

State of Planetary Defense Foundation

Www.PlanetaryDefenseFoundation.Net

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Planetary Defense Foundation — Current State

Planetary Defense Foundation is now a working mission platform.

It has become an integrated public-facing planetary-defense command system with:

- a live mission homepage,
- public education and outreach tools,
- NEO / close-approach intelligence,
- a working TESS Observatory control page,
- ASI AIR / EQMod telescope integration,
- physical roof/mount safety sensors,
- email/account access,
- failover infrastructure,
- and automated watchdogs that keep critical observatory systems online.

The goal is clear:

Protect Earth by improving public awareness, observation capability, asteroid/comet tracking, and operational readiness for near-Earth object discovery and follow-up.

TESS — the mission AI assistant — is now supporting that goal across web operations, observatory control, infrastructure monitoring, and planetary-defense data briefings.

Mission introduction

The **Planetary Defense Foundation** exists to help protect our planet from asteroids and comets by combining public education, practical observatory operations, near-Earth object monitoring, and open mission tools.

Our work supports four major planetary-defense needs:

1. Awareness

Teach the public that asteroid and comet impacts are real natural hazards that can be detected, tracked, studied, and mitigated.

2. **Observation**

Build and operate TESS Observatory as a backyard/remote-capable observatory for asteroid, comet, and sky-monitoring work.

3. **Data and intelligence**

Use NASA/JPL close-approach data, public NEO feeds, and mission dashboards to identify relevant objects and plan observations.

4. **Operational readiness**

Maintain infrastructure, communications, failover systems, email, telescope controls, and safety gates so the platform can function during real observing sessions.

Current public-facing systems

System	State
Homepage	Operational on LAN origin
TESS Observatory page	Operational
Email / Exchange Server	Operational
Register button	Working
Forgot Password button	Working
ASIAIR Pro status	Online
Direct INDI / EQMod	Connected
Sky-Watcher GTi control path	Control via ASIAIR
ESP32 HOME sensor	HOME_CONFIRMED
Roof camera	Live
ASIAIR IP watchdog	Active every 2 minutes
Primary/failover sync	Operational
Mission-control MCP tools	Available

Public HTTPS site-health checks currently show Cloudflare/WAF-style 403 responses from some scripted probes, while local/origin checks show the web systems responding. Email public HTTPS is confirmed HTTP 200.

Tools and systems we created

1. **TESS Mission Homepage**

The homepage now acts as the public mission portal.

It includes:

- Planetary Defense Foundation branding.
- TESS identity and AI presence.
- Public infrastructure HUD.
- NEO watch ticker.
- Daily planetary-defense briefing.
- TeamSpeak / Discord communications widget.
- Links to major mission areas:

- Find Asteroids
- TESS Observatory
- Orbiter Console
- Forums
- Downloads
- Resources
- Email access

Purpose:

Give visitors a high-tech public gateway into asteroid/comet awareness, mission operations, and Planetary Defense Foundation tools.

2. Daily Planetary Defense Briefing

We created a daily briefing system using NASA/JPL CNEOS close-approach data.

Current briefing source:

NASA/JPL CNEOS CAD API

Recent public-safe close-approach objects returned:

Object	Close approach UTC	Distance
2026 LZ	2026-Jul-19 01:52	62.252 lunar distances
2025 MB90	2026-Jul-19 02:04	4.955 lunar distances
2026 NQ1	2026-Jul-19 15:44	15.286 lunar distances
2019 NG2	2026-Jul-20 04:01	23.071 lunar distances
2009 HC	2026-Jul-20 07:08	63.914 lunar distances
2021 NQ1	2026-Jul-20 10:00	68.513 lunar distances

Purpose:

Turn raw NASA/JPL close-approach data into mission-readable public awareness and observing context.

3. TESS Observatory Console

The Observatory page is now the operational control and status center for TESS Observatory.

Current verified systems:

```
ASIAIR Pro: [REDACTED IP]
Direct INDI: connected
EQMod Mount: connected
Tracking: OFF
Park: PARKED
Motion: IDLE
ESP32 HOME: HOME_CONFIRMED
Roof camera: LIVE
```

The Observatory page includes:

- Email/password gate.
- Register account button.
- Forgot Password button linked to Exchange Server recovery.
- Live roof camera.
- Telescope status panel.
- ASIAIR / EQMod state.
- GTi control-path display.
- Telescope keypad.
- Roof open/close command panel.
- INDI PARK/HOME and UNPARK controls.
- Safety-gated movement controls.

Purpose:

Provide a protected, visual mission-control interface for real observing and asteroid/comet follow-up.

4. ASIAIR / EQMod Direct INDI Integration

We restored and stabilized Direct INDI by discovering that ASIAIR moved IPs:

```
Old stale IP: [REDACTED IP]
Current verified IP: [REDACTED IP]
MAC: [REDACTED MAC]
INDI port: 7624
```

Direct INDI now reports:

```
EQMod Mount v0.7
Device: /dev/ttyUSB0
Tracking: OFF
Park: PARKED
Motion N/S: IDLE
Motion E/W: IDLE
```

Purpose:

Connect the website/backend directly to telescope mount telemetry and control status.

5. ASIAIR IP Watchdog

Because the router cannot reserve DHCP leases, we created a Proxmox-hosted virtual “reservation” watchdog.

Installed on PVE1:

```
/usr/local/sbin/tess-observatory-asiair-ip-watchdog
```

Timer:

```
tess-observatory-asiair-ip-watchdog.timer
Runs every 2 minutes
```

It:

1. scans the Observatory subnet,
2. finds ASIAIR by MAC,
3. checks port 7624,
4. updates CT127 and CT117 if ASIAIR IP changes,
5. restarts only the Observatory service,
6. logs state and verification.

Purpose:

Prevent ASIAIR DHCP changes from breaking telescope/INDI status again.

6. ESP32 HOME Sensor

We integrated the ESP32 MPU6050 HOME sensor:

```
Device: TESS-MOUNT-HOME-01
IP: [REDACTED IP]
State: HOME_CONFIRMED
```

It provides live physical mount attitude confirmation:

```
motion: stable
home_verified: true
```

tolerance: 5°

Purpose:

Add a real physical safety layer before roof movement or telescope operations.

This is critical because software state alone is not enough. The mount can say one thing in software, but the ESP32 gives a physical confirmation.

7. Roof Camera

The Observatory page has a live roof camera feed.

Current state:

Roof camera: LIVE
Resolution: 1280x720

Purpose:

Let the operator visually confirm observatory/roof state before and during operations.

8. Conservative Roof / Telescope Safety Gates

We built conservative roof safety logic.

Before OPEN/CLOSE, the system checks:

- ESP32 HOME confirmed.
- Motion stable.
- ASIAIR / EQMod tracking off when available.
- Mount motion idle.
- Operator confirmation when needed.
- Relays return OFF/idle after motion.

Purpose:

Prevent unsafe roof/telescope motion and keep hardware protection conservative.

9. Exchange Server Email System

Planetary Defense Foundation email is operational.

Verified:

```
https://mail.planetarydefensefoundation.net/  
HTTP 200  
TLS valid  
IMAPS 993 valid  
SMTP submission 587 STARTTLS valid  
SMTP 25 open
```

Exchange Server containers are running:

- nginx-Exchange Server
- postfix
- dovecot
- SOGo
- rspamd
- redis
- mysql
- acme
- watchdog

Purpose:

Provide real mission email, account access, registration workflows, password recovery, and official communications.

10. Observatory Registration / Password Recovery

We fixed the Observatory login gate buttons.

Current state:

Button	Status
Register	Opens registration request flow
Forgot Password	Links to Exchange Server reset page

Forgot Password now goes to:

```
https://mail.planetarydefensefoundation.net/reset-password
```

Purpose:

Make Observatory access manageable without requiring manual intervention for every password issue.

11. Primary + Failover Website Origins

We maintain both:

Primary CT127
Failover CT117

Important Observatory/homepage patches are deployed to both.

Purpose:

Keep Planetary Defense Foundation online and recoverable if the primary web origin fails.

12. TESS Mission-Control MCP Layer

The mission-control tool layer is active.

Available public-safe tools include:

planetary_defense_briefing
site_health
observatory_status
infrastructure_status
mission_status
sync_primary_failover_plan

Safety boundaries:

- no secrets exposed,
- no destructive controls by default,
- no telescope movement exposed without gates,
- public-safe mission data only.

Purpose:

Give TESS a controlled, safe operational API for mission status, site health, observatory state, and close-approach briefings.

What we can now do for asteroid/comet defense

With the current platform, we can start operating in a real mission workflow:

1. Identify targets

Use:

- NASA/JPL CNEOS close-approach data,
- NEO Watch ticker,
- Find Asteroids tools,
- nightly visibility planning,
- future MPC/ephemeris integrations.

2. Check observing conditions

Use:

- Weather page,
- Tonight page,
- roof camera,
- ESP32 sensor,
- Observatory status.

3. Prepare the Observatory

Verify:

```
Roof safe
Mount HOME/PARK verified
Tracking OFF
Motion IDLE
ASIAIR online
EQMod connected
Camera live
```

4. Observe

Use:

- ASIAIR / EQMod,
- Sky-Watcher GTi,
- ASI183MC Pro main camera,
- ASI120MM guide camera,
- TESS Observatory Console.

5. Document and communicate

Use:

- Planetary Defense Foundation website,
- mission homepage,
- forums,

- email,
- TeamSpeak,
- Discord,
- TESS briefings.

6. Expand toward reporting

Next future step:

- add target selection,
- add plate-solving workflow,
- add astrometry export,
- connect to MPC reporting guidance,
- automate nightly candidate lists.

Current mission posture

Planetary Defense Foundation: operational
TESS Observatory: operational
Email: operational
ASIAIR/INDI: operational
Safety sensors: operational
Public mission tools: operational
Failover posture: active

The one current caution:

Some scripted public HTTPS site-health probes receive HTTP 403 from the Cloudflare/public edge.

That appears to be edge/WAF behavior, because origin/LAN checks show the homepage and Observatory responding. Email public HTTPS is clean.

Bottom line

Planetary Defense Foundation is now positioned as a working planetary-defense mission platform: part public education network, part observatory operations center, part asteroid/comet intelligence dashboard, and part resilient infrastructure stack.

We have built the foundation needed to begin serious asteroid and comet monitoring work.

Next mission phase: start planning nightly observing sessions and build the asteroid/comet target acquisition pipeline.