Lunar Liberation Point 4

the control over whole world including warfare; and, Lunar Liberation Point 4 is the one where the gravitational pull of the moon and the earth are exactly equal (p.6C-5).

In regards of Astro-strategic models of space regionalization, Starun, (2019) found a trend of 'Geopolitization of Space' (pp.33-59) referring 'increasing application of geopolitical concepts to outer space environment' (p.31). One of the initial geopolitical factors was the U.S. military's intention to establish military installations on the moon (Chapman 2008:9; Moltz 2011:96). All these descriptions were west oriented though, the first space explorer Russia, the then USSR remains in the military strategy of space's astro-strategic models, more specific to aerospace warfare. As Starun (2019) reminds that, 'It is also important to keep in mind that the Russian theater of military operations (ground, sea, aerospace, cyberspace) is not equal to respective physical domains, but is labeled after the physical space where the target is located and includes all weapons and other military assets used to

strike that target, which may not be based in the same physical domain with it (p.59)'; Krinitsky (2013:71) finds that although there is officially no "space TMO" in Russian military strategy, only the "strategic space zone" as a holistic domain and "strategic aerospace lines of communication." Eventually, Collins (1998:7) "describe space as a distinctive military medium" (Satrun, 2016:41-2), which led the space an inspiration of military utilization.

Satellite Warfare between Force Multiplier and Armed Race

The term 'Star War' was no more a science-fiction movie title, rather in March 1983, both *Time* and *Newsweek* had cover stories that referred to their President Ronald Regan's initiative. That was to challenge USSR's Last true Comrade Breznev's moderate project of space weaponization. Despite the US dominance, many states are investing in space assets and developing peaceful space use. For more than last half a century, military use

Perryman Jr. (1998) finds today's fighter pilots accurately kill ground targets by using satellite near **real-time data and images**. Satellite technologies were heavily utilized in all major wars **in last 50 years**.

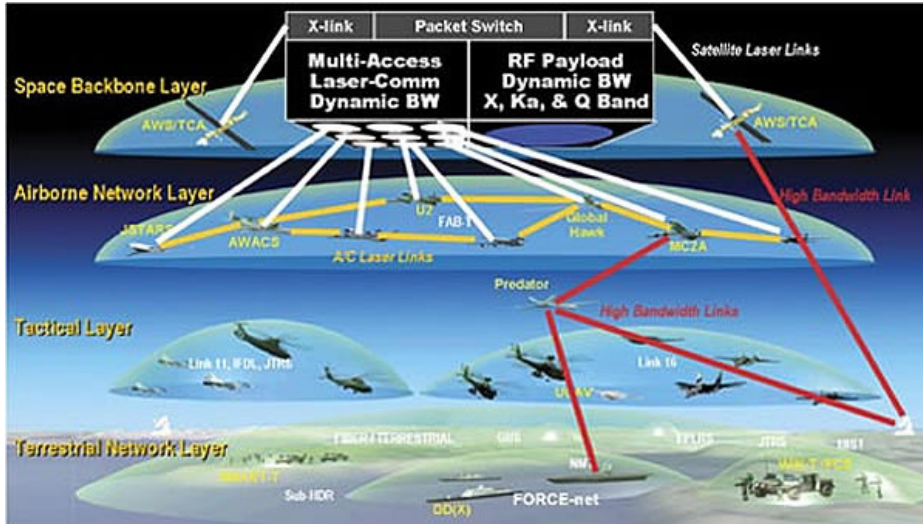


Photo
Space based Command, Control and Communication network

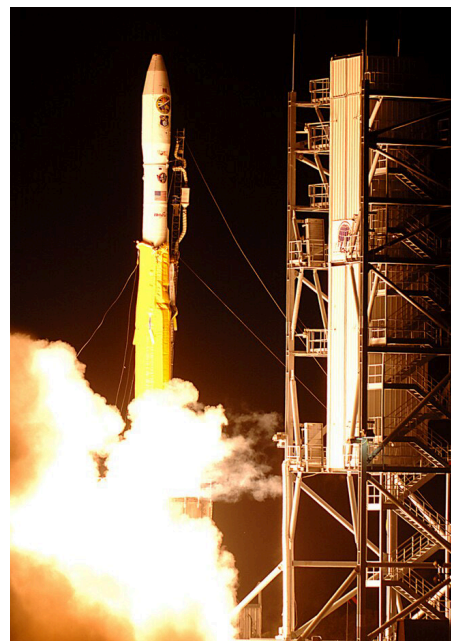
the aerospace attack field, Satellite imagery offers large area capture in a single pass, but, as Balova (2023) finds that AI drones have become a powerful tool for geospatial intelligence in recent years.

Lellouche (1987) referred 'this basic linkage between military and space technology constitutes the essence of one of the most noteworthy aspects of the present debate on the military uses of space: the question of anti-ballistic missile (ABM) defence incorporating devices deployed in space.'(p.6). The USA Projects of Space Weaponization is fascinating. Devid (2004) finds that one of the most intriguing weapons under research is hyper velocity rod bundles. The weapon consists of orbiting platforms with tungsten rods, capable of being satellite-guided to targets on Earth, and capable of striking at speeds exceeding 12,000 feet per second. Today, aerospace systems of the globe should think of dealing with these rod bundles if released from outer space towards inner space precision targets. Defense against solid metal rods in the atmosphere is challenging due to their high speed and lack of vulnerable points. The best approach, as GlobalSecurity.org (2024) suggests, is to attack them in space before they reenter, with an optimum orbit altitude of 8,000 kilometers and response time of 1.5-2 hours. As a showbiz of aerospace defence, China launched her first anti-satellite missile in 2007 that successfully destroy a defunct weather satellite (AFP 2007). American innovation to this aspect is ahead enough. Since long, Space based Laser Weapons (SBLW) delivers its offensive ability not by only creating a missile defence but also by exerting direct offensive operation (Altmann 1986:151). It further implies today that besides destroying enemy ICBMs, space-based lasers would also be designed to disrupt or destroy enemy satellites and knock out high- flying enemy aircraft or cruise missiles. The USAF plans counter aerospace projects using satellite bodyguards, similar to conventional interceptors. These "hunter-killer" satellites detect space-based threats and receive Earth's warnings, aiming to blind or destroy

of Space shuttle and Space stations have brought a new definitions in the air warfare itself (Boyne, 2002:586-588). The military's use of satellites nowadays has improved the efficiency of force deployment. Communication satellites not only delivered digitized connectivity but also rendered expanded C4ISR. Perryman Jr.(1998) finds today's fighter pilots accurately kill ground targets by using satellite near real-time data and images. Satellite technologies were heavily utilized in all major wars in last 50 years. Operation Allied Force was fought almost exclusively with aerospace power, with 50 American satellites aiding Western Europe. It emerges a concept of 'aero-electro-magnetic-space' (Armitage, 2000). Today's air Intelligence is based on Satellite where Spy Satellites are the intelligence tools. USAF has launched spy satellites into orbit with the intention of providing enhanced space operations to help war fighters on 30 Jun 11 (gotgeoint.com, 2011, refer to Image 2). However, the Iraq War has faced backlash for its space image errors, leading to the WMD hoax. Gurantz (2024) finds 'the Russia-Ukraine War has shown that satellites are key enablers of modern warfare and that states will target satellites with counterspace systems' (p.2). Recently, the US Space Force threatens to

transform jammer deployment in the Indo-Pacific region into an "electronic warfare battle" with China. PLA's electronic warfare gear is changing rapidly, with complex structures in new phased array radars. This shift in aerospace defence is bringing a new paradigm to the field. On

Photo
USAF Spy Satellite launched in 2011



Today's air power, in an age of modernity, seeks space support in many ways. It is no more air power as defined rather renamed as **aerospace power** in all leading doctrines, rather 'space' is now distinct as 'Air and Space'.

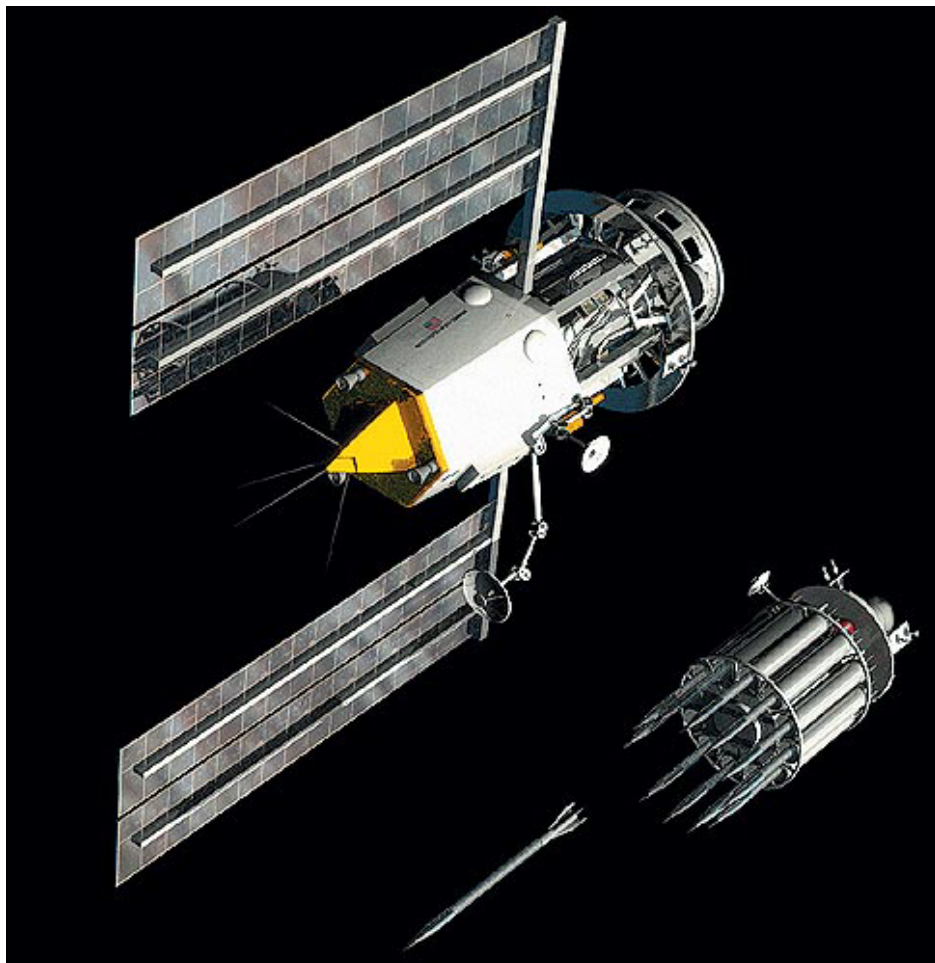


Photo
Hypervelocity Rod Bundles

enemy ASAT weapons. Starun (2019) refers that Carter's article (1986), former U.S. Secretary of Defense in 2015-17, on satellites and anti-satellites (pp.46-98), focusing on deployment limits and orbit assumptions. (p.39)

Aerospace Superiority

Klein (2006) finds that although air and space are different environments, they have an 'interrelationship and dependency due to shared activities and adjoining boundaries' (p.15). The future of air warfare is therefore, mortgaged to aerospace power that entails the space also. Today's air power, in an age of modernity, seeks space support in many ways. It is no more air power as defined rather renamed as

aerospace power in all leading doctrines (UK AP 3000 4th Edition, p.iii), rather 'space' is now distinct as 'Air and Space' (UK JDP 0-30 2nd Edition, cover pg). Either they are called 'aerospace' or air and space separately; they are required to be integrated, as US Doctrine document (2003) has referred US Air Force stance that Air and space are distinct domains with distinct physical laws, but linked by their combined effects. To achieve common purpose, they need to be integrated, acknowledging their differences. (p.4) Earlier White (1958) had spelled that for all practical purposes air and space merge, forming a continuous and indivisible field of operations (p.41); and today Smith (2001) finds that

aerospace power is no different from air power because it delivers similar products to users (p.109). Military users have seized the opportunity since humans first investigated aerospace, including airspace, and are about to adopt the term "aerospace superiority" in their lexicons.

Suppositions

The article's biggest limitation is that it only covers what humans are currently able to investigate in space. Who knows where human endeavors may lead in the "post" modern period that transcends this area? ALLAH says: O ye assembly of Jinns and men! If it be ye can pass beyond the zones of the heavens and the earth, pass ye! not without authority shall ye be able to pass! (Al Qur'an 55:33). This article discussed near-Earth astro within a vast solar system. Undeniably, this solar system is billions of times tinier within the Milky Way. The Milky Way is just a tiny piece of heavens, as revealed. 🌌

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Discussions focused on developing **training curricula**, conducting specialised **aviation courses**, and enhancing **joint training programmes**. Both institutions also explored the possibility of signing a Memorandum of Understanding (MoU) to strengthen collaboration.



Photo
The CAAB Chairman and the AAUB Vice Chancellor share a moment of unity

AAUB Vice-Chancellor Meets CAAB Chairman

S&B Desk:

Aviation and Aerospace University Bangladesh (AAUB) Vice-Chancellor Air Vice Marshal A K M Manirul Bahar met with Bangladesh Civil Aviation Authority (CAAB) Chairman Air Vice Marshal Monjur Kabir Bhuiyan at CAAB headquarters on 3 October 2024.

Discussions focused on developing training curricula, conducting specialised aviation courses, and enhancing joint training programmes. Both institutions also explored the possibility of signing a Memorandum of Understanding (MoU) to strengthen collaboration.

Future initiatives may include faculty exchange programmes, joint research projects, and infrastructure development for training facilities. The leaders also emphasised the importance of industry-academic partnerships to align training programmes with evolving global aviation standards.

Both parties expressed a strong commitment to fostering innovation and capacity-building, aiming to position Bangladesh as a regional hub for aviation excellence.

Source: AAUB; 4 October 2024.

Aerospace Carnival 2024 at AAUB

S&B Desk:



Photo
Aerospace Carnival 2024 IMPULSE 1.0 at Lalmonirhat Campus of AAUB

Aviation and Aerospace University Bangladesh (AAUB) hosted Aerospace Carnival 2024—IMPULSE 1.0 at its Lalmonirhat Campus on 23 November 2024, bringing together over 200 university students and nearly 600 students from local schools, colleges, and madrasas. The event, organised by AAUB's Aero-Astro Club and Drone Club, aimed to promote aerospace education and inspire innovation.

The carnival featured a Science Olympiad, Aerospace Case Studies, Drawing Challenges, MATLAB Problem Solving, Paper Plane Competitions, Project Exhibitions, and Poster Presentations, fostering creativity, analytical thinking, and technical skills. A seminar highlighted aerospace research opportunities in Bangladesh and the university's role in shaping future aeronautical engineers and innovators.

AAUB's Pro-Vice Chancellor, Air Commodore Md. Moinul Hasnain, attended as the Chief Guest and Keynote Speaker, emphasizing the university's commitment to advancing aerospace research and developing skilled manpower in the aviation sector.

Source: AAUB, 23 November 2024

AAUB Marks 5th Raising Day

S&B Desk:



Photo
AAUB students showcase artistic talent at a cultural show marking the 5th Raising Day

In a heartfelt celebration of the institution's achievements and goals, the Aviation and Aerospace University Bangladesh (AAUB) brought together staff, faculty, and students for its 5th Raising Day on 28 February 2024.

Chief of Air Staff, Air Chief Marshal Shaikh Abdul Hannan, attended as the chief guest and inaugurated the day's events. In his address, he underscored the importance of aligning AAUB's growth with 'Perspective Plan 2041' and urged all stakeholders to

work towards making the university a leading aviation research hub.

Vice-Chancellor Air Vice Marshal A K M Manirul Bahar reaffirmed AAUB's commitment to providing internationally recognised education in aviation, space, and technology. He thanked the leadership for its continued support and acknowledged the dedication of students and staff in shaping the university's future.

A key highlight of the celebration was the launch of a Cube Satellite developed by AAUB, officiated by the chief guest. The day's events also featured a cultural programme performed by students. To mark the occasion, a special journal titled The Quest for Excellence and a commemorative brochure were published.

Source: AAUB; 28 February 2024

AAUB held a **hybrid workshop** and innovation showcase on 9 May 2024, titled **Building Smart Bangladesh: Smart Approach to Higher Education**.



Photo
First ever Cube Satellite Balloon testing in Bangladesh

Bangladesh's First Successful Cube Satellite Balloon Test

S&B Desk:

On 28 February 2024, Aviation and Aerospace University Bangladesh (AAUB) celebrated its 5th anniversary by conducting the first successful Cube Satellite balloon test in Bangladesh. The event was attended by the erstwhile Chief of Air Staff as well as

the Vice Chancellor of AAUB, Air Vice Marshal A K M Manirul Bahar. It featured the launch of a Cube Satellite to a height of 1,126 feet using a weather balloon.

The satellite's data, including temperature, pressure, altitude, and images, was captured through a self-made ground station. This achievement is a milestone for AAUB, which led the 'Pico-Satellite for Bangladesh' project in collaboration with the ICT Division A2i and Pico Satellite Company.

The project's success underscores Bangladesh's progress in space technology, with hopes of producing and exporting small satellites in the future.

Source: AAUB; 22 April 2024

Smart Aviation in Bangladesh: Challenges and Opportunities

S&B Desk:

AAUB hosted a hybrid seminar on 18 January 2024 titled 'Developing Smart Aviation in Bangladesh: Challenges and Opportunities' at its Lalmonirhat campus. Organised by the Department of Aircraft Maintenance Engineering and supported by the AI and Robotics Club of AAUB, the seminar aimed to provide insights into Bangladesh's aviation industry's current landscape, focusing on technological advancements and growth prospects.

A keynote was delivered by Wing Commander J. M. Mostafizur Rahman (Retd.), CEO of Sky Capital Airlines Ltd. The Chief Guest was Air Vice Marshal Muhammad Mafidur Rahman, Chairman of CAAB, while Air Vice Marshal A. S. M. Fakhru Islam, AAUB's former Vice Chancellor, chaired the event.

Source: AAUB; 17 January 2024

Academia-Industry Collaboration for Smart Bangladesh

S&B Desk:

A workshop titled 'Innovate for Impact: Academia-Industry Collaborative Research & Innovation Projects for Building a Smart Bangladesh' was held at AAUB on 9 July 2024. Air Vice Marshal A K M Manirul Bahar, Vice Chancellor of AAUB, attended as chief guest and keynote speaker.

The event began with a welcome speech by the Vice Chancellor, followed by detailed discussions on the role of AAUB's Research and Innovation Centre (RIC). Speakers emphasised RIC's mission to advance knowledge, enhance digital skills, and address real-world challenges through collaborative research and innovation.

The workshop concluded with closing remarks by Pro-Vice Chancellor Air Commodore Md. Mainul Hasnain.

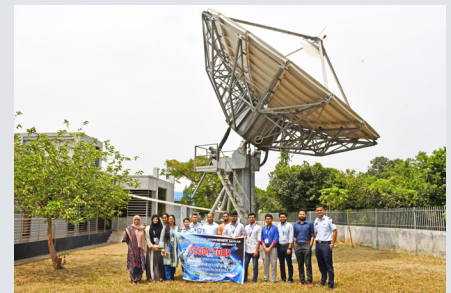
Source: AAUB; 9 July 2024

In Brief

Aviation Management Students Visit to HSIA

On 3 October 2024, students from the MBA in Aviation Management programme at AAUB visited Hazrat Shahjalal International Airport (HSIA), Dhaka, as part of their curriculum.

The visit aimed to provide students with practical insights into airport operations, management, and supply chain systems. The tour was organised by Group Captain (Now Air Commodore) Abu Zafor Mohammad Hasan, Chairman of the Department of Aviation Operation Management, with Dr. Hosne Nasrin as the chief coordinator.



SSE Students Visit to BAF VSAT HUB Station

On 23 April 2024, students from the 2nd batch of the Department of Space Communication and Navigation Technology, along with faculty members from the Department of Space Systems Engineering, visited the Bangladesh Air Force VSAT HUB Station. The visit aimed to provide practical insights and enhance the theoretical knowledge of the students in satellite communication and space systems.

Stress Management for Higher Education

AAUB organised a seminar on 'Stress Management in Higher Education Institutions' at its Lalmonirhat campus on 22 April 2024.

The seminar, led by the university's Institutional Quality Assurance Cell (IQAC), aimed to raise awareness about mental health and promote healthy practices among students, faculty, and staff. Dr. Md Azharul Islam, Associate Professor at the University of Dhaka, delivered the keynote.



University Oversight Visit

A team from the Ministry of Education, led by Additional Secretary Ms. Khaleda Akter, visited AAUB Lalmonirhat Campus on 19-20 December 2024 to review university activities.



Enhancing Facilities for Education

Vice Chancellor Air Vice Marshal A K M Manirul Bahar met with Professor Dr. SMA Faiz, Chairman of UGC, on 5 January 2025 to discuss about improving the university's educational facilities.



Discussion on Academic & Infrastructure Development

Vice Chancellor Air Vice Marshal A K M Manirul Bahar met with Honourable Education Advisor Wahiduddin Mahmud on 13 January 2025 to discuss about future academic and infrastructure development.

The Kibo Robot Programming Challenge

Asst Prof Md Samim Rahman

The Kibo Robot Programming Challenge (KRPC) is an educational programme in which students solve various problems by programming free-flying robots (Astrobee and Int-Ball) in the International Space Station (ISS). The Japan Aerospace Exploration Agency (JAXA) organises this programme in collaboration with the National Aeronautics and Space Administration (NASA).

Team_mukul, led by Muhtasim Redwan from the aeronautical engineering (avionics) department, secured 3rd place in the final round of the 5th KRPC. A total of 661 teams participated from 35 countries in the 5th KRPC, and only 13 teams were selected for the final round, which includes teams from the USA, UAE, Republic of the Philippines, Thailand, Taiwan, and many more. JAXA appreciated the AI model Team_mukul used in the competition.

This Year's Mission: In 2024's challenge, the astronaut on the ISS is preparing for the Asian Try Zero-G experiment, only to discover essential tools and manuals are missing! With time running out before the experiment begins, teams need to guide the Astrobee to locate these items while avoiding some Keep Out Zones and ensure the mission's success.

Space Robotics and Innovation

S&B Desk:

Aviation and Aerospace University Bangladesh (AAUB) organised a groundbreaking workshop titled Space Robotics Education, Research, and Entrepreneurship: Bangladesh and Global Perspective on 9 December 2024 at its Dhaka campus. Conducted in hybrid mode, the event underscored the university's commitment to advancing aerospace education and fostering innovation.

The workshop, hosted by AAUB's Institutional Quality Assurance Cell (IQAC) and supported by the AAUB AI & Robotics Club, aimed to enhance the quality of higher education and inspire future leaders in the aerospace sector. Air Vice Marshal A K M Manirul Bahar, Vice-Chancellor of AAUB, attended as chief guest and delivered the welcome speech.

The renowned engineer and scientist Mr. Mizanul H. Chowdhury, a key figure in NASA and MIT projects, delivered a keynote presentation.

Source: AAUB; 9 December 2024

Aircraft and Space Vehicle Design

S&B Desk:

The Institutional Quality Assurance Cell (IQAC) of Aviation and Aerospace University Bangladesh hosted a workshop on aircraft and space vehicle design and ongoing research activities on 1 June 2024. The event, held at the Dhaka Campus, featured Senior Loads and Dynamics Engineer from Boeing Company, Professor Dr. Humayun Kabir, as the keynote speaker.

Vice Chancellor Air Vice Marshal A K M Manirul Bahar highlighted the university's unique role as the nation's sole institution dedicated to aviation and aerospace education. Dr. Kabir emphasised the importance of research alongside academic studies.

Pro Vice Chancellor Air Commodore A T M Habibur Rahman concluded the workshop with closing remarks and a vote of thanks. The event underscored the university's commitment to advancing aerospace innovation through collaboration and knowledge-sharing.

Source: AAUB; 1 June 2024

Team_mukul, led by Muhtasim Redwan from the aeronautical engineering (avionics) department, secured 3rd place in the final round of the 5th kRPC.

AAUB Receives CAAB-Approved AMTO Certification

S&B Desk:

On 25 June 2024, Aviation and Aerospace University Bangladesh (AAUB) was awarded the CAAB-approved ANO (AW) Part 147 AMTO certification, enabling the university to conduct Aircraft Maintenance Engineering (AME) programmes and module examinations for undergraduate students.

The certificate-awarding ceremony was held at the CAAB headquarters in Dhaka, with CAAB Chairman, Air Vice Marshal Muhammad Mafidur Rahman, as the chief guest and AAUB Vice Chancellor, Air Vice Marshal A K M Manirul Bahar, as the special guest.

The Vice Chancellor expressed gratitude for CAAB's support and highlighted AAUB's pivotal role in advancing the national aviation sector.

Source: AAUB, 25 June 2024

Seminar on Nanotechnology in Aerospace

S&B Desk:

Aviation and Aerospace University Bangladesh (AAUB) hosted a seminar on "Nanotechnology in Aerospace" on 27 February 2024 at its Lalmonirhat campus. Organised by the Department of Science and Humanities, the event highlighted the innovative applications and transformative impact of nanotechnology in aerospace research.

Vice Chancellor, Air Vice Marshal A K M Manirul Bahar inaugurated the seminar. Keynote speakers included Dr. Al-Nakib Chowdhury, Professor at BUET, and Dr. Shahzad Hossain, Principal Scientific Officer at the Bangladesh Atomic Energy Commission and Assistant Professor at AAUB.

Source: AAUB; 27 February 2024

In Brief

ASAI Students Visit to BAF Bases

On 15 May 2024, students from the Masters of Science in Aviation Safety and Accident Investigation programme at AAUB visited the Aero Medical Institute (AMI) at BAF Base Bangabandhu and the Flight Safety Institute (FSI) at BAF Base Bashar as part of their curriculum.

The team, led by Air Commodore ATM Irfanur Rahman, Dean of the Faculty of Aviation Standardisation, Regulations, and Safety.

14th Syndicate Meeting

AAUB held its 14th Syndicate Meeting on 8 October 2024, chaired by Vice-Chancellor Air Vice Marshal A K M Manirul Bahar.

The Vice-Chancellor reflected on the sacrifices of the nation's student martyrs before outlining key university developments since the 12th Syndicate Meeting. Discussions covered recent seminars, agreements, research initiatives, and student engagements, including the launch of a Cube Satellite and accreditation from the Civil Aviation Authority of Bangladesh.

15th Syndicate Meeting

AAUB held its 15th Syndicate Meeting on 17 December 2024, chaired by Vice-Chancellor Air Vice Marshal A K M Manirul Bahar.

In his opening remarks, the Vice-Chancellor emphasised AAUB's role as a center for aviation and space technology education, committed to preparing youth for the challenges of the 4th Industrial Revolution. He highlighted the university's dedication to fostering knowledge, skills, patriotism, and discipline while benefiting from collaboration with the Bangladesh Air Force.

MoU with NovoAir

Aviation and Aerospace University Bangladesh (AAUB) signed a Memorandum of Understanding (MoU) with NovoAir on 11 January 2024 at its Dhaka campus. AAUB (former) Vice Chancellor, Air Vice Marshal ASM Fakhru Islam, attended as the Chief Guest, while NovoAir Managing Director, Group Captain Md. Mofizur Rahman (Retd), was present as the Special Guest.

The event was attended by the pro-vice chancellor, deans, heads of departments, and senior university officials.

Annual Cultural Festival at Lalmonirhat Campus

S&B Desk:



Photo
AAUB students rocking the crowd!

AAUB celebrated its annual cultural festival on 17 January 2024 at its Lalmonirhat campus.

The event featured musical performances by university students, local artists, and bands, blending traditional and contemporary styles. AAUB Vice Chancellor, Air Vice Marshal A S M Fakhru Islam, attended alongside Civil Aviation Authority officials and local Members of Parliament.

Faculty members, students, and university staff gathered to enjoy a vibrant showcase of cultural talent, reflecting the artistic diversity.

Source: AAUB; 17 January 2024



Photo
Drift with the wind, chase the sky; Spread your wings and learn to fly!

THE STORY BEHIND BANGLADESH'S FIRST-EVER CUBE SATELLITE BALLOON TESTING

Air Cdre (Retd) Md Afzal Hossain, BUP, ndc, psc, Ph.D,
Distinguished Professor, AAUB

Assistant Professor Md Samin Rahman, Assistant Professor, AAUB

Muhtasim Redwan, Student, Dept. of AE (Avionics), AAUB

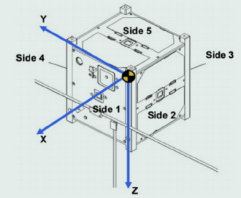
The journey of Pico satellite for the Bangladesh project started back in 2019, at a two-day convention of NRB (Non-Resident Bangladeshis) engineers held by the Economic Relations Division (ERD), a2i (Access to Information in Bangladesh), and Bridge 2 Bangladesh (B2B) jointly. A total of nine business sessions were held in the two-day conference. In the sessions, NRB engineers presented their innovative project proposals. Among those proposals, Professor Dr. Nazmul Ula, Associate Dean and Professor of Electrical and Computer Engineering at Loyola Marymount University in the United States, who is also a

valiant freedom fighter, shared his thoughts on developing a space programme in Bangladesh.

He said, "The Bangabandhu Satellite-1 is Bangladesh's first geostationary communications and broadcasting satellite; it is, of course, a big achievement. In addition, we propose the development of several small satellites to monitor climate change and weather patterns. To support this initiative, we recommend establishing a Bangladesh Space Agency (BASA). Furthermore, we plan to offer training programmes for young engineers to build their skills in this field. It's very effective to give an extra dimension with other developing countries." From there, an idea of developing a series of Pico satellites, or cube satellites, locally that are low in cost but high in return was developed. Later, a tripartite MoU (Memorandum of Understanding) for commercial production of space-life suitable modules in Bangladesh was signed on 6th March 2022. Our university signed the MoU with Bridge to Bangladesh (B2B), Aspire to Innovate (A2I), and Pico Satellite Company.

Air Commodore Mohammad Abdullah Al Mahbub, on behalf of AAUB, Faruq Ahmed Jewel, Head of Technology of a2i, Sajedul Islam, Vice President of B2B, and Professor Dr. Nazmul Ula signed the MoU

The main objective of this project is to commercialise the manufacture of cube satellites having a **10 cm x 10 cm x 10 cm dimension** and **weighing not more than 1.3 kg.**



for establishing Pico Satellite labs. Then finally, under the supervision of Professor Dr. Nazmul Ula, AAUB started Pico Satellite for Bangladesh with 5 teams, namely the Ground Station, Electronics and Power System, Mechanical, Communication, Control and Navigation, and lastly the Software Team.

The main objective of this project is to commercialise the manufacture of cube satellites having a 10 cm x 10 cm x 10 cm dimension and weighing not more than 1.3 kg. Besides commercialising the manufacturing process, the project also envisions for

- International collaboration on research in the field of design, development, and launching of CubeSats

International collaboration and cooperation with Pico Satellite Company

- Expansion of joint research initiative with NRB Scholar Dr. Nazmul Ula

- Infuse education on the design, development, and launching of CubeSats into the undergraduate students of AAUB.

- Develop a collaborative research ecosystem amongst the students and faculties of AAUB

- Create a pathway for Bangladesh to achieve its own space economy.

To accomplish the task, the project members have accomplished making a 137 MHz QFH antenna that was able to receive NOAA weather satellite signals and upload to the Satnogs network, which is an open-source platform aimed to create a satellite ground station network.

Later, a cost-effective ground station installed with an automated tracking system was designed and built, on which a conference paper titled "Design and Development of an Indigenous Ground Station for LEO Orbit Satellites" was published from IEEE. To test the automated tracking system, a cross Yagi antenna was also designed. The tracking system corrects the azimuth and elevation as the satellite passes over the head. The azimuth and elevation information were calculated



Photo
A milestone for AAUB: First ever Cube Satellite Balloon testing in country

using the Two Line Element Set (TLE) of the satellite using a Raspberry Pi, and then according to that calculation, the azimuth and elevation were controlled.

And then lastly, till now, the biggest achievement of the team is their successful balloon testing. On 28th February 2024, on the Fifth Foundation Anniversary of AAUB, a commercially off-the-shelf satellite was attached to a balloon and sent to an altitude of 1126 feet. It was done in the presence of Air Chief Marshal Shaikh Abdul Hannan, BBP, BUP, nswc, fawc, psc, Hon'ble Chief of Air Staff, Bangladesh Air Force, as the Chief Guest. Honourable Vice Chancellor of AAUB Air Vice Marshal A K M Manirul Bahar, OSP, BSP, ndc, hdmc, afwc, psc, ADWC; Honourable Vice Chancellors of other universities; teachers; and other distinguished guests were also present at that time.

The on-board software was programmed, and the payload board was designed by the picosatellite team. Alongside that, a

ground station was also designed by the team with a dashboard that showed the data received from the satellite.

Temperature, pressure, altitude, and satellite camera images were recorded and sent to the ground station using the cube satellite. This type of test is the first in Bangladesh.

A 1U prototype CubeSat has also been designed by the team. The prototype CubeSat was not space-grade, except that it was able to perform all the functionality of a CubeSat. For communication, LORA communication modules were used.

As of now, the team is working towards building an indigenous space-grade cube satellite so that it can be commercialised as soon as possible. Soon, instead of having high-cost, large satellites looking over our matters, our country will be able to supply low-cost, small satellites for all individual aspects like agriculture, weather, defence, etc. 🇷🇵

FROM ORBIT TO OPPORTUNITY: FUELLING GLOBAL GROWTH

Shahana Afrin Dina
Lecturer, AAUB



Photo
Grace is everywhere if only we dare to look beyond the obvious and leap towards infinity

Space exploration, once government-led, has evolved into a thriving, frontier-pushing industry driving global economic growth. With cutting-edge technologies, growing international collaboration, and the rise of private companies, it has become a major force for innovation and economic progress. The industry's impact spans diverse fields such as telecommunications, environmental monitoring, agriculture, and finance.

From Government Control to Private Ventures: The Transformation of Space

Historically, space exploration was dominated by national agencies like NASA and Roscosmos, centred on scientific discovery and national prestige. However, the landscape has shifted dramatically with the rise of private firms such as SpaceX, Blue Origin, and OneWeb. This evolution aligns with supply-side

economics, which emphasises reducing barriers for producers and fostering private-sector investment to drive economic growth.

Game-Changing Innovations Sparked by Space Exploration

The technological innovations derived from space exploration frequently extend beyond the industry itself, generating

The space sector is a substantial source of employment, generating millions of jobs worldwide across diverse fields, from **engineering** and **manufacturing** to **research** and **management**.



economic benefits across various sectors. These advancements often result in enhanced productivity and growth, illustrating the dynamic relationship between space exploration and the broader economy.

Satellite Technology: One of the most impactful contributions of the space sector is the development and deployment of satellite technology. Satellites enable essential services such as global positioning systems (GPS), meteorological forecasting, and telecommunications. These technologies exemplify externalities—positive effects experienced by parties not directly involved in market transactions. For example, GPS technology adds an estimated \$60 billion to the U.S. economy annually, enhancing efficiency across multiple industries. The economic impact of satellite technology can be expressed with the following equation:

$$\text{GDP with satellites} = \text{GDP without satellites} + \alpha \times \text{Productivity Increase}$$

- Here, α denotes the estimated productivity boost associated with satellite communications, highlighting the broader economic advantages of technological progress.
- Productivity Increase is the percentage increase in productivity due to satellite data in sectors such as logistics, agriculture, and communication.

Space Sector: Creating Jobs and Opportunities

The space sector is a substantial source of employment, generating millions of jobs worldwide across diverse fields, from engineering and manufacturing to research and management. This industry contributes to the development of human capital, fostering broader economic growth.

Creation of High-Skilled Employment Opportunities: The sophisticated nature of space exploration necessitates specialised knowledge across a range of fields, such as engineering, physics, data science, and robotics. The growth of private enterprises within the space



Photo
Satellite constellations used for Earth observation transmit high data volumes to Earth stations

industry has heightened the demand for a skilled workforce, leading educational institutions to modify their curricula to meet these needs. Organisations like SpaceX and Lockheed Martin directly employ tens of thousands of individuals while simultaneously generating additional employment opportunities through their extensive supply chains.

Indirect Job Creation through Supply Chains: Beyond direct employment, the space industry generates significant indirect jobs via its expansive supply chain, which includes sectors such as manufacturing, materials sourcing, and software development. Each satellite launch involves collaboration with a variety of suppliers, from metal producers to IT specialists, thereby broadening the employment impact beyond core space companies.

Inspiring Job Creation through Supply Chains: The expansion of the space industry catalyses encouraging students to embark on careers in STEM (Science, Technology, Engineering, and Mathematics) disciplines, which are vital for strengthening a nation's human capital. Both governmental bodies and private

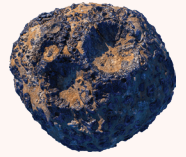
organisations frequently allocate resources to educational programmes designed to provide the workforce with essential skills, resulting in a ripple effect that enhances productivity and fosters innovation throughout the economy.

Space Infrastructure: Driving Economic Growth

Space infrastructure, including satellite networks, ground stations, and spaceports, is vital to numerous essential economic functions. As this infrastructure expands, it creates new industries, enhances existing services, and promotes sustainable economic development.

Initiatives like SpaceX's Starlink aim to provide high-speed internet to underserved areas, fostering digital inclusion and linking remote regions. Satellite networks drive economic growth by offering access to e-commerce, banking, and online education, creating significant opportunities for marginalised communities in parts of Africa and Asia. Satellites collect crucial data on deforestation, climate variations, and greenhouse gas emissions, guiding policy

As terrestrial reserves deplete, space mining could offer an alternative supply. NASA estimates that asteroid "16 Psyche" may hold \$700 quintillion worth of metals.



Overcoming Challenges for Sustainable Growth

Despite the considerable economic opportunities presented by the space industry, several challenges must be addressed to ensure sustainable growth. High costs, regulatory hurdles, environmental considerations, and workforce development needs pose significant obstacles.

Financial Barriers and Accessibility: The high costs associated with space exploration can limit participation to affluent governments and private entities. Technological innovations and policy reforms are crucial for reducing these barriers, making space exploration more accessible, and amplifying its economic benefits.

Environmental Sustainability and Space Debris: The growing accumulation of space debris presents risks to satellites and future missions. Addressing this challenge necessitates international collaboration and regulations to promote sustainable practices, such as mandatory deorbiting or recycling initiatives.

Clear Regulatory Frameworks for Equitable Access: As the space economy expands, establishing comprehensive regulatory frameworks is critical for ensuring fair access, resource distribution, and conflict resolution. Policies that advocate for equitable access to space, especially for developing nations, can help guarantee that the economic advantages of space exploration are widely shared.

The space sector has become a major driver of global economic growth, fostering innovation, job creation, and cross-sector collaboration. Economic theories, such as supply-side economics and innovation theory, highlight their broad impact on development. As technology advances and partnerships grow, the sector's potential for sustainable growth is immense. Overcoming challenges and capitalising on opportunities will be key to maximising its positive influence on the global economy.

Photo
Extracting platinum, nickel and cobalt from asteroids could ease Earth's energy shortfalls

decisions and promoting sustainable practices in sectors like agriculture and resource management. Furthermore, the global economy relies on GPS technology for logistics, transportation, and emergency services.

Space Mining: Economic Potential

Space mining, though still emerging, holds significant economic potential. Extracting valuable resources from asteroids or the Moon could ease Earth's resource shortages. Asteroids contain metals like platinum, nickel, and cobalt, essential for electronics and renewable energy. As terrestrial reserves deplete, space mining could offer an alternative supply. NASA estimates that asteroid "16 Psyche" may hold \$700 quintillion worth of metals.

For space mining to succeed, international agreements and regulations are essential, covering property rights, taxation, and environmental standards. These frameworks would attract investment, enabling space mining to grow as a sector contributing to the global economy.

Global Space Collaboration

Space exploration has become a collaborative effort, with partnerships enabling shared knowledge, technology transfer, and resource pooling. Initiatives like the International Space Station (ISS) and organisations such as the European Space Agency (ESA) demonstrate the economic gains from cooperation. Large-scale projects often require financial resources beyond the reach of individual nations, so cost-sharing enables ambitious missions while maximising the return on investment. For example, ISS member countries benefit from shared research facilities and scientific insights.

Such collaborations also strengthen diplomatic relationships, fostering broader economic ties. Programmes like the Artemis Accords establish guidelines for responsible exploration, laying the groundwork for space economies that benefit all participants. Moreover, international teams drive innovation by combining diverse expertise, particularly in climate monitoring and disaster response, enhancing global resilience and stability.

When an object travels at the speed of light, time stands still for it. That is, if someone travels in space by travelling at the speed of light, then when he returns to Earth, he will be able to see his future relative to the Earth. This is best explained by the 'twin paradox.'

HOW THE MI'RAJ TRANSCENDS TIME AND SPACE

Md Khairul Habib
Student ID: 21024022, AAUB

The event of the night of the Mi'raj of Prophet Muhammad (PBUH) plays a very significant role in the lives of Muslims.

Allah mentioned in the Quran

مِاْرَجُ لَيْلٍ دَجَسْمَلًا نِيْمًا اَلَيْلِيْهِ وَذَبْعَبُ يَرْسَا يَدْلًا نَحْبُسُ
نِيْمٌ هُوَ زَيْدٌ هُوَ لَوْحٌ اَنْكَرَبْتُ يَدْلًا اَصْقَالَ دَجَسْمَلًا يَكْلًا
رِيصَبَلًا عِيْمَسَلًا وَهُ هُنَا اَنْتَبِيَاءُ

Al-Isra (17:1):

"Glory be to Him Who made His servant travel by night from the Sacred Mosque to the Farthest Mosque whose surroundings We have blessed, to show him some of Our signs. Indeed, He alone is the All-Hearing, All-Seeing."

An-Najm (53:7-18):

These verses describe the Prophet's encounter with the Angel Jibreel (Gabriel) during his ascent (Mi'raj), including the vision of Sidrat al-Muntaha (the Lote Tree at the farthest boundary) and divine signs.

According to the Sahih Bukhari (3207) and Sahih Muslim (162), the Hadiths provide detailed accounts of the journey:

1. The Prophet was carried on Buraq, a celestial steed, from Mecca to Jerusalem.
2. He led the Prophets in prayer at Al-Aqsa Mosque.
3. He ascended through the heavens, meeting various prophets (e.g., Adam, Jesus, and Moses) at different levels.
4. He reached the Divine Presence, where the five daily prayers were ordained.

On this night, the Holy Prophet (PBUH) first came from Makkah to Jerusalem at

Masjid Al-Aqsa. From there, he met Prophet Adam (AS) in the first heaven, Prophet Isa (AS) in the second heaven, Prophet Yusuf (AS) in the third heaven, Prophet Idris (AS) in the fourth heaven, He met Prophet Haroon (AS) in the fifth heaven, Prophet Musa (AS) in the sixth heaven, and Ibrahim (AS) in the seventh heaven, and He then visited the Heaven and The Hell which are located above the seventh heaven, and was accompanied throughout this journey by Angels Jibreel (AS) and Burak (a luminous creature or celestial).

But the question is: If the Day of Judgement has not happened yet, then how did Prophet Muhammad (PBUH) see Paradise and Hell on the night of Mi'raj?

To know the answer to this question, first of all, we need to understand time dilation. According to scientist Einstein, time is not absolute; that is, time depends on relative speed and gravity in various ways.

When an object travels at the speed of light, time stands still for it. That is, if someone travels in space by travelling at the speed of light, then when he returns to Earth, he will be able to see his future relative to the Earth. This is best explained by the 'twin paradox.'

Also, when a strong gravitational force is applied somewhere, time almost stops.

Now if we try to know the speed of light a little bit, then we can see that the speed of light is 299792 kilometres per second. Light is the fastest thing in the known universe.

Now the question may arise in our mind: Is there anything more dynamic than

light? Although scientists cannot discover such a thing now, they think there may be something faster than light.

1. According to the theoretical tachyon, hypothetical particles called tachyon are theorized to travel faster than light.
2. In quantum physics, certain phenomena, such as quantum entanglement, involve instant correlations over vast distances, seemingly faster than light.
3. According to the cosmic inflation, during the universe's early expansion, space itself expanded faster than light.

If we understand the above, then we can say that the night of Maraj of Prophet Muhammad (PBUH) is not impossible.

The first thing is that Buraq (قارِب) carried by the Holy Prophet (PBUH), is an Arabic word whose root is قَرَب (barq), which means lightning, in Hadith Sharif. Buraq is described as larger than a donkey but smaller than a mule, dazzling, white, and capable of incredible speed, travelling at the pace of a glance.

The most amazing thing is that this whole thing is happening in just one night on earth. From this, we understand that the speed of Buraq may have been much faster than the speed of light, for which Earth time was almost fixed for the Prophet (PBUH). Due to which he was able to visit both Paradise and Hell. And was able to see the future.

Observing the whole event,

It's become vivid that the scientific limitation still bounded us to explain some certain phenomena, described in the religious book, and in those cases we should accept the limitation of the science in the explanation of those spiritual events.

In this literature, we understand that we must appear before Allah at some point, and that time is very near. So, we should fully surrender to Allah and atone for our mistakes. So that we can be successful. 🌟

Bangladesh has significantly reduced its **blocked airline funds**, releasing **\$124 million** in the past six months, according to the **International Air Transport Association (IATA)**.



The Chief of Air Staff distributed certificates among the participants

7th International Flight Safety Seminar Concludes in Dhaka

S&B Desk:

The 7th International Flight Safety Seminar 2024, jointly organized by the Bangladesh Air Force and the Civil Aviation Authority of Bangladesh (CAAB), concluded today (23 Oct) at the Pan Pacific Sonargaon, Dhaka. The three-day event, held from 21–23 October, focused on the theme "Promoting Flight Safety by Embracing Technological Advancements."

Air Chief Marshal Hasan Mahmood Khan, Chief of Air Staff, Bangladesh Air Force, attended the closing ceremony as the chief guest and distributed certificates to participants. In his address, he underscored the importance of technological adaptation in aviation safety and reaffirmed the Air Force's commitment to modernization.

The seminar featured discussions among aviation experts, military officials, and industry leaders from multiple countries, enhancing global cooperation in flight safety.

Source: www.tbsnews.net; 23 October 2024

Bangladesh Eases Airline Fund Restrictions, Releases \$124 Million

S&B Desk:

Bangladesh has significantly reduced its blocked airline funds, releasing \$124 million in the past six months, according to the International Air Transport Association (IATA).

The remaining restricted funds now stand at \$196 million, down from \$320 million in April.

Despite this progress, Bangladesh remains among the top three nations with the highest blocked airline revenues.

Globally, \$1.7 billion in airline funds remain blocked, with Bangladesh's foreign exchange constraints cited as a key challenge.

Source: www.tbsnews.net; 10 December 2024

Aviation Basic Course 13 Concludes at Army Aviation Group

S&B Desk:

The Aviation Basic Course 13 at the Army Aviation Group concluded at Dhaka Cantonment, marking another milestone in Bangladesh Army's aviation training. Chief of Army Staff General Waqar-uz-Zaman attended the ceremony as the chief guest, presenting certificates and flying brevets to the graduating officers.

Established in 1978, the Army Aviation Group provides aviation training for military and police personnel under the motto "Gati O Nipunta." This year, 24 officers participated, including 18 from the Army, four from the Navy, and two from Bangladesh Police.

Among the top graduates, Lt. Adnan Rakib (Navy), Capt. Abdullah Al Hasib (Army Aviation), and Capt. Md Fahim-al-Zaman (UAV Regiment) were recognized for excellence. Senior military and police officials, along with distinguished guests, attended the event.

Source: www.tbsnews.net; 11 December 2024

Biman Bangladesh Reports Record Revenue for FY 2023-24

S&B Desk:

Biman Bangladesh Airlines has achieved record revenue of Tk 10,575 crore for FY 2023-24, reflecting a 9.5% growth from the previous year. The airline reported an

operational profit of Tk 1,556 crore, though exchange losses and taxes reduced net profit to Tk 282 crore.

Despite currency depreciation challenges, Biman maintained its fourth consecutive year of net profit post-pandemic. The airline transported 3.36 million passengers across 30 routes, up by 100,000 from the previous year. Cargo operations surged, generating Tk 637 crore—a 60% increase year-on-year.

Source: The Business Standard, 24 December 2024

Biman Plans Major Expansion: 26 New Aircraft by 2034

S&B Desk:



Your home in the sky!

Biman Bangladesh Airlines has announced an ambitious expansion strategy, aiming to add 26 new aircraft by 2034. The plan, approved at the airline's 300th Board Meeting, will grow its fleet from 21 to 47 aircraft, a 122% increase over the next decade.

The expansion includes:

- 8 aircraft with 300-seat capacity
- 6 aircraft with 270 seats
- 6 aircraft with 160 seats
- 4 regional jets with 70 seats
- 1 wide-body aircraft with 400 seats

Biman's CEO Shafiqul Azim confirmed that new routes, including Australia and New York, are already in the pipeline.

Source: The Business Standard, 31 March 2024

Ethiopian Airlines, Africa's largest carrier, has launched its **Dhaka-Addis Ababa route** with inaugural flight **ET 678**, which landed at **HSIA** on 3 November 2024.

Ethiopian Airlines Begins Bangladesh Operations

S&B Desk:

Ethiopian Airlines, Africa's largest carrier, has launched its Dhaka-Addis Ababa route with inaugural flight ET 678, which landed at HSIA on 3 November 2024. The airline will operate five weekly flights, offering seamless connections to over 155 destinations. CEO Mesfin Tasew called Bangladesh a "rapidly expanding market."

Source: The Business Standard, 3 November 2024

Biman Considers Boeing Proposal After Airbus Deal

S&B Desk:

Biman Bangladesh Airlines is evaluating a fresh proposal from Boeing while advancing its negotiations with Airbus. Newly appointed Managing Director & CEO Jahidul Islam Bhuiyan stated that discussions with Boeing will follow after finalizing the Airbus agreement.

"We need more aircraft to sustain our growth strategy. While Airbus negotiations are progressing, we will also assess Boeing's offer," Bhuiyan said at a Dhaka press briefing.

Source: The Business Standard, 30 June 2024

US-Bangla Airlines Marks 10 Years of Operations

S&B Desk:

US-Bangla Airlines celebrates its 10th anniversary, highlighting its expansion to 20 destinations, a fleet of 24 aircraft, and plans for further growth.

Founded on 17 July 2014, US-Bangla Airlines started its journey with domestic flights and has since expanded to international routes, including Kolkata, Dubai, Kuala Lumpur, and Singapore. The airline, which currently operates 24 aircraft, plans to introduce flights to Delhi, Riyadh, and Dammam, with further expansion to London and Rome by 2025, and New York and Toronto by 2027.

Source: TBS News, 17 July 2024

Bangladesh set to launch direct flights with Switzerland

S&B Desk:



Bangladesh & Switzerland seal pact for direct flights

Bangladesh is set to launch direct flights with Switzerland with at least 14 flights operating between the countries per week. The Government of Bangladesh and the Swiss Federal Council in Bern inked an agreement to this end on 4 June 2024.

Under the terms of the agreement, designated airlines from both countries will be able to operate 7 passenger and 7 cargo flights per week.

Source: tbsnews.net; 14 June, 2024

Cox's Bazar Airport Extends Hours, Boosting Flight Operations

S&B Desk:

Flight operations at Cox's Bazar Airport have increased following an extension of the takeoff and landing schedule by three hours, now running until 10:00 PM daily.

The new schedule, effective from October 27, allows tourists and business travelers to arrive in the morning and return at night. With the extension, two additional flights now operate daily, bringing the total to 16. The first additional flight departs at 8:30 PM, followed by another at 10:30 PM.

Source: Aviation News BD | November 6, 2024

In Brief

US-Bangla to Launch Daily Jeddah Flights

US-Bangla Airlines will begin daily Dhaka-Jeddah flights in August 2024, catering to expatriates and religious pilgrims. Operated by Airbus A330-300 with 436 seats, the new route addresses rising demand for Hajj and Umrah travel, strengthening connectivity between Bangladesh and Saudi Arabia.

US-Bangla Gains CAAB Approval for Aviation Training

The US-Bangla Institute of Aviation (UIA) is now a CAAB Part 147-certified training center, approved to offer B1 and B2 type-rating programmes for ATR 72-600 and Boeing 737 aircraft. The milestone allows aviation engineers to receive internationally recognized training domestically, reducing costs. The approval follows two years of rigorous compliance efforts.

Biman Secures IOSA Renewal, Reinforcing Global Safety Standards

Biman Bangladesh Airlines has successfully renewed its IATA Operational Safety Audit (IOSA) registration for the 12th time, extending its compliance until December 14, 2026.

A five-member audit team from U.S.-based Argos Pros conducted the evaluation from September 1-5, 2024. IOSA is a globally recognized audit that assesses airline operational safety and management systems.

The certification is essential for maintaining IATA membership and codeshare agreements.

Biman Expands Madinah Flights Amid High Demand

Biman Bangladesh Airlines will increase its Madinah flights to six per week from 27 December 2024 to accommodate rising Umrah pilgrimage demand. Tickets are available via Biman's sales centers, website, app, and agents. The expansion enhances accessibility for religious travelers.

A BRIGHT RED DOT

- Munira Nawar
Lecturer, AAUB

"Listen up, kids, the midterm will be starting on 28 February 2224, sharply at 8:00! Don't be late! And don't forget your assignment." Shouted Mr. Nakamura while the bell rang.

The ringing of bells is one of the loudest moments of school. It announces relief and liberty at the same time. Teachers pack their copies and sheets for the office, and students run off in whatever direction they find faster.

Watanabe started off for home when the bell fully stopped. All the kids disappeared, and Mr. Nakamura also left for the office. He has always been like this. He is probably the only 16-year-old in the interplanetary Japanese heritage residential area who doesn't like to go to the simulation place where you can blow off Deimos with a simulation gun—that too for only 5 Martian bucks!

His father is a cultivator near the Samara Vallis. He mainly grows protein plankton and processes them in his homemade plankton maker. Organic superfood production has been on the rise since last century. There was a time when people survived only on canned foods when they were forced to flee from Earth. It was inhospitable to the mass population; it was hot, and the soil turned all plastic; things got worse when several volcanic eruptions happened in a single century. But the good men on earth predicted this would happen and started investing in rehabilitation on Mars.

The ever-curious mind of Watanabe searched the alleys of cloud libraries, and he would read whatever has a single clue on life on earth. He sometimes wonders why Earth attracts him so much. He learns about his heritage, his people, the weather, the nature, the artists, and the scientists. To sum up, everything a 16-year-old could read and perceive.

He slowly started for home. He typically enjoys his time alone while walking home. Nature here is mostly sandy, with a few greenhouses here and there. Some cultivators are growing organic fruits, some are growing meat, and some are producing plankton like his father. The red soil beneath his feet flew with each step. Life is great here on Mars. There is no country system, so the whole planet lives in harmony. There is no nationality for people, so no room for racism or violence. General security is controlled by Inter-Mars Security Services (IMSS), which is a compilation of members from every heritage. The administration for the whole planet is supervised by the Inter-Mars Admin Panel (IMAP), where members are nominated from each heritage as well. Life is too simple and uncomplicated here. Watanabe has read about the great wars on earth; he couldn't understand why people, the same

people living here, would go to the extent of blowing each other's land just for oil! It is a blessing that they scanned most of the books from Earth before departure. Still, there are some people living on earth, mainly in the pole area, for research purposes, though.

Watanabe's favourite spot on Mars is Mariner crater; it is named after Mariner 4, a spacecraft sent centuries ago by the good men from Earth, his forefathers. This is a tranquil place; generally, kids do not come here often. It was almost afternoon; he could see Deimos and Phobos slightly visible from here. But all he could think about is the Moon. His curious mind always questioned him, how life on earth could have been, how the moon would have looked like from there! He read about the green nature, forests, birds, and animals of Earth from the books of cloud libraries. Even people on earth could keep animals in their homes as pets. How exciting it could be! He could only keep an AI robot without any real name as his assistant. No pets!

When Watanabe reached home, it was supper time already. Mrs. Nakuto, his mother, told him that they have a guest today, his father's friend, Dr. Nagasawa, who is a space scientist and a professor at the Martian Aviation and Aerospace University. He just came back from an expedition from Earth.

"There's my boy! You've grown already!" Said Dr Nagasawa. He often travels between Earth and Mars; that's why he looks much younger than his father, though they are the same age.

"Uncle Nagasawa, I couldn't tell you how excited I am to see you. Now you have to tell me everything about Earth. I read all the stories about it." Said Watanabe.

"Well, dear kiddo, how about you join me at the university? Your school is about to be finished; have you chosen any career yet?" asked Dr Nagasawa while sipping organic coffee grown in his father's greenhouse.

"No, not yet. But I am always so fascinated by the stories of Earth, you know. I recently read Carl Sagan, the planetary scientist, and I found his discovery mind-blowing. I was thinking if I could study space science and go on an expedition like you."

Mr. Nakuto, Watanabe's father, was slightly surprised to hear this. He thought that his son would prefer a job in the Inter-Mars Security Services. But he always believed that children should follow their passion anyway. Though it means that Watanabe will be away from home and the planet.

Though Mars has been their home now for centuries, deep inside every person here on Mars longs for their real home, Earth. Where they had lived for generations.



"Son, if you are really into space and planetary science, I think you should go for it. And I believe you couldn't get a better mentor other than Nagasawa here," said his father.

That night, after Dr Nagasawa left, Watanabe started scrolling through MarsTube with his AI assistant beside him. He played his favourite video of Carl Sagan describing his planet, Earth, before Voyager 1 left the solar system. It was around 1990, almost 230 years ago. Thanks to the cloud storage system on Earth, he could access such old videos now. It always felt magical to Watanabe when Carl Sagan said,

"Look again at that dot. That's here. That's home. That's us. On it, everyone you love, everyone you know, everyone you ever heard of, and every human being who ever was, lived out their lives. The aggregate of our joy and suffering, thousands of confident religions, ideologies, and economic doctrines, every hunter and forager, every hero and coward, every creator and destroyer of civilisation, every king and peasant, every young couple in love, every mother and father, hopeful child, inventor and explorer, every teacher of morals, every corrupt politician, every "superstar," every "supreme leader," every saint and sinner in the history of our species lived there--on a mote of dust suspended in a sunbeam. The Earth is the only world known so far to harbour life. There is nowhere else, at least in the near future, to which our species could migrate. Visit, yes. Settle, not yet. Like it or not, for the moment the Earth is where we make our stand."

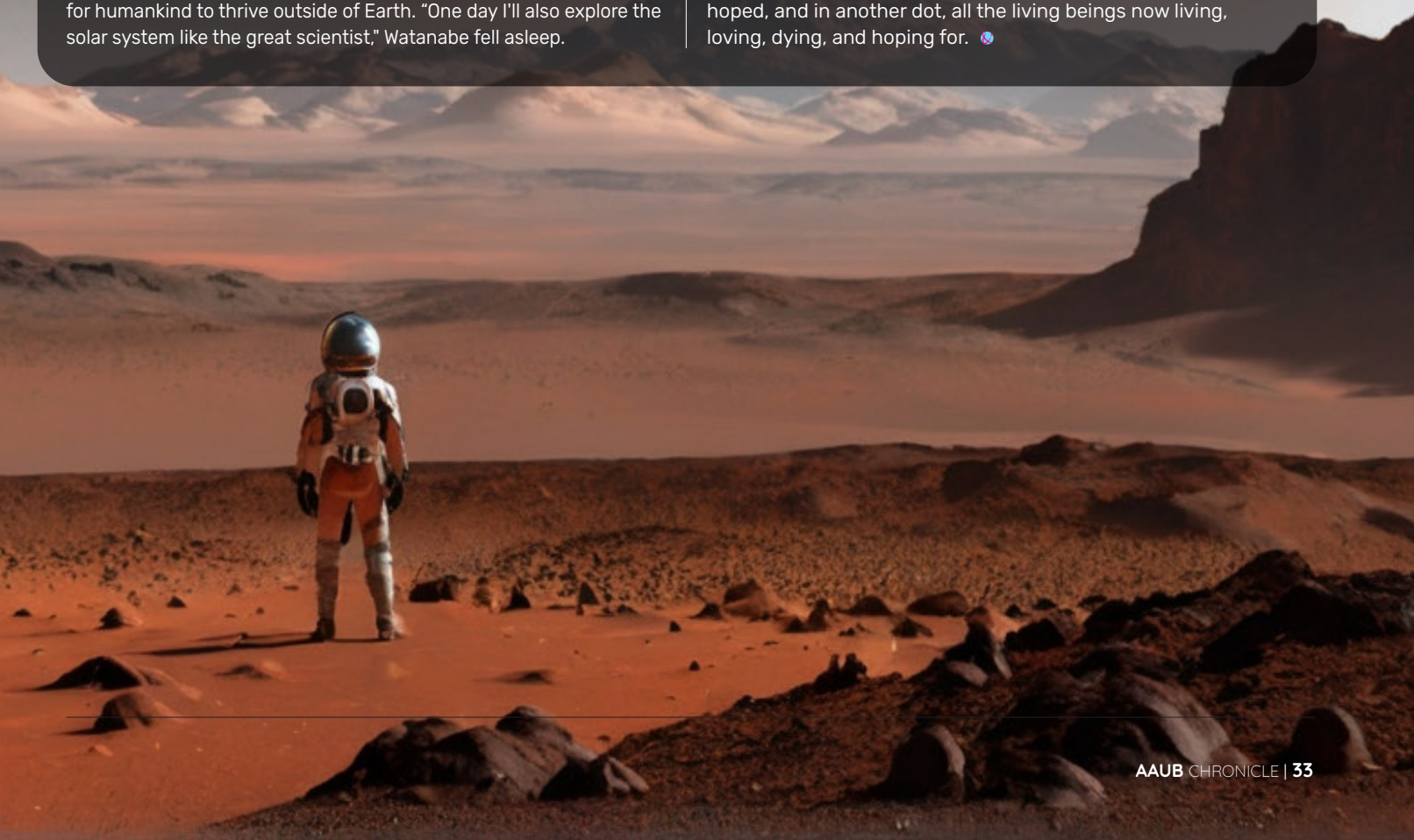
Watanabe wished he could meet Mr. Sagan now and tell him that they have made it. Mars is home now. Scientists like him made it possible for humankind to thrive outside of Earth. "One day I'll also explore the solar system like the great scientist," Watanabe fell asleep.

February 28, 2230, 8:00 AM, Martian Time. On the very occasion of Martian Aviation and Aerospace University's Raising Day, a special team of scientists, astronauts, and engineers started their journey on "Mars Shuttle-30". Watanabe is one of the aerospace scientists in the team. This expedition is led by Dr Nagasawa. Everyone gathered, cheering for the team. Though Mars has been their home now for centuries, deep inside every person here on Mars longs for their real home, Earth. Where they had lived for generations. Their forefathers, culture, heritage, and every existence that made them human, they left there. Every time an expedition starts for Earth, everyone holds onto a hope that one day they might be able to visit Earth, who knows, maybe even live there.

The engine roars, and with the announcement, the shuttle fires off to the sky. Watanabe holds onto his seat. This is his first time going to space. It is a roller coaster of emotions for him; he is excited, afraid, sad, and hopeful all at the same time.

"That's only natural, Son." Dr Nagasawa comforted him.

After 36 hours in the shuttle, Watanabe finally took a look outside. It was all dark and unbelievably quiet. They have travelled 100 million km already. So, they are in a middle spot between Earth and Mars. It is a befuddled moment for him. He is going where it used to be home, and he is leaving what he calls home now. He glanced outside once more, and, like Carl Sagan, he saw a bright red dot on the other side of a pale blue dot. In one dot, all the living beings lived, loved, died, and hoped, and in another dot, all the living beings now living, loving, dying, and hoping for. 🌍



The 232-foot Super Heavy booster, after propelling the Starship, returned to the launchpad and was caught by enormous mechanical arms—an innovation poised to revolutionize space travel.

In Brief

Qatar Airways Integrates Elon Musk's Starlink WiFi Onboard

Qatar Airways launched its first flight equipped with Elon Musk's Starlink internet service on October 22.

During a previous test flight, Musk participated in a live video call with Qatar Airways CEO Badr Mohammed Al-Meer. Passengers experienced internet speeds of up to 215 Mbps—far surpassing the airline's standard inflight WiFi, which offers just 5 Mbps at a cost of \$10 per flight.

Saudia for 105 Airbus Aircraft

Saudia Group, the owner of Saudia Airlines and budget carrier flyadeal, has signed a landmark deal with Airbus for the purchase of 105 aircraft.

The first batch of aircraft is scheduled for delivery in Q1 2026. The new order, which includes narrow-body aircraft, is in addition to the 88 planes already set for delivery over the next five years.

New Insights on Dark Energy

A decade-long study by the Dark Energy Survey (DES) of nearly 1,500 supernovae reveals new insights into dark energy, which drives the universe's accelerated expansion. Announced at the 243rd AAS meeting, the findings confirm the standard cosmological model while suggesting dark energy's density may vary over time. This research enhances our understanding of the universe's evolution.

Infrared Map of the Milky Way

Astronomers have unveiled the most detailed infrared map of the Milky Way, containing over 1.5 billion celestial objects. Using the European Southern Observatory's (ESO) VISTA telescope, the project spanned 13 years and accumulated 500 terabytes of data—the largest observational effort with an ESO telescope to date. The map consists of 200,000 images taken by VISTA's infrared camera, VIRCAM.

SpaceX Achieves Historic Starship Flight

S&B Desk:



SpaceX test launch from Boca Chica, Texas

SpaceX has successfully executed a landmark test flight of its Starship rocket, featuring a controlled splashdown in the Indian Ocean and the first-ever mid-air booster recovery using the "Mechazilla"

system. The flight, launched from Boca Chica, Texas, represents a significant engineering milestone in reusable spaceflight.

The 232-foot Super Heavy booster, after propelling the Starship, returned to the launchpad and was caught by enormous mechanical arms—an innovation poised to revolutionize space travel.

With steady progress across five test launches since 2023, SpaceX aims to conduct an unmanned Moon landing before sending a crew, including the first woman, by 2027-2028.

Source: The Guardian; 13 October 2024

Airbus Revises 2024 Delivery Target

S&B Desk:

European aerospace giant Airbus has revised its 2024 aircraft delivery target due to persistent supply chain challenges, particularly in engines, aerostructures, and cabin equipment. The company now aims to deliver approximately 770 commercial aircraft, down from its initial forecast of 800.

In addition, Airbus announced a €900 million (\$965 million) charge related to its satellite business, following a comprehensive review of its Space Systems programmes.

Source: www.tbsnews.net; 25 June, 2024

The spaceplane is designed to support China's space station by providing low-cost, reusable cargo transportation.

China has been operating a classified military spaceplane for extended missions, raising speculation about its potential strategic applications.

Source: reuters.com; 12 November 2024

DARPA AI for Military Applications

S&B Desk:

The Defense Advanced Research Projects Agency (DARPA) is prioritizing the development of artificial intelligence (AI) systems that can be trusted for military decision-making. Speaking at the Center for Strategic and International Studies, Matt Turek, deputy director of DARPA's Information Innovation Office, emphasized the importance of AI in preventing technological surprises from adversaries and ensuring strategic superiority.

DARPA integrates AI, machine learning, and autonomy in approximately 70% of its programmes and actively engages

academia and industry for transformative innovations. One such initiative, the Artificial Intelligence Cyber Challenge, leverages generative AI to identify and rectify vulnerabilities in critical infrastructure software. Through various high-stakes competitions, DARPA continues to drive AI advancements for defense applications.

Source: www.defense.gov; 27 March 2024

Futuristic Superplane Closer to Reality

S&B Desk:

A revolutionary superplane, capable of flying from London to New York in just 90 minutes, is edging closer to reality. Beijing-based Space Transportation recently completed the first test flight of its Yunxing aircraft prototype, which is designed to reach speeds of Mach 4 (3,000 mph)—twice as fast as the retired Concorde.

The aircraft features advanced aerodynamics, thermal protection, and control systems tailored for high-speed travel. With a vertical takeoff and landing capability, Yunxing is expected to reach altitudes above 65,600 feet. Space Transportation aims to launch full-scale commercial flights by 2027, potentially heralding a new era of supersonic travel.

Source: www.thesun.co.uk; 29 October 2024

IATA Projects \$1 Trillion Revenue in 2025

S&B Desk:

The International Air Transport Association (IATA) forecasts airline industry revenue exceeding \$1 trillion in 2025, despite significant aircraft shortages caused by production delays at Boeing and Airbus.

IATA Director General Willie Walsh criticized aircraft manufacturers for supply chain inefficiencies, which have led to rising costs and delays in fleet expansion. Airlines argue that without newer, fuel-efficient planes, they struggle to

reduce operational costs while meeting growing demand.

Source: www.reuters.com; 10 December 2024

Europe's Ariane 6 Returns to Space

S&B Desk:



ESA's Ariane 6 shoots high

The European space industry marked a significant milestone with the maiden flight of the Ariane 6 rocket, restoring the continent's independent access to space. The European Space Agency (ESA) hailed the mission as a success.

Launching from French Guiana, Ariane 6 deployed three micro-satellites for research purposes.

Developed by ArianeGroup at a cost of €4 billion, Ariane 6 is set for 29 missions, including 18 launches for Amazon's Kuiper internet constellation.

Source: Reuters; 10 July 2024

ISRO: India's Space Milestones in 2024

S&B Desk:

India's space agency, ISRO, achieved significant milestones in 2024, solidifying its global position. Key accomplishments included the January launch of XPoSat, making India the second nation with an X-ray polarimetry observatory. Aditya-L1 reached its halo orbit in February, and successful Reusable Launch Vehicle tests occurred in March and June. The SSLV-D3 launch in August showcased cost-effective satellite deployment, while November's Hab-1 analog mission

simulated interplanetary conditions. Additionally, ISRO launched the Proba-3 mission for ESA in December.

Source: www.business-standard.com/india; 29 December 2024

ASAFA Launched to Promote Sustainable Aviation Fuel in Asia

S&B Desk:

The Asia Sustainable Aviation Fuel Association (ASAFA) has been launched in Singapore to accelerate the production and use of low-carbon aviation fuels across the region. Despite the Asia-Pacific being the largest air travel market, it trails behind Europe and the U.S. in Sustainable Aviation Fuel (SAF) development.

Co-founded by former Airbus executive Fabrice Espinosa and other industry experts, ASAFA's founding members include major players like Korean Air and DHL Group.

Source: www.greenairnews.com | 11 November 2024

Highest-Resolution Image of a Supermassive Black Hole

S&B Desk:

Scientists have captured the most detailed image yet of a supermassive black hole, located 55 million light-years from Earth. Using the Event Horizon Telescope (EHT), researchers achieved unprecedented resolution, revealing a multi-color view of the black hole for the first time.

Previous images, including the famous 2019 "Eye of Sauron" depiction, showed the black hole as a glowing orange ring. However, the new images, released by the Center for Astrophysics at Harvard & Smithsonian (CfA) and the Smithsonian Astrophysical Observatory (SAO), feature turquoise and red hues. The EHT links six telescopes across the globe, creating an Earth-sized observatory.

Source: The Sun | 27 August 2024



Photo
In the sky, precision is everything. Every detail matters, without exception.

INVESTIGATING THE TRUTH BEHIND AVIATION SAFETY

Md. Mahabubur Rahman
Student ID: 23036003, AAUB

Aircraft accidents are among the most tragic events in the world of aviation. Though they are rare, when they occur, they often leave families devastated, lives shattered, and entire communities affected. However, behind the heart-wrenching scenes of these accidents lies a meticulous process of

investigation aimed at preventing such tragedies in the future. As a student of Aircraft Accident Investigation, I have come to appreciate that the true work begins not in the aftermath of the crash but in the comprehensive investigation that follows. The goal of this process is not to assign blame but to understand

the root causes of the event and use those findings to improve safety protocols, technology, and human factors in aviation.

When an aircraft accident occurs, the primary responsibility of investigators is to gather and analyse evidence. This includes everything from the wreckage at

Aircraft accident investigations are not about pointing fingers or placing blame but about improving the **safety of future flights**. Each tragedy provides critical insights that help shape the future of aviation, pushing the industry toward **greater innovation** and **stronger safety measures**.



the crash site to the flight data recorders (FDR, commonly known as the black boxes) and cockpit voice recorders (CVR). The black box is the most valuable source of information, capturing key data such as speed, altitude, and engine performance. Investigators use this information to recreate the final moments of the flight and identify any deviations from standard operations.

While the black box provides crucial technical data, investigators also look at human factors, such as pilot decisions and crew communication. This comprehensive approach helps to reveal not just what happened but why it happened, uncovering the underlying issues that contributed to the crash. Such findings highlight the importance of Crew Resource Management (CRM), which focuses on improving communication, teamwork, and decision-making under stress.

Once the investigation is complete, the work doesn't end with the identification of causes. The real impact of an investigation lies in the lessons learnt and the preventive measures that follow. The aim is to ensure that the same mistakes are not repeated and that future aviation operations are safer. Take, for instance, the tragic crash of Air France Flight 447 in 2009. Investigators found that a combination of faulty sensors (pitot tubes) and pilot misjudgement contributed to the loss of the aircraft. As a result, new training protocols were introduced to better equip pilots in handling unusual technical failures and maintaining control in unexpected circumstances. These lessons were not just applied to the airline involved but became part of global aviation safety standards.

Similarly, following the US-Bangla Airlines crash Flight-211 in 2018, mental health evaluations for pilots, more rigorous training on communication during high-pressure situations, and greater emphasis on weather-related decision-making were recommended and



Photo
Searchers recover the tail section of Air France flight 447 from the Atlantic on June 7th, 2009

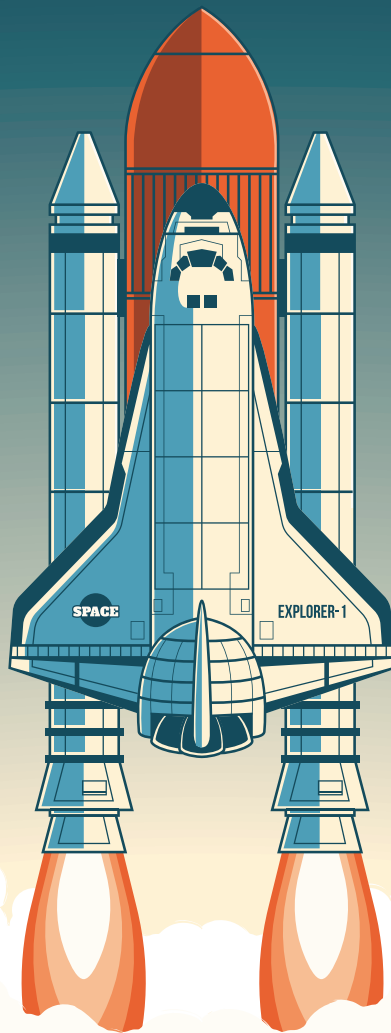
implemented by regulatory bodies. These improvements have since influenced aviation safety protocols worldwide, showcasing how an investigation can transform tragedy into positive change.

Modern technology plays a crucial role in aircraft accident investigations. Beyond the traditional black boxes, tools like 3D simulations and drones are now commonly used to help recreate the accident and understand the accident site in great detail. Advanced AI algorithms are also being employed to analyse vast amounts of data from flight recorders, weather reports, and maintenance logs, allowing investigators to spot trends and identify potential safety risks more quickly.

The investigation of accidents has thus evolved into a more sophisticated, data-driven process that leverages the latest technology to improve both the speed and accuracy of conclusions. This, in turn, leads to faster implementation of

safety measures, ensuring that the lessons learnt are acted upon sooner rather than later.

Aircraft accident investigations are not about pointing fingers or placing blame but about improving the safety of future flights. Each tragedy provides critical insights that help shape the future of aviation, pushing the industry toward greater innovation and stronger safety measures. The combination of technology, human factors research, and international cooperation has led to a steady improvement in aviation safety. As aviation professionals and future leaders in the field of aviation safety and accident investigation, it is our responsibility to learn from the past, innovate for the future, and ensure that the skies are safer for all. The investigation process is not just about uncovering the truth behind an accident—it is about using that truth to make aviation the safest it can be for generations to come. 🌍



RE-ENTRY CAPSULES: THE PORTAL TO SPACE DISCOVERY

Md Shaishab Ahmed Shetu
Student ID: 23056003, AAUB

Aviation and Aerospace University Bangladesh is at the forefront of space education in Bangladesh, offering specialised programmes in Space System Engineering and Satellite Communication. These programmes will undoubtedly give us important knowledge of satellite systems, communications, and space science, opening the door for Bangladesh's space goals to advance even further. An essential component of human space

exploration is a reentry capsule, which is made to go from Earth to space and back. A number of meticulously planned procedures must be followed in order to launch a spacecraft into space and bring it back to Earth safely.

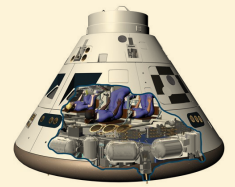
Journey to Space

Launch: The journey to space begins with a launch using a powerful rocket like NASA's Space Launch System (SLS) or SpaceX's Falcon 9.

Separation: Once the rocket reaches the desired speed and altitude (typically above 100 km, which is considered the Kármán line marking the edge of space), the reentry capsule separates from the rocket. In this phase, astronauts experience weightlessness.

Orbiting: After separation, the capsule enters orbit. Depending on the mission, this could be low Earth orbit (LEO) or higher, such as geostationary orbit or a transfer orbit to other destinations, like

Re-entry capsules are crucial for both the safe return of humans and the testing of technologies that will enable extended space missions.



the Moon or Mars. For missions to other planets, like Mars, the spacecraft may execute specific trajectory manoeuvres, such as a gravity assist or Hohmann transfer orbit, to ensure it reaches its destination efficiently.

Travel to Other Planets: When travelling to other planets, the capsule follows a calculated trajectory that involves a long-duration cruise phase in space. For example, a mission to Mars would involve months or even years of travel, depending on the distance, orbital alignments, and the spacecraft's propulsion capabilities.

Arrival and Exploration: Upon reaching the destination, such as Mars, the capsule would go through another series of manoeuvres to enter the planet's atmosphere (if applicable) or to orbit for satellite deployment or landing.

Returning to Earth

Orbital Decay: Before re-entry, the capsule's orbit naturally decays due to atmospheric drag, or the crew may execute a deorbit burn to begin the descent. The capsule's orientation is critical during this phase, as it needs to remain in a specific attitude to ensure a safe entry angle.

Atmospheric Entry: The capsule enters the denser layers of the atmosphere, where friction generates extreme heat. The heat shields absorb the energy and gradually wear away in a controlled manner (ablative cooling), preventing the capsule from overheating.

Plasma Formation: As the capsule travels through the atmosphere, a plasma layer forms around it, causing communication blackouts (up to several minutes). This is a normal phenomenon due to the ionisation of air around the capsule.

Deceleration: Once the capsule has slowed sufficiently and descended to lower altitudes, parachutes deploy in

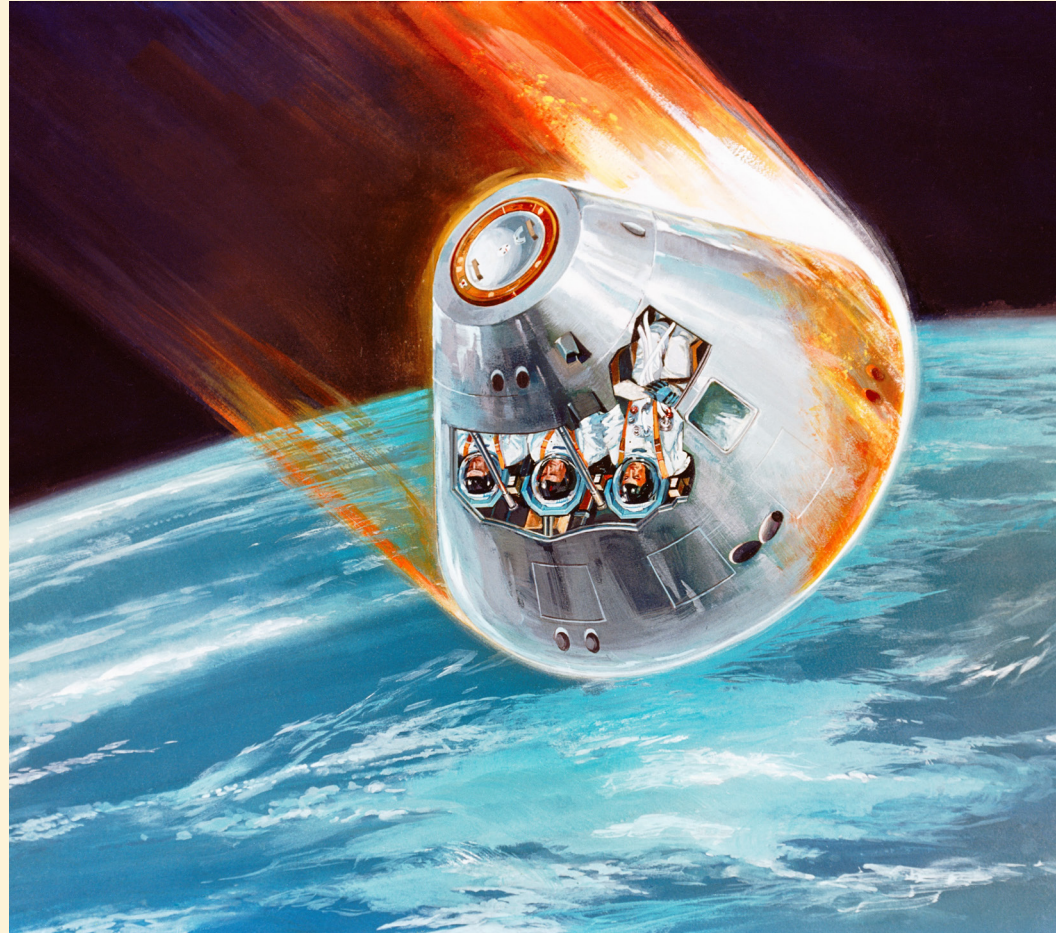


Photo
The 1960s-era Apollo capsule during atmospheric reentry. Yes, this isn't the Orion capsule; I just thought it looked too cool to not use. (Plus, Orion is heavily based on Apollo.)

stages. First, small pilot chutes are deployed to extract the main parachutes, which slow the capsule's descent to a safe speed.

Landing: Finally, the capsule lands softly, either via splashdown into the ocean or a controlled landing on solid ground, depending on the mission. Recovery teams then retrieve the capsule and crew for post-mission operations.

Re-entry capsules are crucial for both the safe return of humans and the testing of technologies that will enable extended space missions. These capsules provide invaluable data on the safety and viability

of human space travel, especially for longer missions, such as those to the Moon, Mars, and beyond. As humanity ventures deeper into space, the success of human exploration beyond Earth will depend heavily on the safety, reusability, and development of re-entry technologies. The continued improvement of re-entry capsules will ensure safe return journeys, contributing to the overall success of future deep-space missions. 🚀

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