US Army Airfield Pavement Assessment Program

Geotechnical and Structures Laboratory
Vicksburg, MS

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Background

- Initiated in May 1982 by the Department of the Army
- Requested by FORSCOM, TRADOC, and AMC
- Army Airfields (AAFs) last evaluated in the 1960s
- Pavements designed for WWII and Korean War era aircrafts
- Now required to support heavier and larger aircraft

1941-1993 AAF Mission Aircraft

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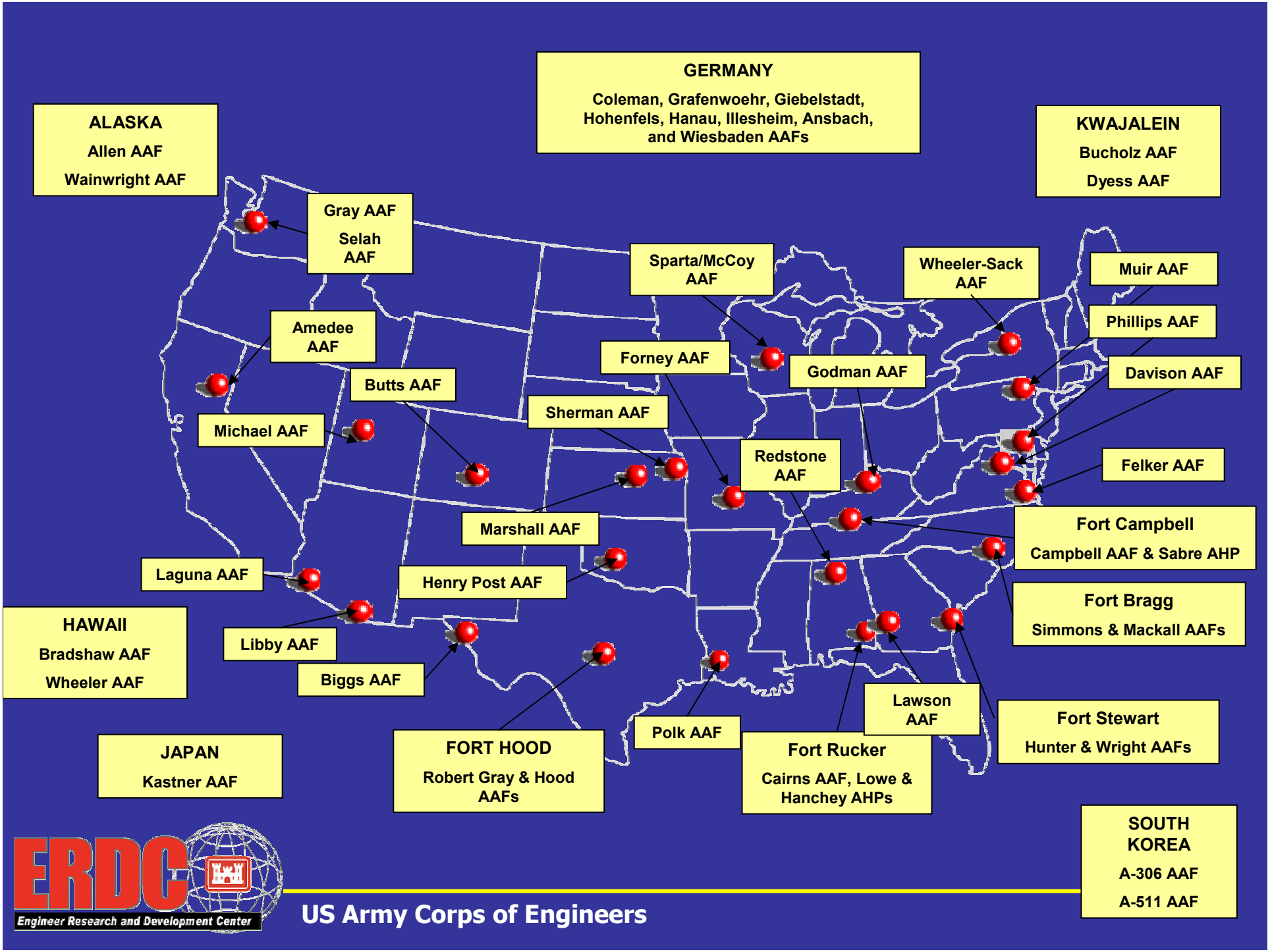
Significance

- Determines the overall mission readiness of the AAFs in support of the Army's force projection mission
- Provides technical data required to quantify airfield pavement maintenance, construction, and repair needs
- Data assists in optimal use of available funding for maintenance and repair (M&R)
- Provides information for establishing work plans necessary to reach and maintain AR 420-72 facility condition requirements
- Provides data for runway-bearing strengths

Why ERDC?

- Leadership in pavement design, evaluation, and research
- Expertise
- Military and security issues
- Database expansion and research validation
- Consistency
- Equipment
  - Dynatest heavy weight deflectometer (HWD)
  - 2 Dynatest falling weight deflectometers (FWDs)
  - dynamic cone penetrometer (DCP)
- State of the art equipment implementation
  - ground-penetrating radar (GPR)
  - portable seismic pavement analyzer (PSPA)


GERMANY
Coleman, Grafenwoehr, Giebelstadt, Hohenfels, Hanau, Illesheim, Ansbach, and Wiesbaden AAFs
ALASKA
Allen AAF
Wainwright AAF
KWAJALEIN
Bucholz AAF
Dyess AAF
Gray AAF
Selah AAF
Sparta/McCoy AAF
Wheeler-Sack AAF
Muir AAF
Phillips AAF
Amedee AAF
Forney AAF
Godman AAF
Davison AAF
Butts AAF
Sherman AAF
Michael AAF
Redstone AAF
Felker AAF
Marshall AAF
Fort Campbell
Campbell AAF & Sabre AHP
Laguna AAF
Henry Post AAF
Fort Bragg
Simmons & Mackall AAFs
HAWAII
Bradshaw AAF
Wheeler AAF
Libby AAF
Biggs AAF
Lawson AAF
Fort Stewart
Hunter & Wright AAFs
Polk AAF
JAPAN
Kastner AAF
FORT HOOD
Robert Gray & Hood AAFs
Fort Rucker
Cairns AAF, Lowe & Hanchey AHPs
SOUTH KOREA
A-306 AAF
A-511 AAF
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Inspection Intervals

- Critical Category I airfields
  - structural evaluation including nondestructive testing (NDT) every 5 years
  - pavement condition survey to determine the pavement condition index (PCI) every 5 years

- Category I airfields and instrumented heliports
  - structural evaluation including NDT every 8 years
  - pavement condition survey to determine the PCI every 4 years

Objectives

- Structural evaluation
  - determines allowable aircraft loads and design traffic
    - FWD/HWD
    - DCP
- Visual evaluation
  - pavement condition survey
  - identify M&R
- Test new technologies
  - PSPA
  - GPR

FWD/HWD

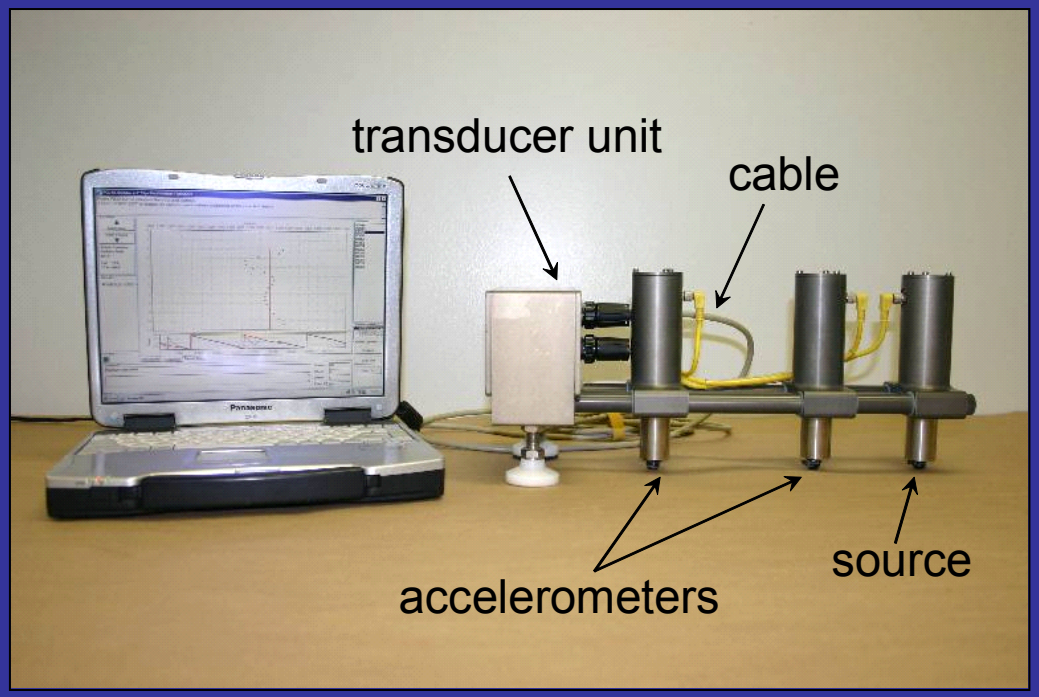
- Trailer mounted, nondestructive, impact load device
- Dynamic force applied to the pavement
  - drop height of 0-15.7 in
  - 0-50,000 lbs
  - 25-30 ms duration
- Applied force and pavement deflections are measured

DCP

- Determines strength (CBR) of underlying soil layers
- Thickness is delineated from changes in strength
- 4 main components
  - cone, rod, anvil, hammer
- Procedure:
  - 1-in drilled hole
  - drop hammer until penetration depth is 20-30 mm
  - record number of blows and depth
  - penetration/mm is correlated to CBR

PSPA

- Measures seismic modulus of concrete pavements
- Quick, simple, nondestructive
- Measurements taken from near surface pavements



GPR

- GPR is used to non-invasively determine thickness of pavements
- Two radar antennas are usually used
  - 1 GHz – penetrates pavements up to 3 ft
  - 500 MHz – penetrates pavements up to 6 ft
- Depth of penetration is dependent on the material type and the dielectric constants

Pavement Condition Survey

- Visual inspection to determine present surface condition
  - types of distress
  - severity of distress
  - quantity of distress
- Airfield broken into features and sample units
- Estimated quantities and severity of distresses are used to compute the PCI for each feature




Micro PAVER

- Developed by USACE, Champaign, IL
- Aids pavement managers in:
  - developing and organizing the pavement inventory
  - assessing the current conditions of pavements
  - developing models to predict future conditions
  - reporting on past and future pavement performance
  - developing scenarios for pavement M&R based on budget or condition requirements

NDT Analysis

- Pre-evaluation
  - climatological data
  - traffic data (critical aircraft and maximum number of passes)
- Load-carrying capacity
  - strength of the pavement
  - gross weight of the aircraft
  - number of applications of the load
- ACN/PCN method is used to report pavement load-carrying capacity
  - ACN – structural effect of an aircraft (single wheel load)
  - PCN – load-carrying capacity in terms (single wheel load)
  - ACN/PCN ratio
    - should be < 1
    - pavement life is greater than the design life

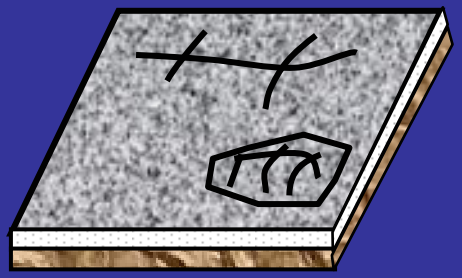
PCASE

- Developed by USACE, Vicksburg, MS
- Aids in the design and evaluation of transportation systems

- Some capabilities:
  - generate ACN curves for any vehicle
  - analyze DCP data with DCP module
  - generate a design curve for any aircraft
  - determine the load-carrying capacity for any airfield using modulus values
  - backcalculate the modulus using the FWD/HWD data
  - percent-life curves can tell how much damage an aircraft will do to an airfield
  - use the NDT module to analyze deflection data

Determination of M&R Recommendations

STEP 1
INSPECT PAVEMENT: DETERMINE DENSITY AND SEVERITY OF VARIOUS DISTRESS TYPES



STEP 2
COMPUTE PCI (0 - 100)

PCI

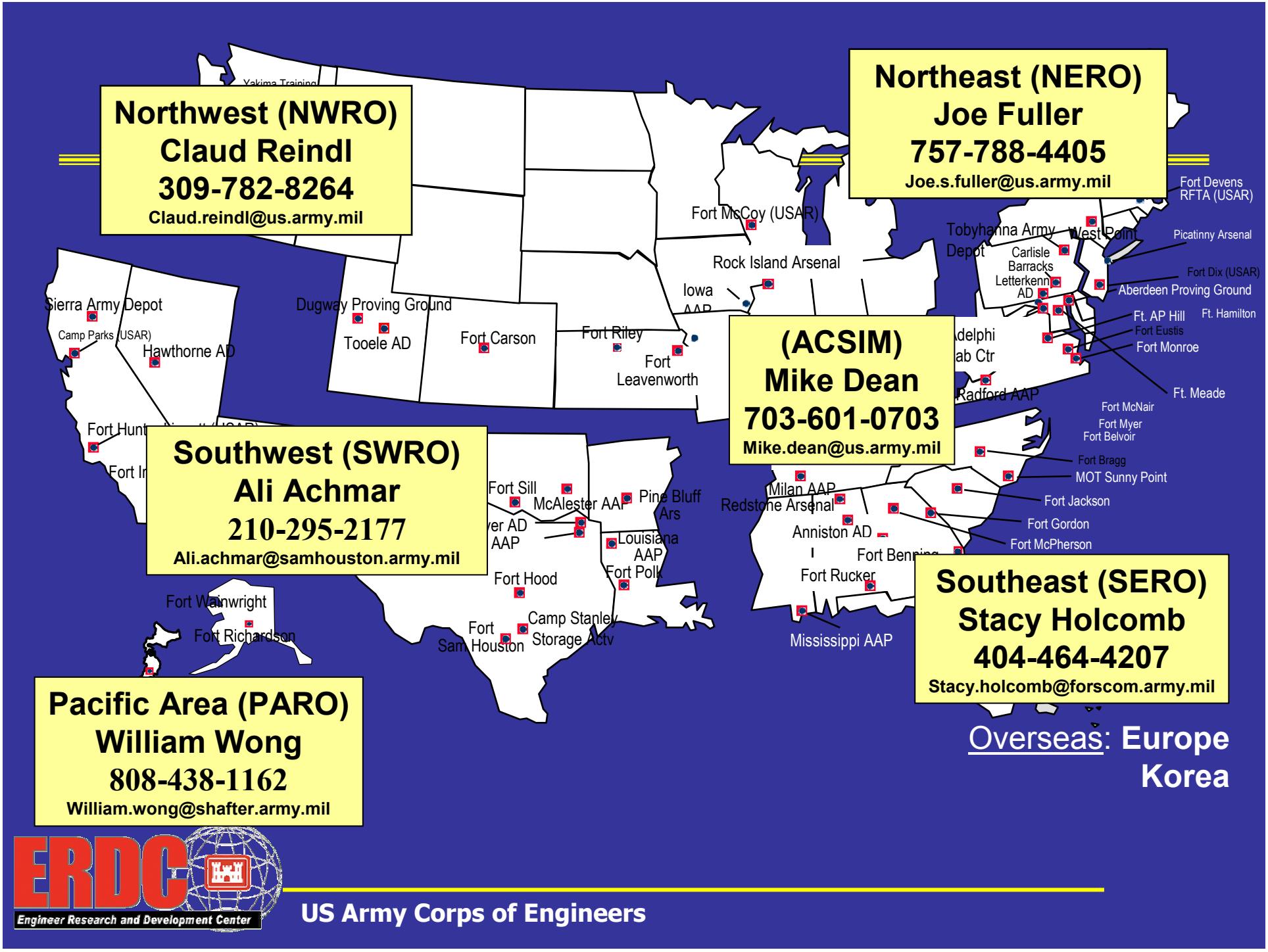
STEP 3
DETERMINE CONDITION RATING

- Excellent
- Very Good
- Good
- Fair
- Poor
- Very Poor
- Failed

STEP 4
NDT METHOD OF DETERMINING LOAD-CARRYING CAPACITY (PCN)

STEP 5
DETERMINE M&R ALTERNATIVES BASED ON RESULTS OF 3&4

STEP 6
PERFORM LIFE CYCLE COST ANALYSIS AND IMPLEMENT THE MOST FEASIBLE M&R ALTERNATIVE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Fort Carson
Fort Riley
Fort Leavenworth
Tobyhanna Army Depot
West Point
Carlisle Barracks
Letterkenny AD
Fort Devens RFTA (USAR)
Picatinny Arsenal
Fort Dix (USAR)
Aberdeen Proving Ground
Ft. AP Hill
Ft. Hamilton
Fort Eustis
Fort Monroe
Ft. Meade
Radford AAP
Fort McNair
Fort Myer
Fort Belvoir
Fort Bragg
MOT Sunny Point
Fort Jackson
Fort Gordon
Fort McPherson
Fort Benning
Fort Rucker
Milan AAP
Redstone Arsenal
Anniston AD
Mississippi AAP
Fort Sill
McAlester AAP
Pine Bluff Ars
Louisiana AAP
Fort Polk
Fort Hood
Fort Sam Houston
Camp Stanley Storage Actv
Fort Wainwright
Fort Richardson
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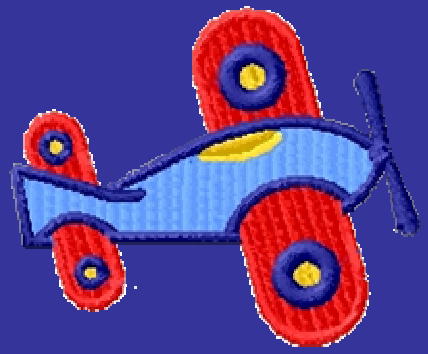
Airfield Evaluation Summary

- Review previous reports
- Brief installation personnel
- Get necessary data
- Drive over and identify overall visual condition
- Mark features and sample units
- Survey, NDT
- Review PCI sheets and NDT data
- Enter all information into PAVER, PCASE
- Analyze data
- Generate report



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