

Using VA to Mitigate Airfield Funding-Shortfall Risk

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OUTLINE

- Introduction
- Airport Overview
- Project Overview
- Workshop Process
- Workshop Results
- Selected VA Proposals
- Lessons Learned
- Conclusions

INTRODUCTION



Taxiway Safety Enhancement Program (TSEP)

- Phased 5-year program
- Funding risk
 - Increased construction costs
 - Decreased out-year funding allocation

INTRODUCTION

How to Mitigate Funding Risk?

- Cost reduction options
- How, without impairing essential functions?
- Value study

INTRODUCTION

Value Study Approach

- FAA Advisory Circular 150/5300-15A *Use of Value Engineering for Engineering and Design of Airport Grant Projects*¹:

*“VE provides the funding agency and the sponsor of a project the opportunity and means of improving the project and **substantially reducing costs.**”*

- Formal VE study not in scope
- Informal, internal value study workshop

AIRPORT OVERVIEW

Lexington, Kentucky -- “Horse Capital of the World”



AIRPORT OVERVIEW

Lexington Blue Grass Airport²



Existing Airfield

- 1M+ passengers/year
- 5 major airlines
- Corporate, charter, private
- Air cargo (horses)
- One commercial runway (4/22)



AIRPORT OVERVIEW

Airport Design Aircraft



- FAA Design Group III
- Representative aircraft: MD-80 & B-737

AIRPORT OVERVIEW

Occasional Aircraft

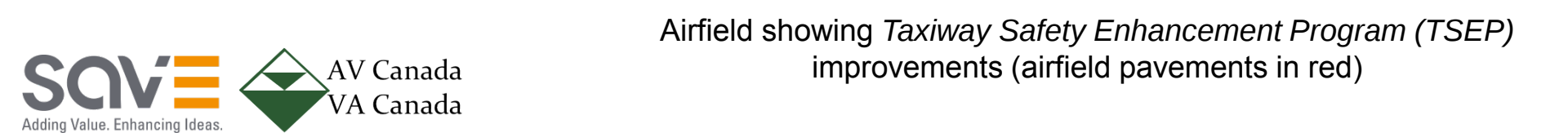


- FAA Group V horse-industry private aircraft
- Representative aircraft: B-747 & B-777



AIRPORT OVERVIEW

Lexington Blue Grass Airport Master Plan³



AV Canada
VA Canada

AIRPORT OVERVIEW

Taxiway Safety Enhancement Program (TSEP)³



Airfield rendering after TSEP improvements

AIRPORT OVERVIEW

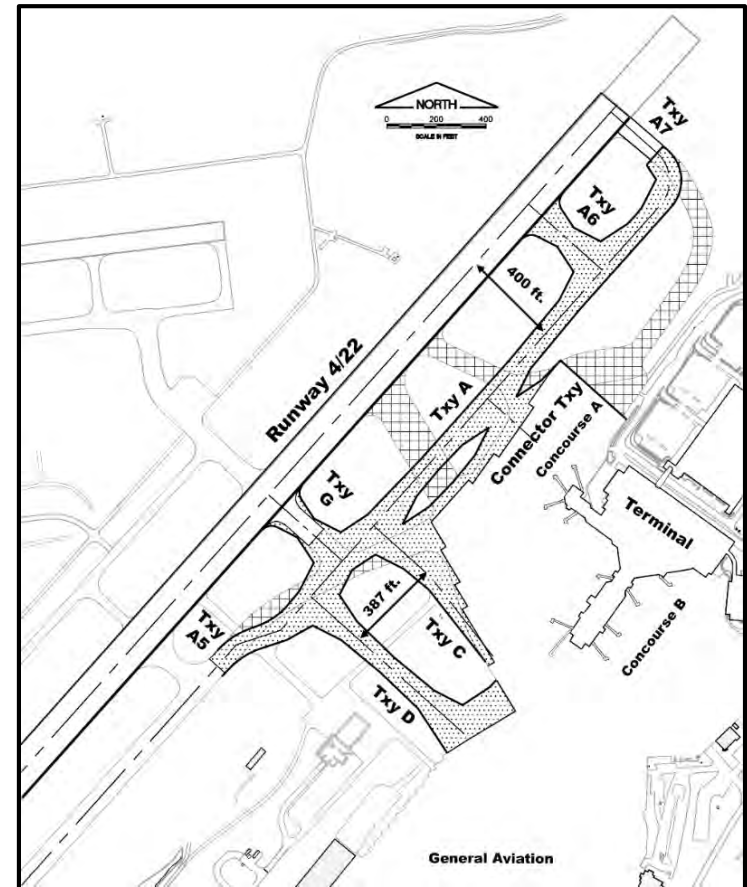
TSEP Project Functions

- *Reduce* runway *incursions* potential
- *Reduce* aircraft *conflicts* (head to head) potential
- *Increase* operational *flexibility*
- *Increase* aircraft movements *separation*

PROJECT OVERVIEW

TSEP Geometric Improvements

- New parallel Taxiway A 400' from Rwy. 4/22
- New Taxiway C
- New Taxiway D 387' offset from Taxiway C
- Widen existing Taxiway G
- New bypass Taxiway A6
- New Terminal A apron Connector Taxiway
- Remove existing conflicting taxiways



WORKSHOP PROCESS

Design Stage:

- Draft 35% design report

Workshop Scope:

- Primary airfield project elements
- Airfield building not included

Workshop Goals & Objectives:

- Develop 4-5 feasible VA proposals
- Reduce project cost by 4-5%

WORKSHOP PROCESS

Workshop Team

- Five independent CMT subject matter experts (SMEs)
 - Airport planning
 - Airfield geometrics
 - Airfield pavements/geotechnical
 - Aviation lighting/navaids/utilities
 - Airfield operations/constructability
- One design team member for background information & administrative support
- Value study leader (SAVE-certified AVS)
- Two SMEs participated via tele-video

WORKSHOP PROCESS

Information Phase

- Pre-workshop information package
 - Airport master plan
 - Taxiway Safety Enhancement Program
 - TSEP airfield geometric improvements
- Project presentation at workshop
 - Airport master plan
 - Taxiway Safety Enhancement Program
 - TSEP airfield geometric improvements

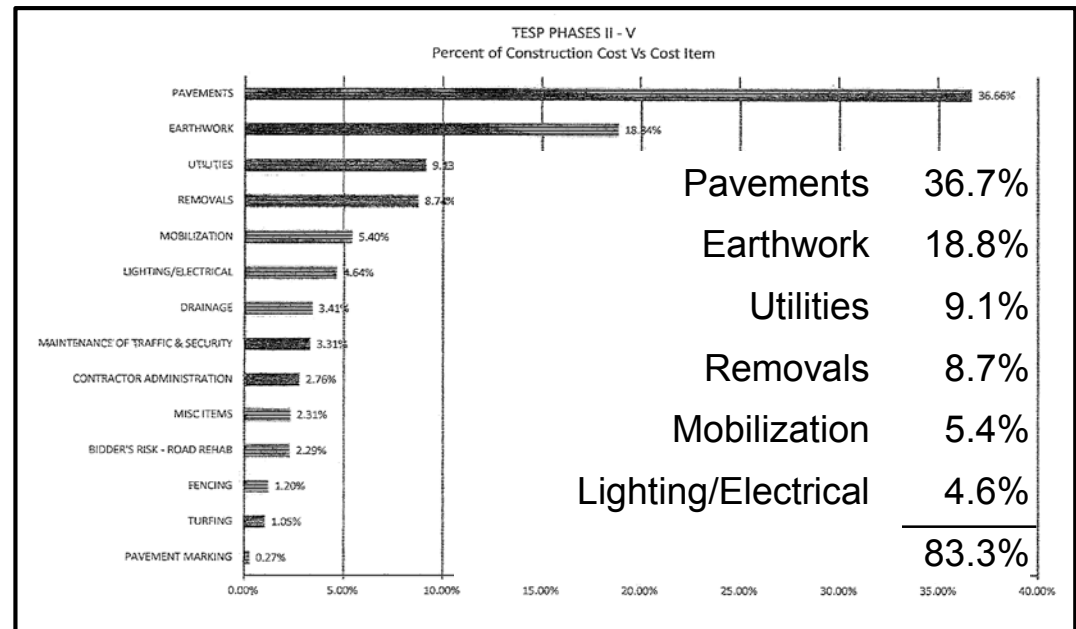


Workshop project presentation

WORKSHOP PROCESS

Information Phase

- Baseline cost model
 - 83% of construction cost in six items
 - 36% of construction cost: pavements
- Total baseline construction cost: \$21.6 million



WORKSHOP PROCESS

Functional Analysis Phase

- Top nine cost components selected from cost model as value targets

A Pavements

B Earthwork

C Utilities Construction

D Removals

E Mobilization

F Lighting/Electrical

G Drainage

H MOT & Security

I Bidders Risk – Road Rehab.

WORKSHOP PROCESS

Functional Analysis Phase

- Value targets defined with active verbs and measurable nouns
- Prepared-in-advance list
- Supplemented by workshop team

WORKSHOP PROCESS

Functional Analysis Phase

- Value-target function examples

VALUE TARGET

Pavements

Utilities Construction

VERB

Support

Resist

Support

Reduce

Eliminate

Maintain

Reduce

NOUN

(Aircraft) Load

Stress

(Aircraft) Repetitions

(Adverse) Travel

Conflicts

Service

Dispersion

WORKSHOP PROCESS

Functional Analysis Phase

- Value-target function examples

VALUE TARGET

Lighting/Electrical

Security

VERB

Prevent

Guide

Increase

Prevent

Protect

Restrict

NOUN

Outages

Pilot

Reliability

Incursions

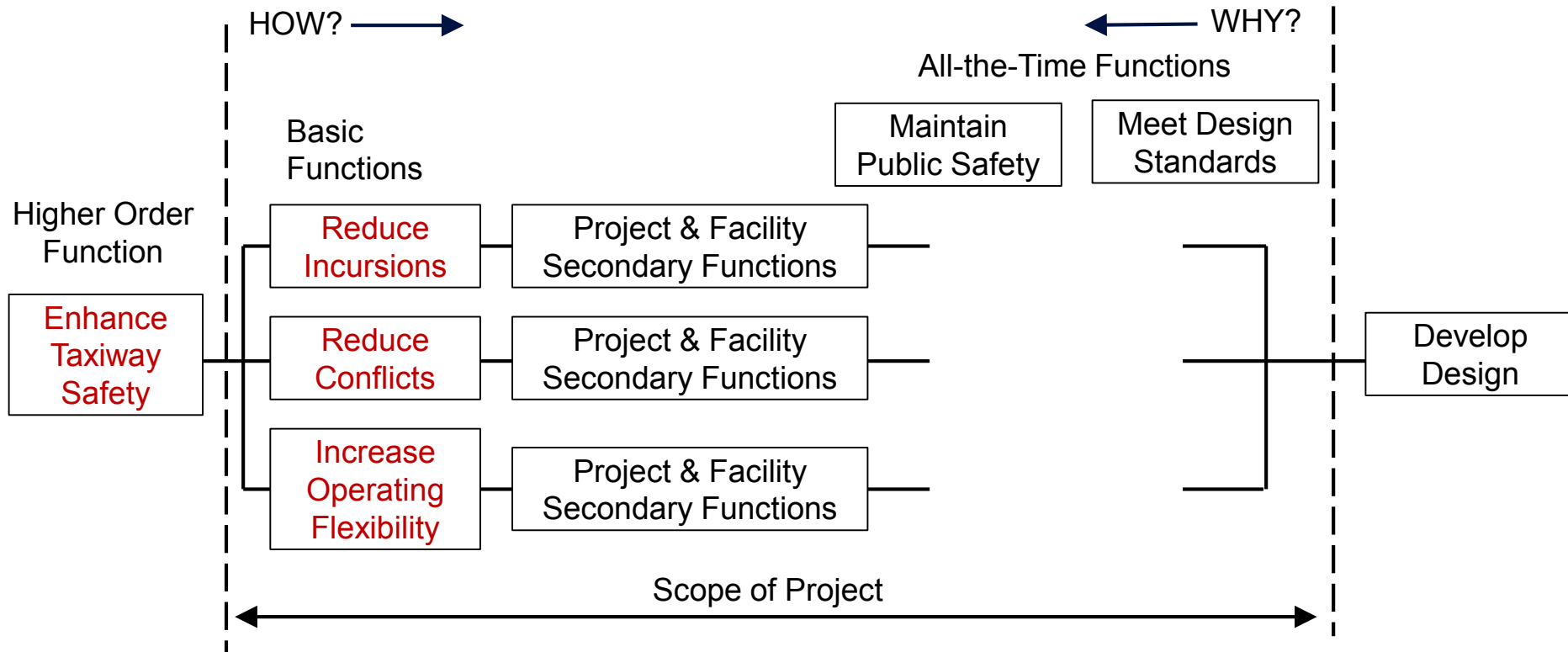
Passengers

Access

WORKSHOP PROCESS

Functional Analysis Phase

- FAST Diagram prepared post-workshop
- Increases design team understanding of project functions/VA proposals



WORKSHOP PROCESS

Creative Phase

- Creative ideas brainstormed; first individually; then as a group
- Administrative-support team member recorded ideas from off-site/tele-video team members
- Ideas recorded on flip charts for each value target



Brainstorming alternative ideas



Tele-video participants

WORKSHOP PROCESS

Evaluation Phase

- Team classified ideas using 9-cell matrix
- Potential VA opportunities:
 - 4 rating = same functionality; decrease cost
 - 5 rating = increase in functionality; decrease cost
- Potential deferrals:
 - 2- rating = decrease in functionality; decrease in cost

9-Cell Matrix Methodology⁴

		PROBABLE EFFECT ON COST		
		Increase	Same	Decrease
PROBABLE EFFECT ON FUNCTION	Increase	Requires additional funding (2+)	✓ (4)	✓ (5)
	Same	X (1)	Possible different approach (3)	✓ (4)
	Decrease	X (1)	X (1)	Scope deferral or elimination (2-)

² SAVE International Value Analysis Module I Basic Certification Workbook, Enliga Consultants and Advantage Facilitation Services, (Ft. Collins)

WORKSHOP PROCESS

Evaluation Phase

- Ideas rated by team on 1-5 scale
 - 5 = Superior
 - 4 = Good
 - 3 = Average
 - 2 = Fair
 - 1 = Poor
- Ideas recorded on spreadsheet and sorted by rating

EVALUATION PHASE - IDEA RATING/SELECTION
BLUE GRASS AIRPORT | LEXINGTON, KENTUCKY
TAXIWAY SAFETY ENHANCEMENT PROGRAM - PHASE B-V

Project: TSEP Phase B-V
Location: Lexington Blue Grass Airport

Team: CMT Value Solutions
Date: November 30, 2014

Idea	Idea Class	Scores	AVERAGE	Prelim Select for writeup	Idea Design	Comments	Assignment
C-5 Eliminate manholes and use handholes/plazes	5	4 5 5 5 4 5	4.67		DS		
A-10 Provide single route for TDG 5 (B-747) aircraft	4	5 5 5 5 4 5	4.50		D		SH
A-11 Hybrid geometric design for two ADGs (3 & 5)	4	5 4 5 5 2 5	4.50		D		SH
A-1 Reduce Txy. Geometry to design aircraft ADG 3	4	4 5 4 4 4 5	4.33		D		SH
A-9 Eliminate unused Txy. A5 fillets (NE side)	4	3 4 5 5 3 5	4.17		D		SH
C-1 Shorten duct bank routes (insufficient time / information for write-up)	4	5 5 3 4 3 5	4.17		D		TM
F-2 Re-use existing guidance signs / convert to LED	4	5 4 4 4 4 3	4.00		D		TM
M-2 Limit Contractor access to the airfield	4	4 5 4 4 4 5	4.00		D		JF
A-8 Crush existing PCC on-site for use as F209 subbase	4	5 4 3 2 4 5	3.83		DS		
B-2 Geosynthetic fabric vs. lime modified subgrade	4	4 4 3 5 4 3	3.83		D		RT
A-6 Redesign PCC using Geotech Rpt. CNG (G) vs. BL (B)	4	4 3 2 4 4 5	3.67		D		RT
D-3 Salvage value items (steel skin and structure)	4	5 2 3 4 4 4	3.67		DS		
M-5 Eliminate wildlife storage / dedicated landside access & storage	4	3 4 4 3 2 5	3.67		D		JF
I-1 Temporary access road vs. rehab existing	4	4 4 4 4 3 3	3.67		D		AB
D-2 Utilize combination bids and additive alternatives	4	5 4 3 2 4 3	3.50		DS		
D-2 Remove and relocate as opposed to just remove	4	5 3 3 4 3 2	3.50		DS		
F-1 Dimable or timed lighting	5	2 4 4 3 4 3	3.33		DS		
A-3 Eliminate (defer) N. Connect. Txy. From Apron to Txy. A	2	4 2 4 4 2 1	3.00		PD		SH
A-4 Reduce F-209 from 12" to 6" / increase PCC from 15" to 15.5"	4	3 4 4 1 4 2	3.00		D		RT
C-2 Eliminate relocations where deep buried	4	2 4 4 1 3 4	3.00		DS		
A-2 Eliminate (defer) Taxiway AS	2	2 2 3 5 3 2	2.83		PD		SH
B-4 Buried MSE Walls	4	4 3 3 1 3 3	2.83		R		
G-1 More open channel flow to reduce pipe costs	2	2 2 2 1 2 1	1.83		R		
Pavements (RICH)							
A-5 Reduce PCC thickness by adding reinforcement	3				R		
A-7 Use HMA Pavement Structure for Taxiway pavement	3				DS		
A-12 Allow Contractor option of PCC on roadway/parking lot	3				DS		
Earthwork (Brian)							
B-1 Contact Local Quarries for assessment of borrow availability	3				DS		
B-3 Increase aggregate depth to reduce earthwork	24				DS		
B-5 Phase Earthwork to Control Settlement					BL		
B-6 Alternatives to lime stabilization	3				DS		
B-7 Rate Control Tower for LOS Improvement	3				R		
Utilities (Tom)							
C-3 Combine BGA/PAA duct banks					BL		
C-4 Any wireless solutions that allow us to drop wiring	3				DS		
Removals (Andy)							
D-1 Remove Pavement only outside of proposed pavement limits	1				R		
D-4 Salvage HMA for recycling					BL		
Mobilization (Andy)							
E-1 Designate 1 staging and storage area throughout all phases	4				DS		
Light/Electrical (Tom)							
F-3 Use secondary windcone and convert to primary	4				DS		
F-4 Landside lighting should be LED	4				DS		
F-5 Use taxiway catenary lights at centers as opposed to edge lights	1				R		

Idea rating spreadsheet

WORKSHOP PROCESS

Development Phase

- Team developed top 9 VA proposals
- Recorded on workshop worksheets
 - Function addressed
 - Original and proposed concepts
 - Cost impacts
 - Advantages/challenges
 - Cost calculations
 - Sketches (where applicable)
- One post-workshop VA proposal (“P” label)



Team development of VA proposals

WORKSHOP PROCESS

Presentation Phase

- Workshop summary prepared by facilitator
- Submitted to airport approximately two weeks following workshop
- Results presented to airport by project manager three weeks following workshop

WORKSHOP RESULTS

- Creative ideas: 52
- VA proposals:
 - During workshop 9
 - Post workshop 1
 - Total 10
- Design suggestions: 27

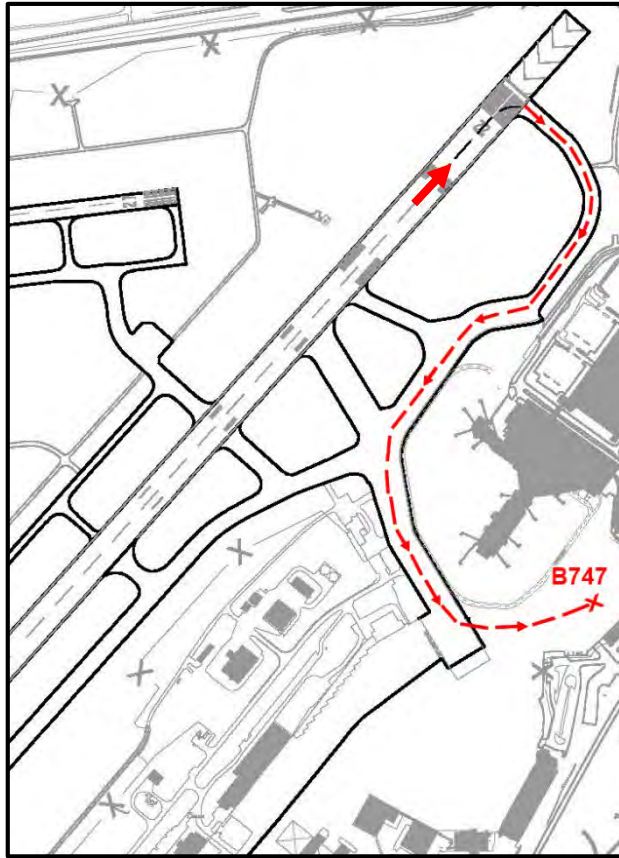
WORKSHOP RESULTS

VA Workshop Results

■ Cost reduction options:

■ VA proposals (10)	\$1,251,000	(5.8% of construction)
■ Deferral proposals (2)	<u>\$1,424,000</u>	(6.6% of construction)
■ Total	\$2,675,000	(12.4% of construction)

SELECTED VA PROPOSALS



Existing taxi route to GA parking

A-11 – Provide geometric design for two airplane design groups (III & V)

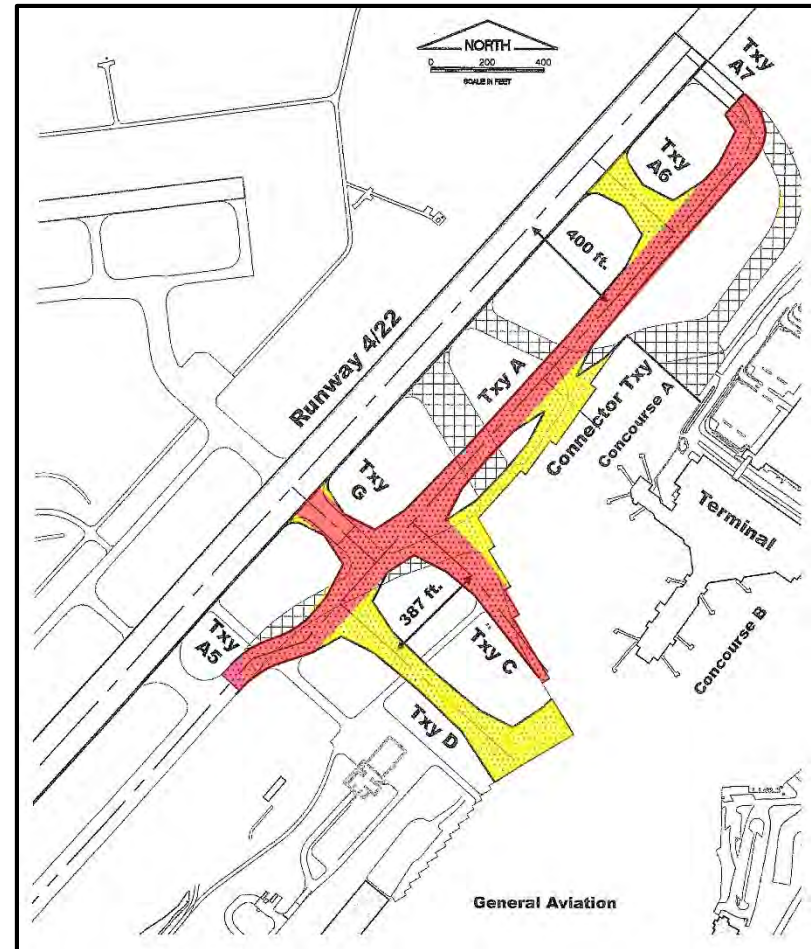


B-747 at GA parking apron

SELECTED VA PROPOSALS

A-11 – Geometric design for two airplane design groups (III & V)

- Red pavement area: Group V
- Yellow pavement area: Group III
- Cost savings = Group V/Group III cost differential
- Cost savings = \$421,000



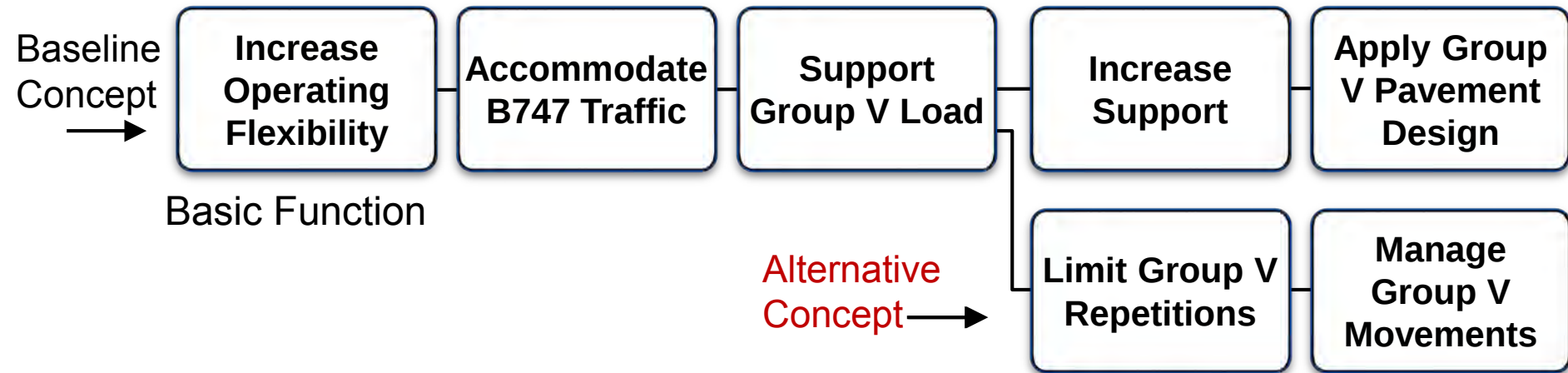
SELECTED VA PROPOSALS

A-11 – Provide geometric design for two airplane design groups (III & V)

HOW?
→

FAST DIAGRAM

← WHY?



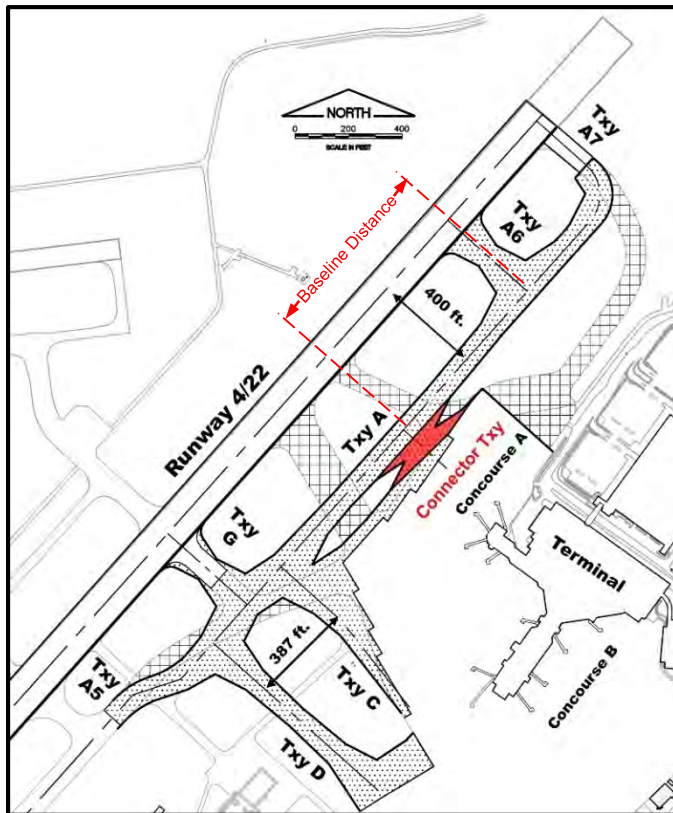
SELECTED VA PROPOSALS

A-4 – Redesign PCC pavement using CBR (6) vs. baseline CBR (3)

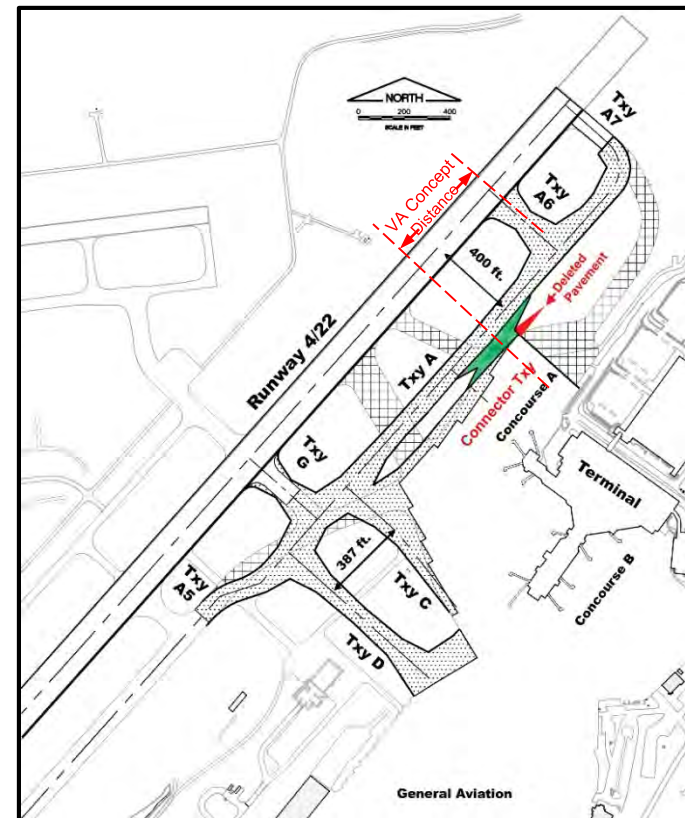
- Baseline PCC design based upon past airport materials history
- VA proposal based upon in-situ materials samples
- Using extra-strength CBR 6 design value yields thinner PCC pavement
- Lower-strength CBR 3 design value (more conservative design) yields surplus function PCC for design service life (but extended service life)
- Cost savings = \$304,000

SELECTED VA PROPOSALS

A-13P – Relocate Apron Connector Taxiway to north apron edge



Connector Taxiway (Baseline)



Connector Taxiway
(VA Alternative)

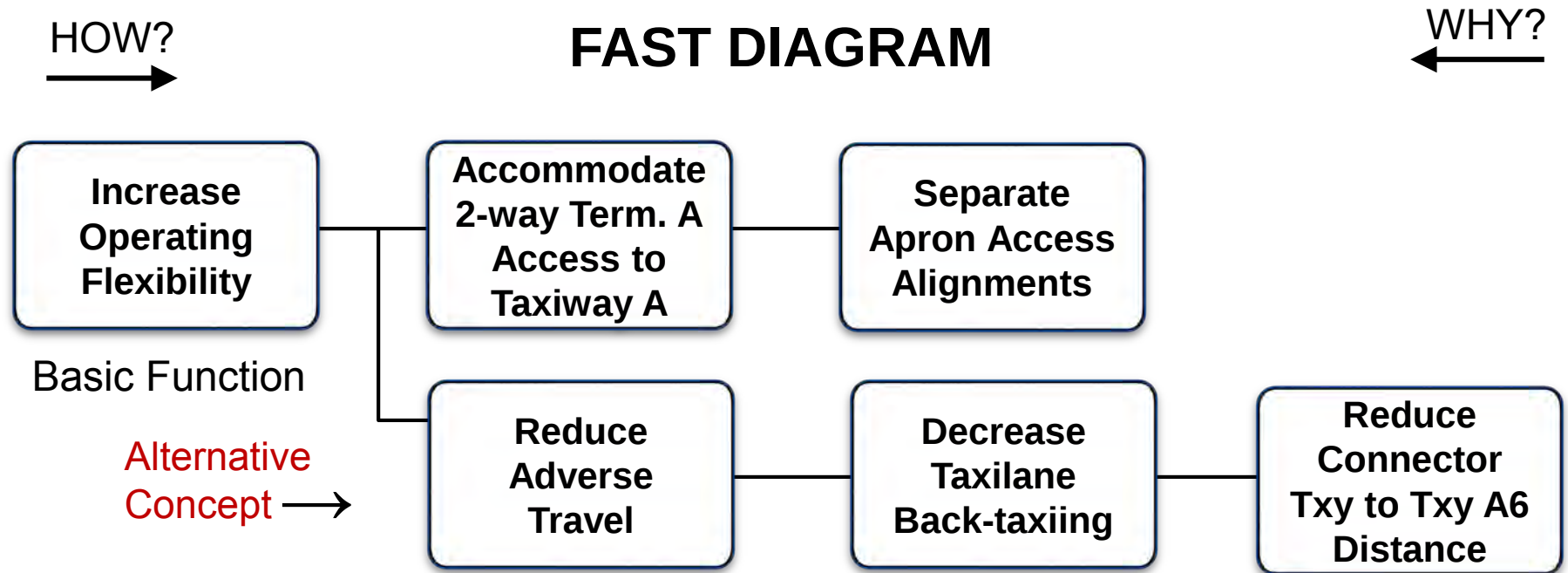
SELECTED VA PROPOSALS

A-13P – Relocate apron Connector Taxiway to north apron edge

- Provides two operational benefits
 - Runway 22 landings clear Taxiway A sooner
 - Improves aircraft operational positioning to some Concourse A gates
- Cost savings = deletion of one of four pavement fillets
- Cost savings = \$89,000

SELECTED VA PROPOSALS

A-13P – Relocate apron Connector Taxiway to north apron edge



LESSONS LEARNED

Workshop Evaluation

■ Workshop team ratings (1-5 scale)	<u>Rating</u>
■ Project Information Package	4.00
■ Project Presentation	4.17
■ Workshop Job Plan	4.50
■ Instructions	4.67
■ Schedule	3.33
■ Facilitator	4.67
■ Team Members	4.67
■ VA Alternatives	<u>4.17</u>
OVERALL TEAM RATING	4.27

LESSONS LEARNED

Workshop Evaluation

- Workshop team feedback
 - Strongest aspects of VA workshop:
 - *“Teamwork & idea creation.”*
 - *“Brainstorming of new ideas.”*
 - *“Function analysis.”*
 - *“Process and independence of SMEs.”*
 - Workshop could have been improved in the following ways:
 - *“Wished we had more time.”*
 - *“Position project information exhibits closer to tele-video camera.”*
 - *“Link facilitator PC to remote-participant PCs.”*

LESSONS LEARNED

- Additional pre-work required for one-day workshop.
- Compression of function analysis (FA) phase possible with some pre-prepared 2-word function definitions, though workshop yield would likely increase with additional FA time.
- More of 27 design suggestions would likely have been developed into VA proposals with additional workshop time.
- Post-workshop FAST diagram can educate design team about project functions and VA concepts.
- Tele-video participants possible, though in-person preferred.

CONCLUSIONS

- VA workshop accomplished workshop goals:
 - 10 VA proposals vs. 4-5 goal
 - Cost reduction of 5-6% possible (without compromising essential functions) vs. 4-5% goal
 - Additional \$1.42 million (6.6%) deferral cost reduction available for affordability reasons
- Airport has contingency cost-reduction options to mitigate funding-shortfall risk

REFERENCES

¹Federal Aviation Administration, September 30, 2008, *Use of Value Engineering for Engineering and Design of Airport Grant Projects*, Advisory Circular AC 150/5300-15A.

²Lexington-Fayette Urban County Airport Board, Fran Taylor Editor, 2014, *Blue Grass Airport – An American Aviation Story*, 212-215, West High LLC and Lexington-Fayette Urban County Airport Board, Lexington, KY.

³Crawford, Murphy & Tilly, Inc., 2013, *Moving Forward – Airport Master Plan Update*, 15, Lexington, KY.

⁴Enlign Consultants & Advantage Facilitation Services, 2008, *Module I Basic Certification Training Workshop Workbook*, 125.



QUESTIONS?

Using Value Analysis to Mitigate Airfield-Program Funding Risk

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