

An Examination of the F-8 Crusader through Archival Sources

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Abstract

This article uses recently released U.S. Navy documents and also correspondence with pilots and maintainers to add to existing biographies of the Vought F-8 Crusader in service with the U.S. Navy in Vietnam. It examines the common claim that the F-8 was ‘the last of the gunfighters’ and shows that as per Navy tactical doctrine its pilots actually used AIM-9 Sidewinders as their primary weapon. The capability of the F-8’s avionic equipment is examined, and it is shown that the stresses of carrier operations degraded their reliability. The aircraft required ground control intercept support to achieve a kill. Information on effective tactics for interceptions is provided, showing the value of the ‘loose deuce’ pair of aircraft operating together. Finally, a comparison is made between the F-8 and the F-4 which replaced the F-8 in U.S. Navy service progressively up to 1976.

This article reflects the views of the author and does not reflect the policy of the U.S. Government, the Department of Defense, the U.S. Air Force, nor Air University

1. Introduction

When the United States escalated its involvement in the Vietnam War in 1965, one of the two fighters the Navy and the Marine Corps utilized was the F-8 Crusader (Figure 1). Each of the five Essex-class attack carriers then in commission utilized two squadrons of these jets, and larger carriers cruised with one squadron alongside F-4B Phantoms. The latter practice continued until 1966, when the Navy had enough Phantoms to provide each of its large carriers with two F-4 squadrons.¹ Crusaders remained frontline fighters until March 1976 when the Navy decommissioned the last two American carriers to employ them: the USS Hancock and the USS Oriskany (Figure 2).



Figure 1 A Vought F-8J Crusader of VF-24
Source: US Navy

¹ The USS Coral Sea was the last carrier outside of the Essex class to utilize F-8s in 1965, during which VF-154 deployed. Vietnam Aircraft Carrier Deployments. Naval History and Heritage Command, hereafter referred to as “NHHC.” www.history.navy.mil. The Navy modified fourteen WWII-era Essex class aircraft carriers during the 1950s so as to be able to operate high-performance jets. These improvements included an angled deck and two powerful steam catapults. Seven received the SCB-27C upgrades: Intrepid, Ticonderoga, Lexington, Hancock, Bon Homme Richard, Oriskany, and Shangri-La. Norman Friedman, *U.S. Aircraft Carriers: An Illustrated Design History* (Annapolis: Naval Institute Press, 1983), 295-96, 413.

F-8s achieved fourteen kills against MiG-17s and shot down four MiG-21s during the Vietnam War, while MiG-17s shot down only three Crusaders, a ratio which has fueled interest in its capabilities as an air-to-air fighter ever since. This article adds to the biography of this aircraft through the use of U.S. Navy documentary sources gathered while conducting research for a larger work on the Vietnam War at the Naval History and Heritage Command - the U.S.



Figure 2 USS Hancock (CVA-19) 1968, F-8s and A-4s on deck Source: US Navy

Navy's historical archive; these documents were not available to researchers until the past few years. The utilization of these sources is this article's main contribution to Naval aviation history. In addition, it also makes use of information gathered from pilots and maintainers of this important aircraft via email correspondence. Finally, the article reminds readers that the U.S. Marine Corps utilized the F-8 in combat as a ground attack aircraft in Vietnam from 1965 to 1968.

This article does not make a comprehensive use of histories of every F-8 squadron that saw combat in southeast Asia because there are unfortunately several gaps in the written official squadron histories in the Naval History and Heritage Command files. There is no file at all for 1967 for VF-211, for example, which is regrettable since its aviators shot down 4 MiGs that year. The squadron histories for VF-111 and VF-194 provided little information on the capabilities and use of the F-8, and no history for VF-191 from 1971 through 1974 is filed at the NHHC. Some squadrons' histories are chronicles or lists of accomplishments that do not address or analyze the F-8 Crusader's qualities. The officers of those squadrons were preoccupied with fighting a war, which certainly affected the time available for documenting their achievements.

2. Reputation

One of the common claims about the F-8 series was that it was 'the last of the gunfighters,' the last purpose-designed American fighter with guns for destroying other aircraft.² This

² Eileen Bjorkman, "Gunfighters," *Air & Space Smithsonian* 30: 5 (October/November 2015): 60, Steve Davis, *Red Eagles: America's Secret MiGs* (Oxford: Osprey Publishing, 2008) 47. Peter B. Mersky, "Vought F-8 Crusader," *Wings of Fame* Volume 5 (1996), 32. Zalin Grant, *Over the Beach* (New York: W.W. Norton & Company, 1986), 27. Gilchrist, *Last of the Gunfighters*, 9. John B. Nichols, *On Yankee Station: The Naval Air War over Vietnam* (Annapolis: Naval Institute Press, 1987), 3. Bill Gunston, *Early Supersonic Fighters of the West* (London: Ian Allan, Ltd, 1976), 255. Barrett Tillman agrees that the AIM-9 was "the Crusader's primary weapon." Barrett Tillman, *MiG Master: The Story of the F-8 Crusader* (Nautical and Aviation Publishing Company of America, 1980), 71.

branding has been overplayed. In actuality, missiles were the F-8's primary weapons; its guns were 'secondary'.³ From the late 1950s to around 1965 Western air forces bought into a belief that the new technology of the guided missile had rendered guns obsolete, but the limitations of missiles quickly proved the need for guns on fighters. By 1965 the U.S. Air Force was already looking into using a 20mm gun pod designed for air-to-ground use as an air-to-air weapon by its gun-less F-4C and F-4D fighters.⁴ An F-8's AIM-9 Sidewinder infrared guided missiles (Figure 3) had greater range than its four Mark-12 20mm cannon, and the F-8's guns had a problem with becoming jammed during firing.⁵ One early study concluded that while they were "effective when available," its 20mm cannons were "generally unreliable." Up to December 1966, they either jammed or failed to fire completely "during three of the eight" times they were used against MiGs.⁶ F-8s may have shot down two MiGs with their guns, and possibly a third,⁷ but normally the guns worked only when no G forces were being applied to the airframe, namely 'strafing' targets on the ground⁸ or when fired against a non-maneuvering MiG that was unaware of its enemy's presence behind it. Sustained gun firing was normally possible only by not exceeding one G.⁹

'Nickel 101' may have shot down a MiG-17 with cannon fire on 21 June 1966. According to the contemporary account, Lieutenant Eugene Chancy unleashed "a 20mm burst" at a pair of MiGs as they flew from starboard to port, and then saw jet fuel streaming from one of them. That one was considered "damaged and possibly destroyed." Another F-8's guns jammed



Figure 3 AIM-9C and D Sidewinders on an F-8E Source: US Navy

³ Commander in Chief U.S. Pacific Fleet, "F-8 Weapons Performance against MiG-17 Aircraft," 24 December 1966. Vietnam Command Files, COLL/372, Box 112, File CPF Staff Study 13-66. NHHC. The F-8A, B, and C variants also carried 2.75 inch rockets in the speed brake underneath the fuselage. Mersky, *Vought F-8*, 35.

⁴ Directorate of Operations, History, Assistant for Requirements & Systems Programs, November 1965. K717.01, Jul-Dec 1965, vol. 3, pt. 1. Air Force Historical Research Agency, Maxwell AFB, AL. *History of the Tactical Air Command, July 1962 - December 1962*, 238-39. K417.01, July-Dec 1962, vol. 1. Air Force Historical Research Agency (AFHRA). Excerpt Declassified IAW EO13526, March 2012.

⁵ "Navy MiG Encounter," 14 July 1966. Reference Files, Vietnam, A-Air Warfare (I), Vietnam Air Ops MiG Combat Folder. NHHC. "F-8 Weapons Performance against MiG-17 Aircraft."

⁶ "F-8 Weapons Performance against MiG-17 Aircraft."

⁷ Commander in Chief U.S. Pacific Fleet, U.S. Air-to-Air Activity in Southeast Asia July to December 1967, Staff Study 9-68, 31 August 1968, 52. NHHC.

⁸ Commander R. F. Aumack, Commanding Officer Fighter Squadron One Six Two to Chief of Naval Operations, 1967 Command History, 6 May 1968. Fleet Aviation Commands Pre-1998, AR/229, VF-162, Box 277, File F6. NHHC.

⁹ Enclosure 1: Fighter Squadron One Six Two Command History, 1967. Fleet Aviation Commands Pre-1998, AR/229, VF-162, Box 277, File F6. NHHC.

during that fight.¹⁰ One combat squadron, VF-24, concluded that the problems with the F-8's Mark 12 cannon were serious. "The F-8C Crusader 20mm cannon weapon system proved unsatisfactory under prolonged combat conditions. Although one MiG-17 was downed by 20mm cannon fire, it was done at very close range without the aid of the lead computing gunsight, and under low 'G' flight conditions. Overall reliability of system was unsatisfactory for combat requirements."¹¹ The cannons jammed or did not fire at all "during 3 of 8 engagements involving 20mm firings" through 18 September 1966. Furthermore, during these early engagements, most pilots used their guns "from poor firing positions." Only one of these gun firings scored hits on a MiG-17.¹² VF-24 improved the guns' reliability with "excellent preventive maintenance," but contended that the cannon firing pattern was not tight enough.¹³

The F-8 was actually a missile-first fighter with guns. Its infrared-homing AIM-9D Sidewinders were more reliable than its 20mm cannon. Sidewinders performed pretty well when fired within their parameters; the six out of eleven fired through 1966 that missed did so because the pilot fired them before the aircraft was in a position from which the missile could track and guide on its target. Of the three missiles that tracked, one was fired too far behind the MiG, but the other two destroyed their targets.¹⁴ Although the AIM-9D was a good missile, its reliability deteriorated in service. Commander J.D. Ellison wrote that high-G flight, multiple arrested landings and catapult shots, and repeated flights over months, eroded the missile's reliability.¹⁵ F-8 pilots achieved all but two of their 18 MiG kills with the AIM-9D.¹⁶

Ultimately guns and missiles complemented each other. Commander Lowell R. Myers, for instance, maneuvered his F-8 behind an aggressively flown MiG-21 on 26 June 1968. He fired his guns at the MiG, which induced its pilot to "panic," and zoom up into the sky above. That gave the Crusader's AIM-9Ds a distinctive heat signature without any distracting

¹⁰ Message from CTG 77.3 to CINCPAC/NMCC, 212246Z June 1966. Reference Files, Vietnam, A-Air Warfare (I), Vietnam Air Ops MiG Combat Folder. NHHC. Bruce F. Powers, OEG Representative to Commanding Officer, USS Hancock, "Analysis of MiG Encounter by USS Hancock Aircraft, 21 June 1966. K160.043-51 21 June 1966. Declassified IAW EO 12958 by Executive Order Review Team on 1 August 2001. AFHRA. "F-8 Weapons Performance against MiG-17 Aircraft."

¹¹ Commander J.D. Ellison, Commanding Officer, Fighter Squadron Twenty-Four to Chief of Naval Operations, Command Histories 1967, 26 February 1968. Fleet Aviation Commands Pre-1998, AR/229, VF-24, Box 249, File F31. NHHC. See also, Institute for Defense Analyses, Air to Air Encounters in Southeast Asia, Volume I, Event I-38: "Cannons were completely unreliable, particularly in high G environment."

¹² "F-8 Weapons Performance against MiG-17 Aircraft."

¹³ Commander M.H. Isaacks, Commanding Officer, Fighter Squadron Twenty-Four to Chief of Naval Operations, Command Histories 1968, 20 February 1969. Fleet Aviation Commands Pre-1998, AR/229, VF-24, Box 249, File F30. NHHC.

¹⁴ "F-8 Weapons Performance against MiG-17 Aircraft." AIM-9Ds began replacing AIM-9Bs in the Navy in 1965. <http://www.designation-systems.net/dusrm/m-9.html>. See also <http://www.chinalakemuseum.org/exhibits/sidewinder.shtml>

¹⁵ Fighter Squadron Twenty-Four to Chief of Naval Operations, Command Histories 1967, 26 February 1968. NHHC.

¹⁶ Tillman, *MiG Master*, 205.

infrared in the clear cold background of the sky. Myers watched this unfold, fired a missile, and saw it fly up the MiG-21's afterburner and explode.¹⁷

3. Avionics and Capabilities

The F-8D and F-8E versions are sometimes referred to as 'all-weather fighters', but this is a bit overplayed.¹⁸ All fighters of this era needed either a surface radar station or an airborne radar platform to find the enemy at longer range and guide the fighter to a point where it could lock on to the enemy and take over the intercept itself. While the initial version of the Crusader, the F-8A, possessed nothing more than a ranging radar for its guns, Crusaders beginning with the B model had air-intercept radars. The F-8C's AN/APS-67 could lock on to a target at 16 miles, but with "no angle tracking." Al Lansdowne found the F-8D's AN/APQ-83 to be an improvement,¹⁹ but Jim Alderink, one of the first Top Gun instructors, regarded that radar to be a piece of garbage, and it did not help that pilots did not get enough time to train in using the radar in flight.²⁰

The F-8E's AN/APQ-94 could detect aircraft at longer ranges than those on earlier marks of the F-8, and the 'screen resolution' was "somewhat better", making it easier for pilots to use.²¹ It could detect a MiG-sized aircraft as far out as 30 miles,²² and it might detect a larger aircraft at 50-60 miles.²³ VF-53 found the "APQ-94 reliability [to be] high, and routine BARCAP/FORCECAP tactics were predicated on its utilization." Pilots relied on it during night operations but emphasized visual searches during daytime.²⁴ The AN/APQ-94 could track targets 45 degrees off centerline and 30 degrees down, and it included upgrades to improve its abilities against MiGs: "guns automatic ranging only and . . . boresight angle track." The radar could achieve a lock-on at 25 miles, and functioned in the "X-band

¹⁷ Thomas F. Gates, "Fighter Squadron Fifty-One (VF-51) Screaming Eagles," (1996), 10. Fleet Aviation Command Files, AR/229, Box 255, File F14. NHHC.

¹⁸ Tommy H. Thomason, *U.S. Naval Air Superiority: Development of Shipborne Jet Fighters, 1943-1962* (North Branch, MN: Specialty Press, 2007), 258. Gunston, *Supersonic Fighters*, 250, 253.

¹⁹ Email correspondence with Al Lansdowne, October 7, 2014.

²⁰ Email correspondence with Jim Alderink, September 13, 2014.

²¹ Email correspondence with Hamilton Hicks, September 11, 2014.

²² Message from CTG Seven Seven Pufive to RULLHQ/CINCPAC, "DRV Air Activity," 9 January 1966. K740.04-25, 60/03/18 - 68/02/19. AFHRA. Institute for Defense Analysis, "Air to Air Encounters in Southeast Asia, Vol. I," 1967, Event I-13, p. 103. Email correspondence with Al Lansdowne, October 7, 2014.

²³ Email correspondence with Al Lansdowne, October 7, 2014. Email correspondence with with Cole Pierce, September 28, 2014.

²⁴ Commander Robert E. Weedon, Commanding Officer, Fighter Squadron Fifty-Three to Chief of Naval Operations, 1968 Command History, Enclosure No. 1: Employment of the F-8E. Fleet Aviation Commands Pre-1998, AR/229, VF-53, Box 257, File F3. NHHC. Email correspondence with Cole Pierce, September 28, 2014.

frequency between 8,700 and 9,600 megacycles". The F-8E also had an AN/AAS-15 infrared search and track system which displayed the azimuth of the target on the radar screen.²⁵

When Vought upgraded 136 F-8Es to the F-8J variant, the avionics that came with it received mixed reviews from the fleet. According to one veteran the new radar was not reliable.²⁶ The Fleet Replacement Squadron, VF-124, found that "Although all modified F-8Js were fitted with an updated radar (the APQ-124 which replaced the APQ-94) which increased performance, range, and reliability, it was discovered that the modulators in the new radar failed frequently; thus, many fitted radar systems remained un-repaired while new modulators were supplied to fleet squadrons having higher priority on parts replacement."²⁷ A veteran of the first squadron to take F-8Js to the Tonkin Gulf, John Braly of VF-162, had nothing good to say about this variant. According to Braly, "The project test pilot, LCDR Ken Billue, had recommended it was NOT ready for fleet use, too many problems." Braly noted that this was second hand information. He added, "I think the feelings of most of us that had good F-8 experience was that they took a perfectly good plane, the F-8E, and really screwed it up with added weight, a heavy Magnavox pulse-doppler radar that never worked, the BLC [boundary layer control] which slowed it up, but required too much power to maintain the glide slope and left nothing but after-burner to wave-off if needed, and downsizing of our 20mm ammo cans to make room for worthless ECM gear."²⁸ Pilots of VF-191, on the other hand, appreciated the intercept capabilities of the F-8Js when they received them in November 1968,²⁹ and those of VF-51 found it easier to land because of the boundary layer control system.³⁰

There were reasons for attempting to upgrade the F-8E. Every version was difficult to land on an aircraft carrier - hence the variable incidence wing that pivoted so as to lower the nose at approach speeds so that the pilot could see where he was going.³¹ In 1966, for instance, F-8s suffered an accident rate of 3.26 per 10,000 flying hours. Only the A-4E Skyhawk approached that rate, and the rate for the F-4 was only 2.72.³² The J-model upgrades produced a mixed

²⁵ Annex A, Commander W. A. Gureck, Commanding Officer, Fighter Squadron Fifty-Three to Chief of Naval Operations, Command History 1966, 17 March 1967. Fleet Aviation Commands Pre-1998, AR/229, VF-24, Box 257, File F5, NHHC.

²⁶ Email correspondence with Jim Alderink, September 13, 2014.

²⁷ Commander W. I. Parrish to Chief of Naval Operations, Command History 1969 Fighter Squadron 124, 19 February 1970. Fleet Aviation Commands Pre-1998, AR/229, VF-124, Box 271, File F2. NHHC.

²⁸ Email correspondence with John Braly, September 11, 2014. Boundary layer control was not helpful because it bled air away from the engine, degrading engine performance. Captain Scott Horadan, USN, discussion on November 17, 2015.

²⁹ Commander C.H. Tuomela, Commanding Officer, Fighter Squadron One Hundred Ninety One to Chief of Naval Operations, 1968 Command History, 24 March 1969. Fleet Aviation Commands Pre-1993, AR/229, Box 278, File F10. NHHC.

³⁰ "Fighter Squadron Fifty-One (VF-51) Screaming Eagles," (1996), 10. Boundary layer control blew air taken from the engine over the wings in order to generate more lift at low speeds.

³¹ Tillman, *MiG Master*, 9, 26-28. Sherwood, *Afterburner*, 191. Grant, *Over the Beach*, 27.

³² H. H. Long, 1st Marine Aircraft Wing Command Chronology, February 1967. www.vietnam.ttu.edu. The Vietnam Project at Texas Tech University has scanned most U.S. Marine Corps records connected to the Vietnam War and posted them on the www.vietnam.ttu.edu website. The specific collection is, "U.S. Marine Corps History Division Documents."

bag of consequences for the aircraft's performance. On the one hand the F-8J had a boundary layer control wing which lowered the approach speed by 15-18 knots, a larger horizontal control surface, armor plating, the ALQ-100 and APR-30 for ECM, the new radar, and modifications to the airframe that extended its life to 4000 hours. On the other hand, this added 2,000 pounds to the aircraft's weight, and the use of engine bleed air for the boundary layer control reduced thrust by 1,000 pounds. It was slightly less maneuverable in combat. The F-8J lacked enough engine power "for a carrier deck technique or bolter approach wave off" when carrying 2 AIM-9Ds and 200 rounds of 20mm ammunition if the air temperature was greater than 85 degrees. The temporary fix was to land with minimum fuel, and the permanent fix was the more powerful J57-P420 engine, which VF-53 got before the 1970 cruise.

This squadron was not entirely pleased with the F-8J. Its maintainers found servicing the radar more challenging, and they did not have access to enough spare parts. The new wing developed cracks, but these were fixed before the 1970 cruise. The jet's center of gravity was now more forward than before which caused greater stress on the nose gear. The work around was to carry two instead of four AIM-9D missiles - less weight forward.³³ In the high temperatures of the Tonkin Gulf, Cole Pierce warns, "The F-8J was flat out dangerous . . . If a pilot developed a sink rate on close approach to the carrier, an afterburner wave-off may have been his only option."³⁴ Jim Alderink used the same language: "dangerous," and added, "in hot humid weather should not have been operated. There are many tales of 20 degrees angle of bank, full military power, on speed, and couldn't maintain altitude."³⁵ William Wright found it "easier to land" than an F-8E because its approach speed was slower, but "harder to power out of trouble."³⁶ With the added weight the F-8J did not "turn as well" as the F-8E, but the uprated J57-P420 (19,600 pounds of thrust) managed to compensate to an extent.³⁷

Pilots did not find the aircraft's radar that useful. Over and near Vietnam, pilots used their radars mainly to join up with other aircraft in the strike package or locate a tanker aircraft. "Fighter pilots did not stick their heads into radar scopes over North Vietnam, ever!"³⁸ Dave Woltz explained, "When flying over N. Viet Nam I can't think of any pilots who would consider even looking inside the cockpit to look at a radar that was probably marginal at best. The threat from SAMs and AA fire was always present and you needed to see it." Woltz reminds us of the difference between the radar's reliability in an ideal situation, and during carrier operations in the tropics. In his experience the jets' radars all worked well at the

³³ Enclosure: Employment of the F8J, 1969-1970. Fleet Aviation Commands Pre-1998, VF-53, AR/229, Box 257, File F1. NHHC.

³⁴ Email correspondence with Cole Pierce, September 28, 2014.

³⁵ Email correspondence with Jim Alderink, September 13, 2014.

³⁶ Email correspondence with William W. Wright, September 13, 2014.

³⁷ Email correspondence with Jim Alderink, September 13, 2014. NATOPS Flight Manual, F-8H and F-8J Aircraft, 1 May 1974, NAVAIR 01-45HHE-1, page 1-6. Mersky, *Vought F-8 Crusader*, 128.

³⁸ Email correspondence with Al Lansdowne, October 7, 2014.

beginning of a cruise, but the banging and shaking of takeoffs and landings, the heat, and the saltwater quickly took a toll on these vacuum-tube pieces of technology.³⁹

A study of a period of great MiG activity, July through December 1967, shows that F-8s never made first contact with MiGs via radar detection with their AN/APG-94 sets.⁴⁰ One pilot even responded that the “onboard radar was useless.”⁴¹ Another was marginally less critical, noting that they often did not function; it was unusual for a two-jet tactical element of F-8s flying a night mission to have one working radar among them.⁴² The radar was a circa 1960 machine with vacuum tubes, moving parts and hydraulic fluid, all of which combined to lower reliability and made for compounding difficulties in maintaining and repairing the device.⁴³ James O’Quinn found it about as user-unfriendly for maintenance sailors as one can imagine.⁴⁴

For day fighter missions F-8s carried either two or four AIM-9Ds in addition to their 20mm ammunition; at night they carried an AIM-9C along with an AIM-9D. The D was a stern aspect heat-seeking guided missile, while the C was the same missile body with a semi-active radar homing seeker.⁴⁵ Not often carried, and then so in tandem with AIM-9Bs or Ds, a Crusader pilot did try to use an AIM-9C during a May 1, 1967 engagement but was unable to do so because of the clutter of ground returns.⁴⁶ F-8 pilots did not fire the AIM-9C that often, but squadrons trained with the AIM-9C through 1969. In fact, during a 1968 run-up for a cruise, Lieutenant Commander Richard Taylor of VF-211, “destroyed the first BQM-34 [target drone] from a ‘head on’ aspect with a radar guided AIM-9C missile.”⁴⁷ When Cole Pierce observed one of his squadron mates in VF-221 shoot down a drone with an AIM-9C, he found that persuasive enough to always carry one on his “subsequent MIGCAPs and TARCAPs [Combat Air Patrols against MiGs and Target Combat Air Patrols flown to protect specialized attack aircraft such as AC-130 gunships from enemy fighters].”⁴⁸ Pilots of the new F-8J found that the APQ-124 “proved marginally suitable for AIM-9C missile

³⁹ Email correspondence with Dave Woltz, September 11, 2014.

⁴⁰ Staff Study 9-68, 31 August 1968, 24.

⁴¹ Email correspondence with William W. Wright, September 13, 2014.

⁴² Email correspondence with Jim Alderink, September 13, 2014.

⁴³ Email correspondence with Randy Kelso, September 13, 2014. Mr. Kelso was an aviation fire control technician second class, VF-154, USS Coral Sea, 1964-1966.

⁴⁴ Email correspondence with James O’Quinn, care of Randy Kelso, September 13, 2014. O’Quinn was an Aviation Electronics Technician (Radar) Second Class.

⁴⁵ Fighter Squadron Fifty-Three, Enclosure No. 1: Employment of the F-8E. Enclosure 4: Fighter Squadron One Six Two Command History, 1967. Fleet Aviation Commands Pre-1998, AR/229, VF-162 Box 277, File F6. NHHC.

⁴⁶ Institute for Defense Analysis, “Air to Air Encounters in Southeast Asia, Vol. III,” 1969, Event III-194, p. 222.

⁴⁷ Commander R.A. Van Arsdol, Commanding Officer Fighter Squadron Two Hundred Eleven to Chief of Naval Operations, 1968 Command History, 18 February 1969. Fleet Aviation Commands--Active, VF-211, Box 160, File 1968. NHHC. The BQM-34 was a programmable target drone.

⁴⁸ Email correspondence with Cole Pierce, September 28, 2014.

guidance.”⁴⁹ Logistical and maintenance support for the radar-Sidewinder, however, was inadequate, and the Navy shelved the AIM-9C in 1969 because its launch envelope was “too restrictive,” the missile was too maintenance-intensive, and because the Navy lacked the money to complete a much-needed “major rework” of the missiles. This action “reduced the F8J’s all-weather capability and seriously degraded the Night BarCap threat response capability [Barrier Combat Air Patrols flown between a carrier battle group and the direction from which it is most likely that an enemy attack will come].”⁵⁰ At this stage of the game, however, the retirement of this missile was not a serious loss for the Navy, because from 1969 the fleet would have only five, and soon just two, Essex class attack carriers, which remained in service through 1976. All other carriers utilized two F-4 Phantom squadrons each, which had a better radar-guided missile capability in the AIM-7E-2 than the F-8’s AIM-9C.⁵¹

AIM-9Ds functioned fairly well, but mounting them and then dismounting them a lot could result in cracked motors, and that could result in a missile exploding just ahead of the launch aircraft. Over-handling could also damage “the seeker and guidance system, especially when those rubberized magnetic covers were lost or not used.”⁵² Their seeker heads were more sensitive than those on AIM-9Bs, they could execute tighter turns, and their new rocket motor added a bit more range.⁵³ F-8s often flew with just two AIM-9Ds because that allowed for greater speed and endurance, and the jet would not be above minimum landing weights if returning to the ship with unused missiles.⁵⁴ The AIM-9D, however, did not guarantee kills. When an F-8H hounding two MiG-21s in a continuous left turn fired four AIM-9Ds, none of them scored a lethal hit, nor could his wingman score with gunfire.⁵⁵

As a third-generation fighter, the F-8 did not have the avionics, radar, and fire control system to go out and sweep the skies with its on-board radar as a fourth-generation F-18 would. F-8 fighter sweeps and CAPs had to have the assistance and guidance of a powerful ground station radar and a ground control intercept – ‘GCI’ - controller in order to find and engage MiGs because, like its contemporaries, their onboard radar was too small to scan enough airspace to find their adversaries unassisted. Aircrew relied on early warnings of threats and vectors toward MiGs from ‘Red Crown’, a control agency on board a cruiser or destroyer stationed in the Gulf of Tonkin equipped with a powerful radar, identification friend or foe

⁴⁹ Enclosure: Employment of the F8J, 1969-1970.

⁵⁰ Report of the Air-to-Air Missile System Capability Review, July-November 1968, Appendix III, III-27, III-28. Employment of the F8J.

⁵¹ Enclosure 4: Fighter Squadron One Six Two Command History, 1967.

⁵² Email correspondence with Al Lansdowne, October 5, 2014.

⁵³ Email correspondence with Cole Pierce, September 28, 2014. Email correspondence with Al Lansdowne, October 7, 2014. <http://ausairpower.net/TE-Sidewinder-94.html>

⁵⁴ Enclosure 4: Fighter Squadron One Six Two Command History, 1967.

⁵⁵ HQ CINCPAC, Pacific Area Naval Operations Review September 1968, 17. Vietnam Command Files, Box 105, File September 1968. NHHC.

(IFF), and skilled intercept controllers.⁵⁶ From May through September 1968, for instance, the Red Crown controller directed and managed six of the seven engagements that involved F-8 CAPs. One pilot recalled that F-8s were “totally reliant” on Red Crown guidance for getting vectored toward MiGs.⁵⁷ One should consider the radar controller and the fighter as a team. The jet needed the surface-based radar to find the MiGs and guide them toward a favorable firing position, and the warship needed the interceptor in order to shoot down the MiGs that were outside of the ship’s missile engagement zone.

4. Tactics

The F-8’s tactical procedures began with GCI from Red Crown, whose vectors were the starting point for an intercept. F-8 pilots wanted directives that would put them “between 3 and 9 o’clock 1 - 3 miles aft of the MiG.” From there “The most successful attacks were high speed slashing attacks keeping speed high and at all times maintaining the criteria for offensive maneuvering.”⁵⁸ Always flying in pairs, the Crusader on a day mission with the best functioning radar normally flew as flight leader and “assumed responsibility for navigation and radar search” while his wingman cleared the area with a visual search.⁵⁹ At night the two flew a lead-trail formation, with 2-5 miles between them, and the jet with “the least efficient radar” flew lead and kept track of where the flight was.⁶⁰ It was better for the jet with the more functional radar to fly as the trailer because the pilot could more reliably keep track of his leader.

Once Red Crown sent F-8s after MiGs, aircrews would throttle up to maximum power, look for the MiGs with their eyes, not their radar, and maneuver for a stern shot with an AIM-9 once they saw their target.⁶¹ Over time, Red Crown controllers became more proficient in vectoring Navy interceptors into progressively more favorable firing positions. In the second half of 1967, for instance, the MiG would be in front of the interceptor when the pilot finally saw it only 17 percent of the time - advantage MiG. From May to September 1968, however,

⁵⁶ Fighter Squadron Fifty-Three, Enclosure No. 1: Employment of the F-8E. Email correspondence with William W. Wright, September 13, 2014. An IFF transponder will send a signal to an aircraft and wait for either the correct response (friend) or no response (unidentified, non-transmitting, or hostile aircraft).

⁵⁷ Fighter Squadron Fifty-Three, Enclosure No. 1: Employment of the F-8E. Email correspondence with William W. Wright, September 13, 2014. Commander in Chief U.S. Pacific Fleet, Analysis Staff Study 2-70, Command and Control of MiG Interceptions with SAM and CAP: May - Sept 1968. Vietnam Command Files, COLL/372, Box 113, File CPF Staff Study 2-70. NHHC. Declassified IAW: E. O. 12958 & OPNA VINST 5513.16(Series). US Navy surface-to-air missiles at this time were comprised of the RIM-8 Talos, RIM-24 Tartar, and the RIM-2 Terrier.

⁵⁸ Commander Robert E. Weedon, Commanding Officer, Fighter Squadron Fifty-Three to Chief of Naval Operations, 1968 Command History, Section IV: Combat Tactics. Fleet Aviation Commands Pre-1998, AR/229, Box 257, File F3. NHHC.

⁵⁹ Fighter Squadron Fifty-Three, Enclosure No. 1: Employment of the F-8E. Enclosure 4: Fighter Squadron One Six Two Command History, 1967.

⁶⁰ Enclosure 4: Fighter Squadron One Six Two Command History, 1967.

⁶¹ Fighter Squadron Fifty-Three, Enclosure No. 1: Employment of the F-8E. Email correspondence with William W. Wright, September 13, 2014.

Red Crown positioned interceptors behind MiGs 41 percent of the time - advantage Navy. Electronic jamming was another part of their tactics. Navy jammers could occasionally deny MiG pilots radio communication with their North Vietnamese GCI, and disrupt their GCI radar picture to such a degree that the MiGs would turn on their IFF transmitters in order to make it easier for North Vietnamese controllers to see their own MiGs. American GCI then exploited and tracked the enemy IFF transmissions because they showed precisely where individual MiGs were flying. It was easier for Red Crown to vector F-8s and F-4s toward approaching MiGs whose transponders were 'squawking', so much so that the Americans would not interfere with MiGs' IFF signal; it was just too useful to jam. American forces would, however, jam radio transmissions between MiGs and their GCI in North Vietnam. For instance on 9 July 1968, a MiG-17 attacked an RF-8, but the reconnaissance jet's escorting F-8, flown by Lieutenant Commander John Nichols, was close by. The VHF communication frequency the MiG was using was then jammed, so the MiG-17, following a hard-turning fight, did not know to change its flight path once again as the escorting F-8 closed in from behind for a kill shot against what was now a non-maneuvering target.⁶²

All of this worked together. The Navy's SAM threat, especially in the form of Talos missiles fired from cruisers, encouraged MiGs that tried to attack American warships to fly below the SAM's altitude, which meant that they were flying where F-8s and F-4s were more maneuverable. Manned fighters were often preferable to the Navy's SAMs because they could differentiate between friendly and enemy aircraft that were in close proximity to each other.⁶³

The F-8 was synonymous with a tactical system known as 'loose deuce' [two aircraft covering each other, in which either pilot, depending upon the combat situation, could adopt the role of lead fighter while the other covered as wingman]. F-8 pilots found that the 'tactical wing' formation employing loose deuce tactics worked the best in terms of enabling each aircraft to see far enough behind the other to spot an attacking MiG before it got into firing range.⁶⁴ It was a fluid, flexible system that responded well to the dynamic nature of close-in fighting. Whichever pilot was in the best firing position functioned as the shooter with the other flying support. These roles could change quickly; that was a normal occurrence, and neither pilot's rank mattered; having the advantage over the enemy was what counted. "There was always

⁶² Analysis Staff Study 2-70, Command and Control of MiG Interceptions with SAM and CAP. The information this source adds is the fact of American jamming of North Vietnamese VHF frequencies, which

(⁶² continued) would make it difficult for MiG pilots to radio warnings to each other. Nichols' account that after the AIM-9 he fired missed the MiG-17, "the MiG driver made a fundamental—and fatal—error. He reversed his turn from port to starboard, lighting his afterburner as he rolled wings level." Nichols, *On Yankee Station*, 83. By flying straight and level with a lit afterburner, the MiG pilot provided an easy target for the AIM-9. When Nichols fired the missile, "It was a direct hit . . . right up the tailpipe." From start to finish this engagement took only 35 seconds. Ibid.

⁶³ Ibid.

⁶⁴ Captain Arthur P. Geesey, "Air-to-Air Engagements in SEA, 1968-72," 42. K717.601-9, 19680101 - 19721231. AFHRA. Declassified 1991. Fighter Squadron Fifty-Three, Enclosure No. 1: Employment of the F-8E.

one plane pushing for a firing solution while the other was getting ready to roll in. Gone were the days of the junior wingman being there just to protect the flight leader.”⁶⁵

VF-53’s leadership agreed that “The combat spread with its strong reliance upon equal responsibility within the section, continues to be the best working basis for two-plane fighter tactics.” Their recent experience in airspace saturated with MiGs and SAMs, however, persuaded them to consider employing four-jet formations instead of just two. “Eight fighters cannot wander into the same high threat area, even as four sections of loose deuce and expect to operate with maximum effectiveness. They must maneuver as a team in order to achieve air superiority by maintaining visual contact with one another and responding to one another’s needs with a minimum of chatter on the air . . . This enables the entire formation to close it up and maneuver more freely against a SAM/MIG threat and render mutual support with an increased flight/formation discipline.”⁶⁶

A pair of F-8s piloted by Lieutenant Anthony Nargi and Lieutenant J.G. Alexander C. Rucker piloted illustrated loose deuce to great effect on 19 September 1968. Soon after they were vectored toward a hostile contact, Nargi saw a MiG-21 and went after it. The Vietnamese pilot appeared to see his enemies at the same time and started maneuvering violently “into a loop.” Nargi managed to maneuver his F-8 into a firing position well enough that the AIM-9 he fired not only tracked, it flew “up the tailpipe and blew the whole tail end of the airplane off.” Rucker, the wingman, saw a second MiG-21 and took charge, per loose deuce tactical doctrine. He told Nargi to make a hard turn, which he did, and very soon Nargi had flown into a firing position again. His missile missed, whereupon Rucker went after the MiG, which was still making defensive maneuvers in an effort to defeat a missile shot. This was because Rucker’s missile had exploded close to the MiG, even though it did not knock it out of the sky. The two decided to return to their carrier when they began running short on fuel and the MiG-21 started to outrun them.⁶⁷

The Crusader’s best attribute was that it was maneuverable enough and powerful enough for its pilot to fly it into a good firing position for its AIM-9D Sidewinders with confidence.⁶⁸ The fact that F-8 squadrons emphasized flying in pairs, practicing air-to-air combat - dogfighting, not intercept profiles against bombers - made the pilots first-rate performers of that mission.⁶⁹ Furthermore, the flying skills developed practicing for gun shots better enabled one to maneuver into a good firing position for a stern missile shot. In combat against MiG-17s over North Vietnam, its maneuverability matched or exceeded that of the MiG-17, even when not flying

⁶⁵ Email correspondence with William W. Wright, September 13, 2014. Email correspondence with Jim Alderink, September 13, 2014.

⁶⁶ Annex D Lessons Learned VF-53. Fleet Aviation Commands Pre-1998, AR/229, VF-24, Box 257, File F5, NHHC.

⁶⁷ Message from USS Intrepid to RUYVSYC/CTF 70.2.1.1, 191038Z September 1968. Reference Files, Vietnam, A-Air Warfare (I), File Vietnam Air Ops MiG Combat. NHHC.

⁶⁸ HQ CINCPAC, Pacific Area Naval Operations Review November 1966, 13. Vietnam Command Files, Box 102, File November 1966. NHHC.

⁶⁹ Email correspondence with Dink Alderink, September 13, 2014.

at maximum throttle.⁷⁰ Later tests of a MiG-17 in the United States, however, found that at 300-350 KIAS a well-flown MiG-17 could out-turn anything in the American arsenal, so American pilots had best keep their speed high against that little jet. At higher subsonic Mach numbers - 0.85 - the MiG-17's stick forces became very heavy which meant that the pilot would have a difficult time turning the MiG.⁷¹ The way to defeat MiGs was to "Stay fast, vertical, do not slow turn and wait for him to run out of gas." Jim Alderink warned against getting into a turning fight with a MiG-21 at higher altitudes: "Fast and vertical is the F-8's game. Play to your strength."⁷² Al Lansdowne agreed: use all three dimensions, not the jet's turn rate; "the best maneuver was high speed and high altitude."⁷³ "The most successful attacks were high speed slashing attacks keeping speed high and at all times maintaining the criteria for offensive maneuvering."⁷⁴ A well-flown F-8 was superior to the MiG-17.⁷⁵

MiG-21s, however, were more of a match for the Crusader, and American forces were able to quantify these comparisons through the use of their own MiG-21s. The United States began obtaining MiGs during the late 1960s, which enable the Air Force and Navy to study and test them, and develop the best counter-tactics for defeating them.⁷⁶ During the "Have Doughnut" tests of a MiG-21 in the United States, the F-8 and the MiG-21 were a very close match; neither had an advantage across the board. For example, an F-8's initial acceleration starting at a slower speed was better than that of a MiG-21, but The MiG's acceleration above Mach 1.1 was superior to that of the F-8; the two were roughly equal from Mach "0.6 to 1.1."

Importantly, the F-8 lost energy at a slower rate than did the MiG-21 "under high load factors at speeds below 400 KIAS." On the other hand, at those speeds the "F-8 had less instantaneous g available than the MiG-21," and the MiG was more maneuverable at lower speeds than the F-8. That should not have been surprising, as the MiG-21 had lower wing loading than the F-8; "50-55" pounds per square foot compared to "70-75" pounds per square foot.

Consequently "The F-8 could not successfully turn close in at medium to slow speeds with an aggressively flown MiG-21." The Crusader's advantages existed below 16,000 feet. It could sustain more Gs at 400 KIAS, but the MiG-21 had a bit of an advantage above 450 KIAS. An F-8 also "had superior longitudinal control above 510 KIAS below 16,000 feet." The MiG's "maximum allowable airspeed" below that altitude was 595 KIAS; the Crusader's

⁷⁰ Institute for Defense Analysis, "Air to Air Encounters in Southeast Asia, Vol. III," 1969, Event III-147, p. 159, Event III-194, p. 222; Event III-345, p. 392.

⁷¹ Rob Young, *Have Drill/Have Ferry – Exploitation of the Soviet MiG-17F*.
http://nsarchive.gwu.edu/NSAEBB/NSAEBB443/docs/area51_52.PDF

⁷² Email correspondence with Jim Alderink, September 13, 2014. Email correspondence with Al Lansdowne, October 7, 2014.

⁷³ Email correspondence with Al Lansdowne, October 7, 2014. Lansdowne recommends John Boyd's energy maneuverability reports.

⁷⁴ Fighter Squadron Fifty-Three, 1968 Command History, Section IV: Combat Tactics.

⁷⁵ Staff Study 9-68, 31 August 1968, 14.

⁷⁶ See Steve Davies, *Red Eagles: America's Secret MiGs* (Oxford and New York: Osprey Publishing, 2008).

limit below 25,000 feet was a much greater 750 KIAS.⁷⁷ The F-8s' maneuverability was "closest to matching the MiG-21 maneuverability when the maneuvering altitudes are less than 16,000 feet."⁷⁸ The comparative evaluations demonstrated that the MiG's roll rate was about half that of the F-8, which made it exceedingly difficult for the MiG to evade an F-8 that was on its tail. Mission number 31, for instance, demonstrated that an "F-8 can definitely scissors satisfactorily with the MiG-21 in military power at slow speeds"⁷⁹

In actual engagements over North Vietnam, MiG-21s found it difficult to evade an F-8 if one got behind it; a pair of F-8Hs from the Hancock claimed that they hounded two MiG-21s through seven complete turns during a 17 September 1968 engagement.⁸⁰ Not only was the F-8 maneuverable enough to defeat these MiGs, the pilots expanded their opportunities by "working the vertical" plane in pursuit of a good firing position.⁸¹ The findings of the Have Doughnut tests echoed the advantages of teamwork inherent in the loose deuce concept. Overall, a pair of F-8s should keep their speed high and try to maneuver into the MiG-21's blind zone, which was considerable. The report recommended that pilots, "stay in the MiG-21's blind cone as he reverses. If these maneuvers are performed properly, the F-8 can maintain an offensive position until the MiG-21 is destroyed The F-8 actually pressing the attack on a MiG-21 should keep the MiG-21 engaged while the wingman maneuvers for the kill."⁸²

F-8s were quite maneuverable "if you knew its eccentricities."⁸³ Its 'corner velocity' was about 375 KIAS; this speed provided "the most G available and the highest turn rate," and "Mach 0.9 of course offered terrific maneuverability."⁸⁴ The trait one had to respect the most in turning fights was to never use the ailerons; "use the rudder for angular changes and the stick for G application being careful not to tweak the ailerons." A pilot who violated this would become a passenger "and tumble end over end through the sky and then enter a spin."⁸⁵ Fortunately the F-8 was not that prone to spinning,⁸⁶ unless one was pulling a

⁷⁷ Defense Intelligence Agency, Have Doughnut Tactical, FTC-CCR-20-13-69-INT Vol. II. 2-41 through 2-44. Declassified IAW E.O. 12958, March 23, 2000. This document has many more detailed comparisons of the MiG-21F-13 against American aircraft than are cited here. One can find it online at: http://nsarchive.gwu.edu/NSAEBB/NSAEBB443/docs/area51_50.PDF

⁷⁸ Analysis Staff Study 2-70, Command and Control of MiG Interceptions with SAM and CAP.

⁷⁹ Have Doughnut Tactical, FTC-CCR-20-13-69-INT Vol. II. 2-105.

⁸⁰ Pacific Area Naval Operations Review September 1968, 17.

⁸¹ Email correspondence with William W. Wright, September 13, 2014.

⁸² Have Doughnut Tactical, FTC-CCR-20-13-69-INT Vol. II. 2-57. See also pages 2-58, 2-63, and 2-80 through 2-123.

⁸³ Email correspondence with Jim Brady, September 11, 2014.

⁸⁴ Email correspondence with Cole Pierce, September 28, 2014. Wright states 450 knots: "any faster and you can pull the plane apart."

⁸⁵ Email correspondence with Jim Brady, September 11, 2014.

⁸⁶ Email correspondence with Cole Pierce, September 28, 2014.

substantial amount of Gs “in a vertical dogfight.”⁸⁷ Maintaining one’s speed was essential for defeating MiGs: “Don’t get slow.”⁸⁸

5. First Fights with MiGs

F-8s had their first encounter with hostile jets on 3 April 1965 when North Vietnamese MiG-17s attacked a Navy strike package that was targeting the Dong Phuong Thuong bridge that day. They specifically went after four F-8E Crusaders from VF-211, USS Hancock, that were engaged in a flak suppression mission with A-4 Skyhawks. A MiG-17 got behind Lieutenant Commander Spence Thomas and fired before he realized the MiG was there. His jet took hits on the left wing, and as Thomas flew for the coast, he looked back when he saw more tracers. He then beheld a MiG-17 about 2,000 feet behind him, “just sitting there,” probably out of ammunition. After speeding away, Thomas landed at Da Nang; the MiGs escaped.⁸⁹ It would be more than a year before an F-8 pilot shot down his first MiG.

On 12 June 1966, Blue Flight (two F-8Es and two F-8Cs) engaged four MiG-17s while protecting some A-4s that were bombing targets in the Dai Tan military area. The attack degenerated into a short melee, but soon the F-8s reformed into two elements. Blue 1 got on the tail of a MiG-17 and kept up with it through a series of turn reversals. Commander Hal Marr fired an AIM-9D which tracked, struck, and destroyed his quarry. He scored some 20mm hits on another MiG-17, and may have shot it down as well. A contemporary analysis of aerial combat over Vietnam argued that the “F-8 type weapons systems, air-to-air missiles and 20mm cannon [were] best for air combat maneuvering where visual identification is a preliminary requirement.”⁹⁰

The first F-8 kill of a MiG-21 was more spectacular. With guidance from the USS King, a guided-missile destroyer, an F-8E zoomed up behind it in max power. When the MiG pilot saw him, he began a split-S, which the Crusader pilot matched, shooting him down with an AIM-9 before it went nose down.⁹¹ By December 1966, the Navy had achieved a 2:1 kill

⁸⁷ Email correspondence with William W. Wright, September 13, 2014.

⁸⁸ Email correspondence with Cole Pierce, September 28, 2014. Email correspondence with Jim Alderink, September 13, 2014.

⁸⁹ Interview of LCDR Spence Thomas by Mr. Betty and Cdr Stewart, 3 March 1967, Patuxent River, MD. Message from CTG Seven Seven Pt Seven to JCS, 031451Z April 1965. K160.043-16 April 1965-March 1967. AFHRA. Declassified IAW EO 12958 on 9 March 1993 by Executive Order Review Team. Institute for Defense Analyses, *Air to Air Encounters in Southeast Asia, Volume I, Event I-1*, 33-41. The North Vietnamese claimed two F-8s on April 3, 1965. The Military History Institute of Vietnam, *Victory in Vietnam: The Official History of the People’s Army of Vietnam, 1954-1975*, trans. Merle L. Pribbenow with a foreword by William J. Duiker (University Press of Kansas, 2002), 166.

⁹⁰ Institute for Defense Analyses, *Air to Air Encounters in Southeast Asia, Volume I, Event I-34*.

⁹¹ HQ CINCPAC, Pacific Area Naval Operations Review October 1966, 13. Vietnam Command Files, Box 102, File October 1966. NHHC. This happened on October 9, 1966. Institute for Defense Analyses, *Air to Air Encounters in Southeast Asia, Volume I, Event I-54*. Commander Richard Bellinger was the pilot. He fired both of his Sidewinders, an AIM-9B followed by an AIM-9D, but the narrative does not say which one scored the kill.

ratio with its F-8s. MiGs had shot down three F-8s, for a loss of one MiG-21 and five MiG-17s. The Navy attributed its losses more to the element of surprise than to capabilities of MiG aircraft.⁹² The Institute for Defense Analyses also found that American pilots were often first aware of a MiG's presence when they saw it in their rear-view mirror.⁹³

By the end of Operation Rolling Thunder in November 1968, F-8s had shot down fourteen MiG-17s and four MiG-21s for the loss of three F-8s, all to MiG-17s.⁹⁴ As the air war over North Vietnam subsided, the aviators were afforded fewer and fewer opportunities for kills; VF-24 observed in 1968 that they were sent toward MiGs several times during their cruise, but the MiGs "always fled to their sanctuary before contact could be made."⁹⁵

While the Navy employed F-8s in ground attack missions, the Marine Corps used them against ground targets, mostly on close air support and interdiction within the III Marine Amphibious Force. Three Marine Crusader squadrons, VMF(AW)-312, 232, and 235, based at Da Nang (Figure 4), carried out a variety of missions ranging from bombing the Ho Chi Minh Trail, escorting helicopters, providing close air support, and suppressing enemy fire during rescues of downed aircrews. In addition, a portion of a squadron's F-8s might "sit alert" - waiting by the runway, fully fueled and armed, for the call to immediately take off and carry out urgently needed air strikes, normally in support of ground troops.⁹⁶ During August 1967, for example, close air support missions comprised nearly all of VMF(AW)-232's sorties.⁹⁷



Figure 4 F-8E Crusader of VMF(AW)-232 taking off From Da Nang, probably in 1967
Source: US Navy photograph

The 312nd was the first to enter combat in Vietnam, arriving in December 1965 and

⁹² CINCPACFLT Staff Study 3-67, From Commander in Chief U.S. Pacific Fleet, "U.S. Air-to-Air Incidents in S.E. Asia 3 April 1965 - 31 December 1966," 13 April 1967. Vietnam Command File, COLL/372, Box 112, CPF Staff Study 3-67. NHHC. Declassified IAW: E.O. 12958 & OPNA VINST 5513.16 (Series).

⁹³ Institute for Defense Analyses, *Air to Air Encounters in Southeast Asia*, Volume I, Event I-54.

⁹⁴ Monthly Statistical Summary Southeast Asia Combat Air/Surface Operations, Oct thru Dec 1968, SEACAG/OP-05W/OEG. Vietnam Command Files, COLL/372, Box 92, File CNO Sea Combat Air/Sur Ops Oct-Dec 68. NHHC. Declassified IAW E.O. 12958 & OPNA VINST 5513.16 (Series).

⁹⁵ Fighter Squadron Twenty-Four to Chief of Naval Operations, Command Histories 1968, 20 February 1969. For narratives on aerial engagements between F-8s and MiGs, see Mersky, *F-8 Crusader Units*.

⁹⁶ N. M. Trapnell, Jr. Marine All Weather Fighter Squadron Two Three Two, 6 February 1967, Command Chronology for 1-31 January 1967. N.M. Trapnell, Jr. Marine All Weather Fighter Squadron Two Three Two, 6 March 1967, Command Chronology for 1-28 February 1967. www.vietnam.ttu.edu.

⁹⁷ M.H. Sautter, Marine All Weather Fighter Squadron Two Three Two, 1 September 1967, Command Chronology for 1-31 August 1967. www.vietnam.ttu.edu.

its aircrews were flying combat missions the day after they arrived.⁹⁸ On occasions Marine F-8s bombarded surface-to-air missile sites.⁹⁹ When the Tet Offensive erupted in January 1968, VMF(AW)-235 flew 681 sorties and delivered a thousand tons of bombs, napalm, rockets, and cannon fire. Aircraft like the F-8 were of particular value to soldiers and marines because they could bring a weight of firepower that helicopter gunships, for example, could not match.¹⁰⁰ Although F-8s soldiered on as fighters until 1976, the Marines found them somewhat deficient in the air-to-ground role. Crusaders were fast enough to be a difficult target for ground fire, but F-4 Phantoms were more stable in their bombing runs, which resulted in greater bombing accuracy, and the A-4 Skyhawk was more maneuverable at lower speeds.¹⁰¹ As far as their effectiveness was concerned, Marine Corps records tracked sorties flown, tons of bombs dropped, and the operations in which they participated. They also annotated the specifics of the destruction wrought. The April 1967 narrative summary of the I Marine Air Wing noted that on 3 April, “Two VMF(AW)-235 F-8E Crusaders killed seven enemy troops west of Phu Bai,” and “A VMF(AW)-232 Crusader was credited with setting off nine secondary explosions while attacking an enemy tunnel complex 15 miles south of Chu Lai.”¹⁰² By the time Marine F-8s left South Vietnam in May 1968 they had flown 20,955 sorties.¹⁰³

6. F-8s After Rolling Thunder

Opportunities for air-to-air combat were minuscule for naval aviators after the conclusion of Rolling Thunder in November 1968 until 1972 because American aircraft no longer flew in airspace that MiGs defended. Still, aircraft carriers had to be defended 24-7, so fighters flew defensive patrols; MiGs could become active at any time.¹⁰⁴ The F-8 community also worked

⁹⁸ T. A. Nalle, Commanding officer, VMF(AW)-312, Marine All Weather Fighter Squadron 312 Command Chronology for December 1965. 4 January 1966. T.G. Bronleewe, Jr. 1st Marine Aircraft Wing Command Chronology, December 1965, January 27, 1966. www.vietnam.ttu.edu.

⁹⁹ E. J. Doyle, 1st Marine Aircraft Wing Command Chronology, November 1966, 4 January 1967. www.vietnam.ttu.edu.

¹⁰⁰ C.R. Lundquist, Marine All Weather Fighter Squadron Two Three Five, 7 March 1968, Command Chronology for 1 -29 February 1968. Message from CG III MAF to RUMSAW/COMUSMACV, Air Cav Capability for Marine Division in SVN, 250038Z March 1968. www.vietnam.ttu.edu.

¹⁰¹ Lt Col Ralph F. Moody, et al, U.S. Marines in Vietnam, Part VII: Backing Up the Troops, 20: 3. 30 January 1970, Historical Division HQMC. Norman Anderson Collection, COLL/295, Box 2, Folder 13. Quantico, VA.

¹⁰² See for example, N.M. Trapnell, Jr. Commanding Officer, Marine All Weather Fighter Squadron Two Three Two, Command Chronology, 20 November 1966. G. A. Gibson, Commanding Officer, Marine All Weather Fighter Squadron Two Three Five, Command Chronology, 6 April 1966. H.H. Long, 1st Marine Aircraft Wing Command Chronology, April 1967, 27 May 1967. www.vietnam.ttu.edu.

¹⁰³ Fleet Marine Force, Pacific. Operations of U.S. Marine Forces Vietnam, May 1968. Vietnam, Box 13, Folder 6. Archives Branch, USMC History Division, Quantico, VA.

¹⁰⁴ Fighter Squadron Two Hundred Eleven Cruise Report Flight Data, 1 Sep 1969 - 31 Mar 1970. Fleet Aviation Commands Active, Box 160, File 1969-1970. NHHHC. During its September 1969 - March 1970 cruise, for example, VF-211's F-8s spend 58 percent of their sorties on BARCAP, 26 percent on FORCECAP, 11 percent on escort of reconnaissance, 3 percent on MIGCAP, 1.5 percent on weather recce, and 0.5 percent on strikes. Ibid.

on improving its craft. The 1969 and 1970 VF-124 squadron histories make no mention of Top Gun, per se,¹⁰⁵ but the Navy stateside was pursuing ongoing efforts to improve its air superiority capabilities. Air Test and Evaluation Squadron Four - VX-4 - was in the middle of these efforts, and one of its tasks was the development of revised air combat tactics and doctrine for use in the Vietnam War. Its jets fired, for instance, 25 AIM-9G Sidewinders (an improvement over the AIM-9D) in 1970. Moreover the squadron utilized at least six F-86H Sabres as MiG-17 simulators for the development of new tactics for defeating that MiG. They completed 302 sorties totaling 275 hours. During the course of these tests, Crusader and Phantom pilots performed well against the F-86s “as long as our crews use standard loose deuce” The squadron kept the F-4 and F-8 transition squadrons informed of these developments, briefing “VF-124 and VF-121 ‘Top Gun’ School” on May 15, 1970, for instance.¹⁰⁶ The Navy still needed replacement F-8 pilots, so VF-124 continued that as a primary mission. Since the instructors in VF-124 were combat veterans, they were well-equipped to teach new F-8 pilots combat tactics.¹⁰⁷

The Navy committed an ongoing effort to advanced training after the end of Rolling Thunder. Seventh Fleet, for example, emphasized firing missiles at maneuvering target drones in pursuit of maintaining a general readiness; the Pueblo Crisis encouraged that agenda apart from the possibility of a renewed air war against North Vietnam.¹⁰⁸ Stateside, the Navy established the Navy Fighter Weapons School - Top Gun - and the F-8 Crusader community figured prominently in its formation. It began as an outgrowth of VF-124’s “Crusader College” on December 2, 1968. This initial advanced course for the F-8 Crusader community was four-week course comprised of 75 classroom and 25 flying hours centered around the study of “air combat maneuvering, radar, air-to-air gunnery, sidewinder tactics, air-to-ground delivery and electronic countermeasures.” Flight instruction included sorties against aircraft besides F-8s, among other things. Graduates would function as their squadron’s “Weapons Training Officer.” It came about at the behest of the Chief of Naval Operations. VF-124’s new Top Gun program produced results immediately. One veteran praised their ability to debrief Top Gun training missions as “outstanding,”¹⁰⁹ and another wrote that VF-194’s Top

¹⁰⁵ Command History 1969 Fighter Squadron 124, 19 February 1970.

¹⁰⁶ Commander R. L. Stoddart, Acting Commanding Officer Air Test and Evaluation Squadron Four to Chief of Naval Operations, 1970 Command History, 20 August 1971. Fleet Aviation Commands Pre-1998, AR/229, VX-4, Box 427, File F17. NHHHC. Capt James R. Foster was the CC from January 30, 1969. The project officer for the F-8J was Lt J.B. (John) Foster. Ibid.

¹⁰⁷ Command History 1969 Fighter Squadron 124, 19 February 1970.

¹⁰⁸ Commander L. C. Page, Jr. Commander Attack Carrier Wing Two, Cruise Report, 17 May 1969. Fleet Aviation Commands--Active, CVW-2, Box 13, File 1/68 - 5/69. Seventh Fleet Monthly Historical Summary, August 1969, 10-11. Vietnam Command Files, Box 119. File April 1969 [misfile]. Carrier Attack Wing Eleven End of Cruise Report, 30 December 1968 - 4 September 1969, Ships History Post 2001, Kitty Hawk (CV-63), Box 189, File 1969 Cruise Reports. NHHHC.

¹⁰⁹ Email correspondence with Cole Pierce, September 28, 2014. The Fighter Weapons School’s first C.O. was Commander Harry J. Post. The first graduates were LtJG Robert J. Walters (VF-162), Steven K. Russ (VF-53), John E. Laughter (VF-111), LTs John N. Quisenberry (VF-51), William H. Switzer (VF-191), and Grover Giles (VF-194). “New F-8 Advanced Weapons Course Held at VF-124’s ‘Crusader College,’” *Miramar Jet Journal*, 29: 1 (January 10, 1969). Jim Alderink and John Laughter provided this article.

Gun graduate “was a great instructor.”¹¹⁰ A few F-8 squadrons would enter a combat zone one last time a couple of years hence.

7. F-8s during the Linebacker Campaigns

When the USS Hancock sailed off of the coast of SVN in April 1972, its F-8s functioned as fighter-bombers providing CAS [Close Air Support] to ARVN [Army of the Republic of Vietnam] forces for that month,¹¹¹ while F-8J Crusaders flew 413 combat air patrol and escort missions.¹¹² Actual combat against MiGs, however, was exceedingly rare for F-8 pilots during 1972. More than one source believed that North Vietnamese MiG pilots deliberately avoided F-8 CAPs that year.¹¹³ On 22 May 1972, however, Nickel 101, an F-8J from the USS Hancock engaged a MiG-17 which ran away and then crashed after its pilot ejected so as to avoid being killed by the Crusader pilots. They saw the MiG hit the ground. One individual who read the message was not impressed with the idea of the aviators receiving credit for downing this MiG, however, and wrote in the margin: “Navy kill for scaring pilot out of A/C? Shit!”¹¹⁴ Nickel 101 - Lieutenant Jerry Tucker of VF-211 - did not get credit for a MiG kill.¹¹⁵ The Air Force however credited five aircrews with kills for encouraging a North Vietnamese opponent to fly into the ground while trying to escape.¹¹⁶ The Hancock’s air wing never saw a MiG again during the rest of the cruise.¹¹⁷

Seven months later, during Linebacker II, the Navy assigned F-8s solely to “air superiority missions,” but “MiGs were not launching when we were overhead.” One can only imagine

¹¹⁰ Email correspondence with William W. Wright, September 13, 2014. See also Robert K. Wilcox, *Scream of Eagles: The Creation of Top Gun and the U.S. Air Victory in Vietnam* (John Wiley & Sons, 1990) especially pages 102-203 for an in-depth account of the formation of the U.S. Navy Fighter Weapons School. Wilcox notes that after 1969 this F-8 Crusader Top Gun school “was soon to fade and disappear.” Wilcox, *Scream of Eagles*, 152. As F-4s came to dominate the Navy’s fighter arm, VF-121 supported “the” Top Gun school, with the first class commencing on March 3, 1969. Wilcox, *Scream of Eagles*, 160.

¹¹¹ Commander W. B. Brown, Commanding Officer, Fighter Squadron Two One One to Chief of Naval Operations, 1972 Command History, 11 March 1973. Fleet Aviation Commands Active, Box 160, File 1972. NHHC.

¹¹² Directorate of Operations Analysis, Summary Air Operations Southeast Asia July 1972, 4-A-3. K717.3063 July 1972. AFHRA.

¹¹³ Mersky, *F-8 Crusader Units*, 101. Mersky, *Vought F-8*, 117. Email correspondence with Cole Pierce, September 28, 2014.

¹¹⁴ Message from CTG 77.5 to CJCS, 230830 May 1972. Reference Files, Vietnam, A-Air Warfare (I), Vietnam Air Ops MiG Combat Folder. NHHC. OEG/OP-05W, Summary of Air Operations in Southeast Asia May 1972, Center for Naval Analyses, C-6. COLL/7 Publications of the Center for Naval Analyses, OEG, Box 72, File OEG Memo 1368-72. NHHC. That last word was scribbled, but it is either “shit,” or an acronym. The second document gives a date of May 23.

¹¹⁵ OEG/OP-508W Summary of Air Operations in Southeast Asia, 1 January 1972 - 31 January 1973, table 4-4. COLL/7 Publications of the Center for Naval Analyses OEG, Box 73, File OEG Memo 001448-73. NHHC. Peter Mersky, *F-8 Crusader Units*, 101.

¹¹⁶ Futrell, *Aces*, 157.

¹¹⁷ Fighter Squadron Two One One 1972 Command History, 11 March 1973.

the frustration of the Crusader pilots, who were warriors; “I was flying over their airfield and they did not come up No MiG came into my airspace during the entire 72-73 tour.”¹¹⁸

8. Comparisons with the F-4

The pilots of the F-8 and F-4 communities were rivals for as long as the two aircraft were both in service. During a series of practice combats in 1965, however, the Navy found that the F-4 was superior to the F-8 as a fighter, even in close-in turning fights. In the spring of 1965 the Navy completed a study of the capabilities of its F-4B Phantoms against F-104 Starfighters, F-105 Thunderchiefs, and F-8 Crusaders. The Phantom aviators had little trouble with the Starfighter and Thunderchief, but they “heard the chuckles of the Crusader pilots in the office ...” To everyone’s surprise, the Phantom was a better air superiority fighter than the Crusader, if employed correctly. Over the course of 125 missions F-4B aviators learned how to fully utilize the Phantom. During the first three sorties, an F-4B crew would struggle somewhat against the Crusader, hold its own on the next three, and “By the time they had had six mission in the F-4, they were calling the tune against the aggressive, experienced F-8 pilots.” The reason for this was the combination of decent F-4 maneuverability and greater power. The aviators learned to keep the F-4 fast and most importantly, use all dimensions, especially the vertical plane, to defeat a first-rate adversary, the F-8 and its pilot.¹¹⁹ One veteran recalled an encounter between “a Fleet Replacement pilot” and “an F-4 tactics instructor.” The F-8 pilot got behind the F-4 and was about to make a guns ‘kill’ when “the F-4 did a loop. I could not believe that performance.” F-4s maneuvered and performed best at altitudes below 15,000 feet.¹²⁰

Assessing their relative capabilities becomes more complex when one factors in kills utilizing air-to-air missiles. Much of what that measures is not the capability of the aircraft or the aircrew, but the limitations of the AIM-7 and AIM-9. At first glance the F-8s out-performed the F-4s in the mission of maintaining air superiority. F-8s shot down 18 MiGs for the loss of just 3 Crusaders, but Air Force F-4s downed 107 MiGs losing 72 Phantoms to MiGs, and Navy F-4s shot down 38 MiGs while the MiGs shot down 8 F-4Bs and Js.¹²¹ Often Red Crown vectored F-4s on high-aspect intercepts so as to utilize the front-quarter capability of the AIM-7 - a sensible tactic since MiGs did not have that ability - and was akin to jousting

¹¹⁸ Email correspondence with William W. Wright, September 13, 2014.

¹¹⁹ Colonel Abner M. Aust, Jr. HQ 6002 SEG, “PACAF Tactics/Techniques Program,” 4 May 1965, Attachment 1: “F-4 Fighter vs Fighter Tactics.” K717.549-1, 4 May - 1 July 1965. AFHRA.

¹²⁰ Email correspondence with Al Lansdowne, October 5, 2014. Message from 432 TACRECONWG/DO Udorn RTAFB to RUMMRSA/7AF/DO, “MiG Tactics,” 151140 May 1972. K717.03-221, July 1971-June 1972, vol. 3. Excerpt Declassified on 22 August 2013 IAW EO 13526. AFHRA. See also message from CINCPACAF to AIG 7289, “MiG Encounters for 10 May,” 112356Z May 1972. Reference Files, Vietnam, A-Air Warfare (I), Vietnam Air Ops MiG Combat Folder. NHHC.

¹²¹ Futtrell, *Aces*, 157. A Comparative Analysis of USAF Fixed-Wing Aircraft Losses in Southeast Asia Combat, Technical Report AFFDL-TR-77-115 (December 1977), 17. Headquarters PACAF, Summary of Air Operations Southeast Asia, December 1972, 4-C-1. K717.3063, AFHRA. Chris Hobson, *Vietnam Air Losses: United States Air Force, Navy, and Marine Corps Fixed-Wing Aircraft Losses in Southeast Asia, 1961-1973* (Hinckley, England: Midland, 2001), 271. Brad Elward & Peter Davies, *U.S. Navy F-4 Phantom II MiG Killers: 1965-1970* (Oxford: Osprey Publishing, 2001), 86

with a much longer lance. This was F-4B and F-4J doctrine, but that also meant using a missile that had problems firing, guiding, and detonating properly. Consequently the F-4s in both services were employing as their first choice a munition with a lower kill probability than the AIM-9. It was also relatively easy to pop off an AIM-7 outside of its firing parameters. When F-4s and F-8s employed Sidewinder shots from behind, they demonstrated roughly the same performance.¹²²

But pilots of VX-4 who evaluated missile, aircraft, and pilot performance in 1970 noticed that F-8 pilots' training emphasized dogfighting, while F-4 pilots' training emphasized intercept profiles. That gave the Crusaders obvious advantages when an engagement devolved into a furball; they knew better how to fly their jet into a rear aspect firing position.¹²³ Each aircraft had different advantages depending on altitude. F-8s preferred to engage F-4s above 15-20,000 feet because they were more maneuverable there than Phantoms. Not so at lower altitudes; "Down low the F-4 could turn tight circles with that large wing and lots of thrust."¹²⁴

As the F-8 closed out its career, it participated in the development of more sophisticated air-to-air combat training during the early and middle 1970s. Navy fighter units began dissimilar air combat training with Air Defense Command F-106s in 1970, supporting operation College Dart.¹²⁵ In November 1972, for example, VF-211 participated in DACT against A-4s and F-106s.¹²⁶ In February 1973, several aircrews of the 87th Fighter Interceptor Squadron, an F-106A unit from K.I. Sawyer Air Force Base on the upper peninsula of Michigan, flew their Delta Darts to VF-24's base at Naval Air Station Miramar. Pilots from the two services flew air combat maneuvering sorties against each other in order to hone their skills, and "Both units benefitted from this training and exchanged ideas about Navy/Air Force Fighter Tactics."¹²⁷ The F-8J's "zoom capability" surprised Air Force pilots who encountered it during DACT training missions in the 1970s.¹²⁸ One veteran of those exchanges, a reserve F-8 pilot in VF-201, found that the F-8 could out-accelerate the F-106, but could out-turn it only below 250 knots. John Watkins believes that if the Air Force had installed a gun in the F-106 sooner, "it would have been the best dog fighter of its time, but as it was, the F-8 took

¹²² Analysis Staff Study 2-70, Command and Control of MiG Interceptions with SAM and CAP.

¹²³ Ibid.

¹²⁴ Email correspondence with William W. Wright, September 13, 2014. Email correspondence with Jim Alderink, September 13, 2014.

¹²⁵ Major Haight, Message from ADC to CSAF/XOOS, Final Report, 1971 Tactical Fighter Symposium, 17 September 1971. K410.01-21, FY1972, vol. 5. AFHRA.

¹²⁶ Fighter Squadron Two One One 1972 Command History, 11 March 1973.

¹²⁷ Commander J. B. Nichols, III, Commanding Officer, Fighter Squadron Twenty-Four to Chief of Naval Operations, Command History 1973, 26 March 1974. Fleet Aviation Commands Pre-1998, AR/229, VF-24, Box 249, File F25, NHHC.

¹²⁸ Lieutenant Colonel James R. Mathews and TSgt E. W. Kinnecom, Historical Record of the 4757 Air Defense Squadron (IWS) for the period ending 31 December 1972. K410.012 October-December, 1972. AFHRA.

this accolade!”¹²⁹ In August 1974 VF-24 flew over to Nellis Air Force base in Nevada for practice combat against Air Force F-4Es and F-105s. One of the very last F-8J squadrons, VF-24 ‘Checkertails’ “enjoyed a high kill-to-engagement ratio throughout the training period.” It and its Air Force adversaries found this kind of training and doctrinal exchange mutually beneficial.¹³⁰

While I have focused on the capabilities and accomplishments of a machine in war, we need to remember the solitary humanness of this aircraft’s story as well. Annotations about the deaths of aviators are particularly striking: on 4 February 1968 “LTJG P. F. Cherney was lost at sea when his Crusader developed engine trouble, and, finally, engine seizure, seconds after he was catapulted from the deck It was night with heavy seas, rain, and very low ceilings.” He never ejected, and he never had a chance. What a lonely way to die. No gravesite, no funeral, one sentence in a squadron history. His replacement was LTJG W. H. Switzer, III.¹³¹

For nearly twenty years, the F-8 Crusader series provided the smaller Essex class aircraft carriers with a fighter that was a match for any bomber or fighter the Soviet Union could put in the air. It squeezed more speed, endurance, and maneuverability out of the J-57 engine than any of its contemporaries powered by the same engine. Considering the small size its radar had to be since the air intake was at the front of the plane, the APG-94 radar was impressive for its generation in terms of detection and lock-on range; GCI would not have to walk the F-8 to within a couple of miles of its adversary. It was too bad that the Navy had not tested its guns and missiles under more rigorous, realistic conditions. Its pilots would have achieved more kills had its guns been reliable in high-G fights, and had they been taught better about the absolute requirement to fire missiles only when within the AIM-9’s parameters, the F-8 Crusader would have been even more of a MiG master.

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¹²⁹ Email correspondence with John Watkins, September 12, 2014.

¹³⁰ Commander J.T. Kryway, Commanding Officer, Fighter Squadron Twenty-Four to Chief of Naval Operations, Command History 1974, no date. Fleet Aviation Commands Pre-1998, AR/229, VF-24, Box 249, File F24, NHHC.

¹³¹ Fighter Squadron One Hundred Ninety One, 1968 Command History, 24 March 1969. The F-8 suffered a high accident rate throughout its career. Sherwood, *Fast Movers*, 151.

Vietnam War (London: Osprey Publishing Limited, 1998); Paul D. Gillcrist, *Crusader! Last of the Gunfighters* (Atglen, PA: Schiffer Publications, 1995); John Darrell Sherwood, *Fast Movers: America's Jet Pilots and the Vietnam Experience* (New York: The Free Press, 1999), 147-81. John Darrell Sherwood, *Afterburner: Naval Aviators and the Vietnam War* (New York and London: New York University Press, 2004), Ron Knott, *Supersonic Cowboys* (Plymouth, MA: River City Press, Inc., 2009). The Navy and Marines used the F-8C, D, and E versions during Vietnam, and later in the war the F-8H, a rebuilt F-8D, and the F-8J, a rebuilt F-8E. This article reflects the views of the author and do not reflect the policy of the U.S. Government, the Department of Defense, the U.S. Air Force, nor Air University.

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http://www.iupress.indiana.edu/product_info.php?products_id=390945

Other publications include

The Relationship between Diplomacy and Military Force: An Example from the Cuban Missile Crisis *Diplomatic History* 38: 1 (Winter 2014), pp 137-181.

Missed Opportunities before Top Gun and Red Flag *Air Power History*, 60: 4 (Winter 2013), pp 18-31.

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