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# LIGO Project Status

Gary Sanders  
NSF Technical Review  
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# This Talk

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- **Technical Status**
- **Status of LIGO Organization**
  - » LIGO Scientific Collaboration
  - » Gravitational Wave International Committee (GWIC)
  - » LIGO Laboratory
    - Both observatories are functioning as operating organizations
  - » LIGO Program Advisory Committee
- **Cost/Schedule Status**
  - » covered mainly in this talk as emphasis in this review is technical

**LIGO Construction is 88% complete!**



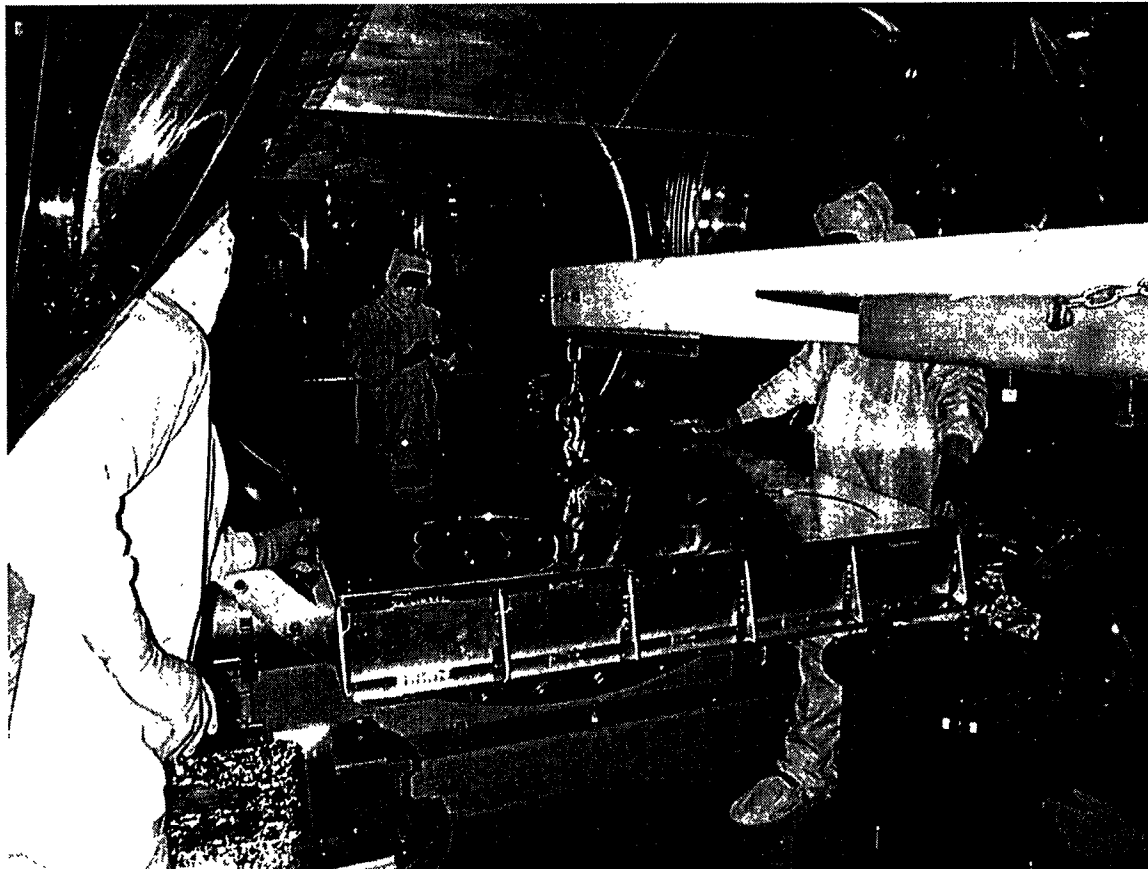
# Project Manager's View: Status of the Project

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- Project performance close to baseline cost/schedule
- Facility construction, including vacuum systems, near completion at both sites
- Buildings accepted, occupied and in use
- Detector design is essentially complete
- Detector fabrication in full swing with major bid jeopardy passed and many items being delivered for installation
- Installation of detector at Hanford is underway
- Data analysis and modeling systems being implemented

# Picture of the Month: Installing Detector in the Vacuum System

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# Technical Highlights - Livingston Observatory

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- **Beam Tube Fabrication and Installation complete**
  - » X arm vacuum performance accepted, Y arm essentially accepted
- **Vacuum equipment installation essentially complete**
- **Commissioning of vacuum system volumes is underway**
  - » Right end station accepted, others in progress
  - » Gate valve inspection and rework/repairs underway
- **All buildings in use and undergoing shakedown**
  - » Electrical substation provided by DEMCO cured power instability
  - » Punchlist and building QA items being worked or reworked
- **Preparations begun for early '99 detector installation**

# Livingston Aerial View

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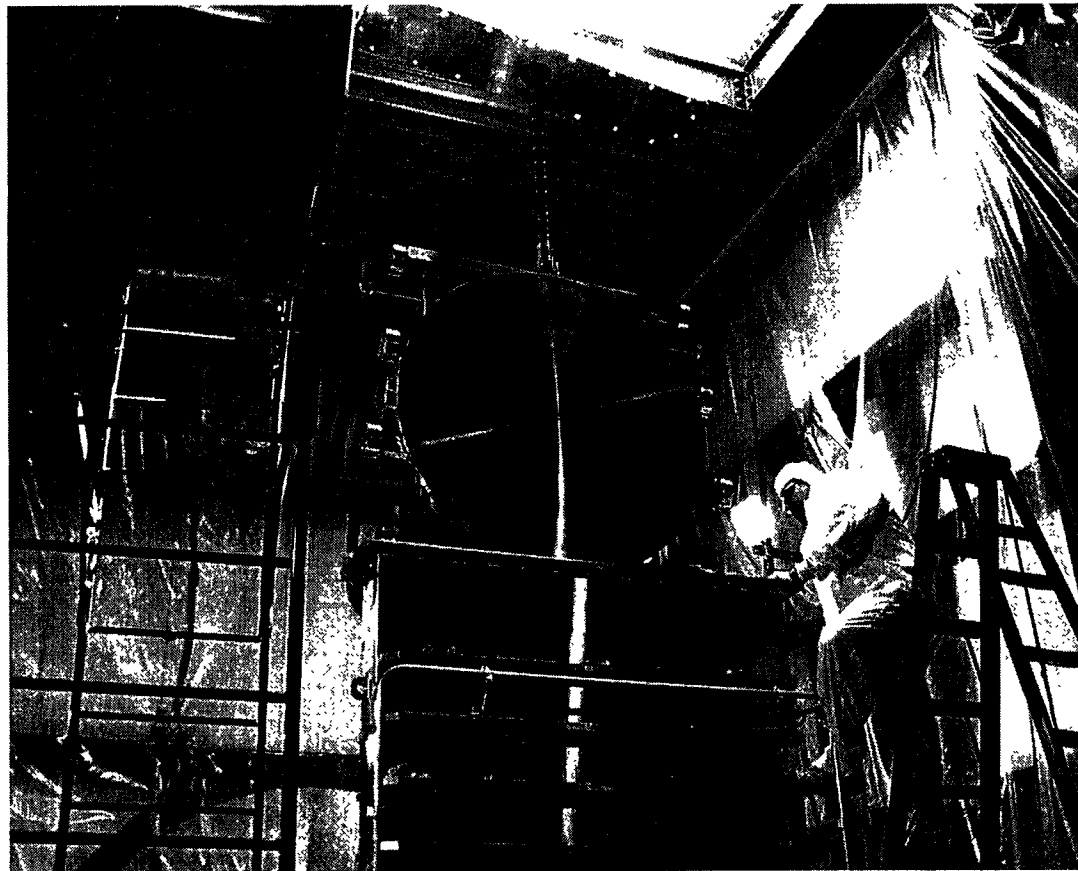
# Livingston Corner Station

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# Mid-Station Gate Valve Repair

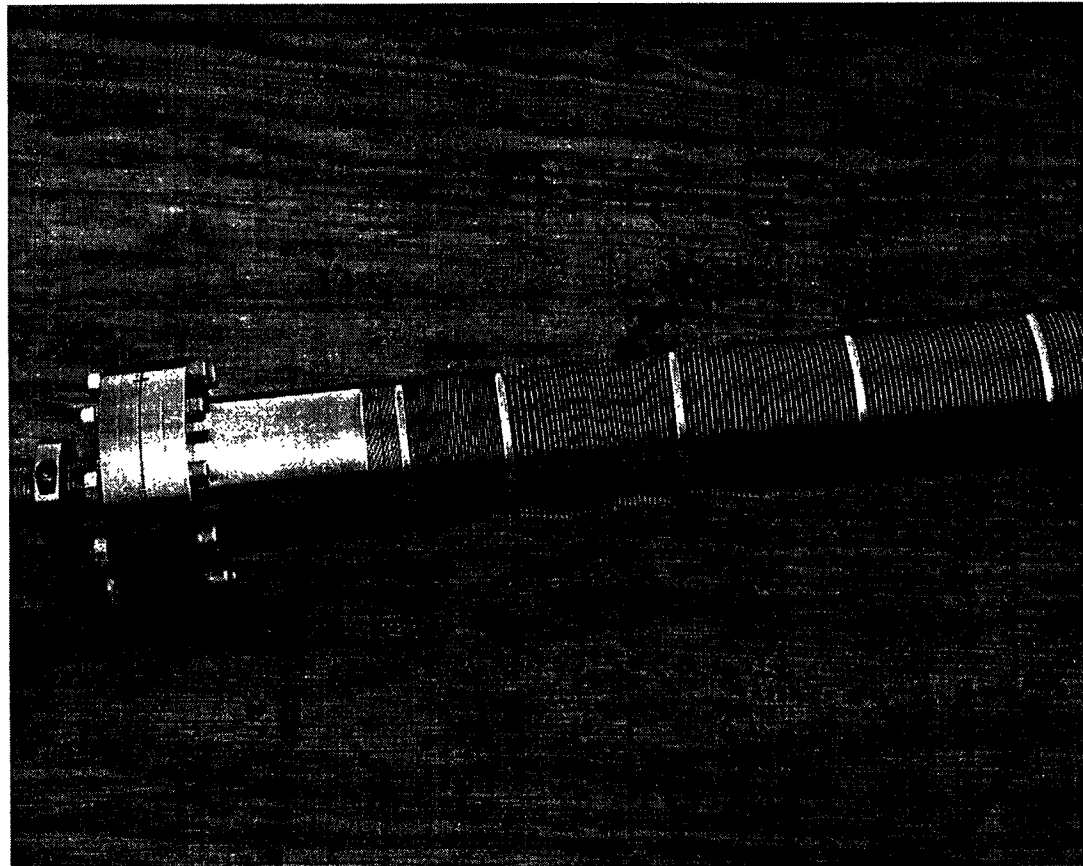
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# Gate Valve Lead Screw Bellows

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# Livingston Mid-Station Sheared Gate Valve Stop

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# Technical Highlights - Hanford Observatory

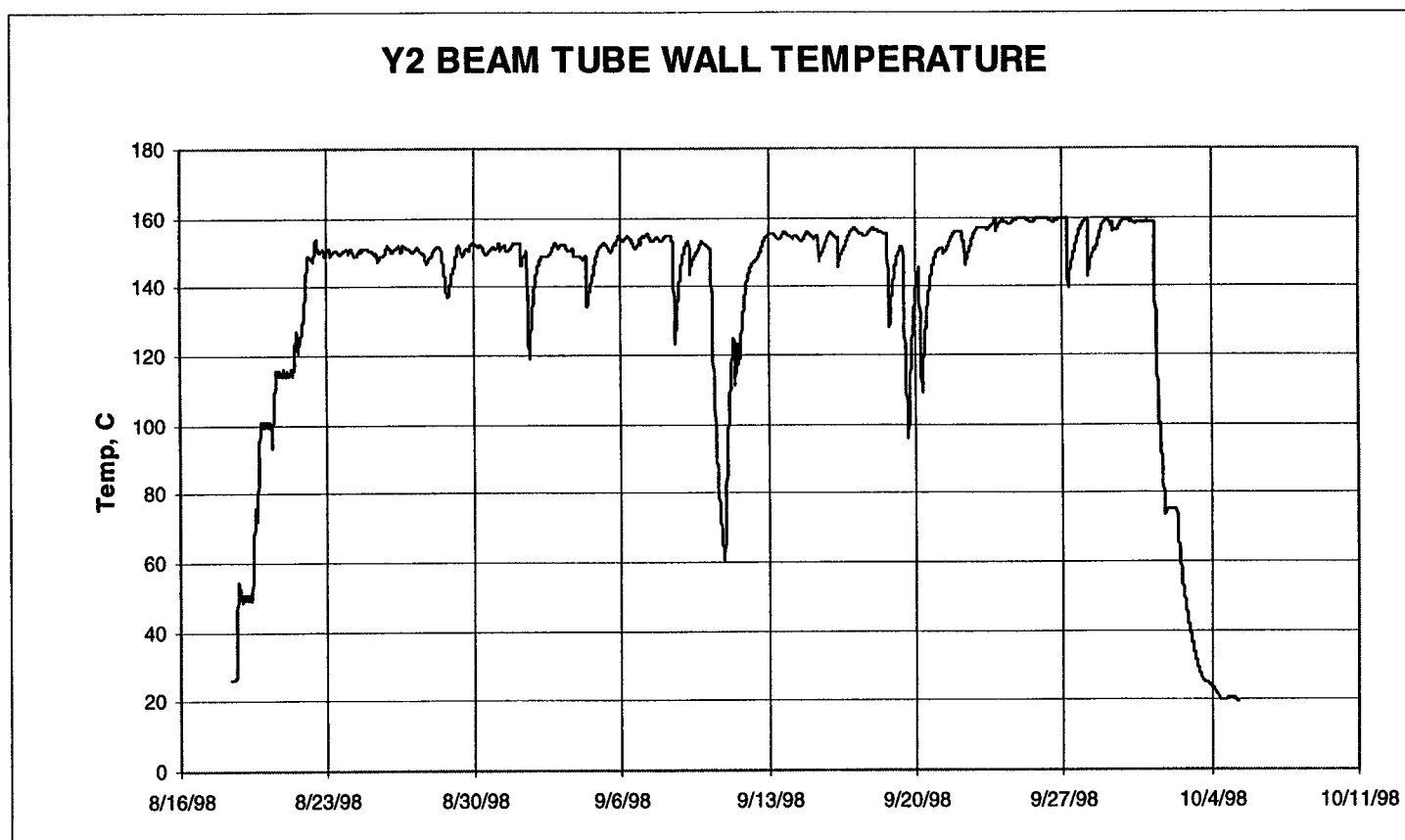
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- Buildings and vacuum systems essentially complete
- About 50% staff on board
- Technical site characterization underway
- First beam tube module successfully baked
- Detector installation is underway

LIGO Hanford Observatory has transitioned from a construction site to a Laboratory!



# First Module Bakeout



# Technical Highlights - R&D

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- Construction related R&D
  - » MIT Phase Noise Interferometer
    - Phase Noise experiment successfully completed
    - Completed digital loop test of suspension controller
    - Carried out prototype diagnostics testing
  - » Caltech 40 Meter Interferometer
    - Has successfully achieved stable lock in power recycled configuration
    - Detailed characterization underway
    - Data taking planned by year end
- Advanced R&D activities initiated
  - » Thermal noise, Resonant Sideband Extraction, sapphire, vertical isolation studies already underway
  - » Multiyear funding just received to initiate other activities

# Thermal Noise Interferometer

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# Vertical Isolation Research

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# Technical Highlights - Detector Design and Fabrication

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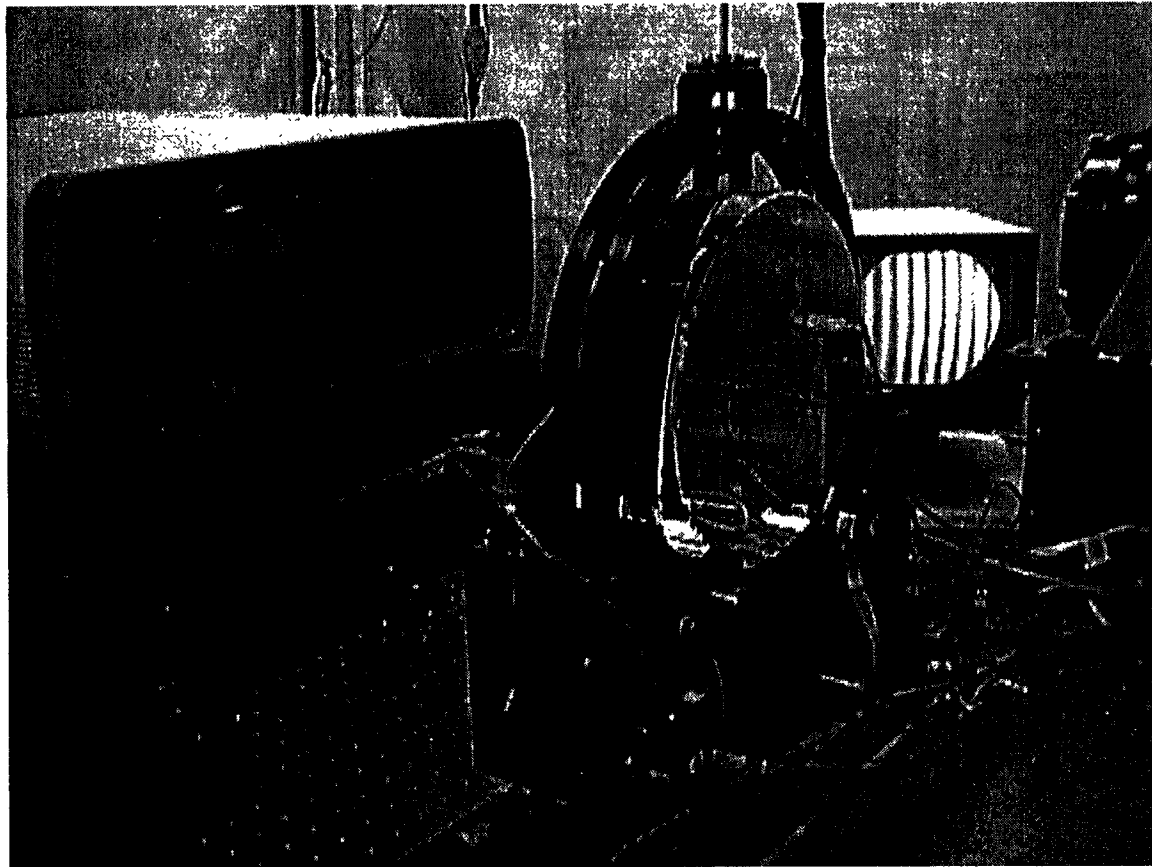
- 2 km IFO Prestabilized Laser installing at Hanford
  - » other lasers are being delivered
- Input Optics installation in early stages
- CDS DAQ/backbone/networks running at Hanford
- Core Optics nearly all fabricated
- Core Optics Support systems essentially designed
- Alignment Sensing system in use on prototypes
- Large Optics Suspension in production
- Seismic System first article tests successful and real installation is underway





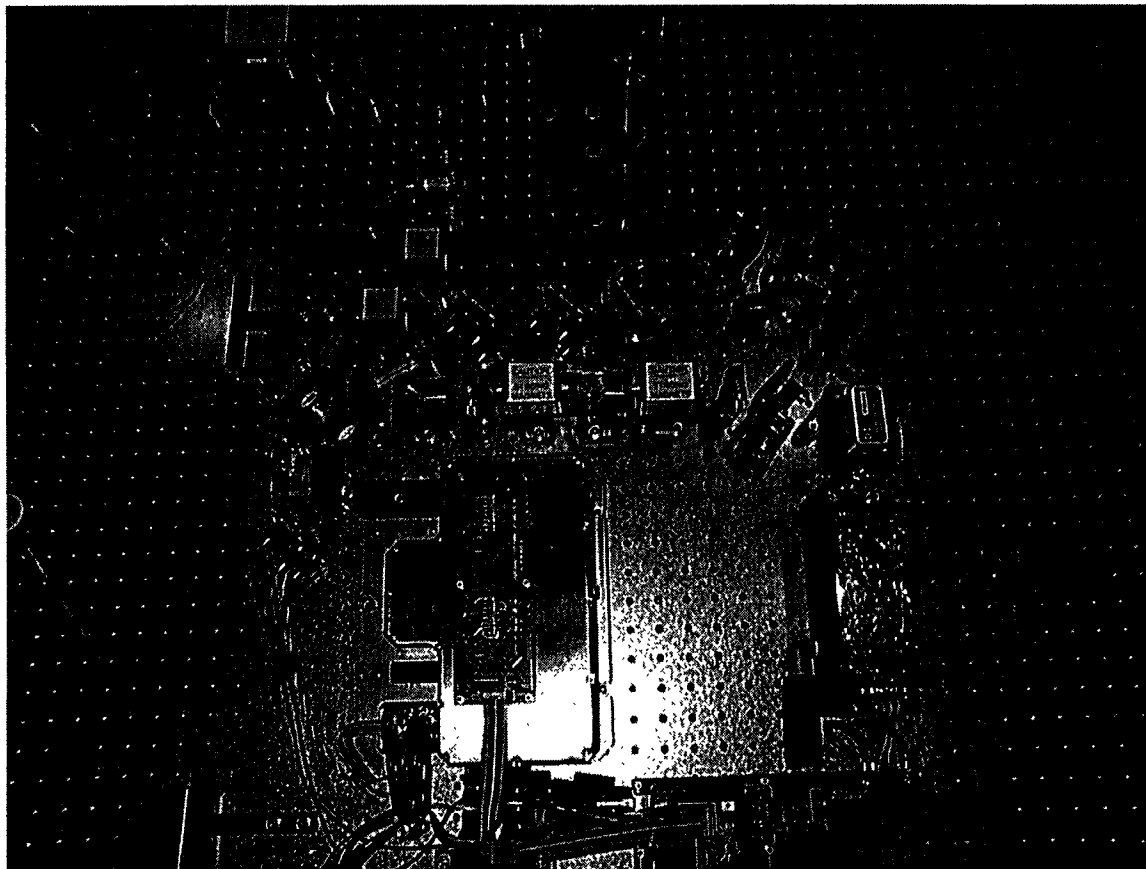
# IR Interferometer at Caltech Is In Use

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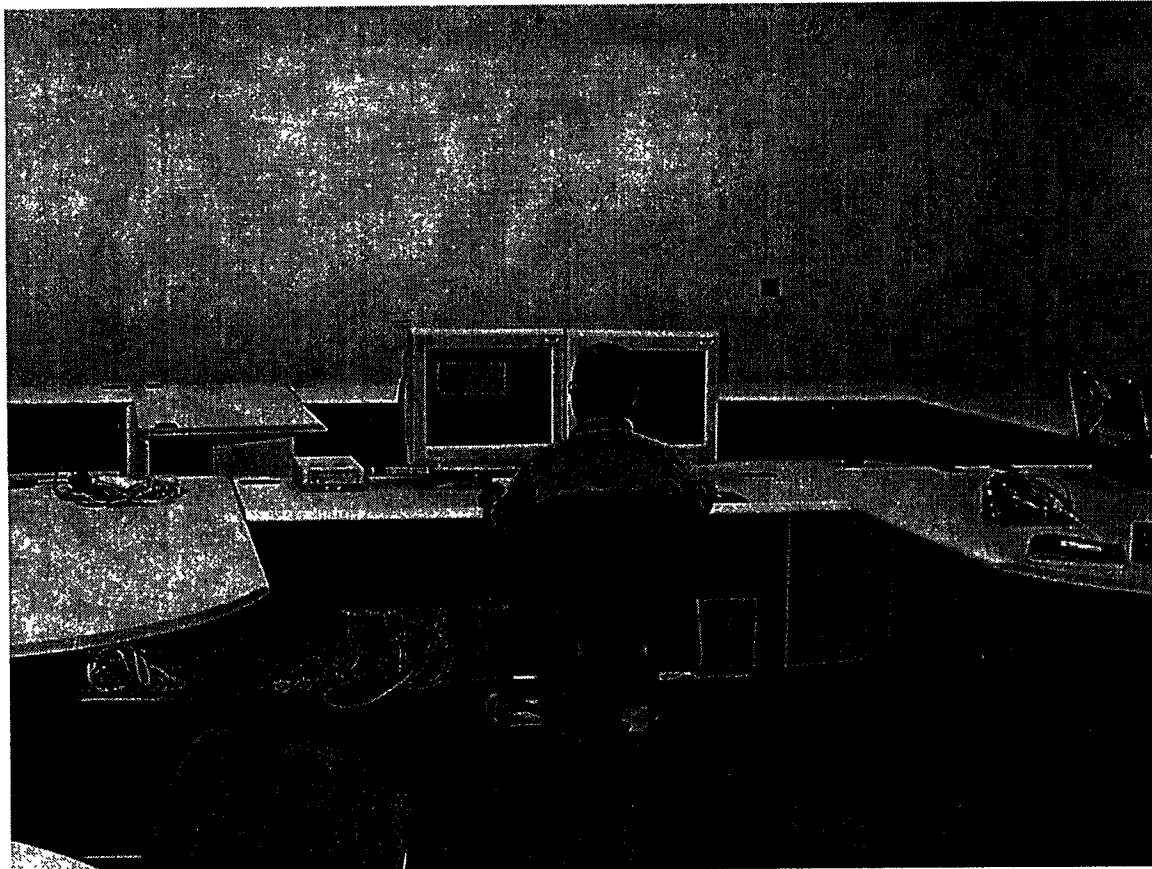
# Hanford 2 km IFO PSL

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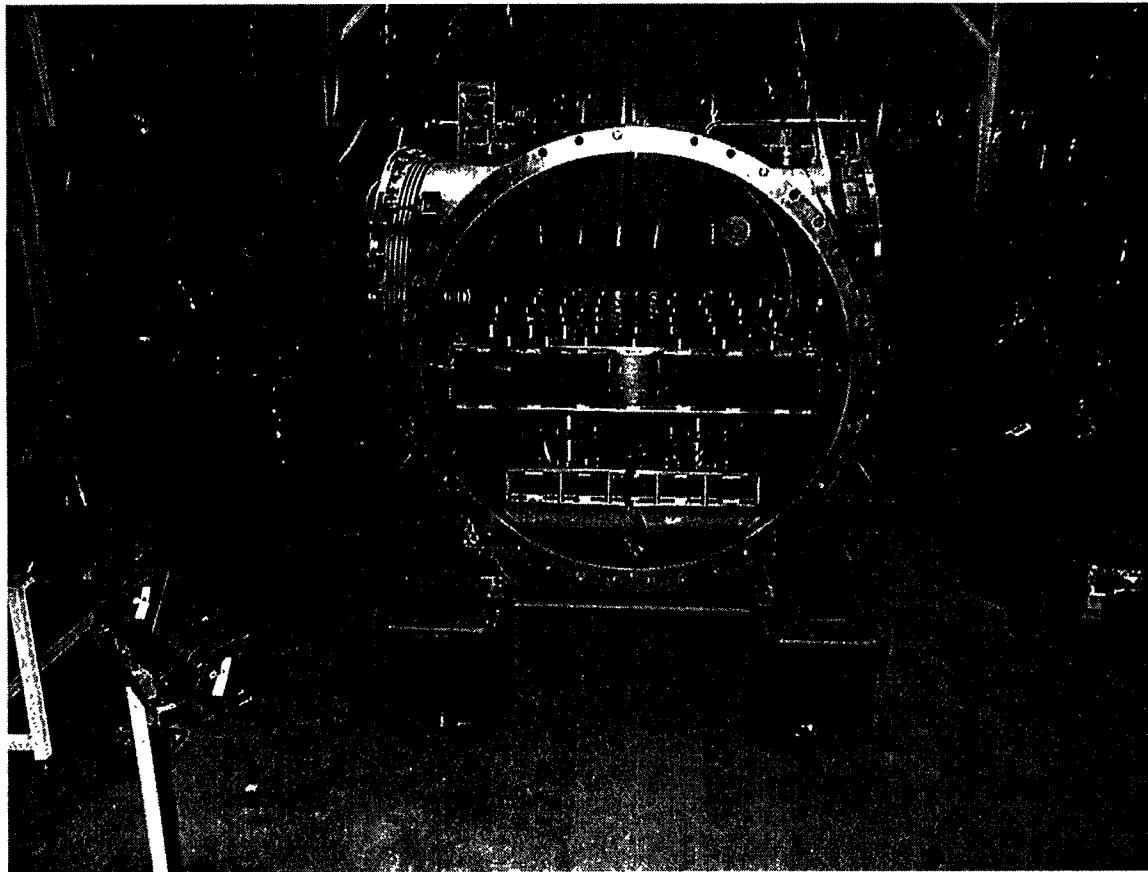
# CDS Starts Up in the Control Room

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# HAM First Article Test at Hanford

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# Detector Status

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- Detector installation is underway and buildup of effort is following our plan
- Detector delivery and implementation has not slipped significantly since the 2 - 3 month delay presented at the Spring 1998 review
  - » Seismic design and fabrication is still the pacing item
    - Some delay caused by beam tube valve difficulties and this delay was applied to completing first article tests
  - » Core optics coating failures fall within our plan
  - » IR interferometer procurement has followed its recovery plan with a second vendor

# Status of LIGO Organization

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- LIGO Scientific Collaboration is now an autonomous organization
  - » Boulder meeting in August
  - » Recent White Paper draft issued to describe R&D program of LSC
- Gravitational Wave International Committee (GWIC)
  - » GWIC #2 April 1998 in Livingston
  - » GWIC #3 December in Paris
- LIGO Laboratory observatories are functioning
- Program Advisory Committee
  - » next meeting in November
- Education and Outreach programs being established



### SUMMARY INTEGRATED SCHEDULE

