Strategy

- Current total budget ~ $1M
- Maximize MIPS(MFLOPS)/Watt
- Minimize components to be qualified
- Minimize no. of boards used
- Development restricted to pin compatible CPU replacement &/or hardening existing boards
- Compression in software
- Central computing & control; distributed data acquisition if needed (A/D), distributed controllers to close simple & high speed loops

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Computing Budget

Stereo	130 Mips
Light Striping	10 Mips
Safeguarding/ local Nav	15 Mips
Global Nav	10 Mips
Star tracking	5 Mips * 1/10
Position Estimation	4 Mips
Compression	?
Power management	2 Mips
Comm pointing	5 Mips
Safeguarding layers	2 Mips

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Testing Process

- Test hardware = EVB+ I,V,Temp,latchup monitors
- Test software = chip function + upset monitors
- Gamma Ray: spec for 12 kRad, test for 20 kRad
- Hi E Proton:$500/hr x 1 hr/part x 3 parts
- Heavy Ion: $700/hr x 1 hr/part x 3 (min) to 5 parts
- Shielding: reduce total dose & upsets by half
- Flight software: Needs periodic memory scrubs
- Need to Leverage: test facilities, EVBs of new Fabs, Chip test software, joint efforts with chip makers
- Start early to reduce costs

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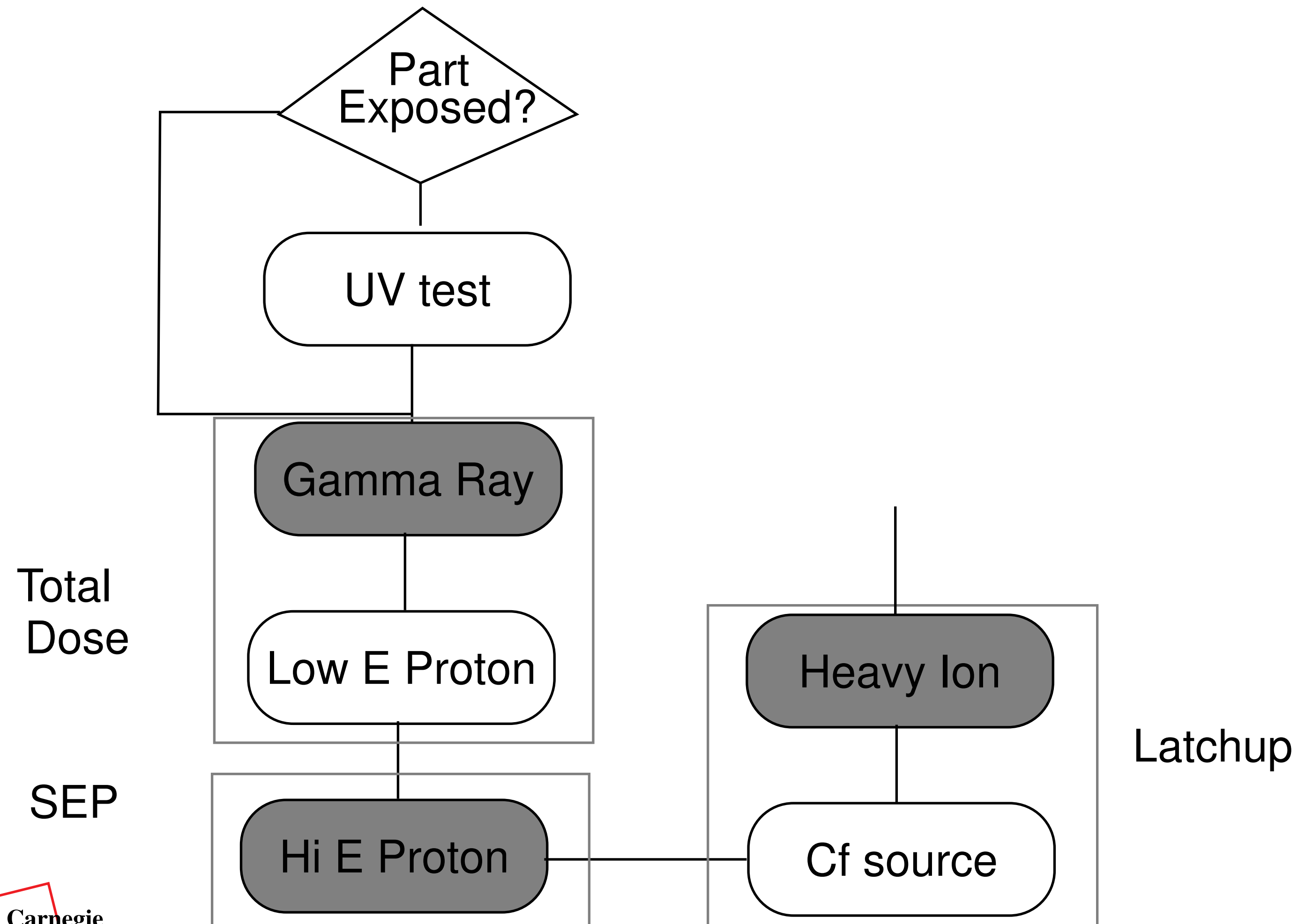
Testing Process



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Available CPUs

- **Mips RX000 compatible**
  - 0.1. Mongoose R3000 compatible: 3Mrad, Heavy ion LET ~85, error LET > 25 Mev, SEU 1 upset/ 105 years. Core CPU candidate; < 5 W, 25 MHz-scalable,
  - 0.2. R3081: 3 W, 66 MHz CPU, Space approved (27 MIPS, 11 MFlops)
  - 0.3. R4600:?
  - 0.4. ICE:?
- **i860/960**
  - 0.5. i860: ~4W, 80 MFLOPS, Space qual
- **IBM Risc 6000**
  - 0.6. RAD6000-SC: SEU 1 upset/yr, 16.9 W-20 MHz, 20 MIPS (spec)

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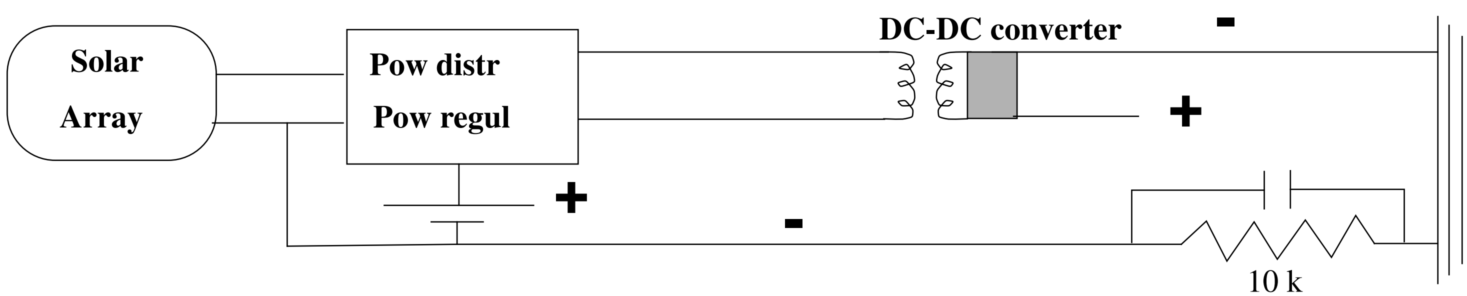
Power System

- Clean ground essential
- Do not run Analog lines longer than ~ 1 m
- Avoid pyro charges
- Star configuration with direct power links to components
- Add margin to components for increasing consumption with age (10-20% for electronics)



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Computing System

- Computing Board: Skybolt Shamrock (320 MFlops, 35 W)
- Controllers: SMD ([77,131] Mips,[16,25] W, 64 bit I/O, 2 Framebuffers, VxWorks supported)
- Controllers: RMC-D, 40 bit I/O, 27 Mips, IMU interface, 10W
- Distributed controllers: 8051 < 2 W
- Mesur VME cage, 16 & 32 bit slots
- Video switch:?
- Central A/D: Cassini REU
- Distributed A/D: Clementine
- Serial interface: 1553+1773 LSI module
- Current configuration: 2 SMD 131 Mips, 1 RMC-D, 10 distributed controllers with serial interface = 70 W
- High end config: 1 skybolt + 1 SMD 77 Mips, 1 RMC-D, 10 distributed controllers = 75 W

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Computing Overview

- Requirement ~ 100 W, 10 actuators, 6 cameras
- VxWorks (FRC exp, tools, well recommended, porting to new boards)
- Issue of distribution vs central partially resolved
- Viable scenarios sketched

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