

1 CAD design of seating cushions.

## HYBRID AIRCRAFT SEATING STRUCTURE

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### Clean Sky

Clean Sky is the largest European research program developing innovative, cutting-edge technology to reduce CO<sub>2</sub> and gas emissions, and noise produced by aircraft. Funded by the EU's Horizon 2020 program, Clean Sky contributes to strengthening collaboration in the European aviation industry, global leadership and competitiveness.

### Hybrid Seating Structure

Efficient hybrid lightweight design means the generation of innovative products using lightweight construction, based on a material combination which increases the efficiency of a given system. The targets of our work are:

- Manufacturing and installation processes for hybrid structures (case study: seating structures) to enable the industrial application.

- Reduction of the CO<sub>2</sub> footprint of PUR seating cushions by using
  - raw materials based on renewable resources, and
  - raw materials out of recycling process
- Substitution of hazardous flame retardants by flame retardants out of sustainable resources or non-hazardous, easy-to-recycle flame retardants.
- Development and material selection according to the principles of Eco Design
- Use of Life Cycle Assessment (LCA) and collection of material and production data for evaluation of the environmental benefits





## Fire Protection

Flame retardants are a key element for every flammable material to pass the high fire regulation standards of aviation. Most plastics need special flame retardants which provide good fire behavior without a strong impact on the mechanical properties. The EU evaluated halogenated flame retardants with REACH, and new REACH-compatible substitutes need to be found. Furthermore, a change in regulations now considers the production of toxic fumes while burning, which inhibits the use of flame retardants with a radical-catching mechanism. One highly flammable plastic in an airplane is the flexible polyurethane-based seating cushions of aircraft seats. Where the wrong flame retardant is used, this material burns with an immense smoke production inhibiting visibility and placing all passengers in danger of intoxication.

## Advanced Green PUR

Polyurethane (PUR) is a key material in the aircraft interior. Not only the seating cushions but also other design elements of the furniture are made of PUR. In a large passenger aircraft the amount of seats and cushion material is significant to the overall weight and has a high impact on the recycling strategies needed for these airplanes. New developments allow the substitution of harmful substances in the production process of the foams, and the use of renewable raw materials. The renewable raw materials are a key element in becoming independent from fossil carbon sources, in order to achieve better availability and lower fluctuations in price due to independence from politics and from the new development of natural mineral deposits. Furthermore, they have the possibility to become carbon dioxide

neutral in an all-renewable-energy-based economy and therefore do not contribute of land-filling fossil carbon in the atmosphere.

Renewable raw materials are either carbon dioxide based (plants or CO<sub>2</sub> directly) or recycling materials from mechanical or chemical recycling processes.

The new developments are:

- New PUR formulation building on CS1
- Advanced recycling process for PUR and its additives

## Call for Partners

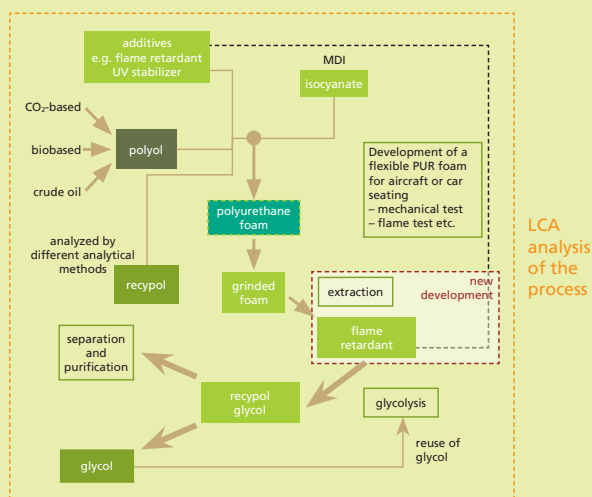
Collaboration is searched for the design and manufacturing of molds for the hybrid liquid compression co-molding process according to the design of the “Hybrid Aircraft Seating Design (HAIRD)” project.

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## Recycling of biobased polyurethanes and their flame retardant.



LCA analysis of the process