The Titan III family was begun in the early days of the Titan II program shortly after NASA got involved with the Titan program. Martin Company was looking to the future. The Titan II missile had a strong competitor eating up potential Titan II ICBM orders in a small solid rocket known as Minuteman. The Minuteman promised a similar range and a more straightforward storage method at a lower cost. Martin approached the USAF to talk about a new, improved satellite booster that had superior performance to the Atlas. Knowing just how much mass a Titan II could hurl downrange, the USAF agreed to fund a study. The study results were the Titan IIIA, IIIB, IIIC, and IIID, developed as a "standardized Space Launch vehicle with no capability to launch nuclear warheads." The last part of that quote is critical because without it, and the modifications to the 2nd stage that prevent the mounting of the Titan II guidance and warhead bus, the Titan III would be subject to arms talks even though it was a satellite booster.

The result of this is the Titan III program. This program would spawn many follow-on programs, but the initial concept was simple. Take the Titan II core, modified it so it cannot carry nuclear weapons, and then via 3rd stages, or a combination of 3rd stages and solid Boosters make a heavy-duty space launch booster.

The early progress on the Titan III can be confusing. First, we have to start before Titan II with the USAF's 'Space Development Program,' which saw the funding of large solid rocket motors tested in the following diameters; 86", 96", 100", and eventually 120". This program fell apart just as Aerojet with their 100" SRM, and United Aircraft Chemical Systems Division's with it's 120" SRMs started their testing. As a proposal for the SLV-4 competition, Aerojet with Martin would propose SOLTAN or Solid Titan. The whole rocket was called SOLTAN, not just the SRM. The SOLTAN was a slightly modified Titan II with two 3 segment 100" SRMs from Aerojet. Given how Aerojet designated most of their solid Rocket motors, we can assume this would be called the AJ-100. This program and the SLV-4 program both fell apart. Some sources list the Titan Gemini Launch Vehicle of NASA as the SLV-4, but this was not the case. The USAF then started "Project Phoenix." Phoenix, as in a new SLV rocket, would be developed from the ashes of SLV-4 and the Space Development program. That rocket would later become the Titan III. A Rocket, we all sort of know it today. I say sort of know because the initially 4 Titan III variants proposed were not what we know.

As initially proposed in Project Phoenix, the Titan IIIA would be a modified Titan II with no 3rd stage and an altered 2nd Stage to prevented mounting nuclear warheads. Titan IIIB would be a Titan IIIA but with an Agena A or B 3rd stage. Titan IIIC would be a Titan IIIA with 2 Aerojet 100" SRBs, and Titan IIID would be a IIIC with Agena as the upper stage and two of the Aerojet 100" SRBs. Two and a half unrelated developments quickly altered these plans. First, Martin Corporation showed up early on with the Transtage, which on paper was better than Agena in many ways. At about the same time, the second development was that Aerojet was having issues getting their thrust vectoring system to work on their 100" SRM. The semi-related success of the United Aircraft's liquid injected thrust vectoring on their larger 120" SRMs meant that the USAF could substitute the 100" 3 segment SRM with the larger and now more efficient 120" 2 or 3 segment SRM.

The USAF and DOD re-worked project Phoenix around these developments, and the real Titan III was born. The Titan IIIA would be a test launcher for the new Transtage upper stage to make sure Martin's design was better than Agena A. The Titan IIIA would end up having more in common with the Titan II than any of it's Titan III brethren. This was because they were built as Titan II missile production line and were then modified. The Titan IIIB would still launch the Agena upper stage, as it was integral to the NRO's satellite efforts. Titan IIIC would gain larger 120" SRMs and fly with Transtage like the Titan IIIA. The first Titan IIIC would fly on the AJ-5 engines, like the Titan IIIA, the first Titan IIIC was assembled on the missile production line. All other Titan IIICs flew the improved AJ-9 engines

With the end of Project Phoenix and the Titan III project launch, the USAF decided to delete the Titan IIID as initially proposed. It would never return in the new Titan III project. The demand for larger CIA/NRO payloads on larger Agenas meant the Titan IIIB's only change from Project Phoenix to the Titan III project was substituting the newer AJ-9 family of engines. Titan IIIA now carried Transtage and was considered a test launcher. And Titan IIIC would now have Transtage as a 3rd stage and still fly with a SRM 0-stage. However, the Titan IIIC SRMs would change twice before their first launch. Well, you have made it through the first "rapids" of changes in the Phoenix/Titan III program.

The Titan III (excluding the IIIA) flew almost exclusively on the LR87-AJ-9 and LR91-AJ-9 engines. However, a lot of documentation would make this seem to be false or a lie. It is not. You see due to the "CRASH" nature of the conversion of the Titan II to Hypergolic fuel and then the POGO issues in the Titan II…. The development of the Titan III engines lagged a bit at Aerojet. At the same time, Martin Corporation, who was setting up a new production line for the "civilian" Titan III program rockets, was not ready to actually build the new Titan IIIs at the new facility. This meant that all 5 Titan IIIAs, and the first Titan IIIC were constructed on the missile production line and then modified to meet the Titan III Standards. Specifically the new 2nd stage to payload interface. Aerojet had two development programs for their AJ-23 family that ran congruently. In the first program, the LR87, and to a lesser extent, the LR91 received a more in-depth anti pogo treatment than initially applied to the in-service Titan II and the Titan IIGLV. Simultaneously, the fabric bell extension previously only used on the LR91 was tested on the LR87 first stage engine with surprising success when attached AFTER the tube-wall cooling jacket for the previous engine variant. The extensions were relatively small on the LR87-AJ-9 when compared to the latter version. All of these modifications resulted in the previously mentioned higher thrust AJ-9 engines. Now a key point to note, while D.Sc Rao (whom I mentioned in my LR79 document) worked at NAA Rocketdyne, he developed a mathematical formula to optimize engine bells for optimal efficiency (thrust or ISP or a balance of both.) His calculations were not fully grasped or utilized by other companies for some time, up to several years. Aerojet did not fully integrate the work of Doctor Rao until after the AJ-9 was ready for production. Quickly Aerojet started experimenting with slightly altered bell shapes on later Titan III launches. These experiments led to overlarge actuators, which then led to reinforced structures and wider combustion chamber spacing. These changes would all combine on the latter -AJ-11 engines. Almost all sources stated -AJ-11 engines flew on the Titan III when it was just an -AJ-9 that sometimes had "flight test" items for the future AJ-11, not actual all up -AJ-11 engines.

Hopefully, that is not at all confusing. I know it took me a while to wrap my head around all of that.

With Aerojet testing more and more features of the future -AJ-11 engines on the latter Titan III flights, it was only a matter of time before the USAF ordered the -AJ-11 engines into production. The USAF re-designated Titan Rockets based on their core engine generation to separate the AJ-9 powered from the AJ-11 powered Titan IIIs. So, Titan IIIx is powered by the "First Generation" -AJ-9 engines. Titan 23x would gain the new -AJ-11 engines with nothing else changing …. Well, this excludes the minor changes to the UA-1205 through this same timeframe. As was seen in the last post, the UA-120x family would go through 3 generations of changes. Some 2nd and 3rd tier sources claim the changes to the UA-1205 as the source for these latter designations. As far as the USAF was concerned, a UA-1205 is a UA-1205, nothing more needed to discuss.

The Titan IIIB and IIIC would both acquire the Aerojet AJ-11 engines becoming the Titan 23B and the Titan 23C. At this point, the USAF also needed a no upper stage version of the Titan 23C. This new rocket is the Titan 23D. So as you see, the Titan IIID never existed except on paper, so please do not spread lies by calling any real rocket that!

During the bulk of Project Phoenix as well as the actual start of the Titan III program, the USAF and the NRO had their eyes on something huge… It was called MOL to the public, and privately, it was called KH-10 Dorian. It was a mini space station in space that would be launched on an "evolved" Titan III. Secrecy meant that at the time, the public was told it would be our first space station(s.) But in reality, the mini space station would have a giant camera and a wet film lab. Or in other words, it was a spy satellite that was manned by two crewmembers. The two crew, a pilot and a developer/Photint interpreter, would operate the space station for many days while taking pictures of the Soviet Union or Red China, or wherever else was deemed critical at the time. During this time, they would develop "critical" images in space and attempt to provide information to the military, or CIA on the ground. They would detach their Gemini II capsule and return to Earth with the developed and un-developed film after their mission. The KH-10 would be left to burn up shortly in the atmosphere. Later in the KH-10s engineering development, ways to make the station re-usable and create a way to dock it while in orbit. Quickly this system was surpassed by the potential of the digital camera system. The MOL/KH-10 program was canceled in 1969. While it never flew, the Titan IIIM provided lots of upgrades to the rest of the Titan III family. The AJ-11 engines mentioned above took over on the Titan 23 launches around 1970. The UA-1207 SRM would eventually fly on the Titan IV in the 1990s and would prove the way for designing the UA-1206 for the Titan 34D. The extended length first stage tankage would be integrated on the Titan 34 family of core stages.

After the Titan 23 family, came the Titan 33. The 33 family was an upper stage upgrade to the Titan IIIB and Titan 23B. Some sources assume the Titan 33B launched a special large antenna ENLINT satellite doe to only having 2 launches. Others, citing the large fairing used on payloads carrying the Ascent Agena, state the 33B was the initial Ascent Agena launch vehicle. In either case, we can only guess and surmise as the NRO payloads in question are still

classified. The 33B is the only known Titan 33x family member. There are only two known launches of the Titan 33B.

At approximately the same time as the development of the Titan 33, the Titan 24B and 34B were developed. The Titan 24 and 34 family would see the addition of the extended length first stage tank first developed for MOL/KH-10 on the Titan IIIM. The Difference between the 24B and the 34B is what version of the Agena it carried and with what payload fairing. The Titan 24B launched Agena D based satellites with the same interface as every Titan IIIB and 23B few with. The Titan 34B, having the large 10ft diameter fairing as flown on the Titan 33B, flew the Ascent Agena.

NASA makes a proud return to the Titan with their Titan 3E. Titan 3E is not a USAF program and was not designated 23E like it's actual build standards would suggest it be named. The Titan 3E would be the first Titan variant to fly with the Centaur upper stage… in the D.1T form. While not the first Titan Centaur proposal, the Titan 3E differed from earlier proposals by using a large fairing that gave the Titan 3E a "Hammer head" appearance due to the large fairing diameter compared to the smaller diameter of the Core Stage. This larger fairing would allow NASA to launch relatively large space probes on the Titan Centaur 3E as they called it. The Titan 3E would be responsible for flinging man-made objects further away from Planet Earth than any other rocket before or since! Of course, Titan 3E was responsible for launching Viking 1 and 2 to Mars, Helios A and B to the Sun, Voyager 2 and Voyager 1 on the outer planets tour. Now when are the Borg going to come at us as "V'Ger" and try to assimilate us… whoops, need to stop watching StarTrek in the background while I write this 

For all the neat things launched on the Titan 3E, it was one of many signs of problems to come for the US space launch programs. First, there were malfunctions on several launches. Since the rocket could compensate for all but one of these failures during the launch, they were not considered failures but rather "anomalies." But still, the problems were visible and known…. NASA quietly and quickly backed away from Titan as a potential booster for their programs. Of course, Titan 3E was a stop-gap while awaiting on Nixon's "Wunderkind," AKA the Space Shuttle. Those probes just HAD to launch when they did so Titan Centaur 3E exists.

Developed for the USAF to continue launching the ever-heavier KH-9 and future KH-11 spy satellites, the Titan 34D would combine the Titan IIIM first stage to the core, a new 5.5 segment SRM, and the latest technical features from the 3E, 24B and 34B Titans as a direct replacement for the Titan 23D. The 34D would really show to the public what was already brewing in the 1970s at Martin Marietta on the Titan Production line as well as what the US space industry was going through. Quality control issues and "cost cutting" efforts given Titan was going to die soon. After all, the Space Shuttle was going to replace ALL the launch vehicles right? In short a lackadaisical attitude was brewing in the disposable space launcher industry as a whole because of the governments stance on Space Shuttle.

Well, two of the Titan 34Ds would explode with spectacular results. The first while downrange carrying the first KH-11 digital satellite. This just a few months before the Space Shuttle

Challenger explosion. Then in the final KH-9 Launch, A Titan 34D explodes 6 seconds after SRM ignition. The results of these two explosions, The Challenger disaster, and the explosion of a Delta rocket, all within a short period of time, left many questions to answer.

It is with the launch of the first Titan 34D that the entire Titan III development program ends. We have a program that, through the 1960s, was one of the most successful launch programs. We see problems starting to crop up in the 1970s, but they are ignored, with the result that by the 1980s, quality control is skipped, and rockets burst in the air!

Ok that is probably a significant oversimplification of many factors, but it gets the point home.

EVERY Titan 3 rocket described above can be made in BDB. The Titan IIIB and IIIC rockets need the patch from the Extras to turn the LR87-AJ-5, and LR91-AJ-5 into their AJ-9 derivatives. But aside from that, everything is in stock BDB. Know that the final configuration of the Titan IIIM was never fully programmed, nor was it ordered, so we do not know the rocket's designation or the final configuration. The Titan 3M is at your discretion to build above the 2nd stage in the core. BDB provides options to construct a MOL station without the KH-10 spy stuff should you wish to.

A brief followup on the Titan III family I posted an hour ago:

I was looking for some data that Zorg asked for last week when I came across a "history" of USAF space flight document. In the Titan III article I talk about Nixon and his want to get rid of disposable launchers... and replace them all with Space Shuttle. Well this declassified document called "The Air Force and the National Security Space Program 1946-1988" by one R. Cargill Hall, has some doozies that I did not remember reading. It turns out that After Nixon, President Ford wrote a document re-affirming that the USAF would launch NRO launches on Space Shuttle. Then comes Carter. He *ALSO* re-affermed the Space Shuttle with a document that would curtail some of the excess spending on Space Shuttle. This reduced the Space Shuttle from 10 to 4 with options for more flying Orbiters and from 2 launch sites to "one with the possibility of a second." Then, Ronnie Ray Gun... err Ronald Reagan became president and not only did they order the 2nd USAF launch site... they started ordering long lead items for an additional Shuttle (Endeavor.)

While this isn't a Space Shuttle forum. You can see why in my last paragraphs talking about the Titan IIIE and 34D I mention the lackadaisical attitude of Martin Marietta, the USAF, NASA and many others toward the quality and or improvement of the Titan SLV.

Also a minor correction. Several early "classified" (since released to public domain) documents talked about Hydraulic fluid being used in the UA120x SRMs. All of these documents are from the time of Project Phoenix or early on in the Titan III program. I have read in the past several "non technical" documents cite NTO, N2O2 or Di-nitrogen Tetra oxide (we tend to just call it Nitrogen TetraOxide or NTO.) Well I have MOL released document that clearly cites NTO

several times. And the 2nd Generation UA1207 would have flown with 24 injector points not the 32 I mentioned in the UA120x article above. TBC that does not mean the Titan IV did not fly with 32 NTO injection points. Just that as designed for MOL it was 24.

Lastly now in 4 USAF official documents the Titan 34D is quoted as 5.5 segments not 6.5 segments. This includes a history document on USAF/NRO launches from the article mentioned at the top of this post. I have looked several times and through out the communication between a bunch of us in this forum I see the 1206 called a 6.5 segment SRM repeatedly. the BDB realnames data clearly calls out 5.5 segments and I will be fixing this in my UA120x document as well as the Titan III document within the next hour. *Sheepish shrug* Whoops Errors found and will be corrected.