# Orchestrated Confusion: Air Doctrine and Design Shifts Embodied by the F-4 Phantom

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The old maxim that militaries always prepare to fight the previous war is inaccurate. Rather, militaries usually prepare to fight what they presume the next war will be. During the Cold War between the United States and the Soviet Union, this attempt to predict and prepare for a hypothetical war informed the design and procurement policies of the Air Force and Navy aviation. The United States military assumed that a large-scale nuclear war was the most significant threat, and designed their weapons accordingly. The role of fighter planes to establish air superiority -- through engaging in dogfights characterized by close combat and hard maneuvering -- was abandoned and reshaped.[1] The end result was the creation of the F-4 Phantom II: a "fighter" plane lacking most attributes of true fighter aircraft. Designed for high-speed interdiction of lumbering enemy bombers, the F-4 was ironically never used in its intended role. Instead, it found itself facing MiGs over the skies of Vietnam, a conflict for which it, and the airpower doctrine that spawned it, were woefully inappropriate.

Following World War II, the newly minted United Stated Air Force (USAF) founded its identity on the delivery of nuclear bombs, creating Strategic Air Command (SAC), the largest of three separate command divisions, for this exact purpose in 1946. It consisted of a large force of land-based, long-range bombers under the leadership of General Curtis LeMay. According to President Dwight D. Eisenhower's "New Look" defense policy, the Air Force, led by SAC, was to provide an umbrella of atomic bombs to protect the entire free world. In the hypothetical case of a feared next war with the Soviet Union, SAC intended to "replay" an idealized version of the ending of World War II, lobbing nuclear bombs on the Soviet Union's vital centers.[2] However, most planners hoped that SAC would simply act as a strategic deterrent, preventing war through the threat of massive retaliation. Thus,

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1 For a full examination of fighter tactics and specific maneuvers traditional fighters are expected to perform, see Robert L. Shaw, *Fighter Combat* (Annapolis, Naval Institute Press, 1985).

2 Tilford, *Crosswinds*, 20-22.

conceptual links directly connected SAC's size and reach to the prevention of World War III.[3] The doctrine of massive retaliation and all its inherent assumptions took on almost religious overtones, and adhering to its tenets became necessary for the growing cult of atomic power. As one historian has stated, "Strategic bombing, independent of surface campaigns, was the one mission that air power alone could fulfill, and it was to be the foundation of the Air Force's identity… its advocates took on all the zeal, inflexibility, and myopia of the 'true believer.'"[4]

All other aspects of air power bent to the needs and nature of the strategic bombing mission. Tactical air concerns, such as air superiority, supply interdiction, and ground support (Close Air Support, or CAS) diminished in importance, viewed as either irrelevant, or as missions which could be easily accomplished by SAC as a matter of course. Air superiority, the realm of fighter planes, became almost worthless.[5] Despite a few small voices of criticism, the USAF devoted less than 6 percent of its research and development resources into tactical and fighter roles.[6] The Air Force clung to the tenets of its doctrine as SAC's budget continued to grow at the expense of the Army, Navy, and other Air Force divisions. As a result, several tactical fighter wings (TFWs) disappeared in the late 1950s.[7]

Secondary air missions of interdiction, ground support, and air superiority became the responsibility of a separate Air Force command: Tactical Air Command (TAC), which competed with SAC for funding and indeed its very survival. Air Force leadership regarded TAC – and the entire concept of fighter escorts to establish air superiority – as out of date, irrelevant, and "a functional and organizational anachronism."[8] In order to justify itself and earn precious funding, TAC attempted to overlap with SAC's mission by focusing on two main roles: delivery of nuclear weapons in a tactical

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[3] Craig C. Hannah, *Striving for Air Superiority* (College Station: Texas A&M University Press, 2002), 28.
[4] Caroline F. Ziemke, "In The Shadow of the Giant: USAF Tactical Air Command in the Era of Strategic Bombing, 1945-1955" (PhD diss., Ohio State University, 1989), 7.
[5] Tilford, *Crosswinds,* 8-9.
[6] Ziemke, "Shadow of the Giant," 99-100.
[7] Mark Clodfelter, *The Limits of Airpower: The American Bombing of North Vietnam* (New York: The Free Press, 1989), 28.
[8] Ziemke, "Shadow of the Giant,"10, 76-8, 114.

context, and the interception of enemy nuclear bombers.[9] Essentially, TAC abandoned its traditional role of air superiority, once deemed necessary to set the stage for bombers but now regarded as irrelevant to a hypothetical next war.[10] TAC instead developed into a microcosm or slight translation of SAC, focusing on delivering smaller, tactical nukes with its own set of high-speed, long-range fighter/bombers. Such planes could theoretically drop nuclear bombs quickly on tactical targets while intercepting enemy bombers that threatened U.S. soil. Because war planners considered enemy bombers the biggest threat to the United States, air defense completely revolved around the creation of these high-speed interceptors, designed to demolish these bombers from long range, even beyond visual range (BVR) if possible. This led to the idea that guided missiles should replace guns as the interceptor's primary weapon. The conception of the fighter plane thus morphed from an agile dogfighter to that of a fast interceptor designed to kill with a missile in one single pass without maneuvering or engaging other fighters at all.[11]

Through a series of shifts designed to reinforce the quasi-religion of strategic bombing, the very definition of air superiority changed. Previous conceptions of air superiority involved swarms of fighter planes that cleared the skies of enemy fighters to clear a path for bombers. In this new context, fighters were obsolete, yet Air Force leadership still used the term "air superiority," redefined to designate the interception of enemy bombers. As a result, the Air Force lacked a doctrinal niche for air-to-air combat against enemy fighters and interceptors, yet the continued use of the term created the illusion that these roles were still covered. This redefinition of the mission went further, incorporating preemptive bombing strikes against enemy aircraft on the ground as part of the "air superiority" objective. Air Force Chief of Staff Hoyt S. Vandenberg testified to Congress in 1953 that, "The main defense of the United States lies in the strategic air arm's ability to destroy the bases. That is the only efficient way to

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9 Ziemke, "Shadow of the Giant," 249-50.
10 Hannah, *Striving for Air Superiority*, 30, 22.
11 Frederick H. Smith, "Current Practice in Air Defense," *Air University Review*, v. 6, Spring 1953, 31-39.

knock a possible air force out of the air and get air superiority."[12] In other words, air superiority was a job for bombers.

The definition of air superiority appeared mangled beyond recognition. This re-purposing provided a pretext for the Air Force to invest further in bombers and interceptors while claiming investment in the air superiority mission. The aircraft TAC designed during the early 1950s, such as the F-100 Super Sabre, F-101 Voodoo, and F-105 Thunderchief did not resemble the agile fighter planes of previous wars. Instead, they excelled at speed, designed to drop tactical nuclear weapons on a target and then escape immediately or to interdict enemy bombers.[13] TAC's transformation left it hardly capable of performing some of its traditional key roles, especially that of air-to-air combat, creating a system that was unprepared for what it found in Vietnam in terms of both material and doctrine. The Air Force sacrificed TAC and the air superiority mission on the altar of strategic bombing doctrine.[14]

These developments informed the Air Force's approach to aircraft design, yet the F-4 Phantom was not originally an Air Force project -- it originated in the Navy. Thus, the strategies and doctrines of Naval Aviation exerted the largest influence on the inception of the Phantom. Like TAC, the Navy also bowed to the doctrine of massive retaliation, which formed the conceptual underpinning for a large aircraft carrier force with nuclear-ready planes. In 1955, the Navy commissioned four new *Forrestal* class supercarriers with additional carriers to follow in the following years.[15] By 1962, the Navy was the proud owner of twenty-six aircraft carriers, including USS *Enterprise*, the first nuclear-powered carrier. Unlike the Air Force's long-range intercontinental bombers, Navy aircraft possessed a limited range.[16] Naval aviation was ideal for striking enemy ground installations such as ports, airfields, and naval production facilities. While these attacks were "conventional" when compared to massive atomic

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[12] United States. Congress. House of Representatives. "Department of Defense Appropriations for 1953." 82nd Congress, 2nd session. (Washington D.C.: 1952), pg 2-3, 10, 1028-9, as quoted in Ziemke, "Shadow of the Giant," 235.
[13] Hannah, *Striving for Air Superiority*, 23, 46.
[14] Ziemke, "Shadow of the Giant," 303.
[15] Peter Davies, *USN F-4 Phantom II vs VPAF MiG-17/19* (New York: Osprey, 2009), 36-7.
[16] George W. Baer, *One Hundred Years of Sea Power: the U. S. Navy, 1890-1990* (Stanford: Stanford University Press, 1994), 334.; Robert W. Love, Jr., *History of the United States Navy, Vol. 2* (Harrisburg: Stackpole Books, 1992), 375-6.

retaliation, they did include a nuclear component in the form of smaller, tactical nuclear weapons. Advances in nuclear technology made this possible through the production of smaller bombs that smaller Navy craft could carry.[17]

The Navy worried that carriers were vulnerable to fighter attacks and, by extension, to tactical nuclear strikes, thus it sought to increase defenses against airborne threats. One method for doing so was the development of jet fighter/interceptors. The goal of these craft was similar to the TAC interceptors, requiring high-speed, high-altitude, and long-range attack capabilities, yet the Navy did not neglect the need for maneuverability and air-to-air combat that the Air Force marginalized or ignored. The first of these Navy-designed supersonic jet fighters were the F9F-6 Cougar in 1952, the F-8U Crusader in 1955, and McDonnell's F3H Demon in 1956. To increase their attack range, the AIM-9 Sidewinder heat-seeking missile replaced the unguided air-to-air rockets these planes originally carried. The Demons also made use of the radar-guided AIM-7 Sparrow.[18]

Though the design of these craft included air-to-air combat and maneuverability considerations that the Air Force lacked, the Navy still downplayed other key aspects of the traditional air-to-air role. For example, the Fleet Air gunner Unit (FAGU), which trained weapons officers on Navy planes, closed in 1960 and new training syllabi excised air-to-air combat. Navy planners assumed that the capability of long-range missiles rendered visual encounters with enemy planes a rare, if non-existent possibility, thus gunnery was a wasted skill.[19] These assumptions later became ludicrously contradictory during the Vietnam War, when planners specified rules of engagement that required visual identification of enemy planes before firing missiles. By designing craft designed to intercept and fire missiles from long range, they considered the air-to-air role covered. In reality, the abandonment of previous requirements for the role such as maneuverability, gunnery, and close-range dogfighting marked the end of the air superiority concept.

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[17] Baer, *One Hundred Years of Sea Power*, 334-8.
[18] Love, *History of the United States Navy*, 382-3.
[19] Davies, *F-4 vs MiG 17/19*, 4.

Eisenhower's famous use of the term "Military-Industrial Complex" was particularly apt for the period. Few defense contractors existed, and the large sums involved in contract awards and losses could make or break companies quickly. To keep options open, the military had a strong incentive to keep their contractors afloat, sometimes making purchases regardless of actual needs. The military also encouraged these companies to push the envelope of cutting-edge technology, sometimes guided by strict mission parameters, at other times without many guidelines at all. Thus, a strong paternal bond developed between the military and its industrial suppliers, creating an environment that encouraged companies to experiment and take risks without fear of a total company failure.[20]

In September 1952, the Navy Bureau of Aeronautics (BuAer) invited proposals for a new fighter plane dedicated to the (redefined) air superiority and interception missions. The Navy eventually awarded this contract to McDonnell's rival firm Chance-Vought, whose entry became the F-8U Crusader. McDonnell's design in this competition was a version of the F3H Demon upgraded with a dual-engine and a missile armament.[21] In 1954, the losses from this project nearly destroyed McDonnell. Yet the Navy had much to lose if its weapons manufacturers closed and viewed these defense contractors as too big to fail. This paternal bond formed a key component of the Navy's standard procurement procedure, which encouraged unsolicited proposals from creative companies, judged solely on technical merit with no regard to cost.[22]

McDonnell engineer Herman Barkley took the upgraded F3H Demon's rejection as a personal challenge and immediately began designing an unsolicited new aircraft initially without military funding.[23] Original sketches for the new craft consisted of yet another version of the Demon, similar to the design that had already failed against Vought's F-8U. The Navy had a vested interest in allowing McDonnell to experiment with the design. It could keep McDonnell afloat, allowing it to remain a

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[20] Glenn E. Bugos, *Engineering the F-4 Phantom II: Parts Into Systems* (Annapolis: Naval Institute Press, 1996), 23.
[21] Enzo Angelucci and Peter M. Bowers, *The American Fighter* (New York: Orion, 1987), 451, 310; Larry Davis, *F-4 Phantom II's in Action* (Carrollton: Squadron/Signal Publications, 1984), 4.
[22] Bugos, *Engineering the F-4*, 15-17.
[23] Angelucci and Bowers, *The American Fighter*, 451, 310. Davis, *F-4 Phantom II's in Action*, 4.

valuable supplier, and perhaps reap some return on the initial investment they had both placed in the failed F3H. Upon review of these sketches, The Navy did support the project, but gave no stated mission requirements for the plane, encouraging McDonnell to experiment on the drawing board. According to J. S. McDonnell himself, “All we had to work with in the beginning [of F-4 Phantom II Development] was a gleam in the customer's eye. . . . What followed was two years. . . of orchestrated confusion.” The Navy, because of their doctrinal assumptions, wanted to focus on high-speed interceptors, but was purposefully vague about communicating this, hoping McDonnell would reach in new and unexpected directions. This lack of specificity, and a desire to maximize profits by designing a versatile plane that functioned in many contexts, led McDonnell to develop a multi-role aircraft not optimized for the air-to-air mission.[24]

The earliest F-4 design, coded as the AH-1, was a twin-engine craft with a single pilot and four twenty-millimeter cannons.[25] These early designs impressed the Navy, which promptly ordered two prototypes.[26] In December 1954, the Navy transferred the plane, originally slated for a ground attack role, to its fighter branch, placing Commander Francis X. Timmes as the officer in charge of the project. Timmes was purposefully vague and delayed making any specific requirements until the spring of 1955, when he emphasized the high-speed interceptor role and stressed adaptability. The Navy also wanted the plane to feature two seats, two engines, and an armament of exclusively missiles. The additional engine allowed for higher speeds and larger amounts of ordnance conducive to interception missions. To meet this requirement, the plane featured eleven hardpoints for carrying bombs or missiles, the most ever designed on an airframe. The two-seat cockpit reduced pilot workload and allowed for the operation of increasingly complex radar equipment, increasing the plane's adaptability. The insistence on a missile-only approach theoretically made the plane more versatile as well. Since pilots would ideally fire missiles from long range, before acquiring visual identification, the aircraft did

[24] Bugos, *Engineering the F-4*, 23, 9, 13-14.
[25] Lloyd S. Jones, *U.S. Fighters* (Fallbrook: Aero Publishers, 1975), 310.
[26] Angelucci and Bowers, *The American Fighter*, 310.

not need to maneuver, further reducing pilot workload and theoretically keeping crews from risky close combat situations. Missiles weighed much less than guns, increasing the plane's performance. In July 1955, the Navy rewarded McDonnell's efforts with a contract for the production of seven prototypes.[27]

To optimize the airframe's design, engineers performed extensive tests on scale models, testing them in wind tunnels, dropping them from airplanes, and strapping them to rockets to gather flight data. Over 5300 hours of such tests led to thinner wingtips and the noticeably high tail position. Supersonic flight introduced a host of new problems since shockwaves could affect maneuverability and jet intake. Turning at supersonic speeds often caused "roll coupling," which made a craft uncontrollable, a condition from which trained pilots instantly ejected. Efforts to prevent potentially lethal roll coupling led to the two most characteristic visual elements of the Phantom. The first was the pitched up wingtips set at a 12-degree dihedral, which solved some problems but created others that necessitated the second: a large, high tail, pitched down with an unusual negative 23-degree dihedral.[28]

Technological advances in building materials also influenced these designs. A new honeycomb material enhanced the structural stability of the plane, especially in the tail, without a corresponding increase in weight. A final guard against losing control through roll coupling was the "Stab Aug" stability system that automatically corrected an unstable flight path quicker than a pilot could react. To deal with intake problems, the F-4 featured another innovation: variable intake ramps. Two small ramps just in front of and inside the jet intakes guided airflow. The inside ramp, controlled by an onboard computer, could sweep from a zero-to-fourteen degree incline to better guide airflow into the engines as necessitated by changes in speed and temperature. This system increased the top speed of the plane significantly.[29] To increase the plane's versatility and allow for carrier landings, McDonnell introduced another innovation to increase low-speed performance characteristics: Boundary Layer Control. In this system, excess air from the engines blew out across the wings. This seemingly cheated

[27] Bugos, *Engineering the F-4*, 20, 25-28.
[28] Ibid, 37-40.
[29] Ibid, 51-2.

the laws of physics, generating more lift by superficially mimicking high-speed conditions. The final shape of the plane resulting from these tests and design changes was bizarre by any standards of the time. It became a joke to claim that the F-4 performed better flying backwards.[30] These design choices, emphasizing high speed and lack of maneuverability – the latter so much so that tight maneuvering risked the pilot's life via roll coupling – all reflected the doctrinal and systematic influences which exalted the interceptor role at the expense of the air superiority mission.

Problems expanded as McDonnell experienced great difficulty in the development of parts and subsystems for the various prototypes in what one historian labeled, “a maelstrom of constant design changes.”[31] Due to advances in technological complexity, these subsystems required a deeper level of integration with the plane's structure than earlier generations of aircraft. Frequent design changes, initiated by the Navy, often necessitated alterations to the entire aircraft. McDonnell subcontracted many of these systems to various developers, who designed them for specific roles the Navy had in mind for the F-4. Yet these systems often created new, unique problems.

One of the key systems was the Central Air Data Computer (CADC), an analog computer that continuously monitored information from outboard sensors, recalculating and correcting data to ensure the plane’s instruments displayed accurate information. The CADC integrated with other key equipment, such as the intake ramps, bombing and navigation systems, missile fire controls, and the autopilot system. The F-4 also relied on large radar systems. The primary radar, designed by Westinghouse, had to tie to smaller radars in the Raytheon-designed AIM-7 Sparrow missiles. Westinghouse continually upgraded their equipment until 1963, when they took over the contract for missile firing systems from Raytheon, allowing them to more smoothly integrate these systems.

Balancing all of this complex equipment caused severe problems with electromagnetic interference. Sensors and other devices used competing radio signals to communicate and often

[30] Lou Drendel, *F-4 Phantom II's in Action* (Warren: Squadron/Signal Publications, 1972), 6.
[31] Bugos, *Engineering the F-4*, 93, 49.

interfered with each other. In an extreme example, one pilot's plane lost control every time he spoke certain words into his headset. His particularly low voice happened to resonate at the same frequency as the radio signal involved in the autopilot system sensors, thus his voice would activate the autopilot system and cause the plane to veer out of control. Designers regarded the production process as too advanced to correct this flaw and simply placed a warning against this in the manual.[32]

These subsystems each increased the Phantom's performance in particular roles. Separately, they all worked well, but in combination, the plane buckled under the weight of “mission creep,” the tendency to add functionality to multi-mission craft. These additions came at the price of air-to-air combat performance, as none of the subsystems focused on close-range fighting or maneuverability. The F-4's internal systems, like its airframe design, proved to be successful in the areas the military deemed important for the hypothetical next war with the Soviet Union, but they created severe problems felt by many pilots in the unique environment of Vietnam.

Though the paternal bond between the Navy and its developers was strong, the military was loathe to place all its eggs in one basket.  While The Navy could not legally release design specifications for the developing F-4 to competing firms, it could solicit proposals for other planes in the same mission roles, primarily that of interception. Timmes did exactly that in August 1955. The company that stepped up to the plate was none other than McDonnell's old nemesis: Chance-Vought. Vought had developed an upgraded version of their successful F-8U Crusader, the very plane that had beaten McDonnell's F3H Demon.

Both planes impressed BuAer, which wanted both to enter production, but the Chief of Naval Operations deemed this too costly and demanded that the Navy would only produce one, fueling the already intense rivalry between the companies and culminating in an unofficial flyoff beginning on 15 September 1958. The tests emphasized the interceptor role, focusing on maximum speed and climbing rates at various altitudes. The assessments did not include maneuverability, gunnery, and other metrics

[32] Bugos, *Engineering the F-4*, 61-2, 64-5, 85-6, 92, 68-9.

pertinent to air-to-air combat, as doctrinal assumptions had almost completely erased their relevance.

In every tested category, the F8U-3 Crusader proved superior. It even had better fuel mileage. Its only drawbacks were a lower payload and time-consuming maintenance requirements. Despite this, George Spandenberg, then the director of BuAer's Evaluation Division, considered single-seat, single-engine planes inherently unreliable and thought a two-seat plane would boost morale, boldly asserting, “The single-seat fighter era is dead.” Thus, advocates of the F-4 often claim the Phantom “won” the contest while a close look at the flyoff reveals the upgraded Crusader had clear performance advantages in every category. In February 1959 McDonnell received a contract for the production of twenty-four Phantoms. By September, the number increased to 133.[33] The decision to rely on two-seat, two-engine aircraft necessitated larger planes. This size differential between the F-4 and the enemies it later faced in Vietnam further limited its effectiveness in air combat.

Despite the Phantom's lackluster performance at the flyoff, it was still an impressive aircraft in many respects. Between December 1959 and April 1962, the F-4 set over a dozen world records, the most coveted (and revealing of the plane's doctrinal design focus) of which was that of absolute top speed: 1,606.3 miles per hour.[34] The Air Force observed these record-setting demonstrations and grew interested in the plane's usefulness as a strategic bomber, able to deliver nuclear warheads quickly over vast distances.[35] Yet these tests did not evaluate the Phantom’s performance in typical air combat roles.

The F-4 also possessed many problems that came back to haunt the military over the jungles of Vietnam and that appear almost negligent in retrospect. One gaping flaw was its horrid visibility, mostly to the rear, especially dangerous since most air-to-air threats originated from behind. The engines also produced gigantic streams of thick black smoke that gave away the locations and heading of all Phantoms in the air. Engineers had developed a makeshift solution to the smoke problem, at the

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[33] Davies, *F-4 Phantom II vs MiG 17/19*, 16; Drendel, *F-4 Phantom II's in Action*, 6; Bugos, *Engineering the F-4*, 95-9.
[34] Mick Spick, *All-Weather Warriors: The Search for the Ultimate Fighter Aircraft* (London: Arms and Armour Press, 1994), 131; Angelucci and Bowers, *The American Fighter*, 310-1.
[35] Bugos, *Engineering the F-4*, 104.

cost of a few thousand dollars per plane. Pressured to limit expenses, military planners found it cheaper to allow this smoky bull's-eye to hover over their pilots. The F-4's radio – vital in combat situations – was notoriously unreliable and the plane was extremely vulnerable to ground fire because of its delicate hydraulic systems. This was a particularly potent flaw as ground fire was one of the largest threats faced in Vietnam, causing more aircraft losses than anti-aircraft artillery (AAA), surface-to-air missiles (SAMs), MiG fighters, and friendly fire combined.[36] The F-4 was also the first plane bereft of an internal gun, which caused the loss of several kill opportunities and sparked heated discussion among pilots and engineers until a later Air Force model added a cannon. By far the worst and most dangerous problem of the F-4 was that of "departure," also known as the "Adverse Yaw Effect," the tendency to lose control and stall during hard maneuvers. Disturbed airflow over the plane rendered the control surfaces ineffective and the pilot incapable of guiding the aircraft. Pilots rarely received training in correcting and preventing departure. The conditions creating this hazardous situation were more likely to occur in air-to-air combat, where agility and maneuverability are required.[37]

The election of John F. Kennedy brought changes in military policy, most importantly the adoption of a strategy of "flexible response" as opposed to the Eisenhower concept of massive retaliation. Rather than focusing on the ability to annihilate the Soviet Union at a moment's notice, the Air Force took on a variety of new roles such as airlifts, rapid deployment, counterinsurgency, and the training of native air forces. Flexible response doctrine dictated that the Air Force be able to handle varying levels of conflict and conventional war, not just a hypothetical nuclear war. This increased the role of TAC significantly, and further fostered an emphasis on versatility in its aircraft.[38]

The new Secretary of Defense, Robert McNamara, was keen to save as many dollars as

[36] For more on radio and equipment problems, see Richard S. Ritchie, United States Air Force Oral History Program, Interview #K239.0512-630, 11 Oct 72 and 30 Oct 72, 8. Hannah, *Striving for Air Superiority*, 70, 73. Across the Air Force, Navy, and Marines combined, from January 1962-January 1973, 930 planes were lost to small arms ground fire, or, 45% of losses by known causes. AAA claimed 632, SAMs shot down 191, MiGs destroyed 79, and friendly fire claimed 25.

[37] Hannah, *Striving for Air Superiority*, 54-57, 63-4; Marshall Michel, Clashes, 85-6; Clodfelter, *Limits of Airpower*, 133.

[38] Bernard C. Nalty, ed., *Winged Shield, Winged Sword: History of the United States Air Force Vol 2* (Washington, D.C.: Air Force History and Museums Program, United States Air Force, 1997), 173, 209-10.

possible, accomplished through an increased emphasis on versatile, multi-mission planes and an insistence on the new concept of "commonality," dictating that the different service branches (especially the Air Force and Navy) share the same aircraft.[39] The versatile F-4 epitomized the concept of flexible response. McNamara was convinced that the Phantom, originally designed for bomber interception and tactical nuclear delivery, would be equally effective in a conventional war in the various levels of conflict dictated by flexible response. The Air Force assumed the Phantom was effective in the air-to-air combat role against Soviet fighters because in a flight test, it outmaneuvered another Air Force interceptor, the F-105 Thunderchief.[40] This however was an unfair comparison. The F-4 was indeed more maneuverable than the F-105, but the Thunderchief was a high-speed interceptor and ground attack craft, purposely lacking in maneuverability, and it in now way compared to the agile, small soviet MiG fighters that the F-4 later faced in the skies of Vietnam.[41]

The Air Force eventually ordered more than triple the number of Phantoms as the Navy, lending considerable weight to their many modification requests made in August 1962. McDonnell eventually created four new models of the Phantom to Air Force specifications, the first and most significant of which was the F-4 C.[42] While Navy designs conceived of the plane as tied to the carrier itself, the Air Force desired a more autonomous aircraft. The first change was new power plants enabling the engines to start with less support equipment, allowing operations at distant forward air bases. Unhampered by carrier landing requirements, USAF Phantoms could carry more ordnance, fuel, and on-board equipment than their Navy counterparts, but the additional weight and the thinner paved runways used by the Air Force necessitated changes to the Phantoms tires and braking systems. Designers attempted to lower instrument panels to improve cockpit visibility. The C model placed flight controls in the

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[39] Bugos, *Engineering the F-4*, 117-8.
[40] Nalty, *Winged Shield, Winged Sword*, 186, 199.
[41] Bugos, *Engineering the F-4*, 116-120.
[42] Anthony M. Thornborough, *USAF Phantoms: Tactics, Training, and Weapons (*New York: Arms & Armour Press, 1988), 11-12; Bugos, *Engineering the F-4,* 115. In Navy designs, the backseat pilot was a radar operator and weapons officer with no access to flight controls.

backseat and improved the computers to allow for vastly improved autopilot and navigation systems. These navigation systems integrated with the bombing targeting system, increasing the Phantom's effectiveness in ground attack roles. However, bombing was still a complex, manual system that relied on crew expertise and required pilots to memorize tedious charts detailing proper bomb release points for various altitudes and angles of attack.[43]

The F-4 Phantom II's design process was the epitome of both the dominance of the strategic bombing mission and flexible response doctrine. Originally conceived as an interceptor and soon burdened by “mission creep” that insisted it handle multiple roles, the plane was the poster child for pre-Vietnam Air Force doctrine, namely, the quasi-religious devotion to strategic bombing that minimized all other roles of airpower, especially air superiority. War planners designed planes either to deliver nuclear weapons, or to intercept enemy bombers. Air superiority was dead. Thus the F-4 was a fighter plane possessing few characteristics of traditional fighters. It was large, cumbersome, and built around the concept of long range attacks, sacrificing the agility and armament necessary of true air superiority craft. The plane was also plagued with technical problems such as the notoriously faulty radios, high risk of departure, and tell-tale black smoke trails.

The F-4 was not even the best performing plane in the roles it was assigned. During its design process, it proved inferior to Vought's upgraded Crusader prototype in every tested category. It had originated as a project the Navy did not ask for, but funded in order to save McDonnell, which it viewed as too big to fail. It was kept from joining the pile of discarded prototypes only because of Navy leadership's predetermined preference for dual-seat, twin-engine aircraft. Finally, the Air Force adopted the Phantom largely because the craft proved more versatile than its other interceptors at a time when Defense Secretary Robert McNamara was pushing the concept of commonality that emphasized multi-role planes used by multiple branches.

The F-4 was exactly the plane the military wanted it to be: a high-speed, poorly maneuvering

[43] Thornborough, *USAF Phantoms*, 11-12; Bugos, *Engineering the F-4*, 115.

interceptor based on long-range attacks that could also service ground attack and support missions. While the Phantom would undoubtedly have performed extremely well in its designed role of intercepting enemy bombers, it ironically never had to. Instead of saving the world from nuclear Armageddon in the hypothetical World War III, the F-4 instead flew in a limited war over the jungles of a tiny third world country that many Americans had trouble locating on a map. The enemies it faced were not large lumbering bombers threatening nuclear annihilation, but missiles, ground fire, and maneuverable MiG fighters much more adept at air combat. Statistically, the deadliest enemy for the Phantom, one of the most powerful and expensive planes in U.S. history to that point, was an individual on the ground with a small machine gun.

Ultimately, the F-4 Phantom II was a jack-of-all-trades and master of none, sacrificing specified excellence for versatility. While strategic bombing, although controversial, made sense when warring against fully industrialized modern nations, the concept was highly flawed in limited wars against nonindustrial societies. The United States thus entered war in Vietnam with aircraft and an airpower doctrine completely unsuited for the type of warfare it found there. Similar to the doctrine that spawned it, the F-4 was the right plane for the wrong war.

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