COST ESTIMATION FOR
VERY HIGH LEVEL LANGUAGES

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COST ESTIMATION FOR
VERY HIGH LEVEL LANGUAGES

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MAY 17, 1985
OUTLINE

- PROBLEM OVERVIEW
- COCOMO ATTRIBUTES
- PREDICTIONS VS. ACTUALS
- CONCLUSIONS
FAA Problem

- FAA evaluates approximately 200 flight simulators quarterly
- Manual tracking system
- FAA manpower ceiling
- 300 simulators by 1986
- Rotary wing aircraft by 1988
- FAA using Burroughs B-20 series computers

FAA Solution

- Simulator inventory and evaluation schedule system (SIESS)
SIESS FUNCTIONS

- TEAM ROSTER DATA
  - QUALIFICATIONS
  - PERSONNEL DATA

- SIMULATOR INVENTORY DATA
  - STRUCTURE AND CAPABILITIES
  - LOCATION AND OPERATOR

- QUALIFICATION TRACKING
  - SIMULATOR LEVELS

- EVALUATION SCHEDULES
  - NEXT EVALUATION DATE
  - EVALUATOR SCHEDULING

- PERSONNEL SCHEDULES
  - PERSONAL COMMITMENTS
  - TRAVEL CALENDAR

- EVALUATION CHECKLIST
  - CUSTOMIZED FORMS
  - CYCLE DATA

- DISCREPANCY HISTORY
  - TRACKING
SIESS CODE COUNT

- 3250 LINES OF CODE
- 1000 DATA DICTIONARY ITEMS
- 750 LINES OF OUTPUT REPORTS AND DISPLAY FORMS

TOTAL: 5000 LINES OF CODE
LOOP UNTIL FINISH;

DISPLAY Simchecklist FORM;

ACCEPT (OperatorName VERIFY VERIFYPROC OperatorHelpProc,
SimType VERIFY VERIFYPROC SimTypeHelpProc,
OperatorSimID);

LOOKUP SimOperatorKey IN SimInventoryFile;

IF FOUND THEN;

DISPLAY SimInventoryForm FORM;

DISPLAY SimInventoryFile;

ENDIF;

ReadFnkey Prompt "Depress [GO] to continue";

END;
<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator Name</td>
<td>1</td>
</tr>
<tr>
<td>Type</td>
<td>2</td>
</tr>
<tr>
<td>Operator Simulator Ident.</td>
<td>3</td>
</tr>
<tr>
<td>Criteria</td>
<td>4</td>
</tr>
<tr>
<td>Level</td>
<td>5</td>
</tr>
<tr>
<td>Serial Number</td>
<td>6</td>
</tr>
<tr>
<td>Operator Abbreviation (4 letters max)</td>
<td>8</td>
</tr>
<tr>
<td>Location City</td>
<td>9</td>
</tr>
<tr>
<td>State</td>
<td>10</td>
</tr>
<tr>
<td>Zip</td>
<td>11</td>
</tr>
<tr>
<td>Location Abbreviation (4 letters max)</td>
<td>12</td>
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<tr>
<td>Contact</td>
<td>14</td>
</tr>
<tr>
<td>Title</td>
<td>15</td>
</tr>
<tr>
<td>Phone</td>
<td>(16)</td>
</tr>
<tr>
<td>Ext</td>
<td>17</td>
</tr>
<tr>
<td>Operator Address</td>
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</tr>
<tr>
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<tr>
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<tr>
<td>Phone</td>
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<tr>
<td>Ext</td>
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<tr>
<td>Principal Operations Inspector (FAA-POI)</td>
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<tr>
<td>FSD0</td>
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<tr>
<td>Phone</td>
<td>(34)</td>
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<tr>
<td>Ext</td>
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</table>

**FIELD NUMBERS**

1. Type operator name (e.g. Eastern Air Lines) then depress [RETURN]

**AVAILABLE KEYS**

For help, depress [HELP], select from HELP FORM, then depress [GO] to return to SIMULATOR DATA FORM then depress [RETURN].
# DATA DEFINITION

"one line of code"

<table>
<thead>
<tr>
<th>Data Item Name:</th>
<th>Data Item Desc:</th>
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<tbody>
<tr>
<td>SIMTYPE</td>
<td>Simulator type (aircraft model)</td>
</tr>
<tr>
<td></td>
<td>same as evaluator qualification</td>
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<table>
<thead>
<tr>
<th>Last Changed:</th>
<th>File Storage Information:</th>
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<tbody>
<tr>
<td>09/28/84</td>
<td>Element Format: STRING</td>
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<tr>
<td>11:13:20</td>
<td>Element Length: 10</td>
</tr>
<tr>
<td></td>
<td>Repeating Item (Y/N)?: N</td>
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<tr>
<td></td>
<td>Number Of Occurrences: 1</td>
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</table>

<table>
<thead>
<tr>
<th>Form Data Accept And Verification Rules:</th>
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<tbody>
<tr>
<td>Form Field Length: 10</td>
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<tr>
<td>Accept Options: Compress Embedded Blanks?: Y</td>
</tr>
<tr>
<td>Verification Option: PATTERN</td>
</tr>
<tr>
<td>Pattern: XXXXXXXXXXX</td>
</tr>
<tr>
<td>Domain Options:</td>
</tr>
<tr>
<td>In Table Name:</td>
</tr>
<tr>
<td>In Range:</td>
</tr>
<tr>
<td>From:</td>
</tr>
<tr>
<td>To:</td>
</tr>
</tbody>
</table>

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SOFTWARE COST DRIVER RATINGS

REQUIRED SOFTWARE RELIABILITY (RELY)
- NOMINAL - NO SERIOUS RECOVERY PROBLEM

PRODUCT COMPLEXITY (CPLX)
- NORM

EXECUTION TIME CONSTRAINT (TIME)
- NOMINAL - NO CONSTRAINTS

VIRTUAL MACHINE VOLATILITY (VIRT)
- HIGH - OPERATING SYSTEM CHANGES
- ADS ERRORS
- HARDWARE PROBLEMS

COMPUTER TURNAROUND TIME (TURN)
- LOW - INTERACTIVE

ANALYST CAPABILITY (ADCAP)
- HIGH - REQUIREMENTS DOCUMENT
- AMBIGUOUS
- GOOD COMMUNICATION
SOFTWARE COST DRIVER RATINGS

APPLICATIONS EXPERIENCE (AEXP)
  - VERY LOW - NO EXPERIENCE

PROGRAMMER CAPABILITY (PCAP)
  - VERY HIGH - CAPABLE SMALL TEAM

VIRTUAL MACHINE EXPERIENCE (VEXP)
  - VERY LOW - NO EXPERIENCE

PROGRAMMING LANGUAGE EXPERIENCE (LEXP)
  - VERY LOW - NO EXPERIENCE

MODERN PROGRAMMING PRACTICES (MODP)
  - HIGH

REQUIRED DEVELOPMENT SCHEDULE (SCED)
  - NOMINAL
SOFTWARE COST DRIVER RATINGS

DATA BASE SIZE (DATA)
- LOW 1st DELIVERY
- HIGH 2nd DELIVERY
- 3 1/2 MM, 1 MONTH EXTRA

MAIN STORAGE CONSTRAINT (STOR: HIGH)
- BUFFERS, INDEXES, RECORDS
- SPOOLER QUEUE, ISAM

SOFTWARE TOOLS (TOOL : HIGH)
- INTEGRATED INTERPRETER/EDITOR
- DATA BASE SUPPORT TOOLS
- FORMS EDITOR
- MENU, FUNCTION KEY SUPPORT
- SCREEN DUMPS
EFFORT SENSITIVITY

MAN MONTHS

10 11 12 13 14 15 16 17 18 19 20

RELAY  DATA  TIME  STORE  VIRT  TURN  A CAP  C AP  P VEXP  L EXP  M OD  TOOL  S CED

HI  HI  HI  HI  HI  HI  HI  HI  HI  HI  HI  HI  HI  HI

20%

BEST GUESS

ACTUAL

20%
CONCLUSIONS

- OLD PROBLEM

  "WHAT IS A LINE OF CODE?"

- WITHIN 20% OF THE PROJECT ACTUALS 68% OF THE TIME

- JUSTIFIES THE USE OF A VERY HIGH LEVEL LANGUAGE