

## Kistler K-1 Reusable Aerospace Vehicle



*Presented To The 41<sup>st</sup> Space  
Congress, Panel Session V -  
Commercial Use of Spaceports*

**April 28<sup>th</sup>, 2004**



# K-1 Program Overview

*The Future Is Reusable Aerospace Vehicles*

Kistler's Objective is to Develop Fully Reusable Two Stage Aerospace Vehicles For Low-Priced Commercial Space Delivery and ISS Resupply



- Vehicle Stages Designed for 100 Flights
- Designed for 9-Day Turnaround, with 3-Day Response Time Possible
- Both Stages Return to Launch Site for Refurbishment and Reuse
- Horizontal Vehicle Processing and Checkout
- Integrated Vehicle Health Management System
- Fleet of Vehicles

Streamlined  
Operations



Low Cost and  
Fast Turnaround



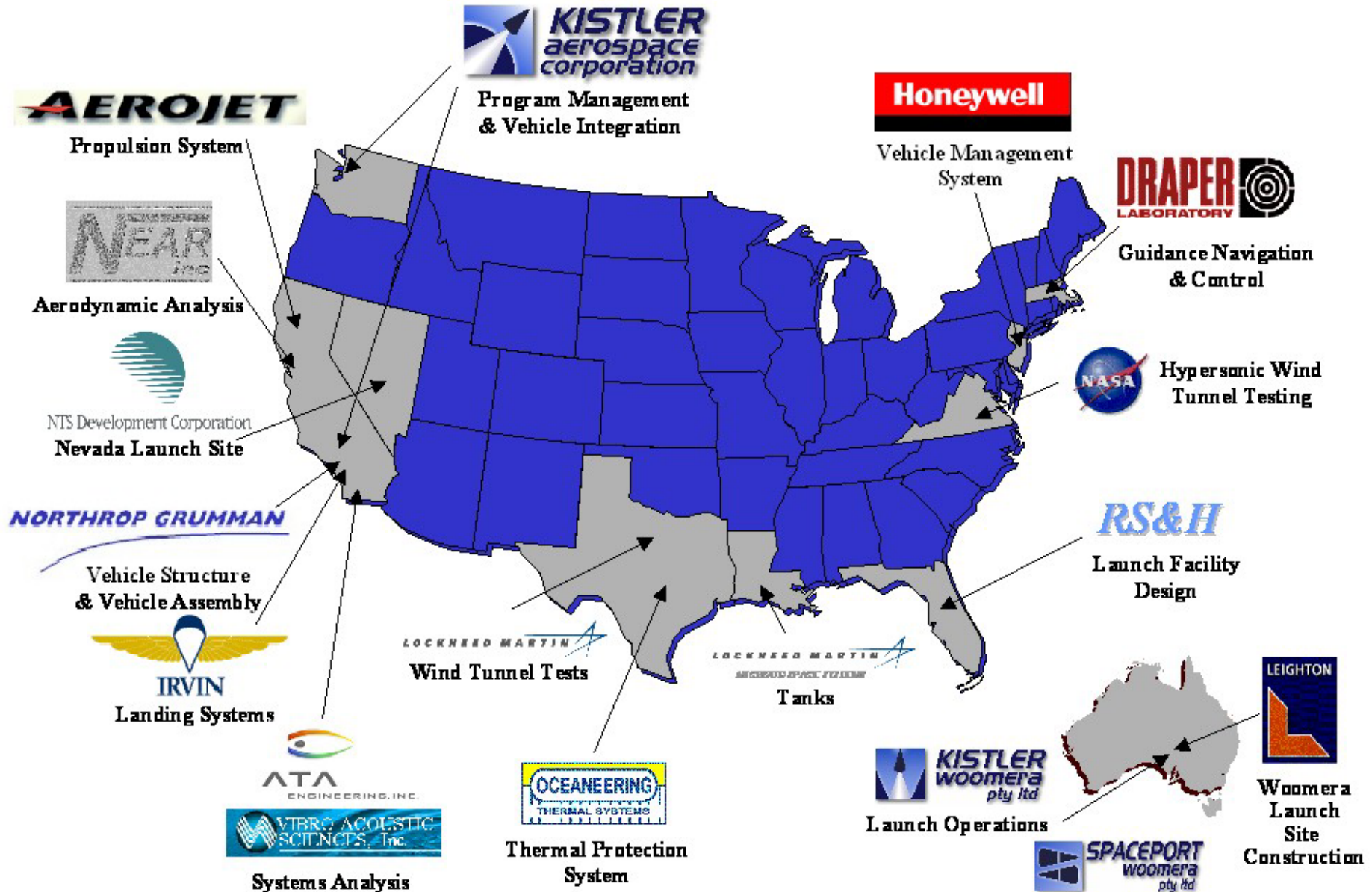
Schedule Flexibility  
and Responsiveness

- K-1 vehicle 1 is ready for integration and launch
  - 75% hardware, 85% design, 100% Guidance Navigation & Control (GN&C) software complete
  - Over \$500 million in private capital invested
- Hardware on hand and testing status supports confidence that the K-1 vehicle will be delivered on time and on budget
- K-1 addresses multiple market applications, e.g.,
  - 12,500 lbm to LEO due east
  - 7,000 lbm upmass to ISS and 2,000 lbm downmass from ISS
- Existing technologies and the experienced K-1 team assures the accomplishment of the K-1 mission



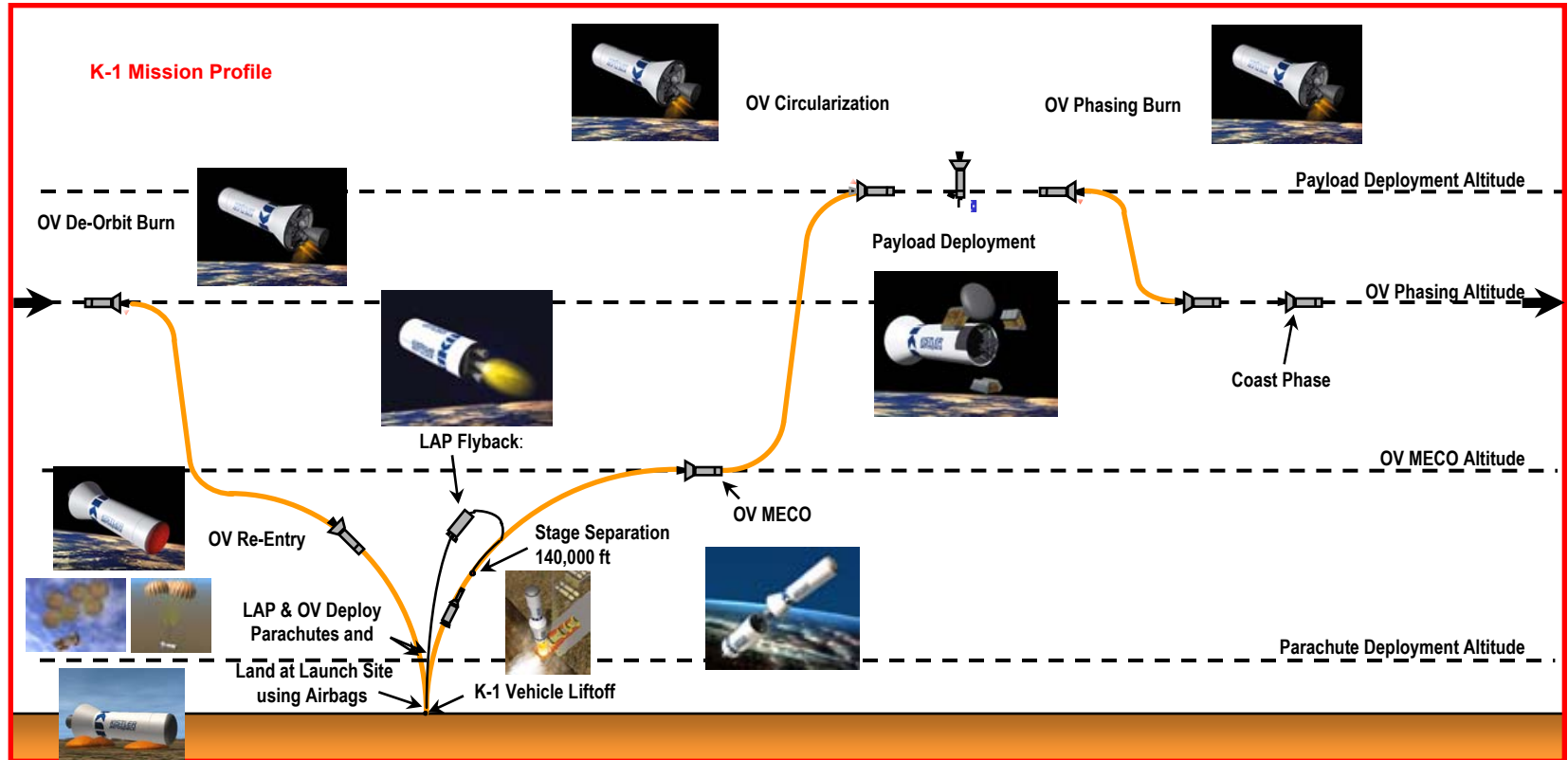
# K-1 Contractor Team Represents Best of Industry

*The Future Is Reusable Aerospace Vehicles*



# K-1 Mission Profile Overview

*The Future Is Reusable Aerospace Vehicles*



## Typical Event Sequence

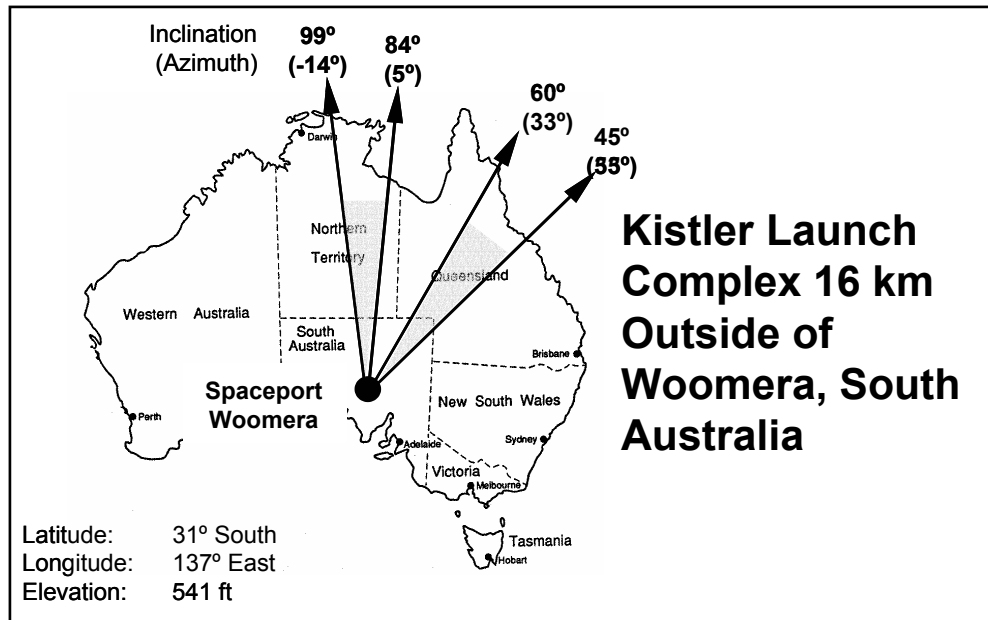
Event	Time
LAP Ignition	0:00:00
LAP Boost C.O.	0:02:20
Separation	0:02:20
LAP Restart	0:02:24
LAP Flyback C.O.	0:02:54
LAP Landing	0:10:47

Event	Time
OV Ignition	0:02:27
OV C.O.	0:06:19
OMS Insertion Burn	0:50:22
Payload Deployment	1:05:00

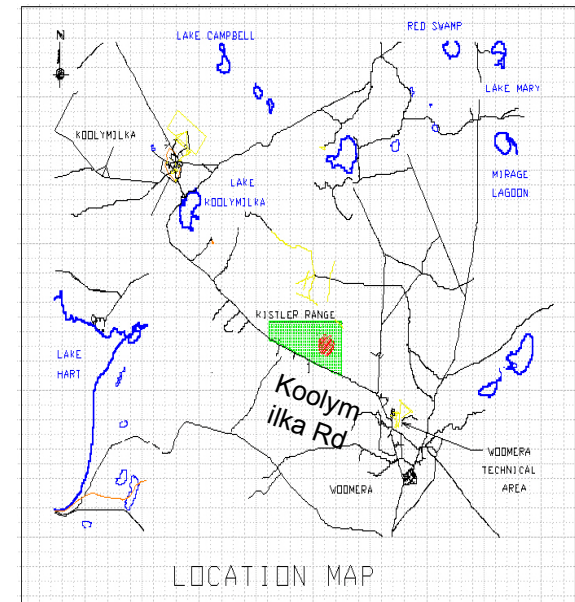
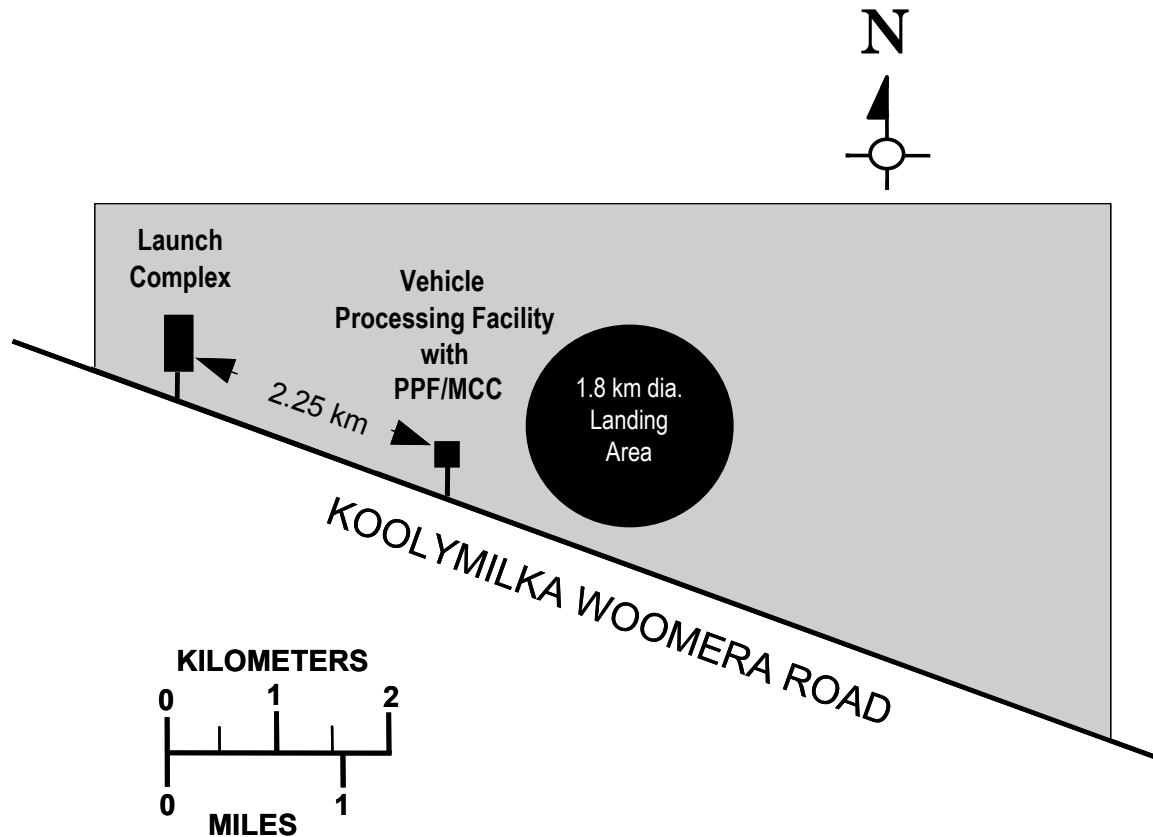
Event	Time
OMS Phasing Burn #1	1:30:31
OMS Phasing Burn #2	13:39:06
OMS Re-entry Burn	22:50:22
Re-entry Interface	23:34:22
OV Landing	23:50:04

Time in Hrs:Min:Sec

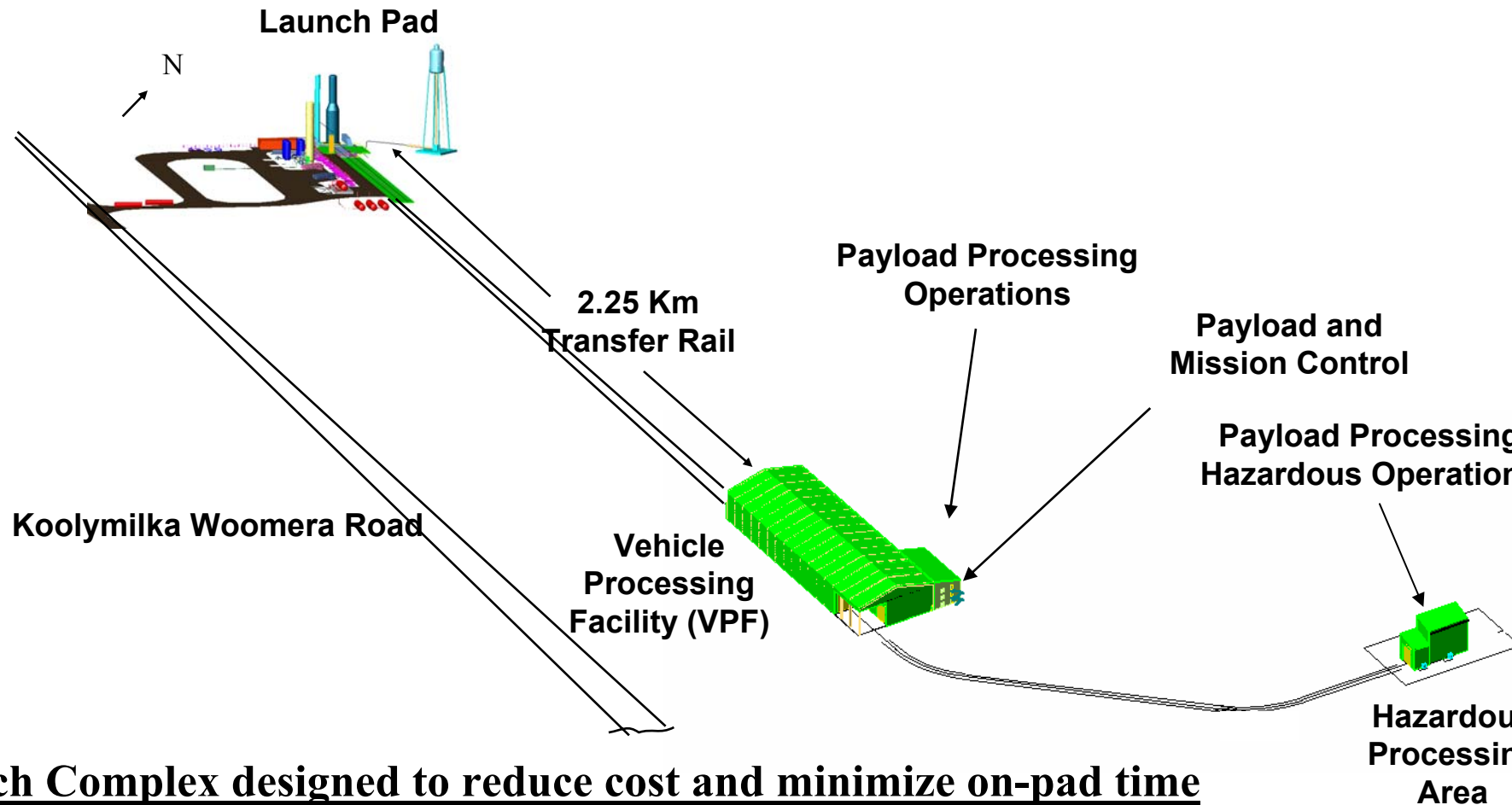
- Contracts Executed for Site Design and Construction
- Launch Site Design Completed by Leighton Contractors and RS&H
- Environmental Approval Received March 1998
- Launch Operations Contract Signed April 1998
- Native Title Agreement Signed
- Site Ground Breaking July 1998
- Export License Approved November 1998



- Kistler leasehold from Government of South Australia (30 square km)
- 18 km northwest of Woomera Village
- In Woomera Prohibited Area (127,000 square km)

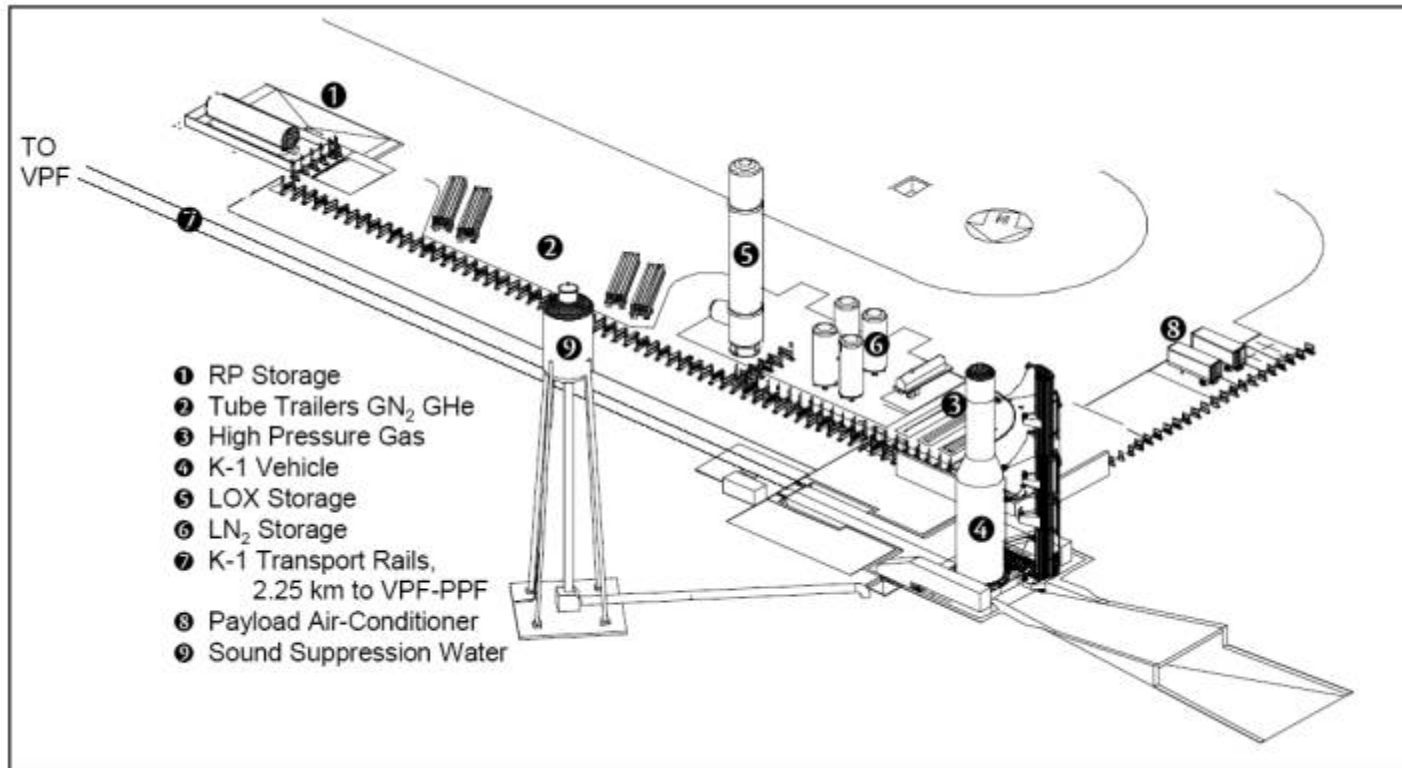


**Woomera Location**



## Launch Complex designed to reduce cost and minimize on-pad time

- Six hours rollout to launch
- Minimum required support equipment
- Simple, reliable launch complex

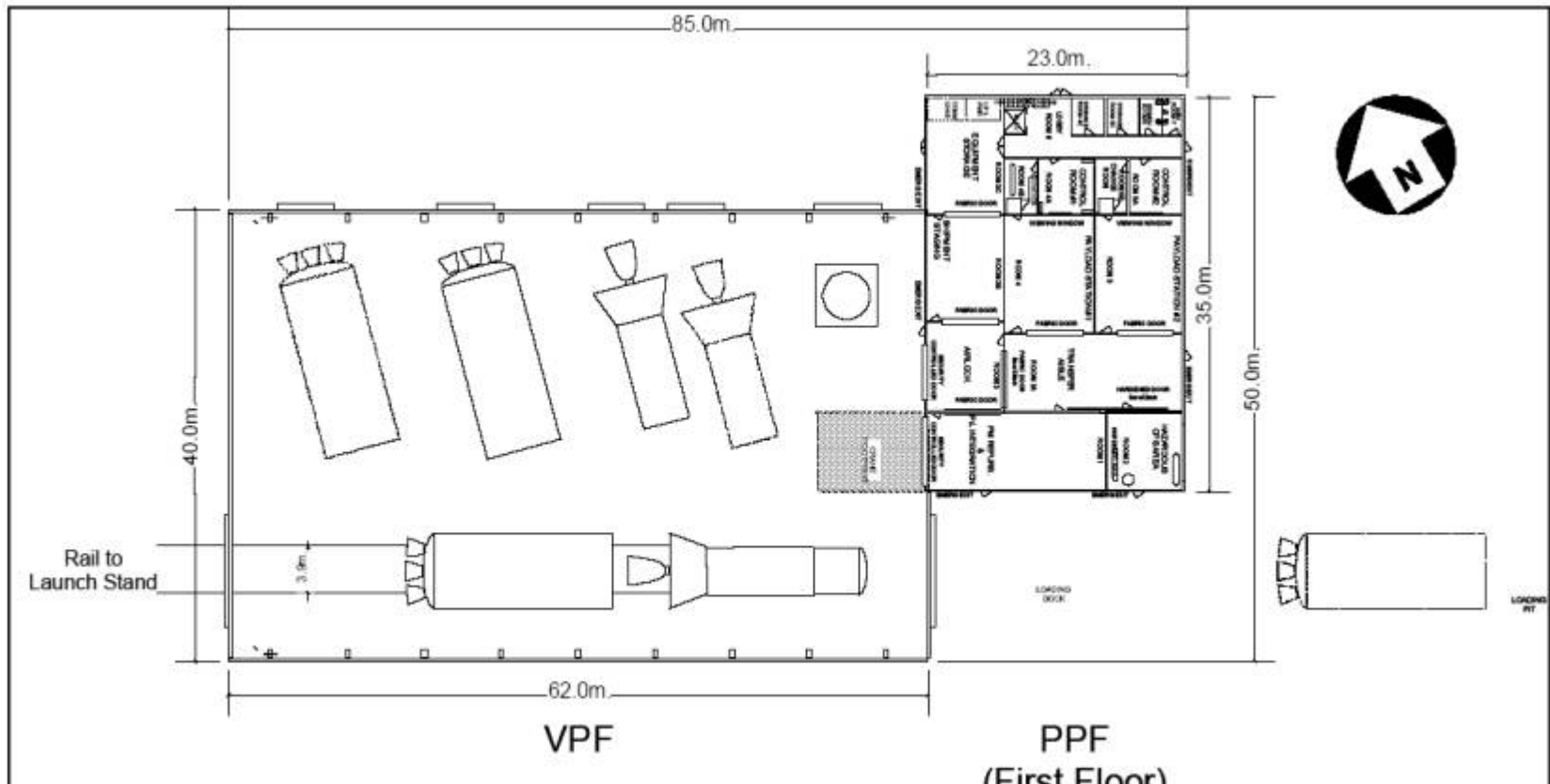


- Rail system is used to transport the vehicle from the VPF to the launch stand
- Erector is used to move the vehicle to an upright position on the launch ring
- Fueling operations are completed in 3 hours while final functional checks are performed
- Entire process from VPF rollout to launch takes approximately 6 hours

# Vehicle Processing Facility (VPF)

*The Future Is Reusable Aerospace Vehicles*

- Payload and Mission Control and Payload Processing integral to VPF
- Design provides efficient horizontal processing of K-1 vehicle
- Sufficient space to accommodate 3 K-1 vehicles and payload modules
- Large bay doors at each end of the VPF allow for entrance and exit
  - Rails provided from VPF to launch pad for vehicle transport
- Provides required equipment to support vehicle check-out



- Kistler is presently planning to operate out of Kistler-developed spaceports
  - Utilize existing infrastructure (e.g. utilities and facilities)
  - Develop K-1 launch complex
- Kistler’s commercial RLV requires a flexible, inviting environment
  - Wide-open, flat spaces are required for landing and recovery operations
  - Friendly regulatory environment
  - Use “Range on the Vehicle,” e.g. accommodate advanced, GPS-based, autonomous flight termination systems
- Kistler is extremely interested in any spaceport that can provide the flexible environment required to operate a commercial RLV