cargo facts asia 2025

Large Unmanned Cargo Aircraft (UCA) utilization in commercial air cargo service

AIR WHITE WHALE
白鲸航线

General Roadmap: Unmanned & New Energy

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1st Gen. Aircrafts (1900-1950)

- piston engine
- primitive aerodynamic characteristics
- main airframe materials: wood, canvas, etc.

Flyer 1

2nd Gen. Aircrafts (1950-2000)

- jet engine
- classic aerodynamic characteristics
- main airframe materials: advanced alloy, composite material, etc.

A380

3rd Gen. Aircrafts (2020-2050)

- new energy power
- unmanned aviation

ZERO-emission (2040)

unmanned aerial vehicles (UAVs) (2035)

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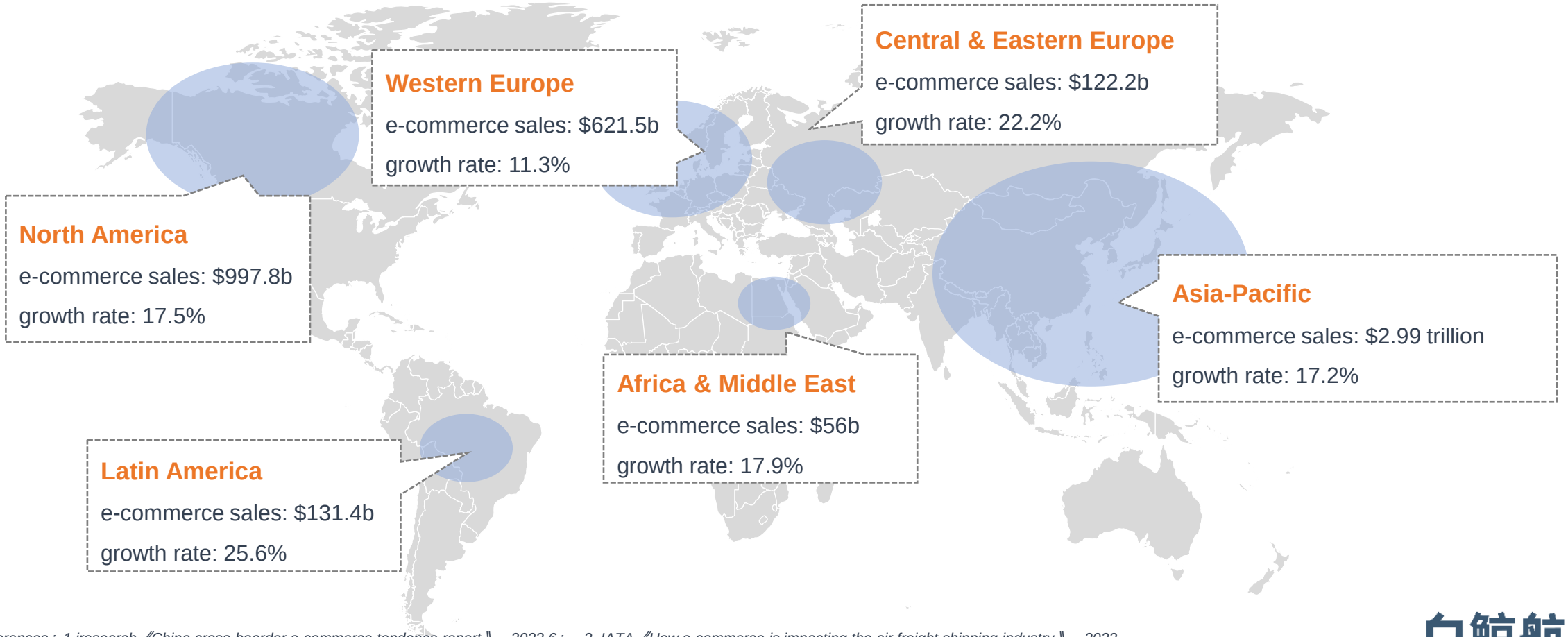
Air Cargo Capacity Growth Driven By E-commerce

The global e-commerce market reached a total of $4.9 trillion in 2021 (+17%).[1,2]

The global air cargo market reached $119.91b in 2021 (+9.98%) and is projected to reach $450b in 2035.[3]



References：1.iresearch《China cross-boarder e-commerce tendance report》，2022.6； 2. IATA《How e-commerce is impacting the air freight shipping industry》，2022
3. Air Cargo Market Analysis Report《A $119.91 Billion Market in 2021 - Global Forecast to 2027》，2022

Fast and Faster!

Faster delivery has become customers' No. 1 requirement.[2]

Express Companies

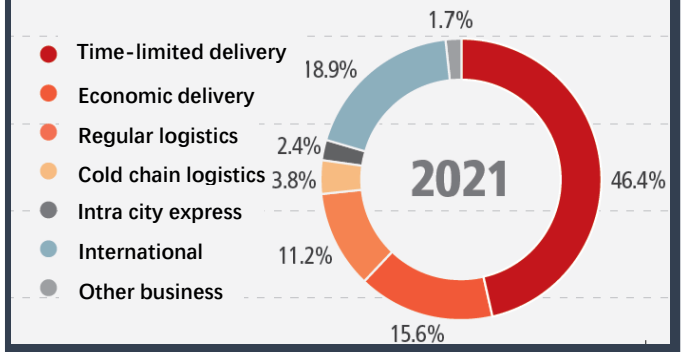
Consumers

Faster!

Online Merchants

Faster delivery helps express companies win competition.

Time-limited delivery accounts for 46.4% of total freight turnover of SF Express.[1]



Faster delivery accelerates merchants' turnover of cash flow and improves customer loyalty.

京东 淘 多 唯品会 vip.com

E-commerce and express delivery only represent half of the air cargo market; the other half is more traditional: fresh goods, high-value industrial components, etc.

References：1.《SF annual report 2021》 2.《2020-2021China express delivery and logistics industries current situation and typical case research report》，iresearch，2021

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Why go unmanned?

Passenger aircraft belly cargo

- Multiple carriers moving airfreight: lack of control of belly resources
- Fixed passenger flight schedules: not flexible, maybe will not align with the rhythm of ground logistics
- Unstable timeliness: capacity affected by passenger luggage
- Limited capacity per aircraft: relatively small
- Restricted cargo types: e.g., batteries or slightly larger dimensions cannot be transported
- Mismatch between passenger routes and cargo routes
- Inefficient loading system for air freight: large containers or pallets for international routes need to be re-packaged

Why go unmanned?

Large manned cargo aircraft

- Limited flexibility and population coverage: only serve a few major cities, but not a huge number of smaller cities or rural areas
- High operating costs: e.g., 737F's direct operation cost is 5x that of trucks per ton-kilometer
- Restricted flight schedules: only flies at night in China
- Aging aircraft: potential risks, relative difficulties in recruiting pilots
- Larger pilot workforce: ~6-7x that of unmanned aircraft, high human cost and complicated management
- Frequent maintenance: Due to the aging fleet

Why go unmanned?

Small manned cargo aircraft

- High cost per ton-kilometer: much higher than 737 freighters
- Weather: flights disrupted by low-altitude weather
- Speed: low
- Volume: small, unable to carry larger ULDs
- Range: shorter

Small manned cargo aircraft is not survivable in China, due to the low price of cargo service due to competition.

Why go unmanned?

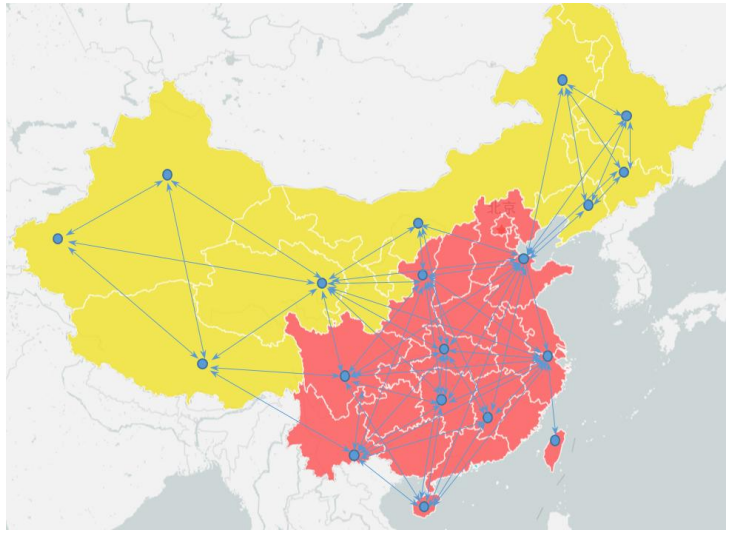
Pilots

- Work away from home: they need to go with aircraft
- Harsh working environment: noisy and with vibration
- Time not efficiently used: little to do when autopilot is working

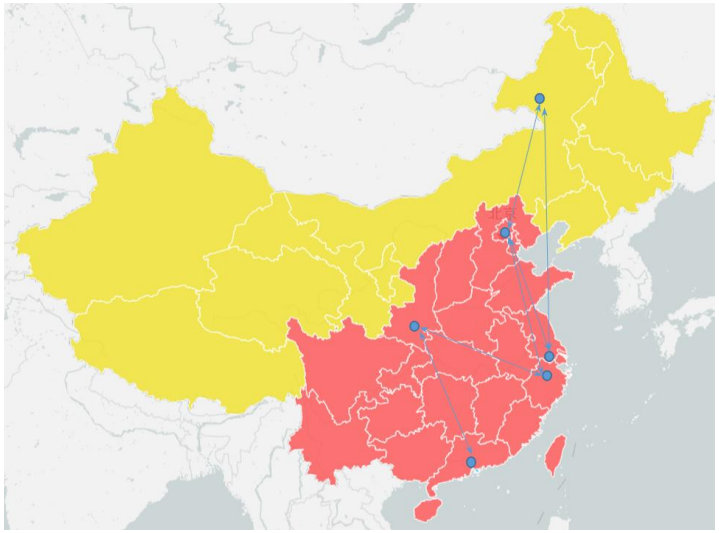
How should it be?

- High population coverage: should be relatively small, e.g., Cessna 408, ATR42 size
- Low ton-kilometer cost: lower than 737F
- Universal usage: can work in most scenarios where manned aircraft work, e.g., bad weather
- Longer range: are better to cover some point-to-point longer routes
- Cross-ocean operation: so it can serve islands
- Well adapted into current manned aviation operation system: so it can be easily accepted
- High safety: basic requirement for mass operation

What scenario to use?



General point-to-point

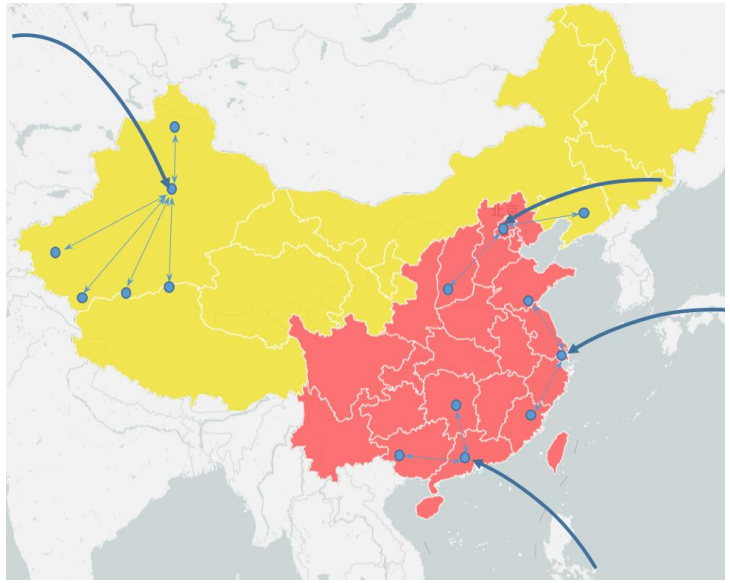


From large major origin to major cargo destination

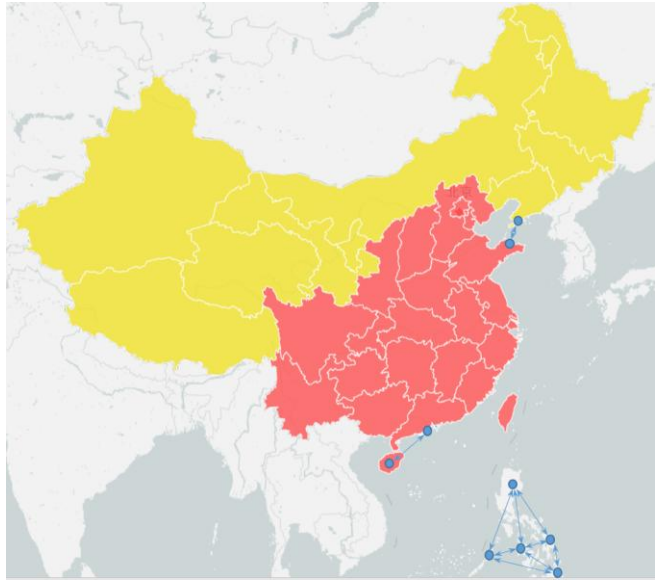
Routes between hubs for hub-spoke mode

Spoke routes for hub-spoke mode

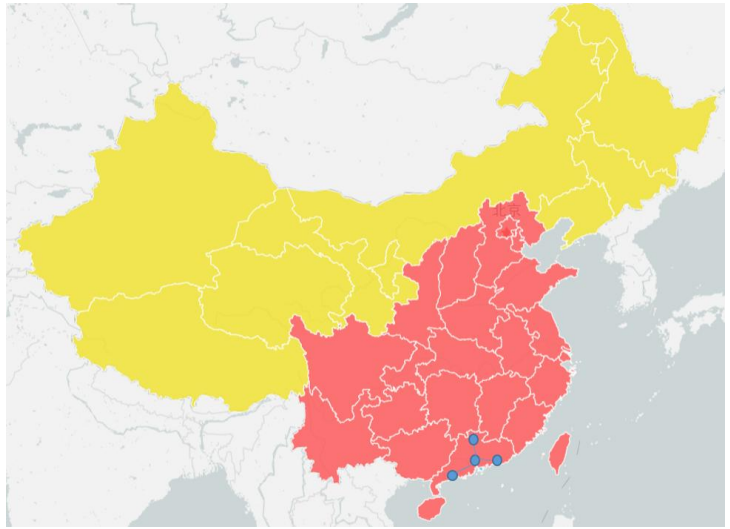
What scenario to use?



Connections for international flights



Cross-ocean flights



Short routes that are not sensitive to prices

Flights over complicated terrain

AirWhiteWhale W5000:
Largest Unmanned Cargo Aircraft Globally at Present

Wingspan:	22.79 m
Length:	22.90 m
Height:	7.83 m
Max. cruise speed:	526 km/h
Max. take-off weight	10.8 tons
Max. payload:	5 tons
Volume:	>65 m³
Range:	up to 2,600 km
Runway Length:	800–1,200 m

AirWhiteWhale W5000: Largest Unmanned Cargo Aircraft Globally at Present

- Non-pressurized cargo hold and optional pressurized cargo containers when needed, reducing weight
- Square-section fuselage, increasing space utilization
- Rear cargo door
- Ultra-large capacity fuselage, up to 65 cubic meters, to adopt low-density express delivery goods
- Primarily composite material structure, corrosion-free and fatigue-free, reducing maintenance costs
- Powered by two 900 kW-class turboprop engines
- Autonomous flight, much more intelligent than autopilot
- Monitoring staff on the ground to monitor the status and communicate with Air Traffic Control, and ground pilots to deal with emergencies and give major commands

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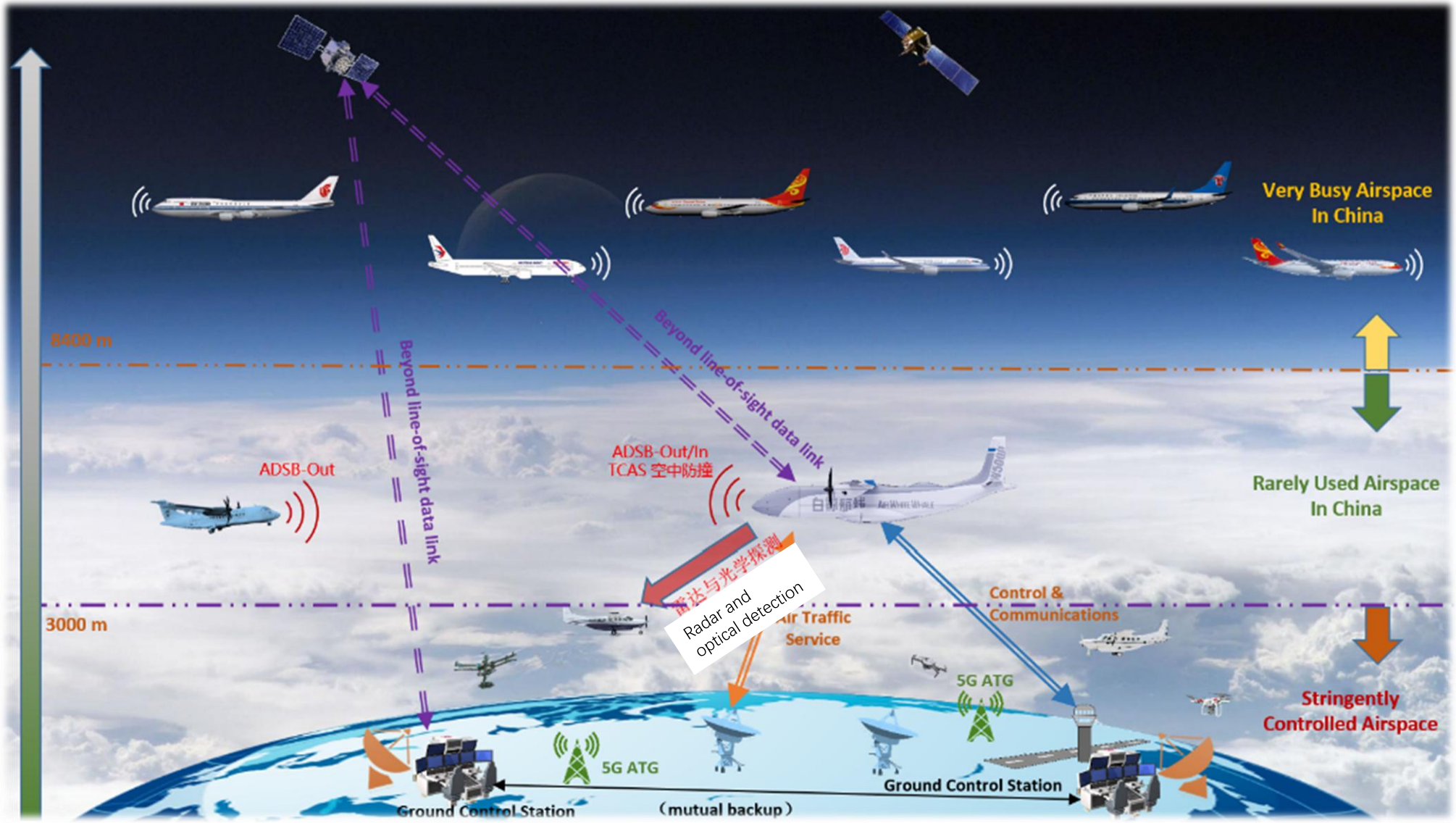
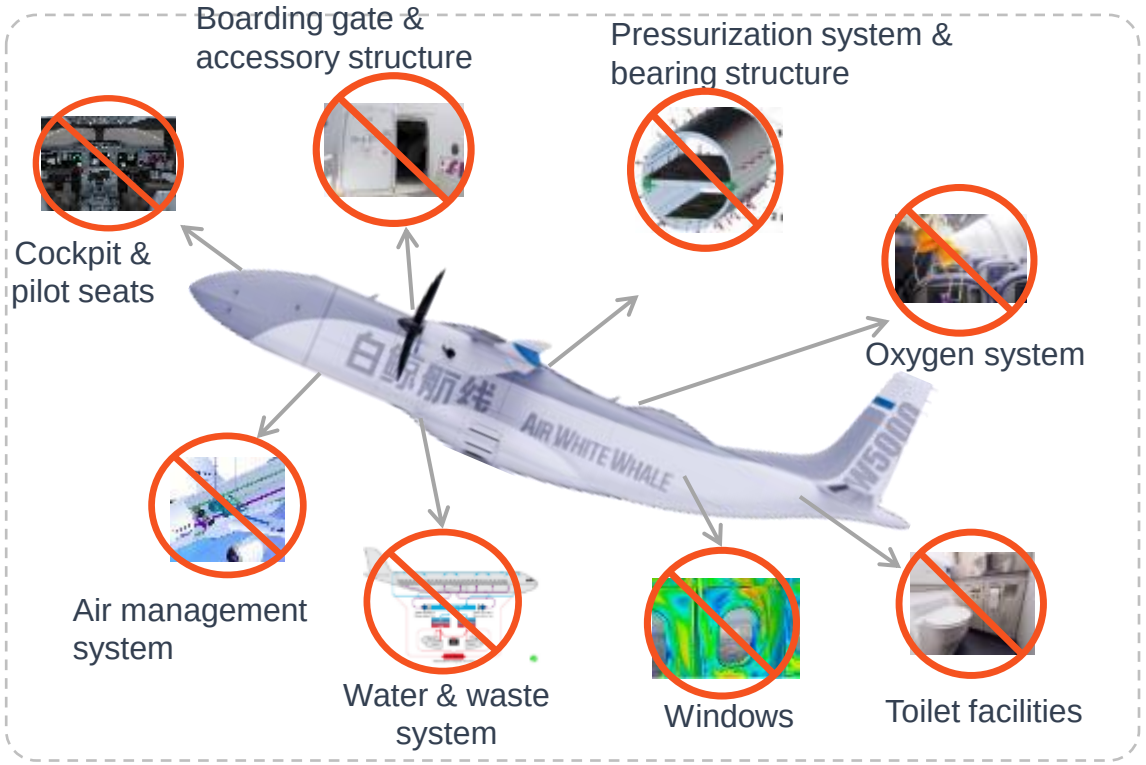
W5000 control



Why low cost?



- **8 major systems removed, aircraft system weight reduced by 34%, price per aircraft reduced by 15%**
- **6 pilots removed for each aircraft**
- **Much simpler structure and systems, reducing cost**
- **Non-pressurized cargo hold, weight reduced**
- **Square-cross-section fuselage, space saved, weight reduced**
- **Can operate nearly 24 hours a day, better utilization rate**
- **15-min. stop-over time, better utilization rate**
- **52% composite structure by weight, less maintenance**

W5000 vs. ATR

ATR42-300F

W5000

	Cargo volume (m^3)	Operation empty weight (kg)	Direct operation cost (ton-km)
ATR42-300F	~51	~10,029	~6.12
W5000	65 (↑ 27%)	~6,000 (↓ 40.1%)	~2.7 (↓ 57.1%)

Responses from unmanned cargo aircraft

More stable and controllable than belly cargo

Fully controlled by operator

High coverage of population

More than 90% of China's population

Low operation cost compared to manned small and large cargo aircraft

40% lower than 737 per ton-km

Great working environments for ground pilots

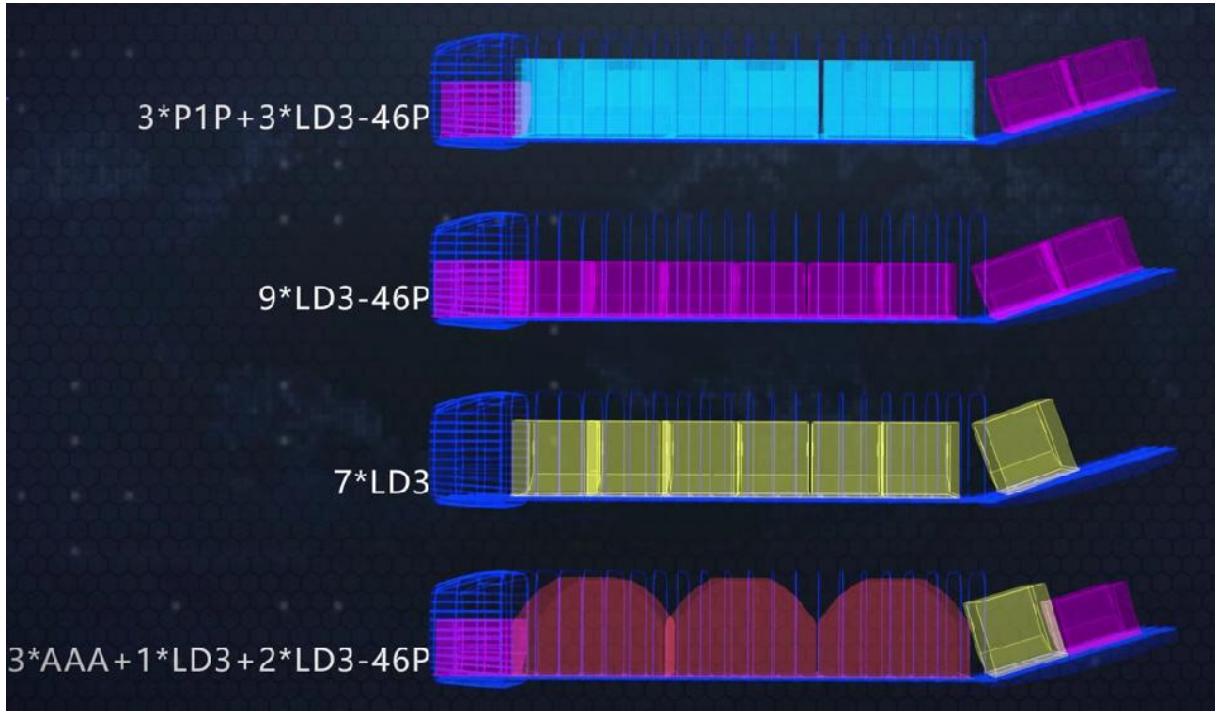
Work at headquarters; no need to sit on aircraft or fly far away from home; and one group of flight crew can control

7 aircraft

W5000: totally different from traditional UAV

- Positioned as a universal cargo aircraft
- Designed and manufactured using the approach, standards and supply chain of manned aircraft
- Operational scenarios as diverse as manned aircraft, with minimal operational restrictions
- As safe as manned aircraft
- As reliable as civil aviation aircraft
- Capable of operating in densely populated areas
- Integrated flight with manned aircraft
- Capable of flying fixed routes like civil aviation aircraft, or flexible temporary routes
- Operates on national civil aviation routes, or flies low-altitude routes
- Integrated into the civil aviation air traffic control network
- Capable of taking off and landing at both general aviation airports and civil aviation airports
- Capable of operating at high-altitude airports
- Capable of operating in adverse weather conditions
- Capable of continuous operation
- Capable of carrying most common cargo containers and pallets
- Utilizes standard cargo handling equipment

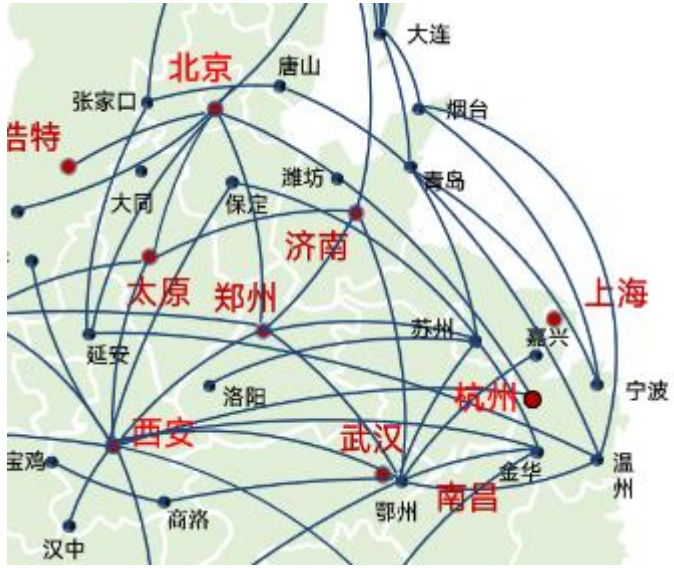
W5000 cargo hold



12 types of ULDs (containers: LD3, AAA(AAY), LD6, LD3-45W, LD9, Demi, LD8; pallets: P1P, LD3-46P, P9P, FQA, 62” pallet for ATR); the most flexible cargo system, without loading maps, but free to load different types of ULDs; to directly transfer ULDs from different manned freighters without re-packaging

Allow 10m ultra-long cargo, which is only possible on 747 for civil aircraft

Point-to-Point Mode Reconstructs Aviation Logistics Network



Point-to-Point Flight Mode
(small hub)

Hub Air Cargo Mode

Denser Network

Higher Timeliness

Lower Cost

Air logistics network reconstructed

Explosive growth in air cargo volume

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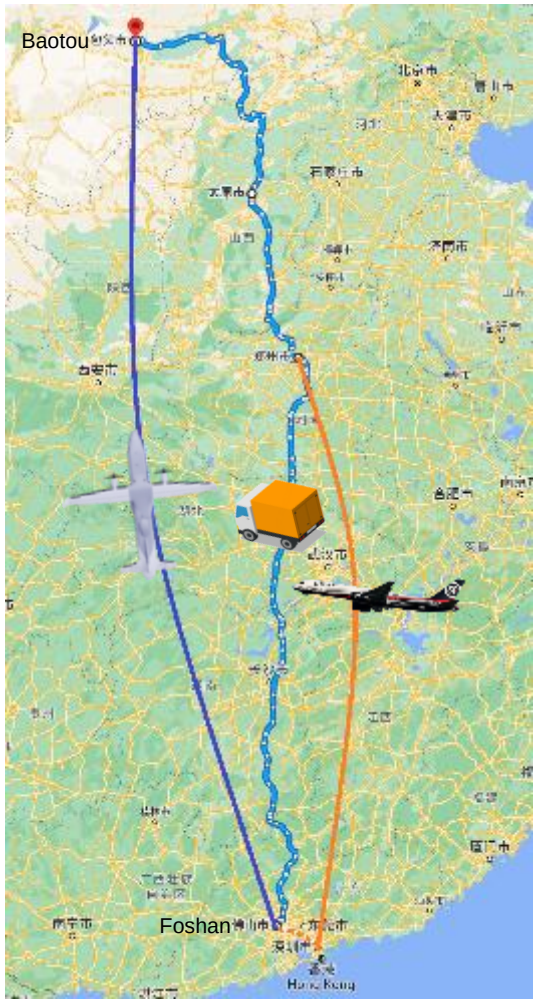
Direct Flight Mode is the Optimal Air Cargo Solution

Comparison of Transportation Alternatives from Foshan to Baotou



SF Speedy Express

¥ 77

Sorting Sorting Sorting

Foshan Shenzhen Zhengzhou Taiyuan Baotou

48h

SF Standard Express

¥ 45

Sorting Sorting

Foshan Zhengzhou Taiyuan Baotou

72h

AirWhiteWhale Solution

¥ 56

Foshan Baotou

8h

cost-benefit ratio
(RMB-hour)

3696

3240

448

>8x

Hub Mode: multiple sorting, higher cost, higher loss

Direct Flight Mode: lower cost, higher timeliness, less loss

*Take express delivery of 4KG items as an example. The express price advantage of items within 1kg is more significant. Data for Nov. 2022

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W5000: Adapted to Current Aircraft Operation System

- Same Air Traffic Control mode
- Same general aviation and civil transportation airports to use
- Same air routes
- Same surveillance mode
- Same ground staff
- Same cargo loading
- Same ULDs
- Same ground operation
- Same navigation system
- Same departure and arrival procedures for airports
- Same safety level as manned aircraft
- Better collision avoidance
- Better pilot working environment
- Better communication between ground staff and pilots
- Better communication between AOC and pilots
- New ground station and data link

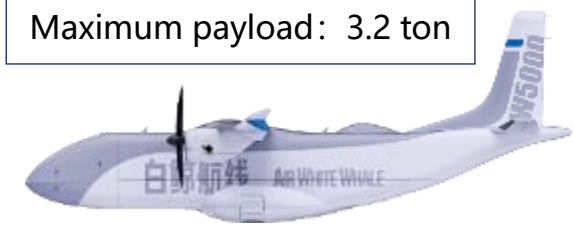
W5000 vs 737F

	W5000	737F class manned cargo aircraft
Direct operation cost	2.69 RMB/ton-km √ √ √	4.7 RMB/ton-km √ √
Effective population coverage	90% of all √ √ √	Only large airports, cannot cover smaller cities and rural area √ √
Air route resource occupied per unit cargo	Higher √ √	Lower √ √ √
Speed（km/h）	526 √ √	800 √ √ √
Range（km）	2600 √ √	~4000 √ √ √
Total timeliness	Direct flight, faster √ √ √	Faster speed, but needs transfer √ √
Airport adaptability	GA airport and non-busy civil aviation airport √ √	Civil aviation airports, mega airports √
Air route application	Easy, due to lower flight altitude and less flights of general aviation airport √ √ √	Difficult, due to flights in the air route and busy civil aviation airports √
Automation level	High automation level between aircraft, ground station, ground staff, and AOC √ √ √	Partly automated √ √
Life	>25 years √ √ √	<15 years, because it is converted from old aircraft √ √
ULD type	12 types √ √ √	3-5 types normally √ √
Communication between AOC and pilot	Data link to transfer everything √ √ √	Other dedicated approach, e.g., ACARS, needing payment √ √
Communication between ground staff and pilot	Dedicated client device √ √ √	Earphone and hand gesture √ √
Pilot recruitment and management	Easy, less, no need to fly away, good environment √ √ √	Relatively difficult to recruit √ √

W5000 Family

- Regional cargo aircraft in the United States mainly carries 1.7 tons, 2.7 tons, 5.6 tons and 8 tons of cargo.
- China's population is 4 times that of the US, and its total express parcel volume is about 5 times that of the US (2021 data).
- China has 303 cities with a population of more than 1 million; the US has 10.
- China express business requires a cargo plane with a larger cargo capacity (more detailed calculations are available).

W5000S Shorter
Maximum payload：3.2 ton



W5000 Standard
Maximum payload：4.8 ton

W5000L Long
Maximum payload：8 ton

Cessna 208B
Maximum payload：1.7 ton

Cessna 408
Maximum payload：2.7 ton

ATR 42
Maximum payload：5.6 ton

ATR 72
Maximum payload：8 ton

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Orders

Currently, W5000 has accumulated 300+ orders from 12 customers.

Order-signing ceremony with Kuayue Express