Avionics

Fernando Perez
Avionics Requirements

• Processor must provide enough computational power
  – Approximately 23 MIPS

• Processor must have at least 35 DIOs and 6 A/Ds
  – Must provide for serial communications

• Minimize weight and volume

• Minimize power usage
Avionics Design

- Need 2 processors for required DIO and A/D inputs
  - Metrology dedicated Tattletale
  - DSP
- 6 major avionics boards
  - UARTs - Propulsion
  - Power - DSP
  - Metrology - Tattletale
- Additional supporting boards
  - 8 small metrology US/IR connector boards
  - 2 communication boards
- Most boards sent out for layout and population
  - DSP, Tattletale, and Communications boards are COTS
  - Power board layout and population done in house
  - Metrology Ultrasound/IR connector boards populated in house
- Required power and signals distributed through interconnecting boards under metrology and propulsion
  - Reduces noise interference on important signals
  - Reduces number of wires
  - No extra card cage needed
Avionics Components

Processor Specifications

<table>
<thead>
<tr>
<th></th>
<th>Tattletale</th>
<th>TIM-DIO 40</th>
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</thead>
<tbody>
<tr>
<td>DIOs</td>
<td>16</td>
<td>64</td>
</tr>
<tr>
<td>A/Ds</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>MIPS</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>Tot. Mass (kg)</td>
<td>0.028</td>
<td>0.09</td>
</tr>
<tr>
<td>Tot. Vol. (cm³)</td>
<td>46.2</td>
<td>86</td>
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<tr>
<td>Power (W)</td>
<td>2.25</td>
<td>1</td>
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<tr>
<td>RAM (MB)</td>
<td>0.256</td>
<td>0.5-2</td>
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<tr>
<td>Tot. Cost ($)</td>
<td>1190</td>
<td>1275</td>
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TIM-DIO 40

Tattletale Model 8
**Prototyping**

- Acquire circuit boards
  - Sketch from subsystems
  - Design circuit board connectors
  - Schematic captured in OrCAD
  - Boards sent out for manufacturing
  - Board layout and population verified

- All boards integrated
- Total mass $\approx 540$ g

**Results**

- Entire system was provided the required voltages and signals
Avionics Comparison with Requirements

- Needed computational power provided

- All needed DIO and A/D lines provided
  - Serial Communications provided

- All signals and power routed to the required locations

- Total power draw acceptable
  - Power of DSP higher than expected (3 W)
  - Power of Tattletale lower than expected (< 2 W)
Avionics Changes for Flight

- Decrease size of several circuit boards
- Send power board out for professional layout and population
- Reset buttons added to outside of SPHERE for DSP and Tattletale resets
- Improve connectors between avionics boards and subsystems