The Tezca Talon

A Supersonic Homeland Defense Interceptor

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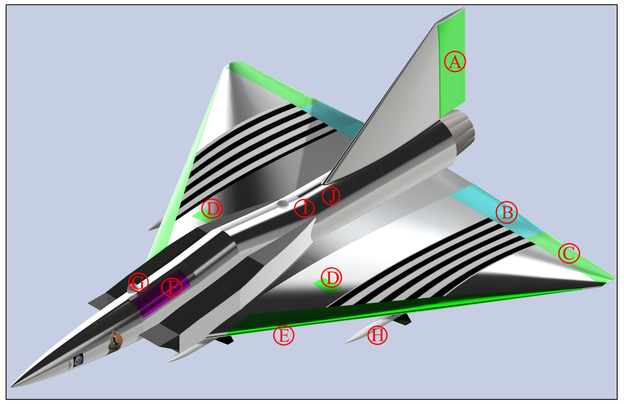
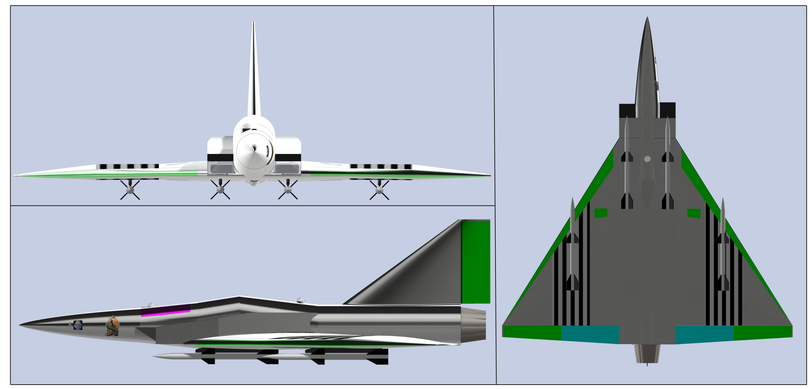
The AIAA Homeland Defense Interceptor competition challenges students to a cost-effective, unmanned supersonic interceptor for three distinct missions: Defensive Counter Air Patrol (DCA), Point Defense Interception (PDI), and Intercept/Escort (I/E). These missions demand endurance, agility, and versatility. The Tezca Talon was engineered to meet this challenge. Featuring a delta wing for supersonic performance and high lift devices for efficient loitering, it is powered by the proven F100-PW-229 engine and remotely piloted to minimize operator risk. Equipped with AIM-9X and AIM-120 Missiles, the Tezca delivers high mission adaptability, performance, and cost efficiency, offering a modern solution for homeland air defense.

External Features:

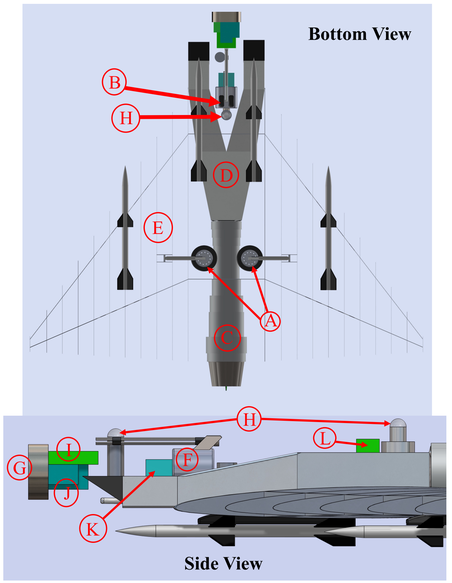
Key	
A	Rudder
B	Elevators
C	Ailerons
D	Speed Breaks
E	Leading Edge Flaps
F	Access Panel
G	IRSTS (3x, One Hidden Below)
H	AIM-120 (4x)
I	Aft-Most CG, w/ Payload (131% MAC from Nose)
J	Aerodynamic Center (132% MAC from Nose)



Tezca Talon 3-View:

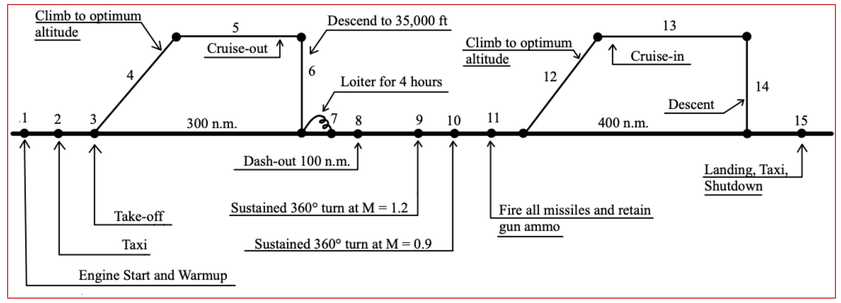


Internal Components:



Key	
A	Main Gear
B	Nose Gear
C	Engine
D	Inlets
E	Fuel Space
F	Vulcan Cannon + Ammo Drum
G	AESA
H	IRSTS (3x)
I	ICNIA
J	Avionics
K	APU
L	Digital Flight Computer

Defense Counter Air Patrol Mission:



Primary Mission: Defense Counter Air Patrol

The most taxing mission, this profile includes a 4-hour loiter followed by a 100 nautical mile dash at maximum speed at 35,000 feet. It also requires the aircraft to perform sustained 360-degree turns at Mach 1.2 and 0.9.

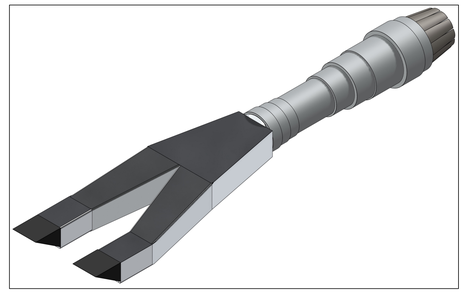
Secondary Mission: Point Defense Intercept

This mission entails a 200 nautical mile dash at maximum speed at 35,000 feet, along with sustained 360-degree turns at both Mach 1.2 and Mach 0.9.

Tertiary Mission: Intercept/Escort

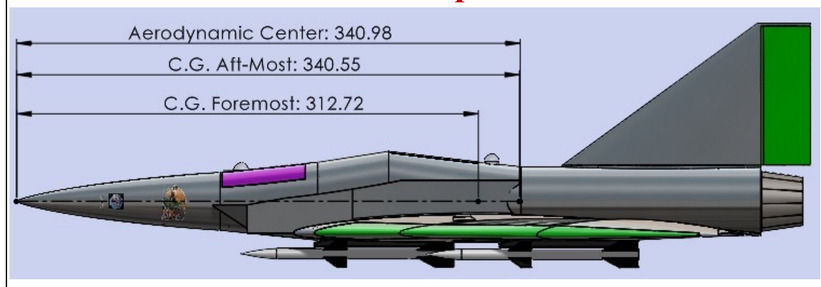
This profile involves a high-speed dash at 35,000 feet (distance unspecified) followed by a 300 nautical mile escort segment

Propulsion System:

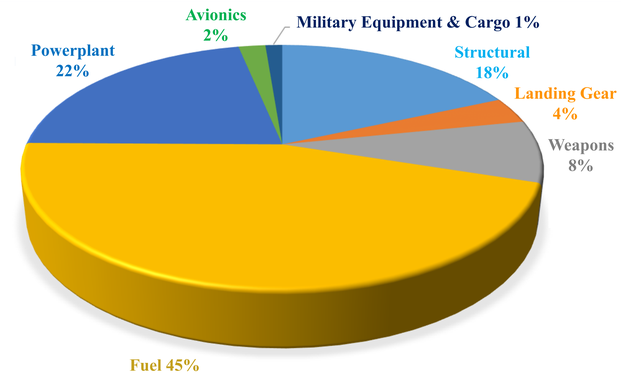


Pratt & Whitney F100-PW-229 Engine Characteristics	
Thrust	29,160 lbs (Wet) 17,800 lbs (Dry)
Weight	3,826 lbs
Thrust-Weight [Aircraft TOW]	0.961 (Wet) 0.635 (Dry)
Bypass Ratio	0.36
Fuel	Jet-A1
Max Diameter	3.875

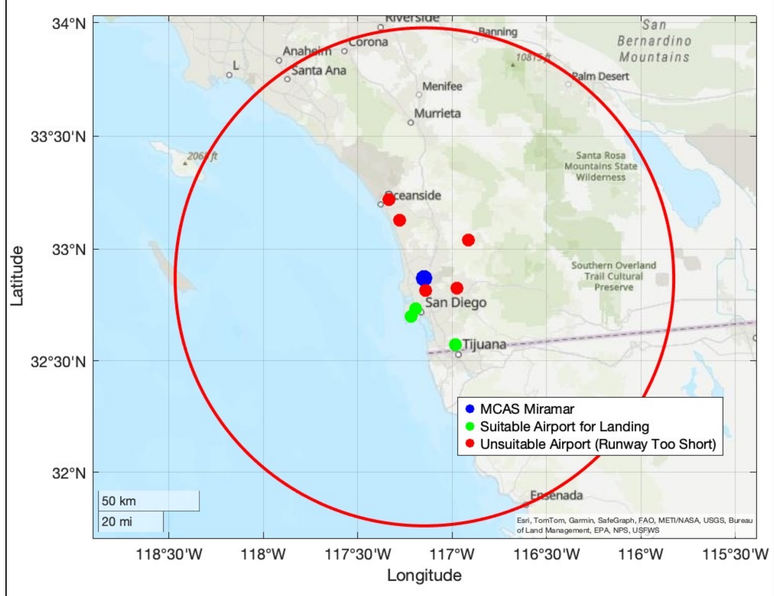
Mass Properties:



Weight Breakdown:



Emergency Engine Out Procedure:



Max Time of Flight in Engine-Out Scenario		
Alt. (ft)	35,000	
Max Time (min.)	17.27	
Airport	**Runway Length (ft)**	**Landing Status**
San Diego Intl (SAN)	9400	Suitable
Montgomery Field (MYF)	3400	Unsuitable
Brown Field (SDM)	8000	Suitable
Gillespie Field (SEE)	5400	Unsuitable
North Island NAS (NZY)	8001	Suitable
Ramona Airport (RNM)	5000	Unsuitable
Oceanside (OKB)	2700	Unsuitable
Carlsbad Palomar (CRQ)	4877	Unsuitable

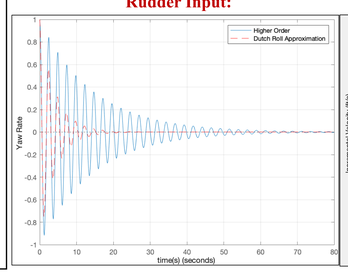
Stability:

Flight Conditions: 60% Fuel at Mach 0.5 at 35,000 ft

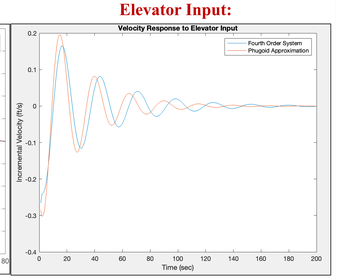
Lateral Stability		
Mode	**Desired Objective**	**Objective**
Dutch Roll	>1 Freq. (rad/s)	2.593 rad/s
Dutch Roll	>0.02 Damping Ratio	0.0169 Damping Ratio
Spiral	>12 sec Double Amp	37.93 sec Double Amp
Roll	< 1 sec Time to Half	0.50 sec

Longitudinal Stability		
Mode	**Desired/Required Damping Ratio**	**Damping Ratio**
Short Period	0.35-1.3 Desired	0.6015
Phugoid	>0 Required	0.0728

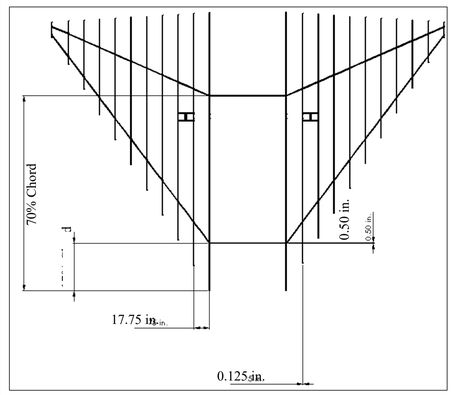
Yaw Rate Response to Impuse Rudder Input:



Velocity Response to Elevator Input:



Wing Structure:



Stress (MPa)	
Aluminum 7075 T6 Yield Strength	503
X Max Bending Stress	38.1
Y Max Bending Stress	19.7
Max Shear Stress	6.97

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