Within the nuclear and aeronautic industry advanced forms of nondestructive testing (NDT) methods have been applied both for manufacturing control (e.g. welding) and in-service inspections since more than four decades. This development has been driven by the introduction of structural design and risk based inspection programs based on the damage tolerance concept. Increasing fuel costs and sharp waste requirement in the air transport industry drives the development of lighter constructions reducing security margins in contrast to more strict regulations and requirements on high safety from society. The title above refers to an ambition to also convince conventional industries to use modeling as a tool in the development of new nondestructive technologies.

One possible way to remove excess material, for example in gas turbine engine components, without decreasing safety is to increase the capability and reliability of used quality control. Such quality control improvements would facilitate less uncertain fatigue life predictions, which would then support cutting some of the excess material in the component without lowering the safety factors. New manufacturing concepts require more sophisticated methods of inspection that besides being tailored for a high degree of automation also increases the information exchange to the whole production process.

The seminar will by some examples describe the development of a methodology that incorporates nondestructive evaluation (NDE) with structural integrity and thereby providing lifetime assessment. By mathematical modeling of a NDT system it is possible to provide a higher level of information than previous systems. This new area of research, Integrity and quality assessment by NDE (IqNDE), intends to increase the amount of information from the output of nondestructive techniques in order to increase the economic value of the inspections.

Ultrasonic techniques are not only used as methods for in-service inspection of defects but also as a tool for quality assessment in various manufacturing processes. Examples of the latter are measurements of induced hardening depths, assessment of weld quality (defects) and cast iron quality (nodularity). In an ongoing European project (Product Uniformity Control – PUC), the intention is to use ultrasonic information in order to assess material parameters such as grain sizes and content (ferrite/martensite).