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Low-Cost High Precision Aerial Delivery System (LC-ADS)

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Low-Cost High Precision Aerial Delivery System (LC-ADS)

DZ – drop zone
CARP – Computed Air Release Point

COTS UAV
autopilot
3D-printed container
1-2 lb
guidance unit

- Flight to DZ
- Wind estimation
- CARP w/r to desired target location
- Min time trajectory to CARP
- Release of container
- Guided delivery
- RTB to recharge & reload

CARP
Steer
Est. Wind
Target
Dispersion due to wind
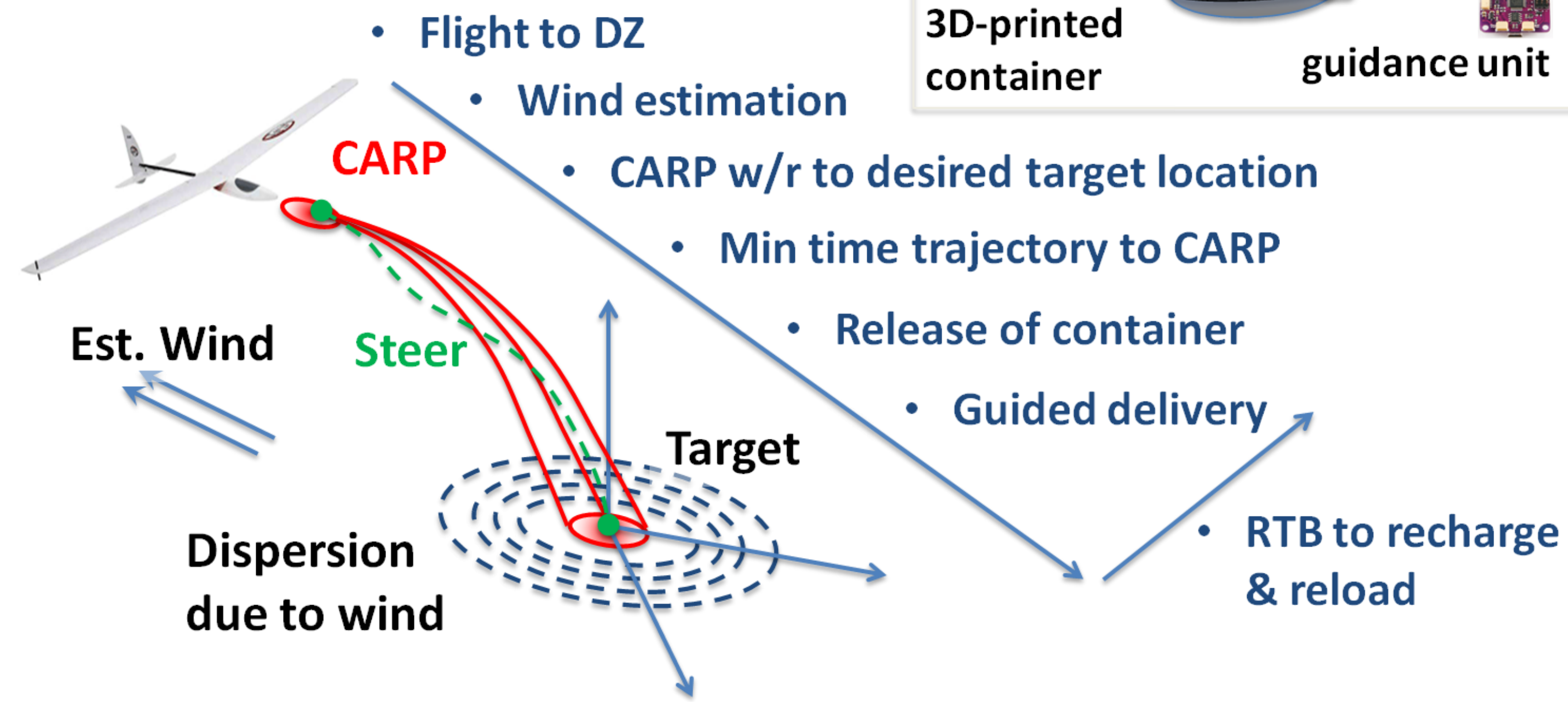
Objectives

- Enable autonomous precision delivery of 1–2 lb payloads from a low-cost small UAV. Two delivery schemes will be evaluated: 1). using a dropped store with controlled glide, and 2). using a remote landing/launch procedure to support 2–way delivery.
- Guarantee robustness of the UAV in the presence of significant variation of wind conditions (~50%) and change of weight (~25%).

Background

- Operational Aerial Delivery Systems (e.g. C–17, C–130) require expensive instrumentation, manning power, ground and aircrew operational support, and significant preparation time with logistics tail.
- Presence of human pilots and payload crew results in high altitude and large offset distances. Despite recent advances of ADS systems, major drawbacks remain a high cost per pound of payload delivered, significant preparation time, and high probability of loss.

Technical Approach

- Develop two schemes for the precision delivery of small payloads to remote areas:
  - Using a released, guided store to deliver payloads where remote landings are either not possible or not desired.
  - Develop a remote landing and relaunch scheme that allows the UAS to autonomously land at a remote location, and then be autonomously relaunched after the payload has been delivered and/or replaced.
- To achieve this the UAS will need to:
  - Estimate local wind, use stored DTED data to predict the optimal release point (CARP) or landing profile.
  - Automatically generate end solution for the payload release and/or landing.
- Released payloads will optionally steer to the desired target.

Motivation

- Expedited delivery of high value supplies, packaged in a small, expendable delivery container, can be critical for the survival of people in remote areas.
- Use of a low–cost, expendable UAS for these missions removes human operators from harms way.
- The remote landing/launch scheme allows for two–way delivery of payloads.
- The proposed system is cheap and scalable so that multiple cooperative UAVs can deliver packages to remote denied areas.
- Operational impact of the system is high with very low cost and manning footprint that would be required to support its operation.
- An IFC for the proposed asset is currently in progress for other projects.

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