

# Earth–Aegis Long-Hauler Dossier

## *A Spacefaring Railroad for Cargo and Crew Transfer*

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### 1. Overview

The Earth–Aegis Long-Hauler is a heavy-duty, zero-g-native transport vehicle designed to move both cargo and passengers between Earth orbit and Aegis Station. Built from current and near-term technology, the Long-Hauler functions as a modular, reusable space train — capable of ferrying large crew rotations and freight shipments with high reliability and low operating cost.

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### 2. Mission Profile

- Transfer up to 48 passengers or crew members between LEO and Aegis Station
  - Deliver bulk freight, water tanks, habitat shells, RONS, and mission equipment
  - Serve as a lifeline for station resupply, construction support, and evacuation
  - Operate autonomously or under remote supervision
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### 3. Specifications (Current-Tech Compatible)

Attribute	Value / Estimate
Total Length	50–70 meters
Passenger Capacity	24–48 (short-duration config)
Cargo Capacity	20–30 metric tons
Pressurized Volume	~100–120 m <sup>3</sup> (crew module)
Transfer Duration	5–7 days (chemical)
Power Supply	Solar array (250–400 m <sup>2</sup> ) + battery
Propulsion (Main)	Ion or Hall-effect electric drive
Propulsion (Boost)	Methalox or hypergolic kick stage
Docking Ports	Fore and aft
Reusability	5–10 round trips minimum

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### 4. Modular Architecture

The Long-Hauler is structured like a zero-g orbital train. Each section is modular and designed for rapid reconfiguration based on mission type. The standard operational layout (from front to rear) includes:

1. **Crew Command Module (Foremost)**
    - Piloting, nav systems, and docking collar for Aegis Station
    - Life support and comms integration
  2. **Passenger Modules (Stackable)**
    - 8–16 bunks per car
    - Shared hygiene unit, galley, and emergency systems
    - Expandable up to 48-person total capacity
  3. **Cargo Modules**
    - Modular pallets, tanks, or pressurized bays
    - ISO lock rails with robotic access points
    - Configurable per flight for mass or volume priority
  4. **Power & Radiator Section**
    - Midship or rear-mounted solar arrays or Kilopower reactor
    - Thermal loops and radiator fins for heat management
  5. **Propulsion Stack (Aftmost)**
    - Ion or Hall-effect thruster array for long-haul burns
    - Chemical kicker stage for transfer and rendezvous
    - RCS system for attitude and docking control
- The Long-Hauler is built around a central spine and modular dock system:
- **Crew Module:** Pressurized, habitable transport for crew
  - **Freight Pods:** Palletized cargo, water tanks, or research payloads
  - **Power Block:** Solar panels or small reactor + battery racks
  - **Propulsion Stack:** Electric thruster frame + maneuvering system
  - **Chemical Kick Stage:** Detachable booster for orbit changes
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## 5. Crew Module Features

- Up to 48 passengers in stacked sleeping bays
  - Communal galley and hygiene pod (toilet + water reclamation)
  - Emergency supplies, medkit, O<sub>2</sub>/N<sub>2</sub> tanks
  - Central corridor with group lighting and comms
  - Minimal radiation shielding via water walls or mass buffers
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## 6. Freight Integration

- Standard cargo racks and ISO-compatible pallet mounts
- External access via robotic arm or EVA
- Internal cargo bay configurable for:
  - RON units
  - Regolith processor skids
  - Sample returns or water tanks

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## 7. Systems & Operations

- **Propulsion:** Ion/Hall thrusters for long-term efficiency
- **Boost Stage:** Methalox for quick departure or capture
- **Power:** Solar arrays or Kilopower-class reactor
- **Life Support:** ECLSS (CO<sub>2</sub> scrubbers, O<sub>2</sub>/N<sub>2</sub> tanks)
- **Docking:** NASA/ESA standard ports, front and rear
- **Automation:** Autonomous nav, with ground override

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## 8. Role in Aegis Infrastructure

- Enables full crew rotations without capsule reliance
- Hauls critical cargo that won't fit inside conventional capsules
- May support emergency evacuation or mobile depot roles
- Scales with station growth and lunar operations

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