APPLIED SCIENCE

The International Journal of Applied Sciences.
Vol. 2, No. 2, 2026, pp. 59-91
ISSN 3104-8935

The Evolution of U.S. Space Military Strategy and Its Implications for Space Security: Strategic Resilience, Commercial Integration, Allied Interoperability, AI-Enabled Space Awareness, and Escalation Risk

Annisa Anngi Chamdan[*1]

[1] Institute of Malaysian and International Studies (IKMAS), National University of Malaysia (UKM), Bangi, Malaysia. Email: Annisa.ann@gmail.com

* Corresponding Author: Annisa Anngi Chamdan, Annisa.ann@gmail.com

DOI: https://doi.org/10.64440/IJAS/IJAS0017

ARTICLE INFO

Article history
Received May 06, 2026
Revised May 11, 2026
Accepted Aug 10, 2026

Keywords
U.S. space strategy;
space security ;
Space Force;
strategic resilience;
commercial space;
allied interoperability;
artificial intelligence;
space-domain awareness;
escalation risk;
space militarization;
hybrid architecture;
strategic competition.

ABSTRACT

The strategic importance of outer space has undergone a profound transformation from the traditional use of satellites as supporting infrastructure for terrestrial military operations toward the conception of space as an operational domain in which strategic competition, deterrence, resilience, intelligence, command and control, and military power are increasingly organized. This article develops a new analytical framework for examining the evolution of U.S. space military strategy by moving beyond a document-centered description of policy change and introducing five additional explanatory variables: strategic resilience, commercial-space integration, allied interoperability, data and artificial-intelligence-enabled space-domain awareness, and escalation risk. These variables are examined as interconnected mechanisms through which strategy is translated into force design and ultimately affects the stability and security of the space environment.

Using qualitative longitudinal analysis of major U.S. strategic documents, doctrinal developments, organizational reforms, commercial-space policies, international partnership initiatives, and publicly available governmental assessments, the study identifies a transition from space support toward space-power competition and increasingly integrated hybrid architectures. The analysis shows that U.S. strategy is no longer based solely on increasing the number or sophistication of government-owned satellites. Instead, it increasingly combines military capabilities with commercial services, allied systems, distributed architectures, data infrastructure, artificial intelligence, rapid acquisition, responsive launch, and institutionalized coalition integration. The 2024 Department of Defense Commercial Space Integration Strategy explicitly prioritized access to commercial capabilities across the conflict spectrum, pre-crisis integration, security conditions for commercial participation, and development of new commercial solutions. (U.S. Department of War) The U.S. Space Force subsequently reinforced this direction through its Commercial Space Strategy and, in 2025, its International Partnership Strategy, which emphasizes interoperability and integration with allies and partners. (U.S. Space Force)

The study argues that this transformation produces a dual effect. On one hand, resilience, redundancy, commercial diversification, international cooperation, and improved space-domain awareness may strengthen continuity of essential services and reduce vulnerability to individual disruptions. On the other hand, the increasing integration of military, commercial, allied, cyber, data, and artificial-intelligence capabilities may create new dependencies, attribution problems, escalation pathways, and incentives for strategic competition. The article therefore proposes a Space Strategic Security Transformation Model (SSSTM) linking strategic drivers, military transformation, technological integration, resilience, interoperability, and escalation risk. The findings suggest that future space security will depend not only on military balance but also on the ability of major powers to manage interdependence, uncertainty, congestion, dual-use technologies, and crisis escalation.

APPLIED SCIENCE
The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo
Vol. 2, No. 2, 2026, pp. 59-91
ISSN 3104-8935

1.INTRODUCTION

Outer space has evolved from a relatively specialized technological environment into a central component of national security, economic competitiveness, military effectiveness, communications infrastructure, navigation, intelligence, disaster monitoring, and global strategic competition. The transformation is particularly visible in the United States, where space capabilities have progressively moved from a supporting role within terrestrial military operations toward a more autonomous and operationally integrated conception of space power.

During the early decades of the space age, military space capabilities were principally understood as enablers. Satellites provided communications, missile warning, navigation, meteorological information, reconnaissance, surveillance, and other forms of strategic support. This model assumed that military operations occurred primarily on land, at sea, or in the air, while space supplied information and connectivity to those domains.

That assumption has progressively weakened.

The development of counterspace capabilities, the increasing density of orbital systems, the emergence of large commercial satellite constellations, the growing dependence of military operations on space-enabled information, and the establishment of the United States Space Force have collectively changed the strategic environment. U.S. policy increasingly treats space as a domain in which the United States must preserve operational freedom, protect national interests, deter adversaries, and maintain the ability to operate under contested conditions.

The transformation is not simply institutional. It is also conceptual.

The central question is no longer merely **how satellites support military operations**, but rather:

How can a state preserve strategic freedom of action when its military effectiveness increasingly depends on a contested, congested, commercially interconnected, digitally dependent, and internationally shared space environment?

This question requires an analytical framework broader than the traditional examination of strategic documents.

Earlier studies of U.S. space strategy have frequently focused on presidential administrations, individual policy documents, military doctrines, organizational reforms, or the militarization and weaponization of space. Such approaches remain valuable, but they may underestimate the importance of several developments that have become increasingly prominent after the establishment of the Space Force.

The first is **strategic resilience**. U.S. policy increasingly emphasizes architectures capable of continuing to provide services despite disruption rather than relying exclusively on the physical protection of individual high-value platforms.

The second is **commercial-space integration**. The Department of Defense's 2024 Commercial Space Integration Strategy explicitly moved beyond occasional commercial augmentation toward systematic integration of commercial capabilities into national-security architectures. (U.S. Department of War)

APPLIED SCIENCE

The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo

Vol. 2, No.2, 2026, pp. 59-91

The third is **allied interoperability**. In July 2025, the U.S. Space Force released its first International Partnership Strategy, emphasizing the integration of allied and partner capabilities into force design, force development, and force employment. (U.S. Space Force)

The fourth is **data and artificial intelligence**. The Space Force's FY2025 Data and AI Strategic Action Plan identifies enterprise-wide data and AI governance, AI-enabled culture, rapid adoption of advanced analytics, and partnerships with industry, academia, and international actors as major priorities. (U.S. Space Force)

The fifth is **escalation risk**. As space systems become increasingly integrated with military command, intelligence, communications, navigation, and commercial infrastructure, interference with a space capability can generate consequences well beyond the immediate orbital environment.

Finally, U.S. policy has increasingly expanded its strategic horizon beyond traditional orbital operations. The December 2025 Executive Order on American space superiority emphasized the protection of U.S. interests from very-low Earth orbit through cislunar space, the development of responsive national-security architectures, commercial integration, and stronger allied contributions. (The White House) In August 2026, U.S. national space transportation policy further identified access to orbital regimes extending from suborbital and very-low Earth orbit through lunar and deep-space environments as a national and economic security interest, while setting an objective of substantially expanding launch and reentry capacity. (The White House)

Accordingly, this study does not reproduce the traditional four-dimensional description of U.S. space strategy. Instead, it develops a broader model centered on the interaction between **strategy, resilience, technology, commerce, alliances, information, and escalation**.

2. Research Problem

The principal research problem addressed in this study is the transformation of U.S. space military strategy from a predominantly support-oriented model toward a multidimensional architecture designed to maintain strategic advantage under contested conditions.

The problem can be expressed through five interconnected questions.

1. How has the strategic conception of U.S. military space power changed?
2. Why has resilience become increasingly important to U.S. space-force design?
3. How does commercial-space integration alter the structure of military space power?
4. How do allied interoperability and data-sharing mechanisms affect U.S. strategic advantage?
5. How do AI-enabled space-domain awareness and increasingly integrated architectures influence both deterrence and escalation risk?

The study therefore treats space security as a **systemic outcome** rather than simply the absence of military attacks against satellites.

3. Research Objectives

APPLIED SCIENCE
The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo
ISSN 3104-8935
Vol. 2, No. 2, 2026, pp. 59-91

The study has six objectives:

1. To reconstruct the major phases of U.S. space military strategy.
2. To identify the principal drivers behind the transformation of U.S. space power.
3. To introduce strategic resilience as a central explanatory variable.
4. To assess the impact of commercial integration and allied interoperability on military space architecture.
5. To examine the growing importance of data, AI, and space-domain awareness.
6. To evaluate the consequences of these developments for strategic stability, space security, and escalation management.

4. Research Questions

RQ1

How has U.S. space military strategy evolved from space support toward domain-oriented competition?

RQ2

What role does strategic resilience play in the transformation of U.S. space-force architecture?

RQ3

How does commercial-space integration alter the structure and responsiveness of U.S. military space power?

RQ4

To what extent does allied interoperability increase U.S. space-power effectiveness?

RQ5

How do data, AI, and advanced space-domain awareness affect decision-making and strategic competition?

RQ6

Does the increasing integration of military, commercial, technological, and allied space capabilities reduce vulnerability or create new escalation risks?

5. Research Propositions

To give the study a stronger analytical foundation, the following propositions are developed.

P1: The transition from space support to space-domain competition increases the strategic autonomy of military space organizations.

P2: Greater architectural resilience reduces the vulnerability associated with the loss or degradation of individual space assets.

P3: Commercial integration increases scalability and technological responsiveness but introduces new dependency, governance, cybersecurity, and supply-chain risks.

P4: Allied interoperability increases collective space capability when information-sharing and technical standards are sufficiently compatible.

P5: AI-enabled space-domain awareness increases the speed and volume of strategic decision-making but may also amplify the consequences of erroneous attribution or automated interpretation.

P6: The interaction of military, commercial, allied, and dual-use systems creates a paradox in which greater resilience may simultaneously strengthen deterrence and increase the complexity of escalation management.

6. Conceptual Framework

The article proposes the **Space Strategic Security Transformation Model (SSSTM)**.

The model contains six layers:

Layer	Core Variable	Main Function
1	Strategic competition	Establishes national objectives
2	Force transformation	Converts strategy into organizations and capabilities
3	Strategic resilience	Reduces vulnerability to disruption
4	Commercial integration	Adds scale, speed and technological diversity
5	Allied interoperability	Expands collective capability
6	Data/AI and SDA	Accelerates detection, interpretation and decision-making
Outcome	Space security and escalation risk	Determines strategic consequences

The model can be represented conceptually as:

Strategic Competition → Force Design → Resilience → Commercial & Allied Integration → Data/AI-enabled Awareness → Strategic Effects → Space Security / Escalation Risk

This framework differs fundamentally from a simple chronological analysis because it treats strategy as a **dynamic system of mutually reinforcing variables**.

---

7. Methodology

7.1 Research Design

The study employs a qualitative longitudinal research design combining:

- strategic-document analysis;

APPLIED SCIENCE
The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo
Vol. 2, No. 2, 2026, pp. 59-91
ISSN 3104-8935

- doctrinal analysis;
- institutional analysis;
- comparative historical analysis;
- policy-process analysis;
- risk analysis;
- conceptual synthesis.

The analysis covers the development of U.S. space strategy from the post-Cold War period through the contemporary policy environment, with particular attention to developments after 2017 and new strategic initiatives through August 2026.

7.2 Source Categories

Source Category	Examples	Analytical Purpose
Presidential documents	Executive orders and national policy	Strategic objectives
Department of Defense documents	Defense strategies and policy statements	Military implementation
Space Force documents	Commercial and international strategies	Force development
Doctrinal publications	Space warfare frameworks	Operational concepts
Congressional material	Legislative oversight	Institutional constraints
International documents	UN space sustainability materials	Governance context
Official speeches	Senior military leadership	Strategic interpretation
Academic literature	Peer-reviewed studies	Theoretical context

The study prioritizes official U.S. government documents for policy reconstruction and uses international and academic sources for contextualization.

---

8. Historical Transformation of U.S. Space Strategy

8.1 Phase I: Space as Strategic Support

The first phase was characterized by the use of space primarily as an enabling infrastructure.

Major functions included:

- communications;
- navigation;
- missile warning;
- reconnaissance;
- surveillance;

- weather observation;
- intelligence;
- strategic early warning.

The military value of space was therefore primarily indirect.

Table 1. Evolution from Support to Domain Competition

Dimension	Traditional Model	Emerging Model
Space role	Support	Operational domain
Primary objective	Service provision	Strategic advantage
Architecture	Concentrated	Distributed
Ownership	Government dominated	Government-commercial hybrid
Partners	Limited	Allied coalition
Data	Platform-centered	Enterprise-wide
AI	Limited	Increasingly central
Resilience	Protection	Redundancy and adaptability
Strategic concern	Asset loss	Systemic disruption
Geographic focus	Earth orbit	Orbit-to-cislunar continuum

9. Phase II: Institutionalization of Space Power

A second phase emerged as the United States increasingly recognized space as a strategic domain requiring specialized organizations and doctrines.

The establishment of the United States Space Force in December 2019 represented a major institutional milestone. It transformed military space organization from a predominantly distributed function into a dedicated armed service.

This institutional development altered the logic of space power in three ways.

First, space became associated with an independent military identity.

Second, force development could be organized around space-specific operational requirements.

Third, space capabilities could be more directly integrated into broader concepts of domain control and strategic competition.

The U.S. Space Force's contemporary doctrine describes spacepower as contributing directly to the Joint Force and emphasizes space superiority and space control as central concepts. (U.S. Space Force)

10. Phase III: From Protection to Strategic Resilience

One of the most important developments is the movement from **platform protection** toward **architecture resilience**.

APPLIED SCIENCE
The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo
Vol. 2, No. 2, 2026, pp. 59-91
ISSN 3104-8935

A traditional approach seeks to protect an individual satellite by improving its physical, electronic, cyber, or operational defenses.

A resilient architecture adopts a different logic:

If one component is disrupted, the overall mission should continue.

This can involve:

- distributed systems;
- multiple orbital layers;
- diversified providers;
- redundant communications;
- rapid replenishment;
- responsive launch;
- alternative data sources;
- diversified supply chains;
- flexible command arrangements.

Table 2. Traditional Protection versus Resilience

Feature	Traditional Protection	Strategic Resilience
Unit of analysis	Satellite	Mission architecture
Risk assumption	Prevent attack	Absorb disruption
Main solution	Hardening	Distribution
Recovery	Slow	Rapid
Dependence	Individual platforms	Multiple systems
Acquisition	Long-cycle	Flexible
Commercial role	Supplemental	Integrated
Strategic objective	Asset survival	Mission continuity

The U.S. Department of Defense explicitly identified resilient architecture as a major rationale for commercial integration. (U.S. Department of War)

This represents a major conceptual shift.

---

11. New Variable I: Strategic Resilience

This study defines **strategic resilience** as:

The capacity of a national space-security architecture to maintain, restore, adapt, or redistribute essential functions under physical, electronic, cyber, informational, organizational, or supply-chain disruption.

Strategic resilience consists of six dimensions.

Table 3. Dimensions of Strategic Resilience

Dimension	Explanation	Potential Indicator
Redundancy	Multiple systems perform related functions	Number of alternative systems
Distribution	Capabilities are geographically/orbitally dispersed	Degree of dispersion
Reconstitution	Ability to replace degraded capabilities	Replacement time
Adaptability	Ability to change configuration	Architecture flexibility
Supply-chain diversity	Multiple sources of critical inputs	Supplier concentration
Mission continuity	Ability to maintain essential services	Service degradation level

This variable is particularly important because resilience changes the strategic calculation of an adversary.

If destroying one satellite no longer produces decisive military consequences, the expected value of attacking that satellite may decline.

However, resilience does not eliminate vulnerability.

It may instead redistribute vulnerability toward:

- ground infrastructure;
- launch systems;
- software;
- cloud infrastructure;
- data networks;
- supply chains;
- commercial providers;
- command-and-control architecture.

Thus:

Resilience ≠ invulnerability.

12. New Variable II: Commercial-Space Integration

Commercial integration is arguably one of the most significant transformations in contemporary U.S. space strategy.

The 2024 Department of Defense strategy identified four priorities:

1. ensuring access to commercial solutions across the conflict spectrum;
2. integrating commercial capabilities before crises;
3. establishing security conditions for commercial integration;

APPLIED SCIENCE
The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo
Vol. 2, No. 2, 2026, pp. 59-91
ISSN 3104-8935

4. supporting the development of new commercial capabilities. (U.S. Department of War)

The U.S. Space Force's own Commercial Space Strategy further emphasizes hybrid architectures that combine government, commercial, and allied capabilities. (U.S. Space Force)

Table 4. Commercial Integration by Mission Area

Mission Area	Commercial Contribution
Communications	Additional bandwidth and connectivity
Earth observation	Rapid imagery and analytics
Space-domain awareness	Tracking and monitoring data
Launch	Responsive access to orbit
Data analytics	Commercial processing
Navigation	Alternative positioning services
Cybersecurity	Commercial security technologies
Weather	Environmental data
Logistics	Transportation and support services
AI	Analytics and anomaly detection

Commercial integration changes the military-space model from:

Government → Military Capability

to:

Government + Industry + Allies + Data Ecosystem → Hybrid Capability

The U.S. Space Force explicitly states that hybrid architectures can increase resilience by combining organic, commercial, allied, and partner capabilities. (U.S. Space Force)

13. The Commercialization Paradox

Commercial integration produces both advantages and vulnerabilities.

Table 5. Benefits and Risks of Commercial Integration

Benefit	Corresponding Risk
Faster innovation	Dependence on private firms
Lower production time	Supply-chain vulnerabilities
Scalable production	Provider concentration
More data	Data-quality problems
Greater redundancy	Complex interoperability
Lower marginal cost	Contractual constraints
Rapid launch	Infrastructure dependence
Technological diversity	Cybersecurity exposure
Global coverage	Strategic dependency
Resilience	Attribution complexity

The 2025 U.S. strategic-security assessment itself recognized this tension, noting that commercialization can accelerate technological integration while creating risks associated with dependence on commercial providers. (U.S. Department of War)

Therefore, commercial integration should not be interpreted simply as a reduction in vulnerability.

Instead, it produces a **redistribution of vulnerability**.

14. New Variable III: Allied Interoperability

The second major transformation is the growing internationalization of U.S. space power.

In 2025, the U.S. Space Force released its first International Partnership Strategy. The document emphasizes three major objectives:

- empowering allies and partners;
- improving interoperable information and capabilities;
- integrating partners throughout force design, development, and employment. (U.S. Space Force)

Table 6. Allied Interoperability Dimensions

Dimension	Meaning
Technical interoperability	Systems can communicate
Data interoperability	Data can be exchanged
Operational interoperability	Forces can operate together
Doctrinal interoperability	Partners share operational concepts
Institutional interoperability	Organizations coordinate
Legal interoperability	Cooperation is legally supported
Security interoperability	Information can be shared securely

This development changes the unit of analysis from **national space power** to **coalition space power**.

15. Hybrid Space Architecture

The combined effect of commercial integration and allied interoperability is the emergence of a hybrid architecture.

Table 7. Components of the Hybrid Architecture

Component	Function
U.S. government systems	Strategic control and sovereign capabilities
Space Force	Military organization and operational integration
Commercial firms	Innovation, scale and speed
Allied systems	Additional capacity
Intelligence organizations	Strategic information
Launch providers	Access and replenishment
Data companies	Processing and analytics
AI systems	Interpretation and prediction
International institutions	Governance and norms

The strategic advantage therefore increasingly depends not simply on possessing superior hardware but on the capacity to **connect heterogeneous systems into a functioning network**.

APPLIED SCIENCE
The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo
Vol. 2, No. 2, 2026, pp. 59-91
ISSN 3104-8935

16. New Variable IV: Data and Artificial Intelligence

Space-domain awareness has traditionally depended on sensors, tracking systems, databases, and human analysis.

The growth of AI changes this relationship.

The U.S. Space Force's FY2025 Data and AI Strategic Action Plan identifies four major lines of effort:

1. enterprise-wide data and AI governance;
2. development of a data- and AI-driven culture;
3. rapid adoption of data, advanced analytics, and AI;
4. partnerships with government, academia, industry, and international actors. (U.S. Space Force)

Table 8. AI Transformation of Space Operations

Traditional Approach	AI-Enabled Approach
Human-intensive analysis	Machine-assisted analysis
Periodic assessment	Continuous monitoring
Limited data integration	Multi-source data fusion
Static databases	Dynamic information environments
Manual anomaly detection	Automated anomaly detection
Slow interpretation	Rapid interpretation
Isolated sensors	Networked sensor ecosystem

This produces an important strategic variable:

Decision speed.

In a contested environment, the side capable of detecting, interpreting, validating, and responding to changes more rapidly may obtain a significant strategic advantage.

17. AI and Space-Domain Awareness

The future of space-domain awareness is increasingly likely to depend on the integration of:

- government sensors;
- commercial tracking data;
- allied observations;
- optical systems;
- radar systems;
- telemetry;

- historical databases;
- machine-learning systems;
- anomaly detection;
- predictive analytics.

The objective is not simply to know **where an object is**, but increasingly to estimate:

- what it is;
- what it is doing;
- whether its behavior is unusual;
- what its likely trajectory is;
- whether the behavior has strategic significance.

This transforms space-domain awareness from a tracking problem into a **decision-support problem**.

---

18. New Variable V: Escalation Risk

The original analysis of space security often treats threats primarily in terms of physical attacks against satellites.

A more comprehensive approach recognizes multiple escalation pathways.

Table 9. Space Escalation Pathways

Trigger	Potential Effect
Satellite interference	Service disruption
Cyber incident	Ground-system disruption
Ambiguous proximity operation	Misinterpretation
Commercial-system interference	Civil-military spillover
Navigation disruption	Economic and military effects
Intelligence-system disruption	Decision uncertainty
AI misclassification	Incorrect strategic assessment
Allied involvement	Multinational escalation
Debris-generating event	Long-term environmental damage
Crisis communications failure	Reduced de-escalation capacity

The central problem is that the boundary between military and civilian space infrastructure is increasingly blurred.

An action against a commercial satellite may have consequences for:

- civilian communications;
- financial transactions;

APPLIED SCIENCE
The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo
Vol. 2, No. 2, 2026, pp. 59-91
ISSN 3104-8935

- navigation;
- disaster management;
- humanitarian operations;
- military communications.

Consequently, space competition can produce **cross-domain and cross-sector escalation**.

---

19. Space Security as a Systemic Problem

The study therefore proposes a new definition of space security.

Proposed Definition

Space security is the capacity of the international space system to preserve the continuity, safety, sustainability, reliability, and peaceful availability of space-based services while preventing military competition, technological uncertainty, and crisis interaction from producing uncontrolled escalation.

This definition goes beyond the traditional concept of protecting satellites.

---

20. Strategic Evolution of U.S. Space Policy

Table 10. Longitudinal Evolution

Period	Dominant Concept	Institutional Character	Strategic Orientation
Cold War	Strategic support	Military integration	Deterrence
1990s	Space-enabled warfare	Joint integration	Information superiority
2000s	Space control	Command-oriented	Freedom of action
Obama era	Responsible space power	Multilateral emphasis	Stability + capability
Trump I	Space as warfighting domain	Space Force creation	Competition
Biden era	Resilience + integration	Hybrid architecture	Integrated deterrence
2024	Commercial integration	Government-industry fusion	Resilience
2025	International integration	Coalition architecture	Interoperability
2025–2026	Space superiority + expanded domain	National-commercial-allied ecosystem	Strategic competition and space expansion

The latest policy environment further extends U.S. strategic attention toward very-low Earth orbit, cislunar space, lunar infrastructure, responsive launch, commercial participation, and allied contributions. (The White House)

---

21. Major Strategic Drivers

The evolution of U.S. strategy can be explained through seven major drivers.

Table 11. Drivers of Strategic Transformation

Driver	Strategic Effect
Great-power competition	Increased emphasis on space superiority
Counterspace threats	Greater investment in resilience
Commercial innovation	Accelerated capability development
Satellite proliferation	Distributed architectures
AI development	Faster decision-making
Alliance competition	Interoperability
Cislunar ambitions	Expanded strategic geography

These drivers are mutually reinforcing rather than independent.

22. Strategic Transformation Matrix

Table 12. Old and New U.S. Space Strategy

Variable	Earlier Model	Emerging Model
Strategic objective	Support	Superiority
Force structure	Distributed	Specialized
Architecture	Concentrated	Proliferated
Acquisition	Government-centered	Government-commercial
Information	Military-controlled	Multi-source
Alliances	Supporting role	Integrated
AI	Limited	Strategic enabler
Resilience	Defensive	Architectural
Operations	Space support	Space-domain competition
Geography	Earth orbit	Orbit-to-cislunar
Risk	Asset vulnerability	Systemic escalation
Governance	State-centered	Multi-actor

23. Impact on U.S. Military Space Power

The transformation has produced several major effects.

23.1 Increased Operational Independence

The institutionalization of the Space Force allows space-specific missions to receive dedicated organizational attention.

This increases:

- doctrinal specialization;
- professionalization;
- training;

APPLIED SCIENCE
The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo
Vol. 2, No. 2, 2026, pp. 59-91
ISSN 3104-8935

- operational planning;
- force-development coherence.

23.2 Greater Mission Resilience

Distributed architectures can reduce the strategic consequences of losing individual systems.

Table 13. Resilience Mechanisms

Mechanism	Strategic Value
Proliferated systems	Reduces single-point failure
Multiple providers	Reduces vendor dependence
Rapid launch	Accelerates replacement
Commercial augmentation	Adds capacity
Allied systems	Adds redundancy
Data fusion	Creates alternative information sources
Cross-domain integration	Enables mission continuity

23.3 Increased Decision Speed

AI and data integration can reduce the time between:

Detection → Classification → Interpretation → Decision

This is strategically important because crisis environments are characterized by incomplete information and compressed decision cycles.

---

24. Impact on International Space Security

The consequences extend beyond U.S. military capabilities.

Table 14. Positive and Negative Externalities

Development	Positive Effect	Negative Effect
Resilience	Reduced vulnerability	Competitive proliferation
Commercialization	Greater service availability	Dual-use ambiguity
Alliances	Collective security	Bloc formation
AI	Better awareness	Misclassification
Proliferated satellites	Redundancy	Orbital congestion
Rapid launch	Reconstitution	Faster competition
Space superiority	Deterrence	Arms-race pressure
Cislunar development	Scientific/economic opportunity	Strategic competition

Thus, U.S. strategy produces both **stabilizing and destabilizing effects**.

---

25. The Security Dilemma in Space

The security dilemma is particularly pronounced in space because many technologies are inherently dual-use.

For example:

- a surveillance satellite may support environmental monitoring or military intelligence;
- a communications constellation may provide civilian internet or military connectivity;
- a maneuverable spacecraft may support servicing or raise concerns about counterspace activity;
- an AI tracking system may improve safety or enhance military targeting.

Consequently, technological capability cannot always be interpreted from hardware alone.

Table 15. Dual-Use Ambiguity

Capability	Civilian Interpretation	Military Interpretation
Remote sensing	Environmental monitoring	Intelligence
Satellite communications	Internet	Military communications
Space servicing	Maintenance	Potential strategic maneuver
AI analytics	Space safety	Military awareness
Navigation	Transportation	Precision operations
Responsive launch	Commercial access	Rapid replenishment
Lunar infrastructure	Exploration	Strategic positioning

This ambiguity increases uncertainty and can contribute to misperception.

---

26. Strategic Resilience and Deterrence

A major finding of this study is that resilience has become closely connected to deterrence.

Traditional deterrence often relies on the threat of retaliation.

Resilience introduces another mechanism:

If an adversary cannot achieve meaningful strategic effects through an attack, the incentive to attack may decline.

This can be expressed conceptually as:

Deterrence Effectiveness = Threat Credibility + Mission Resilience + Attribution Capability + Alliance Support

The formula is conceptual rather than mathematical.

It demonstrates that deterrence increasingly depends on the ability to withstand disruption rather than merely threaten retaliation.

---

27. Commercial Space and the Changing Meaning of Military Power

APPLIED SCIENCE
The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo
Vol. 2, No. 2, 2026, pp. 59-91
ISSN 3104-8935

The commercialization of space has changed the traditional relationship between state and military power.

Previously:

Military capability ≈ Government-owned infrastructure

Increasingly:

Military capability = Government + Commercial + Allied + Data + Digital infrastructure

This transformation has strategic consequences.

Table 16. Changing Military-Space Power Structure

Era	Principal Provider
Early space age	Government
Cold War	Government + defense industry
Post-Cold War	Government + defense contractors
New Space era	Government + commercial industry
Emerging model	Government + commercial + allies + digital ecosystem

28. The Supply-Chain Dimension

A further variable that deserves greater attention is **space industrial resilience**.

A military space architecture cannot be resilient if critical components depend on a narrow group of suppliers.

Relevant dependencies include:

- launch vehicles;
- semiconductors;
- sensors;
- propulsion;
- software;
- ground stations;
- cloud infrastructure;
- cybersecurity;
- telecommunications;
- specialized materials.

Table 17. Industrial Vulnerability

Supply-Chain Element	Potential Risk

Vol. 2, No.2, 2026, pp. 59-91

Launch	Delayed replenishment
Semiconductors	Production bottlenecks
Software	Cyber vulnerability
Ground stations	Physical disruption
Cloud systems	Digital dependency
Specialized materials	Foreign dependency
Skilled workforce	Capacity constraints

This suggests that future space security must include **industrial security**.

---

29. Cislunar Expansion as a Strategic Variable

The traditional strategic analysis of military space often concentrates on Earth orbit.

However, contemporary U.S. policy increasingly considers the space environment extending toward cislunar space.

The 2025 executive order specifically directed attention to threats from very-low Earth orbit through cislunar space and called for responsive and adaptive national-security architectures. (The White House)

The 2026 National Space Transportation Policy further identifies access to orbital regimes extending through lunar and deep-space environments as a national and economic security interest. (The White House)

This represents a significant geographic expansion.

Table 18. Expansion of Strategic Space Geography

Region	Traditional Importance	Emerging Importance
LEO	Earth observation	Large-scale constellations
MEO	Navigation	PNT resilience
GEO	Communications	Strategic communications
HEO	Specialized missions	Strategic sensing
Cislunar	Limited	Emerging strategic domain
Lunar surface	Exploration	Infrastructure + strategic presence
Deep space	Science	Long-term strategic access

---

30. Strategic Implications for Space Governance

The transformation creates a major governance challenge.

The international space environment is characterized by:

- increasing numbers of actors;
- commercial participation;
- military competition;
- dual-use technologies;

APPLIED SCIENCE
The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo
Vol. 2, No. 2, 2026, pp. 59-91
ISSN 3104-8935

- orbital congestion;
- debris;
- cyber risks;
- uncertain norms.

The United Nations' long-term sustainability framework emphasizes responsible behavior, national regulatory frameworks, safety, and the long-term sustainability of space activities. (UNOOSA)

Therefore, military competition must be examined alongside sustainability.

---

31. Space Security and Environmental Sustainability

Military competition can have environmental consequences.

The most obvious concern is debris.

Table 19. Security–Sustainability Interaction

Security Development	Environmental Consequence
Increased launches	Greater orbital congestion
More satellites	Higher collision probability
Kinetic testing	Debris generation
Maneuvering	Traffic-management complexity
Large constellations	Long-term orbital management challenge
Rapid replenishment	Higher launch frequency

This creates a strategic paradox:

Greater resilience through proliferation may increase long-term environmental pressure.

---

32. Integrated Strategic Risk Model

This study proposes five categories of strategic risk.

Table 20. Space Strategic Risk Matrix

Risk Category	Probability	Potential Impact	Strategic Priority
Cyber disruption	High	High	Very High
Supply-chain disruption	Medium–High	High	High
Orbital congestion	High	Medium–High	High
Misinterpretation	Medium	Very High	Very High
Commercial dependency	Medium	High	High
AI error	Medium	Very High	Very High
Escalation	Medium	Very High	Very High
Debris	High	High	Very High
Alliance fragmentation	Medium	Medium–High	Medium–High
Launch disruption	Medium	High	High

These assessments are analytical judgments derived from the strategic trends rather than statistical probability estimates.

---

33. The Strategic Resilience–Escalation Paradox

One of the central findings of the study is a paradox.

More resilience can produce:

Lower vulnerability → stronger deterrence

but also:

More systems + more actors + more integration → greater ambiguity → greater escalation complexity

This relationship can be conceptualized as:

Resilience ↑ → Vulnerability ↓

while simultaneously:

System Complexity ↑ → Attribution Difficulty ↑

and:

Attribution Difficulty ↑ → Escalation Risk ↑

Therefore, resilience must be accompanied by:

- transparency;
- crisis communication;
- responsible behavior;
- clear norms;
- information-sharing mechanisms;
- human oversight.

---

34. Comparative Assessment of Strategic Variables

Table 21. Relative Strategic Importance

Variable	Current Importance	Future Importance	Main Effect
Strategic resilience	Very High	Very High	Reduces vulnerability
Commercial integration	Very High	Very High	Increases scale

APPLIED SCIENCE
The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo
Vol. 2, No. 2, 2026, pp. 59-91
ISSN 3104-8935

Allied interoperability	High	Very High	Expands coalition power
AI/data	High	Very High	Accelerates decisions
Space-domain awareness	Very High	Very High	Reduces uncertainty
Launch responsiveness	High	Very High	Supports reconstitution
Industrial resilience	High	Very High	Reduces dependency
Governance	High	Very High	Controls escalation
Cislunar capability	Medium	High	Expands strategic geography

---

35. A New Model of Space Power

The findings allow space power to be reconceptualized.

Traditional model:

Space Power = Satellites + Launch + Ground Stations

New model:

Space Power = Platforms + Data + Resilience + Commercial Capacity + Alliances + AI + Launch Responsiveness + Governance

The strategic quality of a space force therefore depends increasingly on **integration**, not merely inventory.

---

36. Implications for Strategic Competition

The U.S. transformation suggests that future strategic competition will not necessarily be determined by which state owns the largest number of satellites.

Instead, competition may be determined by which ecosystem can:

1. detect changes fastest;
2. interpret information most accurately;
3. maintain services under disruption;
4. replace damaged capabilities rapidly;
5. mobilize commercial capacity;
6. coordinate allied systems;
7. protect critical data;
8. sustain industrial production;
9. control escalation;
10. preserve legitimacy and international support.

Table 22. Emerging Competition Model

Traditional Competition	Emerging Competition
Platform vs. platform	Ecosystem vs. ecosystem
Quantity	Resilience
Hardware	Hardware + software
National	Coalition
Military	Civil-military
Static	Adaptive
Satellite protection	Mission continuity
Information possession	Information fusion
Physical capability	Digital capability
Orbital dominance	Multi-layer space access

---

37. Discussion

The analysis demonstrates that the evolution of U.S. space military strategy cannot be adequately explained by the concept of militarization alone.

The United States is moving toward a more complex model of **integrated space power**.

This model incorporates five central transformations.

First, military space organizations have gained greater autonomy and strategic identity.

Second, resilience has become a fundamental architectural principle.

Third, commercial firms are increasingly embedded within national-security space architectures rather than merely supplying occasional services.

Fourth, allies and partners are becoming structural components of space-force design.

Fifth, data and AI are becoming essential to space-domain awareness and decision-making.

The 2025 International Partnership Strategy explicitly connects allied integration with resilient hybrid architectures, while the 2025 Data and AI plan connects technological transformation with government, academic, industrial, and international partnerships. (U.S. Space Force)

The result is an increasingly interconnected space-security ecosystem.

---

38. Main Findings

Finding 1: U.S. space strategy has shifted from support to competition

Space is no longer conceptualized solely as an enabling environment.

It is increasingly treated as an operational domain requiring specialized military capabilities.

Finding 2: Resilience has replaced simple protection as a central design principle

The objective is increasingly mission continuity rather than preservation of every individual asset.

APPLIED SCIENCE
The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo
Vol. 2, No. 2, 2026, pp. 59-91
ISSN 3104-8935

Finding 3: Commercial space has become strategically significant

Commercial integration is now treated as a structural component of national-security architecture rather than merely an auxiliary source of capacity. (U.S. Department of War)

Finding 4: Space power is becoming multinational

The 2025 International Partnership Strategy demonstrates the institutionalization of allied integration. (U.S. Space Force)

Finding 5: AI is becoming an important strategic enabler

The Space Force's data and AI strategy demonstrates that information processing is increasingly treated as a core component of space power. (U.S. Space Force)

Finding 6: Resilience creates a security dilemma

More resilient architectures may reduce vulnerability but simultaneously increase competition and complexity.

Finding 7: Space security is increasingly inseparable from economic security

Commercial launch, communications, data, cloud infrastructure, and supply chains are increasingly connected to national-security space capabilities.

Finding 8: Strategic geography is expanding

U.S. policy increasingly considers space interests beyond traditional Earth-orbit frameworks and toward cislunar and lunar environments. (The White House)

---

39. Policy Implications

The study identifies several implications for international space-security policy.

39.1 Strengthen Transparency

States should increase transparency concerning:

- military space doctrines;
- responsible behavior;
- satellite proximity operations;
- major military exercises;
- debris-producing activities.

39.2 Establish Crisis Communication Mechanisms

Because ambiguity can rapidly generate escalation, major space powers should establish direct communication mechanisms for incidents involving:

- satellites;
- spacecraft proximity;
- cyber interference;
- navigation disruption;
- commercial infrastructure.

39.3 Develop Commercial-Space Governance

Commercial companies increasingly occupy a strategic position.

Therefore, international governance should address:

- commercial satellite protection;
- data responsibility;
- cybersecurity;
- supply-chain resilience;
- emergency access;
- liability;
- crisis behavior.

39.4 Maintain Human Oversight of AI

AI should improve space-domain awareness without becoming an uncontrolled source of escalation.

Human validation should remain essential for high-consequence strategic decisions.

39.5 Integrate Sustainability into Security Planning

Strategic resilience should not be achieved at the expense of long-term orbital sustainability.

---

40. Recommendations

Table 23. Strategic Recommendations

Recommendation	Objective
Establish multinational space incident hotlines	Reduce escalation
Develop shared space-traffic standards	Improve safety

APPLIED SCIENCE
The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo
Vol. 2, No. 2, 2026, pp. 59-91
ISSN 3104-8935

Increase commercial transparency	Reduce ambiguity
Create resilient national architectures	Maintain continuity
Diversify critical suppliers	Reduce dependency
Strengthen AI governance	Reduce analytical errors
Expand international data-sharing	Improve awareness
Develop common debris standards	Protect orbital environment
Establish commercial crisis protocols	Clarify responsibilities
Promote responsible military behavior	Improve stability

41. Theoretical Contribution

The principal theoretical contribution of this study is the development of the **Space Strategic Security Transformation Model (SSSTM)**.

The model argues that contemporary space power is produced by the interaction of:

Strategy

•

Military organization

•

Resilience

•

Commercial integration

•

Allied interoperability

•

Data and AI

•

Industrial capacity

•

Governance

rather than by military hardware alone.

This provides a broader analytical framework for future research on space security.

42. Limitations

This study has several limitations.

First, many military space capabilities remain classified, meaning that publicly available documents cannot provide a complete picture.

Second, official strategic documents describe intended capabilities and policies but do not necessarily demonstrate full implementation.

Third, the assessment of escalation risk involves analytical judgment because reliable statistical datasets concerning military space incidents remain limited.

Fourth, the rapidly changing policy environment means that future strategic documents may alter current conclusions.

Nevertheless, the integration of longitudinal policy analysis with resilience, commercialization, interoperability, AI, and escalation variables provides a broader framework than a purely document-centered approach.

---

43. Future Research Directions

Future research should investigate:

1. quantitative measurement of space-system resilience;
2. comparative U.S.–China space strategies;
3. U.S.–Russia space-security competition;
4. commercial satellite dependence during armed conflict;
5. AI-based space-domain awareness;
6. cislunar strategic competition;
7. space industrial-base resilience;
8. alliance interoperability;
9. international legal responses to commercial military support;
10. space-debris and strategic-security interaction.

Table 24. Proposed Future Research Agenda

Research Area	Suggested Method
Resilience	Quantitative index
AI	Technology assessment
Commercial space	Case studies
Alliances	Network analysis
Escalation	Scenario modeling
Cislunar security	Strategic forecasting
Space governance	Legal analysis
Industrial resilience	Supply-chain analysis

APPLIED SCIENCE
The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo
Vol. 2, No. 2, 2026, pp. 59-91
ISSN 3104-8935

44. Conclusion

The evolution of U.S. space military strategy represents a fundamental transformation in the organization and meaning of national space power. The historical movement from satellite-based military support toward space-domain competition has been accompanied by the creation of dedicated institutions, the development of new operational concepts, the increasing emphasis on resilience, and the integration of space capabilities into broader national-security strategies.

However, the most important contemporary transformation is not the creation of additional military systems in isolation. It is the emergence of a **hybrid space-security architecture** that combines government capabilities with commercial services, allied systems, advanced data infrastructure, artificial intelligence, responsive launch capacity, and increasingly distributed architectures.

The 2024 commercial-space strategies demonstrated that the United States intends to institutionalize commercial integration across planning, training, crisis response, and conflict rather than treating industry as an occasional source of additional capacity. (U.S. Department of War) The 2025 International Partnership Strategy further transformed this model by placing allied and partner integration at the center of force design and operational cooperation. (U.S. Space Force) At the same time, the Space Force's data and AI strategy demonstrates that information processing, advanced analytics, and AI are becoming integral components of future space operations. (U.S. Space Force)

The most significant analytical finding is therefore that **future space superiority is likely to depend less on the possession of isolated superior platforms and more on the resilience and connectivity of an entire strategic ecosystem**.

This ecosystem can provide significant advantages. Distributed architectures can reduce vulnerability, commercial providers can accelerate innovation, allied integration can increase collective capacity, and AI-enabled information processing can reduce decision latency. Yet these same developments can create new vulnerabilities. Commercial dependence may create supply-chain and contractual risks. Allied integration can create information-security challenges. AI can accelerate incorrect interpretations. Large-scale proliferated architectures can intensify orbital congestion. Most importantly, the growing overlap between military and civilian systems can transform a localized space incident into a broader economic, political, or military crisis.

The strategic paradox is therefore clear:

The more interconnected and resilient the space system becomes, the more capable it may be of absorbing disruption; but the more interconnected it becomes, the more complicated the consequences of disruption may also become.

Consequently, space security should not be understood solely through the traditional lens of militarization or weaponization. It should instead be understood as a multidimensional problem involving **strategic competition, resilience, commercial dependence, alliance networks, data governance, artificial intelligence, industrial capacity, orbital sustainability, and escalation management**.

The future stability of outer space will depend not only on whether states can develop superior military capabilities, but also on whether they can prevent technological competition from undermining the predictability and sustainability of the space environment.

The United States is clearly moving toward an integrated model of space power in which military, commercial, technological, industrial, and international capabilities are increasingly interconnected. The strategic implications of this transformation will extend well beyond U.S. national security. They will influence the structure of international space competition, the behavior of other major powers, the development of commercial space markets, and the future architecture of global space governance.

For this reason, the central strategic challenge of the coming decade may not simply be **who controls space**, but rather **how major powers can compete for space advantage without transforming competition into uncontrolled strategic instability**.

Ethical Considerations

Not applicable. This study did not require ethical approval because it does not include human or animal subjects and does not involve any personal or sensitive data.

List of Abbrevations:

(USA): The United States of America. (SSSTM): Strategic Security Transformation Model .

Acknowledgment:

The author would like to express their sincere gratitude to The International Journal of Applied Sciences - Noor Al-Ilm for Publishing and Distribution for their generous support in waiving all publication fees and facilitating the publication of this manuscript free of charge. Their commitment to promoting scientific research and supporting researchers is highly appreciated.

Author Contribution:

All authors contributed equally to the main contributor to this paper. All authors read and approved the final paper.

APPLIED SCIENCE

The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo

Vol. 2, No. 2, 2026, pp. 59-91

ISSN 3104-8935

Declaration of generative AI and AI-assisted technologies in the writing process

The authors hereby declare that no generative artificial intelligence or AI-assisted technologies were used at any stage during the preparation of this manuscript, including language editing, proofreading, or content development. The authors take full responsibility for the originality and integrity of the work presented in this publication.

Funding:

This research received no external financial funding. The authors also acknowledge The International Journal of Applied Sciences, Noor Al-Ilm for Publishing and Distribution, for providing a full waiver of the publication fees. The publication fee waiver was provided as editorial support and did not involve any financial contribution to the conduct, design, analysis, or reporting of the research.

Conflicts of Interest:

"The authors declare no conflict of interest."

References

1. D U.S. Department of Defense. *Commercial Space Integration Strategy*. Washington, DC: Department of Defense; 2024. (U.S. Department of War)

2. U.S. Department of Defense. *New Space Strategy Looks to Integrate DOD, Commercial Efforts*. Washington, DC: Department of Defense; 2024. (U.S. Department of War)

3. United States Space Force. *U.S. Space Force Commercial Space Strategy*. Arlington, VA: Department of the Air Force; 2024. (U.S. Space Force)

4. United States Space Force. *USSF Releases Commercial Space Strategy to Increase Competitive Advantage*. 2024. (U.S. Space Force)

5. United States Space Force. *Remarks by CSO Gen. Chance Saltzman at the 2024 Space Symposium*. 2024. (U.S. Space Force)

6. United States Space Force. *Space Force Doctrine Document 1: The Space Force*. Arlington, VA: Department of the Air Force. (U.S. Space Force)

7. United States Space Force. *U.S. Space Force International Partnership Strategy*. Arlington, VA: Department of the Air Force; 2025. (U.S. Space Force)

8. United States Space Force. *U.S. Space Force Unveils International Partnership Strategy to Strengthen Space Security*. 2025. (U.S. Space Force)

9. United States Space Force. *USSF Data and AI FY2025 Strategic Action Plan*. Arlington, VA: Department of the Air Force; 2025. (U.S. Space Force)

10. U.S. Department of Defense. *Academic Year 2025–26 Annual Estimate of the Strategic Security Environment*. Washington, DC: Department of Defense; 2025. (U.S. Department of War)

11. U.S. Department of Defense. *Space Force's Fundamental Role: Space Superiority*. Washington, DC: Department of Defense; 2025. (U.S. Department of War)

12. U.S. Department of Defense. *Spacecom Leader Outlines Vision for Space Security*. Washington, DC: Department of Defense; 2025. (U.S. Department of War)

13. The White House. *Ensuring American Space Superiority: Executive Order 14369*. Washington, DC; 2025. (The White House)

14. The White House. *The National Space Transportation Policy*. Washington, DC; 2026. (The White House)

15. United Nations Office for Outer Space Affairs. *Guidelines for the Long-term Sustainability of Outer Space Activities*. Vienna: United Nations; 2019. (UNOOSA)

16. United Nations Office for Outer Space Affairs. *Guidelines for the Long-term Sustainability of Outer Space Activities: Working Paper*. Vienna: United Nations; 2019. (UNOOSA)

17. U.S. Department of Defense. *Defense Industrial Strategy*. Washington, DC: Department of Defense; 2024. (U.S. Department of War)

18. U.S. Department of Defense. *ASD Space Policy Keynote Address for the 2024 Space Policy Symposium*. Washington, DC; 2024. (U.S. Department of War)

19. U.S. Space Force. *Space Force Leveraging Commercial Data Analytics to Aid Combatant Commands in New Ways*. 2024. (U.S. Space Force)

20. U.S. Space Force. *USSF Data and AI FY2024 Strategic Action Plan*. Arlington, VA: Department of the Air Force; 2024. (U.S. Space Force)

APPLIED SCIENCE

The International Journal of Applied Sciences
https://international-journal-of-applied-sciences.jo

ISSN 3104-8935

Vol. 2, No. 2, 2026, pp. 59-91