

CLEEN II - Structurally Efficient Wing (SEW)

Presented to: CLEEN II Consortium Public Session

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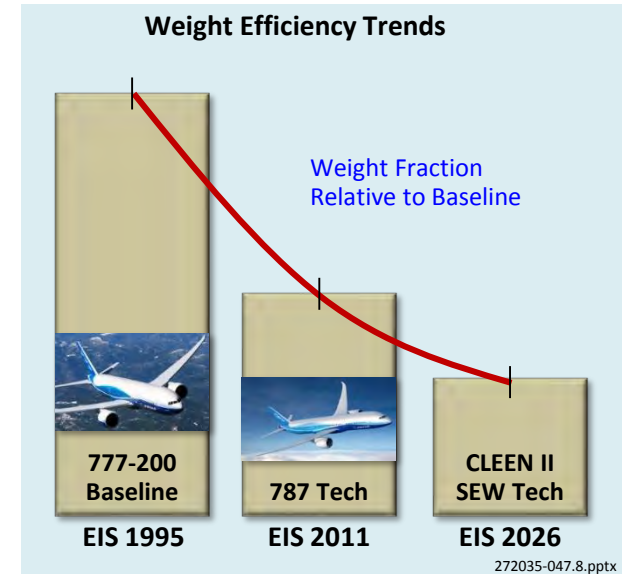
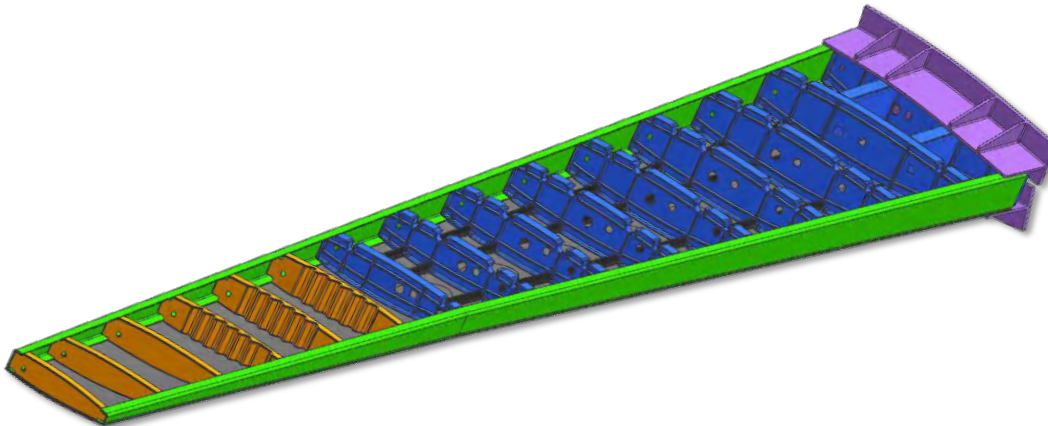
Date: Nov 2, 2016

Boeing -Structurally Efficient Wing (SEW) Elevator Speech

- Boeing will develop, build, and test a next-generation wing structure that demonstrates significant improvements in structural efficiency.
- SEW could potentially reduce fuel consumption up to 3.5% through weight reduction of the wing.
- SEW contributes to the FAA's CLEEN II goal of reducing fuel burn.

Boeing -Structurally Efficient Wing (SEW)

- Under CLEEN II, the goal of the Boeing project is to develop and demonstrate advanced aircraft wing technologies that show a continued weight reduction as compared to the 777-200 baseline



CLEEN II SEW Technologies

New technologies enable changes in the wing architecture:	Goal Impact	Benefits and Application
• Advancing manufacturing technologies • Modeling- Rapid finite element modeling configuration optimization • Advanced prepreg composites • Resin-infused stitched blade stringers • Resin-infused hat stringers • Advanced alloy metallic ribs • Resin-infused sine wave ribs • Stamped thermoplastic ribs	Fuel burn reduction	Lower weight, higher performance wing

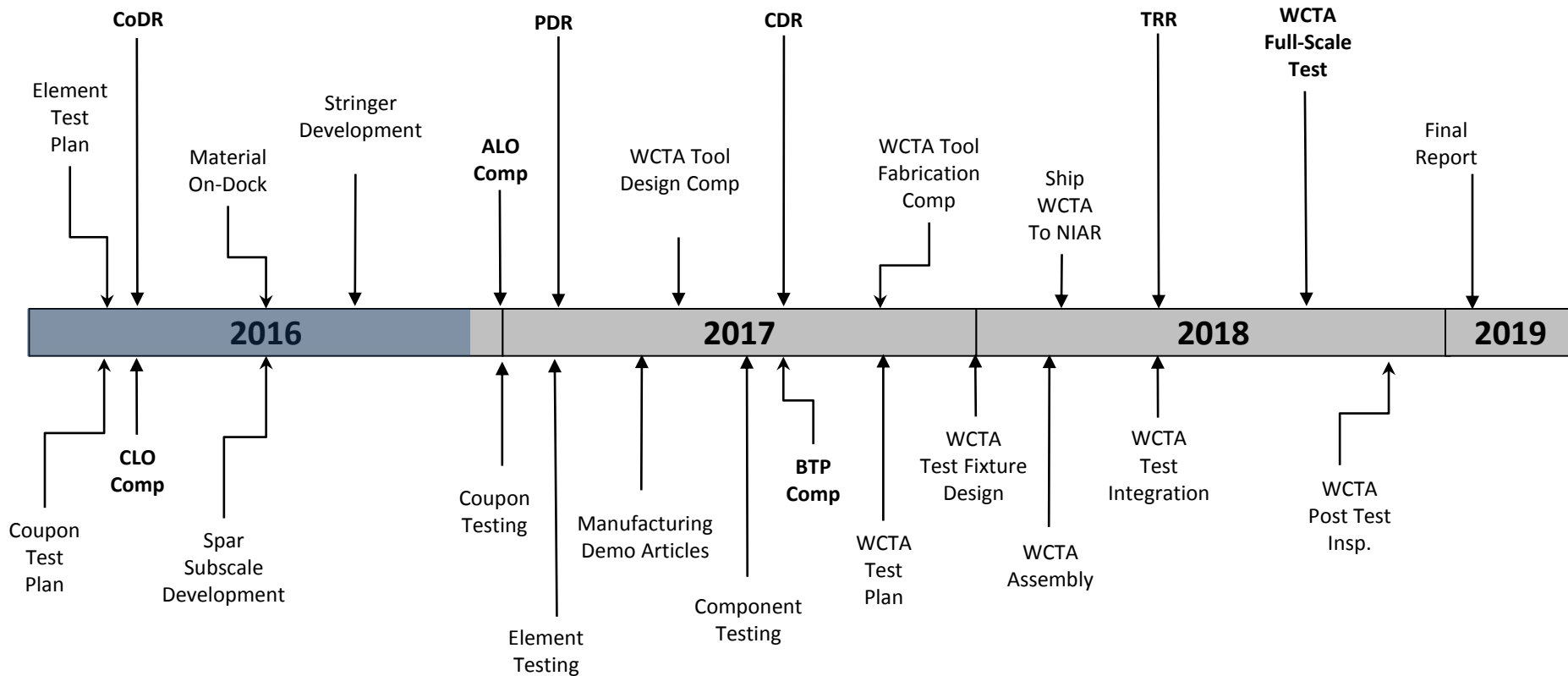
All of these technologies are contributing to the fuel consumption reduction goal by reducing structural weight

Project Year 1 Achievements

Boeing Structurally Efficient Wing

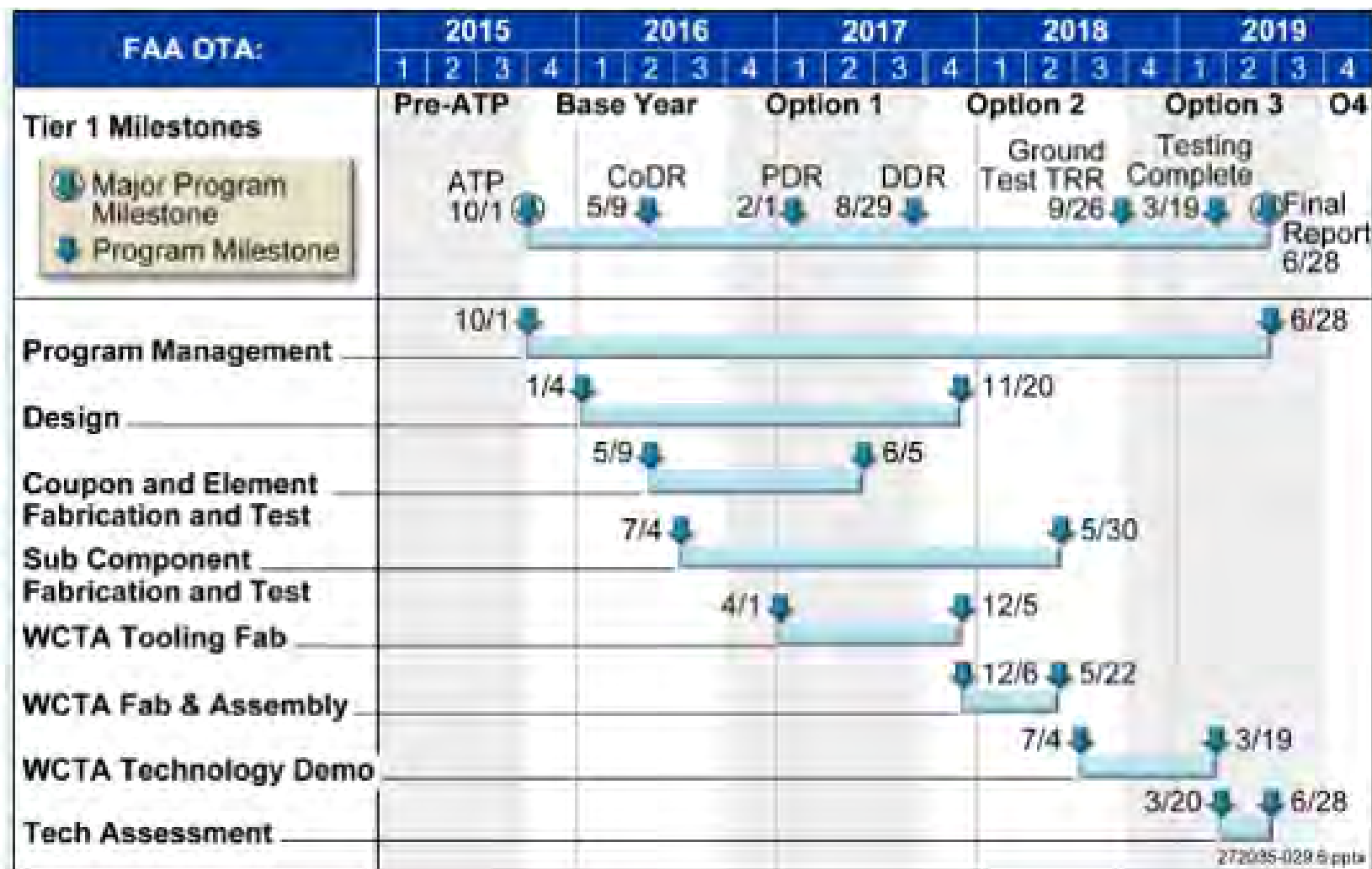
- *OTA signed Oct 7, 2015*
- *CoDR successfully completed Mar 15, 2016 (several months early)*
- *Assembly Layout (ALO) Design near complete*
- *Structural Analysis maturing*
- *Design Properties and Testing Plan near complete*
- *Manufacturing Plan and Schedule near complete*
- *Weight reduction calculations continue to indicate 28% goal achievable*

Project Year 2 SEW Plans

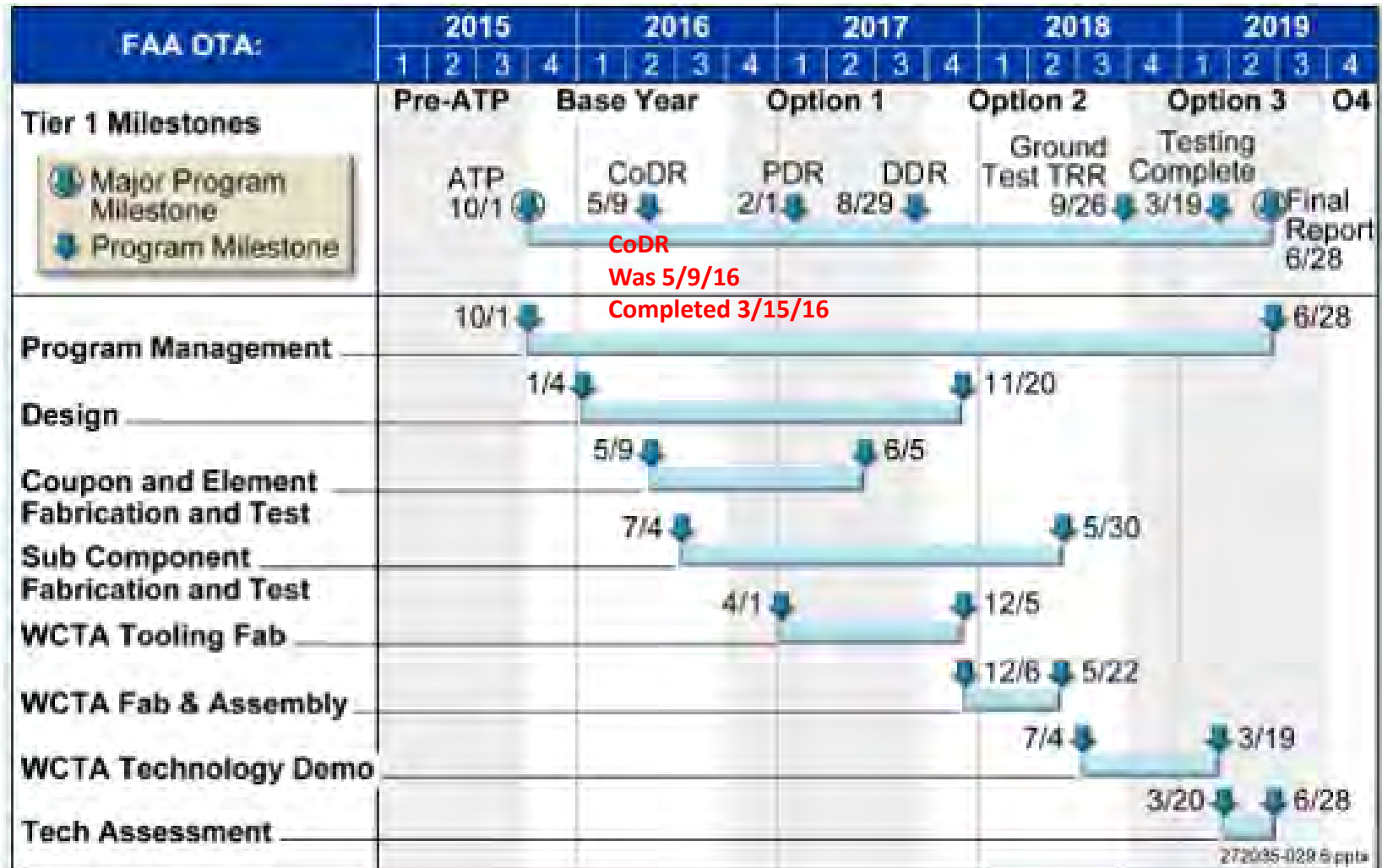


Building Block Approach used to Address Scale-up Challenges

Baseline Schedule Finishes in Spring of 2019

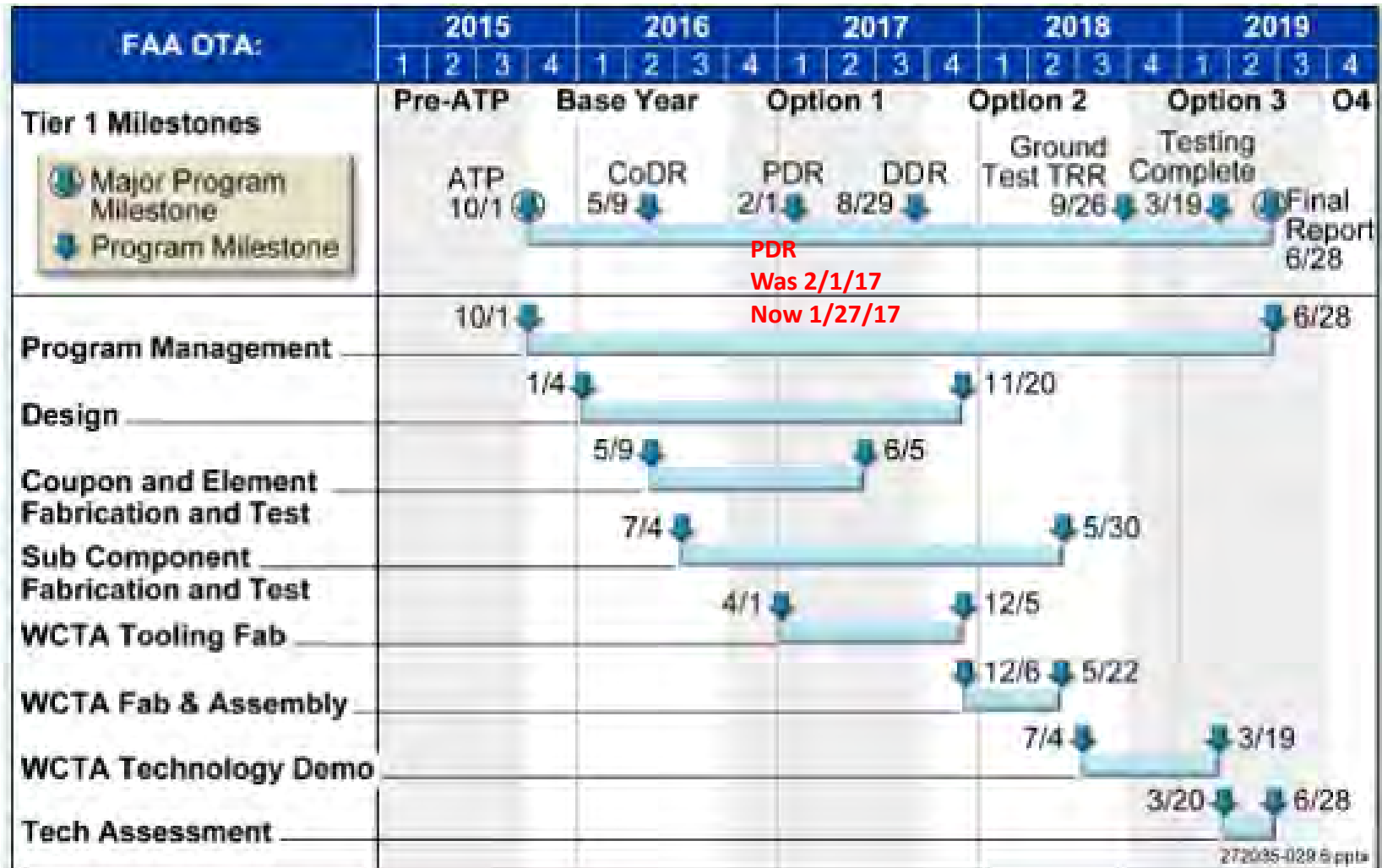


Baseline Schedule Finishes in Spring of 2019



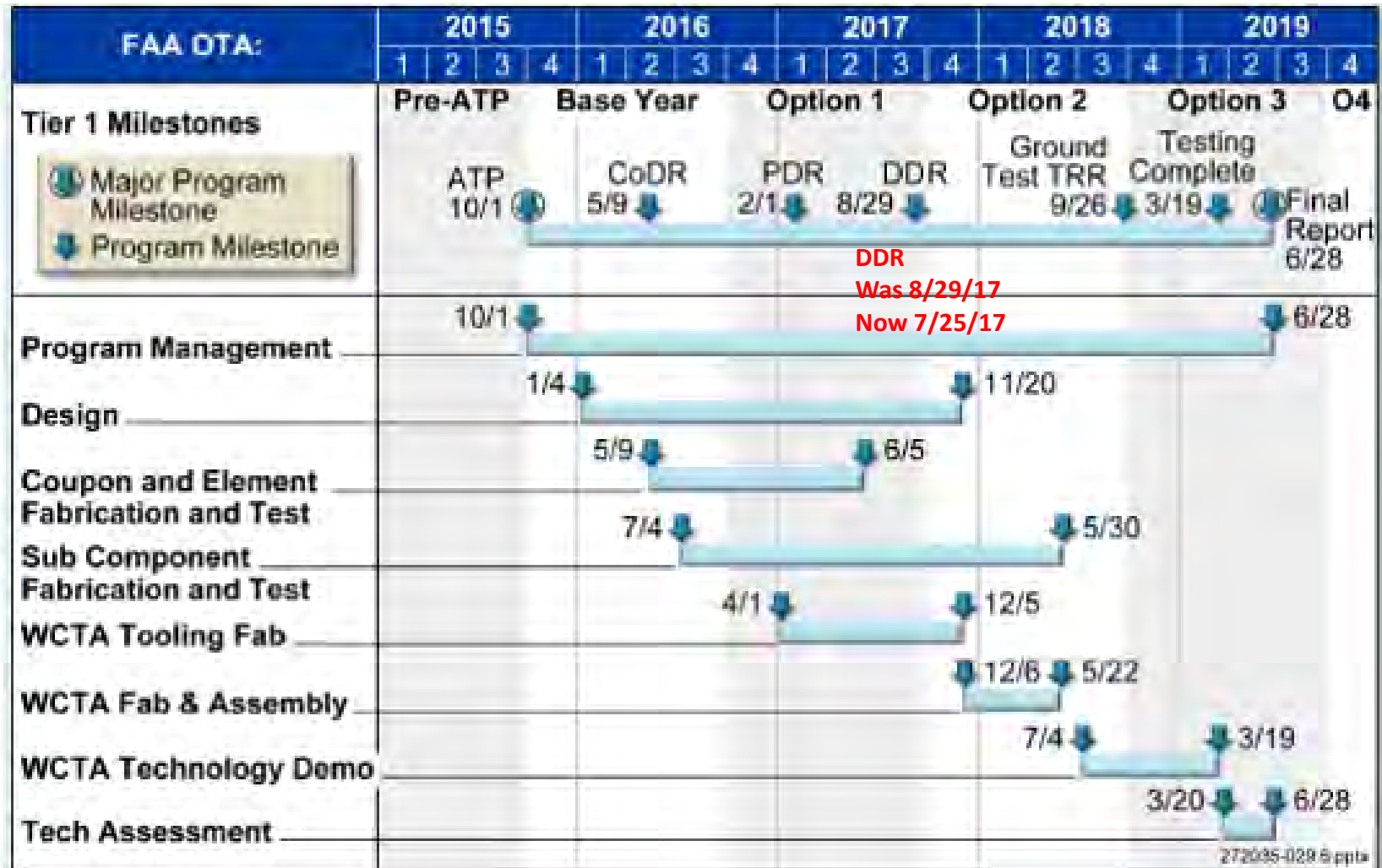
Accelerated Schedule Note

Baseline Schedule Finishes in Spring of 2019



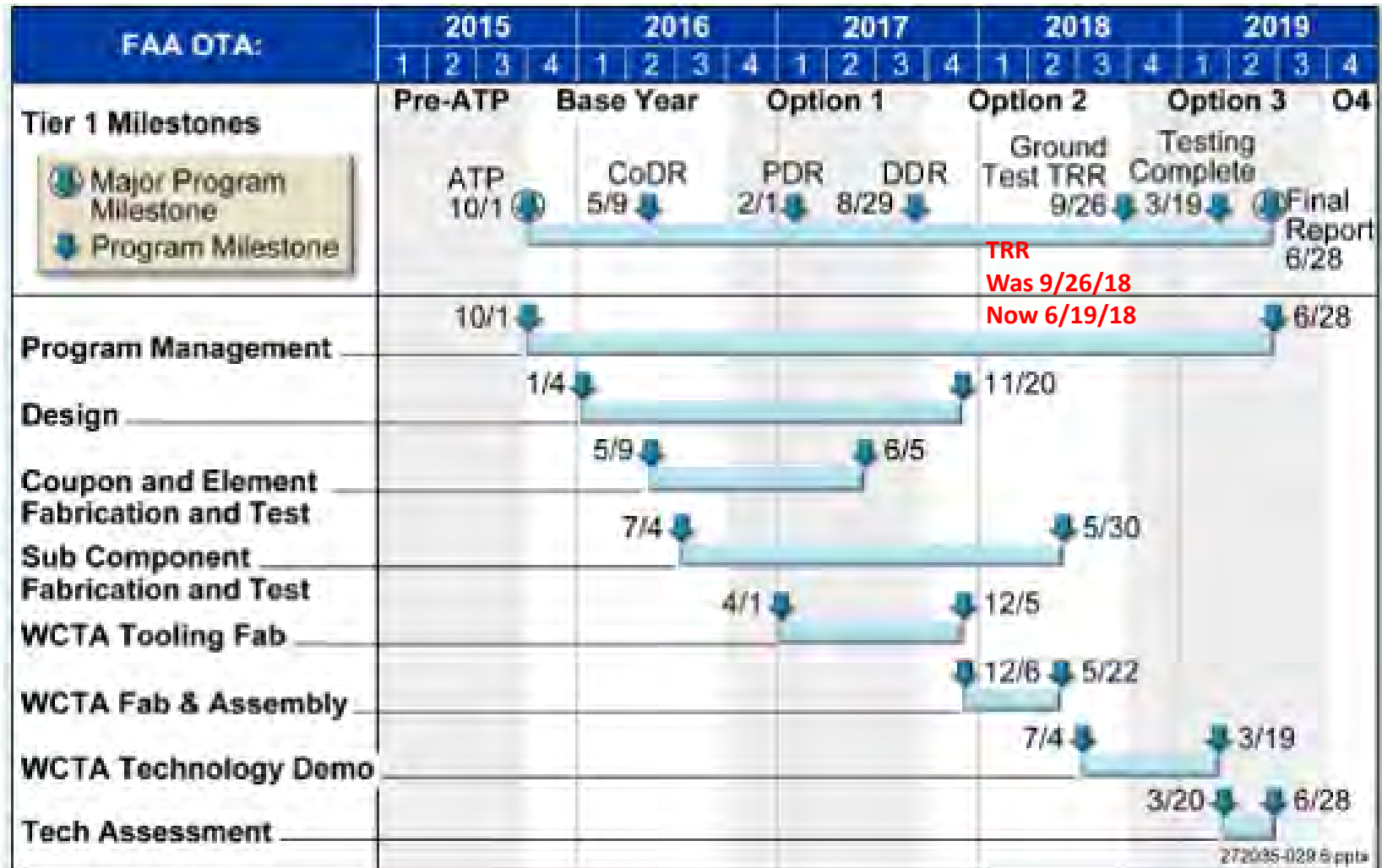
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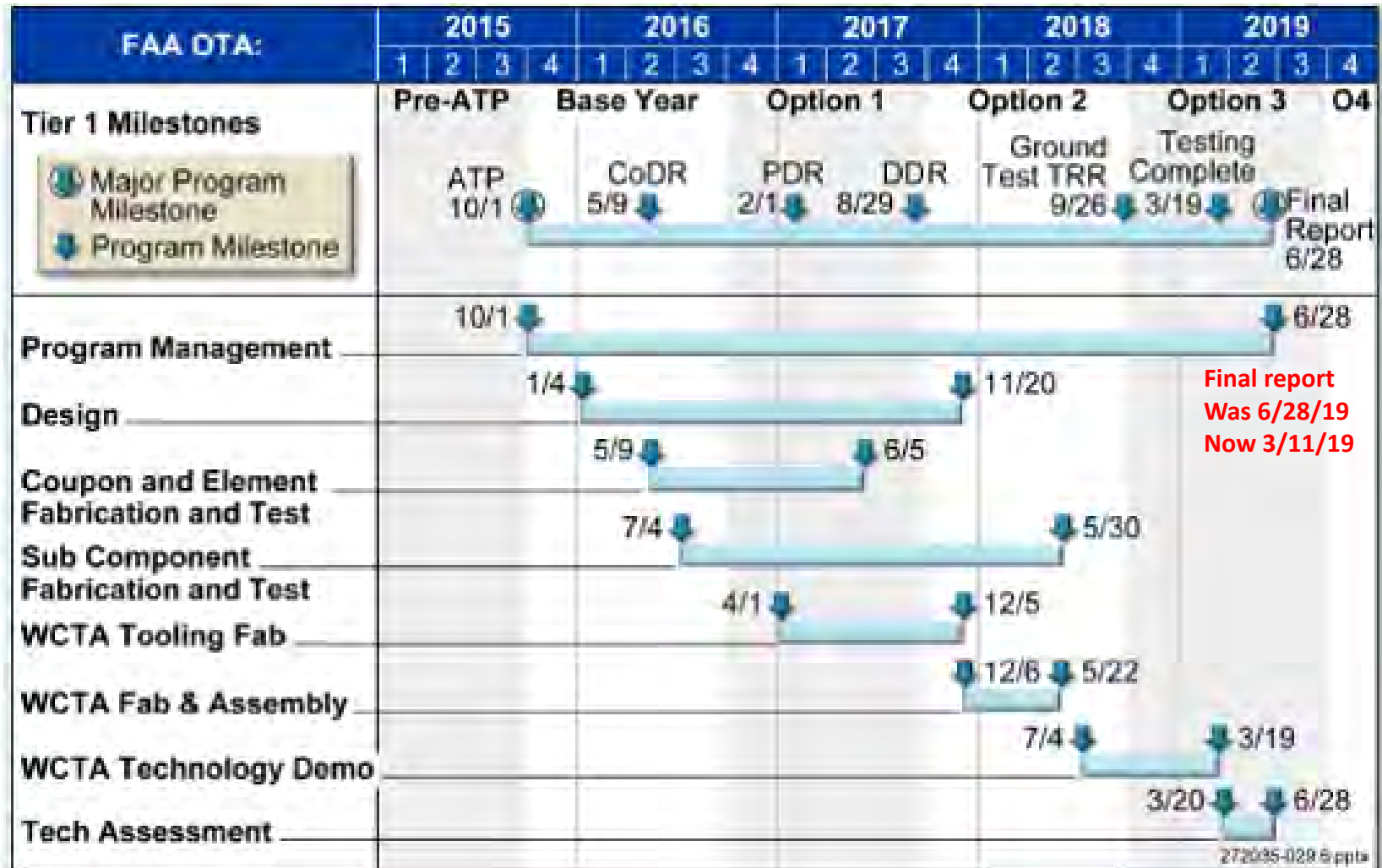
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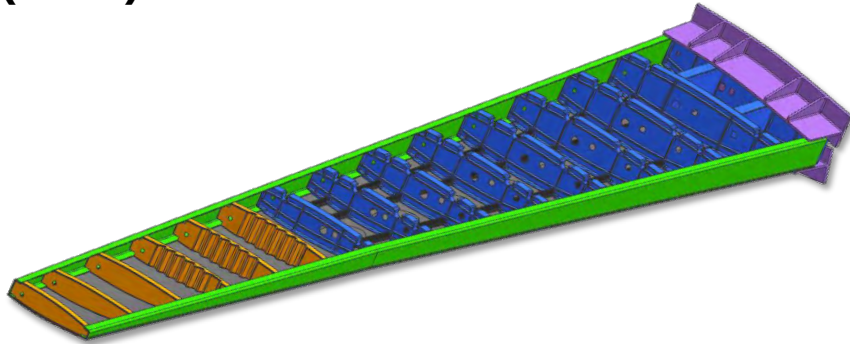
Accelerated Schedule Note

Baseline Schedule Finishes in Spring of 2019



Accelerated Schedule Note

Boeing Structurally Efficient Wing (SEW)



Anticipated Benefits: *Cumulative predicted impact over twenty years:*

- Jet A fuel consumption savings of approximately 200 million tons
- CO2 production avoidance of approximately 660 million tons

Risks/Mitigation Plans:

- *Risks Identified, mitigation plans in place*

Objectives: *Demonstrate a suite of material and structural technologies that will contribute to the FAA's CLEEN II goal of achieving fuel burn reductions by 2026.*

Work Statement: *Boeing's disciplined development and building-block test approach will mature structural wing technologies and will demonstrate via the Wing Component Test Article (WCTA).*

Accomplishments/ Milestones since Boeing initiated this technology/project:

- OTA Signed Oct 7, 2015
- CoDR completed Mar 15, 2016

Schedule:

- Oct 2015 ATP
- Mar 2016 CoDR
- Jan 2017 PDR
- Aug 2017 DDR
- Jun 2018 TRR
- June 2019 Program Complete

Summary

- The SEW technologies selected represent Boeing's highest potential structural concepts that have a clear path to certification and implementation.
- Our building-block test approach will develop the selected technologies along the TRL scale, resulting in a TRL 6 demonstration when the Wing Component Test Article (WCTA) test is complete.

Acronyms

- ATP Authority to Proceed
- CoDR Concept Design Review
- DDR Detailed Design Review
- PDR Preliminary Design Review
- SEW Structurally Efficient Wing
- TRR Test Readiness Review
- WCTA Wing Component Test Article