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## AN ITALIAN EXPERIENCE ON MORPHING AIRCRAFT SYSTEMS

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It is not a case the session on “Adaptive Structures for Aeronautical Applications” within AIDAA XXV has been jointly organised by the Politecnico di Milano, the University of Napoli and the Italian Aerospace Research Centre (CIRA). Those organisations have been producing substantial work within the National frame on that topic and are more and more cooperating on many projects, within the Italian and the European frame. This co-operation has the added strength in bringing together their broad international relationships that spread over the five continents and involve partners from Brazil, Canada, China, Russia, South Africa, Turkey, USA and, of course, the EU. Such a favourable situation is naturally bringing to consolidate the achieved attainments and move forward to look for the real implementation of the developed technology, making the research group to face important challenges for the certification and the deeper understanding of the related phenomena.

In this paper, the attention will be paid to the different steps that are necessary to conceive, design, manufacture, test and implement the targeted morphing systems in flight. A special

focus will be given to the aspects of refining and shaping the available tools for this kind of integrated structures, individuating the necessary upgrades for those special processes, essential to get the authorizations by the aviation authorities as the FHA investigations or the aeroelastic test, and assessing the necessary standards for making the processes compatible to the numerical and experimental tools of the different partners to allow for collaborative developments. Also, further going into the details of morphing systems development, certain peculiar aspects shall be dealt with, often exasperated within that frame, like studies on the kinematic behaviour of highly deformable architecture, the inclusion of suited elasticity properties in the mechanical connections, the effect of deformable skin of other special materials on the structural damping and dynamic response, the effects of the higher modal density on the aeroelastic behaviour, optimisation aspects including topology of components and geometry of the structural parts, the experimental test configurations these particular systems shall undergo in order to provide data sufficient to be allowed to fly, and so on.

In the end, it will be presented a general overview of the current scenario of the research on morphing in Italy, including connected partners, highlighting major scientific, technological and implementation challenges.

Keywords: Morphing wing structural systems, Numerical modelling, Structural static and dynamic behaviour, Experimental characterisation, Aircraft systems implementation, Flight tests.