



# Engineering Portfolio

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# PUMP AND ACCUMULATOR SYSTEM FOR CREWED SPACEFLIGHT CAPSULE

## Summary

- An electromechanical system controlling fluid pressure
- Bellow accumulator with centrifugal pumps

## Contributions

- Engineering direction and manufacture/assembly documentation
- IPD Team
  - Implementing engineering changes
- Led root cause investigations
  - Accumulator leak
  - Presence of FOD in accumulator tank



# PUMP AND ACCUMULATOR SYSTEM FOR CREWED CAPSULE

## Challenges

- Accumulator leaks
- Foreign Object Debris (FOD) inside accumulator tank
- Improving system efficiency

## Solutions

- Removed FOD while preserving accumulator tank
  - Created repair instructions FOD removal
  - New instructions obviated need to destroy tank
- Prevented further risk of FOD entry during assembly
  - Mandated additional assembly inspections
- Minimized risk of leakage
  - Reduced welded surface area
- Innovate highly efficient two-phase design (in progress)



# THREE-WAY MODULATING VALVE

## Summary

- Electromechanical system controlling flow of hydrofluoroether (HFE)
- Control balance between two flow paths simultaneously

## Contributions

- Built valve prototype
  - Proof of concept and manufacturability
  - Identified and resolved design problems:
    - > HFE ingress into sensitive components
    - > Precise, real-time flow modulation
- Engineering direction and manufacture/assembly documentation
- IPD Team
  - Implementing engineering changes
- Real time assembly floor oversight and support



[valvesolutions.com/product/3-way-flanged-globe-valve-with-belimo-actuator](https://valvesolutions.com/product/3-way-flanged-globe-valve-with-belimo-actuator)

# THREE-WAY MODULATING VALVE

## Challenges

- Precise, real-time flow modulation
- HFE contamination of ESD components
- Complex assembly process
- Defective components (supplier error)

## Solutions

- Custom spool and actuator design
- Magnetic drive shaft design
- Prototype identified assembly challenges
  - Addressed in final assembly instructions
- Assembly involved live collaboration with shop floor
- Navigated part shortage issues
  - Identified alternate components



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# AIR DROP PLATFORM STRUT SUPPORT SYSTEM

## Summary

- Mechanical system to manage impact forces during airdrop

## Contributions

- Designed innovative strut support system
  - Research, calculations, CAD models
  - Identified and resolved design problems
    - > Material flexibility
    - > Weight reduction
- Manufacture/assembly documentation
- Created working prototype
  - Led Cross-Functional team to create prototype
    - > Design, Manufacturing and Procurement



[www.army.mil/article/254684/devcom\\_tests\\_airdrop\\_system\\_for\\_rapid\\_deployment\\_in\\_the\\_field](http://www.army.mil/article/254684/devcom_tests_airdrop_system_for_rapid_deployment_in_the_field)

# AIR DROP PLATFORM STRUT SUPPORT

## Challenges

- Unique design, distinct from competitors
- Hardware durability
- Payload weight

## Solutions

- Custom spring-loaded design
  - More compression on impact
  - High durability
  - Distinct from competitor solutions
    - > Mechanical over material
- Deliberate material choice
  - Maximized durability/weight considerations
  - Calculated requirements based on exerted forces



[www.army.mil/article/254684/devcom\\_tests\\_airdrop\\_system\\_for\\_rapid\\_deployment\\_in\\_the\\_field](http://www.army.mil/article/254684/devcom_tests_airdrop_system_for_rapid_deployment_in_the_field)

# MECHANICAL AIR PRESSURE RELEASE VALVE

## Summary

- Designing a reusable air bag system for air drop platform
  - Moved to reusable mechanical system

## Contributions

- Designed air pressure release valve
  - Research, calculations, CAD models
  - Identified and resolved design problems
    - > Deployment timing
    - > Reusability
- Manufacture/assembly documentation
- Created working prototype
  - Led Cross-Functional team to create prototype
    - > Design, Manufacturing and Procurement



[www.aerotechnews.com/blog/2022/03/17/devcom-tests-airdrop-system-for-rapid-deployment-in-the-field](https://www.aerotechnews.com/blog/2022/03/17/devcom-tests-airdrop-system-for-rapid-deployment-in-the-field)

# MECHANICAL AIR PRESSURE RELEASE VALVE

## Challenges

- Reusability
  - Common design is single-use (bursting air bag)
- Timed deployment
  - Must deploy at certain payload velocity
- Must withstand turbulent air flow

## Solutions

- Custom valve design featuring sturdy, re-closable valve
  - Survived multiple impacts
- Magnetic locking mechanism
  - Valve deployed at defined air pressure threshold
  - Locking mechanism withstood turbulent air flow
- Created and tested working prototype
  - Simulation and field-based testing
    - > Test utilized military-grade air drop platform



[www.aerotechnews.com/blog/2022/03/17/devcom-tests-airdrop-system-for-rapid-deployment-in-the-field](https://www.aerotechnews.com/blog/2022/03/17/devcom-tests-airdrop-system-for-rapid-deployment-in-the-field)

# About Me

- Trilingual: English, Polish, Spanish
- Love building cool stuff
  - (Boeing Starliner field service at NASA)
- 3D printing (Ender 3 V2)
- Indoor rock climbing enthusiast

