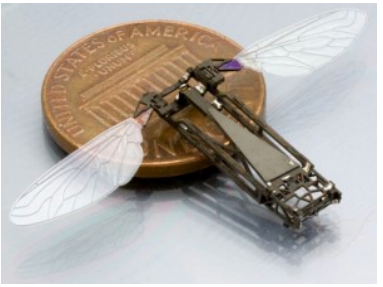
Aerial Robot Locomotion – Quick Intro

September 2, 2014



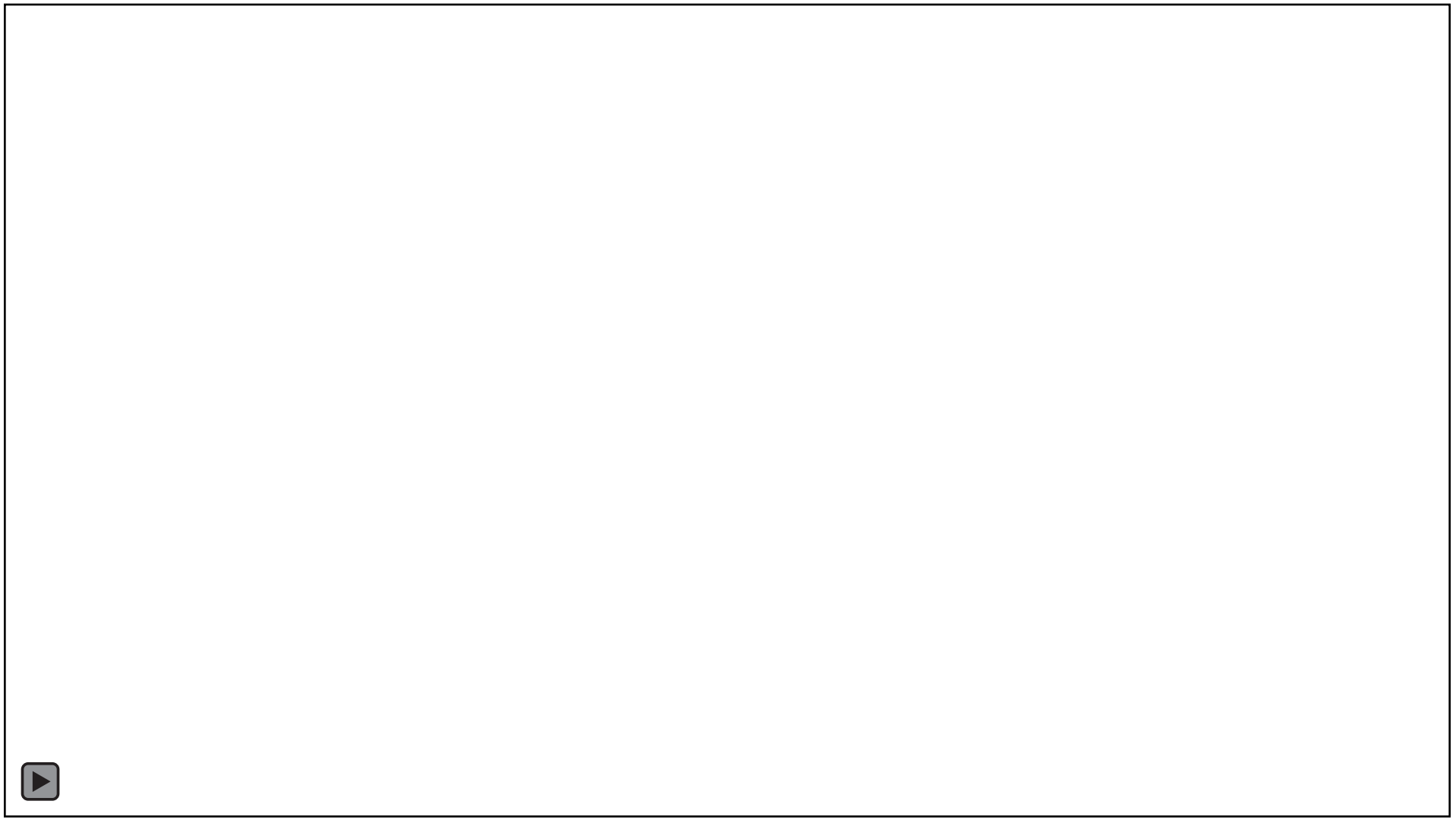
Reading Assignments

- Today: Finishing up Ch. 2; beginning Ch. 3
- Next time:
  - *Continue Ch. 3*

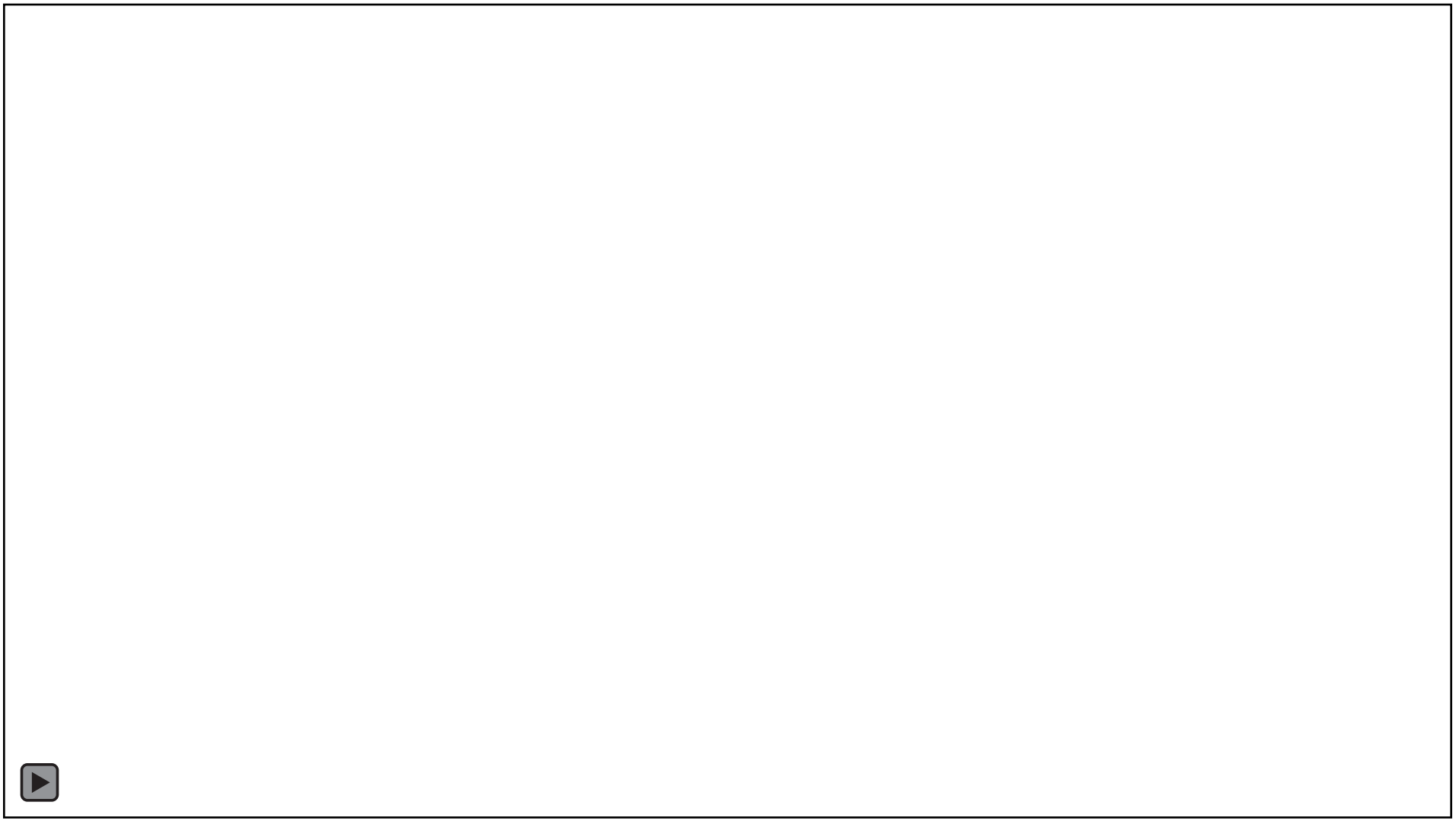
Aerial Robots – Applications

- Remote sensing: pipeline spotting, powerline monitoring, volcanic sampling, maping, meteorology, geology, agriculture, etc.
- Disaster response: chemical sensing, flood monitoring, wildfire management
- Surveillance: law enforcement, traffic monitoring, coastal and maritime patrol, border patrols
- Search and rescue: especially in low-density or hard-to-reach areas
- Transportation: small and large cargo, passenger transport
- Communications: permanent or ad hoc communication relays
- Payload delivery: firefighting, crop dusting
- Image acquisition: Cinematography, entertainment

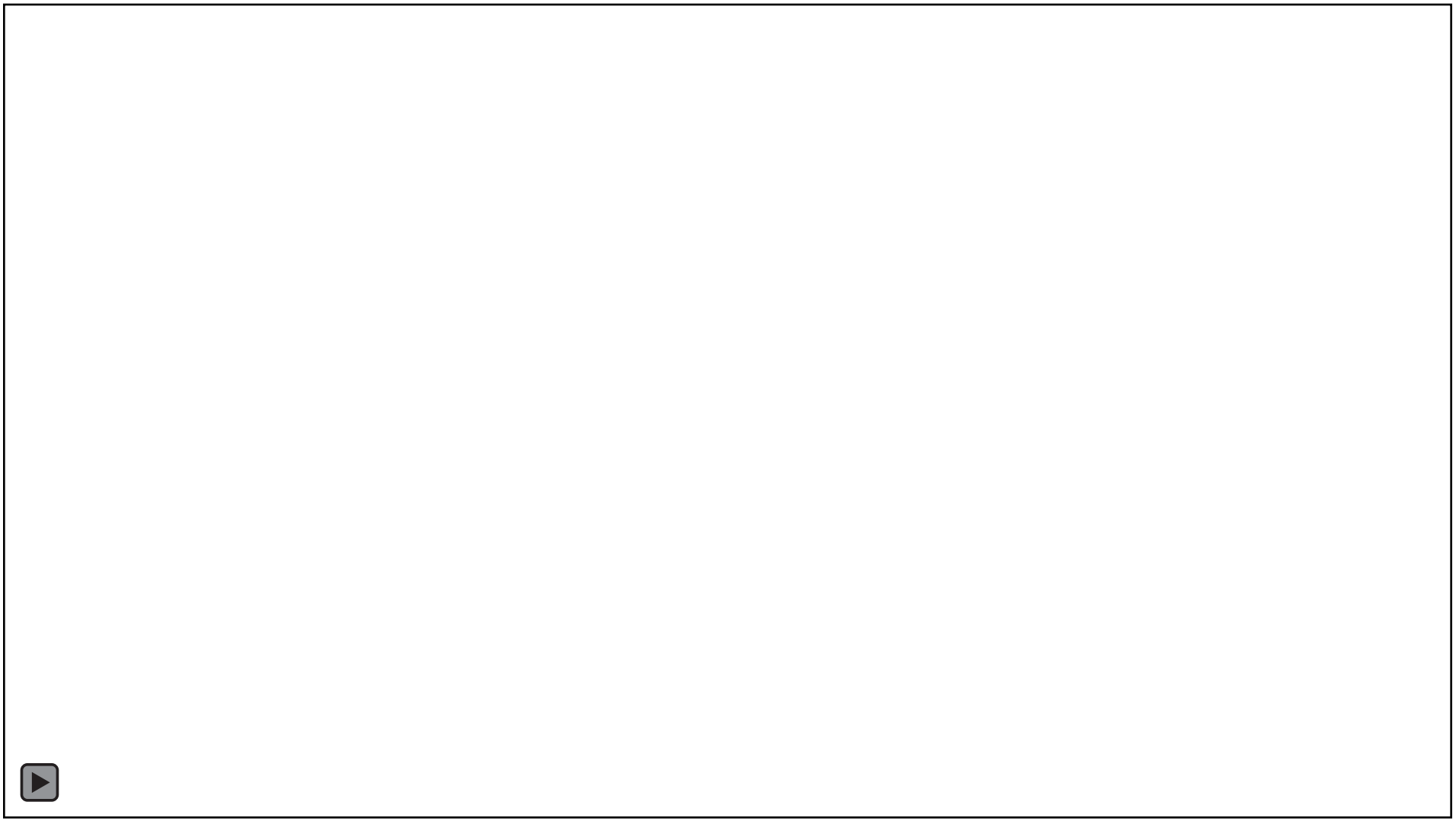
Aerial Robot Application Example



Another Aerial Robot Example



Another Aerial Robot Example



Flight Vehicle Types & Flight Regimes

- Types:
  - *Fixed-wing*
  - *Flapping wing*
  - *Combinations*

- Regimes:
  - *Hover (i.e., speed of vehicle relative to surrounding air is small)*
  - *Cruising (i.e., significant relative speed between vehicle and surrounding air)*

- Lighter-than-air systems (e.g., blimps)

Taxonomy of Aerial Vehicles

- Vast number of UAVs
- Most are fixed wing
- Are available at wide range of altitudes

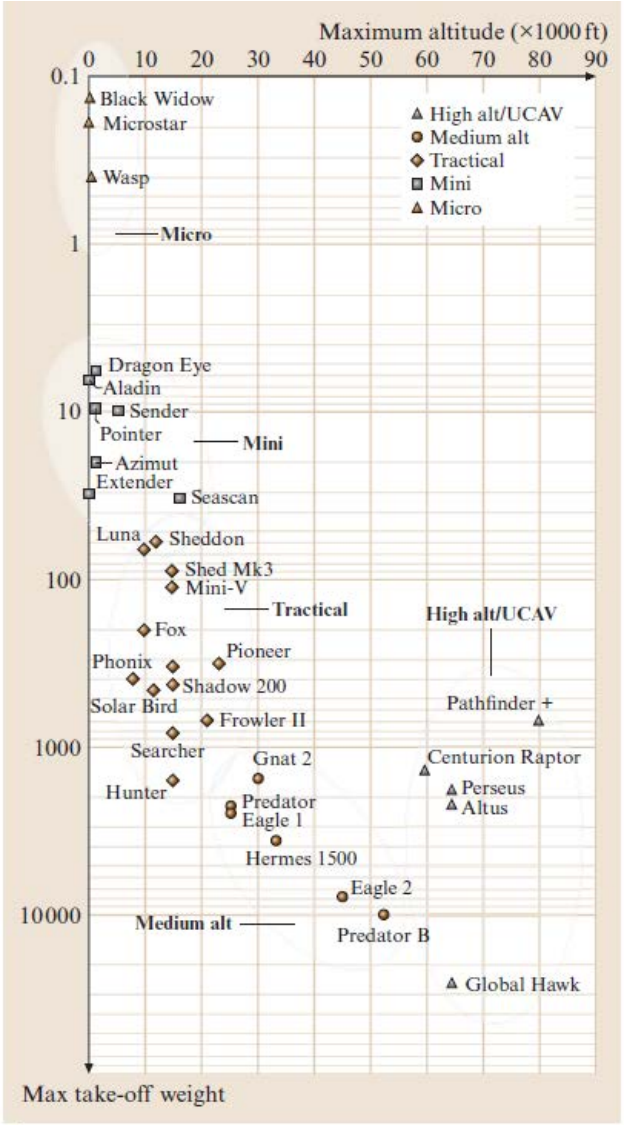


Fig. 44.3 Taxonomy of unmanned aerial vehicles (after *R. Weibel* [44.4, 5])

Technical challenges

- Regulations and certification
- Human-Machine interfaces
- Navigation
- Agile flight and fault tolerance
- Obstacle avoidance
- Landing
- Multi-vehicle coordination

Inner-Loop Control: Sensing and Estimation

- Sensing for aerial vehicles:
  - *Inertial navigation systems*
  - *Global navigation satellite systems*
  - *Terrestrial radio navigation systems*
  - *Air data probes and altimeters*
  - *Radar and passive vision sensors*
  - *Magnetic compasses*
  - *Distance measuring*