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ENLISTED OR OFFICER DRONE PILOTS?

by

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Disclaimer

Abstract

This paper compares remotely piloted aircraft—drones—operations in both the US Army and US Air Force. It argues that officers should continue to pilot Air Force drones because of the increased risks and more complicated missions of Air Force drones versus Army drones. It points out that the current rise of drones and decline of manned aircraft in the Air Force will push its officers to drones anyway. This is a good trend because the risks and complexity of Air Force drones missions will increase with time. The same trend in the Army will force that service to use warrant officers in its most challenging drone missions, leaving the commissioned Army officers free to do their primary job—leading heroically from the front.

The Army and Air Force both fly remotely piloted aircraft, or drones. Army drone pilots are enlisted; Air Force drone pilots are officers. Army enlisted pilots complain of unequal treatment relative to their Air Force colleagues. Air Force pilots feel that they are doing a job that is beneath them. Why did the services decide on different qualifications for the same task? Both Army and Air Force drones share a unique warplane trait—the lack of physical danger to the pilot. They also currently perform the same mission—supporting ground forces in Iraq and Afghanistan. But dig a little deeper and differences begin to emerge. While both sets of pilots begrudge their video game status, the disparagement affects the warrior Army more than it affects the technologist Air Force. While the Army has more drones, Air Force drones pose more risks: they are larger, faster, fly higher, and carry more numerous and more lethal weapons. While they both generally fly the same missions now, Air Force drones conduct the more challenging missions, a trend that will continue as the Air Force contemplates future missions against different enemies independent of the Army. Current Air Force pilots must also contemplate their personal futures as drones relentlessly replace current aircraft. Although enlisted personnel have a proud flying history, the Air Force should continue to have officers fly its drones because their stigma is irrelevant in the Air Force, they pose more risks, fly more complicated missions, and will continue to replace today's manned aircraft.

The video game stigma of drones is largely irrelevant in the Air Force. Except for the minority portion of Air Force personnel in harm's way, such as special operations aircrew or army-like convoy gunners, the bulk of Air Force jobs are technology driven and relatively safe from harm. Examples include missileers, satellite operators, and cyber officers. Air Force leaders are mostly "military managers," men who reflect the "scientific and pragmatic dimensions of war making."[1] Unless the drone control room is getting shot at, drones require military managers more than heroes.

The video game stigma of drones has a greater significance in the Army. The ground service is eternally responsible for boots on the ground. Its officers must lead from the front to have any moral authority over their soldiers. Army officers must not be military managers, but "heroic leaders," men who embody "the martial spirit and the theme of personal valor."[2] Valor, by definition, is "the strength of mind that enables a person to encounter danger."[3] Drones do not require heroic leaders. It is in the Army's interest to keep its officers at the front and employ technicians to fly their drones.

Based on personal experience, flying these video games is harder than it looks. Former Air Force chief of staff Gen Michael Ryan said "we shouldn't have pilots stick-and-ruddering UAVs."[4] He was right as long as the only demand on the aircraft is a simple autopilot maneuver. The problem, however, is that spectators—the people who need drone video—unknowingly demand maneuvers that an autopilot cannot do. One example is when the MQ-1 or MQ-9 must fly directly over the target for the best possible picture. A design flaw prohibits a drone camera from looking straight down: the camera swings uncontrollably without warning. Another design limit prevents the aircraft from banking too far: the body of the airplane blocks the satellite antenna, cutting the link to the pilot. The fix is to stick-and-rudder the airplane, despite what Gen Ryan thinks. The pilot flies directly over the target in a slip, banking far enough to prevent the camera from losing the target, but not far enough to lose control of the airplane. He performs this maneuver with the power back at idle to minimize engine noise to the enemy on the ground. The resulting descent forces the pilot to coordinate real time with other aircraft in the area to avoid midair collisions, something else the video game computer cannot do on its own.

Army drones pose fewer risks than Air Force drones, requiring less qualified pilots. Army drones are smaller. The mitigated risks from being smaller have to do more with physics than Freud. A small airplane has a lower chance of colliding with a manned airplane. Line up every Army drone from wingtip to wingtip: the resulting formation measures over 9,300 feet wide (see table 1). Line up every Air Force drone in the same manner: they would span 22,300 feet, 2.4 times larger than the Army formation. Extend this physics fantasy to kinetic energy ($KE=0.5mv^2$). If soldiers could watch every Army drone simultaneously collide while going as fast as it possibly could, the resulting explosion would no doubt be a crowd pleaser. It would have the kinetic energy of 252 one-ton trucks all hitting you at 100 miles per hour. Airmen, however, would see an explosion with 65 times more energy, the equivalent of over 16,000 trucks (see table 2). Why?—because Air Force drones fly faster and have more mass. Air Force drone collisions hurt more than Army collisions, before even considering the greater number of weapons on Air Force drones.

Army drones stay close to the ground. Above 14,000 feet, 82% of the drones belong to the Air Force. Above 18,000 feet, 93% of drones are Air Force (see table 3). Above 25,000 feet, every drone is Air Force. Because Army drones do not fly as high, the Department of Defense (DOD) and Federal Aviation Administration do not plan to integrate them into its Jet Route – Class A airspace from 18,000 feet to 45,000 feet.[5] Army drones normally do not coordinate with non-Army aircraft in Iraq and Afghanistan. Instead they fly beneath a coordination altitude and in airspace given to them by their division,[6] removing any need to deconflict with non-Army aircraft. Air Force drone missions, conversely, routinely coordinate with most agencies in the theater on every mission. The added risk to Air Force drones from flying higher and greater coordination implies the need for more qualified pilots—officers.

Safety statistics support the Air Force's stance on officer drone pilots. Since Air Force drone flying poses more risks, Air Force drones should have a higher mishap rate. Instead, Army drones crash 3.6 times more often than Air Force drones (see table 4). It appears that the higher qualified Air Force pilots do not crash as often as their lesser qualified Army peers. Service culture may be a factor as well. Air Force chief of staff Gen John Jumper accused the Army of treating its drones like trucks instead of airplanes.[7] This echoes similar sentiments from World War II when Air Chief Marshal Arthur T. Harris, commander of RAF Bomber Command, accused the Royal Army of thinking of airplanes as horses.[8] Even if the Army did have officers fly its drones, perhaps their culture would still drive them to lose more airplanes than the Air Force, despite the higher risks of Air Force airplanes.

Air Force drones are more lethal than Army drones. Only 13% of Army drones carry weapons, compared to 83% of Air Force drones (see table 5). If every Army drone employed every weapon it had on a single target, that target would suffer the effects of 138 weapons with 1,400 pounds of explosives (see table 6). The Air Force, conversely, could employ five times the weapons with *thirty-two* times the explosives, with only its standard weapon loads. If the Air Force chose to load nothing but bombs on its MQ-9s, the same number of weapons would provide *fifty-four* times the explosives that the Army could provide (see table 7). The greater lethality Air Force drones demands higher qualified pilots. Besides, if enlisted pilots crash 3.6 times more often than officers, does that imply they miss their targets more often as well?

Mission complexity in Army drones lags behind the Air Force. The Air Force first used weapons on drones in 2001 with the MQ-1.[9] The Army followed in 2004 with its MQ-5.[10] The Air Force has a drone that was born with weapons in 2007 with the MQ-9. The Army has yet to acquire its own armed drone from birth, the MQ-1C.[11] Army drones together perform three missions according to the DOD—battlespace awareness, protection, and force application. Air Force drones together perform these missions plus three more—command and control, net centric [sic], and building partnerships. Only 5% of Army drones perform more than two different missions. Every Air Force drone performs three missions or more (see table 8).

The disparity in drone mission complexity continues to increase. Initially the only mission was intelligence, surveillance, and reconnaissance (ISR). With weapons came the close air support (CAS) mission. Stinger missiles enabled an MQ-1 to engage an Iraqi MiG-25 in 2002.[12] Table 9 lists twenty two evolving drone missions in three sets: (1) missions being improvised now without formal training or doctrine to compensate, (2) future drone missions that Air Force chief of staff Gen Norton Schwartz alluded to, and (3) future drone missions contemplated in the Air University research paper database. The DOD plans to procure eighteen new drone models through 2034 with eyebrow raising missions like "floating mine neutralization" and fire fighting.[13] Drones will continue to take up a bigger proportion of Air Force operations, perhaps defining them in the future—a bitter pill for the fighter dominated service culture today. Air Force officers should continue to play an active part in these increasingly complex and important systems.

Current Air Force pilots must also contemplate their personal futures as drones relentlessly replace current aircraft. There were 4,328 Air Force aircraft in 2004.[14] That number decreased by 338 by 2009, including 152 of the popular stick-and-rudder airplanes (fighters, bombers, and attack aircraft).[15] Although the number of pilots decreased as well, the loss rate for pilots (4%) was only half the rate for airplanes (8%) (see table 10). The average age of an F-15 today is 24.7 years.[16] One of these F-15s disintegrated while flying in November 2007.[17] The Air Force grounded every F-15 for 18 days as a result.[18] Does this foreshadow similar cases?

The average age of an A-10 is 26.6 years: B-52s average 46.8 years![19] The original number of F-22s was to be 800.[20] The current plan is to order only 22.5% of the original number (180).[21] That assumes that Congress will remove the halt to production it imposed in July 2009.[22] The Air Force plans to acquire 1,761 F-35s.[23] If the F-35 suffers the same fate as the F-22, the Air Force will only get 22.5% of its original order, or 396 F-35s. Those 396 airplanes need to replace the 2,165 non-F-22 fighters currently in the inventory,[24] a difference of almost 1,800 airplanes. Where do the current and future fighter operators of these 1,800 lost airplanes plan to go, if not to drones?

Contrast the dying of traditional warplanes with the youth and growth of cyber aircraft. The average age of a drone is 1.9 years.[25] There were eight Air Force drones in 2004.[26] That number increased by 172 by 2009, a 2,250% increase.[27] The Air Force plans to acquire 320 more drones by 2014,[28] making them more numerous than the current B-1, B-2, B-52, A-10, and F-22 inventories combined.[29] The Air Force bought more unmanned than manned airplanes and trained more cyber than physical pilots in FY2009.[30] Surely the Air Force will not retain combat pilots in dwindling but popular airplanes when reality needs their skills in "obscure, unmanned, freaks of aviation on the front lines of progress."[31] Current trends will push stick-and-rudder heroic pilots kicking and screaming into the military-manager cockpits of the future.

Then Air Force chief of staff Gen Ronald Fogelman forced officer instructor pilots to fly the first Air Force drones in the mid-1990s. He did so after seeing the problems the Army had.[32] This policy wisely continues to the present day. It should continue into the future. Air Force drones require more qualified pilots because of their greater risks, complexity, and lethality—traits that continue to grow with time. The Army will follow the Air Force's lead, just as they did by putting weapons on their drones. As Army drones grow in risk, complexity, and lethality, warrant officers will find themselves taking over the most challenging missions, leaving their commissioned officers to continue leading heroically from the front.

Table 1. Drone wingspan comparison (sum of aircraft*wingspan)

Drone model	Number in inventory	Individual wingspan (feet)	Fleet wingspan (feet)
RQ-7 Shadow 200	460	14	6440
MQ-5B Hunter	44	34.25	1507
I-Gnat-ER	25	56	1400
Total Army	**529**		**9347**
RQ-4 Global Hawk	54	130.9	7068.6
MQ-1 Predator	170	55	9350
MQ-9 Reaper	90	66	5940
Total Air Force	**314**		**22358.6**

Adapted from Department of Defense. *FY2009-2034 Unmanned Systems Integrated Roadmap* (Washington, DC: Department of Defense, 2009).
Note: Of the 34 drones in the roadmap, only the six above apply: they are the Army/Air Force drones that require more than being simply thrown in the air, like the 10,000 four pound RQ-11s currently in both inventories.

Table 2. Drone kinetic energy comparison (sum of aircraft*0.5*weight*speed*speed)

Drone model	Number in inventory	Gross weight (kg)	Maximum speed (m/s)	Kinetic energy (megajoules)
RQ-7 Shadow 200	460	170.1	56.6	125.3
MQ-5B Hunter	44	884.5	56.6	62.3
I-Gnat-ER	25	1360.8	61.7	64.8
Total Army	**529**			**252.4**
RQ-4 Global Hawk	54	14628.6	180.1	12805
MQ-1 Predator	170	1020.6	60.7	319.7
MQ-9 Reaper	90	4762.8	123.5	3267.2
Total Air Force	**314**			**16391.9**

Adapted from Department of Defense. *FY2009-2034 Unmanned Systems Integrated Roadmap* (Washington, DC: Department of Defense, 2009).
Note: Of the 34 drones in the roadmap, only the six above apply: they are the Army/Air Force drones that require more than being simply thrown in the air, like the 10,000 four pound RQ-11s currently in both inventories.

Table 3. Drone altitude comparison

Altitude (feet)	# Army drones	# Air Force drones	% Air Force drones
65,000	0	54[a]	100
50,000	0	144[b]	100
25,000	25[c]	314	92.6
18,000	69[d]	314	82.0
14,000	529	314	37.2

Adapted from Department of Defense. *FY2009-2034 Unmanned Systems Integrated Roadmap* (Washington, DC: Department of Defense, 2009).
Note: Of the 34 drones in the roadmap, only the six above apply: they are the Army/Air Force drones that require more than being simply thrown in the air, like the 10,000 four pound RQ-11s currently in both inventories.
[a]RQ-4 only
[b]RQ-4 and MQ-9
[c]I-Gnat-ER only
[d]I-Gnat-ER and MQ-5B

Table 4. Drone mishap comparison

Drone model	Number of class A or B mishaps per 100,000 hours after 10,000 cumulative flight hours[a]
RQ-7 Shadow 200	375
MQ-5B Hunter	95
I-Gnat-ER	26
Total Army	**496**
RQ-4 Global Hawk	46
MQ-1 Predator	45
MQ-9 Reaper	47
Total Air Force	**138**

Adapted from Department of Defense. *FY2009-2034 Unmanned Systems Integrated Roadmap* (Washington, DC: Department of Defense, 2009).
Note: Of the 34 drones in the roadmap, only the six above apply: they are the Army/Air Force drones that require more than being simply thrown in the air, like the 10,000 four pound RQ-11s currently in both inventories.
[a]Numbers interpreted from figure A.2. on page 93

Table 5. Weaponized drone comparison

Service	Number of weaponized drones	Total number of drones	Weaponized drone percentage
Army	69[a]	529	13.0%
Air Force	260[b]	314	82.8%

Adapted from Department of Defense. *FY2009-2034 Unmanned Systems Integrated Roadmap* (Washington, DC: Department of Defense, 2009).
Note: Includes only MQ-1, RQ-4, MQ-5, RQ-7, MQ-9, and I-Gnat-ER
[a]I-Gnat-ER and MQ-5B
[b]MQ-1 and MQ-9

Table 6. Drone weapon comparison (sum of aircraft*weapons*explosive weight)

Drone model	Number in inventory	Number of weapons per aircraft	Fleet total weapons	Explosive weight (pounds)	Fleet explosive weight
RQ-7 Shadow	460	0			
MQ-5B Hunter	44	2	88	6[a]	528
I-Gnat-ER	25	2	50	17.6[b]	881.8
Total Army	**529**		**138**		**1409.8**
RQ-4 Gbl Hawk	54	0			
MQ-1 Predator	170	2	340	17.6[b]	5996.6
MQ-9 Reaper[c]	90	2	180	17.6[b]	3174.7
		2	180	196.2[d]	35318.1
Total USAF	**314**		**700**		**44489.3**

Adapted from Department of Defense. *FY2009-2034 Unmanned Systems Integrated Roadmap* (Washington, DC: Department of Defense, 2009) as well as Hewson, Robert. *Jane's Air Launched Weapons* (Alexandria, VA: Jane's Information Group, 2009).
Note: Of the 34 drones in the roadmap, only the six above apply: they are the Army/Air Force drones that require more than being simply thrown in the air, like the 10,000 four pound RQ-11s currently in both inventories.
[a]GBU-44/B Viper Strike
[b]AGM-114K Hellfire (8kg HE charge)
[c]MQ-9 standard loadout is 2 AGM-114s and 2 GBU-12s
[d]GBU-12B,C,D (89kg Tritonal)

Table 7. Air Force weapon recomputation with 100% bombs on MQ-9s

Drone model	Number in inventory	Number of weapons per aircraft	Fleet total weapons	Explosive weight (pounds)	Fleet explosive weight
RQ-4 Gbl Hawk	54	0			
MQ-1 Predator	170	2	340	17.6[a]	5996.6
MQ-9 Reaper	90	4	360	196.2[b]	70636.1
Total USAF	**314**		**700**		**76632.7**

Adapted from Department of Defense. *FY2009-2034 Unmanned Systems Integrated Roadmap* (Washington, DC: Department of Defense, 2009) as well as Hewson, Robert. *Jane's Air Launched Weapons* (Alexandria, VA: Jane's Information Group, 2009).
[a]AGM-114K Hellfire (8kg HE charge)
[b]GBU-12B,C,D (89kg Tritonal)

Table 8. Drones mission comparison

Drone model	Number	Battlespace awareness	Protection	Force application	Command & control	Net centric	Building partnerships
RQ-7	460	**X**	**X**				
MQ-5B	44	**X**	**X**				
I-Gnat	25	**X**	**X**	**X**			
RQ-4	54	**X**			**X**	**X**	**X**
MQ-1	170	**X**	**X**	**X**			
MQ-9	90	**X**		**X**			**X**

Adapted from Department of Defense. *FY2009-2034 Unmanned Systems Integrated Roadmap* (Washington, DC: Department of Defense, 2009).
Note: Of the 34 drones in the roadmap, only the six above apply: they are the Army/Air Force drones that require more than being simply thrown in the air, like the 10,000 four pound RQ-11s currently in both inventories.

Table 9. Drone mission complexity

Current missions without continuation training or formal doctrine:
Combat search and rescue (CSAR)[a] Multi-ship formations of drones[a] Naval shipping traffic awareness[b] Strike Coordination and Reconnaissance (SCAR)[c] Armed overwatch[c] Armed reconnaissance[c] Tactical Air Coodinator (airborne) (TAC(A))[c]
Future missions mentioned by the chief of staff:
Air Refueling Multi-aircraft control Suppression of Enemy Air Defenses (SEAD) Swarm tactics Multi-ship formations of drones with manned airplanes
Air University database requested research paper topics for academic year 2010:
Autonomous ISR and Weaponized Unmanned Aircraft Systems Air and Missile Defense in North America and EUCOM Intra-theater airlift Detailed construction engineering reconnaissance Antisubmarine warfare Employing weapons of mass destruction Natural disaster support Air sampling National Guard domestic disaster support Forward Air Controller Airborne (FAC(A))

Adapted from Air Land Sea Application Center. *Air Land Sea Bulletin*, no. 2009-3 (Langley AFB, VA: ALSA Center, 2009) as well as Gen Norton A. Schwartz, chief of staff, US Air Force (address, UAS Beta Test Graduation, Creech AFB, NV, 25 September 2009) and https://www.afresearch.org/skins/RIMS/home.aspx [search topics keywords unmanned, uas, and uav, accessed 30 September 2009].

[a]Capt Steven Mwesigwa, "Predator and Reaper Advancement in Combat Capabilities," 4.

[b]Jim Sebastian, "Small Tactical Unmanned Aircraft Systems: New Fleet Tactics," 8.

[c]Maj Bryan Callahan, "USAF Theater Unmanned Aircraft: Lessons Learned from the 26th Weapons Squadron, USAF Weapons School," 11-12.

Table 10. Loss of operators and aircraft in the USAF

Date	Pilots and Navigators	Total Active Duty Aircraft
30 September 2003	16028	4328
30 September 2008	15427	3990
Percentage change	-4%	-8%

Adapted from Tamar A. Mehuron, ed., "2004 USAF Almanac," *Air Force Magazine*, May 2004, 51, 58, as well as Tamar A. Mehuron, ed., "2009 USAF Almanac," *Air Force Magazine*, May 2009, 38, 48.

Endnotes

[1] Morris Janowitz, *The Professional Soldier* (New York, NY: Macmillan), 21.
[2] Ibid.
[3]*Merriam Webster's Collegiate Dictionary*, s.v. "valor."
[4] Quoted in LtCol Houston Cantwell, "Operators of Air Force Unmanned Aircraft Systems, Breaking Paradigms," *Air & Space Power Journal* 23, no. 2 (Summer 2009), http://www.airpower.maxwell.af.mil/airchronicles/apj/apj09/sum09/cantwell.html.
[5] Department of Defense, *FY2009-2034 Unmanned Systems Integrated Roadmap* (Washington, DC: Department of Defense, 2009), figure A.3, 94.
[6] Pfc April Campbell, "Unmanned Aerial Vehicles Show Battlefield to Soldiers," *Department of Defense News*, 13 January 2008, http://www.defenselink.mil/news/newsarticle.aspx?id=48617 (accessed 22 November 2009). "The division grants the brigade's airspace priority based on the threat and the amount of benefit it will provide in a certain area for a certain period of time."
[7] Lt Col Houston Cantwell, "Operations of Air Force."
[8] Richard G. Davis, *Carl A. Spaatz and the Air War in Europe* (Washington, DC: Office of Air Force History, 1993), 95.
[9] Department of Defense, *Integrated Roadmap*, 63.
[10] Ibid., 65.
[11] Ibid., 64.
[12] Kenneth Munson, ed. *Jane's Unmanned Aerial Vehicles and Targets* (Alexandria, VA: Jane's Information Group, 2004), 229.
[13] Department of Defense, *Integrated Roadmap*, 17-19.
[14] Tamar A. Mehuron, ed., "2004 USAF Almanac," *Air Force Magazine*, May 2004, 58.
[15] Tamar A. Mehuron, ed., "2009 USAF Almanac," *Air Force Magazine*, May 2009, 48.
[16] Mehuron, "2009 USAF Almanac," 49.
[17] Bruce Rolfsen, "Crash prompts F-15, F-15E groundings," *Air Force Times*, 6 Nov 2007, http://www.airforcetimes.com/news/2007/11/airforce_f15grounding_071104/ (accessed 15 November 2009).
[18] "Entire F-15 fleet returning to flight," *Air Force Print News*, 21 November 2007, http://www.af.mil/news/story_print.asp?id=123076914 (accessed 15 November 2009).
[19] Mehuron, "2009 USAF Almanac," 49.
[20] Everest E. Riccioni, "F-22 Raptor Acquisition – A New Tragic Comedy in 4 Acts," *Military.com*, 22 June 2004, http://www.military.com/NewContent/ 0,13190,Defensewatch_062204_Raptor,00.html (accessed 15 November 2009).
[21] "F-22 Raptor Production," *GlobalSecurity.org*, http://www.globalsecurity.org/military/ systems/aircraft/f-22-production.htm (accessed 15 November 2009).
[22] Lester Haines, "US Senate halts F-22 Raptor production," *The Register*, 22 July 2009, http://www.theregister.co.uk/2009/07/22/senate_cancels_raptor/print.html (accessed 15 November 2009).

[23] CSS, ACSC.
[24] Mehuron, "2009 USAF Almanac," 48. Total active duty fighters 1375 (A-10, F-15C-E, F-16), guard fighters 687 (A-10, F-15A-D, F-16), reserve fighters 103 (A-10, F-16).
[25] Mehuron, "2009 USAF Almanac," 49. 180 drones with a cumulative age of 348.8 results in an average individual age of 1.9 years.
[26] Mehuron, "2004 USAF Almanac," 58.
[27] Mehuron, "2009 USAF Almanac," 48.
[28] Gen Norton A. Schwartz, chief of staff, US Air Force (address, UAS Beta Test Graduation, Creech AFB, NV, 25 September 2009).
[29] Mehuron, "2009 USAF Almanac," 48.
[30] Donna Miles, "Unmanned aircraft crews strive to support warfighters," *Air Force News Service*, 13 November 2009, http://www.af.mil/news/story_print.asp?id=123177702 (accessed 15 November 2009).
[31] Edward Odom, "Unmanned Aircraft System Integration into the National Airspace System," *Air Land Sea Bulletin*, no. 2009-3 (September 2009): 22.
[32] Lt Col Houston Cantwell, "Operations of Air Force."

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