Production & Maintenance

Steven J. Durand

December, 2004
Manufacturing Goals

- Out-source board assemblies
- Ready the facility for manufacturing
- Build modules in-house as needed
- Maintain the Schedule
Circuit Boards Designs

- Designed for automated assembly
  Pick-and-Place, PROTEL
- Designed for easy module assembly
- Multi-layer boards (6-22)
- BGA, surface mount components
  - Components on both sides
- Ready for Out-Sourcing
NRAO will Provide:

- Basic Ordering Agreement, 1-2 years
  - Long term commitment
- Software designs and BOMs
- Design reviews with vendors
- Dedicated test fixtures
Board Vendor Provides:

- Fully assembled boards/cables
- Partially tested
  - Flying probe tests
  - NRAO test fixtures
- ESD packaged and labeled
- Scheduled deliveries
- Hazardous chemical handling
In-house Module Assembly Preparation

- Trained staff
- Same team that built the prototypes
- Complete assembly drawings
- New soldering stations
- Test equipment & computers in place
Planning for Small Production Runs

- Goal is to produce 28 similar antennas
- Small quantity builds, 5-10 at a time
- In house Module assembly
Attributes of In-house Module Assembly

- Minimize module storage problems
- Tight engineering control
- Perfect design
- Fast turn-around time
- Distributed Parts inventory
ESD Preparation

- 12 ESD stations including floor mats
- ESD totes and parts bins
- ESD shoes and wrist straps
- Humidity controlled facility
Quality Tools

- Shaker Table
- Environmental Chambers
- RFI Shielded Chamber
- EVLA Test rack
- Producing written QA procedures
Rework procedures

- Red/Green Tags
- ESD Vacuum Bagger
- AOC warehouse for completed modules
- AOC Inventory control
Inventory Control

• New and old warehouse managed by Skip Lagoyda, Business Manager

• Control of High Dollar items

• PeopleSoft software re-order mechanisms
Purchasing Support

- Competitive bid procedures
  creative selection criteria allows for best vendors – not only lowest price
- BOA, Blanket Orders, ASAP procedures
- Negotiated warranties
  Balanced with in-house testing
Large Procurements

- Project buys, High dollar items
- Qualified Vendors
- Best price strategy
- Minimize obsolescence costs
- Freezes the design
Appropriate Funding Allocation – DTS Example

- Formatter board parts cost: $9,559.79 (Qty - 10)
  - Includes $152.16 cost for assembly & test
  - Includes $6,600 for 3 transponders
- Bogue Machine parts $2,640 (Qty – 4)
- RFI Honeycomb filters $442 per DTS

Total $12,641
DTS Example Continued

• Estimated Costs (excluding samplers)
  Power supply board, VICOR bricks $2,700
  MIB and digital board $1,500
  Optical hardware $600

• Total ~ $17,440 ea ($69,764 per antenna)
  Current WBS estimate $72,000

• In-House Assembly/Test Labor $4,000
WBS
Budget Management Tool

- Detailed budgets have been developed and are backed by actual cost data
- Reviews twice per year
- Managed cash flow and work load
  - Supports the Schedule
We are Ready for Production

- Production Plan & QA
- Outsourcing commitment
- Cost saving steps in place
- COTS parts & equipment
- Support the Present Schedule