

AIAA Aerospace Sciences Meeting, Reno NV 10-13 Jan 05

Configurable Air Transport (CAT)



Mike Snead, P.E.

**Agile Combat Support Lead
Air Force Research Laboratory**

12 Jan 05

**The views and opinions expressed are those of the author
and do not represent the views or opinions of AFRL**

Distribution A: Approved for public release, distribution unlimited



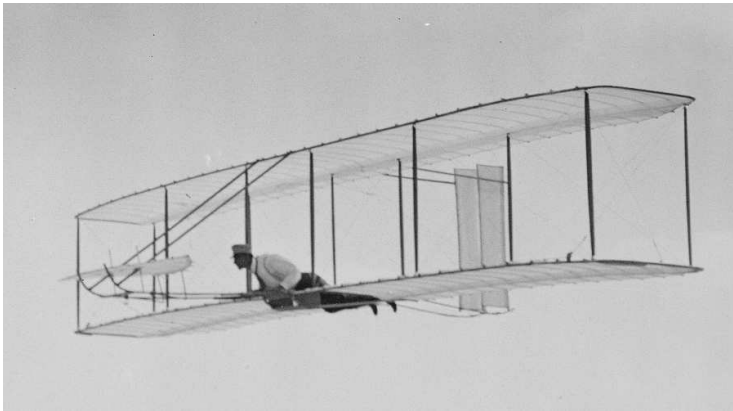
Presentation Outline



- **Brief history of aircraft designs**
- **Benefits of cargo containerization**
- **Fairchild modular aircraft – XC-120**
- **First version of the CAT**
- **Updated version of the CAT**
- **Tanker and airlift mission applications**
- **Cross-platform utilization**
- **Commercial applications**
- **Conclusions**

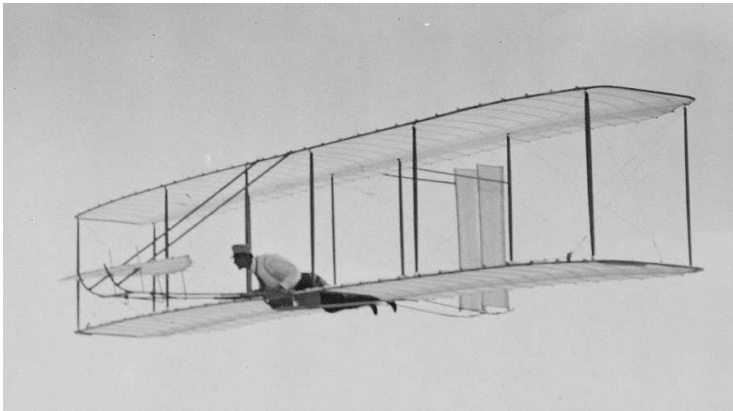


Aircraft Design History





Aircraft Design History



Vincent Burnelli-designed UB-14 (1934)



Traditional Cargo Loading



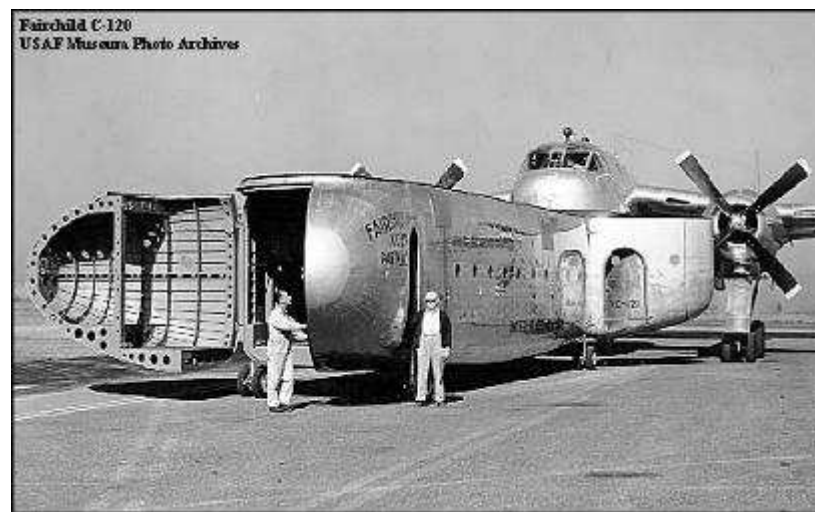
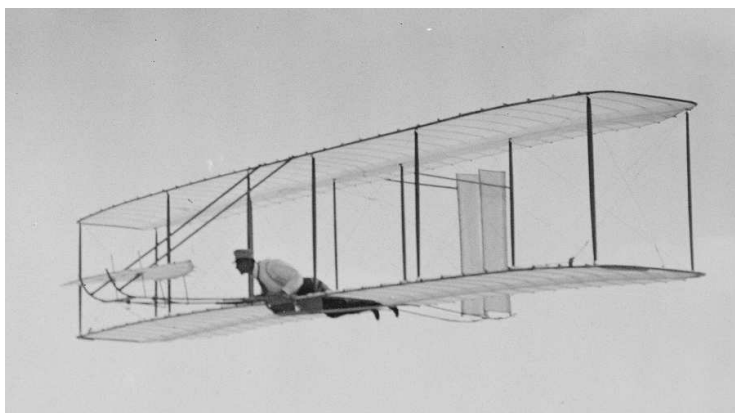


Containerization of Cargo





Aircraft Design History





New Air Transport Options

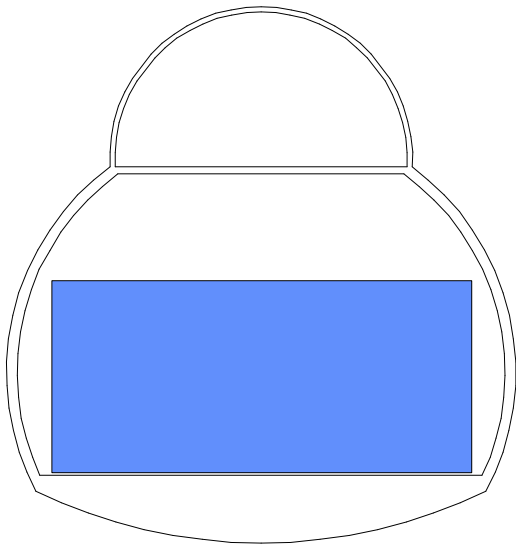


Configurable Air Transport (CAT)

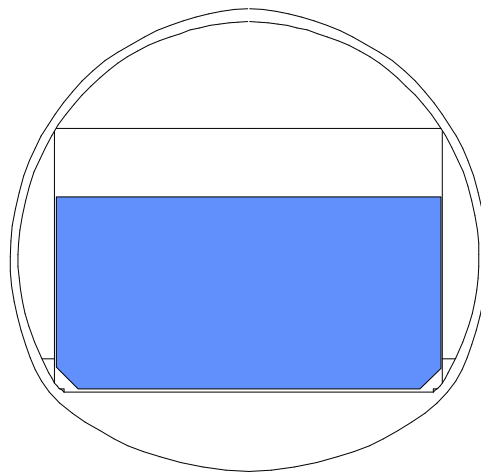
- Multi-mission reconfiguration
- Bare base opening
- Rapid / early force deployment
- Air “basing” airpower projection
- Homeland defense



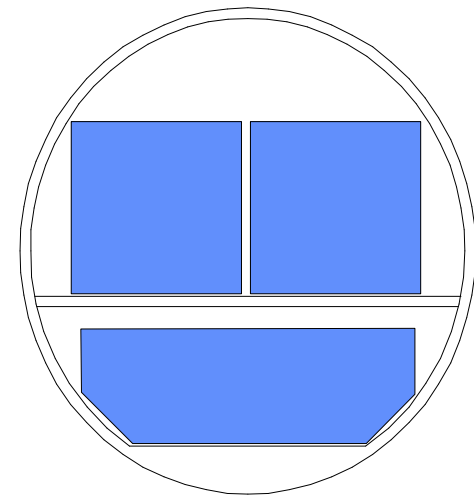
Wing-Body Cargo Configurations



C-5



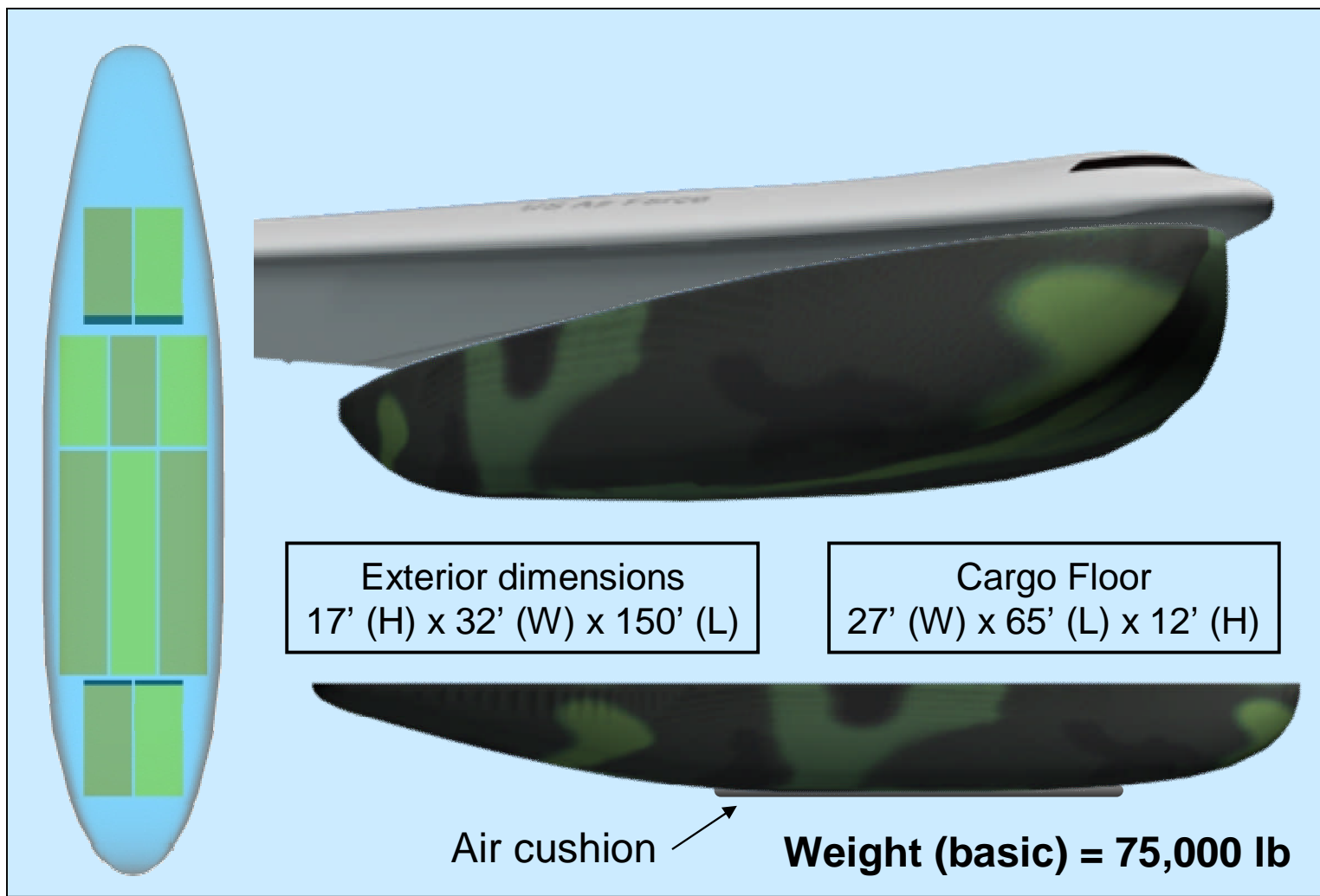
C-17



747-400



Original CAT Module

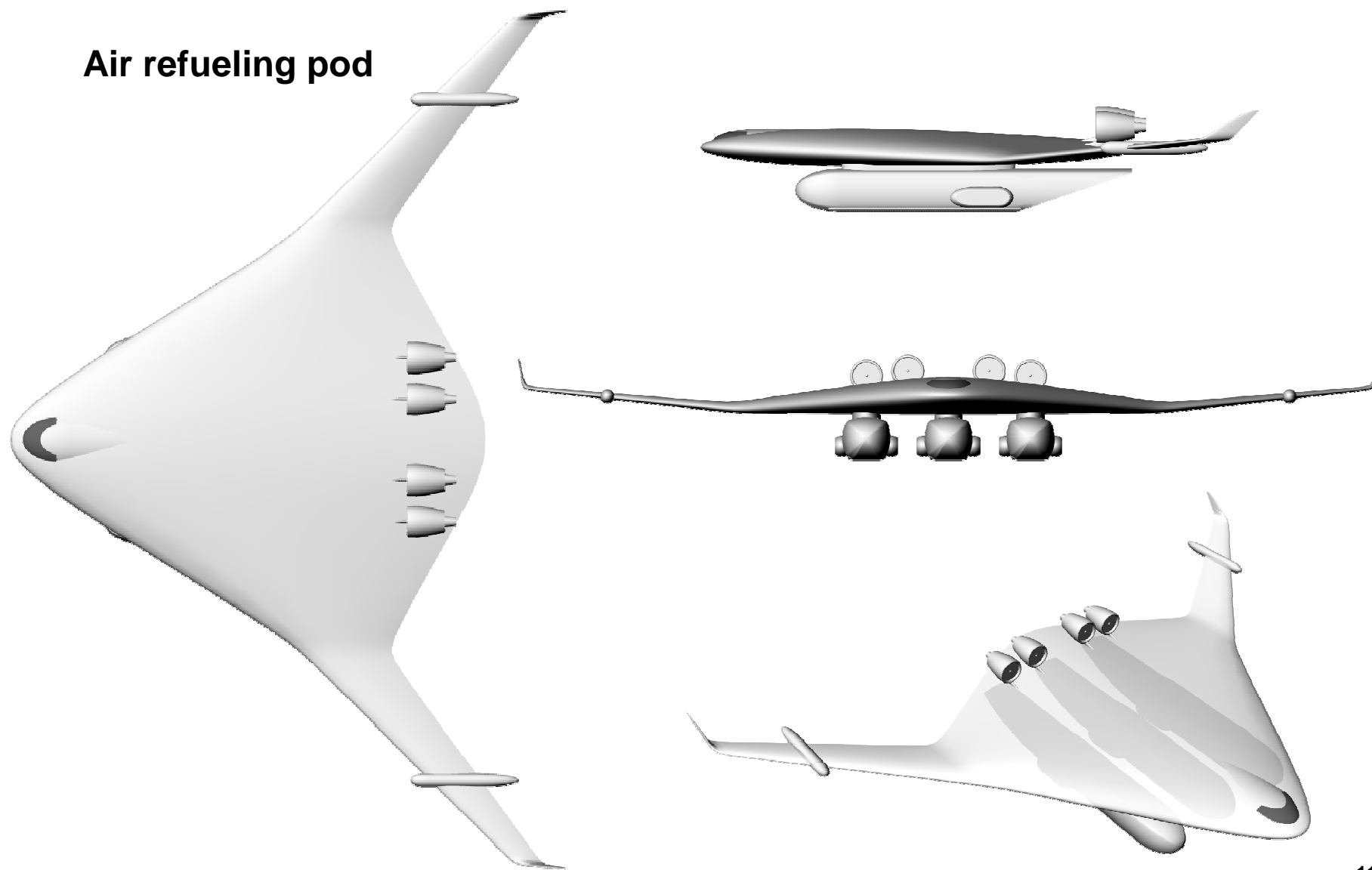




Updated CAT "Sketch"



Air refueling pod



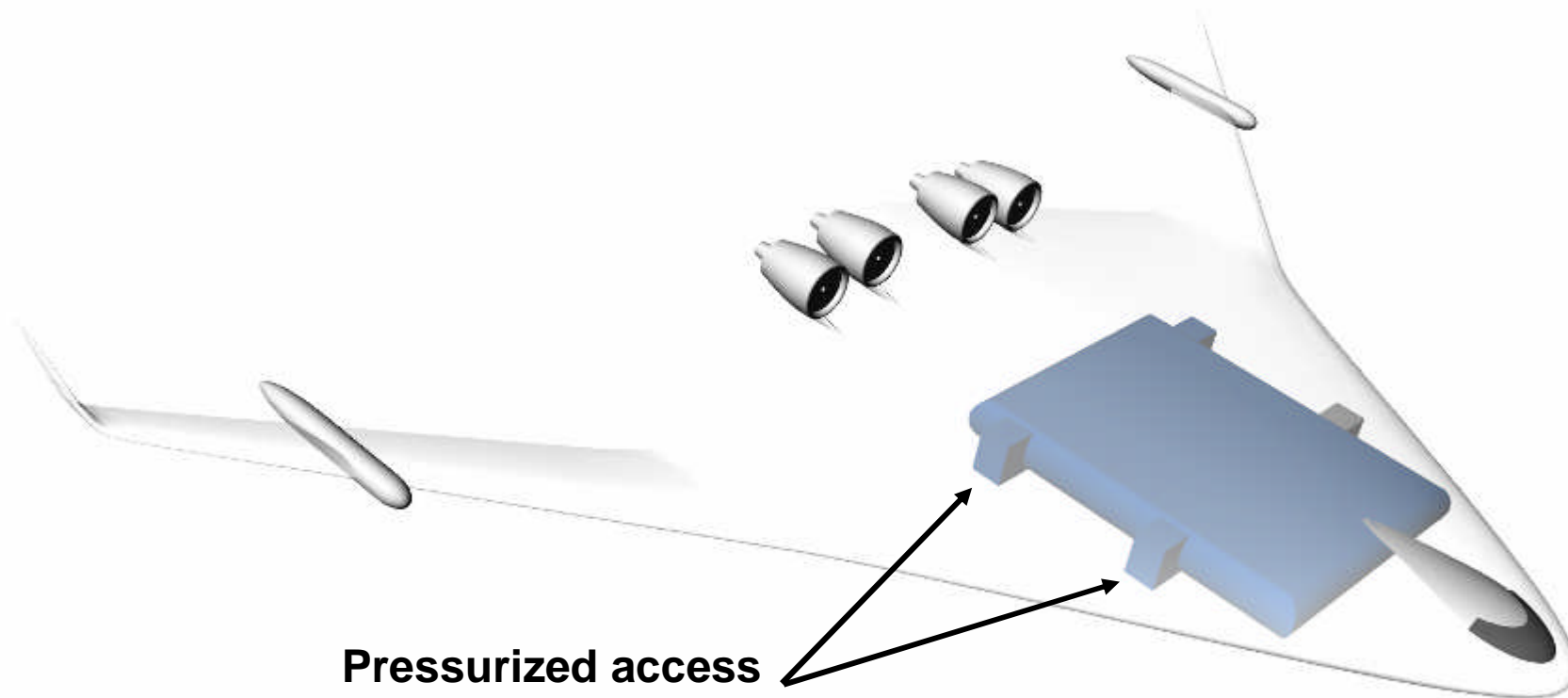


Internal Compartment



Over 2,000 sq. ft. of internal pressurized compartment (7 ft ceiling height)

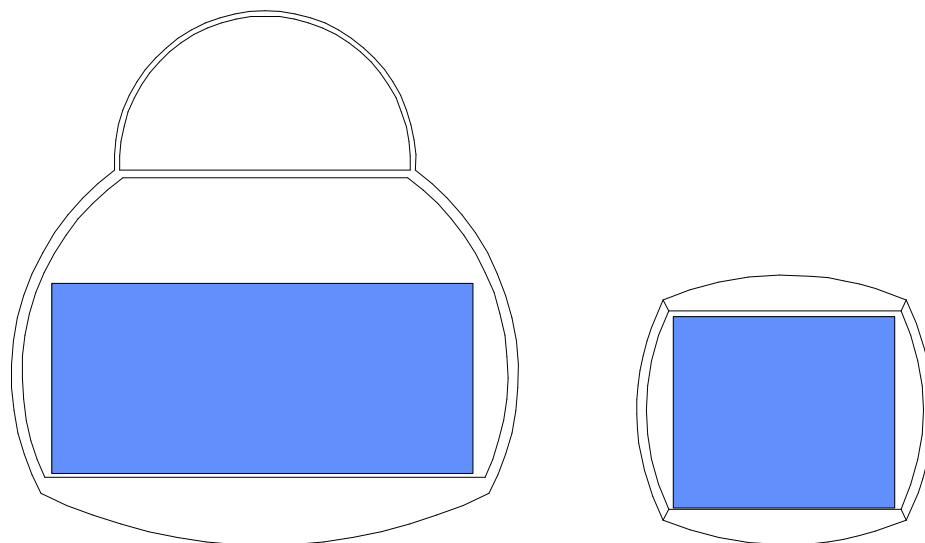
- Passenger transport
- Long duration mission (e.g., AWACS) crew rest



Pressurized access
to outer modules



C-5 & Updated CAT

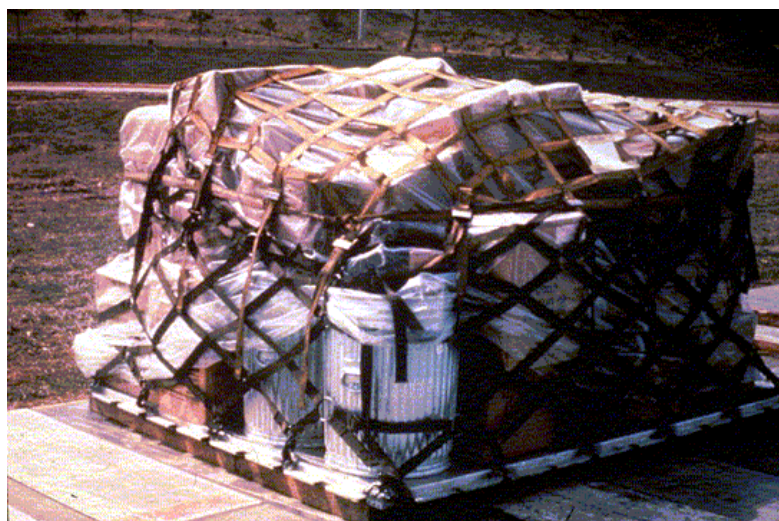


CAT Module



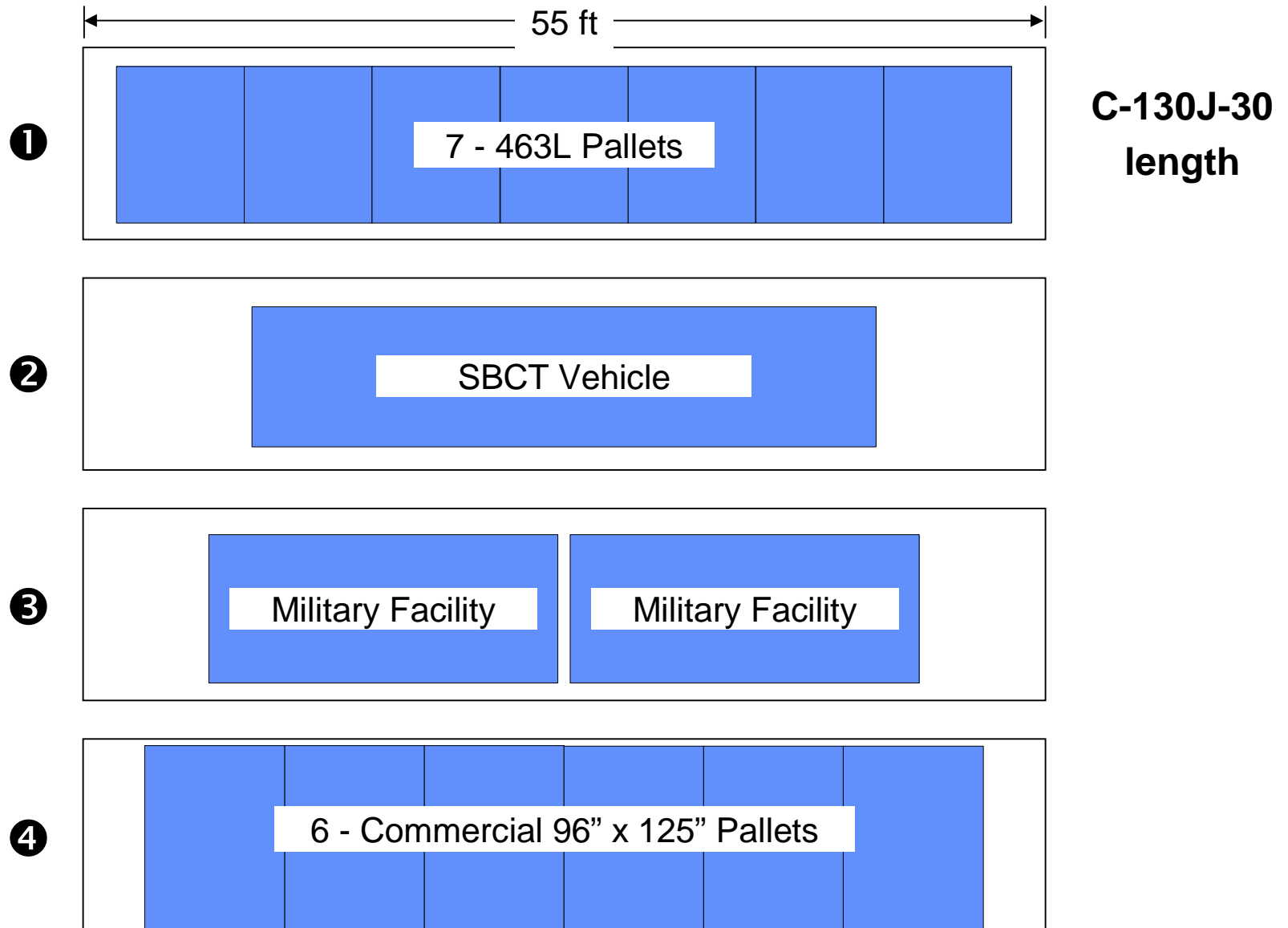


Module “Sizing” Payloads





Updated CAT Module Floor

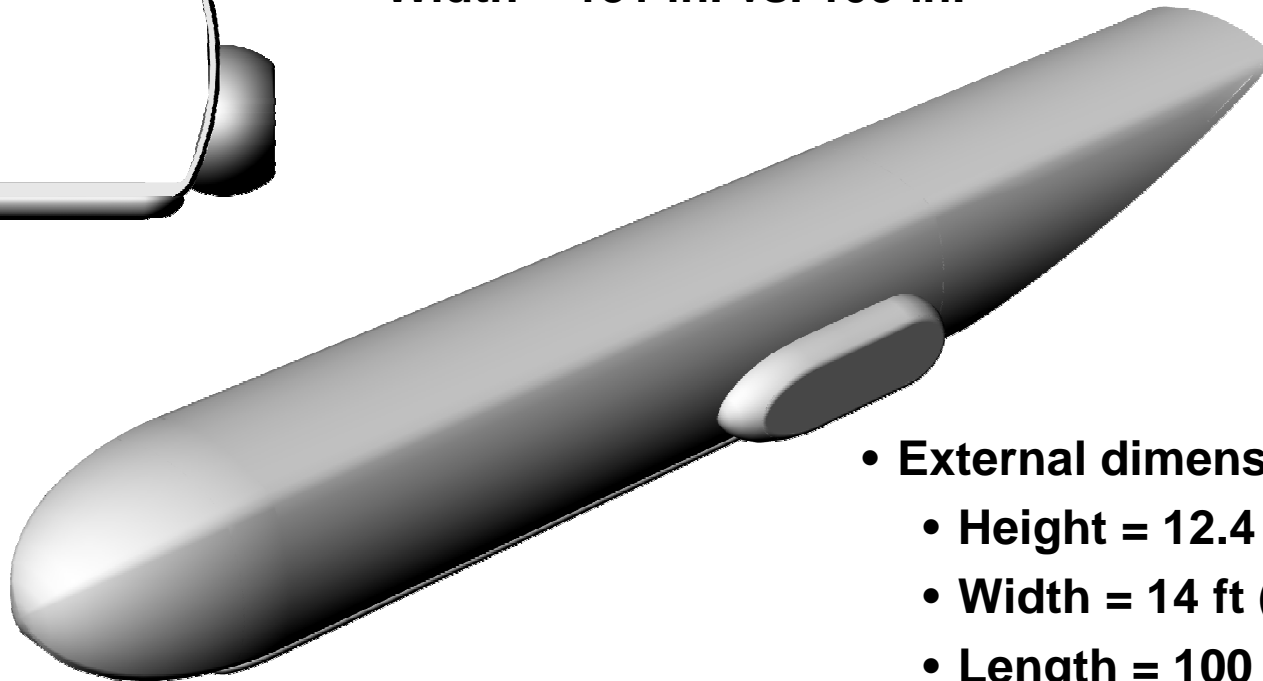




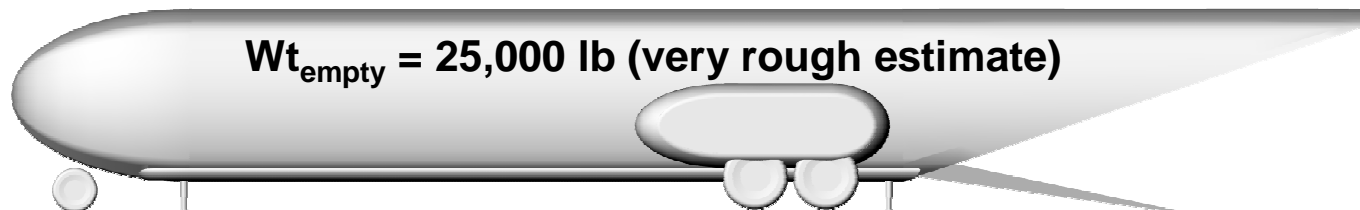
Updated CAT Module



- Internal dimensions vs. C-130
 - Height = 112 in. vs. 107 in.
 - Width = 131 in. vs. 109 in.

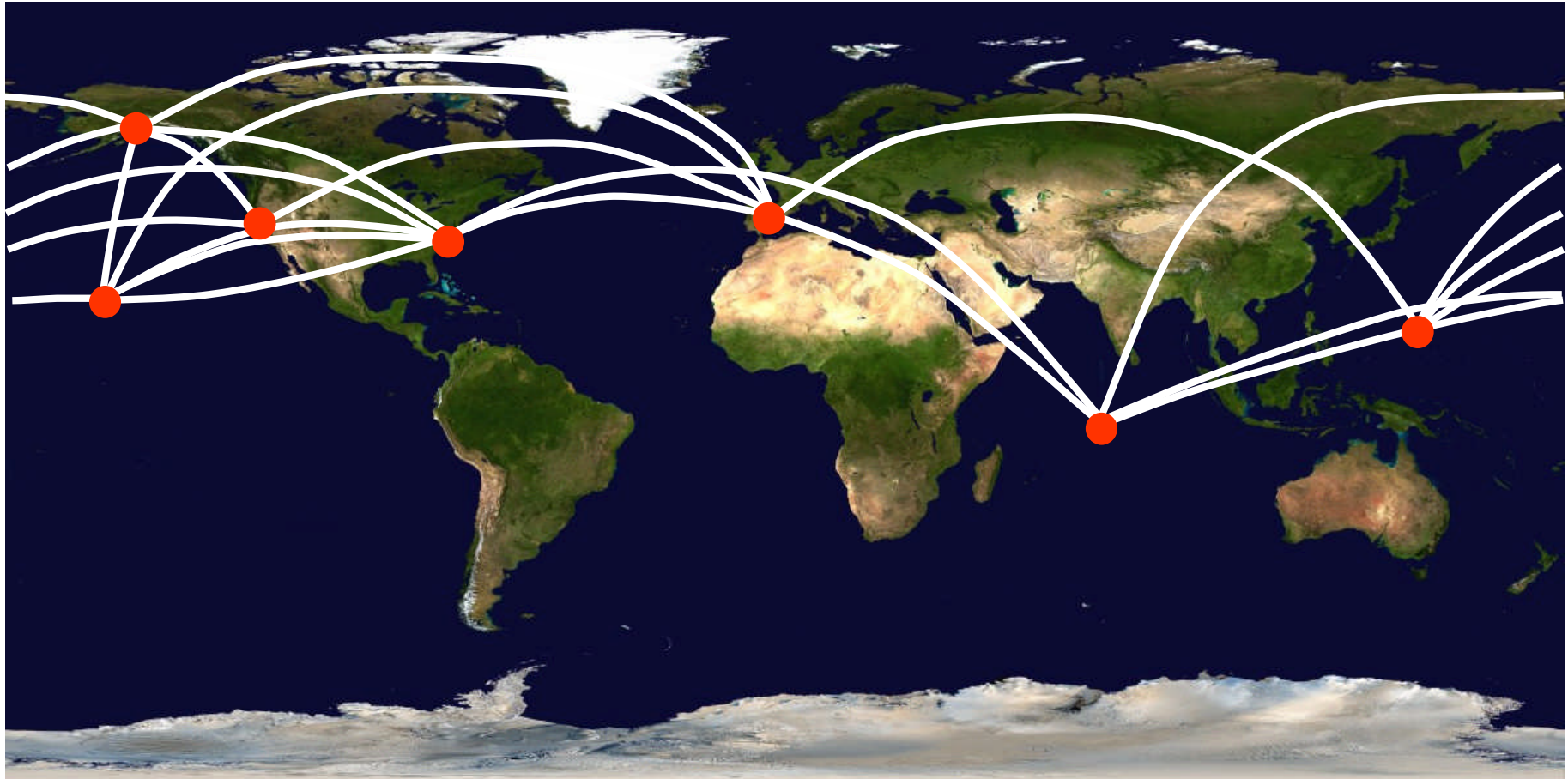


- External dimensions
 - Height = 12.4 ft
 - Width = 14 ft (w/o wheels)
 - Length = 100 ft





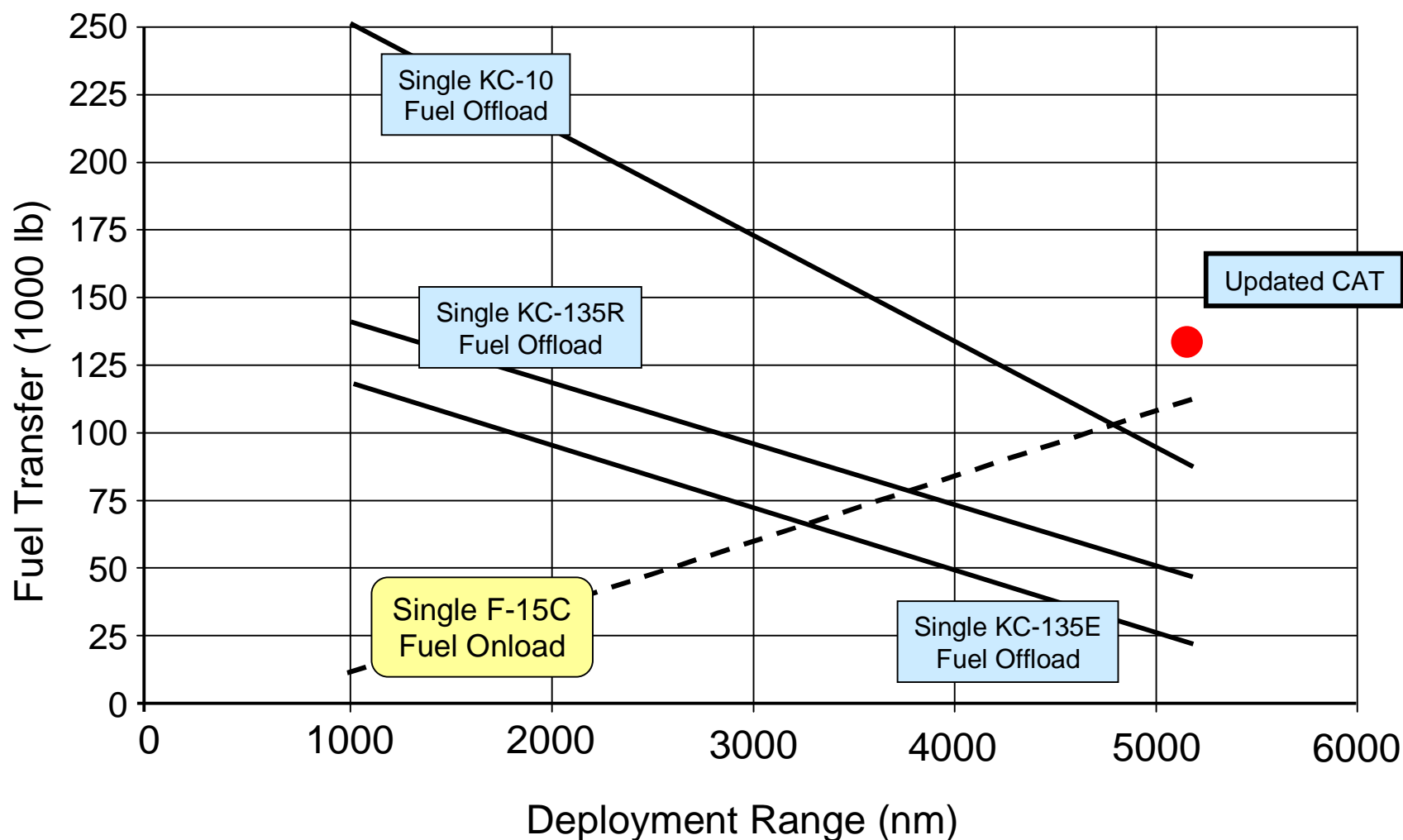
CONUS APOEs & GLOBAL FSLs



- Longest direct great circle distance = 4,500 nm (design distance = 5,200 nm)
- Longest great circle route = 8,800 nm (design distance = 10,000 nm)



KC-10, KC-135E/R, Updated CAT



Source: Air Force Pamphlet 10-1403

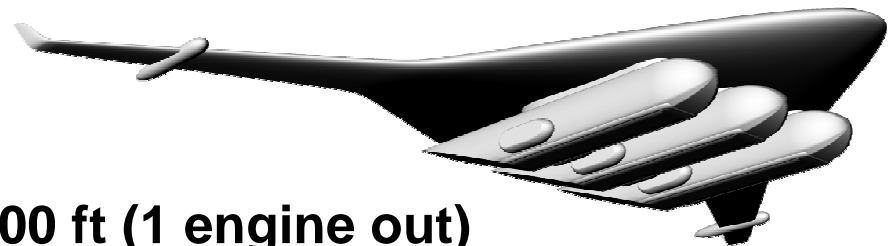


Updated CAT Characteristics



**Rough
estimates**

- **Cargo configuration**
 - TOGW = 650,000 lb
 - Design payload = 168,000 lb (3 average wt modules)
 - Design payload = 154,000 lb (2 max wt modules)
 - 3 module net payload = 84,000 lb (28,000 lb per module)
 - 2 module max payload = 104,000 lb (52,000 lb per module)
 - Unrefueled range = 5,200 nm
 - Wing span = 259 ft
 - Fuel burn = 147,000 lb
 - Balanced field length = 10,000 ft (1 engine out)
- **Tanker configuration**
 - TOGW = 617,000 lb
 - Fuel offload = 132,000 lb (F/A-22 escort range of 5,200 nm)
 - Balanced field length = 8,000 ft (1 engine out)





Updated CAT Module Payloads



- **Empty Wt = 25,000 lb (rough estimate)**
- **7 463L pallets with avg load of 4,000 lb = 28,000 lb**
- **Army FCS vehicle with max wt = 50,000 lb**
- **2 20-ft military containers or mobile facilities @ 25,000 lb each w/ 463L pallets = 52,000 lb**
- **48 passengers + passenger accommodations = 25,000 lb**



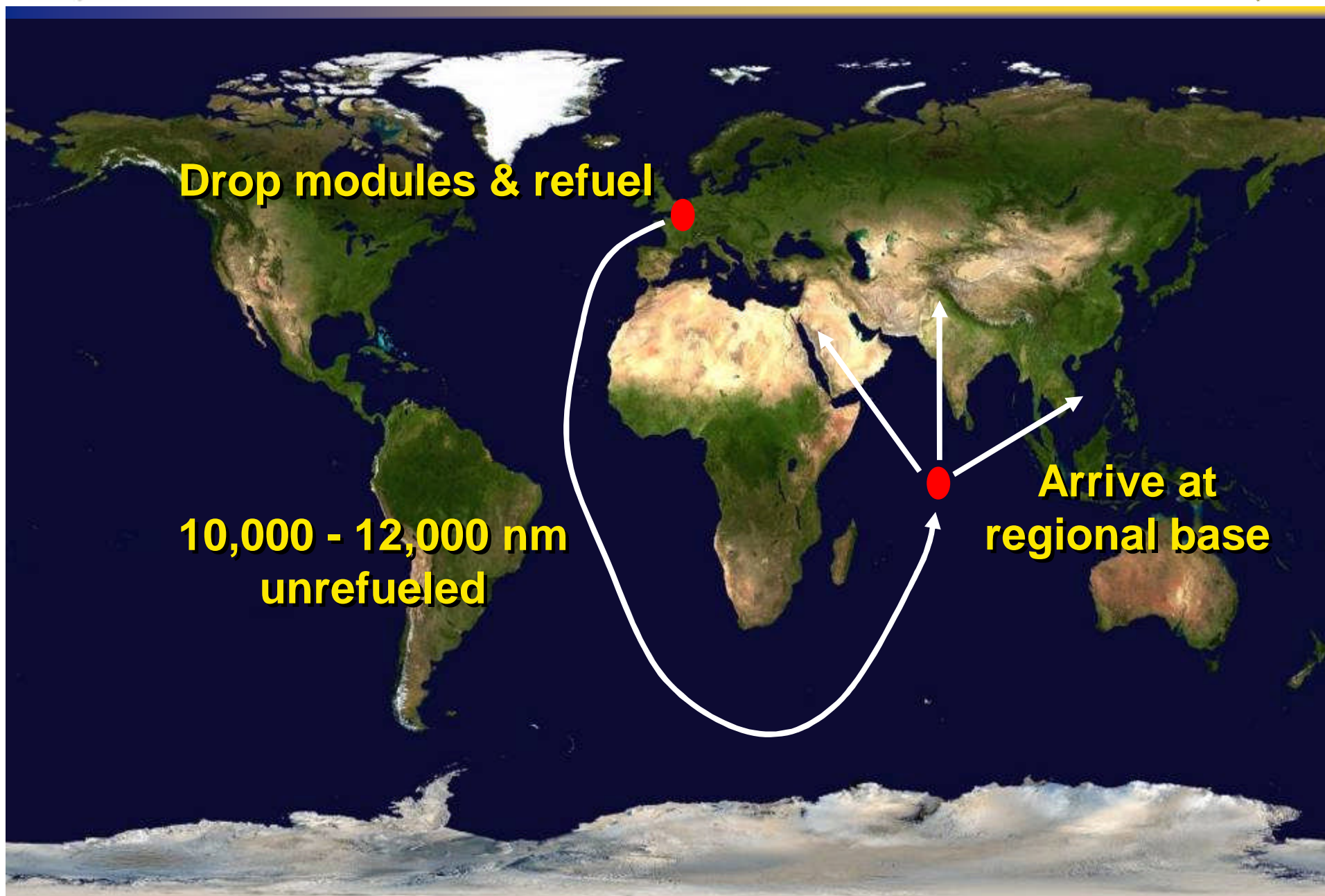
CAT Module Drop



30 minutes to land – taxi – drop modules – taxi - takeoff



24-hr Global CAT Repositioning

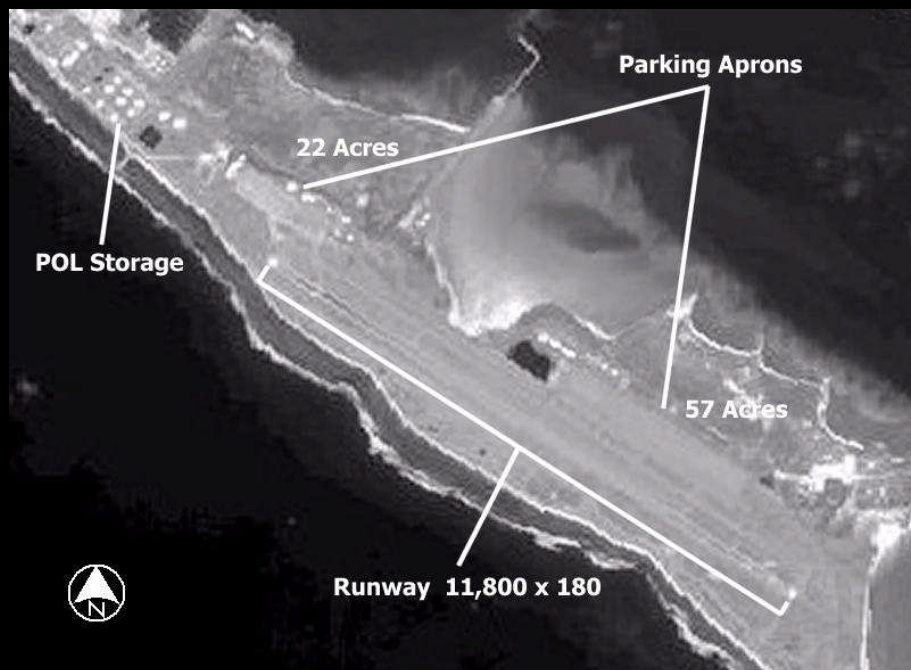




Module Pre-Positioning



Diego Garcia



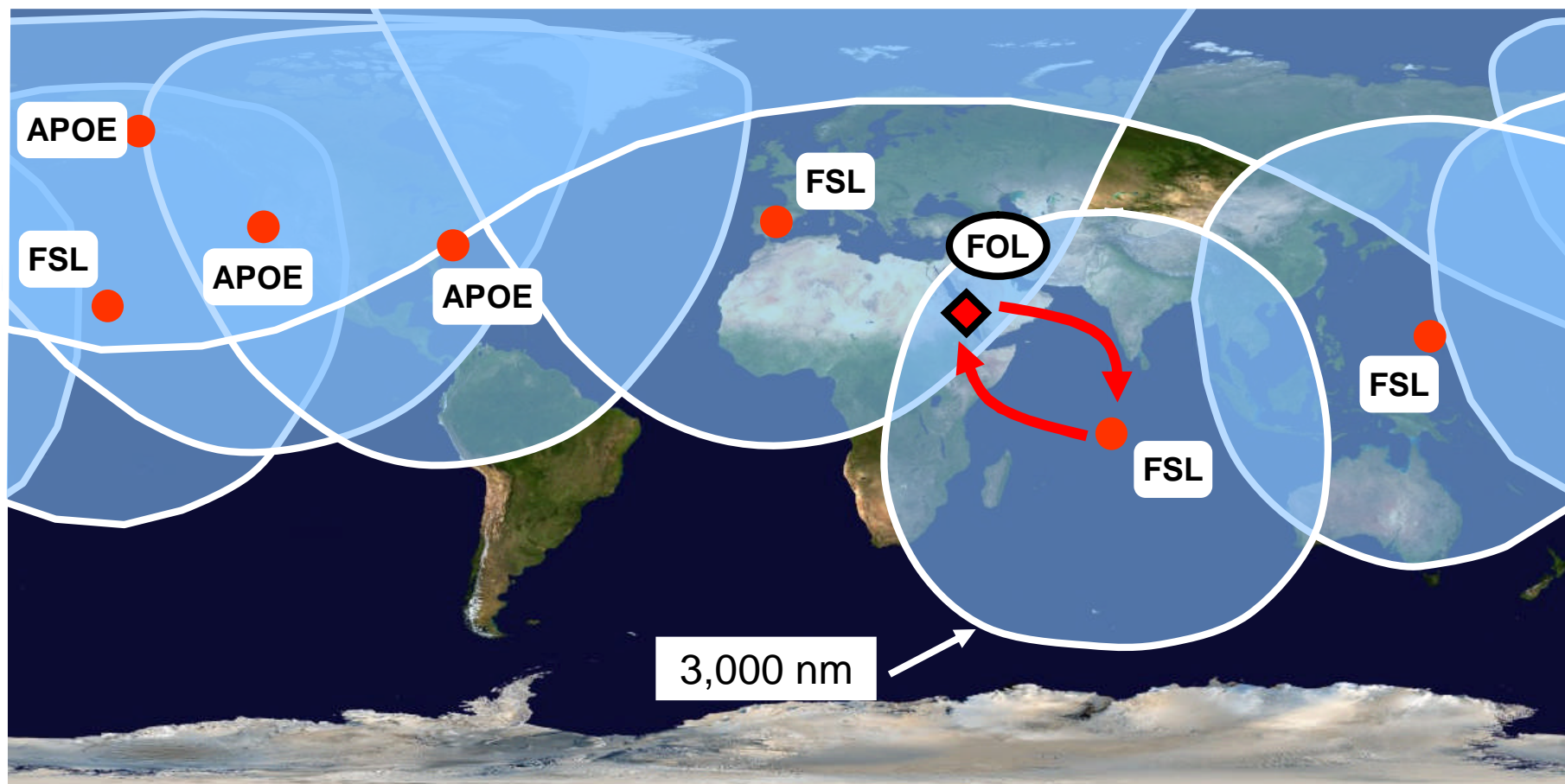


Improved Ramp Utilization



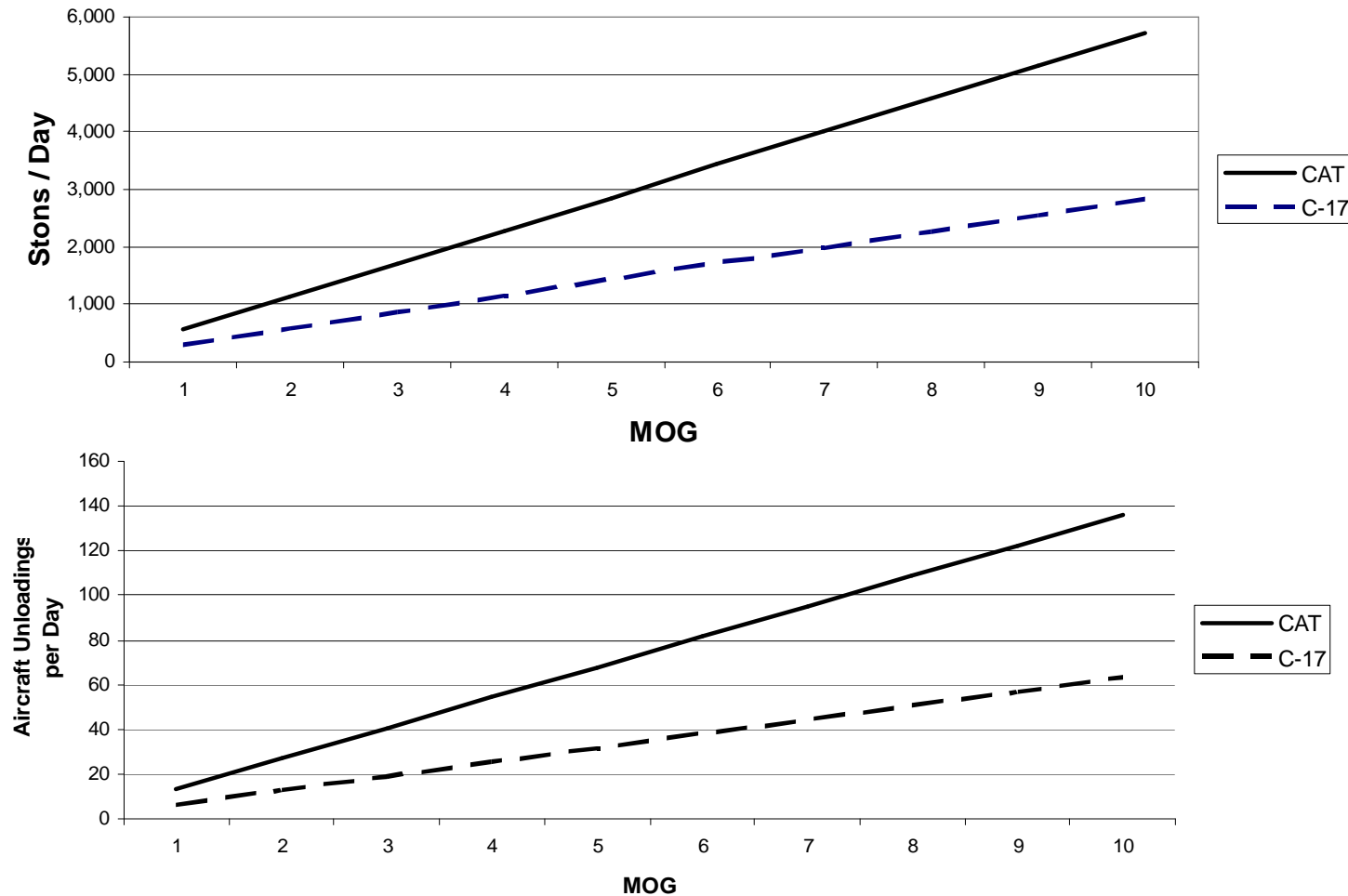


FSL-FOL Air Bridge





C-17 Vs. Updated CAT



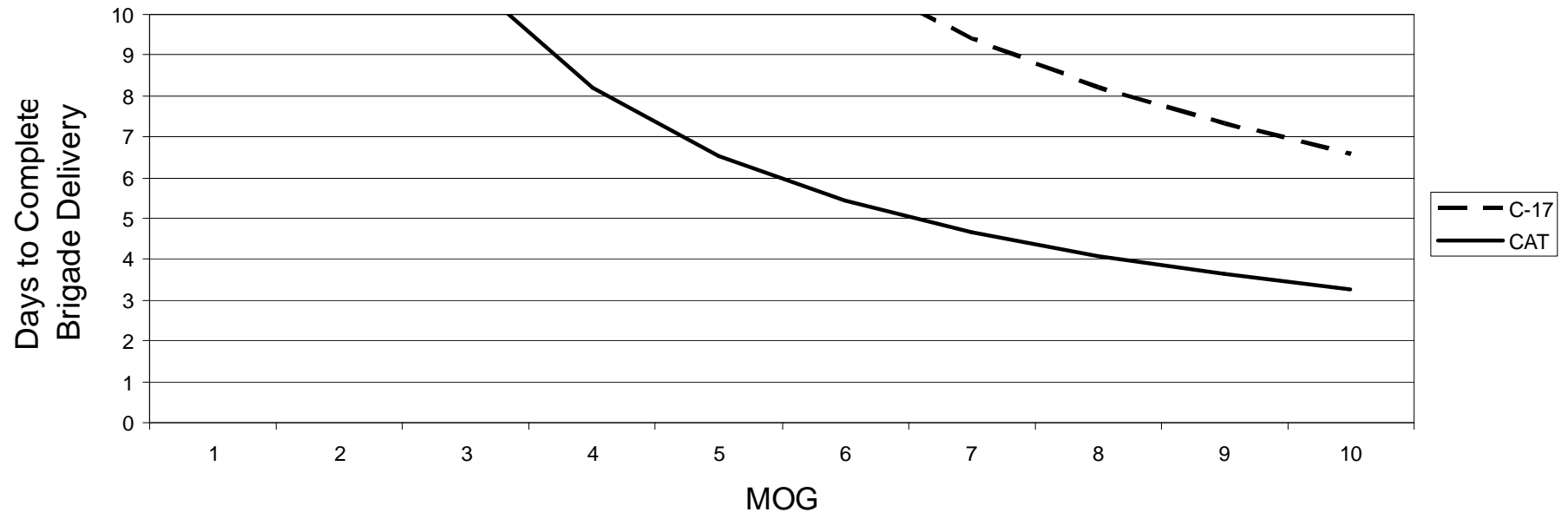
C-17 ground time = 3.25 hours Updated CAT ground time = 1.5 Hours

C-17 load = 45 tons Updated CAT = 42 tons

Queuing efficiency = 85%



Brigade Delivery



- **Army brigade**
 - 14,000 tons of vehicles and equipment
 - 3,500 personnel
 - 2,500 for 3 days of sustainment
 - 1,000 Air Force personnel
 - 900 tons of equipment
- **C-17 delivers 18,550 tons***
- **Updated CAT delivers 18,700 tons***

- **CAT delivery w/o refueling**
 - 10 min. land/taxi
 - 15 module demate
 - 20 min. taxi/position
 - 15 min. mate
 - 20 min. anomaly resolution
 - 10 min. taxi/takeoff
 - **90 minutes**

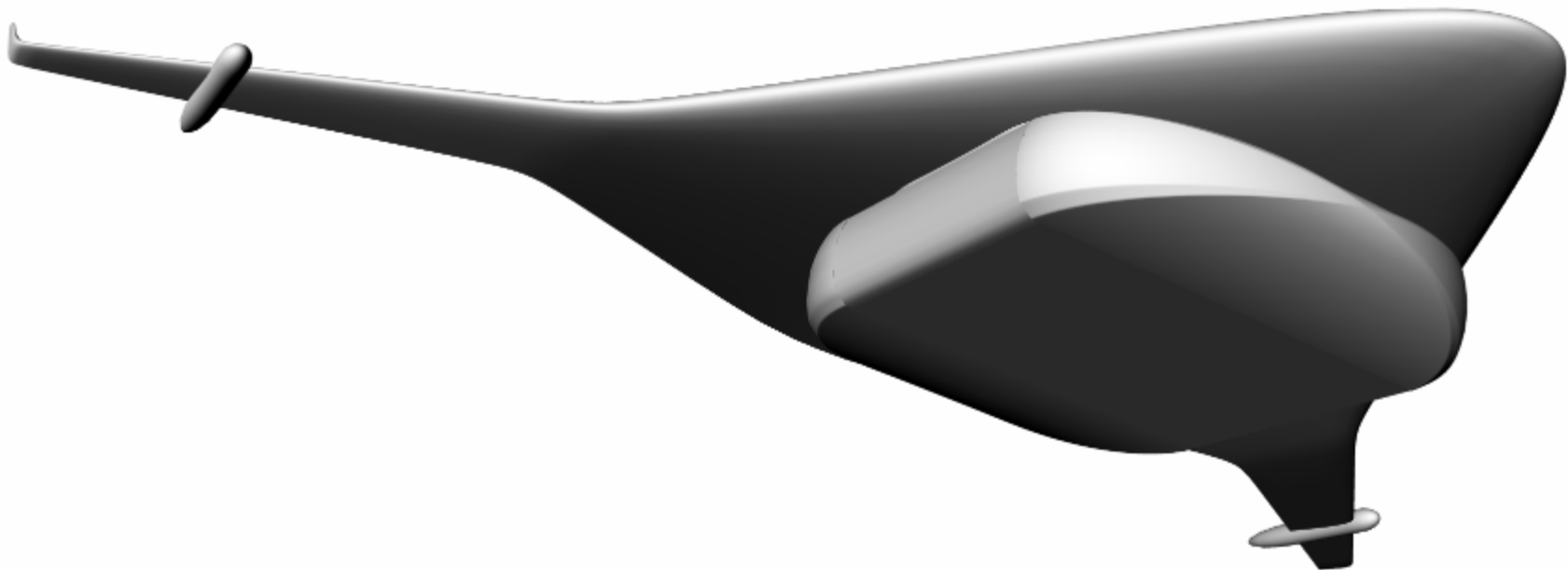
* - passengers converted to equivalent payload; yields slightly different values



Super Module



- Nearly 3,000 sq. ft. of floor area
- Used for
 - AWACS, JSTARS, Flying command posts
 - Fwd bare base facilities

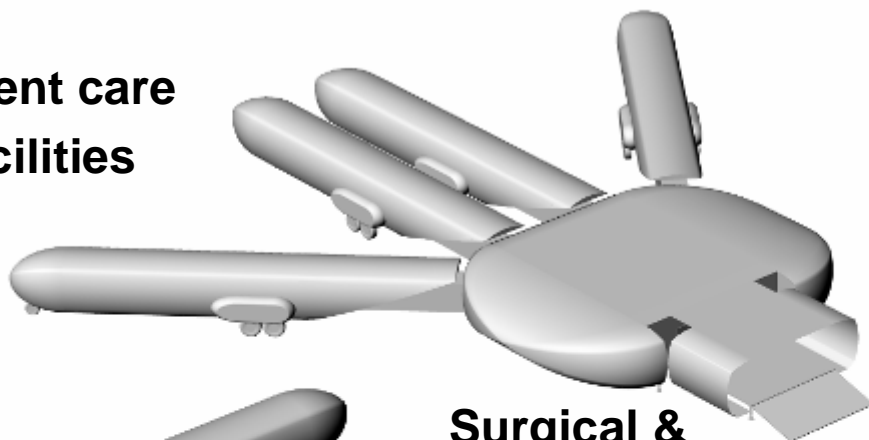




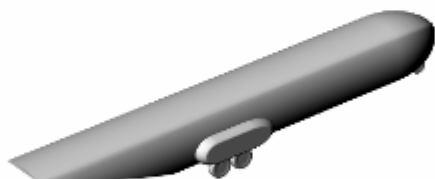
Fwd Hospital



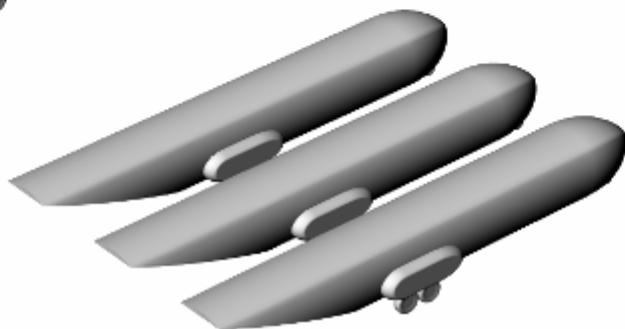
Patient care facilities



Surgical & diagnostics

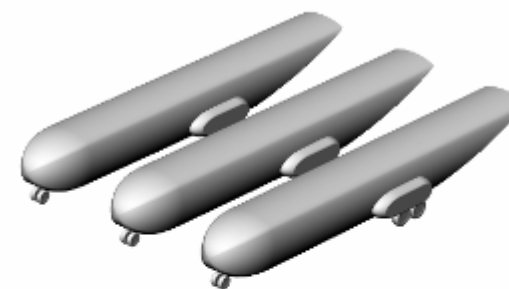
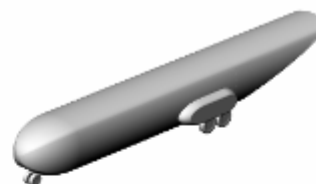


Water



Supplies

Power generation



Rest quarters

Ambulance drop-off point



Cross-Platform Module Movement

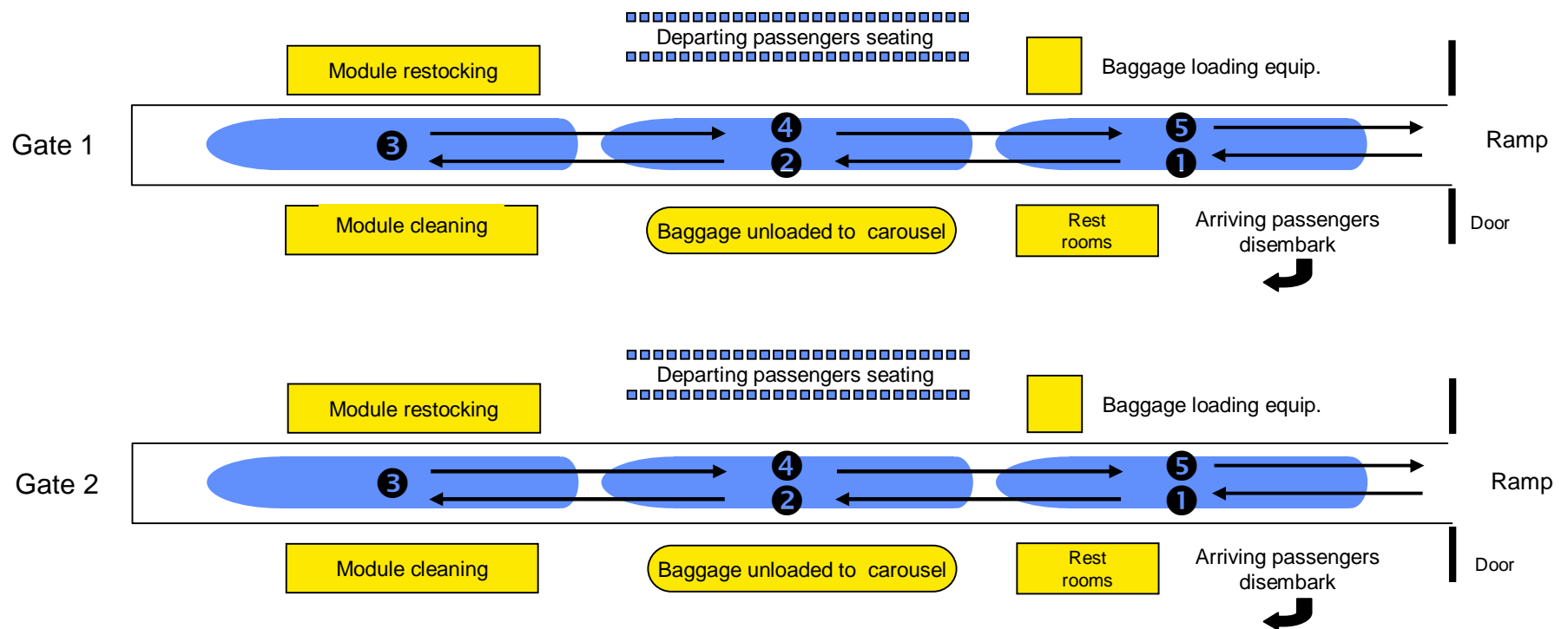


- **Air mobility solution must be complete and integrated**
 - Efficiently / effectively move cargo/personnel from base to final landing site
 - Only load and unload cargo from module once
- **SECDEF goals drive need for rapid global mobility**
 - 10 days to get into position
 - 30 days to win war
 - 30 days to reposition forces
- **Use of CAT module provides foundation for a family of air and land mobility solutions**
 - Advanced tactical transport
 - Heavy lift helicopter
 - Lighter-than-air craft
 - Road / rail

**Integrated
solution**



Airport Design





Conclusions



- **Cargo containerization demonstrated to improve throughput and decrease cost**
- **XC-120 idea update – yields revolutionary air mobility capability**
 - Improved cargo throughput
 - Multi-mission capabilities
- **Common platform with new tanker**
 - Development/ops cost sharing for many missions
- **Multi-platform air module applications**
 - Strategic and tactical air mobility
 - Fwd base facilities
 - Commercial air cargo and passenger transport



QUESTIONS?