

Commercialization of Lunar Rover Prototypes



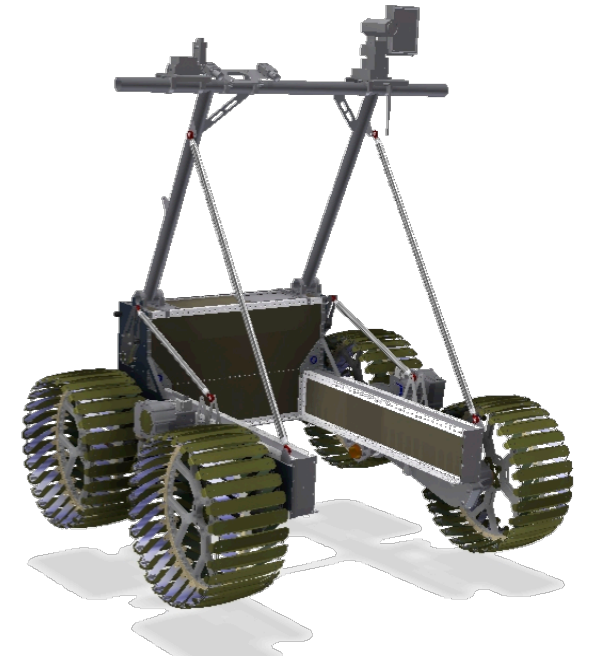
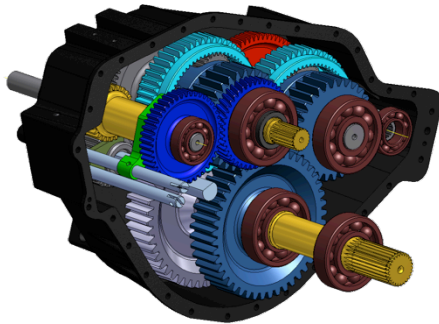
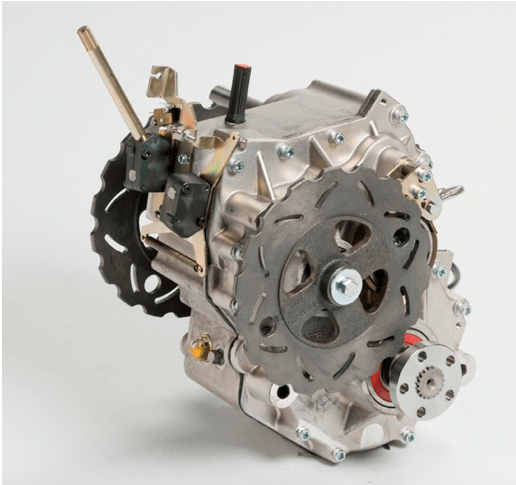
Ontario Drive & Gear
Lunar and Commercial
Rover Program

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Ontario Drive & Gear
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Ontario Drive & Gear

- **Gear Division** (Transmissions, gears)
- **Vehicle Division** (“ARGO” extreme terrain amphibious vehicles)
- **Space/Robotics Division (SRD)**

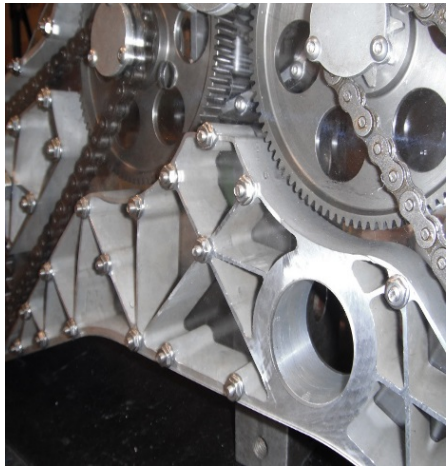
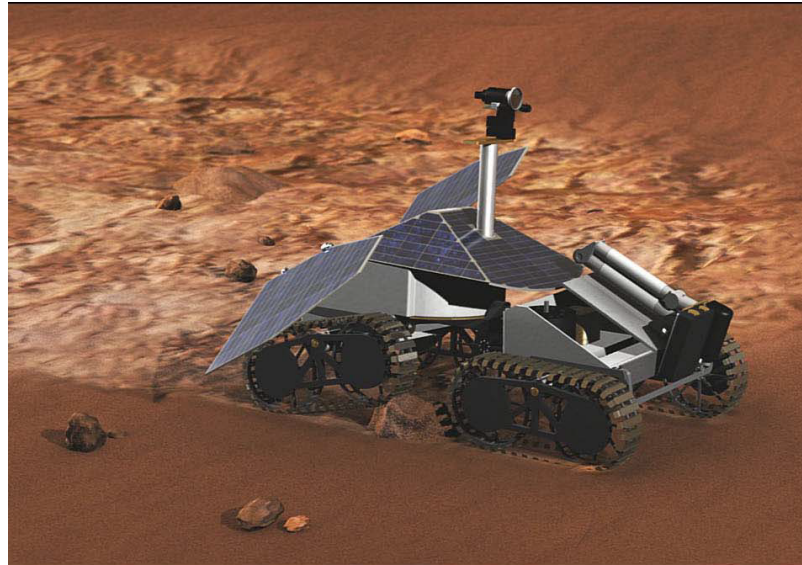


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Space/Robotics Division

1. Concept Generation
2. Design & Analysis
3. Manufacturing & Assembly
4. Deployment
5. Support





Juno Rover (2008 – 2009)

- Hawaii ISRU
demonstration

Artemis Sr.
Rover (2011)

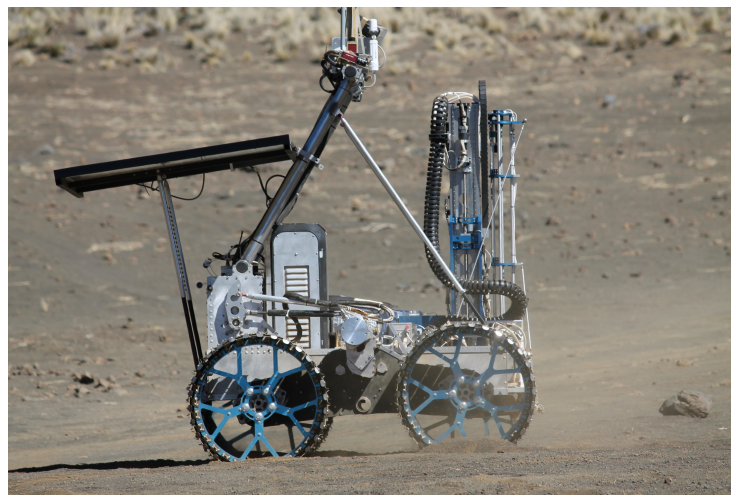


Juno 2 Rover (2011)

-Hawaii MMAMA
field test

Artemis Jr. Rover (2012)

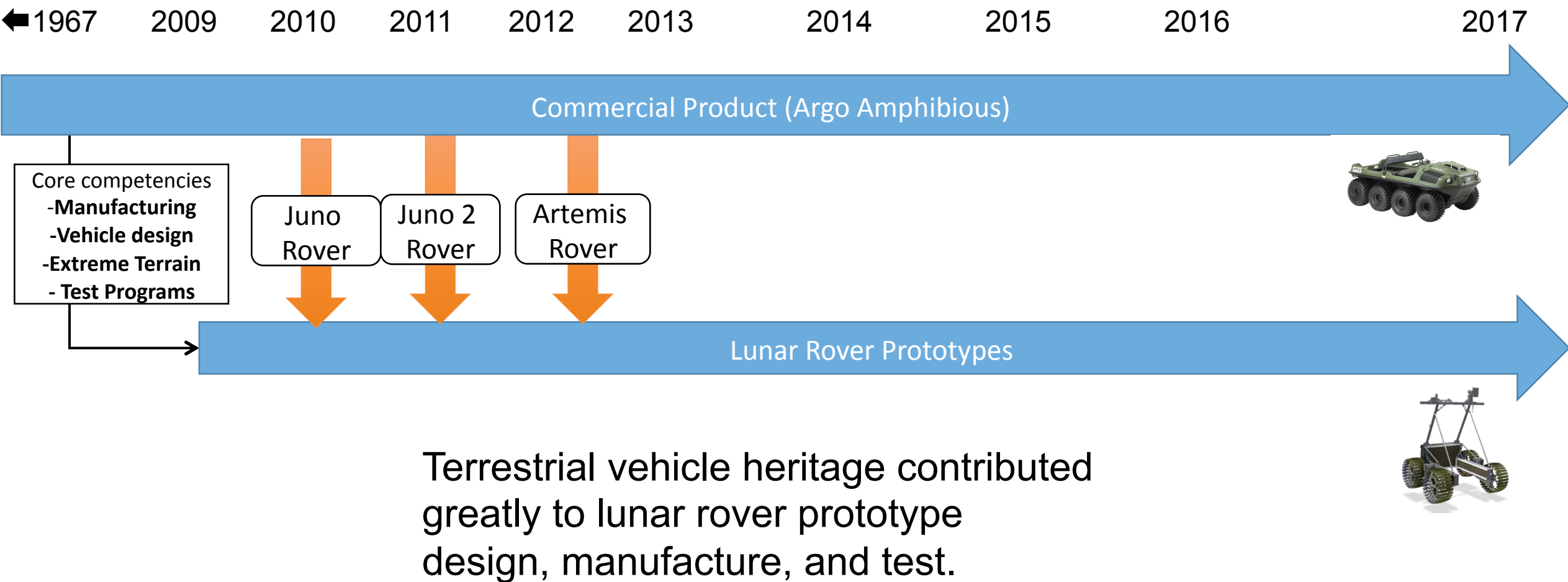
-Hawaii RESOLVE field
test



CSA Rover Prototypes



Technology Transfer Between ODG Vehicle Programs



Mauna Kea Hawai`i, 2008



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Mauna Kea (Hawai'i) January 2010 – RESOLVE



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Extreme Terrain Testing



Wheel testing at the
Canadian Space Agency in
preparation for field test
in Hawaii.

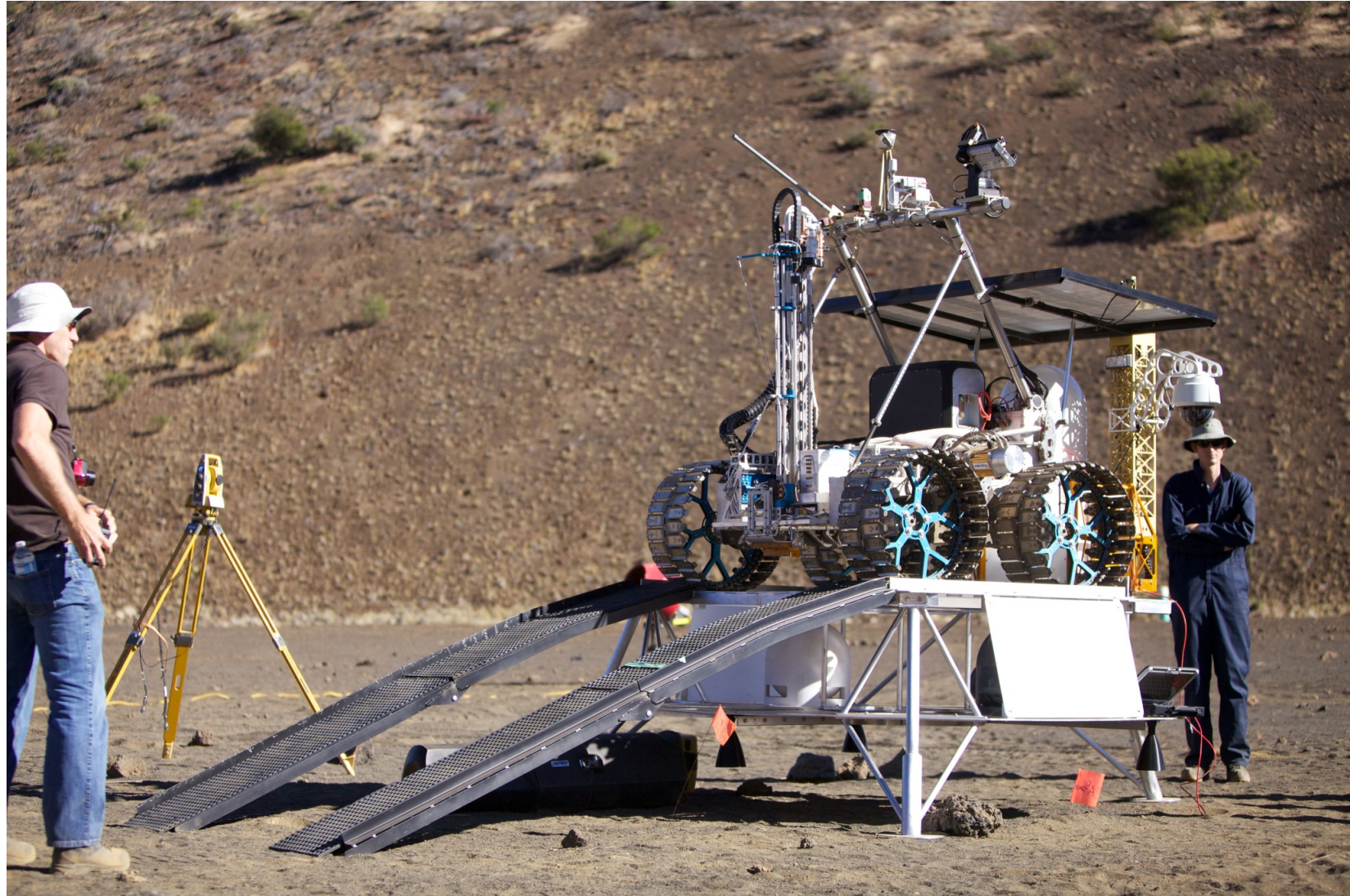


2012 MMAMA Field Test

- Apollo Valley, Mauna Kea
- 25 km extreme terrain



RESOLVE, July 2012, Mauna Kea Hawai`i



Technology Transfer: Traction Elements

Rubber tracks, single joint



Jointless Track Systems (T.W.A.C.S.)



Low pressure, compliant rubber tires



Compliant Wheels (T.I.R.E.L.E.S.S.)



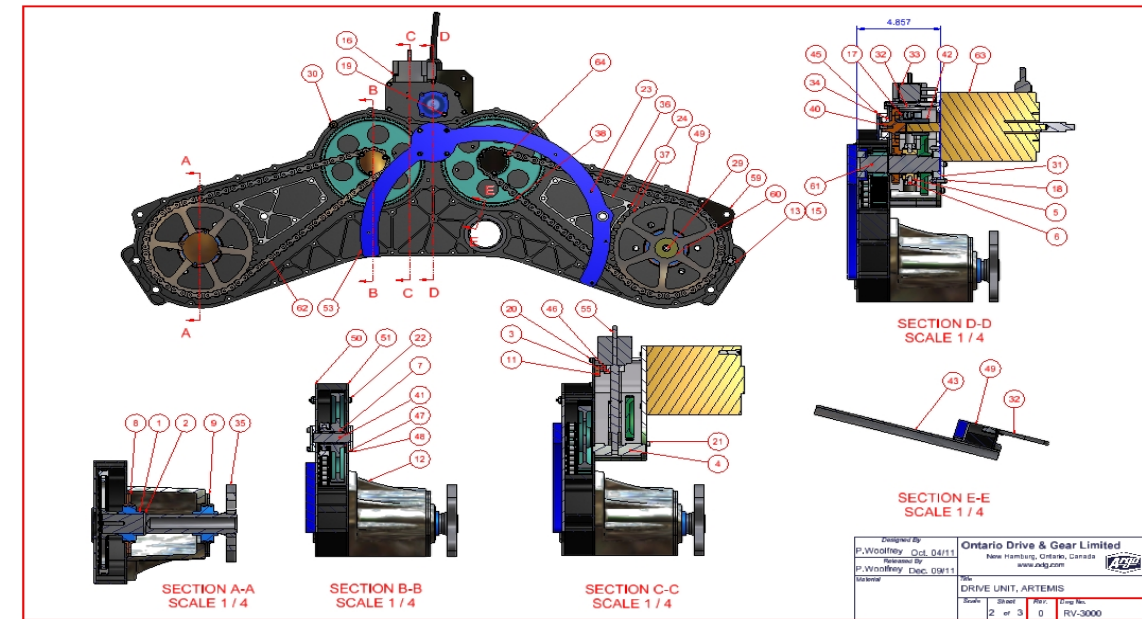
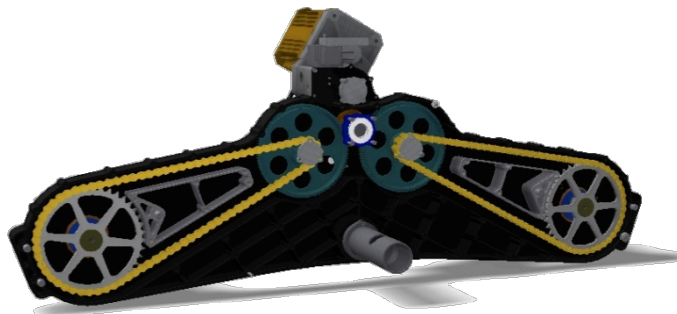
Technology Transfer: Dust/ contaminant protection

Terrestrial

- Minimal points of entry (single point per wheel)
- Triple-lip rubber seals

Space

- Minimal points of entry
- Three-stage non-contact metallic seal



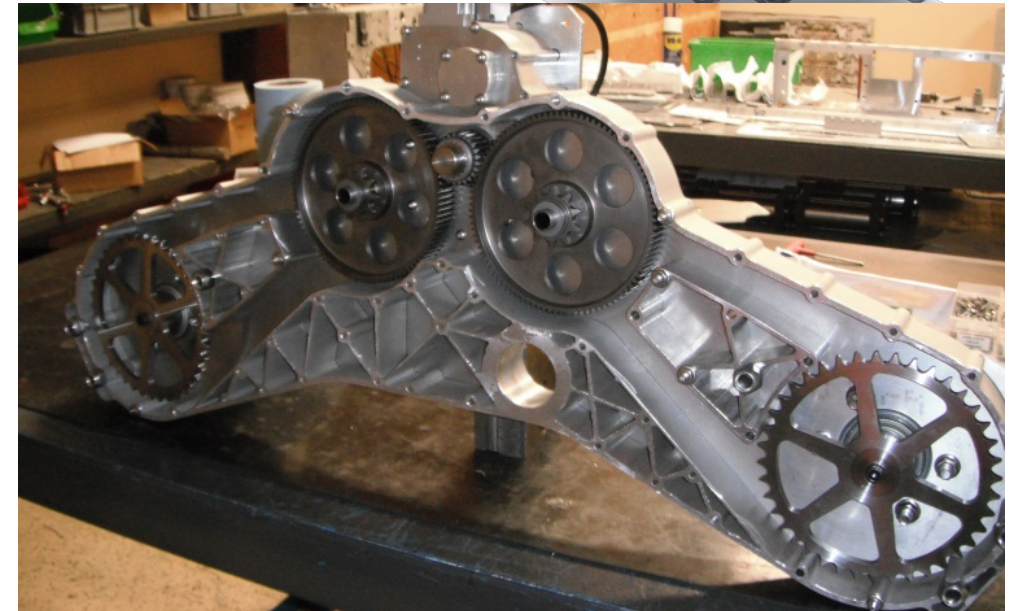
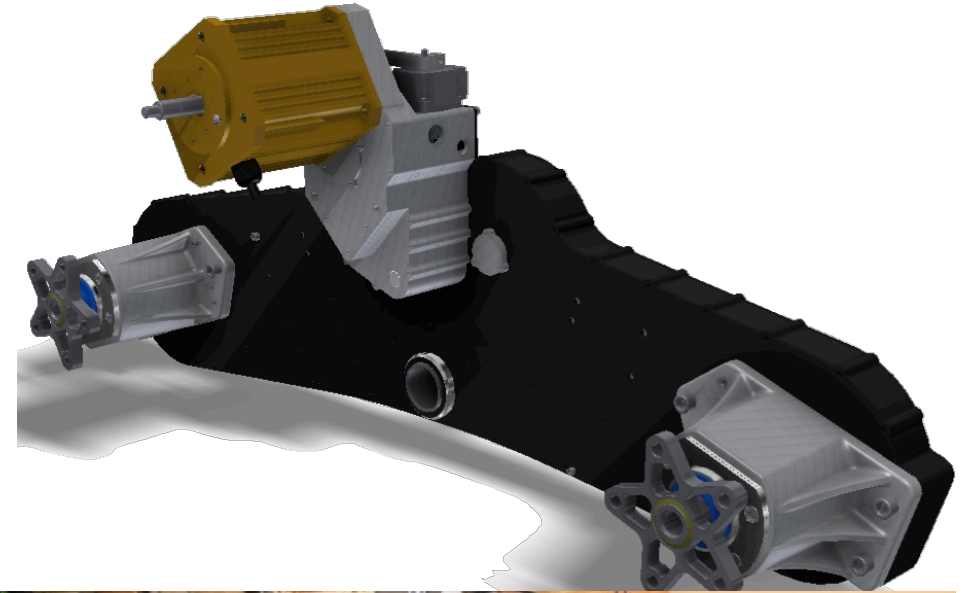
Technology Transfer: Drive System

Terrestrial

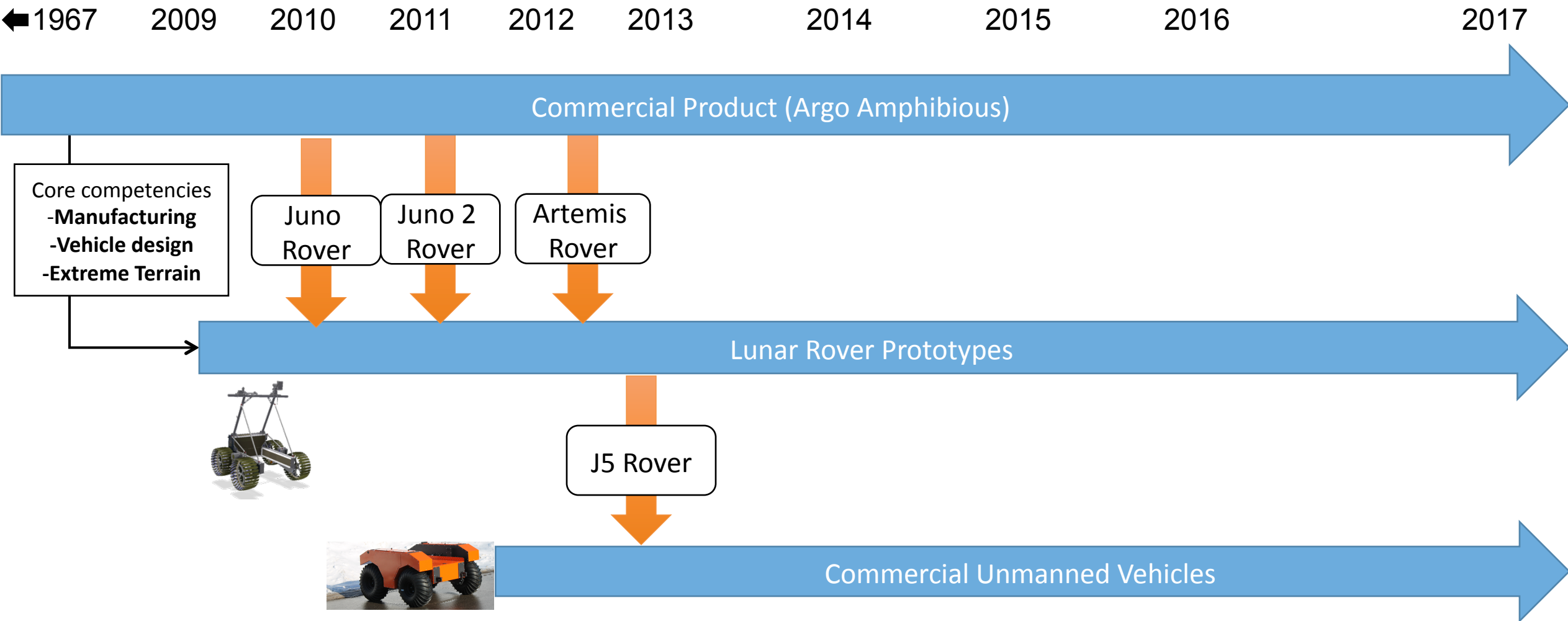
- Chain drive (carbon steel chain, 1140 steel sprockets)

Space

- Chain drive (316 stainless steel chain, titanium sprockets)
- Lightweight
- Efficient
- Tolerant of contamination, misalignment, variations in center-to-center values
- Minimal lubrication requirements



Technology Transfer Between ODG Vehicle Programs



Rover Commercialization

2013 – Began development of next gen rover – **ARGO J5 Rover**

- Improved dust/thermal protection
- Multiple battery options
- Multiple traction options
- Commercial platforms
- Research platforms
- Military version





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Key Features

- 250 kg mass
- 350 kg payload
- 0-20 km/h
- Up to 12 hour runtime
- 50 cm wheel travel
- 35-40 degree slopes
- 24 cm ground clearance
- Low ground pressure (2-6 PSI)



Key Features

- Rugged
- Weatherproof
- Amphibious
- Fearless



Technology Transfer: Suspension

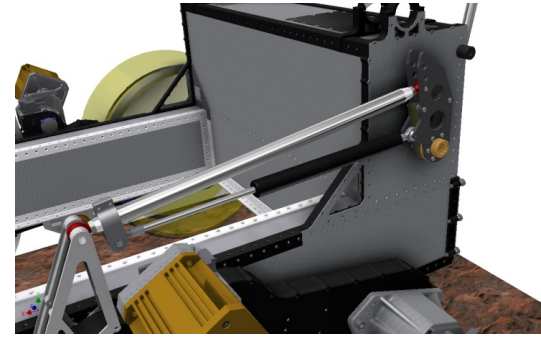
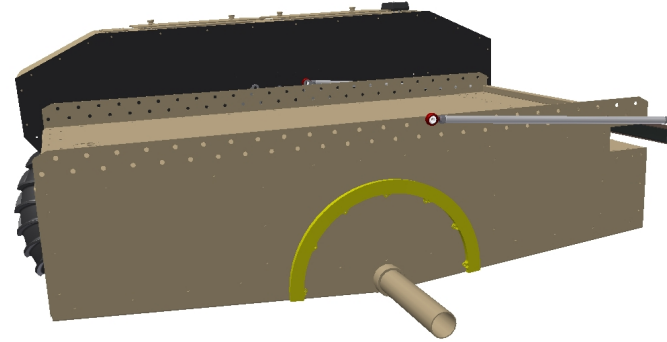
Terrestrial

- Differentially-linked rocker bogie

Space

- Differentially-linked rocker bogie

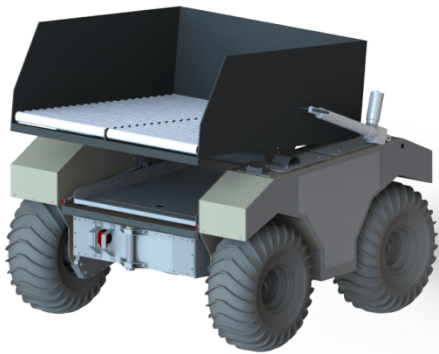
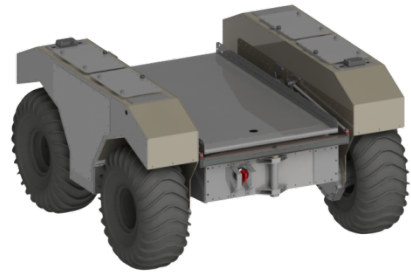
High payload capability, no springs, no dampers



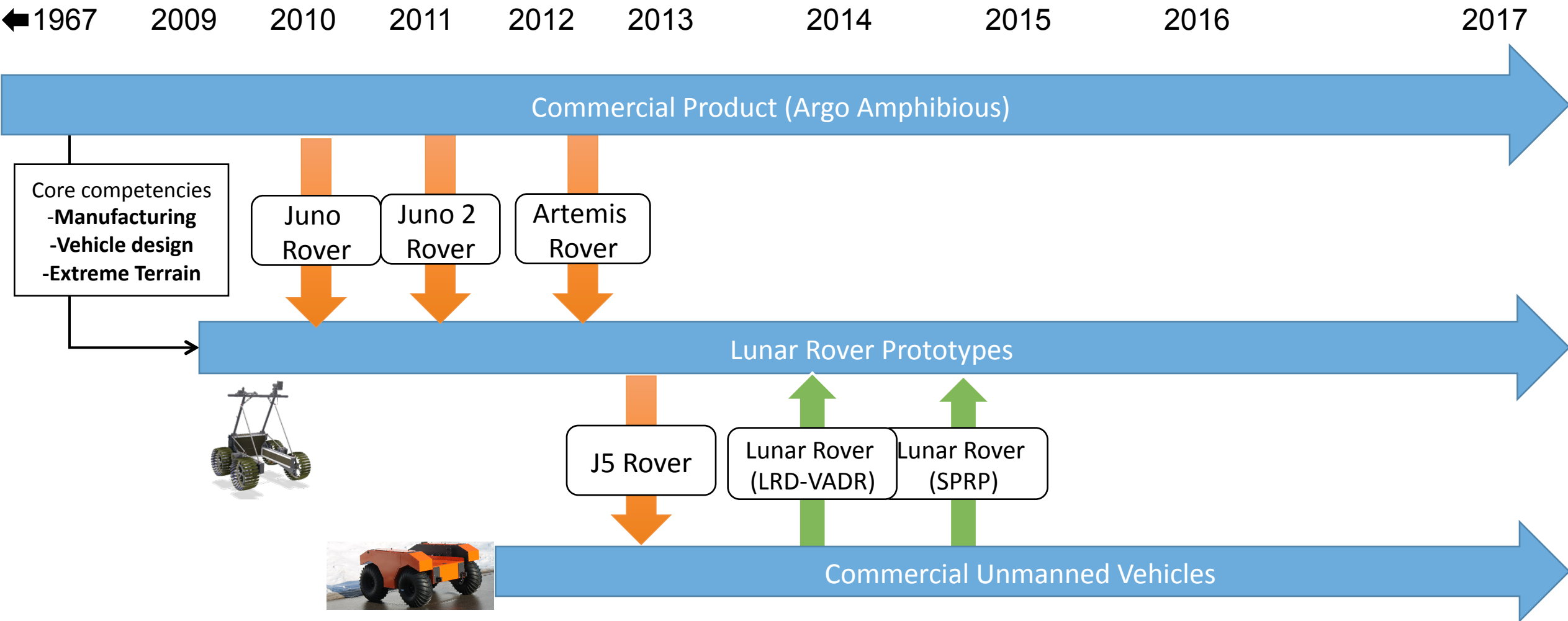
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Applications

- Agricultural
- Security
- Military
- Industrial

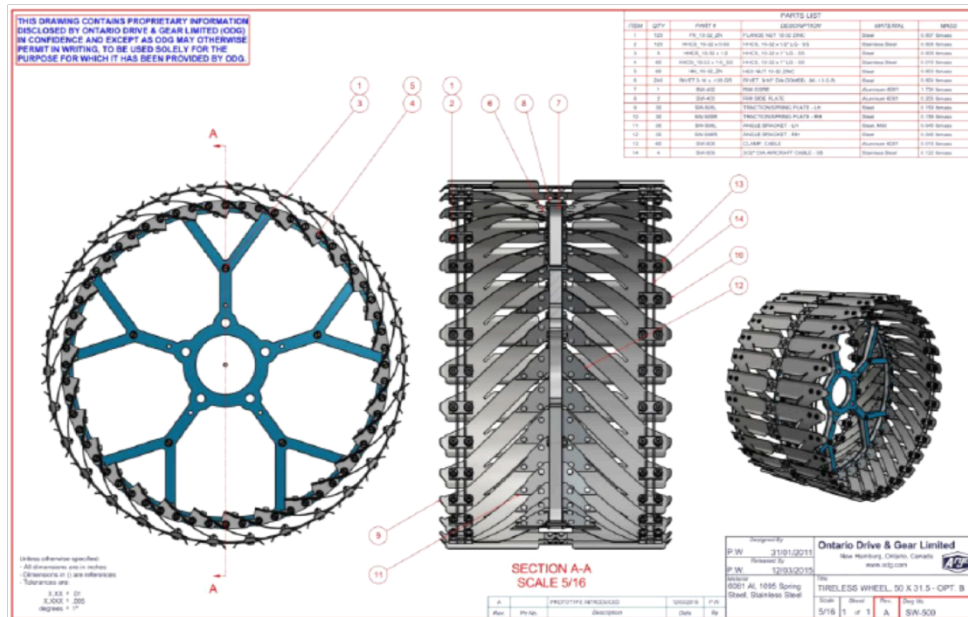


Technology Transfer Between ODG Vehicle Programs

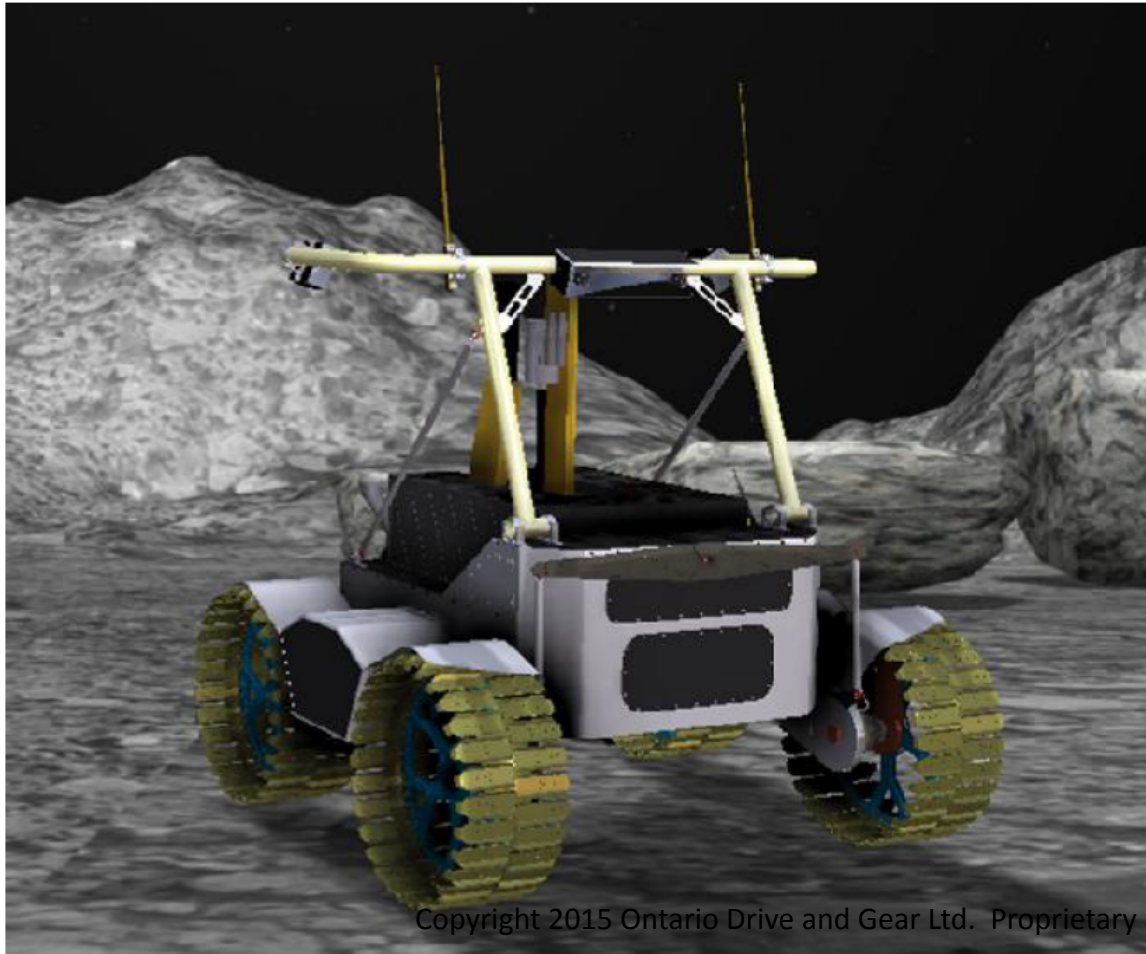


Lunar Rover Development

- ODG is currently participating in a several contracts to develop lunar mobility technology
 - Lunar Wheel Development
 - LRPDP (mid-size rover, TRL-6 drivetrain)
 - SPRP (small rover)

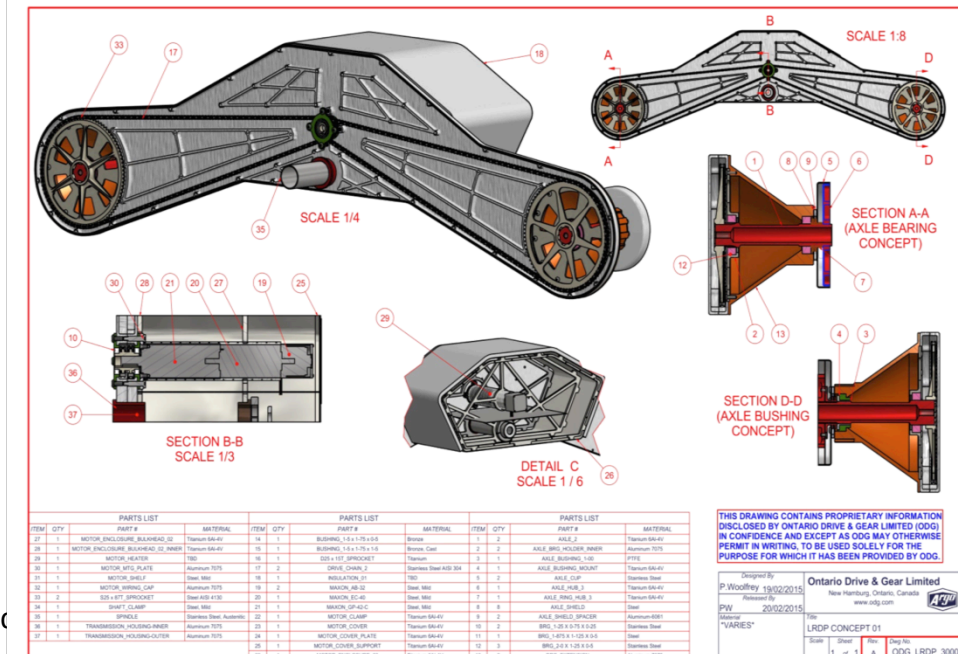


Midsize Lunar Rover Drivetrain Development



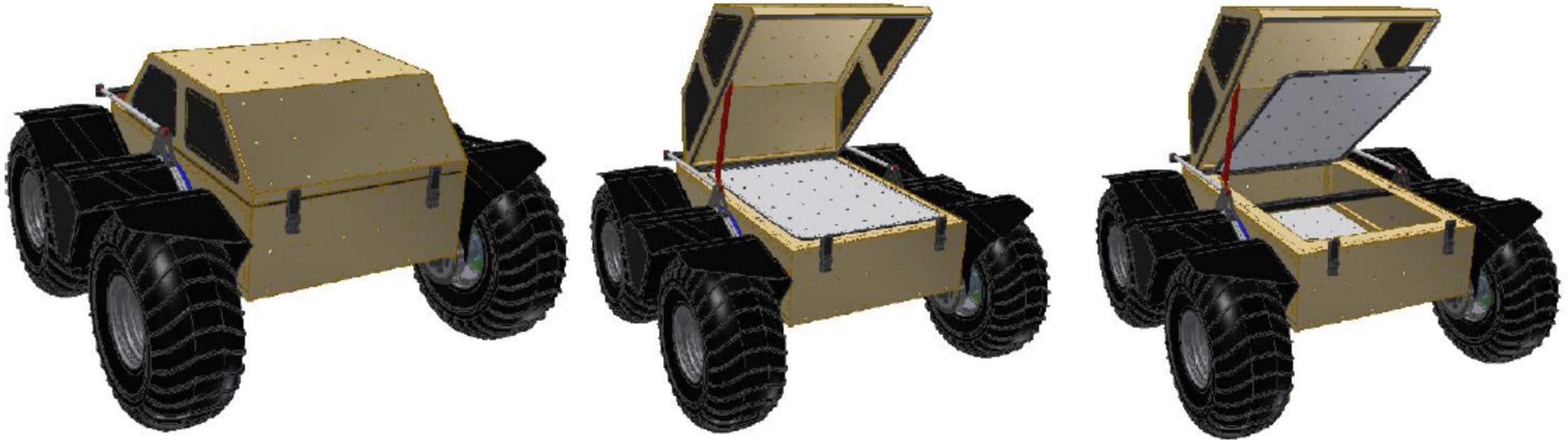
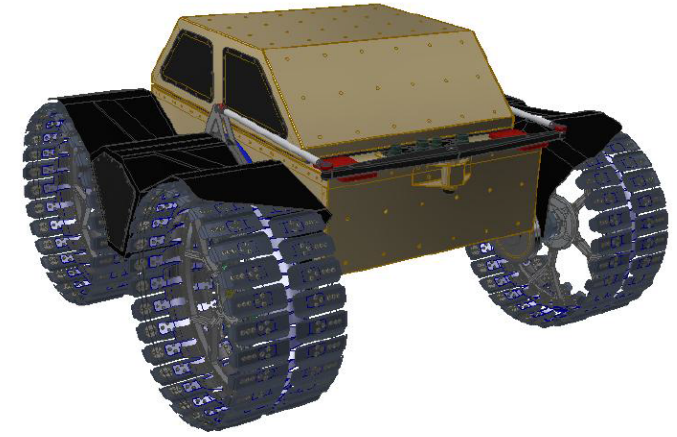
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- TRL-6 drivetrain
 - T-Vac testing
 - Dust testing
- Reduced mass (50%)
- Lunar Rover Drivetrain – Vacuum And Dust Rated (LRD-VADR)

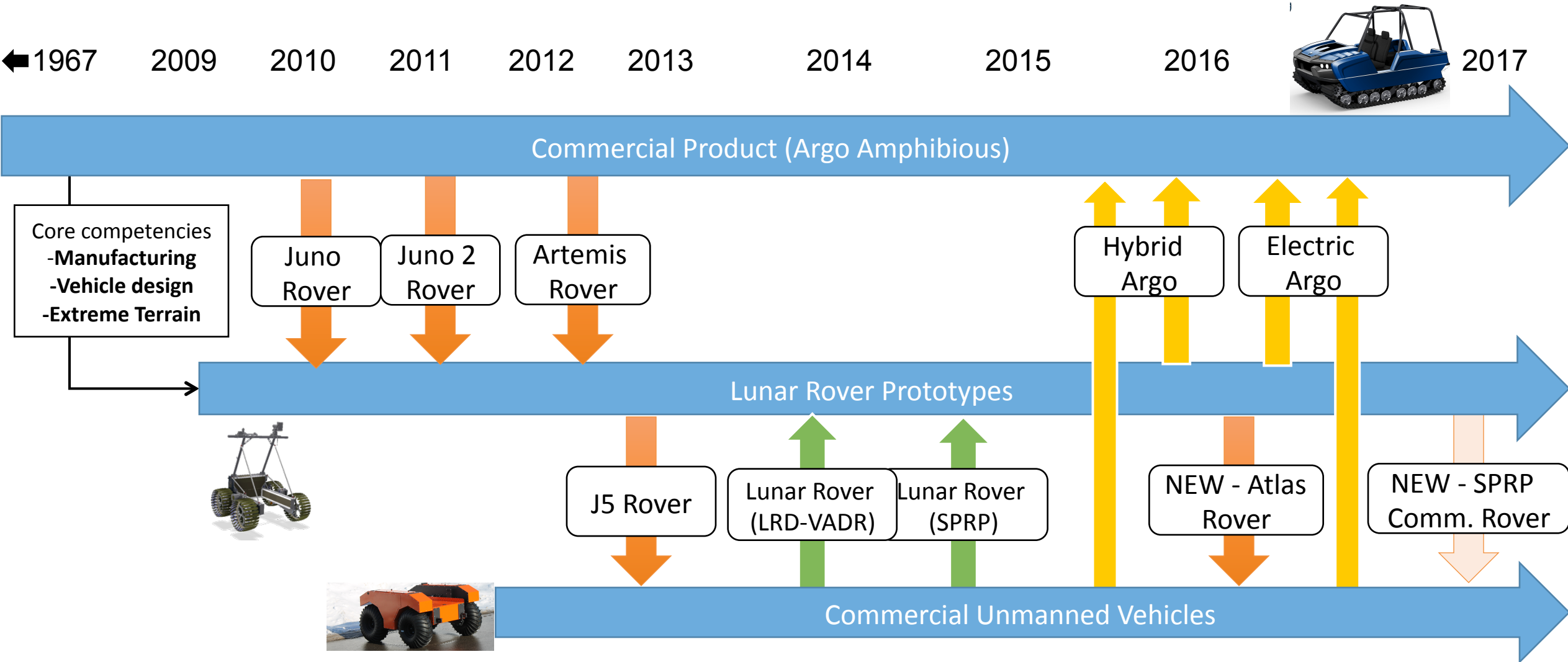


Small Lunar Rover Development

- Reduced mass (90kg)
- Intended for wheel testing and analog testing



Technology Transfer Between ODG Vehicle Programs



Commercial Vehicle Development

Atlas UGV



Unmanned Ground Vehicle

- 6-wheel
- 8-wheel
- Argo mechanicals
- J5 componentry
 - Batteries
 - Motors
 - Controllers
 - Electronics



Commercial Vehicle Development

Electric Argo

- Proprietary steering transmission
- J5 motors, batteries, etc.
- Argo mechanicals



Next Gen. Argo Vehicle

- Gas/Electric Hybrid
- Increased Amphibiosity
- Extreme terrain
- High speed



Questions?

(or just watch
this promo video
in silent awe.)

