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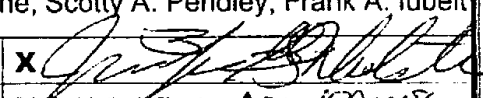
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Modeling the Effects of Maintenance Capabilities on Aircraft OperationsThis presentation is believed to be ☐ SECRET ☐ CONFIDENTIAL ☒ UNCLASSIFIED and will be presented in☐ Special Session ☐ Tutorial ☐ Demo ☐ CG: A-B-C-D-E-F (check one) ☒ List all WG(s) #: 19, 21, 29B

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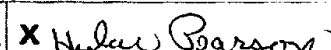
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Air Force Logistics Management Agency

Modeling the Effects of Maintenance Capabilities on Aircraft Operations



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Overview

- **Background**
 - **Aircrew/Aircraft Tasking System (AATS)**
 - **AFLMA Study**
- **Modeling Maintenance Capabilities**
 - **Net Effective Personnel (NEP)**
- **What is the effect?**



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AATS



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AATS

- **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)**

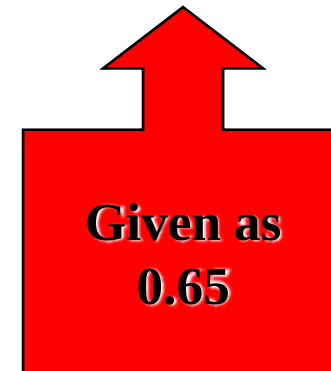
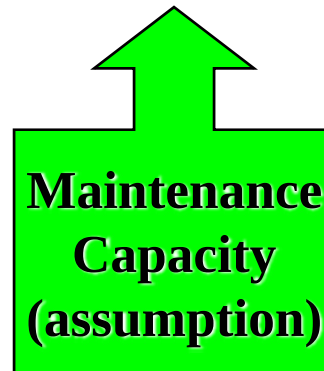


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How does AATS determine MW?

Maintenance Withhold =

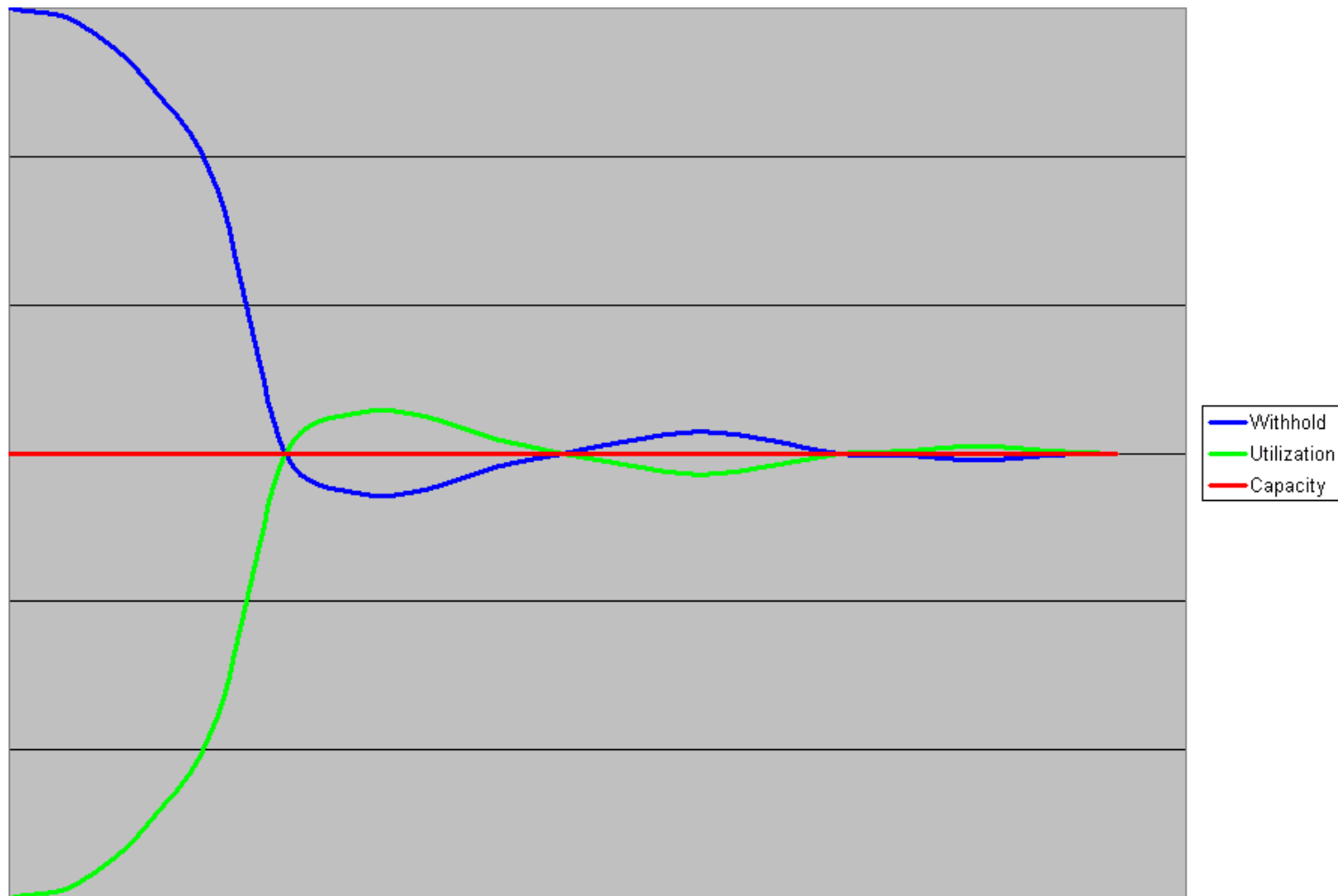
$(\text{Avg Possessed} - \text{Deployed}) * (1 - \text{Commitment Threshold})$





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Effect of Maintenance Withhold



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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?



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AFLMA Study



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Study Drivers

- **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.**



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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**



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Results



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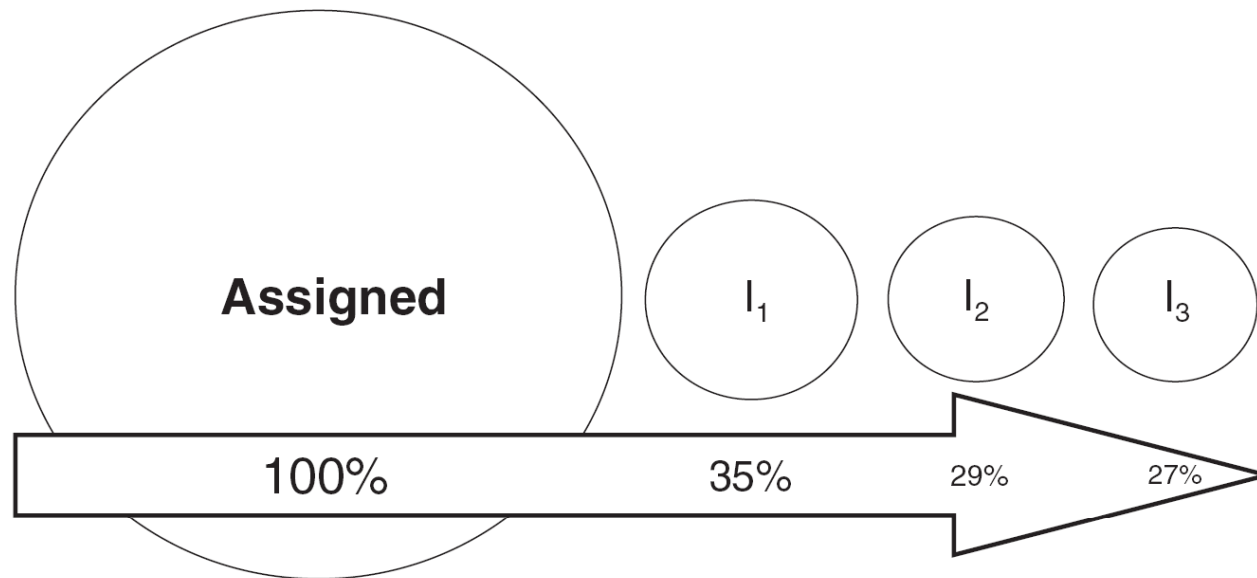
Net Effective Personnel (NEP)

- **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



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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
 - $T_{75}(A_{75NT} + P_t A_{75T}) + T_3(P_e A_3)$



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The MC adjustment

$$NEP = T_{75}(A_{75NT} + (P_T * A_{75T})) + T_3 (P_E A_3)$$

Possible NEP hours = NEP * Total Quarterly Hours

$$\frac{\text{Possible NEP Hours}}{\text{Actual Hours Worked}} = \frac{\text{Quarterly Hours Available}}{\text{Adjustment}}$$
$$\text{Adjustment} = \frac{\text{Quarterly Hours Available} * \text{Actual Hours Worked}}{\text{Possible NEP Hours}}$$



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New MW Calculation

**New MW =
(Avg Poss. – Dep.)*(1 ± adj. - Commitment Threshold)**



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Operational Effects



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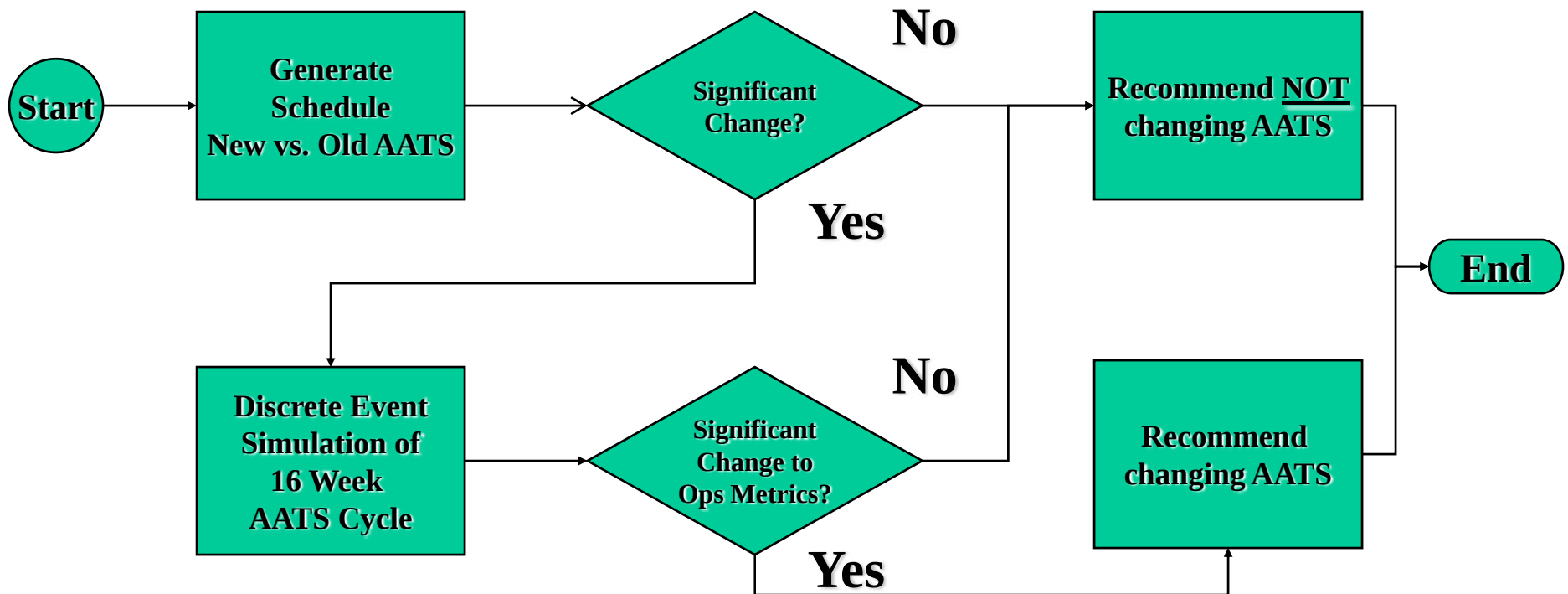
Effect on Operational Metrics

- **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



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Effect on Operational Metrics





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Discrete Event Simulation

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



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Any Questions?



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