THE LAST PILOT

From the Wright Cyclone to the Autonomous Swarm:

The End of the Age of Human Flight

By M. A. Rozas Pashley

> *They were young men who flew because there was no other way to get the machine where it needed to go. The machine needed them. That is no longer true. That is everything.*
>
> -- Working note, May 2026

The Workbench

I was twelve years old, and I was building a Corsair.

It was a 1/48 scale Revell kit, the Vought F4U, spread across a workbench in components, the fuselage halves, the inverted gull wings with their distinctive W break, the enormous three-bladed Hamilton Standard propeller that dominated the nose like a statement of intent. The plastic smelled of something industrial and precise, it could also have been the Bostik cement. The instructions and the striking box illustration were followed for precise guidance and then discarded. Because what I was building was not the kit. I was building the smell of aviation fuel and cordite, my imagination flying alongside the fighter pilots who wrote their memoirs in the post war and took me across the deadly skies of occupied Europe or the endless island-hopping Pacific Theatre of Operations. I read the aviation books, I poured over the archive aviation photographs, I sought bought and read vintage WW2 era Aviation magazines and the contemporary “jet aviation” ones; I would later carefully apply the deep navy blue of the Pacific war colour scheme on the kit model, and just as carefully weathered it with swift brushstrokes using the tiny Tamiya paint cans, brushing the engine cowling with oil stain streaks running aft from the exhaust stacks on either side. Applied correctly it told the story of a hard-worked war engine. The wear and tear at the wing roots, the chipped paint along the leading edges showing the silver aviation aluminium, I so gently applied in a detailed sfumato, the black gunpowder scorching around the gun ports of the six .50 calibre Browning cannons and trailing the dedicated open ports and blast tubes under the aircraft's wings that ejected spent brass cartridges and

The classic 1/48 scale Revell kit, the Vought F4U *Corsair:* Death from Above.

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disintegrating metal ammo links. An imaginary stoogie clenched between my teeth. Flight goggles on, brown leather jacket and coming in from the sun. Tatatatatatatatatata. All six cannons firing in unison, a flying wall of lead. Death from Above.

The Japanese called it Whistling Death. The sound came from air moving through the oil cooler inlets in the wing roots at high speed, a frequency that arrived before the aircraft was visible, a warning delivered too late to act on. The pilot heard nothing. He was the source of the sound. He was already past.

The Pratt & Whitney R-2800 Double Wasp radial that powered the production F4U produced 2,000 horsepower through those three massive four-metre blades of Hamilton Standard Hydromatic constant-speed propeller whose pitch the pilot could fine-tune from the cockpit via a dedicated control lever. Full fine pitch for take-off, maximum thrust at low airspeed, engine screaming. Coarse pitch for cruise, the note dropping, the aircraft surging forward at altitude. The pilot managed throttle, mixture, and pitch simultaneously, three separate levers optimising a single propulsion system in real time through feel and sound and seat-of-the-pants intelligence that no instrument could replicate and no manual could fully teach. He was the computer. His nervous system was the algorithm. The reaction time of a gunslinger. Failure was not even

considered as it entailed certain death, bailing over the shark infested deep blue ocean or enemy controlled insular jungle. There was no reset button.

Riding the Corkscrew

The torque from that R-2800 on take-off was savage enough to veer the aircraft violently left if the pilot did not apply precisely the correct right rudder at precisely the correct moment. The enormous propeller required the distinctive inverted gull wing to give it ground clearance, that glorious W section that made the Corsair one of the most beautiful military aircraft ever built was not aesthetic. It was engineering solving a problem created by the engine's power, beauty as a byproduct of necessity. The Navy initially rejected the F4U for carrier operations because the long nose made forward visibility on final approach dangerously poor. It took Fleet Air Arm pilots, trained in the demanding approaches of British carriers, to prove it could be done. Then the Navy relented.

A Pratt & Whitney R-2800 Double Wasp radial powering the F4U produced 2,000 horsepower via three massive four-metre blades of Hamilton Standard Hydromatic constant-speed propeller.

That machine required everything a human pilot had. Every second of every flight. There was no moment when the Corsair flew itself, when the pilot could release his attention and let the machine continue. The R-2800 radial was alive in a way that demanded constant conversation,

through the stick, the rudder pedals, the throttle quadrant, the pitch lever, the trim wheel, the physical sensation of the airframe in the seat and the hands. The pilot knew the engine was healthy by the quality of its vibration, knew the airspeed was increasing by the changing note of the wind over the canopy, knew the G-load by the weight of his own blood in his extremities. The machine communicated in a physical language that the body learned to read over hundreds of flight hours until the aircraft and the man became a single flight & fight system.

I knew none of this aged twelve. only its unusual, attractive aerodynamic shape of the thing and the imagined pungent smell of cordite. But I understood, with the instinctive certainty that children sometimes reach that through those stirring accounts of human bravery and valour I read in so many pages, I shared the memories of those men who flew them and clearly saw that the airman inside the machine was essential. The Corsair without its pilot was not a weapon but aluminium, perspex, rubber, rivets and wire.

The pilot was what made it dangerous and a thrilling lethal business, the subtle glorification of chivalry in wartime, stripped of its darker consequences and the human toll paid whenever we speak of aerial warfare. All warfare.

I want to record that understanding carefully, because it soon may become historical.

THE LIQUIDATION

Before we discuss what is coming, allow me to share something important what was lost.

The men who flew the Corsairs and the Thunderbolts, the Ilyushins and the Messerschmitts, the Spitfires and the Zeros were not randomly selected from the populations that produced them. They were the physical and cognitive peak of their generations, carefully chosen and selected from a human resource described as *The Greatest Generation*: men who volunteered, willing to die for an ideal, be it God, King, Empire, Rodina, Reich or Democracy.

Furthermore, to fly a high-performance fighter in combat in 1944 required extraordinary three-dimensional spatial reasoning, fast-twitch decision architecture capable of processing and acting on threat information in fractions of a second, the physical strength and coordination to manage an aircraft under G-loads that turned blood to concrete, the psychological resilience to operate at the edge of survivable experience repeatedly, day after day, and the particular quality of courage that is not the absence of fear but the ability to act in its presence with full knowledge of the odds.

Death was your other wingman, every time you flew a combat mission.

These were not common qualities. They are not now. The filter that identified and concentrated them in the cockpits of the Pacific and the skies over Europe was brutal and precise. And then those cockpits were often shot out of the sky.

The body count is recited and memorialised and turned into statistics that paradoxically insulate us from the reality. What is almost never calculated honestly is the total loss accrued: Humanities scientific theories never published. Novels unwritten. Enterprises never founded. The children unborn who would have built and dreamed the next things.

A human generation, in some countries very nearly the entire generation, of the most physically capable, bravest, intellectually talented, skilled young men that those societies had produced was removed from the shared gene pool of human knowledge, inventiveness and achievement. The loss does not stop at the body count. It ramifies forward and compounds through time indefinitely, invisibly, in the shape of everything that was not invented, not composed, not discovered, not built. To this very day.

And then it happened again. Korea. Vietnam and 200 hot regional wars within a "Cold War", that is how 20th century wars were sold to us: streamlined, industrial, slick psyop, agitprop, jobs. The ones without the big memorial pages. The same selection process operating in reverse, identifying the best and placing them in harms way, generation after generation. The bravest going over the top, into the grinder. No such thing as a gallant death, just the loss remains.

The civilisation we inhabit is partially defined by its own absences. The architecture of human knowledge has holes in it cast exactly like the people who were supposed to fill them. We will never know what was in those men. We can only measure the absent silence.

This is not sentimentality. This is the baseline against which the coming transition must be measured. Because the argument for removing the human from the cockpit is, at one level is simple: we cannot afford and are no longer willing to keep putting our best people inside machines and flying them into a war zone. The AI does not have parents. It does not have unwritten theorems. It does not leave behind a desolate future when it does not return.

This argument that promises change does not make the irreplaceable losses described any lesser.

THE BIOLOGICAL PROBLEM

The pilot was not the limiting factor in the Corsair. The R-2800 and the airframe marked that limit. The pilot was the enabling factor, the mind that made the system functional, the hands that gave it purpose, the eyes that found the target. Remove the pilot and you had an expensive aluminium sculpture. This relationship, human as enabler, machine as instrument, held for the

entire history of manned flight from Kitty Hawk to approximately the mid-2010s. It then quietly and without announcement inverted.

The F-35 Lightning II is the clearest expression of that inversion. Its fly-by-wire flight control system limits manoeuvre to 9G, the approximate outer edge of what a trained pilot in a G-suit can sustain without losing consciousness. The F-35 airframe's actual structural limit is 13G. That 44 percent performance margin above the operational ceiling exists solely to protect the biological occupant. The machine is being artificially constrained by the presence of the man inside it.

The survivability doctrine built into the F-35 makes the constraint explicit in a way that no previous aircraft did quite so nakedly. The A-10 Warthog carried 540 kilograms of titanium armour around its cockpit, the famous bathtub, specifically designed to bring the pilot home through direct fire. The A-10's philosophy was clear: the pilot matters enough to defend. Its survivability doctrine was armour.

The F-35 carries no equivalent protection. The canopy is not bullet-proof. The F-35's survivability doctrine is entirely stealth-dependent, the aircraft protects the pilot by not being trackable, not by its on-board armour. On 19 March 2026, when a Chinese YLC-8B UHF radar pinged an F-35C over Iranian airspace and ground fire hit the cockpit zone, the survivability doctrine that replaced the titanium bathtub with invisibility was empirically tested. The pilot just happened to survive. The strategic assumption did not.

But here is what the programme offices will not say plainly: the F-35 was designed without a titanium bathtub not because the designers were indifferent to pilot survival, but because at some level of the programme architecture the pilot's long-term tenure in the cockpit was already understood to be transitional. You do not invest in armour for an occupant you know will eventually not be there.

Remove the human from the F-35 and the engineering calculation changes in every dimension simultaneously. The mass freed from life support, ejection seat, pressurisation, controls, helmet system, and pilot exceeds 300 kilograms at the conservative estimate and approaches 700 kilograms at the upper bound.

Freed from its biological purpose, that mass becomes fuel, sensors, or weapons. The software governor unlocked to the structural ceiling gives the airframe the 13G capability it has always possessed and never been permitted to use. The full engineering case is set out in the companion document, The Ghost Programme.

See companion document: *The Ghost* Programme. A Plausible Technical Companion to *The Last Pilot*

The Corsair pilot was the part that made the machine dangerous. In the F-35, the pilot has become the part that makes the machine less dangerous than it could be. That inversion is the hinge on which the entire history of military aviation turns.

THEY ALREADY KNEW

An unsettling aspect of the F-35's design philosophy is not the lack of armour but the timeline.

By the early 2000s, while the F-35 programme was in full development at Lockheed Martin's Skunk Works, the same organisation was simultaneously developing the X-62A VISTA, a highly modified F-16D used to evaluate autonomous flight technologies.

Direct Voice Input and the Virtual Head-Up Display, both developed and tested on the VISTA autonomous platform, were subsequently incorporated directly into the F-35 cockpit design. The same Skunk Works. The same decade. The technologies bridging the autonomous test platform and the supposedly manned production aircraft were identical.

The Boeing X-45 unmanned combat aerial vehicle, a mid-2000s concept demonstrator for fully autonomous military strike aircraft, was running in parallel with the F-35 development programme. The Boeing X-37, transferred from NASA to DARPA in 2004, began its classified

validation of suborbital autonomous operations during the same period.

The autonomous combat aircraft was not a future concept being developed alongside the manned F-35. It was, plausibly, the same programme architecture bifurcated into a classified track and a public track, with the public track carrying a pilot because the legal, political, and institutional frameworks of the early 2000s required one. The AI that would eventually operate the platform was already maturing in classified development when the first F-35 production contracts were signed. It was as stealthy as the aircraft it was designed to ride, present, and entirely unannounced.

DARPA's Air Combat Evolution programme, which in December 2022 flew AI algorithms autonomously in an actual F-16 at Edwards Air Force Base and in 2024 conducted the first live AI-versus-human dogfight in which the AI won, was not a sudden leap. It was the public surface of a development arc that had been running for two decades below the classification threshold.

The $2.1 trillion lifetime cost of the complete F-35 programme, calculated across a 92-year span to 2088, (contract awarded 1996, first flight 2006) is not the cost of one manned fighter aircraft. It is the cost of the transition infrastructure, the sensor fusion baseline, the datalink architecture, the autonomous systems integration framework, and the legal cover of a uniformed human in the cockpit, for the platform that was always the real destination.

The pilot was the price of doing business in an institutional environment not yet ready to buy what was actually being built.

THE AGENTIC TURN

The official framing of what is being built is careful and politically necessary. The F-35 pilot, we are told, will control up to eight Collaborative Combat Aircraft simultaneously from the cockpit via a touchscreen tablet interface. The human retains meaningful authority for engagement decisions while delegating tactical execution to autonomous systems. The language satisfies the requirement of the laws of armed conflict, meaningful human control over lethal force decisions, while describing something that, examined honestly, cannot be what it claims to be.

A single human pilot simultaneously flying an F-35 at combat speed in a contested electromagnetic environment, managing eight autonomous aircraft each executing independent concurrent missions, ISR on one node, electronic warfare suppression on another, a kinetic strike package on a third, air-to-air intercept on a fourth, is not meaningfully controlling those missions at the tactical execution level. The cognitive bandwidth does not exist. The human brain processing threat data, flying the aircraft, and issuing high-level intent commands to an AI swarm

is not supervising those drones. It is ratifying decisions the AI has already made at machine speed, milliseconds before the report reaches the cockpit display.

The human provides mission intent at the outset. The human provides legal authorisation at the theatre level. The agentic AI manages the formation, allocates targets, sequences engagements, deconflicts airspace, and adapts to threat responses in real time at speeds no nervous system can match. The human is not in the loop, he is over the loop, and the loop is moving too fast to wa

Both Collaborative Combat Aircraft prototypes, Anduril's YFQ-44A and General Atomics' YFQ-42A, completed their first flights in 2025. Both were semi autonomous from the first taxi test. Anduril went from clean-sheet design to first flight in 556 days, a timeline that signals AI-integrated engineering workflow compressing what once took a decade into less than two years. There is no operator with a stick and throttle flying these aircraft behind the scenes. The next iteration will be faster. The compounding has begun and it does not run backwards.

THE GHOST OF DYNA SOAR

In December 1963, Secretary of Defense Robert McNamara cancelled the Boeing X-20 Dyna Soar programme. The X-20 was a single-pilot spaceplane designed to achieve orbital or

suborbital flight, conduct reconnaissance or weapons delivery missions, and return to a conventional runway landing. McNamara cancelled it because he could not articulate a mission that justified the cost over ballistic missiles. He was right, by the calculus of 1963.

The mission now exists. The technology to implement it is arriving on a timeline measured in months, not decades.

The Boeing X-37B Orbital Test Vehicle has been validating the suborbital and orbital manoeuvre envelope since 2010, conducting missions measured in hundreds of days under substantial classification. It has demonstrated autonomous re-entry and precision runway landing without a pilot, repeatedly and reliably. The Northrop Grumman X-47B demonstrated fully autonomous Navy carrier operations in 2013, catapult launch, precision navigation, arrested landing on a moving deck, without a pilot and without remote control in the conventional sense. The carrier deck, the most demanding aviation environment on earth, was conquered by an autonomous system twelve years ago.

Stack those two lineages. Add the Anduril Lattice autonomy architecture, hardware-agnostic, the same autonomous decision framework running across aircraft, ground vehicles, maritime systems, and whatever platform comes next. Add the propulsion advances compressing the development timeline. What you arrive at is not an aircraft. It is an orbital weapons node with an autonomous crew of one, and the one is not biological. A platform that launches, achieves altitudes beyond conventional air defence geometry, conducts its mission, and recovers, all without a human inside it nor in meaningful real-time control of its tactical decisions.

The Dyna Soar pilot that McNamara cancelled in 1963 has been quietly replaced not by a better pilot but by the absence of the requirement for one. When? Anduril built a combat aircraft from clean sheet to first flight in 556 days. The decision to build the next platform may already have been made where they do not issue press releases, in a facility whose power draw appears on no utility company's books, accessed by a route that does not appear on any public map.

THE VACUUM

Laws of armed conflict require meaningful human control over lethal force decisions. The principle is clear. The definition of meaningful is not. The gap between what the principle requires and what technology is building widens at a rate legal frameworks cannot match.

Lets imagine an on-board agentic AI managing sixteen autonomous combat aircraft across a 200-kilometre battlespace that operates at decision speeds measured in milliseconds. The human commander who nominally authorises the mission does so at the outset, at the level of intent.

What happens between that authorisation and kinetic ordnance detonation is a cascade of autonomous decisions made at machine tempo that no human nervous system can meaningfully supervise in real time. The human is present in the chain of command. The human is absent from the direct tactical operational chain.

The atomic bomb was not preceded by an international legal framework governing its use. The framework came after, built around the reality that the weapon had already been used. The autonomous lethal system will follow the same pattern. The lawyers will arrive after the engineers, as they always have and will, construct the framework around what already exists.

There is a further consequence that democratic societies have not yet reckoned with honestly. The pilot who does not come back from a mission is a death that is understood, mourned, and politically priced. The autonomous system that is lost on a mission is a procurement problem. Remove the human cost from military action and the political threshold for initiating it changes. Whether it changes in a direction that benefits humanity is a question that no engineer's specification sheet addresses, and no programme office will be required to answer.

WHAT THE MACHINE WILL NEVER KNOW

The agentic AI that manages the autonomous swarm from the orbital node will be, by every measurable operational metric, better than the man it replaces. It will not black out at 13G. It will not misread its altimeter in cloud. It will not make the category of error that has killed pilots since the first cockpit was designed.

It will never know the particular quality of courage required to climb back into that cockpit the morning after the man in the next aircraft did not come back. The courage that is not the absence of fear but the ability to act in its presence, repeatedly, with full knowledge of the odds, because the mission required it and because the men beside you were doing the same thing and you simply refused to play chicken.

It will never know what the twelve-year-old was building a 1/32 scale model of an aircraft he would never fly, was unaware he was paying tribute to men he would never meet, it was something in that air machine and the stories of the men who flew it that demanded some sort of unspoken acknowledgement.

It represented the absolute outer limit of what a human being could do inside a machine. The long, specific, unrepeatable moment of a planetary technotronic industrial revolution between Kitty Hawk and the DARPA Air Combat Evolution programme when the human was the most capable component of the system. When the machine needed the man in a way that was not nominal, not legal, not political, but operational and physical and real.

That moment is ending. It has been a long Summer sunset, far longer than most people realise, and the coming sunrise will arrive faster than most people are ready for. The new dawn will come with the technotronic fruits so painstakingly cultivated. There is no good or evil inherent in this statement. The question is how to use it wisely, and in warfare, real victory is never having to resort to it. *Si vis pacem para bellum*, or Peace through Strength, if you must.

From the P-47 Thunderbolt to the F-47, in designation, an echo across eighty years of the same alphanumeric stamp on the leading edge of airpower.

The F-47, whatever form it ultimately takes, and it may look less like a fighter aircraft and more like the suborbital ghost of the Dyna Soar with an AI core and a payload bay where the pilot used to sit, is not the next generation of what the Corsair was.

It is the first generation of something that has no historical precedent and no proper name yet. Something new begins.

They do not make humans like they used to. The men who flew the Corsairs and the Thunderbolts were real life Icarus come true, men who strapped themselves to controlled

explosions in cast aluminium cylinders and flung themselves at the sun and sometimes did not come back; they knew the odds, and went anyway.

Artist concept of a future AI Loyal Wingman UCAV. A F35U Ghost, as an AI alpha node, could control a wing of #8, or even #16, Attritable AI drones, expendable/self return to base.

We miss them. We should.

And we should think what replaces them, not better pilots, not safer pilots, not more humane pilots, but the end of an Era. The last pilot has not yet flown his last mission. But he is flying now, in an F-35 whose fly-by-wire governor restrains what the airframe can really do, managing a tablet interface that controls drones his nervous system cannot simultaneously supervise in real time, in a cockpit that engineers are already designing steadily as surplus to requirements.

He does not know he is the last. They never do.

The Revell Corsair I built aged twelve remains somewhere forever in my memory, fully assembled, details exactly right, the wear, the chipped leading edges, the gunpowder marks, the

deep navy blue of the Pacific. The Hamilton Standard propeller, the blade pitch coarsened for velocity, the R-2800 at 110 percent full military power, the note of it dropping half a tone as the aircraft accelerated away from whatever it just did.

The pilot remains inside. He is always inside. He smells of aviation fuel and cordite and the particular cold, cold, sweat of a man who has just done something at the edge of what is survivable and plans to do it again tomorrow. A twenty-three year old. A hero warrior but he seems oblivious, he is the most capable component of the system. The system requires him.

For a while longer. Just for a little longer.

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