INTRODUCTION

Since the Soviet Union collapsed, the Cold War era is believed to be over. Contrary to our predictions, regional conflicts due to ethnic, religious, territorial, economic, and natural resource problems are increasing even more in the post–Cold War period. The Korean peninsula is known as the only place where traces of the Cold War still remain. Military confrontation between South and North is threatening not only our national security but also regional peace and stability.

North Korea, having one of the world’s largest military forces, is a major threat to our national security. In North Korea, more than one million troops, about 4,000 tanks and 500 battleships, and in excess of 800 fighter aircraft are deployed toward the South.\(^1\) Kim Jong Il’s strategy on reunification and diplomatic relations still relies upon military power. North Korea has independent capability to deliver disastrous chemical, biological, and nuclear warheads. Another Korean war, if one occurs, may have disastrous results due to the casualties and massive destruction. Accordingly, our military readiness should focus on deterrence. In case of war, however, we have to win, and support national reunification while minimizing

casualties and damage to South Korea’s infrastructure. Thus, our national requirement forces us to pursue a fast and “clean war.” Air and space power through their inherent speed, range, and precision can respond to this need by delivering precision strikes, supplies, or surface forces where and when they are needed.

Another form of military action we have to concern ourselves with is low-intensity conflicts with neighboring nations. Our national policy clearly states that our diplomatic relations with neighboring countries will be developed and maintained based on friendship and mutual support. However, national security by its nature requires us to consider all possibilities. Disputes with and among neighboring countries on air and sea control, territorial and environmental problems, and under-sea resources development are now arising. Our military capability is not aimed to dominate or win a war with those nations but to protect national interest and assets in the worst case of a conflict. Consequently, it is necessary for our nation to retain a military capability that is small but able to react quickly, precisely, and with the necessary range. The history of the Korean peninsula indicates that such a capability is essential to the national security. Again, air and space power of the ROK Air Force will take the leading role for this type of readiness.

This chapter discusses directions to develop the roles and structures of air and space power of the ROK Air Force for the 21st century.

A NEW ERA IS COMING

In the past, head-on-head collisions were common. That is, in the context of military power, tanks were mainly used for counter-attacking enemy tanks, warships were used for defeating enemy warships, airplanes were deployed to counter enemy airplanes. It was a symmetric engagement.

Early in this century, mankind evolved land/sea operations to land/sea operations supported from the air. Then, air power grew to be indispensable to the protection of national interests. During the 1991 Gulf War, the 38-day air campaign concentrated land-based tactical fighters, carrier-based airplanes, and long-range bombers in an intense campaign to destroy Iraq’s ability to fight effectively. Following the air campaign, coalition ground forces completed the
defeat of a 42-division force in about 100 hours with fewer than 100 Americans killed and wounded. Since the Gulf War, this type of asymmetric engagement has been more common.

In the last decade there has been another giant leap forward. Terrestrial operations are now supported from space. In the Gulf War, the United States used Navstar Global Positioning System (GPS) satellites to guide precision weapons and navigate in an unfamiliar terrain. Its 24 satellite constellation beams continuous navigation signals to earth, allowing users to determine their location within 16 meters, velocity within a fraction of a mile per hour and the time to within a millionth of a second. Satellites with infrared telescopes saw the faint heat of SCUD missiles from more than 22,000 miles away, so the United States could warn their troops and allies. Weather, communications, and intelligence satellites contributed in many invaluable ways to the success of their operations from halfway around the world. General Fogleman is often quoted as saying, “I think that space, in and of itself, is going to be very quickly recognized as a fourth dimension of warfare.”

The more recent history of the application of air and space power, especially post–Desert Storm, has proven that air and space power now has the potential to be the dominant and, at times, the decisive element of combat in modern warfare. Air and space power have changed the way wars are fought. The traditional three-dimensional battlefield has now shifted into a fourth medium with the use of air and space power. It would appear inevitable that early in the next century space power will become as indispensable to our success as air power.

Since the launch of Sputnik on October 4, 1957, space has become increasingly crowded. Today there are more than 8,000 known objects orbiting the earth and nearly 900 satellites are operating in space. In the next ten years, more than 1,000 satellites are projected to be launched. Today, more than 1,100 commercial companies

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across 53 countries are developing, manufacturing, and operating space systems. By the end of the century, it is estimated that more than 20 nations will have space-based intelligence and targeting capabilities. According to intelligence estimates, over the next 10 years, several Third World countries will develop the technology and capability to launch intercontinental ballistic missiles. North Korea launched the first medium-range Taepo Dong I ballistic missile last year. The launch probably had multiple purposes, including serving both as an advertisement for the country’s missile technology and as a bargaining chip to win concessions from other countries. Also, our country will launch 19 more satellites on-orbit with several missions by 2015.5

General Myers,6 in his speech at the Air Force Association in 1998, said, “Space has become a military and economic center of gravity. So much of the world standard of living, so much of its commercial wealth, depends on space.” The nation’s dependence on space capabilities in the future, rivals its dependence on electricity and oil in the past. Electricity and oil were critical parts of the industrial revolution; space capabilities are emerging as vital to the information revolution.

In the 21st century, military operations will rely even more on such services as global communications, reconnaissance and surveillance, missile warning, weather, and navigation. Only these information services and space capabilities can provide dominance on the battlefield and allow for precision engagement.

Many things are changing as we approach the new era. The lead time might be longer, the time of engagements shorter, the systems more complicated, missiles more prevalent, and a reliance on space-based assets common. Precision, range, lethality, speed, and versatility are all greater than in the past. Such changes will continue.

5The Republic of Korea Ministry of Science and Technology, National Space Master Plan, November 1997.
6Commander in chief of North American Aerospace Defense Command (NORAD) and US Space Command (USSPACECOM) and commander of Air Force Space Command (USAFSPACECOM).
Preparing now for the military challenges of air and space power in the 21st century is essential to our national security.

AIR AND SPACE POWER IN THE 21ST CENTURY

The Air Force’s basic functions are the broad, fundamental, and continuing activities of air and space power. Air and space power is intrinsically different from either land or sea power, and its employment must be guided by axioms different than those for surface forces. Both the air and space mediums involve operations in three dimensional space. While airpower is primarily affected by aerodynamics, space power is guided by the principles of orbital mechanics, and is not limited by the vertical extent of the atmosphere. Both share the advantages of three-dimensional maneuvers, such as overlooking enemy positions and the ability to maneuver beyond enemy surface forces, and both are inextricably linked by warfighting principles.

Air and space power can deter an adversary from taking actions against our national interests by providing the capability to project potent military power in a matter of hours. It is the knowledge that air and space intelligence, surveillance, and reconnaissance systems are closely watching their activities and that land-based fighter and attack aircraft are available to sweep the skies and prevent movement of ground forces with a large variety of capabilities, which gives an adversary reason to pause and reconsider his objectives and plan of action.

Air and space power has become the great enabler that allows all land, sea, and special operations forces to optimize their contributions to national security. Without air and space superiority, air and surface operations would be exceedingly hazardous. Without rapid airlift, timely response to crises would be virtually impossible. Without our information gathering and dissemination systems, all operations would proceed much more ponderously, and with greater risk of surprise.

Thus, operations in each of the three realms of air, space, and information are synergistic and overlapping. Therefore, air and space power is defined as the integrated application of air and space systems to project strategic military power.
The power that the air force can employ in the world of the 21st century is critical to the national ability to survive and prosper in a complex, interdependent, constantly changing security environment. As we construct adequate power to perform successful air and space power functions in the 21st century, the requirement to be flexible is highlighted.

Most air and space forces can perform multiple functions to achieve various strategic, operational, or tactical effects; some perform them in unique ways. It is this inherent versatility, when combined with the speed, flexibility, and global nature of our reach and perspective, that generates the unique Air Force contribution to joint force capabilities. These battle-proven functions can be conducted at any level of war and enable the Air Force to shape and control the battle space.

- **Counter-Information.** Counter-Information seeks to establish information superiority through control of the information realm. The focus of the effort is on countering the enemy's ability to attain information advantage.
- **Counter–Air and Space.** Counter–air and space function consists of operations to attain and maintain a desired degree of air and space superiority by the destruction or neutralization of enemy forces. The main objectives of counter–air and space operations are to allow friendly forces to exploit air and space capabilities, while negating the enemy’s ability to do the same.
- **Strategic Attack.** Strategic attack refers to operations intended to directly achieve strategic effects by striking at the enemy’s center of gravity. Strategic attack should affect the enemy’s entire effort rather than just a single action, battle, or campaign.
- **Counter-Land.** The main objectives of the counter-land function are to dominate the surface environment and prevent the opponent from doing the same. Counter-land involves those operations conducted to attain and maintain a desired degree of superiority over surface operations by the destruction or

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neutralization of enemy surface forces. This direct attack of adversary surface operations by air and space forces is the essence of asymmetric application, and is a key to success during operations to decisively halt an adversary during initial phases of a conflict.

- Counter-Sea. Counter-sea functions are an extension of Air Force functions into a maritime environment. They include sea surveillance, antiship warfare, protection of sea lines of communications through antisubmarine and antiair warfare, aerial mine-laying, and air refueling in support of naval campaigns.

ORGANIZING AIR AND SPACE POWER IN THE ROK AIR FORCE FOR THE 21ST CENTURY

The nature of the force available in the 21st century will determine the effectiveness of the power of the ROK Air Force. Hence, force structure decisions made now are crucial to the strategic environment of the future. The key challenge for the ROK Air Force is to build an efficient and smart air force to ensure the core competencies of air and space power, that is, information superiority, air and space superiority, precision engagement, and agile combat support.\(^9\) The core competencies represent air and space power capability embodied in a well-trained and well-equipped air force. The core competencies are essential for sufficiently capable air and space power functions. Utilizing them will allow the Air Force to achieve dominance in air and space to protect the nation, its assets, and its citizens. This is what enables the timely, effective application of our capabilities. It permits the Air Force to do things first, as well as farther, faster, and better than an opponent.

Enhancing Air Power

Airpower, in the midst of a technological and philosophical evolution, will become the “strategic instrument of choice” for the nation’s

\(^9\)Ibid., pp. 27–35.
leaders because of its ability to make war—or influence peace—decisively, accurately, over long ranges, and on short notice. Air power has arguably become the dominant force element in most circumstances of war. Ever since World War II, it has provided ground forces with the freedom to operate, unmolested, from above. Now, through a combination of technological development and astute concepts of operations, it could become an even more pivotal element of national power. The past decade has seen many air power instruments evolve from advanced development to operational use.\(^\text{10}\) Today, air weapon systems promise to generate even more dramatic changes on the battlefield, further widening the gap between states that possess them and those that do not. This implies that the key to ensure our national security is to properly equip our Air Force with the weapon systems for future air operations.

The current national economic situation and the limited defense budget require our force enhancement programs to be prioritized as they proceed. When it comes to investment priority, fighter aircraft must be considered first since it is the means and basis for exercising airpower, while the other systems are to provide improved efficiency, effectiveness, and survivability of our assets. Considering the national security environment and the threats, the fighters currently being deployed in the ROK Air Force have some deficiencies in terms of range, maneuverability, accuracy, and munitions. Consequently, the advanced fighter program, known as the F-X program, is the most time critical and thus has the highest priority. With the F-X fleet, most of our critical strategic requirements could be satisfied. We will be able to achieve fast air dominance over the North Korea Air Force and deliver all kinds of state-of-the-art precision munitions with coverage of the entire peninsula. The F-X fleet is also the only means to destroy or neutralize North Korea’s strategic weapon systems, regardless of their location. It will also provide us with quick-reaction capability in case of conflicts with neighboring countries. Hence, the F-X program could be the basis of our national defense even after reunification, should it occur in the near future as expected.

The next priority should be given to building our independent operational capability. The scale and capacity of the air power retained by each country may differ in accordance with national environment, strategic objectives, threats, etc. However, all air forces are equipped with similar weapon system structures. These consist of intelligence and surveillance systems, combat and support forces, and C4I systems. Figure 7.1 shows the weapon system structure required for a modern air campaign. The current status of the weapon system structure of the ROK Air Force is also presented in this figure.

As indicated, the ROK Air Force is not properly equipped for independent air operations. The Air Force’s efforts to build a proper weapon system structure have continued for decades without reaching the ultimate goal. As a result, our independent operational capability still remains restricted.

![Air Force Weapon System Structure Required for the 21st Century](image)

Our national defense policy is based on the ROK-US combined defense system, and the combined Air Force is believed to have enough capability to defend our nation. The ROK Air Force, however, should
be able to perform all sorts of air operations independently for the following reasons:

- An independent nation requires its own independent military operational capability.
- U.S. force deployment to the Korean peninsula may be too slow or not possible at all if the United States is involved in wars in several different parts of the world.
- The role and operations of U.S. forces may be limited in the event of a military conflict—however small the possibility—with neighboring countries.

The independent capability of the ROK Air Force should be able to take a key role, without the support of U.S. forces, to deter the North Koreans and prevent North Korea’s air superiority. As a deterrent force, the ROK Air Force should have the capability to deliver immediate and punishing responses to North Korean acts of aggression. The ROK Air Force also should be able to deter by providing a robust defense capability and maintaining information, surveillance, and reconnaissance dominance. For the North to have any chance of success in a conventional attack against the ROK, they would need to exploit the element of surprise. The ROK Air Force should be able to respond immediately and deny the North any such opportunities.

To protect our national interest and resources from potential conflicts with neighboring countries, quick-reaction forces that are capable of exercising all types of air operations in the Korea Air Defense Identification Zone (KADIZ) are also required. Understanding that successful air operations greatly depend on the capability of weapon systems, it is important to have advanced high quality systems. This does not imply that our Air Force must become a superpower. Quick reaction, precision engagement, and extended combat range are the core capabilities to be achieved. The size of high quality weapon systems will be small enough so that neighboring counties may not consider them a threat against their vital national interest.

Undoubtedly, the advanced fighter (F-X) is the key element to satisfy the above requirements. In order to have independent operational capability, the ROK Air Force needs additional systems such as strategic intelligence systems, airborne early warning and control (AEW&C) systems, tanker aircraft, Electronic Warfare (EW) aircraft, and Anti Tactical Ballistic Missiles (ATBM), etc. The acquisition programs for these systems will follow the F-X program.

Constructing Space Power

Space has been militarized for several decades. Reconnaissance, surveillance, early warning, communications, weather, and navigation satellites were designed and deployed to serve national security needs in the world. Our second immediate challenge must be constructing Space Power to perform space force operations successfully.

Space Force Operations

Today, many Air Force missions are conducted in the vertical dimension above the land and sea. These missions have been historically carried out in the atmosphere. This situation is rapidly changing. Access to and use of space is central for preserving peace and protecting national security as well as civil and commercial interests.

Air Force’s space operations focus on controlling the space environment, enabling and supporting operations for terrestrial forces, supporting space forces, and applying force.

- Space Control. Space control is the means by which we gain and maintain space superiority to assure friendly forces can use the space environment while denying its use to the enemy. Gaining space superiority is a primary goal of a military campaign and must be gained early to ensure freedom of action. Like air super-

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iority, space superiority helps to provide the freedom to conduct operations without interference from an adversary. To accomplish this, space forces must survey space, protect our ability to use space, prevent adversaries from interfering with that use, and negate the ability for adversaries to exploit their space forces. Counter-space is the mission carried out to achieve space control objectives by gaining and maintaining control of activities conducted in or through the space environment.

• Enhancing Operations. Force enhancement operations consist of those operations conducted from space with the objective of enabling or supporting terrestrial forces. Navigation, communications, reconnaissance, surveillance, ballistic missile warning, and environmental sensing help reduce uncertainty and friction at all three levels of war: strategic, operational, and tactical. Enabling and supporting space operations increase a force’s ability to detect, plan, and react faster than an adversary’s terrestrial forces operations.

• Supporting Space Forces. Space force support is carried out by terrestrial elements of military space forces to sustain, surge, and reconstitute elements of a military space system or capability. These activities deploy, sustain, or augment on-orbit spacecraft, direct missions, and support other government or civil organizations. Space force support involves spacelift and satellite operations.

• Application of Force. The application of force consists of attacks against terrestrial targets carried out by military weapon systems operating in space. Currently, there are no force application assets operating in space, but technology could change so that force application missions can be performed from platforms operating in space. For example, space systems such as the space-based laser could provide space-based attacks against terrestrial targets and provide the timely suppression of enemy defenses to improve the penetration effectiveness of air assets.

AIR FORCE’S ROLE IN THE AGE OF SPACE

Fifty years of Air Force leadership in the air have made the Air Force the undisputed master of national air operations. If we are to
continue to be the master of air and space in the future, it is necessary to keep pace with the changing times.

The Air Force’s role in the age of space can be expressed as maintaining a leadership role inside the military and building a partnership outside the military. Inside the military, the Air Force should maintain leadership in operating space power. Outside the military, the Air Force needs to build a partnership with the other forces and civil, commercial, and international communities.

**Inside the Military: Maintaining Leadership**

Space power is derived from national, civil, and commercial space systems and associated infrastructure. These assets include space-based systems, ground-based systems for tracking and controlling objects in space and transiting through space, launch systems that deliver spacecraft, and people who operate, maintain, or support these systems. Space power will be instrumental in getting the right military capability to the right forces, at the right time.

Space is generally recognized as an Air Force domain for several reasons.

First, air power and space power are inextricably linked as components of the vertical dimension of warfare. Space is the largest operating medium and surrounds all other operating media. There are no international agreements delineating a boundary between air and space. However, terrestrial-based forces generally operate below an altitude of 100 kilometers; whereas space-based forces operate above this altitude. In addition to this, the fact can not be overlooked that the Air Force has accumulated the technologies and experiences to operate the weapon systems in the air. Today, as an integral element of national capabilities, air power influences operations throughout the conflict spectrum. The Air Force contributes at all levels of military activities in this three-dimensional space. Tomorrow, space power and space force will take over the same role.

Second, there is a need for unity of command. Centralized control and decentralized execution are essential to the successful and optimal use of space power. General Thomas D. White said, “A lack of centralized authority would certainly hamper our peaceful use of
space and could be disastrous in time of war.” The Air Force is unique in its ability to capitalize on the attributes of space systems by being able to respond with rapid mobility and firepower to the near-real-time information afforded by systems operating in space. The Air Force’s advantage in managing space arises from the attributes of space power: (1) global coverage, (2) flexibility, (3) economy, (4) effectiveness, and (5) robustness. Those are very similar to the attributes of air power which the ROK Air Force has kept for 50 years. This situation is very common in many space-advanced countries in the world.

By keeping the Air Force’s leadership in space power, unity of command can be achieved efficiently and Full Force Integration can be conducted successfully.

Outside the Military: Building Partnerships

The use of space has been limited by the high cost of placing satellites in orbit. The cost of mass in orbit is approximately $20,000 per kilogram. Many studies on space launches have searched for ways to reduce cost, but none have proposed a definite way of reducing cost substantially. General Myers said, “Space is simply too expensive, too interdependent, too complex, and too important to go it alone.” It is a real challenge.

John O’Neill at Johnson Space Center gave a suggestion, “Government and commercial partnerships in a new operations paradigm may provide lowered cost for programs and new opportunities for industry.”

As we look to the future, it is clear that resources will remain constrained. Partnering with other parties will help us to develop and field systems much quicker by cross-sharing efforts. If done correctly, our partnerships will leverage existing development efforts with a limited amount of defense funding to develop the required military capabilities.

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14Ibid.
In the United States, the Evolved Expendable Launch Vehicle (EELV) program is perhaps the preeminent current example of partnering between the Air Force and the private sector. Boeing, Lockheed Martin, and the Air Force have each invested $1 billion in EELV development. The effort will ensure that the next generation of U.S. commercial launch rockets will be able to meet the requirements necessary for government payloads and should reduce by $6 billion the cost of DoD’s planned launches between 2002 and 2020. In the GPS program, the customer went from giving Boeing a statement of work to providing only a statement of objectives. That helped send costs down from $43 million to $28 million per satellite. On-orbit lifetime has increased from 6 to 13 years.15

Future partnerships may reflect the reality that true savings and performance improvement come when the military just states requirements and stays away from telling industry how to do its job.

Unfortunately, our National Space Master Plan does not state any partnerships at the National Defense level. As one of the biggest users of space and a leader of military space, the Air Force needs to build new organizational relationships and partnerships with other government agencies and the private sector. This will allow all of us to do far more than any of us could do alone.

Air Force’s Effort for the Age of Space

It is imperative that the Air Force determine where to go and how to get there. As a first step, the ROK Air Force established a “Space Systems Branch” in the Combat Development Group last year. Now the branch is working on a plan, called “ROK Air Force’s Long Range Plan (LRP) for Space,” that will shape our evolution from an Air Force to an Air and Space Force.

The LRP lays out operations concepts, key technologies required and lays the groundwork to examine migrating missions to space. The branch has, from the start, cooperated with the Agency for Defense Development (ADD), the Korea Aerospace Research Institute (KARI),

the Korea Advanced Institute of Science and Technology (KAIST), and industries to ensure a credible plan. Then the members developed specified objectives, tasks, and finally, a detailed road map of goals and organizations to operate the space systems. The LRP mutually supports and is supported by the National Space Master Plan, as well as provides direction to the ROK Air Force. In the LRP, our space missions were categorized based on the four Space Force Operations. Major program requirements are forecasted to meet our space missions for the next 15 years. Our goal in LRP is “Constructing Foundations for Air Force’s Space Operations” by 2015.

- **Space Control.** Our nation needs to develop near real-time and near-earth space surveillance capabilities to enable our initial steps to begin space control missions. The Air Force plans to construct a Space Surveillance System by 2015. To perform its mission, the facility brings together Electro Optical telescopes, low-light-level television, and computers. Space surveillance involves detecting, tracking, cataloging and identifying man-made objects orbiting Earth.

- **Force Enhancement.** The nature of our national security interests requires military use of space systems for communications, weather, surveillance, early warning, and navigation. Space-based earth surveillance and ballistic missile warning are our key programs for Force Enhancement. The ROK Air Force will provide accurate information to the warfighter. To ensure the support in other areas, such as communications, weather, and navigation, cooperation with the civil, commercial, and international sector will be maximized.

- **Space Force Support.** In the area of Space Force Support, the civil and commercial sector will conduct a Spacelift such as launching satellite systems while the Air Force will operate military satellites and payloads. The Air Force Satellite Control Network will provide a means to maneuver, support, and sustain our national on-orbit assets. Air Force’s space operators will track the various kinds of national satellites and operate military

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16*Space Operations Doctrine.*
payloads. Also, they will prepare the readiness to control those systems in war.

- Application of Force. Currently, there are no force application assets operating in space, but the technology and national policies of other countries could change so that force application missions can be performed from platforms operating in space. We will monitor the R&D effort of space systems such as the space-based laser and transatmospheric vehicles.

CONCLUSIONS

By way of summing up, air and space power will take decisive roles in winning a war in the 21st century. We should be aware of the important and time-critical decisions that the Air Force needs to make for the next century. I firmly believe we are at a crossroad.

To enhance airpower successfully, the ROK Air Force needs to employ such advanced weapon systems as advanced fighter for air superiority, precision guided munitions, tankers for air refueling, airborne early warning and control (AEW&C) systems, and electronic warfare aircraft for suppression of enemy air defense, etc.

The ROK Air Force puts a first-priority on the advanced fighter program over other programs in consideration of strategic need. The other programs will be implemented gradually, based on the national defense budget.

To carry out a successful evolution from an Air Force to an Air and Space Force, we will construct foundations for the Air Force’s space operations by 2015. A space surveillance system will be the cornerstone on which our ability to control space will be built. We will maintain a leadership role in the areas of air and space inside the military. And we will build a partnership with the other South Korea forces, as well as with the civil, commercial, and international communities.

The ROK Air Force will strive to maximize opportunities in air and space as the use of military power evolves. This tremendous challenge can be met only by a national effort. The Republic of Korea must be prepared to devote the time and resources necessary to ensure our Air Force will meet all threats into the next millennium.