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BLINDING THE EYES OF THE CORPS:
FORESIGHT AT LAST?

BY

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BLINDING THE EYES OF THE CORPS:
FORESIGHT AT LAST?

by

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ABSTRACT

This thesis juxtaposes the enabling attributes of tactical aerial reconnaissance with the myopic force structure policy which resulted in the demise of Marine aerial reconnaissance on the eve of the Persian Gulf War. Commencing with the debut of American photo reconnaissance aircraft in World War I, and continuing through the present, the U.S. tactical aerial reconnaissance capability problematic development cycle of high emphasis during war and gross neglect during peacetime is documented. For the United States Marine Corps, the impact of this trend of dysfunctional command priorities during Desert Shield/Desert Storm contingency operations in Southwest Asia is elucidated and the misnomer of "intelligence failure" is revealed. Based on analysis of these events and the recurring intelligence requirements of combat, this thesis sets forth the requirement for continuous maintenance of a viable tactical aerial reconnaissance capability within the Marine Corps.

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AGL	above ground level
ATARS	Advanced Air Reconnaissance System
BDA	battle (or bomb) damage assessment
C3	command, control, and communications
CCD	charge coupled device
CENTAF	Air Forces, U.S. Central Command
CENTCOM	U.S. Central Command
EO	electro-optical
ECM	electronic countermeasures
ETARS	Expeditionary Tactical Air Reconnaissance System
FAF	Fifth Air Force
FEAF	Far East Air Forces
FIIU	Force Imagery Interpretation Unit
FMF	Fleet Marine Force
FY	fiscal year
I&W	indications and warnings
IIF	Imagery Interpretation Facility
INS	inertial navigation system
IOC	initial operational capability
JIPC	Joint Imagery Production Complex
JSIPS	Joint Service Imagery Processing System
KTO	Kuwait Theater of Operations
LST	landing ship, tank

LVT	landing vehicle, tracked
MARCENT	Marine Forces, U.S. Central Command
MEB	Marine Expeditionary Brigade
MEF	Marine Expeditionary Force
PI	photo (or imagery) interpreter
PR	photo reconnaissance
RAF	Royal Air Force
RGFC	Republican Guard Forces Command
RPV	remotely piloted vehicle
RSAF	Royal Saudi Air Force
RTS	Reconnaissance Technical Squadron (U.S. Air Force)
SIDS	secondary imagery dissemination system
TAC RECCE	tactical aerial reconnaissance
TARWG	Tactical Aerial Reconnaissance Working Group
TRS	Tactical Reconnaissance Squadron (U.S. Air Force)
UN	United Nations
USAAF	U.S. Army Air Force
VC	Composite Squadron (U.S. Navy)
VMCJ	Marine Composite Reconnaissance Squadron (circa Vietnam War)
VMD	Marine Photographic Squadron (circa World War II)
VMF	Marine Fighter Squadron
VMFP	Marine Photographic Reconnaissance Squadron (post-Vietnam)

VMJ	Marine Photographic Squadron (circa Korean War)
VMSB	Marine Scout/Dive Bomber Squadron

EXECUTIVE SUMMARY

Tactical aerial reconnaissance, airpower's oldest mission, has been an effective force multiplier for the military forces of many nations. However, development of this vital military capability in the United States has been neither historically consistent nor functionally oriented. Commencing with the debut of photo reconnaissance aircraft in World War I, and continuing through the present, the development of U.S. "tac recce" has followed a problematic cycle of high emphasis during war and gross neglect during peacetime. As a result, U.S. forces have never arrived on the field of battle in possession of a tac recce capability commensurate with their mission requirements.

For the U.S. Marine Corps, this myopic trend reached its nadir on August 10, 1990, when the Corps' only remaining tac recce squadron was disbanded on the eve of the Persian Gulf War. The dissolution of these assets was the product of dysfunctional command priorities, which discounted the enabling attributes of aerial reconnaissance, and consequently reduced the fiscal and doctrinal support needed to maintain such vital resources.

The emergence of new requirements to support precision munitions delivery, responsive battle damage assessment, obstacle breaching operations, and collateral damage

limitation within the politically constrictive environment of Operation Desert Shield/Desert Storm resulted in a geometric increase in Marine imagery tasking. But unfortunately, the Marine Corps no longer had the organic capability to satisfy such requirements.

Despite wide-ranging efforts to compensate, all available options proved to be incapable of satisfying Marine imagery requirements in Southwest Asia. Operational commanders quickly acknowledged that only an organic tac recce capability, such as that which recently had been forfeited, could ensure timely and responsive intelligence support.

Following combat operations, many Marine commanders called for the reestablishment of organic tac recce. However, by later mislabeling the demise of Marine tac recce as an "intelligence failure," a counterproductive group of observers tacitly diverted attention from the systemic deficiencies of command emphasis which are clearly responsible for blinding "The Eyes of the Corps." Thus, potential exists to revert to the same fiscal and doctrinal neglect which has shackled development of tactical aerial reconnaissance for most of this century.

As a paradigm, the Persian Gulf War indicates that future conflicts will conceivably be even more demanding of a viable aerial reconnaissance capability. Coalition warfare in the emerging world order will emphasize the careful application of

force within a framework of close political oversight. While recent experience clearly showed that tac recce can excel in such environment, it also reaffirmed that those assets will continue to be most responsive to their owners.

Previous wars have extended the luxury of time to reconstitute languid capabilities, but future conflicts more likely will require U.S. Marine Corps readiness to fight upon arrival. In this context, continuous availability of a viable tac recce capability is essential to combat effectiveness.

The current era of political scrutiny and fiscal austerity demands that planners carefully preserve vital capabilities in the U.S. military force structure, and avoid misprioritization pitfalls which threaten readiness.

To this end, the Corps must escape the myopic trend which recently precluded the availability of an organic tac recce capability during crisis and combat. Recognition of previous dysfunctional command priorities, and abandonment of the misleading "intelligence failure" label are central to the resolution of this problem.

Although the planned Marine tac recce capability promises to provide timely and responsive support, previous myopic force structure policies still preclude the availability of this capability until 1995; the legacy of the past thus lingers. To prevent resurgence of this phenomenon in the long term, it would be prudent for the Marine Corps to place

greater command emphasis and program support on tactical aerial reconnaissance and similar force enabling capabilities.

I. INTRODUCTION

"Reconnaissance can never be superseded; knowledge comes before power, and the air is first of all a place to see from."

Sir Walter Raleigh
(Brookes, 1975, p.9)

Tactical aerial reconnaissance is the employment of manned aircraft to collect current information on enemy activity, installations, and terrain within the immediate area of operations; it is airpower's oldest mission, having been employed by France as early as 1794. Throughout the history of modern warfare, tactical aerial reconnaissance has proven to be an effective force multiplier on the battlefield. (*Air reconnaissance*, 1979, p.3)

Although aerial reconnaissance, evolving from primitive observation balloons to supersonic multisensor aircraft, has played a vital role in combat for many nations' military forces, its development as a military capability in the United States has been neither historically consistent nor functionally oriented. Commencing with the debut of photo reconnaissance aircraft in World War I, and continuing through the present, this vital capability has followed a problematic cycle of high emphasis during war and gross neglect during peacetime. Despite a continual increase in the requirement for aerial reconnaissance among operational commanders throughout post-World War I military history, *the U.S. military services*

have never arrived on the field of battle in possession of an aerial reconnaissance capability commensurate with their mission.

For the United States Marine Corps, this myopic trend reached its nadir on August 10, 1990, when the Corps' only remaining tactical reconnaissance squadron was disbanded, and "The Eyes of the Corps" were functionally blinded, immediately prior to the commencement of contingency operations in Southwest Asia.

Operations Desert Shield and Desert Storm revealed an unprecedented demand for imagery intelligence among Marine commanders. The emergence of new requirements to support precision munitions delivery, responsive battle damage assessment, obstacle breaching operations, and collateral damage limitation within a politically constrictive environment resulted in a geometric increase of imagery requirements. But the Marine Corps had no organic capability to satisfy the imagery intelligence requirements of its operational commanders.

Initially, the Marine Corps examined the feasibility of reactivating the Marine Tactical Reconnaissance Squadron to support operations in Southwest Asia. However, when prevailing fiscal and temporal constraints forced abandonment of this option, alternate sources of imagery support were necessarily sought.

All available options, including remotely piloted vehicles, joint service capabilities, and national systems proved to be incapable of satisfying Marine requirements during crisis and combat operations. Only an organic tactical aerial reconnaissance capability could have provided the timely and responsive support sought by Marine commanders. Thus, the Marine Corps was somewhat harshly reacquainted with the *enabling* attribute of tactical aerial reconnaissance; the lack of such a capability seriously jeopardized planning for effective, but judicious application of combat power during operations in Southwest Asia.[1]

Immediately following Operation Desert Storm, there was an explicit demand for immediate reconstitution of the Marine Corps' organic tactical aerial reconnaissance capability, based upon that recent experience. However, as it does all too frequently, time has dampened the fervor with which this end is being pursued.

Although the planned future Marine aerial reconnaissance capability will surely provide timely and responsive support, it will not be operational until 1995. Tacit acceptance of a three-year capability gap subsequent to the elucidative

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[1]Note that the Marine Corps' effectiveness despite this significant capability void can largely be attributed to the six-month preparatory period and the extensive 39-day air campaign which preceded ground combat operations in Southwest Asia.

experience of combat in Southwest Asia constitutes an imprudent extension of the very trend which deprived the Marine Corps of aerial reconnaissance during planning throughout Operation Desert Shield and indeed during combat throughout Operation Desert Storm.

As a paradigm, the Persian Gulf War indicates that future conflicts will conceivably be even more demanding of a viable aerial reconnaissance capability. Coalition warfare in the emerging world order will emphasize the careful application of force within a framework of close political oversight. Issues including non-provocative reconnaissance for escalation control, precision targeting for damage limitation, rapid and accurate satisfaction of battle damage assessment requirements, and post-war monitoring for ceasefire and/or treaty verification will dominate the intelligence collection effort. It is precisely in such an environment that tactical aerial reconnaissance excels. However, it is also reasonable to expect that aerial reconnaissance assets will continue to be most responsive to their owners.

In the past, major conflicts have generally been of sufficient duration to allow reconstitution of the U.S. aerial reconnaissance capability through accelerated research and development programs directed toward satisfying the immediate needs of the war. However, recent experience suggests that although future conflicts will levy a dramatically more taxing

demand for aerial reconnaissance, they likely will not provide the luxury of time to reconstitute a demobilized capability; U.S. forces may be required to fight upon arrival in the theater of operations.[2] Thus, in order to ensure maximum effectiveness in future conflicts, the U.S. Marine Corps must escape the myopic trend which recently precluded the availability of a vital organic intelligence capability during crisis and combat.

To elude this trend, the Corps must acknowledge that the Marine tactical aerial reconnaissance debacle was not an issue of intelligence failure; rather it was a manifestation of a systemic dysfunction in command priorities.

The purpose of this thesis is to juxtapose the enabling attributes of tactical aerial reconnaissance with the myopic force structure policy which resulted in the demise of Marine aerial reconnaissance on the eve of the Persian Gulf War. Chapter II reviews the historical development of aerial reconnaissance, from its inception as a military capability through the post-Vietnam period. Chapter III examines the emasculation of the Marine Corps Imagery Intelligence Architecture through the untimely dissolution of Marine

[2]Note that Operations Desert Shield and Desert Storm, despite the anomaly of wide-spread political and fiscal support from both domestic and international sources, and notwithstanding a six month preparatory period prior to ground operations, did not result in a reconstituted Marine tactical aerial reconnaissance capability.

tactical aerial reconnaissance assets. Chapter IV discusses Marine imagery intelligence shortfalls experienced during Operations Desert Shield and Desert Storm. Chapter V presents the significance of aerial reconnaissance in the context of national system and remotely piloted vehicle capabilities. The final chapter promulgates the requirement for the Marine Corps to consistently maintain a viable tactical aerial reconnaissance capability.

It is paramount that the Marine tactical aerial reconnaissance--as well as the aggregate intelligence capability--receive peacetime *command* emphasis which is commensurate with its wartime impact. Neglect of these enabling capabilities constitutes a failure in command, and jeopardizes the effectiveness of Marines in combat.

II. AERIAL RECONNAISSANCE: AN HISTORICAL PERSPECTIVE

A. THE EVOLUTION OF AERIAL RECONNAISSANCE

"I have spent all of my life in trying to guess what lay on the other side of the hill."
The Duke of Wellington
(Rodgers, 1983, p.157)

Military commanders have sought the capability to "see over the next hill" since the advent of armed conflict among men. On the earliest battlefields, commanders in control of the highest terrain were able to more effectively monitor enemy activity with their own eyes, and thus plan friendly operations accordingly. The invention of the telescope and similar optical devices in the sixteenth century greatly extended the ranges at which the commander could track enemy movements. However, as the scope of warfare and the size of the battlefield increased, information regarding enemy activities beyond the range of the aided eye became increasingly more vital, as well as more elusive. In the military profession, such knowledge became known as "intelligence," while efforts to acquire such knowledge were termed "reconnaissance." (Heiman, 1972, p.IX)

In efforts to surmount the limitations presented by distance and terrain, nations have sent military observers

aloft on reconnaissance missions, in a variety of contraptions, for centuries. (Burrows, 1986, p.28)

> Chinese and Japanese folklore mention the use of spotters who either went up in baskets suspended from giant kites or else were strapped right onto them. France is credited with being the first western nation to use aerial reconnaissance. It organized a company of "aerostiers" in April 1794, during the revolutionary wars, and is said to have kept one balloon aloft for nine hours while the group's daring commander, Colonel Jean Marie Joseph Coutelle, made continuous observations during the battle of Fleuries in Belgium.[3] (Burrows, 1986, p.28)

In fact, the French victory at Fleuries was largely attributed to Colonel Coutelle's observations of enemy activity. (U.S. Marine Corps FMFM 5-10, 1990, p.1-1) The French quickly became strong advocates of aerial reconnaissance; "Napoleon used a company of aerostiers in the siege of Mantua in 1797, and the following year took a balloon corps on his expedition to Egypt." (Burrows, 1986, p.28) Napoleon was noted for his tactic of exploiting the weakest sector in his opponent's front at a decisive moment, through the effective application of the Jominian military principles of mass and concentration of effort. The balloon offered Napoleon a means by which he could accurately ascertain the

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[3]Over a year before this first military employment of aerial reconnaissance, the French aeronaut Blanchard made a balloon ascent before a large crowd in Philadelphia to introduce flight to the Americans. General George Washington was among the observers at this event on 9 January 1793. (see Heiman, p.7 for discussion)

disposition of enemy forces and subsequently exercise optimal control over his artillery and infantry. (Heiman, 1972, p.8)

Although the observation balloon significantly extended the range at which the military commander could collect intelligence, there were three distinct disadvantages inherent to this method. First, the observer might not fully appreciate the tactical implications of all observed activity. Second, the observer's report was highly subjective. Finally, aside from the terse notes dropped to the ground, the observer could not provide detailed information until he landed. Because the observer's memory and personal interpretation provided the only available record of these reconnaissance missions, it is reasonable to expect that pertinent details easily could have been lost. (Stanley, 1981, p.19)

In the year following Napoleon's defeat at Waterloo, French scientist Joseph Nicephore Niepce began experimenting with lithographic processes, and by 1822, he successfully produced what is considered to be the first permanent photograph in his laboratory. Later, in 1829, Niepce formed a partnership with French painter L.J.M. Daguerre, an inventor who had conducted extensive experiments with the photosensitive properties of silver salts. After Niepce's death in 1833, Daguerre continued to conduct research in the chemical photographic process, and finally, in 1838, succeeded in permanently capturing the image

of the "camera obscura"[4] on a chemically treated copper plate through his newly developed silver-based technique. This first practical photographic process was aptly named the "Daguerreotype." (Heimann, 1972, pp.8-10)

While visiting France in 1839, American inventor Dr. Samuel F.B. Morse was fascinated by the Daguerreotype. "Morse brought the news of the invention back to the United States, where photographs became popularly known as "tintypes."[5] Within a few years, a flourishing photographic industry was established in America, on a magnitude which eclipsed that of Europe. (Heiman, 1972, p.11)

The economic potential of the photography business stimulated continued research and development in both the United States and Europe. Eventually, a photographic technique known as the "wet collidion process," developed by British architect Scott Archer in 1851, significantly expanded the potential applications of photography by reducing the required exposure time from four thousand seconds (for the Daguerreotype) to eight seconds. (Heimann, 1972, p.12)

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[4]Literally translated from Latin, "camera obscura" means "dark chamber;" the word "camera," as applied to contemporary photographic equipment, is derived from this early terminology.

[5]The term "tintype" refers to the metal sheet, which constituted the focal plane for early photographs.

The invention and subsequent improvement of the camera and related photographic technology clearly offered a new range of possibilities, as well as a higher grade of effectiveness for aerial reconnaissance "because it promised to provide tacticians on the ground with detailed photographs they could study, rather than with impressionistic sketches or oral descriptions of what was happening beyond their line of sight." (Burrows, 1986, p.29)

Notwithstanding the apparent military advantages afforded by the advent of aerial flight and photography, the two infant technologies were not married until 1856, when French balloonist Gaspard Felix Tournachon photographed Paris from the air.[6] The first American aerial photograph was credited to *Samuel A. King and James W. Blackwere*, after they successfully captured a picture of South Boston from the basket of the balloon "Queen of the Air," twelve hundred feet above ground level (AGL). (Burrows, 1986, p.29)

During the U.S. Civil War, Union Army reports not only recorded significant use of balloons for visual aerial reconnaissance, but also documented the first military application of aerial photography:

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[6]Tournachon photographed Paris using an improved Daguerreotype process, which required a total exposure time of eighty seconds.

> Photographers succeeded in capturing on a single photo plate all of the countryside between Richmond and Manchester to the west and the Chickahominy river to the east. Photo prints were made from the negative and a map grid was superimposed on the photos. The observer in the balloon was then able to give the commanders on the ground, who had a duplicate photo, immediate information of enemy activity and to pinpoint targets by grid coordinates. (Heiman, 1972, p.17)

Yet, despite such encouraging results, the employment of aerial reconnaissance during the American Civil War was, at best, limited, due to a number of reasons.

> Balloon baskets were relatively small and the cameras of the day were large and bulky. Furthermore, they used (photographic) plates that had to be coated with a light-sensitive emulsion in the field and then quickly used. In addition, the photographs had to be developed soon after being taken or their image would fade. Since it was impractical to repeatedly send up and then pull down the large balloons, there was little aerial photography of battlefields during the war. (Burrows, 1986, p.29)

Nevertheless, after the Civil War, serious experiments with aerial photography continued, and were well under way by the turn of the century. In addition to balloons, kites and even pigeons[7] were considered as platforms for aerial cameras. Concurrently, the development of photographic processing techniques and camera equipment proceeded with fervor and yielded such developments as the Kodak No. 1 Box Camera and

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[7]The "pigeon camera," patented by Julius Neubronner, was a 2.5 ounce timer-activated device which was designed to be carried by homing pigeons. Although the technique was a well-received novelty at expositions, "pigeon reconnaissance" proved to be impractical for military applications.

paper roll film.[8] (Heiman, 1972, p.24) However, at Kitty Hawk, North Carolina on 17 December 1903, the Wright brothers achieved a milestone which would not only revolutionize the science of aerial reconnaissance, but would also unalterably transform both the military and civilian worlds.

Following the maiden flight of the Wright brothers' heavier-than-air craft,

> military establishments in the United States and in Europe were quick to understand that airplanes added two incalculably important dimensions to aerial reconnaissance: speed and range. Airplanes, which did not have to be held captive by restraining ropes (like balloons), could go virtually anywhere in search of information and then get back speedily. This was seen for what it was almost from the beginning: a military weapon of staggering value. It took time for airplanes to be produced and distributed, but once that had been done, their adaptation to reconnaissance was swift and apparently unquestioned. (Burrows, 1986, p.31)

The first recorded photograph taken from a heavier-than-air vehicle was taken by cameraman L.P. Bonvillain, who accompanied Wilbur Wright on a demonstration flight near Le Mans, France in 1908. (Brookes, 1975, p.13)

By January 1911, the first American photograph from an airplane was attributed to an anonymous passenger on a Curtiss Hydroplane flying above the San Diego waterfront. When the

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[8]The Kodak No. 1 Box Camera and paper roll film were invented by George Eastman in 1883 and 1888, respectively. The No. 1 camera offered the advantage of a lightweight, compact system, while roll film facilitated the collection of a continuous strip of photography.

U.S. Army Signal Corps established a flight training school at College Park, Maryland, later in the same year, aerial photography instruction was included in the curriculum. (Stanley, 1981, p.21)

The airplane's debut in combat also occurred in 1911, when Italy went to war with Turkey over the control of Libya. On 23 October 1911, Captain Carlo Piazza, commander of the Italian air flotilla in Libya, flew a visual reconnaissance mission over Turkish positions in his Bleriot aircraft. Having been convinced of the military significance of aerial reconnaissance, on 23 February 1912, Captain Piazza mounted a borrowed camera below his aircraft and continued his reconnaissance missions with the advantages afforded by photography. (Brookes, 1975, p.13)

> The results were so impressive that another pilot, Captain Ricardo Moizo, also borrowed a camera and fitted it to his aeroplane (sic). The sum total of these officers' efforts during the campaign did not amount to much in terms of numbers of prints, but they did point the way to the future. Inaccuracies on maps were highlighted by reference to their photographs, and they were able to do some survey work from the air in addition to accurate troop and battery spotting. The Italian-Turkish war was a limited beginning, but it showed - to those who were willing to look - that aerial photography had great potential. (Brookes, 1975, p.13)

Britain and France, already embroiled in the conflict sweeping across Europe, were more than willing to look at aerial photography as a prospective force multiplier.

B. WORLD WAR I: AERIAL RECONNAISSANCE COMES OF AGE

"Elevatis Nihil Celatur - To Those High Up, Nothing is Concealed."
British 681 Reconnaissance Squadron Motto
(Brookes, 1975, p.203)

"If the camera and airplane were the mother and father of photo reconnaissance, then World War I was its midwife." (Burrows, 1986, p.32) As the sluggish war of attrition took shape in the Autumn of 1914, commanders became increasingly concerned with monitoring enemy activity beyond the stagnant front lines, to gain knowledge of any preparations which threatened to break the deadlock. The airplane promised to fulfill the paramount need for reconnaissance, because it not only provided a means of seeing over the next hill, but could see over as many hills as necessary, unimpeded by trenches and obstacles. (Heiman, 1972, p.40)

Accordingly, reconnaissance airplanes began to appear over the battlefield in increasing numbers.[9] With the proliferation of aircraft, the rapid rise in reconnaissance missions, and the inevitable juxtaposition of photographic and visual reconnaissance capabilities, the limitations of aerial

[9]The significance ascribed to aerial reconnaissance during the First World War is underscored by Sir Walter Raleigh's statement that "the single use in war for which the machines of the Military Wing of the Royal Flying Corps were designed and the men trained was reconnaissance." (see Brookes, p.16 for discussion)

observers, as previously experienced in the era of the balloon, again became apparent, but in a more pronounced way.[10]

The camera clearly offered an optimal solution to the problems presented by the use of observers on aerial reconnaissance missions. As an objective, mechanical device, the camera was not constrained by the factors of human judgement and fatigue; it recorded *everything* within its field of view, and was much more sensitive than the human eye; and it provided a detailed record of its observations, which could be efficiently and effectively reproduced for mass consumption. Furthermore, since the aerial photographer required significantly less training than the aerial observer, photographic reconnaissance aircrew could be replaced at a relatively higher rate.

Therefore, as reconnaissance sorties became longer, involving deeper penetrations into enemy airspace at increasingly higher altitudes, and as cameras became more

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[10]Brookes notes that "observers could only absorb, or concentrate on, a limited amount of data at 70 MPH (the average speed of the reconnaissance aircraft)...even if an observer thought he saw what he was looking for among the wealth of information that was visible beneath him, he might be mistaken - the most skilled eye could confuse stretches of tar on a road for troops on the move, or shadows cast by gravestones as a bivouac site. It was also impossible for the human brain to absorb everything of interest on a two-hour flight - a man looking for troop movements might miss fresh excavations or aircraft concentrations." (p.17)

dependable, far greater reliance was placed on photographic evidence to reveal the enemy's plans and preparations.

As early as March 1915, "a trench map prepared chiefly from aerial photographs was used with great success by (the British) in the attack at Neuve Chappelle, and from there on there was a continual urgent demand for photographic reconnaissance" (Babington-Smith, 1957, p.4) by ground commanders.[11]

However, "despite its operational trials of aerial reconnaissance, by 1916 the United States had made pitifully few advances, compared to the European combatants," (Stanley, 1981, p.21) so that when America declared war on the Central Powers in 1917, the U.S. Army could not claim a viable aerial

[11]Babington-Smith also notes initial resistance to aerial photography: "At the start of the war some of the Army diehards had felt it was *unsporting* (emphasis added) to photograph the German rear positions, but these scruples were soon forgotten." (p.4) On the same issue, Brookes states "some conservative elements went so far as to say that the reconnaissance aircraft was an unethical intrusion into the gentlemanly pursuit of war - it was *not quite cricket* (emphasis added) to spy into an enemy's back yard and photograph him with his trousers down." (p.21) It is indeed fortunate for the Allies that such moral inhibitions were cast aside early in the war.

photographic capability. Thus, in the United States, "a mad scramble took place to organize aerial photographic units."[12] (Heiman, 1972, p.50)

By the close of 1917, the German aerial reconnaissance effort yielded an average of *four thousand photographs each day*, and covered the entire Western Front every two weeks.[13] During March of 1918, Germany dedicated 505 of a total of 2,047 aircraft on the Western Front to reconnaissance missions. (Burrows, 1986, pp.33-34)

Combined British and French photographic reconnaissance missions roughly equaled those of the Germans until mid-1918. However, by Autumn 1918, the Allied reconnaissance effort had assumed prodigious proportions.

> During the Meuse-Argonne offensive that September...*fifty-six thousand aerial reconnaissance prints were delivered to various U.S. Army units within a four-day period. The total number of prints provided between 1 July, 1918 and Armistice Day the following November came to 1.3 million.* (Burrows, 1986, p.36)

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[12]Heiman also notes that "as so often has been the case, the Americans have always had to 'catch-up' when thrust into a war and literally build a war machine from scratch. This was especially true in World War I." (p.48)

[13]On 1 January 1918, in preparation for his last great offensive, Ludendorff wrote that "complete photographic reconnaissance (his emphasis) with no gaps must be ensured. This is of decisive importance." In his manual on "The Attack on Position Warfare," Ludendorff stated that the needs of aerial photography were to be paramount when new aircraft reached the front; he placed fighters at the bottom of the list. (see Brookes, p.33 for discussion)

By the close of the war, Lieutenant Edward Steichen, Officer-in-Charge of the American Expeditionary Force Photo Section, stated "the consensus of expert opinion, as expressed at the various inter-Allied conferences, is that at least two-thirds of all military information (was) either obtained or verified by aerial photography."(Brookes, 1975, p.16)

It is estimated that by the end of World War I, at least twenty-five percent of all the aircraft involved had been employed as aerial photography platforms (Burrows, 1986, p.36), and by 11 November 1918, "virtually every major application of photographic reconnaissance that was to be employed over the next 50 years had been tried and tested." (Brookes, 1975, p.34)

It is significant to note that the development of aerial photographic equipment generally kept pace with the development of the airplane during the First World War. Technological advances yielded increased operating altitudes and velocities for aircraft, as well as corresponding improvements in focal length and shutter speed for aerial cameras.[14]

[14]Focal length determines the range and/or altitude at which targets can be photographed by a particular camera, while camera shutter speed determines the speed at which an aerial photography platform can travel and still collect a usable (not blurred) image.

Thus, the First World War had clearly been a watershed event in the evolution of aerial photography as the paragon of tactical reconnaissance. However, in the wake of The Great War aerial reconnaissance was surprisingly accorded a significantly reduced priority in the military.

1. The Interwar Years: A Trend Emerges

"Now, here, you see, it takes all the running you can do, to keep in the same place."
Lewis Carroll in *Alice's Adventures in Wonderland*

> The value of aerial reconnaissance having been established in World War I, low-keyed research, much of it significant, continued throughout the twenties and thirties despite shrunken military budgets and a concomitant competition for funding among all commands within the military services. Where the Army was concerned, the Air Corps...was far back in line behind the other fighting commands, and even behind the Corps of Engineers, in competing for precious dollars. Even within the Air Corps itself, pursuit and bomber wings, and the research that went into them, had priority over reconnaissance. And there was another wrinkle. Since top commands in air forces throughout the world traditionally went to pursuit and bomber pilots, just the way most ground army generals and navy admirals came from the infantry, cavalry, artillery, and the dreadnought flotillas, respectively, there were no delusions among career-minded junior officers the in Army Air Corps that specializing in reconnaissance - in picture-taking and interpretation - would put stars on their shoulders. (Burrows, 1986, p.36)

During the vast demobilization which followed the war, aerial reconnaissance was relegated to a status of virtual insignificance. In fact, in the U.S. Army Air Corps, "development of such equipment as fire extinguishers and parachutes took priority over aerial photography." (Heiman, 1972, p.55)

Even in the British Royal Air Force (RAF), where aerial photography had been extensively developed and employed during the war, aerial reconnaissance specialists began to disappear as multi-mission squadrons were promoted to minimize the fiscal signature of the service.

As a result, during the inter-war years "no one became particularly proficient in the art (of aerial photography) or bothered much about its application...everyone regarded aerial reconnaissance as a minor adjunct to their duties." (Brookes, 1975, p.55)

Winston Churchill referred to the inter-war period as the "locust years"- an era during which pacifism and retrenchment had taken their toll on the recently developed and hard bought military capabilities of the Allies. While it is reasonable to expect that a significant demobilization will follow a major war, it is likewise logical to presume that critical military capabilities will be preserved on a proportional, albeit smaller, scale in the post-war force. Yet, notwithstanding the high level of emphasis placed on aerial reconnaissance during the war, this vital capability was blatantly neglected throughout the demobilization period which followed the First World War.

Thus, just as the military value of aerial reconnaissance was unquestionably established during World War I, so was an unfortunate policy which discounted its significance during

the post-war period. In the United States, the relative priority accorded to aerial photography among military capabilities during the war would never be restored in the post-war force. This precedent set in motion a myopic trend from which the American Armed Forces would never escape.

Had it not been for a handful of zealots who rejected the emerging careerist tendencies in the U.S. military officer corps, the American aerial reconnaissance capability would have fallen into complete obscurity during the inter-war years.[15] Foremost among these pioneers was George W. Goddard, a U.S. Army Air Corps officer who had served as an instructor at the Army Aerial Photography School in 1917.

Subsequent to the war, Goddard conceived, tested, and implemented a variety of new aerial reconnaissance techniques: he experimented with both infrared and long-range photography; he formalized the U.S. Army's first Aerial Photographic Mapping Unit; he perfected night aerial photography procedures; and he successfully transmitted photographs over telegraph wires. (Burrows, 1986, p.37)

Goddard's most significant accomplishment was his development of the stereoscopic twin-lens strip camera.

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[15]Heiman agrees that "in the United States, only the persistence of a small group of officers and civilian scientists enabled the Air Corps to develop cameras and equipment suitable for photo reconnaissance. (p.28)

Previously, tactical reconnaissance aircraft had exclusively relied upon high-speed oblique-mounted camera systems which tended to yield blurred images when employed on low-altitude, high-speed missions, due to the inability of the camera shutter to operate at a speed commensurate with the ground speed of a low-flying aircraft. Camouflaged gun emplacements and similar targets proved to be invulnerable to the oblique camera, since the mission profile required to ensure target coverage[16] was beyond the technical capability of the available camera system. In 1939, Goddard invented a shutter-less camera which effectively matched film speed with aircraft ground speed through the use of an electronic synchronizing mechanism; the system also collected stereoscopic coverage through the use of two lenses. (Burrows, 1986, p.38 and Heiman, 1972, p.74)

While Goddard focused on surmounting the mechanical limitations of aerial cameras, American filmmakers - primarily Eastman Kodak - were developing improved aerial films. Significant progress was made in increasing the light sensitivity and reducing the diameter of the silver grains integral to the film emulsion. Ultimately, improved films, combined with more capable cameras, ostensibly promised to

[16]In this case, the mission profile would necessarily be low-altitude to defeat the effectiveness of camouflage and high-speed to defeat the effectiveness of the weapon crew.

increase the resolution[17] and hence, the intelligence value of aerial photographs. (Burrows, 1986, p.39)

However, despite the dedicated efforts of George Goddard, Eastman-Kodak, and other inclined parties, the American aerial reconnaissance capability was at a much lower state of readiness than that of the aggregate U.S. military on the eve of World War II. The U.S. Navy had no recognizable aerial photographic reconnaissance capability (Stanley, 1981, p.100); maritime scout aircraft, as well as longer range aircraft[18] were employed for visual observation, and not photography missions. (Burrows, 1986, p.47)

> The Army was using three different kinds of flying units to gather information...none of them suited to the sort of photoreconnaissance that was suddenly required in a war whose fronts changed rapidly. There were observation units attached to ground forces that used light planes for close support, artillery spotting, and other missions that depended on visual sighting and a high degree of ground-air coordination. There was photo-mapping, which for the most part used commercial airliners that were wholly inadequate for combat. Finally, there were squadrons that were technically dedicated to reconnaissance, but these were really bomber units whose planes carried cameras in addition to guns and bombs. Training emphasized bombing and self-protection, while photography, largely for bomb damage assessment, was secondary. (Burrows, 1986, p.48)

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[17]"Resolution" refers to the minimum separation distance between two objects on the ground at which an aerial reconnaissance system can discriminate the objects from one another.

[18]The major long-range aircraft in the U.S. Navy inventory at the outset of World War II were the PBY Catalina and the PB2Y Coronado; neither had been specifically configured to conduct aerial photography missions.

The U.S military services simply lacked the physical means prerequisite to the establishment of a credible aerial reconnaissance capability. The science of photo interpretation, the methods by which analysts extract information of intelligence value from aerial photographs, was also underdeveloped in the United States. On a conceptual level, a significant lack of foresight, coupled with a stubborn resistance to change, also constrained the development of aerial photography within the American armed forces. "As late as 1940 the (Army) General Staff was still emphasizing the training of aerial observers, whose main function would be to direct artillery fire as they had in World War I," (Heiman, 1972, p.89) despite the overwhelming requirement for a photo reconnaissance capability and the well-documented limitations of observers as intelligence collectors.

Thus, between the end of World War I and the start of World War II, the concepts, skills, and equipment associated with aerial photography were not accorded a high priority in the United States, perhaps because the inter-war period "was a time when men tried to forget the miseries of The Great War, and succeeded only in forgetting the lessons they had learned from it." (Brookes, 1975, p.35) Although the development of the airplane and its associated weapon systems proceeded with vigor after World War I, the development of reconnaissance

systems failed to keep pace. From then on, the U.S. armed forces followed a clearly discernible pattern with regard to aerial photography: immediately prior to and during war, heavy emphasis would be reactively placed on the development of aerial reconnaissance capabilities; but commencing with the post-war demobilization and continuing through the subsequent period of peace, disproportionately low emphasis (relative to wartime experience) was placed on the development of reconnaissance capabilities, and consequently, reconnaissance systems were not concomitantly improved as aircraft capabilities evolved.

Accordingly, as the Second World War developed and assumed increasingly ominous proportions, American military commanders became progressively more interested in acquiring photo reconnaissance and photo interpretation capabilities; the development of both was necessarily on a "crash" basis in the early years of the war. (Heiman, 1972, p.78)

C. WORLD WAR II: DEMAND INCREASES

> *"The military organization that has the best photographic intelligence will win the next war"*
> Generaloberst Werner Frieherr Von Fritsch
> (Brookes, 1975, p.35)

France and Britain had successfully avoided the pitfalls which plagued the deficient American aerial reconnaissance capability. The French had organized tactically-oriented photo reconnaissance units well before the start of the war:

> The French made maximum use of photography after the Germans reoccupied the Rhineland in 1936. When the Germans began constructing the Siegfried Line, the French Air Force methodically photographed the process on a regular basis. The French...were able to prepare detailed plans (of the fortifications) because they saw the foundations laid, the walls go up, and the roofs installed. (Heiman, 1972, p.79)

During the first six months of the war, the French had successfully photographed 6,000 square miles of enemy territory.

Likewise, the RAF had established a viable capability and had employed its assets prior to the war. As early as 1935, the British photographed Eritrea, Abyssinia, Cyrenaica, and Sicily to monitor the Italo-Abyssinian conflict. By 13 November 1939, camera-equipped Spitfires[19] were operating as dedicated reconnaissance platforms. Within the first six months of the war, the British had photographed in excess of 7,500 square miles of enemy ground.[20] (Heiman, 1972, p.81)

"However, the United States entered World War II as it had entered World War I - woefully unprepared in photo

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[19]These assets were popularly known as the "Heston Flight," because the aircraft were based at the Heston Aerodrome.

[20]It is significant to note that on 3 January 1940, the RAF held a conference to discuss requirements for aerial photography. The conference not only established a service level aerial photography organization; it also ruled that "the development of reconnaissance aircraft should always be kept ahead of contemporary fighter performances." (Brookes, 1975, p.56)

intelligence skills and collection capabilities." (Stanley, 1981, p.36) The procrastination and low-prioritization with which the American military infrastructure had approached the development of aerial reconnaissance had manifested itself as a clear tactical disadvantage - a handicap which would have to be swiftly surmounted if any measure of combat effectiveness was to be realized on the field of battle.

To this end, the U.S. Navy dispatched three officers[21] to Medmenham, England (the photo reconnaissance headquarters of the RAF) in the spring of 1941 with a singular purpose.

> The Navy, seeing war clouds in the Pacific, recognized that the tight security of the Japanese...meant that if war came, they would have practically no intelligence with which to work. A photo intelligence capability would be needed on each carrier and amphibious force. (Heiman, 1972, p.85)

After three months, the naval officers returned to the United States and opened a photo interpreter school at Anacostia Naval Air Station in Washington, D.C.

In the summer of 1941, the U.S. Army Air Corps also sent an officer[22] to Britain; the Army was interested in collecting information on aerial camera capabilities and photo interpretation techniques. Subsequent to his trip, the Army

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[21]The three officers were Lieutenant Commander Robert S. Quackenbush, Jr., USN; Captain Charles Cox, USMC; and Captain Gooderman McCormick, USMC. (see Heiman, pp. 84-85)

[22]The officer was Captain Harvey C. Brown, Jr.

officer spearheaded the training of photo interpreters at Carlisle Barracks, Pennsylvania. (Heiman, 1972, p.85)

The impending war also brought long-overdue organizational changes and hardware procurement efforts directed toward enhancing the American aerial photography capability. Just prior to the Japanese attack on Pearl Harbor, the U.S. Army Air Force (USAAF)[23] established specifically organized, equipped, and trained photo groups, and also placed a dedicated reconnaissance squadron within each heavy bomber group. In early 1942, the Boeing Aircraft Corporation began producing reconnaissance variants of the B-17 Flying Fortress, the first American military aircraft to be specifically configured for aerial photography. Shortly thereafter, P-38 *Lightning* fighters were also modified for photo reconnaissance. (Heiman, 1972, pp. 89-92)

The USAAF's 3rd Photo Group became the first American aerial reconnaissance unit to see extensive action in the war. After being deployed to North Africa in November 1942, the Group became a component of the Combined Northwest Africa Photographic Reconnaissance Wing,[24] which included RAF and South African Air Force reconnaissance units. Under this

[23]The U.S. Army Air Corps had been redesignated the USAAF prior to the war.

[24]The USAAF 3rd Photo Group Commanding Officer, Lieutenant Colonel Elliot Roosevelt, was appointed Commanding Officer of the Northwest Africa Photographic Reconnaissance Wing.

organization, neophyte American reconnaissance aircrews and photo interpreters gained valuable experience from their seasoned Allied counterparts.[25]

> The 3rd Photo Group began operations with B-17s (called F-9s in their reconnaissance configuration) and P-38Es, but transitioned as soon as possible to exclusive use of the advanced, better-performing P-38G/Hs (known as F-5As). The later model Lightnings could fly twenty miles an hour faster than their predecessors, four thousand feet higher, and with two fuel tanks slung under their wings, four times farther. (Burrows, 1986, p.48)

American Aviation's P-51 Mustang (called the F-6 in its reconnaissance variant) was also adapted for aerial photography. With a speed of over 400 miles per hour, the F-6 was exceptionally popular with pilots tasked to fly low-altitude missions (Burrows, 1986, p.49). Later, "other aircraft, such as the B-25 Mitchell and B-26 Marauder were modified for reconnaissance duties to replace the slow flying aircraft that were in the air support units at the beginning of the war." (Heiman, 1972, p.94) Over the course of the war, no less than twenty aircraft had been modified and employed to conduct aerial photography (see Table 1).

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[25]Stanley remarks "fortunately, as during The Great War, the United States found that its British allies were well on the right track and were unselfish in sharing their hard-won secrets. (p.36)

TABLE 1
U.S. TACTICAL RECONNAISSANCE AIRCRAFT IN WORLD WAR II

TYPE	SPEED	SERVICE CEILING	RANGE
U.S. ARMY AIR FORCE:			
Fairchild F-1	138mph	17,000ft	900mi
Beechcraft F-2 (UC-45)	220	27,000	900
Curtiss O-52	170	23,000	750
Douglas F-3 (A-20)	300	25,000	1,000
Lockheed F-4 (P-38E)	390	38,000	500
Lockheed F-5 (P-38G/H)	410	40,000	2,000
North American F-6 (P-51)	440	42,000	1,000
Consolidated F-7 (B-24)	290	28,000	2,300
Boeing F-9 (B-17)	260	28,000	2,000
North American F-10 (B-25)	300	25,000	1,500
Boeing F-13 (B-29)	375	38,000	3,600
Lockheed A-29 (Hudson)	250	26,500	1,500
Lockheed B-24 (Ventura)	315	24,000	950
U.S. NAVY/MARINE CORPS:			
Douglas SBD-1P (Dauntless)	250	24,000	770
Brewster F2A-2P (Buffalo)	300	30,000	900
Vought F4U-1P (Corsair)	400+	40,000	1,000
Grumman F6F-3P (Hellcat)	375	37,000	1,000
Curtiss SB2C (Hell Diver)	280	24,500	1,100
Grumman TBF-1CP (Avenger)	278	24,000	2,000
Consolidated PBY (Liberator)	190	18,000	3,000

(Source: Stanley, 1981, pp.80 and 100)

By the winter of 1944, each of the Army Air Forces had its own armada of reconnaissance aircraft. Three combat groups, each having three squadrons of twenty-five aircraft, worked Italy and the Mediterranean. The Eighth and Ninth Air Forces in England, which were bombing the continent on a massive scale, had twenty reconnaissance squadrons between them, for a total of nearly five hundred aircraft at strength. Seven other squadrons flew photoreconnaissance missions in the China-Burma-India theater. (Burrows, 1986, p.50)

It was during the Second World War that the United States Marine Corps initially employed aerial reconnaissance on a significant scale. The first dedicated Marine Photographic Squadrons, VMD-154 and VMD-254, were commissioned at San Diego, California on 1 April 1942; both squadrons proved to be vital to Marine operations in the Pacific.

VMD-154, equipped with the Corps' first four-engined aircraft - the PB4Y-7P Liberator - and commanded by Lieutenant Colonel Elliot F. Bard, commenced combat operations from Espiritu Santo during October 1942. The newly formed squadron immediately began assisting Army F-9s in photographing and mapping the entire South Pacific to support theater amphibious operations.

In preparation for operations on Guadalcanal, VMD-154 used modified F4F-7P Wildcats to photograph Japanese front lines and installations, and from 19 October to 1 November 1942, the squadron flew daily reconnaissance missions to produce the first detailed photography of the enemy in the Pacific.[26] On

[26]Major Michael Sampas and Captain Herman A. Hansen flew these missions.

5 December 1942, VMD-154 provided conclusive photographic evidence of Japanese airfield construction on the island of Munda, in New Georgia; this discovery was the impetus for strike operations which yielded the destruction of twenty-four Zeros and nine occupied troop barges from 12 to 24 December 1942.[27]Later, on 26 January 1943, the squadron succeeded in photographing the Puluwat Group, and thereby became the first unit to penetrate the Truk area. (Sherrod, pp. 112, 123, and 460)

VMD-154 flew in excess of three hundred photo reconnaissance missions over Japanese bases during operations in the Solomon Islands alone. In recognition of VMD-154's vital contribution to Marine operations in the South Pacific, the squadron was awarded the Presidential Unit Citation (PUC), the highest award a military unit may receive. (Sherrod, pp.428 and 460)

The other reconnaissance squadron commissioned in the spring of 1942, VMD-254, deployed to Espiritu in November 1943, and gradually moved northward as the island hopping campaign proceeded. On 4 February 1944, two VMD-254 PB4Y-7P Liberators executed the first photo reconnaissance of the

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[27]Commencing on 12 December, Marine Scout/Dive-bomber Squadron 142 (VMSB-142) and Marine Fighter Squadron 121 (VMF-121) operated on a daily basis, assisted by VMD-154 aerial reconnaissance support, against Japanese logistics, equipment, and personnel at Munda. (see Sherrod, p.123)

large Japanese base on Truk Atoll itself, in what has since been described as the most daring photographic mission of the entire war.[28] During their twelve-hour flight, the two aircraft successfully photographed significant elements of the Japanese combined fleet, as well as extensive aircraft activity, despite heavy enemy fire. Thirteen days later, a combined air and surface strike was launched against Truk, based upon intelligence derived from VMD-254's bold accomplishment. (Sherrod, pp.205-206)

> Three (Japanese) cruisers went down, and so did three destroyers, 2 submarine tenders, an aircraft ferry, 6 tankers, 3 auxiliary cruisers, and 19 cargo vessels - a total tonnage of more than 200,000. About 325 airplanes were destroyed or damaged; so were storage facilities for food and fuel. Truk was left all but defenseless by this brilliant strike. (Sherrod, p.206)

On 30 March 1944, VMD-254 headquarters moved to Guadalcanal, and by 1 July of the same year, the squadron had flown 260 combat photo missions over a number of important targets, including Yap, Woleai, Guam, Truk, New Hanover, New Ireland, New Britain, Green, Emirau, Ulithi, Solomons, and New Hebrides. (Sherrod, p.477)

Two additional Marine Photographic Squadrons were commissioned later in the war: VMD-354 and VMD-954, on 1 July 1943 and 25 September 1944, respectively. From July 1945 until

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[28]The pilots were Major James R. Christensen and Captain James Q. Yawn.

the end of the war, VMD-354 operated from Peleliu, Ulithi, and Okinawa. VMD-954 operated from Cherry Point, and later from Greenville, North Carolina as the replacement training squadron for photographic reconnaissance aircrews. (Sherrod, p.467)

"As the number of photo reconnaissance missions proliferated in both theaters, so too, did qualitative improvements in the photographic equipment itself." (Burrows, 1986, p.50) A veritable flood of technical innovations promised to greatly enhance the capability and value of aerial photography: high resolution color film had been perfected, and had been regularly employed throughout 1945; radar imaging systems, which offered a day/night, all-weather capability, had been introduced[29]; and long focal length cameras, whose lenses automatically compensated for air temperature and atmospheric pressure fluctuations, had been invented.[30] Additionally, heat-sensitive infrared film, a medium with

[29]RAF Mosquitos were the first aircraft to employ radar reconnaissance systems. (see Goddard, pp.322 and 328)

[30]In earlier cameras, temperature and pressure fluctuations caused slight changes in the shape of the lenses; this effect in turn produced distortion on the photograph. Long focal length cameras (up to 240 inches) invented by Harvard astronomer Dr. James Baker, effectively surmounted the limitations of earlier systems, and therefore permitted reconnaissance pilots to collect photography at higher, safer altitudes. (see Goddard, pp.327-328)

camouflage-defeating properties, was in the advanced stages of development. (Goddard, 1969, pp. 236, 322, and 327-328)

1. The Post-war Trend Continues

> In 1945 it would have been difficult to find one Army, Navy, or Marine officer in the U.S. military establishment who would not have acknowledged the vital importance of aerial reconnaissance. It had been a long, difficult, uphill battle by the proponents of aerial reconnaissance but it appeared they were finally victorious by the end of World War II, that never again would the United States be caught without the skilled manpower and modern equipment necessary to fulfill the aerial reconnaissance mission efficiently. It appeared that way but it wasn't. The severe "economy" programs between 1945 and 1950 took their toll of the established aerial reconnaissance systems and prevented the required research and development programs necessary if aircraft, cameras, and technicians were to keep up with the fast-moving jet age. (Infield, 1970, p.134)

Once again, after conclusively proving to be a paramount prerequisite for success in combat, aerial reconnaissance was reduced to an issue of marginal significance during the post-war demobilization period. Lacking the resources for continued development, the doctrine, equipment, and personnel which constituted the aerial reconnaissance capability within the U.S. Armed Forces were left, at best, stagnant. As other tools of war, especially the airplane, enjoyed extensive improvement, the U.S. tactical photo reconnaissance capability languished and effectively eroded. Furthermore, with the advent of nuclear weapons, advances in intelligence technique and hardware development were almost exclusively dedicated to

supporting centralized strategic operations throughout the decade following World War II; by design, this research did not allocate resources to the improvement of tactical aerial reconnaissance capabilities. (Infield, 1970, p.225)

D. THE KOREAN WAR: DAWN OF THE JET AGE

> *"Fighter planes win battles, but photo reconnaissance wins wars."*
> General "Hap" Arnold, USAF
> (Benford, 1984, p.138)

On 25 June 1950, 93,000 North Korean troops invaded South Korea in an attempt to force reunification of the peninsula. Under the auspices of the United Nations (UN) Security Council, the United States moved to intervene, and by 3 July, the first American forces - aircraft from Carrier Air Group Five - were committed to the conflict. From the start, combat in Korea promised to challenge the atrophied American military forces, especially in the realm of aerial reconnaissance, where the U.S. capability proved to be inadequate once again.

> Certainly one of the greatest deficiencies was up-to-date intelligence, and the fluid battle situation made the problem more acute. In the early days of the conflict it became obvious that, in this new war, aerial reconnaissance would be of more importance than it had been in previous wars. It also focused on the tragic demobilization that occurred after World War II and the impact of the atomic bomb and jet aircraft on tactical reconnaissance. (Heiman, 1972, p.111)

"America's mood after VJ Day demanded virtually instantaneous and total demobilization." (Hallion, 1986, p.3) But, while demobilization was effective in reducing the

overall size of the armed forces, it was again ineffective in preserving the relative significance among military capabilities prescribed by recent experiences in combat. Consequently, on the eve of yet another major conflict, the U.S. Armed Forces were condemned to experience a lamentable incongruity between tactical aerial reconnaissance requirements and capabilities.

In the spring of 1949, the entire United States Air Force could claim the equivalent of only one reconnaissance group: two squadrons in the continental United States and one in the Far East Air Forces (FEAF).[31] But the availability of even such a modest stock of hardware was deceiving, for "much American reconnaissance experience had evaporated as PIs returned to civilian life and aircrews moved on to other specializations; the shortage of trained manpower was particularly noticeable at the outbreak of the Korean War." (Brookes, 1975, pp.219-220) The Air Force reconnaissance capability was austere, at best.

Not surprisingly, the United States Army was even less prepared to fulfill the reconnaissance requirements of the forthcoming conflict.

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[31]The FEAF was the U.S. Air Force component of the Far East Command; it encompassed all Air Force installations in the Far East. (see Mead, p.26 for command relationships)

> Beginning its war in Korea, Eighth Army did not possess even the shell of (an aerial reconnaissance) system. There were no interpreters, no air crews adequately trained for the mission, and no production apparatus to process work had the specialists been available. This service had (also) been one of the major casualties of the breakneck demobilization of 1945-1946. The machinery was junked or warehoused. The experts doffed their uniforms and returned to their former tasks. They could not be replaced overnight. (Marshall, 1953, p.5)

Ironically, given the state of aerial reconnaissance in the U.S. Armed Forces, it quickly became apparent that in this new limited and politically scrutinized war, photo intelligence would play a role greater than it had in World War II. Because American military operations in Korea were developed and executed in the context of prevailing diplomatic constraints, and because American forces were restrained from any intelligence collection which could appear provocative, oblique and panoramic aerial cameras offered the primary means by which enemy activity could be effectively monitored. Additionally, lacking the requisite contingency plans and topographic products to support combat operations in Korea, U.S. Forces were compelled to rely upon aerial reconnaissance to fill gaps in basic intelligence. (Infield, 1970, pp.135-136)

As a stopgap measure, on 9 July 1950 the 8th Tactical Reconnaissance Squadron (TRS)[32] was moved from Yokota Air Base (just outside Tokyo) to Itazuke Air Base (on Kyushu, the

[32]The 8th TRS was the FEAF reconnaissance squadron.

closest air base to Korea) with the mission of providing photo reconnaissance support for Eighth Army and Fifth Air Force (FAF)[33] operations in Korea. However, such expedient efforts proved unsuccessful.

> Typical of the sad disarray of reconnaissance and the necessary support, the RF-80A of the Eighth Tactical Reconnaissance Squadron flew missions over Korea and upon returning to their base at Itazuke, the negatives had to be flown to the only reconnaissance technical squadron in the Pacific, which was located at Yokota Air Base. Because of bad weather, sometimes the finished pictures were not delivered to units in Korea for a week. (Heiman, 1972, p.112)

In an attempt to improve aerial reconnaissance support for the Eighth Army and FAF, the 162nd TRS - specialists in night photography - and the 363rd Reconnaissance Technical Squadron (RTS) were dispatched to Itazuke during August and September 1950. Despite the shortages of equipment, inexperience among personnel, and general lack of efficiency which understandably characterized FAF reconnaissance operations during this initial period, a wealth of valuable intelligence was gleaned from the available aerial photographs. (Infield, 1970, pp.136-137)

Perhaps the most notable aerial reconnaissance coup of these tumultuous months, if not the entire war, was achieved in support of the landing at Inchon. Once General MacArthur, Supreme Commander of Allied Forces in Korea, selected the port

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[33]FAF, headquartered at Tokyo, was the largest subordinate command of FEAF. (see Mead, p.26 for command relationships)

city of Inchon for an amphibious invasion, the U.S. Navy was challenged with surmounting the hazards posed by the landing area's extreme tides and submerged obstacles. The 8th TRS was tasked with photographing the Inchon coast at various tidal stages in order to accurately determine the optimal time and place for the assault. Using a combination of stereo strip and panoramic cameras, and flying at low level, the 8th TRS acquired complete target coverage. After studying the film, photo interpreters[34] accurately determined the height of the seawall and underwater obstacles, and provided the vital data to concerned, yet dubious naval officers. (Infield, 1970, pp 137-138)

> All doubt was erased at 1730 hours on the evening of September 15 when twenty-three waves of LVTs (tracked landing vehicles), along with eight LSTs (tank landing ships) made the beach assault. The 15-foot seawall protecting the beach was easily surmounted by the Marines because, just as the PIs had predicted, the tide was high enough to permit scaling. Later evidence proved that (the PIs) were correct in their predictions to within a few inches. The Inchon landings were a magnificent success. The North Koreans were taken by surprise and within ten days, the North Korean People's Army, which had been near victory, was broken and beaten...In all of military history there was no more effective amphibious operation and the success of the Inchon landings hinged on the aerial photographs of the harbor obtained by the 8th Tactical Reconnaissance Squadron. (Infield, 1970, p.138)

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[34]The photo interpreters who studied the film of Inchon were Colonel Richard W. Philbrick, USAF, Mr. Donald J. Graves, and Mr. Amrom H. Katz, all deployed to Korea from Wright Patterson Air Force Base, Ohio; these gentlemen were considered to be among the most skilled photo analysts in the world at the time. (see Infield, p.138)

In response to the overwhelming demand but limited capability to produce aerial photography, the U.S. Air Force commissioned an investigation of reconnaissance requirements in Korea.[35] As a result of this study, the Air Force activated the 67th Tactical Reconnaissance Wing in February 1951. The 67th Tactical Reconnaissance Wing, the largest organization of its type during the Korean War, included the following existing and newly formed units: the 67th Reconnaissance Group, the 8th TRS, the 12th TRS, the 15th TRS, the 45th TRS, the 162nd TRS, the 543rd Tactical Support Group, and the 363rd RTS. For its part, in accordance with a reciprocal agreement[36], the U.S. Army formed the 98th Engineer Aerial Photo Reproduction Company and subordinated it to the Eighth Army in July 1952. (Infield, 1970, pp. 133-143)

While the Army and Air Force seemed to have solved the organizational impediments to effective aerial reconnaissance, a significant technical problem persisted throughout the war. The RF-80A, the workhorse of Air Force tactical reconnaissance during the Korean War, was not equipped with suitable aerial

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[35]Colonel Karl L. Polifka, USAF, a distinguished reconnaissance pilot, was tasked with this study on 24 January 1951. He was subsequently placed in command of the 67th Tactical Reconnaissance Wing in Korea. (see Infield, p.141)

[36]The Army agreed to perform photo exploitation and reproduction for ground units. Infield notes that "the Eighth Army couldn't live up to the agreement during the first two years of the conflict because they did not have the technicians available." (p.143)

cameras. The RF-80A's cameras had been designed to operate aboard conventional (propeller) aircraft, instead of faster jet aircraft. Consequently, in order to acquire usable large scale, overlapping photo coverage, the RF-80A pilot had to decrease his speed over the target. Obviously, this technique made the RF-80A an easy prey for enemy fighter aircraft and anti-aircraft artillery. (Heiman, 1972, pp.117-118 and Infield, 1970, pp.143-144)

It is significant to note that the technical limitations of the RF-80A's cameras was a direct result of the post-war neglect which plagued the development of reconnaissance capabilities following both World Wars. Aerial reconnaissance systems "would have been debugged by the time the Korean War began, except for problems of getting the necessary money from greatly reduced defense budgets." (Heiman, 1972, p.118)

The same austere fiscal climate that remarkably funded development of the costly jet aircraft engine failed to place proportionate emphasis on the relatively inexpensive development of aerial cameras. Given the well-defined trend which, by then, governed the development of such systems, it is not surprising that "the new war and...events on the battlefield changed priorities overnight." (Heiman,1972, p.119)

The failure to concomitantly improve reconnaissance system and aircraft performance capabilities again forced the

American military establishment to reactively search for suitable equipment to support forces in Korea. In the Air Force, this shift in priority was woefully late, for the RF-80A problem was never fully resolved.[37] (Heiman, 1972, p.118 and Infield, 1970, p.144)

Yet, notwithstanding initial organizational problems and persistent technical limitations, U.S. Air Force photo reconnaissance support was in overwhelming demand. Statistics regarding the performance and output of comparable reconnaissance units in the Second World War and the Korean War reflect the progressively increasing significance which military commanders placed on the capability (see Table 2).

The U.S. Navy experienced major difficulties in providing aerial reconnaissance support to the fleet with its own assets. Carrier-based detachments from Composite Squadron 61 (VC-61) were primarily employed to conduct bomb damage assessment (BDA) photography. However, VC-61's F9F-2P Panthers could not operate effectively at high altitude, where photo coverage and aircraft survivability were maximized. Furthermore, the limited shipboard photo processing, reproduction, and exploitation facilities were quickly swamped

[37]The Air Force eventually modified the RF-86 Sabre with newer cameras, but the aircraft could still not operate at high speeds without collecting blurred photography.

by even moderate volumes of photography. Navy procurement of the F2H-2P Banshee, a more capable aircraft, surmounted the altitude limitations of the Panther, but exacerbated the

TABLE 2
COMPARISON OF PERFORMANCE AND OUTPUT
FOR EQUIVALENT AERIAL RECONNAISSANCE UNITS
IN WORLD WAR II AND THE KOREAN WAR*

	WORLD WAR II	KOREAN WAR
MAXIMUM MISSIONS PER MONTH	1,300 (April 1945)	2,400 (May 52)
AVERAGE MONTHLY SORTIE RATE	604 (1944-1945)	1,792 (52-53)
MAXIMUM PHOTO NEGATIVE PRODUCTION PER YEAR	243,175 (9X9)	736,684 (9X18)

* World War II statistics are the highest figures for any single reconnaissance group; Korean War statistics are for the 67th Tactical Reconnaissance Wing. Unit sizes are comparable. note difference in photo negative size.

(Source: Infield, 1970, pp.153-154)

problem of adequate facilities. (Hallion, 1986, pp.200-201)

To supplement its marginal capability, the Navy relied heavily upon the 67th Tactical Reconnaissance Wing as well as

Marine Photographic Squadron 1 (VMJ-1) to satisfy outstanding reconnaissance requirements. (Infield, 1970, pp.154-155)

VMJ-1, formed in February 1952, was based at K-3 Airfield in Pohang, Korea.

> Under FAF control until late in the war, the squadron's 550 mph F2H-2P twin-jet Banshees flew unarmed deep into enemy country - even as far as the MiG-guarded Yalu - photographing positions, airfields, power plants, and other targets. An escort plane flew cover while the photo ship took pictures. (Mead, 1972, p.491)

VMJ-1's Banshee, considered to be superior to the Air Force reconnaissance aircraft, was credited with dramatically improving the quality of aerial photography in the combat theater.

During operations in Korea, VMJ-1 achieved phenomenal output levels. For Marine requirements alone, peak daily output reached 5,000 prints; average monthly output was steady at 100,000 prints. VMJ-1's gross wartime output was 793,012 feet of processed aerial photos; in terms of ground coverage, this figure was "equal to a continuous photographic strip six and half times around the Earth at the equator." (Mead, 1972, p.491) Overall, the Marine squadron accounted for 33% of the entire UN photo reconnaissance effort and at least 40% of all FAF intelligence collection missions.[38] (Mead, 1972, pp.238, 348, and 491)

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[38]VMJ-1 was under the operational control of FAF from February 1952 until 1 July 1953, when it reverted to 1st Marine Air Wing control.

Throughout the Korean War, aerial reconnaissance proved to be of greater importance and in higher demand than in any previous conflict. "According to a survey made shortly after the truce, air reconnaissance accounted for about 44 percent of all intelligence used by ground units; in some cases, the percentage was as high as 95." (Infield, 1970, p.153)

These figures, as well as those in Table 2 suggest that most aerial reconnaissance requirements were met during the Korean War. But in reality, while the statistics reflect a dramatically increased dependency on aerial reconnaissance, the wartime demand for aerial photography far exceeded the aggregate capabilities of all the U.S. Armed Forces.

The Korean reconnaissance experience forced the U.S. Navy to reexamine its carrier-based aerial reconnaissance capability. The Navy's Third Korean Evaluation Report stated: "The prospects of similar requirements in operations of this nature in the future should be recognized and increased facilities provided; the ever-growing importance of aerial photography to the carriers for intelligence must be considered for future operations in other theaters." (Hallion, 1986, p.201)

Near the end of the conflict, the U.S. Eighth Army revealed that no more than seventy-five per cent of its wartime aerial reconnaissance requirements were fulfilled, and warned that a

similar unit would require *five thousand negatives per day* to sustain operations in subsequent conflicts. (Infield, 1970, p.14)

1. Crisis Follows Demobilization

"Once the battles came to an end in Korea, however, Eighth Army's warning was promptly forgotten and aerial reconnaissance was (again) neglected in the military budget and on planning boards." (Infield, 1970, p.15) With the Cold War in full swing, the U.S. military infrastructure focused its fiscal resources on the almost exclusive development of strategic capabilities, particularly on those assets and techniques which would deter or prevail in the much anticipated, cataclysmic confrontation between the United States and the Soviet Union. As a result, "tactical reconnaissance was allowed to decline to a point where the lack of assets to provide low-altitude confirmation of the presence of missile sites in Cuba became an embarrassment." (Allen, 1990, p.256)

During the Cuban Missile Crisis (October 1962), the United States initially relied upon the U-2, a high-altitude strategic reconnaissance aircraft, for aerial photography of suspected Soviet missile sites. However, as the U-2 became

increasingly more threatened by surface-to-air missiles,[39] and as the requirement for detailed, large scale photography grew, it became apparent that a complementary tactical reconnaissance system was needed to effectively monitor developments in Cuba. The President of the United States turned to the Air Force and the Navy for a solution. (Heiman, 1972, pp.134-143)

The Tactical Air Command (TAC) of the U.S. Air Force immediately deployed its twin-jet McDonnell RF-101 Voodoo, the first supersonic photo reconnaissance aircraft, to conduct low-level reconnaissance missions over Cuba in support of the National Command Authority. The RF-101 proved to be ideal for the task; flying at 300 feet AGL and at supersonic speeds, the Voodoo could not only defeat the Cuban air defense systems, but could also collect the necessary target coverage. But, although the Voodoo clearly offered a vital capability during the Cuban Missile Crisis, unfortunately only a small number of the RF-101 aircraft had been procured by TAC.

For once, the United States had a reconnaissance aircraft technologically capable of fully satisfying the requirements of a national crisis, but shamefully few of these assets were available. TAC had been a casualty of both the demobilization

[39]The Soviet SA-2 posed the greatest threat to the U-2 in Cuba. The SA-2 was specifically designed to intercept aircraft at high altitude. The system's effectiveness was greatly reduced at low altitudes.

which followed the war in Korea and the strategic emphasis which, by then, governed the allocation of fiscal resources. Most of the money which had been allotted to the development and procurement of tactical airpower during the war had subsequently been spent on the strategic missile program. (Heiman, 1972, pp.141-142)

Shortly after the Cuban Missile Crisis highlighted the lamentable degree to which the American tactical aerial reconnaissance capability had eroded, the U.S. military community began to turn its attention toward another volatile region: Southeast Asia. Together, the Missile Crisis experience and the prospect of intervention in Vietnam provided the impetus for redevelopment of a viable tactical aerial reconnaissance capability among the military services (Allen, 1990, p.256).[40] Once again, U.S. aerial reconnaissance was subjected the familiar crash development program on the eve of war, instead of a progressive program of improvement based upon proven and consistent requirements.

In response, the Air Force established the Tactical Aerial Reconnaissance Center (TARC) at Shaw Air Force Base, South

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[40]This process commenced with President Kennedy's adoption of "flexible response," a new national military strategy which emphasized the concomitant development of nuclear and conventional forces. Heiman notes that under the President's new strategy "TAC began receiving...reconnaissance aircraft to augment its relatively few RF-101s. It was well that this happened because a small war in Southeast Asia was fanning hotter." (Heiman, p.142)

Carolina on 8 February, 1963 with the mission of keeping aerial reconnaissance forces fully updated and prepared to fulfill the requirements of the U.S. Armed Forces. The TARC was tasked with conducting the test and evaluation of tactical aerial reconnaissance systems; it was also responsible for developing new doctrine, organizations, tactics, and techniques. However, despite the seemingly long-range focus of the TARC, the majority of the center's projects were necessarily focused upon meeting the immediate needs of the forthcoming conflict in Vietnam. (Infield, 1970, p.15) In this respect, the TARC was not the manifestation of a proactive approach to aerial reconnaissance, but instead was a central coordination facility for the pre-war crash development program.

E. THE VIETNAM WAR: THE ADVENT OF MULTISENSOR RECONNAISSANCE

In the early 1960's, aerial reconnaissance provided a reliable means of monitoring activity in Vietnam[41] without arousing serious political objections from other major powers. However, as the United States contemplated direct intervention in Vietnam, it became increasingly more apparent that the available capability was less than optimal.

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[41]The first U.S. military aircraft used in Vietnam were RF-8A reconnaissance aircraft launched from the deck of the USS Midway. (see Mersky & Polmar, p.10)

> As in previous wars, aerial reconnaissance immediately became much in demand by the commanders of troops on the ground. For several years prior to the entry of U.S. forces into the fighting, concentrated development programs had been underway to prepare the U.S. Armed Forces with special capabilities for counterinsurgency warfare. At the start of the United States' involvement, the (American military services) were not unprepared, but they had not yet solved the big problem of the peculiar type of reconnaissance then in demand...The foe used the protection of the jungle canopy whenever possible. Thus, the reconnaissance requirement was vastly different from what had been experienced before. In addition, the enemy placed heavy reliance on nighttime operations. (Heiman, 1972, 142-143)

Consequently, an incredible research and development effort was reactively focused on using technologies such as lasers, infrared sensors, and side-looking airborne radar (SLAR) to solve the problems of aerial reconnaissance in Vietnam. It is significant to note that while such sophisticated sensing techniques had been developed, they had not been fully adapted for military use, due to the previous lack of emphasis and paucity of funding for such endeavors.

It is reasonable to conclude that, had aerial reconnaissance been assigned a peacetime priority commensurate with its wartime impact, advanced reconnaissance sensors would have been fully integrated into the U.S. military capability well before the deployment of American naval forces to

Vietnamese waters in 1961. Instead, "multisensor imagery reconnaissance"[42] was placed in accelerated development.

"For the next ten years, all the services increased and modernized their tactical reconnaissance capabilities." (Allen, 1990, p.256) The U.S. Navy conceived the Integrated Operational Intelligence System, a program which involved the development of a multisensor reconnaissance aircraft in conjunction with an associated carrier-based intelligence processing capability. The Navy ultimately developed the RA-5C Vigilante, an A-5A heavy bomber modified to carry optical, infrared, and SLAR sensors, as well as an increased fuel load.[43]The RA-5C was specifically designed to work with the Integrated Operational Intelligence Center (IOIC), which was installed aboard larger (i.e. Forrestal-class) carriers. The IOIC was equipped with state-of-the-art imagery processing and exploitation equipment, and was capable of producing finished prints within ten minutes of the reconnaissance aircraft's

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[42]"Multisensor imagery reconnaissance" refers to an aerial reconnaissance capability which includes electronic sensors (i.e. infrared, SLAR) in addition to optical sensors (cameras). Beginning with the advent of multisensor systems, the all-inclusive term "imagery" was applied to the products of aerial reconnaissance; from then on, "aerial photography" was correctly used to describe only the products of optical sensors.

[43]The first operational detachment of RA-5Cs was a 6-aircraft detachment of Reconnaissance/Attack Squadron 5, which deployed aboard the USS Ranger in July 1964.

return to the carrier.[44] At the peak of the war in Vietnam, the U.S. Navy operated ten RA-5C squadrons. (Heiman, 1972, p.226 and Mersky & Polmar, 1981, pp.153-154)

However, the RA-5C was not without problems. The aircraft's highly sophisticated electronic equipment demanded intensive maintenance support, while its reconnaissance systems required special pre-flight preparation; together, these constraints often limited the immediacy with which the Vigilante could respond to support requests in a dynamic environment. These limitations can be directly attributed to the "crash" development program which yielded the Vigilante. (Mersky & Polmar, 1981, pp.153-156)

The Navy also funded production of the RF-8G, a variant of the RF-8A Crusader. Delivered in 1965, the RF-8G had enhanced aircraft performance and reconnaissance system capabilities, but the modified Crusader still lacked several significant characteristics which had become crucial to the viability of reconnaissance aircraft: low-level speed, all-weather sensors, and a navigator[45].

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[44]Note that the IOIC's capability to deliver prints within ten minutes, although impressive for its era, is somewhat misleading. The ten minute figure accounted only for imagery processing and printing time, and assumed a single target mission; it did not account for exploitation, reporting, and annotation, nor did it apply to multi-target missions.

[45]In reconnaissance aircraft, the navigator assumes responsibility for operation of the reconnaissance systems, as well as for navigation of the mission; the pilot retains

The U.S. Marine Corps, in response to the new aerial reconnaissance requirements created by the war in Vietnam, procured the RF-4B in 1965.[46] The RF-4B was a multisensor reconnaissance variant of the highly successful F-4B Phantom II; it was specifically developed for the Marine Corps, and it provided remarkable service in Vietnam. (Boyne, 1985, p.87)

> The big RF-4B provided greater power, twin-engine safety, two crewmen, and a variety of imagery sensors never before available to the Marines. Additionally, the reconnaissance Phantom was capable of acquiring imagery at night, an improvement over the RF-8, whose after-dark capabilities were severely limited and seldom used. (Mersky, 1983, p.222)

(The capabilities of the RF-4B are discussed in detail later.)

The U.S. Air Force also acquired a Phantom II variant, the RF-4C, in significant quantities to replace its meager and aging reconnaissance aircraft inventory. The capabilities of the RF-4C were virtually identical to those of the RF-4B.

In Vietnam, Aerial reconnaissance proved to be more vital to the intelligence effort than ever before.[47] It often provided the only means of monitoring the status of enemy

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responsibility for flying and maneuvering the aircraft. This division of labor yields enhanced aircraft survivability and optimal mission results. (see Infield, p.228 for discussion of the significance of the RA-5C navigator)

[46]The RF-4B first flew on 12 March 1965; the first aircraft was delivered to the Marine Corps in May 1965. (see Boyne, 1985, p.160)

[47]Mersky & Polmar note that "the importance of aerial reconnaissance in Vietnam cannot be overstressed." (p.150)

forces and supply routes. The need for aerial reconnaissance was perhaps most strongly demonstrated during the Christmas truce periods, especially prior to the Tet Offensive and after the 1 November 1968 bombing halt; while most of the American forces enjoyed a holiday standdown during these periods, the aerial reconnaissance assets were operating at a high tempo. "While fighter and attack aircraft's exploits took most of the headlines, on a day-to-day basis,...the reconnaissance planes carried a large burden of the war effort." (Mersky & Polmar, 1981, pp.150 and 157)

A sampling of operational statistics reveals the magnitude of the demand for aerial reconnaissance in Vietnam: the U.S. Air Force's 460th Tactical Reconnaissance Wing recorded a record monthly output of 4,650,000 feet of imagery for one of its squadrons, while VMCJ-1 completed 4,500 combat reconnaissance sorties between 1965 and 1970. (Infield, 1970, p.249 and Mersky, 1983, p.244)

"Overall, the first real improvements in the capability of tactical reconnaissance since World War II occurred during the Vietnam War." (Fulbright, 1987, p.9) Advanced systems such as infrared and SLAR sensors greatly expanded imagery collection options by eliminating the sanctuary which darkness and foul weather normally provided the enemy.

Still, the Southeast Asia experience highlighted serious deficiencies in the U.S. aerial reconnaissance capability. The

war in Vietnam was characterized by poorly defined fronts and an elusive enemy; this environment made the timely dissemination of intelligence derived from aerial reconnaissance a paramount requirement. In the later stages of the war, computerized and standardized exploitation reports were introduced, and these structured reporting procedures ultimately enhanced the speed with which information was disseminated.[48] (Fulbright, 1987, pp.9-12)

However, it is significant to note that operational commanders increasingly sought (and continue to seek) imagery products; aerial reconnaissance reporting alone failed to meet the commanders' expectations of adequate support. In Vietnam, imagery products - prints - were rarely delivered to ground commanders in time to be of significance to the battle. Thus, although tremendous improvements in sensor capabilities emerged during the Vietnam War, the U.S. aerial reconnaissance was clearly plagued by an inefficient and unresponsive product dissemination system. (Fulbright, 1987, pp.9-12)

Furthermore, the proliferation of highly sophisticated air defense systems, such as mobile surface-to-air missiles and radar-controlled anti-aircraft guns fueled concerns about the

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[48]Fulbright notes that this development was a "mixed blessing" because it also established direct computer links with Pacific Command and Washington D.C. intelligence agencies, thereby providing a conduit for direct tasking from such agencies. (p.10)

survivability of traditionally unarmed reconnaissance aircraft. By the end of the war in Vietnam, American operational commanders had begun to openly question the tactical reconnaissance force's ability to provide timely intelligence support and to survive in emerging high threat environments. (Montgomery, 1981, p.9)

1. The Final Drawdown

The fresh concerns which arose during the war were exacerbated by the resurgence of some familiar issues following the conflict. Despite the operational impact of aerial reconnaissance in combat, a career as a reconnaissance pilot offered slim hope for advancement. In the Navy,

> ...no RF-8 pilot who stayed within the light photo reconnaissance community was given command of an air group, *and only a select few* of the RA-5C flight crews reached that position. VFP detachments aboard carriers were normally commanded by no higher rank than a lieutenant commander, while the larger fighter and attack squadrons were led by full commanders; the air wings counted senior commanders and junior captains at their head. Even though he had charge of what amounted to a small squadron, with its accompanying responsibilities, the officer-in-charge of a photo detachment was still a junior officer in charge of a support group and was not in the right pipeline for command. (Mersky & Polmar, 1981, p.159)

Similar attitudes prevailed in both the Air Force and Marine Corps, and had the net effect of eroding the corporate knowledge and experience which had accumulated in the tactical reconnaissance communities during the war. Pilots and specialists alike intentionally departed the reconnaissance

vocation for more promising career paths in a manner remarkably reminiscent of the post-World War II exodus.

The typical organizational changes were also forced upon the reconnaissance force following the Vietnam War. A significant amount of the by then formidable Air Force reconnaissance capability was gradually shifted to the reserves and Air National Guard. The Navy's dedicated reconnaissance squadrons were disbanded, and the multi-mission F-14 Tactical Airborne Reconnaissance Pod System (TARPS) squadrons were introduced as an "interim" capability.[49] (Allen, 1990, p.256) And, finally, the Marine Corps reduced its capability from three composite reconnaissance squadrons to one consolidated imagery reconnaissance squadron.

The Marine Corps' post-Vietnam aerial reconnaissance organization was quantitatively inferior to the wartime capability; nevertheless, the singular imagery reconnaissance

[49]The stated objective of the TARPS program was to provide an interim aerial reconnaissance capability to the fleet after the retirement of the aging RA-5C and until the introduction of a "follow-on" dedicated reconnaissance aircraft. The multi-mission nature of the TARPS squadrons ultimately resulted in a degradation of the Navy's reconnaissance capability, because aircrew could no longer focus on reconnaissance alone (this phenomenon will be further discussed later). The Navy's continued reliance on TARPS, an interim solution, reflects the tacit priority ascribed to the development and deployment of the "follow-on" capability. It is unlikely that TARPS will be replaced prior to 1995, the currently projected year for initial operational capability (IOC) of the Advanced Tactical Air Reconnaissance System (ATARS).

squadron provided the foundation for the Marine Corps Imagery Intelligence Architecture for fifteen years.

III. THE MARINE CORPS IMAGERY INTELLIGENCE ARCHITECTURE

> *"In peacetime, no one cares about the capability, but as soon as the bullets start to fly, what do they need?...they need 'tac recce'."*
> Lieutenant General Charles Pittman, USMC
> (Pittman, 1992)

Successful imagery intelligence operations are based upon a continuous cycle of collection, processing/production, exploitation, and dissemination. Following the war in Vietnam, the Marine Corps organized two interdependent units - Marine Tactical Reconnaissance Squadron Three and the Force Imagery Interpretation Unit - to provide the requisite capabilities for a viable Marine imagery intelligence architecture.

A. "THE EYES OF THE CORPS"

Marine Tactical Reconnaissance Squadron Three (VMFP-3) was commissioned on 1 July 1975 as a component of the Third Marine Aircraft Wing (3rd MAW) at Marine Corps Air Station (MCAS) El Toro, California. VMFP-3's assigned mission was to "conduct aerial multisensor imagery reconnaissance, to include aerial photographic, infrared, and side-looking airborne radar reconnaissance in support of Fleet Marine Force (FMF) operations." The organization quickly became known as "The

Eyes Of The Corps." (Fagan, 1992, p.1)[50] In amplification of its stated mission, the squadron was specifically tasked with the following responsibilities:

> 1. Conduct day and night multisensor imagery reconnaissance.
> 2. Conduct aerial prestrike and poststrike multisensor imagery reconnaissance for targeting and damage assessment.
> 3. Maintain the capability of operating from aircraft carriers, advanced bases, and expeditionary airfields within the capability of assigned aircraft.
> 4. Maintain the capability of operating during darkness and under instrument flight conditions.
> 5. Provide for the production and reproduction of aerial multisensor imagery obtained by organic aircraft, within the capability of assigned laboratory equipment.
> 6. Maintain the capability of deployment or extended operations involving aerial refueling.
> 7. Deploy detachments aboard aircraft carriers, to advanced bases, or to expeditionary airfields as directed.
> 8. Process and provide aerial imagery to wing and/or Commander Landing Force.
> 9. Provide liaison personnel to wing and landing force staffs for assistance in VMFP-3 employment planning.
> 10. Perform organizational maintenance on assigned aircraft. (Fagan, 1992, p.1)

Although initial training for Marine reconnaissance aircrews was frequently provided by U.S. Air Force reconnaissance squadrons, VMFP-3 acted as its own training squadron to fulfill the unique training syllabus required to ensure the provision of effective support for amphibious forces. Accordingly, the squadron exclusively represented the Marine Corps' corporate knowledge and operational experience in aerial reconnaissance. (Fagan, 1992, p.2)

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[50]Lieutenant Colonel Fagan was VMFP-3's final Commanding Officer.

VMFP-3 regularly deployed detachments in response to a variety of support requirements, including national, fleet, and exercise taskings[51] (Table 3 lists VMFP-3 detachment deployments for the four year period from 1984 through 1987). Thus, it was not uncommon for VMFP-3 to have three detachments deployed while simultaneously conducting basic aircrew training. Finally, in addition to training and operational commitments, the squadron was tasked with conducting test and evaluation of reconnaissance systems for the Marine Corps.

On an organizational level, VMFP-3 clearly played a vital role in the development and maintenance of an aerial reconnaissance capability within the Corps; on a tactical level, the squadron contributed the imagery collection and production elements - the RF-4B Phantom II reconnaissance aircraft and the ES-40A Mobile Photographic Processing Facility, respectively - which were crucial to the Marine Imagery Intelligence Architecture in the post-Vietnam years.

[51]VMFP-3 also participated in the peace-time aerial reconnaissance program (PARPRO), a national-level collection program; the squadron also permanently deployed a detachment aboard the USS Midway until 1984.

TABLE 3
VMFP-3 DEPLOYMENTS FROM 1984 THROUGH 1987

1984

Combined Arms Exercise (CAX) 7-84
Kernel Usher 84
Ocean Wave 84
PARPRO 84
Quick Strike 1-84
Red Flag 5-84
Top Gun 84
Weapons and Tactics Instructor (WTI) Exercise 1-84, 2-84

1985

Bushwacker 1-85
CAX 1-85, 3-85, 4-85, 5-85
Kernel Usher 4-85
PARPRO 85
Team Spirit 85
WTI 1-85, 2-85

1986

Bushwacker 1-86
CAX 1-86, 5-86, 10-86
Constant Peg 86
Cope Strike 86-12, 86-13
Kernel Blitz 86-2
PARPRO 86
WTI 2-86

1987

CAX 1-87, 2-87, 3-87, 6-87
Kernel Blitz 1-87, 2-87
PARPRO 87
Solid Shield 87
Team Spirit 87
WTI 1-87, 2-87

(Source: VMFP-3 Command Chronology)

1. The RF-4B Phantom II

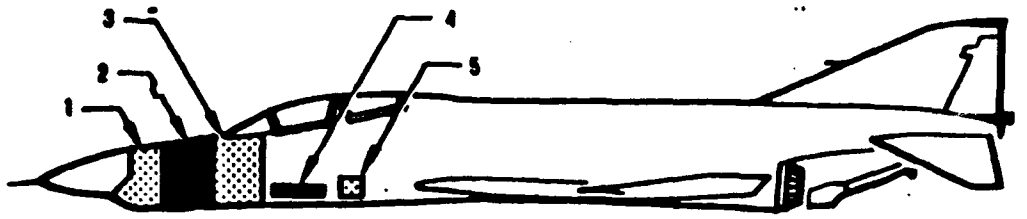
The twin-seat RF-4B was powered by two General Electric J79-GE-8 turbojet engines, which yielded 16,500 pounds of thrust each (in afterburner) and produced a maximum level speed in excess of Mach 2, with external aircraft stores. In the ground attack mode,[52] the RF-4B had a combat radius of over 1,600 kilometers. (Taylor & Munson, 1978, p.373 and Taylor, 1969, p.376)

The reconnaissance version of the Phantom II, like its fighter counterpart, carried a pilot and a navigator in tandem. However, the RF-4B was not equipped with dual controls, nor was it configured to accept armament. Therefore, the RF-4B navigator was designated a "Reconnaissance Systems Officer" (RSO), and was given responsibility for the operation of on-board reconnaissance sensors.

The RF-4B's imagery systems were installed in five internal sensor stations located below and forward of the cockpit. All aircraft were capable of carrying a variety of optical and electronic imagery sensors (see Figure 1). The Phantom's reconnaissance systems provided the Marine Corps with the

[52]A ground attack profile is appropriate for assessing the combat radius for reconnaissance missions.

Reference: NAVAIR-01-245FDC-1



Station	Camera	Focal Length (inches)	Depression Angle (degrees)	Camera Position	Camera Type
1	KS-87 ①	3.6	23.5 ② or 90	Oblique (Forward) or Vertical In-Flight Rotatable	Frame
2	KA-56	3	90	Vertical	Panoramic
	(2) KS-87	3	30	Oblique (L&R)	Frame
	(2) KS-87	6	37.5	Oblique (L&R)	Frame
	KS-87	3.6	90	Vertical	Frame
	KS-87	12,18	5,15,30	Oblique (L or R)	Frame
	KS-87	18	5,15,30 and 90	Oblique (L or R), Vertical, In-Flight Rotatable	Frame
3	KS-87	6,12,18	90	Vertical	Frame
	(2) KS-87	6	71.6,	Split Vertical	Frame
	(2) KS-87	12	80.5,	Split Vertical	Frame
	(2) KS-87	18	83.7	Split Vertical	Frame
	KS-116	12	90	Vertical	Panoramic
4	AN/APD-10 Radar Mapping Set ③				
5	AN/AAD-5 Infrared Reconnaissance Set				

① In all installations the KS-87 and KS-72 cameras are equivalent and can be interchanged.
② In A/C 15-7349 through 15-7351, fixed camera mount installed. Depression angle 23.5°, 43.5° or 90°.
③ The AN/APD-10 recorder is installed in station 2 or 3. Cameras cannot be installed with the recorder.
④ See reference for full variety for sensor combinations that may be installed.

Figure 1: RF-4B Reconnaissance Systems

(Source: McDonnel-Douglas, 1983, p.4)

flexibility to support a broad spectrum of missions, including all altitude, stand-off, wide area, day/night, and all weather reconnaissance.

The RF-4B's optical sensors were capable of employing black and white (panchromatic), color, panchromatic infrared, and camouflage detection infrared (CDIR) films.[53] The cameras were designed to collect imagery in stereo at high speeds and during defensive maneuvers, if required. One camera was able to process panchromatic film while airborne, and subsequently eject a film canister to ground forces. Later developments yielded a tri-lens camera and a 60-inch focal length long range optical (LOROP) system for the RF-4B.[54]

The aircraft's electronic sensors were capable of penetrating the shroud of night or weather to detect enemy activity. The thermal infrared line scanner (IRLS) and SLAR systems effectively expanded the Marine commander's scope of vision beyond the visible spectrum and facilitated 24-hour imagery collection operations. The SLAR system had a "moving target indicator" (MTI) feature which automatically

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[53]Each film type had specific applications. Panchromatic was best suited for high resolution and mensuration requirements (it was the most widely used film); color was used for terrain analysis requirements; panchromatic infrared was employed to detect thermal emitters; and CDIR was utilized to locate camouflaged positions and/or equipment.

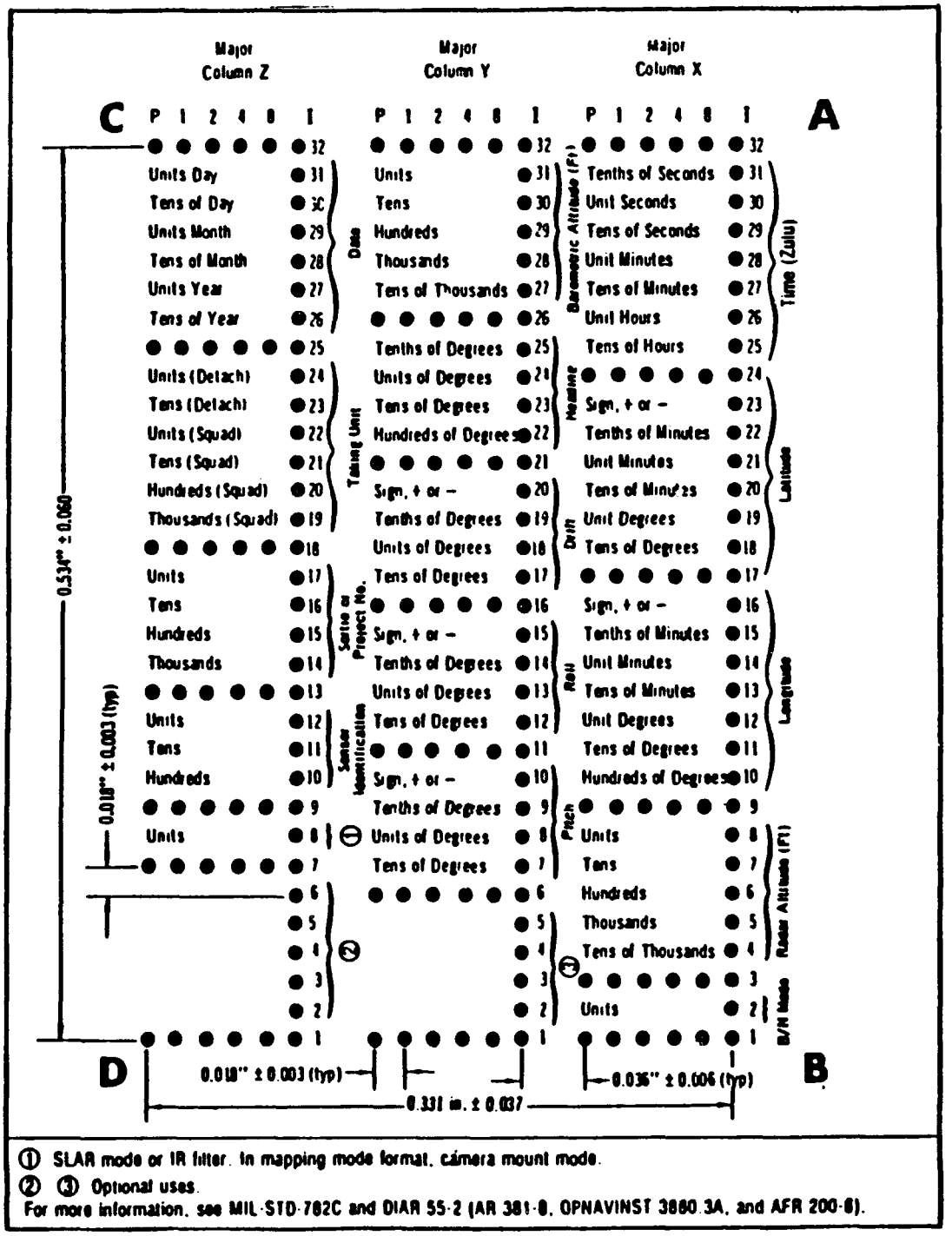
[54]The KS-153 tri-lens camera facilitated wide area coverage, while the KS-127 LOROP system permitted stand-off (up to 30 nautical miles) oblique coverage.

highlighted moving vehicles in the target area. A later modification to the RF-4B SLAR enabled the system to down-link radar imagery in near-real-time to a ground station over 150 miles away. "Hiding anything from this aircraft, when all systems were deployed, was virtually impossible." (Fagan, 1992, p.2)

The RF-4B's reconnaissance sensors were supplemented by the Airborne Data Annotation System (ADAS), a device which superimposed vital reference data on each frame of exposed imagery. The ADAS annotated the RF-4B imagery with a "code matrix block"[55] in the upper left corner of each frame. The small (1" X.5") code matrix block consisted of three major columns of dots which represented the reconnaissance mission data. (The code matrix block is illustrated in Figure 2). The date, taking unit, sortie/project number, and sensor identification were pre-set by the RF-4B ground crew, while the remaining information (altitude, heading, drift, roll, pitch, time, latitude, and longitude) was provided and updated in-flight by the aircraft's inertial navigation system (INS).

The code matrix block was instrumental to the provision of timely imagery intelligence support; its machine-readable format facilitated automatic target location and mission

[55]This feature was also known as the "ADAS block."



① SLAR mode or IR filter. In mapping mode format, camera mount mode.
② ③ Optional uses.
For more information, see MIL-STD-782C and DIAR 55-2 (AR 381-8, OPNAVINST 3880.3A, and AFR 200-8).

Figure 2: RF-4B ADAS Code Matrix Block

(Source: McDonnel-Douglas, 1983, p.135)

plotting by advanced imagery exploitation systems (see discussion of the AN/TYQ-12 Imagery Interpretation Facility below).

All imagery acquired by the RF-4B, regardless of the imaging sensor, was recorded on film and had to be processed prior to exploitation. For finished imagery products, the processed film had to be enlarged and printed.[56]

2. The ES-40A Mobile Photographic Processing Facility

The ES-40A Mobile Photographic Processing Facility - a deployable, precision aerial photographic laboratory - provided VMFP-3's imagery processing and production capability. The ES-40A consisted of four 10 X 10 X 20 foot shelters: two processing shelters, one administration shelter, and one refrigeration shelter. The processing shelters, which comprised the heart of the ES-40A, contained the wet-film processing, printing, and production equipment[57] required to transform the RF-4B's raw imagery into products suitable for imagery analysis. The administration shelter provided the ES-40A with office space, while the refrigeration shelter

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[56]Note that the production of a contact print, that is a roll of imagery printed directly from the roll of film, did not require enlargement. Contact prints were used to construct imagery mosaics of large area targets.

[57]The ES-40A processing shelters included two Versamat Continuous Roll Processers, an EN-52C Projection Enlarger, a Kokomo Contact Printer, and a print dryer.

provided storage for the facility's consumable stock (i.e. duplication film, photographic paper, and processing chemicals). For SLAR operations, the ES-40A was augmented by an additional facility which reconstructed the radar data into imagery.[58]

The ES-40A required specific logistical support for operation, including a fresh water supply (approximately 1 gallon per minute at 40 pounds per square inch), a frequent resupply of chemicals (120 gallons of fixer and developer per day), and a constant electrical power source (usually a MEP-9 generator).

The ES-40A was staffed by trained photographic technicians, as well as equipment maintenance personnel. Together, VMFP-3's photographic processing equipment and personnel comprised a section known as "photo line." Every squadron detachment was accompanied by an appropriately-sized complement of photo line assets.

After having been collected and processed by the RF-4B and ES-40A, VMFP-3's imagery was delivered to the Marine imagery exploitation organization - the Force Imagery Interpretation Unit (FIIU) - for completion of the imagery intelligence cycle.

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[58]This facility, also housed in a 10 X 10 X 20 foot shelter, was known as the "SLAR correlator."

B. THE FORCE IMAGERY INTERPRETATION UNIT

The FIIU was formed in September 1983, in an effort to consolidate the imagery exploitation expertise which had previously been resident in the Marine divisions and air wings.[59] Three FIIUs were organized to provide each Marine Expeditionary Force (MEF) with multisensor imagery interpretation support; a fourth FIIU was established in the U.S. Marine Corps Reserve (USMCR).[60]

The FIIU was equipped with the AN/TYQ-12 Imagery Interpretation Facility (IIF), an imagery exploitation system which had been specifically designed to work with imagery obtained from the RF-4B's reconnaissance sensors. The IIF was a mobile, rugged facility capable of deploying to the field by air, land, or sea; the system was sized to support the imagery intelligence requirements of a Marine Expeditionary Brigade (MEB).[61]

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[59]The Marine divisions and air wings maintained organic imagery exploitation expertise in the Photographic Imagery Interpretation Units and the Photographic Imagery Interpretation Branches, respectively.

[60]1st FIIU (III MEF) is located at Marine Corps Base Camp Butler, Okinawa; 2nd FIIU (II MEF) is located at MCAS Cherry Point, North Carolina; 3rd FIIU (I MEF) is located at MCAS El Toro, California; and 4th FIIU (USMCR) is located at Buckley Air National Guard Base, Denver, Colorado. Note that the MEF was designated the Marine Amphibious Force (MAF) until 1987.

[61]The MEB was known as the Marine Amphibious Brigade (MAB) until 1987.

The IIF was housed in one 10 X 10 X 20 foot steel shelter; the system included two automated imagery workstations for exploitation operations, two microcomputers for report drafting, a line plotter for overlay preparation, a minicomputer for database storage, and an encrypted communications interface for report dissemination.

The automated imagery workstations comprised the core of the IIF. Each workstation consisted of a light table[62] with magnification optics, a map board with cross-wires, and a code matrix block reader. When used in conjunction with properly annotated film, the workstation allowed the analyst to quickly and accurately determine the location of a desired target on both the film and reference map.[63]

The FIIU maintained a variety of other exploitation equipment, including standard light tables to support fixed site operations and man-portable light tables for

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[62]A light table is the equipment with which an imagery analyst views transparent imagery. A simple light table consists of a translucent sheet of glass or plastic atop a diffused light source and an optical, usually binocular, magnification system.

[63]Note that target location, not exploitation, is generally the most consuming task inherent to imagery analysis. The IIF workstation concept facilitated more timely imagery intelligence support by drastically reducing the time required for target location. By reading the code matrix block data, the system automatically advanced the film roll (which could be 1000. feet long) to the appropriate frame and simultaneously moved the reference map cross-wires to the accurate map location.

expeditionary operations. It is significant to note that the FIIU had no organic capability to effect timely dissemination of imagery reports and products. Despite repeated attempts to acquire appropriate equipment, the exploitation organization had neither communications gear to facilitate report transmission, nor vehicles to deliver imagery products. Consequently, the FIIU was *entirely* dependent upon external support for dissemination.

In addition to its primary mission of supporting FMF operations, the FIIU was responsible for conducting continuous imagery exploitation training, maintaining the MEF imagery archive, and conducting test and evaluation of prototypical imagery exploitation and dissemination systems.

The FIIU commander was a Marine captain who had been trained as an imagery analyst. Imagery analysts comprised the bulk (80%) of the FIIU staff. All PIs received a minimum of six months of a basic imagery exploitation training syllabus; most completed ten months of formal training.[64] Equipment technicians and administrative clerks comprised the remainder of the FIIU staff.

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[64]Marine imagery analysts are trained by the U.S. Air Force Air Training Command at Goodfellow AFB, Texas, where the six-month Basic Imagery Analyst Course and the four-month Defense Sensor Interpretation Application Training Program are offered.

Third FIIU at MCAS El Toro, California, was unique among the other exploitation units. As a result of its proximity to VMFP-3, 3rd FIIU developed an especially close working relationship with the reconnaissance squadron's aircrew and photo technicians. And since it was subordinate to I MEF, 3rd FIIU had the distinctive responsibility of providing simultaneous planning and operational support to two geographically separated MEBs.[65]

Thus, 3rd FIIU worked directly with VMFP-3 on a regular basis, while the other FIIUs did so only during periodic deployments; and 3rd FIIU maintained two AN/TYQ-12 IIFs, while the others each had only one.[66]

VMFP-3's RF-4B and ES-40A, together with the FIIU's IIF provided the FMF with a comprehensive imagery intelligence architecture; these assets represented the pinnacle of the Marine Corps' tactical aerial reconnaissance capability in the post-Vietnam years.

C. THE CALM BEFORE THE STORM

Although VMFP-3 provided an effective, dedicated aerial reconnaissance capability to the Marine Corps from its debut

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[65]5th MEB and 7th MEB, both subordinate to I MEF, are responsible for contingencies in the U.S. Southern Command and U.S. Central Command theaters of operation, respectively.

[66]The author served as Commander, 3rd FIIU from January 1989 through June 1991.

in the FMF, and "The Eyes Of The Corps" were in constant demand for support of Marine exercises and operations around the globe, the RF-4B and ES-40A were never viewed as optimal capabilities by some consumers. By the early 1980s, critics began to articulate dissatisfaction with the available Marine tactical reconnaissance assets on three interrelated points.

First, VMFP-3's Phantoms were rapidly approaching twenty years of service. Most of the squadron's aircraft had already been overhauled through the Naval Aircraft Rework Facility's Service Life Extension Program (SLEP) at least once, and the aircraft had begun to demonstrate an increasing need for intensive maintenance to remain operational. Spares had become scarce and cannibalization of aircraft for parts became commonplace.

Second, the RF-4B reconnaissance sensors all employed film-based recording media. Film obtained from the Phantom's optical and electronic systems had to be returned to base, downloaded, and processed before exploitation operations could commence. And while the analyst's textual report could conceivably be transmitted within minutes of its completion, the delivery of photographic products could take hours or days, depending upon the availability of courier assets. (Table 4 illustrates the typical collection to dissemination time for film-based reconnaissance systems). Accordingly, the RF-4B's film-based sensors were not viewed as responsive,

TABLE 4
FILM-BASED RECONNAISSANCE SYSTEM
DISSEMINATION TIME REQUIREMENTS

REPORTING:

FUNCTION	**TIME (IN MINUTES)**
Aircraft Return to Base	10 - 40
Film Downloading	10 - 20
Film Processing	10 - 45
Film Exploitation	15 - 60
Report Preparation	5 - 30
Report Transmission	30 - 300
Time for receipt of textual report	70 - 495

PRODUCTION:

Film Printing	10 - 120
Product Annotation	10 - 60
Product Delivery	60 - ?
Time for receipt of products	150 - *days*

efficient systems capable of meeting the requirements of a dynamic environment.

Finally, the RF-4B was inextricably linked to the ES-40A, and operation of the photo lab levied unique logistical requirements, including transportation, fresh water, photographic chemicals, and waste disposal.[67]

It is significant to note that, as the RF-4B was subjected to increasingly harsh criticism, the ADAS - the vital link between the reconnaissance aircraft and the exploitation system - became a chronic problem for VMFP-3 maintenance personnel and FIIU imagery analysts alike. The ADAS was reliant upon the RF-4B INS for its positional data; however, since the INS was one among many of the aircraft's frequently failing avionic systems, it was often incapable of providing accurate data. Consequently, the FIIU's IIF was often of no great utility, as the imagery analysts were forced to revert to time-consuming, manual target location and mission plotting techniques.

ADAS malfunction in the RF-4B eventually became so frequent that the system's failure was ultimately accepted as a somewhat ordinary condition during preflight checks, and

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[67]For transportation, the ES-40A required 3 C-130 lifts; for operations, the system needed an electrical power source, approximately 1 gallon of fresh water per minute at 40 pounds per square inch, 120 gallons of photographic fixer and developer per day, and a toxic waste disposal site for effluent.

accurate ADAS data became an "exception to the rule." In fact, a non-functional ADAS, although a serious impediment to the provision of timely imagery intelligence support, was not considered sufficient grounds to declare an aircraft "down" for maintenance. *Interestingly*, U.S. Air Force RF-4Cs of similar age were able to provide accurate ADAS data during this same period.

The chronic RF-4B ADAS failure, when contrasted with the fully operational RF-4C ADAS, seemed to suggest that the system had not been given an appropriate priority in VMFP-3's maintenance schedule. In fact, imagery analysts widely interpreted this situation as evidence of a preoccupation with flight hours and a concomitant lack of emphasis on the reconnaissance mission within the squadron, not an inherent characteristic of the RF-4B. Nevertheless, the ADAS issue provided RF-4B critics with yet another topic of concern.

In addition to the perceived limitations of the RF-4B and ES-40A, military technological developments stimulated increased dissatisfaction with film-based aerial reconnaissance among a growing constituency within the Marine Corps. Dramatic increases in both the mobility and lethality of weapons systems, combined with the advent of precision, high-value attack systems prescribed the need for detailed,

timely intelligence. The RF-4B, with its film-dependent sensors, did not offer a solution to forthcoming challenges. (Montgomery, 1981, pp.9-10)

At the same time (in the early 1980s), alternative technologies for collecting aerial imagery, especially sensor developments, were emerging and offering potential solutions to the perceived problems of the RF-4B.

The introduction of the charge coupled device (CCD),[68] a solid-state, photon-sensitive element which facilitated the construction of rugged, large focal plane digital sensors, imparted considerable momentum to the quest for a near-real-time imagery system.

CCD sensors offer the inherent advantages over traditional optical sensors listed below:

1. geometric precision and stability; geometric distortion is virtually absent from the CCD focal plane, and the sensor has only a minor temperature dependence.[69]
2. high sensitivity; especially when cooled, the CCD sensor can be up to one hundred times more sensitive than

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[68]Although it had been developed in the early 1970s, the CCD did not mature as a military aerial reconnaissance technology until the mid-1980s.

[69]This is primarily due to the extremely low thermal expansion coefficient of silicon, the material from which the semiconductor photo array is constructed.

photographic material, and can function under low light conditions.

3. compact, robust design; CCD sensors are significantly smaller than aerial cameras[70] and are virtually insensitive to external influences such as magnetic fields and vibration. (Jahne, 1991, pp.2-3)

Perhaps most importantly, CCD sensors collect imagery in the form of digital signals. Because these digital signals are electronically reconstructed to form the original image, CCD sensors *preclude the requirement for film processing*. Digital imagery may be stored on tape (as well as other media) until completion of the reconnaissance mission, or can be electronically transmitted to a ground station *while the mission is in progress*. Furthermore, digital imagery can be subjected to a wide range of manipulative and enhancement

[70]This advantage makes the CCD sensor attractive to aircraft designers.

techniques which may increase the effectiveness of the imagery analyst.[71] Thus, the CCD has strong potential to overcome all existing obstacles to timely and effective imagery support.

1. The Dissolution of VMFP-3

Issues pertaining to Marine tactical aerial reconnaissance requirements and capabilities were discussed by representatives from the intelligence, ground, and aviation communities at the Tactical Aerial Reconnaissance Working Group (TARWG), a semi-annual meeting jointly convened by the Intelligence and Aviation Divisions of Headquarters, U.S. Marine Corps.[72]

The TARWG provided an open forum for discussion of perceived shortfalls, as well as proposed enhancements of the Marine aerial reconnaissance capability. Continued criticism of film-based systems, coupled with the availability of

[71]An example of such a technique is the "grey stretch." The grey stretch function separates the grey shades on a digital image (typically 256 different shades) into their discrete electronic values, allows contrast adjustment between these values, and consequently facilitates differentiation between extremely subtle shades on the image. The grey stretch often permits detection of objects which might not normally be discernible to the human eye. For example, an oblique photograph of an aircraft hangar might reveal only impenetrable shadow inside the structure, whereas a similar digital image, after a grey stretch, could separate a previously invisible aircraft from the surrounding shadow.

[72]The aviation weapons section of the Aviation Division (Code APW) was (and continues to be) responsible for the articulating aerial reconnaissance aircraft and sensor requirements. The author was a TARWG participant from 1985 through 1990.

alternative technologies, made the development of a near-real-time reconnaissance capability increasingly more prominent on the TARWG agenda. By 1982, the Marine Corps had made a conscious commitment to participate in the development of the Advanced Tactical Airborne Reconnaissance System (ATARS), a CCD-based, "electro-optical"[73] system.

ATARS was widely heralded as the panacea sought by Marine imagery intelligence consumers. The system promised high quality, near-real-time imagery, without the logistical burden imposed by cumbersome film processing systems. Additionally, when the F/A-18D Hornet was designated as the ATARS platform,[74] concerns about aircraft survivability quickly waned.

The F/A-18D was to be a multi-mission aircraft, capable of carrying weapons as well as reconnaissance sensors. When configured for reconnaissance, the aircraft would not have an air-to-air gun, since the ATARS sensors would replace the cannon in the forward cockpit bay. However, the F/A-18D could still be equipped with air-to-air missiles for self defense and/or ordnance for ground attack. With such flexibility, the

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[73]An electro-optical system combines the CCD focal plane with optical lenses.

[74]A vehicle which carries reconnaissance sensors is known as a "platform."

F/A-18D would mark the introduction of a well-armed, highly survivable Marine reconnaissance aircraft, and the demise of the "unarmed and unafraid" RF-4B.[75]

A comprehensive exploitation system, the Joint Service Imagery Processing System (JSIPS) was conceived to replace the AN/TYQ-12 as the primary equipment of the FIIU. JSIPS would be designed to receive imagery from the F/A-18D ATARS via a digital data link; the system promised to facilitate the immediate exploitation of imagery through the use of "softcopy" (digital) workstations and the timely dissemination of both reports and products via secondary imagery dissemination systems (SIDS).[76] Together, ATARS and JSIPS seemed to represent an optimal architecture for future Marine imagery intelligence operations.

However, the push toward ATARS and JSIPS was largely based upon some highly questionable paper studies, which neglected to address significant technical issues, such as the integration of divergent imaging, exploitation, and communication technologies.

> ATARS was born based on these studies, contractor promises, and the promise of real time tactical

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[75]"Unarmed and unafraid" was the perennial motto of reconnaissance pilots who flew poorly armed aircraft in the face of danger.

[76]SIDS are high resolution digital imagery transmission devices. The U.S. Navy's Fleet Imagery Support Terminal (FIST) is an example of SIDS.

> reconnaissance. With the birth of ATARS, the death of photographic reconnaissance was sounded, at least officially. (Allen, 1990, p.257)

By the mid-1980s, the Marine Corps had not only awarded contracts for the development of ATARS and JSIPS, but had also begun planning for the retirement of the RF-4B and the dissolution of VMFP-3. These two interrelated force structure decisions immediately generated a measure of corporate inertia which ultimately led to the *complete* demise of tactical aerial reconnaissance within the Marine Corps for a significant period of time.

The initial operating capability (IOC) of the F/A-18D ATARS was originally scheduled to coincide with the demise of the RF-4B; both systems were to be maintained in parallel, with a gradual introduction of Hornet airframes and a simultaneous incremental retirement of Phantoms, until the transition was completed. However, several factors undermined execution of this prudent strategy.

From a fiscal perspective, to justify procurement of the multi-mission F/A-18D in an era of increasingly scarce fiscal resources, the Marine Corps had to demonstrate economy in its proposed aviation force structure. The F/A-18D was to fulfill the mission of several aircraft (i.e. fighter, attack, all-weather attack, reconnaissance); therefore, to ensure funding of the new Hornet, the Corps needed to replace a larger number

of "obsolete" aircraft with a smaller number of F/A-18Ds.[77] This requirement was prerequisite to the acquisition of the F/A-18D, and was driven by the military budgeting process of the era. (Pittman, 1992)

Also, VMFP-3 was a relatively expensive squadron to maintain, primarily due to its large number of support personnel and the intensive maintenance requirements of its aging aircraft. Continued operation of VMFP-3 until IOC of the F/A-18D, and throughout the planned eighteen to twenty-four month transition period,[78] began to appear less attractive within the prevailing fiscal constraints, despite the capability requirements for combat readiness.(Pittman, 1992)

From a perceptual viewpoint, Marine infantry battalions were demanding more resources during this period, and the Commandant of the Marine Corps[79] did not perceive maintenance of the RF-4B to be as significant a requirement as the immediate expansion and modernization of ground forces. (Pittman, 1992)

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[77]On 27 April 1992, the author interviewed Lieutenant General Charles Pittman, USMC (ret), who was the Marine Corps Deputy Chief of Staff for Aviation during this period. LtGen. Pittman stated: "to get the F/A-18D, a new aircraft, we had to show that we were giving up more aircraft than we were procuring." (Pittman, 1992)

[78]This period accounts for the training of aircrew and support personnel.

[79]General A.M. Gray was the Commandant during this period.

Additionally, and perhaps most significantly, *the Marine Corps saw no major conflict looming on the horizon in which tactical aerial reconnaissance would play a major role.* Therefore, when faced with the option of standing down an operational A-6 Intruder (all-weather attack) squadron or disbanding VMFP-3 early, the Marine Corps curiously chose to relinquish its tactical aerial reconnaissance capability in order to comply with the budgetary stipulations governing procurement of the F/A-18D.[80] Plans to make a smooth transition from the RF-4B to the F/A-18D were summarily abandoned, as the dissolution of VMFP-3 was tentatively scheduled for the end of fiscal year (FY) 1989 and F/A-18D ATARS IOC was optimistically projected as FY 1992. (Pittman, 1992) Thus, the phenomenon known as the "tac recce gap" was born. Willingness to sanction such a capability gap was met with significant resistance.

The Marine Corps intelligence community was the primary source of adamant opposition to early retirement of the RF-4B. During increasingly volatile TARWG sessions, intelligence

[80]This decision was indeed curious, because if Marine force structure planners saw no conflict on the horizon, it would arguably have been more appropriate to disband an Intruder squadron (of which there are many) rather than the RF-4B squadron (of which there was only one).

officers from throughout the FMF warned of potentially devastating consequences if the Marine Corps were to be committed to combat during the three-year tac recce gap.

To appease the concerns of the perceived doomsayers, in 1987 the Aviation Division proposed procurement of the Expeditionary Tactical Aerial Reconnaissance System (ETARS), a pod-mounted system for the AV-8B Harrier, as an interim capability. However, it was quickly determined that the requirements of budgeting, development, and flight testing would preclude the delivery of ETARS within three to four years. Therefore, because the system could not have diminished the potentially negative impact of the tac recce gap, ETARS was never seriously pursued further.

Meanwhile, the inevitable contractor delays caused slippage in the development and production schedules for ATARS,[81] and lengthened the period of the tac recce gap. By 1988, the projected IOC for ATARS was 1994.[82] It is significant to note that although IOC for the ATARS sensors was postponed, IOC for the F/A-18D airframe experienced minimal, if any delays. Yet, without the ATARS sensors, the F/A-18D could have no impact as a tactical aerial reconnaissance platform.

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[81]Similar delays affected the JSIPS program.

[82]JSIPS IOC was then projected at 1992.

By 1989, the ATARS program slipped again, and IOC was postponed until FY 1995. In response to this delay, the Aviation Division agreed to retain a skeleton capability of eight RF-4Bs until July 1991. But this action proved to be no more than a perfunctory gesture, for by April 1990, *after obtaining concurrence from the FMF commanders*, the Aviation Division scheduled retirement of the remaining VMFP-3 elements for October 1990.[83] (see the Appendix for the complete text of the VMFP-3 deactivation message).

Thus, a fiscally-driven, cosmetic approach to force planning, a dilatory process of reconnaissance system acquisition, and a low prioritization of tactical aerial reconnaissance (among *peacetime* commanders) led to the decision which allowed the complete demise of Marine aerial reconnaissance during the now five-year tac recce gap. This myopic decision was clearly an extension of the cyclical trend which had governed the U.S. tactical aerial reconnaissance

[83]LtGen. Pittman stated that the FMF commanders were consulted and they subsequently concurred with a plan to retire the remaining RF-4Bs. The VMFP-3 deactivation message indicates that LtGen. Pittman discussed the issue with both LtGen. Cook (then Commanding General, FMF Atlantic) and LtGen. Milligan (then Commanding General, FMF Pacific) on 9 March 1990 (reference 'C' and its amplification reflects this conversation; see Appendix B). Note that the actual dissolution of the remaining VMFP-3 elements occurred on 10 August 1990.

capability since the end of the First World War. For the United States Marine Corps, it was a decision which would produce almost instantaneous repercussions.

With the dissolution of VMFP-3, the Marine Corps gambled that there would be no war or crisis which would require a tactical aerial reconnaissance capability during the tac recce gap; the Corps immediately lost its wager, and gained the dubious distinction of being the only military organization to have ever demobilized its tactical aerial reconnaissance assets at the *commencement* of a major conflict.

IV. THE PERSIAN GULF WAR

"Getting along without air photo coverage imposes acute strain on a modern field force."
S.L.A. Marshall
(Marshall, 1950, p.5)

"A serious shortfall the Marines faced was the absence of a tactical aerial reconnaissance platform able to provide imagery responsive to ground commanders' requirements. The RF-4B, recently taken out of service, had not yet been replaced by the reconnaissance pods programmed for the F/A-18D"
(Conduct of the Persian Gulf War, 1992, p.C-11)

At 0100 local time on 2 August 1990, three Iraqi Republican Guard Forces Command (RGFC) divisions launched an attack across the Kuwaiti border, as an incredulous community of free nations looked on.

> A mechanized infantry division and an armored division conducted the main attack south into Kuwait along the Safwan-'Abdally axis, driving for the Al-Jahra pass. Another armored division conducted a supporting attack farther west. Almost simultaneously, at 0130, a special operations force conducted the first attack on Kuwait City - a heliborne assault against key government facilities. Meanwhile, commando teams made amphibious assaults against the Amir's palace and other key facilities....
>
> The three attacking armored and mechanized formations, supported by combat aircraft, linked up at Al-Jahra. The two divisions conducting the main attack continued east to Kuwait City, where they joined the special operations forces by 0530. By 1900, Iraqi forces had secured the city. Concurrently, the supporting armored division moved south from Al-Jahra to establish blocking positions on the main avenues of approach from the Saudi border....
>
> On 4 August, Iraqi tanks were establishing defensive positions. Hundreds of logistical vehicles were moving men and massive quantities of munitions and supplies south. RGFC infantry divisions that had been deployed to the border area in late July moved into Kuwait, occupied Kuwait City, and secured the primary lines of

> communication to and from southern Iraq. By this time, more Iraqi divisions were moving south to Kuwait from garrisons in Iraq. These forces would replace the RGFC units in defensive positions in Kuwait. This replacement was ominous for, while it allowed a possible return of RGFC units to Iraq, it also freed these formations for a subsequent attack into Saudi Arabia....(Conduct of the Persian Gulf War, 1992, pp.1-2)

By 6 August, the Iraqis were conducting massive consolidation and resupply operations throughout Kuwait; this activity was widely interpreted as possible preparation for continued advances to the south. At this time, the Iraqi force in Kuwait was estimated to be at least eleven divisions strong, with 200,000 men and 2,000 tanks. On the same day, the President of the United States ordered the deployment of American combat forces to Southwest Asia, and on 7 August 1990, Operation Desert Shield commenced.

A. OPERATION DESERT SHIELD

On 8 August, undaunted by growing international condemnation, the Iraqi leader Saddam Hussein publicly announced the annexation of Kuwait; invoking historical and cultural commonality, he labeled the overridden emirate as the 19th Province of Iraq. (Conduct of The Persian Gulf War, 1992, pp.44-45)

Within the following week, 7th MEB had deployed from Twentynine Palms, California to Al-Jubayl, Saudi Arabia as the lead element of a force which would ultimately grow to two MEFs. On 19 August, the main body of 3rd FIIU also arrived in

Al-Jubayl as an element of Surveillance, Reconnaissance, and Intelligence Support Group 7 (SRISG-7).[84]

However, although the Marines of 3rd FIIU were combat ready - they had arrived fully trained, with all available equipment - the imagery analysts lacked even a nebulous mission. In fact, the Marine imagery exploitation unit received little, if any direction from the Brigade, because between the peak of Iraq's blitz of Kuwait and the deployment of the first Marine forces to Southwest Asia, a surreal yet consequential event had transpired: *on 10 August 1990, while the bulk of I MEF donned desert camouflage in anticipation of the first major war in over fifteen years, the MCAS El Toro Band lent an ironic measure of pomp to the ceremony which officially deactivated the remnants of VMFP-3.*

As a result of the series of myopic decisions which culminated in this event, "The Eyes of the Corps" were blinded at precisely the time when they were most needed. The bitter irony was that the forthcoming war in the Persian Gulf would ultimately generate the heaviest demand for imagery intelligence ever experienced in the history of the Marine Corps.

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[84]The SRISG is a task-organized unit of intelligence and related support capabilities which is deployed with Marine Air/Ground Task Forces (MAGTFs).

During the initial stages of Operation Desert Shield, a surprisingly cavalier attitude toward imagery intelligence prevailed among the 7th MEB staff. Imagery analysts were predominantly employed to fill sand bags and prepare administrative correspondence during their first six weeks of deployment. At one point, when a frustrated FIIU Commander inquired about establishing an imagery-related mission for his unit, the response he received was that "imagery just isn't a priority." This observation was extremely short lived.

By late September, I MEF had arrived in Al-Jubayl, and had been established as the component command for Marine Forces U.S. Central Command (MARCENT). MARCENT immediately began planning for defensive and potential offensive operations in its area of responsibility. However, even a cursory examination of MARCENT's available cartographic stocks quickly revealed inaccuracies and gaps in the topographical map coverage of northern and coastal Saudi Arabia. In lieu of tactical aerial reconnaissance - the preferred method for updating maps - the MARCENT intelligence staff proposed use of the Marine remotely piloted vehicle (RPV) to obtain current imagery coverage of areas of concern.

The Marine RPV, the Pioneer, was equipped with an electro-optical imaging system which could downlink imagery in near-real-time to a ground station. The Pioneer's imaging system was not capable of standoff (i.e. long range oblique)

collection; the RPV had to fly relatively close to the target area to collect suitable imagery. However, even with direct overflight of the target, the Pioneer collected imagery most suitable for detection purposes, but not detailed exploitation or terrain analysis. In the Marine Corps, the Pioneer was predominantly employed for fire support coordination (i.e. target acquisition, fire adjustment) purposes; its utility as a viable imagery reconnaissance system was tenuous, at best.

Yet, the RPV represented MARCENT's singular organic source for imagery collection of any type. Accordingly, permission to conduct RPV reconnaissance flights in the Kuwaiti border areas was requested from U.S. Central Command (CENTCOM). However, CENTCOM refused to approve MARCENT's request for an unanticipated reason: politics! The Pioneer contained parts manufactured by an Israeli firm, and compromise of this fact might have debilitated the fragile political-military coalition which was being assembled to confront Iraq.

CENTCOM was concerned that a Marine RPV might malfunction and crash in Kuwait, where Iraqi forces could conceivably examine the aircraft and expose the origin of the Pioneer's parts. Since there was scarce ideological cohesion between the Islamic and western nations of the coalition at this early stage, proof of Israeli complicity in western, especially American, intervention conceivably could have enervated, if not shattered the delicate alliance. Therefore, the Marine

Corps was ironically prevented from employing its only imagery collection asset throughout the five month period of Operation Desert Shield.

The Kuwaiti border area remained an area of increasing concern to MARCENT, because not only was it a region for which current topographical data was lacking; national intelligence sources indicated that it was also an area in which the Iraqi forces were constructing their most concentrated network of defenses and obstacles. And as the prospect of breaching the Iraqi defenses in offensive operations became more real, MARCENT became more desperate in its quest for imagery. Furthermore, there was a marked paucity in the availability of signals intelligence (SIGINT) and human intelligence (HUMINT) in the theater of operations, but not due to any lack of collection assets. The Iraqi forces were well cognizant of American SIGINT capabilities; consequently, Iraqi units in Kuwait exercised such painstaking discipline over electronic and communications emissions that most of the technologically sophisticated U.S. SIGINT capabilities were of marginal use in monitoring Iraqi activity.[85] HUMINT collection, having been

[85]Proponents of SIGINT would undoubtedly argue that the SIGINT assets indirectly accomplished a significant mission in the Persian Gulf, since mere cognizance of their capability precluded effective Iraqi command and control. This phenomenon certainly cannot be discounted, but SIGINT was nevertheless unable to help campaign planners who were concerned with terrain features and obstacle construction.

constrained by political concerns, was likewise of little consequence.[86] Therefore, imagery represented virtually the only source of current tactical intelligence the Kuwait Theater of Operations (KTO). At this point, The Marine Corps, by now functionally lacking an organic capability to collect *any* imagery, sought support from external sources. In the near term, the U.S. Air Force seemed to be a potential savior.

The Air Force had activated a squadron of Air National Guard RF-4Cs, and had deployed the reconnaissance aircraft to Al Dhafra, United Arab Emirates in late August 1990. By early September, these assets were conducting regular reconnaissance missions near the Kuwaiti border. The RF-4Cs returned their film to Al Dhafra for immediate processing, exploitation, production, and dissemination. Within 48 hours after the mission, the film was delivered to Air Forces, U.S. Central Command (CENTAF) headquarters in Riyadh, Saudi Arabia[87] for further exploitation and production. Upon learning of CENTAF's

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[86]CENTCOM was unwilling to permit active HUMINT collection (including deployment of Marine Force Reconnaissance assets) to avoid the appearance of an aggressor during what was perceived as a politically sensitive, formative period for the coalition. It is significant to note that plans for potential offensive operations against Iraqi forces were still compartmented at this time.

[87]CENTAF headquarters was located in the Royal Saudi Air Force (RSAF) headquarters building.

capability, MARCENT dispatched the FIIU commander to Riyadh to establish liaison with the CENTAF intelligence officer.[88]

By early October, MARCENT and CENTAF had negotiated a mutual support agreement, whereby in return for additional exploitation support from 3rd FIIU, CENTAF would provide imagery collection and production support to MARCENT. To this end, 3rd FIIU relocated its main body to the RSAF headquarters in Riyadh, and established a small detachment at Al Dhafra. This mutually beneficial relationship immediately provided a bittersweet revelation to MARCENT.

The Air National Guard RF-4Cs flew unobtrusive missions fifteen miles south of the Kuwaiti border, but using their 60-inch focal length cameras,[89] those Phantoms were able to effectively image areas up to fifteen miles north of the border. The RF-4Cs were thus able to acquire current, detailed imagery coverage of the defensive belts with which MARCENT had become especially concerned. However, MARCENT's collection requests were, understandably, not given priority over CENTAF's requirements, and MARCENT was prohibited from directly tasking RF-4C missions. Most significantly, the Marines suddenly realized that their recently retired RF-4Bs

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[88]The author served as Commander, 3rd FIIU and Commander, MARCENT FIIU for the entirety of Operations Desert Shield and Desert Storm. CENTAF's intelligence officer was Col. Christon, USAF.

[89]The Air National Guard RF-4Cs used the KS-127 camera.

could have provided an identical capability, and would have been directly responsive to MARCENT's requirements.

In November 1990, MARCENT actually considered reactivation of its reconnaissance Phantoms. However, the idea was chimerical, for most of the last RF-4Bs had been cannibalized and scattered; one of the aircraft had been mounted on a concrete pedestal in front of a midwestern town hall. Still, Marine ground and aviation commanders continued to levy overwhelming requirements against a tenuous, if not nonexistent capability.

Third FIIU's CENTAF detachments represented MARCENT's only source of current imagery throughout most of Operation Desert Shield. As demand for imagery products continued to increase, MARCENT deployed VMFP-3's ES-40A from MCAS El Toro, where it had been awaiting transportation to the logistical depot, to Riyadh as an organic production capability. But the ES-40A alone was incapable of slaking the Marine commanders' thirst for imagery products because *without a dedicated collection capability, timely and responsive coverage of MARCENT areas could not be guaranteed.*

In the closing weeks of Operation Desert Shield, MARCENT looked toward a newly introduced imagery intelligence capability, the Joint Imagery Production Complex (JIPC), for support. The JIPC had been established in late December 1990 as a reception, exploitation, and production site for national

imagery. Located at Riyadh Air Base, the JIPC was an expansive facility, and was operated by a joint/combined staff.[90] By early January 1991, 3rd FIIU had been augmented by 2nd FIIU, and the composite organization was designated the MARCENT FIIU. With these increased personnel assets, MARCENT established a sizeable FIIU detachment at the JIPC. Later, through coordination with the U.S. Navy, CENTCOM had an ES-40A delivered from Naval Air Station Cubi Point, Republic of the Philippines, to the JIPC for MARCENT's use.

Although establishment of the JIPC was a milestone in the Persian Gulf War, as well as in the history of American military intelligence,[91] it did little to alleviate the perceived shortage of imagery intelligence among Marine commanders. The JIPC produced high-quality, large-format imagery products for MARCENT in volume on numerous occasions; yet due to the competing priorities which governed the tasking of national systems, the JIPC could not guarantee complete and timely coverage of MARCENT's areas of interest.

The national imagery collection systems from which the JIPC derived its imagery were heavily tasked by CENTCOM and

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[90]The JIPC Director was Col. R.H. Clegg, USA. The JIPC was staffed by personnel from the U.S. Army, U.S. Marine Corps, U.S. Navy, U.S. Air Force, RAF, British Army, Canadian Air Force, Australian Army, and Washington D.C.-based civilians.

[91]The JIPC represented the first time a capability of its sort had ever been deployed in a theater of combat.

its components, but these systems were accessible in theater for only a limited amount of time during each 24-hour period. Furthermore, the national systems were extensively employed for indications and warnings (I&W) purposes by Washington D.C. area consumers. Therefore, because national imagery collection missions were neither consistently (or even frequently) prioritized in MARCENT's favor, nor constantly in view of MARCENT's operating area, Marine commanders could not completely rely upon the JIPC for timely and responsive support.

Thus, although MARCENT belatedly gained access to two external sources of imagery, neither CENTAF nor the JIPC was primarily dedicated to support of MARCENT and consequently, neither organization could satiate the demand for imagery among Marine commanders. Only an organic aerial reconnaissance capability, directly tasked and controlled by MARCENT, could have alleviated the imagery shortfalls in Southwest Asia. This already acute problem was only further exacerbated by the initiation of combat operations.

B. OPERATION DESERT STORM

The Desert Storm strategic air campaign was specifically directed toward destruction of Iraqi command, control, and communications (C3) facilities, and military/industrial

production capabilities while minimizing collateral damage.[92] To accomplish these goals, CENTAF precision strike missions were heavily reliant upon detailed targeting.

Throughout the strategic air campaign, imagery was the *unitary* source of intelligence upon which detailed targeting was based to support the delivery of precision munitions. While national imagery systems provided effective support for deliberate targeting, only tactical aerial reconnaissance systems provided the responsiveness prerequisite to reactive and immediate restrike targeting. Although CENTAF and the JIPC made every effort to satisfy the imagery requirements for MARCENT strike operations, the Marine aviation assets were unable to directly task imagery collection assets, and consequently lacked optimal support.

During the Desert Storm tactical air campaign, targeting was even more heavily dependent upon tactical aerial reconnaissance. The dynamic tactical environment demanded immediate pre- and post-strike reconnaissance to support effective target acquisition and restrike determinations. RPVs lacked the speed and range for such missions, while national systems lacked the responsiveness; only tactical aerial

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[92]Collateral damage limitation was sought for its political utility. Note that throughout Operation Desert Storm, President Bush used the media to declare that he had "no argument with the Iraqi people." Collateral damage limitation lends credibility to such a policy and minimizes the negative political impact of enemy propaganda.

reconnaissance assets were proven suitable to support the requirements generated during the tactical air campaign. Lacking its own capability, MARCENT was forced to rely upon less responsive external aerial reconnaissance support during the tactical air campaign.

Tactical aerial reconnaissance also played a pivotal political role, as it provided conclusive evidence of Iraqi ecoterrorism in the Persian Gulf,[93] and delivered proof of the coalition's collateral damage limitation policy.

Finally, in the Desert Storm ground campaign--the culmination of coalition operations in Southwest Asia--MARCENT operated in a similar environment of voluminous imagery requirements, but with a limited capability. Having been tasked with the mission of attacking through the highly developed Iraqi obstacles and defenses in southern Kuwait, MARCENT was faced with a particularly pressing need for responsive imagery support.

The defensive belt, which had by then become popularly (or unpopularly, depending upon one's geographic location) known as "the wall of death," was a complex and formidable system of interlocking barriers designed to impede and attrite the attacking coalition forces. "The wall of death" included

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[93]Tactical aerial reconnaissance assets imaged leaking off-shore oil terminals which had been intentionally damaged by Iraqi forces.

extensive infantry trenches, revetted armor positions, barbed wire, fences, minefields, and "incendiary trenches."[94]

Because it was widely believed that any Iraqi employment of chemical weapons would most likely occur while coalition ground forces were caught in "the wall of death," the specter of massive casualties loomed over the forthcoming Marine ground assault. At the same time, dichotomous *domestic* political pressure was demanding the minimization of friendly casualties during the ground war. Therefore, to succeed within the prevailing military and political constraints, MARCENT took painstaking efforts to ensure a swift breaching operation.

Implicit in these efforts was the requirement to provide Marine combat engineers with highly detailed and current intelligence concerning the exact dimensions, linear sequence, and spatial separation of Iraqi obstacles; it was self-evident that such information could only be derived from imagery.

Accordingly, MARCENT submitted a significant volume of imagery requirements to CENTAF, the JIPC, and national intelligence agencies in preparation for the ground campaign.

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[94]The incendiary trenches were interlocking systems of one-kilometer-long trenches, each of which had been connected to a petroleum source (one pumping station had been constructed to serve each group of ten trenches). These unique oil-filled obstacles were to be set ablaze in front of the advancing coalition forces for physical and psychological impact.

While each of these organizations supported the Marine requirements with a varying degree of responsiveness, the aggregate effort yielded scarcely usable results, for the uncoordinated coverage and analysis of "the wall of death" produced largely contradictory intelligence.

No single agency was able to collect and analyze synoptic coverage of the target area;[95] and therefore, MARCENT sequentially received reports and products from multiple organizations. The total effort resulted in a significant degree of confusion, because as Marine analysts plotted each agency's slightly different mensural and locational data for individual obstacles, an extremely inaccurate and muddled picture of southern Kuwait emerged.

MARCENT ultimately appealed to a national intelligence agency for adjudication of the inconclusive imagery intelligence, *but did not acquire an authoritative analysis of "the wall of death" until within one week of the ground campaign, and then only by dispatching two officers from the theater of operations to Washington, D.C.*[96] Nevertheless, the

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[95]It is significant to note that national systems were technologically incapable of providing such support, while CENTAF RF-4Cs, although capable, could not be exclusively dedicated to such a monumental effort and still fulfill Air Force support requirements.

[96]The two officers were Captain Donahue and Captain Rizzio, intelligence collection officers from First Marine Division and Second Marine Division, respectively.

Marine combat engineer platoons never received copies of the elusive imagery products which depicted the obstacle belts. There were simply not enough prints to go around.[97]

Ironically, the Marine RF-4B could easily have provided synoptic panoramic coverage of the Iraqi defenses in Kuwait, had the aircraft been available.[98] Furthermore, an organic tactical reconnaissance capability, coupled with the available Marine exploitation and production assets, would clearly have circumvented the confusion which plagued Marine imagery intelligence during the Desert Storm ground campaign.

C. LESSONS OF EXPERIENCE

Imagery shortfalls during Operations Desert Shield and Desert Storm prompted a demand among Marine commanders for the reconstitution of an organic tactical aerial reconnaissance capability. Lieutenant General Walter E. Boomer, Commanding General of MARCENT during operations in Southwest Asia, noted:

> In terms of intelligence, we probably have put too many eggs in the satellite basket. In a campaign the size of Desert Storm, the satellites get overworked and fail to meet the expectations of the commanders, especially at lower levels. We've led them to believe that they're going to get some marvelous stuff--and what they do get is pretty good--but it never quite measures up to their expectations, and they want to know why....

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[97]This problem was also the result of the sluggish Marine intelligence dissemination capability, a phenomenon to which an entire thesis could be dedicated.

[98]The RF-4B KS-116 camera would have provided this capability.

> We desperately missed the tactical reconnaissance capability that the RF-4B, which left the inventory just as this campaign started, would have provided. It's got to be one of our top priorities to get that capability back into the Corps. We simply can't place total reliance on satellites for real-time surveillance, battle-damage assessment, and the like. (Boomer, 1991, p.50)[99]

Likewise, in his comments before the U.S. Senate, Major General James M. Myatt, Commanding General of the First Marine Division during operations in Southwest Asia, observed that national systems were incapable of adequately supporting Marine requirements, especially during the ground campaign.[100] He also cited the vulnerability of RPVs in contrast to high-speed, stand-off capable tactical aerial reconnaissance platforms. Major General Myatt emerged as a strong proponent for the reestablishment of a Marine tactical aerial reconnaissance capability.

Thus, immediately following the Persian Gulf War, it appeared that the Marine Corps had largely acknowledged the vital role of aerial reconnaissance, and through recognition

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[99]When interviewed by the author on 24 April 1992, Lieutenant General Boomer noted that "Tactical aerial reconnaissance is an absolutely vital capability. It was the missing link in Southwest Asia, a capability gap for which we paid a price...The low priority accorded to tactical aerial reconnaissance is a recurring problem over history. No one wants to pay attention to the capability until wartime." (Boomer, 1992)

[100]Regarding national systems, Major General Myatt noted that "There are only so many systems, and they have to meet the priorities of the Nation." (U.S. Senate, 1991, p.89)

of this clear and present requirement, had resolved to maintain a viable capability from then on.

However, the paucity of essential imagery intelligence support during MARCENT ground operations also propagated a rash of well-founded, but woefully misplaced criticism which threatened to mitigate the post-war crusade. One high-ranking observer noted:

> The weakest area I observed was intelligence...I had the sense *many of the problems are endemic and stem from the way we select, train, and educate our intelligence personnel. We fail to establish an operational mindset in too many of the officers.* To sum up my case, from October 1990 through January 1991, the 1st Marine Division tried without success to obtain quality imagery of breach sites through the intelligence system...In the meantime, I examined first-class aerial photos obtained by the U.S. Army and the British forces for their units on an early and continuing basis. (Van Riper, 1991, p.4)

This implicit indictment of the Marine Corps intelligence establishment was reinforced by numerous charges of "intelligence failure," which proliferated throughout the Marine Corps; the allegations eventually appeared in media sources as well.

Yet, the Marine intelligence community was strongly opposed to the "tac recce gap" from its conception (as noted earlier), and at times represented the only organized source of solid opposition to the myopic policy. Furthermore, FMF intelligence officers attempted to formally dissuade early dissolution of VMFP-3 at every possible opportunity.

In contrast, ground commanders did not support continued maintenance of VMFP-3. As discussed earlier, prior to scheduling retirement of the remaining RF-4Bs, the Aviation Branch solicited contrary input from FMF commanders. But the operational commanders did not consider tactical aerial reconnaissance to be of such importance that it should be allowed to encroach upon funds appropriated for ground programs, and therefore did not support continued maintenance of the capability. The Marine Corps intelligence community could not possibly have influenced the situation any more than it did. (Pittman, 1992)

Thus, a perceptual failure in the Marine Corps command structure, similar to that which discounted the significance of aerial reconnaissance subsequent to every major conflict since World War I, precluded the availability of responsive tactical aerial reconnaissance support for the Marine Corps at the outset of Operation Desert Shield. Perhaps the ultimate irony lies in the fact that *some of the same officers who had explicitly supported the early dissolution of VMFP-3 were among those who were quick to condemn the imagery intelligence deficiency in Southwest Asia.* (Pitmann, 1992)

The Marine intelligence community is admittedly responsible for a variety of issues; however, the demise of tactical aerial reconnaissance cannot be counted among these issues. In this instance, the "intelligence failure" label

threatens to confine the aerial reconnaissance issue to a specific functional area, and consequently discount the systemic issue of command emphasis which is at the root of the problem.

The onus of "intelligence failure" in this incident must thus be recognized as misleading, inappropriate, and counterproductive. It is the overall command structure which bears the incumbent responsibility for maintaining a viable force composition. This responsibility holds in the past as well as in the future.

Labeling the debacle of Marine aerial reconnaissance as an "intelligence failure" tends to connote the existence of this phenomenon within the exclusive purview of intelligence officers, and presents the risk of diverting or concealing the issue from the mainstream of fiscal and doctrinal concerns. To thus denigrate such a proven, vital capability this process is both deceptive and dangerous. Accordingly, it is paramount that the systemic nature of tactical aerial reconnaissance be fully recognized to preclude the emergence of similar capability gaps in the future.

V. FUTURE CAPABILITIES

"I just think there is now a void in the intelligence system because we focus too much on what might be called 'national systems,' which respond more to national directive out of Washington."

General H. Norman Schwarzkopf, USA
(U.S. Senate, 1991, pp.320-321)

"RPVs have a role, but I think RPVs in some cases are vulnerable. We need the RPV capability, but we also need the fast-moving tactical aerial reconnaissance capability."

Major General James M. Myatt, USMC
(U.S. Senate, 1991, p.89)

A viable imagery intelligence architecture must, above all, be based upon an effective collection capability. In the current and projected combat environments, the tactical effectiveness of an imagery collection capability is measured in terms of several variables, including its ability to:

1. collect high-quality imagery
2. respond to the commanders' requirements
3. provide timely results
4. conduct non-provocative missions
5. operate effectively within the threat environment

It is evident that these measures of effectiveness will undoubtedly be of increasing importance on the dynamic, politically constrained battlefields of the future; it is

likewise evident that neither national systems nor RPVs will, by these measures, be as effective as tactical aerial reconnaissance.

A. NATIONAL SYSTEMS

The United States maintains a highly sophisticated constellation of national imagery collection systems which are indisputably capable of collecting high-quality imagery, conducting non-provocative missions, and surviving the threat. However, U.S. national imagery systems were conceived, designed, and deployed for two primary purposes: strategic I&W and arms control verification.

Current "tactical exploitation of national systems" (TENCAP) doctrine evolved as an adjunct mission of national systems, in order to broaden--but not alter--their range of application. Therefore, even when heavily tasked by combat essential TENCAP requirements, *national systems will remain primarily dedicated to the strategic mission, and cannot be relied upon for responsive, timely tactical support.* Furthermore, although the physical laws which govern the flight of national systems facilitate predictable platform

availability, they also preclude the immediate or "on-call" availability which is so vital in a fluid tactical environment.[101]

This is not to say that national systems are of no use to the tactical commander. National imagery systems are admittedly useful in operational planning where time is not a dominant consideration, and especially where non-provocative coverage of denied areas is required. But in combat, where imagery frequently performs a decisive role, national systems lack the requisite responsiveness and timeliness to be tactically effective.

B. REMOTELY PILOTED VEHICLES AND UNMANNED AIR VEHICLES

Significant emphasis has recently been placed upon the development of RPVs as aerial reconnaissance platforms. RPVs, also known as unmanned air vehicles (UAVs), provide a major advantage in their ability to collect near-real-time imagery through the employment of compact EO sensors and relay systems.

However, current and planned RPV/UAV platform designs are significantly constrained by size and weight, and therefore

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[101]Brookes notes "It is in the tactical environment that the manned PR (photo reconnaissance) aircraft scores over the satellite. Time is usually at a premium in scenarios such as Vietnam, as it would be if the divisions of the (former) Warsaw Pact marched on the Rhine, and space vehicles are very demanding of time." (p.231)

cannot accommodate long focal length (i.e. 60-inch+) reconnaissance systems. Consequently, RPVs and UAVs remain functionally incapable of collecting high-quality imagery during high-altitude missions and not suitable for conducting non-provocative stand-off reconnaissance missions.[102]

Due to their relatively slow speed, restricted altitude, and limited maneuverability, RPVs and UAVs are also somewhat vulnerable to enemy air defenses, and unsuitable for many post-strike reconnaissance requirements.

RPVs and UAVs are highly effective for surveillance and detection applications, especially in low or medium threat environments, but they cannot serve as substitutes for tactical aerial reconnaissance.

C. TACTICAL AERIAL RECONNAISSANCE PLATFORMS

Of the available imagery collection capabilities, only tactical aerial reconnaissance platforms can satisfy all the requirements for effectiveness. Multisensor imagery reconnaissance aircraft can collect high-quality imagery during low-altitude, high-speed missions, as well as during non-provocative standoff missions.

With the development of highly effective electronic countermeasures (ECM) equipment and suppression of enemy air

[102]This limitation is due to the requirement for overflight of the target area.

defense (SEAD) doctrine, tactical aerial reconnaissance platforms have become extremely survivable in restrictive threat environments.

Forthcoming reconnaissance aircraft equipped with digital sensors will provide a high-quality near-real-time capability which will surmount the limitations of the RPV/UAV and national capabilities alike.

Considering these capabilities it is perhaps most significant to note that tactical aerial reconnaissance platforms provide an unparalleled level of responsiveness to the tactical commander. The range and speed of current reconnaissance aircraft, coupled with their "on-call" availability to the tactical commander, make these assets the optimal source for tactical imagery support.

Likewise, during pre- and post-combat operations, tactical reconnaissance platforms offer a timely and effective means of monitoring enemy activity in a non-provocative manner. Their stand-off capability is both militarily and politically indispensable, as it facilitates reactive planning and ceasefire compliance verification without threatening escalation.

The inherent capabilities of national imagery systems, RPVs/UAVs, and tactical reconnaissance platforms can ostensibly appear to be considered complimentary; in fact, this is true to a degree. Yet, it must be recognized that in

the absence of national systems and RPVs/UAVs, tactical aerial reconnaissance platforms can still provide the tactical commander with timely and effective imagery support. The converse is not true for either national systems or RPVs/UAVs. Imagery intelligence is a truly enabling function of combat, and aerial reconnaissance is the *sine qua non* of tactical imagery intelligence.

D. THE ADVANCED TACTICAL AIR RECONNAISSANCE SYSTEM

The F/A-18D ATARS promises to provide the Marine Corps with a viable aerial reconnaissance capability, unsurpassed in timeliness and responsiveness. The digitally downlinked ATARS sensors will effectively eliminate the time required for the aircraft's return to base, film downloading, and film processing (refer to Table 4, page 77). In conjunction with ATARS, the SIDS resident within JSIPS will eliminate the time required for report transmission, film printing, and product delivery. Conceptually, the ATARS-based imagery intelligence architecture should provide the tactical imagery consumer with high-quality products within minutes of the reconnaissance mission's completion.

Perhaps most importantly, ATARS will be an organic system directly responsive to the Marine commanders. With the advent of ATARS, Marine imagery requirements will not be constrained by the prioritization policies of external organizations, as

they had been in the Persian Gulf War; the "eyes of the Corps" will be able to see again.

Yet, amidst this optimistic vision of a viable tactical aerial reconnaissance capability, *the legacy of myopia prevails: ATARS IOC will still be delayed until 1995, and in the event of another major crisis or conflict occurring during the remainder of the "tac recce gap," the Marine Corps will again be completely dependent upon external imagery intelligence support.*

The United States Marine Corps is still paying for a wager it lost in August, 1990.

VI. CONCLUSION

"If we choose wisely today, we can do well something America has always done badly before--we can draw down our military force at a responsible rate that will not end up endangering our security. We did not do this well after World War II, and we found ourselves unprepared for the Korean War barely five years later. We did not draw down intelligently after Vietnam, and we found ourselves with the hollow forces of the late '70s. We are determined to avoid repeating these costly errors.

The Honorable Mr. Dick Cheney,
U.S. Secretary of Defense
(U.S. Department of Defense, 1992, p.xxvii)

"Qui desiderat pacem, praeparet bellum--he who desires peace, prepares for war."

Vegetius
(Brookes, 1975, p.219)

The development of a viable tactical aerial reconnaissance capability within the U.S. military has clearly been characterized by a myopic trend. Since its debut with American forces in World War I, tactical aerial reconnaissance has fulfilled an increasingly vital role. Yet, despite its enabling attributes, the capability has been plagued by peacetime neglect following every major conflict.

In the past, the pursuit of accelerated development programs during protracted conflicts has compensated for this endemic myopia, and has permitted a reactive reconstitution of languid peacetime aerial reconnaissance capabilities. However, future conflicts may not accommodate such reactive force structure policies. In fact, after having completely dissolved

its aerial reconnaissance assets immediately prior to a swift, but major war, the U.S. Marine Corps was recently denied the luxury of time for reconstitution of its capability, and was consequently subjected to the full deleterious effect of its shortsightedness.

During Operations Desert Shield and Desert Storm, the Marine Corps was harshly reacquainted with the fundamental requirement to maintain a viable tactical aerial reconnaissance capability. Immediately following combat operations, many Marine commanders demanded reestablishment of organic tac recce. However, by popularly labeling the demise of Marine aerial reconnaissance as an "intelligence failure," the counterproductive cacophony of observers has tacitly diverted attention from the systemic deficiencies of command emphasis which ultimately precluded the availability of responsive imagery intelligence support in Southwest Asia. Thus, potential exists for reversion to the very same fiscal and doctrinal neglect which has governed the development of tactical aerial reconnaissance for most of this century. At any rate, the legacy of previous myopia threatens to haunt the Marine Corps, for the Corps must still survive a three-year tac recce gap prior to the planned IOC of ATARS in 1995.

Although it was militarily anomalous, owing to its five-month preparatory period, Operation Desert Storm was paradigmatic of future conflicts in several respects. At the

operational level, the Gulf War firmly established tactical aerial reconnaissance as the future paragon of tactical imagery support, through the juxtaposition of the relative capabilities of all available imagery sources in a combat environment for the first time. Those possessing organic assets found that aerial reconnaissance surpassed the effectiveness of both national systems and RPVs in providing timely and responsive imagery intelligence support to their parent organizations.

From an international political perspective, Desert Storm ushered the arrival of close political oversight, demanding the judicious application of combat power, which promises to dominate the phenomenon of coalition warfare in the emerging world order. Combat operations in Southwest Asia were clearly governed by issues such as non-provocative crisis monitoring and strict collateral damage limitation; such issues may have superseded the importance of unbridled use of force in military doctrine... perhaps irreversibly.[103]

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[103]The Hon. Mr. Les Aspin, Chairman of the House Armed Services Committee, recently noted that "Operation Desert Storm revealed significant problems in intelligence support. Tactical intelligence, in particular, quickly proved to be a serious flaw in the support chain...The greater degree of interdependence between combat and support suggests the need for a revised method of evaluating service priorities. What has emerged as an important lesson from Operation Desert Storm is that acquiring support systems consistent with high-tech weapons may be more important than buying the next generation plane or tank." (see U.S. House, pp.36-38)

Finally, from the domestic political perspective, Desert Storm set a somewhat burdensome perceptual precedent among the American people. In fulfilling domestic demand for a swift war, the U.S. military forces unwittingly cultivated the popular perception that overwhelming victory may be achieved with relatively few casualties. Consequently, the American Armed Forces may henceforth be charged with the subtle, but powerful, obligation to conduct only swift and relatively bloodless wars.

As an inevitable military and political paradigm of future conflicts, Operation Desert Storm prescribes the consistent maintenance of a viable tactical aerial reconnaissance capability among the U.S. Armed Forces. Only aerial reconnaissance can ensure timely and responsive support of: non-provocative imagery collection escalation control, effective planning for ground operations, precision targeting for collateral damage limitation, prompt coverage for BDA, and post-war monitoring for ceasefire compliance verification. Ultimately, a viable tactical aerial reconnaissance capability facilitates both the judicious application of power and the conservation of human lives. Therefore, the capability is prerequisite to the fulfillment of both the projected military and political requirements of future war. But forthcoming conflicts may conceivably require U.S. Forces to fight upon arrival; furthermore, future conflicts may not allow time to

reconstitute demobilized assets. In this context, a languid tactical aerial reconnaissance capability would clearly present a serious liability.

The current era of fiscal austerity demands that planners carefully choose to preserve essential capabilities in the U.S. military force structure, and avoid the pitfalls of misprioritization which threaten combat readiness.

To this end, the U.S. Marine Corps must escape the myopic trend which recently precluded the availability of an organic aerial reconnaissance capability during crisis and combat. Recognition of previous dysfunctional command priorities, and abandonment of the inaccurate, counterproductive "intelligence failure" label are central to the resolution of this problem.

On the issue of Marine imagery intelligence deficiencies during Operation Desert Storm, one observer noted that the problem stemmed from the Marine Corps' failure establish an operational mindset in its intelligence officers (Van Riper, 1991, p.4). Given the circumstances surrounding the debacle of VMFP-3, this observation begs the issue. Current and future warfare requirements mandate a rebalancing of the "traditional" combat to combat support ratio to reflect greater emphasis on key support elements such as tac recce.

In the near term, the Corps will continue to pay for its myopic gamble. To prevent the resurgence of this particular problem in the long term, *it may be prudent for the Marine*

Corps to strive toward the establishment of an intelligence-oriented mindset in its command structure.

APPENDIX. VMFP-3 DEACTIVATION MESSAGE

R 040001Z APR 90
FM CMC WASHINGTON DC//A//
TO CNO WASHINGTON DC//OP-05//
CG FMFLANT
CGFMFPAC
INFO COMNAVAIRPAC SAN DIEGO CA
COMNAVAIRLANT NORFOLK VA
CG SECOND MAW
CG THIRD MAW
CG FIRST MAW
MAG ELEVEN
VMFP THREE
BT
UNCLAS //N03000//
SUBJ: RF-4B PLAN
REF/A/DOC/CMC/13OCT89//
AMPN/MCBUL 3125//
REF/B/RMG/CMC/150012ZNOV89//
REF/C/CON/DCS AVN/09MAR90//
AMPN/BETWEEN LTGEN PITMAN DCS AVN, LTGEN COOK FMFLANT, LTGEN MILLIGAN FMFPAC//
RMKS/
1. REF A IS THE MARINE AVIATION PLAN (AVPLAN) FOR FY 89-90
2. REF B MODIFIED REF A TO RETIRE THE REMAINING RF-4B'S IN VMFP-3 BY JUL 91.
3. AS DISCUSSED AT REF C, THE COSTS OF RETAINING RF-4B'S HAVE BECOME PROHIBITIVE IN THE CURRENT BUDGETARY ENVIRONMENT.
4. ACCORDINGLY, CMC (CODE ASL) WILL INITIATE ACTION TO TRANSFER THE REMAINING EIGHT RF-4B'S FROM VMFP-3 NO LATER THAN OCT 90. MMOA/MMEA WILL EFFECT ANY PERSONNEL TRANSFERS NECESSARY THROUGH THE NORMAL STAFFING PROCESS.
5. REQUEST CG FMFPAC DEVELOP A POA&M TO DEACTIVATE VMFP-3.
6. VMFP-3 HAS PROVIDED SUPERB SUPPORT THROUGHOUT THE HISTORY OF THE SQUADRON, BUT DEACTIVATION HAS BECOME AN UNAVOIDABLE ECONOMIC NECESSITY.
7. HQMC POC: MAJ P.F. SHUTLER (APP-31), AUTOVON 224-2189, LTCOL A.H. RICHARDSON (ASL-33), AUTOVON 224-1328.//

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