

### Electrical Suggestions

- most common cause of scientific instrument failures is probably poor electrical connections
- use good grounding practice
- chassis ground on the aircraft is very different from in your lab
- good practice to secure all connectors with detents or screws
- good practice to strain-relieve all cables
- good practice to use differential inputs for all critical signals
- design so that the instrument can take unexpected power outages
- aircraft 28V is not always well regulated
- put hold-downs on all edge-card connectors (including PCI and ISA cards)
- allow margin on power-supplies to account for increased thermal load at reduced pressure
- tiny metal chips can move around on circuit boards even during very mild vibration
- be tidy, especially with wire-wrap

### Mechanical Suggestions

- use aircraft-rated fasteners for structural parts
- approval will be easier if you enclose your instrument
- even though WB-57 is low vibration, it's good practice to use lock-washers/locking helicoils

### Heater Suggestions

- if you let your instrument get cold it will also get wet from condensation when the plane lands
- heat with controlled heaters, not uncontrolled power dissipation
- this avoids hot spots and keeps instrument from overheating during ground check-out
- good practice to include over-temperature thermostats on every
- good practice to use proportional or zero-crossing heaters
- consider the possibility of heaters inducing mechanical distortions
- thermal gradients will be much larger at low pressure than at sea level

### General Suggestions

- design so you can check out critical functions **after** loading onto the aircraft
  - operations on instrument between lab and flight should be simple (different connectors...)
  - if you must make a complicated attachment have some verification after connection
  - design so that instrument is not permanently damaged by a cold soak
  - test critical sub-assemblies at reduced pressure
  - "part control" during assembly - don't wait to get that washer out until later
  - don't assemble your instrument after arrival at Ellington
  - you aren't ready until the instrument starts up every time in the lab without help
  - consider the possibility of condensation in inlet and exhaust lines
  - only use the back-seater for controls that require it
- example: she/he can turn something off before starting descent - you can't anticipate that
- example: your instrument computer can open a valve for five minutes better than he/she can
- experienced personnel need to be in the field with the instrument