
Master’s thesis at the Institute for Helicopter Technology

Summary and Background:
So far, small and medium-sized helicopter are mainly equipped with skid landing gears because of their lower weight, lower complexity and cost-effectiveness compared to a wheeled or retractable landing gear. However, helicopters with skids have limited application areas and would gain greater flexibility with a wheeled landing gear. Wheeled landing gears are usually seen with helicopters from a size range of about 3 tons take-off weight and upwards. In contrast to skids it offers:

- Easy maneuvering of the helicopter on the ground, taxiing to the launch site or hangar
- A higher energy absorption at impact, since they are mostly equipped with oil-hydraulic dampers
- The suspension design characteristic allow for a specific tune so that ground resonance is not favored or made possible

To enable the use of retractable landing gears in smaller helicopters, a very weight-saving and cost-effective integration is necessary. Landing gears are responsible, unless they are designed retractable, for a significantly aerodynamic resistance. They are therefore often considered in the hull retractable constructed, which, however, is associated with higher design effort and even more to development/production and maintenance costs.

The objective of this thesis is to conduct a cost-benefit analysis of helicopter landing gears for small helicopters and electric powered vertical takeoff and landing aircraft.

Procedure:
1. Literature research and requirement analysis
2. Generation and validation of a small/medium sized Helicopter as well as a eVTOL simulation model with NDARC (NASA Design and Analysis of Rotorcraft)
3. Assembly of Mission scenarios into a representative spectrum
4. Characterization of significant landing gear parameters
5. Development of a landing gear cost-fuction
6. Sensitivity Analysis of selected design parameters
7. Cost-benefit analysis and discussion

Methods: python, openMDAO, NDARC, Gensim

Qualifications:
- Lecture: Helicopter Engineering 1 (Auslegung und Entwurf v. Hubschraubern 1)
- Lecture: Fundamentals of Helicopter Aerodynamics or Flight-physics of Helicopters
- Programming experiences and enthusiasm to program

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