EVOLUTION OF EQUATIONS

February 2, 2011

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Personal Background

- Operations Research Analyst since 2001, began as a trainee in AMCOM Command Analysis
- Worked for Department of the Army 32 years
- Worked Joint Cargo Aircraft program, an ACAT I joint program for 5 years as lead cost analyst
- Currently Lead Cost Analyst in Command Post Systems & Integration, CECOM organization which has multiple ACAT II and III programs

Equation Building Background

- Most seasoned cost analysts began creating equations in Excel
- Provide all the information used in the equation
- Spent a lot of time writing long equations
- Calculating inflation manually
- Manually create charts evolved to Excel graphs
- 15 Apr 04, Army memorandum, requiring ACEIT usage for all Army ACAT I and II programs
- ACEIT drastically reduces estimate preparation time
- What-if drills can be performed in a much more timely and efficient manner

ACEIT History

- Began using ACEIT Version 6.0 in 2001
- Step up from Excel to building equations in ACEIT
- Automatically applied inflation
- Define multiple variables manually
- 15 successful years of continual product improvement
- DASA-CE sponsors Army training
- Great technical support, if need assistance

Excel Equations

- **Multiple worksheets:**
  - **Quantities**
  - **Schedule**
  - **Unit cost**
  - **Inflation indices**
  - **Throughputs**
  - **Equations**

Excel Equations

- **Sample Quantity List of Equipment Types**

	Eq 1	Eq 2	Eq 3	Eq 4	Eq 5	Eq 6	Eq 7	Eq 8	Eq 9
Unit 1		2	9	3	7	5	18	5	16
Unit 2		3	9	6	6	3	6	11	14
Unit 3		3	7	5	6	2	6	8	11
Unit 4	2	2	8	10	6			1	21
Unit 5	2	2	7	9	5	0	2	1	19
Unit 6			2		3	2		1	7
Unit 7	1	1	5		4			1	13
Unit 8	1	2	4		3			1	10
Unit 9	1	1	4		3			1	11
Unit 10	8	8	8	10			12	1	21
Unit 11	1	1	4	1	3				7
Unit 12	1	1	1	1	1			1	1

Excel Equations

- **Sample Schedule List**

		FY13										FY14										FY15									
TYPE	ID	EQ 1	EQ 2	EQ 3	EQ 4	EQ 5	EQ 6	EQ 7	EQ 8	EQ 9	EQ 10	EQ 1	EQ 2	EQ 3	EQ 4	EQ 5	EQ 6	EQ 7	EQ 8	EQ 9	EQ 10	EQ 1	EQ 2	EQ 3	EQ 4	EQ 5	EQ 6	EQ 7	EQ 8	EQ 9	EQ 10
Active	Unit 1													1	1				0	0											
Active	Unit 2													5	6	5	10	0													
Active	Unit 3			0	0	0																2	2		6	6					
Active	Unit 4											6	6					12			1										
Active	Unit 5											2	2		2					7	1										
Active	Unit 6																							2	0	3	2		1	7	1
Active	Unit 7																					1	1							4	
Active	Unit 8																0							4	1	3	0			7	1
Active	Unit 9																					1	1	4	1	3				7	1
NG	Unit 10																					2	2								
NG	Unit 11											1	1	4	4	3	2	0	1	11	1										
NG	Unit 12											1	1	4	1	3				7	1										
Reserves	Unit 13													2	0	3	2		1	7	1										
Reserves	Unit 14													2		3	2		1	7	1										
Reserves	Unit 15	1	1	4	0	3	0	0	1	11	1																				
Reserves	Unit 16													1		1	2		1	4	1										
Reserves	Unit 17													4	1	2	2		2	6	1										

Excel Equations

- **Sample Training Cost**
- **Inflation Indices**
- **Sample Equipment Unit Cost**

ECHELON	NET/ICS
Unit 1	0.270
Unit 2	0.250
Unit 3	0.250
Unit 4	0.600
Unit 5	0.200
Unit 6	0.152
Unit 7	0.200
Unit 8	0.200
Unit 9	0.200
Unit 10	0.200
Unit 11	0.200
Unit 12	0.200
Unit 13	0.175
Unit 14	0.175
Unit 15	0.175
Unit 16	0.175
Unit 17	0.175
Unit 18	0.175
Unit 19	0.175
Unit 20	0.175
Unit 21	0.175
Unit 22	0.175
Unit 23	0.175
Unit 24	0.175
Unit 25	0.175
Unit 26	0.175
Unit 27	0.175
Unit 28	0.175
Unit 29	0.175
Unit 30	0.175
Unit 31	0.175
Unit 32	0.175
Unit 33	0.175
Unit 34	0.175
Unit 35	0.175
Unit 36	0.175
Unit 37	0.175
Unit 38	0.175
Unit 39	0.175
Unit 40	0.175

INFLATION	
	1.002544
FY05	0.928212
FY06	0.952767
FY07	0.975628
FY08	0.991736
FY09	1.003446
FY10	1.016948
FY11	1.033409
FY12	1.050826
FY13	1.06869
FY14	1.086858
FY15	1.105334
FY16	1.124125
FY17	1.143235

DESCRIPTION	UNIT COST
Eq 1	
CFE/INT	$ 0.394
GFE/REQ	$ 0.069
SCI	$ 0.068
Eq 2	
CFE/INT	$ 0.394
GFE/REQ	$ 0.121
SCI	$ 0.068
Eq 3	
CFE/INT	$ 0.099
Eq 4	
CFE/INT	$ 0.026
Eq 5	
CFE/INT	$ 0.018
SCI	$ 0.062
Eq 6	
GFE	$ 0.054
UPS/TFOCA	$ 0.008
Eq 7	
GFE	$ 0.028
UPS/TFOCA	$ 0.008
Eq 8	
LARGE	$ 0.276
Eq 9	
MEDIUM	$ 0.112
Eq 10	
1.019774011	
Eq 11	**$ 0.747**
CFE/INT	$ 0.394
GFE	$ 0.160
SCI	$ 0.083
CFE ASL	$ 0.020
ECO	$ 0.033
Tac ,etc	$ 0.058
Eq 12	**$ 0.636**
CFE/INT	$ 0.394
GFE/REQ	$ 0.175
SCI	$ 0.068
CFE ASL	$ 0.096
ECO	$ 0.028
Tac ,etc	$ 0.058

Excel Equations

- **Sample Equations:**

  = G26+G33+G40

  = SCHEDULE!BE402

  = SCHEDULE!M101*EQ_2*FY_13

  = SUM(E2:E109)

  = SUM(COST!CP392:CY392) + SUM(COST!CP400:CY400)

- **Data entered as throughputs:**

  = 1560000 * 0.75

  62000

Early ACEIT Equations

- (1+CamdenMult)*62417* LMMFC_Fee
- UC_ATIRCM_AKIT*QP_TRAIN
- (MSLI&AMM * CTR$ * EMD%)
- FYISLIDE(FYCFIRSTYR(@FLDONLYYRS))
- ((((DAGR_NUM*.5)*.5)*((1536*.5)/12))*4)*2
- (OPTEMPO/MTBF)*WO_RATE*(AUC36D)
  - OPTEMPO AND AUC36D WERE VARIABLES
  - MTBF AND WO_RATE WERE NORMAL DECs

Early ACEIT Equations

- IF(FYYR<2013,0,QP_TRAIN*UC_JTRS)
- IF(FYCVAL(@PROD&FLDYRS)>0,200)
- 1 * IF(BUYQ=0, 0, 247213.28)
- IF(AND(FYYR>2007,FYYR<2011),C_CLIN_0001AB_$* QP_REQUIREMENT_TRAINING*TRAIN_BASE_PILOTS,0)
- IF(FYYR<2063,(FYCCUM(@QP_REQUIREMENT_TRAINING,FYYR-YBPF)*(TRAIN_BASE_PILOTS*C_CLIN_0002AA_$)),0)

Early ACEIT Equations

- IF(AND(FYYR>FYCLASTYR(@FLDONLYYRS),FYCVAL(@OMAYrs)>0),TRNER_PDSS,FYFACT)
- IF(FYYR=2003,prod*.129,IF(FYYR=2004,prod*.215,IF(FYYR=2005,prod*.075,IF(FYYR=2006,prod*.09,IF(FYYR=2007,prod*.10,IF(FYYR=2008,prod*.015,IF(FYYR=2009,prod*.0125,IF(FYYR>2009,prod*.0)))))))
- FYRepeat(@GOTS_REPARABLES_ACTIVE, 7,3)

Early ACEIT Equations

- FYCVAL(@QF_NG_ARMY,FYYR) *(PER_DIEM_TRANSPORTATION_AC +AIRFARE_TRANSPORTATION_AC) * 4[CREW OF 4, 2 PILOTS, 2 LOADMASTERS TO PICK UP AIRCRAFT AND FLY TO UNIT]
- IF(FYYR = FYCFIRSTYR(@QF_NG_ARMY) -1 , 2) [2 ARMY ACCEPTANCE PILOTS FOR DURATION OF FIELDING] * COST_ACCEPT_PILOT_TRNG_PER_STUDENT
- IsBetween(FYYR,FYCFirstYr(@QO_FRP_RESERVES_ARMY), FYCLastYr(@QO_FRP_RESERVES_ARMY)) * RATE_MIL_COMP_PAY_HQ_CO_RESERVES_ARMY

ACEIT 7.2 Capabilities

- Window and Workscreen Tabs
- Dynamic Equation columns (DECs)
- Shows the sum of numbers in any selected cells
- Inputs/Results Viewer (IRV)
- Equation Builder – assists in defining unique IDs
- User Defined Functions (UDF)
- Additional Session Analyzer tests
- Run Excursions

Window and Workscreen Tabs

- **Window Tabs added to the top of the screen to improve navigation**
- **Color Options are on the right-click menu**
- **Workscreen Tabs added to the bottom of the screen to improve workscreen navigation**

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Dynamic Equation columns (DECs)

- Most commonly used for intermediate inputs or calculations on a row
- Make your session wider rather than longer
- You can reference a DEC on a difference row (Dot notation)
- Simple cost estimate that has no time phasing
- Use to store complexity factors on equations
- Store data from 3rd party tools
- Store index data to use with SUMIF function

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Sum of Numbers in Selected Cells

- **Shows sum of numbers in any selected cells on:**
  - **Workscreens**
  - **Inputs/Results Viewer**
  - **Report Viewer**

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Inputs/Results Viewer (IRV)

- Calculation results are stored so user doesn't have to calculate as often when opening/closing IRV
- New option to lock cases – no changes can be made (Army Cost Position (ACP), Acquisition Program Baseline (APB), Baseline Program Office Estimate (POE)
- DEC results can be viewed in IRV
- Multiple IRV windows can be open for the same session

Equation Builder

- **Enhanced to show the row and WBS description**
- **Added a Category radio button to filter category columns**

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Functions

- **Standard**
  - **Mathematical Functions (Abs, Exp, Ln, Pi, RndDn, Sin)**
  - **Standard ACE Functions**
  - **Date Functions**
- **Special functions to perform:**
  - **Economic Analysis (Break even year, discount factors, payback)**
  - **Functions to manipulate FY inputs (FYI functions**
  - **Calculated Values (FYC functions)**
  - **Functions to let you perform matrix manipulations**
- **User Defined Functions (UDF) to automate repetitive calculations**

Session Analyzer

- Gaps
- Overlaps in yearly phased results
- Sunk costs beyond the current year
- Overrides in the baseline column
- Logical CES number/appropriation matchup
- Risk Confidence Level
- CV Range Checks
- Best practice violations (guidelines) rather than errors that must be fixed
- Tools, Session Analyzer → Go to Example File

Running Excursions

- Create new cases
- Create what if/sensitivity cases from IRV
- Enter overrides for variables or costs you wish to perform excursions on
  - IRV
  - Select Inputs
  - Calculate first to see BY results
  - Type override value in desired column
  - Override in total column or the yearly columns
- Calculate new case

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Good ACEIT Practices

- Remember to write equations as simple as possible
- Document, document, document – good practice to document as you build ACEIT session while data is fresh on your mind
- Write the equation so someone can pick up estimate and be able to understand easily!!!
- Run Session Analyzer to check best practices
- Use Bookmarks
- Review File Properties of Session (contact info on Summary tab)

Good ACEIT Practices

- **Use Comments:**
  - **Comment Rows, designated with * as first character**
  - **Comment DECs, place for a quick note**
  - **Comments in the Equation/Throughput column, in square brackets [ ]**
- **WBS/Variable Description Test – the more descriptive the easier to follow**
- **Use Traceback Navigator to understand functions used**
- **Automate methodologies**

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QUESTIONS

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