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# Build Your Own or Buy Off The Shelf?

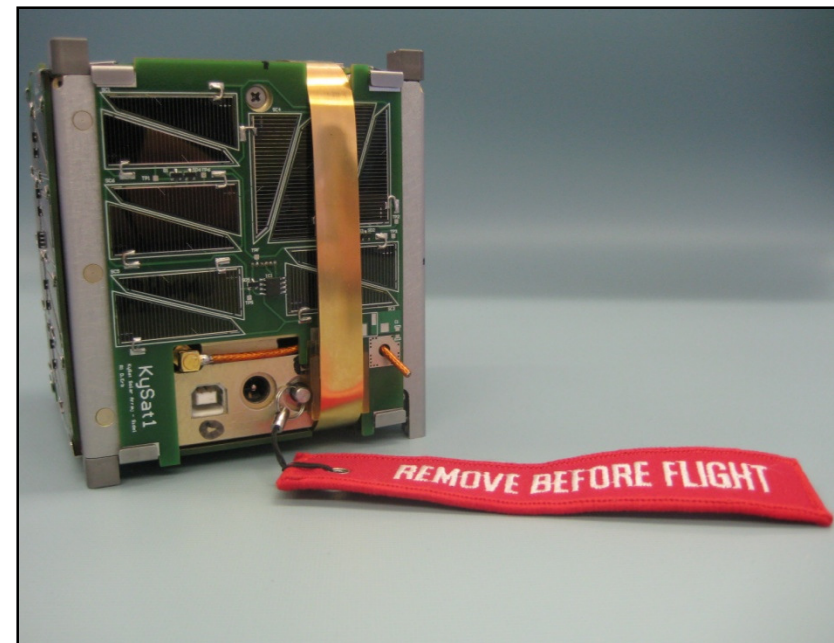
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# Overview



- The Three Constraints (plus One)
- A Quantitative Approach
- What to Expect
- What Not to Expect
- Thoughts for Third Party Developers



# The Three Constraints



- Performance; Schedule ;  
Budget
- Only two of these can be  
constrained

All decisions must take into account the effect they will have on these constraints; particularly on the how the unconstrained must change





## ...plus One

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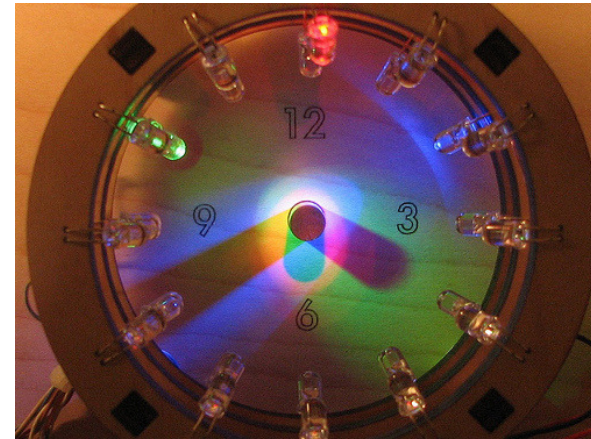
What kind of experience should/must be gained?

- For the Program
  - Increase In-House Knowledge
  - Avoid Single String Suppliers
  - Gain Industry Partners
- For the Participant
  - Increase Individual Knowledge
  - Work With Third Parties
  - Integrate/Troubleshoot a Black Box Design

# Performance

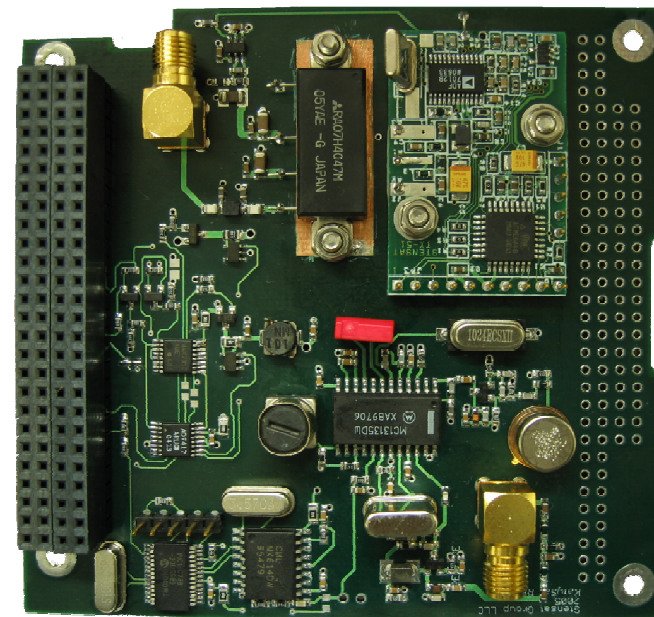


- In House
  - Customizable
  - Knowledge Base Required
- Third Party
  - Leverage Existing Knowledge
  - Limits to Customizability



# Example – StenSat Radio

- ❑ ConOps required a relatively high powered transmitter
- ❑ Lack of RF building experience led to an off-the-shelf solution
- ❑ Solution lacked the ability to adjust power output
- ❑ Inability to customize led to a negative power budget

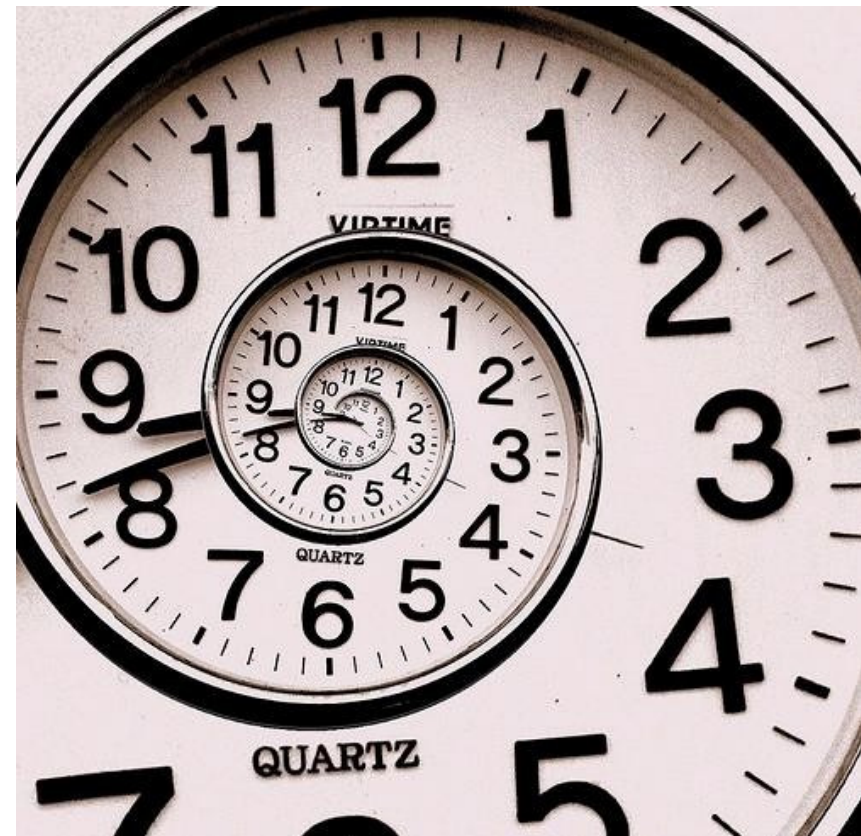




# Schedule



- Third Party
  - Off the Shelf/Instant Gratification
  - Unforeseen delays due to integration/troubleshooting
- In House
  - Designed with integration in mind
  - Allows for easier troubleshooting
  - Lack of experience can cause gross underestimation



# Example – Vibration Facility



- ❑ On-site testing facilities is a goal of Kentucky Space
- ❑ Facilities included custom fixturing and custom control software
- ❑ Lack of experience led to gross underestimation of the time necessary
- ❑ ~10 months behind schedule the shaker is still not fully operational





# Budget



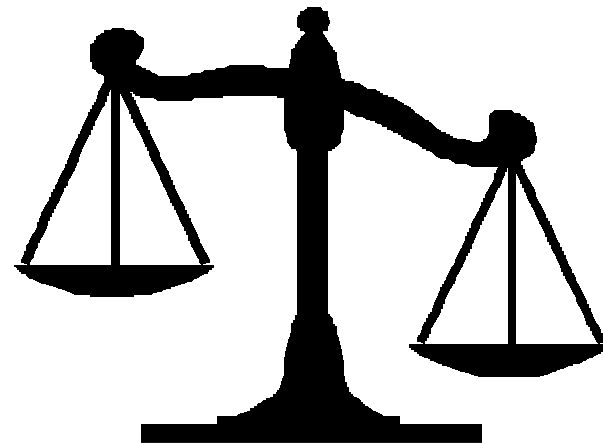
- Development costs are low in academia; much higher in industry
- Third party designs are generally much more costly
- When looking strictly at dollars; it almost always makes sense to design in-house



# A Quantitative Approach



- How to deal with the interplay between all the constraints?
- Attempt to quantify and look for relationships
  - Cost Benefit Analysis
  - Risk Benefit Analysis
  - Risk Value Analysis



# Risk Value Analysis



$$\text{Value} = \frac{\text{Performance} \times \text{Good Feeling}}{\text{Cost} \times \text{Hassle}}$$

- Performance – How well does the technology fit the requirements
- Good Feeling – On time, good communication, education
- Cost – Total opportunity cost
- Hassle – Red tape, failed parts

$$\text{Risk} = \frac{\text{Complexity} \times \text{Significance}}{\text{Experience} \times \text{Heritage}}$$

- Complexity – How much does this technology have to do
- Significance – What is the potential impact from failure
- Experience – How much experience does the developer have with working with this technology
- Heritage – TRL

# Expectations

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## □ What to Expect

- Accurate Specs
- Full Disclosure of Bugs/Design Changes
- Easy Communication
- Troubleshooting Help

## □ What Not to Expect

- Plug and Play
- Full Disclosure of Design
- Instant Communication
- Automatic Credulity

# Third Party Developers



- ❑ Everyone makes mistakes; disclose problems
- ❑ Don't overstate specs
- ❑ Don't promise what can't be delivered
- ❑ Disclose design changes and update specs
- ❑ Straightforward Communication







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