

AFRA R&D workshop



AFRA R&D Workshop Agenda

- Convene & Introductions
- R&D committee Draft Mission Statement
- R&D needs, project formation and execution
- Status on 787 section capture
- Recycling R&D at the National Manufacturing Institute of Scotland - Light Weight Manufacturing Centre by Prof. Iain Bomphray
- Questions and discussion

AFRA R&D workshop

Draft Mission Statement

“ Identify, prioritize and execute relevant R&D for improved commercial aircraft recycling economics and environmental benefit”

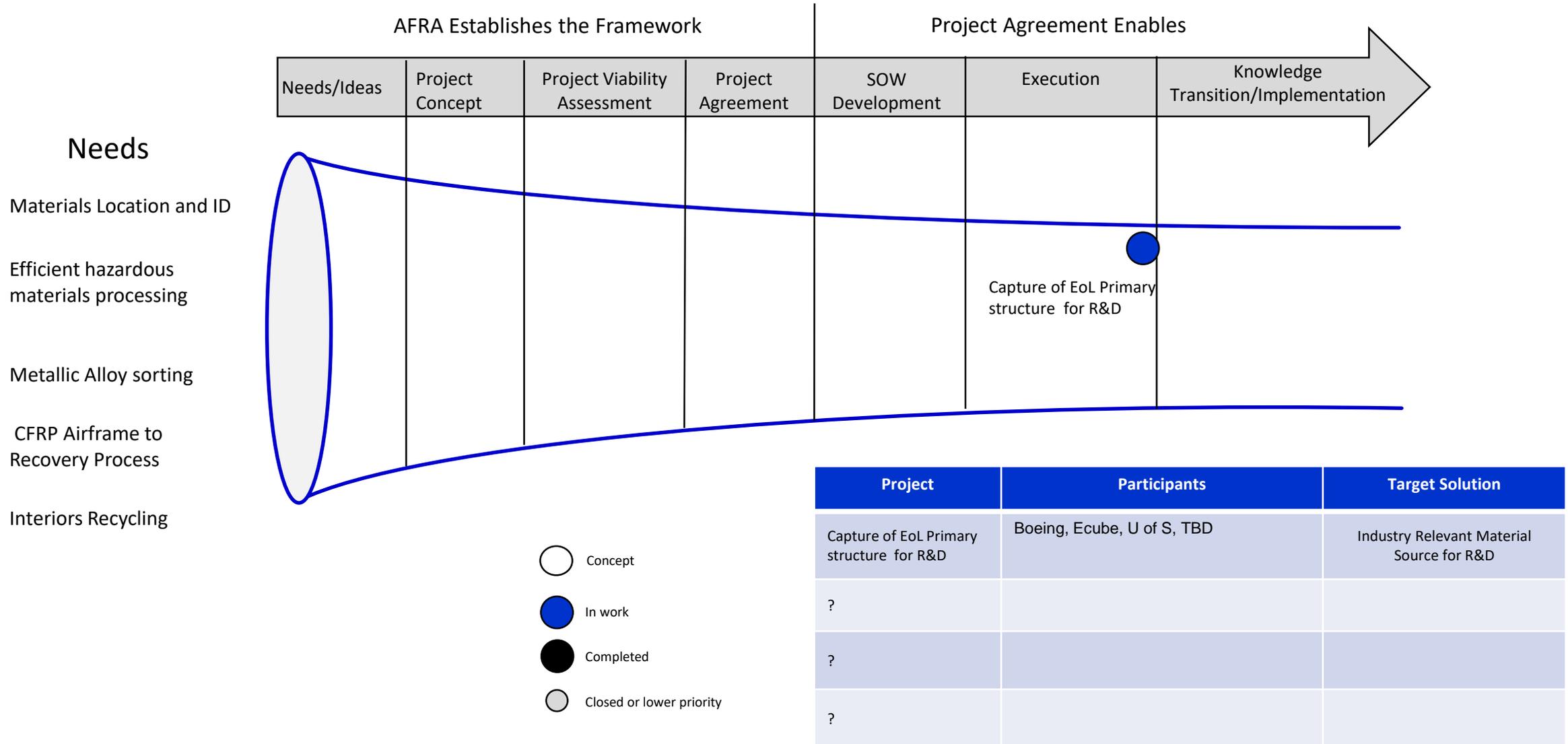
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R&D needs, project identification and execution



Project development and implementation Pipeline



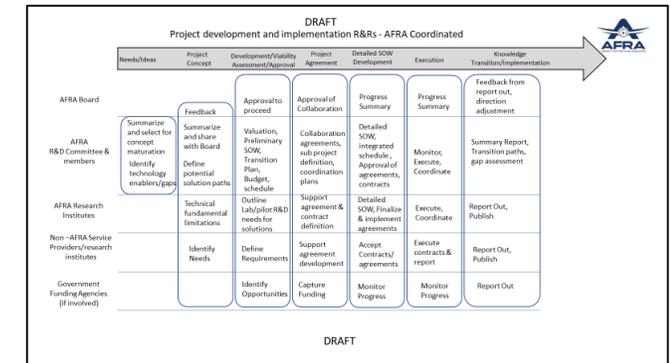
DRAFT

Technology Needs

- Materials Location and ID
 - Efficient means of dismantler/recycler ID of materials location for optimal deconstruction, value capture
- CFRP Airframe to Recovery Process
 - Efficient means of deconstruction, size reduction and sorting for second use material recovery process inputs
- Efficient hazardous materials processing
 - Efficient separation and/or in process destruction of hazardous materials
- Metallic Alloy sorting
 - Separate alloy series for higher downstream value
- Interiors Recycling
 - Assess recycling path potentials

AFRA R&D project Cadence

- Continuously define needs/R&D project concepts
- Mature select concepts and start ~1-2 per year
- Leverage funding
 - AFRA funding
 - AFRA member in kind contribution, directed funding
 - Government funding based on cost match from AFRA and members
 - Members bring government calls for proposal to R&D Committee attention for targeting
- Engage airlines, aircraft owners? If so to what extent
- 2-4 project themes in Detailed SOW & Execution phase
- Seek precompetitive learnings for science and physics fundamentals
- Subsequent scale up and IP generation by AFRA individual members or consortia
- AFRA support of negotiated collaborative terms and conditions



Project development

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Background

- Two B787-8's recently retired and parted out in Scotland.
 - Earliest service retirement of majority CFRP composite primary structure aircraft
 - No current viable EoS CFRP recycling solution as compared to metals
 - The Aircraft Owner supported AFRA capture of CFRP airframe segments for R&D

Status

Near Term (Phase 1)- AFRA ownership and control of select airframe CFRP sections for future AFRA coordinated R&D efforts. (COMPLETE)

Longer Term (Phase 2) – AFRA coordinated recycling R&D to explore improvement of future retirement residual value and avoid landfill disposal

AFRA Support for Phase 1

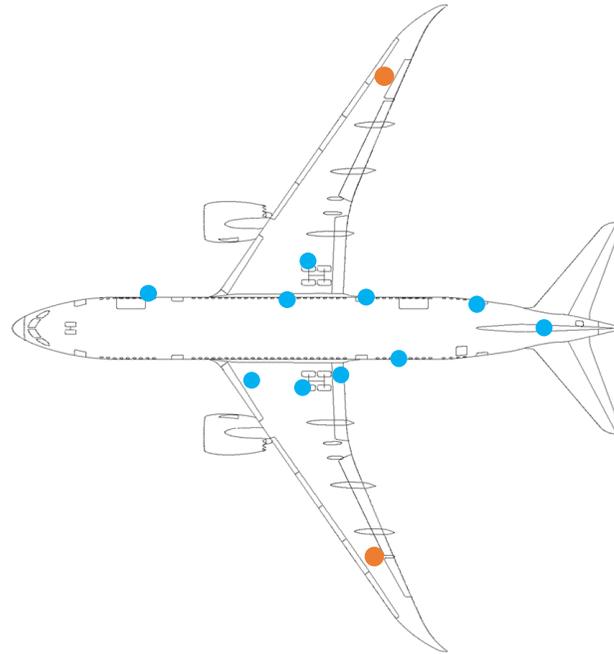
- Contracted for purchase of aircraft sections as articles for a nominal fee
- Contracted for pick up and transportation
- Contracted for unload and storage site
- Overall project management and coordination (Boeing assist)

787 CFRP Airframe Harvested Sections



- First Shipment: 2 Flatbed Trucks Carrying Total of 4 38ft Section Wingtips
- Storage at University of Strathclyde

- Second Shipment: 2 Containers Carrying total of 10 Articles
- Storage at Ecube in Whales



ROM estimates of location to visually depict article location coverage only

1. Wing Root RH
2. Wing Section I/B
3. Wing Section I/B
4. Fuselage to aft bulkhead
5. Aft fuselage cabin
6. Aft fuselage cabin
7. FWD fuselage cabin
8. Vertical Fin
9. Wing Section
10. Wing Section



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