

Can Airplane Recycling Take-Off?

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Introduction

- As of 2015, the worldwide air transportation industry is expected to contain an estimated 10,000 aircraft ready for retirement and dismantling.
- When recycling and disposing of an aircraft, the difference between having a loss and a profit is with the resale of aircraft parts, namely the engines.
- Reselling an airworthy engine could lead to revenues anywhere between \$220,000 and \$4,000,000. Based on estimated payoffs, scrapping an engine delivers estimated revenue between \$16,000 and \$26,000.
- This study performs a decision analysis to decide if applying a change in fiberglass recycling, textile recycling, and systematic disassembly is feasible.

Current Recycling Process

- Decommissioning:** Airliner takes Aircraft out of service. Maintenance continues to make sure that the aircraft parts can be re-sold. The aircraft is often taken to a graveyard. For this project we chose a graveyard in Roswell, New Mexico.
- Disassembly:** Parts are removed from aircraft for resale. Seats, interior cabin panels, insulation, etc. removed.
- Dismantling:** Aircraft structure shredded by excavators. (see pictures below).
- Disposal:** Interior lining is landfilled. Parts that are not sold are either landfilled or sold as scrapped metal. Metal is sold for scrap. Hazardous wastes disposed of according to law.



Methodology for paper

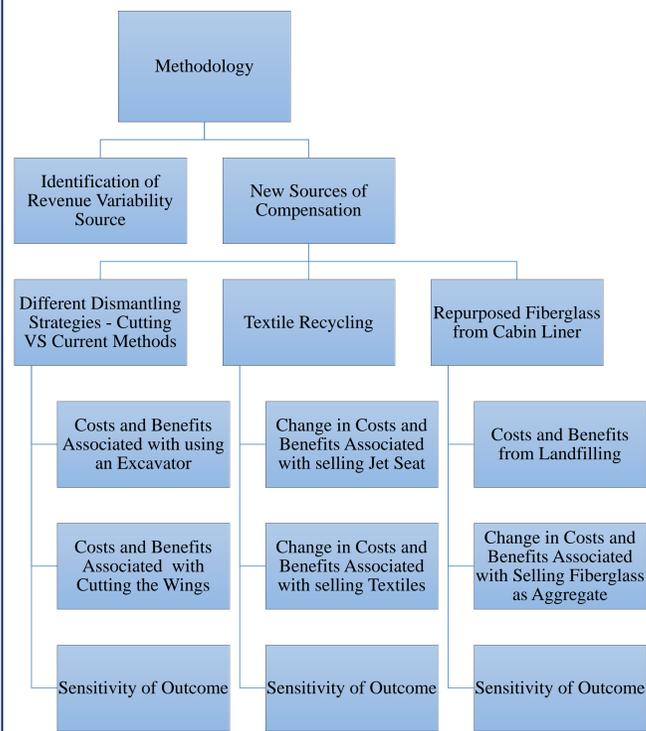
This analysis was divided into two sections:

- Identification of the source of revenue variability
- Suggested Methods to Compensate for lost revenue

The three methods suggested for compensation were:

- Modification of how the wings are demolished for better quality aluminum
- Selling the textiles from seats
- Repurposing of Fiberglass cabin panels and insulation

Costs and revenues associated with improvements were identified. Using Precision Tree © software, variability and risks in resulting options were accounted for in a sensitivity analysis to determine the effect of different factors on the overall mean value of adding the suggested action to the recycling process.

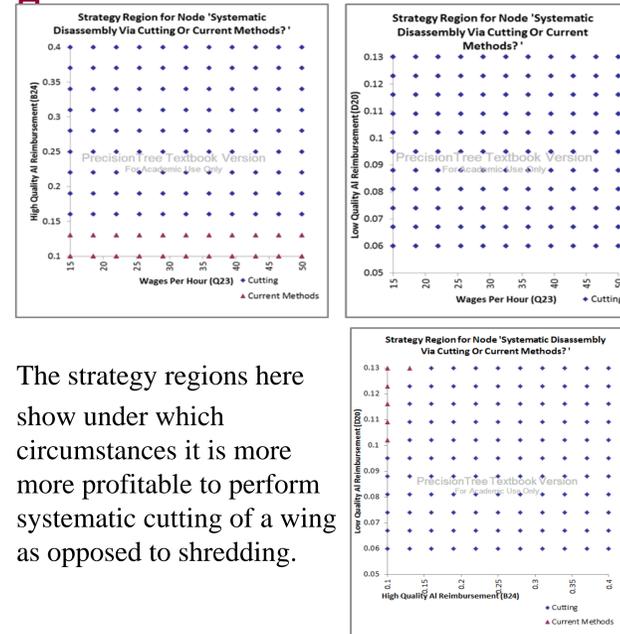


The Aircraft



- The MD-80 series aircraft was known as the workhorse of the American Airlines fleet. American Airlines plans to retire all of its remaining MD-80 Series aircraft (consisting of MD-82 and MD-83).
- For the purposes of this study, calculations were based on the MD-82 aircraft.

Modification of Aircraft Dismantling Process : The Wings

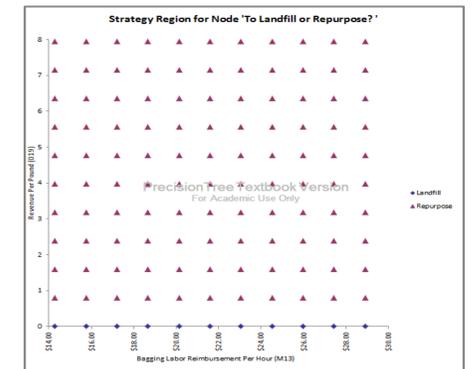


The strategy regions here show under which circumstances it is more more profitable to perform systematic cutting of a wing as opposed to shredding.

- The current processes involved in recycling the outer metallic body of end-of-life aircraft are highly dependent on bulk shredding.
- Recycling aluminum only uses 4% as much CO2 as primary production, energy savings are at 95% (Das et al. 2007).
- Reusing aluminum in a aerospace application requires metals to have a high purity and the specifications are likely to be violated using the standard shredding strategies.
- Cutting the wing piece by piece adds labor costs but increases the quality of aluminum, which in turn increases revenue.

Insulation and Cabin Panel Recycling

- The McDonnell Douglas MD-80 series aircraft originally uses a fiberglass insulation.
- Applying research from the CORDIS from the European Union, the alternative strategy is for shredded insulation to be recycled as an aggregate in high strength lightweight concrete, cladding panels and paving blocks, which works as long as there is a natural pozzolan or fly ash to keep the silica in the from reacting with the alkali in the cement.



This graph shows that as long as the fiberglass can be sold, it is the better option instead of landfilling.

Textile Recycling

- For a 130 seat MD-80, the total estimated amount of leather that could be recycled in 2,248.5 square feet.
- It can be inferred that the leather from a MD-80 could sell for \$11,310.
- \$14.29 is the median salary of a textile employee in the United States. An assumption is also being made that it would take 1 hour of labor the process 1 seat. Labor being considered it would cost \$1,857.70 to process the seats from one plane. The profit from processing leather from a used plane seat could be as high as \$9,452.30.

