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Online Damage Detection on Metal and Composite Space Structures by Active and Passive Acoustic Methods

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In the frame of ESA funded programme Future Launcher Preparatory Programme Period 1 "Preparatory Activities on M&S", Aerospace & Advanced Composites and Thales Alenia Space-Italia, have conceived and tested a structural health monitoring approach based on integrated Acoustic Emission - Active Ultrasound Damage Identification. The monitoring methods implemented in the study are both passive and active methods and the purpose is to cover large areas with a sufficient damage size detection capability. Two representative space sub-structures have been built and tested: a composite overwrapped pressure vessel (COPV) and a curved, stiffened Al-Li panel. In each structure, typical critical damages have been introduced: delaminations caused by impacts in the COPV and a crack in the stiffener of the Al-Li panel which was grown during a fatigue test campaign. The location and severity of both types of damages have been successfully assessed online using two commercially available systems: one 6 channel AE system from Vallen and one 64 channel AU system from Acellent.

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