Platz, R and Götz, B., 2017, Non-probabilistic uncertainty evaluation in the concept phase for airplane landing gear design, Proceedings of the Society for Experimental Mechanics, Volume 3 Part F2, 2017, Pages 161–169, 35th IMAC Conference and Exposition on Structural Dynamics, 2017; Garden Grove; United States; 30.1–2.2.2016.

Abstract Predicting the kinematic and dynamic behavior of complex load bearing structures with high safety requirements such as landing gears is time consuming. For that, mathematical analytic, finite element or multi body surrogate models are needed for numeric simulation purposes. Today, these models take into account both deterministic and non-deterministic approaches. However, before adequate and verified simulation begins, the modeling of the mathematical surrogates requires most of the time for adequate prediction, including model verification, before even more costly experimental testing phase begins. This contribution investigates an approach based on Info-Gap analysis to predict critical performance requirements of major landing gear design alternatives in an early design stage. This analysis uses only simple analytical but comparable and sufficient adequate models for four major design concept alternatives according to basic design rules found in relevant literature. The concepts comprise one telescopic and three different trailing link designs. It is the aim to make decisions in selecting the most suitable design as early as possible in the design stage with taking into account uncertaintybefore time consuming efforts in modeling finite element and multi body models for detailed prediction are conducted. Particularly, the authors evaluate the robustness to uncertainty or how much of an uncertainty horizon by means of uncertain compression stroke ability due to varied stiffness properties can be tolerated with the four different concepts, until the absolute maximum allowable compression stroke limit is reached. This contribution continues the authors prior work presented at IMAC 2016. In there, the authors evaluated and compared the performance requirements like compression stroke ability and ride quality, elastic force retention, structure strength, and weight of mechanisms for main and nose landing gears resulting from the four significant structural design concepts in mathematical physical models in an analytic deterministic way.

Keywords Concept evaluation, Decision making, Info-gap analysis, Landing gear, Uncertainty.