

## **K1DM3 Design Note**

### **Manually Deploying K1DM3 in case of an Actuator Failure**

**Chris Ratliff**

**18 Feb., 2016 (v1.1)**

#### Outline:

In the case of actuator failure, removing the Exlar actuators is trivial in the deployed position, simply unpin the ends of the actuators and remove. The kinematic coupling clamps keep the swing arm stable in the deployed position. In the cases of the mirror being on the handling cart in the mirror remove position, or if installed at the end of the tower in the retracted (or partially retracted) position, actuator removal is more involved. This document describes the procedure.

#### On handling cart with mirror in remove position:

In this case there needs to be a system that eliminates any force on the Exlar actuators. We achieve this with a linear jacking screw assembly. This assembly is shown in Figure 1. This manual jacking assembly consists of a weldment that attaches to the swing arm and parts that attach to the inner drum. The jacking screw attaches to these parts with pins at clevis joint connections. The entire assembly installed on K1DM3 is shown in Figure 2.

To remove the Exlar actuators in the mirror remove position (or any non-deploy position) while on the handling cart there are a series of steps outlined here:

1. Install Cross bar clevis on swing arm
2. Install inner drum clevis on inner drum
3. With two people holding the jacking screw, person1 is to pin the machine screw end of the jack to the inner drum clevis with a ball detent pin.
4. With person2 holding the larger diameter end that attaches to the swing arm, person1 extends the jack screw with the rotation handwheel until the jack is extended enough that person2 can insert another ball detent pin into the pin holes.
5. To eliminate force on Exlar actuators, the jacking screw must be further extended to take up the gravitational forces of the swing arm.
6. When the u-joint sides of the Exlar actuators can be moved freely, they can be removed by removing the pins and screws at each end of the actuator.

#### K1DM3 installed on tertiary tower with mirror in retract (or partially retracted) position:

Again in this case there needs to be a system that eliminates any force on the Exlar actuators so that they can be removed. In the case where the mirror is retracted at the end of the tertiary tower, the jacking screw assembly needs to initially have a pushing force to remove the actuators and then a

pulling force to bring the swing arm back into the deployed position. The initial pushing force is to push against the retract docking mechanism and relieve any forces on the actuator so the pins can be removed. Subsequently, we want to bring the swingarm into a safe position where we can lock the swingarm in the deployed position where the kinematic coupling clamps will keep the mirror safe from large amplitude movement. Here are the steps in removing the Exlar actuators when in the retracted position while installed on the tertiary tower:

1. Install Cross bar clevis weldment on swing arm
2. Install inner drum clevis weldment on inner drum
3. With two people holding the jacking screw, person1 is to pin the machine screw end of the jack to the inner drum clevis with a ball detent pin.
4. With person2 holding the larger diameter end that attaches to the swing arm, person1 extends the jack screw with the rotation hand-wheel until the jack is extended enough that person2 can insert another ball detent pin into the pin holes. (this person should wear a harness attached to the tertiary tower)
5. To eliminate force on Exlar actuators, the jacking screw must be further extended to take up the spring forces of the retract docking springs.
6. When the u-joint sides of the Exlar actuators can be moved freely, they can be removed by removing the pins and screws at each end of the actuator.
7. After actuators are removed, jack screw assembly can be retracted so deploy clamps can be set.

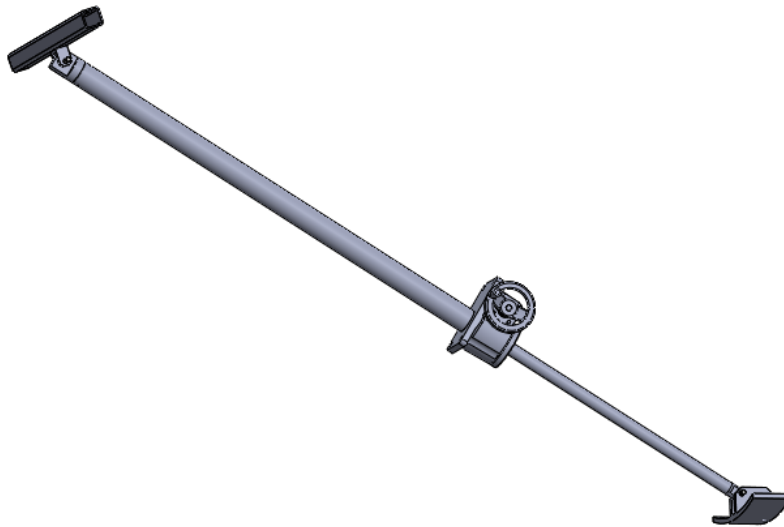


Figure 1. Manual Deploy Jacking Assembly

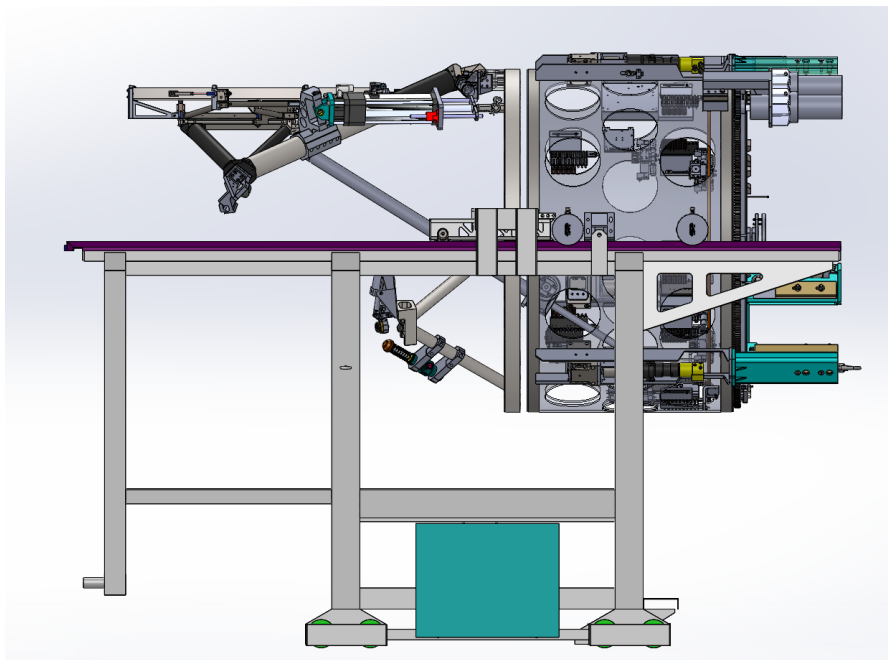


Figure 2. Manual Deploy Jacking Assembly Installed on K1DM3 (Handling Cart Shown Too)

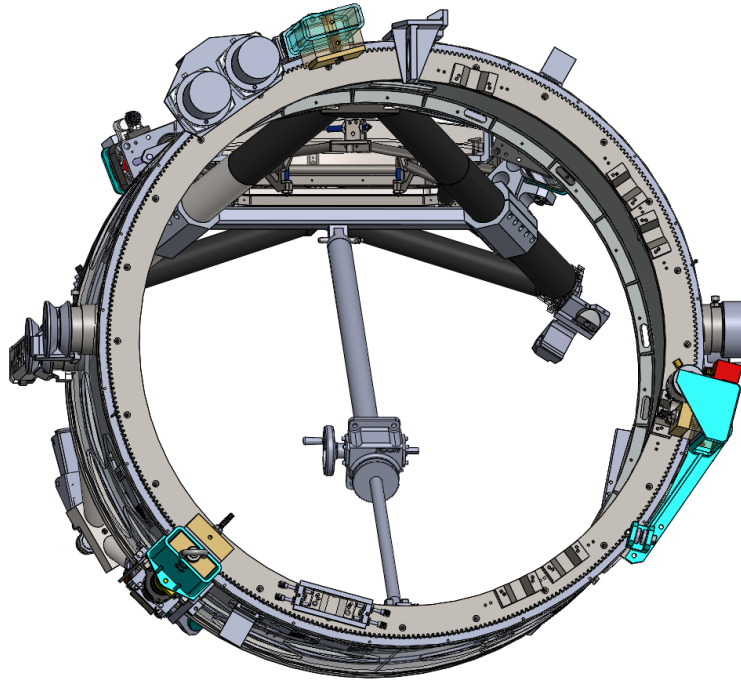


Figure 3. Additional View of Manual Deploy Jacking Assembly Installed on K1DM3

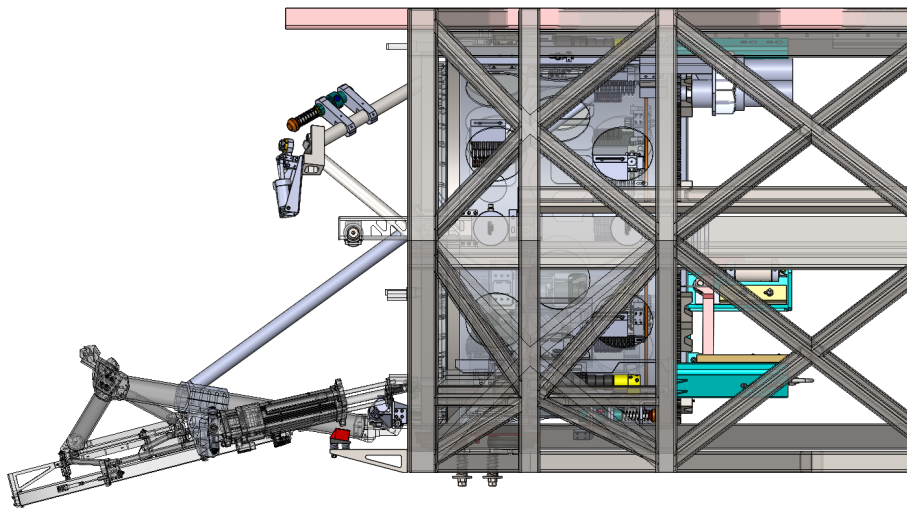


Figure 4. Manual Deploy Jacking Assembly When Actuator Fails At End of Tertiary Tower

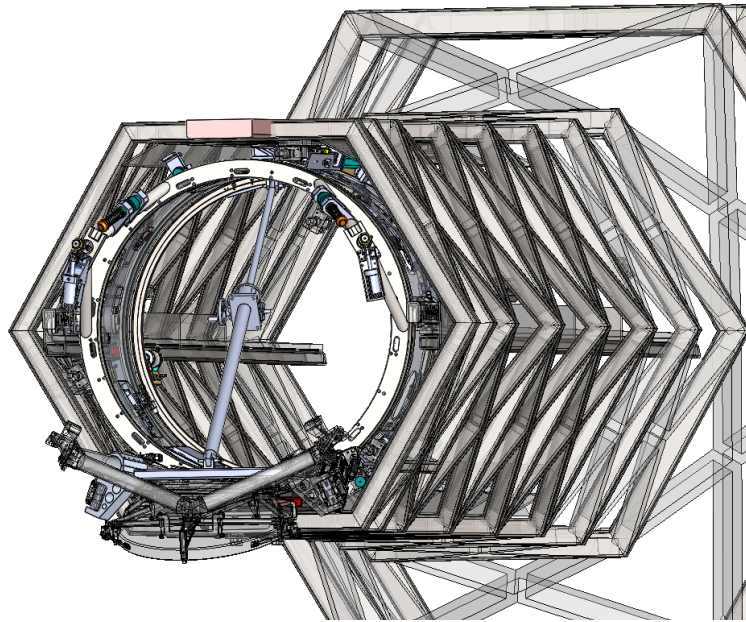


Figure 5. Additional View When Installed At End of Tertiary Tower