Airfields and the Pacific Deterrence Initiative

Moderator: Maj Arpan Patel, P.E., PMP, USAF

Speakers:

- Col Matthew Beverly, P.E., PMP, USAF
- Mr. Matt Kundrot, P.E., HDR, Inc.
- Lt Col Brandon Balskus, P.E. USAF
- Wayne Seiler, Ph.D., P.E., All About Pavements, Inc.

May 14, 2024, 1:30 p.m.

HOUSEKEEPING ITEMS

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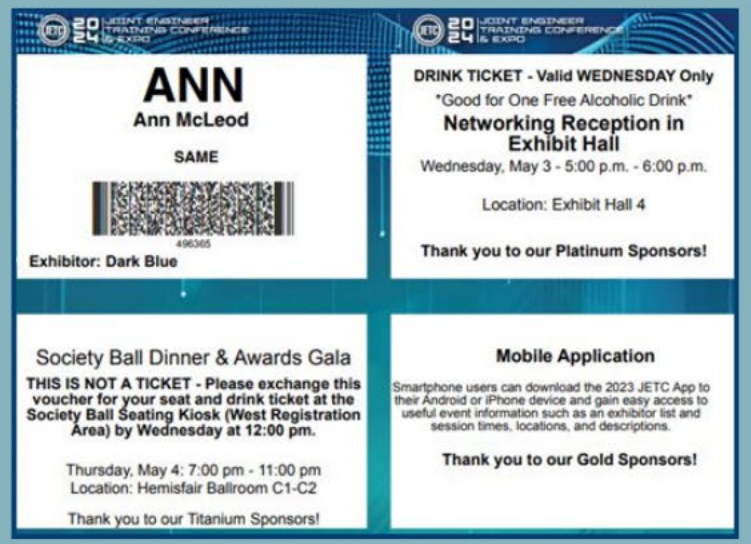

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JETC Joint Engineer Training Conference & Expo

MAY 14-16, 2024
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MODERATOR

Arpan Patel, P.E., PMP, Maj, USAF

560th RED HORSE Squadron
Director of Operations

Fun Facts

- Sports Teams: D.C. Sports, USAFA Falcons, UT Austin
- Played a round at the world's worst golf course…
- Elected Director, SAME National Board

Joint Engineer Training JETC Conference & Expo

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SPEAKER

Matt Beverly, P.E., PMP
Col, USAF

Joint Task Force-National Capital Region
Liaison to USNORTHCOM

Fun Facts

- Sports Teams: USAFA Falcons
- Vacation Spots: Places w/n 4-6 hours of the current assignment
- Did you Know I…
  - Planned Manas Airbase, Kyrgyzstan on engineering paper
  - SAME Joint Engineering Contingency Operations COI Vice Chair
- Hobbies: snow skiing, hiking/camping, starting woodworking

JETC Joint Engineer Training Conference & Expo

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SPEAKER

Matt Kundrot, P.E.

HDR Engineering, Inc.

Military Aviation Market Lead

Fun Facts

- 4,000 hours flying helicopters and fixed wing and three trips flying a helicopter between Alaska and the lower 48.
- 5 more takeoffs than landings
- Almost no home improvement project I won't take on.
- One of my best bar stories: Flying Tom Clancy to his house.

JETC Joint Engineer Training Conference & Expo

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SPEAKER

J. Brandon Balskus, P.E.
Lt Col, USAF

Commander, 823rd RED HORSE Squadron

Fun Facts

- Sports Teams: USAFA Fighting Falcons, Florida State Seminoles, Atlanta Braves, Mighty Jacksonville Jaguars
- Vacation: Key Largo & the North Carolina Coast
- Did you Know I…was the last male in my family line…and then had 4 sons!
- Hobbies: Golf, anything on the water, coaching Little League, being a Dad.

Joint Engineer Training JETC Conference & Expo

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SPEAKER

Wayne Seiler, PhD, P.E.
All About Pavements

President, Principal Engineer

Fun Facts

- Sports Teams: USAF Falcons, U of Illinois Fighting Illini
- Vacation Spots: RV travel in U.S.
- Did you Know I…My wife and I feed fish…..but never catch them!
- Boating on MN Lakes and Gulf of Mexico

Airfields and the Pacific Deterrence Initiative

Learning Objectives

Objective 1: Understand the ACE Concept of Operations and the US military engineer's role to support

Objective 2: Understand the unique challenges airfield planning and construction has in the Pacific

Objective 3: Understand industry, government and aviation consultants' roles

Objective 4: Learn airfield engineering concepts such as airfield geometrics, structural capacity, surface condition, clear space and more

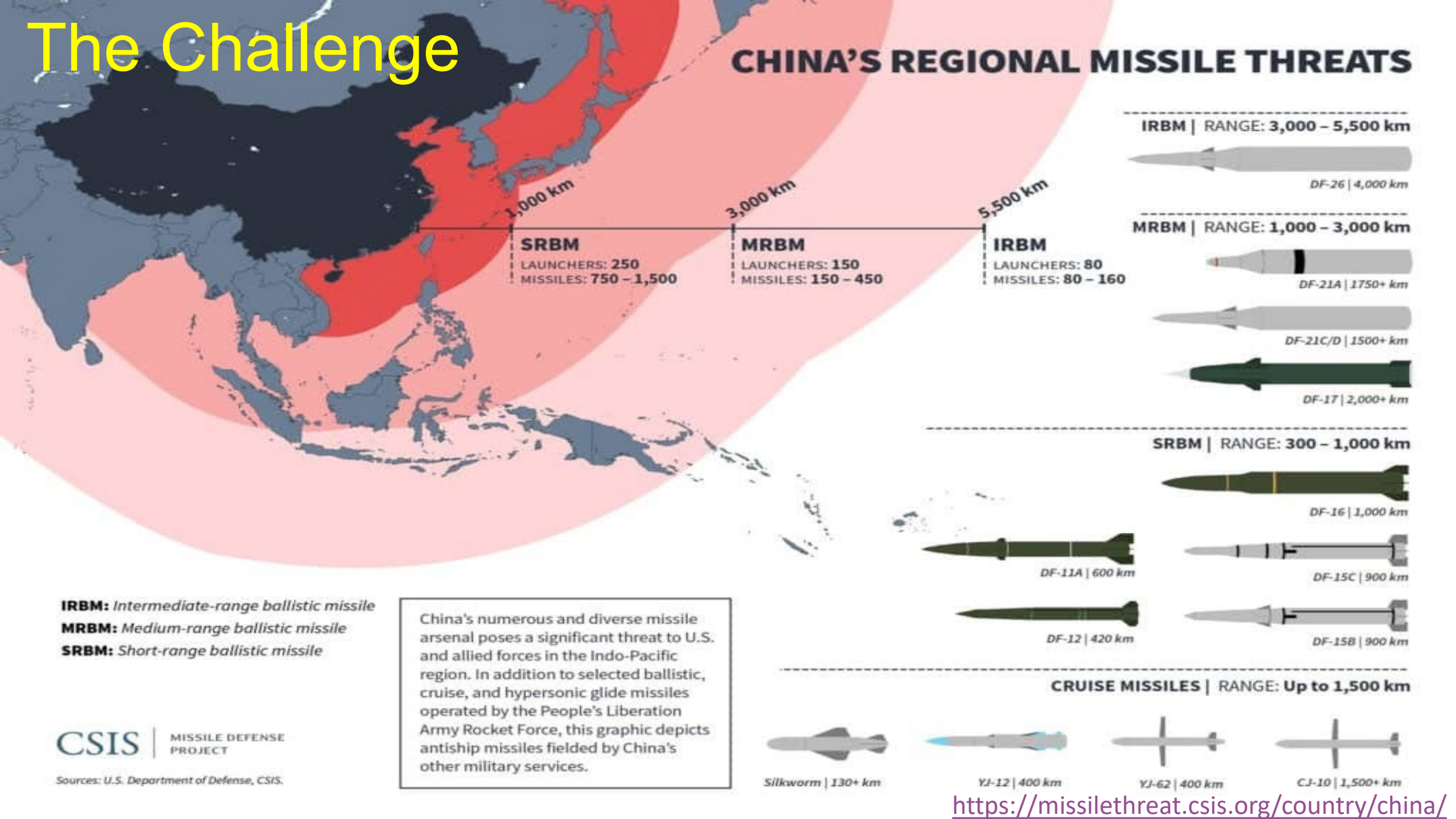
Agenda

1. Pacific Deterrence Initiative (PDI): The Threats and US Force Posture to Protect and Respond
2. Agile and Expeditionary Airfield Strategy
3. What are Expeditionary Airfields?
   - Background
   - Operational Planning Guidance
4. Recommendations for Simplified Expeditionary Airfield Concepts
5. Expeditionary Airfield Pavements

The Pacing Threat

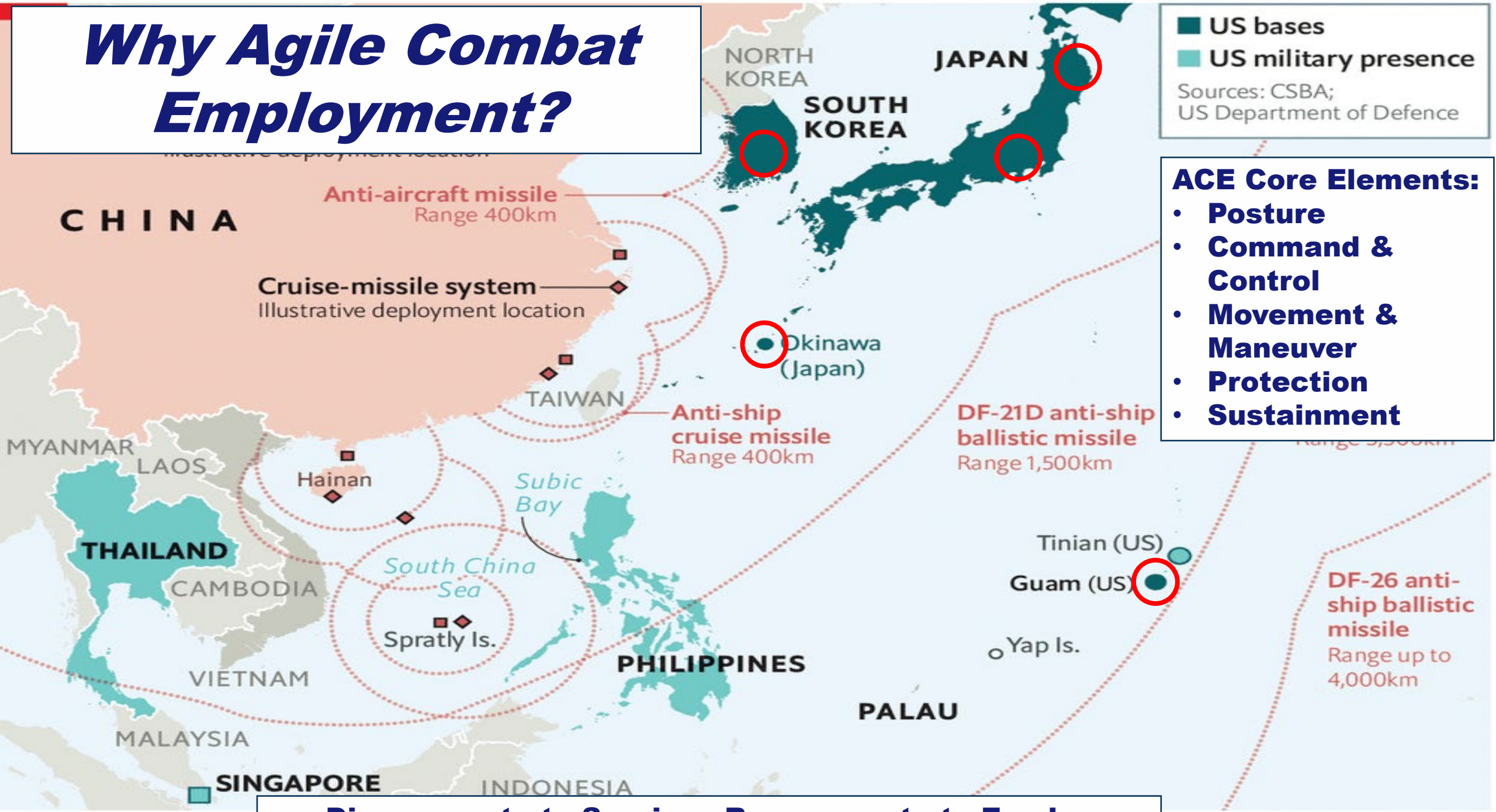
- **National Security Strategy**: "The People's Republic of China harbors the intention and, increasingly, the capacity to reshape the international order in favor of one that tilts the global playing field to its benefit."
- **National Defense Strategy**: "The PRC remains our most consequential strategic competitor for the coming decades."
- **Secretary of the Air Force**:
  - "The threat of attack from violent extremist organizations still exists, and we will address those threat as they occur. But China is by far our pacing challenge."
  - "China has been reoptimizing its forces for great power competition and to prevail against the U.S. in the Western Pacific for over 20 years. China has been building a military capability specifically designed to achieve their national goals and to do so if opposed by the United States"
- **CIA Director (2023):** "President Xi has instructed the PLA, the Chinese military leadership, to be ready by 2027 to invade Taiwan, but that doesn't mean that he's decided to invade in 2027 or any other year as well"

The Challenge



https://missilethreat.csis.org/country/china/

Why Agile Combat Employment?



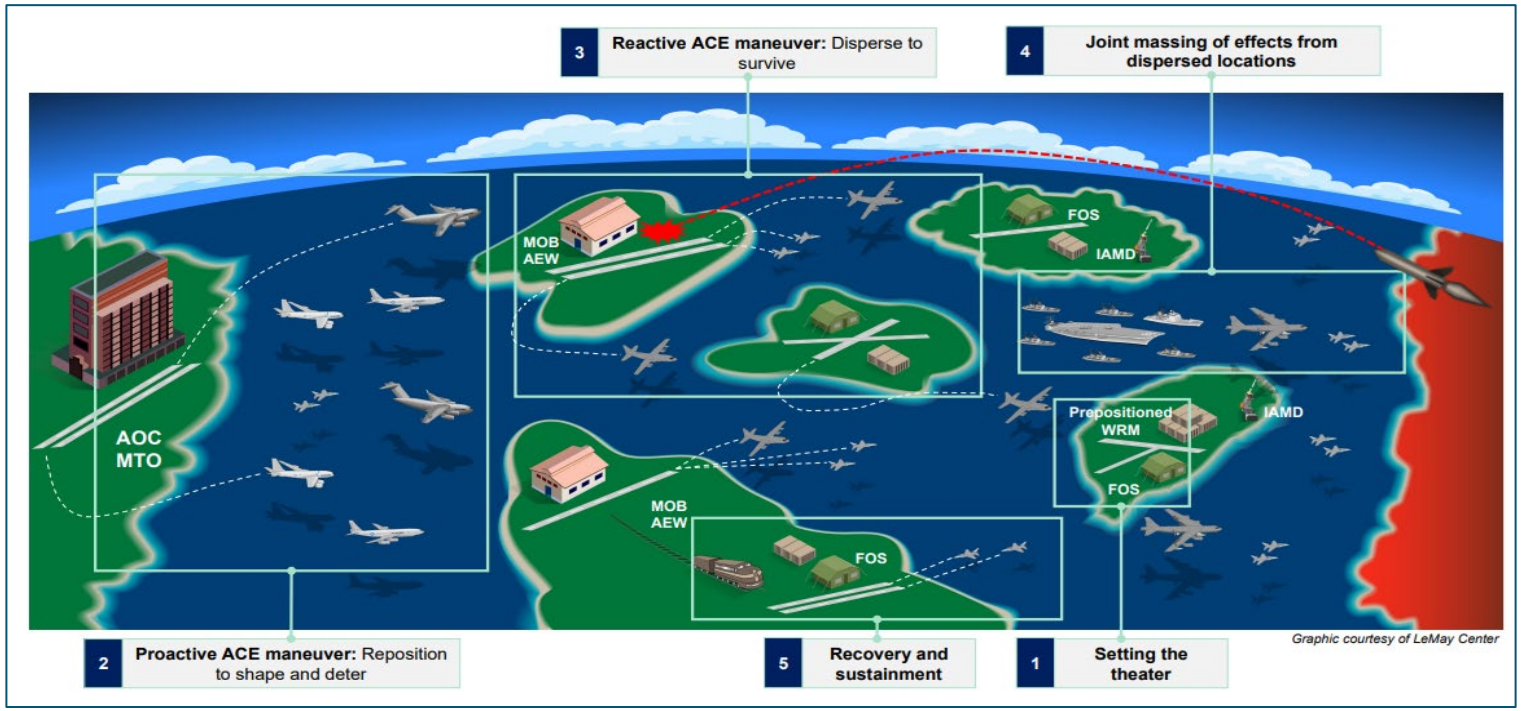
ACE Core Elements:

- **Posture**
- **Command & Control**
- **Movement & Maneuver**
- **Protection**
- **Sustainment**

Disaggregate to Survive…Re-aggregate to Employ

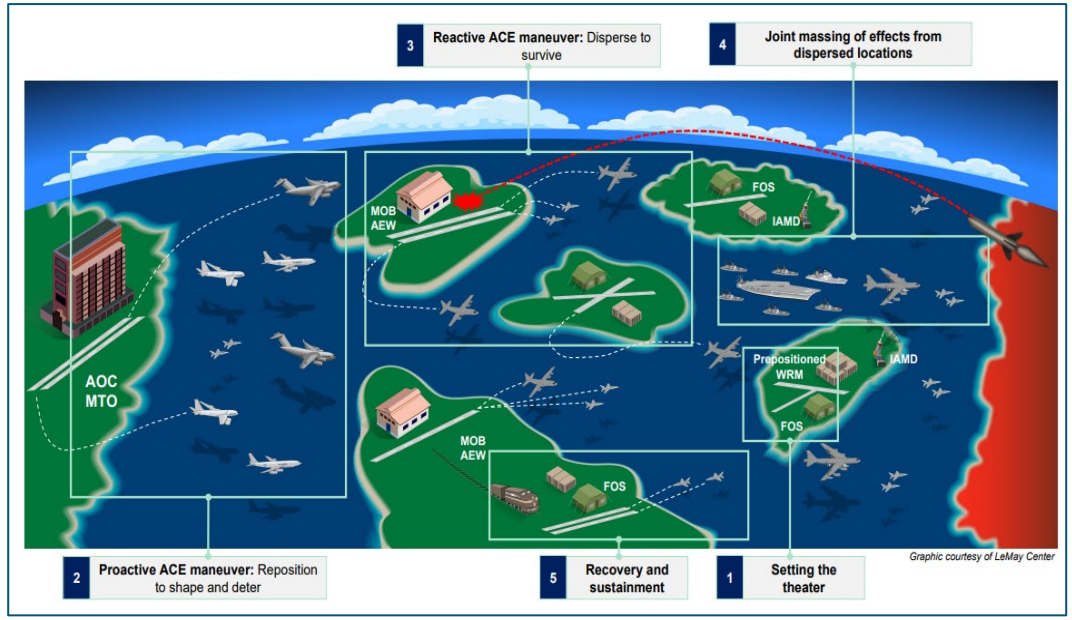
Our Challenge:

How Operators See the Issue

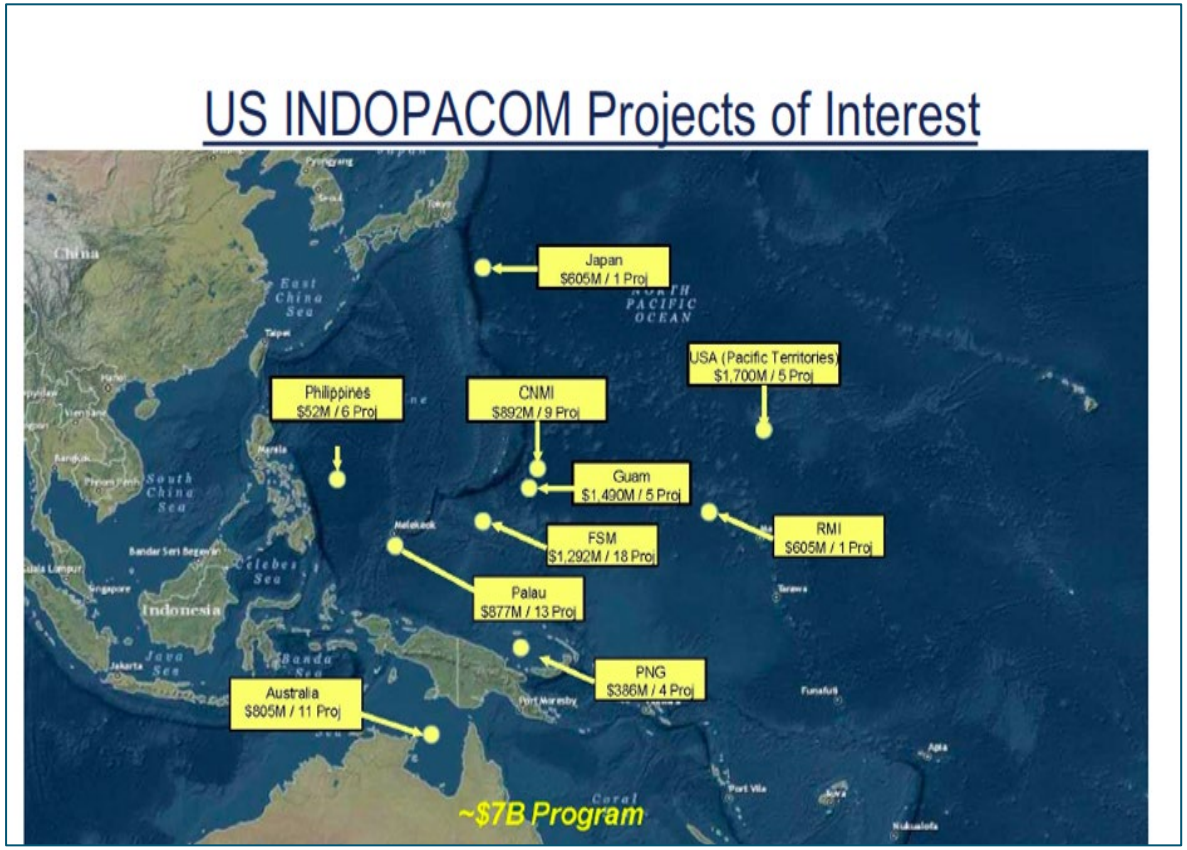


Our Challenge:

How Operators See the Issue



How Engineers want to See the Issue



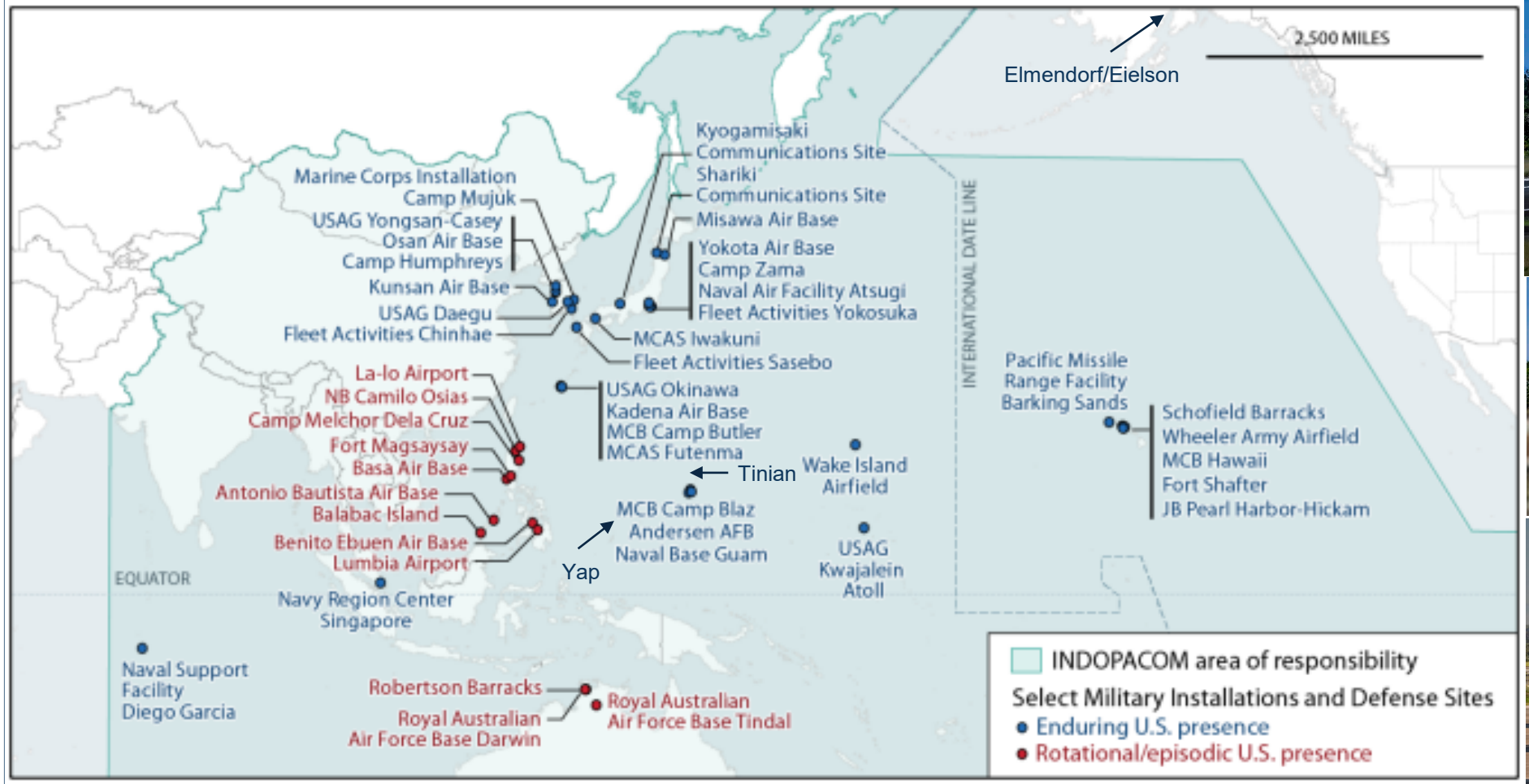
What are Expeditionary Airfields for the PDI?

All photos sourced from DVIDShub.net

PDI Airfield Planning and Design

1. The need for additional airfield footprint has been known for over 10 years now. 2027 is quickly approaching.
2. Existing air bases increasingly vulnerable. Need to develop locations to disperse and respond – All aircraft types
3. Minimal progress made. Only major US DOD capacity enhancement project under construction is Tinian Airport.
4. Lack of practical guidance and understanding of the requirements of airfields to support USAF, USMC, and USN PDI expeditionary air operations.
5. Need for a Framework for PDI Airfield Operational Planning and Design – Focused Guidance for Prepared Facilities

Airfield Planning and Development in INDOPACOM



Source: CRS Report R47589, *U.S. Defense Infrastructure in the Indo-Pacific: Background and Issues for Congress.*

Airfield Planning and Design for PDI

1. What is an Expeditionary Airfield (ACE, EABO) and “High-Performance” Expeditionary Airfield?
2. What criteria are used for advanced planning and design?
3. Are there simpler standards we can establish to expedite execution of expeditionary airfields?
4. What are common misconceptions in planning and design of expeditionary airfields that often lead to delay?
5. Recommendations for improving expeditionary airfield planning and design to meet the urgent need of ACE and EABO concepts of operations.

What are Expeditionary Airfields for PDI?

At least 10 different types described in published US DOD doctrine, operations, planning, and design guidance

- Landing Zones and Strips (Paved and Unpaved)
- Forward Operating Bases (FOBs) and Forward Operating Locations (FOLs)
  - Paved runways from 1,600 feet to over 8,000 feet long
- Divert, Dispersal, and Logistics Hubs with runways 8,000 feet to over 12,000 feet long
- Emerging airfield types for various unmanned aerial systems

What Criteria Applies to Expeditionary Airfields?

- More than 10 guidance documents provide relevant information on planning and design of expeditionary airfield facilities
- UFC 3-260-01 Airfield and Heliport Planning and Design
  - USAF C-130/C-17 LZ Criteria
  - USMC V-22 and F-35B FOB Criteria
  - Class A Airfield Criteria – Limited practical expeditionary application
  - Class B Airfield Criteria: Fighters, Tankers, Transports
- There is a **huge gap** between LZ/FOB and UFC Class B airfield criteria
- For the PDI, we need to define the practical guidance and standards for suitable “High Performance Expeditionary Airfields”
  - Operationally driven planning and design guidance
  - Expending too much time and cost trying to apply impractical standards

Expeditionary Runway Footprint

Published Guidance for Paved Runways and Airfields

- C-130/C-17 LZ
- USMC F-35 FOB Runway

→ Approx 100 to 150 Acres

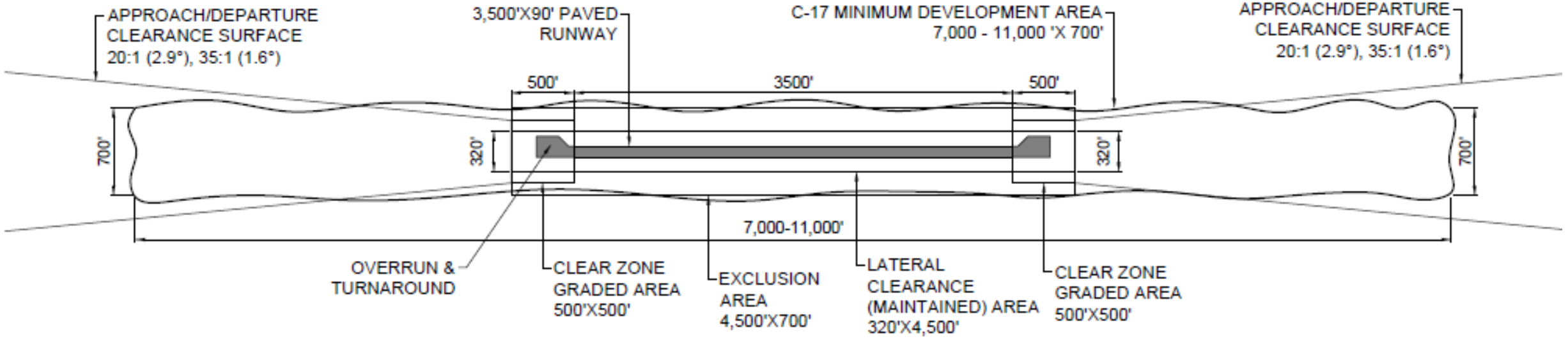
GAP

- CONUS/PACAF Class B Runway: >1,000 Acres
- USAFE/AFRICA Class B Runway: <1,000 Acres
- Army Class B, FAA, HN/ICAO

→ +/-1,000 Acres

What is the required footprint for a PDI High Performance Expeditionary Airfield?

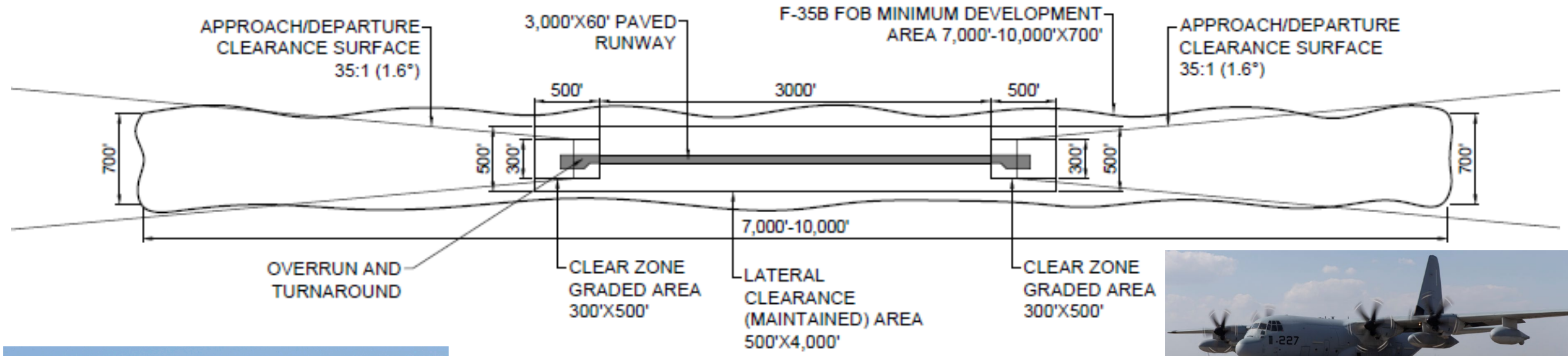
C-17 PAVED LZ FOOTPRINT



NOTES:

1. PAVED LENGTH: 3,500' MINIMUM (EXCLUDING OVERRUNS)
2. PAVED WIDTH: 90' MINIMUM
3. GRADED AND OBSTACLE FREE AREA 52 ACRES
4. APPROACH/DEPARTURE SLOPES: 20:1 (2.9°) FOR C-17, 35:1 (1.6°) FOR C-130
5. RUNWAY END OBSTRUCTION REMOVAL: 3,000' X 700' (UP TO APPROX 48 ACRES)
6. C-17 MINIMUM DEVELOPMENT AREA: 7,000' X 700' (APPROX 113 ACRES) TO 11,000 X 700' (180 ACRES)

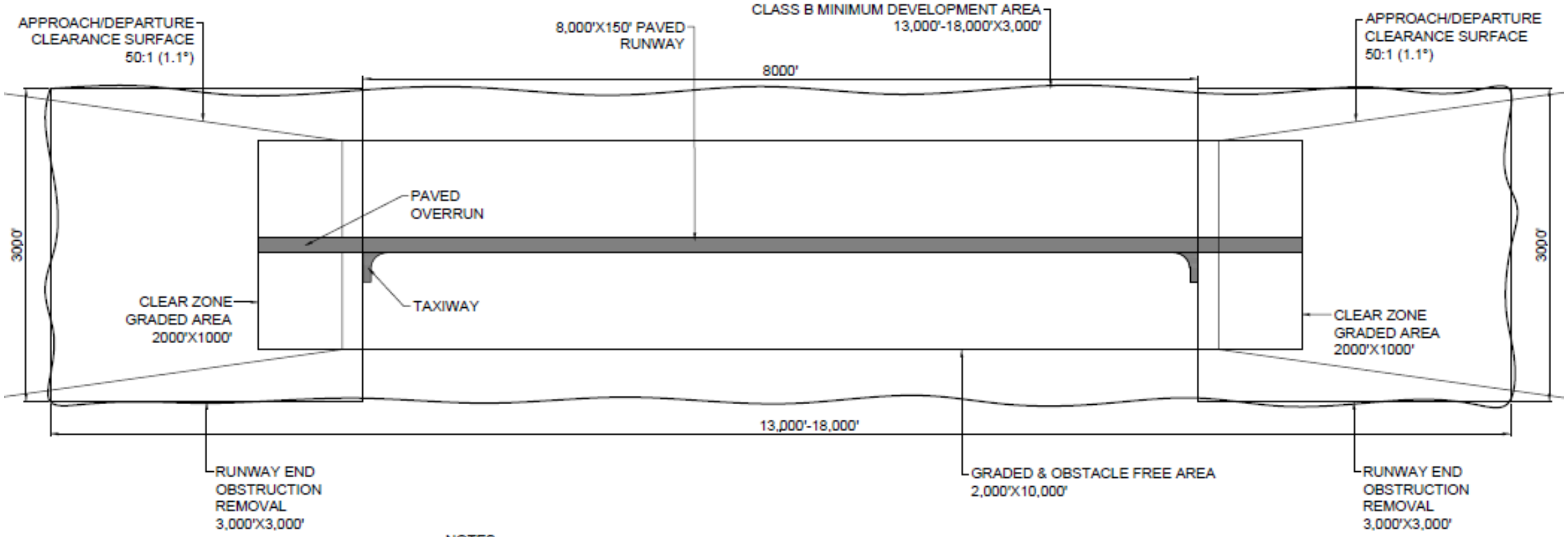
F-35B+ FOB FOOTPRINT (C-130 CAPABLE)



NOTES:

1. PAVED LENGTH: 3,000' MINIMUM (EXCLUDING OVERRUNS)
2. PAVED WIDTH: 32' MINIMUM, 60' TYPICAL
3. GRADED & OBSTACLE FREE AREA: APPROX 46 ACRES
4. APPROACH/DEPARTURE SLOPES: 35:1 (1.6°)
5. RUNWAY END OBSTRUCTION REMOVAL: 3,000' X 500" (UP TO APPROX 35 ACRES)
6. F-35B FOB MINIMUM RUNWAY DEVELOPMENT AREA: 7,000' X 700' (APPROX 113 ACRES) TO 10,000' X 700' (APPROX 161 ACRES)

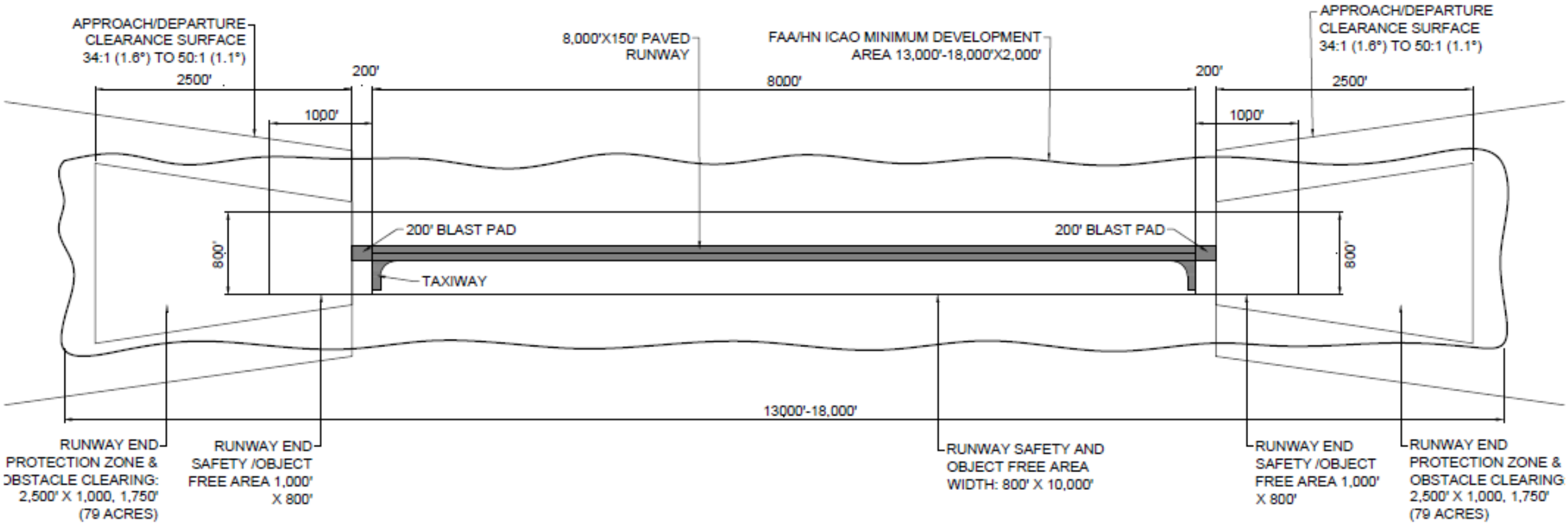
UFC CLASS B AIRFIELD USAF/PACAF/CONUS



NOTES:

1. PAVED LENGTH: 8,000' MINIMUM
2. PAVED WIDTH: 150' MINIMUM
3. GRADED & OBSTACLE FREE AREA: (APPROX 460 ACRES)
4. APPROACH/DEPARTURE SLOPES: 50:1 (1.1°)
5. RUNWAY END OBSTRUCTION REMOVAL: 3,000' X 3,000' (APPROX 207 ACRES)
6. CLASS B MINIMUM RUNWAY DEVELOPMENT AREA: 13,000'X3,000' (895 ACRES) TO 18,000'X3,000' (1,240 ACRES)

Army Class B, FAA, HN/ ICAO RUNWAY FOOTPRINT

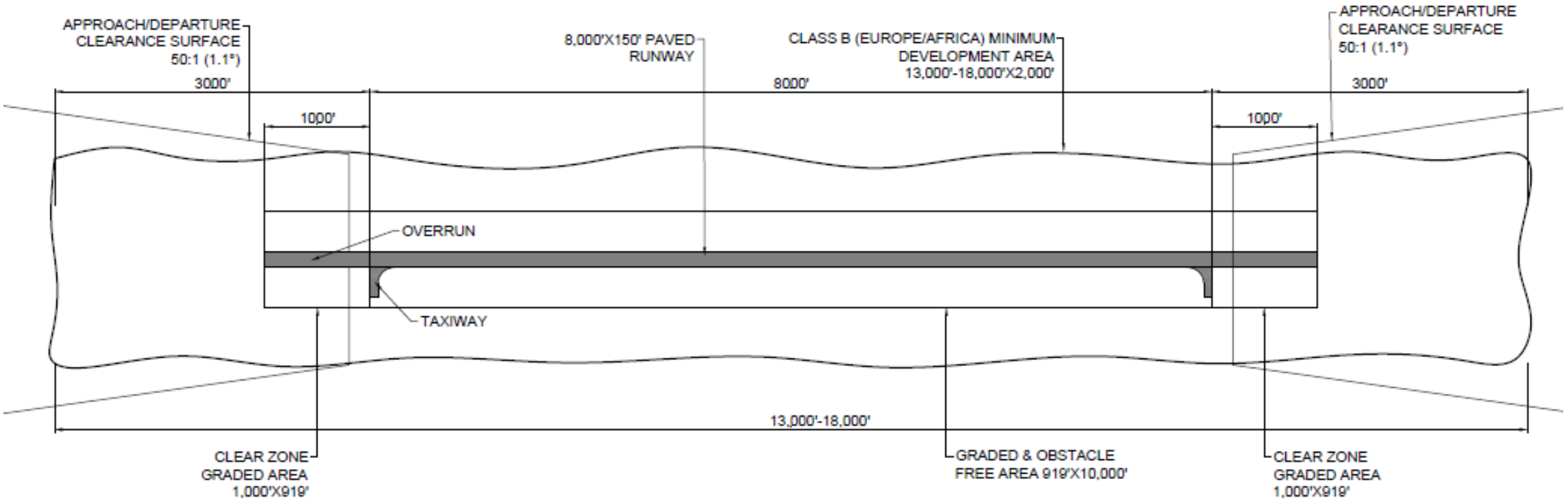


NOTES:

1. PAVED LENGTH: 8,000' TYPICAL MINIMUM
2. PAVED WIDTH: 150' MINIMUM
3. RUNWAY SAFETY AND OBJECT FREE AREA: 184 ACRES
4. APPROACH/DEPARTURE SLOPES: 34:1 (1.6°) TO 1:50 (1.1°)
5. RUNWAY END OBSTACLE REMOVAL: 2,500' X 1,000' X 1,750' (79 ACRES)
6. FAA/HN ICAO MINIMUM DEVELOPMENT AREA: 13,000' X 2,000' (597 ACRES) TO 18,000' X 2,000 (826 ACRES)

CLASS B RUNWAY USAFE/AFRICA THEATER FOOTPRINT

USAFE-AFRICAI 32-1007 CLASS B RUNWAY (AIR FORCE - EUROPE AND AFRICA)



NOTES:

1. PAVED LENGTH: 8,000' MINIMUM
2. PAVED WIDTH: 150' MINIMUM
3. GRADED OBSTACLE FREE AREA (APPROX 211 ACRES)
4. APPROACH/DEPARTURE SLOPES: 50:1 (1.1°)
5. RUNWAY END OBSTRUCTION REMOVAL (APPROX 138 ACRES)
6. CLASS B MINIMUM RUNWAY DEVELOPMENT AREA: 13,000X2,000' (600 ACRES) TO 18,000'X2,000' (826 ACRES)

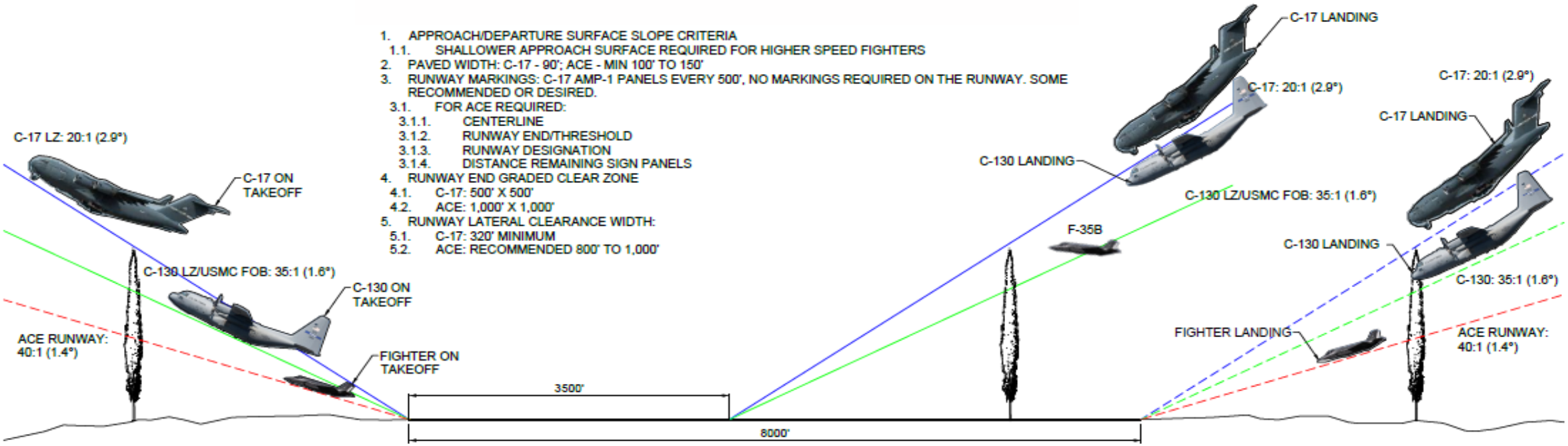
High Performance Expeditionary Runways

Requirements Defined by Operational Needs: All Weather, Day & Night

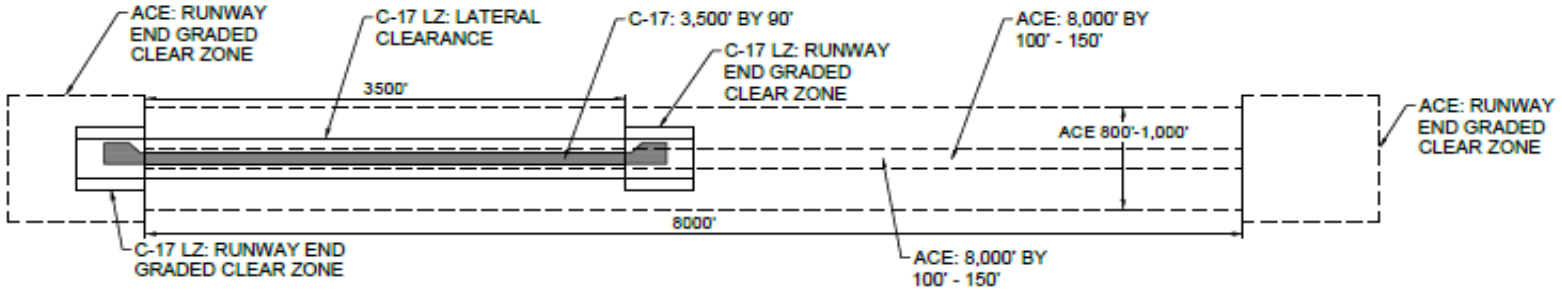
- Mission
  - Divert, Stopover, Logistics
  - Contingency FOL: Fuel, Weapons
  - Duration
- Aircraft Requirements
  - Size: Dimensions and Weight
  - Performance: Speed and Approach/Departure Slope
- What are the Magic Numbers for Runway Length and Critical Dimensions?
  - Every 1,000 feet of runway = 500 miles of range, one hour of endurance, payload, or fuel for tankers, transports, and P-8
  - 35:1 or 40:1 slopes
  - 500’ to 1,000’ wide cleared width
- What do we need initially (IOC)? What do we need to sustain the mission (FOC)?

Extended C-17 Shortfalls as an Expeditionary Runway

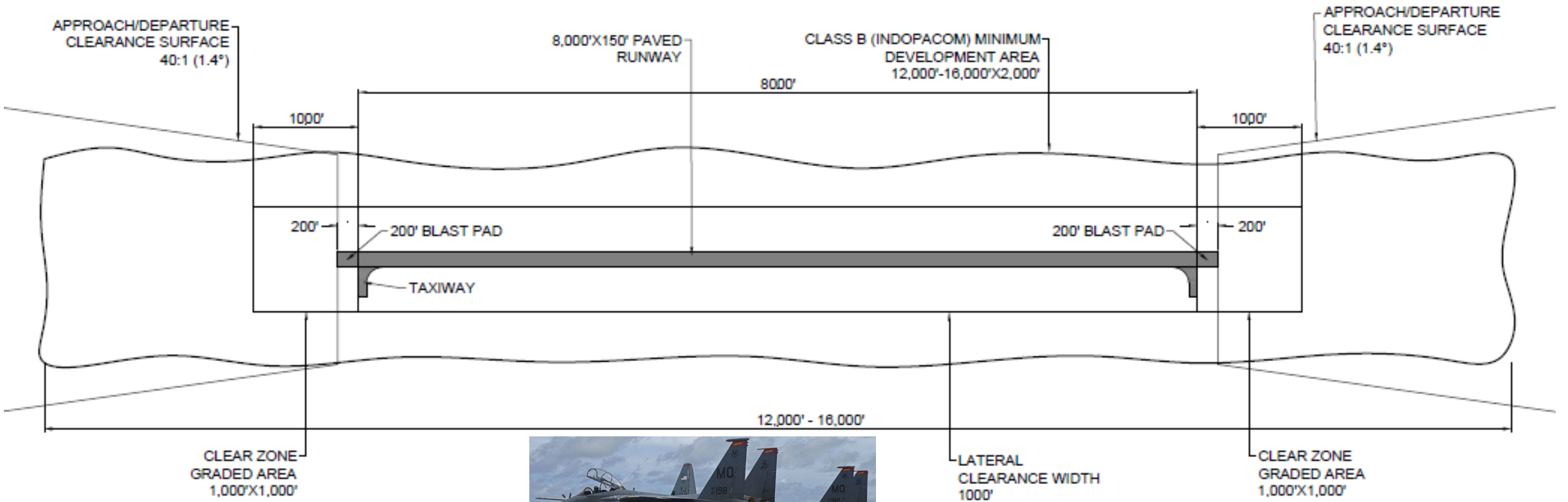
1. APPROACH/DEPARTURE SURFACE SLOPE CRITERIA
   1.1. SHALLOWER APPROACH SURFACE REQUIRED FOR HIGHER SPEED FIGHTERS
2. PAVED WIDTH: C-17 - 90'; ACE - MIN 100' TO 150'
3. RUNWAY MARKINGS: C-17 AMP-1 PANELS EVERY 500', NO MARKINGS REQUIRED ON THE RUNWAY. SOME RECOMMENDED OR DESIRED.
   3.1. FOR ACE REQUIRED:
      3.1.1. CENTERLINE
      3.1.2. RUNWAY END/THRESHOLD
      3.1.3. RUNWAY DESIGNATION
      3.1.4. DISTANCE REMAINING SIGN PANELS
4. RUNWAY END GRADED CLEAR ZONE
   4.1. C-17: 500' X 500'
   4.2. ACE: 1,000' X 1,000'
5. RUNWAY LATERAL CLEARANCE WIDTH:
   5.1. C-17: 320' MINIMUM
   5.2. ACE: RECOMMENDED 800' TO 1,000'



C-17 LZ EXTENDED TO 8,000' FOR ACE RUNWAY
-APP/DEP SURFACE ARE NOT CLEAR FOR FIGHTER AND TANKER OPERATIONS



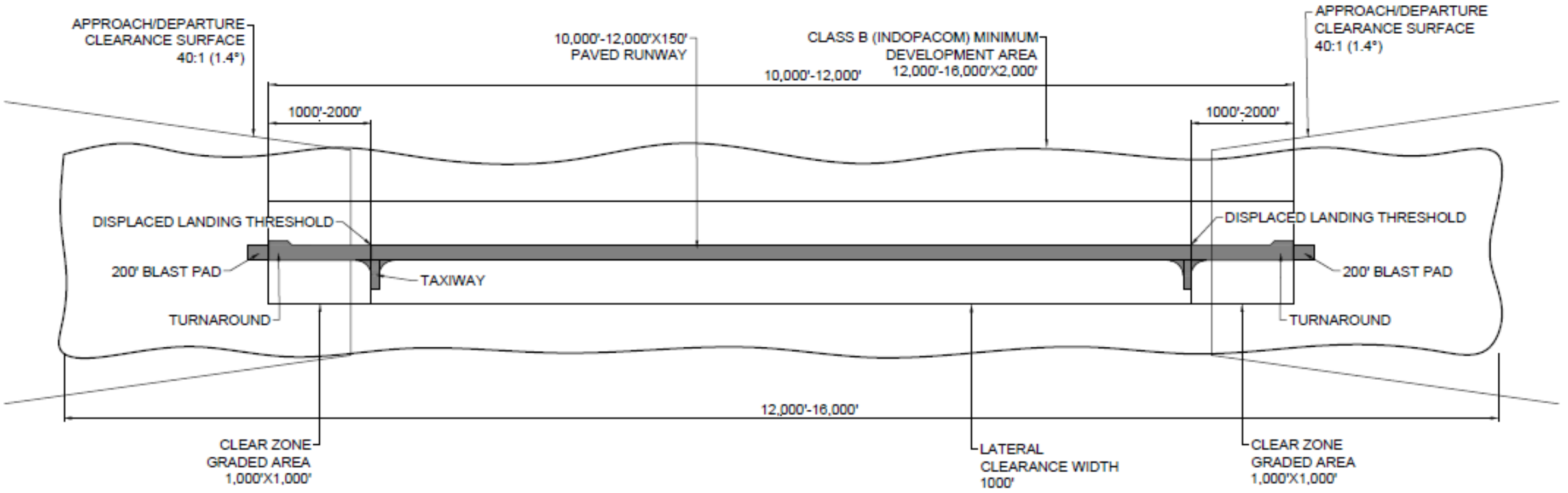
INDOPACOM High Performance Expeditionary Runway Footprint



NOTES:

1. PAVED LENGTH: 8,000' (2,440M) PRACTICAL JOINT USE MINIMUM (FIGHTER, P-8, TANKER)
2. PAVED WIDTH: 150' (45M) MINIMUM
3. GRADED & OBSTACLE FREE AREA: (APPROX 230 ACRES)
4. APPROACH/DEPARTURE SLOPES: 40:1 (1.4°)
5. RUNWAY END OBSTRUCTION REMOVAL: 2,000' X 1,000' (46 ACRES)
6. MINIMUM DEVELOPMENT AREA: 12,000' X 2,000' (551 ACRES) TO 16,000' X 2,000' (735 ACRES)

How to Fit 10,000 Feet of Runway in an 8,000 Foot Box



NOTES:

1. PAVED LENGTH: 10,000'-12,000' TO PROVIDE MAXIMUM P-8, TANKER, AND TRANSPORT PAYLOAD/RANGE
2. PAVED WIDTH: 150' (45M) MINIMUM
3. GRADED & OBSTRUCTION FREE AREA: (230 TO 275 ACRES)
4. APPROACH/DEPARTURE SLOPES: 40:1 (1.4°)
5. RUNWAY END OBSTRUCTION REMOVAL: 2,000' X 1,000' (46 ACRES)
6. MINIMUM DEVELOPMENT AREA: 12,000' X 2,000' (551 ACRES) TO 16,000'X2,000' (735 ACRES)

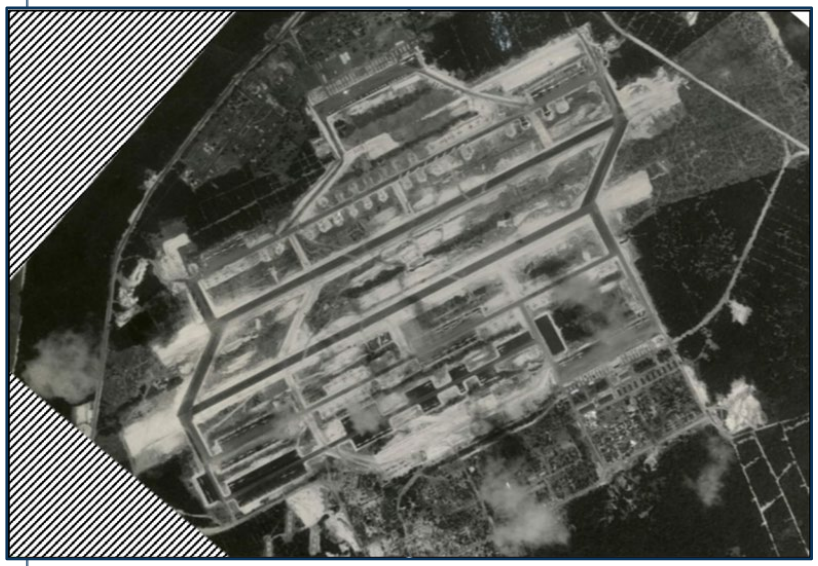
Common Misconceptions in High Performance Expeditionary Airfield Planning

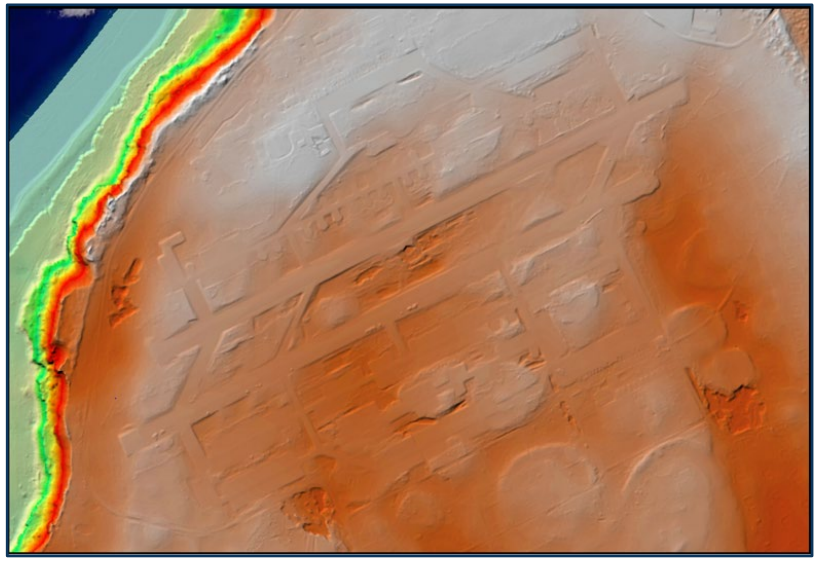
1) Assuming Asphalt is Cheaper than Concrete
2) Appropriate application of UFC airfield design standards at HN military and civil airfields
3) Designing for C-130s and C-17s Back Up Capabilities
4) Understanding the F-35B is a not VTOL aircraft
5) P-8A runway and parking requirements
6) Integrating Unmanned Aerial System (UAS) requirements and operational impacts

Common Roadblocks and Delays to Execution

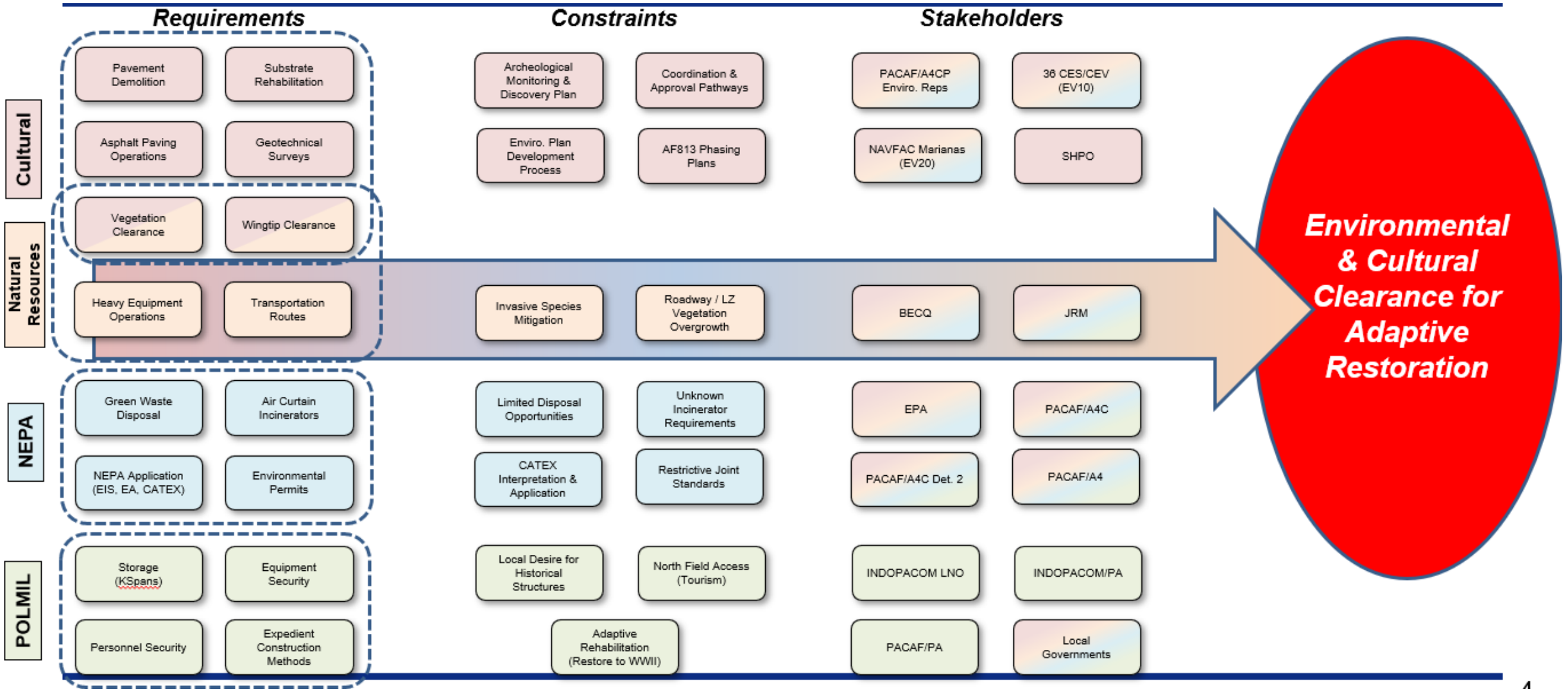
1) Lacking operational input to airfield facility planning
2) Disconnects in Environmental Impact Analysis Process (EIAP)
3) The lack of a theater airfield planning standard for PACOM
4) Lack of construction industry engagement and competitive construction procurement strategy
5) Lacking construction quality and oversight strategy – Shortages of personnel and reliance on contractor

Transportation Routes
Broadway, Tinian

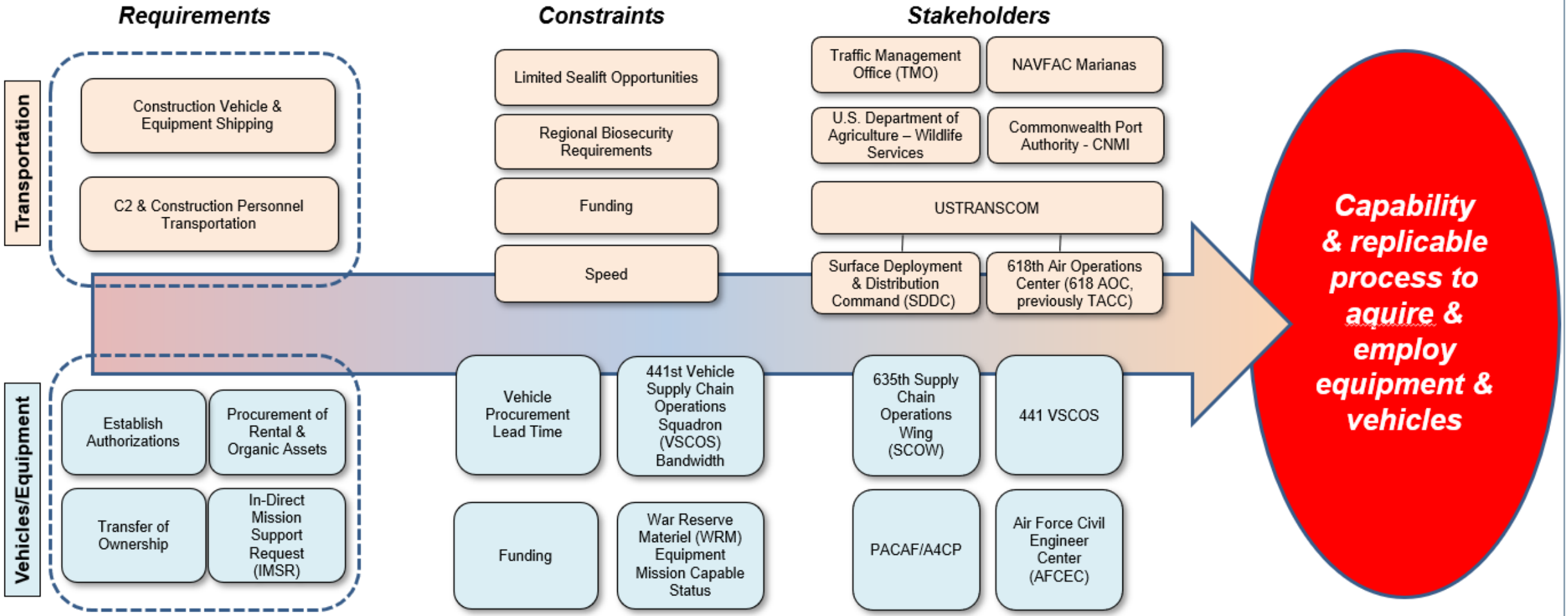




Pacific Operating Environment

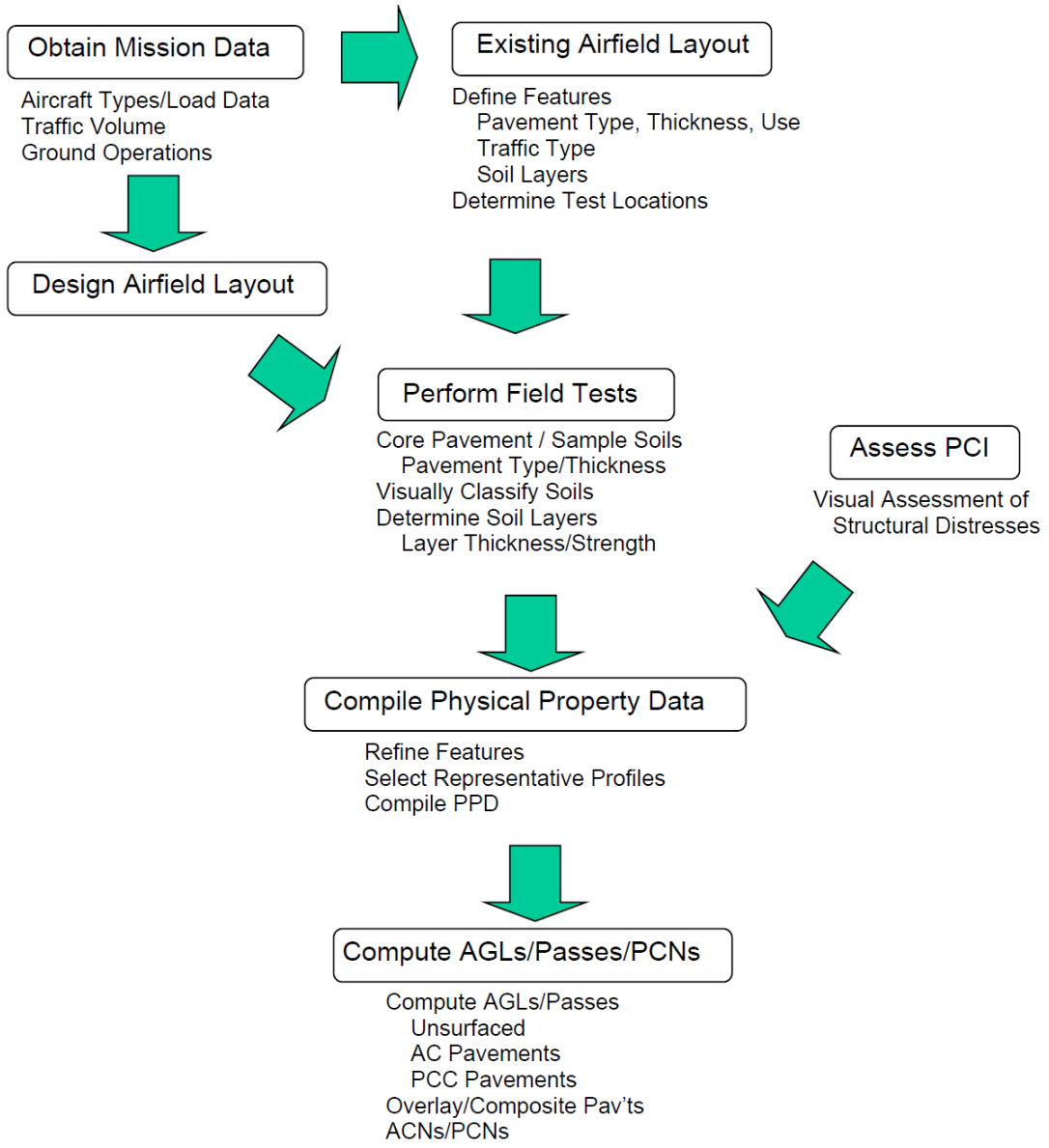


Pacific Operating Environment



Basic and High-Performance Expeditionary Airfield Pavements

Engineering Technical Letter 02-19: Airfield Pavement Evaluation Procedures



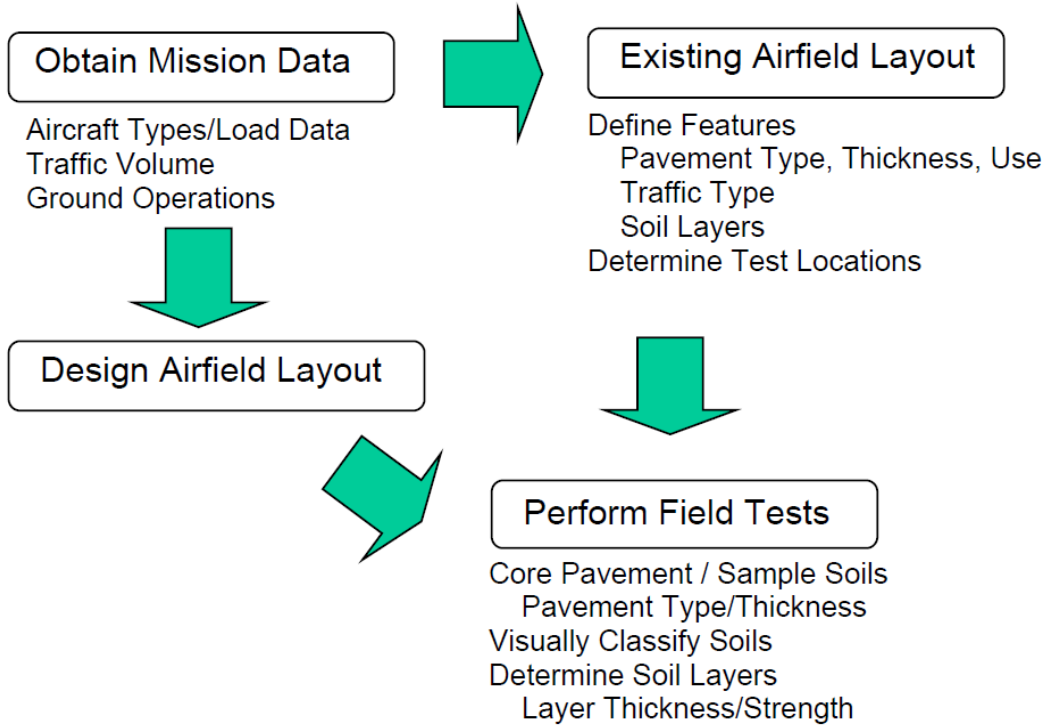
Basic and High-Performance Expeditionary Airfield Pavements

Key Aircraft Characteristics

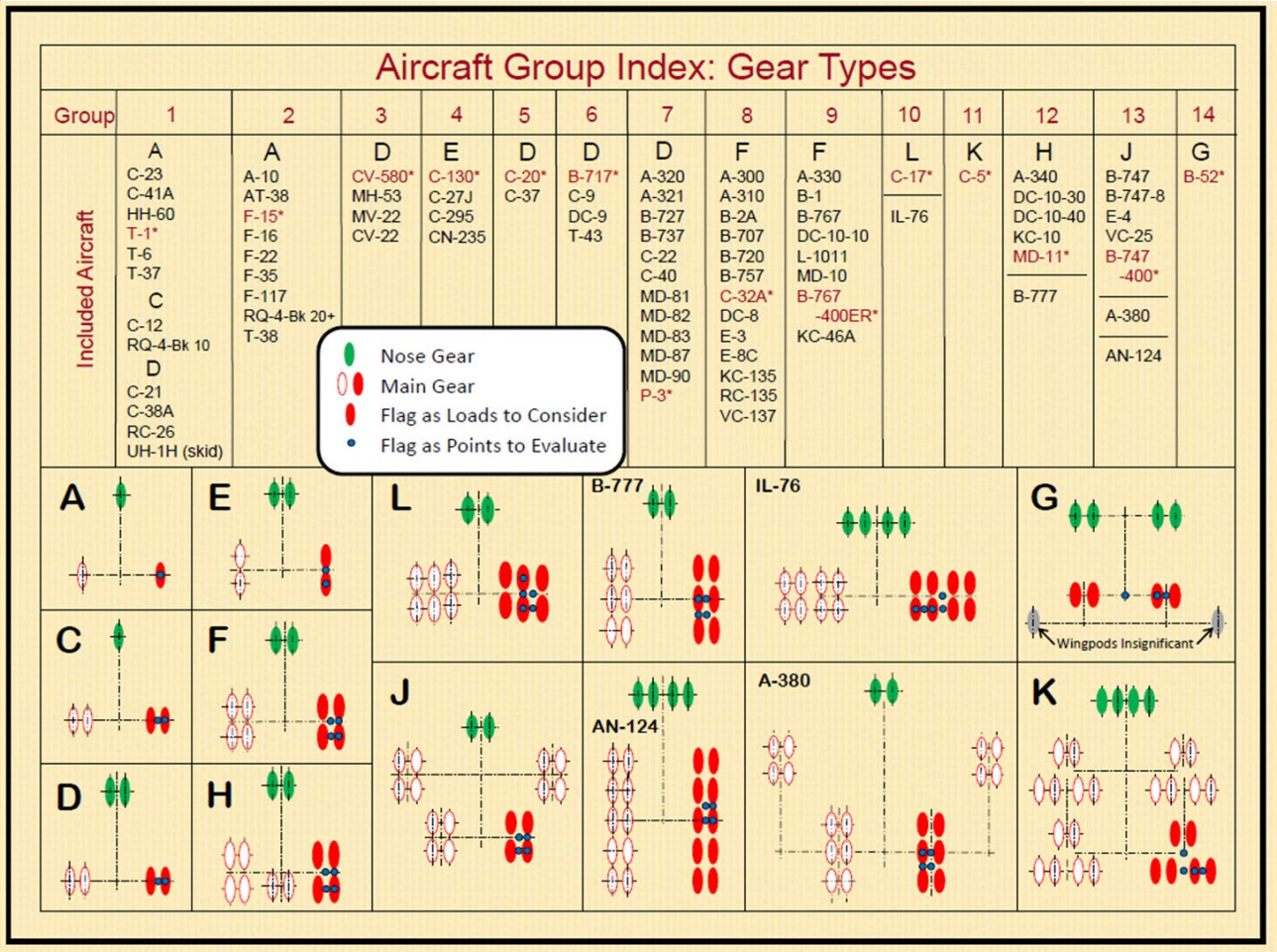
- Maximum Gross Takeoff and Landing Weights
- Main Gear Tire Pressure and Configuration
- Number of Departures and Arrivals

Durability and Strength of Pavement Layers

- Surface, Base, Subbase, and Subgrade Soils
- Material Susceptibility to Local Climatic and Moisture Conditions



Basic and High-Performance Expeditionary Airfield Pavements



Obtain Mission Data

Aircraft Types/Load Data
Traffic Volume
Ground Operations

Existing Airfield Layout

Define Features
- Pavement Type, Thickness, Use
- Traffic Type
- Soil Layers

Determine Test Locations

Design Airfield Layout

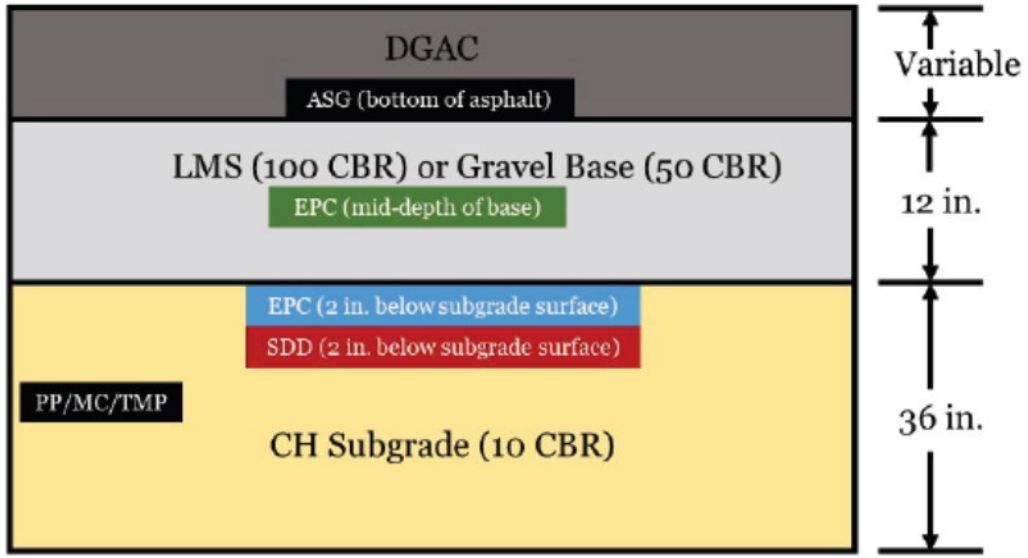
Perform Field Tests

Core Pavement / Sample Soils
- Pavement Type/Thickness

Visually Classify Soils

Determine Soil Layers
- Layer Thickness/Strength

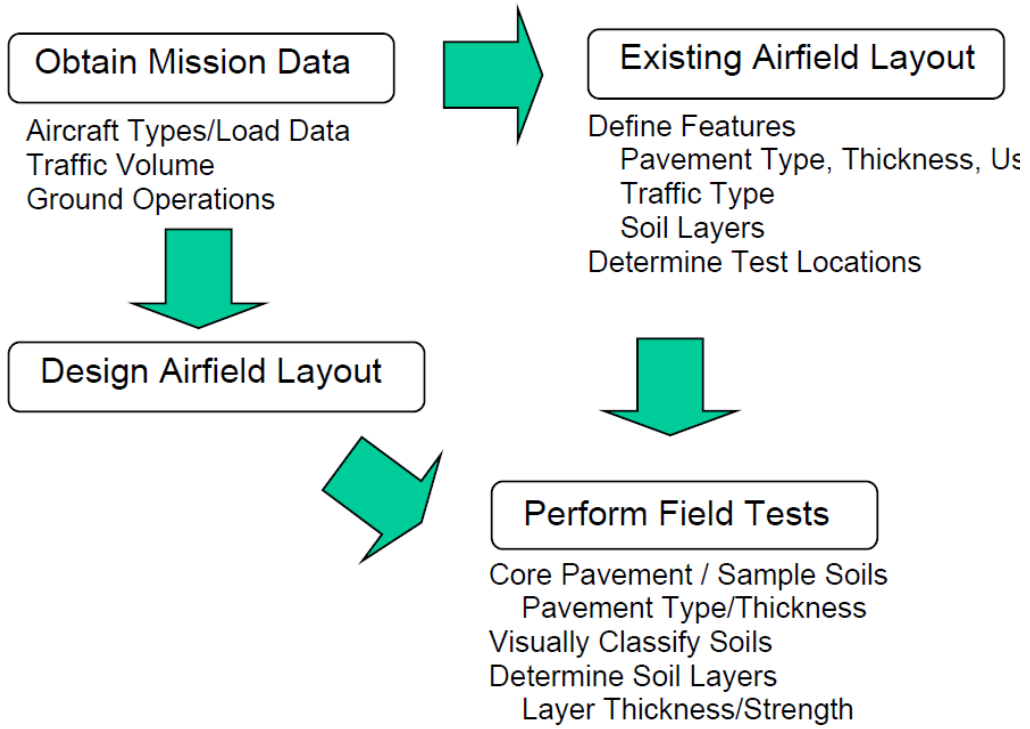
Basic and High-Performance Expeditionary Airfield Pavements



DGAC = dense-grade asphalt concrete
LMS = crushed limestone
CH = high-plasticity clay

NOT TO SCALE

ASG = asphalt strain gauge
EPC = earth pressure cell
SDD = single-depth deflectometer
PP/MC/TMP = pore pressure/moisture content/temperature



Thin Asphalt Layer Thicknesses: 1.0, 1.5, and 2.5 inches

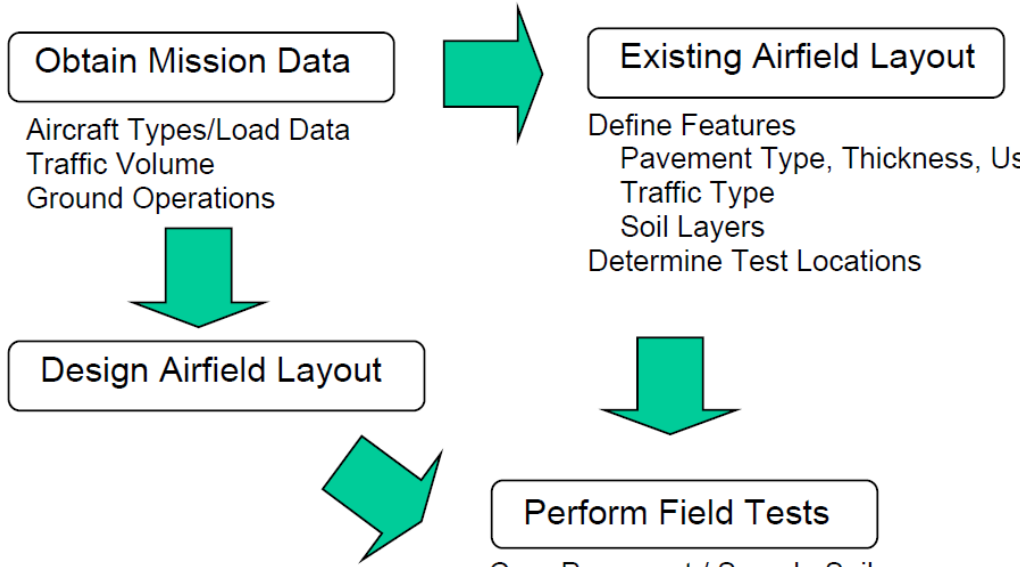
Basic and High-Performance Expeditionary Airfield Pavements

Naval Expeditionary Runway Construction Criteria

P-8 Poseidon Pavement Requirements

W. Jeremy Robinson, Jeremiah M. Stache, Jeb. S. Tingle, Carlos R. Gonzalez, Anastasios M. Ioannides, and James T. Rushing

March 2023



Thicker PCC Layer Thicknesses: 8.0 or 14 inches?

Approach for Design and Construction of Expeditionary Pavements

- Moving AE Firms Away from Conventional Construction Mindset
  - We are not building pavements with expected service lives of 30 to 50 years
  - What is an acceptable design reliability and performance risk?
  - How can we judiciously reduce our QC and QA construction requirements?
  - Once an airfield is operational, can we rely more on routine on site repairs?

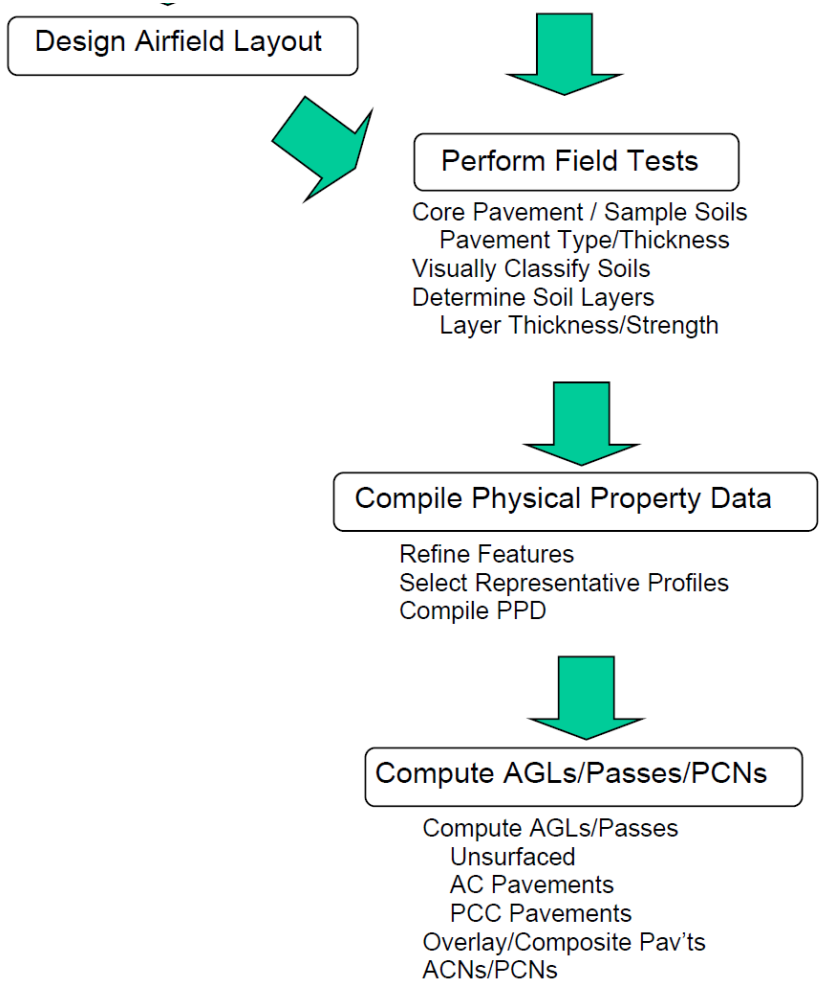
- Can We Used a Phased Approach for Construction?
  - Initially rely on local materials to construct the subbase/subgrade foundation
  - Use stabilization agents for weak subgrades, base layers, and wearing surface
  - Develop geometric and structural foundations that supports broad missions

Approach for Design and Construction of Expeditionary Pavements

- Mission Requirements Drives Need for Flexible Pavement Capacity
  - Accomplished with Tri-Service Construction Units or Private Contractors
  - Asphalt Surface Layer Construction with Variable Thicknesses and Lifts
  - Develop geometric and structural foundations that support broader AC missions
- Tri-Services are Enhancing Field Evaluation and Design Tools
  - PCASE Pavement Evaluation and Design Tool
  - Contingency Airfield Pavement Specifications (TSPWG M 3-260-02.09-2)
  - ERDC Development of an Engineering Soil Database

Basic and High-Performance Expeditionary Airfield Pavements

- Data Ranked Into Three Tiers
  (Web Development Underway)
  - Tier 1 – USACE or USAF Reports
  - Tier 2 – USCS Data Collected by Non-DoD sources
  - Tier 3 – Other Sources Such As Agricultural & Geological Classification Data
- Current Database Coverage
  - Tier 1 – 52 Countries and All US States
  - Tier 2 – 16 Countries
  - Tier 2 – 31 Countries



Recommendations – PDI Airfield Planning

1) Integrate and Coordinate with INDOPACOM J3 (Operations) and JPMO (Planning and Engineering)
2) Define the Joint USAF/USMC/USN High Performance Expeditionary Airfield
3) Plan and execute like operations: IOC (Initial Operational Capability) and FOC (Full Operational Capability)
4) Publish a Planning Guide to DOD and AE Community
5) Training, Training, Training
6) Airfield design and construction industry engagement – Best Practices
7) Need more DOD and DOS staffing in all execution agencies

Conclusion and Discussion

- What's next? Industry… Government…
- Balancing Reliability and Risk
- Airfields and the Pacific part 2…? SAME SBC 2024?
  - Contracting Lense – can small or large business, industry and academia help? What are the current vehicles and upcoming opportunities to help the military engineer in the Pacific?

Session Name

THANK YOU

Please take a few minutes to complete a short survey about this session. Your feedback will help us improve future programming for JETC.

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