

Automated Mirror Cover Naval Precision Optical Interferometer

Team 8
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Aerial view of the NPOI facility

The NPOI

- The Navel Precision Optical Interferometer is a United States Navel Facility
- The facility uses several small telescopes to collect light from stars
- The light is then reflected down a vacuum tube where it is collected and translated into meaningful data
- This data is then used to recreate an image of a star

The Mirrors

- Each telescope has a mirror
- The mirror is made of glass coated with aluminum
- The aluminum is only a few molecules thick

Needs Identification

- Current system is awkward and hazardous
- Possibility for damage to sensitive equipment exists
- Physical labor is required to make current system work
- Time requirements are an issue as facility increases in size

Current System



Operational telescope and Siderstat



Telescope and Siderostat currently under construction

Needs Statement

Potential for injury to employees of the
Navel Prototype Optical Interferometer
is unacceptable

Objectives

- Operate remotely
- Nitrogen purge
 - Automatic shut off when cover is open
- Maintain balance of siderostat

Manual Covers



Siderostat with Current Cover Attached

Constraints

- Must not prevent star light from siderostat
- Full range of motion of siderostat must be maintained
 - Tilt: -10 to 60 degrees
 - Pan: -60 to 60 degrees
- The cover must be able to close in the event of a power outage

Test Environment

- **Location:**
 - Flagstaff, Arizona
- **Equipment:**
 - Scale model of the siderostat with identical functionality.
 - Tank of compressed Nitrogen

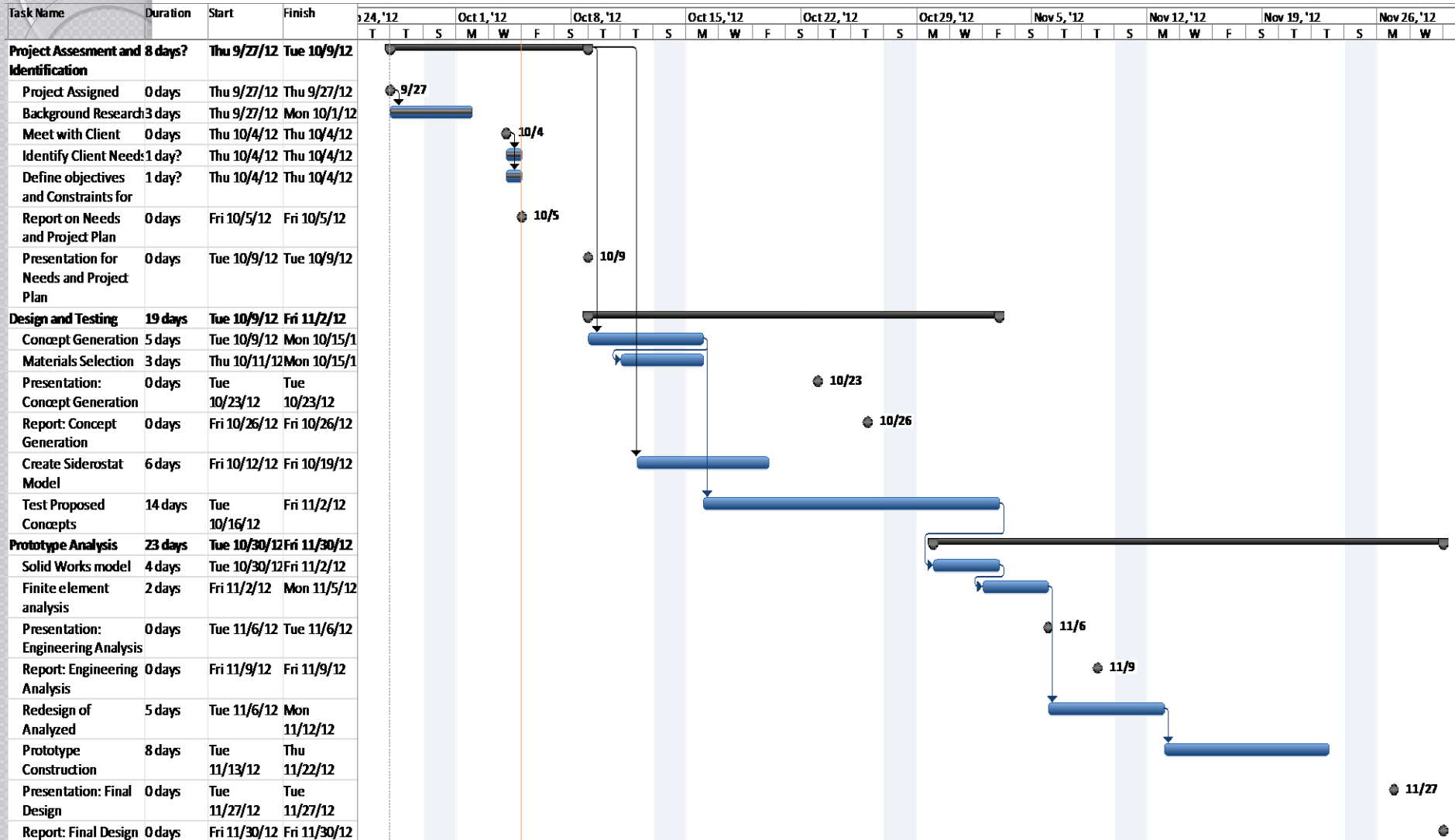
Test Environment

- Temperature range (-20F to 100F)
 - A foam cooler and dry ice
 - A foam cooler and heat source
- Interruptible power source
 - Power outlet

Quality Function Diagram

		Engineering Requirements							
		Yield Strength	Young's Modulus	Moment of Inertia	Weight	Cost	Thermal Expansion	Dimensions	Power
Client Requirements	Durability	x	x			x			
	Inexpensive	x	x		x	x			
	Protect mirror from the elements	x						x	
	Maintain nitrogen purge							x	x
	Mitigate need for human interaction								x
	Low weight	x	x	x	x	x			
	Does not interfere with star light							x	
	Maintain range of swivel of siderostat			x				x	
	Withstand Temperatures (-20F TO 100F)						x		
Units	psi	psi	in ⁴	lb	\$	in/in *F	in	Volt	

Team Schedule





Questions?