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# What's new in aircraft materials recycling? AiMeRe Project



**CLEANSKY**



ICAO HQ, Montréal, Canada

9 – 10 SEPTEMBER 2014



**CLEANSKY**

- Europe's largest Aeronautics Research Programme ever
- Environmental objectives, mainly CO<sub>2</sub> and noise reduction (from ACARE)
- €1.6B value, split 50/50 between the Commission (cash) and Clean Sky members and partners (in kind)
- 570 participants
- Integrated breakthrough technologies, up to full scale demonstrators
- CleanSky2 is coming.... (€4bn)



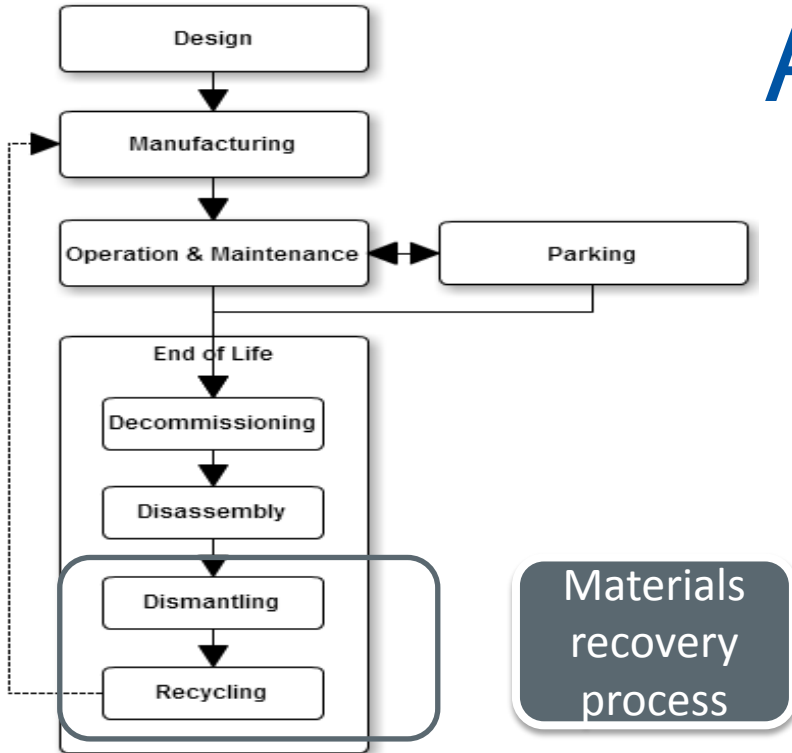


# AiMeRe Project

- Aircraft METals REcycling [aimereproject.org](http://aimereproject.org)
- *Eco-Design* topic area of CleanSky
- Goals: Assess the dismantling process and propose process improvements, ***provide recommendations for Design for Environment***
  - WP1: State of the art
  - WP2: Dismantling process
  - WP3: Processing and metallurgical trials
  - WP4: Potential industrial applications
  - WP5: Dissemination



# Aircraft End of Life

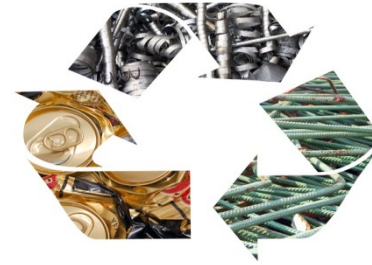


- Why recycle aircraft?
  - Prevent image loss
  - Avoid parking costs
  - Minimize env. impacts
  - Make money from part-out and metal sales
  - Create new European industry
- New 'urban mine'



# Materials Recovery Process

- I. Decontamination
- II. Part-out (under EASA Part 145)
- III. Transfer to the dismantling platform
- IV. Extraction of landing gears
- V. Preparation of dismantling
- VI. Interior stripping
- VII. Customer cuts
- VIII. Specific materials extraction
- IX. Scrapping
- X. Shredding and sorting





# Dismantling Process



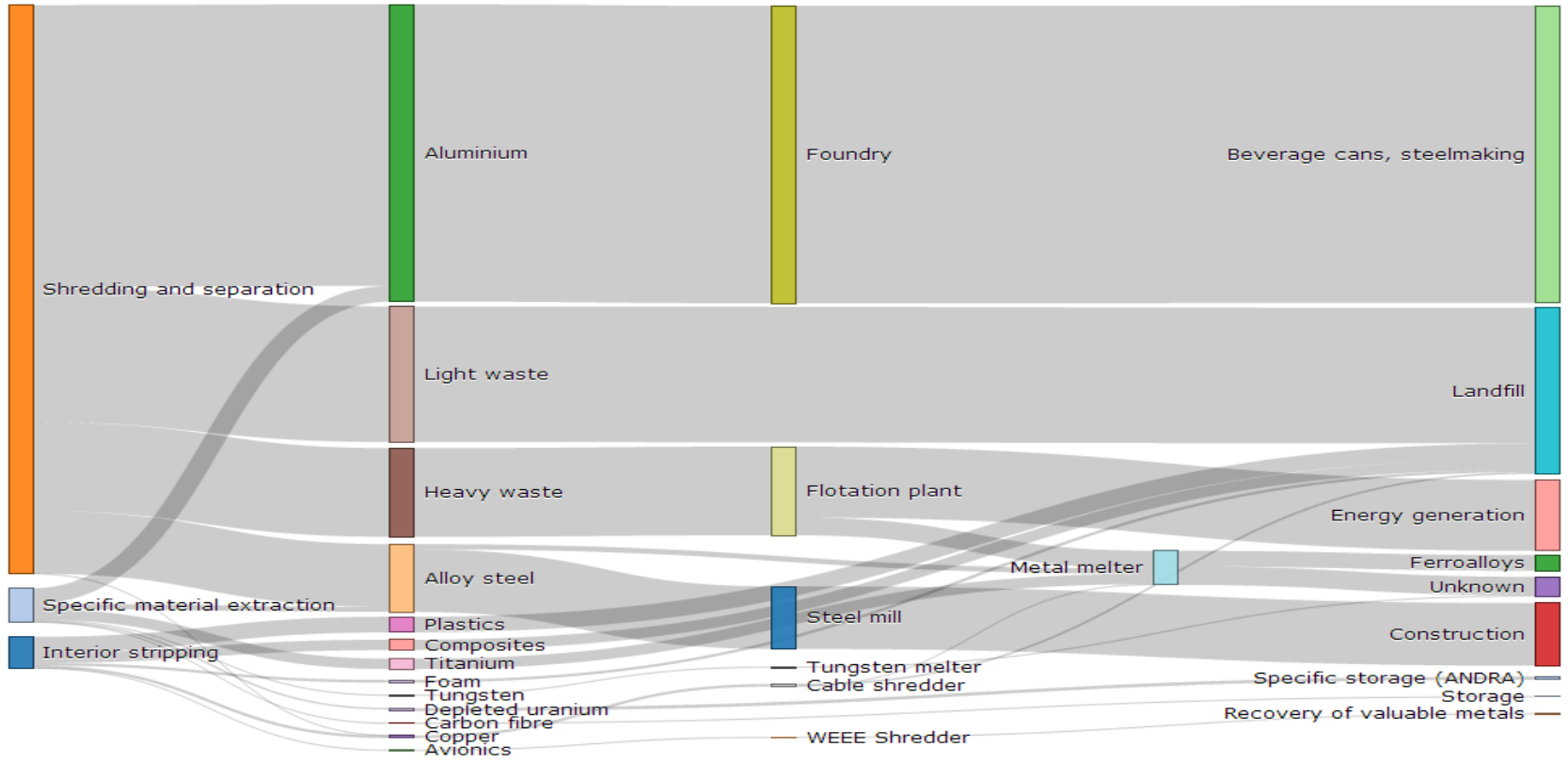


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# video

<http://www.euronews.com/2013/09/16/aviation-from-scrap-to-eco-design/>







# Today's challenges in aircraft recycling

- Manual vs mechanical separation of materials
  - Quality vs cost
- Missing end-use applications
  - Downcycling vs upcycling
- Hazardous materials present in aircraft
- Recycling of EOL avionics and electronics
- Recycling of future alloys (eg Al-Li) and composites



## (further) challenges..

- Logistics of end-of-life aircraft
- Business model
  - MRO vs parking vs waste management
  - Metal prices
- No EU/international legislation
  - Best Management Practice Guides by AFRA





# Opportunities for Aircraft Recycling

- Increasing number of EOL aircraft
  - Economies of scale
- Improving technologies
  - Investment in research
- Increasing environmental awareness
  - Societal pressure
- Future aircraft: Designed for Recycling?





# New Ideas for Problem Areas

- Rivets (notably titanium ones)
  - Recover using a drilling robot?
  - Or through better sorting?
- Toxic paint primer
  - Replace with a non-toxic alternatives?
- Many different alloys and alloy families
  - Use different coloured paint primers to facilitate their identification and separation?



## New Ideas

- An information system for aircraft recycling
  - Information from manufacturers on composition etc. for certified recyclers
- Other inspiration from auto industry:
  - Standard for calculation of recyclability and recoverability
  - Use of secondary raw materials
  - Use of renewable materials



## New Ideas

- Geographical challenges of aircraft EOL
  - Creation of recycling clusters?
- How to create incentives for recycling?
  - Eco-contribution for recycling?
- Find new imaginative ways to employ aircraft materials
  - Eg design objects, interior decoration, ...



# Conclusions

- Recycling is not enough
  - Need to work on the development of end use applications
- For future aircraft, need to move from “end-of-pipe” waste management more towards a “closed loop” approach
- Better exploitation of ‘urban mines’ needed in all sectors
  - Aviation needs do its bit (why not lead the way?)



# Conclusions

- Re-use applications for recovered materials currently missing
  - Downcycling instead of recycling
- Aircraft aluminium alloys could be used for instance in vehicles, bicycle frames and buildings
  - Potential future applications for EOL aircraft aluminium?
  - What about non-structural aeronautical uses?





# Conclusions

- Need to facilitate aircraft dismantling and recycling?
  - Ideally less different materials and material combinations
  - Less (preferably no) hazardous and toxic materials
  - Facilitate recycling through better design
    - Eg less use of glue, more easily removable fasteners
  - Need to provide more information for recyclers on aircraft composition



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