INERTIAL COMPENSATION METHOD FOR AN IMPULSE FACILITY : TRANSFER FUNCTION METHOD

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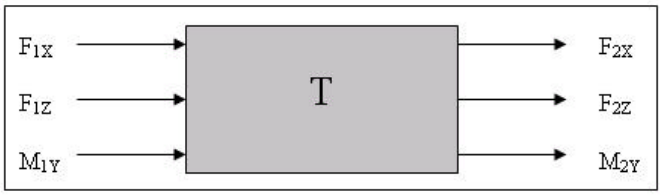
Force measurements on models in impulse facilities, such as V.K.I. Longshot, are perturbed by inertial effects. The goal of this project is to improve measurement capability in this type of facilities by developing and testing an inertial compensation method.

The chosen approach is the measurement of the transfer function of the system (model and balance) by recording his response to a single pulse excitation. By applying this transfer function to the measured Forces and Moments, it's possible to obtain the true aerodynamic forces.



$$\begin{pmatrix} F_{1x} \\ F_{1Z} \\ M_{1Y} \end{pmatrix} = \begin{pmatrix} T_{11} & T_{12} & T_{13} \\ T_{21} & T_{22} & T_{23} \\ T_{31} & T_{32} & T_{33} \end{pmatrix}^{-1} \bullet \begin{pmatrix} F_{2X} \\ F_{2Z} \\ M_{2Y} \end{pmatrix}$$

To apply this single pulse excitation, we've chosen to apply a constant force to the system and to remove this force in an as short as possible time. Our objective is to obtain a force cutting time of about 50 µs (that correspond to a 20 KHz excitation).

We have established an experimental technique to apply this type of solicitation and we have created a one axis fast response balance that permits to record the exact solicitation profile applied to the system.

Finally, we have computed the transfer function of the system with a data processing software and we've tested the method on a recording from Longshot.