

ET FORUM

TECH TALKS

Cool ET Tools:

Coordinate Measuring Machines (CMM)

This ET Forum Tech Talk Session features Pete Cirak, Quality Assurance at Seal Dynamics defining the uses of Coordinate Measuring Machines (CMM), industry applications, and integrating them into our technical education programs.

January 22, 2021



part of the
FloridaMakes
network



ET FORUM

TECH
TALKS



Dr. Marilyn Barger

Director

Florida Advanced Technological
Education Center, part of the
FloridaMakes Network

Who we are



Lara Sharp

Program Director of Engineering, Manufacturing,
and Building Arts at St. Petersburg College





Who we are

Florida Advanced Technological Education Center



*Strengthening Career & Technical Education for
the 21st Century Perkins V Act, State Leadership*

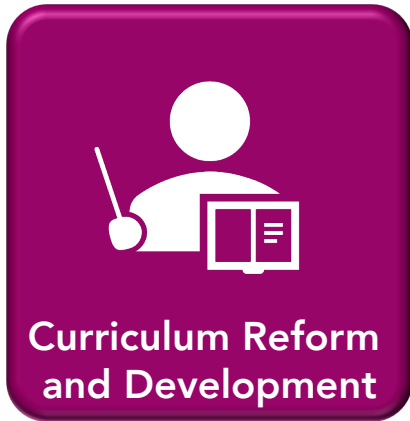
VISION

FLATE will drive
Florida's World-class
Manufacturing
Workforce Education





FLATE'S Work



Impact locally. Lead nationally.



Guest Speaker

Pete Cirak

Quality Assurance Director
Seal Dynamics



SEAL DYNAMICS
A **HEICO** COMPANY

The Ins and Out of Coordinate
Measurement Machines



- Types of CMMs
- Components of a CMM
- Operating Environment
- How a CMM Works
- Part Set-Up
- Initial Part Alignment

Types of CMMs



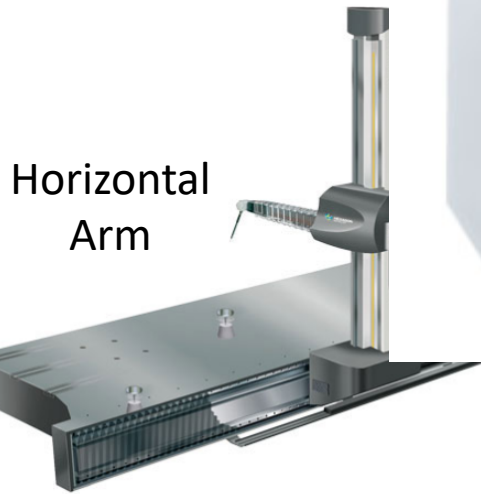
Cantilever



Gantry

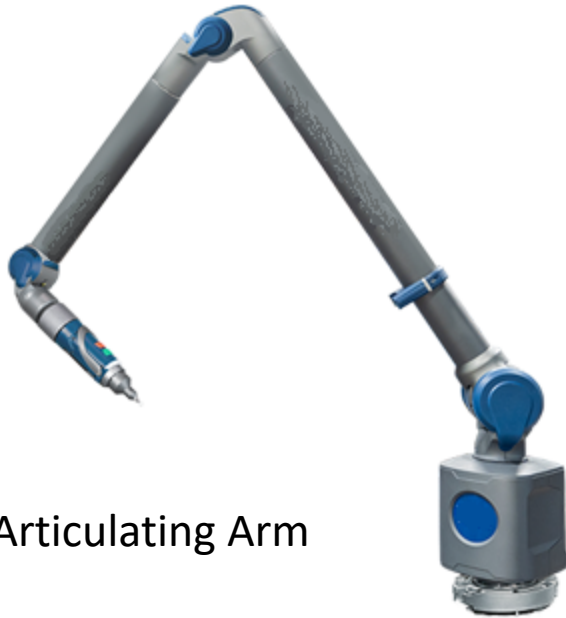


Bridge



Horizontal
Arm

Devices like CMMs



Articulating Arm



Watch Video

CMM Software

The screenshot displays the CMM Manager software interface. The main window shows a 3D model of a part with a coordinate system (X, Y, Z) overlaid. A scale bar indicates 0.7 inch. The program list on the right includes:

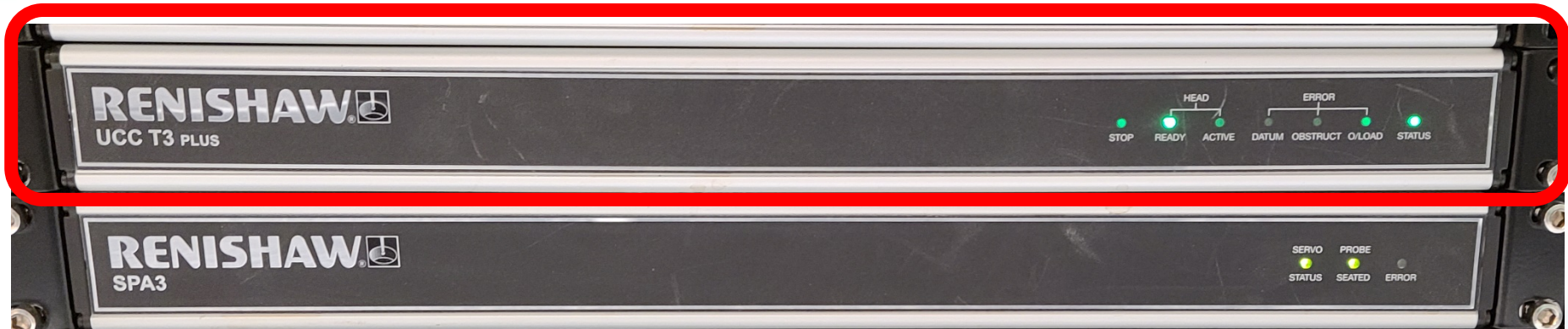
- 001 Program Settings
- 002 Get "Probe_2,2mm"
- 003 Sync Part Ref Frame
- 004 'Collect the start time
- 005 Measure Datum_A
- 006 Level to Datum_A
- 007 Measure Datum_B
- 008 Align to Datum_B
- 009 Measure Datum_C
- 010 Construct Origin
- 011 Set Origin to Origin
- 012 Save Ref Frame Base Alignment

The status bar at the bottom shows "Ready" and "Probe_5_1mm INCH Base_Alignme MORE...". The system tray at the bottom right shows the time 3:36 PM and date 1/19/2021.

CMM Controller

CMM Software → Controller → CMM

Controller



Servo Power
Amplifier

Operating Environment

- Temperature and humidity
- Cleanliness
 - Don't forget air
- Vibrations



What does a CMM know?

- Home and volume
- Probe size
- Location of probe center
- Travel direction (vector)

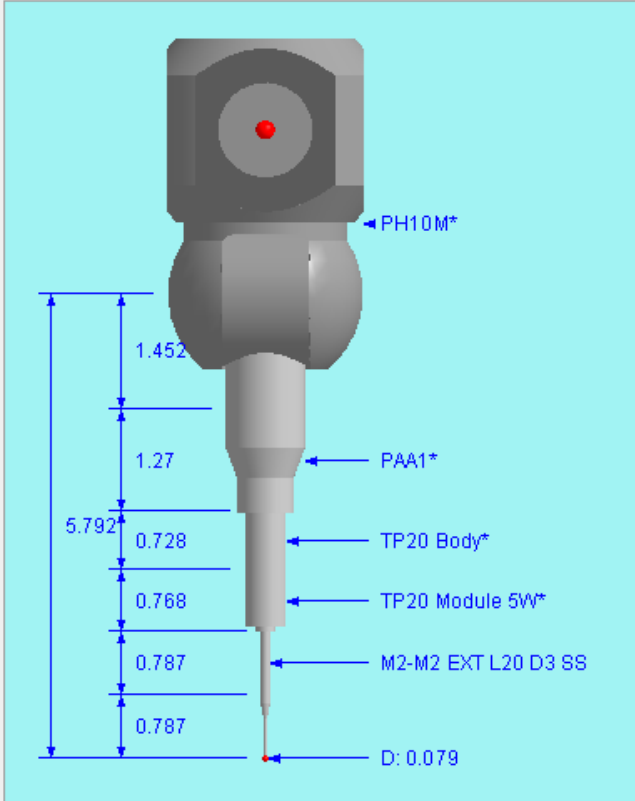
So be careful what you teach it.

CMM Probe Details

Probe Assembly

Active Probe Assembly -- Renishaw PH10M
Probe_2_2mm

File: C:\ProgramData\QxSoft\CMM-Manager 2020\Resource\Probe.cfg



PH10M*

1.452

1.27

5.792

0.728

0.768

0.787

0.787

PAA1*

TP20 Body*

TP20 Module 5W*

M2-M2 EXT L20 D3 SS

D: 0.079

Probe Length: 5.792 (from probe head center to stylus center)

Probe Assembly List

RefTool	Add	Delete
Probe_2_2mm	Load	Save
Probe_3_Edge_Finder	Load One	Save One
Probe_4_4mm		
Probe_5_1mm		
Probe_6_Disc		Set Active

Probe Assembly Setup

Probe Property

Non-repeatable Hard Probe

No Probe Disable Manual Change Prompt

Extensions & Touch Probes

Add Delete Clear

Available Models

PAA1*	PAA1
TP20 Body*	PAA2
TP20 Module 5W*	PAA3
M2-M2 EXT L20 D3 SS	PEM1
	PEM2
	PEM3

Stylus

3P 6P Star Stylus Disc Cylinder

D = 0.079, L = 0.787

Edit Stylus

Stylus Knuckle

Update Assembly Reset Assembly

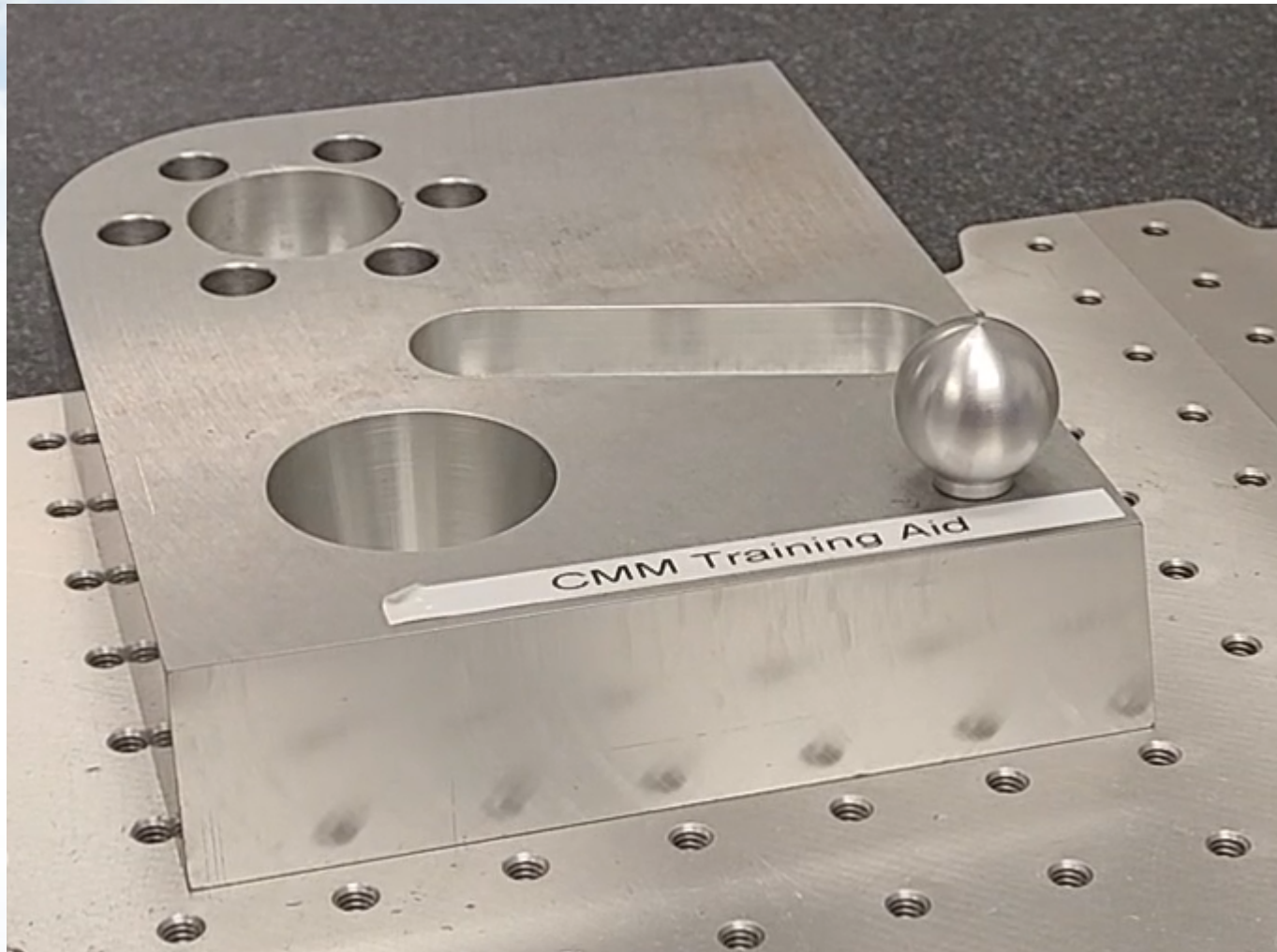
Stylus Module

Station: 1 Port: 2 Assign

Close

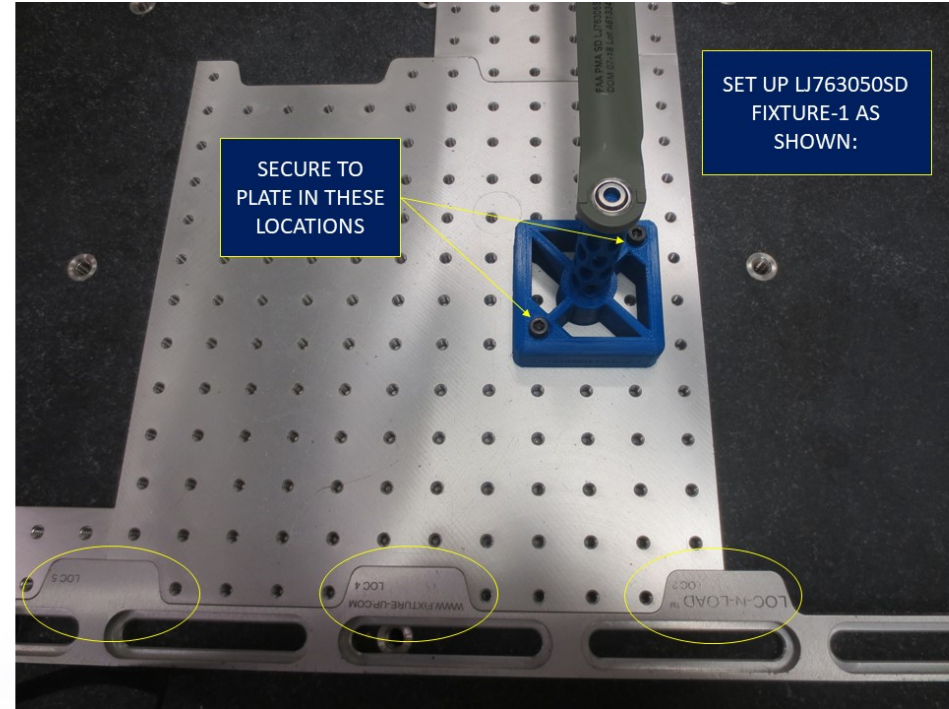
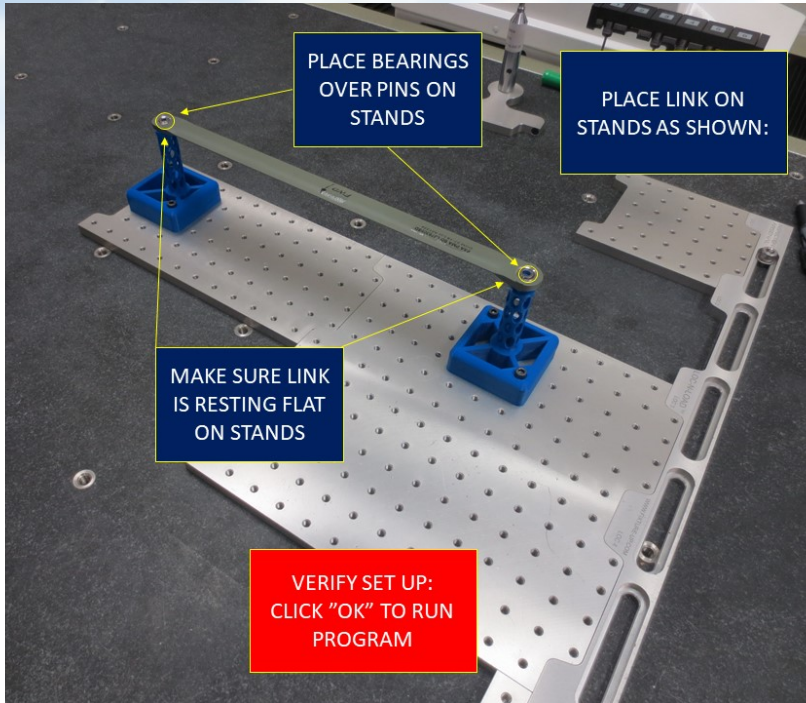
- Machine calibration
 - Typically performed annually
 - Whenever it is moved
 - Significant work is performed
- Probe tip calibration
 - Typically performed weekly
 - Whenever a tip is changed
 - After a collision or similar event

Master Part

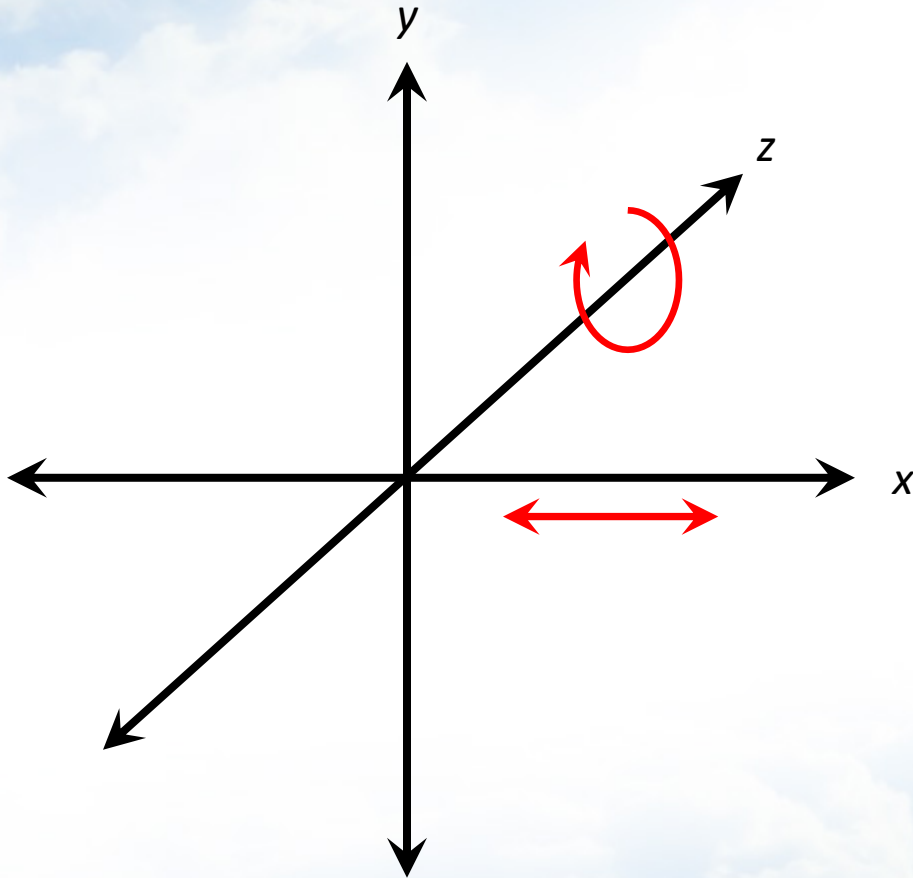


- Easily repeatable
- Sturdy/Stable, can handle the trigger force
- When possible mimic the design datums
- Document the set-up
- Have someone test it

Part Set-up

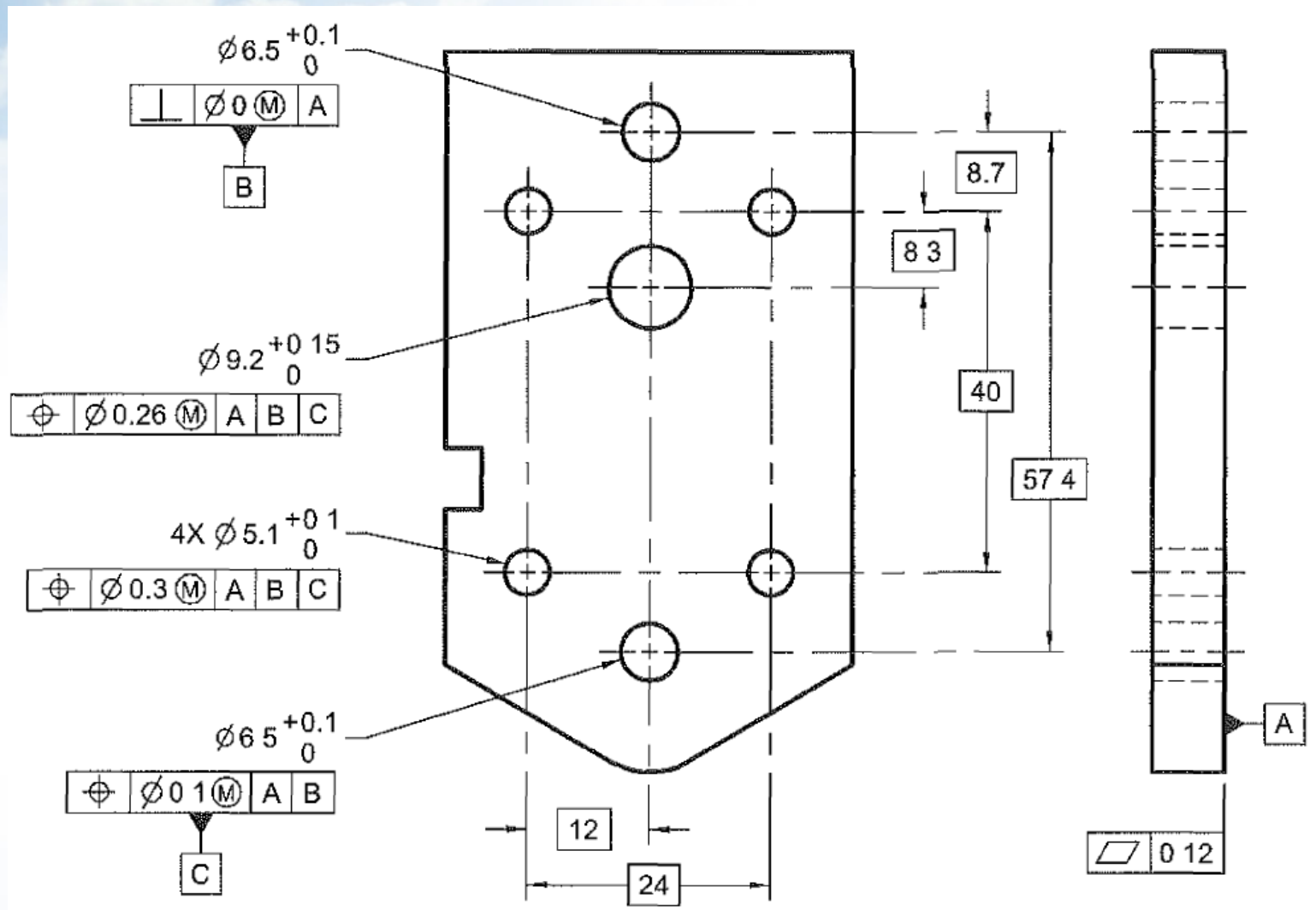


- Best Practice – use datum feature simulators
- Doesn't need to be datum system
- Understand types of features
 - Plane, line, point
- Constraining the six degrees of freedom



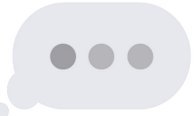
3 Translations
3 Rotations

Datums and Degrees of Freedom



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Quality Assurance Director
Seal Dynamics

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Q & A



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Resources

[Free lessons, labs, and activities--www.skillscommons.org](http://www.skillscommons.org)

[FARO Training Academy--https://www.faro.com/support/training/training-videos/](https://www.faro.com/support/training/training-videos/)

<https://metrology.news/future-coordinate-measuring-machines/>

<https://www.youtube.com/c/GaugeHow/featured>



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JOIN US!

TECH TALKS Session 2:

Tools to Better Implement Root Cause Analyses

Friday February 26, 9-10 AM EST

Featuring Bill Mazurek,
President and Managing
Director of Maz-Tech &
Associates, LLC.

[Register](#)

TECH TALKS SESSION 3:

Exploring Occupational Safety and Health Administration for Manufacturing

Friday April 23, 9-10 am EST

Featuring Mr. Mike Ennis, FloridaMakes Business Advisor at the Manufacturers Association of Florida's Space Coast

[Register](#)

Visit FloridaMakes/[Events](#) or Register [Here](#)

Or events on www.flate.org



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Thank You!



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Presentation and link to the recording available at www.flate.pbwiki.com