The Environmentally Responsible Aviation (ERA) Project

Fayette Collier, Ph.D., M.B.A.
Project Manager

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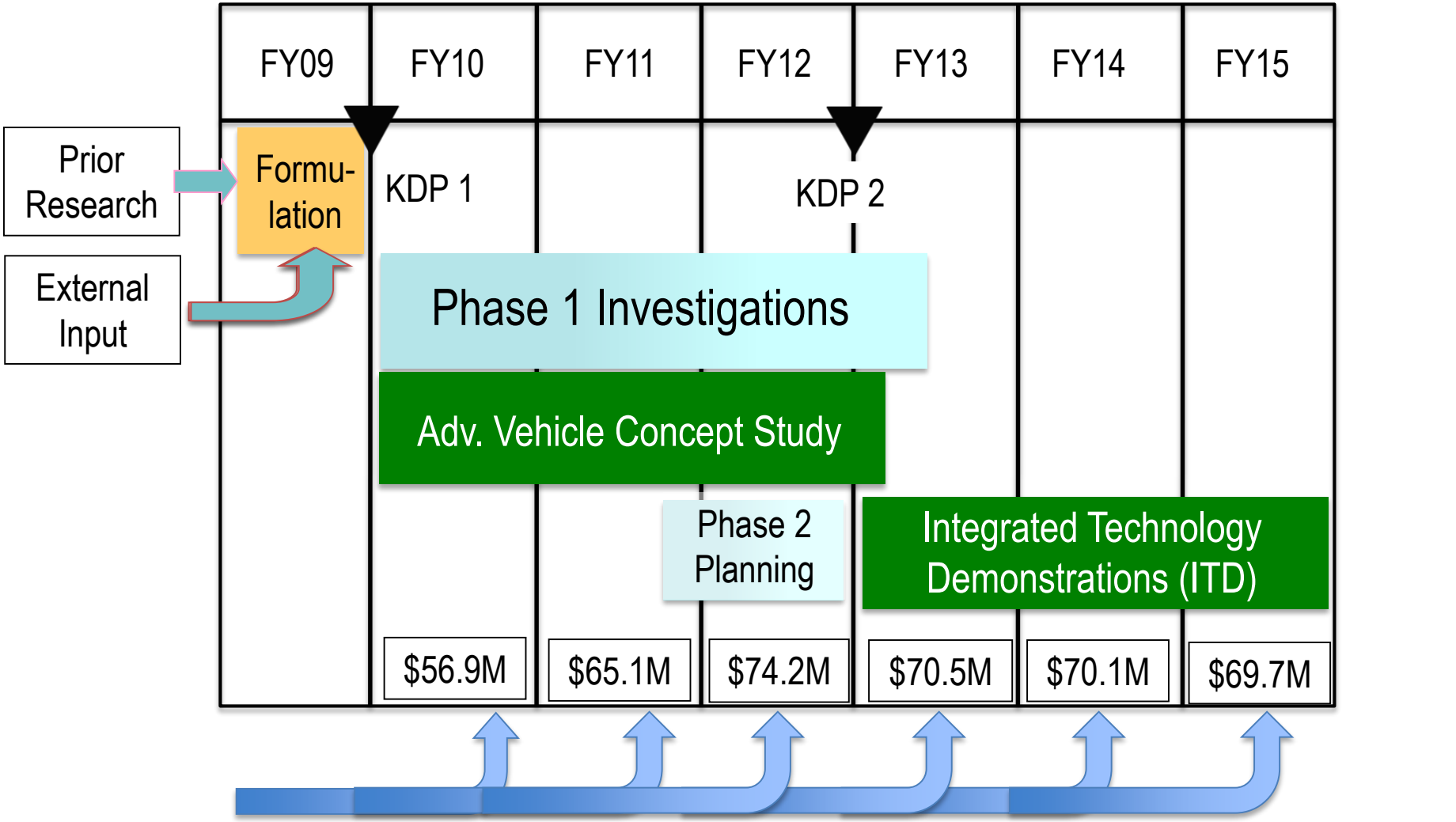
Environmentally Responsible Aviation

- Vision
  - expand the viable and well-informed trade space for commercial transport design decisions
  - enable simultaneous realization of national noise, emissions, and performance goals
- Mission
  - Execute integrated technology demonstrations
  - Partner w/Industry and transfer knowledge
- Scope
  - Mature technology for application in the 2020+ time frame
    - Advance the state-of-the-art, reduce risk of application
  - Perform system/subsystem research in relevant environments

Environmentally Responsible Aviation



Environmentally Responsible Aviation

	Integrated Technology Demonstrators	Partner
	AFC Enabled Vertical Tail and Advanced Wing Flight Experiment	Boeing
	Damage Arresting Composites Demonstration	Boeing
	Adaptive Compliant Trailing Edge Flight Test	AFRL/FlexSys
	Highly Loaded Front Block Compressor Demonstration	General Electric
	2nd Generation UHB Propulsor Integration	Pratt & Whitney
	Fuel Flexible, Low NOX Combustor Integration	Pratt & Whitney
	Landing Gear and Flap Edge Noise Reduction Flight Test	Gulfstream
	UHB Integration on Hybrid Wing Body Aircraft	Boeing

Integrated Technology Demonstrator
AFC Vertical Tail and Advanced Wing Flight Test

Weight | **Drag** | TSFC | Noise | NOx

End TRL: 6

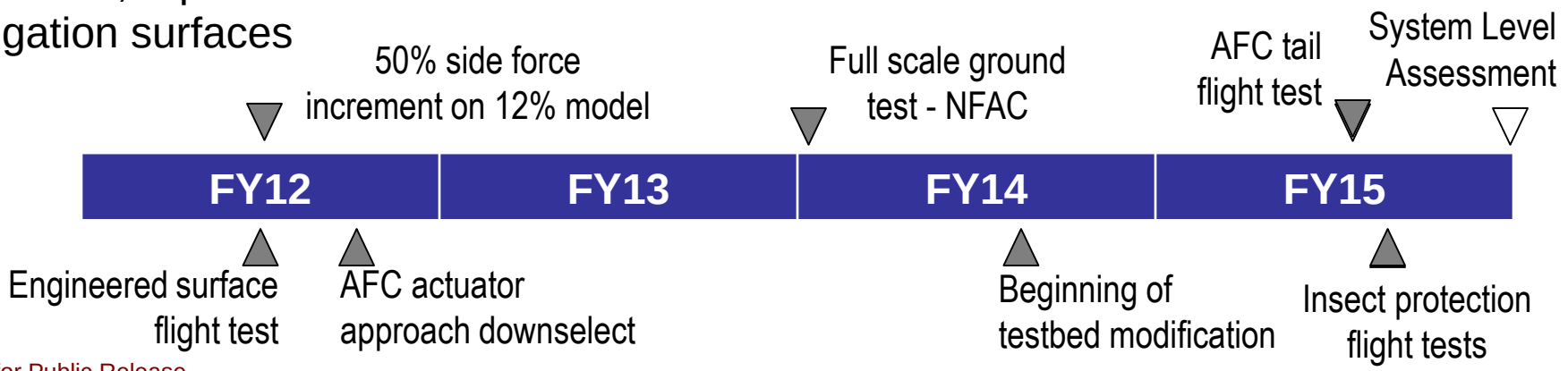
Key Performance Parameters

- Reduce total cruise drag by 1.5%
- Enable more laminar flow to reduce total cruise drag by at least 3 percent

Technology Insertion Challenges Addressed

- Full-scale AFC demonstration in flight
- Effect of flight profile on insect accumulation
- Durable, repairable insect adhesion mitigation surfaces

NASA/BOEING B757 ecoDemonstrator FCF March 2015



Integrated Technology Demonstrator
Adaptive Compliant Trailing Edge Flight Demonstration

Weight | Drag | TSFC | Noise | NOx

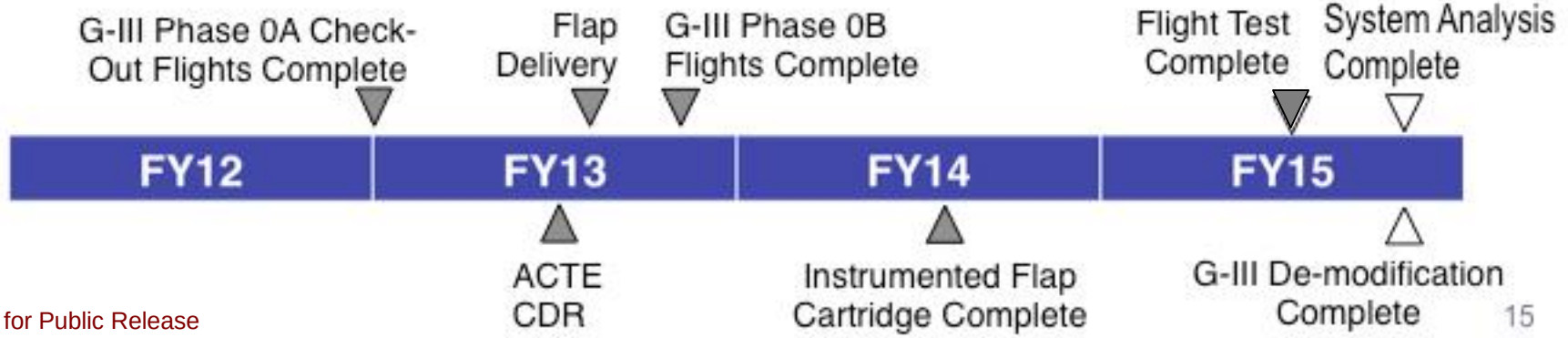
End TRL: 6

Key Performance Parameter Goal

Demonstrate in flight the viability of an ACTE system, to enable a 5% reduction in wing weight when using a MLC / GLA system on transport aircraft

Technology Insertion Challenges to be Addressed

- Airworthy, non-metallic compliant trailing edge flown at high dynamic pressures
- Flexible transition region flown at transonic high altitude flight conditions
- Analytical and ground test flutter predictions validated through flight



Projected Impact of ERA Technologies on the US Fleet