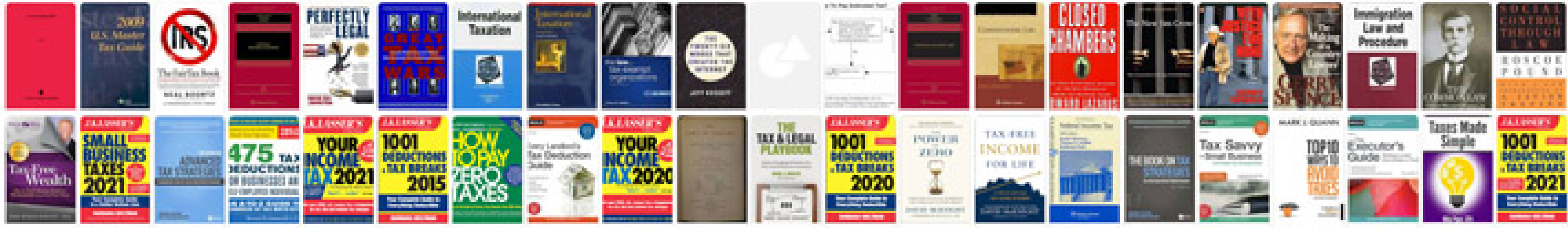

Sr 71 startup

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The SR was developed as a black project from the Lockheed A reconnaissance aircraft during the s by Lockheed's Skunk Works division. American aerospace engineer Clarence "Kelly" Johnson was responsible for many of the aircraft's innovative concepts. The shape of the SR was based on that of the A, which was one of the first aircraft to be designed with a reduced radar cross-section. At one point, a bomber variant of the aircraft was under consideration, before the program was focused solely on reconnaissance. Mission equipment for the reconnaissance role included signals intelligence sensors, a side-looking airborne radar , and a photo camera; the SR was both longer and heavier than the A, allowing it to hold more fuel as well as a two-seat cockpit. The aircraft was introduced to operational service in January During aerial reconnaissance missions, the SR operated at high speeds and altitudes Mach 3. If a surface-to-air missile launch was detected , the standard evasive action was simply to accelerate and outfly the missile. A total of 32 aircraft were built; 12 were lost in accidents with none lost to enemy action. NASA was the final operator of the type, retiring their examples in Since its retirement, the SR's role has been taken up by a combination of reconnaissance satellites and unmanned aerial vehicles UAVs ; a proposed UAV successor, the SR was under development by Lockheed Martin, and scheduled to fly in In late , the CIA approached the defense contractor Lockheed to build an undetectable spy plane. The work on project Archangel began in the second quarter of , with aim of flying higher and faster than the U Of 11 successive designs drafted in a span of 10 months, "A" was the front-runner. Despite this, however, its shape made it vulnerable to radar detection. The downing of Francis Gary Powers 's U-2 underscored its vulnerability and the need for faster reconnaissance aircraft such as the A Thirteen were built; two variants were also developed, including three of the YF interceptor prototype, and two of the M drone carrier. The J58s were retrofitted as they became available, and became the standard powerplant for all subsequent aircraft in the series A, YF, M , as well as the SR The A flew missions over Vietnam and North Korea before its retirement in The program's cancellation was announced on 28 December , [12] due both to budget concerns [13] and because of the forthcoming SR, a derivative of the A The SR designation is a continuation of the pre bomber series ; the last aircraft built using the series was the XB Valkyrie. However, a bomber variant of the Blackbird was briefly given the B designator, which was retained when the type was changed to SR Reconnaissance equipment included signals intelligence sensors, a side-looking airborne radar , and a photo camera. Johnson and his administration for falling behind the Soviet Union in developing new weapons. The media transcript given to the press at the time still had the earlier RS designation in places, creating the story that the president had misread the aircraft's designation. The specialized tooling used to manufacture both the YF and the SR was also ordered destroyed. The dark color led to the aircraft's nickname "Blackbird". While the SR carried radar countermeasures to evade interception efforts, its greatest protection was its combination of high altitude and very high speed, which made it almost invulnerable. Along with its low radar cross-section, these qualities gave a very short time for an enemy surface-to-air missile SAM site to acquire and track the aircraft on radar. If the SAM site could track the SR and fire a SAM in time, the SAM would expend nearly all of the delta-v of its boost and sustainer phases just reaching the SR's altitude; at this point, out of thrust, it could do little more than follow its ballistic arc. Merely accelerating would typically be enough for an SR to evade a SAM; [2] changes by the pilots in the SR's speed, altitude, and heading were also often enough to spoil any radar lock on the plane by SAM sites or enemy fighters. On most aircraft, use of titanium was limited by the costs involved; it was generally used only in components exposed to the highest temperatures, such as exhaust fairings and the leading edges of wings. Lockheed found that washing welded titanium requires distilled water , as the chlorine present in tap water is corrosive ; cadmium -plated tools could not be used, as they also caused corrosion. The high temperatures generated in flight required special design and operating techniques. Major sections of the skin of the inboard wings were corrugated, not smooth. Aerodynamicists initially opposed the concept, disparagingly referring to the aircraft as a Mach 3 variant of the s-era Ford Trimotor , which was known for its corrugated aluminum skin. Fuselage panels were manufactured to fit only loosely with the aircraft on the ground. Proper alignment was achieved as the airframe heated up and expanded several inches. The outer windscreen of the cockpit was made of quartz and was fused ultrasonically to the titanium frame. The red stripes featured on some SRs were to prevent maintenance workers from damaging the skin. Near the center of the fuselage, the curved skin was thin and delicate, with no support from the structural ribs, which were spaced several feet apart. The Blackbird's tires, manufactured by B. Goodrich , contained aluminum and were filled with nitrogen. Titanium was in short supply in the United States, so the Skunk Works team was forced to look elsewhere for the metal. Much of the needed material came from the Soviet Union. Colonel Rich Graham, SR pilot, described the acquisition process:. Back when they were building the airplane the United

States didn't have the ore supplies â€” an ore called rutile ore. It's a very sandy soil and it's only found in very few parts of the world. The major supplier of the ore was the USSR. Working through Third World countries and bogus operations, they were able to get the rutile ore shipped to the United States to build the SR The second operational aircraft [39] designed around a stealth aircraft shape and materials, after the Lockheed A , [39] the SR had several features designed to reduce its radar signature. Special radar-absorbing materials were incorporated into sawtooth-shaped sections of the aircraft's skin. Cesium -based fuel additives were used to somewhat reduce exhaust plumes visibility to radar, although exhaust streams remained quite apparent. Kelly Johnson later conceded that Soviet radar technology advanced faster than the stealth technology employed against it. The SR featured chines, a pair of sharp edges leading aft from either side of the nose along the fuselage. These were not a feature on the early A-3 design; Frank Rodgers, a doctor at the Scientific Engineering Institute, a CIA front organization , discovered that a cross-section of a sphere had a greatly reduced radar reflection, and adapted a cylindrical-shaped fuselage by stretching out the sides of the fuselage. Aerodynamicists discovered that the chines generated powerful vortices and created additional lift , leading to unexpected aerodynamic performance improvements. Landing speeds were also reduced, as the chines' vortices created turbulent flow over the wings at high angles of attack , making it harder to stall. The addition of chines also allowed the removal of the planned canard foreplanes. During one mission, SR pilot Brian Shul flew faster than usual to avoid multiple interception attempts; afterward, it was discovered that this had reduced fuel consumption. At the front of each inlet, a pointed, movable cone called a "spike" inlet cone was locked in its full forward position on the ground and during subsonic flight. Moving the spike tip drew the shock wave riding on it closer to the inlet cowling until it touched just slightly inside the cowling lip. This position reflected the spike shock wave repeatedly between the spike center body and the inlet inner cowl sides, and minimized airflow spillage which is the cause of spillage drag. The air slowed supersonically with a final plane shock wave at entry to the subsonic diffuser. Downstream of this normal shock , the air is subsonic. It decelerates further in the divergent duct to give the required speed at entry to the compressor. Capture of the plane's shock wave within the inlet is called "starting the inlet". Bleed tubes and bypass doors were designed into the inlet and engine nacelles to handle some of this pressure and to position the final shock to allow the inlet to remain "started". In the early years of operation, the analog computers would not always keep up with rapidly changing flight environmental inputs. If internal pressures became too great and the spike was incorrectly positioned, the shock wave would suddenly blow out the front of the inlet, called an "inlet unstart ". During unstarts, afterburner extinctions were common. The remaining engine's asymmetrical thrust would cause the aircraft to yaw violently to one side. SAS , autopilot, and manual control inputs would fight the yawing, but often the extreme off-angle would reduce airflow in the opposite engine and stimulate "sympathetic stalls". This generated a rapid counter-yawing, often coupled with loud "banging" noises, and a rough ride during which crews' helmets would sometimes strike their cockpit canopies. NASA developed a computer to control the engine bypass doors which countered this issue and improved efficiency. Beginning in , the analog inlet control system was replaced by a digital system, which reduced unstart instances. This proportion increased progressively with speed until the afterburner provided all the thrust at about Mach 3. Air was initially compressed and heated by the inlet spike and subsequent converging duct between the center body and inlet cowl. The shock waves generated slowed the air to subsonic speeds relative to the engine. The air then entered the engine compressor. Air passing through the turbojet was compressed further by the remaining five compressor stages and then fuel was added in the combustion chamber. After passing through the turbine, the exhaust, together with the compressor bleed air , entered the afterburner. The rotating machinery had become a drag item [59] and the engine thrust at high speeds came from the afterburner temperature rise. Originally, the Blackbird's J58 engines were started with the assistance of two Buick Wildcat V8 internal combustion engines , externally mounted on a vehicle referred to as an AG "start cart". The start cart was positioned underneath the J58 and the two Buick engines powered a single, vertical drive shaft connecting to the J58 engine and spinning it to above 3, RPM, at which point the turbojet could self-sustain. Once the first J58 engine was started, the cart was repositioned to start the aircraft's other J58 engine. Later start carts used Chevrolet big-block V8 engines. Eventually, a quieter, pneumatic start system was developed for use at main operating bases. The V8 start carts remained at diversion landing sites not equipped with the pneumatic system. Several exotic fuels were investigated for the Blackbird. Development began on a coal slurry power plant, but Johnson determined that the coal particles damaged important engine components. To start the engines, triethylborane TEB , which ignites on contact with air , was injected to produce temperatures high enough to ignite the JP The TEB produced a characteristic green flame, which could often be seen during engine ignition. On a typical SR mission, the airplane took off with only a partial fuel load to reduce stress on the brakes and tires during takeoff and also ensure it could successfully take off should one engine fail. As a result, the SRs were typically refueled immediately after takeoff. However, leaks were measured in drips per minute, and were not significant compared to the overall capacity. Supersonic flights generally lasted no more than 90 minutes before the pilot had to find a tanker. The KCQ had a modified high-speed boom, which would allow refueling of the Blackbird at nearly the tanker's maximum airspeed with minimum flutter. This unusual instrument projected a barely visible artificial horizon line across the top of the entire instrument panel, which gave the pilot subliminal cues on aircraft attitude. Nortronics, Northrop Corporation 's electronics development division, had developed an astro-inertial guidance system ANS , which could correct inertial navigation system errors with celestial observations , for the SM Snark missile, and a separate system for the ill-fated AGM Skybolt missile, the latter of which was adapted for the SR Before takeoff, a primary alignment brought the ANS's inertial components to a high degree of accuracy. In flight, the ANS, which sat behind the reconnaissance systems officer's RSO's , position, tracked stars through a circular quartz glass window on the upper fuselage. The system's digital computer ephemeris contained data on a list of stars used for celestial navigation : the list first included 56 stars, and was later expanded to The SR carried a Fairchild tracking camera and an infrared camera , [77] both of which ran during the entire mission. As the SR had a second cockpit behind the pilot for the RSO, it could not carry the A's principal sensor, a single large-focal-length optical camera that sat in the "Q-Bay" behind the A's single cockpit. Wide-area imaging was provided by two of Itek 's Operational Objective Cameras , which provided stereo imagery across the width of the flight track, or an Itek Optical Bar Camera , which gave continuous horizon-to horizon coverage. Both the first SLAR and ASARS-1 were ground-mapping imaging systems, collecting data either in fixed swaths left or right of centerline or from a spot location for higher resolution. An air conditioner used a heat exchanger to dump heat from the cockpit into the fuel prior to combustion. Blackbird pilots and RSOs were provided with food and drink for the long reconnaissance flights. Water bottles had long straws which crewmembers guided into an opening in the helmet by looking in a mirror. Food was contained in sealed containers similar to toothpaste tubes which delivered food to the crewmember's mouth through the helmet opening. Reconnaissance missions over North Vietnam were code named "Black Shield" and then renamed "Giant Scale" in late O'Malley and Major Edward D. The USAF could fly each SR, on average, once per week, because of the extended turnaround required after mission recovery. Very often an aircraft would return with rivets missing, delaminated panels or other broken parts such as inlets requiring repair or replacement. There were cases of the aircraft not being ready to fly again for a month due to the repairs needed. Rob Vermeland, Lockheed Martin 's manager of Advanced Development Program, said in an interview in that high-tempo operations were not realistic for the SR From the beginning of the Blackbird's reconnaissance missions over North Vietnam and Laos in , the SRs averaged approximately one sortie a week for nearly two years. By , the SRs were averaging two sorties per week, and by , they were flying nearly one sortie every day. Two SRs were lost during these missions, one in and the second aircraft in , both due to mechanical malfunctions. While deployed at Okinawa, the SRs and their aircrew members gained the nickname Habu as did the As preceding them after a pit viper indigenous to Japan, which the Okinawans thought the plane resembled. Only one crew member, Jim Zwayer, a Lockheed flight-test reconnaissance and navigation systems specialist, was killed in a flight accident. There were two routes. One was along the Norwegian west coast and up the Kola Peninsula , which contained several large naval bases belonging to the Soviet Navy's Northern Fleet. Rescue parties were sent in to repair the planes before leaving. On one occasion, one complete wing with engine was replaced as the easiest way to get the plane airborne again. Swedish Air Force fighter pilots have managed to lock their radar on an SR on multiple occasions within shooting range. On 29 June , an SR was on a mission around the Baltic Sea to spy on Soviet postings when one of the engines exploded. The mission was to do an incident preparedness check and identify an aircraft of high interest. It was found that the plane was in obvious distress and a decision was made that the Swedish Air Force would escort the plane out of the Baltic Sea. The event had been classified for over 30 years, and when the report was unsealed, data from the NSA showed that a few MiGs with the order to shoot down the SR or force it to land, had started right after the engine failure. A MiG had locked a missile on the damaged SR, but as the aircraft was under escort, no missiles were fired. One view is that the SR program was terminated due to Pentagon politics, and not because the aircraft had become obsolete, irrelevant, suffered maintenance problems or had unsustainable program costs. In order to be selected into the SR program in the first place, a pilot or navigator RSO had to be a top-quality

USAF officer, so continuing career progression for members of this elite group was not surprising. These generals were adept at communicating the value of the SR to a USAF command staff and a Congress who often lacked a basic understanding of how the SR worked and what it did. However, by the mids, these SR generals all had retired, and a new generation of USAF generals wanted to cut the program's budget and spend its funding on new strategic bomber programs instead, especially the very expensive B-2 Spirit. Also, the SR program's "product", which was operational and strategic intelligence, was not seen by these generals as being very valuable to the USAF. A general misunderstanding of the nature of aerial reconnaissance and a lack of knowledge about the SR in particular due to its secretive development and operations was used by detractors to discredit the aircraft, with the assurance given that a replacement was under development. The SR, while much more capable than the Lockheed U-2 in terms of range, speed, and survivability, suffered the lack of a data link , which the U-2 had been upgraded to carry. This meant that much of the SR's imagery and radar data could not be used in real time, but had to wait until the aircraft returned to base. This lack of immediate real-time capability was used as one of the justifications to close down the program. Attempts to add a datalink to the SR were stymied early on by the same factions in the Pentagon and Congress who were already set on the program's demise, even in the early s. However, the USAF refused to spend the money. While the SR survived attempts to retire it in , partly due to the unmatched ability to provide high-quality coverage of the Kola Peninsula for the US Navy, [] the decision to retire the SR from active duty came in , with the last missions flown in October that year. The SR program's main operational capabilities came to a close at the end of fiscal year October The 1st SRS kept its pilots and aircraft operational and active, and flew some operational reconnaissance missions through the end of and into , due to uncertainty over the timing of the final termination of funding for the program. The squadron finally closed in mid, and the aircraft were distributed to static display locations, with a number kept in reserve storage. From the operator's perspective, what I need is something that will not give me just a spot in time but will give me a track of what is happening. When we are trying to find out if the Serbs are taking arms, moving tanks or artillery into Bosnia , we can get a picture of them stacked up on the Serbian side of the bridge. We do not know whether they then went on to move across that bridge. We need the [data] that a tactical, an SR, a U-2, or an unmanned vehicle of some sort, will give us, in addition to, not in replacement of, the ability of the satellites to go around and check not only that spot but a lot of other spots around the world for us. It is the integration of strategic and tactical. Congress re-examined the SR beginning in Hall addressed the question of why the SR was retired, saying it was under "the belief that, given the time delay associated with mounting a mission, conducting a reconnaissance, retrieving the data, processing it, and getting it out to a field commander, that you had a problem in timelines that was not going to meet the tactical requirements on the modern battlefield. And the determination was that if one could take advantage of technology and develop a system that could get that data back real time Macke told the committee that they were "flying U-2s, RCs , [and] other strategic and tactical assets" to collect information in some areas. They maintained that, in a time of constrained military budgets, designing, building, and testing an aircraft with the same capabilities as the SR would be impossible. Congress's disappointment with the lack of a suitable replacement for the Blackbird was cited concerning whether to continue funding imaging sensors on the U Congressional conferees stated the "experience with the SR serves as a reminder of the pitfalls of failing to keep existing systems up-to-date and capable in the hope of acquiring other capabilities. Modifications were made to provide a data-link with "near real-time" transmission of the Advanced Synthetic Aperture Radar's imagery to sites on the ground. The reactivation met much resistance: the USAF had not budgeted for the aircraft, and UAV developers worried that their programs would suffer if money was shifted to support the SRs. Also, with the allocation requiring yearly reaffirmation by Congress, long-term planning for the SR was difficult. In June , the U. Supreme Court ruled that the line-item veto was unconstitutional. NASA operated the two last airworthy Blackbirds until The SR was the world's fastest and highest-flying air-breathing operational manned aircraft throughout its career. The SR also holds the "speed over a recognized course" record for flying from New York to Londonâ€"distance 3, Sullivan and Noel F. Widdifield, reconnaissance systems officer RSO. For comparison, the best commercial Concorde flight time was 2 hours 52 minutes and the Boeing averages 6 hours 15 minutes. On 26 April , , flown by majors Thomas B. Estes and Dewain C. Udvar-Hazy Center in Chantilly, Virginia. On 6 March , Lt. Raymond E. Yeilding and Lt. Joseph T. President, the termination of the SR was a grave mistake and could place our nation at a serious disadvantage in the event of a future crisis. Yesterday's historic transcontinental flight was a sad memorial to our short-sighted policy in strategic aerial reconnaissance. Speculation existed regarding a replacement for the SR, including a rumored aircraft codenamed Aurora. The limitations of reconnaissance satellites , which take up to 24 hours to arrive in the proper orbit to photograph a particular target, make them slower to respond to demand than reconnaissance planes. The fly-over orbit of spy satellites may also be predicted and can allow assets to be hidden when the satellite is above, a drawback not shared by aircraft. Thus, there are doubts that the US has abandoned the concept of spy planes to complement reconnaissance satellites. On 1 November , media outlets reported that Skunk Works has been working on an unmanned reconnaissance airplane it has named SR , which would fly twice as fast as the SR, at Mach 6. United States Air Force [] [] []. Twelve SRs were lost and one pilot died in accidents during the aircraft's service career. Some secondary references use incorrect series aircraft serial numbers e. SRC []. Data from Lockheed SR Blackbird []. From Wikipedia, the free encyclopedia. For other uses, see SR disambiguation. Supersonic reconnaissance aircraft in service with US Air Force Main article: Lockheed A Macke to the Senate Committee on Armed Services. Main article: Lockheed Martin SR Aviation portal United States portal. Retrieved: 14 March Business Times. Retrieved: 30 June CSI Publications. Retrieved 13 April Lockheed: The People Behind the Story. Turner Publishing Company. Archived from the original on 4 October Retrieved 2 October Retrieved: 17 October Archived on 17 April Zenith Press. Retrieved: 31 May Archived in Retrieved 16 January Retrieved 4 May Retrieved: 7 February Retrieved 9 March Ratnayake and Casie M. Retrieved: 7 September Retrieved 29 May Aircraft VOL. SR Online. Retrieved 21 July Veteran Tales Project. Event occurs at Retrieved 13 August â€" via YouTube. Retrieved: 13 December Retrieved 19 March December Retrieved 24 July Retrieved: 3 March Stratonauts: Pioneers Venturing into the Stratosphere. Retrieved 29 October Sled Driver. Archived from the original on 6 July Retrieved 6 July Erik Johnston. Retrieved 29 August The Online Blackbird Museum. The Untouchables. Mach One. Central Intelligence Agency. Retrieved 16 July Breaking Defense. Norway: Side3. Retrieved 11 September Retrieved 7 October Side3 in Norwegian. Retrieved 12 May ISSN Retrieved 25 September Retrieved: 16 August Retrieved: 18 October Retrieved: 14 February Graham Zenith Imprint. Aviation Week. Archived from the original on 11 August Retrieved 1 November Reed Business Information. Archived from the original on 21 January Retrieved 6 December Retrieved 28 April Event occurs at 1h12m40s. Retrieved: 12 November Retrieved: 10 February Air Force Armament Museum. March Field Air Museum. Archived from the original on 4 March Retrieved 5 May Warrior Flight Charity. 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B-1 B B B FB FB B-1 B-2 B-3 to B 2 B R R R R RS RS SR SR Categories : Lockheed aircraft s United States military reconnaissance aircraft Twinjets Tailless delta-wing aircraft NASA aircraft Signals intelligence Aircraft first flown in Stealth aircraft Supersonic aircraft High-altitude and long endurance aircraft Strategic reconnaissance aircraft Aircraft related to spaceflight. Hidden categories: CS1 Norwegian-language sources no Wikipedia articles needing page number citations from August Webarchive template wayback links Use dmy dates from March Use American English from July All Wikipedia articles written in American English Articles with short description Short description is different from Wikidata Articles containing potentially dated statements from All articles containing potentially dated statements All pages needing factual verification Wikipedia articles needing factual verification from February All articles with unsourced statements Articles with unsourced statements from February Wikipedia articles needing clarification from May Commons link is locally defined. Namespaces Article Talk. Views Read Edit View history. Help Learn to edit Community portal Recent changes Upload file. Download as PDF Printable version. Wikimedia Commons. The raised second cockpit is for the instructor. Strategic reconnaissance aircraft. Lockheed , Skunk Works division. Clarence "Kelly" Johnson. Lost, 18 December []. Cosmosphere , Hutchinson, Kansas []. Science Museum of Virginia , Richmond, Virginia []. Smithsonian Institution Steven F. Lost, 10 October Cockpit section survived and located at the Seattle Museum of Flight. Nicknamed "Rapid Rabbit" and wearing a Playboy bunny image as tail art. Lost, 20 July [3]. Wikimedia Commons has media related to SR Blackbird. Redesignated A-series B B The SR, an aircraft that first flew some 50 years ago next Monday, still holds the public's imagination like no other flying machine. It could lob a couple of guys, some cameras, radars and jammers through the air at Mach 3. Yet seeing it perform down-low at an air show was something akin to watching Darth Vader cook a turkey with force lightning then carve it with his lightsaber. Although the Blackbird was a fairly maneuverable machine considering its intended purpose, it was not at home under knots doing turns and low approaches in front of air show crowds. Yet this is what made the jet so amazing to watch, the fact that this foot long titanium jet-sled could still put on a show down in the thick air, and what a spectacle it was. With its bus sized afterburner plumes and high angle of attack slow maneuvering, the Blackbird looked like a sci-fi god performing in a mortal's world. Sometimes this 'bottom of the envelope' maneuvering combined for some sporadic engine effects. The SR's finicky J turbojets had their airflow issues up high and at supersonic speed, with 'unstarts' being a major hurdle during the genesis of the Oxcart program , down low these same engines could backfire and were susceptible to intermittent compressor stalls at high angles of attack, especially when the throttle was advanced. The results of which were huge fireballs erupting out the back of the big black jet. When they happened they were a real crowd pleaser to say the least. The whole SR air show affair looked like something of a fish out of water, an aircraft trying to show what it can do on someone else's terms and this is what made it so damn thrilling. It occurred during the Edwards Open House and was nothing near to the ungainly performances and nerve wracking shows of the s, although it did include a sonic boom flyby at 80, feet. Still, in the decade and a half that has passed since the Blackbird last graced the skies, her presence has been sorely missed. Maybe, in the not so distant future, we will finally have something as outrageous to replace her , although with a more diverse mission set. Until then, at least we have some videos to remember just how crazy she looked doing her thing in front of air show crowds around the globe. Here are some bonus SR air show videos, and let's not forget some epic flybys:. Tyler Rogoway is a defense journalist and photographer who maintains the website Foxtrot Alpha for Jalopnik. It came 61 years after the Wright Brothers at Kitty Hawk. Fifty years later, it's still unbeaten. That's kind of sad. The A. Tyler Rogoway. Share This Story. Get our newsletter Subscribe. By Jared Keller July 24, No wonder the SR became the preferred delivery craft for specially trained and colorfully attired multinational paramilitary squads : Of all the aircraft ever conceived by the U. Air Force, the Blackbird is most synonymous with speed. Luckily, you can now spend all day watching the SR and the YF scream across anonymous skies, if you so desire. While the cache of hundreds of videos includes some random gems like the landing of an ill-fated horned XBA Valkyrie , our favorite SR fanboy, Rogoway, surfaced a handful of fantastic clips of two Blackbirds stretching their wings over southern California. The test in the first video is no science experiment. Taking off is easy; landing is far more difficult. Jared Keller View Jared Keller's articles. Contact the author here. Wars are fought and ultimately won by the troops who slog through grime and uneven ground to take the hill Get the latest in military news, entertainment and gear in your inbox daily. Landing Taking off is easy; landing is far more difficult. Jared Keller View Jared Keller's articles jaredbkeller jared taskandpurpose. Before the Quantifying the exact level of badass-ness the SR Blackbird achieved during its active career from the s to the s is impossible -- partly because, as a spy plane, much of its anecdotal history remains behind a veil of security. From its very first test flight, three days before Christmas in , it straddled the boundaries between physics-bending speed and safety, top secret missions and public rockstar status, and even between Earth and space. Now basking in its second decade of retirement, Blackbird stands as a towering figure in the history of aviation, one which still holds more than its share of records. This is that very plane landing after that record-setting run, and while a few pilots took their Blackbirds faster, they weren't on an official two-way record run. Just before start of the second pass, one of the engines shut down. Before the engine could be restarted, the plane was well beyond the start line. Still, we exited the gate at Mach 3. Life's funny like that sometimes. The Blackbird is feet long, which is absolutely huge for a two seat aircraft. Each of those engines was good for hp. Without them, too much or too little air rushing into the intake airflow properties change at hypersonic speeds can cause a near instantaneous and absolutely catastrophic loss of control. The first testing location? Area Testing in the desert north of all those Las Vegas wedding chapels makes a lot of sense now, huh? Perhaps unsurprisingly, it was operated by the CIA. After setting several speed records, the prototypes saw fruitful careers helping NASA with research. Why go public with an untested, top secret spy plane? Presidential election rival Barry Goldwater had claimed the Soviets were getting a technological lead. When LBJ announced the plane to the public, he changed the name -- maybe by mistake He controversially called it the SR, which obviously stuck, instead of the RS Regardless, it forced designers to change the name on 33, different drawingsâ€¦ by hand. On December 22nd, , the SR took off for the first time This is that plane, on that day, taking off on that flight. Stop for a moment and think about the significance of this photograph. The evasive maneuver used by most pilots? Not a single one was ever shot down. At Mach 3, some parts of the plane could reach 1, degrees F Once an object in the atmosphere approaches Ludicrous Speed , friction from the flow of air causes a lot of heat buildup. As it happens, black paint helps dissipate that heat better than other colors -- 86 degrees better on the Blackbird -- so over 60 pounds of paint were applied to keep those temperatures from causing catastrophic failures. The flight suit was essentially built for space Engineers adapted it from the Gemini missions, and it would later be adapted further into the space suits you know today. The fuel tanks held fuel about as well as a colander holds water Thanks to the supremely high operating temperatures, and due to the way materials expand with heat, the body panels were engineered to fit very loosely when cold. On the ground, they leaked so badly that crews would fill the plane immediately before takeoff, and while the plane warmed up, it had to meet with a refueling rig after only seven minutes in the air. SRs spent a lot of time behind refueling planes Those engines burned upwards of 44, pounds of fuel each hour , making refueling every 90 minutes a necessity. All told, 56 Qs were made, or three for every two 32 SRs. The fuel required is every bit as bonkers as the rest of the SR story Late in the s, the CIA, the Air Force, and Shell collaborated on a fuel called JP7, which was structured specifically to work well at ultra high altitudes and at supersonic speeds. JP7 production caused a nationwide shortage of bug spray. One of the ingredients in JP7 just so happened to be a crucial part of Flit mosquito repellant. Louis to Cincinnati in eight minutes flat. Five years into retirement, it un-retired In a move that presaged Brett Favre by more than a decade, the Blackbird came out of retirement for a series of NASA projects, retiring again, for good this time, by It was the ultimate alpha in a sky full of alphas Watch this video for what is undoubtedly the single greatest 2, mph smack down story ever declassified. Seriously, though, watch this account. He grew up with photos of the SR, and only wishes he could have experienced it in person before they were grounded forever. Things You Didn't Know About. Our Newsletter. What's in my bar. Thrillist Serves. Enter your email address Subscribe. Social Media Links. The specific ore, utile ore, used to create titanium is found in few parts of the world. One of the largest supplies is in Russia. The U. This led to frustration on the assembly line when many pieces broke before they could be assembled. The nose cone detached and three different cones were used for three different purposes of the SR One cone housed the radar unit and the other cone housed the Optical Bar Camera, which surveyed the Earth in massive proportions. This interchangeability gave the U. This machine took a photo 72 miles wide, about as wide as the entire state of Vermont. Part of the nose cone designed for this camera had a glass strip on the underside of the nose cone that allowed the camera to look below to take images. Once a SR returned to base, the photo-maintenance division removed the film and cut it into foot long segments. From there, they would put on surgical gloves and go up and down the lines, inspecting this missive roll of film for cuts, tears or scratches. This was a time consuming process that had to be done correctly or else the entire mission may have been for nothing. Click the icon on the bottom right of the image to learn about that photo. Four bolts seems a little lackadaisical. But, the engineers at Skunk Works knew what they were doing. The air pressure was so great during flight that four clevis bolts were all that was necessary to keep the nose cone in place. While the nose cone did hold firmly in place with only four bolts, the nose configuration caused aerodynamic issues with the SR Because of directional stability issues, two small ventral fins to the engine nacelles were added and a large, hydraulically powered folding ventral fin on the centerline of the aft fuselage was added. Well over a hundred missiles were shot at the SR, but the Blackbird was just too fast and its jamming technology was too sophisticated for one to ever catch up. The jamming technology used in the SR essentially denied the missile from receiving any updated information from the Blackbird. The closest a missile ever got was 1. Air Force designed and built the SR in secrecy. Security clearance kept employees, crew, pilots, etc. Work started in and speculation started not long after. Many inside the aviation industry knew something was up at Lockheed, but no one really knew what was being built until President Johnson announced the SR Blackbird in What an accomplishment inside of one of the most legendary planes in history. The fewest flight hours recorded came from the SRA which only reached Friction at high altitude and high speed heats up the airframe. Many parts of the SR reached from degrees Fahrenheit, but the airframe above the engines reached over 1, degrees. Overall, the average skin temperature of the SR was over degrees. The quartz glass in the cockpit was 1. Over 90 percent of the SR was made of titanium alloy. Factor in glass for the cockpit and landing gear material â€" that means basically the whole aircraft was titanium alloy. Titanium alloy was popular because of its high corrosive resistance, high specific strength and low specific gravity. It was also a bio-compatible material and non-magnetic. Of the 12 SRs that were lost, four were tied to tire failure. The plane originally took off with 80, pounds of fuel, which put a disproportionate amount of pressure on the tires. It caused them to fail upon landing. So the takeoff fuel load was reduced to 40, pounds and was refueled in air before leaving for its mission. It would roll over on itself and crash, so half the fuel was helpful. At the speeds the SR flew, the tires heated up just like the airframe even though they were housed inside of a cell. If normal air was used to inflate the tires, the oxygen would seep out even while the landing gear was retracted. To combat that issue, pure nitrogen became the standard to inflate the lbs. Also, these tires were 2-ply. A typical commercial airliner only inflates its tires to about pounds per square inch. Some missions lasted as long as 10 hours or more, which required about 5 aerial refuels. Also, tubed food was fed through a helmet and water was drunk through a tube as well. Typical missions were closer to 2. These missions required the pilots to come down to about 25, feet of altitude in order to receive refuel every two hours or so. Before GPS and even more advanced technology, star-gazing was a reliable way to determine geographic location. The SR was equipped with a sensor that locked on to stars in space and relayed that information back down to Earth in order to give an updated location. It was so accurate, mind you this is in the s, that it guaranteed a correct positional read within feet while the plane was traveling 2, mph. Matter expands when hot, this is science. An aircraft is no different. Expansion Joints line the aircraft at strategic locations to allow the airframe to expand without causing damage to the plane. The SR expands three to four inches in length during flight and the expansion gap in the image above can expand one to two inches as well. There are more expansion joints riddle throughout the airframe, but the one above is the most significant. As the SR went into Supercruise, these expansion joints were absolutely necessary. This tool has been used for complex multiplication for centuries, and is now replaced by high-tech calculators and computers. Later tests confirmed that the SR would have been built the exact same way had the technology of today been around then. No engine can absorb supersonic air, so the airflow must be adjusted. Although it definitely adds to how cool the SR looks on the ground, it has a much more important role in flight. However, it moves aft once the SR reaches about Mach 1. The turbojet engine functioned more like a turbo ram engine over 2, mph because it bypassed a lot of the air around the engine back into the afterburner. Which is critical. Secret missions of three SRs left Japan and crossed paths simultaneously over Hanoi at times throughout the Vietnam War. This style of signaling occurred to U. Heads of States in other countries as well, specifically Panama. It was a signal to get out. It was critical that the shockwaves stay inside the inlet. This resulted in an unstart in one of the engines that sent the plane into a violent slice. To combat this, a program was developed that forced the other engine to unstart sympathetically in order to keep thrust symmetrical. Theoretically, this forced both the spikes to return to their subsonic position and level the aircraft. Liftoff speed was roughy mph. Landing speed was roughly mph. Gross takeoff weight is about , pounds, including a possible fuel weight of 80, pounds. The airframes are built almost entirely of titanium and titanium alloys to withstand heat generated by sustained Mach 3 flight. Aerodynamic control surfaces consist of all-moving vertical tail surfaces, ailerons on the outer wings, and elevators on the trailing edges between the engine exhaust nozzles. The SR reached a maximum speed in excess of Mach 3. The SR Blackbird cruising speed was Mach 3. Some estimates claim the SR can fly well over Mach 3. But these numbers we know for a fact. To put that in perspective, Colorado is about , square miles. It took roughly an hour to warm it the 10 degrees necessary. This afterburning, single rotor turbojet had a nine- stage pressure ratio compressor and a two stage turbine, yielding 32, pounds thrust. The CIA flew an A, the single-seat version of the aircraft, powered by two J58s in early , less than four years after Pratt started work on the project. The pilots also needed special protection to fly the aircraft and were outfitted with pressure suits and helmets that provided pure oxygen. The pilots were provided high-protein, low-residue meals of steak and eggs three hours before each flight to provide energy for the rigors of flying the Blackbird and to reduce the need for a restroom at 80, ft. It flew from Los Angeles to Washington, D. It averaged 2, miles per hour on this flight. Once it landed in D. The SR served as an unparalleled force multiplier with its advanced sensors and mission critical reconnaissance. Even with its short operational life span the SR set the stage for the development of supersonic and hypersonic technology. The aircraft went from idea to in service in only 20 months. A feat of epic proportions. SR missions demanded perfection from the entire team of pilots, maintainers, mission planners and photo processors. There was no room for error due to the sensitivity of the intelligence and technology used in gathering it. The Blackbird got its name, in part, for its jet black color. The SR was actually painted a shade called Emissivity Black and was mixed with microscopic iron ferrite balls. These microscopic iron ferrite balls dissipated radar signals and heat. This website uses cookies so that we can provide you with the best user experience possible. Cookie information is stored in your browser and performs functions such as recognising you when you return to our website and helping our team to understand which sections of the website you find most interesting and useful. Strictly Necessary Cookie should be enabled at all times so that we can save your preferences for cookie settings. If you disable this cookie, we will not be able to save your preferences. This means that every time you visit this website you will need to enable or disable cookies again. This image is taken from 65, feet above Monterey Harbor. It is a 10x magnification on the original image and has been cropped. The white dots in the water at inch wide bouys. Lockheed Martin. Popular Posts. Privacy Overview This website uses cookies so that we can provide you with the best user experience possible. Strictly Necessary Cookies Strictly Necessary Cookie should be enabled at all times so that we can save your preferences for cookie settings. Enable or Disable Cookies. Enable All Save Settings. The cart used two Buick Wildcat V-8 racing engines, each of cubic inch displacement. Together the engines produced over horsepower and were tied to a common gear box to deliver torque through the vertical starter drive shaft to the Js. The aircraft engines had to be spooled up to at least 3, rpm for starting and ignition. Unlike conventional aircraft, all variants of the Blackbird used a very unique starting system that consisted of a drive shaft that was vertically inserted through the underneath each of the nacelles to the engines. This shaft would spin, thus turning the turbines inside the J58 and starting the aircraft. However, it was not by this simple system alone that the Blackbird was started. This process was a coordinated effort between the aircrew and the "buddy" crew, those who helped prepare the aircraft for flight. In the early days, the Buick-based carts were used. These units were yellow and had twin Buick V-8 engines in them. However, later in the program, these engines were replaced with big-block Chevy engines, thus deriving the Chevy starter cart. The engines in the carts are accessible through opening hoods on the sides of the cart. The exhaust for the engines is routed through an exhaust pipe on the side of the cart noticeable in the upper right image of the NASA cart. The two engines are connected via drive belts. Both starter carts are of the same dimensions although they are distinguishable. Even though the Buick carts are commonly yellow, the Chevy carts have been in a variety of colors: standard olive drab dull, dark green , black, and NASA's stylish white with the blue stripe. There were also other methods of starting the aircraft, two of these were developed for the proposed FB program. The Air Force had a requirement that in order for the FB to be successful as an interceptor, it would need to be started without delay for a quick launch. This starting system consisted of an attachable unit under the nacelle like any other starter cart, but there was a chemical process that took place in adjacent starting cartridges. This reaction allowed for the spinning of the vertical drive shaft, thus starting the engine. In addition, another process was developed which was turbine-powered. However, these systems proved impractical for the SR and were not used considerably. Eventually, these carts were phased out when permanent starting systems were installed in the Beale AFB hangars. This system consisted of compressed air tanks of considerable size that were used to rotate an attached unit. However, the portable carts were still servicing SRs at distant operating locations. It is not known how many of these carts were built, nor how many exist today. Little information is released on this subject simply because it is not a prime area of interest. These carts are on display in various museums around the country. The Buick's. The original start carts were Buick wildcat cubic inch V-8 engines developing horsepower. There were two Buick engines mounted tandem side by side with automatic transmissions. They were coupled together to drive a vertical shaft that was inserted into the starter mechanism on the bottom of the SR's engine. For the first time observer of an SR launch, the engine starts in themselves were almost indescribable. For one thing there was no mufflers on the Buick engines. As the Buick RPM was advanced, Flames almost three feet long erupted from the side of the start cart. It truly sounded like the beginning of the Indianapolis Then it all starts all over again with 1 engine. It never failed to thrill me to start the Blackbirds engines with the Start Carts. The original design was conceived by two Lockheed Skunk Works engineers who had prior race car engine knowledge. In the mid's, the engines of the start carts was changed to Chevrolet LS-7 's. The Chevrolet big block engines developed horsepower each. Even so, for many years they were still referred to as the Buick's. It is true that the start carts were hard to maneuver around. Logistically, a recovery of a Blackbird at another base could be done easier with Pneumatic Air. The launches were never quite the same without the Buick's or the 's. Along with maintaining all support equipment, they took great pride in maintaining the Start Carts tuned and in tip top condition. A job well done. Click on Picture to enlarge. J Engine Starter Cart. Buick Starter Cart at Blackbird Airpark. Last

Updated. Military WWII. During the Cold War, this plane could fly higher and faster than any other -- and 55 years after its first flight, it still does. The Lockheed SR, designed in secrecy in the late s, was able to cruise near the edge of space and outfly a missile. To this day, it holds the records for the highest altitude in horizontal flight and the fastest speed for a non-rocket powered aircraft. It was part of a family of spy planes built to venture into enemy territory, without being shot down or even detected, in a time before satellites and drones. The black paint job, designed to dissipate heat, earned it the nickname Blackbird, and paired with the sleek lines of the long fuselage, made the plane look unlike anything that had come before -- a design that hasn't lost any of its brilliance. An SR "Blackbird" during a training mission in Most conventional airplanes look like someone built them -- this one almost looks like it was grown. A CIA spy. In May , an American U-2 spy plane was shot duown in Soviet airspace while taking aerial photographs. Initially, the US government said it was a stray weather research aircraft, but the story fell apart once the Soviet government released photos of the captured pilot and the plane's surveillance equipment. The incident had immediate diplomatic repercussions for the Cold War and reinforced the need for a new type of reconnaissance plane that could fly faster and higher, safe from anti-aircraft fire. The task of designing such an ambitious machine fell on Clarence "Kelly" Johnson, one of the world's greatest aircraft designers, and his secret division of engineers at Lockheed, called Skunk Works. Everything," recalled Johnson, who died in , the same year the Blackbirds were first retired from service. The original plane in the Blackbird family was called the A and made its maiden flight on April 30, In total, 13 As were produced, and the plane was a top secret, special access program operated by the CIA. The Blackbird still holds many aviation records. In it flew a coast to coast flight, from Los Angeles to Washington, in 67 minutes. Credit: NASA. Titanium skin. Because the aircraft was designed to fly faster than 2, mph, friction with the surrounding atmosphere would heat up the fuselage to a point that would melt a conventional airframe. The plane was therefore made of titanium, a metal that was able to withstand high temperatures while also being lighter than steel. Using titanium presented other problems, however. First, a whole new set of tools -- also made of titanium -- had to be fabricated, because regular steel ones shattered the brittle titanium on contact. Second, sourcing the metal itself proved tricky. The US government had to purchase a lot of that, probably using bogus companies," said Merlin. The initial aircraft were flown completely unpainted, showing a silver titanium skin. They were first painted black in , after the realization that black paint -- which efficiently absorbs and emits heat -- would help lower the temperature of the entire airframe. The "Blackbird" was born. Same plane, different names. The A was soon evolved into a variant that was designed as an interceptor -- a type of fighter aircraft -- rather than a surveillance plane. Effectively, this meant adding air-to-air missiles and a second cockpit, for a crew member to operate the necessary radar equipment. This new plane, which looked identical to the A except for the nose, was called the YF A third variant was produced around this time, called the M, which had a pylon on its back for mounting and launching one of the first unmanned drones. Two were built, but the program was halted in after a drone collided with its mothership, killing one of the pilots. Project Habbakuk: Britain's secret attempt to build an ice warship. The final derivative of the A, with a twin cockpit and larger fuel capacity, was called the SR -- for "Strategic Reconnaissance" -- and first flew on Dec. This is the version that would go on to perform intelligence missions for the US Air Force for over 30 years, and a total of 32 were built, bringing the final tally for the Blackbird family to The double cockpit of a Lockheed SR Stealth before stealth. The fuselage of the SR included some of the very first composite materials ever used in an aircraft, which made the plane harder to spot for enemy radar. Flying at a higher altitude than anti-aircraft fire could reach, faster than a missile, and barely visible to radar, the Blackbird could enter hostile airspace practically undisturbed. As a result, no Blackbird was ever shot down by enemy fire. However, its reliability was an issue, and 12 out of 32 were lost to accidents. It was also a complicated plane to operate and fly. A Blackbird operational mission essentially had a countdown, like a space mission did, because there was so much preparation involved in both getting the crew ready and the vehicle ready, an unbelievable amount of effort and manpower," said Merlin. The pilots also had to suit up in a special way, due to the extreme conditions found at high altitude. No Blackbirds were ever flown over Soviet airspace -- something the US government stopped doing entirely after the incident -- but they still played an important role in the Cold War, and performed missions in other critical theaters such as the Middle East, Vietnam and North Korea. Concordski: What ever happened to Soviets' spectacular rival to Concorde? In , the SR set the records it still holds: flying at a sustained altitude of 85, feet, and reaching a top speed of 2, The program was halted in -- with a brief revival in the mids -- once technologies like spy satellites and UAVs unmanned aerial vehicles or drones had become more feasible and offered instant access to surveillance data. The SR was last flown by NASA in , which used two of the aircraft for high-speed and high-altitude aeronautical research. Since then, the surviving Blackbirds have all found their way into museums. Privacy Terms. Quick links. Seems like they shouldn't start the engines and rev them all the way up, but I guess it didn't matter Powered by 2 Buick big block engines making HP each. The engines power a vertical drive unit that spins the jet engines up to ignition speed. These engines were commonly found in the Buick Wildcats in the early to mid 60s To further distance itself from the Invicta, the Wildcat had Electra like taillights, a bucket seat interior, a center console with tachometer and transmission shifter. It had the famous Dynaflow transmission shared by all full-size Buicks, plus special exterior side trim, vinyl-covered roof new for , and its own unique emblem: a stylized head of a wild cat, located on each of the C-pillars. However, the Wildcat did share the LeSabre's and Invicta's trio of VentiPorts on the front fenders, a design cue lasting only through the model year. From to the Wildcat was its own series, no longer a subseries of the Invicta. The model had a large aluminum trim panel on the side of the body that seemed to compete directly with the Oldsmobile Starfire, another full-size "sporty" model by GM. Wildcats built in the model year did not have the traditional horizontal VentiPorts like other Buicks, but instead had vertically situated chrome hash-marks on the lower front quarter panel directly behind the front wheel housings. After becoming its own full series in , the Wildcat added a convertible and four-door hardtop sedan to the original two-door hardtop coupe introduced in In the four-door version, a bench seat was standard but the bucket seat and console interior used in the coupe and convertible were optional. In , a pillared four-door sedan was added to the line and two levels of trim were available - standard and Custom, with a mid-line Deluxe sub-series added for only. From to , the base with trim similar to the '65 Wildcat Deluxe and Custom trims were again the sole options. The hp kW cubic-inch Wildcat V8 remained the standard engine through From to a larger cubic-inch Wildcat V8 was also available, producing either hp kW with a factory four-barrel carburetor or hp kW with two four-barrel carburetors "dual quads". This version also featured finned cast aluminum valve covers with the Buick logo embossed on the top. Also beginning in , a three-speed manual transmission with column shift became standard equipment on all Wildcats, with either the four-speed manual only or three-speed automatic Super Turbine transmissions as options. Interestingly, engine names referred to engine torque output rather than displacement. The "dual quad" version of the Wildcat was dubbed "Super Wildcat. Early versions were buicks. There was also an injection of a fluid that spontaneously combusts when exposed to the atmosphere to get the engines started. The plane held a canister of this stuff, good for a few restarts if needed while airborne. There are some excellent stories online about this aircraft, particularly the ones written by the crew chief who went through the process of getting some of them reactivated after the first shut down. As I understand it the plane was capable of going beyond having enough air on the wings to control direction, so it was possible for the plane to go into orbit. If this happened, there was supposed to be a lever that would evacuate all air in the plane to space, killing the pilot. Eventually, the plane would reenter and burn up but not until long after the pilot would have died from lack of oxygen. All with very low flight time, and enormous expense. That program was run by the CIA, with their own pilots and whatnot. Sandiego air museum has an A12 out front. Seems like we could do some things better 30 or 40 years ago. Remember the SST that never got built? The Concorde? Amazing stuff. Last edited by 97kwd on Wed Apr 08, pm, edited 1 time in total. If we ever get leadership that loves this nation again, it would be jaw dropping what we'd be able to accomplish. I know we try to limit the politics here, but I just have to say, the death of America began in the s with the rise of the American Liberal, and we will remain in a death spiral until we can get the American liberal out of politics, journalism and education. During engine starts, at least 2 "shots" were required. SR's launched with little fuel in the tanks in order to ease loads on the tires, landing gear, in

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case of an engine failure, ensuring that the SR could still take-off on one engine. The afterburners were shut off in order to slow down for the in-flight refueling tanker, the plane refuels, then once clear, the pilot hits the afterburners again, which again requires 1 shot of TEB in order to ignite the JP-7 fuel. During supersonic flight, the SR needed to find a tanker every 90 minutes. Here is a couple personal photos I took of a SRA serial number "". That is inlet air temp, the heat is created solely as the air is compressed by ramming into the engine, the fuel has NOT been added yet. Very similar temps to which the hottest parts of the Space Shuttle experienced during it's re-entry into the Earth's atmosphere at speeds of Mach 25 18,mph. Here is a J engine on full afterburner showing the Mach diamonds in its exhaust. Here is a Lockhead M which carried the D drone. And finally the last of the group, the Lockheed YF which was

designed to be the missile carrying Interceptor variant.