

AU/ACSC/03-1253E/2003-04

AIR COMMAND AND STAFF COLLEGE

AIR UNIVERSITY

AIR FORCE SPACE EDUCATION:
TRANSFORMING FOR JOINT OPERATIONS

by

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A Research Report Submitted to the Faculty

In Partial Fulfillment of the Graduation Requirements

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Maxwell Air Force Base, Alabama

April 2003

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Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE APR 2003		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE Air Force Space Education: Transforming For Joint Operations				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Air University Press Maxwell AFB, AL 36112-6615				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 33	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

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Preface

After 15 years of service in the space operations career field, I considered myself a space professional. However, I spent most of my career at the squadron or wing level developing expertise in several space weapon systems. As ACSC immersed me in operational-level thought and joint force employment, I realized I had much to learn to transform to an operational-level space professional. Would I be ready to plan and execute space forces on a Unified staff, or provide the best space course of action to the Joint Force Commander? My negative answers to these questions made me realize I needed to be educated on all aspects of space power with a joint perspective, leading to the idea of a total space professional. Further, before you can employ space power to create effects in a joint environment, the people requesting these effects need to be educated on what space can do for them. Hence, I decided to review the current and future offerings in Air Force space education.

The nature of the research entailed reviewing training documentation, requiring substantial help from many individuals at the various space training organizations. Specifically, I would like to thank Lt Col Dan Jordan and his staff at AFSPC/CVX for their insight into future Air Force space education plans. I also thank Mr. Curtis Bell and Mr. Jeff Barker for educating me on the Navy and Army space education programs, respectively. Also, I want to thank the course instructors, Mr. Al Sexton and Mr. Brent Marley, for always being available to answer questions and pointing me in the right direction. Finally, I need to thank my family for their unending patience, especially my wife who thoughtfully listened and supported me as I worked through the issues—I hereby appoint her as an “honorary” space professional.

Abstract

In response to the Space Commission Report, each of the military Service departments are evaluating how they develop their respective cadre of space professionals. Further, each Service's space cadre focuses on integrating space with Service-specific capabilities to support individual Service missions. However, "space is inherently joint,"¹ supporting all military Services, and must be integrated into joint operations, because "the days of single Service warfare are gone forever."² If the future of war is joint warfare, who is developing joint space expertise? In other words, who is developing a space cadre that understands all aspects of space (i.e., "total" space professionals capable of enhancing the integration of space into joint operations)? The Air Force, as the executive agent for space, has the opportunity and responsibility to lead the way.

Effective integration of space into joint operations requires education on both ends of the spectrum: total space professionals educated to plan and execute space in a joint environment, and non-space military personnel educated to understand how space contributes to the success of joint operations. Thus, this paper introduces the concept of operational-level total space professionals, and assesses how well Air Force space education programs contribute to their development. Additionally, the paper reviews the space content of Air Force officer Professional Military Education (PME) to gauge the quality of space awareness throughout the non-space Air Force.

The methods used to conduct the research included personal contacts with instructors, course developers, and students; combined with a review of courseware, syllabi, lesson plans, school catalogs, joint and Air Force space doctrine, Army and Navy space education programs,

government reports, and graduate-level research papers via the Air University Library and the Internet.

The research findings indicate that while no official education program exists to develop total space professionals for joint operations, Air Force space education programs collectively provide most of the required knowledge spread across a number of courses. Furthermore, the Air Force does not provide continuous learning opportunities to maintain and update space corporate knowledge. However, the Air Force is planning and developing future space education courses to help fill this void. Moreover, all Air Force PME schools include space in their core curricula, but the mid-level and senior-level schools should increase their core space content and emphasize space at the operational level of war.

Lastly, the paper concludes with several recommendations to strengthen the Air Force's development of total space professionals and to raise the space awareness of the non-space Air Force.

Notes

¹ Maj Larry G. Price, "Space Operations in the Joint Warfighting Arena: The Viability of a Joint Force Space Component Commander," research report no. AU/ACSC/144/2000-04 (Maxwell AFB, Ala.: Air Command and Staff College, April 2000), 15.

² Joint Publication 1, *Joint Warfare of the Armed Forces of the United States*, 24 November 2000, III-1.

Chapter 1

Introduction

A strong, proactive space professional development program is essential to safeguarding our nation's leadership position in space and our way of developing airmen.

—General Lance Lord, USAF

In its final report, submitted in January 2001, the Commission to Assess United States National Security Space Management and Organization (the Space Commission), recommended the nation “create and sustain a cadre of space professionals” through career development, education, and training.¹ In the years before the Space Commission Report, each Service had developed space education and training programs designed to meet Service-specific space needs. For example, the primary focus of space in the Navy is to “further enhance the combat effectiveness of the Fleet by conducting Navy space operations, integrating space into Naval operations, and generating Naval space requirements.”² However, it is highly likely the U.S. military will fight as a joint team in the future, requiring space professionals to understand space in a wider perspective beyond an individual Service focus. Service-specific cadres could lead to space stovepipes in the joint operational environment, impeding space synergy. If the Services educate space cadres that focus on Service needs, who will train and educate joint space expertise? The Air Force, as the executive agent for space, should play a large role; hence, this paper focuses on Air Force space education programs, specifically for space operators.

Successful integration of space into joint operations requires developing space operators at

the operational level who can synergistically employ all aspects of space in support of the joint force commander's (JFC) objectives, combined with space-knowledgeable military forces that share a basic understanding of space capabilities and limitations (i.e., they know what space can and cannot do). Thus, enhancing joint operations requires Air Force space education programs to transform to: (1) develop operational-level space professionals with a total space perspective, and (2) raise the space awareness of the "non-space" military population, ensuring the "warfighter knows the questions to ask to enhance his capabilities."³

Consequently, this paper begins by defining the concept of an Air Force operational-level "total" space professional, characterized by space mindedness, a warrior spirit, a joint mentality, and an understanding of "total" space. Next, to determine if the Air Force is on track to produce Air Force "total" space professionals, the paper reviews various sources of current Air Force space education as well as future plans. Moreover, while the paper focuses on Air Force education, it briefly reviews Army and Navy space training programs to understand how sister Services train their space cadres, and to search for ideas to improve Air Force space training. In addition, to assess the development of space awareness in the general Air Force, the paper examines the space content of Air Force officer Professional Military Education (PME) schools. Finally, the paper concludes with recommendations to help transform Air Force space education to enhance joint operations.

Notes

¹ *Report of the Commission to Assess United States National Security Space Management and Organization* (Washington D.C.: The Space Commission, 11 January 2001), 27.

² Lt Col J. Kevin McLaughlin, "Military Space Culture," Space Commission Background Papers, n. January 2001, n.p., on-line, Internet, 3 March 2003, available from <http://www.fas.org/spp/eprint/article02.html>.

³ MSgt Austin Carter, USAF, "Course Trains Space Cowboys," Air Force News, Air Force Space Command Public Affairs, 16 May 2001, n.p., on-line, Internet, 2 April 2003, available from http://www.af.mil/news/May2001/n20010516_0665.shtml.

Chapter 2

Air Force “Total” Space Professional

Ultimately, the Air Force needs space professionals that understand how space operations integrate throughout military operations.

—AFDD 2-2

Space professionals come in all varieties, including space operators and acquisition personnel from all Services, as well as scientists and engineers from academia and industry. To maintain a feasible focus, this paper concentrates on a small subset of the nation’s space cadre—Air Force space operations officers at the operational level. By the time Air Force space operators reach the field grade level, most have undergone formal training and developed experience in at least two or three weapon systems (i.e., they have mastered space operations at the tactical level). However, there is no formal training program associated with operational-level space operations, specifically addressing the planning and integration of space forces and capabilities into joint operations. To be effective at the operational level, one needs more than just a fundamental understanding of Air Force space operations at the tactical level. Operational-level space operators need space mindedness, a warrior spirit, a joint mentality, and “total” space perspective.

Space Mindedness

Space mindedness is a mental cultural framework, an understanding that space, space operations, and space capabilities are unique and different from air. Similar to Billy Mitchell's air mindedness concept, people with space mindedness understand the space medium and can visualize its potential.¹ Understanding the medium means developing knowledge and experience operating space systems. Visualizing space's potential implies an appreciation of space's current and future contributions to joint warfare. While currently filling primarily a force enhancement role, space minded operators envision and advocate future offensive capabilities as well. Space operators must persevere in an Air Force environment that is slowly improving its corporate space mindedness. The Air Force has transitioned from an "air force" to an "air and space" force, but some cultural resistance remains. For instance, although space is recognized as a separate medium, chapter one of AFDD 2-2, Space Operations, opens with a quote, "There is no division...between air and space. Air and space are an indivisible field of operations."² Further, in September 2001, when commenting on the qualifications of Gen Myers (formerly USCINCSpace) to serve as Chairman of the Joint Chiefs of Staff, a former Air Force Chief of Staff quipped, "Myers is not a space weenie,"³ supporting a negative stereotype. Many space operators accept the stereotype that space operators provide space support to the warfighter, but are not recognized as warfighters themselves. With that attitude, space operators will never become warfighters, and space will not realize its full potential. To effectively integrate space capabilities into the fight, operational-level space professionals need space mindedness, but they also need a warrior spirit.

Warrior Spirit

In the generic sense, warrior spirit is an uncompromising will to prevail in the face of challenges.⁴ In the military sense, it's a commitment to the defense of the country, protecting its ideals and freedoms.⁵ As such, operational-level space professionals require a warrior spirit to continuously demand more of military space capabilities, specifically space superiority and offensive space capabilities (i.e., space force application, other than ICBMs).

The space warrior mindset begins with space superiority. Space professionals need to think "space superiority first," much like a Joint Force Air Component Commander (JFACC) pursues air superiority first. Further, much like air superiority, "space superiority is likely to be a prerequisite to effective pursuit of other objectives."⁶ When the U.S. goes to war, a space professional's first concern must be the adversary's space assets or access to space products--how can the enemy use space to his advantage? Additionally, the space professional must consider the enemy's efforts to negate or deny U.S. space capabilities. Having addressed these concerns, the space professional can focus on optimizing force enhancement capabilities and traditional space support to the warfighter. The U.S. military's "ability to provide these supporting space capabilities to the warfighter is dependent on [its] ability to control space."⁷

In addition to space superiority, space professionals require a warrior spirit to lead the transformation of space from strictly a force enabler role to a combined force enabler and force provider role. Although no offensive space weapons systems currently exist, space professionals must lay the groundwork for weapons in space. In fact, the time for weapons in space is fast approaching; according to Undersecretary of the Air Force, Peter B. Teets, "we're going to want to, if necessary, deny an adversary their use of space...[and] offensive space capability is something...we need to start to work on."⁸ "Weaponization of space is inevitable,"⁹ to ignore it

is a disservice to the nation.¹⁰ Air Force operational-level space professionals with a warrior spirit will lead the way integrating space force application into joint space operations.

Joint Mentality

“No matter where we fight in the future, no matter what the circumstances, we will fight as a joint team.”¹¹ Space forces have emerged as a “significant force multiplier when integrated into joint operations,”¹² providing navigation, weather, communications, surveillance and reconnaissance, and missile warning support to all military forces. Before Desert Storm, most Air Force space operators operated in a vacuum, isolated from joint operations. The success of space systems during Desert Storm proved the need to integrate space with joint forces.¹³ Today, however, most Air Force space operators continue to manage space operations in an environment removed from joint operations. Most Air Force space operators do not deploy in-theater; only a small number, mostly Weapons School graduates (“W” grads) and Joint Space Support Team members, actually gain theater and joint experience. Thus, the majority of Air Force space operators develops an insular, non-joint mentality. However, space supports all military forces and the Air Force serves as the executive agent for space. Therefore, it follows that Air Force operational-level space professionals will most likely play the predominant role regarding planning and execution of joint space forces.

To effectively plan and integrate joint space operations, Air Force space professionals must know joint space doctrine and Air Force space doctrine, and must be familiar with sister Service space doctrine or concepts of operations. Further, Air Force space professionals must know the capabilities and limitations of Air Force and sister-Service space systems, and comprehend how to leverage the appropriate systems to produce the desired effects. A prime example illustrating the joint nature of space capabilities is the Army’s Joint Tactical Ground Station (JTAGS).

JTAGS, operated by the 1st Space Battalion, receives and disseminates ballistic missile warning data from the Air Force's Defense Support Program (DSP) satellites, and is operated by joint Army and Navy crews.¹⁴ Consequently, Air Force space professionals must understand how all Services employ space capabilities, because the best space capability to generate a specific effect for the JFC may not be an Air Force system.

In addition to doctrine and capabilities, Air Force space professionals must comprehend how an Air Operations Center (AOC) functions, because a joint AOC is the mechanism that will most likely plan and employ joint space forces in future conflicts. Joint doctrine states the JFC "normally designates a single authority to coordinate joint theater space operations and integrate space capabilities."¹⁵ Further, the JFC selects a space authority based on the component who has the preponderance of space capabilities and the ability to command and control them (including reachback)¹⁶--normally this is the Air Force Component Commander (COMAFFOR). Further, the COMAFFOR is normally designated the JFACC. As such, Air Force Doctrine espouses renaming the JFACC as the Joint Force Air and Space Component Commander (JFASCC),¹⁷ and designating the JFASCC as the supported commander for joint space operations.¹⁸ Hence, the most likely hub of future joint space operations will be the JFASCC's joint AOC. Thus, Air Force operational-level space professionals need to know AOC functions.

Lastly, as Air Force space professionals plan and execute joint space operations, a joint mentality is essential to transform from a traditional strategic or global concept of focus to a combined global and theater focus, because space capabilities can provide effects simultaneously on a theater, regional, and worldwide scale. For example, the Global Positioning System (GPS) provides navigation services to coalition forces fighting the War on Terrorism in Afghanistan, as well as to coalition forces fighting to liberate Iraq in Operation Iraqi Freedom.

Total Space

The U.S. military only owns one-fifth of the space assets available to win wars.¹⁹ In addition to the U.S. military, a number of non-military organizations can bring space assets to the fight.²⁰ Therefore, Air Force operational-level space professionals must plan and execute space forces with a “total space” perspective. This paper defines “total space” as the aggregate of all space assets available to support joint operations.

Subsequently, joint doctrine divides total space into five categories: DOD, National, civil, commercial, and foreign.²¹ First, DOD assets are resources operated by the armed forces and USSTRATCOM (e.g., GPS, DSP, and Milstar). Second, National assets are managed by the U.S. intelligence community (e.g., reconnaissance satellites of the National Reconnaissance Organization [NRO]). Third, civil assets are operated by U.S. government agencies like NASA, and the National Oceanographic and Atmospheric Administration (NOAA) (e.g., NASA’s Tracking and Data Relay Satellite System [TDRSS]). Fourth, commercial assets are resources managed by privately owned businesses (e.g., Space Imaging’s Ikonos program). Finally, foreign assets include resources managed by other countries, or international consortia not controlled by the U.S. (e.g., INTELSAT and INMARSAT communication satellites). Each of these non-military assets may play increasingly key roles in future conflicts.

Furthermore, the U.S. military’s reliance on non-military space assets continues to grow. For example, during DESERT STORM, military satellites provided 85 percent of the communications used by the U.S. military; however, during ALLIED FORCE, commercial entities provided 60 percent of the satellite communications used by the U.S. military.²² Further, U.S. intelligence community assets are high demand/low density assets; if demand exceeds supply, the U.S. military may pursue commercial imaging products. Thus, space professionals

must understand the capabilities and limitations of non-military assets in order to exploit total space. Additionally, a total space perspective includes an awareness of potential enemy space capabilities (the “red threat”). Space professionals must understand how adversaries could utilize space to support enemy operations. Further, space professionals must also “anticipate hostile actions that attempt to deny friendly forces access to or use of space capabilities.”²³ Moreover, adversaries may utilize the same space assets as friendly forces. For instance, it is conceivable that U.S. military and enemy communications could utilize the same transponders on a consortium satellite, or the enemy could utilize GPS signals for their own use.

Consequently, Air Force operational-level space professionals must grasp the capabilities and limitations of non-military space assets to provide optimal space courses of action. Additionally, they must understand access procedures for non-military assets, including any pre-established service agreements between USSTRATCOM and consortia or alliance partners. Ultimately, the best space capability to generate a specific effect for the JFC may not be a U.S. military space asset.

In summary, successful integration of space into joint operations requires space professionals with a broad space perspective. Air Force operational-level space professionals, who will lead the planning and execution of joint space operations, require space mindedness, a warrior spirit, a joint mentality, and a total space perspective. The following chapter reviews various sources of current Air Force space education as well as future plans, to determine if the Air Force is on track to produce Air Force “total” space professionals.

Notes

¹ Maj James P. Cashin and Maj Jeffrey D. Spencer, “Space and Air Force: Rhetoric or Reality?” Research Report no. AU/ACSC/023/1999-04 (Maxwell AFB, Ala.: Air Command and Staff College, April 2000), 16.

² Air Force Doctrine Document 2-2 (AFDD 2-2), *Space Operations*, 27 November 2001, 1.

Notes

³ Ms. Nancy Benac, "Threats of tomorrow already face Joint Chiefs," *Corpus Christi Caller Times*, 28 September 2001, n.p., online, Internet, 21 March 2003, available from <http://www.caller2.com/2001/September/28/today/national/12885.html>.

⁴ Lt Col Thomas C. Walker, *Implementing Aerospace Integration: The Quest for Aerospace Culture*, research report (Maxwell AFB, Ala.: Air War College, February 2000), 56.

⁵ Ibid., 57.

⁶ AFDD 2-2, 31.

⁷ Air Force Space Command Strategic Master Plan FY04 and Beyond, 5 November 2002, 4.

⁸ Peter B. Teets, "DOD Space Chief Outlines Priorities," *Air Force Link*, 14 February 2003, n.p., on-line, Internet, 21 March 2003, available from <http://www.af.mil/news/Feb2003/21403406.shtml>.

⁹ Maj M.V. Smith, *10 Propositions Regarding Spacepower*, (Maxwell AFB, Ala.: Air University Press, 2002), 79.

¹⁰ *Report of the Commission to Assess United States National Security Space Management and Organization* (Washington D.C.: The Space Commission, 11 January 2001), 17.

¹¹ Joint Publication 1, *Joint Warfare of the Armed Forces of the United States*, 14 November 2000, III-1.

¹² Joint Publication 3-14 (JP 3-14), *Joint Doctrine for Space Operations*, 9 August 2002, I-1.

¹³ Maj Perry Nouis, U.S. Space Command spokesman, "Down-to-Earth Answers to Space Questions," *American Forces Information Service*, 5 April 2001, n.p., on-line, Internet, 4 April 2003, available from http://www.defenselink.mil/news/Apr2001/n04052001_200104052.html.

¹⁴ "JTAGS – Joint Tactical Ground Station," Global Security.org, 18 January 2003, n.p., on-line, Internet, 21 March 2003, available from <http://www.globalsecurity.org/space/systems/jtags.htm>.

¹⁵ JP 3-14, III-1.

¹⁶ Ibid., III-3.

¹⁷ AFDD 2-2, i.

¹⁸ Ibid., viii.

¹⁹ Maj Larry G. Price, "Space Operations in the Joint Warfighting Arena: The Viability of a Joint Force Space Component Commander," research report no. AU/ACSC/144/2000-04 (Maxwell AFB, Ala.: Air Command and Staff College, April 2000), 3.

²⁰ AFDD 2-2, 36.

²¹ JP 3-14, II-6.

²² AFDD 2-2, 37.

²³ JP 3-14, I-1.

Chapter 3

Air Force Space Education

The space folks didn't know war, and the warriors did not know space.

—General Chuck Horner, USAF

Much has been done to bridge the knowledge gap between warfighters and space operators since General Horner served as Commander in Chief of United States Space Command. However, the Space Commission stated the core curriculum of the military education system does not stress at the appropriate level the operational application of space systems to combat operations.¹ Applying the ideas discussed in the previous chapter, this chapter reviews Air Force officer space education and training courses to determine if current and future efforts support the development of operational-level total space professionals. The chapter begins with the first training all space operators receive.

Officer Space Prerequisite Training (OSPT)

OSPT provides the basic knowledge required to perform the duties associated with the space and missile operations career field (13SXX). The 7-week course, taught by Air Education and Training Command (AETC) at Vandenberg AFB, gives entry-level Air Force space professionals a thorough overview of space fundamentals, including orbital mechanics, space environment, and space policy and law. Further, the course provides a detailed review of all 13SXX mission areas: satellite command and control, spacelift, missile combat crew, space surveillance, and

space warning; allowing graduates to easily transition between mission areas throughout their careers.² Primarily an Air Force school, the curriculum does not explore Army and Navy space capabilities; however, the course does cover the full spectrum of Air Force space assets as well as civil, commercial, and foreign space systems.³ Thus, entry-level space operators begin their careers with a near-total space perspective. After OSPT, space operators receive specific weapon system training, but will not receive additional training to update their broad OSPT knowledge base. The Air Force currently does not offer continuous space education; hence, to ensure their initial space corporate knowledge does not atrophy, space operators must maintain and update their total space perspectives themselves.

USAF Space Operations School (SOPSC)

The Space Warfare Center's SOPSC envisions itself as "the Air Corps Tactical School of Space" and serves as Air Force Space Command's (AFSPC) lead agent for advanced space education programs.⁴ As such, the school at Schriever AFB offers several courses to train the space warrior. The Advanced Space Operations Course (ASOC) is a 2-week course that emphasizes the "integration and employment of space systems and their products into theater operations in support of campaign and operations planning, situation awareness and battle management, and mission planning and execution."⁵ ASOC trains total space (i.e., DOD, civil, commercial, National, and foreign space systems). Moreover, ASOC trains in a joint environment, that is, the student body is good mix from all Services. This joint environment is enhanced by guest lectures from Army Space Support Teams. Furthermore, ASOC invites the 527th Space Aggressor Squadron to brief "red" space threats and U.S. vulnerabilities to enemy space control efforts (e.g., GPS jamming).⁶ In addition to ASOC, SOPSC offers a shorter, mobile version, the Space Operations Course, designed to provide a broad overview of how

space enables military planning and operations, tailored to the customer.⁷ Finally, the 1-day Space Operations Course – Executive (SOC-E) focuses on the space needs of numbered air force (NAF) commanders, senior MAJCOM staff officers, combat air force (CAF) commanders, and others filling theater command positions.⁸

In addition to space operations courses, SOPSC offers courses designed to train space professionals for theater warfighting. For instance, the 5-day Space in the AOC course (SAOCC) prepares space operators to “effectively augment theater AOCs during exercises and real world contingencies.”⁹ The course focuses on space support products and provides hands-on training with simulated AOC systems; essential information for total space professionals. Collectively, the curriculum of the SOPSC provides total space knowledge in a joint environment for space professionals, but it is not designed or manned to educate the entire field grade space cadre.

Command and Control Warrior School (C2WS)

The C2WS at Hurlburt Field provides joint AOC training and is the executive agent for Air Tasking Order training.¹⁰ Of the six courses it teaches, the Joint Aerospace Command and Control Course (JAC2C) is the most relevant to operational-level space professionals. The JAC2C is a 15-day class focusing on the “command and control (C2) of joint air operations in a theater battle at the operational level of war.”¹¹ The core program emphasizes the basic doctrine and mission of the Services, air tasking order development, and the capabilities and limitations of C2 warfare strategies.¹² Additionally, the class includes a 1-hour lecture on space support for joint operations, providing all students an overview of space C2 and identifying space systems supporting joint warfare.¹³ In addition, the class divides into eight functional area training tracks, including a space track. The space track provides approximately 7 hours of instruction to

space operators. The lessons include an overview of NRO systems and products; theater missile defense (TMD) architecture and the role of space forces in TMD; military applications of GPS, including navigation warfare concepts; and a “battle damage indications” lecture providing an overview of space capabilities to provide Battle Space Characterization to the AOC.¹⁴ Further, the space track provides a brief overview of existing space threats to the AOC, specifically AOC space superiority concerns and the military utility of gray space assets.¹⁵ Currently the JAC2C is open only to students who will perform duties in a theater AOC environment. Nevertheless, this course instills a joint warrior mentality and provides critical knowledge of joint AOC operations—key components of a total space professional.

Space Division, USAF Weapons School

Space Division’s mission is to prepare graduates to enhance combat effectiveness by “integrating, training and improving space capabilities at the operational level of war.”¹⁶ The school teaches the Space Weapons Instructor Course (SWIC) at Nellis AFB, and its objectives include producing weapons officers who: (1) are experts in space force enhancement and counterspace planning and execution; (2) understand the planning and execution of air power; and (3) have leadership skills to lead the integration of air and space.¹⁷ These objectives translate into a fast-paced SWIC curriculum providing a broad overview of Air Force air and space power weaponry and associated planning issues. A plus for the space professional, the course builds a strong space superiority knowledge base through approximately 32 hours of counterspace instruction (not including exams). Further, the SWIC provides 30 hours in signals and imagery intelligence, enhancing National systems knowledge. Moreover, by definition, the SWIC is a warrior course and the USAF Weapons School environment is the hub of warrior spirit. However, although SWIC includes topics on joint planning, the SWIC is primarily air-

centric, focused on developing weapons experts who link air and space power in support of the CAF and AOCs.¹⁸ Thus, given its mission, the course does not cover Army and Navy space forces, capabilities or utilization of space. Further, SWIC attendance is highly selective, educating only a small number of space “W-grads” each year.

Interservice Space Fundamentals Course (ISFC)

While most courses in this chapter focus on expanding the education of space professionals, the ISFC is a 10-day familiarization course that provides fundamental space knowledge to non-space personnel, graduating approximately 500 people annually from all Services and all ranks.¹⁹ The objectives include raising the awareness of space operations in the general military and providing a basic understanding of how space contributes to the success of military operations.²⁰ Offered by AETC’s Detachment 1 of the 533rd Training Squadron at Schriever AFB, the course presents three blocks of instruction. Block I, Foundation and Theory, presents a basic overview of orbital mechanics, space law, doctrine, space environment, and satellite and rocket theory. Block II, Space Systems, covers U.S. and rest of world (ROW) satellite, launch, and missile systems. Finally, Block III, Technical Applications, includes a thorough organizational review of U.S. Strategic Command and its components’ space capabilities, and concludes with a scenario exercise that tasks students to determine the appropriate space assets in response to a crisis. The course serves as an outstanding tool to increase space awareness throughout the non-space community of the Air Force and other Services.

Future Air Force Space Education

In response to the Space Commission’s recommendation to develop a space professional cadre, AFSPC developed the Space Professional Strategy to guide the command’s efforts. The

strategy, still in draft form as of April 2003, directs the development of “specific education and training initiatives [to] develop military space leaders with a stronger foundation in space and a greater understanding of the capabilities of our mission systems.”²¹ Specifically, the strategy envisions a series of courses spread over a space operator’s career, beginning with an entry-level course, Space 100, and progressing with periodic space education “booster shots” named Space 200 and 300, administered at the 8 and 15-year points, respectively.²²

The series begins with Space 100, a 7-week AETC course for all operators and acquisition personnel assigned to AFSPC. Taught at Vandenberg AFB, Space 100 will provide basic space competencies, and is heavily influenced by the existing OSPT curriculum. In fact, comparing the proposed Space 100 curriculum with the OSPT course training standard confirms that the new course is essentially OSPT with a substantially increased acquisition content, to meet the needs of the expanded course audience (OSPT now includes acquisition accessions). Like OSPT, current plans for Space 100 do not include a discussion of Army and Navy space forces or capabilities.

Next, mid-grade space professionals at the 8 to 10 year point will attend Space 200, a 20-day course under development by the SOPSC at Schriever AFB. Building on ASOC, the proposed course training standard trains “various DOD, civil, commercial, national, and foreign space systems,”²³ essentially total space. Additionally, the draft course adds acquisition topics and plans to include a joint perspective on the other Services’ space warfighting methods.²⁴ The proposed course training standard and course chart indicate separate 1-hour blocks of instruction for Army and Navy space integration. Moreover, the suggested goals of Space 200 include integrating and employing space systems into theater operations, cultivating an air and space warrior culture, and training space professionals from a joint warfighting perspective.²⁵

Consequently, in theory, Space 200 may produce graduates with all characteristics of an Air Force total space professional.

Finally, at the 15-year point, space professionals will attend Space 300. The specifics of Space 300 have yet to be determined, but the course will focus on strategic-level space operations and is expected to build on the SOPSC's senior level courses like the Senior Space Officer in Theater course.²⁶

In addition to the space competency courses, the Space Professional Strategy also envisions Advanced Space Training, sponsored by SOPSC, to increase weapon system expertise within AFSPC. Still in the concept phase, early estimates call for four courses, including navigation operations, space control, missile warning operations, and intelligence/surveillance/reconnaissance.²⁷ Unlike space Weapons School graduates, who normally leave AFSPC to fill billets in AOCs or NAFs in the "flying world," advanced space training graduates would serve as "über-operators," providing specialized weapon system expertise to squadrons within AFSPC.²⁸ For instance, a navigation operations graduate would be assigned to the 2nd Satellite Operations Squadron to lead the mission tactics shop for GPS operations.

In February 2003, the Vice Commander of AFSPC directed the SOPSC to develop and administer the Space 200, Space 300, and Advanced Space Training courses. The SOPSC expects to debut a Space 200 prototype in the summer of 2003.²⁹ Additionally, the Vice Commander instructed the SOPSC to develop long-term plans for a joint space university.³⁰ AFSPC is seemingly ready to shoulder executive agent responsibilities for space education.

In general, the various current Air Force space education programs collectively teach the required information, but no single course or program provides all aspects required to develop operational-level total space professionals.

Notes

¹ *Report of the Commission to Assess United States National Security Space Management and Organization* (Washington D.C.: The Space Commission, 11 January 2001), 47.

² Course Training Standard V3OQR13S1-000, *Officer Space Prerequisite Training*, 381st Training Group, August 1999, 4.

³ Capt Tommy Ray, Space Operations Training Flight Commander, interviewed by author 24 February 2003.

⁴ "Fact Sheet," *The USAF Space Operations School*, n.p., online, Internet, 21 March 2003, available from <http://www.sopsc.us/Documents/The%20SOPSC%20Fact%20Sheet.pdf>.

⁵ "Classroom Courses," USAF Space Operations School course overview, n.p., on-line, Internet, 21 March 2003, available from <http://www.sopsc.us/SOPSCClassroomCourses.htm>.

⁶ Maj Dwayne Hall, Chief, Education and Training Branch, USAF Space Operations School, interviewed by author 20 February 2003.

⁷ "Classroom Courses," 21 March 2003.

⁸ Ibid.

⁹ Ibid.

¹⁰ "Fact Sheet," *Command and Control Warrior School*, n.p., on-line, Internet, 26 March 2003, available from <http://www2.acc.af.mil/afc2tig/text-only/index-txt.html#C2WSFactsheet>

¹¹ Capt Gregory Parker, executive officer and Chief, Initial Training, C2 Warrior School, interviewed by author 27 February 2003.

¹² Parker interview.

¹³ Parker interview.

¹⁴ Parker interview.

¹⁵ Parker interview.

¹⁶ Maj Peter J. Flores, Assistant Operations Officer, Space Division, USAF Fighter Weapons School, interviewed by author 27 January 2003.

¹⁷ Flores interview.

¹⁸ USAF Weapons Instructor Course, Space Syllabus, draft, USAF Weapons School, Nellis AFB, NV, January 2002, 10.

¹⁹ MSgt Austin Carter, USAF, "Course Trains Space Cowboys," Air Force News, Air Force Space Command Public Affairs, 16 May 2001, n.p., on-line, Internet, 2 April 2003, available from http://www.af.mil/news/May2001/n20010516_0665.shtml.

²⁰ Ibid..

²¹ *Space Professional Strategy*, Air Force Space Command, draft, 6 January 2003, 5.

²² Lt Col Dan Jordan, AFSPC/CVX, interviewed by author, 29 January 2003.

²³ *Space 200 Training Plan*, USAF Space Operations School, draft, 12 March 2003, 4.

²⁴ Ibid., 3.

²⁵ Ibid., 5.

²⁶ Jordan interview.

²⁷ Jordan interview.

²⁸ Jordan interview.

²⁹ Lt Gen Robert C. Hinson, Vice Commander, AFSPC, memorandum to the Space Warfare Center Commander, subject: Space Operations School Involvement in Space Professional Development, 13 February 2003.

³⁰ Ibid..

Chapter 4

Army and Navy Space Education

...the goal of the Army leadership is to “normalize” Space across the Army, with all officers having a basic understanding of Space and military operations...

—Brigadier General Richard V. Geraci, USA
Deputy Commanding General, Army Space Command

I think it is time for each of the Fleet Commanders...to have a Space Section in their Staffs...[and] there should be a system set up so these officers are kept fully cognizant of the rapidly changing Space picture.

—Admiral Arleigh Burke, 1959

Executive agent responsibilities require the Air Force to champion space for all Services. As such, Air Force total space professionals must be aware of Army and Navy space perspectives to nurture a joint mentality. Additionally, a review of sister-Service space training programs may provide ideas to improve Air Force programs. Hence, this chapter reviews the primary Army and Navy space education programs.

Army Programs

The Army has a different perspective on space cadre development than the Air Force. Unlike the Air Force, which grows space operators from the first day of active duty, the Army space program does not begin until an officer has reached roughly 10 years of service. The Army space education program is comprised of two primary tracks, the Functional Area 40 (FA-40) and Additional Skill Identifier (ASI) 3Y tracks.

FA-40 is a subset of the Army's Information Operations career field and represents the Army's core space operators, providing "in-depth expertise and experience to adequately leverage space assets for the Army."¹ The Army qualifies FA-40 officers via the 7-week Space Operations Officer Qualification Course (SOOQC). The SOOQC includes the usual space fundamentals topics, but focuses on inculcating a total space perspective and an understanding of how to coordinate and deliver space products to the warfighter at the Corps level.² Topics include preparing a blue and gray order of battle, understanding red space systems and threats, and OPLAN space annexes. Finally, SOOQC culminates in an exercise with students performing space staff officer duties "on a Division/Corps staff, under simulated combat conditions."³

ASI-3Y personnel represent the Army's effort to normalize space across the Service.⁴ Students earn the 3Y identifier by completing two electives offered at the Command and General Staff College at Fort Leavenworth. The Space Orientation Course is a 27-hour course that provides an understanding of military space forces and systems, and how they support warfighting. The follow-on course, Space Operations, is a more in-depth, 54-hour class at the TS/SCI level that focuses on space support planning, preparing space knowledgeable officers to integrate space throughout military operations, and to serve on staffs in space-related positions.⁵

Navy Programs

While the Navy does not maintain a separate career field for space operations, it designates space operators with a sub-specialty code for space operations (6206). The majority of Navy officers obtain space training from the Air Force's ISFC and ASOC programs discussed earlier, and the Naval Postgraduate School (NPS).⁶ The NPS offers advanced degrees in Space Systems Operations and Space Systems Engineering. In response to the Space Commission report, the

Navy is developing the Naval Space Cadre Development Plan, which advocates developing a continuing education system based on a 3-level certification program to support ongoing career development.⁷ The proposal categorizes space courses from various sources into basic, intermediate, and advanced levels. Moreover, the plan applies a point system to each course, and after initial certification, Navy space cadre members must earn at least 80 points every two years to maintain certification.⁸ Additionally, the Navy plans to supplement the NPS programs with a Space Systems Certificate comprised of space-related courses available on-line via the Internet.⁹ Finally, Naval Network and Space Operations Command plans to develop a mobile “Naval Space Systems Application Course,” an advanced course similar to the Air Force’s ASOC. Envisioned to provide a detailed overview of Navy space systems, organizations, and procedures, this course will teach Navy personnel how the Navy and Marine Corps employ space power to support the fleet’s warfighting missions,¹⁰ crucial information to enhance a total space professional’s joint perspective.

Notes

¹ “FA-40 Optimizing Space Brochure”, U.S. Army Space and Missile Command, n.p., on-line, Internet, 21 March 2003, available from http://www.smdc.army.mil/FA40/docs/FA40OptimizingSpaceBrochure310_04_01.pdf.

² MAJ Robert M. Dukes, and Capt Michael A. York, Primary Joint Space Education, research report, (Naval Postgraduate School, September 2003), 23.

³ Ibid., 24.

⁴ Mr. Jeff Barker, Senior Space Instructor, U.S. Army Command and General Staff College, interviewed by author 7 March 2003.

⁵ A543 Space Operations Course Advance Sheet, Space Division, Department of Joint and Multinational Operations, U.S. Army Command and General Staff College, Fort Leavenworth, KS, January 2003.

⁶ Mr. Curtis Bell, Training and Space Education Division (N7), Naval Network and Space Operations Command, interviewed by author 12 March 2003.

⁷ Naval Space Cadre Management Plan, draft, Naval Network and Space Operations Command, N7, 23 Jul 2002, 14.

⁸ Ibid., 22.

⁹ Bell interview.

¹⁰ Bell interview.

Chapter 5

Air Force Professional Military Education (PME) and Space

Normalizing space means we make space a part of everyday operations; we educate the warfighters so they understand what space can do for them.

—Lieutenant General Joseph M. Cosumano Jr.
Commanding General, U.S. Army Space Command

In addition to total space professionals, successful integration of space into joint operations requires non-space military forces to have a reasonable degree of space awareness, since “space is an integral part of everything [they] do to accomplish [their] mission.”¹ Further, “commanders would be better able to exploit the full range of combat capability at their disposal if they were educated from the beginning of their careers in the application of space systems.”² Air Force PME provides a means to embed space awareness in the officer corps, from “cradle to grave.” Consequently, this chapter reviews the space content of Air Force PME at Maxwell AFB.

Squadron Officer College (SOC)

SOC manages the Air Force’s junior officer PME, the Air and Space Basic Course (ASBC) and the Squadron Officer School (SOS). ASBC, a 4-week course for newly commissioned officers, produces officers “who can articulate air and space doctrine.”³ The course collectively integrates air and space concepts into a number of lessons explaining air and space capabilities, functions, and core competencies; consolidating learning with an air and space wargame exercise. Additionally, ASBC includes a 1-hour lesson entitled Space Fundamentals. This

lesson establishes a common space knowledge baseline; requiring students to know the mission areas of space and how they support Air Force core competencies. Consequently, ASBC familiarizes new officers with space and exposes them to space doctrine, providing an appropriate level of space awareness to brand new Air Force officers.

At the 4 to 7 year point, approximately 500 company-grade officers attend each SOS class, a 5-week course emphasizing officership. Building on ASBC, SOS includes a 1-hour lesson entitled Space Employment that reviews space systems and capabilities, including counterspace functions, and further exposes officers to space terminology. In addition, SOS provides a 1-hour classified briefing discussing space systems integration.⁴ Finally, SOS incorporates space concepts into a wargame exercise, where students “plan, organize, and schedule photoreconnaissance satellites to provide target information in support of the JFC.”⁵ Thus, SOS provides adequate space awareness to all junior officers as they continue to hone their career field technical skills and approach the operational level of war.

Air Command and Staff College (ACSC)

The ACSC vision proclaims the school as a “world-class team educating mid-career officers to lead in developing, employing, commanding, and supporting air and space power.”⁶ Although the school’s vision promotes space power, the core curriculum includes less than 7 hours of instruction dedicated to space, in a 10-month school. Specifically, the core space curriculum consists of two 1-hour lectures on space history and doctrine; a 1-hour seminar on counterspace and spacelift functions; a 1.5-hour classified lecture on space issues; and 2.5 hours of combined seminar and lecture discussions on nuclear, space, and information issues of USSTRATCOM. Additionally, during the Joint Force Employment Course in the 2002-2003 academic year, space capabilities and limitations were relegated to a 20-minute briefing

embedded in a 2-hour lecture on Air Force service component capabilities. Moreover, the Army and Navy service component capabilities briefings did not discuss Army or Navy space capabilities at all. Consequently, the space content comprises a small portion of the core curriculum, and does not provide non-space students a strong appreciation of total space at the operational level. In contrast, ACSC's space electives provide a solid understanding of space capabilities and focus on the "utility of space to the warfighter."⁷ The Military and Commercial Uses of Space elective examines U.S. and ROW space capabilities, and is geared towards non-space personnel. The Advanced Space Studies elective provides a collaborative learning environment for experienced space operators and includes space campaign building at the operational level. While these electives provide outstanding space awareness, during the 2002-2003 academic year, the two 15-week courses only taught 18 students out of 600.

Beginning with the class of 2004, AETC is transforming the ACSC curriculum into a three-phased approach. Modules 1 and 2 will include the extant curriculum, and module 3 will provide specialized studies in one of eight different disciplines, including space.⁸ The space specialty, called Space Module 3 (or "Specialized Studies" space course), is a 5-week program providing an overview of space functions and applications for approximately 70 students, consisting of both space operators and non-space personnel with follow-on AFSPC assignments.⁹ The course content is under development, but is expected to mirror the current ACSC space electives discussed earlier.¹⁰ A step in the right direction, the new course should strengthen operational-level space awareness and reach a larger slice of the student population.

School of Advanced Air and Space Studies (SAASS)

SAASS is a vigorous 48-week school "educating strategists in the art and science of aerospace warfare."¹¹ The school's core curriculum focuses on broad strategic concepts like air

and space theory, doctrine, strategy, technology, and organization. In this context, it analyzes space issues through the 2-week Space and Information Power course. This class discusses key military space policy issues of the near future, including space strategy (where is the Air Force headed in space?), space weaponization, and information warfare strategies. Furthermore, the class is designed to foster critical thinking of pertinent issues “that might help optimize space and information as instruments of national power.”¹² However, though SAASS recognized the importance of space by recently adding “space” to its name, it is still primarily an air-centric curriculum. For example, while the school spends approximately 7 weeks discussing 100 years of air power history, it does not address 45 years of space power history. Nevertheless, while SAASS could expand its space content, the school provides its small student body a thorough, strategic examination of current and pertinent space issues challenging the Air Force today.

Air War College (AWC)

AWC is a 10-month school educating senior officers to lead air and space forces at the strategic level.¹³ The school’s core curriculum provides two instructional periods (lessons) dedicated to space. AWC’s Strategy, Doctrine and Airpower course provides a lesson entitled “Space as a Strategic Horizon,” which examines how space capabilities and operations influence strategy and vice versa. Next, AWC’s Warfighting course offers the “Emerging Concepts of Space Power Employment” lesson, which discusses space C2 issues, joint and Air Force doctrine, and space support to the JFACC. In addition to the two core lessons, AWC offers two space electives, Space Fundamentals and Space and Information Operations Issues. Similar to the ACSC entry-level elective, the Space Fundamentals course provides an overview of basic space topics like orbits, environment, and military applications of space, but includes a *space support to the theater* campaign exercise. The Space and Information Operations Issues elective,

similar to the SAASS space course discussed earlier, discusses key space and information issues with the goal of “assessing the role and importance of space...to U.S. military strategy.”¹⁴ Topics include the weaponization of space, space superiority, and the vulnerability of U.S. and Allied dependence on space. Consequently, AWC emphasizes space at the strategic level, but the space content is small in proportion to air power.

In summary, all Air Force PME schools have incorporated space into their core curriculum to some degree, and several offer electives to further enhance space knowledge. However, in ACSC, SAASS, and AWC, space content accounts for a very small fraction of the overall curriculum, and ACSC does not focus on space at the operational level of war. Consequently, Air Force PME offers moderate space awareness to non-space personnel.

Notes

¹ Air Force Doctrine Document 2-2 (AFDD 2-2), *Space Operations*, 27 November 2001, 36.

² *Report of the Commission to Assess United States National Security Space Management and Organization* (Washington D.C.: The Space Commission, 11 January 2001), 47.

³ *ASBC 2003 Syllabus*, Air & Space Basic Course, n.p., on-line, Internet, 24 February 2003, available at <http://asbc.maxwell.af.mil/curriculum.htm>.

⁴ Maj Rahn H. Butler, Profession of Arms Division Chief, Squadron Officer College, interviewed by author on 25 February 2003.

⁵ Butler interview.

⁶ “Air Command and Staff College Vision,” n.p., online, Internet, 26 March 2003, available at <http://www.wacsc.au.af.mil/About.htm#goals>.

⁷ *Space Applications for Military and Commercial Use Prospectus*, ACSC Elective 5626, n.p., available from the ACSC Electives Cyberbook, EL-626 Course Syllabus, Academic Year 2003.

⁸ Lt Col Charles Davis, ACSC/DEW, interviewed by author, 18 February 2003.

⁹ Davis interview.

¹⁰ Davis interview.

¹¹ Air University Catalog, Academic Year 2002-2003, (Maxwell AFB, Ala.: Air University Press, 2002), 45.

¹² SAASS 665 Course Syllabus, *Space and Information Power*, School of Advanced Air and Space Studies, Spring 2003, 2.

¹³ Air University Catalog, 9.

¹⁴ AWC 6525 Course Description, *Space and Information Operations Issues*, Air War College, December 2002.

Chapter 6

Recommendations

*Space professionals must simultaneously support **all** Services in **all** theaters **all** of the time in **all** conditions of war and peace.*

—Maj M.V. Smith

It is incumbent upon the Air Force, as the executive agent for space, to lead the development of joint space expertise. This task requires the Air Force to develop: (1) operational-level, “total” space professionals who can plan and employ all aspects of space power in a joint environment, and (2) space-savvy military forces that comprehend what space brings to the fight. As such, this paper defined the concept of an Air Force operational-level, “total” space professional, and examined whether Air Force space education programs facilitated this concept. Next, the paper explored Air Force officer PME as an embedding mechanism for space awareness among non-space personnel. The remaining paragraphs offer recommendations to transform Air Force space education programs, aiding the development of total space professionals and raising the space awareness of the “non-space” Air Force.

Upon review of Air Force space education programs, the Air Force needs to modify current programs to cultivate total space professionals. The current space education program provides a strong initial dose of space knowledge in OSPT, but does not provide periodic enhancements to maintain currency in an ever-changing technological environment. AFSPC is taking steps to nurture the field grade space cadre by developing the Space 200 and 300 courses

to sustain and update mid-career and senior officers. All field grade space operators should attend these courses, not just the “cream of the crop.” Further, AFSPC should study the feasibility of continuous learning programs, similar to the Navy proposal, using web-based and computer-based training, and correspondence courses. Including certification progress in performance ratings provides additional incentive to maintain professional competence.

Additionally, field grade space operators receive sparse training on sister-Service space forces but may be required to plan and manage joint space operations in the near future. This is especially true if the JFACC becomes the supported commander for space operations, making the AOC the joint space hub. Courses like ASOC, SAOCC, and JAC2C provide the required information, but are not fused in a program reaching a large number of field grade space operators. Although not all field grade space operators will fill joint billets or planning positions, they all need to comprehend space at the operational level. Just as “every Marine is a rifleman,”¹ every space operator needs a requisite ethos of space power, regardless of his or her actual job. Space 200 may fill this void in the future, but AFSPC should consider developing a course to prepare Air Force space operators for joint staff or planning positions, similar to the Army’s FA-40 program. Such a course could combine relevant aspects of the ASOC and SAOCC; the joint view of JAC2C; the staff focus and Army perspective of FA-40; the space control emphasis of SWIC; and the naval perspective of the future Naval Space Systems Application Course to instill a joint space warfighting culture in space operators managing deliberate and crisis action planning processes. Finally, this joint space warrior course could be the prototype to launch AFSPC’s joint space university. AFSPC should accelerate joint space university plans and coordinate with USSTRATCOM and USJFCOM to provide a standardized joint space warfighting culture across all Services. Beyond total space professionals, the Air Force must

also raise the space awareness of non-space forces to enhance joint operations.

First, while all Air Force PME schools have integrated space topics into core curricula to some degree, the schools should increase the space content, and respective schools must continue to embed tactical, operational, and strategic space themes. Currently SOC is on target with an adequate space emphasis at the introductory level. However, ACSC does not emphasize space at the operational level. ACSC's core curriculum should teach space capabilities separate from air, include space capabilities of all Services, and focus on space contributions to theater operations. For instance, ACSC should augment the classified lecture entitled "Space Issues" with a follow-on seminar lesson to explore the impact of space on the "kill chain." The proposed Space Module 3 should improve on these areas and will reach a larger audience. Next, though SAASS has a strategic approach to space, it should expand its space content. Indeed, SAASS plans to add an additional week to its core space course for the 2003-2004 academic year. Additionally, AWC focuses on space at the strategic level, but again, a 10-month school might consider increasing its core space offerings. Further, since senior officers may not have had much exposure to space education during their careers, the AWC core curriculum may need to review more basic space concepts in the short term until PME at the lower levels strengthens its core space content. Lastly, besides PME, the Air Force should increase ISFC attendance and augment mobile ISFC teams to proliferate space awareness across the Air Force and other Services.

These recommendations would enable the Air Force to develop highly competent total space professionals while raising the level of space consciousness across the force, producing synergy between space and non-space warfighters and enhancing joint operations.

Notes

¹ *Marine Corps Strategy 21*, 3 November 2000, 6.

Glossary

ACSC	Air Command and Staff College
AETC	Air Education and Training Command
AFB	Air Force Base
AFDD	Air Force Doctrine Document
AFSPC	Air Force Space Command
AOC	Air Operations Center
ASBC	Air and Space Basic Course
ASI	Additional Skill Identifier
ASOC	Advanced Space Operations Course
AWC	Air War College
C2	command and control
C2WS	Command and Control Warrior School
CAF	Combat Air Force
COMAFFOR	Commander, Air Force Forces
DOD	Department of Defense
DSP	Defense Support Program
FA	functional area
GPS	Global Positioning System
ICBM	Intercontinental Ballistic Missile
INMARSAT	International Maritime (Mobile) Satellite Organization
INTELSAT	International Telecommunications Satellite
ISFC	Interservice Space Fundamentals Course
JAC2C	Joint Aerospace Command and Control Course
JFACC	Joint Force Air Component Commander
JFASCC	Joint Force Air and Space Component Commander
JFC	Joint Force Commander
JP	Joint Publication
JTAGS	Joint Tactical Ground Station
MAJCOM	Major Command
NAF	Numbered Air Force
NASA	National Aeronautics and Space Administration
NOAA	National Oceanographic and Atmospheric Administration
NPS	Naval Postgraduate School
NRO	National Reconnaissance Office
OSPT	Officer Space Prerequisite Training
PME	Professional Military Education
ROW	rest of world
SAOCC	Space in the AOC Course

SAASS	School of Advanced Air and Space Studies
SOC	Squadron Officer College
SOC-E	Space Operations Course - Executive
SOPSC	Space Operations School
SOOQC	Space Operations Officer Qualification Course
SOS	Squadron Officer School
SWIC	Space Weapons Instructor Course
TDRSS	Tracking and Data Relay Satellite System
TMD	theater missile defense
USAF	United States Air Force
USCINCSpace	Commander-in-Chief, United States Space Command
USJFCOM	United States Joint Forces Command
USSTRATCOM	United States Strategic Command

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