acamp
ALBERTA CENTRE FOR ADVANCED MNT PRODUCTS

ACAMP Inertial Development

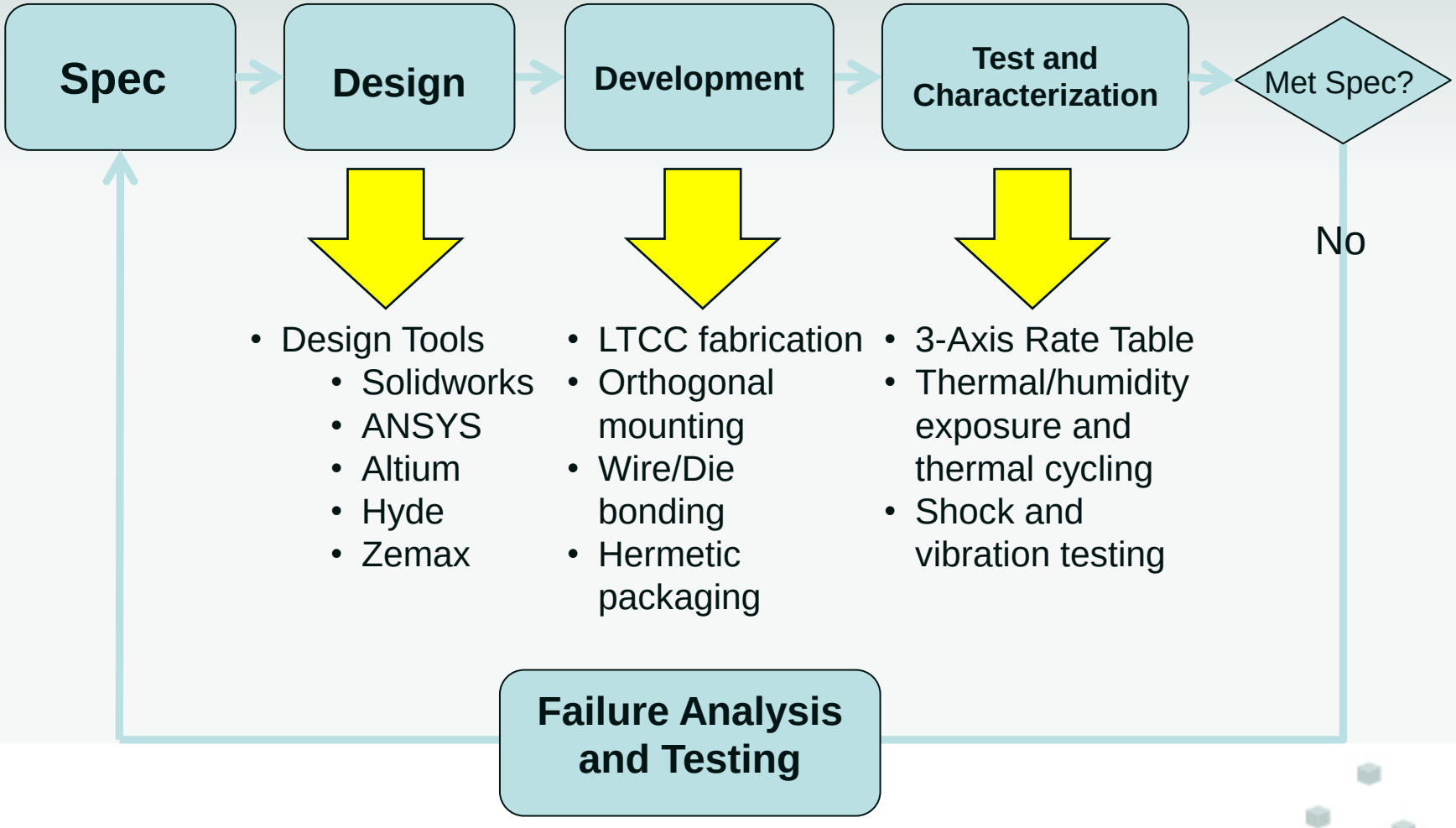
Working with ACAMP

ACAMP INERTIAL DEVELOPMENT

Presentation Agenda

- ACAMP Inertial Development Overview and Workflow
- ACAMP's Smartcube

ACAMP Inertial Development Process



Client Requirements

- ACAMP tailors its role to fit client needs
  - May only need design, or testing - OK
- Client can specify complete project, or work with ACAMP staff to determine the best project solution
- ACAMP can help with designs or developing test sequences if desired
- Summary: **We are flexible!**

Inertial Development Workflow

Spec

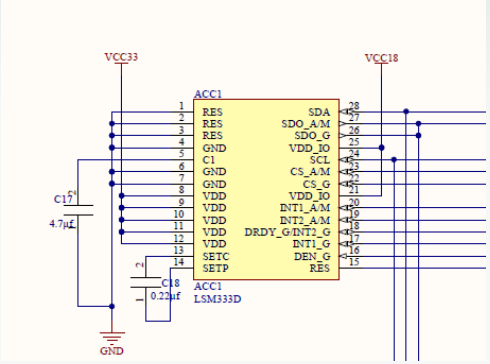
Spec Considerations:

- Target Market
- Commercial, Industrial, Military, Automotive?
- Customer requirements
- Cost restrictions

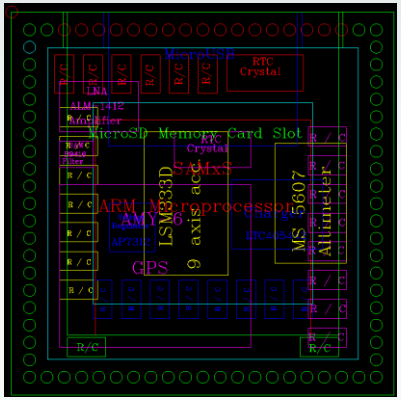
Inertial Development Workflow

Design

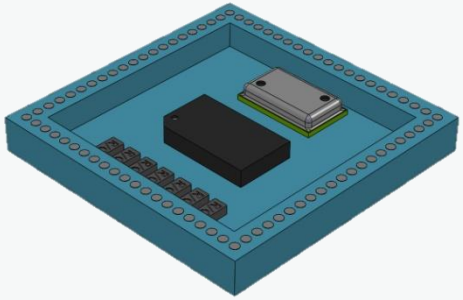
Altium:



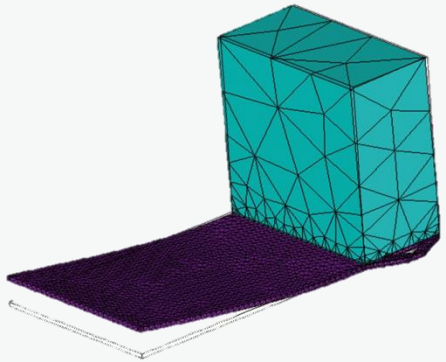
Hyde:



Solidworks:



ANSYS:



Inertial Development Workflow

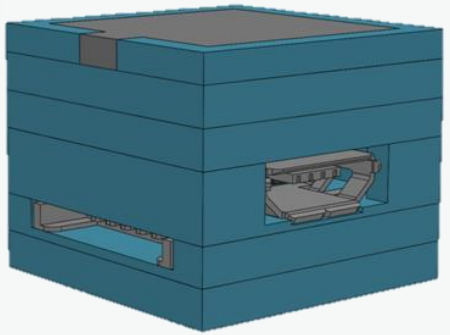
Development

Component placement, interconnect: Palomar, Finetech, F&K

Package sealing options: Solder, Braze, Welding

Board Construction:

- LTCC
- Anything you want

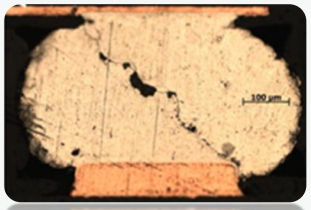


Inertial Development Workflow

Test and Characterization

How well does the device perform?
How well does the device resist the target environment?

Performance Testing:
3-axis Rate Table with temperature chamber



Environmental Testing:

- Temperature
- Humidity
- Vibration
- Shock

Inertial Development Workflow

Test and Characterization

Accelerometer Parameters

- Scale Factor
- Scale Factor Error (1σ)
- Scale Factor Repeatability
- Axis Misalignment
- Absolute Bias
- Bias Repeatability
- In-Run Bias Instability
- Velocity Random Walk
- Temperature Dependence
- Latency Testing

Gyroscope Parameters

- Scale Factor
- Scale Factor Errors
  - Error (1σ)
  - Non-linearity
  - Asymmetry
- Scale Factor Repeatability
- Axis Misalignment
- *g*-Sensitivity
- Absolute Bias
- Bias Repeatability
- In-Run Bias Instability
- Angular Random Walk
- Temperature Dependence
- Latency Testing

Inertial Development Workflow

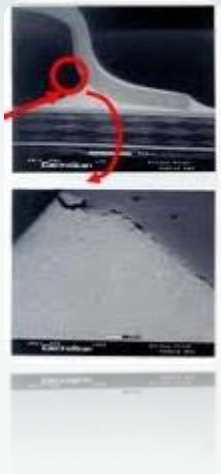
Test and Characterization

Benefits of 3-axis Rate Table:

- Capable of reconstructing real motion profiles
- Faster calibration for IMUs
- Reduces the need for highly complex tooling for multi-axis mounting
- Capable of cross-axis sensitivity measurements
  - Axis misalignment
  - Cross-coupling effects

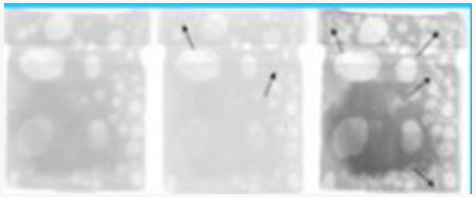
Inertial Development Workflow

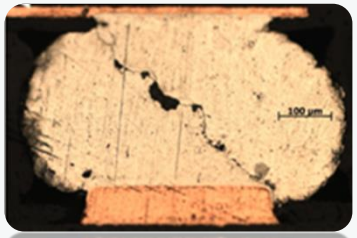
Spec Review



Does the unit meet the spec set out?

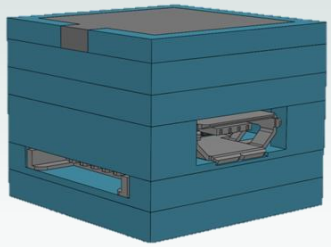
- Yes -> Great!
- No ->
  - What and Why did it not meet the spec?
    - Perform Failure Analysis, non-destructive Test, and Destructive Test to figure out failure modes
  - Redesign based on testing results





Inertial Development Workflow

Spec



- Develop INS product demonstrating our integration capability
- Commercial components selected based on price and performance

Components:

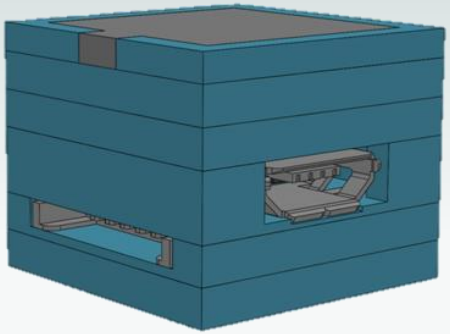
- Inertial: STMicro LSM330
- GPS: ublox AMY-6M
- Pressure: Freescale Semiconductor MPL115AT1
- Processor: Atmel Cortex M3

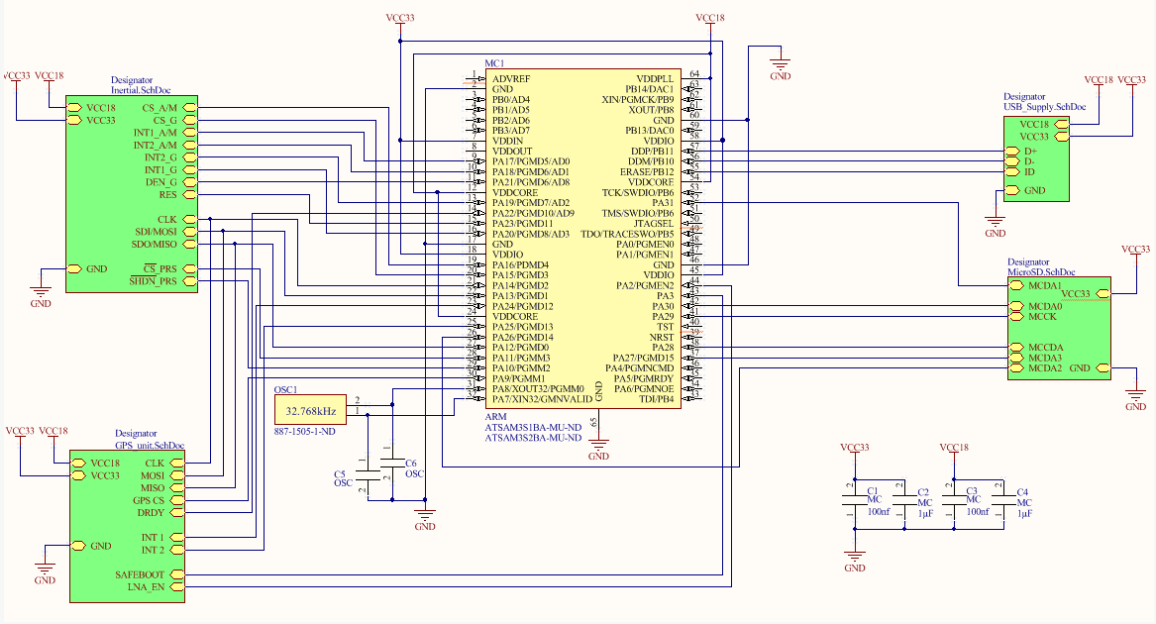
Connectivity:

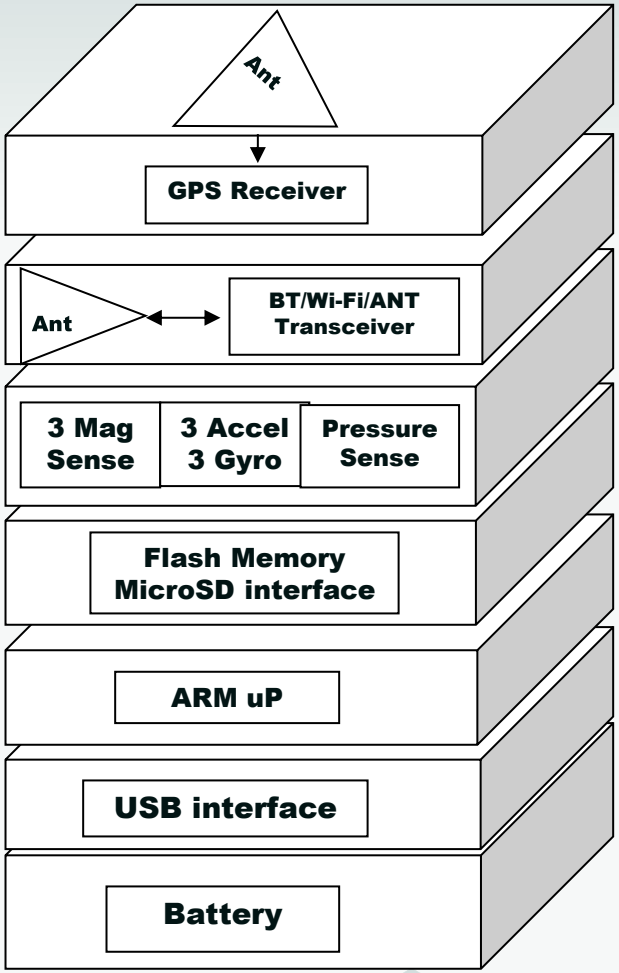
- USB
- Wifi
- Bluetooth

Inertial Development Workflow

Design

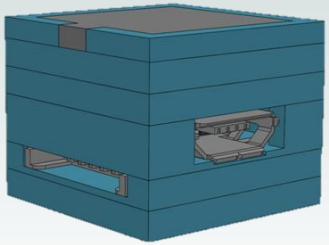


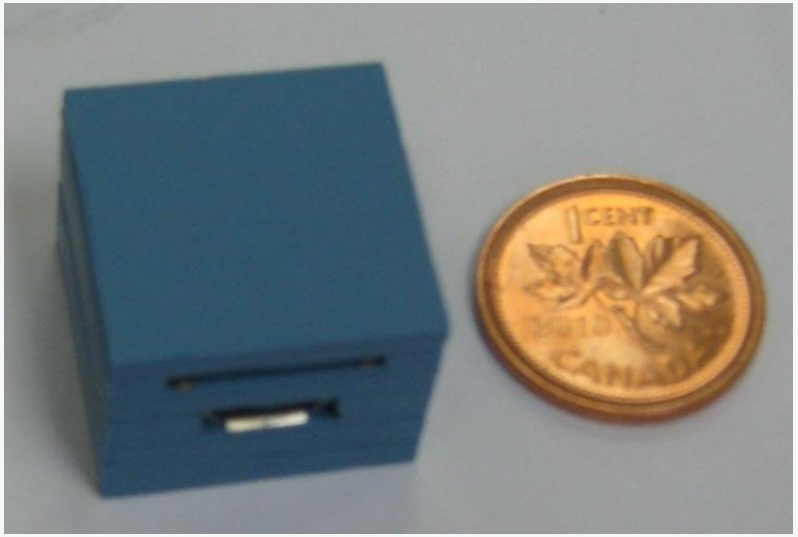




Inertial Development Workflow

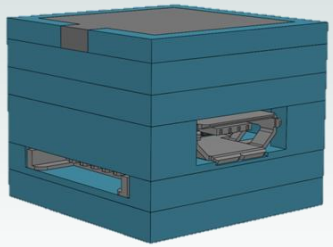
Development





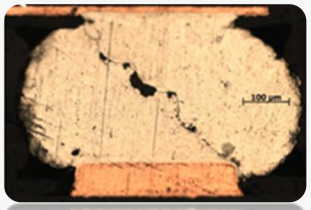
Inertial Development Workflow

Test and Characterization



Coming Up Next:

Performance Testing:
3-axis Rate Table with temperature chamber



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