Non-Passenger Aircraft Considerations

- UAV's
  - Information
  - Cargo
  - Passengers
  - Integration with NAS

- Cargo

Advanced Aircraft Systems and Technologies

Conclusions

- Future aerospace vehicles will exploit a variety of emerging technologies making for an exciting second century of aeronautics.
- Development presents new challenges and will require sustained work in basic disciplines and integrated systems.
- We are unlikely to predict the priorities and requirements that will exist in 2050, and research plans should reflect this.
Piloted Vehicle Autonomy
Autonomous Aircraft Older Than Stanley
## Why Autonomous Aircraft Now?

<table>
<thead>
<tr>
<th>Societal Needs</th>
<th>Autonomous delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urbanization, traffic, time, housing, environment, economics, communications,</td>
<td></td>
</tr>
<tr>
<td>commercial funding</td>
<td></td>
</tr>
<tr>
<td>Regulatory Issues</td>
<td>Safety (ATM, airworthiness), noise, air quality, security, global climate, privacy</td>
</tr>
<tr>
<td>Technological Advances</td>
<td>Electric infrastructure, power systems, energy storage, simulation, sensors, precision nav, deep learning, structures tech</td>
</tr>
<tr>
<td>Personal mobility</td>
<td></td>
</tr>
</tbody>
</table>
Autonomous Aircraft Evolution
Multiple Vehicle Challenges to ATM/ATC/UTM
Personal Air Mobility

Puffin, NASA

Multi-rotor tilt wing

Zee.Aero Concept

Zunum Hybrid
Questions and Issues

• How close is this vision of the future?
• What are the technical/regulatory/social barriers?
• What infrastructure is needed?
• How will flight vehicles interact with ground transport?
• Is the technology scalable to large payloads and high speeds?
• How might this form of air transport change society?
• What should we do now to make this happen?
Critical Technologies

- Vehicle autonomy and augmentation
- Revolutionary propulsion
- (Even more) safety critical software
- Machine learning and adaptive systems
- Aero modeling in more challenging domains
- Scalable structures and manufacturing
- Non-evolutionary design (flexible, fast, believable)
- Low cost avionics