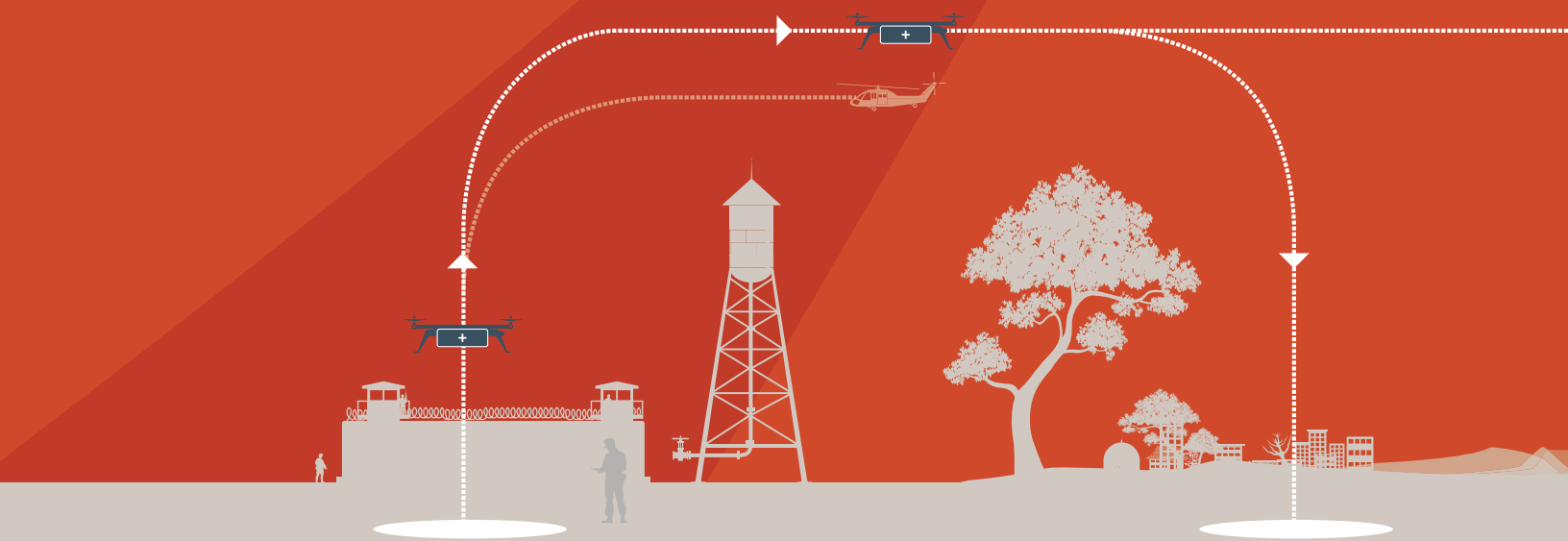
NEAR EARTH AUTONOMY

Defense operations depend on a well-functioning supply chain to bring water, food, fuel, munitions, and medical supplies to warfighters at any time and place. Autonomous unmanned aircraft cargo delivery systems increase logistics safety, speed, and efficiency.

Near Earth's flexible autonomy system architecture and streamlined aircraft integration process decreases cost and time to market for development, testing, and scaling. Their solutions enable safe, efficient, on-demand cargo delivery, disaster relief, inspection, medevac, and passenger transport, while reducing risk to pilots and drivers, and eliminating the need for clear runways and roads.



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Near Earth bridges the gap between aerospace and robotics with complete autonomy systems for aircraft ranging from small drones up to full-size helicopters.

They were founded by Carnegie Mellon University robotics faculty with decades of success building aerial autonomy systems for government organizations including the Air Force, Army, DARPA, NASA, and Navy.

In 2017 Near Earth developed autonomy for the world's first unmanned full-size helicopter. Today, the company is miniaturizing and scaling technology to enable aircraft to autonomously take-off, fly, and land safely, beyond visual line-of-sight and in complex, low-altitude, environments, with or without GPS. The company's engineering and flight testing teams have successfully enabled autonomy across a wide variety of aircraft sizes, types, locations, and applications.

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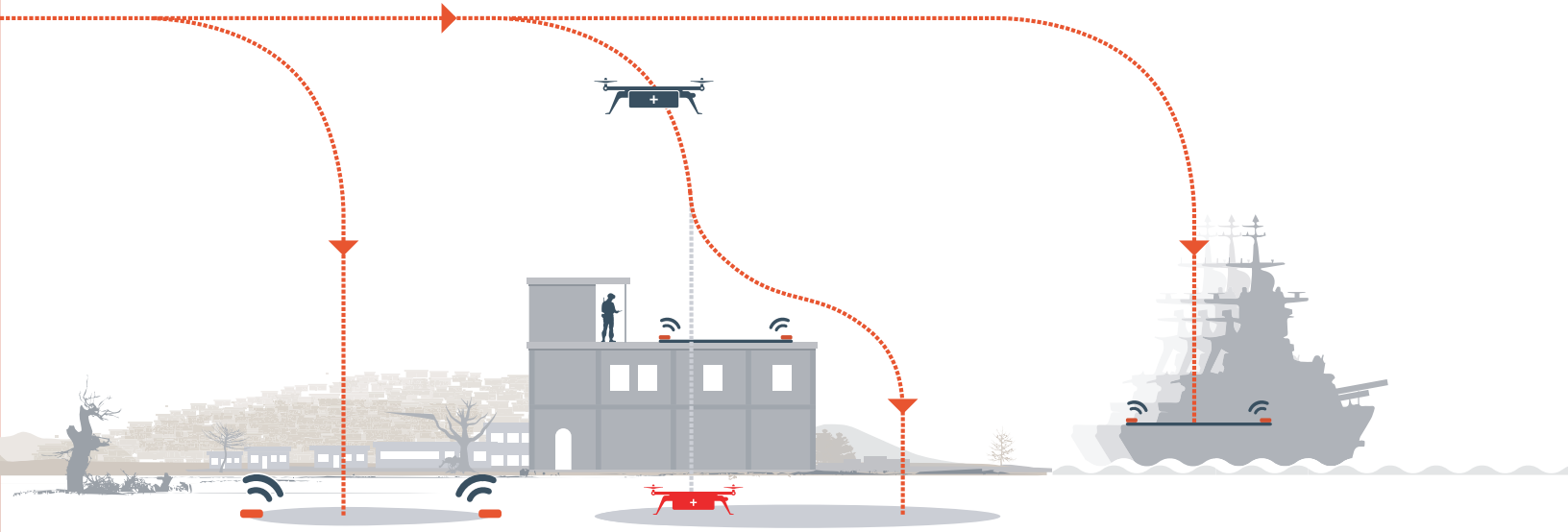


Solutions Across the Military Autonomy Ecosystem

NEAR EARTH AUTONOMY

PRE-FLIGHT & TAKE-OFF

1 | Mission Planning

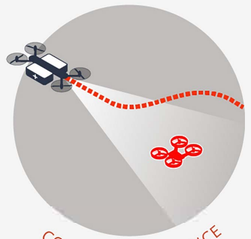
2 | Obstacle Avoidance

OBSTACLE AVOIDANCE

CRUISE

3 | Collision Avoidance

4 | GPS–Denied Navigation



COLLISION AVOIDANCE

UNPLANNED LANDING

5 | Contingency Management

6 | Landing Zone Evaluation

LANDING ZONE EVALUATION

PLANNED LANDING

7 | Precision Landing

PRECISION LANDING

PLANNED LANDING

2 | Obstacle Avoidance

6 | Landing Zone Evaluation

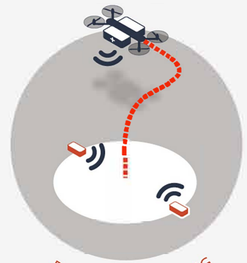
LANDING ZONE EVALUATION

SHIP LANDING

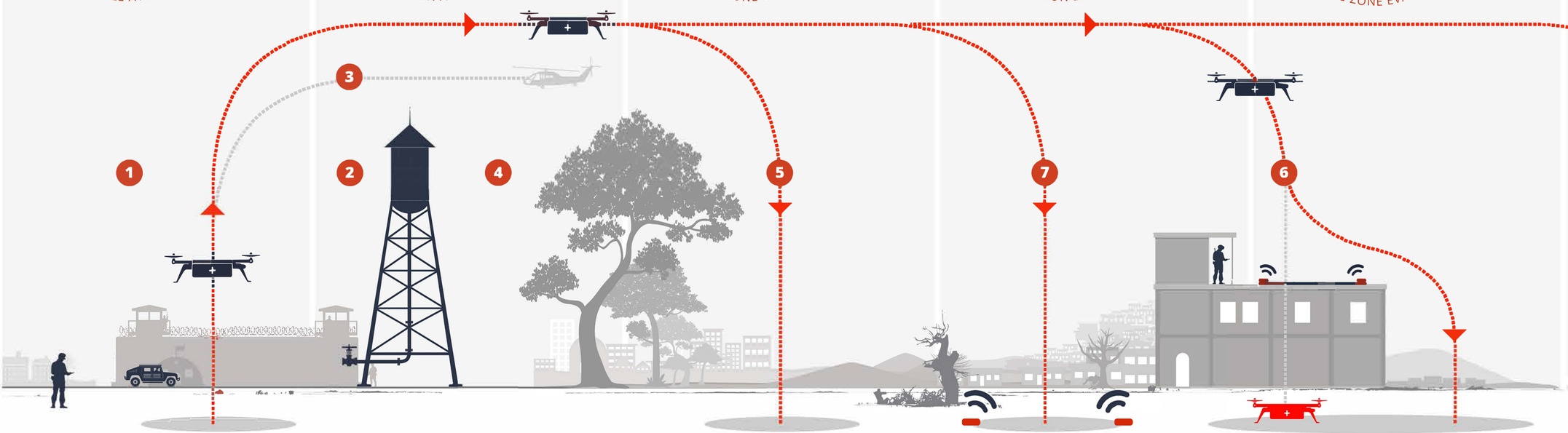
2 | Obstacle Avoidance

6 | Landing Zone Evaluation

7 | Precision Landing



PRECISION LANDING



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NEAR EARTH AUTONOMY

Peregrine Development Kit

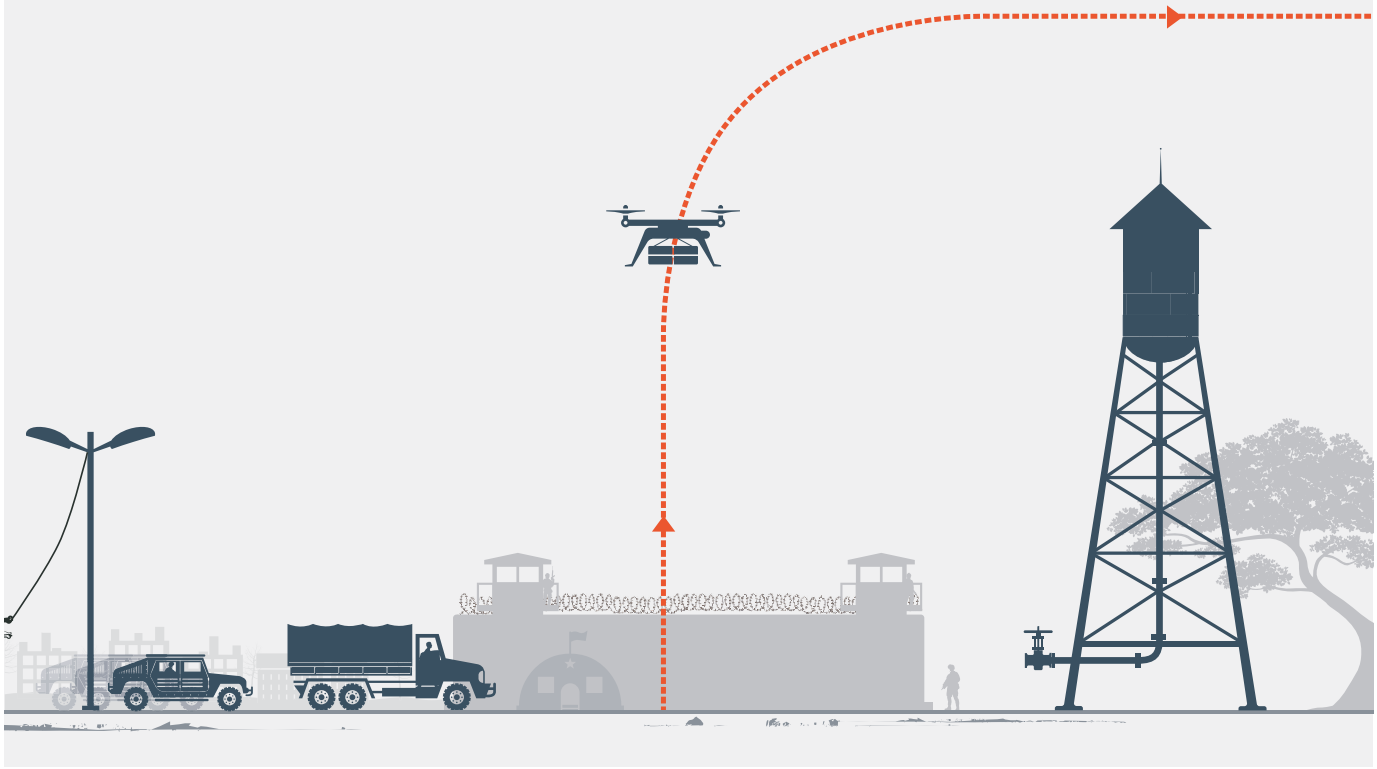
PDK provides Landing Zone Evaluation for UAS applications, enabling integration, open-loop evaluation, and closed-loop testing. PDK is the standard first step to make your aircraft completely autonomous, facilitating Obstacle Avoidance, and Precision Landing capabilities.

Peregrine Development Kit contents

- Autonomy System with sensing and computing capabilities and Near Earth Autonomy application software
- Ground control station with software for mission planning & execution and real-time data product visualization
- Interface control documentation (ICDs) and User Manual
- Access to Near Earth's open-source interface software repository

Optional Upgrades:

- Surrogate Vehicle with integrated autonomy system interface
- Surrogate Vehicle Interface (SVI) reference design using Near Earth's open-source interface software

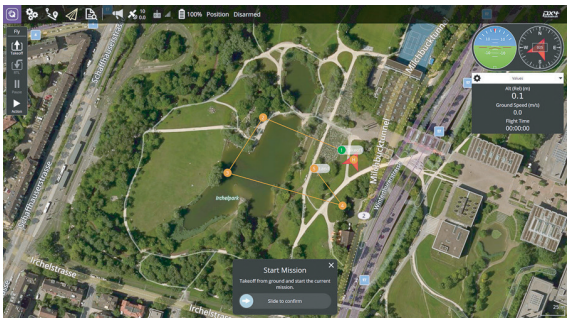


Peregrine payload components

Peregrine Development Kit

PDK enables the evaluation and testing of Near Earth Autonomy capabilities. Use standalone, or we can assist with integration with your own aircraft and systems.

Peregrine shown on example vehicle (TRV-80). We can help integrate the Peregrine with other aircraft and systems.



Mission planning software

Specifications

Physical	
Power:	90 W nominal, 15-30 V DC
Power supply:	Aircraft or shore power, hot-swappable
Ports:	Power input (2x), Gigabit Ethernet, Serial,
	GNSS antenna (2x)
Weight:	3.8 kg (8.4 lb)
Max dimensions:	182 x 165 x 393 mm (7.2 x 6.5 x 15.5 in)
Environmental	
Operating temperature:	2° - 32° C (36° - 90° F)
Ambient humidity:	< 85% Relative humidity
Ingress protection:	Not rated
Lidar sensing	
Sensing range:	Class 1 laser
Scan angle & width:	360° by ±15° vert, 16 scan lines
Scanning frequency:	300,000 samples/sec (600,000 with dual return)
Scan rate:	5 - 20 Hz lateral, 0 – 2.0 Hz axial
Precision:	0.1° – 0.4° angular, ±3.0 cm (typical)
Storage	
On-board storage:	1 TB NVMe solid state drive
Removable storage:	1 TB SATA III SSD
Navigation	
Mode:	GPS-aided inertial
IMU:	Tactical grade MEMS, non-ITAR
Initialization:	Quick alignment via dual antenna
Electrical	
Power:	100 W peak, 50 W idle; vehicle or shore power
Ports:	18-24 V Power input (2x), Gigabit Ethernet (LEMO),
	GNSS Antenna (2x SMA), Debug port
Radios	900 MHz — MAVLink command and control
	5.0 GHz — Real-time visualization and log access

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NEAR EARTH AUTONOMY

Swift Precision Landing System

The system includes an aircraft-mounted **Swift Guidance Module** that locates a **Swift Landing Beacon** on the ground, enabling the aircraft to land at a precise location without GPS.

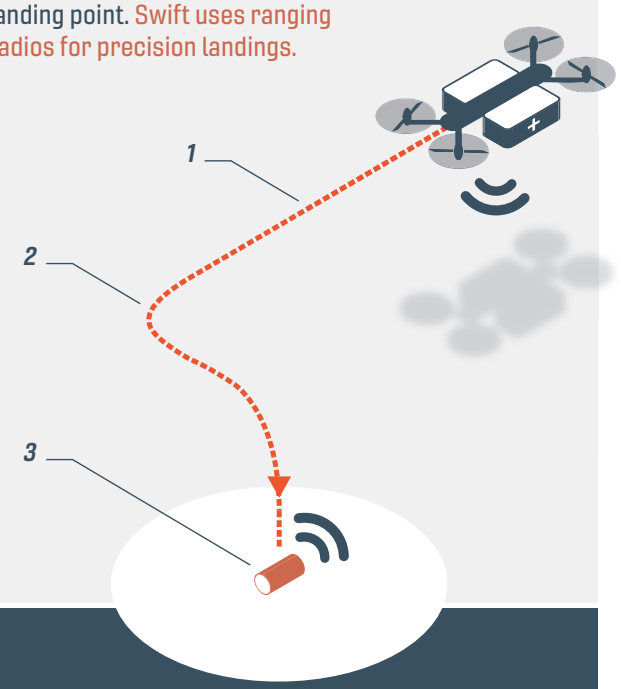
1. An air vehicle equipped with Swift Landing Guidance Module flies to an approximate GPS coordinate.

2. Once within range of the Swift Beacon, the Swift Guidance Module begins receiving radio range measurements and determines the precise location and heading of the landing point.

3. The Swift Guidance Module sends the desired landing point to the air vehicle's avionics guidance system for a precise landing.

Swift system advantages

- ⚠ Visual feedback is unreliable in degraded visual environments (DVE) such as night, smoke, dust, or fog. Swift is not reliant on visual feedback.
- ⚠ GPS alone can't provide a precise landing point. Swift uses ranging radios for precision landings.

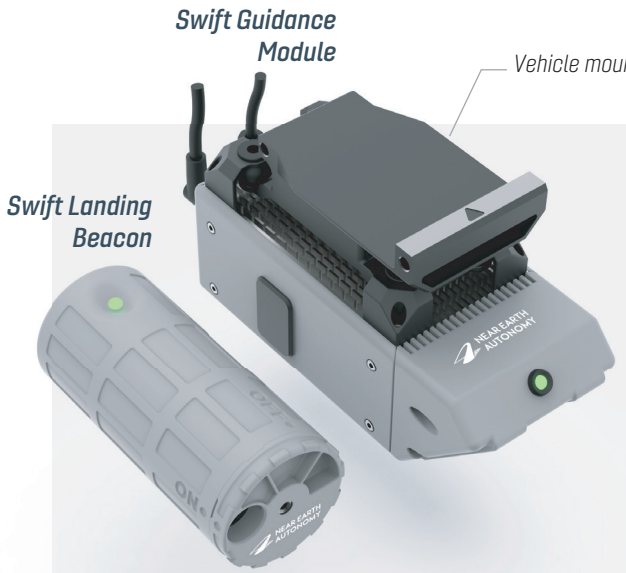


Use case: precision resupply

Set down and activate the Swift Landing Beacon indicating where and in which direction the drone will land.

Swift Guidance Module determines precise location and pose of beacon, even in DVE.

Take the cargo off the vehicle for a successful resupply.



Swift Precision Landing System key functionality

- Dual ranging radios
- Works in any visibility condition
- Lightweight: 595 g (1.31 lb)
- Extensible to future sensor modes

Swift Landing Beacon

Swift Guidance Module specifications

Ports:	Ethernet, DC Power
Weight:	595 g (1.31 lb)

Swift Landing Beacon specifications

Ranging Radios:	Operational Radius 150 m (492 ft)
Weight:	170 g (0.37 lb), including 4 AA batteries
Power:	4 AA Batteries
Expected Battery Life:	16 hrs
Ports:	Micro USB for firmware updates

No performance loss in degraded visual environments (DVE)

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