A Tale of Two Trainers

By: Tony R. Landis

Paths to the Present

FLASHBACK

The Fairchild T-46A and Boeing T-7A

The search to find replacement primary undergraduate, and advanced pilot training aircraft for the US Air Force has been a long and bumpy road that began in the 1970's. The USAF relied on the Cessna T-37 as a primary trainer since the late 1950's, and the idea for a replacement began to surface around the time Cessna ceased production of the aircraft in 1975. Advanced pilot training fell to the Northrop T-38 Talon which first flew in April 1959. Of the 1,187 T-38's constructed before production ceased in 1972, just over 400 were still flyable by 2023, despite numerous upgrades.

The Cessna T-37 was the primary jet trainer for the USAF since the late 1950's. (USAF)

The first significant attempt to replace the T-37 primary trainer came with the Next Generation Trainer (NGT) program of the 1970's. Five aerospace contractors were awarded study contracts when the program received funding in 1980. The Fairchild Republic Company (FRC) won the fixed-price incentive contract on 2 July 1982 for the design, development, fabrication, test and delivery of two test aircraft, and two durability test articles.

Fairchild designed the T-46A Eaglet with side-by-side seating, per Air Training Command specifications, two Garrett F109 engines and twin tails for better stability and spin recovery. Fairchild went to extra lengths to ensure winning the contract for the new trainer. One of those steps was to contract Scaled Composites Company to build a 62 percent scaled flying prototype to test their design. They also significantly underbid the contract, it was calculated and deliberate and the Air Force was fully aware, yet did nothing to correct the situation. FRC management doomed the program from the beginning by attempting to complete the T-46A program within the budget submitted with total disregard to the schedule or work accomplished.

Early concept art of the Next Generation Trainer concept from Fairchild Republic. (Fairchild)

Fairchild contracted Ames Industrial Corp/Rutan Aircraft Factory to build a 62% scale NGT known internally as the Model 73. (Keith Svendsen)

The Model 73 NGT/T-46A prototype during a test flight over the Mojave Desert. (Cradle of Aviation Museum Archives)

By the time the first aircraft was officially unveiled in February 1985, Fairchild was already 6 months behind schedule. The aircraft unveiled that day was closer to a mockup than a flyable airframe with over 1,000 missing components and parts held on with glue and panels made of plastic. While the engineers and production staff did their best to build a good aircraft, Fairchild management was in disarray. Too focused on short-term profits, FRC's parent company, Fairchild Industries made one poor decision after another. During the first 5 years of the T-46 program, FRC made numerous management changes including 4 presidents and 3 T-46 program managers. Other leaders came and went as well, including Vice Presidents and Directors of Manufacturing, Procurement, Financing and Business Development.

Despite the turmoil, the first T-46A, #84-0492, performed its first flight at Edwards AFB, CA on 15 October 1985. A second test aircraft, #84-0493, joined the flight test program after its first flight on 29 July 1986, followed by the first production aircraft, #85-1596 on 14 January 1987. Test pilots flying the aircraft had mostly favorable comments about the aircraft. The aircraft showed signs of the usual teething problems associated with a new design, but most could be easily overcome in testing. The only significant issue was a lack of performance as the actual aircraft had significantly more drag than predicted. Had it not been for the poor managerial oversight at FRC, the T-46A program could have achieved all of its design goals to become the primary trainer the USAF had been searching to find.

Many Air Force dignitaries attended the unveiling of the first T-46A in February 1985. (Cradle of Aviation Museum Archives)

By the time the program was officially terminated on 13 March 1987, the 3 test aircraft had a combined total of 297 flights for 442.6 flying hours. The Air Force would have to wait more than a decade for a T-37 replacement when the service began operational training with the turboprop Beechcraft T-6A Texan II aircraft in 2001, and phasing out the T-37 in 2009.

Sadly, FRC management had begun to take steps to fix many of their issues, but it was too late. Air Force Systems Command (AFSC) Commander Gen. Lawrence Skantze is quoted as saying *"My final word to the Fairchild Board was that although I see clear evidence of solid management recovery initiatives, we may be, in reality, rearranging the deck chairs on the Titanic."*

The second T-46A # 84-0493 and first production T-46A #85-1596 in formation over Edwards AFB, CA prior to program cancellation in March 1987. (AFTC History Office)

The challenge to replace the aging Northrop T-38 Talon advanced trainer shares a similar history. The earliest study came in 1979 when Congress proposed utilizing a single trainer for both the USAF and Navy. Neither service accepted the common design approach and the search continued. The next attempt came in 1985 under the Reconnaissance Attack Fighter Training System (RAFTS) which gained no traction. A Department of Defense (DoD) Inspector General audit in 1992 concluded that modifications to the T-38 under the PACER CLASSIC programs could extend the life of the T-38 beyond 2025 and therefore a decision to replace the aircraft was again delayed.

The prototype T-38 Talon departs Edwards AFB during its first flight on March 10, 1959. (AFTC History Office)

In 2009, the Air Force identified deficiencies in their ability to meet advanced pilot training requirements by 2018 and beyond in an Initial Capabilities Document (ICD). Using this information, the DoD set the requirements for the Advanced Pilot Training (APT T-X) program. The APT T-X mission is to prepare student pilots to operate fourth, fifth and sixth generation aircraft. The new program was not simply a new training aircraft, but an entire training system utilizing the aircraft, ground-based trainers, virtual training systems digital classrooms, as well as maintenance training systems.

A number of issues delayed the release of the Request for Proposals from the Air Force to industry until 30 December 2016. Of the 7 competitors that entered the competition, Boeing took the biggest gamble by signing a Joint Development contract with Saab AB to develop a clean-sheet design for the T-X program, going so far as to build and fly two production-ready prototypes. The two companies relied heavily on advanced digital design and manufacturing techniques using very little touch labor to expedite manufacturing. The first of the 2, F404-powered, twin-tailed, single-engine prototypes took to the air for the first time on 20 December 2016, with the second joining the fleet on 24 April 2017.

The Air Force announced the Boeing/Saab team the winner of the competition on 27 September 2017 with an award value of $813 million for a planned 351 aircraft with the original schedule calling for the Engineering & Manufacturing Development (EMD) aircraft delivery in November 2020 and the first Low-Rate Initial Production (LRIP) aircraft delivery in November 2023. Like FRC, Boeing underbid the contract in the hopes

Known internally as Model 326, the team of Boeing & Saab unveiled their T-X prototype, #N381TX, to the public on 13 September 2016. (Boeing/Saab)

The T-7A program involves an entire training system that includes basic and advance ground training simulators connected virtually for a more realistic training environment. (Boeing/Saab)

of making up the initial costs on a long production run. Spring of 2020 brought significant delays to the program, when the Covid-19 illness impacted businesses and events around the work. Employee illness, company shutdowns, product shortages, and supply and shipping issues set the program back by at least 24 months.

The first Air Force flight of a T-7A took place in St. Louis, MO.,on 28 June 2023 piloted by Maj. Bryce Turner with Boeing's chief T-7 test pilot Steve Schmidt occupying the aft seat. (Boeing/Saab)

Other issues impacted development of the first EMD & LRIP aircraft such as ejection seat certification, software issues, alterations of airframe design & manufacturing and integration of the 8K projectors into the Ground-Based Training System (GBTS). The first EMD T-7A Red Hawk took to the skies for the first time in June 2023, followed by additional EMD airframes later the same year. With the continued delays, it is expected LRIP could begin in mid-2026, with Initial Operational Capability (IOC) by second quarter 2028.

As of June 2024, the Air Force was struggling to keep its aging fleet of 400+ Northrop T-38's flying. Subsystem components and J85 engine parts are long out of production and becoming harder to find as each day passes. Two EMD T-7A's have been delivered to Edwards AFB for testing with others following soon. Like its predecessors, the T-7A shows plenty of potential for sales to other countries and proposed attack & fighter variants could keep T-7A production going for decades if the Air Force and Boeing can get through the initial teething problems.

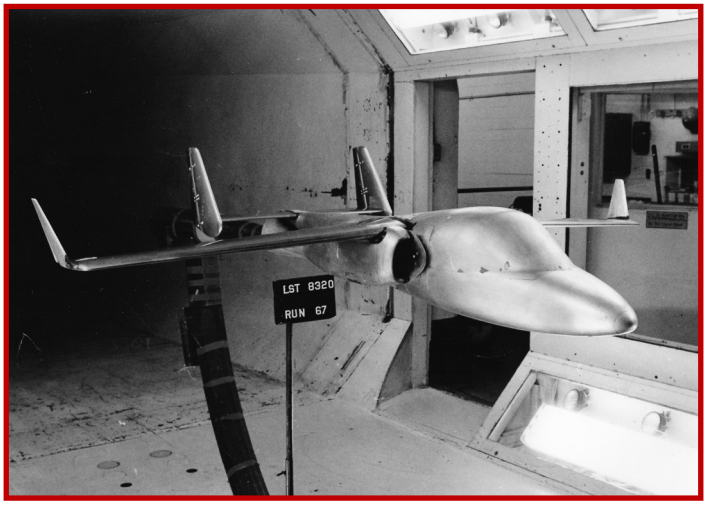
With fourth & fifth generation fighters coming off the line & operating in hostile environments, and sixth generation aircraft on the drawing boards, the need for an advanced pilot training system has never been greater.

T-7A APT-2/21-7002 arrives at Edwards AFB for testing on 8 November 2023 after making stops at Vance AFB, OK, Kirtland AFB, NM, and Luke AFB, AZ. (USAF Photo)

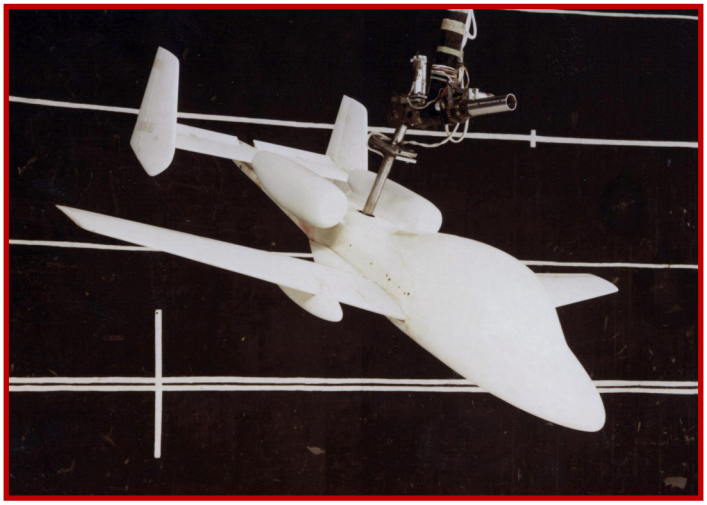
Flight cadets and other personnel get a close-up look at T-7A APT-3/21-7003 during a stop at Columbus AFB, MS, in December 2023. (USAF Photo)

Fairchild T-46A and Boeing T-7A Photo Essay

Despite a few shortcomings that could have been addressed prior to production, pilots testing the T-46A stated the aircraft had nice flying characteristics and they enjoyed flying the small trainer. (AFTC History Office)



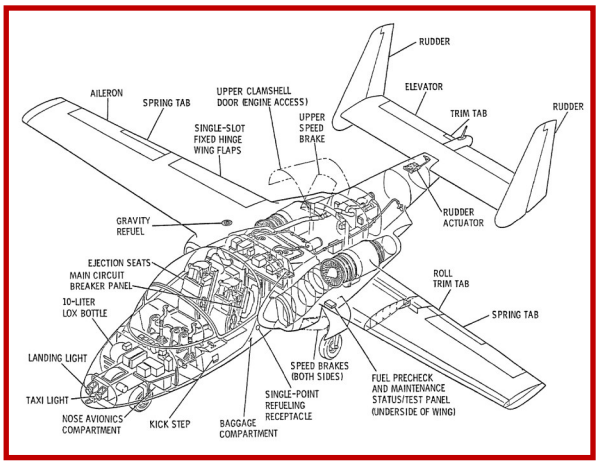
One of many design features tested on T-46 wind tunnel models was the addition of winglets to the outer wings for added stability. (Cradle of Aviation Museum Archives)



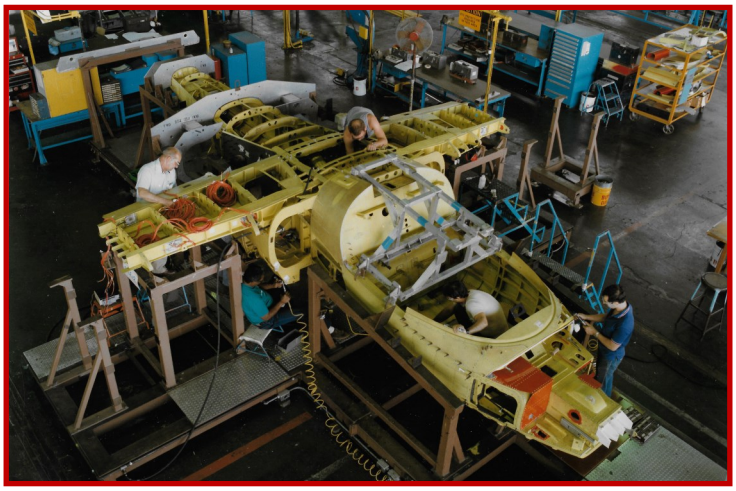
Looking more like an A-10 than a T-46, this wind tunnel model undergoes spin testing in a NASA Langley wind tunnel in 1980. (NASA Langley)

The full-scale mock-up of the T-46A Eaglet is parked next to the T-37 Tweet and Northrop T-38 Talon. (Cradle of Aviation Museum Archives)

The T-46A ejection seat sled departs rockets down the track on another test run at the High Speed Test Track, Holloman AFB, NM on 12 December 1984. (Holloman AFB Archives)

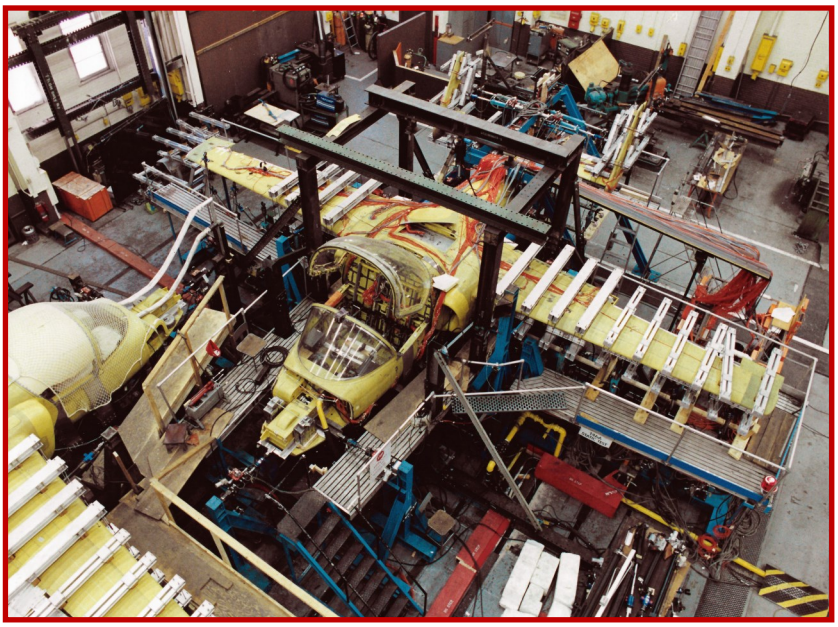


T-46A general arrangement drawing showing the location of major components of the new training aircraft. (Fairchild)



The first T-46A under assembly at Fairchild. The orange wiring being installed in the right will be used for test instrumentation. (Cradle of Aviation Museum Archives)

An A-10 Warthog is parked next to the T-46A mock-up. (Cradle of Aviation Museum Archives)



The first two T-46A airframes undergo structural testing at Fairchild (left). The first T-46 during ground systems tests in 1984 (above). (Cradle of Aviation Archives)

The first T-46A during final assembly at Fairchild prior to disassembly and transport to Edwards AFB for flight testing. (Cradle of Aviation Archives)

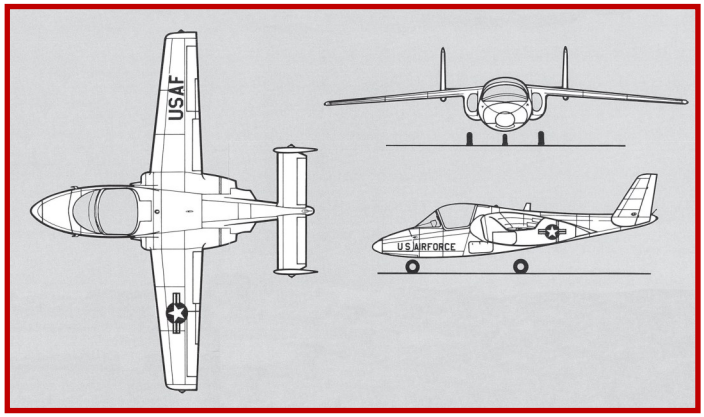
Fairchild produced a limited number of medallions to commemorate the rollout of the first T-46A Trainer. (Author Collection)

The first T-46A is offloaded from a C-5A Galaxy transport at Edwards AFB to begin flight testing. (AFTC History Office)

Right side view of the second T-46A prototype in flight over Edwards AFB.(AFTC History Office)

The first T-46A banks away from the camera during a test mission over the Mojave Desert. (AFTC History Office)

Pilots that flew the T-46A stated the aircraft had excellent handling characteristics, though performance suffered from higher than predicted drag. (AFTC History Office)

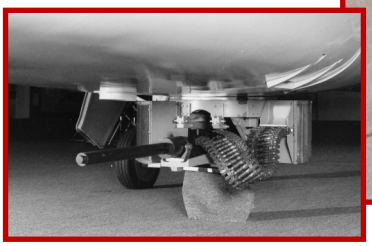


Three-view art of the T-46A. (Fairchild)

The first production T-46A carried the Air Education & Training Center (AETC) emblem on the tails and did not have a test boom installed on the nose. (Cradle of Aviation Archives)

Fairchild Republic attempted to sell the trainer to foreign countries using the designation FRC-225. (Cradle of Aviation Archives)

Using the designation AT-46A, Fairchild proposed a ground attack variant with weapon stations under the wings and gun pod beneath the fuselage. (Cradle of Aviation Archives)



The second T-46A sits in storage at the National Museum of the United States Air Force awaiting restoration. (Dennis Jenkins)

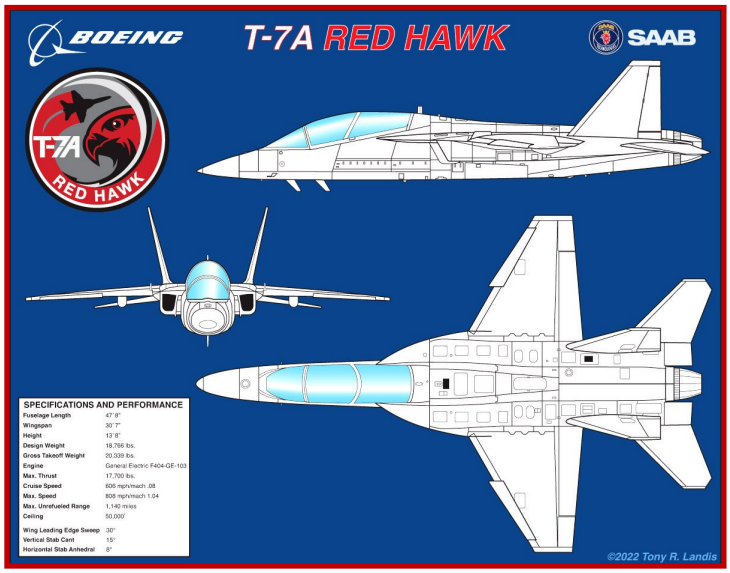
The only production T-46A parked at the 309th Aerospace Maintenance and Regeneration Group (AMARG) in Arizona. (USAF)

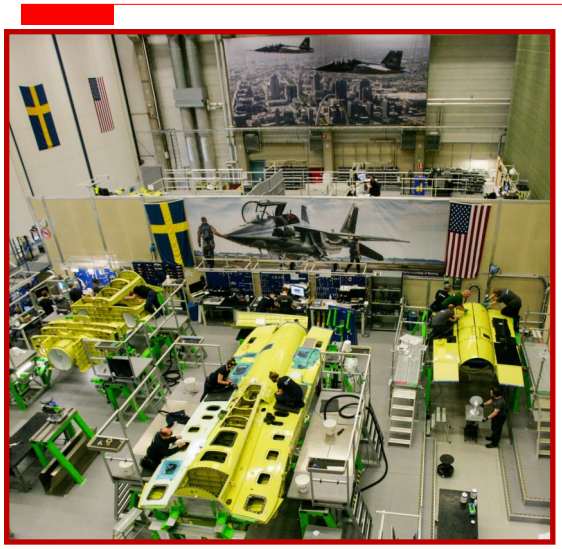
The first T-46A Eaglet parked in outdoor storage at Edwards AFB awaiting restoration. (Author)

The Northrop T-38 Talon has been the pilot training workhorse since the early 1960's. (AFTC History office-above; Christian Ledet-right)

Both T-X prototype aircraft in formation during a test mission out of St. Louis. (Boeing)

The second T-X prototype, N382TX, flying over the Missouri countryside during its first flight on 24 April 2017. (Boeing)





Boeing and Saab relied heavily on digital engineering and manufacturing while constructing the 5 Engineering & Manufacturing Development (EMD) aircraft that are designated APT-1 through APT-5. (Boeing/Saab)

The T-7A cockpit is equipped with a Head-Up display, engine fuel display and 19-inch by 8-inch Large Area Display that replaces traditional flight instruments. (Boeing)

The first of 5 EMD T-7A prototypes is unveiled during a ceremony at Boeing's St. Louis facility on 28 April 2022. (Boeing)

In September 2020, the Air Force announced the adoption of a new weapon system designator prefix for airframes designed and tested digitally. The first aircraft to receive the new lower case 'e' prefix was the T-7A, transforming the designation into eT-7A Red Hawk. The 'e' designation was quietly dropped from most official program documentation by August 2021. (USAF)

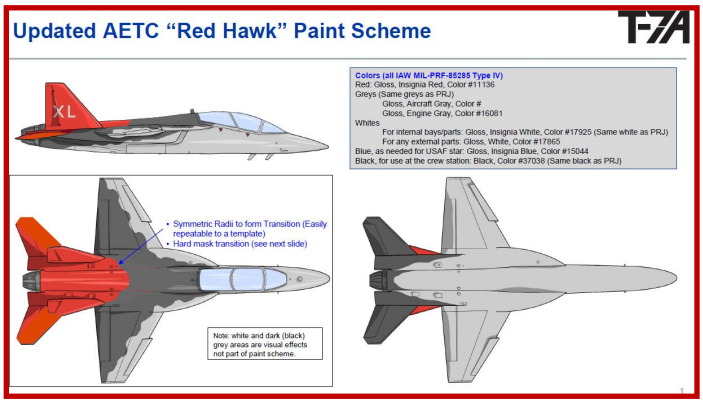
The first T-7A delivered to Edwards AFB, APT-2, arrived for testing on 8 November 2023. (USAF)

The T-7A was put through a series of climatic tests beginning in January 2024 at the Air Force's Climatic Facility at Eglin AFB, FL. (USAF)

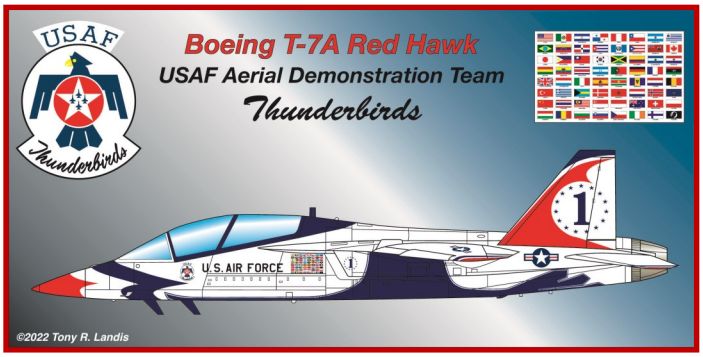
A T-7A Red Hawk flies over the dry lakebed at Edwards AFB, CA during its delivery flight on 8 November 2023. (USAF)

Artist concepts of the T-7A have appeared showing the aircraft in different service liveries including this US Navy paint scheme. (Boeing)

This armed T-X model briefly appeared at an overseas airshow. There are reports that Boeing is working on an armed attack variant of the aircraft designated AT-7A. (AFMC Archives)



The colorful paint scheme used on the Red Hawk is a direct tribute to the Red-Tailed P-51 Mustangs used by the Tuskegee Airmen of WWII fame.



Fictional artwork of a T-7A painted in the markings of the USAF aerial demonstration team "Thunderbirds". (Author)

AFMC History & Museums Program

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