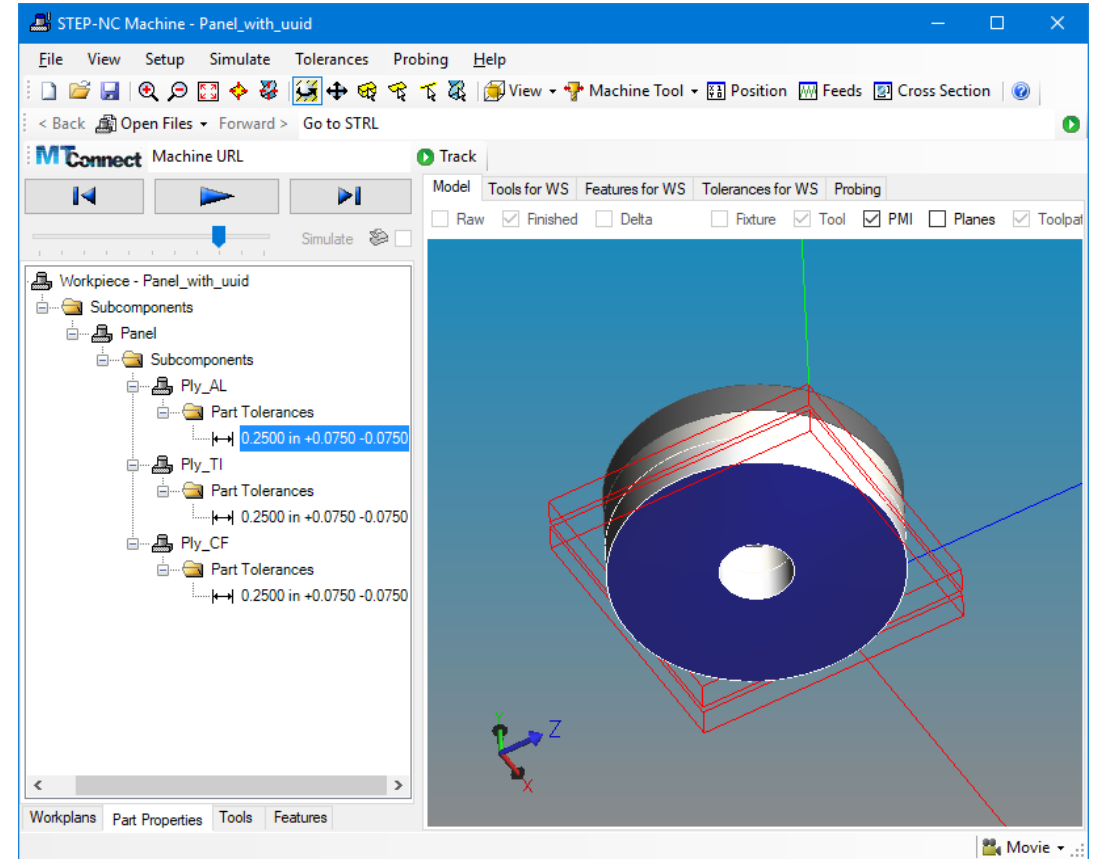
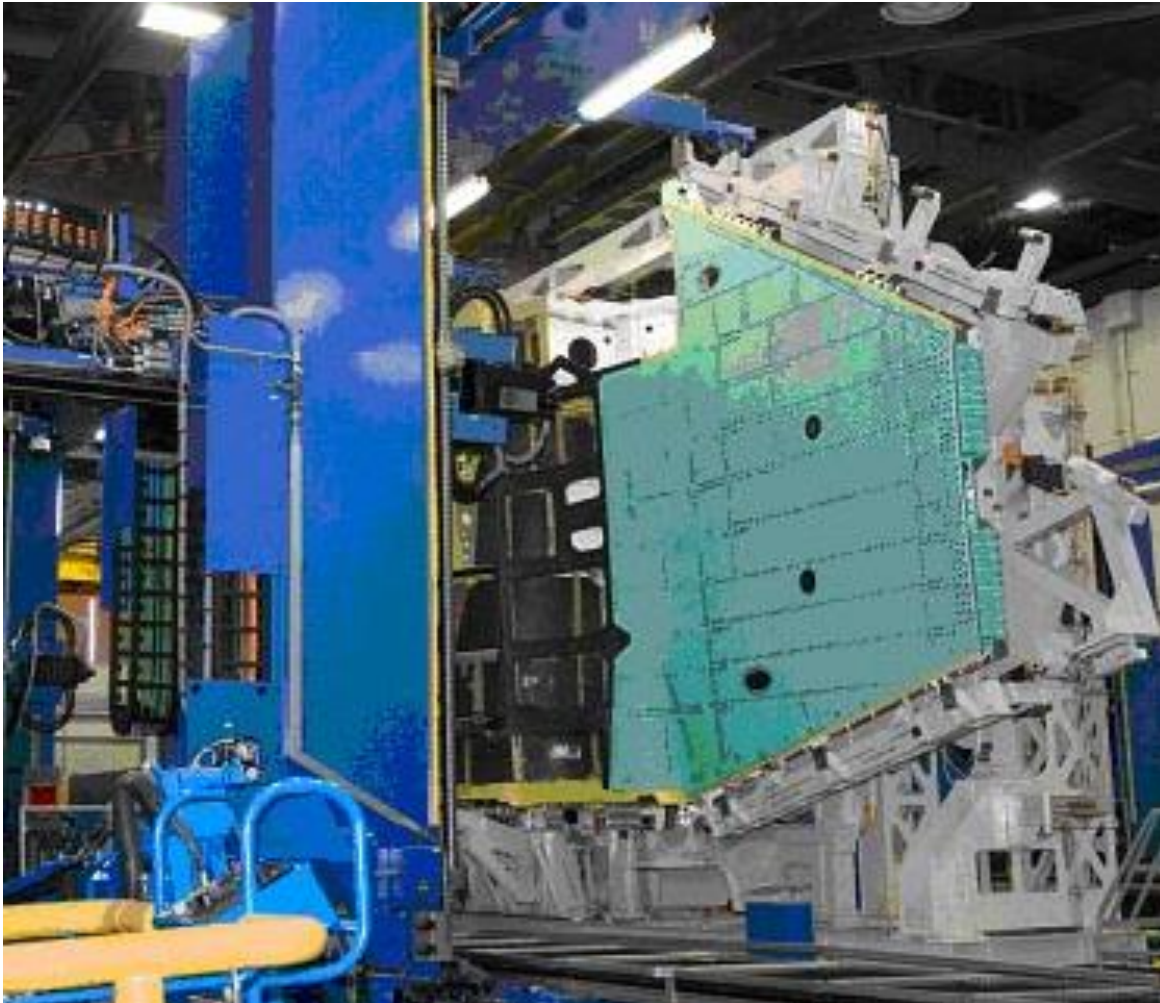


# ISO 23247 Digital Twin Use case #2

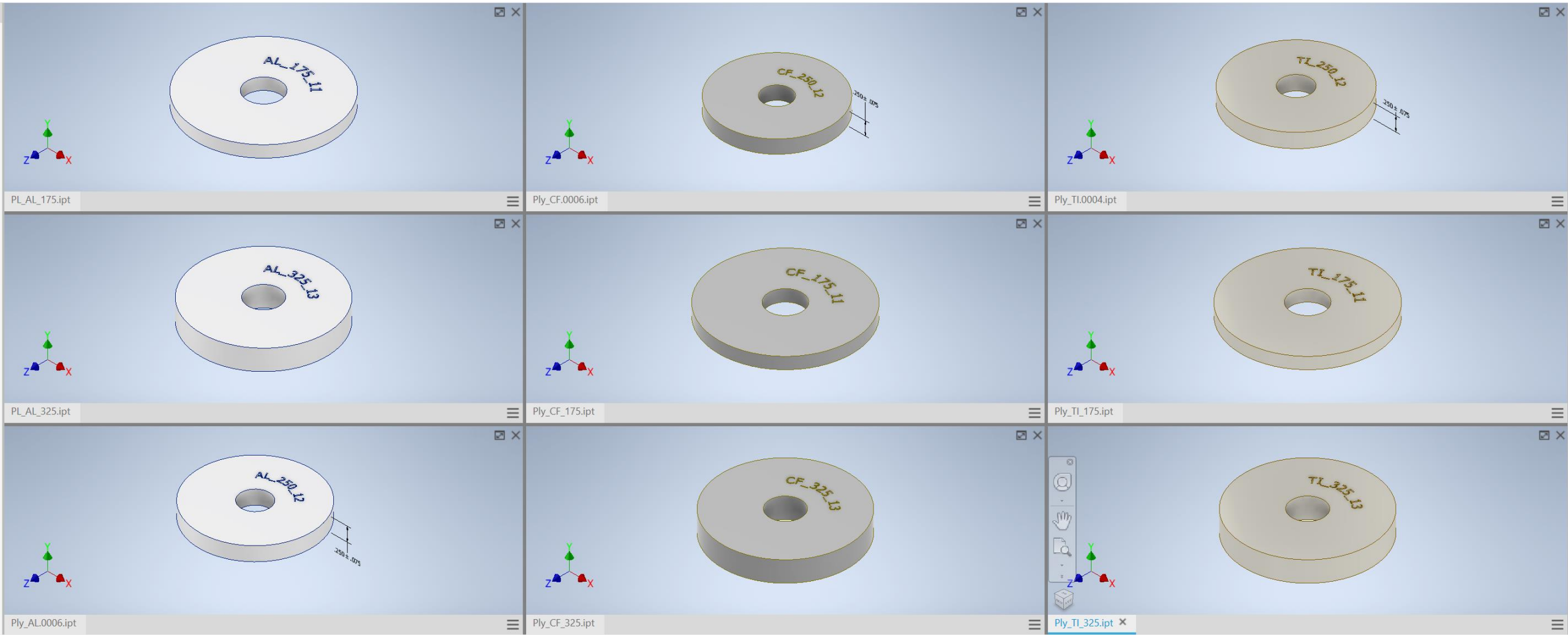
Dress Rehearsal  
September 1, 2020

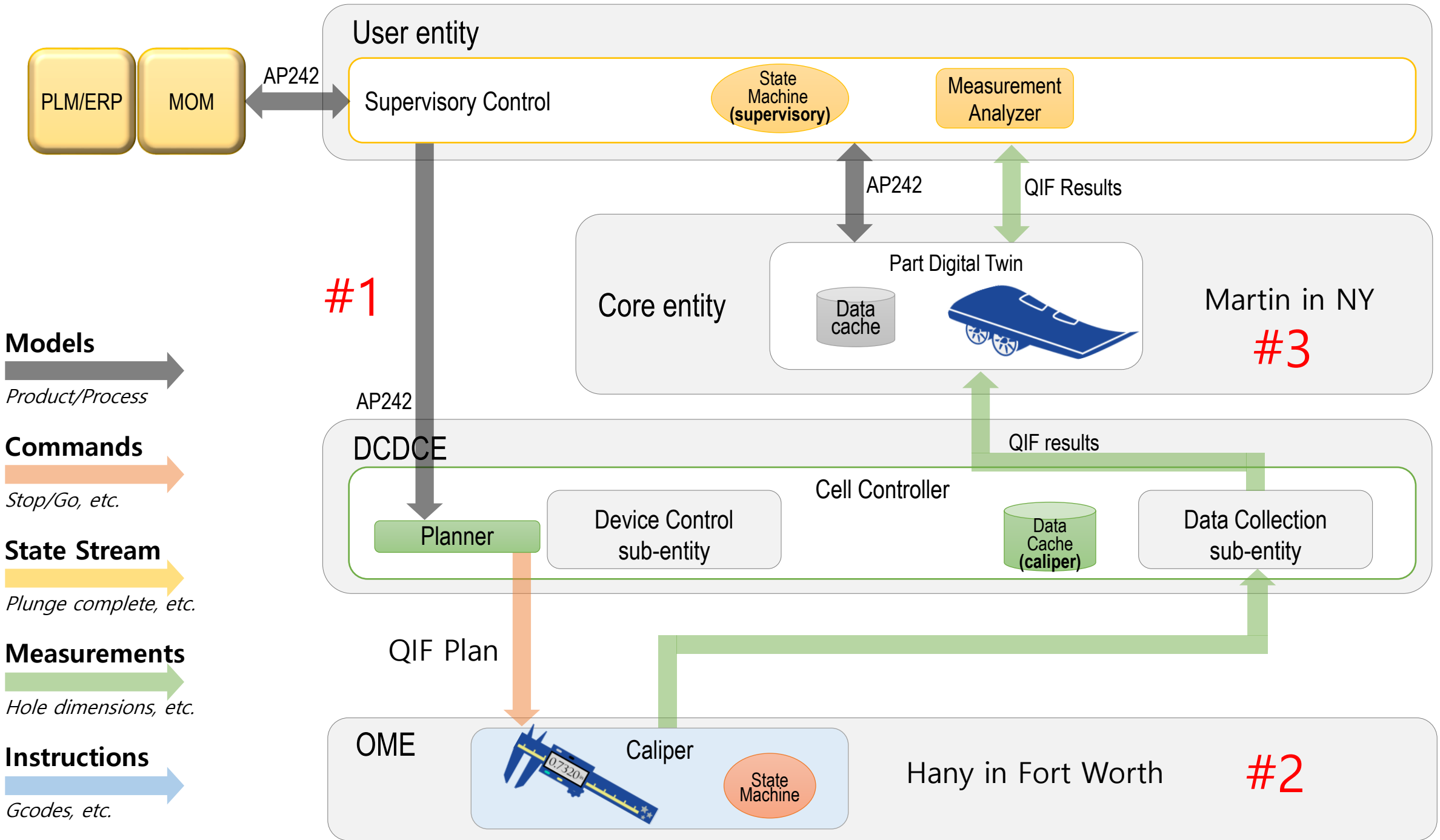
# Use Case 2 – weight reduction



Exact match of fastener to hole depth  
can reduce weight by 500lb

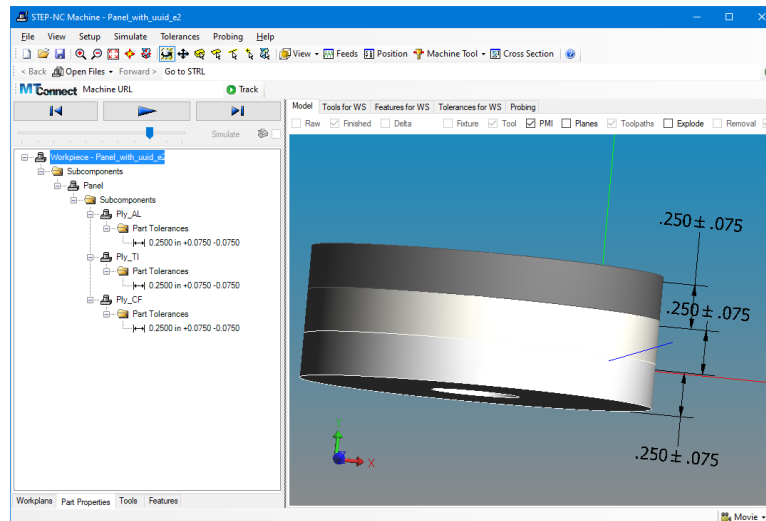
# Measurement samples





# #1 Nominal design data for stack up

- Design file made using Autodesk Inventor
- Converted to Digital Twin by Martin
- Sent to Hany in Fort Worth



```
STEP File Browser - Panel_with_uuid_e2.stp [page 1/2]
File View Navigate Help

/* author */ ('Larry Maggiano'),
/* organization */ ('Mitutoyo America Corporation'),
/* preprocessor_version */ 'ST-DEVELOPER v18.2',
/* originating_system */ 'Autodesk Inventor 2020',
/* authorisation */ '';

FILE_SCHEMA (('AP242_MANAGED_MODEL_BASED_3D_ENGINEERING_MIM_LF { 1
ENDSEC;

ANCHOR;
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<7db0ce4d-dcd7-4fc7-abdf-fc43b9988415>=#469; /* linear distance -
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ENDSEC;

DATA;

/*****
* Application object: WORKPIECE (#10)
* ITS_ID: #10, #12, #13, ['Panel']
* ITS_CATEGORIES [*]: #10, #12, #13, #14, ['Panel']
* ITS_TIMESTAMPS [*]: #10, #414
```

## #2 Measurement using Calipers

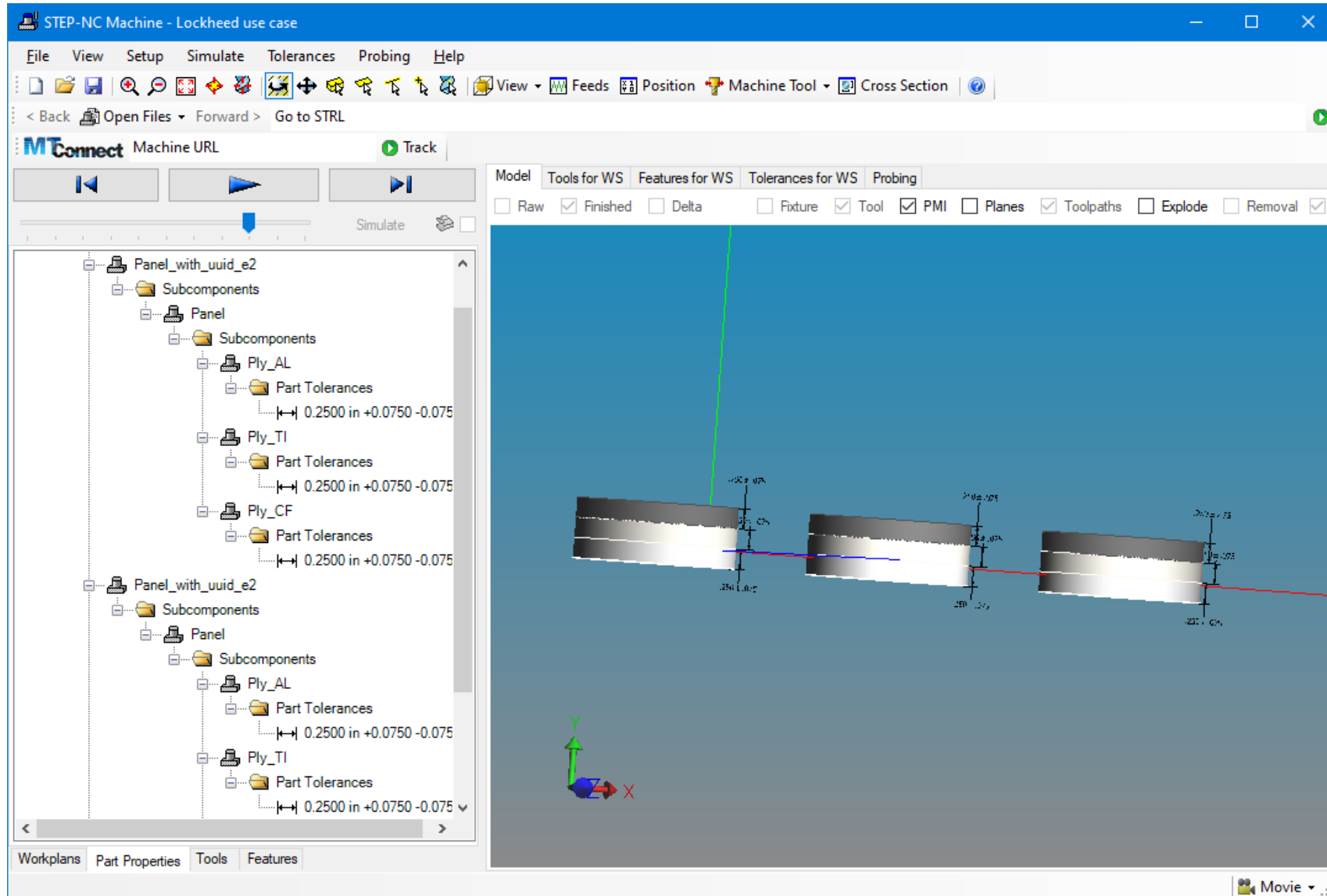
- Hany in Fort Worth uses Mitutoyo Measurlink to plan measurement of the 9 disks belonging to the three stacks
  - Titanium layer represents airframe
  - Composite ply layer represents wing skin
  - Aluminum layer represents washer for fastener
- Hany measures three Titanium disks, three Composite ply disks and three Aluminum disks using calipers
  - The three Titanium measurements are put in TL\_250\_Results.qif
  - The three Ply measurements are put in CF\_250\_Results.qif
  - The three Aluminum measurements are put in AL\_250\_Results.qif

# #3 Apply measurements to Digital Twins

- Martin applies results to Digital Twin of three stacks
  - TL\_250\_Results.qif used to adjust the dimensions of the three Titanium disks
  - CF\_250\_Results.qif used to adjust the dimensions of the three Composite Ply disks
  - AL\_250\_Results.qif used to adjust the dimensions of the three Aluminum disks
- Thickness of each stack-up measured in Digital Twin modeler and in CAD system

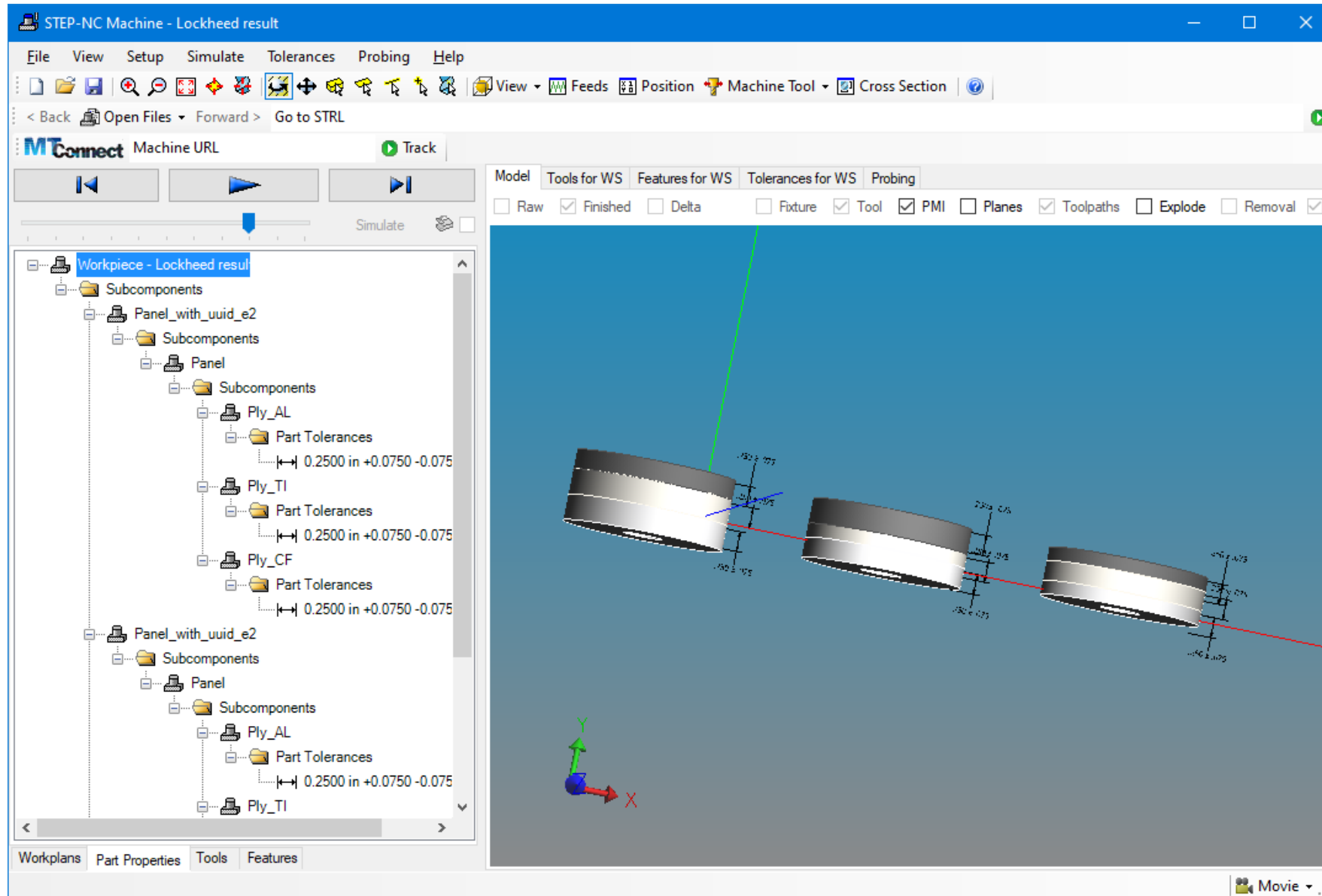


# Three stacks before QIF\_Results applied

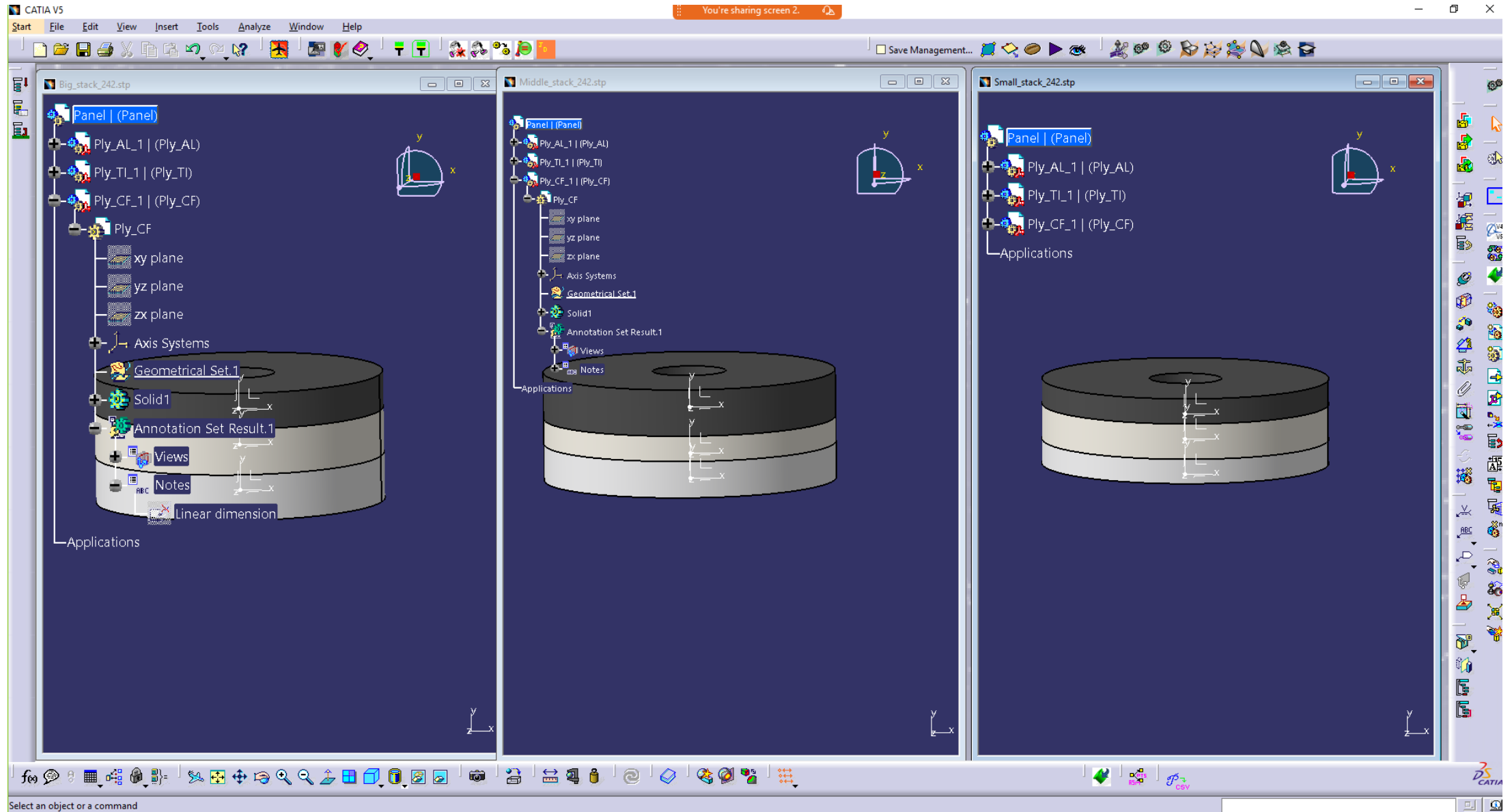




# Three stacks after QIF\_Results applied



# Each stack moved into CATIA



# Three stacks measured

The image displays three sequential screenshots of the STEP-NC Machine simulation software interface, illustrating the measurement of three stacks of parts. The main window shows a 3D model of three cylindrical parts on a blue surface. The left sidebar contains a tree view of the model's structure, including subcomponents Ply\_AL, Ply\_TI, and Ply\_CF, each with associated Part Tolerances. The bottom status bar of each screenshot provides the measured distance from the last face to the current face.

Measurement	Distance from last face (inches)
1	0.888
2	0.746
3	0.597

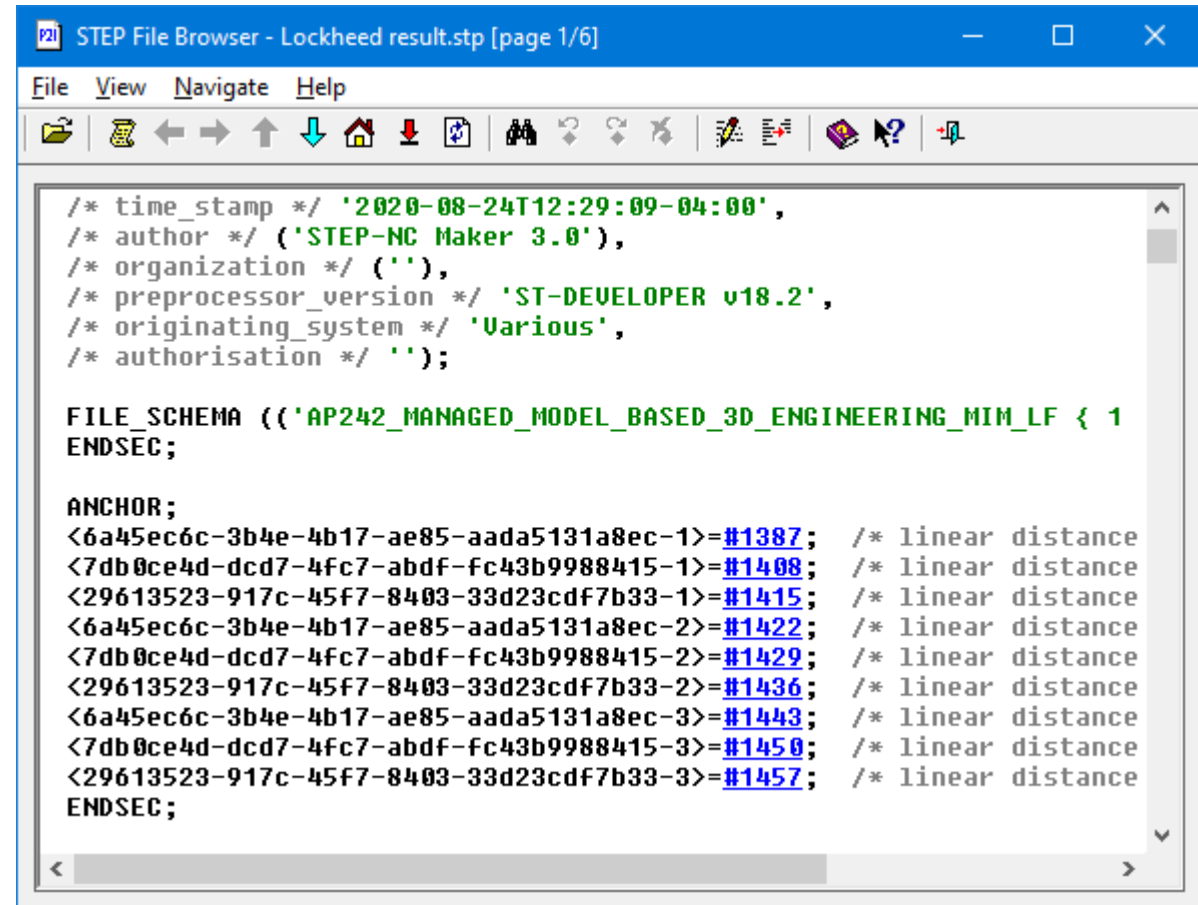
Selected face at #3000 has type plane

Selected face at #2952 has type plane

Selected face at #2976 has type plane

# Digital Twin for the three stacks

- Twin has one UUID per disk (9 total)
- UUIDs made by adding serial numbers
  - "-1" for first stack
  - "-2" for second stack
  - "-3" for third stack
- Can only send STEP for one stack at a time



```
STEP File Browser - Lockheed result.stp [page 1/6]
File View Navigate Help
/* time_stamp */ '2020-08-24T12:29:09-04:00',
/* author */ ('STEP-NC Maker 3.0'),
/* organization */ (''),
/* preprocessor_version */ 'ST-DEVELOPER v18.2',
/* originating_system */ 'Various',
/* authorisation */ '';

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ANCHOR;
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