DEFENSE MINISTRY

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Morten Hanche 20 Apr 2015

Modern air combat; The Right Stuff, Top Gun or something else entirely?

— Here coach Morten called "Air Combat manouver" against another Norwegian F-16. F-35 will also operate this way, but with future sensors and weapons will F-35 could settle a dogfight long before it is discovered by your opponent. Photo: Morten Hanche

Many of my colleagues flyer are curious what the F-35 mean in terms of pure performance; how fast, how high, how far? Performance has also been diligently debated in both newspapers and Internet forums. In this post, I therefore intend to look at how both "stealth" and performance could affect the outcome of a dogfight. I hope you understand that I can not share the "juicy details" but I do not think it is necessary to get your message across.

Modern Air Combat bears little resemblance to fly sequences many know from the film Top Gun. In Top Gun we see "melee" in the air; planes chasing each other with only a few tens of meters. When we exercise similar setup between two F-16, the goal is often to kill your opponent using only aircraft cannon. Usually starting setups between 1,000 and 3,000 feet apart. Within distance has shrunk to 500 meters tend struggle to be settled, without the help of missiles. Top Gun looks great, but it does not describe modern air combat. Training with cannon is not irrelevant, but modern air combat is often decided before the pilots can see each other with their own eyes. Modern missiles have long range and is very maneuverable. They also have reliable sensors and deadly warheads. When we consciously limit ourselves to just use the cannon, it will take much for that not a missile shot has ruled the fight long before there is talk of "Dogfight".

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Air Combat is a merciless arena. The outcome is influenced by many factors, including weather conditions, aircraft maneuverability, range, speed, sensors, antidotes, weapons systems, visual and electromagnetic signature, the pilot's knowledge, training level and will. I mean it is not possible to point to one single factor as the most important. The whole is composed. One weak area does not necessarily mean that the aircraft is badly in dogfight, but the characteristics must be balanced.

The most maneuverable plane has the advantage if it comes to "dogfight". If I can "point" own plane in the direction of the opponent, I can simultaneously follow him with their own sensors and threaten all weapons. Yet it is not always so that the most maneuverable aircraft winner. Modern sensors and missiles changes the balance in a dogfight. Our old F-16 is quite heavy in the butt when they are dressed up with all the necessary role equipment: External Fuel, målbelysningsutstyr, weapon mounts, weapons and equipment for electronic countermeasures. There is little left of maneuverability as the audience will watch a air display.

F-16 must sacrifice a lot of performance to carry the necessary equipment. F-35 can carry a lot of this interior. Photo: Morten Hanche

In return, our F-16 equipped with a helmet sight and highly maneuverable heat-seeking missile. Therefore, it is not as critical that our F-16 is not particularly maneuverable in armaments; our missiles are more maneuverable than any other fighter. Helmet Indicted means we do not need to point the nose of the plane in the direction of the opponent - we can "throw" a shot over the shoulder. Shot can hardly escape ...

It is an advantage to have the fastest fighter. Superior speed makes it possible to collect or escape an opponent. All javelin throwers user misses to throw as far as possible. Likewise, it is advantageous to fly high and fast when a missile being shot. The missile gets more energy which in turn increases the range so that the missile can be fired by the longer distance. If we assume equally proficient pilots, equally good sensors and equally good missiles, it seems that raw performance alone can determine the outcome of a dogfight - the fastest flying can shoot first. Whoever shoots first wins often.

_ F-35 will have a performance with weapons that far exceeds what we have with the F-16 today. Photo: Lockheed Martin

Pierre Spey and other critics have pointed out that the F-35 is not as fast or maneuverable as modern Russian fighter. In a previous section I argued that the performance of the F-16 at air display is theoretical and not available in a war situation. Combat aircraft like the F-16 carries the load out. This reduces the practical range, speed, maneuverability and maximum altitude. (This also applies to your opponent's aircraft, which carries the load out).

With the F-35, we get more of all this, compared to what we are used to today. To discover how much more was a positive surprise for me. In full war equipment operates F-35 effortlessly 10,000 to 15,000 feet higher than our F-16 can, without using afterburner. The speed in 'cruises' is without further 50 to 80 knots higher. In the F-16, I *must* use afterburner and take running speed before a missile shot. F-35 "cruiser" both faster and higher. Therefore, I am ready to shoot far anytime.

> *In full war equipment operates F-35 effortlessly 10,000 to 15,000 feet higher than our F-16 fails*

F-35 also has more fuel than we are accustomed to, it carries the load inside and is not as dependent on afterburner. Therefore we are left with more range than the F-16 and similar aircraft can achieve. "Combat radius" for the F-35 is between 30% and 70% longer than we get with the F-16! The extra range comes in handy in our elongated country. Range may alternatively be replaced in endurance over a given area. This is useful for our little organization, which disposes tanker and relies on versatility in all aspects.

Back to performance; perhaps it is the fastest flying can shoot first? In this case, I take even one important proviso; both planes must discover each other at the same distance if kinematics alone shall be conclusive. My experience shows that this is not very realistic. In daily training between their F-16 and meet with our allies, we experience in practice what radar signature and electronic antidotes means. Our old F-16 is "slim" on radar and are detected late, compared to other modern fighter aircraft. We also notice the effect of external load; the heaviest loaded planes are detected at the furthest distance because the external load increases radar signature. I therefore claim that it is unrealistic to assume that two militant fighter discovers each other simultaneously, although the sensors basically are equally good. The effect of radar signature and electronic antidotes are great.

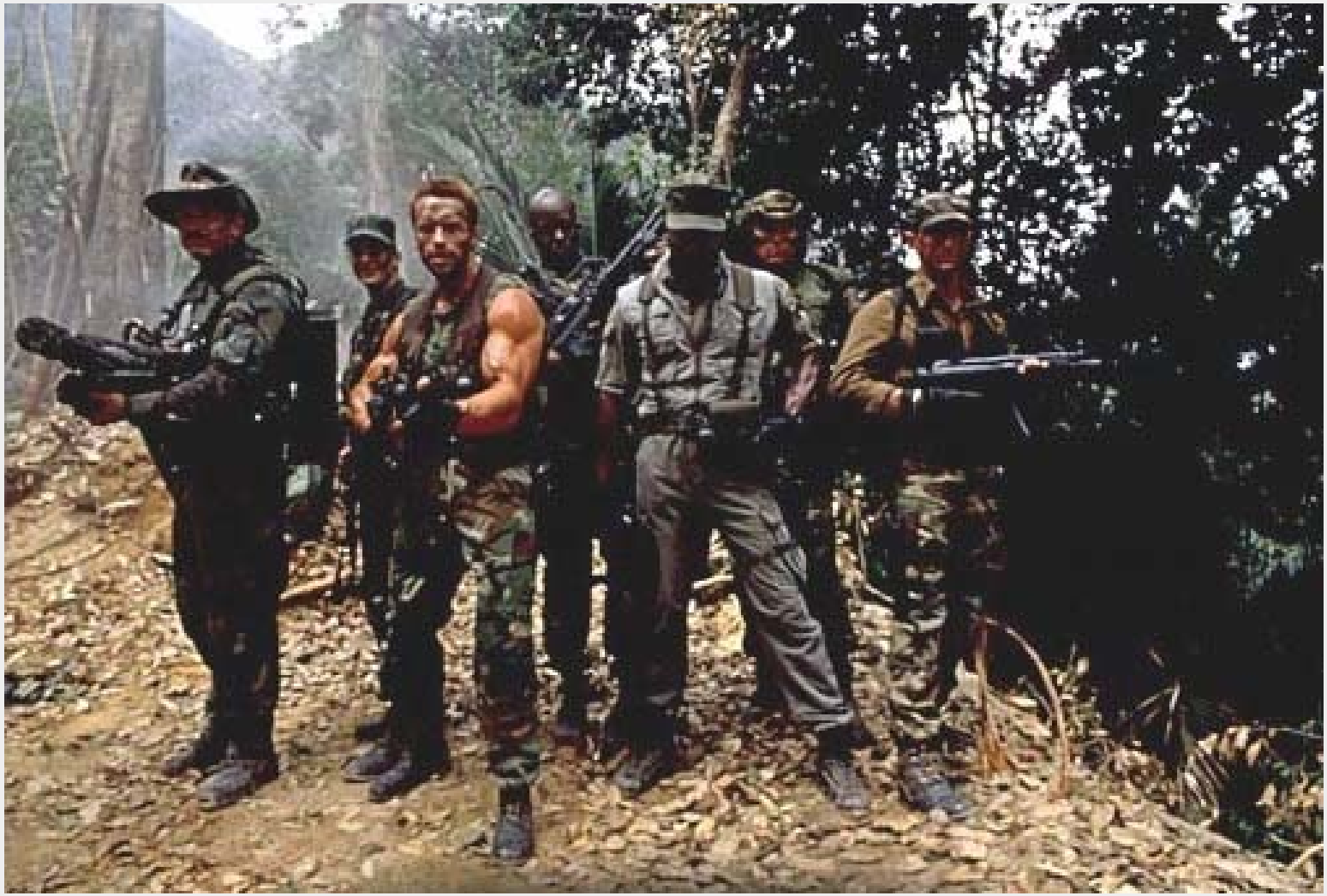
> *The effect of radar signature and electronic antidotes are great.*

If an opponent with "old-fashioned" radar signature meets an aircraft as the F-35, with very small radar signature, it becomes difficult to exploit the benefits that provides superior performance. Imagine a meeting between a highly trained sprinter and a sniper. The mission is to shoot counterpart. Both are armed with hunting rifles, but only marksmen have riflescope. Sprinter has to return a more powerful rifle, but he is dressed in neon colored tracksuit, and takes up on the short end of a football field. Marksman is camouflaged somewhere on the opposite end path. Sprinter is the fastest and the most powerful rifle, but what is he shooting at? While sprinter gallops across the track in search of his opponent, he must take shot after shot. This is not a smooth match. Unfortunately I have found that it is extremely frustrating to train dogfight when we can not find the opponent with its own sensors. It ends rarely good.

The outcome of a dogfight between two identical fighter decided finally by the individual pilot. It requires time and significant resources to cultivate a skilled pilot. Especially important is perhaps a steady supply of flying time, a good and constructive learning environment, access to appropriate airspace and an organization that facilitates training. During exercises have my colleagues in the Air Force and I many times flown against more modern fighter than our F-16. Yet, "wins" we occasionally air war against more advanced adversaries, technically speaking. Often the explanation is that we meet inexperienced pilots. More interesting is perhaps when we meet pilots with completely different culture for learning and collaboration. My impression is that cultures where the distance from the conductor to lead is large, fail to cultivate equally skilled pilots. In such highly hierarchical organizations it is perhaps impossible to be honest with your boss in "debriefing" after the flight. Therefore they miss out on important learning.

If you can not find your opponent can not shoot at him - and then you have little use of maneuverability. Here's term picture in a heads-up display in Norwegian F-16. Photo: Morten Hanche

My point with this post was to show that many variables affect the outcome of the dogfight. The situation is rarely black and white. One of the most diffuse might skill of the individual pilot. I am often surprised when I read cocksure posts in newspapers and comment fields. Common to many such posts is a "digital" interpretation of performance data. A speed XY, B rate YY = A is best, period. One problem is the source data referenced. Another is that it tends to focus on a few isolated parameters. Our experience with the F-35 so far has shown us a fighter that will surprise many in air-to-air role. The combination of high performance, good sensors and low signature makes the F-35 to a dangerous opponent in air campaign. Finally; remember that even Arnold Schwarzenegger had to resort to lavsignatur in the old classic "Predator." When using mud. Brute strength is good, but camouflage also works ...



— It's not just raw power that is important. From the movie "Predator" - photo taken from Wiki.

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