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Original title on 712 A/B: Simulation Modeling of the Altus Assault Landing Zone

Presented in (input and Bold one): (WG_22, CG, Special Session, Poster, Demo, or Tutorial):

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Standard Form 298 (Rev. 8-98)  
Prescribed by ANSI Std Z39-18
Air Education and Training Command

Sustaining the Combat Capability of America’s Air Force

ALTUS AFB ASSAULT
LANDING ZONE STUDY II
MORSS 2005

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Integrity - Service - Excellence
Overview

- Study Objective
- Background
- Approach
- Time in System and Graduate Program Requirements Document
- Limitations
- Assumptions
- Scenario Description
- Results
- Conclusion
- Future Studies
Study Objective

Does the proposed increase in C-17s at Altus AFB drive a requirement for an additional ALZ?
Background

• Dec ’01 – Congress authorized AF 180 C-17s by end of FY07– an additional increment to 222 may be authorized
  • Altus AFB fleet grows to 15 C-17s by FQ08/1; 18 C-17s by FY11 if 222 authorized

• May ’02 – 97th AMW stated the increase drives a requirement for an additional ALZ
  • Pattern saturated on existing ALZ due to conflicting traffic on East runway

• Jul ’02 – AMC as lead command refused the $16.0M funding line for a new ALZ
  • Stated traffic congestion can be handled through better scheduling
Modeling Approach

- Simulated entire flying process for 3 platform training tracks (C-17, KC-135, & C-5) from FY07 through FY11 – ran 1K times each for a total of 5K simulated years
- 26 pilot types modeled with their respective missions (e.g., Aircraft Commander Air Drop, Aircraft Commander Air Refueling, Instructor Pilot Continuation Training, etc.)
  - 12 C-17 types, 7 C-5 types, & 7 KC-135 types
- Factors modeled: VFR, IFR, LL & AR patterns; crew rest; weather; sunrise/sunset; scheduled and unscheduled maintenance; proficiency reflies
Approach Modeling Methodology

Pilot Pair Entry

C-17 ACAD

Weather
Enough time for sortie duration
C-17 Availability

Check

Air Refueling
VFR
Low Level

Fly Sortie 1

Input: GPRD (drives sortie generation)

Output: Avg Time In System (TiS)

Proficiency Refly

Check

NO

GO!

Delay

YES

GO!

Continue Next Sortie

GO!
Understanding TiS and GPRD

- If TiS is beyond the allotted time → saturated
- If GPRD is not met (entry ≠ grads) → saturated
- If TiS is within the allotted time and GPRD is met (entry = grads) → not saturated

- How is a pattern saturation issue determined?
  - Vary resource constraints for C-17, VFR, and Tactical → Increased resource capacity, should result in TiS decrease

- TiS decrease implies that *wait time* for a particular resource (i.e., C-17) is directly affected by increased resource

- TiS unchanged implies that increased resource is not the reason for any *wait time*
Model Limitations

• Constant Day – sunrise/sunset do not vary -- minor

• NVG & C-17 Tactical landings not modeled
  • NVG requirements not yet defined
  • C-17 high-speed tactical landings not supported by current Altus ALZ
Assumptions

• Primary model input: Student/IP GPRD requirements
• General
• Re-fly Factors
• Maintenance
• Weather
• C-17 specific
• KC-135 specific
• BASH
• Resource Capacity
Scenario Description

• **Baseline** – Current Altus AFB resources; 15 C-17s (8-5); VFR at Altus (4)

• **Baseline with Aux ALZ** (new ALZ) – C-17 VFR accomplished at Aux ALZ & Altus AFB (7);
Simulation Results
Simulation Results
C-17 FY07 GPRD Entry/Grad

FY07 GPRD

C-17 Pilot Type

# of Pilots

AC  ACAD  ACIQ  ACRQ  CAD  IAC  IP TPS  PCO  PIQ  SOC

0  50  100  150  200  250  300  350  400

Entry  Baseline  Baseline w/ Aux ALZ
Simulation Results
C-17 FY07 TiS Comparisons

FY07 Time In System

C-17 Pilots (Allotted Fly Days)

Max Desired Flying Days  Baseline  Baseline w/ Aux ALZ
Simulation Results
C-5 FY07 GPRD Entry/Grad

FY07 GPRD

# of Pilots

C-5 Pilot Type

<table>
<thead>
<tr>
<th>C-5 Pilot Type</th>
<th>Entry</th>
<th>Baseline</th>
<th>Baseline w/ Aux ALZ</th>
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<td>AC</td>
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<tr>
<td>SOC</td>
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Zero grads
Simulation Results
C-5 FY07 TiS Comparisons

FY07 Time In System

C-5 Pilots (Allotted Fly Days)

- AC (8)
- ACAR (13)
- ACIQ (8)
- PIQ (14)
- IAC (8)
- SOC (1)

- Max Desired Flying Days
- Baseline
- Baseline w/ Aux ALZ

Over 247 TD
Simulation Results
KC-135 FY07 GPRD Entry/Grad

FY07 GPRD

KC-135 Pilot Type

# of Pilots

Entry
Baseline
Baseline w/ Aux ALZ
Simulation Results

KC-135 FY07 TiS Comparisons

FY07 Time In System

KC-135 Pilots (Allotted Fly Days)

Max Desired Flying Days  Baseline  Baseline w/ Aux ALZ

AC (29)  ACIQ (35)  ACRQ (29)  PIQ (35)  IAC (20)  SOC (7)
Simulation Results

TiS Decrease w/ Aux ALZ x GPRD

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<th>TiS decrease</th>
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<tr>
<td>C-17 AC (154)</td>
<td>12.0</td>
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<td>C-17 CAD (80)</td>
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<td>C-17 PIQ (392)</td>
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<td>C-17 IAC (114)</td>
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<td>C-5 ACAR (12)</td>
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<td>KC-135 AC (150)</td>
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Results

• The model shows the TiS requirement for C-17 and KC-135 pilots cannot be met with current resource availability

• FY07 TiS is improved for all 3 platforms with the addition of an Aux ALZ

• Overall C-17 and KC-135 Baseline TiS implies saturation
Conclusion

- Given the resource capacity and the current GPRD requirements applied to the model, coupled with the Time in System output
  - The Altus AFB simulation model shows pattern saturation
  - Requirement exists for an additional ALZ at Altus AFB
Future Studies

- Model additional C-17 Abeam constraints
- Clarify the high speed tactical approach and the NVG command responsibility training standards for model inclusion
Questions???
Back-up Slides
Assumptions Start
Assumptions
General

• Sorties greater than 99 minutes = 10 min standard deviation
• Sorties less than 99 minutes = 5 min standard deviation
• Aerial Refueling time to and from RP is 80 minutes
• No student refly sorties modeled for KC-135
• Senior Officer Course (SOC) sorties are all during daytime and no reflies required
• Reflies have priority over "new class"
Assumptions General

• Pilots usually fly in pairs, odd pilots can fly in singles
• Global Weather – No-fly weather occurs based on historical average (~3%) (Altus Wx Shop); lasts ½ to 1 day with equal probability
  • C-17 does not take off w/ low ceiling--2-4 hrs delay
• Fifteen-minute taxi-out and an additional fifteen-minute taxi-in incurred before and after each sortie (not counted as flying hours), respectively
• Time in System (TiS): Training days required to accomplish flying training
Assumptions
General

- Schoolhouse Flying Window: 0830-0230
- Training days = 246
- AR resource capacity not affected by C-17 tactical maneuvers
- Altus receivers have priority over non-Altus receivers for AR
- SOC sorties all accomplished at Altus and always Priority 1
- IP sorties accomplished at Altus
Assumptions
C-17

• Staggered take-off calculated as follows:
  • 1st available C-17 is ready at 0830
  • 2nd available C-17 is ready at 17 minutes (0847) into the start of operation, then 15 minute interval for other C-17s

• When the VFR rwy is used for C-17 tactical at Altus, the following resource capacity decrease occurs:
  • VFR = 2
  • IFR & LL = 0
Assumptions
KC-135

- Most evaluation sorties are flown during daylight hours
- IAC sorties are flown anytime
- AC, ACRQ, ACIQ, & CIQ sorties - 1st 2 sorties are during daylight hours, next 2 are during nighttime hours, remaining sorties can be flown anytime
Assumptions
KC-135

- Staggered take-off is calculated as follows:
  - First KC-135 ready 7 minutes (0837) into the start of operation. The 2nd to 5th aircraft becomes available in 15-minute intervals. The 6th to 10th aircraft becomes available in 7.5-minute intervals.

- 25% of all sorties will fly off-station except for SOCs and IPs
Assumptions
BASH/Day/Night

- Occurs in Dec-Jan 1700-1859 hours
- Daylight hours are 0830-1759 (non BASH months)
- Daylight hours are 0830-1659 (BASH months)
- Nighttime hours are 1800-0230 (non BASH months)
- Nighttime hours are 1900-0230 (BASH months)
## Assumptions

### Resource Capacity

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Model Snap-shots
Main Logic

C-17 SET
- C-17 Logic

KC-135 SET
- KC-135 Logic

C-5 One

C-5 Two
- C-5 Logic

Wx Logic
- Time Dependent Logic
- Air Refueling Logic
KC-135 Logic

ACRQ

AC

ACIQ

PIQ

TNOW
08:30:00

1 = Day Time
2 = Night Time

# of Classes generated after pairing up pilots
Prior to Sortie Check
Sortie Profile
Air Refueling Logic
Glossary
Acronyms/Abbreviations

• AC – Aircraft Commander Upgrade
• ACAD – Aircraft Commander Airdrop
• ACAR – Aircraft Commander Air Refueling
• ACIQ – Aircraft Commander Initial Qualification
• ACRQ – Aircraft Commander Requalification
• AETC – Air Education and Training Command
• AFB – Air Force Base
• ALZ – Assault Landing Zone
• AMC – Air Mobility Command
• AMW – Air Mobility Wing
• AR – Air Refueling
• BASH – Bird Aircraft Strike Hazard
• CAD – Copilot Airdrop
• FY – Fiscal Year
• GPRD – Graduate Programmed Requirement Document
• IAC – Instructor Aircraft Commander Qualification
• IFR – Instrument Flight Rules
• IP – Instructor Pilot
• KPP – Key Performance Parameter
Acronyms/Abbreviations

- LL – Low Level
- Mx – Maintenance
- NVG – Night Vision Goggles
- PCO – Pilot Check-out
- PIQ – Pilot Initial Qualification
- Qtr – Quarter
- Rwy – Runway
- SAS – Studies and Analysis Squadron
- SOC – Senior Officer Course
- TPS – Tactical Proficiency Sortie
- VFR – Visual Flight Rules
- Wx - Weather
- XP – Plans and Programs