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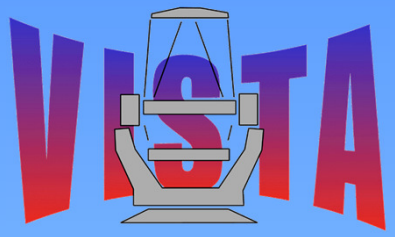


# VISTA – The (Ex) Project Manager's Perspective

**Alistair McPherson**

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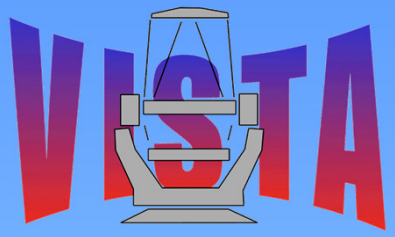


# Presentation

- Project Organisation
- Work Breakdown
- Work Packages
- Contract Management
- Risk Management
- Project Oversight
- Schedule
- Costs
- Critical Items
- Highs & Lows
- Final Words

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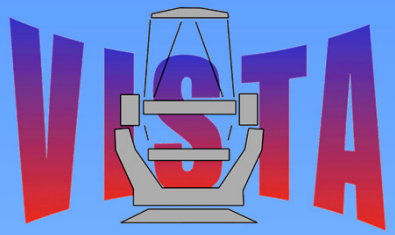


Project Manager
Alistair McPherson

Project Scientist
Will Sutherland

Project Planner
Jackie McDougall

Systems Engineer
Simon Craig

A/Systems Engineer
Andy Born

Contracts Officer
Elaine Robertson

Financial Officer
Christine Campbell

Telescope WPM
Paul Jeffers

M1/M2 WPM
Ian Egan

Software WPM
Malcolm Stewart

Instrument WPM
Kim Ward

Construction WPM
Bryan Little

Coating Plant WPM
John Murray

RAL

ATC

Durham

**Technical Support**

Richard Bennett

Brian Stobie

Steven Beard

Alastair Borrowman

Eli Atad

Naidu Bezawada

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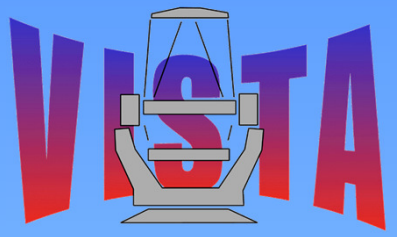


# Project Organisation

- **VISTA Consortium**
  - Vista Executive Board
  - VISTA Science Committee
- **Particle Physics and Astronomy Research Council**
- **VISTA Project Office**

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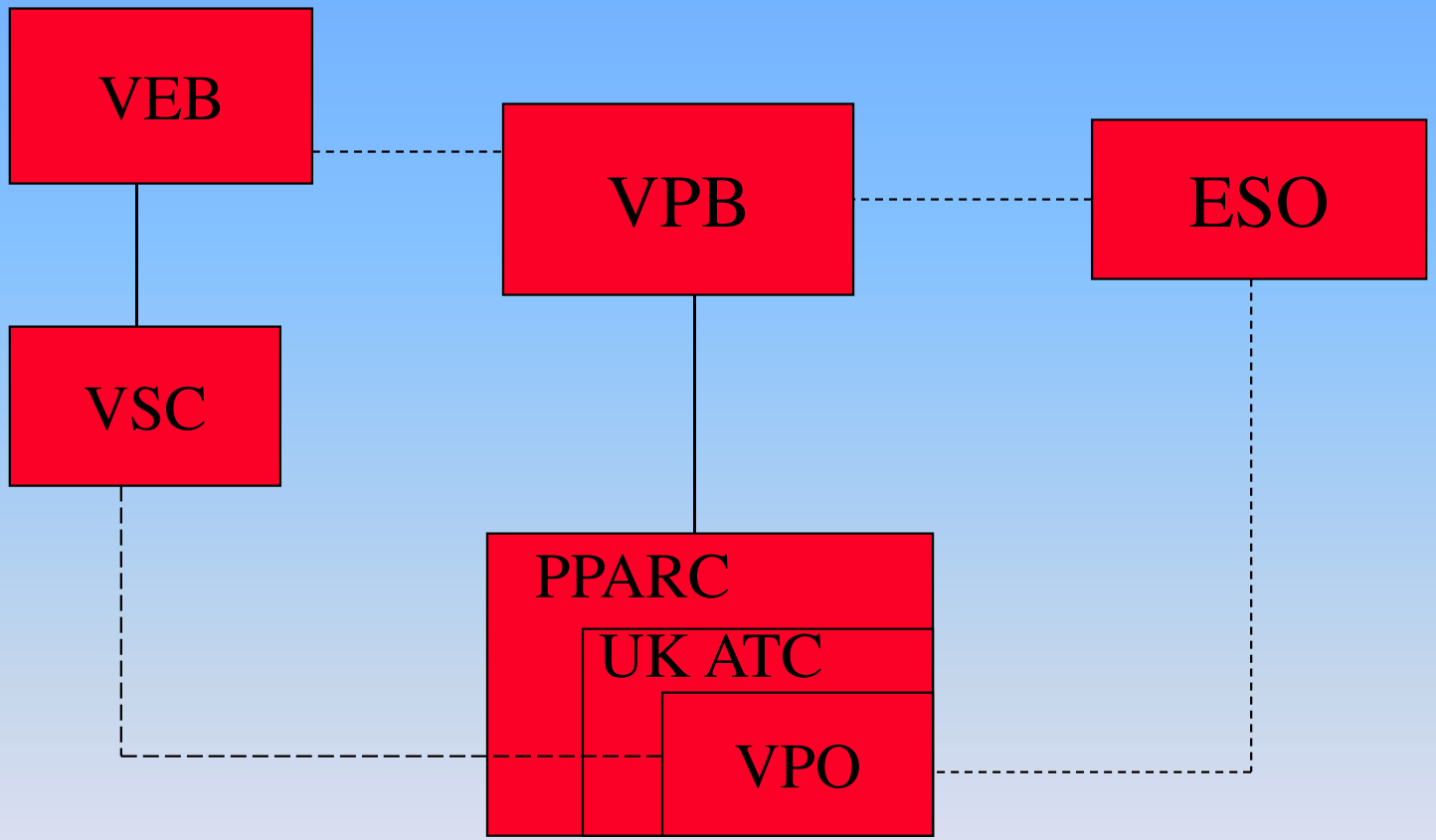
# Overall Management Organisation



# Brief Specification & Deliverables

- 4 metre Class f/1 Telescope
- IR Camera with nominal fov 1.7 deg$^2$ 4*4 array of 2K*2K
- (Optical Camera with nominal fov 2 deg$^2$ 50 CCD array)
- Coating Plant capable of Silver and Aluminium
- Enclosure and Auxiliary Building
- Computing System
- Plant and Services
- Spare Parts
- Documentation

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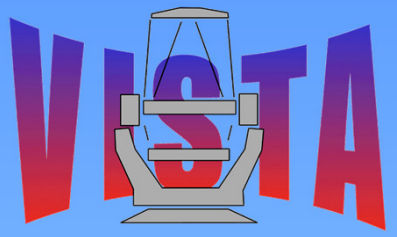
# Work Breakdown Structure




| 1 Telescope | 4 Instrument Mount | 7 Optical Camera | 10 Enclosure | 90 MO |
|---|---|---|---|---|
| 1.1 Azimuth Track | 4.1 Cass. Rotator | 7.1 Optics | 10.1 Enclosure | 90.1 Core Staff |
| 1.2 Azimuth Drive | 4.2 Interfaces to Instrument | 7.2 Focal Plane/Detector | 10.2 HVAC | 90.2 Support |
| 1.3 | 4.3 Cable Wrap | 7.3 Controller | 10.3 Lifting Equipment | 90.3 Contract |
| 1.4 | 4.4 Pipe Infrastructure | 7.4 Chassis | 10.4 Enclosure Control | 90.4 Travel |
| 1.5 Forks | 4.5 Cass Rotator Control | 7.5 Themal Control | | |
| 1.6 Elevation Drive | | 7.6 Filters | 11 Handling Equipment | 91 Tendering |
| 1.7 | 5 M2 Unit | 7.7 Baffles | 11.1 M1 Handling | 91.1 ITT Preparation |
| 1.8 | 5.1 M2 Mirror | 7.8 WFS/Guiding/Autofocus | 11.2 M1 Cell Handling | 91.2 Tender Evaluation |
| 1.9 Centre Section | 5.2 M2 Support | 7.9 Software | 11.3 M2 Handling | 91.3 Contract Negotiations |
| 1.10 Upper Structure | 5.3 M2 Handling Equip | 7.10 Custom Tools | 11.4 Instrumentation Installation | |
| | 5.4 M2 Collimation Unit | | | 92 Shipping and Insurance |
| | 5.5 M2 Baffles | 8 Data Handling | | |
| 1.13 Dummey Mirror Cell | 5.6 Dummy M2 | 8.1 Paranal Data Storage | 12 Mirror Coating | 93 Integrated Logistic Support |
| 1.14 Hydrostatic System | 5.7 M2 Control | 8.2 Paranal Data Reduction | 12.1 Infrastructure | 93.1 Documentation |
| 1.15 Axis Control | | 8.3 | 12.2 Mirror Wash | 93.2 Training |
| | 6 IR Camera | 8.4 Provision of Hardware for | 12.3 Coating Facilities | 93.3 |
| 2 M1 | 6.1 Optics | | | 93.4 Spares |
| 2.1 M1 Mirror Blank | 6.2 Focal Plane/Detector | 9 Site Development | 13 Software | 93.5 Tools and Test Equipment |
| 2.2 M1 Polishing | 6.3 Controller | 9.1 Infrastructure | 13.1 Telescope Control | |
| 2.3 M1 Transportation Box | 6.4 Cryostat | 9.2 Site Preparation | 13.2 High Level Observing Softw | 94 Safety & QA |
| | 6.5 CC Cooling | 9.3 Foundations | 13.3 WFS | |
| 3 M1 Mirror Cell | 6.6 Filters | 9.4 Facilities | | 95 Systems Engineering |
| 3.1 M1 Mirror Cell | 6.7 Cryo Window | 9.5 Power Conditioning | | |
| 3.2 M1 Axial Support | 6.8 Baffles | 9.6 Heat Removal | | |
| 3.3 M1 Radial Support | 6.9 WFS/Autoguiding/Autofocus | 9.7 UPS | | |
| 3.4 M1 Position Control | 6.10 Software | | | |
| 3.5 M1 Dummy Mirror | 6.11 Custom Tools | | | |
| 3.6 M1 Control | 6.12 Filter Mechanism | | | |

# Systems Engineering

- Systems Management
- System Budgets
- Interface Control
- Configuration Control
- Systems Modeling
- Verification Planning
- Hazard Log
- Risk Register

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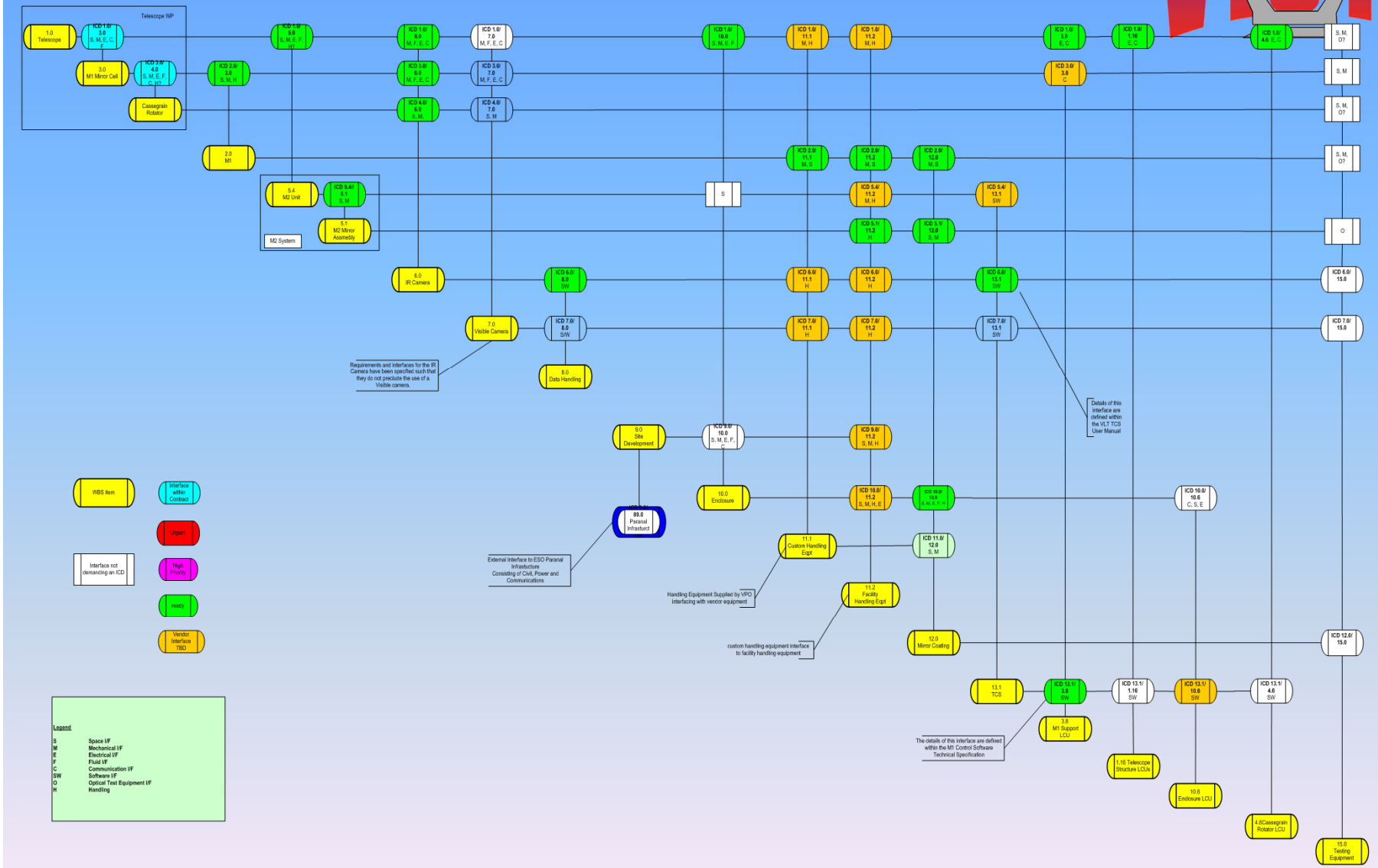
Project Office

# VISTA
## High Level
## N-Squared Diagram

Date:
Issue:
Prepared By
Approved
Page: 1 of 1



# Contract Management

- PPARC/STFC Procedures
- European Procurement
- Best Value for Money

- Procurement Strategies

# Contract Management

- Technical Specification
- Statement of Work
- Applicable Documents
- Commercial Terms & Conditions
- Understand Contractor
- Understand Risks
- Have an alternative plan

# Risk Management

- Risk Management Plan
- Capturing Risks
- Scoring
- Mitigation Plan
- Oversight

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# Impact

| Level | Description | Example eg Fire |
|---|---|---|
| **Low**<br>Grading 1 | Insignificant / Minor | No Injury, low £ loss ,<br>minor loss of reputation |
| **Medium**<br>Grading 2 | Moderate | Injuries need medical attention<br>Significant £ loss, Significant loss of reputation |
| **High**<br>Grading 3 | Major problem | Extensive injury, large £ loss<br>Severe loss of reputation |
| **V High**<br>Grading 5 | Catastrophe | Potential loss of life, significant £ loss and/or loss of science return |

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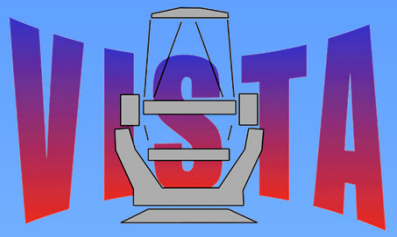


# Likelihood

| Level | Description | Example |
|---|---|---|
| **Low**<br>Grading 1 | Rare | Occur in exceptional circumstances |
| **Medium**<br>Grading 2 | Possible | Might Occur |
| **High**<br>Grading 3 | Likely | Quite likely to occur |
| **V High**<br>Grading 4 | Almost Certain | Will almost certainly occur |

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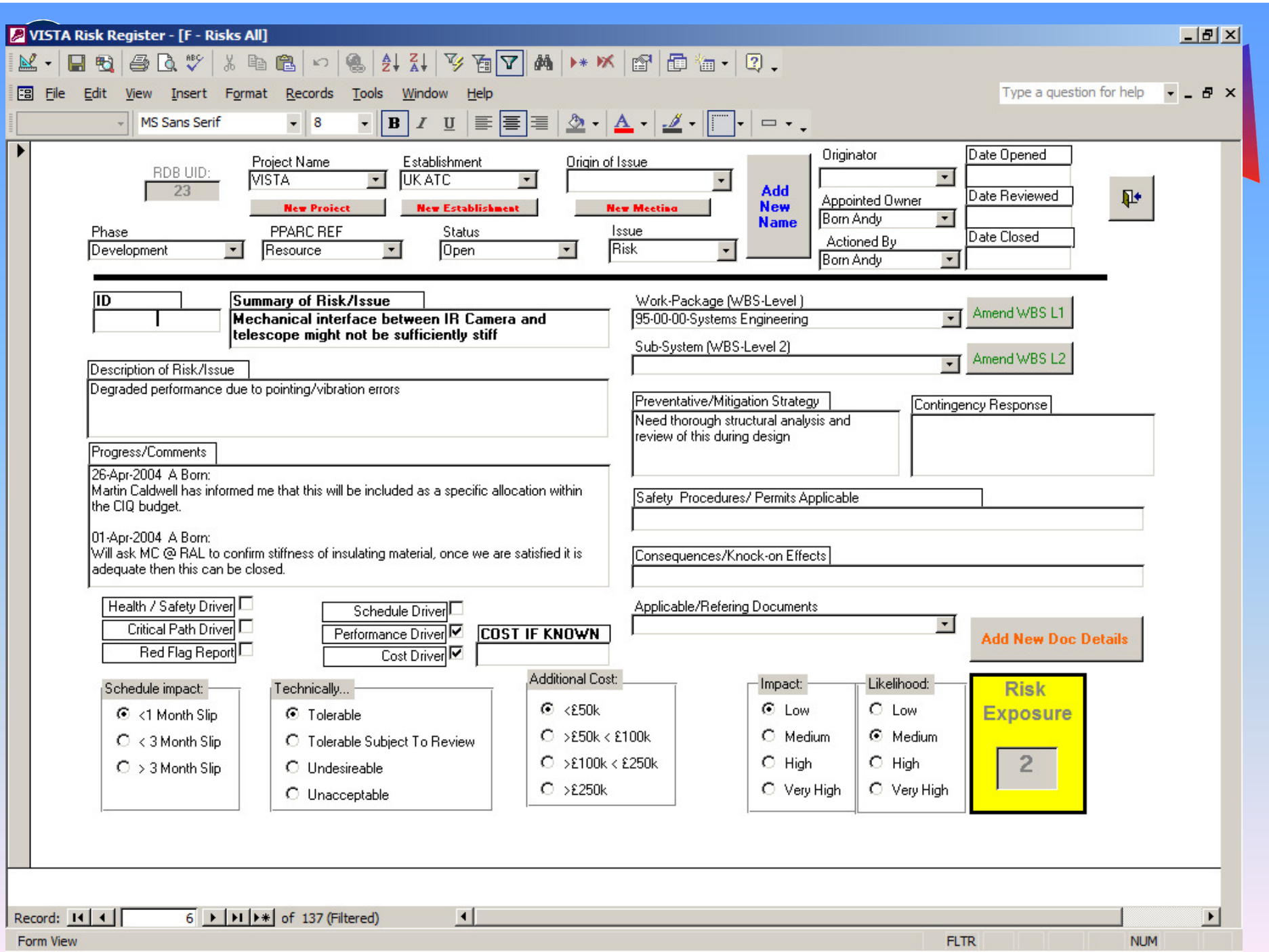
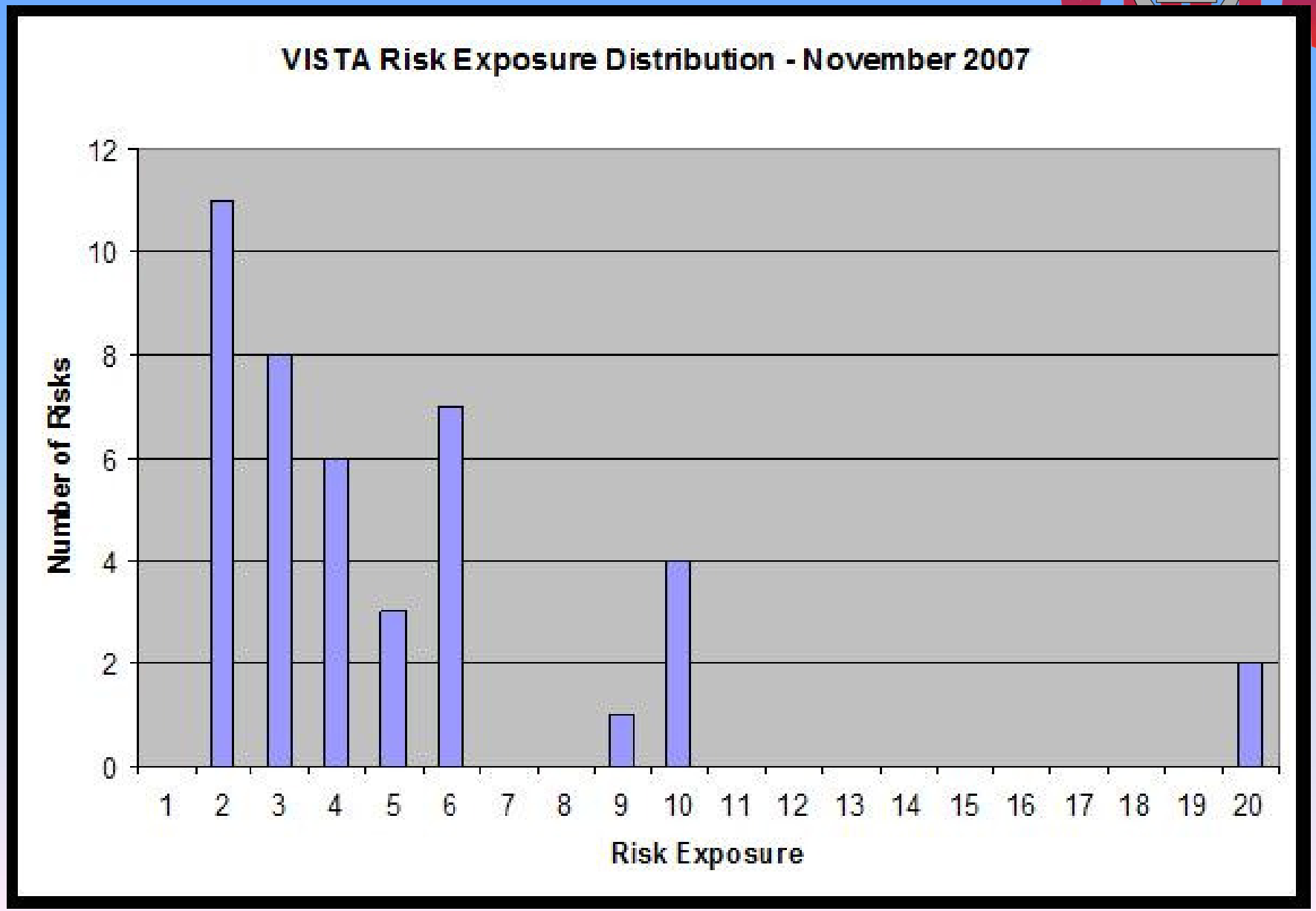
# Risk Score

**Likelihood**

| | | | | |
|---|---|---|---|---|
| V high<br>Grading 4 | 4 | 8 | **12** | **20** Catastrophe |
| High<br>Grading 3 | 3 | 6 | **9** | **15** |
| Medium<br>Grading 2 | 2 | 4 | 6 | **10** |
| Low<br>Grading 1 | 1 | 2 | 3 | 5 |
| | Low<br>Grading 1 | Medium<br>Grading 2 | High<br>Grading 3 | V high<br>Grading 5 |

**Impact**


VISTA Risk Register - [F - Risks All]
File Edit View Insert Format Records Tools Window Help
Type a question for help
MS Sans Serif
8
RDB UID:
23
Project Name
VISTA
New Project
Establishment
UK ATC
New Establishment
Origin of Issue
New Meeting
Add New Name
Originator
Appointed Owner
Born Andy
Actioned By
Born Andy
Date Opened
Date Reviewed
Date Closed
Phase
Development
PPARC REF
Resource
Status
Open
Issue
Risk
ID
Summary of Risk/Issue
Mechanical interface between IR Camera and telescope might not be sufficiently stiff
Work-Package (WBS-Level )
95-00-00-Systems Engineering
Amend WBS L1
Sub-System (WBS-Level 2)
Amend WBS L2
Description of Risk/Issue
Degraded performance due to pointing/vibration errors
Preventative/Mitigation Strategy
Need thorough structural analysis and review of this during design
Contingency Response
Progress/Comments
26-Apr-2004 A Born:
Martin Caldwell has informed me that this will be included as a specific allocation within the CIQ budget.
01-Apr-2004 A Born:
Will ask MC @ RAL to confirm stiffness of insulating material, once we are satisfied it is adequate then this can be closed.
Safety Procedures/ Permits Applicable
Consequences/Knock-on Effects
Health / Safety Driver
Critical Path Driver
Red Flag Report
Schedule Driver
Performance Driver
Cost Driver
COST IF KNOWN
Applicable/Refering Documents
Add New Doc Details
Schedule impact:
<1 Month Slip
< 3 Month Slip
> 3 Month Slip
Technically...
Tolerable
Tolerable Subject To Review
Undesireable
Unacceptable
Additional Cost:
<£50k
>£50k < £100k
>£100k < £250k
>£250k
Impact:
Low
Medium
High
Very High
Likelihood:
Low
Medium
High
Very High
Risk Exposure
2
Record: 6 of 137 (Filtered)
Form View
FLTR
NUM


VISTA Risk Exposure Distribution - November 2007
Number of Risks
0
2
4
6
8
10
12
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Risk Exposure

# Risk Oversight

- Reviewed Monthly by Team
- Reported Monthly to UKATC Management
- Reported to VPB
- Annual Oversight

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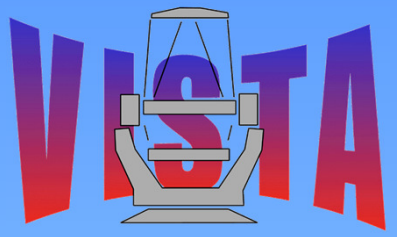
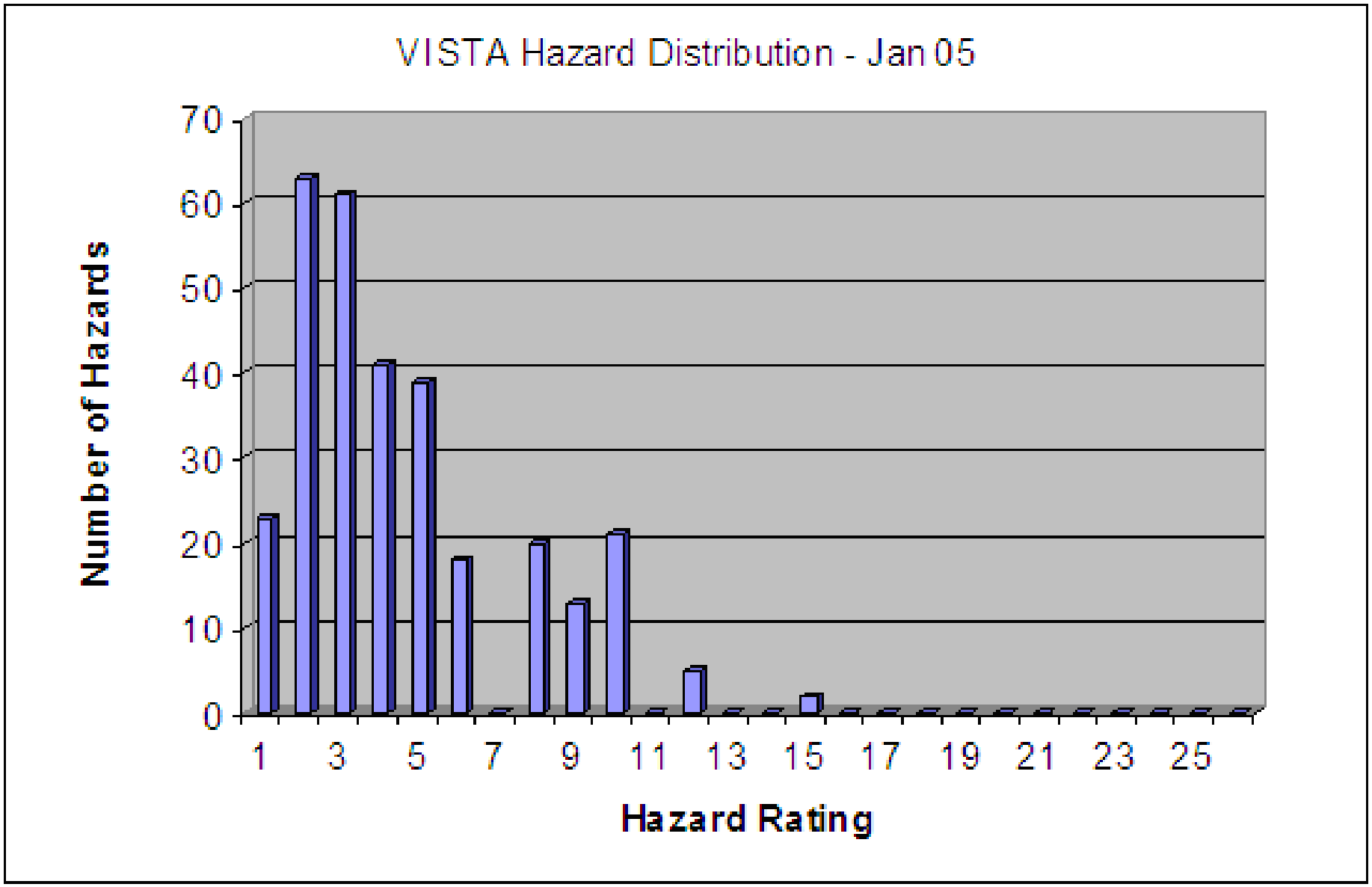



# Safety Hazard Management

- **Similar To Risk Management**
  - Identification
  - Scoring
  - Mitigation
- **Mitigation by**
  - Design
  - Safety Fixture
  - Procedure


VISTA Hazard Distribution - Jan 05
Number of Hazards
70
60
50
40
30
20
10
0
1
3
5
7
9
11
13
15
17
19
21
23
25
Hazard Rating

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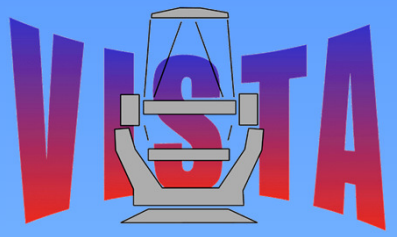



# Schedule - 2002

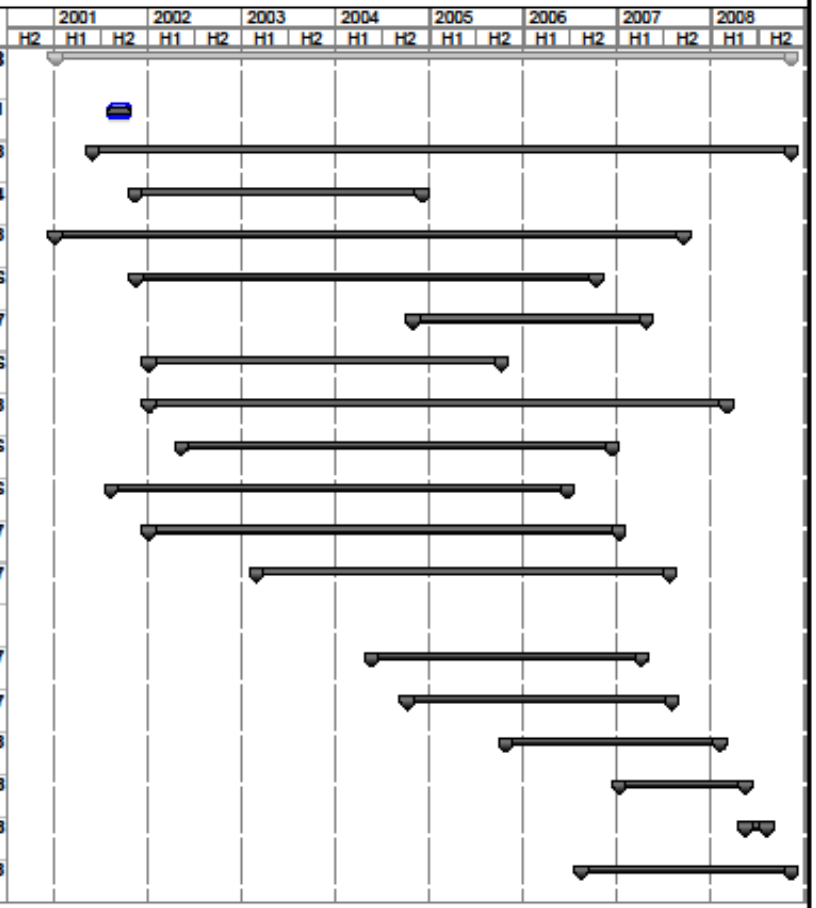
- 2000-2001 - Phase A
- October 2001- Phase B starts
- 2002 - Contract main workpackages
- 2002-2005 - Design and Manufacture Components
- Mid 2006 - Deliver to ESO

# Critical Path - 2008

| Task & Control | Due |
|---|---|
| Fit Camera | June 2008 |
| Complete Camera Verification | September 2008 |
| ESO Acceptance | November 2008 |

VPB(08)11_Project Schedule_V30.mpp

| ID | Task Name | Duration | Start | Finish |
|---|---|---|---|---|
| 0 | **VISTA - "Whole Project" Schedule** | **2045.5 days** | **08 Jan '01** | **20 Nov '08** |
| 1 | Phase A Close-out | 12 wks | 01 Aug '01 | 23 Oct '01 |
| 2 | Milestone Plan | 388.3 wks | 01 Jun '01 | 20 Nov '08 |
| 37 | VISTA Phase B Project Management | 158.4 wks | 12 Nov '01 | 03 Dec '04 |
| 104 | M1/M2 Procurement | 375.1 wks | 08 Jan '01 | 27 Mar '08 |
| 177 | M2 Collimation Unit | 245.4 wks | 19 Nov '01 | 11 Aug '06 |
| 203 | Test Camera | 145.7 wks | 01 Nov '04 | 16 Aug '07 |
| 211 | Enclosure | 222.1 wks | 07 Jan '02 | 10 Apr '06 |
| 251 | Site Preparation | 325 wks | 07 Jan '02 | 28 Mar '08 |
| 278 | Coating Plant | 213.1 wks | 13 May '02 | 12 Jun '06 |
| 304 | Telescope Procurement | 245.1 wks | 13 Aug '01 | 04 May '06 |
| 346 | IR Camera | 263.5 wks | 07 Jan '02 | 24 Jan '07 |
| 367 | Software WP | 248 wks | 03 Mar '03 | 30 Nov '07 |
| 413 | | | | |
| 419 | VISTA DFS | 188.6 wks | 20 May '04 | 31 Dec '07 |
| 427 | Integration, Testing & Commissioning | 137.3 wks | 07 Oct '04 | 25 May '07 |
| 441 | Telescope Installation & Integration | 135.8 wks | 26 Oct '05 | 03 Jun '08 |
| 452 | IR Instrument | 82.2 wks | 24 Jan '07 | 21 Aug '08 |
| 458 | Systems Integration | 0.8 wks | 21 Aug '08 | 27 Aug '08 |
| 460 | VISTA Acceptance | 118.3 wks | 16 Aug '06 | 20 Nov '08 |



# Schedule Issues

- Enclosure
- Telescope Main Structure
- Primary Mirror
- ESO Acceptance

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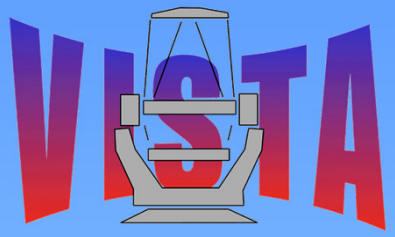


# Telescope Structure

- **3 Bidders**
  - Vertex RSI - UK
  - AMOS – Belgium
  - TTL - UK

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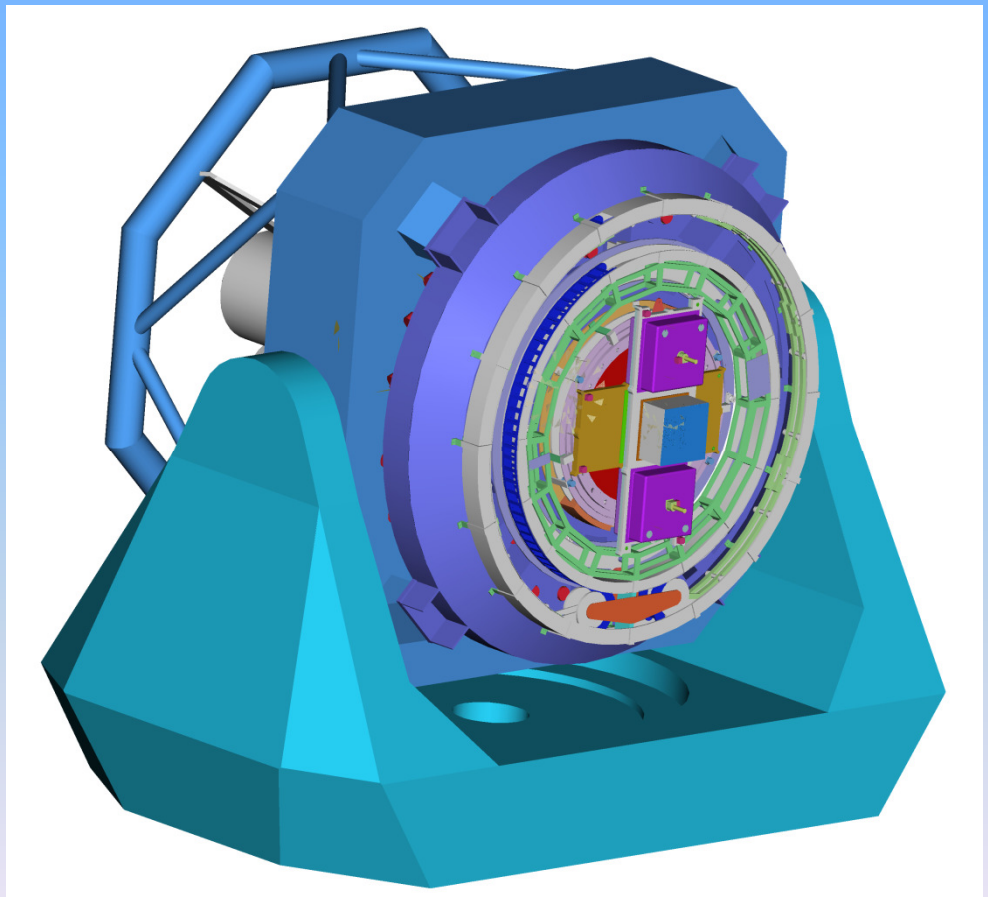
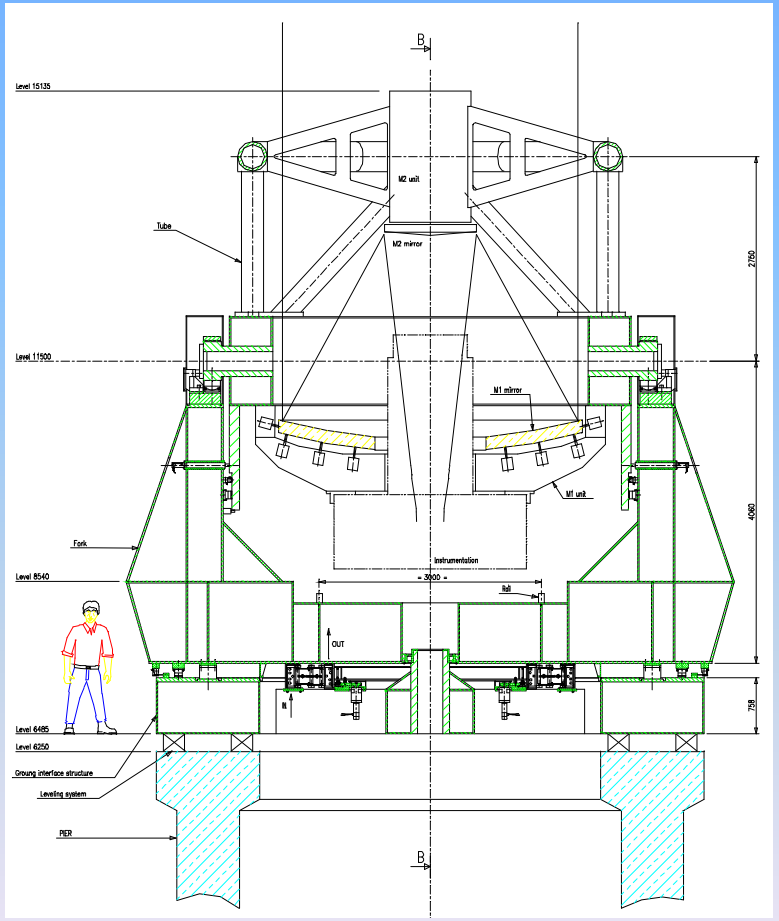
# Telescope Engineering Concept
# AMOS





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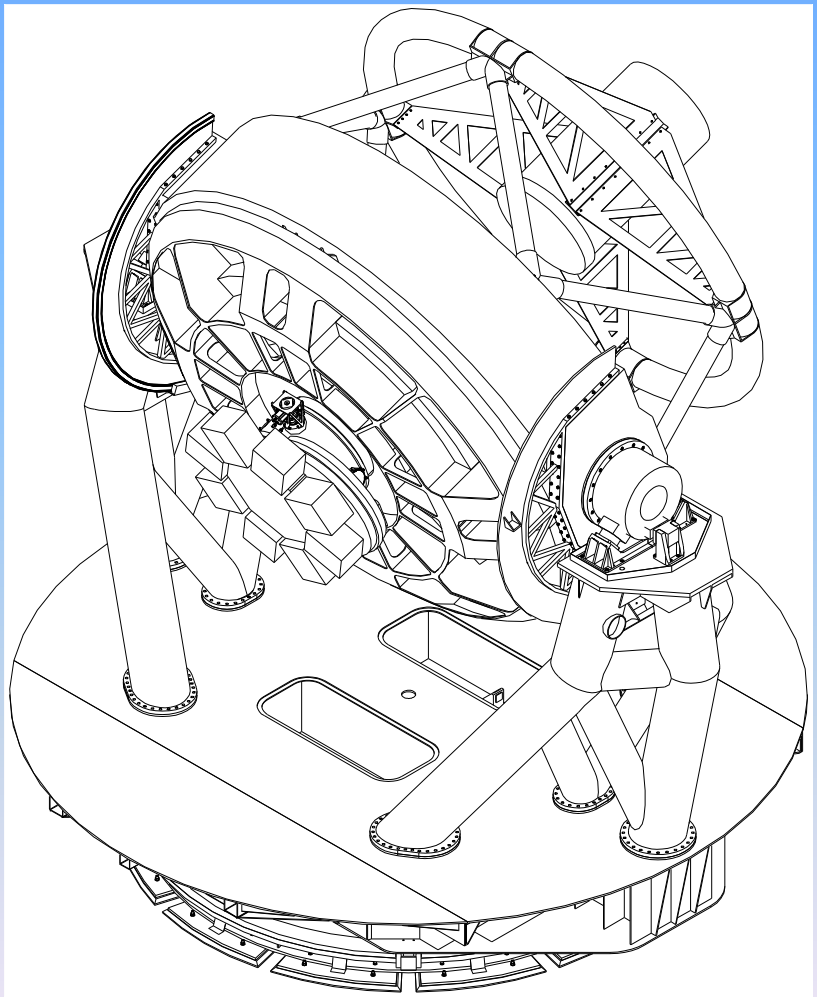
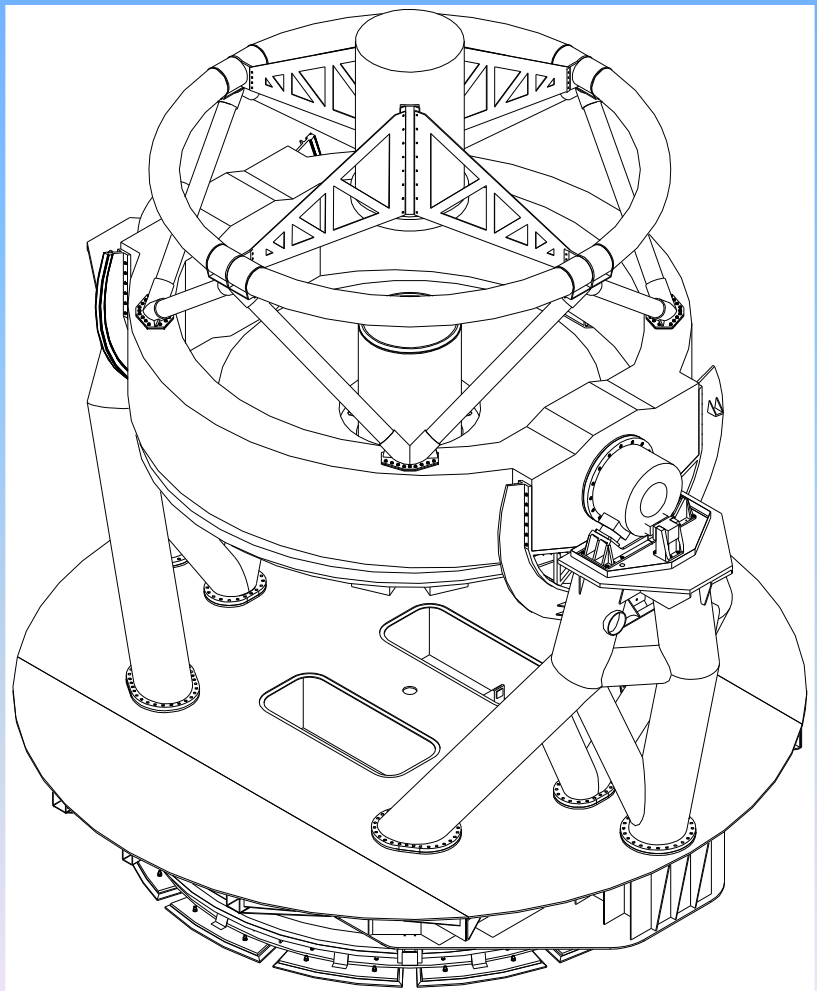
# Engineering Concept - TTL





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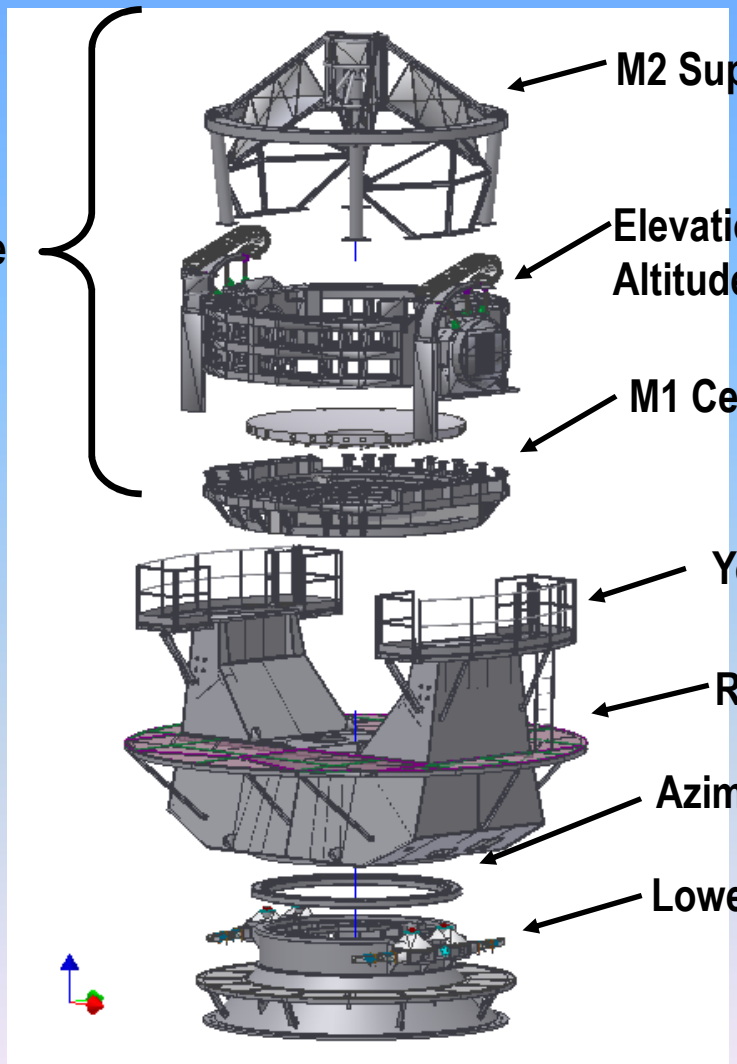
# Overview - Design



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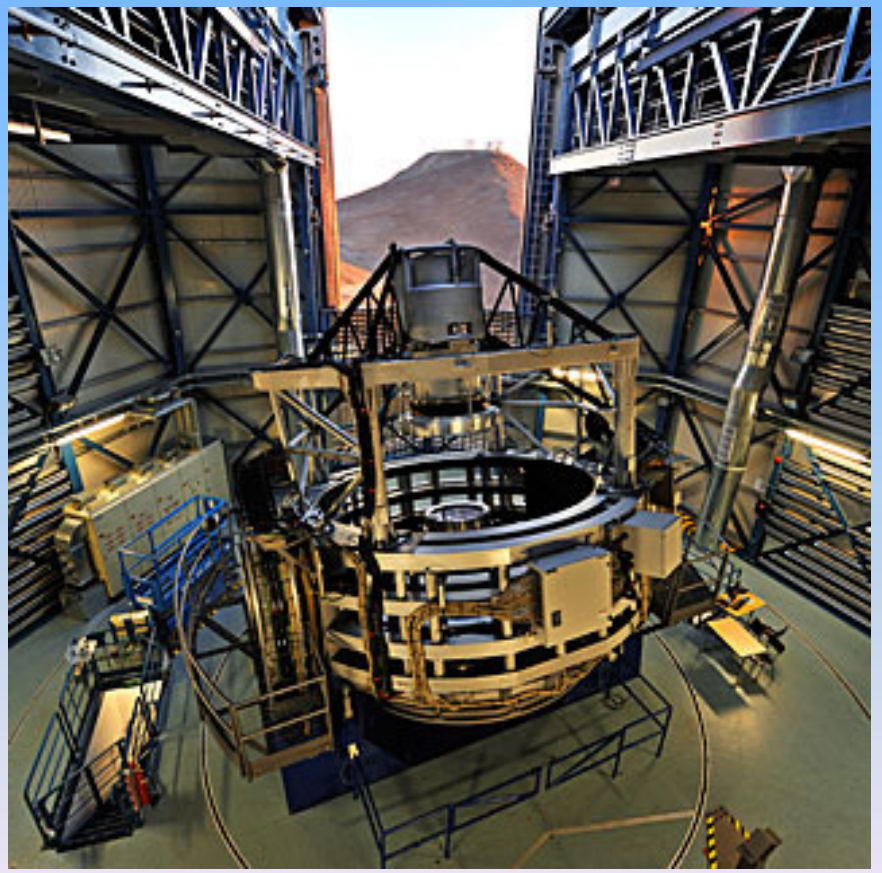
# Engineering Solution- Vertex RSI



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# Telescope Entry

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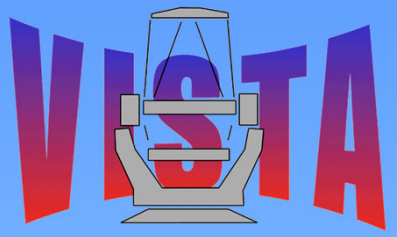


# Site & Enclosure

- **Coast Now DSL – Canada**
- **EOST – USA/Australia**
- **EIE - Italy**

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# NTT Peak

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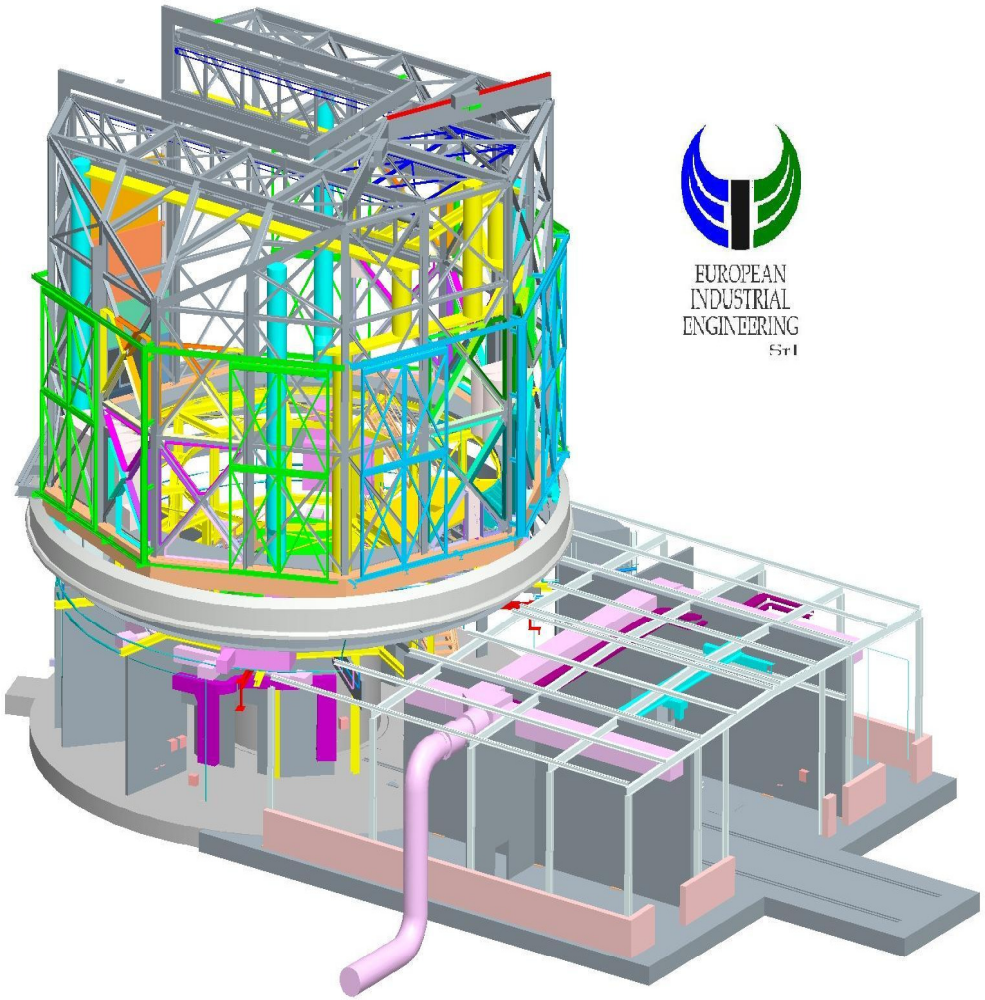
# Site ‘During and After’ Status



Project Office

EUROPEAN
INDUSTRIAL
ENGINEERING
Srl

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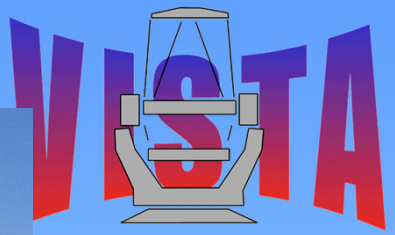



P&H
500
333

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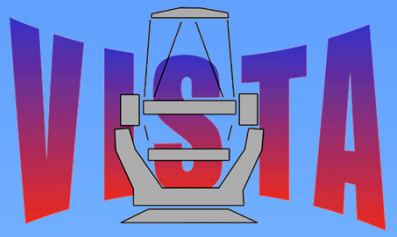


# Coating Plant

- **4 M Coating Plant**
  - Protected Silver
  - Aluminium

- **Bidders**
  - SMC Metalcraft - UK
  - Consortium - South African

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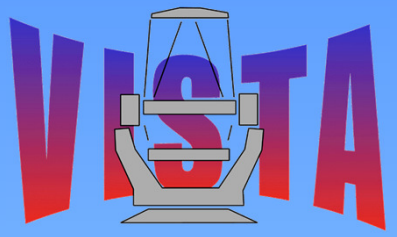


# Coating Plant Issues

- In reality single source contract
- Concern over management
- SMC Dependence on Consultant
- Pressure from other contracts
- Inexperience in running turnkey solutions
- Inexperience in site operations

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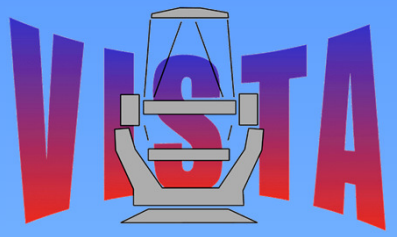


# Mirror Coating Plant - Layout

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# Mirror Coating

- **Vacuum Conditions**
  - Base Pressure – $6.8 \times 10^{-6}$ mbar
  - Time < 1Hr from Atmosphere
  - PPWV – $1.8 \times 10^{-7}$ mbar
  - Leak detection – $10^{-10}$ mbar l/sec
  - Working Pressure – $4.8 \times 10^{-6}$ mbar

Roughing Pumps (Leybold)

2 Cryopumps (Leybold)

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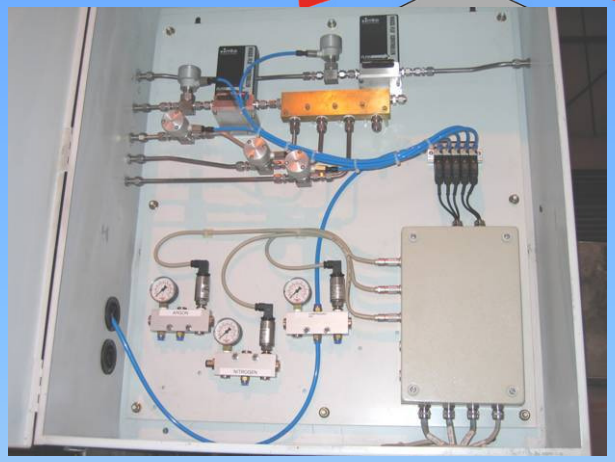
# Mirror Coating

- **Control Parameters**
  - Mirror Rotation – 2.5 rph
  - Gas Flow – 100 $cm^3$ $min^{-1}$
  - Deposition Rate – 1040 nm $min^{-1}$



Coolant & Gas control cabinet

Mirror support

Shutter & Mask

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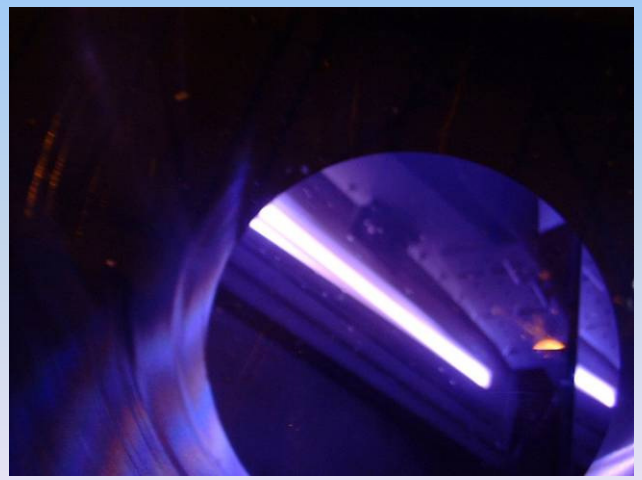
# Mirror Coating

- **Magnetron Set-up**
  - Target - 5N's Aluminium
  - Gas - 7N's Argon
  - Power - 24kW (Max)
  - Pulsed - 100kHz
  - Cooling - Indirect

3 Magnetrons (Angstrom)
Power Supply (Advanced Energy)



Plasma through viewport

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# Mirror Coating

- **Performance Tests**
  - Reflectivity
  - Thickness
  - Adhesion
  - Uniformity (to be done)
- **Test Equipment**
  - Cary 5000 Spectrophotometer
  - Loresta-EP Low Resistivity Meter

Test Samples

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UK Astronomy Technology Centre

# M2 Coating – March 2007

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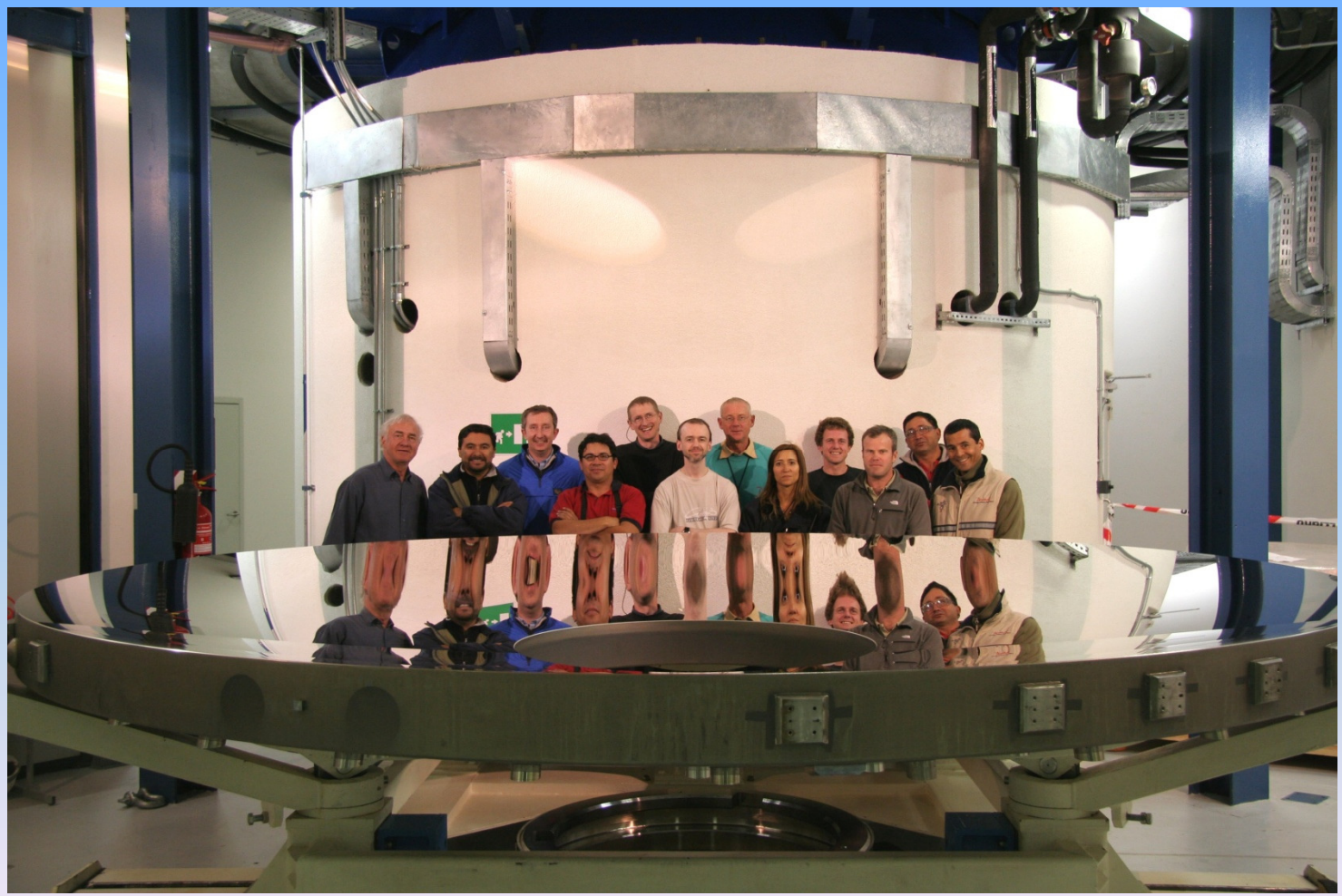
# M1 Coating – March 2008



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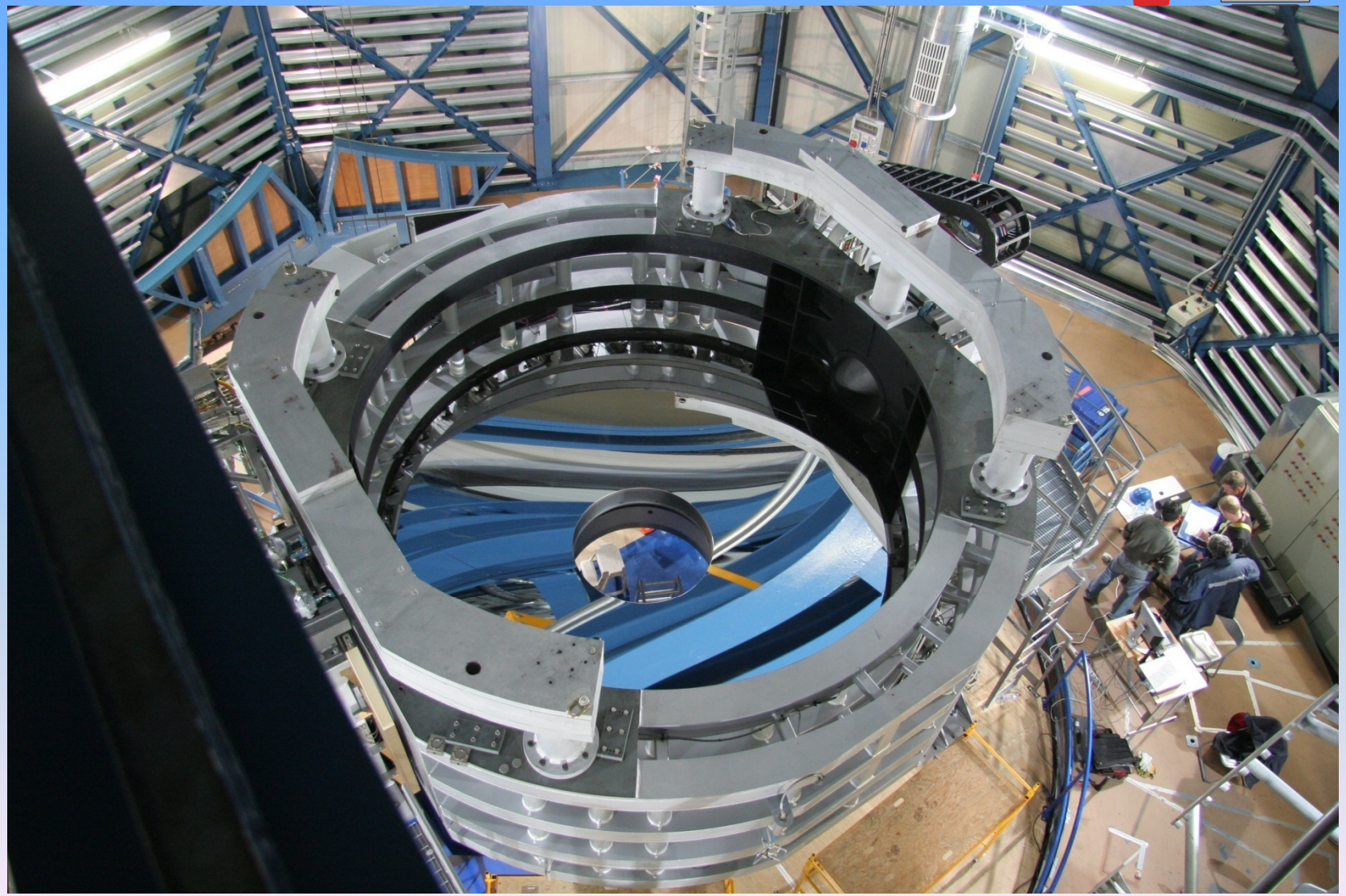
VISTA



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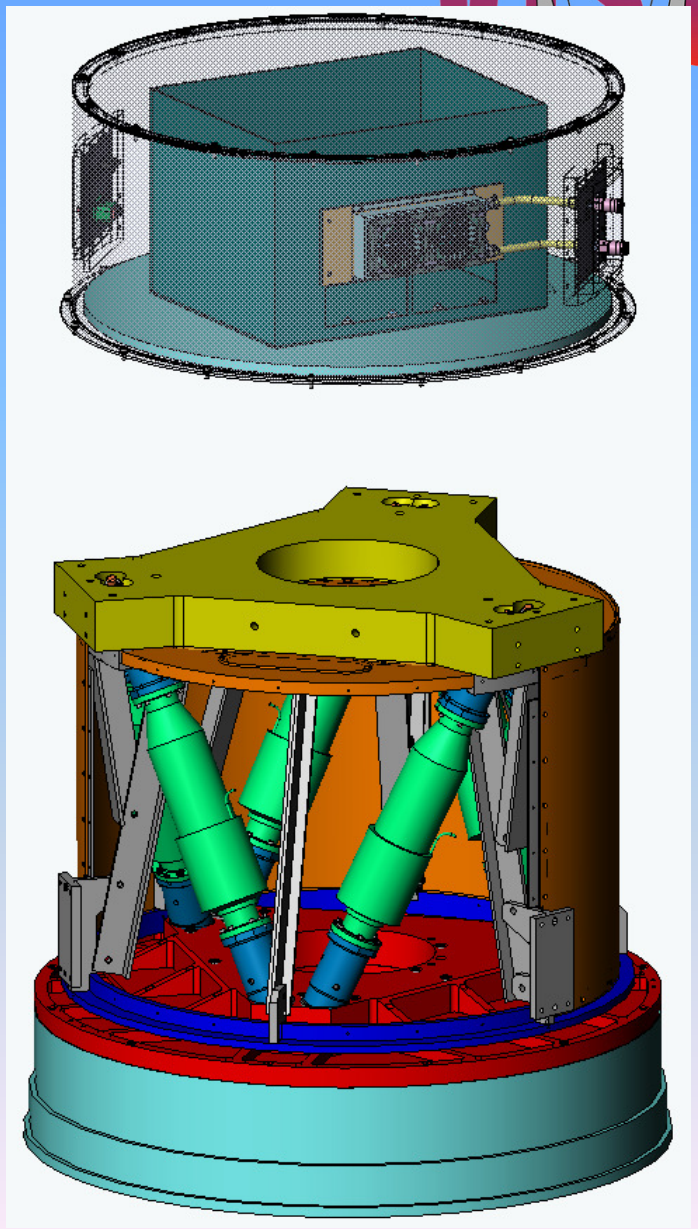
# M2 Unit

- NTE – Spain
- Astrium - Germany



# M2 Unit

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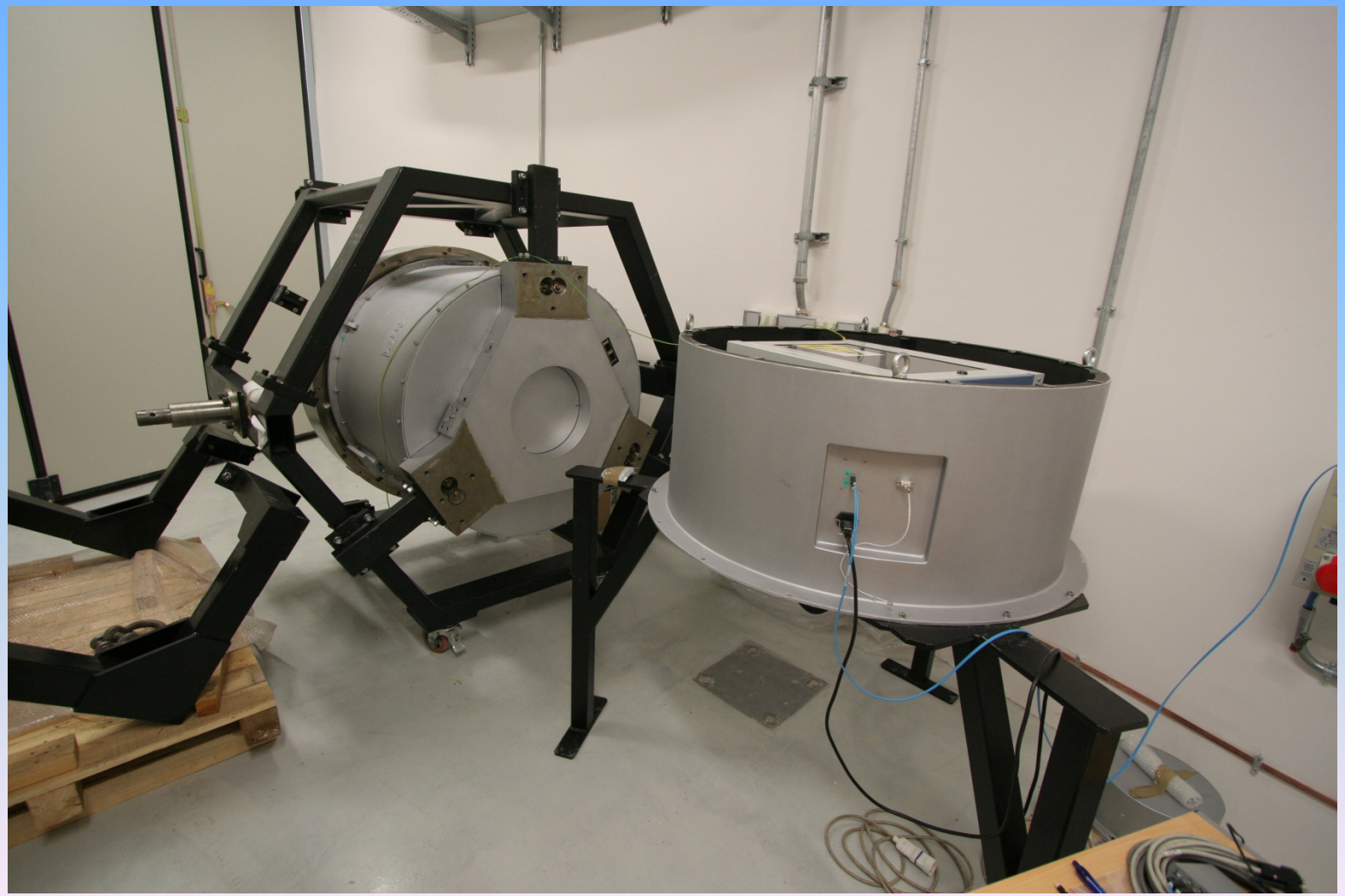
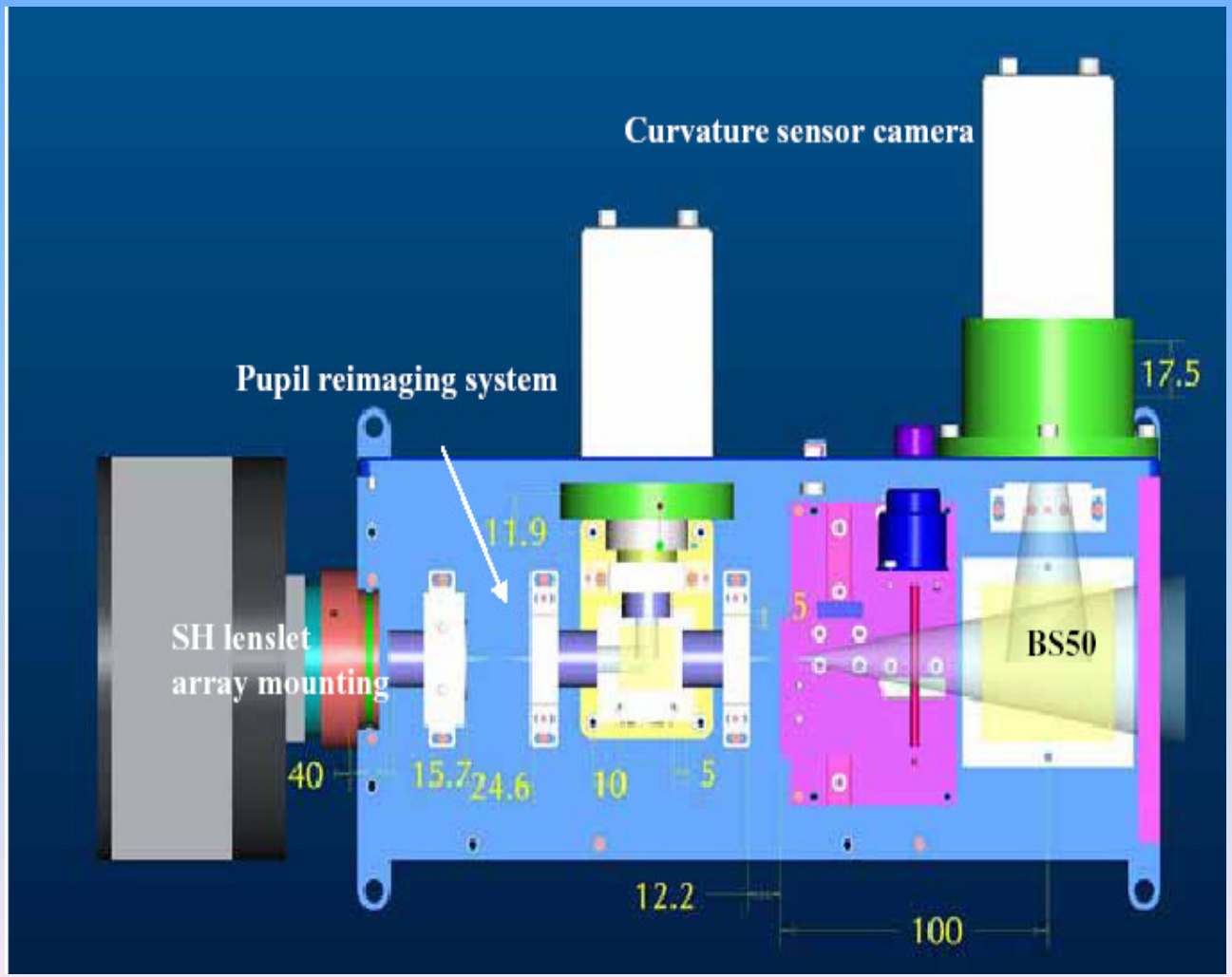
# M2 Unit - Paranal



# Test Camera


Curvature sensor camera
Pupil reimaging system
17.5
11.9
SH lenslet
array mounting
5
BS50
40
15.7
24.6
10
5
12.2
100

# Test Camera – Puntino 500

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# IR Arrays


*First Hardware Delivery on VISTA Program to UK ATC*
*3 Bare Multiplexers - SB-301 VIRGO on Module - 10/07/02*

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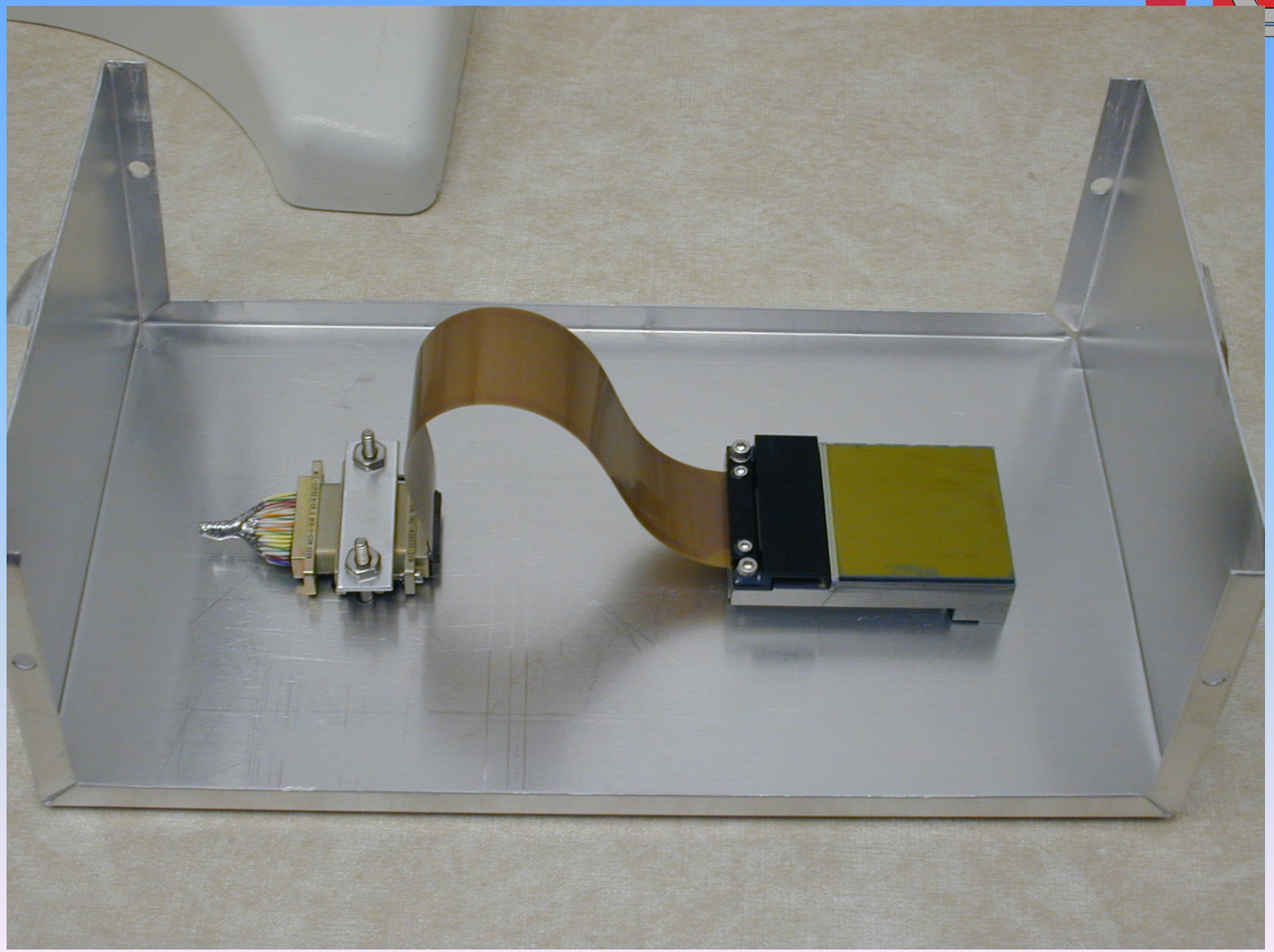

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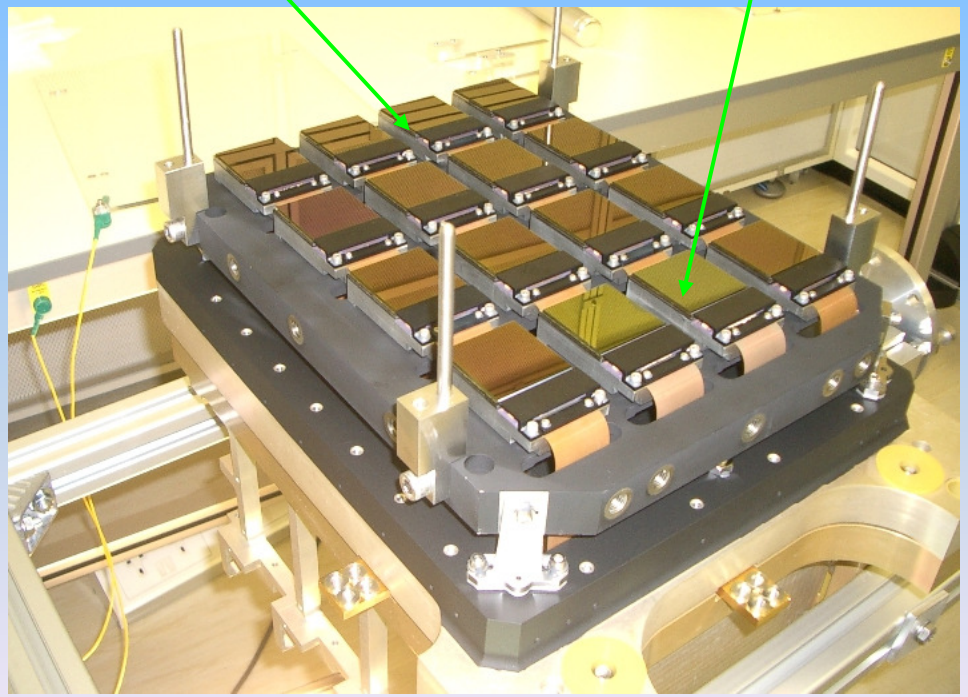
# Detectors

Raytheon engineer assisting RAL

Mounting & installing thermal straps from underneath

16 SG detectors mounted on moly plate

2 detectors with less robust AR coating



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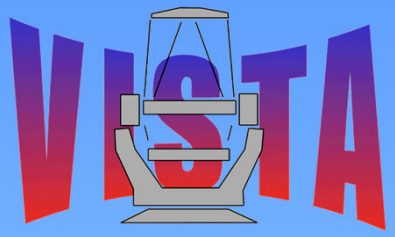


# Control

- **M1 LCU – Contracted to Observatory Sciences**
- **Axis LCU * 3 – UKATC**
- **Enclosure LCU – UKATC**

- **Wavefront Sensing – UoD**

- **ESO Standard**
  - VX Works/VME

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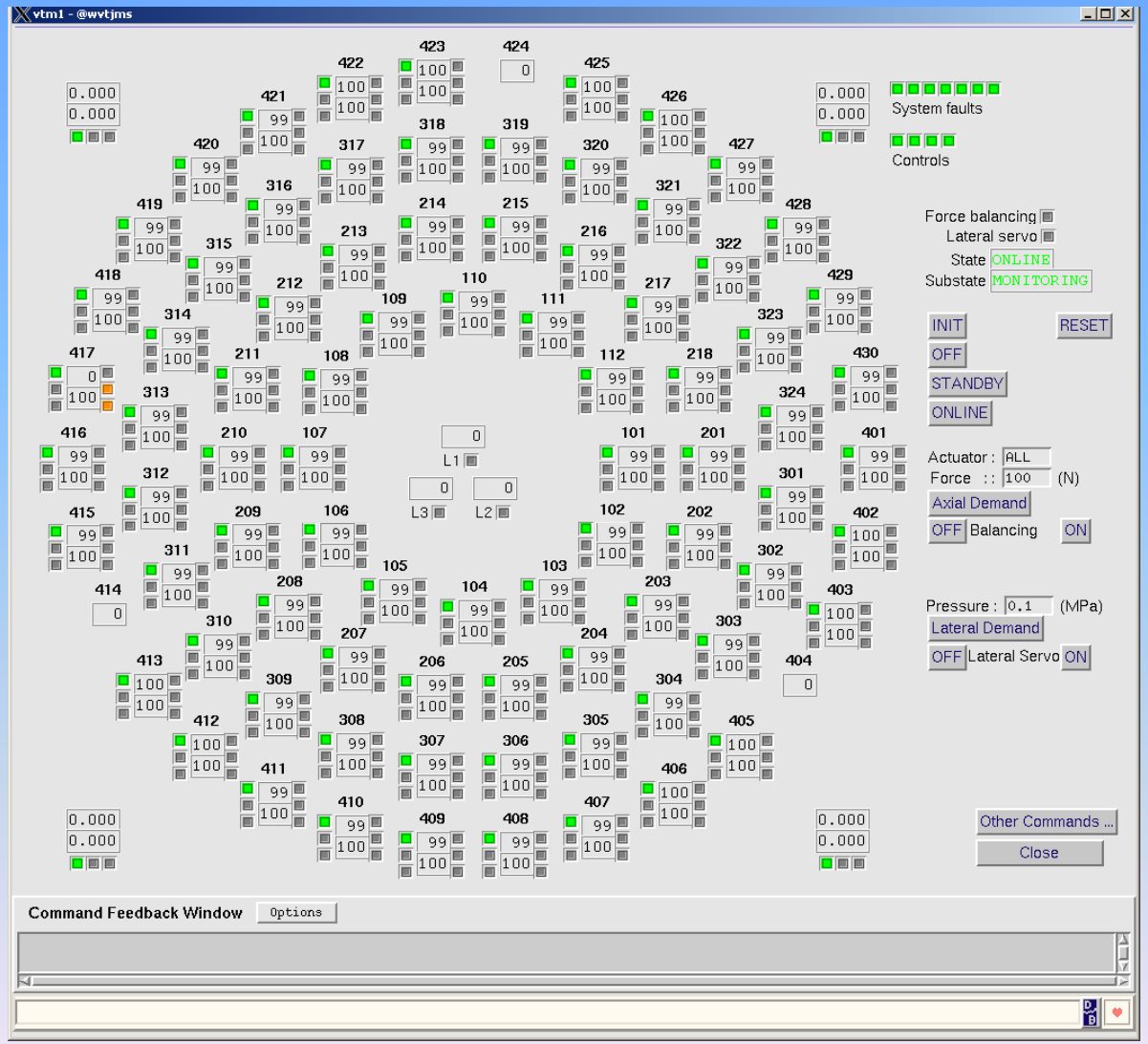
# M1 Control




- New application
  - CANbus
  - VxWorks
  - VLT common software
- Dynamic force balancing
  - counteracts wind
  - 10 Hz achieved
  - 50 Hz goal
  - control loops remain closed during slews

# Axis LCU at VRSI

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# M2 - Blank

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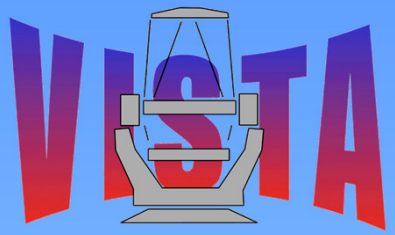
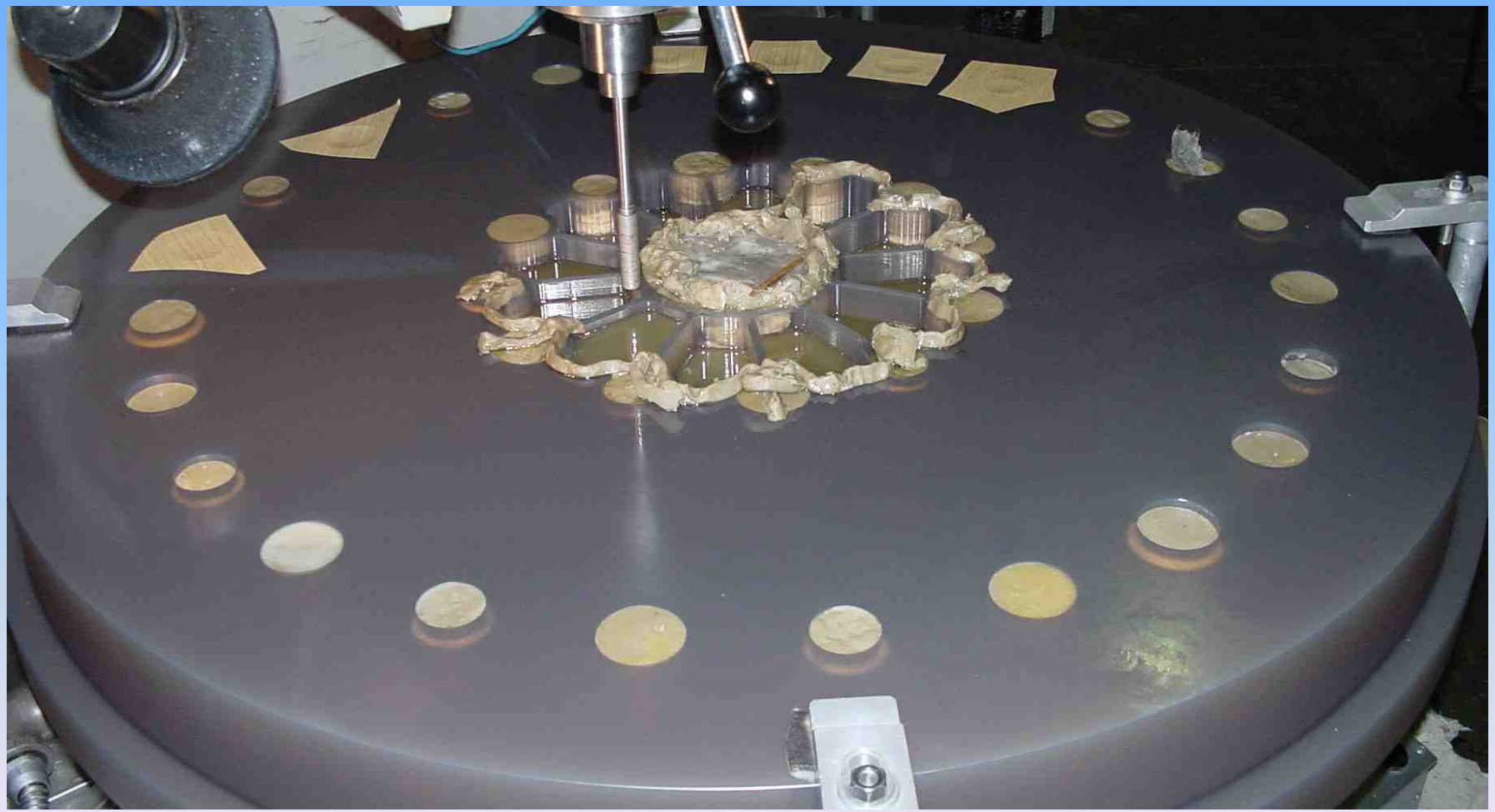



# M2 lightweighting



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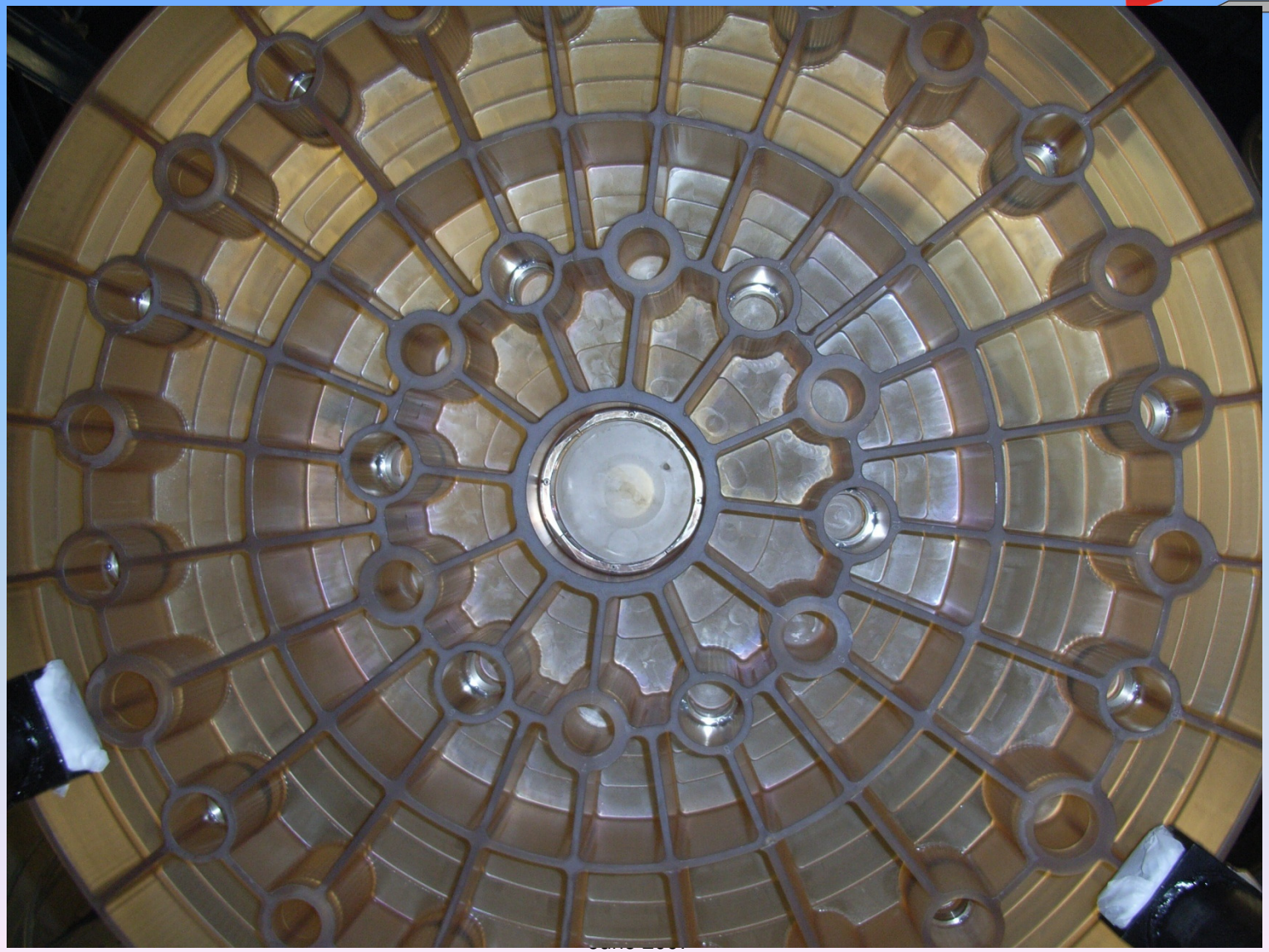
# M2 Underside



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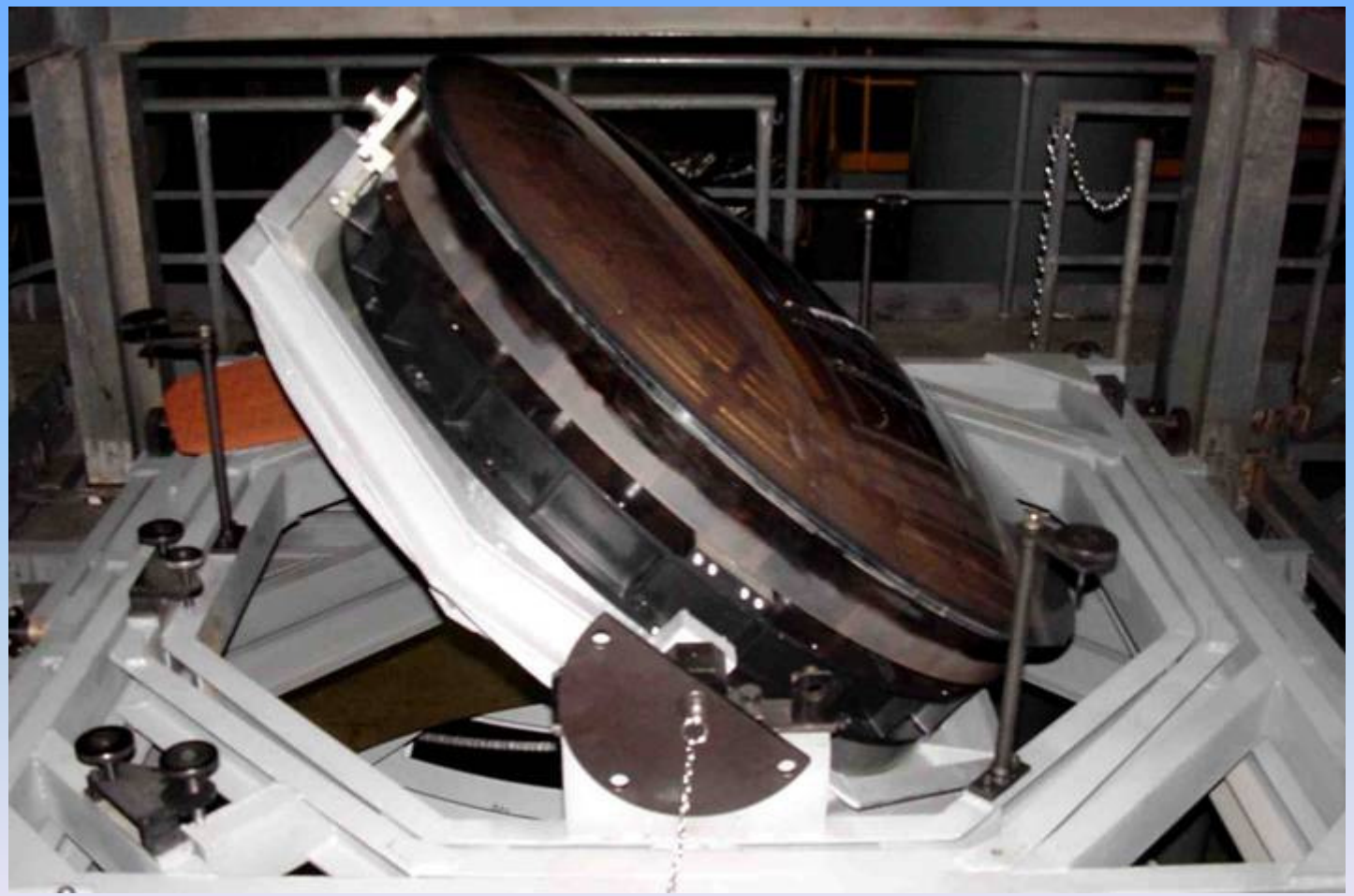
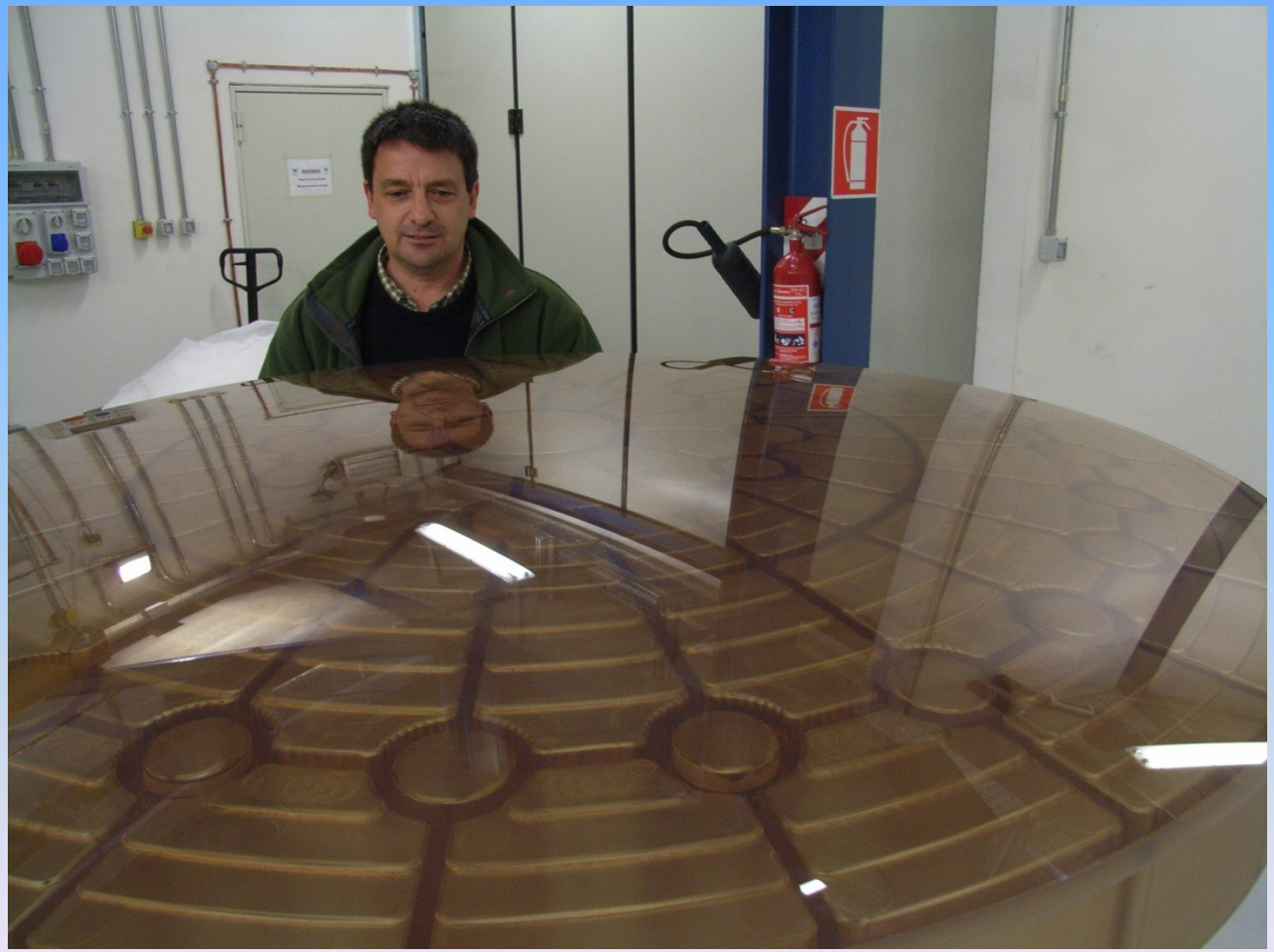
# M2 Mirror & Cell



# M2 in Paranal



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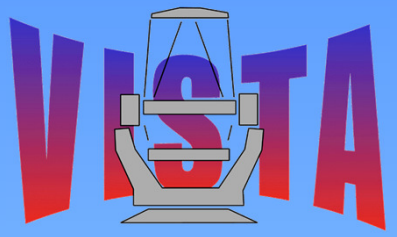


# M1 Blank

- **Bidders**
  - Schott – Germany
  - LZOS/Zeiss – Russia

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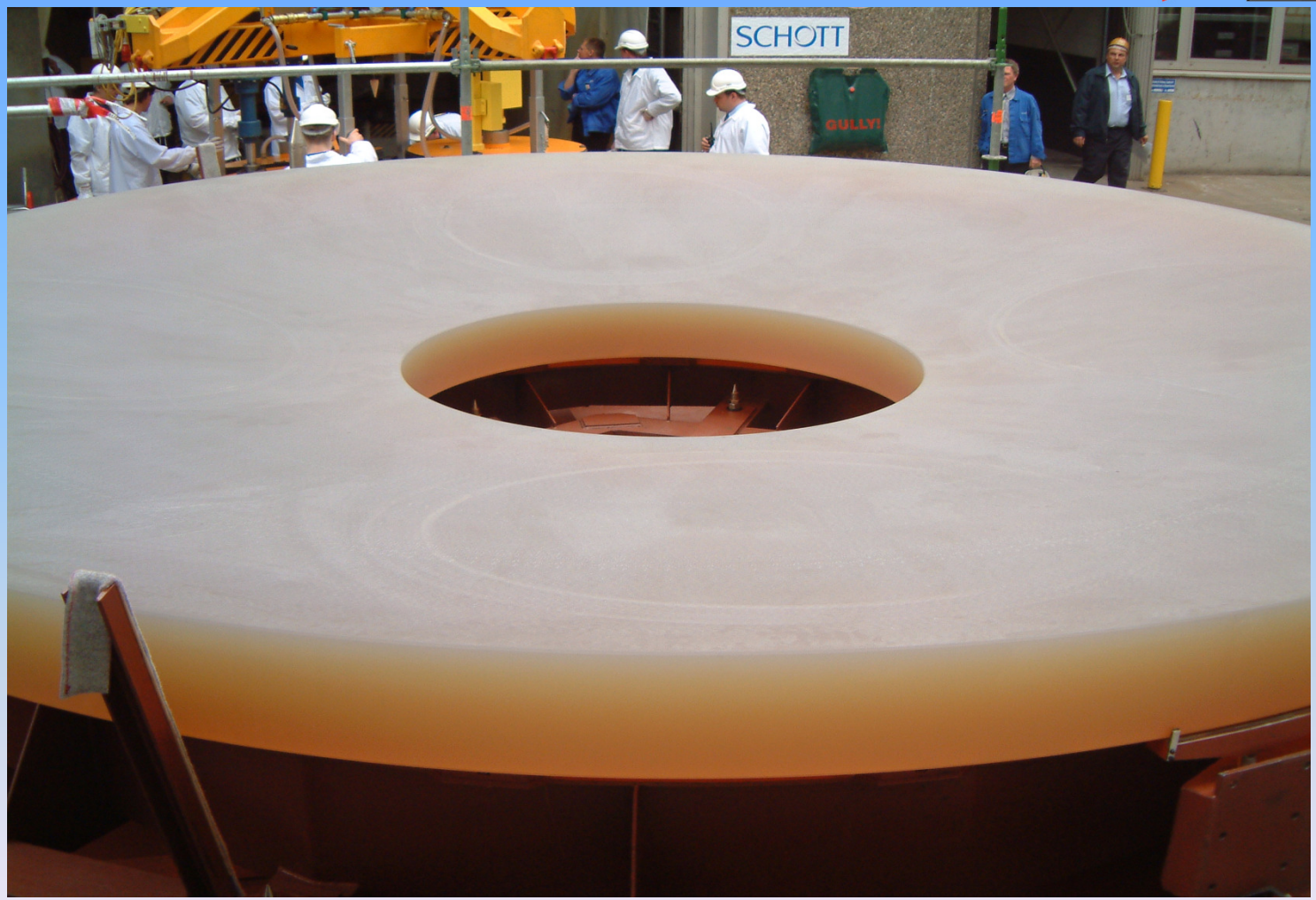
# M1 Blank Delivery



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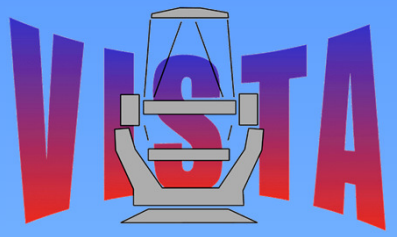
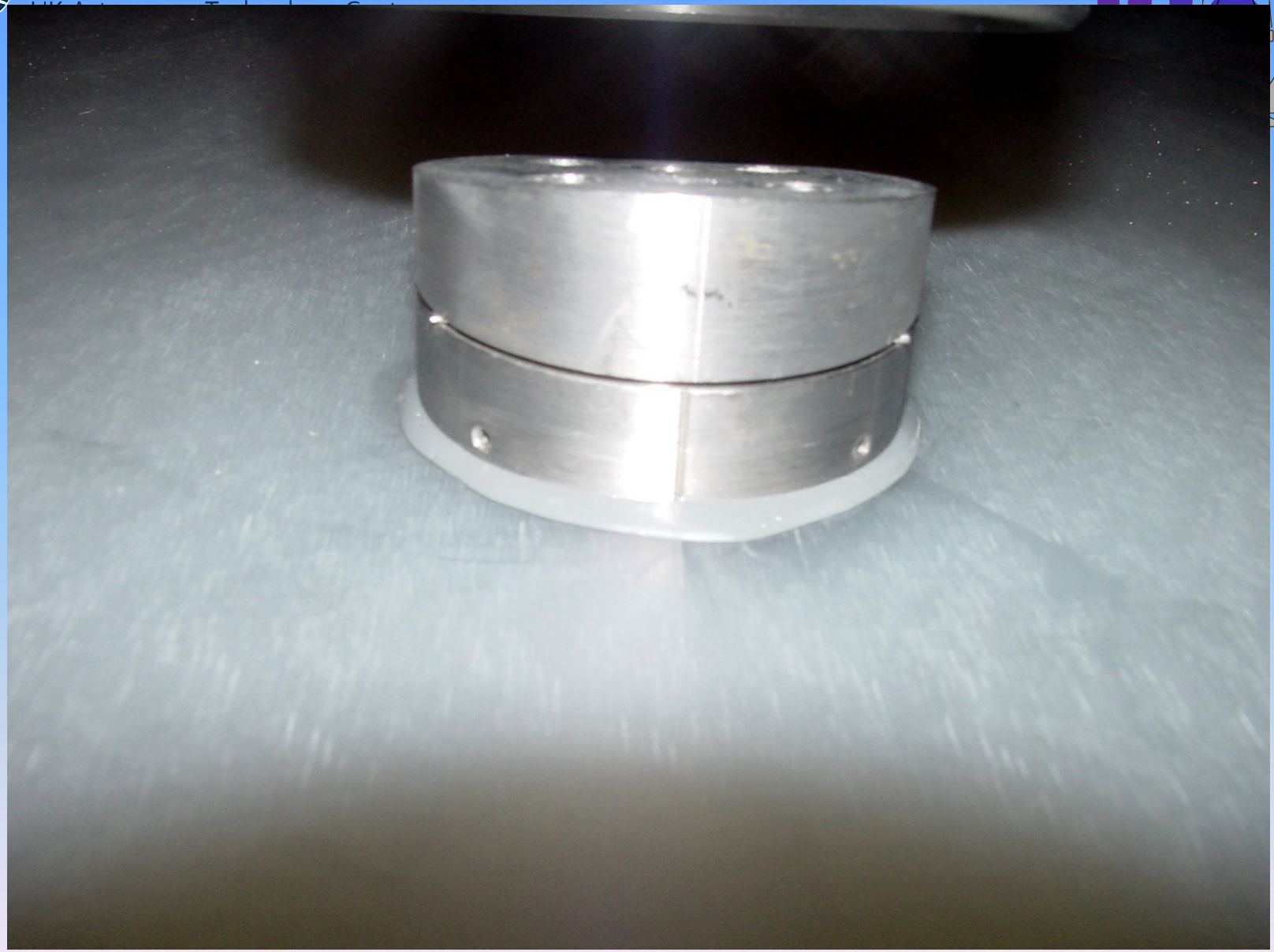



# M1 Figuring & Polishing

- **LZOS – Russia**
- **Sagem – France (REOSC)**



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# M1 Polishing

# M1 – More Polishing

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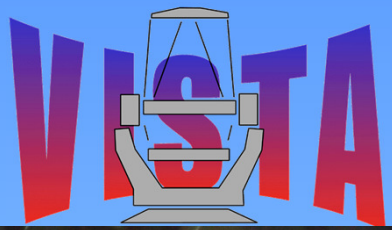
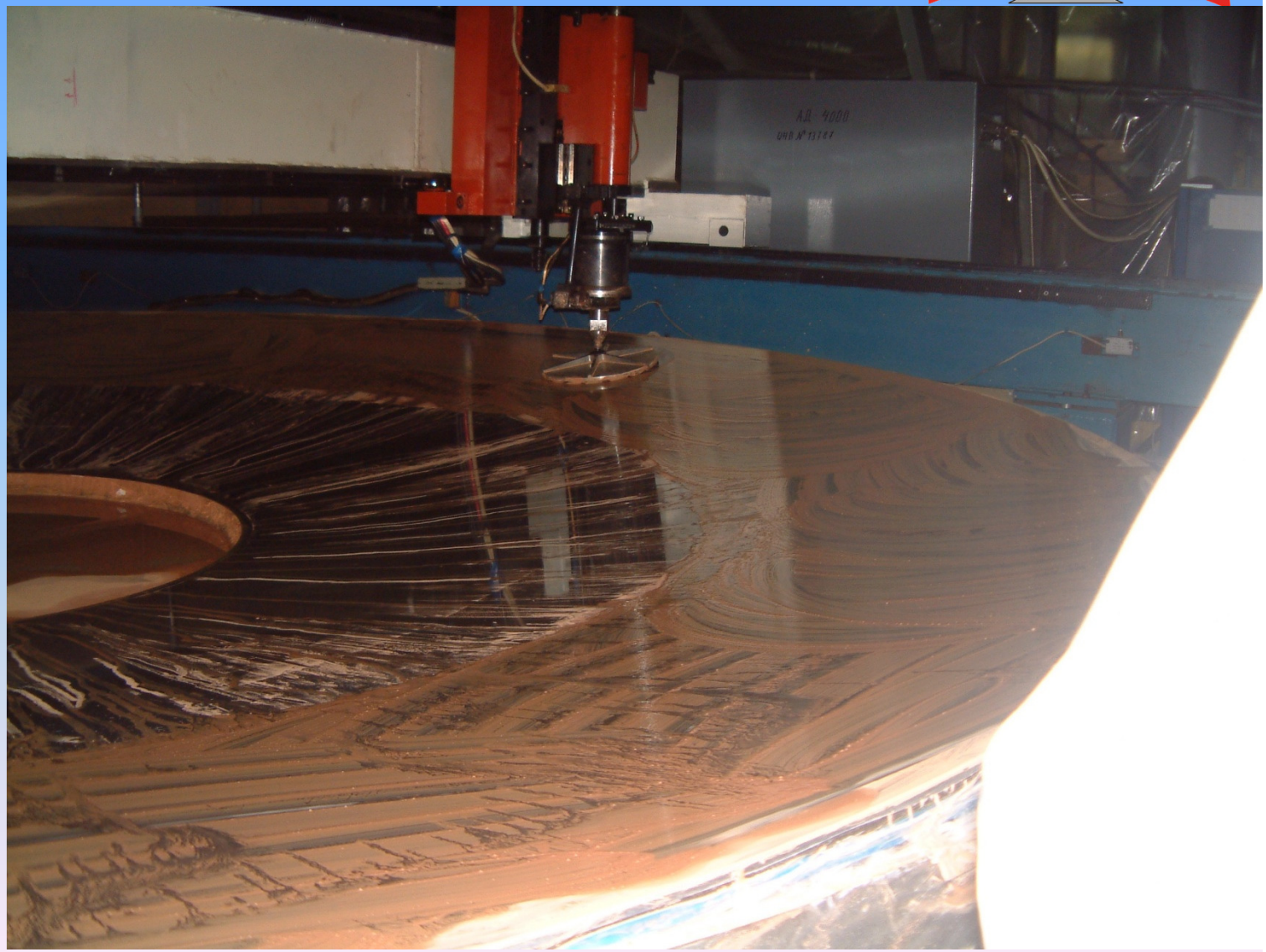



# More....



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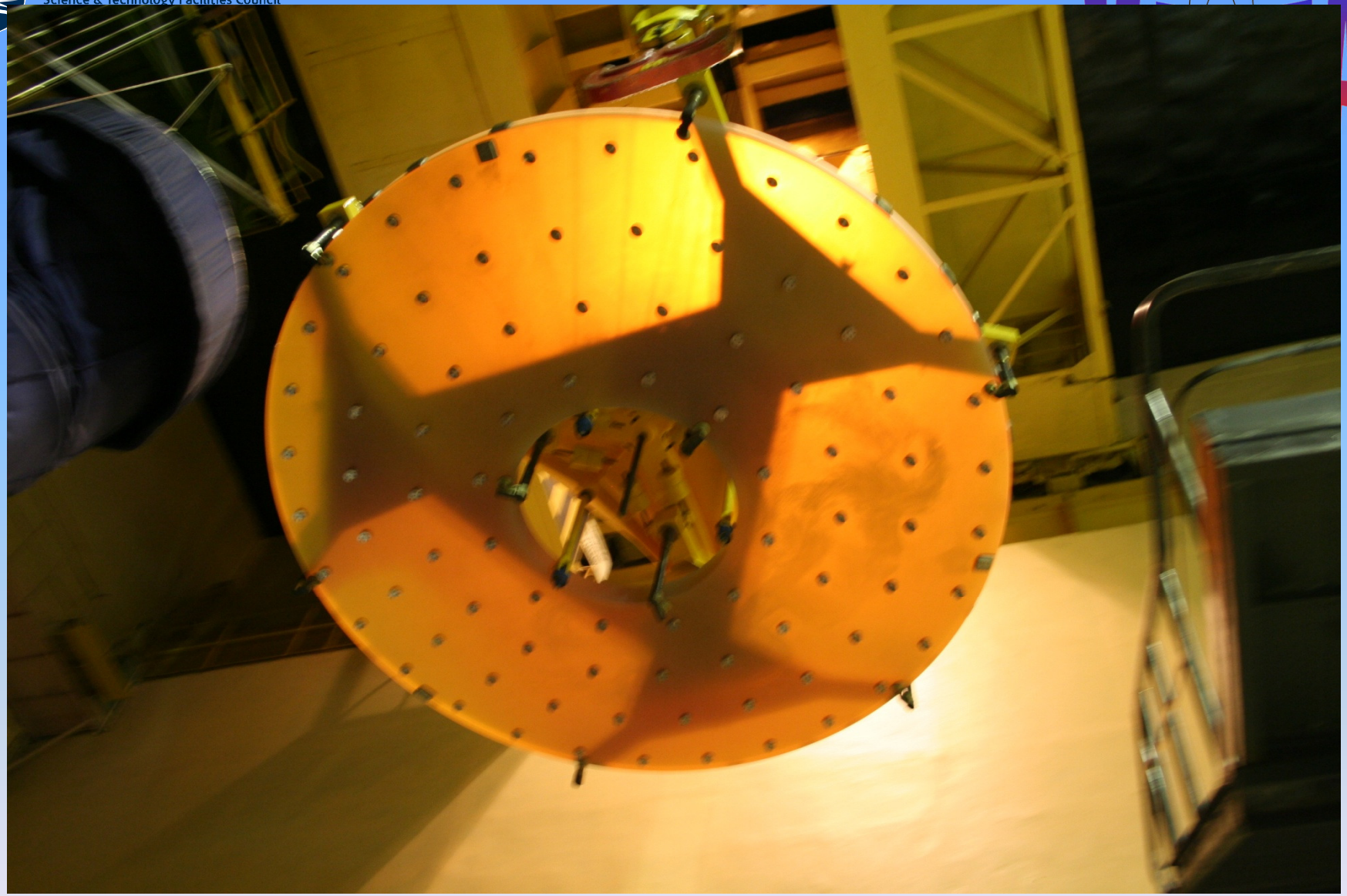
# Expert Testing……



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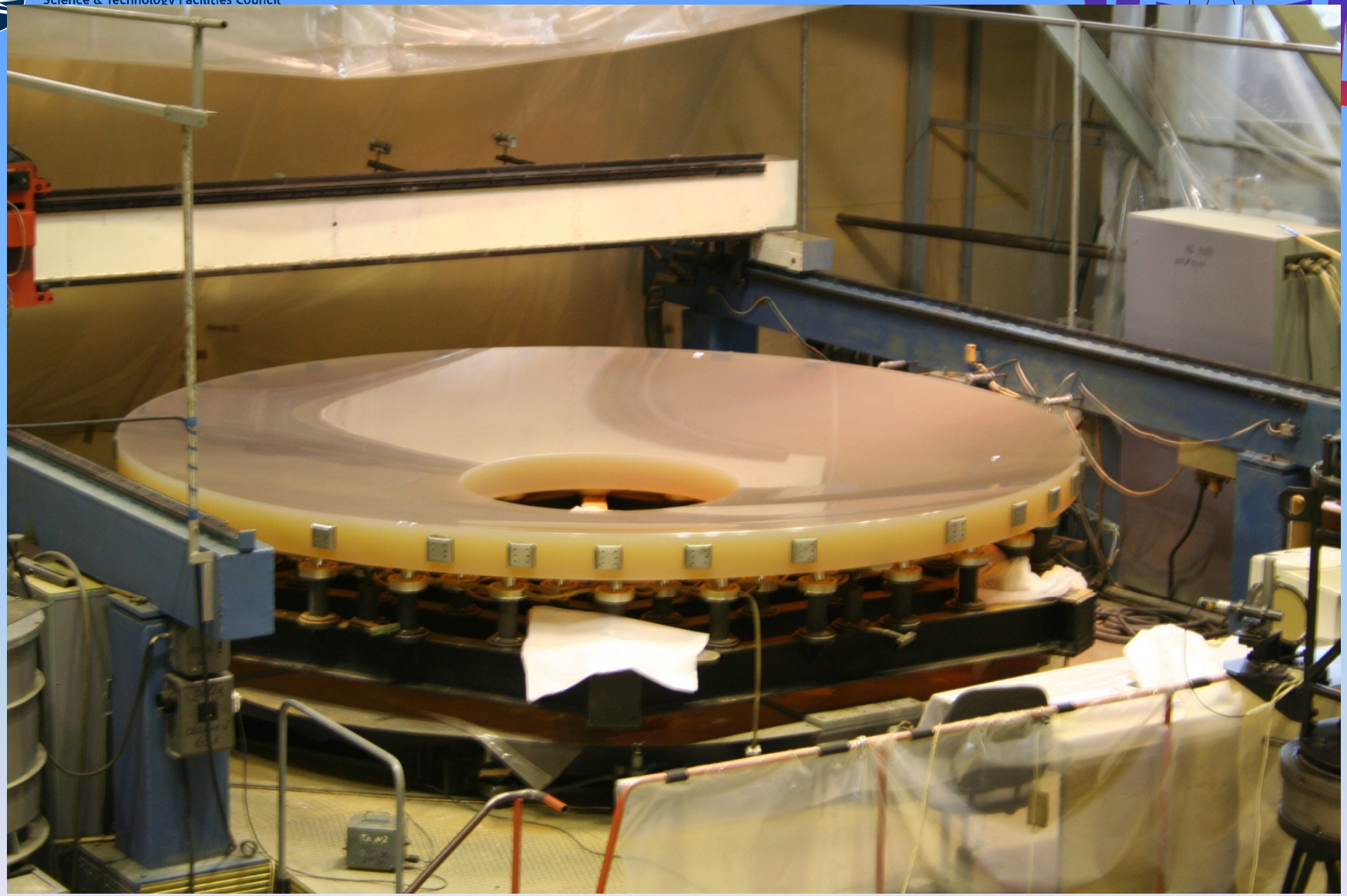


20
RUS

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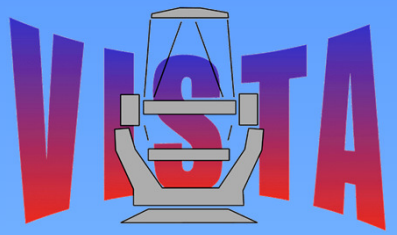


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VISTA
Project Office


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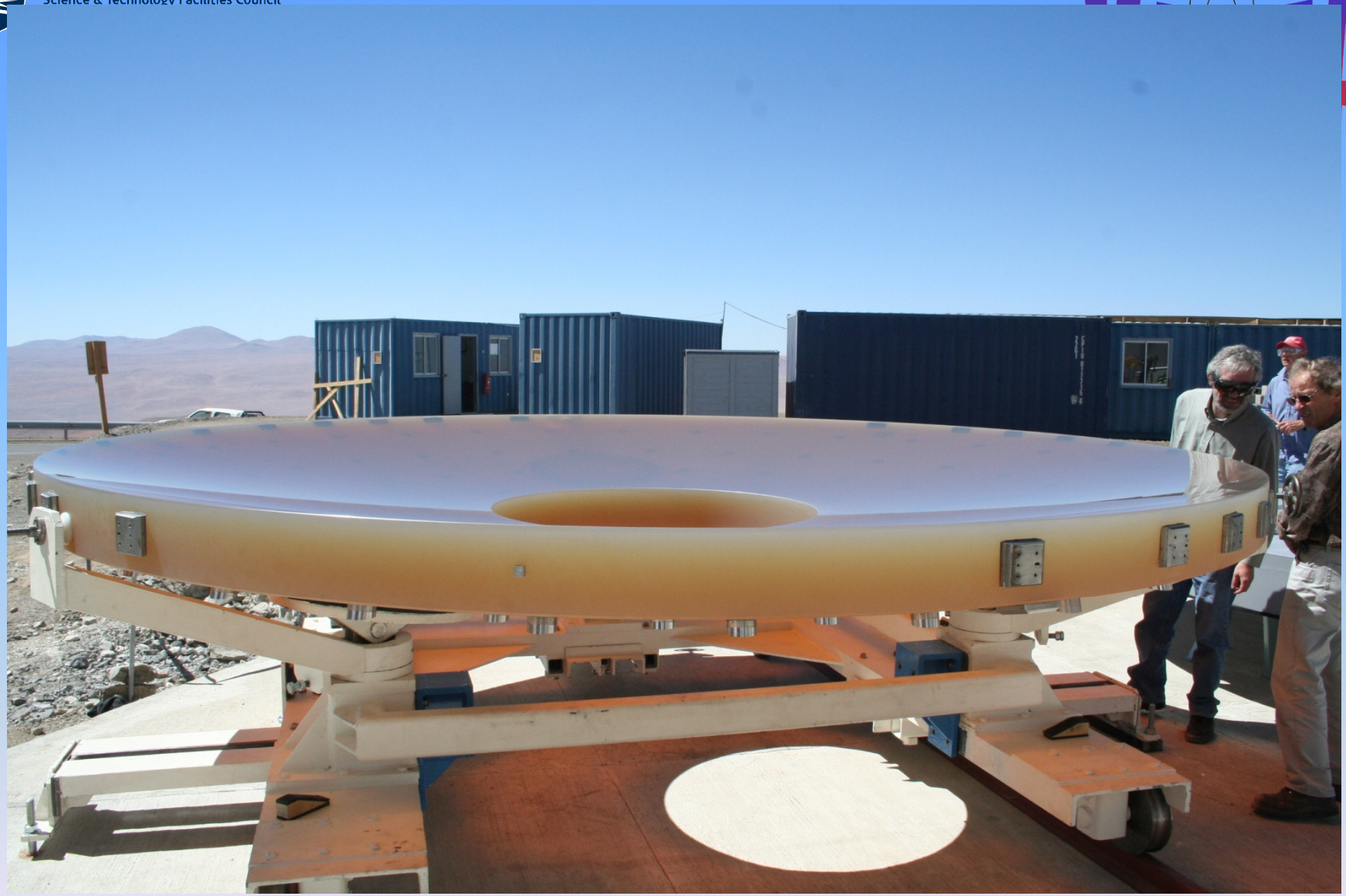
FERROVIAL
Actros
V8


VISTA
VISTA

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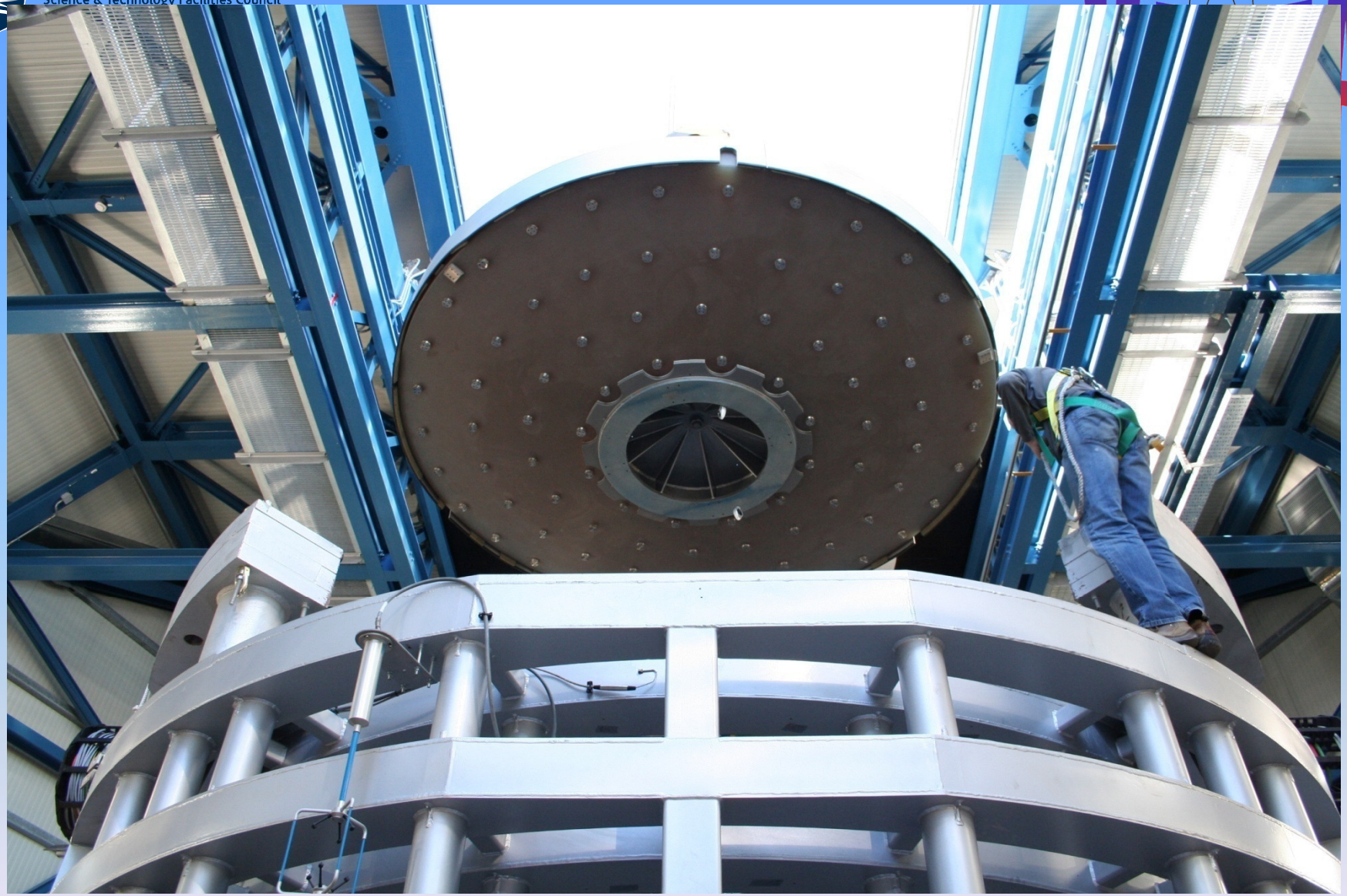

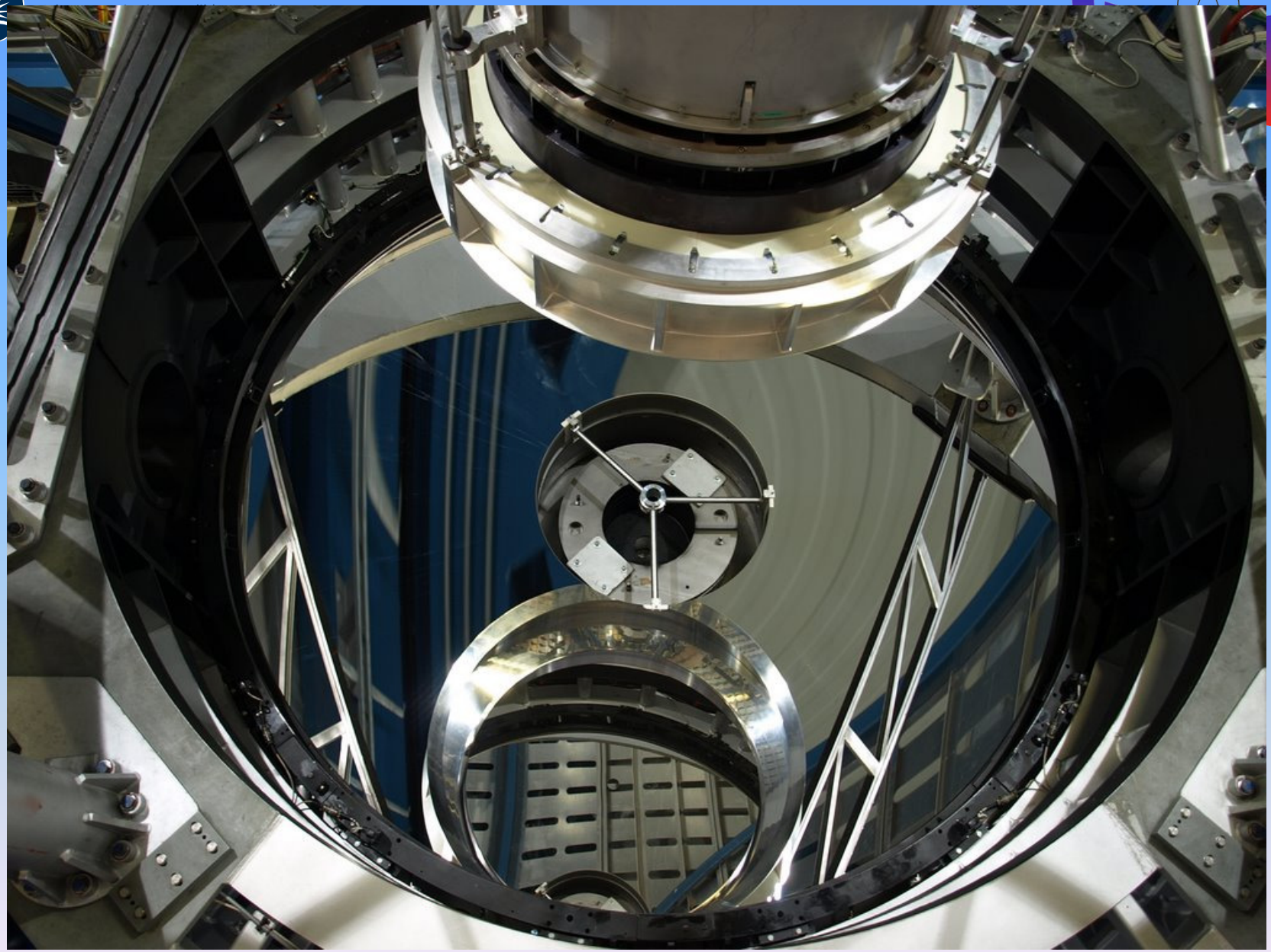

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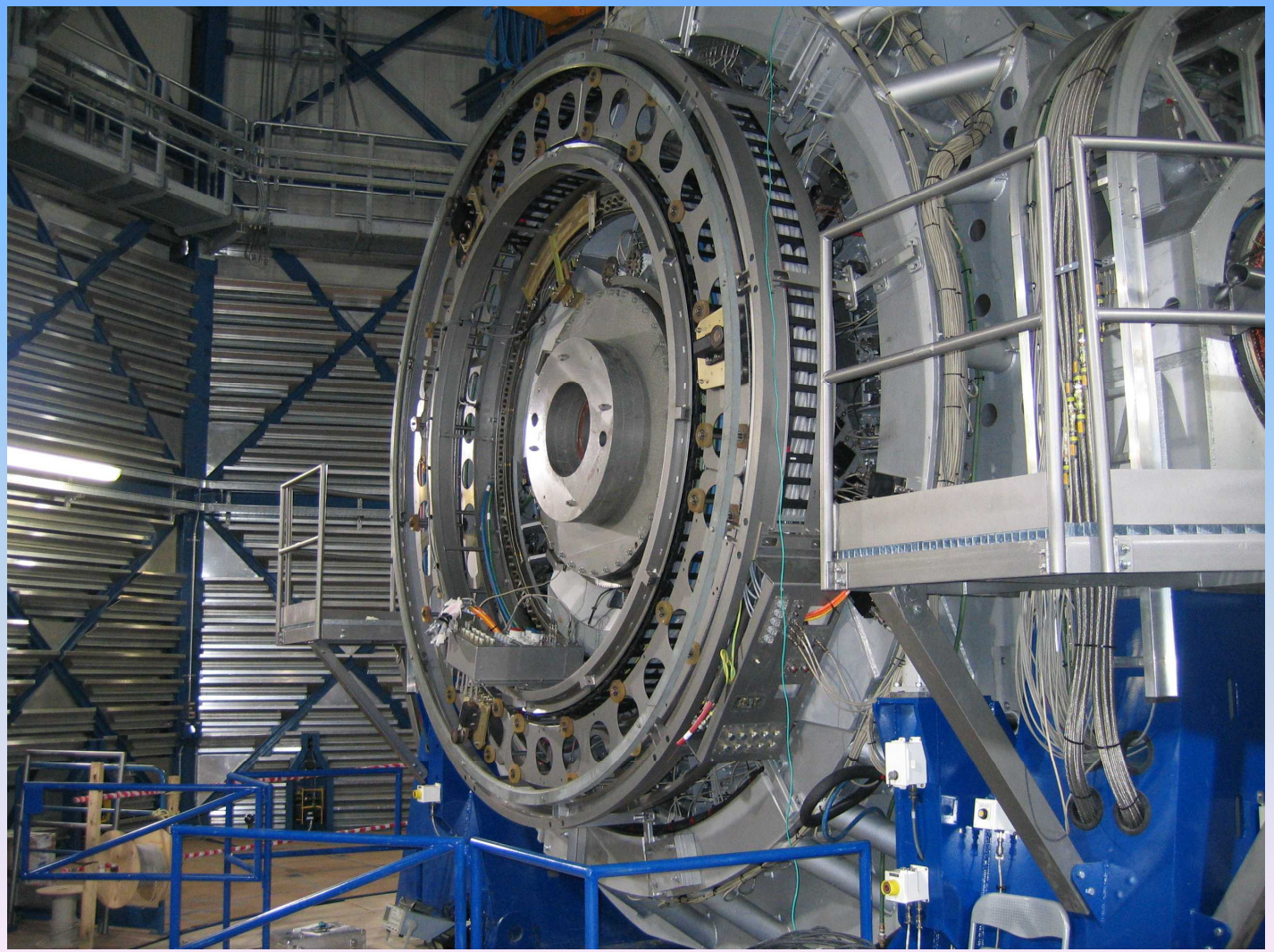
# Cassegraine Wrap



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# Camera Handling

# Nearly There

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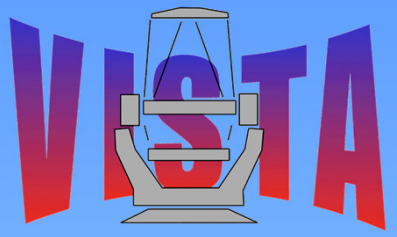
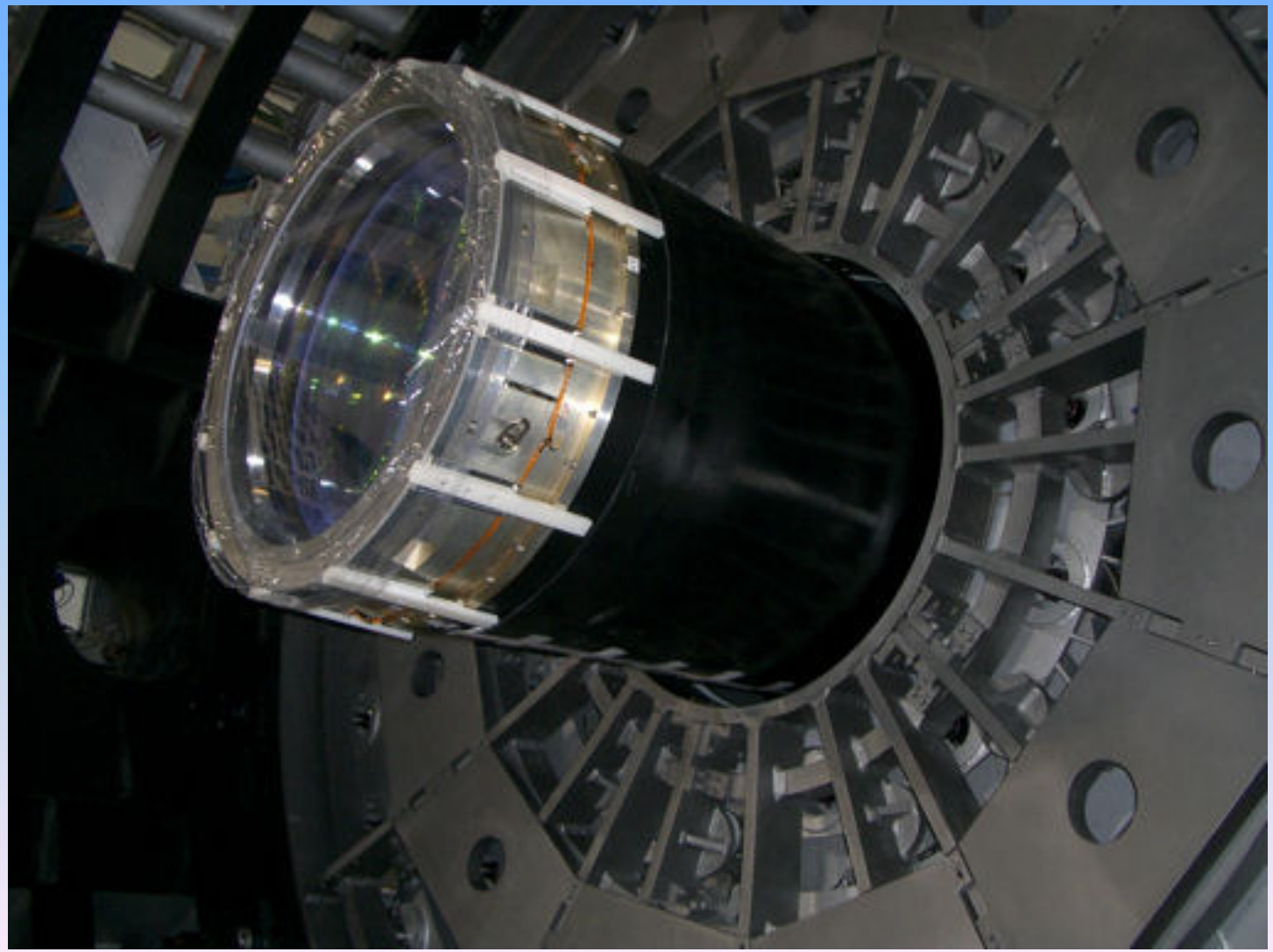
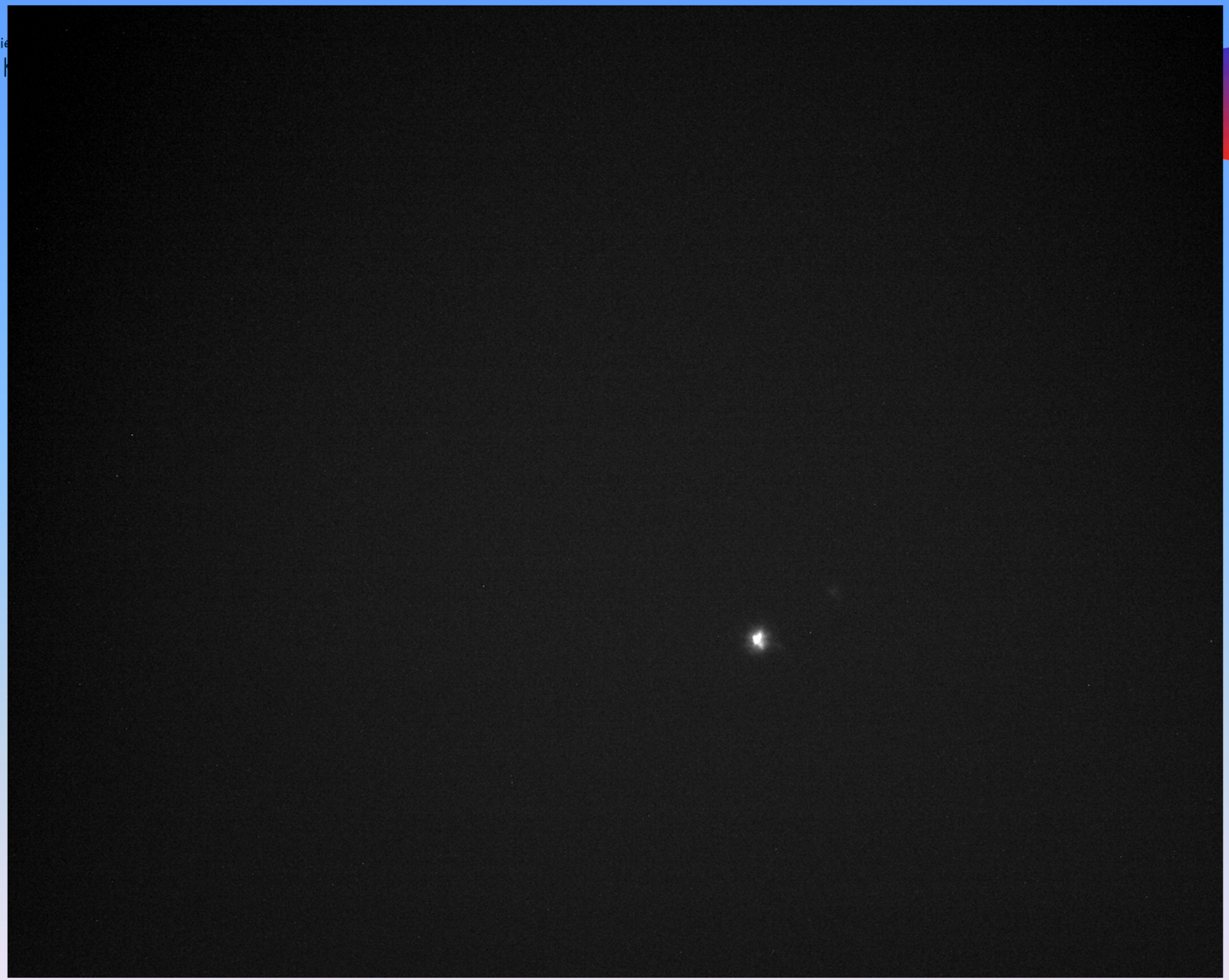



# Camera Mounted





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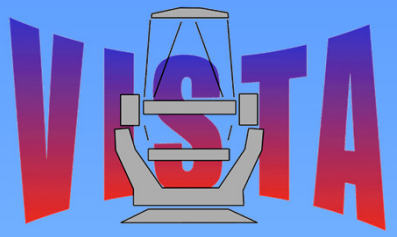


# Critical Items – Frustrations…

- Enclosure
- Coating Plant
- Instrument
- M1……..
- Customers….

# STAGES OF A MAJOR PROJECT

ENTHUSIASM!

DISENCHANTMENT

PANIC

Search for the Guilty →

PUNISHMENT OF THE Innocent

Decoration of all those who took no part

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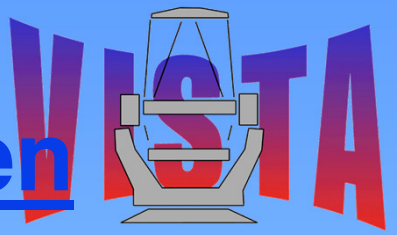


# VISTA Agreement between ESO and STFC

1. **Provision of Additional Spares**
2. **Universal M1 Handling Tool & VLT mirror fixtures (M2, M3 & M5)**
3. **Auxiliary Building Extension**
4. **Extended Warranty - from 2 to 5 years**
5. **Mirror Coating Plant Upgrade**
6. **Development of VISTA Pipeline & Processing of VLT Data**
7. **Provision of Engineering Manpower**
8. **ALMA & KMOS Deliverables**

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# Auxiliary Building Extension

**Objective: To increase the size of the building in order to relocate the plant and provide a cleaner more spacious environment for the handling and preparation of the mirrors during re-coating.**

- Civil Works
- New Crane 8t
- Clean Area
- Operator Control Station

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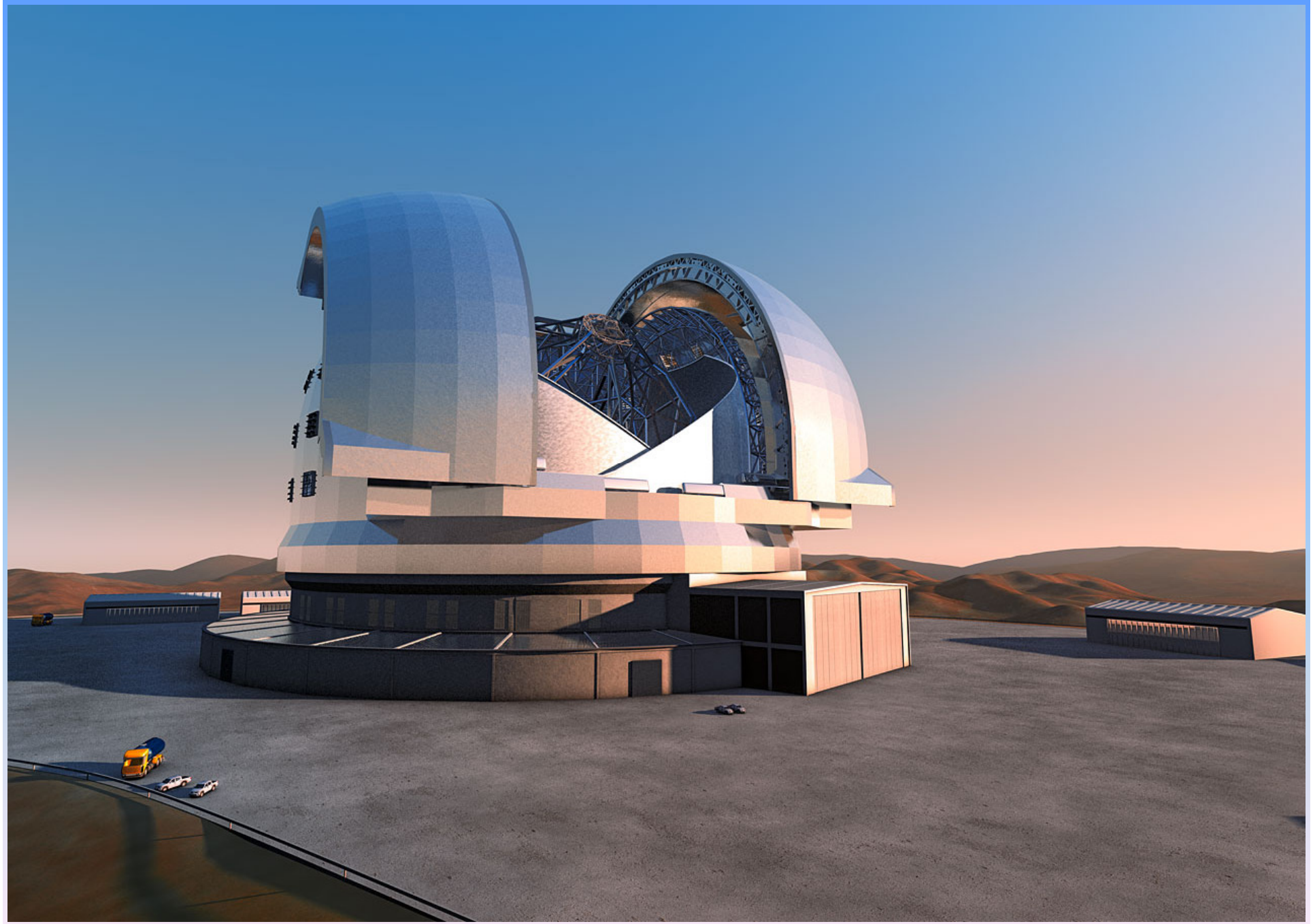
# Coating Plant Upgrade

Objective: To enable better IR-optimised coatings to be produced in terms of optical performance, durability & adhesion including reactive sputtering process.

- Replace Roughing Pumps (Fomblin oil and Dry screwline)
- New 4$^{th}$ Magnetron (Silicon Target)
- Incorporate a Substrate Pre-Cleaning device (Linear Ion Source)
- Process Monitoring (QCM film thickness & vacuum Gauges)
- Control System upgrade
- Additional Process Gas ($N_2$ & $O_2$)



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# Questions...