

AN EXCELLENCE PARTNERSHIP BASED ON HYDROFORMING

NAVA BECOMES ALENIAAERMACCHI'S TECHNICAL PARTNER TO DEVELOP HYDROFORMED CONNECTION



In parallel with the consolidated tradition in the field of military trainers, AleniaAermacchi (a Finmeccanica Group company) has recently played an increasingly important role in the civilian framework by steadily consolidating its participation in international programmes. Indeed, since the latter half of the 1990s, AleniaAermacchi has followed a specialisation path that has won it a leading role for design and implementation of the cold moulding section of Nacelles for leading international airline and corporate aircraft manufacturers. AleniaAermacchi regularly participates in international competitions, winning important acknowledgements in this sector. The skill to

successfully participate in international programmes is the most tangible result of the company's efforts in an ongoing quest to improve the product, optimise processes, and enhance overall efficiency. Nowadays the capacity to cut down production costs and times in order to face the growing and intensive competition in the civil aviation market is an essential requisite. In such a competitive context, results are ensured by factors, such as the experience of personnel, their competence, the capacity to work in teams and by goals, and the insight to daily adopt ongoing improvements. This is what underpins AleniaAermacchi's partnership with the company F.lli Nava s.r.l. of Monza (MI) to produce a Nickel T-piece using Tube Hydroforming (THF) technology. As a result of the partnership with Nava, the renowned manufacturer of hydraulic presses, the company AleniaAermacchi has had access to dedicated know-how relative to hydroforming technology applied to the tube. Making use of all previous productions and with a limited investment budget, the company Nava has designed a pilot mould to run field tests on actual product feasibility for production. The company Nava's approach to hydroforming issues has always focused on practical implementation that, despite being partly simplified to avoid increasing costs, actually takes into account many critical factors, such

as the interaction of different materials placed in contact, tolerance levels of parts being processed and processing of mould parts, friction of moving parts involved, and the effect of lubrication. All this allows a very significant forward leap, starting from numerical simulation and reaching the actual production of items, with a detailed study of all aspects that will later be involved in the production cycle with impetus, in order to evaluate their impact on feasibility and economic efficiency of the process as further upstream as possible. Hence, using a general purpose system that is at present installed in the Company, Nava has created a flexible modular system to support hydroforming tests. This system manages, with appropriate targeted adjustments, quite a large collection of pieces in production-like conditions with regard to the various criticalities described above. In order to complete the mechanical solution and hydraulic drive, a test software has been designed to define a programmed and repeatable process with a fair degree of reliability and repeatability of tests, besides a numerical record of the main drivers that act on the phenomenon in question. All this was achieved as a result of the company Nava's extensive experience in controlling the deformation process. This has always been a strong point of presses marked with

the red rhomboid. Using the hydro-forming technologies perfected by the company Nava has allowed to adopt an entirely new and more decisive approach to the implementation of a critical part for the programme Aer-macchi is developing. The part to be constructed with THF technology is a portion of anti-freeze system tubes of nacelles for a regional jet airliner. The criticality associated with this connection results from heating/cooling cycles generated by the system's intermittent function, and by vibrations induced by the turbofan engine on the structure and anti-freeze system. Considering the criticality of the part, the moulding method must ensure very small dimensional tolerance both in terms of thickness and of external surfaces, in order to allow jointing when welding the head and, not secondarily, to ensure that the air flow passing inside it complies with the plant engineering project requirements. Besides the problem of "design-based construction", the moulding method had to reduce lead time, non recurrent costs (reducing the equipment required for moulding), and recurrent manufacturing costs, while ensuring higher repeatability of the process. Compared to the traditional moulding method (made up of two halves of a mould), hydro-forming eliminates contouring with a 5 axis milling machine, welding to join up the two halves of the T-piece, and non-destructive controls after welding. The finished piece is more uniform, both in terms of surface aesthetics and of the plastic flow lines of the material. Hence, its thickness is more constant and the material accumulates less structural stress. Last but not least, it is subjected to calibration during the process to stabilise its finished dimensions. All these factors cannot be immediately calculated numerically in terms of impact on costs,

but they will determine the assured success of the piece in the framework of the innovative project implemented by AleniaAermacchi. When facing the challenge of the civil aviation market, once again AleniaAermacchi has exploited its experience and know-how without, however, rejecting new solutions but, instead, by favouring and making the most of the opportunity to exchange information and specific experiences of a leading company in its sector, such as the company Nava. It has considered as common factor both successes and errors that are part of the experience acquired during its longstanding glorious history.