

Human Factors Problems Of Flying Wingless Lifting Body Vehicles



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Disclosure Information



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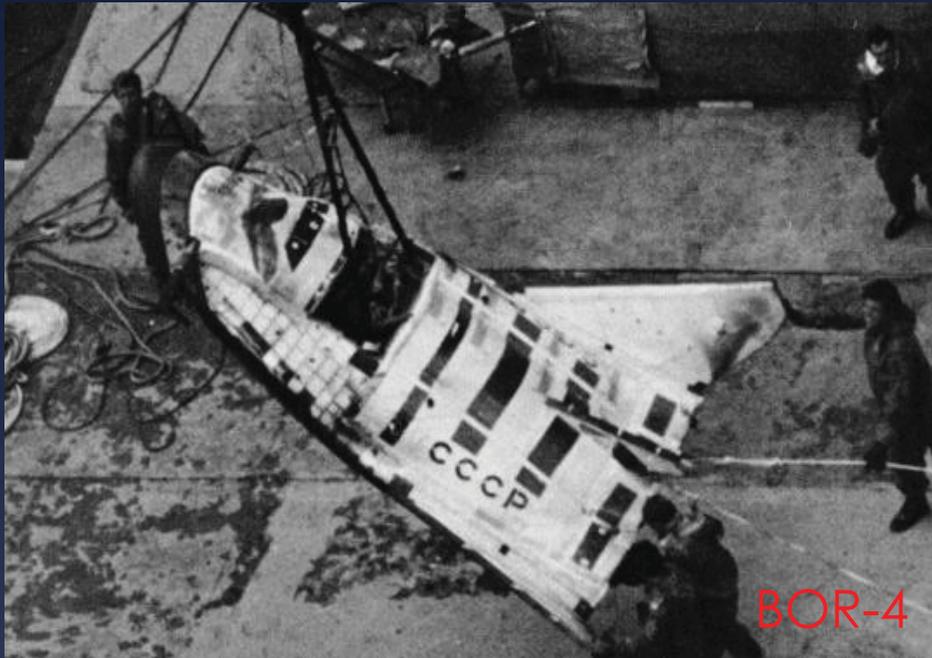
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I have no financial relationships to disclose.

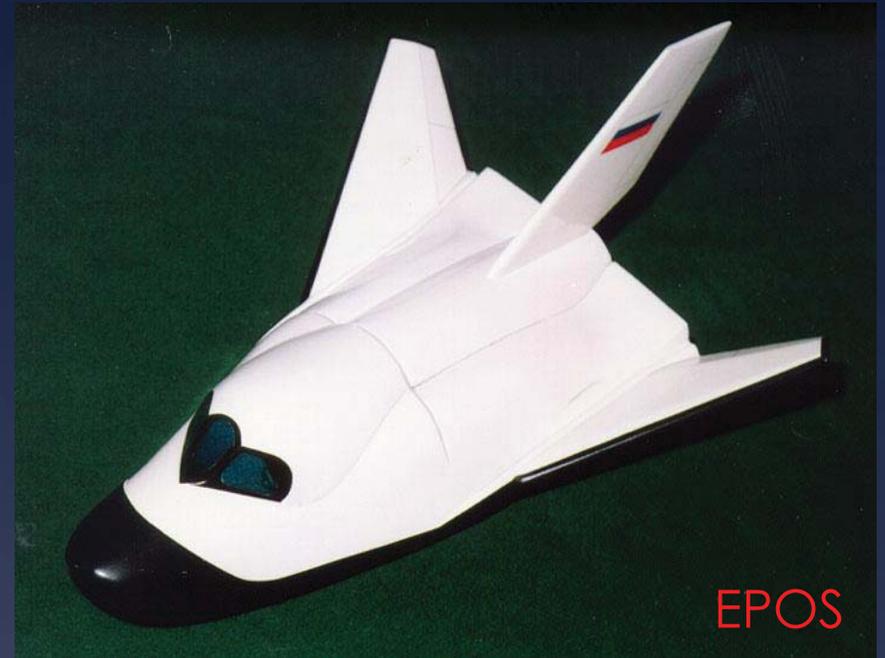
I will not discuss off-label use and/or investigational use in my presentation

Lifting Body Configurations





BOR-4



EPOS

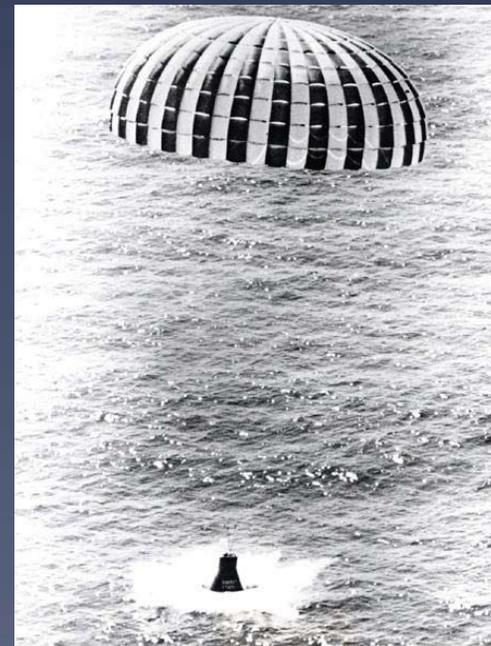
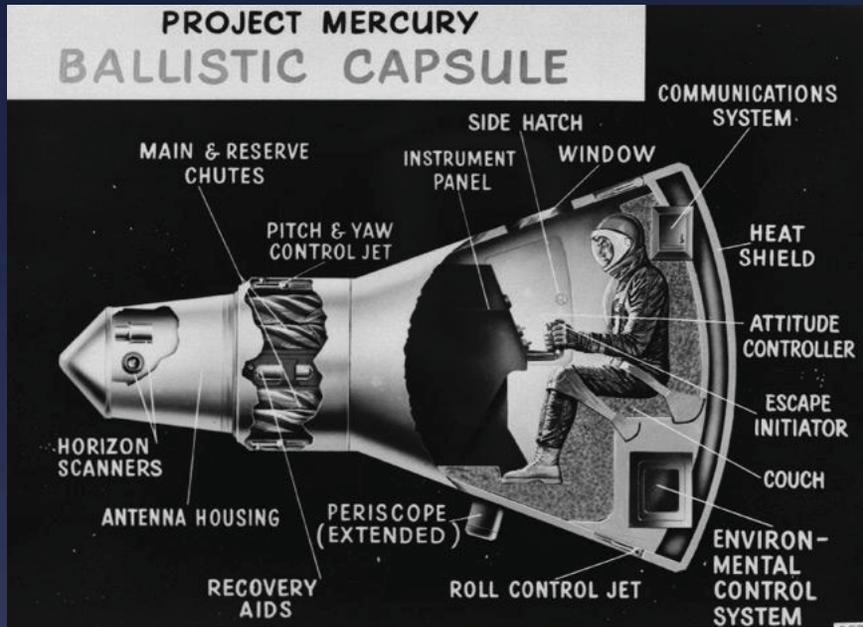


HL-20

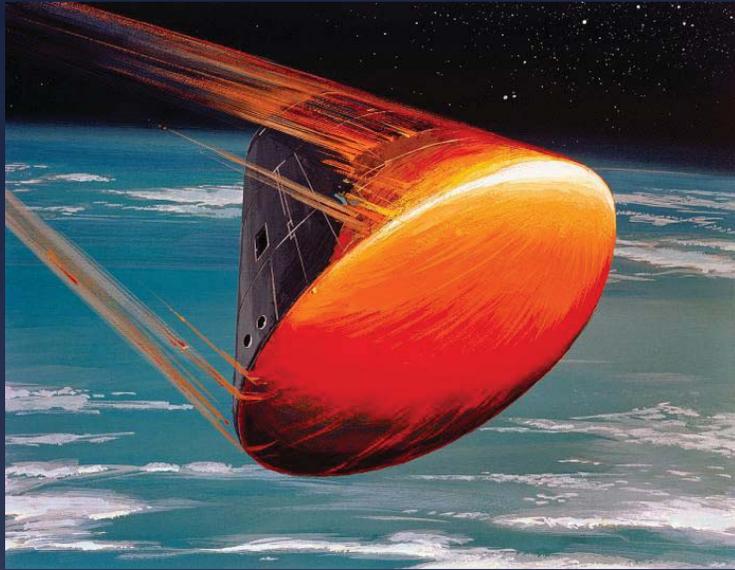


Dream Chaser

Ballistic Capsules



Lifting Reentry



Advantages of Lifting Bodies

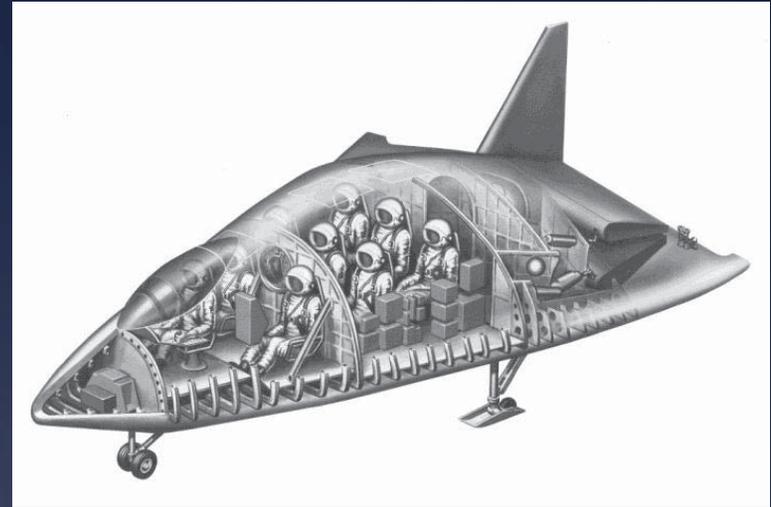
Increased mission flexibility and versatility

Greater reentry cross-range than capsule

Reduced g -loading and reentry heating

Conventional seating arrangement

Capable of precision runway landing



Human Factors Challenges

Pilot workload – Vehicle was prone to longitudinal and lateral oscillations

Pilot-induced oscillation – Simulation predicted potential for PIO

Simulation fidelity – Early simulator design was poor

Need for increased attention to Human Factors Engineering



Case Study 1: Milt Thompson, M2-F2, 12 July 1966

Pilot-Induced Oscillation

Habit Pattern Transfer

Lack of Simulation Fidelity



Case Study 2: Bruce Peterson, M2-F2, 10 May 1967

Habit Pattern Transfer

Spatial Disorientation

Distraction

Task Saturation



Lifting Body HFE Lessons

Accurate Simulation

Practice in the simulator reinforces cognitive habit patterns

Human-Machine Interface

Logical placement of cockpit displays and controls



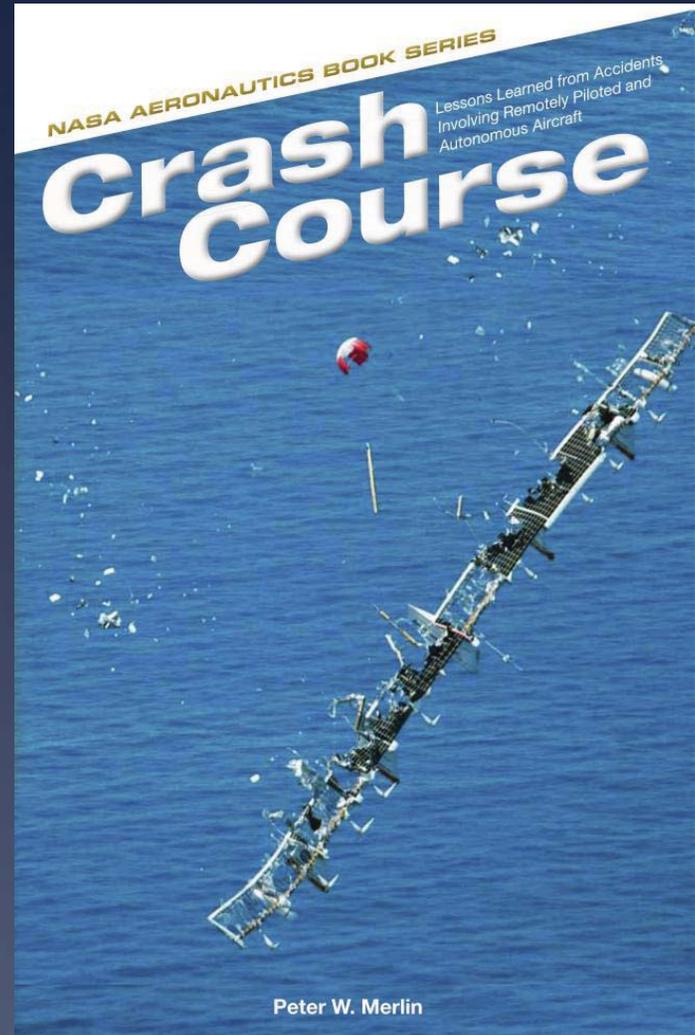
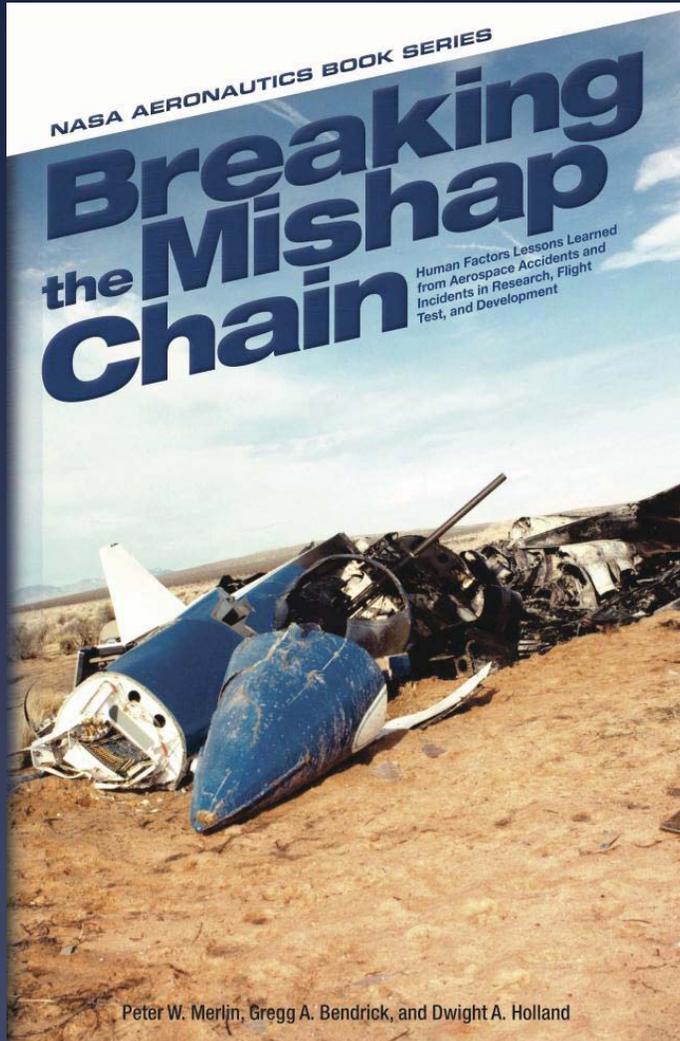
Automated Flight Management Systems

Appropriate use of automation

Learning from past experience is fundamental to the development of safe and efficient new systems and to improving existing systems.

Future mishaps might be avoided through the collection, archiving, and study of data on past accidents and incidents to learn valuable lessons.

Resources



Books and eBooks available
<http://www.nasa.gov/>

Questions?



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