



IPRO 341

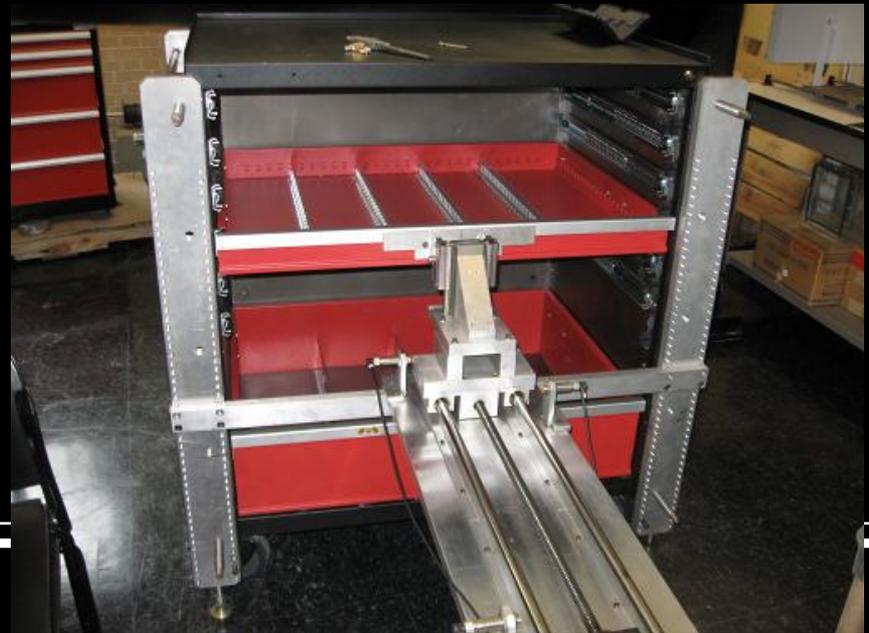
IPRO 341

**Design and Global Market Analysis of a
Tool Cabinet**

Sponsored by: Versatility Tool Works

Objective

- Improve longevity and product desirability
 - Goal: 20,000 cycles @ 440 lbs
 - Develop inexpensive tool tracking system
 - Not your average cabinet!



Purpose – Why?

- End-users want stronger tool cabinets
 - 20,000 cycles @ 440 lbs not yet on market(?)
 - Inexpensive tracking system not yet on market(?)
- Cabinet must hold “tools” like these:



Ethics

- Nondisclosure agreement signed
 - “Engineers shall respect the proprietary information and intellectual property rights of others, including charitable organization and professional societies in the engineering field.”
 - *ASME code of ethics, fundamental canon #5*

Background

- Last semester's record: ~3,500 cycles @ 550 lbs
- Cabinet strengthening
- Lighting concept
- Tracking system concept



Accomplishments

- This semester's record: 20,000 cycles @ 220 lbs (undercarriage system)
 - ***First time 20,000 has been reached!***
 - 20,000 cycles = 10-15 years of use
- Effective testing protocol developed
- Developed tool tracking system
 - Great value and performance!

Team Structure

- 12 members covering 7 majors
- Coordinator
- Testing Team
 - Mechanical testing and recommendations
- Design Team
 - Development of cabinet features

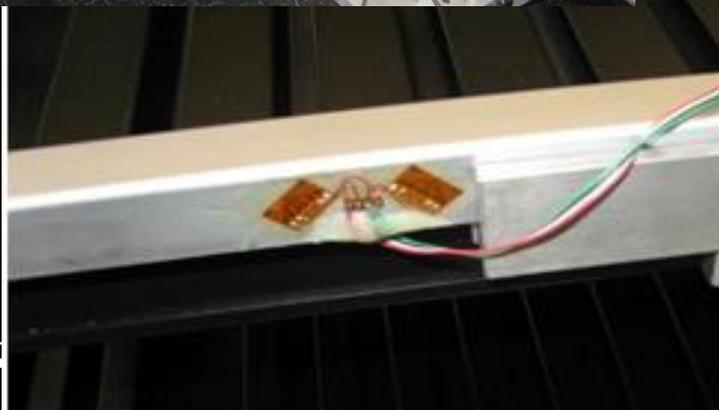
Testing Team

- Steve Falk – MSE
- Eric Hamann – MSE/AE
- Taehoon Kim – ME
- Tom Kozmel – MSE
- Kaisar Syzdykov – INTM
- Robert VanKley
(Captain) – ME

Testing Team: Objectives

- Test drawers to failure
- Collect and analyze data to determine modes of failure
- Suggest and test improvements to design

Testing Team: Testing Setup



Testing Team: Tested Systems



Side mounted slides

-purchased from outside manufacturer



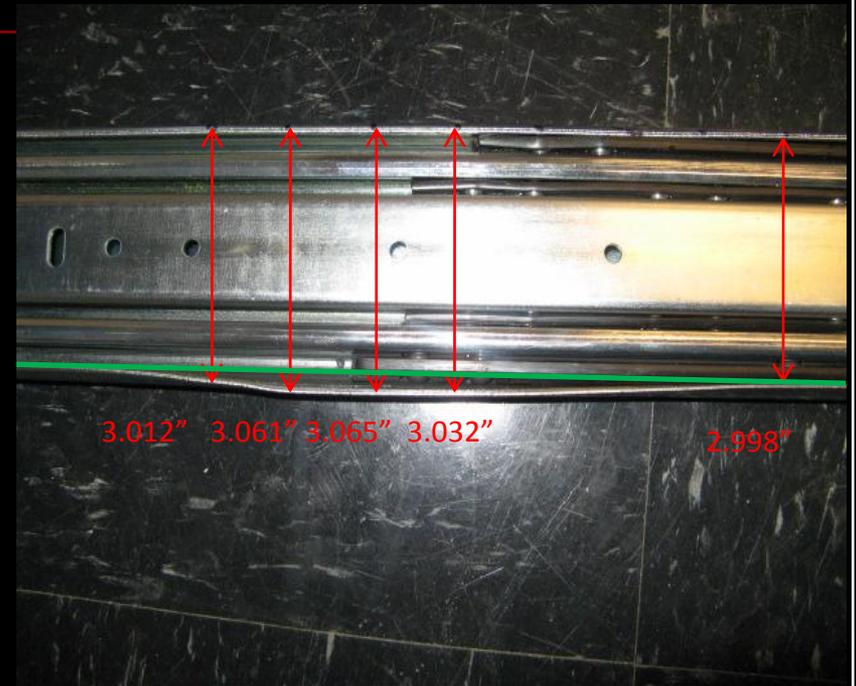
Carriage slides

-designed and fabricated by VTW
- Includes recommendations from
last semester's IPRO

Side Mounted Slide Results



Right slide failed after 680 cycles for
220 lb test



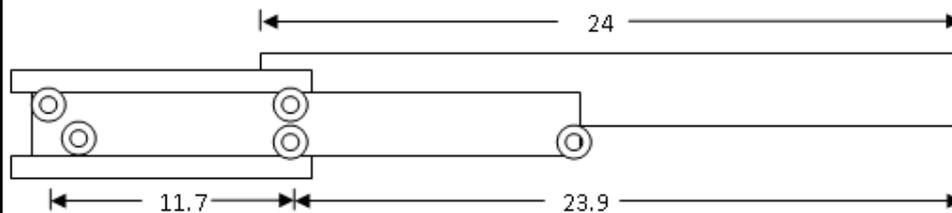
Left slide failed after 1186 cycles for
440 lb test

Undercarriage Slide Results

- System completed 20,000 cycles with 220 lb load
 - Testing discontinued after 2445 cycles with 440 lb load
- No significant guide deformation in either case



Bearing Calculations

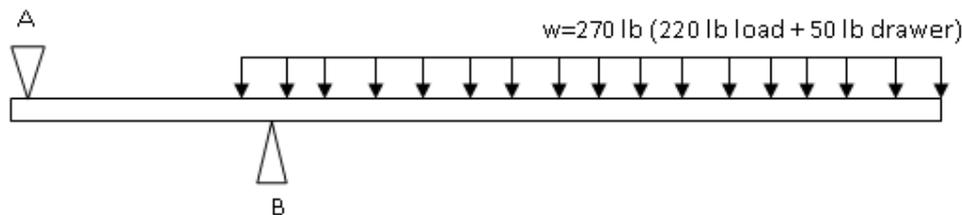


$$\sum M_B = 11.7 A - 11.9(270) = 0$$

$$\Rightarrow A = 275 \text{ lb, or } 137.5 \text{ lbs per wheel}$$

$$\sum F_y = B - A - 270 = 0$$

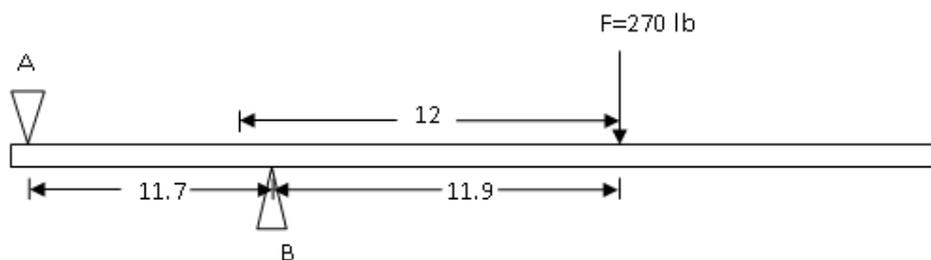
$$\Rightarrow B = 545 \text{ lb, or } 272.5 \text{ lbs per wheel}$$



Repeated for the 440 lb load:

A = 498 lbs, or 249 lbs per wheel

B = 988 lbs, or 494 lbs per wheel



Testing Team: Recommendations

For side mounted slide system:

- Install locks on both sides
- Use slides with higher load rating for 440 lb test

For carriage slide system:

- Replace current bearings with ones rated for the calculated max load of approximately 500 lbs.

Testing Team: Conclusions

- Locking mechanism should always be included on both sides of drawer
- Undercarriage design has most potential
- Improved bearings should significantly increase lifespan of cabinet

Design Team: Members

- Ian Wiese (Captain) – ME/MSE
- Abdul Aleem Syed – MINTM
- Alex Di Sciullo Jones – MSE/AE
- Hon-Kyu (Charles) Chong – CPE
- Johnathan Eckhardt – BUS
- Calin Gavris – CS

Design Team: Objective

- Design and implement desirable features on the cabinet
- Improve longevity of cabinet

Design Team: TTS

- Tool Tracking System
 - No known market competition
 - Barcode system
 - Inexpensive scanner (\$119)
 - ID Automation

Design Team: TTS

- Stick-on barcodes
- User ID
- Tools are scanned in and out



• Usage time recorded

• Enter notes



• Data stored

-maintenance, troubleshooting, warranties, etc.



Design Team: TTS

- Barcode Software
 - Database application – Microsoft Access

Form View

Form View

Form View

Design Team: TTS

■ Equipment

- Computer – Printer
- Scanner – Software

■ Compare

- Tool Cabinet: \$2000
- Single drawer full of tools: \$5000 ~ \$6000
- Fully loaded cabinet: \$30,000+



Design Team: TTS Benefits

- Accountability
- Assign tools to locations
- Tool information
- Printable receipts
- Locate tools → ***Increased Productivity***
- Less lost tools → ***Decreased tool costs***

Design Team: Next Semester

- Test corrugated drawer
 - Operating conditions
- Laser etched barcodes
 - Troubleshoot scanner
- Improved rack slides
- Hutch lighting
- Power tool charging



Questions?

- Thank you for your attentiveness! 😊
 - Please stop by our booth for demonstrations!