REFERENCE TOOLS (AL, 1cm thick plates)

PHASE 1
With 2 ref plates mounted on 2 opposite sides of the bottom tray, the grid is fixed to the tower in the right place.

The ref tool is aligned to the bottom tray by means of an hole and a slot in correspondence to the ref holes that are present in inner side of the bottom tray closeouts. The ref tool is fixed with 2 M$ and 4 M2.5 screws.

The same set of ref holes and threaded holes can be duplicated on the grid. This system will put in place the tower in good alignment respect to the grid.
Possible development for flight units

Refer the tool to tower by the position pins on the bottom tray.

Refer the tool to the grid with position pins that enter in holes drilled in the grid.

Sketch of the proposed reference tool for EM unit.

This tool is equivalent to the 2 reference tools for the EM tower joined together in a more defined geometry. The tool is used to refer the tower to the grid by 3 points on the grid and 3 points on the inner side of the bottom tray closeouts. Few screws fix the relative position.
The JOINT (EM case)

No need of any rework of the flexures; the screw is put in place when the glue is still uncured; the screw itself will align the insert hole to the flexure hole; maximum possible coupling insert-screw with shoulder hole and flexure hole.

All the 12 inserts can be made in the same way.

Not round shape of the insert to avoid rotation

The tolerance of the axis of the thread part and of the cylindrical part can be very tight: these 2 small pieces can be optimized apart (fine thread pitch is possible). The 2 materials can be optimized to reduce relative friction.
THE PROCEDURE

- Assemble the Reference Tools to the Tower
- Do a Dry Test
- Place the 12 inserts in the grid with a long pot life glue (Hysol EA934 NA)
- Remove eventual outflow of the glue
- Assemble the tower to the grid by means of the reference tools
- Put the bolts in the flexures and torque them. The bolts will align the inserts to the flexures holes
- After the glue is cured, all the 12 bolts should be easy to be removed, the inserts will be bonded in a fixed configuration
- The same procedure can be used to match the tower to a second grid after (flight units). To put back the tower to this same grid for TV test, lower tolerance screws can be used.

Hysol EA934

Torquing the bolt the grid insert will be pushed in the flexure direction and stopped by the head against the flexure (blue arrow). During the torquing the inserts will not turn using the head shape showed in the picture.
DRAWINGS DETAILS

Grid holes $\frac{1}{2}''+0.02$

Glue thickness 10mils

Shoulder diam $\frac{1}{4}''+0.0005$

Flexure hole diam. = $\frac{1}{4}''+0.001$

Grid insert diam = $\frac{1}{4}''+0.001$
IMPROVEMENTS

- It should be possible to fit all the 12 bolts
- It should be easy to machine the grid, there is the need of cylindrical holes only, the tolerance errors can be recovered by the glue thickness
- The bolt is a single piece, with a greater diameter. It engages the grid with a quarter of inch fine pitch thread, so it is possible to increase the torque.
- The system is simplified from manufacturing and assembly point of view
- The stiffness of the joint is increased, so the first resonance should increase
THE FLIGHT INSERT CAN HAVE AN INCREASED DIAMETER