

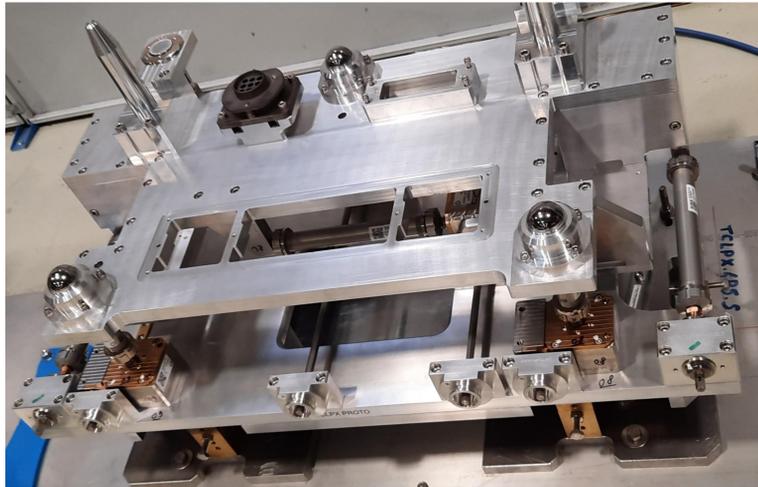
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OBJECTIVES

Design and test of an adjustable 6 Degree of Freedom (DoF) platform that could be remotely activated.

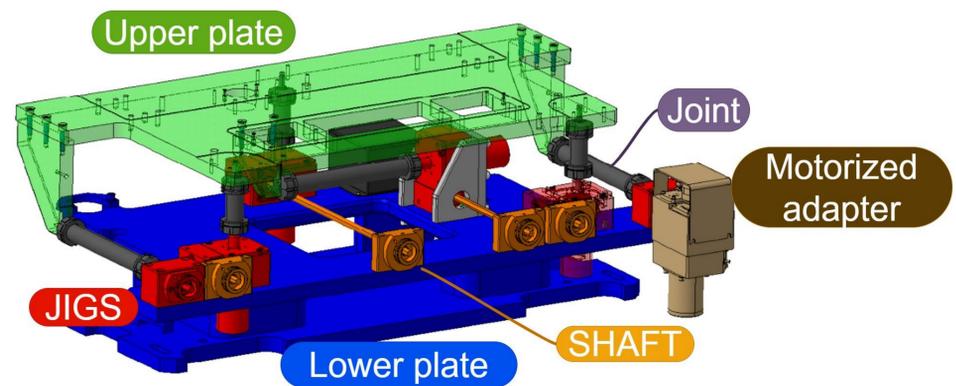
- **Scalable** platform design based on in-house jigs and joints Design.
- **Intuitive kinematics** of adjustment system with micrometric resolution.
- Optional **remote adjustment** using fast plug-in micrometric motorized adapters.



6 DoF Platform Concept

Design of the platform is focused on the scalability and easiness of use. It is composed of:

- A lower interface plate that is rigidly fixed to the floor
 - A set of 6 micrometer actuators (Called JIGs) to perform adjustments in all DoF. The radial actuation is carried out by radial jigs while the vertical and longitudinal adjustments are performed by vertical jigs.
 - Backlash-free joints, with tailored length to avoid any hyperstatism.
 - A set of actuating shafts and supports, gathered at the front part of the platform for an easy access during the actuation of each jig.
 - An upper plate on which the accelerator component can be installed.
- Two platform models are available with a Safe Working Load (SWL) of 300kg and 2000kg to comply with the users needs.

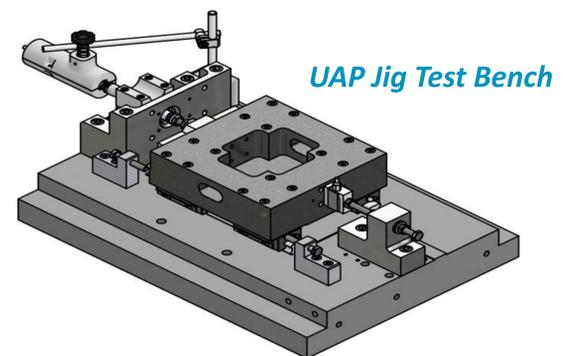


JIGS CHARACTERIZATION

Key components of the platform are the vertical and radial Jigs. A full characterization has been performed using a specific tests bench able to perform load tests, backlash estimations and torque measurement. This characterization step was an important milestone toward the motorization in order to build a functional specification of the motorized adapters.

Mechanical parameters - Vertical Jig

PARAMETER	TARGET	RESULT
Unloaded torque [N.m]	<0.5	0.37
150% Load torque [N.m]	<8	6.7
Input Backlash [μm]	<15	13.3
Output Backlash [μm]	<5	3.4

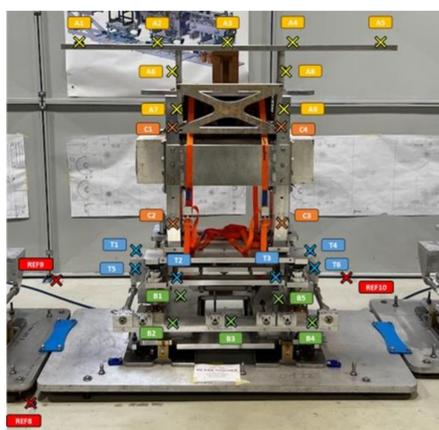


PLATFORM PERFORMANCES – MANUAL VERSION

A series of tests, aiming to represent the different use-cases of the platform, have been conducted in a manual way before installing the motorized adapters. Main results are the following:

- Platform position remains stable within 20μm under external disturbances up to 100kg.
- In case of load removal (800kg) and reinstallation, the UAP position repeatability remains below 12μm and 10μrad (3D Values).
- 3D alignment: Starting from a defect of up to 10mm, reaching a position precision of +/- 50μm and +/-100μrad (3D Values) is possible within 3 to 4 iteration.

UAP Loaded in test Configuration



MOTORIZED ADAPTERS

Development of a plug-in solution to motorize the UAP is under progress. Micrometric motorized adapters will be connected directly to the manual version of the platform to obtain a remotely adjustable platform. Similar adapters prototypes have already been tested; the main achievable characteristics are the following:

- Motorized actuation stroke at the jig level of +/-2.5 mm with a resolution better than 5μm.
- Possible readjustment of the motorized stroke within the JIG global stroke of +/-15 mm by a fast plug-in solution.
- Absolute position monitoring at a micrometric level (20μm maximal defect along the full stroke), provided by an embedded resolver in the adapter.
- Mechanical end-stop safety feature in order to prevent any displacement above the allowed stroke.



Motorized adapters prototypes

CONCLUSIONS

- **Manual version of the UAP validated** following important test campaign.
- Micrometric position adjustment capability confirmed.
- **JIGs characterization performed**, allowing to validated the requested individual performances and prepare construction of motorized adapters.
- **Motorized adapter design validated** on a bigger structure, concept to be scaled for the UAP use in order to validated the global performances.