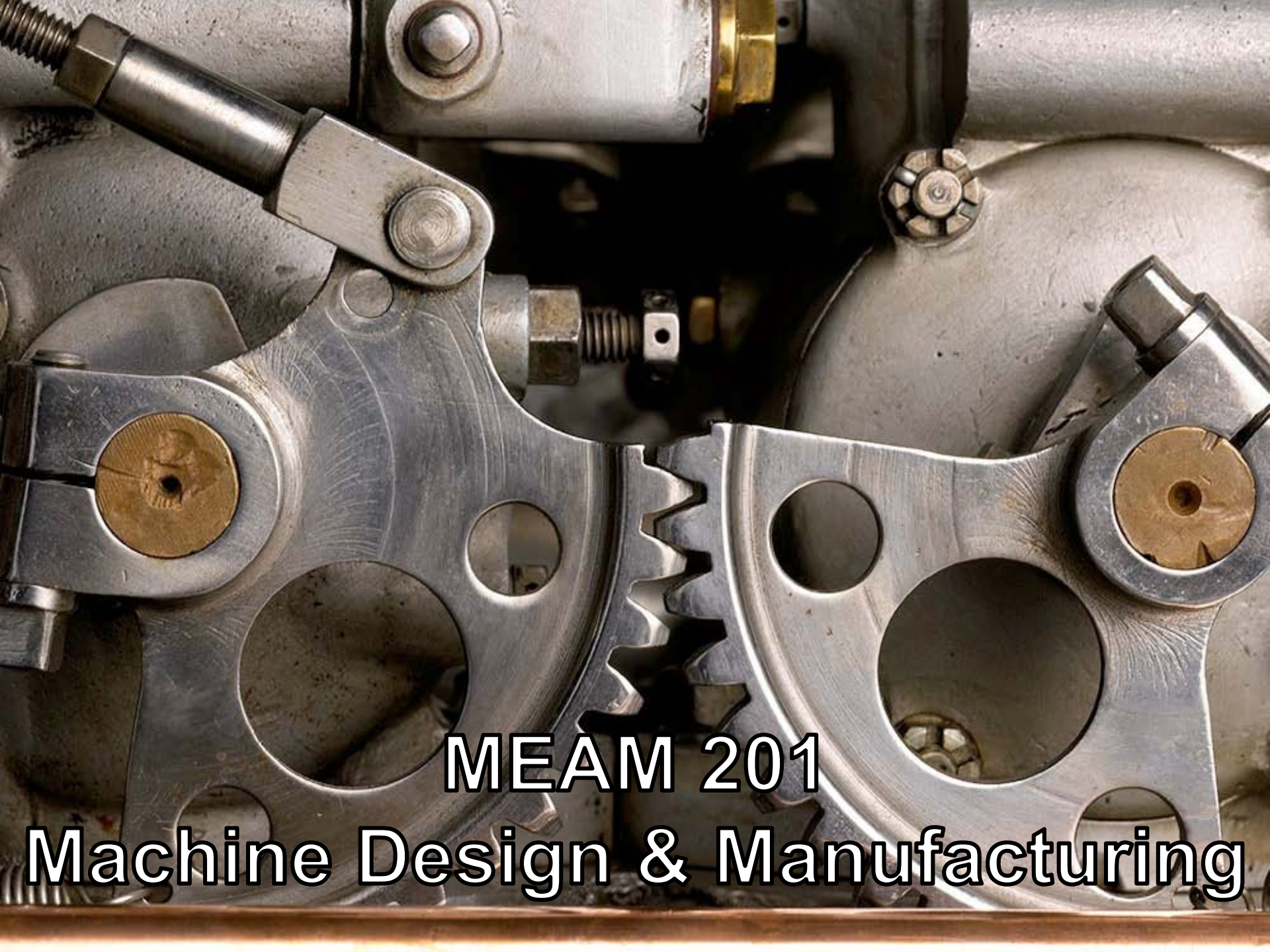
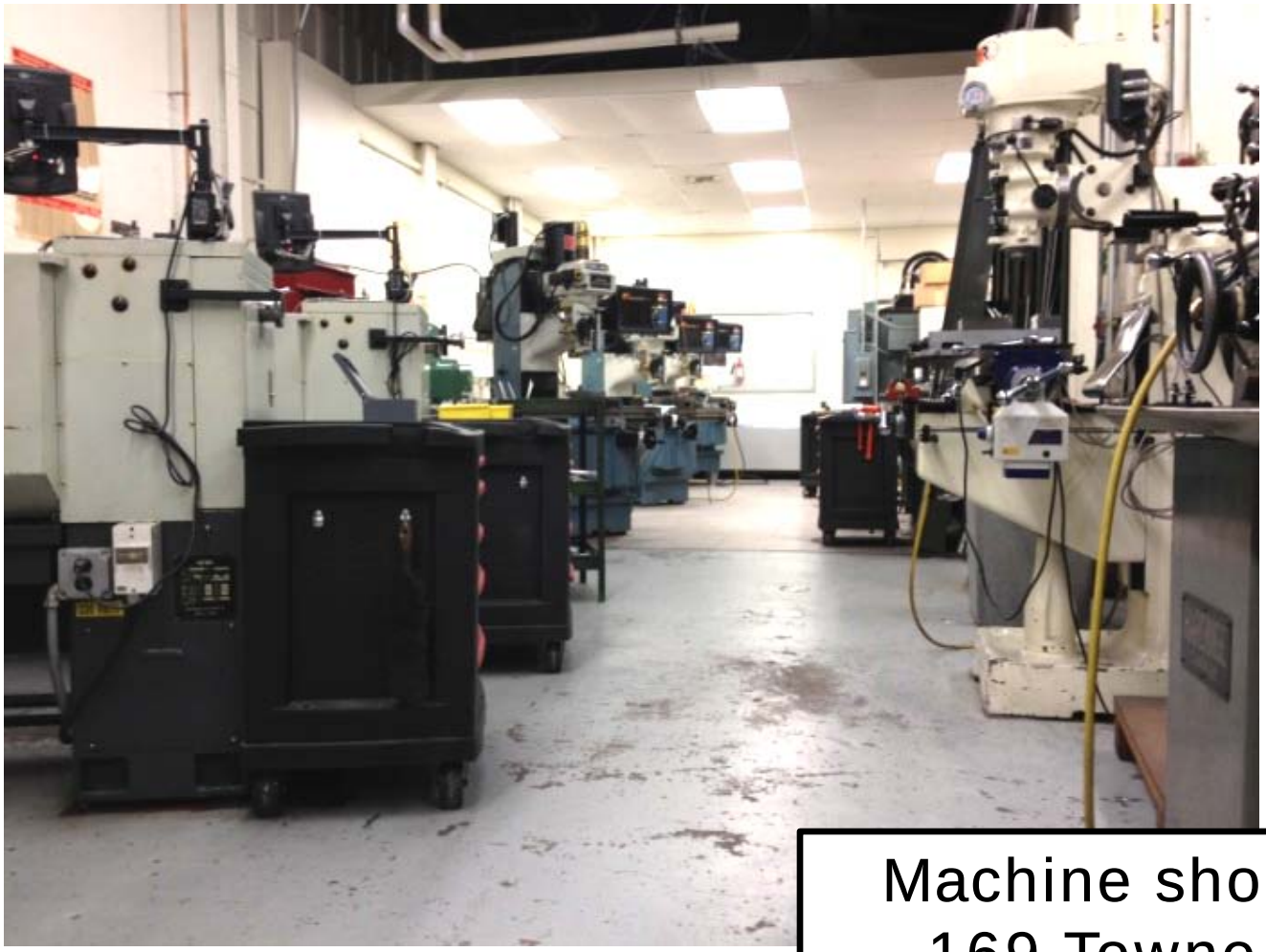


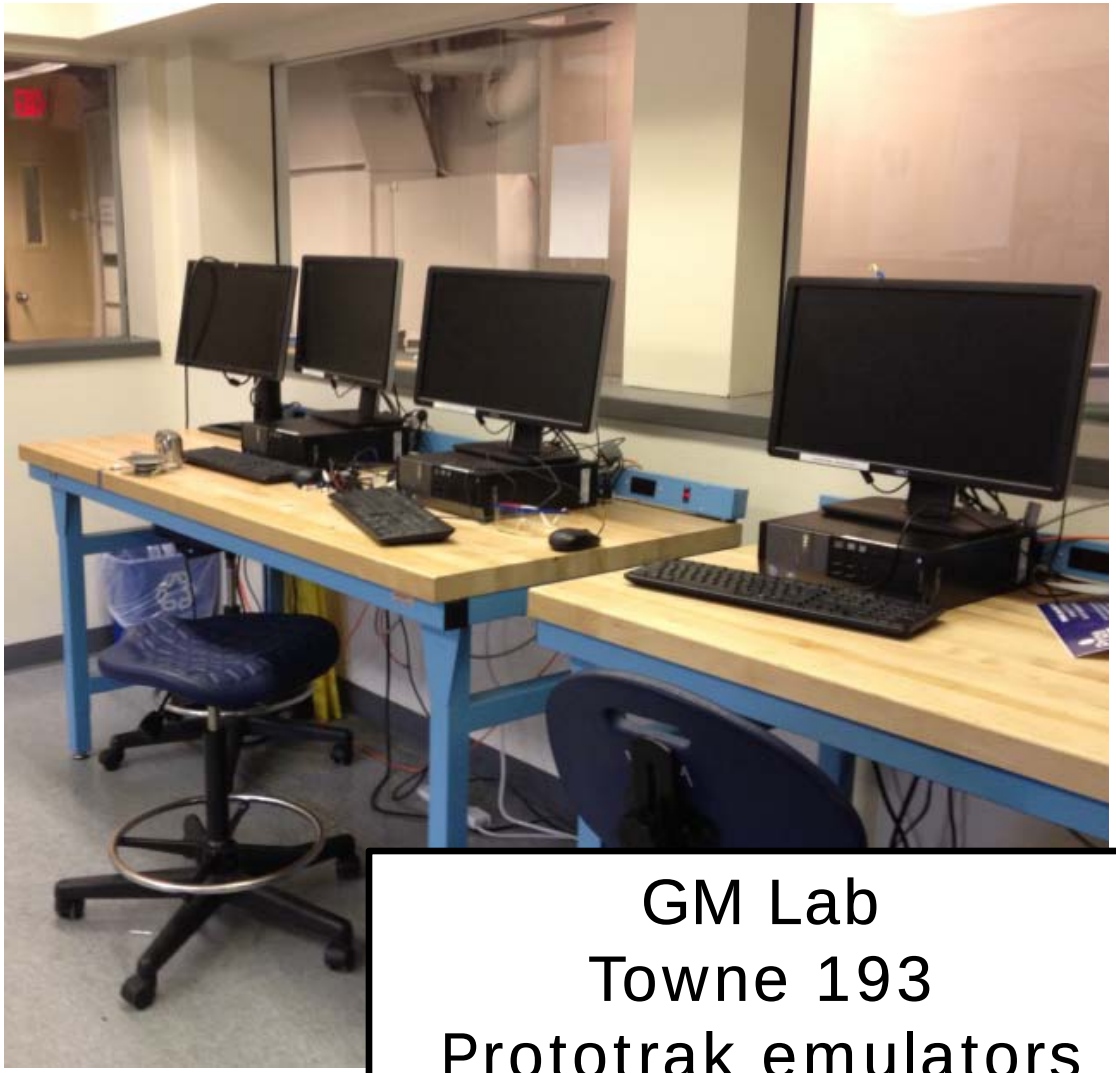
MEAM 201
Machine Design & Manufacturing

Places



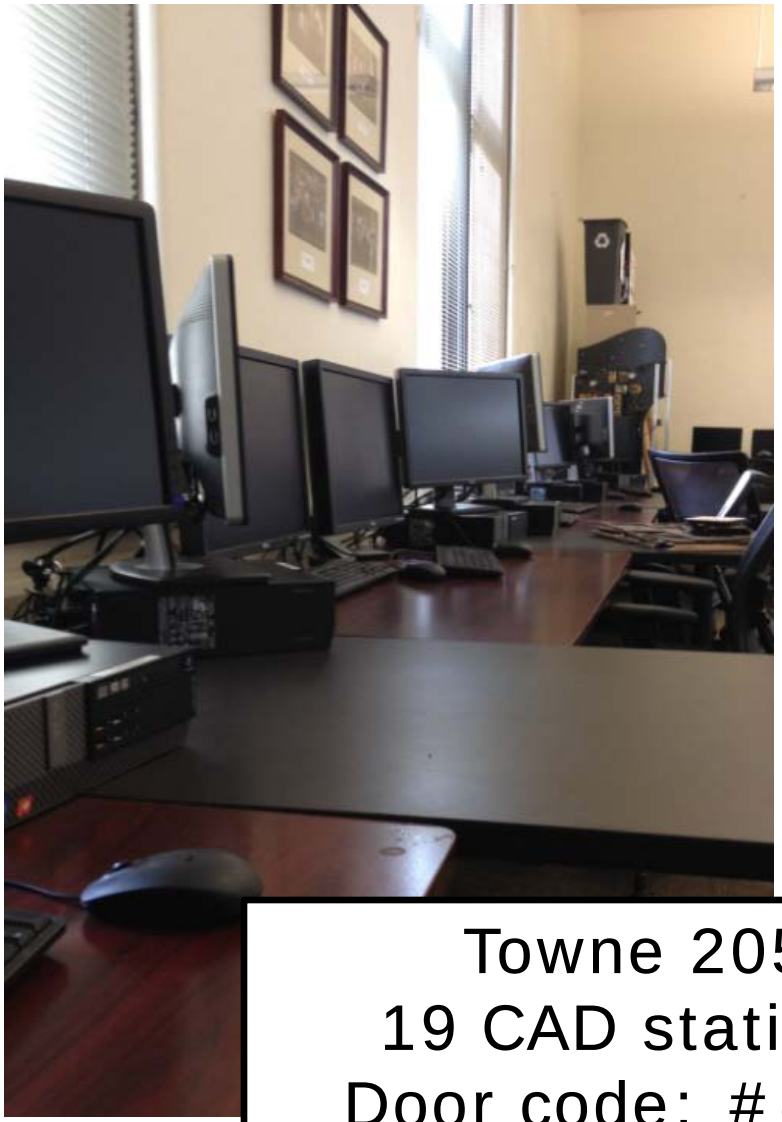
Machine shop
169 Towne

Places



GM Lab
Towne 193
Prototrak emulators

Places



Towne 205
19 CAD stations
Door code: ####

Places

MEAM showcase
Next to the shop and Cyber Café
Engine examples / inspiration

Lectures from 10:30 am - 12 noon in 309 Towne every Tuesday

People

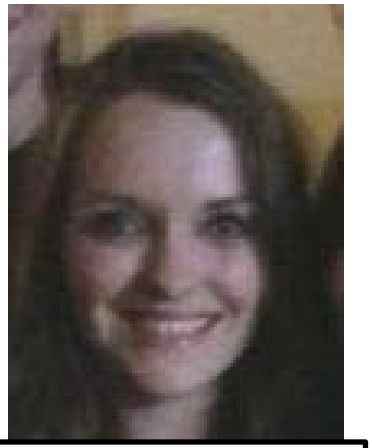
Mike Choi
aka RePeter

Peter Szczesniak

Joseph Valdez

Kevin Alcedo

Aedhan Loomis



Paige Willoughby

*Daleroy Sibanda not shown

Resources

Recommended textbook: Machine Elements in Mechanical Design, 4th ed. by Robert L. Mott

Supplies: Consider purchasing calipers, safety glasses, smock or lab jacket, hand tools

Course wiki: http://medesign.seas.upenn.edu

Homework submissions: Canvas

Contacting the staff: (1) Piazza preferred, or (2) grahamw@seas.upenn.edu

Skills and Topics

- Reading and interpreting technical / engineering drawings
- Safe, responsible, and proficient use of machine shop tools
- Technical understanding of metal cutting techniques
- Common industrial and prototyping manufacturing processes
- Design for manufacturing

Machines

Vertical bandsaw

Manual mill

ProtoTrak mill

Lathe

Grade Components

Component	Percentage
5 -6 Safety / skills tests	10
Lecture / HW assignments	25
Parts submissions	25
Final assembly (quality, functionality, design)	25
Lab Practical	5
Exam	10

Part Submission and Grading

Parts are to be placed in your part box by the beginning of your lab on the part due date

Parts up to one week late will receive a 30% deduction in part grade

Parts up to two weeks late will receive a 60% deduction in part grade

Revised parts may be submitted up to -2 weeks from the course termination (April 15th) and will inherit deductions associated with the original part submission

Piazza post to your TA and the instructors to indicate late or resubmitted parts

Shop Rules

- Only work on machinery for which you have been trained
- Never work alone
- Wear safety glasses at all times while inside the fabrication area
- Wear closed-toe shoes or boots
- Remove jewelry
- Wear no excessively loose clothing that could get caught in machinery
- Tie back long hair
- Do not use your cellphone or headphones while operating machinery

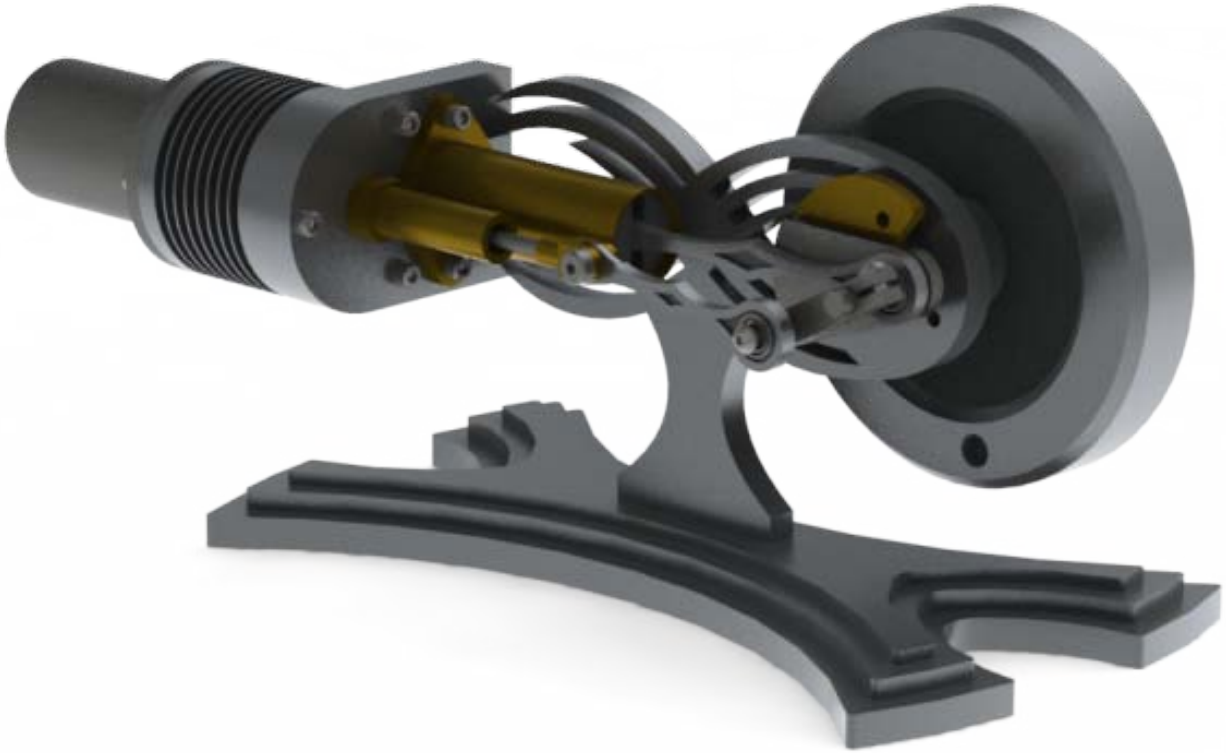
Shop Rules

- Have a clear frame of mind (no intoxication, no excessive sleep deprivation)
- Dispose of any chemical waste in proper containers
- No food or drink are permitted in the shop area
- Ask for help if you are unsure of something
- Keep all work surfaces clean and dry
- Clean, reset, and organize equipment after use
- Report all broken/damaged/worn tools to a member of the lab staff

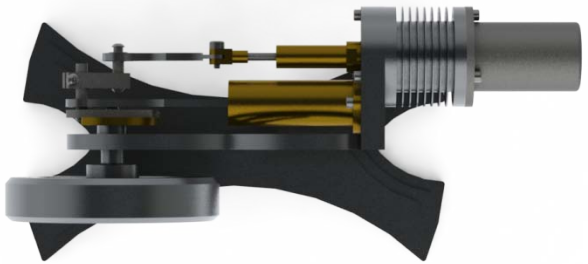
Shop Rules

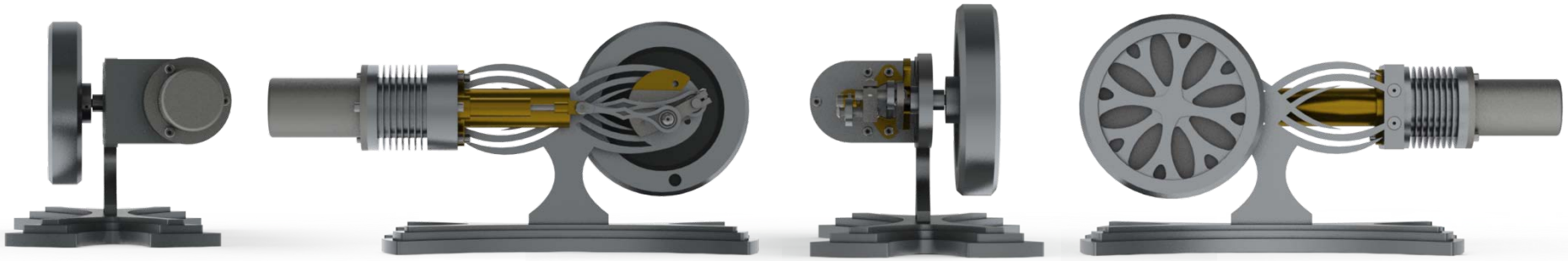
- Complete a 5-10 minute shop job (issued at the discretion of the on-duty staff person) before leaving
- Work to ensure the safety of yourself and others
- Any injuries must be reported immediately via an injury incident report

MEAM 201 Engine Examples

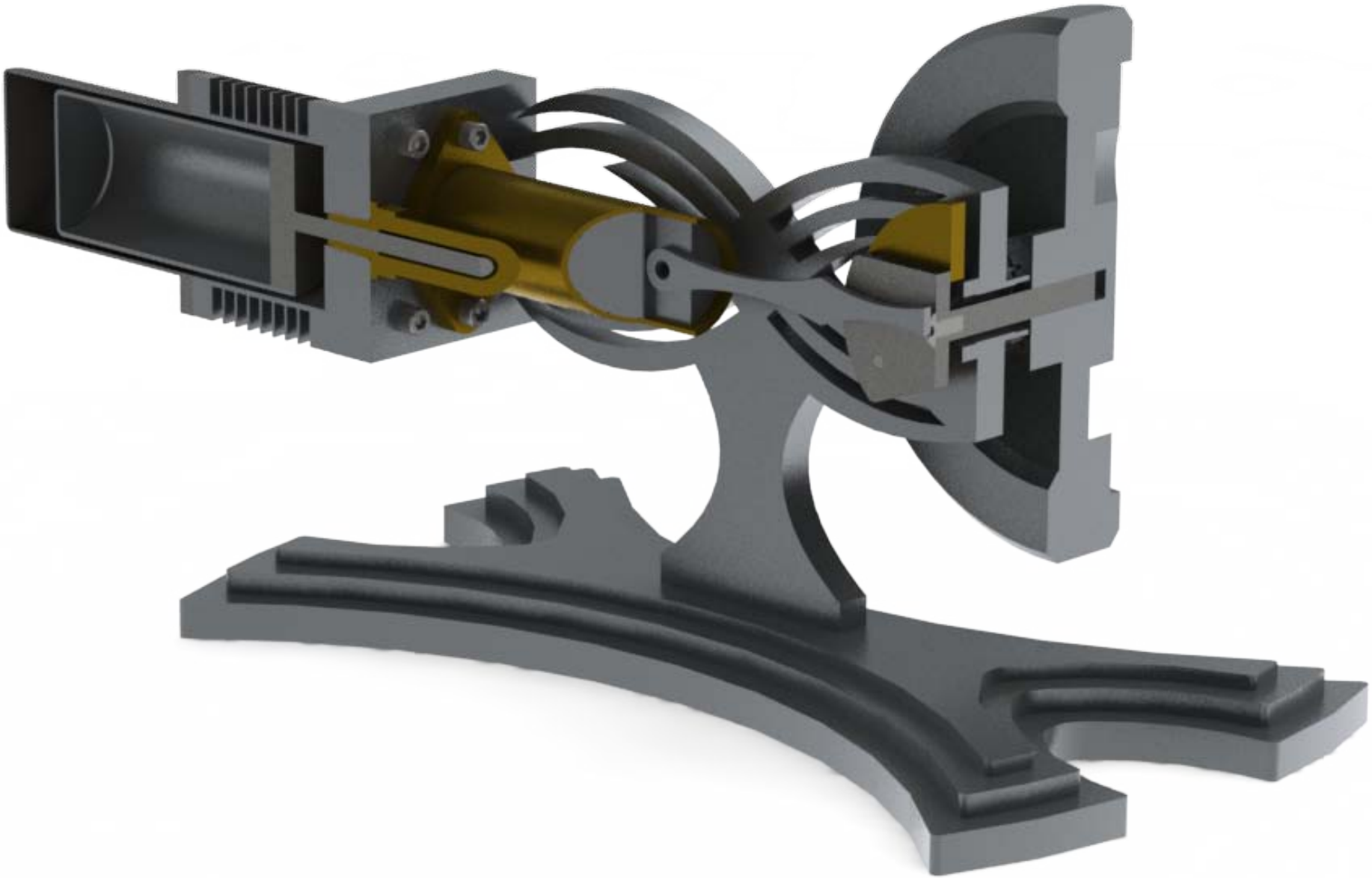


Courtesy of Manfred Ritchie



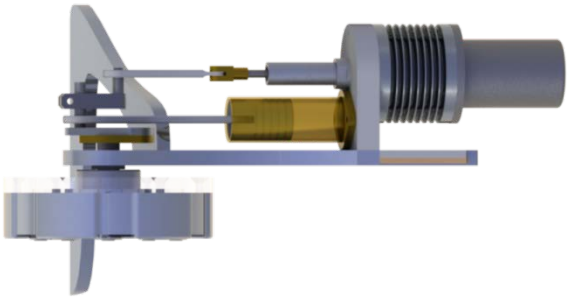


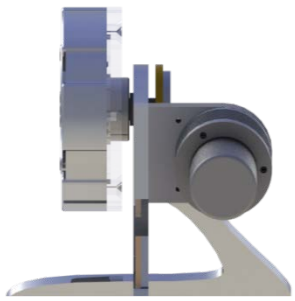
MEAM 201 Engine Examples

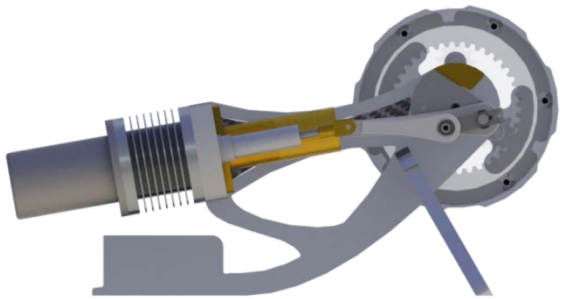


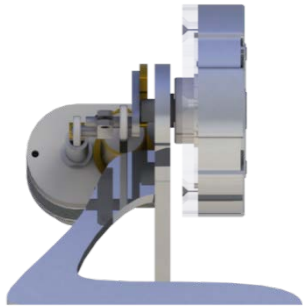
MEAM 201 Engine Examples

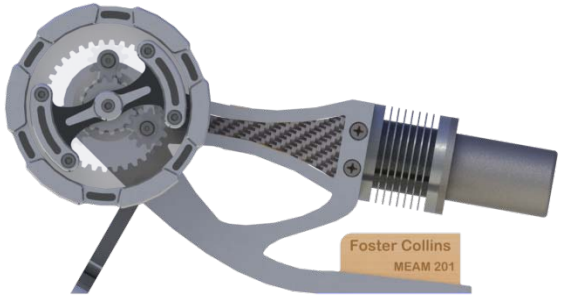
Courtesy of
Foster Collins



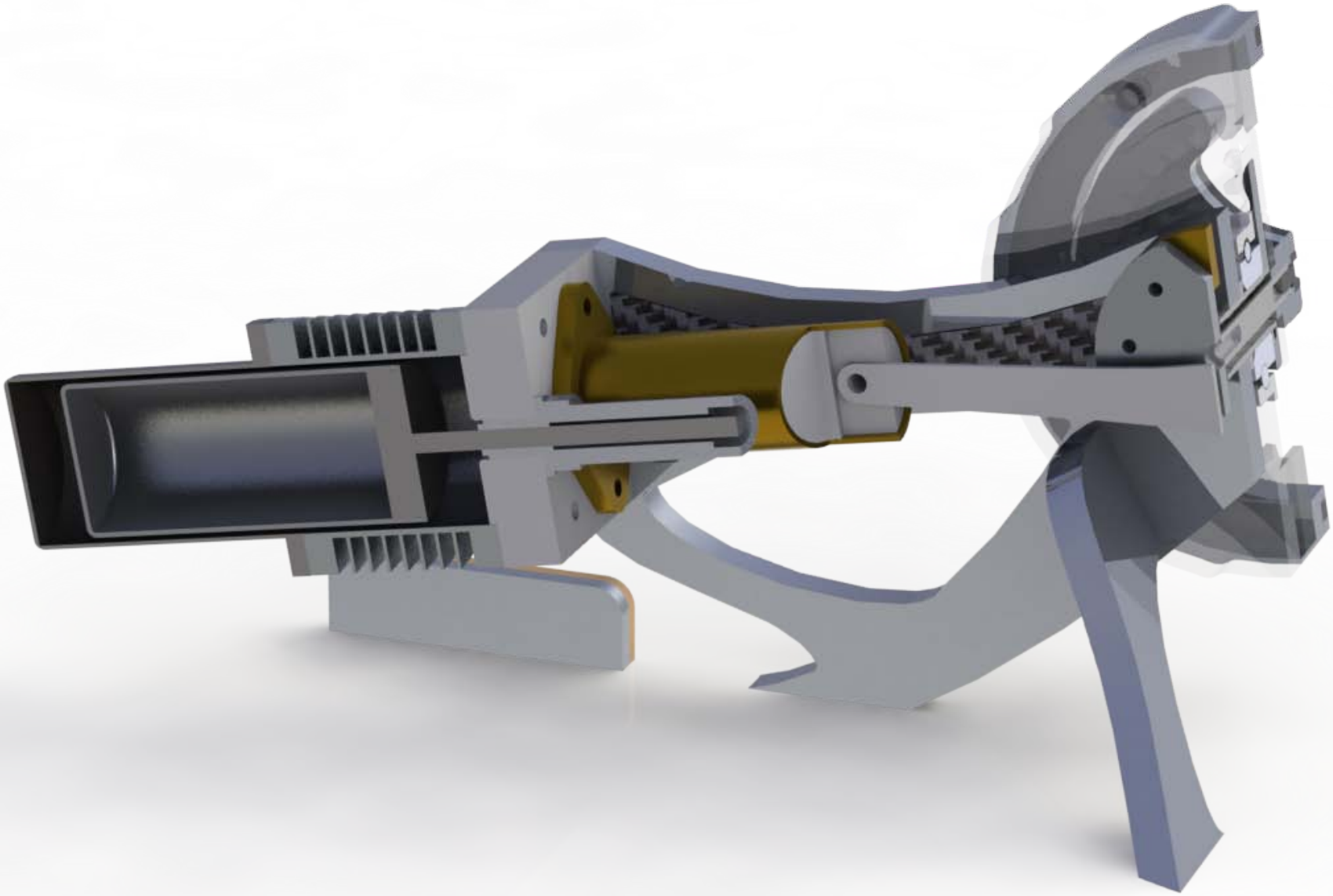




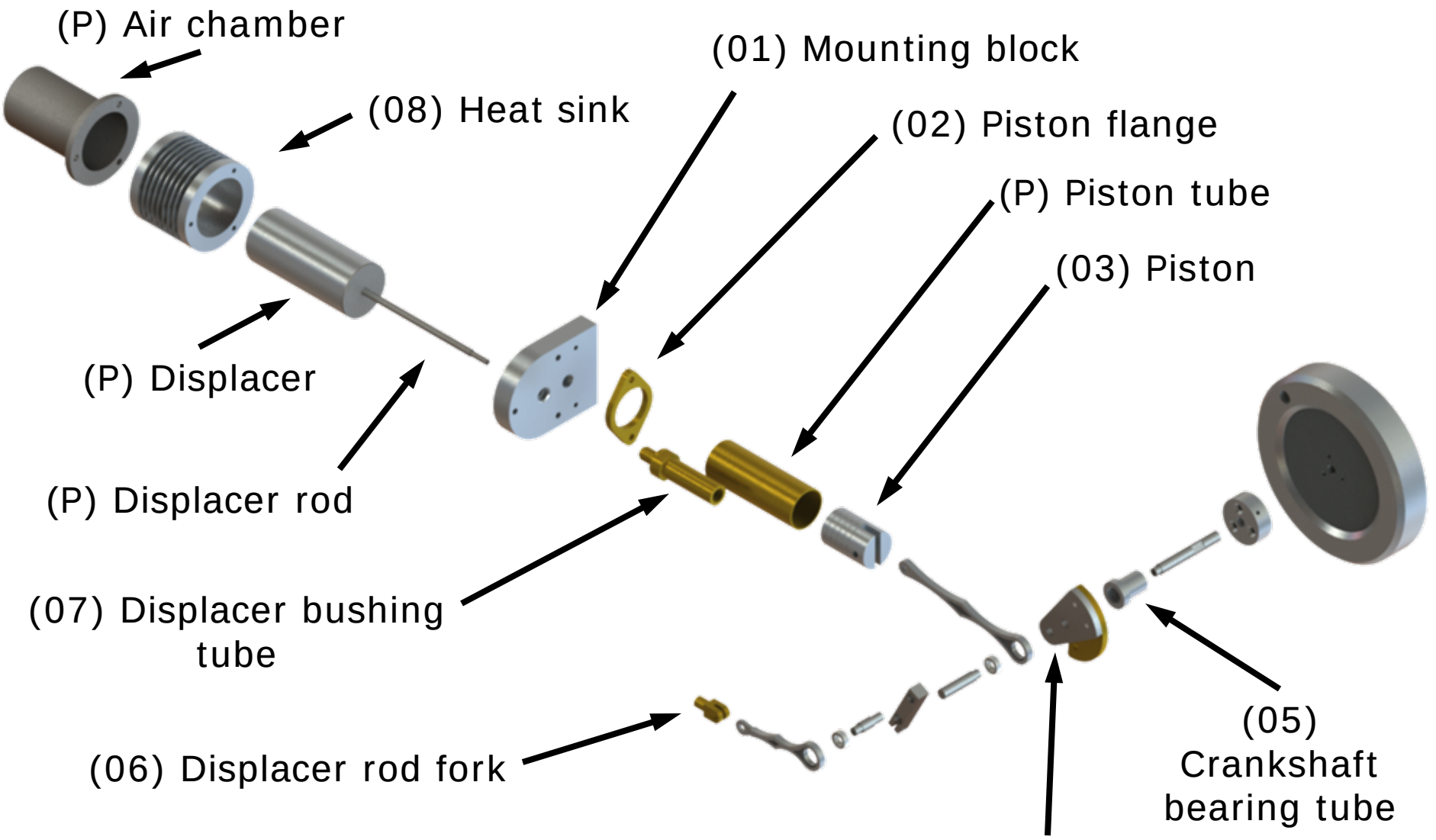




MEAM 201 Engine Examples

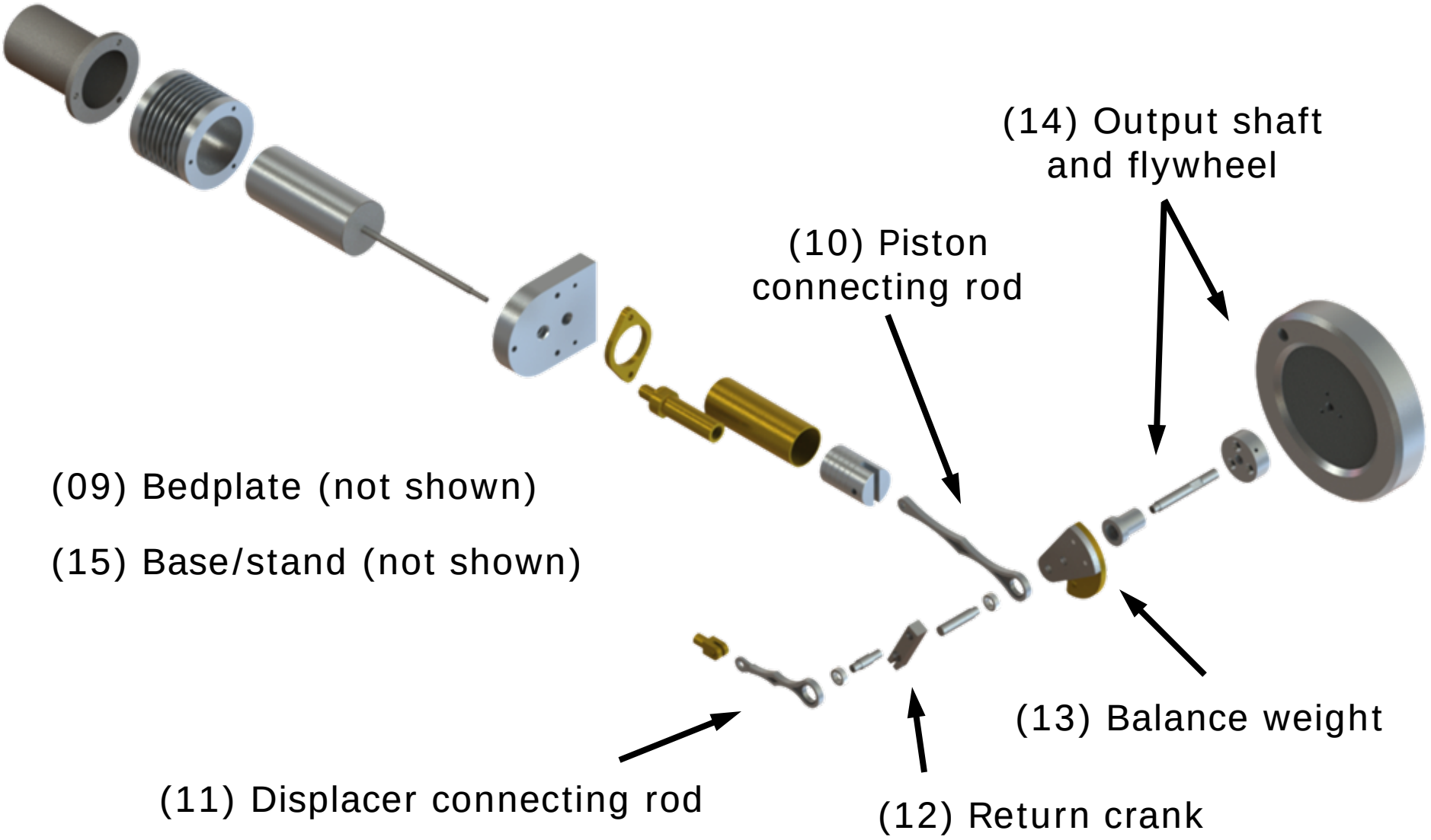


Fully-defined and Provided* Parts

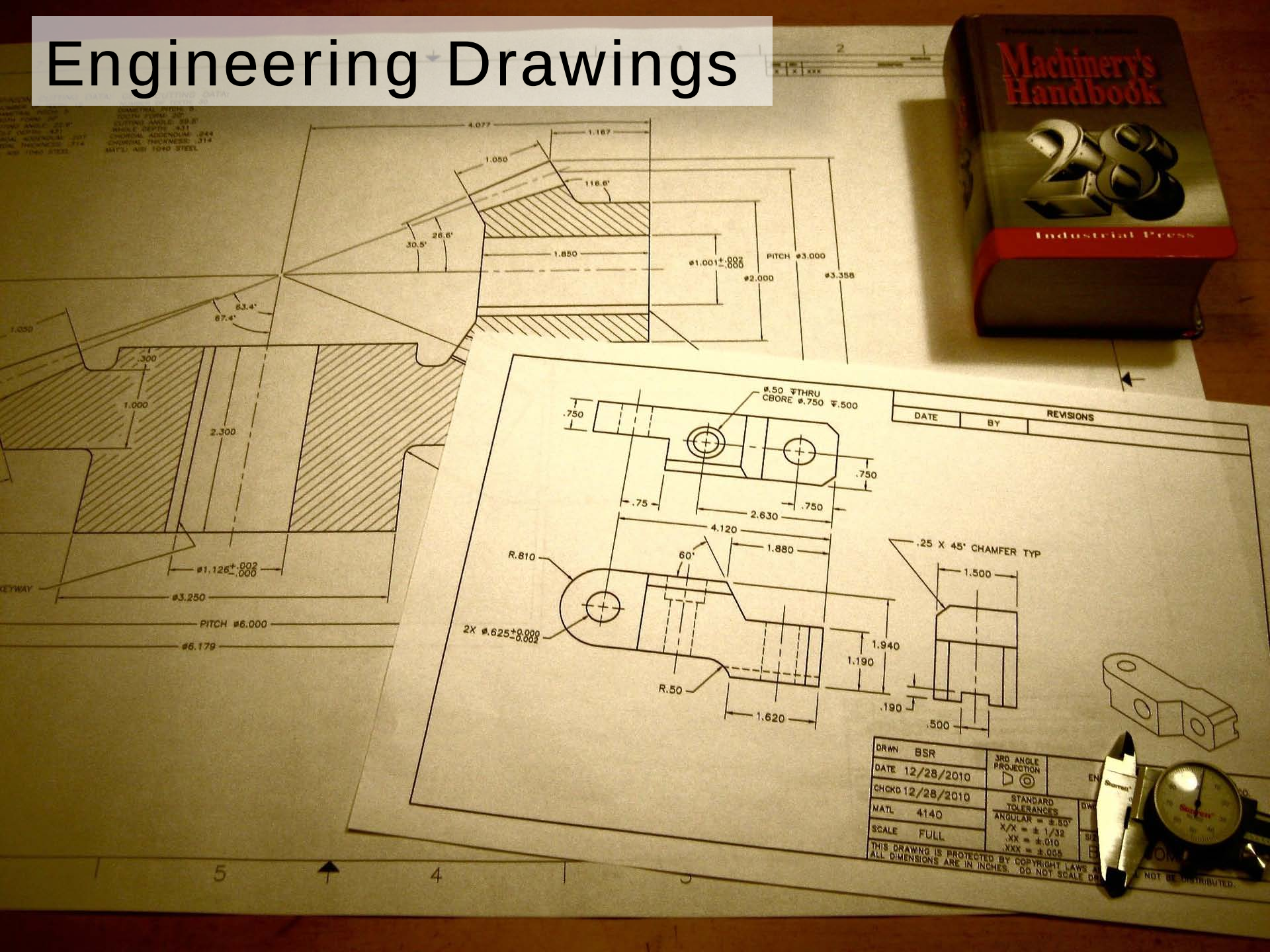


***P = provided**

Design Challenges



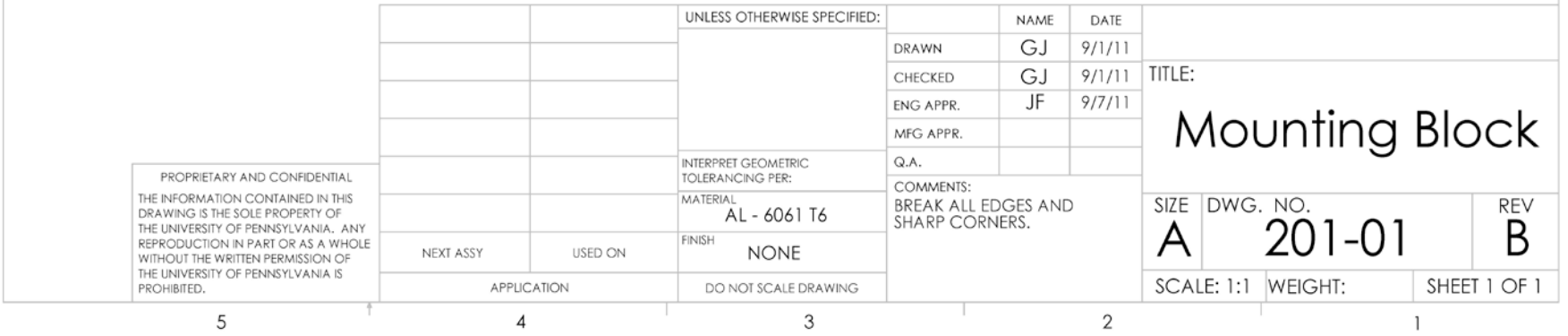
Engineering Drawings



Drawing border lines

- Drawing space -

Title block: conveys notes / details of drawing



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			CHECKED	GJ	9/1/11
			ENG APPR.	JF	9/7/11
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL AL - 6061 T6	COMMENTS: BREAK ALL EDGES AND SHARP CORNERS.		
NEXT ASSY	USED ON	FINISH NONE			
APPLICATION		DO NOT SCALE DRAWING			

TITLE:

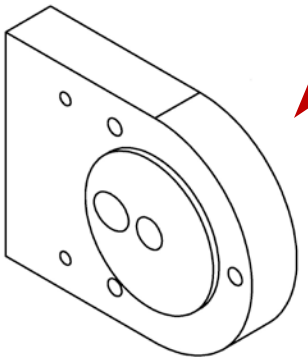
Mounting Block

SIZE	DWG. NO.	REV
A	201-01	B

SCALE: 1:1 | WEIGHT: | SHEET 1 OF 1

5 4 3 2 1

Isometric view



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APPLICATION		

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DIMENSIONS ARE IN INCHES
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ANGULAR: MACH ±1 BEND ±
TWO PLACE DECIMAL ±.01
THREE PLACE DECIMAL ±.005
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INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL
AL - 6061 T6

FINISH
NONE

DO NOT SCALE DRAWING

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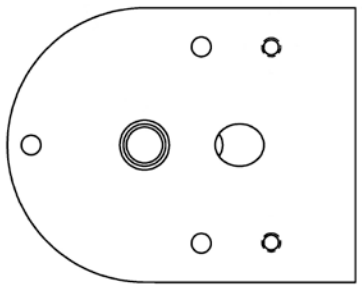
Mounting Block

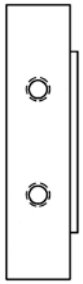
SIZE	DWG. NO.	REV
A	201-01	B

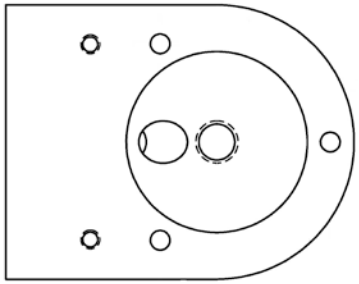
SCALE: 1:1 WEIGHT: SHEET 1 OF 1

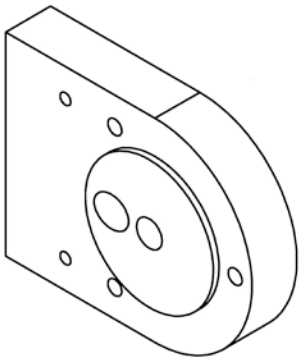
5 4 3 2 1

Orthographic views









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APPLICATION	

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ANGULAR: MACH ±1 BEND ±
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FOUR PLACE DECIMAL ±.0005

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL
AL - 6061 T6

FINISH
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DO NOT SCALE DRAWING

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CHECKED	GJ	9/1/11
ENG APPR.	JF	9/7/11
MFG APPR.		
Q.A.		

COMMENTS:
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TITLE:

Mounting Block

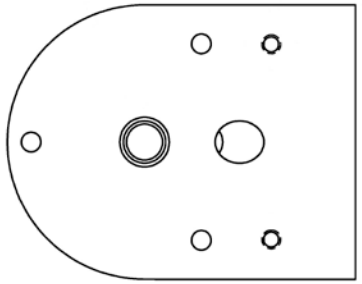
SIZE	DWG. NO.	REV
A	201-01	B

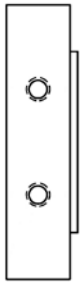
SCALE: 1:1 | WEIGHT: | SHEET 1 OF 1

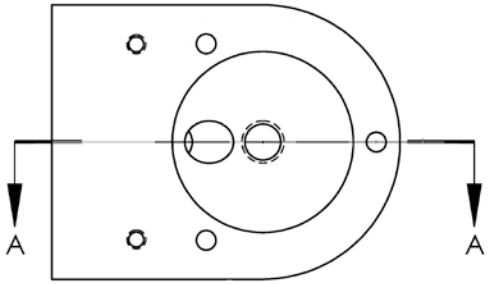
5 4 3 2 1

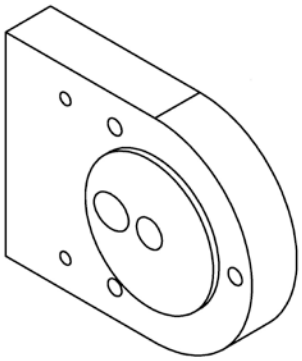
Section view with view arrows

SECTION A-A









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THREE PLACE DECIMAL ±.005
FOUR PLACE DECIMAL ±.0005

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL
AL - 6061 T6

FINISH
NONE

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	GJ	9/1/11
CHECKED	GJ	9/1/11
ENG APPR.	JF	9/7/11
MFG APPR.		
Q.A.		

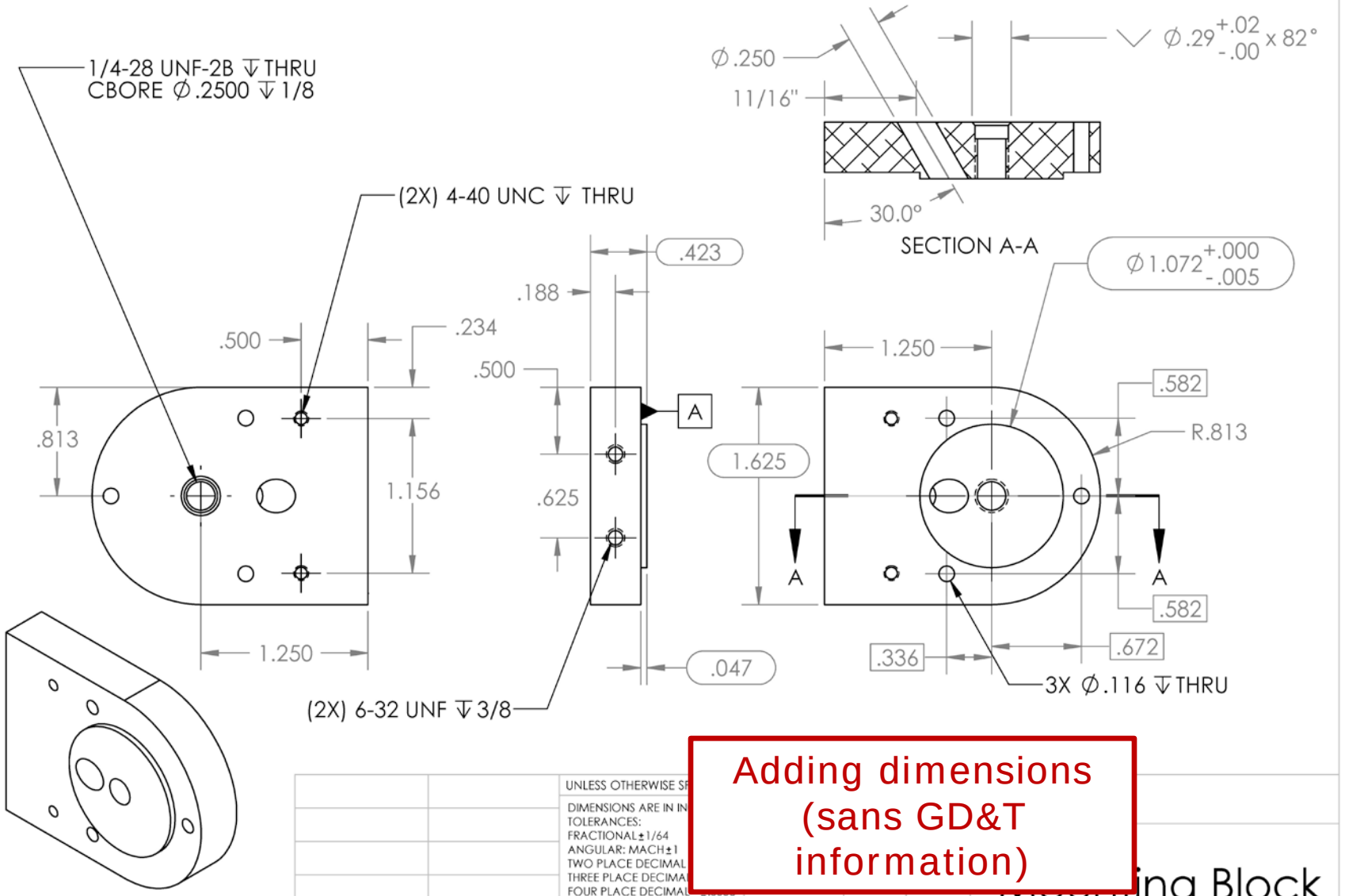
COMMENTS:
BREAK ALL EDGES AND SHARP CORNERS.

TITLE:

Mounting Block

SIZE	DWG. NO.	REV
A	201-01	B
SCALE: 1:1	WEIGHT:	SHEET 1 OF 1

5 4 3 2 1



Adding dimensions (sans GD&T information)

UNLESS OTHERWISE SP
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TOLERANCES:
FRACTIONAL ±1/64
ANGULAR: MACH ±1
TWO PLACE DECIMAL
THREE PLACE DECIMA
FOUR PLACE DECIMAL

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL
AL - 6061 T6

FINISH
NONE

Q.A.

COMMENTS:
BREAK ALL EDGES AND SHARP CORNERS.

NEXT ASSY | USED ON

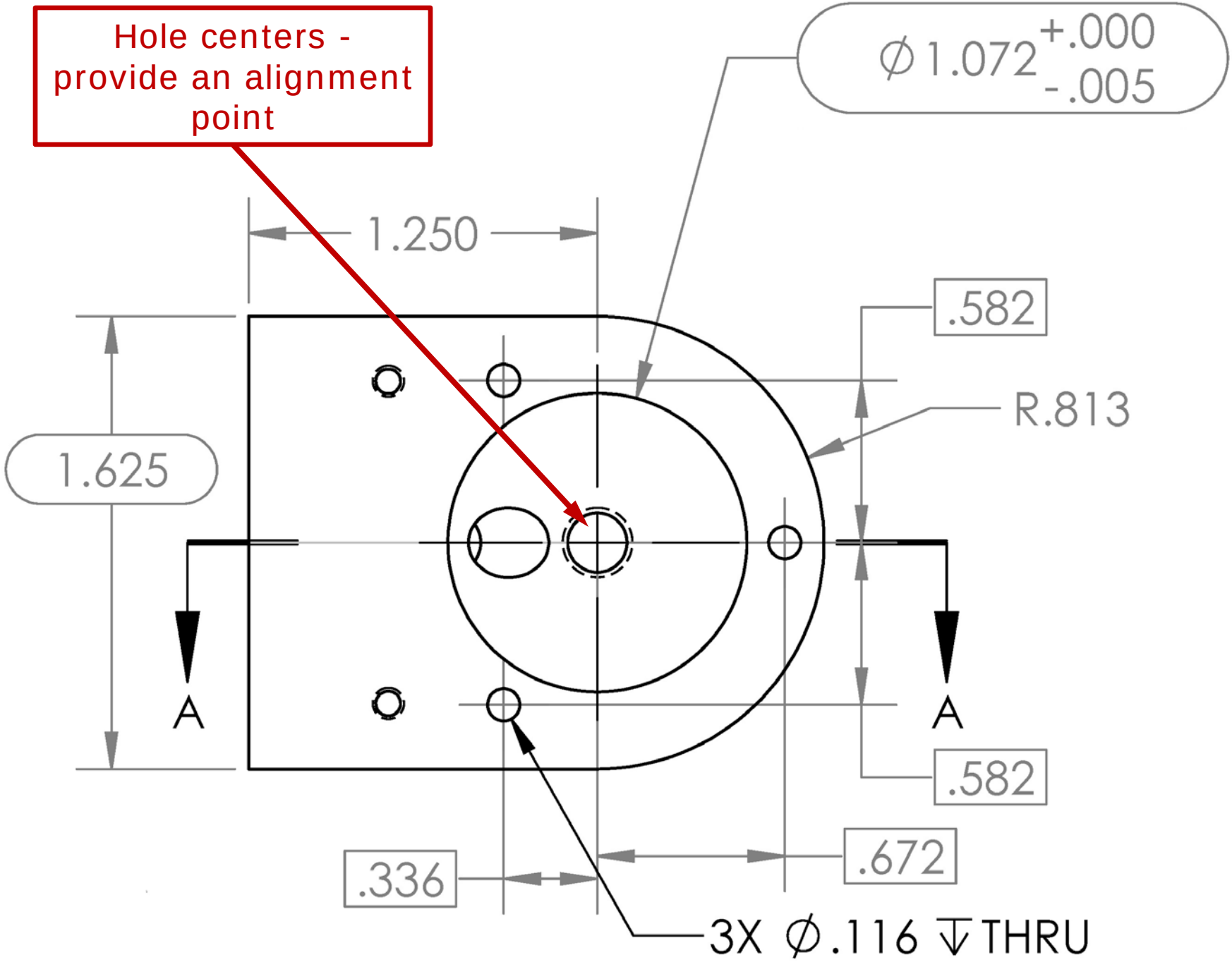
APPLICATION | DO NOT SCALE DRAWING

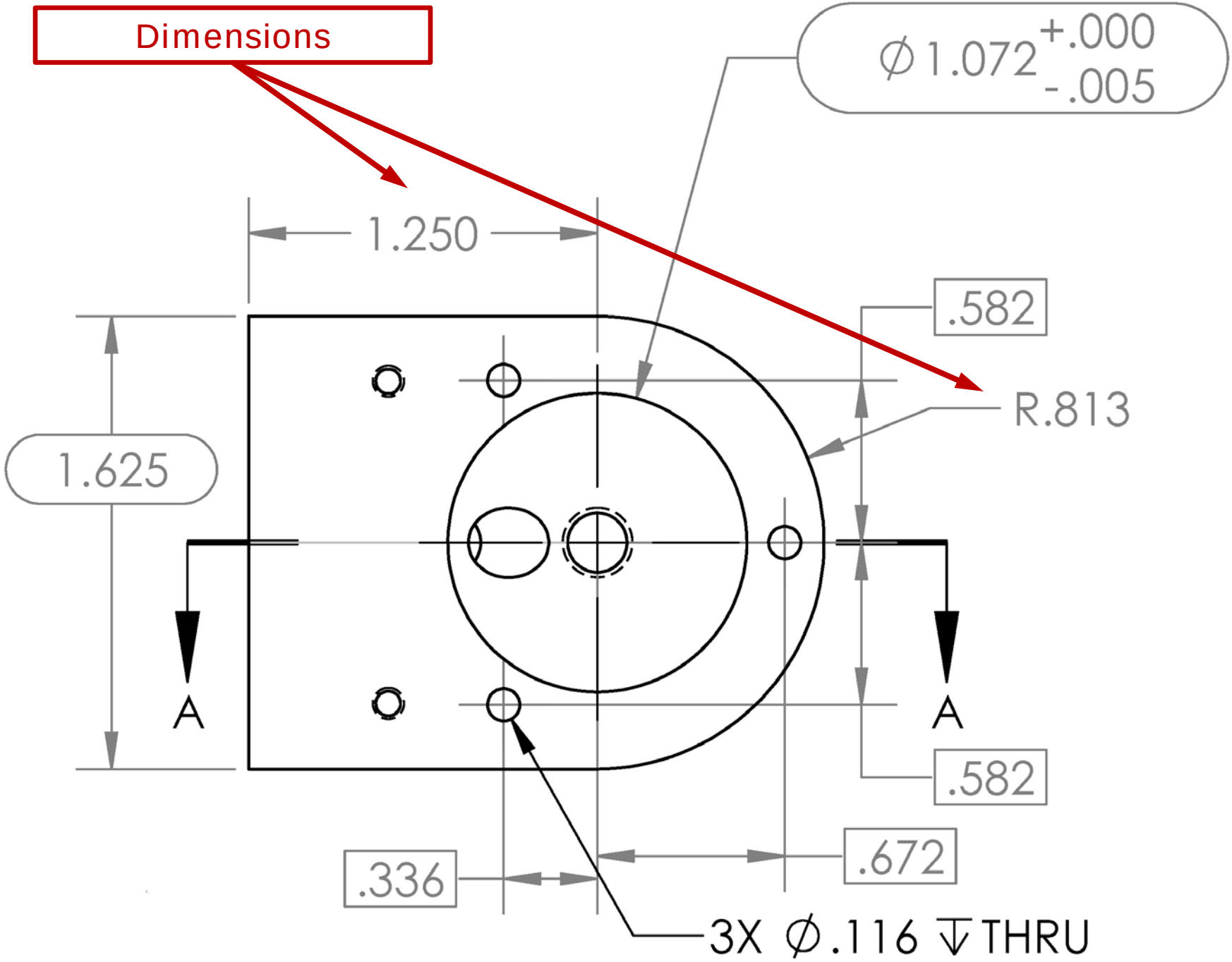
Mounting Block

SIZE	DWG. NO.	REV
A	201-01	B

SCALE: 1:1 | WEIGHT: | SHEET 1 OF 1

5 4 3 2 1


Hole centers - provide an alignment point
Ø1.072 +.000 -.005
1.250
.582
R.813
1.625
A
A
.582
.672
.336
3X Ø.116 ↧ THRU


Dimensions
Ø1.072 +.000 -.005
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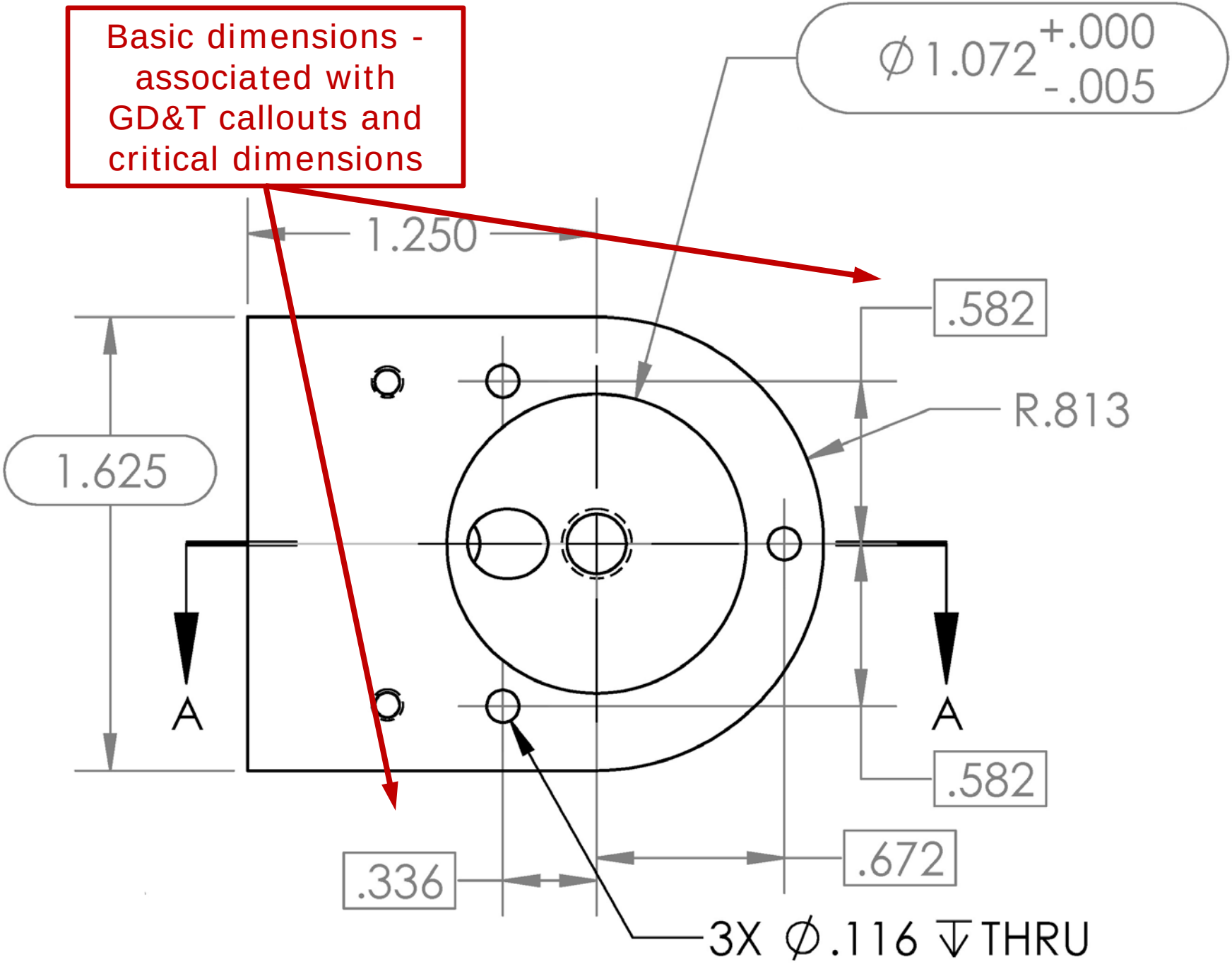
.582
R.813
1.625
A
A
.582
.672
.336
3X Ø.116 ↧ THRU


Basic dimensions - associated with GD&T callouts and critical dimensions
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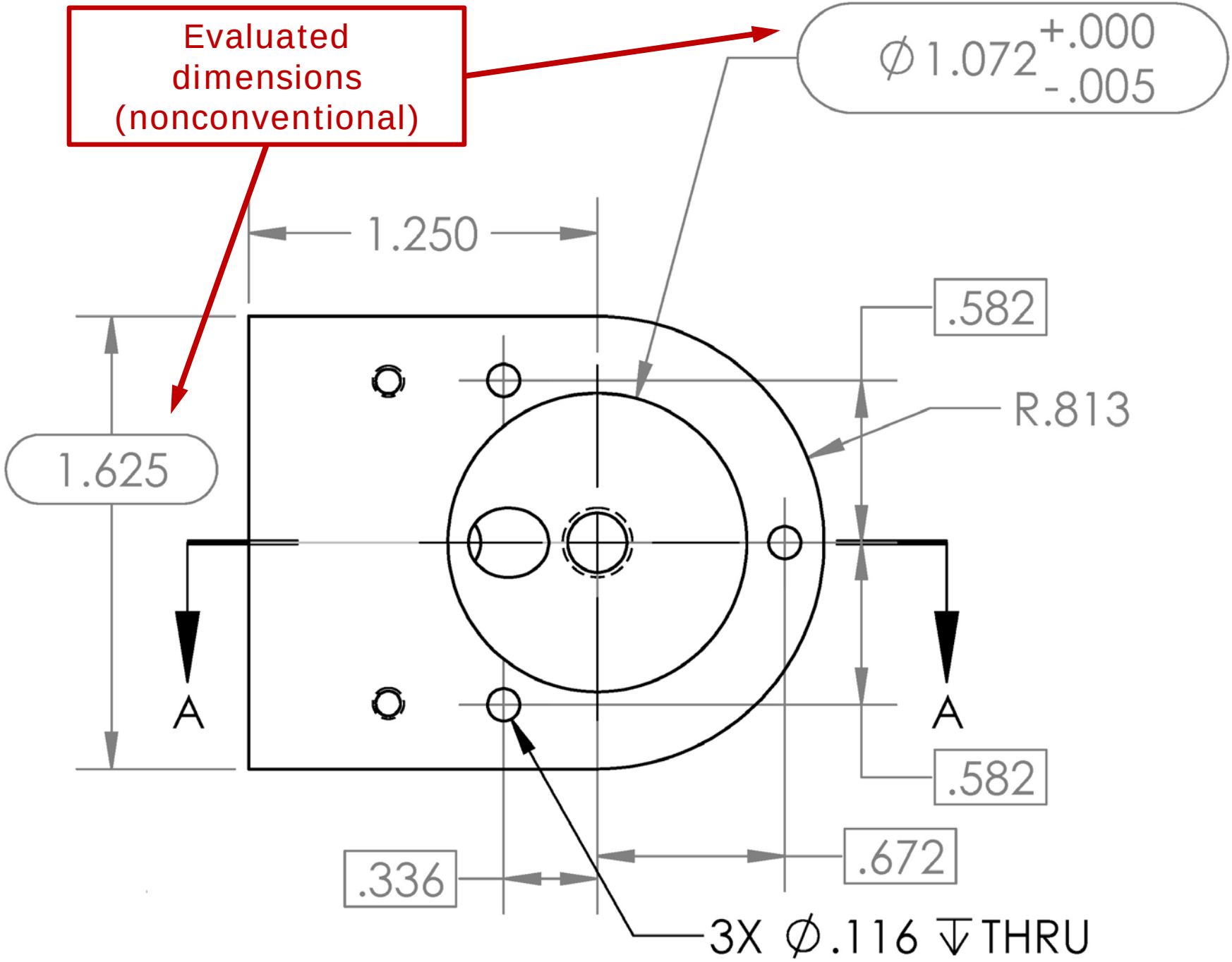
R.813
1.625
A
A
.582
.672
.336
3X Ø.116 ↧ THRU


Evaluated dimensions (nonconventional)
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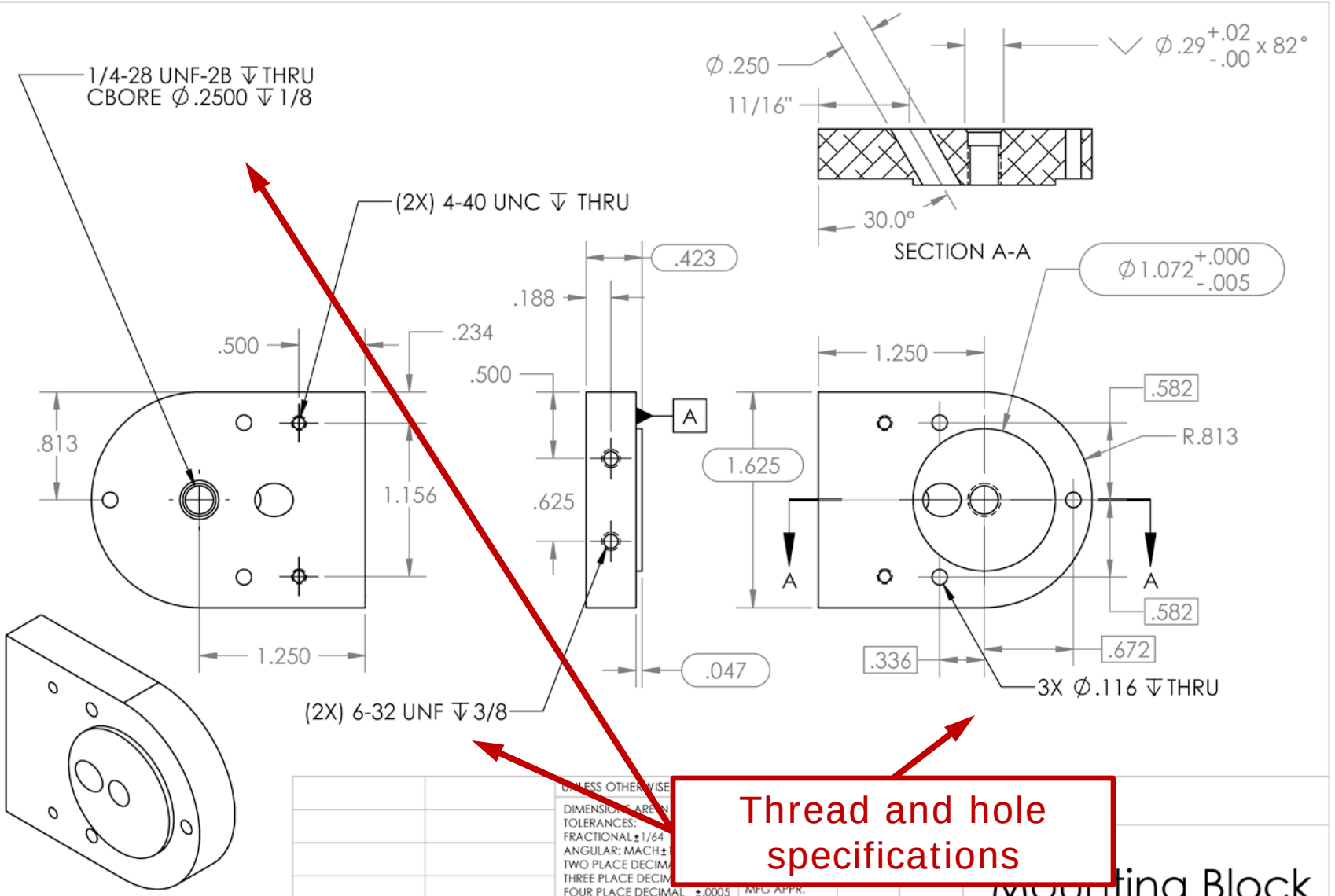
.582
R.813
1.625
A
A
.582
.672
.336
3X Ø.116 ↧ THRU


1/4-28 UNF-2B ↧ THRU
CBORE Ø.2500 ↧ 1/8
(2X) 4-40 UNC ↧ THRU
Ø.250
11/16"
Ø.29 +.02 -.00 x 82°
30.0°
SECTION A-A
.423
.188
.234
.500
.500
.813
1.156
.625
.047
1.250
A
1.625
Ø1.072 +.000 -.005
.582
R.813
.582
.672
.336
3X Ø.116 ↧ THRU
(2X) 6-32 UNF ↧ 3/8
Thread and hole specifications
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TOLERANCES:
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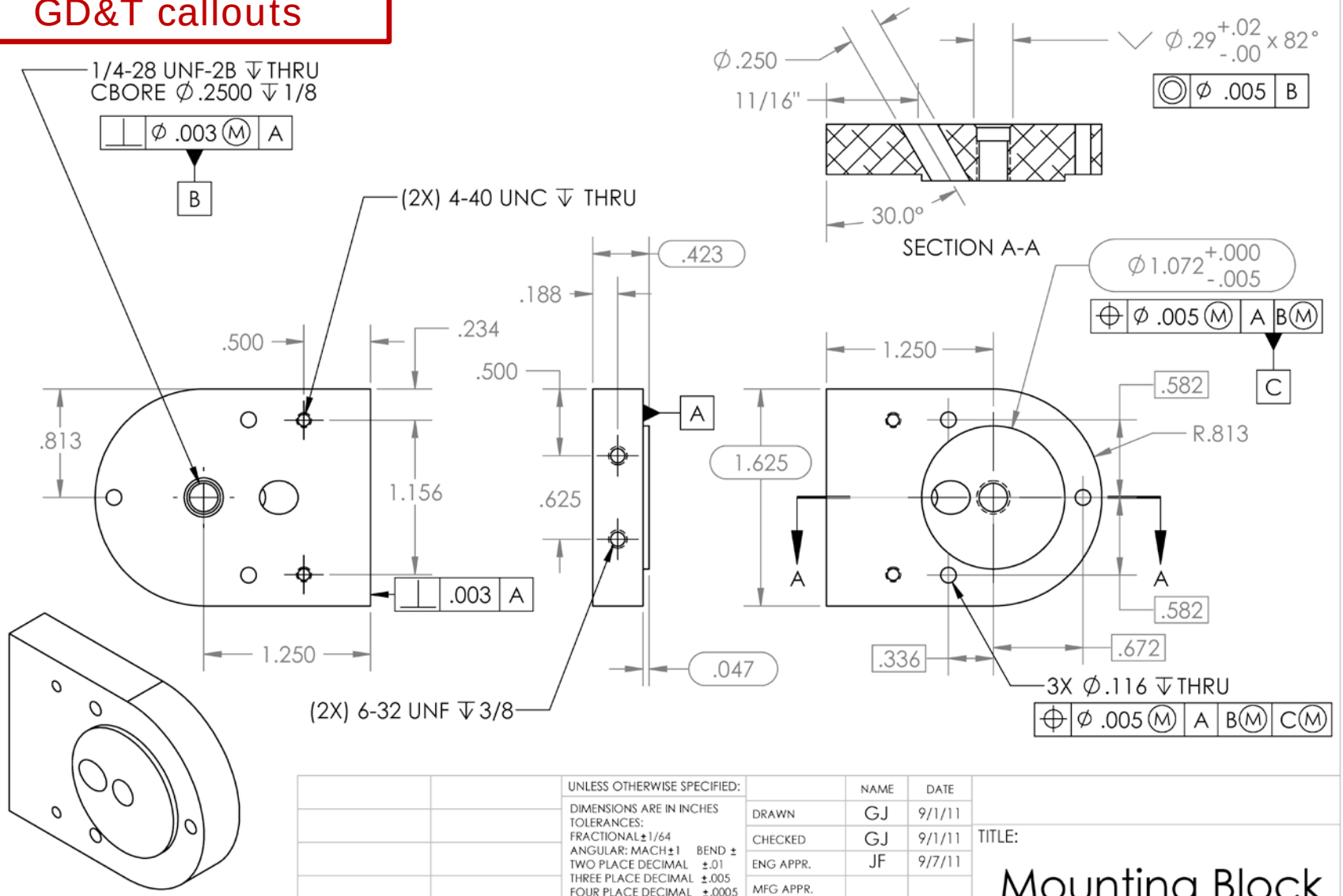
ANGULAR: MACH ±
TWO PLACE DECIMA
THREE PLACE DECIM
FOUR PLACE DECIMAL ±.0005
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
AL - 6061 T6
FINISH
NONE
NEXT ASSY
USED ON
APPLICATION
DO NOT SCALE DRAWING
MFG APPR.
Q.A.
COMMENTS:
BREAK ALL EDGES AND SHARP CORNERS.
Mounting Block
SIZE
A
DWG. NO.
201-01
REV
B
SCALE: 1:1
WEIGHT:
SHEET 1 OF 1
5
4
3
2
1

GD&T callouts



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ±1/64 ANGULAR: MACH ±1 BEND ± TWO PLACE DECIMAL ±.01 THREE PLACE DECIMAL ±.005 FOUR PLACE DECIMAL ±.0005	DRAWN	GJ	9/1/11
			CHECKED	GJ	9/1/11
			ENG APPR.	JF	9/7/11
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL AL - 6061 T6	COMMENTS: BREAK ALL EDGES AND SHARP CORNERS.		
NEXT ASSY	USED ON	FINISH NONE			
APPLICATION		DO NOT SCALE DRAWING			

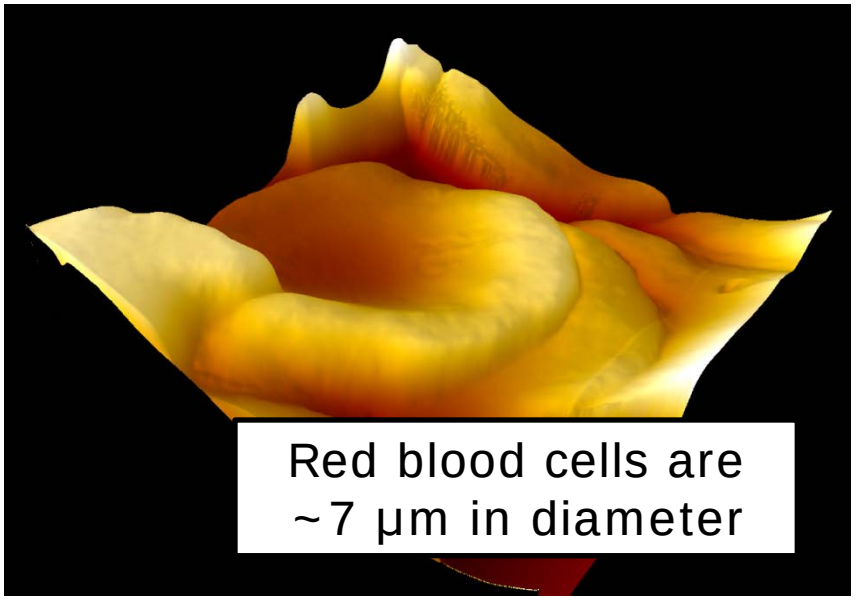
TITLE: Mounting Block

SIZE	DWG. NO.	REV
A	201-01	B

SCALE: 1:1 | WEIGHT: | SHEET 1 OF 1

5 4 3 2 1

How Small Is A Thou?



Typical machining techniques remove down to 2 thousandths of an inch of material

.002” = 125,000 unit cells of Al = 14 hours of nail growth = 7 diameters of a red blood cell = half the width of a human hair

First Assignments

Before your lab on Thursday / Friday

1) View videos G01 and G02 - introduction to vertical bandsaw safety and operation (~10 min in length)
2) Complete a Canvas-based quiz (Q01)
3) Review the lab safety info located at http://medesign.seas.upenn.edu/index.php/Main/LabInfo

Before lecture next Tuesday

1) A01: Stirling engine brief
2) A02: Stirling engine brainstorming
3) Skim the drawing standards reference linked on the course Wiki (http://mscweb.gsfc.nasa.gov/543web/files/GSFC-X-673-64-1F.pdf)
4) Print out all engineering drawings for all fully defined parts