Lift System Overview

Gregg E Pyers
Strong position in all defence sectors

Combat, STOVL, light-attack, trainer, transport, helicopters, maritime reconnaissance and aerial surveillance.
Defence Aerospace

Liftfan

TP400

AE1107C

EJ200

FCAS – Future Combat Air System

T56

Rolls-Royce

CTS800
Key Technology Challenges – Defence Aerospace

Affordable Readiness

Improved Mission Effectiveness

Designing for the Future

Survivability

Integrated Power Systems
Unmanned Air Systems

Complex landscape – multiple systems in service, and in development and demonstration phases

Key technology challenges in integrated power and propulsion system
Lift System for the F35-B

Unique vertical lift technology for the F35-B
Combined STOVL capability of 40,000lbf
Why was the JSF programme started?
F35 Joint Strike Fighter Program

Joint Strike Fighter Program
Three Aircraft Variants

Carrier Variant (CV) F-35C

Conventional Take-Off and Landing (CTOL) F-35A

Short Take-Off Vertical Landing (STOVL) F-35B

• Rolls-Royce provides short take-off vertical landing (STOVL) components to the program.
How did we get there?

Concept
Demonstrator
(1996)

Development
(2001)

Production
(2008)

Entry into Service
(2012)

Initial Operational Capability (IOC)
(2015 – US)
(2018 – UK)
Rolls-Royce LiftSystem®

3 Bearing Swivel Module (3BSM)
Vectors main engine exhaust downward during STOVL operation

LiftFan®
Driven by LP turbine via drive shaft and clutch

Vanebox nozzle (not shown)
Directs LiftFan airflow

Roll Posts
Provide air jets for roll stability

25,000 lb (dry)
40,000 lb (reheat)

20,000 lb
1,950 lb
18,000 lb
Carrier Trials Video
LiftFan Overview

Variable guide vanes

Two stage Blisked fan

Clutch

2 stage counter rotating fan

Variable Area Vane Box Nozzle (VAVBN)

50” diameter flow path

~20,000lb thrust

~29,000Lbf

LiftSystem

Rolls-Royce
3BSM Overview

A single vectoring nozzle provides thrust between 0-95° pitch and ±11° yaw
- Providing STOVL and Supersonic flight
- 43,000lbf (Afterburner)
- 18,000lbf (STOVL)

3 bearings are mounted at different angles in four casings
- Bearing rotation changes jet vector

3 actuators provide control over thrust vector
Roll Post Overview

Bleed air from main engine bypass duct

Roll Post duct fits inside wing

Nozzle with actuator
Program Overview

• Development Completed (Jul 2016)
  • 21,000 test hours
  • 20,000 clutch engagements
  • 1,600 Short Take-offs
  • 1000 Vertical Landings

• Delivering Low Rate Initial Production
  • Dedicated LiftSystem Assembly Facility
  • 70 production LiftSystems delivered to date

• Providing Depot MRO Service
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