AA167\_PostRX

[00:00:00] **John "Slick" Baum:** Welcome to the Aerospace Advantage Podcast. I'm your host, John Slickbaum. Here on the Aerospace Advantage, we speak with leaders in the DoD, industry, and other subject matter experts who explore the intersection of strategy, operational concepts, technology, and policy when it comes to air and space power.

[00:00:16] **John "Slick" Baum:** So if you like learning about aerospace power, you are in the right place. To our regular listeners, welcome back. And if it's your first time here, thank you so much for joining us. As a reminder, if you like what you're hearing today, do us a favor and follow our show. Please give us a like and leave a comment so that we can keep charting the trajectories that matter to you most.

[00:00:36] **John "Slick" Baum:** 2024 marks a major fighter heritage milestone, the 50th anniversary of the F 16's first flight. Heather Penny and I just got back from Edwards Air Force Base where the Air Force marked this occasion and it was incredible. We got to see a ton of vipers, some from its earliest tales and the big wing XL variant to current operational aircraft.

[00:00:58] **John "Slick" Baum:** And of course the [00:01:00] Thunderbirds more importantly, we were surrounded by so many people who were key players in the jet from the earliest days to today. And that's what really counts. The soul of any airplane is comprised of the people who designed it. Produced it fly and sustained it. Plus everyone else who has a part in the enterprise.

[00:01:18] **John "Slick" Baum:** And let's be honest as card carrying Viper pilots, Heather and I had an amazing time connecting with a lot of old friends and making new ones. All of us connected by this amazing airplane. So knowing this anniversary is coming up, we wanted to help tell the story of the F 16 on this podcast. And trust me, we have got an awesome conversation set up for you.

[00:01:40] **John "Slick" Baum:** We've got general Mike Lowe, an absolute legend in air force history. Long before he served as vice chief of staff of the service and later commanded air combat command, he was a young officer just back from flying combat in Vietnam, assigned to work with the father of the F 16. Colonel John Boyd in the Fighter Requirements Directorate in [00:02:00] the Pentagon from November, 1969 to June of 1972.

[00:02:04] **John "Slick" Baum:** He circled back to the program from July, 1973 to June of 1977 as the project manager for the YF 16 and F 16 at Aeronautical Systems Division. He continued to fly the F 16 throughout his career, marking the beginning of a three generation legacy that continues today. In the air force with nearly 9, 000 F 16 hours to the low family name.

[00:02:30] **John "Slick" Baum:** We also have major general Charlie Lyon, who began his career in the F 16 in the early eighties when the jet was brand new and far more basic than anything flying today. He is a fighter weapons school graduate and a 422 test and evaluation squadron instructor pilot, and later a squadron group and wing commander.

[00:02:49] **John "Slick" Baum:** General Lion has flown every block and variant of the F 16 during his time in the Air Force and flew the airplane as one of the first B coursers, being trained by IPs with less than [00:03:00] 100 hours in the jet, to becoming one of the authorities in the aircraft's capabilities and tactics developers. He would also command at the squadron group and wing levels, amassing 3000 hours in the F 16.

[00:03:12] **John "Slick" Baum:** And finally, we've got major general Larry Stuttream who transitioned from the F 4 to the F 16 in the mid eighties. And he'll explain to us what it was like making that adjustment from the Phantom to the Viper and what things were like back in the cold war air force. His ability to compare and contrast the F 16 to other fighters in the inventory is second to none.

[00:03:34] **John "Slick" Baum:** And this history really matters. And that's why we're excited to share it with you today. And let's face it. The F 16 is arguably one of the most influential fighter aircraft to take to the skies and defense of so many nations around the globe. Now, I know, it is no secret that I have an unapologetic affection for this airplane.

[00:03:52] **John "Slick" Baum:** Today's discussion is coming from the objective view. We want to discuss how the program began and initially populated Air [00:04:00] Force ramps as the low cost, high production rate, day only, visual flight roles dogfighter. We also explore how it later evolved to an all weather, all mission fighter. I mean, this evolution is incredible because the flexibility of its design allowed the Air Force to grow the Viper's capability to remain relevant and lethal for five decades of service.

[00:04:23] **John "Slick" Baum:** And, the story isn't finished, with jets still in production and co coms asking for it every day. From its inception in the basement of the Pentagon, To flying and more than two dozen air forces around the globe. You won't want to miss this deep dive into the creation of the F 16 fighting Falcon, affectionately known as the Viper.

[00:04:45] **John "Slick" Baum:** So general low, sir, welcome back to the aerospace advantage. The last time we spoke was a few years ago during the 30th anniversary of desert storm. And now we are back celebrating 50 years of the F 16. So, sir, it is great to have you back on our show. Oh, that's my pleasure. So thank you for [00:05:00] inviting me.

[00:05:00] **John "Slick" Baum:** And Major General Lyon, sir, welcome. I know you are no stranger to the Mitchell Institute. So welcome to the Aerospace Advantage podcast. And thanks for sharing your experiences with the F 16.

[00:05:11] **Maj Gen Charlie Lyon, USAF (Ret.):** Morning, Slick. It's great to join you and Stutz here again at the Mitchell Institute. And what a special treat to be a wingman.

[00:05:17] **Maj Gen Charlie Lyon, USAF (Ret.):** To General Lois, he recounts the origins of the program for us

[00:05:20] **John "Slick" Baum:** today. Well, sir, I have to tell you, I'm pinching myself getting to the opportunity to interview General Lois second time. So I'm right there with you. And Major General Stutz, Stutz Ream, sir, welcome back to the podcast. Always a pleasure chatting with you and getting your perspective on air and space power.

[00:05:38] **John "Slick" Baum:** We're just super excited to discuss your time in the early days of the F 16 with our audience.

[00:05:44] **Maj Gen Larry "Stutz" Stutzriem, USAF (Ret.):** Fantastic. Slick. It's great to be back. I love the work you do and salute to my friend sea lion and my respects to general

[00:05:51] load

[00:05:52] **John "Slick" Baum:** this morning. Amazing. Well, general low, sir, we're just going to jump right into it because, you know, the air force is currently in [00:06:00] the middle of a major modernization push as we work to deal with peer threats like China and Russia.

[00:06:06] **John "Slick" Baum:** This isn't the first time we've faced these pressures and in the latter part of the 1960s and the early 1970s, you know, that marked era of change with the Air Force birthing a clean sweep of new fighters with the F 15, F 16, and the A 10. What was the climate like back then? What drove the Air Force to pursue such a fighter modernization push?

[00:06:27] **John "Slick" Baum:** I mean, F 4s and F 111 and A 7s weren't that old at the time.

[00:06:32] **Gen John Michael Loh, USAF (Ret.):** No, but two out of the three were Navy airplanes, and we vowed after Vietnam, if all of us flying the F 4, C, D, and E models, we vowed at the time, let's see if we can't build a stable of Air Force developed and Air Force invented and Air Force produced fighters because we're tired of flying Navy aircraft, particularly the F 4 that was not designed for the kind of combat that the Air Force normally Flies.

[00:06:56] **Gen John Michael Loh, USAF (Ret.):** The F four was designed as a, as a fleet air defense aircraft [00:07:00] with sparrow missiles and not much maneuver. And we wanted highly maneuverability in the ba in the air battle arena for air fighters and, and both guns, short range missiles and, and a few radar missiles. So therefore, the, the incentive to build up the Air Force was supposed to Vietnam draw down.

[00:07:16] **Gen John Michael Loh, USAF (Ret.):** The desire to build our own stable Air Force developed and produce stable of fighter aircraft and because the F 7, A 7 were both maybe developed and the F 111 turned out not to be quite as affordable as we thought it would be and also limited in range. So that was the impetus for the one of the impetuses for the start of the lightweight fighter

[00:07:38] **John "Slick" Baum:** program.

[00:07:39] **John "Slick" Baum:** Yeah, and sir, you know, I touched on this in the introduction, but you were there from the very start of what would later become the F 16 and you worked with Colonel John Boyd, a man whom many, including yourself, consider the father of the F 16 during multiple assignments. In fact, as I understand it, You were with him in the late [00:08:00] 1960s at Eglin Air Force Base, where he was diving deep into his energy management analysis.

[00:08:05] **John "Slick" Baum:** So could you explain to us why this concept was so foundational to the story? Oh, yes.

[00:08:11] **Gen John Michael Loh, USAF (Ret.):** I had a very close relationship with John Boyd. Our relationship started back in 1966. When I was a young captain fighter pilot flying F 4s, new F 4s in the 33rd Tech fighter wing at Eglin Air Force Base, boy, they just graduated with a degree from uh, Georgia Tech in engineering, and he was at the uh, Air Force Weapons Lab at Eglin across the field, and they're working with Tom Christie, who was the, Who was running the mathematics computer lab at the time, Boyd was just in the very infancy of his development of the theory of energy maneuverability, which if you want an equation, it was very simple.

[00:08:48] **Gen John Michael Loh, USAF (Ret.):** It was piece of best, which is specific excess power, the excess power that you have in a fighter aircraft at any point in the envelope, but equal to the thrust minus drag. Times this velocity, which specific [00:09:00] excess power and the piece of S charts that he developed at the time for any aircraft, in this case, the F 4, showed the parts of the envelope, the flight envelope, altitude versus Mach number, where the F 4 had a lot of excess power in its envelope.

[00:09:17] **Gen John Michael Loh, USAF (Ret.):** And so he came over to 33rd wing before we went to Vietnam. To show where the F 4 had advantages over the MiG 21, which we were fighting with it in Vietnam at the time. And so it was very helpful to, to understand where in the flight envelope we should be fighting MiGs and where we should avoid fights.

[00:09:35] **Gen John Michael Loh, USAF (Ret.):** But at the time I developed a good design. I joined up with him at the Pentagon. I volunteered to come back to be part of the fighter requirement shop with Boyd to help develop new fighter, the lightweight fighter for the Air Force. And so that was the beginning of our relationship, but I worked with Boyd, uh, daily for two and a half years in the Pentagon while we worked the requirements, the EM charts developed contractor interest and the whole uh, study for [00:10:00] the work on the lightweight fighter actually began in 1970.

[00:10:02] **Gen John Michael Loh, USAF (Ret.):** Okay. When we thousand dollars out of the Air Force to do a very innocuous study called the use of energy, the use of energy maneuverability as a design tool for fighter aircraft. Nobody thought much about that, but we were able to generate the interest of industry and we encouraged industry to spend a lot of their own money on it.

[00:10:20] **Gen John Michael Loh, USAF (Ret.):** And sure enough, that came up with a lot of the paper designs for the lightweight fighter at the time.

[00:10:25] **John "Slick" Baum:** Over. Well, sir, I tell you, I mean, I, I've read the book and for those listening to the podcast that have not read Boyd, the fighter pilot who changed the art of warfare, it really gives some background and understanding into the timeframe in which you were, you were working with John Boyd and insert you are now in the fire to requirement shop after getting back from Vietnam in the fall of 1969, as you mentioned.

[00:10:48] **John "Slick" Baum:** What were they up to when you arrived? I mean, you know, the F 15 program was in full swing with major support of Air Force leadership and Boyd was working his energy maneuver effort. And, and, you know, as I understand it [00:11:00] he was teaming with industry players like Harry Hallacher and from General Dynamics John Paterno from Northrop and Kelly Johnson from Lockheed Skunk Works.

[00:11:10] **Gen John Michael Loh, USAF (Ret.):** Yes. In fact, the F 15 had just gone on contract for full scale development. And at the end of 69 when I arrived at the, at the Pentagon and so, it was, it was off and running and it was the fighter for the Air Force. And if anybody objected to the F 15 or tried to raise a competitor to it, they were immediately, immediately shunted, slammed down and outcast.

[00:11:33] **Gen John Michael Loh, USAF (Ret.):** But anyway, we pressed on with our study. And you're right, we had five contractors developing designs for a lightweight fighter using energy maneuverability as the basis for the design effort. And so we were cranking out EM plots for all the fighters against threat aircraft and Tom Christie down at Eglin was cranking them out.

[00:11:53] **Gen John Michael Loh, USAF (Ret.):** And doing very good work there. We weren't getting very far other than paper studies. And of [00:12:00] course we were considered a threat to the F 15. Anything that came up, a lightweight fighter was condemned by McDonnell. It was actually condemned by the Air Force because they thought that all these are Cheap little fighters that can't do anything.

[00:12:12] **Gen John Michael Loh, USAF (Ret.):** So the breakthrough came when David Packard, who was the deputy secretary of defense at the time serving a two year volunteer assignment, he was the CEO of Hewlett Packard and he was serving in the Pentagon and he was tired of looking at paper proposals for major weapons systems. And he said, I want to.

[00:12:30] **Gen John Michael Loh, USAF (Ret.):** build some prototype. We can pick a few programs and build some prototypes so I can actually fly before by. That's where the expression fly before by came about. It was under the Packard study on prototyping back in 1971. And we were influential enough with our contacts in the, in the OSD. All up and down the line and some some some friends who chose not to come out of the closet to influence that study so that Packard picked Lightweight Fighter as one of his two prototyping [00:13:00] candidates.

[00:13:00] **Gen John Michael Loh, USAF (Ret.):** The other was the Advanced Medium Stole Transport, which was to be a competitor with the C 130. But anyway, the Lightweight Fighter was the primary project. And we won that one. We were delayed. That was the first major, first breakthrough in the program. We were actually going to build hardware. And I was part, John Boyd and I both were part of the initial source selection for the lightweight fighter, General Jim Stewart, the commander of ASD at the time, was the source selection authority.

[00:13:26] **Gen John Michael Loh, USAF (Ret.):** We went around to each of the five contractors. And we were able to pick the both uh, the two that were picked as a result of the source selection. I can get into details on that, but I won't for the sake of time with where the general dynamics and the Northrop Grumman YF 16 and the YF 17. And this was, it was important that we fly these airplanes because there were, there were several technical breakthroughs that we need, technical issues that we needed to solve that people were skeptical about.

[00:13:52] **Gen John Michael Loh, USAF (Ret.):** And there were some ops, there were some myths going around about small fighter aircraft. So the prototypes. We wanted to fly the prototypes [00:14:00] because, in the first place, the F 16 had a fully fly by wire flight control system without any mechanical backup. This would be the first time we ever built an airplane, a fighter, or any other airplane that had a full, fully fly by wire electronic flight control system with no mechanical backup.

[00:14:18] **Gen John Michael Loh, USAF (Ret.):** Nobody wanted to accept that. The fighter pilots and Jack said, we're not going to fly an electronic airplane when lightning hits it, or when something happens and we're going to lose control of the airplane. We're not going to. We're not going to fly, we're not going to believe in that. So we had to overcome that technical issue, and we could do that by flying the prototype.

[00:14:35] **Gen John Michael Loh, USAF (Ret.):** The second, the second issue was small fighters can't go anywhere, don't have any range, we can't use them. And uh, they didn't realize that what actually created range in a fighter aircraft technically, and that is, it wasn't the amount of fuel you carried in the airplane, it was the fuel fraction. The percent of fuel, the percent of the weight of the aircraft that was attributed to fuel.

[00:14:57] **Gen John Michael Loh, USAF (Ret.):** It was fuel, initial fuel [00:15:00] divided by the gross weight of the aircraft. And of course, at the time, the F, the T 38 F 5 were flying, and the F 5 was a very short legged fighter. And they kind of assumed that the YF 16 or the F 16 and F 17 would be similar to the F 5. It wouldn't go anywhere. It wasn't suitable for missions that the Air Force had to fly.

[00:15:20] **Gen John Michael Loh, USAF (Ret.):** And as a matter of fact, on internal fuel, the fuel fraction of the F 16 is higher than the fuel fraction of the F 15. And we wanted to make sure that stood. And it did. And of course, even today, if you see an F 15 flying, and it has been throughout its entire life, you'll see a 600 gallon centerline fuel tank strapped to the belly because it didn't have enough internal fuel to do a reasonable even air superiority mission.

[00:15:45] **Gen John Michael Loh, USAF (Ret.):** So, so, we, we debunked that theory that through the prototype flying these long, longer range missions, we, we debunked the theory that small aircraft can't go anywhere. And, and the other thing that made it attractive from my standpoint, [00:16:00] because I was the one responsible for missionizing the airplane into an operational fighter for the Air Force, and not just a prototype with no systems, was the miniaturization, the revolution in the miniaturization.

[00:16:11] **Gen John Michael Loh, USAF (Ret.):** of electronics that occurred during the 1970s, where we had smaller transducers, we had TR modules coming out to replace large apertures for radars, we had other smaller sensors, we had smaller weapons that could develop more explosive power per pound of TNT. So the whole revolution of miniaturization made the F 16 very attractive because we could carry more sensors, the radar could be very useful even air to air, and we could, put a pretty significant payload in and still have a long range.

[00:16:43] **Gen John Michael Loh, USAF (Ret.):** So anyway, that's, so we uh, had a source selection, and we went and flew the prototypes, and once the prototypes started flying, everybody liked the F 16 and F 17. That was attractive. If you ever want to sell a program, get a flying prototype, and it'll sell itself almost. [00:17:00]

[00:17:00] **John "Slick" Baum:** Well, sir, I have to tell you, I mean, I'm sitting on the edge of my seat here because having worked in the fighter requirements office as you did you know, we, you understand the fact that the Air Force decides that they want to have a program.

[00:17:13] **John "Slick" Baum:** They set up requirements and then people respond to that. And as I understand it, and it's crucial for our audience to understand that there was no clear requirement issued by Air Force leaders. To create the F 16 program, you and your team were able to influence some other efforts to really help this pathway for prototypes designed around energy maneuverability concepts.

[00:17:36] **Gen John Michael Loh, USAF (Ret.):** So, sir, can you just talk to us about the fly off?

[00:17:39] **John "Slick" Baum:** So Northrop brings the YF 17, which would later evolve into the F A 18 and General Dynamics has the YF 16. And I'm, you know, when I think about this, you and your team birth, what would, what would be two of the most influential, impactful jet fighters in history? So what was the evaluation program like, and how did [00:18:00] the aircraft do?

[00:18:00] **John "Slick" Baum:** And just to be clear, this is still a concept effort. There's no guarantee the air force will buy any of these jets, right?

[00:18:08] **Gen John Michael Loh, USAF (Ret.):** And that's correct. We were, we were flying the airplanes to, to generate interest and to figure out how to proceed from there. And uh, and also to, overturn some myths about the F 16 because the Air Force was, as you know, dead set against it because they were buying F 15s and just getting into production on the F 15.

[00:18:30] **Gen John Michael Loh, USAF (Ret.):** and the F 16 lightweight fighters were, were, were condemned because There were small fighters that can't go anywhere. So we had a method to overcome that small fighters can't. Go far. And we did that by having the by the prototype allowed us to validate the fact that it's not fuel quantity that matters in the fighter.

[00:18:50] **Gen John Michael Loh, USAF (Ret.):** It's fuel fraction, the amount of fuel in the airplane that is devoted to fuel versus the total gross weight. And we, in fact, on internal fuel outranged, [00:19:00] outranged the F 15 in a combat mission. We also were required to debunk the problem that the fly by wire flight control had on the YF 16 because nobody, even in the operational air force, the fighter pilots didn't want to fly.

[00:19:15] **Gen John Michael Loh, USAF (Ret.):** An all electronic, an all electronic jet that had no mechanical backup. So we were the first fighter that was produced that had a fully fly by wire flight control system with no mechanical backup. And it took the prototype flying to, to, to, To have the pilot community, the fighter pilot community accept the F 16 because we had the quadruple redundant flight control system and we put the flight control computer in a titanium bathtub right underneath the pilot's seat.

[00:19:44] **Gen John Michael Loh, USAF (Ret.):** so that it was a very safe, very safe location. So if the question of electronics came about where we could put a lot more TNT per pound of. a bomb weight, a weapons weight, and also the miniaturization of electronics with the TR modules and all that for the sensors and the smaller computers [00:20:00] and everything allowed the F 16 and F 17 to package a very heavy, very large payload of electronics, as well as a large weapons.

[00:20:08] **Gen John Michael Loh, USAF (Ret.):** weapons payload. So the prototype did all of that. At the same time, as they started flying, we were developing URFP in the Pentagon, as a matter of fact, in the Pentagon for the full scale development of the, of it, because we knew the program was likely to go, to go further. And so that second the second breakthrough was how are we going to get, how are we going to get the, the winner of this competition?

[00:20:31] **Gen John Michael Loh, USAF (Ret.):** into development, full scale development and production. And we had an ally. Our ally was, it was the secretary of the Air Force, Jim Schlesinger. He was an advocate of the lightweight fighters. And so we were developing advocacy as a sideline, you know, anytime you want to sell a program, don't try to sell it on paper, build a prototype and fly it or sail it

[00:20:49] **Maj Gen Charlie Lyon, USAF (Ret.):** or,

[00:20:50] **Gen John Michael Loh, USAF (Ret.):** or, or do something with it, build a demo or a prototype and you'll get a lot of supporters.

[00:20:55] **Gen John Michael Loh, USAF (Ret.):** So we had a lot Prototypes started flying and they saw what they could do in terms of [00:21:00] maneuverability and range and so forth. They, we, we had a lot of advocates everywhere in the Pentagon and industry everywhere except within the Air Force at the time and within and within the McDonnell Douglas, the the contractor for the F 15.

[00:21:13] **Gen John Michael Loh, USAF (Ret.):** So the, the second breakthrough, the first breakthrough was to get the lightweight fighter as a pro, as a flying prototype. The second breakthrough was to make it a program of record. And the second breakthrough occurred in early 74. In fact, this is when the 50 years started in January of 1974 with the first flight of the YF 16.

[00:21:33] **Gen John Michael Loh, USAF (Ret.):** At that time at that time, we were trying to find a way to get it into development and production. We were writing The requirements, the requirements in the RFP for the, for the fighter for the air combat fighter from my white fighter, but the breakthrough was when Secretary Schlesinger, who was an advocate for the program said, I want to build these airplanes and the Air Force rejected.

[00:21:55] **Gen John Michael Loh, USAF (Ret.):** And so the breakthrough came when Schlesinger made an offer to the chief of staff of the Air Force [00:22:00] General David Jones. in early 74, and he said, look, I will make a deal with you, General Jones. I will let you buy the full complement. of F 15s. In fact, at the time, the F 15 was having trouble cost wise.

[00:22:14] **Gen John Michael Loh, USAF (Ret.):** It was becoming very expensive, and the Air Force was afraid they weren't going to be able to buy all of the F 15s that it wanted. So, so Schlesinger came to Jones and, and said, I'll let you buy, I will let you buy, we'll put in the program the full complement, all 750. F 15s. And the Air Force wanted 26 tac fighter wing equivalents at the time, coming out of Vietnam, we're trying to get 26 tac fighter wings.

[00:22:38] **Gen John Michael Loh, USAF (Ret.):** Well, you couldn't get those with all F 15s and F 111s or even A 10s because, because the F 15s were costing too much. So Schlesinger said, I'll make a deal. I'll give you all 750 F 15s, the full complement that you want. If you'll then fill out the rest of the 20 tac 26 TAC fighter wings was the winner of the F YF 16, YF [00:23:00] 17 competition, and they shook hands and General Jones agreed, and it was a win win situation for both of them.

[00:23:06] **Gen John Michael Loh, USAF (Ret.):** It was win win because the Air Force got all the F 15s it wanted, and also got the uh, 26 TAC fighter wing equivalents and the lightweight fighter advocates. Like myself, Boyd, we won because we were able to find a way to get the F 16 into production. So that was win win for both the Air Force, for Lightweight Fighter Advocates, and for the Air Force that wanted 26 stack fighter wings.

[00:23:28] **Gen John Michael Loh, USAF (Ret.):** That was a breakthrough, and that became the program of record when they agreed to that. And we fully funded the uh, Air Combat Fighter Program. And then we had the Source Election Briefing which we ran at the end of the prototype program. We had a full source election competition and I was part of that source.

[00:23:46] **Gen John Michael Loh, USAF (Ret.):** In fact, I gave the briefing, I gave the source election briefing for the F 16 versus F 17 to Secretary McLucas at the time in January 1975 and showed the results of the prototype program and all of the other [00:24:00] elements that go into a source election, including the cost and the risk and then so forth.

[00:24:05] **Gen John Michael Loh, USAF (Ret.):** and we, we favored, we The fighter underground favored the F 16. It was more agile, more maneuverable. The F 17 was a great airplane. Of course, it became the F 18. It's become a great airplane, but it didn't have quite the agility of the F 16 because the F 16 had the fly by wire system, which allowed you to put The uh, center of gravity behind the center of pressure and took a lot of weight out out of what would otherwise be required for static stability.

[00:24:33] **Gen John Michael Loh, USAF (Ret.):** And it also it also was very highly maneuverable, much more maneuverable than the F 17. So, uh, McLucas sector McLucas picked the F 16 and, and full scale development then was underway. and we were, we were ahead of the game at that time. We were not ahead of the game. We were, we had been successful in making the F 16 a program of record and underway as a, as a fully fledged air force fighter.

[00:24:57] **John "Slick" Baum:** Well, sir, I would say, I would say you were [00:25:00] creating. The game with what you all were doing, which is absolutely incredible. And, and you're the milestones that you all created is just mind blowing. and I also think, and I say this kind of joking, but of course our F15 buddies now owe us all a beer instead of making fun of us that we save their, their bacon by making sure that they got the full compliments of the F15, which is something that I did not know.

[00:25:22] **John "Slick" Baum:** Well, one question I want to ask you is, just. Such a how question. How did you set the F 16s initial requirements when it was clear that the Air Force leadership wanted it as a program? What were the influencing factors in your big picture objectives?

[00:25:37] **Gen John Michael Loh, USAF (Ret.):** Okay. Well, we want one, we, and I particularly wanted the F 16 to be a multi role fighter.

[00:25:46] **Gen John Michael Loh, USAF (Ret.):** We, we didn't want it to compete directly with the F 15. In fact, one of the rules when we were developing the. The requirement and the request for proposal was do not put a radar missile on the F 16 because that is the purview [00:26:00] of the, of the air superiority fighter F 15 carrying Sparrow missiles. So we separated ourselves from the F 15 in terms of direct competition by preventing the F 16 from having a radar missile, although we had sideliners, we had a gun.

[00:26:13] **Gen John Michael Loh, USAF (Ret.):** and then the other, the other thing that separated us was I made sure that we put that the F 16 was going to be a multi role fighter, it was going to have as much if not more air to ground capability in it as air to air capability and that was a big breakthrough at the time, because we didn't have a good, we had the F 111 as an air to ground fighter and whatever remnants of the F 4E, F 4D& E we had, but we didn't have a really good fighter Airto ground capabilities.

[00:26:41] **Gen John Michael Loh, USAF (Ret.):** So I was making darn sure that we had a full set of sensors, airto, ground sensors, airto ground weapons and electronic warfare to, to take on the uh, threats, the electronic threats that we would encounter, air both airto air and airto ground. So, so that whole comp, full compliment of, of capabilities that we put in the F [00:27:00] 16 was designed to make it a multi roll fighter, and that that was a, that, that, that, and therefore it did not compete.

[00:27:07] **Gen John Michael Loh, USAF (Ret.):** With the F 15 directly, it became, we had the high low mix, the high was the high altitude, high capability, F 15 for air to air, and the low was the F 16 that had a substantial air to air capability, but also an ample air to ground capability. So the high low mix became the justification the Air Force had for developing both the F 15 and the F 16.

[00:27:29] **Gen John Michael Loh, USAF (Ret.):** The F 15 high. The F 16 low, over.

[00:27:32] **Maj Gen Larry "Stutz" Stutzriem, USAF (Ret.):** Hey, General Lowe, this is Stutz. I'm curious after, you know, you retired in the early nineties, did you have a sense back then that technological development would result in the incredible advances in capability in the F 16 up through, you know, today's block seventies, it's just a fantastic maturing of that airframe.

[00:27:55] **Maj Gen Larry "Stutz" Stutzriem, USAF (Ret.):** Did you have a sense that would happen?

[00:27:57] **Gen John Michael Loh, USAF (Ret.):** A sense of what

[00:27:58] **Maj Gen Larry "Stutz" Stutzriem, USAF (Ret.):** Stutz? That it would [00:28:00] so, develop in, with, with respect to systems,

[00:28:03] **Gen John Michael Loh, USAF (Ret.):** weapons, capabilities. Yes, yeah, I did. And that's why, that's why we were able to configure the aircraft. That was my goal in the, lightweight fighter, or the air combat fighter program office.

[00:28:16] **Gen John Michael Loh, USAF (Ret.):** After we selected the F 16, my goal was to operationalize it. to missionize it. So I had to fully, the prototypes had no systems in it. We wanted a full up round of systems, both air to air and air to ground. And as I said, we, we kept the sparrow off so we could, we could make a clear separation between the F 15 and the F 16 in terms of capability.

[00:28:37] **Gen John Michael Loh, USAF (Ret.):** But we also, but I also envision With the revolution in electronics happening at the time that we could package a lot of capability was in a small airframe like the F 16, and we were able to do that. So I had, I had a bit of a vision that, yeah, with the, with the TR modules, replacing large apertures for radars.

[00:28:55] **Gen John Michael Loh, USAF (Ret.):** With electronic warfare sensors coming in smaller in size because of, [00:29:00] again, the miniaturization of electronics and with the capability of weapons where you were able to develop more TNT per pound of munition, both air to air and air to ground, particularly that we could equip this small airplane with a package that's very, very capable, you know, nearly capable, as capable as the F 111.

[00:29:19] **Gen John Michael Loh, USAF (Ret.):** And we even designed it with nuclear, nuclear provisions on it because it became, and is now today, a nuclear carrier. So, so yeah, I had a, I had faith in the fact that technology that was happening around the technology was, was going to be able to make this F 16 a very, very first class world class fighter.

[00:29:38] **Gen John Michael Loh, USAF (Ret.):** And, and, and the other thing I want to make out, I don't know if you were going to get into this, but I'll let you ask another question. Is that, does that answer your question, Stutz? It sure does, General. The other point, which is very important today in today's Air Force and has been, we haven't done a good job at it.

[00:29:54] **Gen John Michael Loh, USAF (Ret.):** How do you maintain cost discipline? How do you maintain configuration discipline on a [00:30:00] fighter aircraft? We were able to do that on the F 16 while I was in the program office, because we wouldn't let anybody, we had a baseline configuration, and we said, we're going to stick with that. Well, there were so many people coming in from, from everywhere, the laboratories, industry.

[00:30:17] **Gen John Michael Loh, USAF (Ret.):** Tactical air command everywhere. They wanted their widget on the airplane. We've got to put this on the F 16 because they foresaw it as a future and I said, No, we're not going to do that. So eventually, eventually, about six months after putting up with this, I went to the air staff and we, we created the F 16 configuration steering group.

[00:30:36] **Gen John Michael Loh, USAF (Ret.):** F 16 configuration steering group chaired by two star general at the time, Alice Flay, who was the director of operational requirements and the F 16 configuration steering group met, obeyed maybe once every four months, whenever we had enough to talk about by people that wanted to put their widget on the airplane, their system on the airplane, and they would all come to me.

[00:30:59] **Gen John Michael Loh, USAF (Ret.):** the offers would [00:31:00] come to me and I would conduct a cost benefit analysis at right field on how much it would cost and what the capability would be if we put put another weapon on the airplane, put another sensor on the airplane, put a more advanced electronic warfare on the airplane and then wait and then the configuration steering group would meet and there were operators and developers and.

[00:31:18] **Gen John Michael Loh, USAF (Ret.):** And, and those kinds of people on this configuration steering group, and before each configuration steering group, Matt, General Slay and I would get together on the phone and we would go over each of the studies and we would, we would prejudge before the meeting whether these proposals were good or not, or worth putting in, and then we would have the meeting and the proponent would give their briefing and everything and why they wanted it.

[00:31:42] **Gen John Michael Loh, USAF (Ret.):** In every case, we said no. Just saying that we said no, no, we've got a baseline F 16. We want to keep the cost down. We want to keep the cost down. If you want, if you want the original airplane, you develop it on the side and when it's ready for production we'll consider putting it in the airplane, but we're not going to tie [00:32:00] any develop other development program for subsystems to put on the F 16.

[00:32:05] **Gen John Michael Loh, USAF (Ret.):** We're going to go with a baseline. That became the beginning of the Multi Stage Improvement Program, MSIP, where we went from Block 5, Block 10, Block 15, 20, 30, 40, 50, we're up to Block 70 now. And we started with that Configuration Steering Group because everybody, because we knew we had to maintain cost discipline.

[00:32:23] **Gen John Michael Loh, USAF (Ret.):** We've lost that cost discipline. We've lost it in the F 35 program. We've lost it in other programs, as you know, even the T 7 program. We've lost it now. We're probably going to lose it in the And the B 21, if we don't do a similar, have a similar iron clad cost discipline on the, on the airplane. And NGAD, you know, paper airplane NGAD is already blowing up in terms of what its potential cost might be because there's no discipline and no input from the operators to say, Hey, we can, we can solve whatever problem you're trying to solve with numbers.

[00:32:56] **Gen John Michael Loh, USAF (Ret.):** And that was the advantage of the F 16. We can say, Hey, you know, we don't, [00:33:00] we don't have to have one F 16 beat the entire Russian air force. Or even their best fighter on, on a given day, on a good day, we can, we can send numbers instead of sending two F sixteens or f or f sixteens to take on somebody that all the models show that we'd lose if we didn't get outta harm's way.

[00:33:19] **Gen John Michael Loh, USAF (Ret.):** You know, we, we had standoff we said, no, we'll send, we'll send 10, we'll send 20, we'll send 30 F sixteens. and so we use, we use numbers to compensate and, and here what, what has been lost today in the operational world. is this notion about contested airspace. We're afraid to fly into contested airspace.

[00:33:37] **Gen John Michael Loh, USAF (Ret.):** And I said, well, no, we got to fly into contested airspace. You can't fight a war with standoff only. And every airplane, every airplane doesn't have to be stealthy. we've got a good stable of stealthy aircraft, but we ought to cut, you know, we need to compliment that with a whole package of F 16s still today.

[00:33:54] **Gen John Michael Loh, USAF (Ret.):** And that was our, That was our, that was, that was how we sold the F 16. Back in [00:34:00] those days that we could, we could use the numbers and operational fighter pilot tactics to compensate for the fact that we were going up against an adversary that could out, maybe outrange us in terms of, in terms of their radar capability.

[00:34:13] **Gen John Michael Loh, USAF (Ret.):** They could see us first, maybe, but we could still beat them. And so, you know, this whole notion of maintaining costs, And configuration discipline and depending on numbers and fighter pilot ingenuity tactics and tactics to compensate for, for, for for having a shortfall and some other, some other capability should be reinstated today because this notion that we have, we're so afraid of China that we're going to have to stand off.

[00:34:43] **Gen John Michael Loh, USAF (Ret.):** Outside of harm, outside of a contested airspace is nonsense. Over. So now the F 16 is born and the Air Force is off to the races and standing up training and operational bases. And General Lyon, you were there as a brand new second lieutenant, [00:35:00] fresh out of flight school with a new set of wings on your chest.

[00:35:03] **John "Slick" Baum:** What was it like to get an F 16 assignment at assignment night and show up to MacDill for the B course? Well assignment night, it was 1981 for me. The F 16 was the newest aircraft in the inventory, seeing a picture of the F 16 flash on the video screen when my name was called, it was pure exhilaration.

[00:35:25] **Maj Gen Charlie Lyon, USAF (Ret.):** To get a fighter aircraft straight out of UPT, much less a brand new fighter aircraft, the only insurance you had was if you graduated in the top 10 percent of the class. And you had no idea going into assignment night where you ranked in the class. You generally had an idea if you were in the top half.

[00:35:41] **Maj Gen Charlie Lyon, USAF (Ret.):** So this whole thing was a crapshoot getting an F 16. for my class, we knew that there was going to be a couple F 16s, maybe a couple F 15s, and an A 10. But there's a lot of anticipation. I filled out my dream sheet. I ranked F 16 at the top. I was just doing backflips when, when I was announced to getting an F [00:36:00] 16.

[00:36:00] **Maj Gen Charlie Lyon, USAF (Ret.):** MacDill was the second training wing that was established to have F 16 training, and I was in the 63rd Tackle Fighter Training Squadron. We were in the first B course for this, this squadron, and most of our instructor pilots had very little experience in the aircraft. In fact, most of them had just themselves completed the transition course and the instructor course.

[00:36:20] **Maj Gen Charlie Lyon, USAF (Ret.):** So they had somewhere between 50 and 100 hours in the aircraft. The tech orders were new. They had a lot of pen and ink changes. The academics were struggling to keep up with the changes in the aircraft and the systems that we had. And the only simulator we had was located out at Williams Air Force Base in Arizona.

[00:36:35] **Maj Gen Charlie Lyon, USAF (Ret.):** So we traveled out there to get a couple simulator hops prior to our first flight in the aircraft. Which was a two seat B model, and we had an instructor in the backseat. Then we progressed to flying solo in the A model for each phase of instruction. It was very, very volatile. It was just a sense of energy of newness and change and things that are going on.

[00:36:55] **Maj Gen Charlie Lyon, USAF (Ret.):** It was just an incredible time. And you know, we thought about this [00:37:00] because right next to us was an F 4 training squadron. And just the contrast of the F 16 to the F 4. And I had this feeling that we're just going to, we're becoming part of the future, is where the Air Force was going. That was what was great about being at the F 16 at the time.

[00:37:16] **Maj Gen Charlie Lyon, USAF (Ret.):** But at the same time, we're having this ability to carry on the legacy of the F 4, the jack of all trades, master of none. It just, it was an incredible feeling. And let's not forget, this was the era of heaters and guns. Radar missiles were still largely ineffective, so getting to emerge unseen or flying low and avoiding detection by other aircraft was every fighter pilot's goal.

[00:37:40] **Maj Gen Charlie Lyon, USAF (Ret.):** The F 16 provided that advantage, this small, maneuverable, precise navigation, accurate weapons delivery system aircraft. An incredible time and an incredible airplane.

[00:37:52] **John "Slick" Baum:** Well, sir, you just said something that I, you know, I want to pull on this thread a little bit. You mentioned the energy that was going on there.

[00:37:58] **John "Slick" Baum:** I mean, at that time [00:38:00] from it had to be absolutely unbelievable. I mean, it's, it's the F 16 in the eighties. You're getting new jets every year. You mentioned you're kind of replacing the F4. I mean, give us a sense of what that was like.

[00:38:13] **Maj Gen Charlie Lyon, USAF (Ret.):** Well, it all started at 3 D Tactical Fighter Wing at Hill Air Force Base.

[00:38:17] **Maj Gen Charlie Lyon, USAF (Ret.):** The first operational unit and first flight happened in the same month, January 1979. And by early 1980, second lieutenants were already flying the aircraft, not just the old heads. The Air Force declared F 16 IOC in October 1980, less than two years after the first flight, operational flight. So one thing we embraced in the F 16 community from the outset, the spirit of attack.

[00:38:42] **Maj Gen Charlie Lyon, USAF (Ret.):** That was our mantra. And I credit the early tacticians such as Joe Bob Phillips, Norton Nelson, and Wayne Edwards for creating this culture. The spirit of attack is often coined as An innate aggressive desire to seek out and destroy the enemy. And that was how we approached our training [00:39:00] missions. We weren't merely planning to go to the assigned target and drop bombs.

[00:39:03] **Maj Gen Charlie Lyon, USAF (Ret.):** We would just seek out any enemy in the air that chose to put himself between us and the target and kill him. Now that was a really odd mindset for air to ground guys to have. There was a coming out party for the F 16 to demonstrate this. It was a lossy mouth Royal Air Force bomb competition in 1981, less than a year after IOC.

[00:39:25] **Maj Gen Charlie Lyon, USAF (Ret.):** This was composed of U. S. Air Force and Royal Air Force air to ground fighters. They were assigned surface targets to go destroy with precise time over target and air to air aggressors coming to harass them en route to the targets. Well, the F 16s blew away the competition. They had 88 air to air kills.

[00:39:42] **Maj Gen Charlie Lyon, USAF (Ret.):** They destroyed all assigned surface targets. They had a near perfect navigation timing score, and no other team came close. This was the first highly visible application of the spirit of attack, and it was on the world stage in 1981. Two years [00:40:00] later, the coming out party for Gunsmoke, 1983, F 16's premier event.

[00:40:08] **Maj Gen Charlie Lyon, USAF (Ret.):** The teams that went there took number one, number two, and number four place. And the overall competition, just what's going on in the F 16 in the early years. We're going through a lot of transitions of wings, a lot of new people coming in. This is how good the aircraft was though. This is how revolutionary it was at the time.

[00:40:27] **Maj Gen Charlie Lyon, USAF (Ret.):** It was blowing away the competition as we got these new, these new blocks of aircraft, new capabilities. We are flying blind jocks 200 to 275 hours a year. We are exercising monthly in both PACAF, USAFE. And ACC, it was just an incredible time with a lot of focus on readiness and preparedness and a brand new aircraft,

[00:40:53] **John "Slick" Baum:** sir.

[00:40:53] **John "Slick" Baum:** It's absolutely incredible. And I have to say, as you were describing that, I was thinking, you know, arguably one of the most [00:41:00] successful aviation movies and, and, and anticipated aviation movies with Top Gun Maverick, you know, they. Decided that they were going to go low and fast, do a low level to a pop attack.

[00:41:11] **John "Slick" Baum:** I mean, if that's not a flying and attack airplane, as you mentioned I don't know what is, but yeah, as easy it is as it is for us to get super excited. You know, of course the jet did have some growing pains and lessons learned as we say, written in blood. So can you walk us through some of those challenges and, and, and how it was for the air force team, you know, plus the industry partners to come together to solve those.

[00:41:34] **Gen John Michael Loh, USAF (Ret.):** Well, it's true.

[00:41:35] **Maj Gen Charlie Lyon, USAF (Ret.):** In tactical air command, we had 24 Class A safety mishaps across three wings in my first three years flying the F 16. That's the equivalent of one squadron's complement of aircraft. Flight control, system batteries, electrical failures, engine anomalies, pretty significant for a single engine aircraft.

[00:41:54] **Maj Gen Charlie Lyon, USAF (Ret.):** G induced loss of consciousness. These all resulted in the term lawndart. A term by [00:42:00] given by those who didn't fly the aircraft something that wasn't, uh, endeared by us because of the friends that we lost in fatal collisions with the ground. Yeah, we had fatalities. We had fleet stand downs, but we observed changes being made rapidly by General Dynamics, our prime contractor at the time, and systems command to fix these deficiencies.

[00:42:21] **Maj Gen Charlie Lyon, USAF (Ret.):** They're incorporated in the block upgrades, and in the case of G, loss of consciousness by training and educating our pilot community on how to master the art of sustained hygiene environment. Something the pilots hadn't encountered in the third generation fighters that preceded the F 16. We saw a very agile, iterative approach at this time.

[00:42:42] **Maj Gen Charlie Lyon, USAF (Ret.):** I mean, little did I know as a line jock, as a result of what was going on, that these block upgrades were all part of the strategy that General Lowe and others had put in place to rapidly field this low cost fighter. They, they knew that things would have to be fixed along the way. I observed that taking place as did my, my fellow fighter [00:43:00] pilots.

[00:43:01] **Maj Gen Charlie Lyon, USAF (Ret.):** The electrical systems and flight control battery systems logics were fixed as a result of Class A mishaps. So what was the sequence? There'd be a mishap, a stand down. They'd analyze the problem, develop a solution, insert a time critical TCTO, return to flight. The Pratt Whitney F 100 engine came up with a digital EEC, then it came up with a Dash 220 engine, which eventually, by the time it got to the Block 15, We've had better reliability across all, all regions of flight again, very important in a single engine aircraft that you can slap that throttle anywhere you want and have a good confidence that it's going to give you what you need.

[00:43:41] **Maj Gen Charlie Lyon, USAF (Ret.):** We had a larger horizontal stabilizer laser included in the block 15 aircraft, which eliminated the deep stalls and out of control situations. And then on the pilot and the human factor side, by 1984, we learned about the G induced loss of consciousness. Centrifuge training, diet, nutrition, and exercise regimen were [00:44:00] prescribed for the fighter pilots so that they were better conditioned and better prepared to be able to handle the hygiene environment.

[00:44:07] **John "Slick" Baum:** Yeah, you, you really got to see this thing do this massive evolution and you know, of course the tenacity of, of you all to endure. What was going on at the time is absolutely incredible. And as you mentioned, you know, you're flying the jet and there was a plan to upgrade and, and, and expand the envelope, if you will, of what the jet was capable of doing.

[00:44:28] **John "Slick" Baum:** So when did you actually see you know, that the jet was expanding outside its initial parameters, you know, as the day VFR high, low mixed role and what really drove this.

[00:44:40] **Gen John Michael Loh, USAF (Ret.):** Well,

[00:44:40] **Maj Gen Charlie Lyon, USAF (Ret.):** I guess it became evident to me when I joined the 422nd Test and Evaluation Squadron at Nellis in 1987, General Lowe has already described for us the staff's plan to upgrade the F 16 along the way, but as a line jock, until I got the 422, I was unaware of that plan.

[00:44:56] **Maj Gen Charlie Lyon, USAF (Ret.):** I was just out flying airplanes and seeing that, hey, this is great, we're getting new aircraft [00:45:00] almost every year. But I, I observed the plan coming together as we moved from the A model to the C model in 1985. While I was in the 422, we flew the A's and C's at the same time, and you could just tell by this point that the A model was mature, yet it was maxed out, and it really didn't have any more room for growth.

[00:45:20] **Maj Gen Charlie Lyon, USAF (Ret.):** The C model initially had some bugs and some performance limitations. But particularly in the radar, you could just see the growth and the growth potential. This was really important as the threat was involving. You needed to be able to see things earlier, make quicker decisions and react. And the APG 68 gave us the detection range, the radar modes, and eventually the AIM 120 pairing to help counter the threat effectively when we needed it.

[00:45:46] **Maj Gen Charlie Lyon, USAF (Ret.):** The aircraft was getting heavier. This was all paving the way for the eventual late eighties edition of the navigation pod. And what became the eventual block 40 or CG configuration, which turned us into [00:46:00] the complete opposite mission of what the day light White VFR fighter had been into being a nighttime fighter with the CG

[00:46:08] **Gen John Michael Loh, USAF (Ret.):** configuration.

[00:46:10] **Gen John Michael Loh, USAF (Ret.):** All right, gentlemen,

[00:46:11] **John "Slick" Baum:** this one is for all of you. What was it like flying the Viper in the 1980s during the height of the cold war? I mean, there had to be a tremendous focus on combat readiness and you had tons of flying hours, especially versus the folks, you know, that what they're getting today. So, you also had a very defined threat.

[00:46:28] **John "Slick" Baum:** So can you walk us through that era and lessons? Uh, We should think about applying today.

[00:46:33] **Gen John Michael Loh, USAF (Ret.):** Okay. So, yeah, I did not fly the F 16 operational. Yeah, I've flown it many times, but never as a combat ready operational pilot, so I don't have any direct input to your question about flying it in the 80s during the Cold War and leading up to other emergencies.

[00:46:50] **Gen John Michael Loh, USAF (Ret.):** But but during that time, I was, in fact, I was in the TAC headquarters from 1981. To 85 as the director of operational [00:47:00] requirements. and I just watched the F 16 grow in maturity and grow through the MSIP program. One thing I'm surprised that neither Stutz nor Sea Lion brought up was the engine.

[00:47:13] **Gen John Michael Loh, USAF (Ret.):** Now we had a, we had a problem with the engine early on. The engine, the F 100 engine on the F 16 was the same engine that powered the F 15. Big difference is the F 15 had two of them. The F 16 only had one, and when we, when we tried to, when I went up to the F 15 program and we're doing, developing the YF 16, trying to get information about problems they had with the F 100 engine was impossible to get out of the F 15 SPO.

[00:47:42] **Gen John Michael Loh, USAF (Ret.):** Their SPO director was General Ben Vellis. He was ironclad. He had his own direct line to the Secretary of the Air Force and the Secretary of Defense. And he, and they had huge problems with the F 100 engine early on out at Edwards. In fact, they had 20 full scale development aircraft I mean [00:48:00] 10 full scale development aircraft and 40 engines.

[00:48:03] **Gen John Michael Loh, USAF (Ret.):** They had four engines for each airplane because they were constantly swapping out. F 100s and they had huge stall stagnation problems in the F 100. So, so we had a, we had a big problem making the F 100 engine safe in a single engine fighter. That was a big safety issue up front. We didn't have a backup control.

[00:48:21] **Gen John Michael Loh, USAF (Ret.):** We had a We had a Rube Goldberg manual backup control back in the early days of the F 16. It didn't work very well. You had to rub your belly, pat your head in order to make it work even. Most pilots got it wrong anyway. So we, we, and I tried to put a full authority electronic control. In the airplane early and I got thrown out of tack headquarters by General Dixon when I tried to propose it because it was right in the middle of the stall stagnation period.

[00:48:46] **Gen John Michael Loh, USAF (Ret.):** So my only point is I was happy to see in the 80s that those problems had largely been solved with regard to the engine. And the pilots had confidence in the F 100 engine in a single

[00:48:58] **Maj Gen Charlie Lyon, USAF (Ret.):** engine fighter that we [00:49:00] had, we had a

[00:49:00] **Gen John Michael Loh, USAF (Ret.):** hard time getting through back in the early days because nobody thought about, nobody thought, how, how do we use this engine in a single engine fighter because it grew up, the F 100 engine grew up in a twin engine fighter, the F 100.

[00:49:14] **Maj Gen Charlie Lyon, USAF (Ret.):** 15 where single engine where problems

[00:49:16] **Gen John Michael Loh, USAF (Ret.):** with the engine were discarded because you always had two of them and the backup engine was the second engine. So, anyway, I'm happy to hear that neither, neither Charlie or uh, Scott brought up any significant engine problems during, during the early growth years of the F 16.

[00:49:32] **Maj Gen Larry "Stutz" Stutzriem, USAF (Ret.):** Hey, General Lowe, I gotta say that I was a board president out at Luke on a uh, F 16 that was lost for a failed engine. You know, we did our 30 day thing and I'm leaving the base after we finished up and as I'm driving off the base, the second F 16 crashes for the for this.

[00:49:53] **Gen John Michael Loh, USAF (Ret.):** Yeah, there were some growing things.

[00:49:56] **Gen John Michael Loh, USAF (Ret.):** What's the, what's the engine? Yeah,

[00:49:59] **Maj Gen Charlie Lyon, USAF (Ret.):** well, [00:50:00] yes, I talked a little bit about the hours that we got and some of the exercise that we did, but I have to remember in the early 90s, this is the rise. of surface to air missile capabilities, SA 6s, SA 8s, et cetera, in huge capacity. This drove us all into the low altitude arena.

[00:50:17] **Maj Gen Charlie Lyon, USAF (Ret.):** Low altitude pop up attacks with the constantly computing IP that we had, CCIP for general purpose bombs using the INS. For accurate navigation. This is an incredible ability for us to fly low arrival in time with minimum exposure to threats. So we're up being exposed less than 5 seconds.

[00:50:33] **Maj Gen Charlie Lyon, USAF (Ret.):** And the F 16 just gave us the ability to do that flying around as low as you could pop up. Look around. There's the target. Oh, great. Great weapon system solution, boom, bombs on target, off going, get, get home. But now try doing that with an AGM 65 in the same environment, in a single seat aircraft. Ooh, that was really tough, but we did that stuff too.

[00:50:55] **Maj Gen Charlie Lyon, USAF (Ret.):** Let me tell you some of the real fun stuff we did at the same time. As a second lieutenant, [00:51:00] we're going to Nellis, can't tell you what we're going to do, but it's going to be a great DUI, guys. Okay, we get out there. We signed some paper on this old World War Two building. We go on these guys. They have this little ready go patch on.

[00:51:11] **Maj Gen Charlie Lyon, USAF (Ret.):** We signed the paperwork. This has now been declassified. We had to fly BFN against MiG 21s. How great was that? The 4477th Tactical Training Test and Evaluation Squadron, such a confidence builder because that was the little airplane that was the You know, the nemesis of the F 4 in Vietnam, we took our F 16 out against them and saw that we could match them on any day.

[00:51:37] **Maj Gen Charlie Lyon, USAF (Ret.):** And my good friend Hawk Carlisle and I got to fly against each other many times. These were some incredible things that we got to do in just an incredible time. And the lesson for today? Make sure that we are training scenarios continue to adapt to the threat environment because we went from that environment.

[00:51:54] **Maj Gen Charlie Lyon, USAF (Ret.):** I described by the late 1980s, where we had all aspect adversaries with true look down. [00:52:00] Should that shoot down capability? Think about the introduction, the mid 29 and the sue 27. This drove our tactics and our needed capabilities into. Ever increasing reliance on ECM and AIM 120 for self defense and offensive capabilities rapidly.

[00:52:15] **Maj Gen Charlie Lyon, USAF (Ret.):** Quick changing ballgame, and I think our F 35s for today are in the same environment.

[00:52:22] **John "Slick" Baum:** Absolutely amazing. And gentlemen, I'd quickly like to hear from you on this one too, because you, you all live through.

[00:52:28] **John "Slick" Baum:** One of the most successful modernization stories in Air Force history. And given where the Air Force is now trying to birth so many new programs, what lessons do you have for today's airmen? And what does it take to get it right? And, you know, what should be emulated? Are there areas where folks could learn from your

[00:52:44] **Gen John Michael Loh, USAF (Ret.):** mistakes as well?

[00:52:46] **Gen John Michael Loh, USAF (Ret.):** And the development of operational requirements for new aircraft, like NGAD, like CCA, even like B 21 and beyond, there's not enough operator input. It all comes most, we, back in, back in these [00:53:00] days when we were developing F 15, F 16, F 22. We had close interaction between the operators at the Operational Command, Air Combat Command, and the developers at Air Force Materiel Command at right field.

[00:53:11] **Gen John Michael Loh, USAF (Ret.):** Very close cooperation. So we had operator inputs in writing the requirement, and the requirement became the, document of record for, for the aircraft. Today, I don't see As much connection between the developer and the operator as we did then, it is 90 percent developer, 10 percent operator, not the operator's fault.

[00:53:31] **Gen John Michael Loh, USAF (Ret.):** It's the way the system is working right now that we do not have a strong enough requirements input from the operational command. Over.

[00:53:39] **Maj Gen Larry "Stutz" Stutzriem, USAF (Ret.):** Yeah, I'll jump in on that one. And General Lowe and I have talked about this before, and what we do at Mitchell Institute is try to bring together the technologists and the warfighter.

[00:53:51] **Maj Gen Larry "Stutz" Stutzriem, USAF (Ret.):** That structure that existed back then was both organizational, but there were other things that have changed that have not allowed [00:54:00] General Lowe Generals like you to be able to get outside their comfort level, you know, dip into program management, get into technology, and they may not be as well versed in development and in technology, and that's something that was powerful back in that era that the Air Force needs to reclaim.

[00:54:20] **Maj Gen Larry "Stutz" Stutzriem, USAF (Ret.):** I'm totally with you on that.

[00:54:22] **Maj Gen Charlie Lyon, USAF (Ret.):** As I think about this and I think about where the Air Force is today the two things that are really stand out to me, building experience within these new weapon systems, thinking about today's F 35s. In the F 16, we kept the pilots in the cockpits to build overall weapons system level experience. It was so important.

[00:54:45] **Maj Gen Charlie Lyon, USAF (Ret.):** We had an existential threat to our nation, the Soviet Union. We expanded the number of wings. We had to keep the pilots there. That helped ensure that we had safe, relevant flight training as we built up the entire pool of F 16 [00:55:00] pilots. And this was documented to ensure that our pilots weren't penalized for promotion opportunities because they were doing what the Air Force needed them to most be mission ready to protect the nation.

[00:55:11] **Maj Gen Charlie Lyon, USAF (Ret.):** Number 2, incremental upgrades, block deliveries. It delivered combat capability quickly, and at the lowest possible price point, and then it inserted technology. When able, it went back and retrofit, but not everything was retrofitable.

[00:55:29] **Gen John Michael Loh, USAF (Ret.):** That didn't mean that we wouldn't go to war with the previous blocks.

[00:55:33] **Maj Gen Charlie Lyon, USAF (Ret.):** We would, and we're prepared to go to war with those previous blocks. They were still better than the previous generation. That's a lesson to never forget. Let's not forget that even the initial

[00:55:45] **Gen John Michael Loh, USAF (Ret.):** A models

[00:55:46] **Maj Gen Charlie Lyon, USAF (Ret.):** or initial blocks of any new aircraft are as capable as those that they've replaced. Yeah, I think

[00:55:53] **John "Slick" Baum:** it's great.

[00:55:54] **John "Slick" Baum:** And, you know, I, I do want to ask on the last question here you know, what does that mean for the three of you at an [00:56:00] individual level to have been part of the Viper story? I mean, general low, your role is second to none. You created the jet that you, your son, and now your grandson has flown and taken a war.

[00:56:10] **John "Slick" Baum:** And it's literally shaped air power history and general lion and stats. You both help write the operational chapters. So, if you want to sign off and give us your feelings on your time in the Viper, that would be, be great.

[00:56:22] **Gen John Michael Loh, USAF (Ret.):** Well, for my part, it was just gratifying to see uh, I did not fly the F 16 operationally, but my son flew it.

[00:56:29] **Gen John Michael Loh, USAF (Ret.):** he was like Charlie Lyon. He came right out of pilot training and went to MacDill and then went to Han and then to Luke and then got in the guard. And he's, he's still, he's, he's the director of the international guard right now, but he has uh, what, 3, 500 hours in the. F 16 in the Colorado Air National Guard.

[00:56:45] **Gen John Michael Loh, USAF (Ret.):** So it's gratifying to see him. And then of course his son Michael John Lowe is now flying F 16s in Spangdahlem. He was at Kunsan, he was at Aviano, went to Kunsan, now he's at Spang. He's already had three assignments now in F 16s. And in [00:57:00] fact, he just made flight commander. two weeks ago, he calls, Hey, I'm now, now a flight commander.

[00:57:05] **Gen John Michael Loh, USAF (Ret.):** What do I do, coach? Yeah, kind of. So anyway, it's, it's gratifying to see son and now grandson as a leader in the F 16 program. And my only, my only thought is I, I hear rumors that my son talks about, well, everybody wants to get rid of the F 16. Now we're going all FF 35 and all. Don't give up on the F 16 yet.

[00:57:26] **Gen John Michael Loh, USAF (Ret.):** It's still a fantastic fighter. It has every capability anybody would want right now except stealth. And it can come and say for lack of stealth or with a number of reasons. So if you want numbers in your Air Force, and I think we, we've lost track of that now with F 35 costings as much as it does. and F 22s at the, we're not getting enough we again have a fighter shortfall and you know, fill up that fighter shortfall like we did back in the, in the late 70s with F 16s, you've got some very capable F 16s. So don't, my message is. Don't give up on the F 16 yet. And from my own standpoint, it's [00:58:00] very gratifying to see the F 16 endure for so long.

[00:58:02] **Gen John Michael Loh, USAF (Ret.):** Over.

[00:58:04] **Maj Gen Charlie Lyon, USAF (Ret.):** For me, I had the chance to fly the F 16 over off and on over a period of 20 plus years. And what was most gratifying was the launch that this multi role aircraft was able to continue to adapt to a changing environment. In the beginning of planning to go against the Soviet Union, flying low altitude pop up attacks, getting into night precision guided munitions employment, medium altitude, flying, employing AGM 88s, armed targeting system against surface to air missiles, to contributing to the war on terror.

[00:58:41] **Maj Gen Charlie Lyon, USAF (Ret.):** And employing precision guided munitions against terrorists and the Taliban as well, which is very gratifying to see the continuing adaptability of the aircraft, its flexibility and the flexibility of the pilots who flew it. To be able to adapt to the environment and keep [00:59:00] and keep this relevant. I think the F 16 has got to be perhaps the best investment taxpayers have ever made in an aircraft in the Air Force inventory.

[00:59:09] **Maj Gen Charlie Lyon, USAF (Ret.):** When you look at how long it is flown, the price point it came in. And the contribution is made to our defense.

[00:59:16] **Maj Gen Larry "Stutz" Stutzriem, USAF (Ret.):** Yeah, I'll just say I didn't write any chapters, actually. I dog eared a lot of the pages of great airmen, like, you know, General Mike Lowe with us. And memorized what they did and how they did things and, really shaped my career around that. I will say that we need to.

[00:59:38] **Maj Gen Larry "Stutz" Stutzriem, USAF (Ret.):** Understand that this era of the F 16, you know, how it was so vigorous. It was so kinetic. We're now, you know, the Air Force is the oldest and the smallest that it's been in its history. The threat is surging. Capacity matters. And we can't stay in developmental programs forever. We have to procure [01:00:00] stuff.

[01:00:01] **Maj Gen Larry "Stutz" Stutzriem, USAF (Ret.):** And, and and get that technology back on the ramp. So I appreciate, you know, the story of the F 16 for what it informs in terms of getting out of the bathtub the Air Force is in today. But I will say that airplane stands as one of the most amazing innovations in combat aviation and will remain that way for decades and decades to

[01:00:29] **John "Slick" Baum:** come.

[01:00:30] **John "Slick" Baum:** Well, gentlemen, I have to tell you, it is truly been an honor to hear your perspectives on the origin of the F 16 and your personal experiences with the jet. And thank you all for your hard work and dedication to the United States Air Force and the F 16. You've certainly ensured that the Viper is the jack of all trades, but master of none, but that's certainly better than being the master of one.

[01:00:53] **John "Slick" Baum:** It's been a pleasure,

[01:00:53] **Gen John Michael Loh, USAF (Ret.):** Slick, to participate in this, and thank you for the invitation to participate.

[01:00:59] **Maj Gen Charlie Lyon, USAF (Ret.):** Slick, it's been a [01:01:00] real pleasure to be part of the F 16 podcast this morning. I really appreciate the invitation. Thank you so much.

[01:01:07] **Maj Gen Larry "Stutz" Stutzriem, USAF (Ret.):** Hey, thanks as always, Slick. It was great. See

[01:01:10] **John "Slick" Baum:** you soon. With that, I'd like to extend a big thank you to our guests for joining in today's discussion.

[01:01:16] **John "Slick" Baum:** I'd also like to extend a big thank you to our listeners for your continued support and for tuning into today's show. If you like what you've heard today, don't forget to hit that like button and follow or subscribe to the Aerospace Advantage. You can also leave a comment to let us know what you think about our show or areas you think we should explore further.

[01:01:34] **John "Slick" Baum:** As always, you can join in on the conversation by following the Mitchell Institute on Twitter Instagram, Facebook, or LinkedIn. And you can always find us at Mitchell aerospace power. org. Thanks again for joining us and we'll see you next time. Stay safe and check six.