



Overview of Study Results

T.A. Sebring

Initial Objectives of Cornell/Caltech MOU



- ◆ Technical Design of telescope, enclosure, etc.
- ◆ Evaluation of Atacama Sites
- ◆ Definition of Initial Instrument Suite
- ◆ Cost Estimates and Schedules
- ◆ Operations Plan
- ◆ Proposed Management Structure
- ◆ Assessment of Issues Regarding Chilean Ops
- ◆ Plan for Fund Raising

**We have achieved substantial progress
toward all these objectives.**

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Study Process

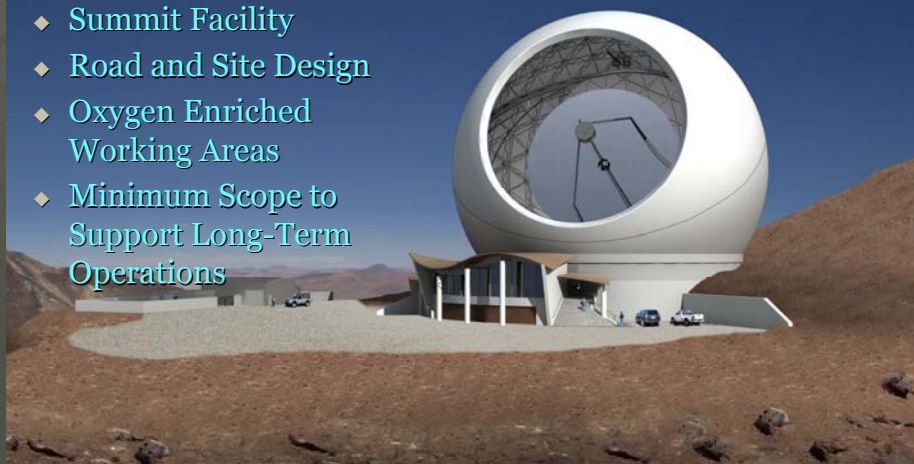


- ◆ Development of Science Objectives
 - Science Committees Proj. Scientists: T. Herter & J. Zmuidzinas
- ◆ Definition of 1st Suite of Instruments
 - Instrumentation Committee Chair: G. Stacey
- ◆ Operational Approach and Requirements
 - Operations Committee Chair: S. Radford
- ◆ Initial Requirements Definition
 - Derived from Science and Instrumentation Requirements
- ◆ Development of Telescope & Enclosure Design
 - Interactive Process with Cornell/Caltech/JPL
 - Use of Internal Resources and Industrial Contracts
- ◆ Cost and Schedule Derived Based on Design

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Overview of Telescope Design: Facility

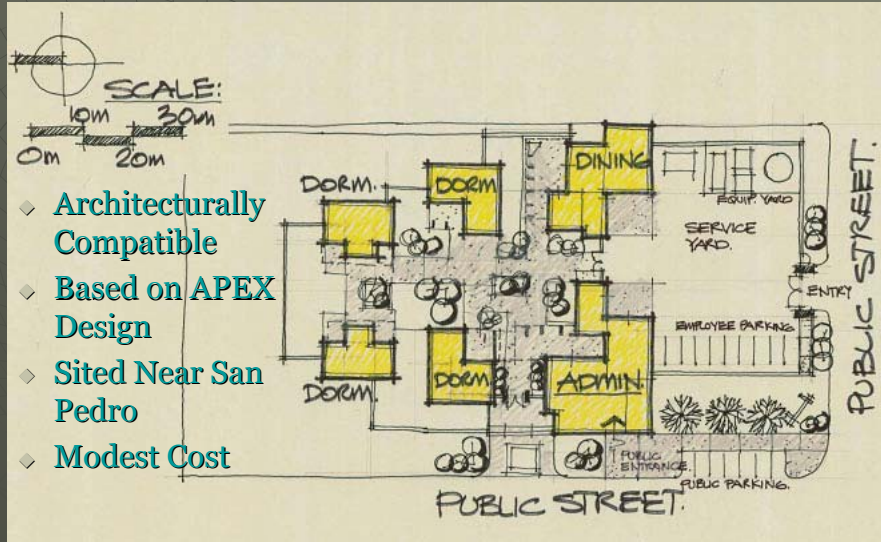
- ◆ Design by M3, Tucson
- ◆ Summit Facility
- ◆ Road and Site Design
- ◆ Oxygen Enriched Working Areas
- ◆ Minimum Scope to Support Long-Term Operations



Cornell Caltech Atacama Telescope
Cerro Chajnantor, Chile



Support Facility Near San Pedro de Atacama



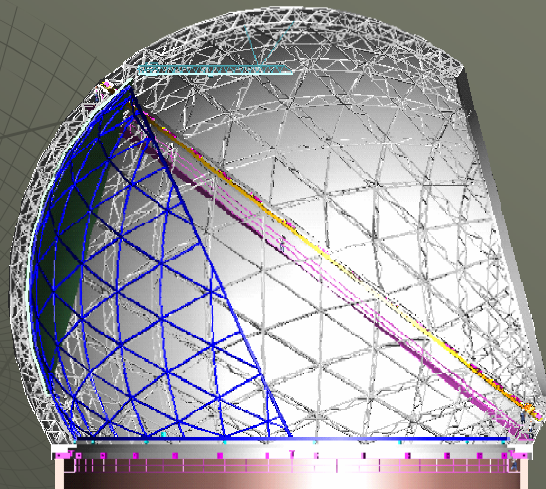
- ◆ Architecturally Compatible
- ◆ Based on APEX Design
- ◆ Sited Near San Pedro
- ◆ Modest Cost

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Telescope Dome Concept



- ◆ AMEC Dynamic Structures Design Study
- ◆ Calotte style chosen
- ◆ Developed Sufficiently for Feasibility Assessment

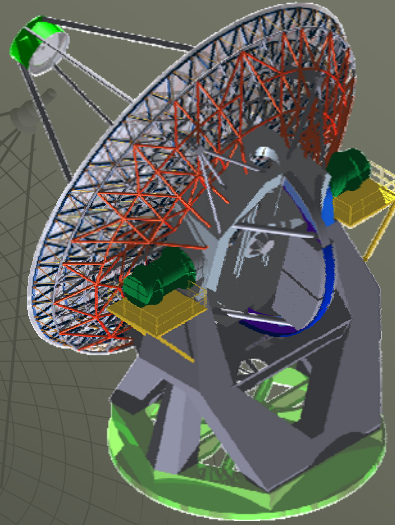


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Telescope Mount Concept



- ◆ Vertex RSI (General Dynamics, Dallas)
- ◆ Hydrostatic and Rolling Element Bearings
- ◆ Proven Drive Concepts
- ◆ First Order Servo Modeling

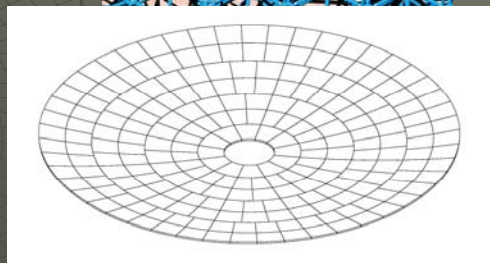


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Primary Mirror



- ◆ Steel Truss: ~5x Lower Cost than CFRP
- ◆ Commercial Actuators Support Axial and Lateral Loads
- ◆ 7 Ring Panel Layout
- ◆ 7 Sets of Identical Panels
- ◆ Total ~ 210 Panels @ ~1.7m Major Dimension

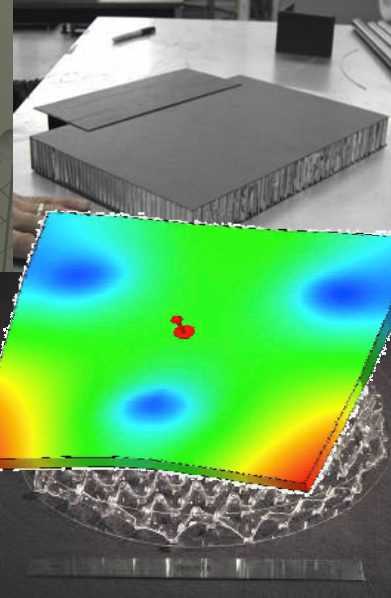


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Primary Mirror



- ◆ Two Panel Approaches
 - Replicated CFRP/Al Sandwich (CMA)
 - Precision Molded Lightweight Borosilicate (ITT)
- ◆ Panels Kinematically Supported on 3 Points (e.g. bipod flexures)
- ◆ ~5 μm rms Panel Figure Total Error



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Panel & Telescope Alignment



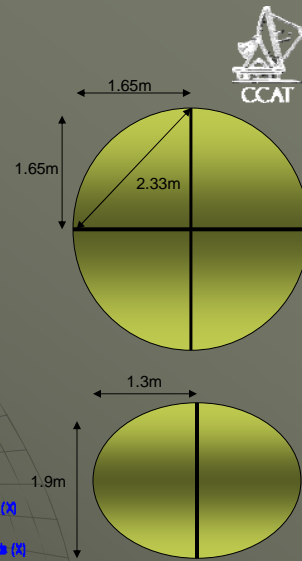
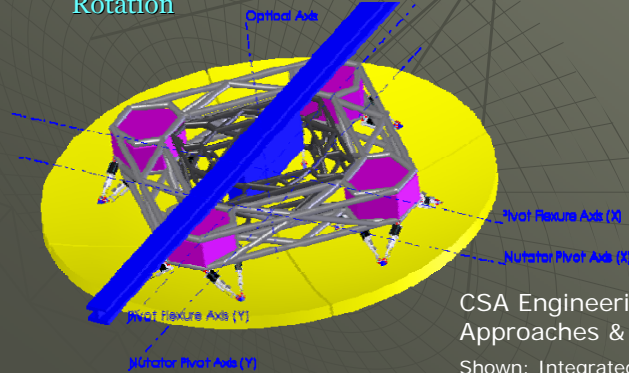
- ◆ Calibration Wavefront Sensor: G. Serabyn, JPL
 - Shearing Interferometer, Point Diffraction Interferometer or Hybrid of the Two
 - Uses Astronomy Imager Camera for Focal Plane
 - Analysis Verifies Acceptable Resolution
- ◆ Edge Sensors...Multiple Options
 - Fogale or Blue Line Engineering Commercial Options
 - TMT Developing System & JPL Looking at Lateral Effect Photodiodes
 - ~1000 Sensors Required
- ◆ Supplemental Sensors
 - JPL Distance Measuring Interferometry
 - Adaptive Optics Associates Hartmann Type Sensor
 - Wavefront Sensing Guider in IR...Depending on Panel Qualities
- ◆ JPL Integrated Model for Next Phase Investigation/Validation

This is Perhaps the Highest Priority Technical Issue

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M2 & M3

- ◆ Segmented Design
 - Segments Same Technology & Process as PM's
- ◆ M2 Requires Alignment & Nutation
- ◆ M3 Requires Alignment & Rotation



CSA Engineering: 2 M2 Approaches & 1 M3
Shown: Integrated Positioning/Nutation

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Other Study Results

- ◆ Definition and Concept Design of Two Instruments
 - Short Wavelength Camera: $\lambda = 200, 350, 450, 620 \mu$
 - ◆ Diffraction Limited
 - ◆ 20%-40% Throughput
 - ◆ Background Limited Performance
 - ◆ NIST SCUBA II Array Technology
 - Long Wavelength Camera: $\lambda = 740 \mu$ to 2 mm
 - ◆ $\lambda = 620$ as a Future Upgrade
 - ◆ Antenna-Coupled Focal Plane Architecture

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Other Study Results



- ◆ **Preliminary Project Plan**
 - Approaches to Organization & Governance
 - Schedules
 - Staffing
 - Procurement Approach
- ◆ **Integration Plan**
 - Subsystem Validation & Testing
 - Packaging and Shipping
 - On-Site Assembly
 - Control Integration, Tools, Commissioning

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Other Study Results



- ◆ **Site Characterization and Testing**
 - Investigation of Chilean Site Access & Permitting
 - Preparation for Site Testing
 - Assessment of Logistics of Alternate Sites
- ◆ **Operation Plan**
 - Observing Modes
 - Logistics
 - Travel, Manpower, Facilities
 - Operations Cost Estimate

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Other Study Results



- ◆ **Schedules**
 - MS Project Schedule Developed
 - Critical Path Analysis
- ◆ **Cost Estimate**
 - Based on Contractor Estimates
 - Standard Estimation Processes, Catalogue Prices
 - Validates \$100m Target for Telescope & 2 Instruments

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Summary: We Believe That We'll Show That:



- ◆ The Science is Compelling and Seminal
- ◆ The Telescope Requirements are Aggressive but Feasible
- ◆ The Concept Designs for Subsystems are Strong, Well Conceived, and Supported by Initial Analyses
- ◆ We Know the Major Risk Areas
- ◆ We Have a Good Organizational Approach
- ◆ Project Costs Can be Contained Within our Target of \$100m

Let's Get On With It and See What You Think!

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