The End of Fighter Aviation
By Mark Jones

A fascinating thing occurs when a fighter pilot realizes his aircraft is equipped with a radar. It's on his second or third flight after being assigned to a fleet model while he's cruising on some jet route in the sunshine, snug wrapped in canvas and fire resistant nomex flipping switches he knows nothing about. Radars to him are lawn fixtures to get satellite cable, or just things rotating on control towers at airports. And why would an airplane even need to transmit anything in the first place.

The only issues of significance stem from the seat of one's pants. Airflow, fuel supply, and aerodynamic feedback. Everything else just detracts from the view. But admittedly some new confusion emerges about how flying might be more than dynamics. About how the screens that he keeps fiddling with might actually contain symbols that have meaning. And how they might somehow be connected to all those conversations between superiors that he can't seem to ever keep up with.

It either registers at this point that he's part of something bigger, or it dies there and is left unaddressed forever. Either way, within a few weeks of the commencement of training, he is summoned along with his classmates into the corner of a quiet room where a black safe sits waiting under guard. The padlock is undone and the contents are put on display. Four tactical manuals measuring several inches thick containing the details of every air threat in existence. Surface-to-air missiles. Shoulder-fired manpads. Russian and Chinese MIG aircraft along with every missile they are thought to be carrying. Their maximum ranges. Who manufactured them. Where and when and how many have been exported since.

It eventually becomes apparent that flying encompasses more than just being airborne. That one's nosecone houses an instrument that is only one part of a giant electromagnetic puzzle. A webwork of tactics that, instead of determining, are rather fueled by what's out there. What the other guy has. How to beat it. And it doesn't take a lot of time to get clued in to the fact that the only window into this world is through one's radar.

In the days that follow, these manuals are gradually employed in filling pilots with rote data. And sooner or later they tune into the fact that all answers are to be sought from the source. It's at that point that these four scrolls become equivalent to gospel, and even lauded as being written in blood. One chapter actually welcomes them with this:

It has been said that the history of failure in war can be summed up with the words 'too late'. While the origin of war can be traced back 5000 years, it can be argued that the most basic objective of combat since the first battle in history has always been, in simplest terms, to hit the other guy before he hits you. Consequently, success in achieving that objective has been contingent upon possessing either a longer reach or a faster punch.

In the earliest battles, men fought with clubs and daggers. Later, their reach was lengthened with the use of spears, and then extended even farther by mounting those spears in bows and launching them as arrows. The use of chariots soon took those same weapons closer and faster to the heart of the enemy than ever before. With the invention of gunpowder, man's reach across the battlefield was even faster and farther in the form of bullets and artillery. Eventually, those same weapons were mounted on sea-borne chariots in the form of ships, and later on mechanized chariots in the form of tanks. Ultimately, the chariots became airborne, turning the two dimensional battlefield into a three dimensional battlespace.

Although technology has changed significantly over the past 5000 years, that fundamental objective of hitting the enemy before being hit remains unchanged. Furthermore, it is apparent now, more than ever before, that the most important dimension on today's modern battlefield is the dimension of time. If one can act before his opponent and force his adversary to react, he can effectively seize the offensive advantage and keep the opponent constantly on the defensive. Nowhere is this principle more important than in the realm of modern aerial combat where the chariots are now supersonic, the punches are thrown at nearly four times the speed of sound, and the knockouts are permanent.

David A. Robinson is an F-18 pilot and former Top Gun instructor who authored the above paragraphs as a Major. They could quite possibly be the most brilliant summation of why weapons symbolize not action, but passivity. Why their design and employment are never meant to provide solutions, and will at best only make them precursors to others. Why the peaceful resolution of any international quarrel would by definition negate the existence of this skill set.

He goes on to describe in the paragraphs that follow the details of how to be tactically proficient. It consumes a few pages and comes replete with a series of charts and matrices specific to various missiles. All of which everyone is eventually expected to master. Shot ranges. Kill probabilities. Calibrated airspeeds. How to achieve the ideal firing parameter. What constitutes a valid shot and what doesn't. Robinson is sandwiched among a number of other elite who have at one time or another been commissioned to contribute a chapter. Most of which demonstrate an analytical clarity common to anyone capable of being cognitive. But they are at the same time saturated in the confidence of those who can only make sense of things by grossly oversimplifying them.
The reason all this is important is that the ability to make a judgment about whether fighter aviation works can only come from an understanding of what they do. And who better to make it than the very people who keep footing the bill. Because these tools we keep amassing are symptomatic of a predilection to outsource our disputes to the whim of hardware, and not humans. It puts a vacuum on our money, our resources, and our potential in an unending quest for the edge, but locks us into orbit around myth concocted to divert us from what works and what might actually yield solutions. It's time for us to go beyond the dimension of time.

It goes without saying that air engagements are designed to achieve only one aim. Physically destroy the other side's aircraft. But this in itself is nothing more than the latest variation on the theme. The only reason aircraft ever became targeted for destruction was because they were being used as fire support for ground troops. And the only reason they were being used as fire support for ground troops was because they were advanced enough to be mass produced in the first place. So everything I'm about to describe is based exclusively on the need to achieve an aim for which the technology was not designed – just forced upon those who opt to participate in this charade of trying to outdo the other with currently available science.

Every sanctioned maneuver and tactic currently in use is designed with only one purpose in mind. Bring about a position of geometrical advantage from which either bullets or missiles can be fired. Every manipulation of the control stick, radio transmission, and flight formation is fashioned around the establishment of these conditions. But all of them are dependent on a long list of factors that rarely remain fixed for an instant. It's a complicated problem with an equally limitless capacity to stimulate, but essentially reducible to three basic actions. Evade, Attack, or Stall. But independent of all interpretation is the basic fact that fighters exist to win. That the only result worth the money is the physical annihilation of one's foe. And for an aircraft to be destroyed, it must first be detected, then locked – either visually or electronically – and finally tracked into the conditions mentioned above. No other scenario is possible.

So the issue at stake is who decides these conditions. The reality is it's not a question of who, but rather of what. The machines themselves form the bedrock of everything. And gadgets, unlike ideals, are bound by limitations. Temperatures at which they overheat. G-forces beyond which they won't pull. Ranges beyond which they simply won't reach. All of these pressed together comprise what's physically possible, but never reflect the scope of actual practice. There's a mind in every man, threats to keep at stiff-arm, and whole regions that won't lend you their airspace. So the operator's slate is eventually subjected to circumstance, and at best provides only a portion of its potential. Typically this takes the form of the following.

A large chunk of sky is marked off on a chart over an engaged area like say, Iraq or Afghanistan. The evolution of events determining the selection of these points is a whole separate problem in itself, but we'll go ahead and refer to them as latitude and longitude. The coordinates then receive a three dimensional definition, and are again chopped up into small individual blocks. All of which are assigned a new boundary. So you eventually end up with a matrix of shapes snugly fit between a patchwork of corridors. It's not only Hornets and Eagles, but also Falcons and Raptors, and everyone wants in on the action. Because everyone's spent the better part of their adult life in a cockpit honing skills that lack the only element that counts. An actual target. And training isn't designed to cultivate a spirit of abstinence in the face of prospective field test experience.

So a document is drafted detailing who gets what block at what altitude and from what time to when. Air refueling will be conducted here and emergency landings

can be made here and this is where we'll jettison unexploded ordinance. Everything gets established and distributed in the form of checklists, and operations become round-the-clock rotations. There's always someone airborne and the radio is never silent, and the most strenuous task becomes relaying one's boredom. But let's pretend something actually happens.

A flight of two fighters is orbiting its block next to everyone else doing the same thing in theirs. Waiting. Conversing with various ground controllers or just daydreaming about dinner. Beanstalked at an altitude that keeps fuel flow down to a minimum while they circle the same point in the sky. Each is busy scanning their half of the area based on a pre-briefed allocation of responsibility. For instance, one takes the upper half, and the other gets the bottom. Either way, it's just a contract between wingmen. So how does a pair of fighters control several thousand cubic miles of airspace? The answer is, they can't. And that's where radars come in.

Any transmission of electromagnetic energy will in part end up back where it came from. Most will get scattered or absorbed by various objects, but the small portion that returns is enough. In it is an imprint of everything that it ran into during its speed of light boomerang across the sky. But if instead of just once, you send it off say, several hundred thousand times a second, the outgoing packets will eventually start coming back to you. And provided they continue to remain of a detectable strength, they can be captured and subjected to analysis.

Comparing an incoming packet with a record of its initial will reveal that it is apparently different. Something shifted. The packet that went out is not the packet that came back. At some point it managed to slam into something. And now that it's come crawling back as a mangled set of wavelengths, the task becomes finding out why. From this comes the extraction of a string of useful facts. Most of which find their way onto a screen in the cockpit in the form of various symbols and digits, and interpreting this collage provides the answers to all the basic sets of questions. Who's out there. Where are they. How fast are they going. Are they alone, or am I up against an entire formation.

The device being described is called the Pulse Doppler Radar. One of which occupies the nosecone of every modern fighter in the world – symbolic of the fact that in order to find something, you've got to go out looking for it. And that's what our two fighters are busy doing. Circling their block spraying pulses across vast swaths of airspace. Analyzing the results that come dancing across the screen between queries about how each loved Annapolis. But collegiate nostalgia isn't the only thing they've stored in bulk. Their very presence in region is predicated on having completed some sort of syllabus. Most of which include the standard array of the latest satellite guided munitions. JDAM, JSOW, etc. Others offer a more congressionally funded understanding of FLIR, MIDS, and laser guided bombs. Some induce sweating. Some induce sleep. But most are heavily devoted to the grueling physical labor of programming a waypoint, pressing a button, and then leaving. Either way, they vary with location. And even if you left unaddressed the question of why they have to differ, you'd still be unable to flee

from why those preparing for worthy causes must be even regulated by a budget in the first place.

But regardless of the program, every salaried occupant of any aircraft equipped with a missile is quickly inundated with what is generally referred to as "timelines." Which as with any use of the term, means a consecutive string of events. But in this case represent just the latest revision on how to detect, lock, and track. It's a canned order of tasks that at first seem intentionally digressive. From the whole point of destroying the other side's aircraft. From the musty effervescence of simply barging in and gunning them into fragments. But the air war has long ceased to mean that. And has for decades now been fashioned around the execution of intercepts devised to wiggle oneself into a preset parameter. Whether or not you even see your opponent is of no significant importance. Just get the missile into a position where it can be launched with what the manuals profess to be a decent probability of collision. All the while dodging the other's electromagnetic spray in order to conceal the fact that you are even in the vicinity. Because essentially it's a question of who detects who first, and then secondly, what gadgets are available. All of which Robinson describes with exquisite precision. But none of which is designed to bring about a permanent resolution to any issue, even if executed perfectly.

One of the sad facts about the structure of modern militaries is that the very individuals that fund them are conceptually unaware of how they function. And provided one has no actual experience running intercepts on fighters, one has likely never participated in any conversations about timelines. And therefore, is in the dark about all of this. But it's important to understand what our two fighters are poised to do should they come across anyone crisscrossing their sector. Even more important than that is the judgment that follows about whether any of it is worth the money invested.

Most of us are under the impression that engaging fighters means turning loops and pulling G's. Spiraling around a bird's nest mixed with good guys and bad guys with your fangs out and your finger on the trigger. Certainly there are tactics on the books for this, but they hardly represent more than a fraction of current training. The less well known truth is that fighters engage fighters by flying straight at each other. Opponents can be detected at over fifty miles of separation, but it's what you do while closing the distance that determines everything about the result. And it's timelines that offer pilots a series of templates about how to wiggle into a firing position. These of course vary according to missile, but are based on essentially the same set of events.

A call is generated by one the fighters themselves or from an external source such as a ground station or ship – or even another aircraft in a completely different location – someone with the ability to observe several blocks at once. The information it contains is of a standardized nature, usually the altitude, location, and general grouping of what's out there. All of this data is typically soaked in a monotone drool and then regurgitated a least once for confirmation. But it's the very last word to which pilots remain attune, because that determines whether or not they can even pull the trigger.

Regardless of who found it, whatever reflects radar energy is often no more than a blob in the distance. No one's even seen it yet, and no one knows what it is. But sometimes available radar energy can be decoded in such a way as to clearly reveal who's actually reflecting it. Pulse Doppler devices can be preprogrammed with special algorithms capable of pinpointing the very model your opponent is flying. MIG 29, Su-27, MIG-23, etc. Echo energy off the compressor blades of the intakes themselves conform beautifully to an electromagnetic beat. Each of which has been catalogued for the purpose of informing pilots not who, but exactly what it is they are up against. And given the proper geometry, this data will show up on most radar screens as soon as the computer can crunch the numbers. It's unclear whether it is indicative of a potent sarcasm or mere lack of it, but the formal name for this is actually Non Cooperative Target Recognition. Either way, confusion imposed by complicated rules of engagement and unreliability inherent to the technology make it rarely passable as grounds for launching a missile. Doing so might annihilate a compatriot. And that's why the last word is so important. If it is "bogey" it's still a blob. If it is "hostile" it's a green light to shoot.

But even if you get the word on something still thirty miles away, you're only through step one of the timeline. At this point our two fighters have already oriented themselves in the direction of the blob in the distance. But not exactly nose to nose. They've offset their track by roughly twenty degrees to one side in order to minimize the high rate of closure. Doing this is also said to help conceal the fact that they're purposefully even targeting it. But provided it isn't a flight of far superior Russian aircraft closing hypersonic from well over 60,000 feet, they've got a few moments to make some decisions. But regardless, it will be over within the span of a minute – which is less than the average freefall skydive.

In keeping with our statement that available gadgets determine everything about tactics, it pays (not much) to know a thing or two about missiles. And the truth is there's basically only three. All of which have remained immune for literally decades to any breakthrough in thinking or even progression of fighter aircraft. You'll find the same missiles that were strapped to American jets in Vietnam are basically the same ones around which fighters are still designed. And given no subsequent overhauls of this form of logic, the phenomenon will likely to continue. The first kind is designed for short range engagements, and is generally reserved for when the other is in sight – when infrared energy can be sensed and tracked. In other words, it detects the heat of aircraft engines. And, therefore, is typically only available when you're behind someone. The second receives its direction directly from the radar, and requires electronic guidance until impact. Meaning, the moment it ventures outside the cone of electronic spray being emitted from the nose of your aircraft, it stops working. The last kind is essentially no different than the second, except for the fact that it can leave the cone and keep working. Sometimes.

The unofficial names for these three kinds of missiles are infrared, semi-active, and active. And not unlike the cigarettes, pipes, and cigars of this world, come in various forms depending on the country. They are manufactured, upgraded, and

warehoused in quantities untraceable by the very people who get the invoice. One nation in particular shelves an arsenal of each, calling them the Sidewinder, the Sparrow, and the AMRAAM. The first is apparently an effort to equate heat-seeking with snakes, while the second alludes vaguely to birds. But the third, for whatever reason, is nothing more than an acronym for Advanced-Medium-Range-Air-to-Air-Missile.

Our pilots, meanwhile, are still closing on the blob, which has since turned into a tight group of two. But they're outfit with at least one of each of the missiles mentioned above. Their objective, as Robinson describes, remains unchanged since the beginning of time. Get a punch off at maximum reach. This, in technical terms, means fire a missile at a physical separation large enough to enable them to flee undetected. But they have no secret gadgets enabling the monitoring of the cockpits of either of the pair in the blob. So unless they get beelined in a manner clearly visible on radar, they have no way to verify if their presence is even known. And the only thing on hand enabling our pilots to make decisions is a meticulous adherence to the timeline.

Which says our blob-pair is ready to be locked. But missiles, as stated earlier, are not always dependent on radar. The Sidewinder, for instance, can be launched from the roof of your car if you could find a way to properly aim it. But until the US collapses and the hardware becomes available, testing of this sort will likely be heavily regulated. And at this range, there is virtually no infrared available.

The radio up to now has been clobbered by a repetitive series of calls. All of them similar to the first. Updates on position, altitude and the direction of the blob pair approaching. The last one was finally punctuated with a "hostile" declaration, but the NCTR equipment has yet to even come up with a model. Meaning, these "hostile" intruders have already been ordered to be shot out of the sky, but the equipment hasn't even deemed them uncooperative. Anyway, time is running out. And the pilots have only seconds to get their radars out of scan mode and into a beam concentrated exclusively on one aircraft. This is generally referred to as "sorting", and basically governs who locks on to what part of the blob. Although it may often be subject to slight airborne adjustment, typically this is all decided ahead of time.

But the last few seconds haven't been filled with only radio calls. The blob pair have actually turned around and are now facing our fighters, and are likely now running timelines of their own. So at this point it's a question of who can get a missile off quickest. But actually it's not quite that simple. There are countless permutations to how this situation can unfold, depending on what kind of missiles are in use. Should the blob pair be equipped with only the semi-active kind, they will still be forced to maintain their general direction. Because that's the only way to ensure that the missiles they fire don't venture out of the limits of their radar. In other words, the first opportunity for the blob pair to physically get away from the situation would be the instant their missiles impact our fighters. Pilots refer to the distance between the fighters and the blob pair at the moment this occurs as the missile's F-pole. It therefore follows that an intercept involving groups equipped exclusively with semi-active is essentially a war

between competing F-poles. Between who can get a missile off first. And even if the other manages a shot with yours in transit, mutually assured destruction is still avoidable. Because any missile launched from a fighter that is subsequently destroyed will no longer be receiving anymore radar data – and will eventually arc off unguided. But all of this changes if you have an active missile on board.

Active missiles are equipped with tiny radars themselves, and are capable of locating targets on their own. The pilot's job is just to point them in the right direction. And based on a data stream transferred to the missile at launch from radars that have already completed "sorting", the missile will eventually open its own eyes and start looking. This is typically referred to as the moment it "goes active", and is also known as "Pit-bull", or more technically, "A-pole". Without getting too technical, AMRAAM's, as a rule, "go active" after travelling roughly one-third of the distance between the shooter and the target at the instant the missile was launched. For example, should our fighters launch AMRAAM's at eighteen miles, they will "go active" when the range ticks down to roughly twelve. Meaning, the fighters are no longer required to keep flying at the blob pair for the purposes of keeping a missile inside the radar cone. And after manually flipping a switch cutting off the radar link to the missile, they are free to go elsewhere and do other things.

But what if the blob pair is also doing the same. What if the fighters have themselves been locked and are now in danger of being subsequently targeted. Honestly put, there are few ways to confirm this. Most fighters are fit with what is generally pronounced "Raw Gear" (despite the fact that the actual acronym reads "RWR"), which is nothing more than a series of passive receivers attached to various points around the aircraft, connected to a gauge in the cockpit. They are installed for the purpose of informing a pilot that he has managed to find his way into someone's radar cone. This is usually interpreted for tactical reasons to mean "oh shit, I'm being chased by a missile" But provided you aren't piloting a Mirage 2000, you've long since discarded this equipment as useless. Switching the thing on will just open up the circuit to every wave currently ricocheting through space, so the device itself eventually depreciates into an attraction fit for the headboard of some pinball arcade. Within the realm of active missiles, it's no longer a battle of F-poles. It's rather one of maximizing one's distance from the other at the point when the missile finally decides to "go active". In other words, it's a joust between A-poles, and essentially a question of who can cut the radar link quickest.

Sort of. Unlike the previous illustration with two semi-active missiles simultaneously airborne, active missiles are obviously at some point bound to "go active". Meaning, regardless of whether your missile impacts one of the blob pair first or not, you're still left with airborne missiles to dodge. In spite of what others may profess, this is virtually impossible to pull off with the naked eye. So the only way to defend oneself against a missile currently tracking is to separate oneself physically from the radar energy. But since there is no definitive way to determine if there's a missile even tracking, measures against this are usually taken preemptively. Which brings us to the next step of the timeline.

It was pointed out earlier that airborne radars function by broadcasting a series of closely-spaced pulses and then comparing what comes back with what went out. That from the frequency shifts exhibited comes some basic data about what it ran in to. Altitude, velocity, position, direction, etc. But what was intentionally not mentioned was that there is one useful exception to this phenomenon. A void, if you will, in which frequency shifts are altogether unobservable. And it's thanks to the research of one Christian Doppler from Austria that any of this is even discussable.

Consistent with the principle that energy reflected off objects in motion will to some extent exhibit a frequency shift, it follows that objects not moving will show none. So in order to even detect any object moving in the vicinity, it must have some sort of relative velocity. Objects moving away from you will show a decrease in frequency, while approaching ones will show an appropriately higher one. But if the movement of both observer and target together happen to maintain the same relative parameters – should they have no closing or opening component – they will be altogether undetectable with what fighters are currently limited to - none other than the pulse Doppler radar.

Everyone knows this, and most take advantage of it by incorporating it into their timelines. So the obvious solution to how to dodge an airborne missile is thus to make oneself electronically invisible. To cloak oneself in a condition of zero relative velocity by maneuvering to place all threats at either the left or right extremes – a place pilots typically refer to as "the beam". It goes without saying that as long as this relationship between radar energy and frequency shifting undergoes no major evolution, any established method for accomplishing this feat will itself continue to remain the same forever. So it isn't a big surprise that the "notch" maneuver I'm about to describe has for literally decades remained virtually unchanged. And given no major paradigm shift in either nature or how we exploit it, this too will likely continue indefinitely.

Suppose our fighters launched an AMRAAM apiece at the point when they were eighteen miles from the blob pair. Now that the separation is twelve, they have no reason to keep making themselves into targets. The missiles are active, the "RWR" gear is blinking, and it's unclear if they've even been fired upon. The timeline at this point calls for both of them to put the blob pair on the beam. In other words, perform some flight maneuver that reduces their relative velocity to zero. Since they've been tracking from the beginning at an offset to reduce closure, it's not exactly a ninety degree turn. More of a flop over to a heading exactly ninety degrees from the blob pair, complimented with an extreme adjustment of altitude. The objective is to eject oneself from the radar spray of the other, while simultaneously attaining electronic invisibility. The altitude shift in this case requires either a climb or a descent, whichever puts them roughly five thousand feet below the blob pair. So the notch can be a rather disorienting maneuver.

Sometimes it works. Sometime it doesn't. Often it can be monitored in its entirety by the other if for some reason the radar manages to keep tracking it. But our fighters have no way of knowing this. Only unhelpful suggestions from the

pinball that's still blinking. Reminding them to keep arcing around the beam. So here they are at some completely different altitude having wiped their radars clean executing the notch. Because the radar spray doesn't extend to ninety degrees from one's nosecone. And even if it did, the fact that they are "beaming" would make it meaningless.

Meanwhile, the range to the blob pair is less than ten miles now, but there is no actual radar data to confirm it. And regardless of whether or not they see any explosions in the distance, they are simply on to the next step in the timeline. Turn back in and figure out what happened. So they each execute a hard climbing turn to get them pointed in what they are guessing is the direction of the blob pair. Their objective at this point is to lock them again on radar while zooming up from their perch below. Should they be successful at this and also equipped with extra missiles, they are generally free to pull the trigger at will. This process of climbing out of the notch and beelining one's adversary is what pilots refer to as "cleaning up the merge". It affords what they believe to be their best chance at capitalizing on whatever is left of the element of surprise. The manuals at this stage prescribe that one's eyes be outside – scanning for either airplanes or debris. It's their first look at what has up to now been just a blob pair, and it determines how the timeline will end.

If the technology was good enough, and their A-pole was longest, there might not be anything left for them to do. But if either of the blob pair are still airborne and searching, it ceases to be a mere war between missiles. Everything at that point becomes a visual engagement, and a series of other factors rush in. Pilot experience, engine thrust, fuel capacity, luck. Actually, it's a different manual altogether.

But when you multiply this picture by hundreds of different blocks manned by thousands of aircraft on constant patrol, you lace it with a complexity of unmanageable proportions and open up huge margins for error. All of which can mutate exponentially into a monster quite ungovernable within the jurisdiction of one individual. And this auctioning off of the problem to legions of the eager empowers thousands with the ability to kill. To run timelines. To pull triggers. To program waypoints and press buttons. To reduce the problem to various issues of procedure. It gives control of heavy weaponry to the physically adept and invites them to get their rocks off on deployment. Away from family. Away from the law. Away from the need to be reflective. To even examine if what they are doing is actually working.

This is what fighter aviation is currently composed of. Granted there are variations on how anyone can run a timeline, each is fastened conceptually to the same theme. For example, missiles can be fired without locks being taken, and sometimes your only job is to pester. Ranges for firing are prescribed for different altitudes, but in the end they are little more than recommendations. One can forego the need to even notch altogether by simply bypassing certain blobs entirely. There are numerous ways to put the puzzle together, but all of them descend directly from one aim. Achieve a set of preset parameters. Put the hardware in a position of relative advantage and send it on its merry old way.

None of this requires the operator to possess an intellect, nor an ability to see the situation from a distance. Doing so might add a little stimulation to the labor, but in the end is of no special significance. The system is not structured to even listen. The fighter pilot is cut from the morally confused, and fashioned into the ethically immune. Cognizant of his contract to adhere to the checklist, but ignorant of what any of it might mean. Reared in the upper reaches of middle class affluence and often radiating with Christian repentance. A crusader with a radar and a supersonic chariot flinging spears with his hands folded in prayer. Detached from what lies dormant at the bedrock of everything. The fact that it's not about him, but rather the gadgets.

It's the data he's managed to assemble through years of constant training. The numbers in all the tables scattered randomly throughout the manuals that keep showing up in every question on every test. It's that none of it was ever designed around crediting the successful, but all of it around unleashing the missile. The bulk of current tactics stem not from pilots themselves, but from the bow wave of technological prowess. From who can funnel the most capital into research and development, and who can wield the mightiest machine. Every question of tactics in fighter aviation is simply a backdrop for how to better one's missile. And the real wars are waged in today's China Lakes and Znamensks. Not in any aerial engagement.

Perhaps this is the only true explanation for why "the fundamental objective…remains unchanged," and why one must "keep the opponent constantly on the defensive". And perhaps this is why the most visible offspring of Robinson's foray into exposition is an apparent obsession with the concepts "unchanged" and "constantly."

So if the Major is correct and what was once hailed as a battlefield has migrated decisively into a "three dimensional battlespace", detecting one's foe will in most cases require more than just eyes. And provided the vast majority of all airborne engagements are thus conducted beyond visual range, it follows that such victory will be contingent more upon the capability of one's gadgets than success in cultivating one's instinct. This gradual separation between parties to conflict is essentially what Robinson is illustrating. In other words, he's elaborating on the reason why everyone in his profession has for 5000 years been foreclosing on their own relevance. And why forking over control to research and development is gradually negating any reason for their existence.

Should gadgets determine the outcome of a vast majority of fights, the study of them will only quicken one's ability to get into position, which by definition would stand in the way of a real solution. The accumulation of such knowledge will continue to grow in complexity and require increasingly more time to master – limiting what remains of the operator's ties to the layman and alienating him from those he professes to defend. It will latch itself to the laboratory and leech gleefully off the beltway while continuing its manufacture of those freshly dedicated to revenge.

But that isn't to say there's anything wrong with piloting airplanes. Or engaging in tasks that require high levels of awareness. These activities exist in states of overwhelming abundance and stand subject only to what limits the mind. Running a café through lunch hour is likely no easier than running an orchestra through Bartok. Steering a city bus through Chicago would likely exhaust anyone's ability to persevere. Just like one false move hauling crab in the Aleutians might mean the difference between fortune and death. These professions demand a sustained concentration that in the end only serves to accentuate one's development. One person's decision to embark on such a career is thus an expression of his desire to grow. And the skills associated with the operation of airplanes in no way represent an exception to this. The intentions of most fighter pilots are themselves typically centered on an innocent wish to succeed. To do well. To not fuck up. And in most cases do not exhibit what is passed around publicly as a premeditated, bloodthirsty urge to dismember. There are of course some of those, but the vast majority are just out to pay the bills. Or keep a marriage. To have fun while providing enough dough to raise a family. And they do what they have to do to stay away from the big questions without disrupting the status quo.

And this is the root of the problem. Fighter aviation exists not as a product of ideology, but as a mutually exploitable career path in spite of it. An overwhelming default for millions of young men and women who aren't after the hype, but are willing to swallow it in order to get what they want. A chance to excel. To hone skills. To create mates and break a sweat for something noble. And it's this tiny personal sacrifice that marks the genesis of selective morality. A numbness to all issues not directly connected to one's objective or its rehearsal. Blank spots and gray areas only interpretable as pure black or pure white. Good people who become faultless and bad people who should perish. Anything to protect the meaning of all the effort expended to get a grip on the controls.

In other words, the excavation of ethics from both sides of the equation is what fighter training is designed to accomplish. To capitalize on ignorance by ensuring pilots can land a plane before they are even capable of understanding its purpose.

This structure yields great success during the early stages of training when the individual focus is less on flying than social acceptance. When the conscript is still ignorant of the fact that he's been involuntarily enrolled in the most rugged reputation-building regimen in the world. Where the widely recognized standard is that new guys don't know anything. And if they did, it'd only be buzz words swallowed whole. Because the job of the rookie is to come across as stupid, but clever enough to repel condescending humor. To shroud the actual dimensions of his tactical knowledge in a self deprecating superficial idiocy. It's the only way to infiltrate this circle of testosterone without wounding the pride of the far more experienced. This collateral duty of trying to get everyone to like you is characteristic of groups with a lot of down time. Small troupes of humans like SWAT teams or bible groups, preparing for similar contingencies but hard up for practical application. And it's this effort expended on getting rated as worthy that helps distract pilots from the cold hard facts.

While the missile may be temporarily useful in eliminating the presence of a so-called air threat, its employment will never eliminate a problem. Because action conducted to “neutralize” is essentially action conducted late, and only prolongs the arrival of the awareness necessary to graduate from the callow notion that perfecting the annihilation a problem somehow equates to having solved it. Further financing for this mindset will no more lead to the seizure of the offensive than a pupil of Robinson’s to the planting of some proverbial knockout. The reason is mindnumbingly simple. Tactics, while stimulating, are determined by gadgets, not by any spontaneous gift of instinct. Where you go and what you do are simply byproducts of the evolution of the missile, and while signing up for this role might get you laid, it will atrophy your soul.