Titans Hypersonic Reentry Light Fighter Jet

PROJECT SUMMARY

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Compiled on behalf of

NSL & Co. LLC

and

Titans Universe
going beyond imagination

for

Titans
Space Industries

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INTRODUCTION

This document offers a summary of the main features and R&D aspects of the Titans Hypersonic Reentry Light Fighter Jet (Titans Fighter Jet or TFJ), a project that has been under planning by Titans Space Industries and Titans Spaceplanes & Space Technologies (jointly called Titans Space).

The hypersonic part of the TFJ refers to its ability to survive (glide) reentry from orbit. The TFJ as a plane is a subsonic light fighter, which will be very effective in several conventional mission roles. For many years, the US Navy operated the A-4 Skyhawk and the Intruder, both of which were subsonic. The AV-8B Harrier II, which is also subsonic, remains in service with the US Marines and the Italian navy (gradually being replaced by the F-35).

In fact, the longest most complex dogfight during Vietnam was between an F-4 supersonic heavy fighter and a Mig-17 subsonic light fighter. Watch this video to learn more about the effectiveness of the subsonic Mig-17.

The TFJ is a highly maneuverable jet that will be attractive to buyers looking for a low-cost, high-performance light fighter jet that will cost between $15-20 million (or even lower) with low operational costs; it is an excellent option for military, surveillance, and research purposes.

The TFJ is primarily intended for the ground attack rather than fighter role; it should also provide some air defense capability as well as patrol and conduct surveillance (i.e. reconnaissance) missions.

Unique: Three Launch Options

The TFJ has three options for launch/take-off:

1. Conventional take-off
2. Zero-Length Launch
3. Transportation by the Titans Spaceplane and dropped from orbit

Conventional take-off

The TFJ can land on and take off from any suitable runway as well as any long straight stretch of highway. The latter ability makes the TFJ useful in regions where an airport

may not be available or occupied by enemy forces.

Zero Length Launch

The TFJ could descend under parafoil after it performs its mission, then be refueled, rearmed, and launched again for another mission with a zero length launch system. This could, for example, be perfect for remote mobile bases in the South China Sea.

Back in the sixties during the Cold War the "zero length launch" concept was investigated by NATO and the Soviets. The application here is that it would be a way of getting the TFJ's airborne again without a runway after they've been dropped into a combat zone (watch this 3rd party video for information).

The TFJ can zero length launch off any suitable ship, including container ships in a one-way trip to mobile or remote bases.

The zero length launch system makes the TFJ useful in most regions in the world.

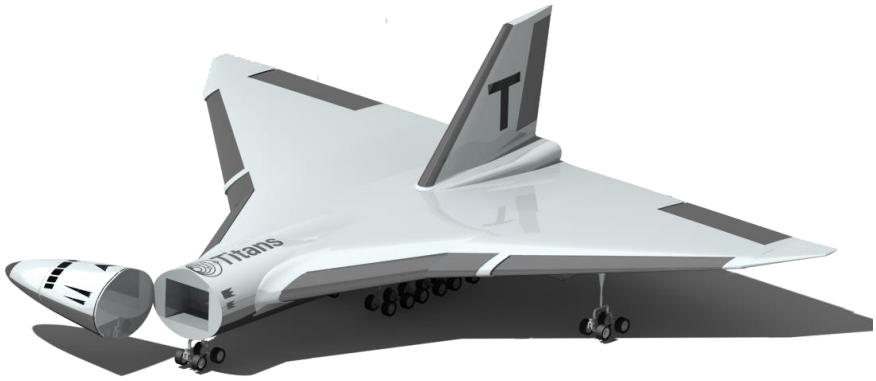
F-100 fighters being prepared for zero length launch

F-100 fighter in a zero length launch

Precision-Dropped from Orbit

The most revolutionary aspect, however, is that the TFJ can be precision-dropped from a Titans Spaceplane anywhere on Earth in less than 2 hours, whether it's in remote regions or in the sea/ocean. The TFJ is designed to survive hypersonic glide during reentry, but in powered flight it functions as a conventional light fighter.

Each Titans Spaceplane can transport 5-7 TFJs at once. The practical use is that it is a fighter that can drop into a war zone and immediately engage in the fight. The Titans Spaceplane would be operating as an aircraft carrier.



Titans Spaceplane Payload bay (accessible when the nose swings to the right)

Functioning as a spy plane for hypersonic reconnaissance missions

The Titans Fighter Jet can be dropped from orbit by a Titans Spaceplane. During the reentry phase from orbit, the TFJ -by utilizing a skip trajectory- can be used as a spy plane for hypersonic reconnaissance missions.

A skip trajectory can extend reentry anywhere from one quarter to halfway around the earth or longer.

A skip trajectory can be viewed as a series of independent ballistic arcs that extend the horizontal distance covered beyond a conventional gliding trajectory. The number of arcs and their amplitude (change in altitude) are not set by the initial velocity. The conditions in the trough at the bottom where the current arc and the next arc intersect (altitude, speed, angle of attack) sets the height of the next arc. During a reconnaissance mission, photography can be performed at any point along the arc, including the top of the arc and the trough. The TFJ does not necessarily need to enter another arc when it reaches the trough, but instead can execute a conventional gliding reentry at the bottom of a preselected arc.

We expect the TFJ to achieve a reduced radar signature (thus being near-stealth) by incorporating Radar Absorbment Material (RAM) into the TPS. RAM uses carbon and TPS uses carbon so there could be a 2-for-1.

The Titans Fighter Jet | Main Features

- Can fly to an altitude of ~50,000 feet (9.5 mi; 15.25 km)

- Can be transported inside Titans Spaceplanes to orbit and released from orbit

- Can be dropped from a Titans Spaceplane to any location on Earth in 90-120 minutes

- Is built to survive hypersonic reentry from orbit

The revolutionary part is that the TFJ, when transported by a Titans Spaceplane, can be precision-dropped anywhere on Earth in less than 2 hours, whether it's in remote regions or in the sea/ocean. Each Titans Spaceplane can transport 5-7 TFJs at once.

Main Capabilities

- The TFJ's large wing area provided by the combination of the wings and lifting body fuselage will provide excellent maneuverability

- The TFJ is able to do an unpowered (precision) landing under parafoil in areas where there is no runway

- We will also investigate the capability for vertically landing the TFJ on its tail using computer-controlled thrust deflectors in the engine exhaust

- The TFJ is able to do a zero length launch from a truck or other mobile platform when a solid propellant rocket motor is attached to the bottom

- We will consider developing a reusable liquid propellant booster instead of the solid propellant booster to reduce the logistics support required for remote or mobile bases

Main Characteristics

Titans Hypersonic Reentry Light Fighter Jet	Characteristics
Length	37 ft (11.2 m)
Wingspan	21 ft (6.4 m) (folding wing tips)
Wing Area	500 sq ft (46.5 sq m)
Standard Empty Weight	8,000 lbs (3,628 kg)
Max Internal Fuel Load	3,000 lbs (1,360 kg)
Max Internal Payload Bay	3,000 lbs (1,360 kg)
Gross Takeoff Weight	14,000 lbs (6,350 kg)
Wingloading	28 lbs psf
Thrust	10,000 lbs (4,500 kg) 45 kiloNewtons
Cruising Speed	500 mph (805 kph)
Top Speed	600 mph (965 kph)
Service Ceiling	50,000 ft (15.24 km)
Ferry Range with external fuel	1,200 mi (2,000 km)
Ferry Range on internal fuel	800 mi (1,287 km)
Skip Glide Reentry Range (when dropped from orbit)	2,000 - 3,000 miles

Design Features

The TFJ is inspired by a number of existing fighter jets and rocketplanes, including the X-24B lifting body. This document concerns the light version, while the next Titans version will be a medium supersonic fighter jet.

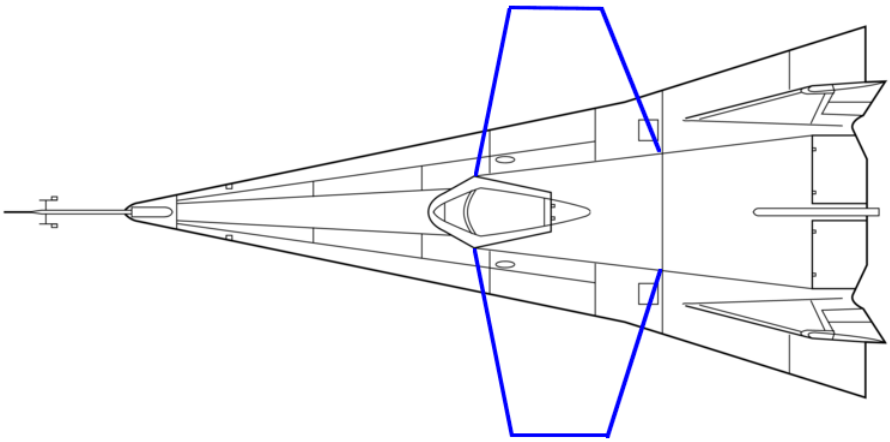
The single-seat TFJ Jet has a projected empty/dry weight of 8,000 lbs and a thrust of 8,000 lbs using two business jet turbofans. Its length will be approximately 37 feet with a wingspan of 21 feet. Although designed to survive hypersonic reentry from orbit when released from the spaceplane, the TFJ's normal cruising speed will be about 500 mph with a top speed of 600 mph. The projected service ceiling is 50,000 feet with a range of 800 to 1,000 nautical miles/1,100 statue miles on internal fuel. The large wing area provided by the combination of the wings and lifting body fuselage will provide the TFJ with excellent maneuverability.

The TFJ has a lifting body fuselage based on the X-24B as this is the optimum shape for hypersonic reentry. The lifting body shape will also aid in maneuverability since the wings will have to do less of the work.

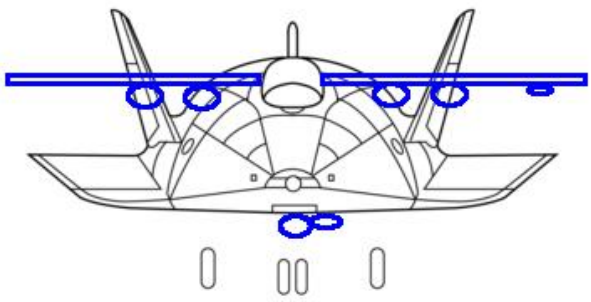
Below you will find three drawings of the X-24B where we added wings and other components like the payload. LIDAR, missile pod, camera (in blue). In cases where the TFJ will be transported in the Titans Spaceplane (to be dropped from orbit) or in heavy lift cargo planes (to be dropped at 30,000 feet), the wings will fold for stowage in the payload/cargo bay.

Please note: the TFJ final design will vary from the one shown below.

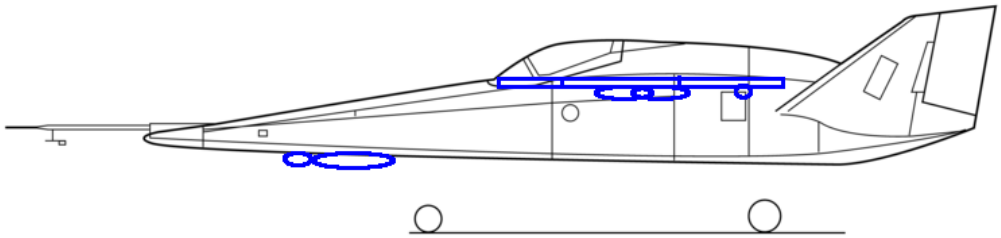
Top view



Front view



Side view



Example of a Business Jet Turbofan Engine

Example Sensor Suites and Weapons

Forward Looking InfraRed (FLIR) Turrets

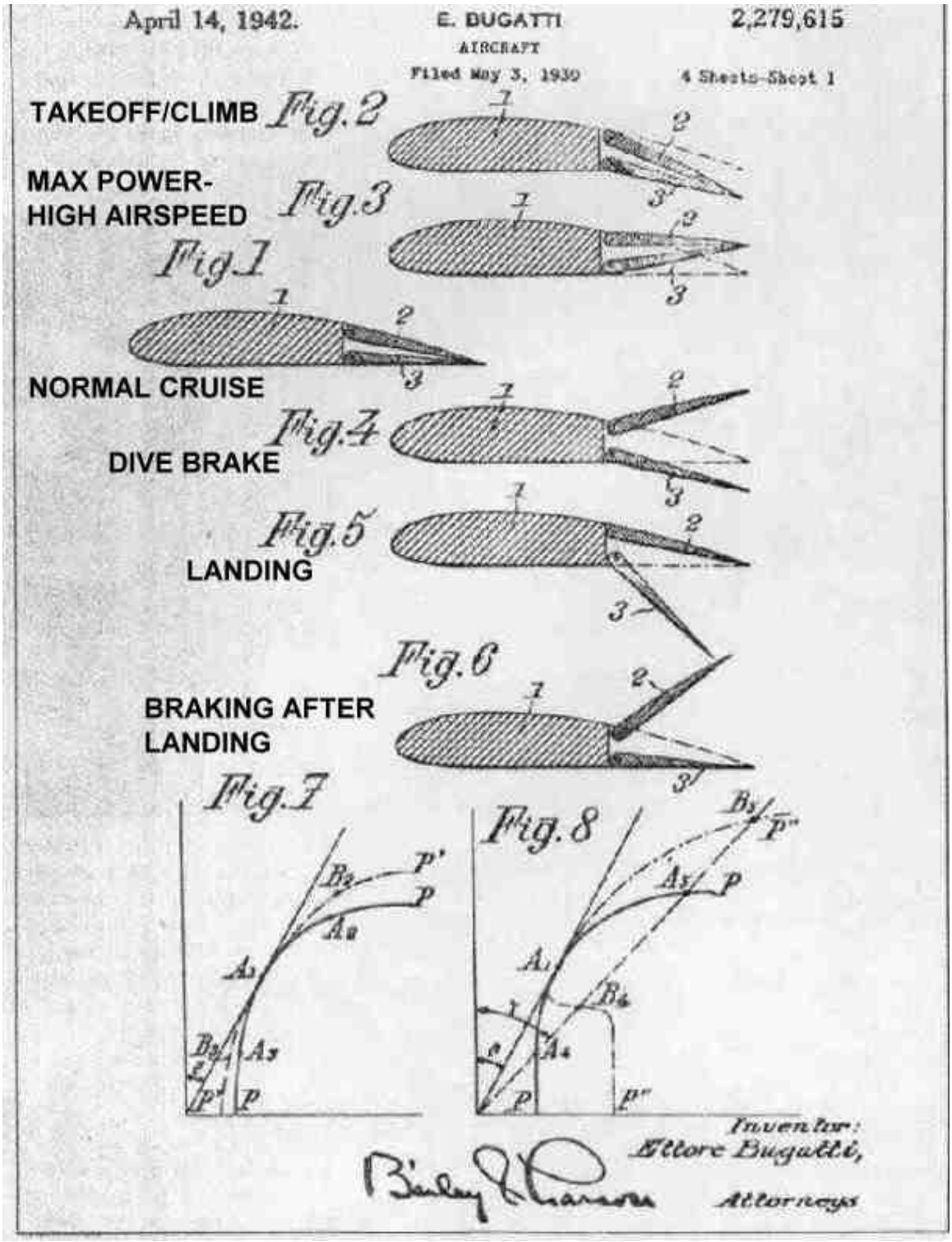
Camera/LIDAR Pod with GPS

Rocket Pods

Stinger Pods


BOEING
EXPERIMENTAL

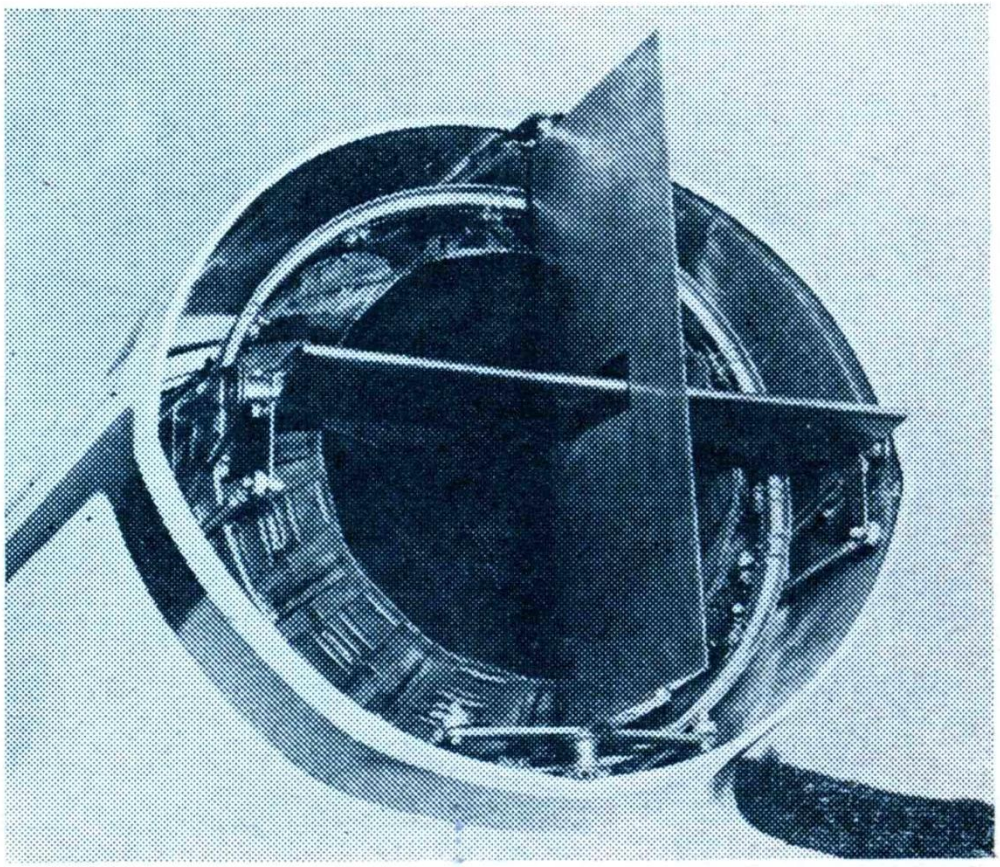
Split flap system used in Bugatti Model 100 record plane



Example of thrust deflectors in jet engine exhaust

photos by Eric Rickman, Harvey Aluminum

BELOW — Titanium thrust deflectors provide only steering; no rudder is used. Afterburner tests melted first set, but Taylor is confident 300 mph can be reached minus burner. Record is 260.35.



HOT ROD MAGAZINE

Research & Development Program

The TFJ has multiple features that will require their own R&D program. Titans Space will be cooperating with third parties wherever possible.

The TFJ R&D Program includes but is not limited to:

- Methods of designing and fabricating hot structure wings and fins out of refractory metals and ceramics which can survive hypersonic reentry speeds without TPS
- Durable reusable TPS systems for a fighter-size aircraft
- Single-use TPS systems which can be applied to an aircraft
- Subsonic aerodynamics of the complete fighter (with and without external stores)
- Hypersonic aerodynamics of the complete fighter when in glide configuration
- Hypersonic heat loads and temperature distribution over the complete fighter when in glide configuration
- Feasibility of reducing TPS requirements by using a nickel-based superalloy skin in select areas
- Integrating a low cost surveillance/reconnaissance sensor suite incorporating a package of commercial off the shelf (COTS) systems including FLIR and LIDAR
- Developing a zero length launch system using a reusable liquid propellant booster
- Developing a precision guided parafoil landing system for emergency landings or areas where there is no runway
- Developing in place of the parafoil landing system a vertical landing system using computer-controlled thrust deflectors in the jet exhaust which will bring the TFJ down in a tail-first attitude

Suitable Missions

The TFJ is primarily intended for the roles of:

- Ground attack
- Air defense
- Armed patrol
- Forward Air Controller
- Intelligence, surveillance, and reconnaissance missions

This document can be read in conjunction with the Titans Spaceport Buildings & Facilities Summary, which explains the factory and machine/engines shops requirement.

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