PART I
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Title of Presentation:
Modeling the Effects of Maintenance Capabilities on Aircraft Operations

This presentation is believed to be: [ ] SECRET [ ] CONFIDENTIAL [ ] UNCLASSIFIED and will be presented in
List all WG(s): [ ] 19, 21, 29B

PART II
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**Title:** Modeling the Effects of Maintenance Capabilities on Aircraft Operations

**Performing Organization:**
Air Force Logistics Management Agency

**Abstract:**
Modeling the Effects of Maintenance Capabilities on Aircraft Operations

Maj Jennifer Walston
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Overview

- Background
  - Aircrew/Aircraft Tasking System (AATS)
  - AFLMA Study
- Modeling Maintenance Capabilities
  - Net Effective Personnel (NEP)
- What is the effect?
AATS allocates Air Mobility Command (AMC) aircrews and aircraft among AMC wings and the Tactical Airlift Control Center (TACC).

- TACC schedules Transportation Command (TRANSCOM) taskings and other operational missions.
- Each wing must support wing training and other mission directed requirements.
- The remaining balance of aircraft is made available for maintenance, i.e. maintenance withhold (MW).
How does AATS determine MW?

Maintenance Withhold =

$\text{(Avg Possessed - Deployed)} \times (1 - \text{Commitment Threshold})$

- Maintenance Capacity (assumption) given as 0.65
Effect of Maintenance Withhold
Modeling Maintenance Capacity (MC)

- Typically calculated with Assigned/Authorized
  - Good initial indicator
  - Does not account for skill levels of the personnel
  - Does not account for daily availability of the personnel
- AATS assumes MC = 1
- Is there a better way?
AMC employs the Aircrew/Aircraft Tasking System which is designed to balance AMC aircrew and aircraft allocations against operational and training requirements.

This process does not take into account a unit’s maintenance capabilities based on current workload, available manpower, experience, or skill level.
AFLMA Study Objectives

- Develop a formula that illustrates maintenance skill-levels impacting aircraft generation
  - Define maintenance capabilities
  - Determine key variables that affect maintenance capabilities
  - Explore other efforts to address maintenance skill level and aircraft generation
- Propose an amendment to the current AATS formula that takes into account maintenance capabilities
- Discuss the possible effect of the formula on aircraft availability
Net Effective Personnel (NEP)

- NEP takes authorized vs. assigned one step further
  - Also takes into account
    - Skill-level productivity
    - Ancillary and computer-based training (CBT) requirements
    - Personnel availability
- Methodology developed for C-5 TNMCM Study
  - Study team developed a representation of the effective personnel resource pool
  - Account for the realities of availability and productivity
  - Allow the resource pool to be viewed objectively
  - Mechanism for comparing maintenance capacity with demand
How is NEP calculated?

- Iteration 1 ($I_1$): Availability
  - $A_{75NT} + A_{75T} + A_3$
- Iteration 2 ($I_2$): Availability and Productivity
  - $A_{75NT} + P_t A_{75T} + P_e A_3$
- Iteration 3 ($I_3$): Availability, Productivity, CBT and Ancillary Training
  - $T_{75}(A_{75NT} + P_t A_{75T}) + T_3(P_e A_3)$

The MC adjustment

$$\text{NEP} = T_{75}(A_{75T} + (P_T \times A_{75T})) + T_3 \times (P \times A_3)$$

Possible NEP hours = NEP * Total Quarterly Hours

Possible NEP Hours

\[=\]

Quarterly Hours Available

Actual Hours Worked

\[=\]

Adjustment

Quarterly Hours Available * Actual Hours Worked

Adjustment

Possible NEP Hours
New MW Calculation

New MW =

\[(\text{Avg Poss.} - \text{Dep.}) \times (1 \pm \text{adj.} - \text{Commitment Threshold})\]
Operational Effects
Effect on Operational Metrics

- **Metrics of Interest**
  - Aircraft break rate
  - Repair rate
  - Mission capable rate
  - Aircraft availability rate
  - Not mission capable maintenance rate
  - Not mission capable supply rate
  - Not mission capable both rate

- **How to Capture**
  - Base Level Test
    - Expensive
  - Simulation
Effect on Operational Metrics

Start

- Generate Schedule
  - New vs. Old AATS

  **Significant Change?**

  - **Yes**
    - Discrete Event Simulation of 16 Week AATS Cycle
      - **Significant Change to Ops Metrics?**
        - **Yes**
          - Recommend changing AATS
        - **No**
          - Recommend NOT changing AATS
    - End

  - **No**
    - End
Discrete Event Simulation

- Cooperative Research and Development Agreement (CRADA) is in coordination with Boeing
  - Boeing Aircraft Operations Methodology
  - Extend Simulation Software
Any Questions?