



WHERE TECHNOLOGY » *TAKES FLIGHT*

Ballistic Cargo Systems



Ballistic Cargo Systems

- Ballistic = not guided
- Accuracy is wind and release point dependent
- Simple to rig/dispatch
- 2-stage capability



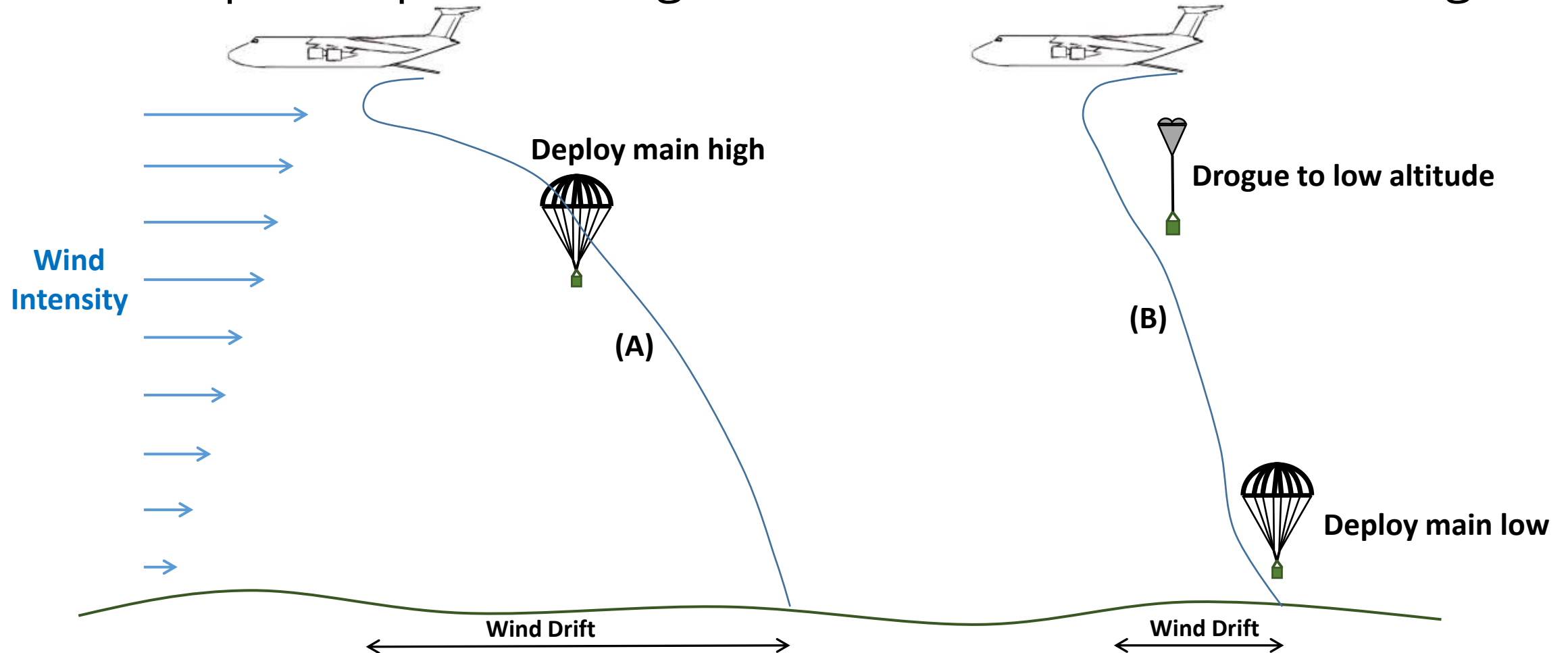
Cargo Parachute Systems

Parachute	Gross Rigged Weight				Max Speed
	Min	Max	Min	Max	
T-11C 800	165 lb	800 lb	75 kg	364 kg	150 KIAS
T-11C 1200	440 lb	1200 lb	200 kg	545 kg	150 KIAS
AS-2000	500 lb	2200 lb	227 kg	1000 kg	150 KIAS
AS-2000 Cluster	2200 lb	5700 lb	1000 kg	2590 kg	150 KIAS
AS-5000	2500 lb	5000 lb	1136 kg	2270 kg	150 KIAS
AS-5000 Cluster	5000 lb	*42000 lb	2270 kg	*19090 kg	150 KIAS

* Pending test program, partners needed

2-Stage Capability

- Example: Dispatch at high altitude with and without 2-stage



2-Stage Capability

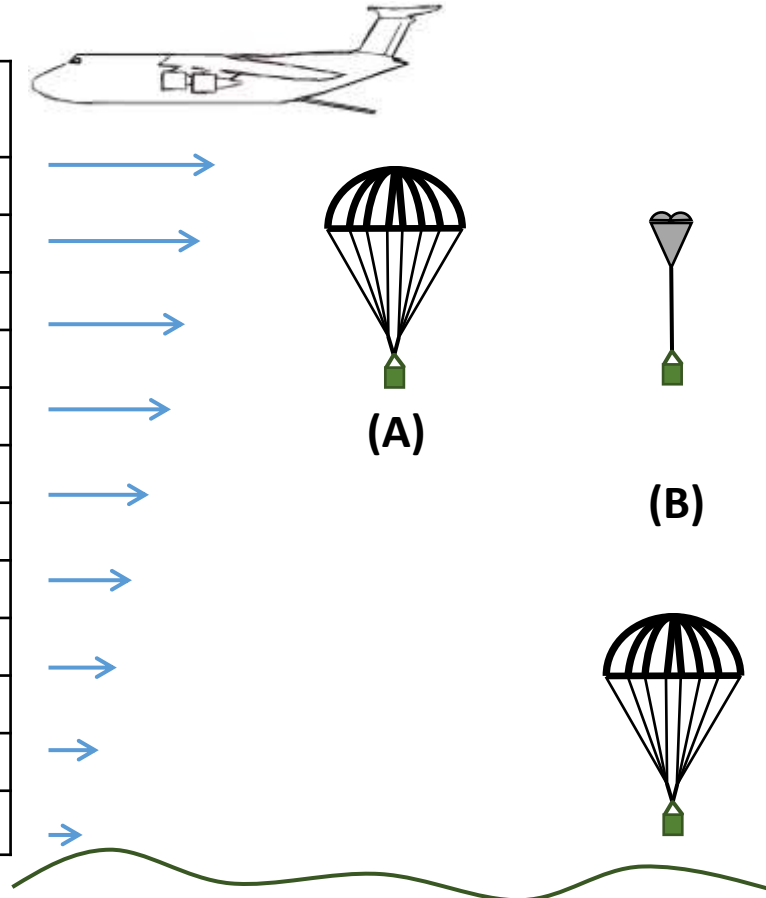
- Example: Dispatch at 10,500 AGL with and without 2-stage

(A)

Altitude (ft)	Wind (kts)	ROD (m/s)	Drift (m)
10000-9000	30	8	588
9000-8000	30	8	588
8000-7000	25	8	490
7000-6000	25	8	490
6000-5000	20	8	392
5000-4000	20	8	392
4000-3000	15	8	294
3000-2000	15	8	294
2000-1000	10	8	196
1000-AGL	10	8	196
Total:			3.9 km
Error:			± 0.8 km

Assume 20% wind error:

(~360 sec descent time)



(B)

Altitude (ft)	Wind (kts)	ROD (m/s)	Drift (m)
10000-9000	30	32	147
9000-8000	30	32	147
8000-7000	25	32	122
7000-6000	25	32	122
6000-5000	20	32	98
5000-4000	20	32	98
4000-3000	15	32	74
3000-2000	15	32	74
2000-1000	10	32	49
1000-AGL	10	8	196
Total:			1.1 km
Error:			± 0.2 km

Assume 20% wind error:

(~109 sec descent time)



T-11 Cargo Parachutes

Lightweight Payloads and Door Bundles

T-11 Cargo Features and Variants

- Widely fielded for personnel use
 - Minimal training for packers
- Direct drop with static line
- Canopy packing similar for all sizes

Parachute	Gross Rigged Weight				Max Speed
	Min	Max	Min	Max	
T-11C 800	165 lb	800 lb	75 kg	364 kg	150 KIAS
T-11C 1200	440 lb	1200 lb	200 kg	545 kg	150 KIAS



T-11 Cargo 1200

T-11 Cargo 800 and 1200



T-11 Cargo 800
Same as live T-11 with
structural upgrades



T-11 Cargo 1200
Increased size with structural
and fabric upgrades

T-11 Cargo Deployment System

- Deployment bags secured without pack tray
- Payload rigging similar to G-12
 - Restraint ties secure to payload



T-11 Cargo 800 and 1200 Deployment Bags



**T-11 Cargo 1200
Packed**



2-Stage with T-11 Cargo



2-Stage for Light Payloads

- Most components are shared with CDS-scale system:
 - Drogue Harness
 - Drogue Release Mechanism
 - Drogue/deployment system
- Drogue and main are scaled for payload weight

	AS-2000	T-11 Cargo
Cargo Container	A-22, others	A7A, others
Main Parachute	AS-2000	T-11C
Drogue	120" Square Crown	72" Square Crown
Drogue Riser	16 ft Riser	
Drogue Harness	Drogue Harness + Taco	
Drogue Release	RS MDR 2k	

T-11 Cargo 2-Stage





AS-2000 Cargo Parachute

**Replacing G-12
Half the weight and pack volume**

AS-2000 Parachute

Canopy Shape	Polyconical
Nominal Diameter	59.7 ft / 18.2 m
Surface area	2802 ft ² / 261 m ²
Skirt band circumference	41.0 ft / 12.5 m
Number of gores	60
Number of sections per gore	7
Gore material	PIA-C-44378, Type VI, 1.5 oz Nylon
Number of reinforcement bands	4
Anti-Inversion Skirt Slits	1 per gore
Suspension line material	PIA-C-5040 Type III, Nylon, 550 lbs
Number of suspension lines	60
Suspension line length	60 ft / 18.3 m



AS-2000 Deployment Bag

Deployment bag type	Locking compartments
Deployment bag dimensions	24 x 22 x 5.5 inches
Deployment bag bridle	Integral
Packed Weight	72 lb (33 kg)



AS-2000 Descent to Landing





AS-2000 Cluster



AS 2000 Cluster

- AS-2000 ROD is designed to be ~23 ft/s at max weight
 - G-12 ROD = 29 ft/s
- Red = pending validation testing

Parachute	No of Parachutes	Drop Method	GRW		ROD	
			Min lb.	Max lb.	Minimum Ft/s	Maximum Ft/s
AS2000 Not reefed	1	Gravity	661	2205	11.6	21.2
	2	Gravity	869	4000	11.6	24.9
	1	2-Stage	661	2205	11.6	21.2
AS2000 Reefed	1	Gravity	661	2205	11.6	21.2
	2	Gravity	869	4000	11.6	24.9
	3	Gravity	1089	5500	11.6	26.1
	4	Gravity	1394	7000	11.6	26.1
	5	Gravity	1672	8500	11.6	26.1



M21 Cutter vs. ASNA DR-1500

M21 Cutter

- One-time use
- Must be secured in accordance with ammunition standards (e.g. in ASP)
- Aluminum cutter bracket
- Secure with screw and lock washer
- Arming Cable
- Explosive Power



ASNA DR-1500 Dereefer

- Electromechanical operation
- Timer can be set from 0-999 seconds
- No shelf/service life
- Fits into the M-21 cutter Bracket
- Uses commercial off the shelf 9-volt battery
- No pyrotechnics



G-12 vs. AS-2000

Gross Rigged Weight

- Minimum 500lbs
- Maximum 2,200lbs

Total System Weight

128lbs

Size

5.7 cu ft.

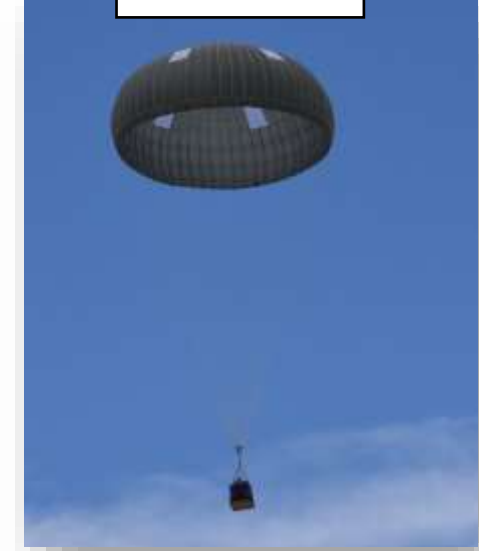
Canopy

- Shape Flat Circular
- Numbers of Gores 64
- Gore material Type I, 2.25-oz Nylon
- Number of Suspension lines 64
- Suspension lines material 7515 Type IV, Nylon
- Number of Riser 2

G-12



AS 2000



- 500lbs
- 2,200lbs
- 65lbs
- 2.8 cu ft.

- Polyconical
- 60
- Type IV cloth 1.2-oz and Type VI 1.5-oz Nylon
- 60
- 5040 Type III, Nylon
- 1 (6 groups)



2-Stage with AS-2000

Rigging for 2-Stage





2-Stage Capability

- Additional components are required:
 - Drogue Harness and Riser
 - Release Mechanism
 - Drogue/deployment system
- Capability extends to existing inventory

	Airborne Systems	Existing Inventory
Cargo Container	A-22	A-22
Main Parachute	AS-2000	G-12
Drogue	120" Square Crown	15 ft Extraction Chute
Drogue Riser	16 ft Riser	
Drogue Harness	Harness + Taco	
Drogue Release	RS MDR 2k	

2-Stage Kit

Kit Includes:

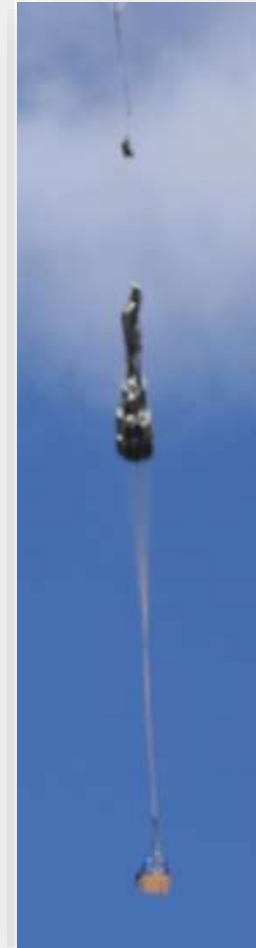
- 120" Drogue
- Drogue Deployment Bag
- Taco Flaps
- Taco Flap Harness
- Drogue Riser
- Drogue Release
- Universal Static Line w/ Snap Hook

Drogue Release Electromechanical:

- Uses Barometric Pressure
- Reads MSL
- Powered by 9-Volt Battery



AS 2000 Drogue Fall



150 KIAS Payload Dispatch



40 Second Drogue Ride



40 Second Droguefall Deployment





AS-5000 Cargo Parachute

**Replacing G-11
Half the weight and pack volume**

AS-5000

- Replacement for G-11
- Reduce pack weight and size by 30%
- Reduced packing and rigging time
- Drops completed up to 5000 lb from C-130



G-11 vs. AS-5000

Gross Rigged Weight

- Minimum 2,270 lbs.
- Maximum 5,000 lbs.

Total System Weight

Size 100 ft. Nominal

Canopy

- Shape Flat Circular
- Numbers of Gores 120
- Gore material Type II or Type III, 1.6-ounce Nylon
- Number of Suspension lines 120
- Suspension lines material Type III, PIA-C-5040
- Number of Riser 3

G-11



Extended Skirt Polyconical

2000 lbs.
5,500 lbs.
174 lbs.
96 ft. Nominal Diameter

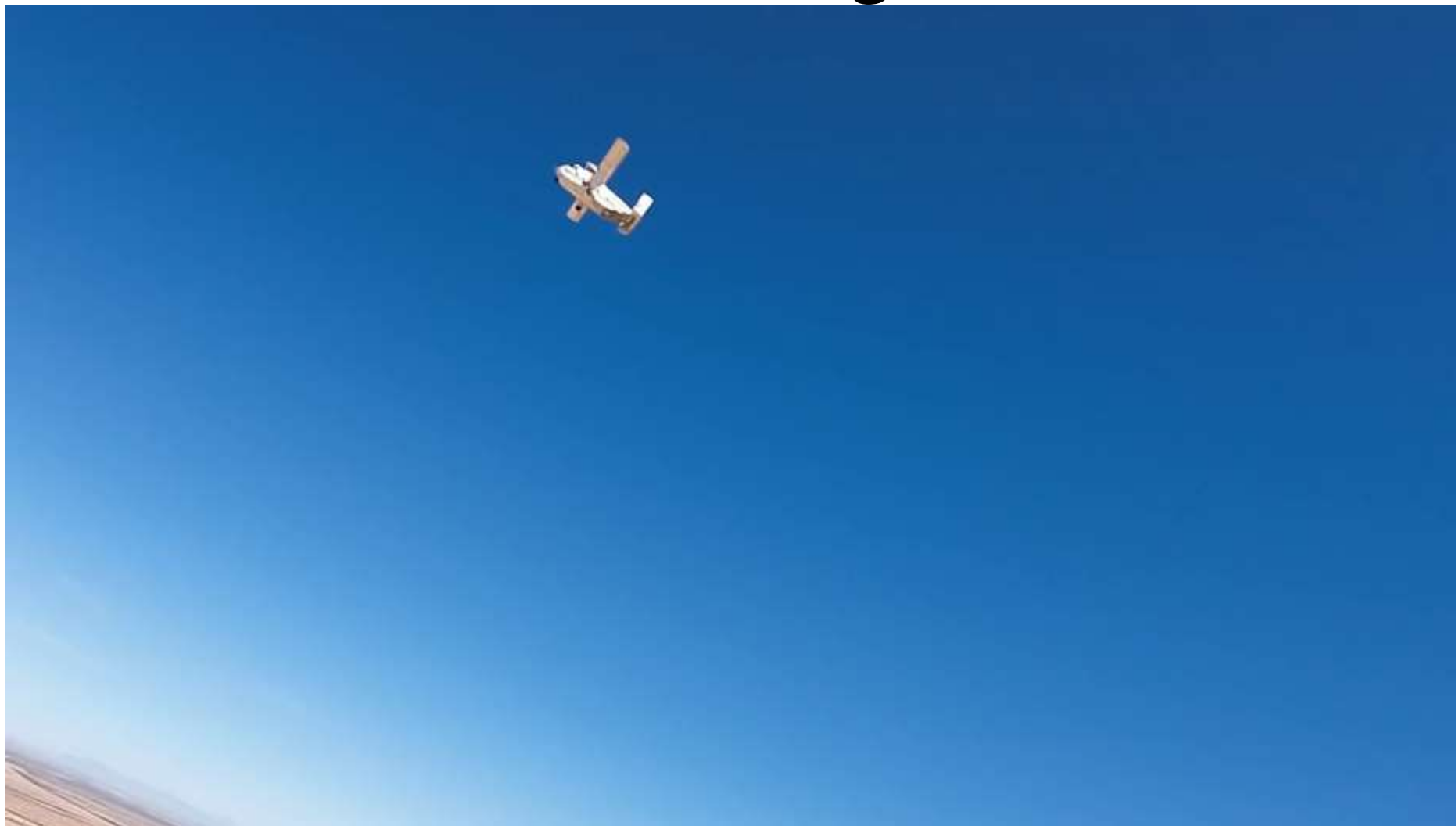
AS-5000



100
Type VI cloth 1.50-oz and Type IV 1.20-oz Nylon
100
Type III, PIA-C-5040
3 (4 leg risers)



AS-5000 Descent to Landing





WHERE TECHNOLOGY » *TAKES FLIGHT*

Questions?

