Improving the Next Generation Fighter Jet Ejection Seat System

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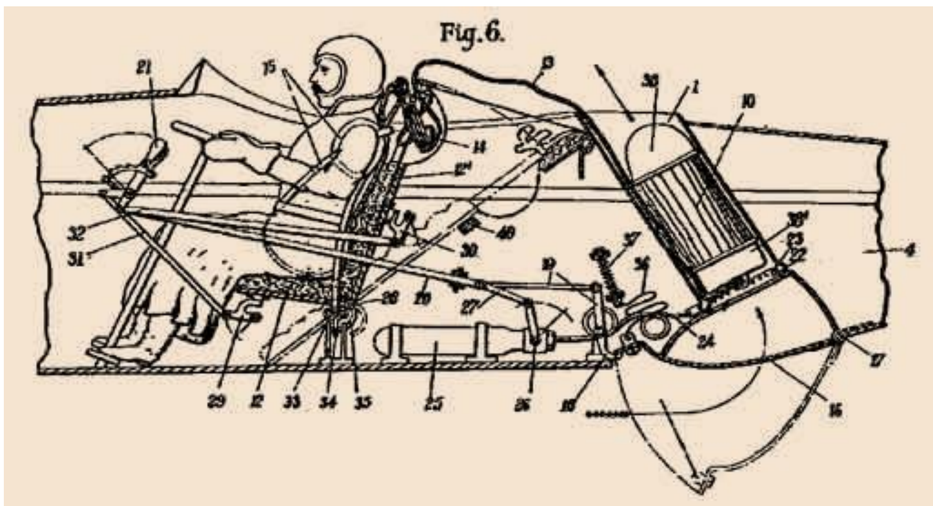
Background

Currently, modern fighter jets operating within the sub-sonic to the super-sonic regime are equipped with rocket-propelled and LASER gyro-guided ejection systems. Its aim is to evacuate the flight crew from any ill-fated jets to safety in the shortest time possible, regardless of the operating attitude and altitude. Many injuries were reported as a result of these high-energy and high-risk maneuvers.

The aims of the study are:

- To identify the operating modes which are most lethal to flight-crew
- To identify and narrow the scope of fatalities post-ejection
- To develop Best-in-Class ejection methods and/or configurations to minimize crew risks



Objectives

To minimize the drag and optimize the G-force impact, which can be achieved by adjusting the seat angle of the pilot during the experiment inside the wind tunnel.

Methodology

1. Without a protective shield, the seat angle of the model pilot is altered, angle of attack (AoA) at 0, 20, 40, 45, 50 degrees at various airspeeds at 5-30 m/s (to simulate pilot ejection without protection).
2. With a protective shield, the seat angle of the model pilot is altered, angle of attack (AoA) at 35,40,45,50 degrees at various airspeeds at 5-30 m/s (to simulate pilot ejection protection). Seat angle vs airspeeds are plotted in the best fit ejection angle configuration for both unprotected and protected profiles.

Findings

Experimental data showed that high drag, acceleration, and parachute failure caused pilot injuries. Changing the reclining angle, adding a protective cover, and backup parachute can prevent these problems. The project aims to develop a new generation of ejection seats, and further research will focus on more comprehensive improvements.

Conclusion

This project suggests two enhancements for next-gen fighter jet seating systems: a 45-degree backward seat angle adjustment before ejection and a protective cover addition. These changes aim to optimize ergonomics and boost pilot survivability by reducing injury risk. The findings highlight the importance of ongoing research and development in ejection seat design to ensure pilot safety and effectiveness in combat scenarios.