MULTILAYER 16g CUSHIONS REPLACEMENT PROJECT

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The replacement of seat cushions on seats installed on aircraft required to comply FAR/CS 25.562 is one of the key areas of business of TESTORI AERO SUPPLY (TAS).
TAS holds an EASA DOA (EASA.21J.350) and POA (IT21G.0014) with yearly consolidated experience in design and manufacturing of aircraft seat cushions.
The following constraints are well-known to the companies active in this market:

1. High costs and lead-times to procure test articles, especially the seats.
2. Lack of knowledge on the already certified seat design.
3. Difficult cooperation from seat manufacturers

TAS has submitted the project " **Development of replacement method for all kind of 16g dynamically tested aircraft seat cushions"** to the European Commission programme for research and innovation named **Horizon 2020.**
The project has been accepted as innovative project eligible to receive a founding by the E.U.
TAS has developed the project in cooperation Politecnico of Milan and with the support of GEVEN, an Italian aircraft seat manufacturer, based on the principle contained in FAA report DOT/FAA/AR-05/5,I **Development and Validation of an Aircraft Seat Cushion Component Test—Vol. I**

TAS has signed with EASA (European Aviation Safety Agency) a Technical Advice Contract to receive technical guidance during the project.
TAS, based on its yearly experience in cushion manufacturing, has decided to use graphite based foams of different density and having different indentation hardness:
"Hard foams" having a density of approx. 65-70 kg/m3, typically used as cushion lowest layer sustaining the loads at the contact with the seat pan.
"**Medium foams"** having a density of approx. 50 kg/m3, typically used as intermediate layer between the seat cover and the hard layer.
"Soft foams" having a density of approx. 45-55 kg/m3. The soft layer is located below the seat cover and is the first contact with the passenger. The aim of this foam is to improve passenger comfort and contribute to **Deep Vein Thrombosis (DVT)** prevention.
The procedure suggests that, based on the comparison results among

- Full scale 14g down dynamic tests using a selected seat equipped with cushions made of selected foams
- Full scale 14g down dynamic test using a rigid seat equipped with cushions made of selected foams
- Dynamic compression tests of cylindrical specimen of selected foams
- Numerical analysis of the dynamic compression tests

It is possible to evaluate if a foams performs better with respect to another one in terms of max lumbar spine load.
Additionally it has been demonstrated how the dynamic compression tests results (numerical) are equivalent to the full scale 14g down dynamic tests results (experimental)
Based on these assumptions in case of a seat cushion substitution project it is possible to evaluate the performances, in terms of max lumbar loads, of the originally dynamically tested

cushion and of the proposed new one performing a dynamic compression test of cylindrical samples.