DoD Contracts Database and Interactive Tool

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SCEA 2012

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Technomics
The Science of Informed Decision Making

Agenda

- Overview/Background
- Process
- Database Composition/Functionality
- Example High Level Growth Factors
- CLIN Level Database
- Future Efforts

Why Collect Contract Data?

1. Contractor Cost Data Reports (CCDRs) and Contract Performance Reports (CPRs) are limited to major programs and/or large contracts.
   - Most programs consist of multiple contracts, not all of which have cost reporting.
2. Contracts provide additional information not found in other data reports.
   - Examples: period of performance start date/end dates by item; SOWs; traceability to funding origin; finer price and quantity detail (depending on CLIN structure).
3. Provides insight to reasons for changes over time – valuable for conducting root cause analysis.
4. Provides means for measuring growth over time.
5. Provides a cross-check with other data sources.

Data – Quality of Data Types

- Actuals for completed programs/contracts

are better than

- Estimates at Complete (EACs) for contracts greater than 90% complete

are better than

➢ Contract line item prices from Schedule [sic] B

are better than

- Historical budget data

Source:
SCEA CEBoK, Unit II - Module 4,
Data Collection and Normalization

Good Estimates Consider All Data Sources

Accounting Data

CCDRs

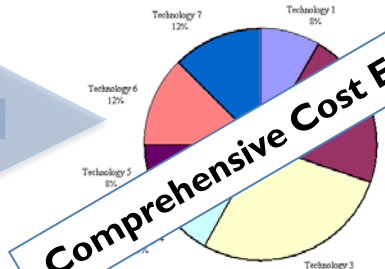
CPRs

CFSRs

Contracts

Budget Docs

Comprehensive Cost Estimate

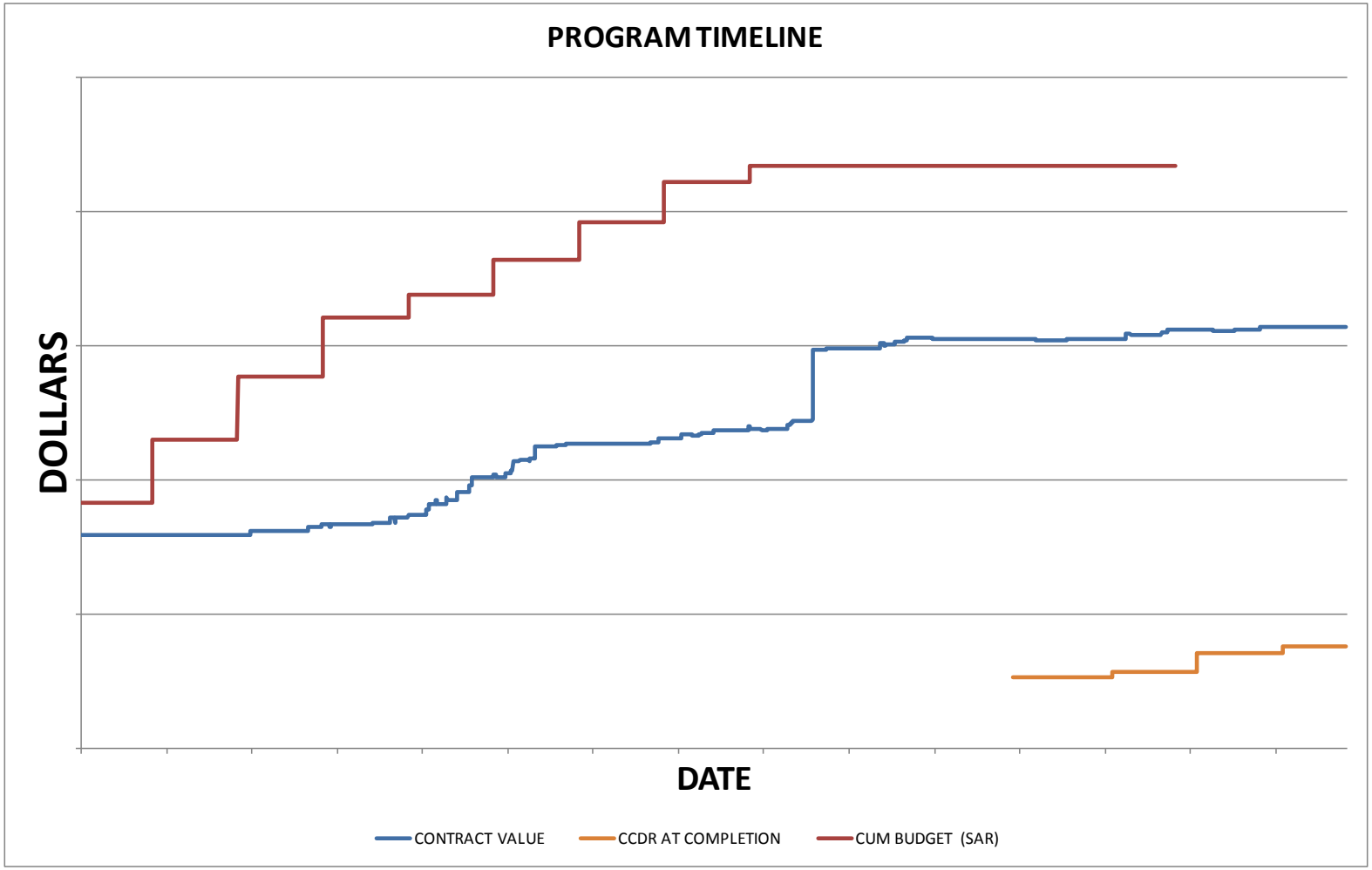


DEPARTMENT OF THE NAVY
FISCAL YEAR (FY) 2010
BUDGET ESTIMATES

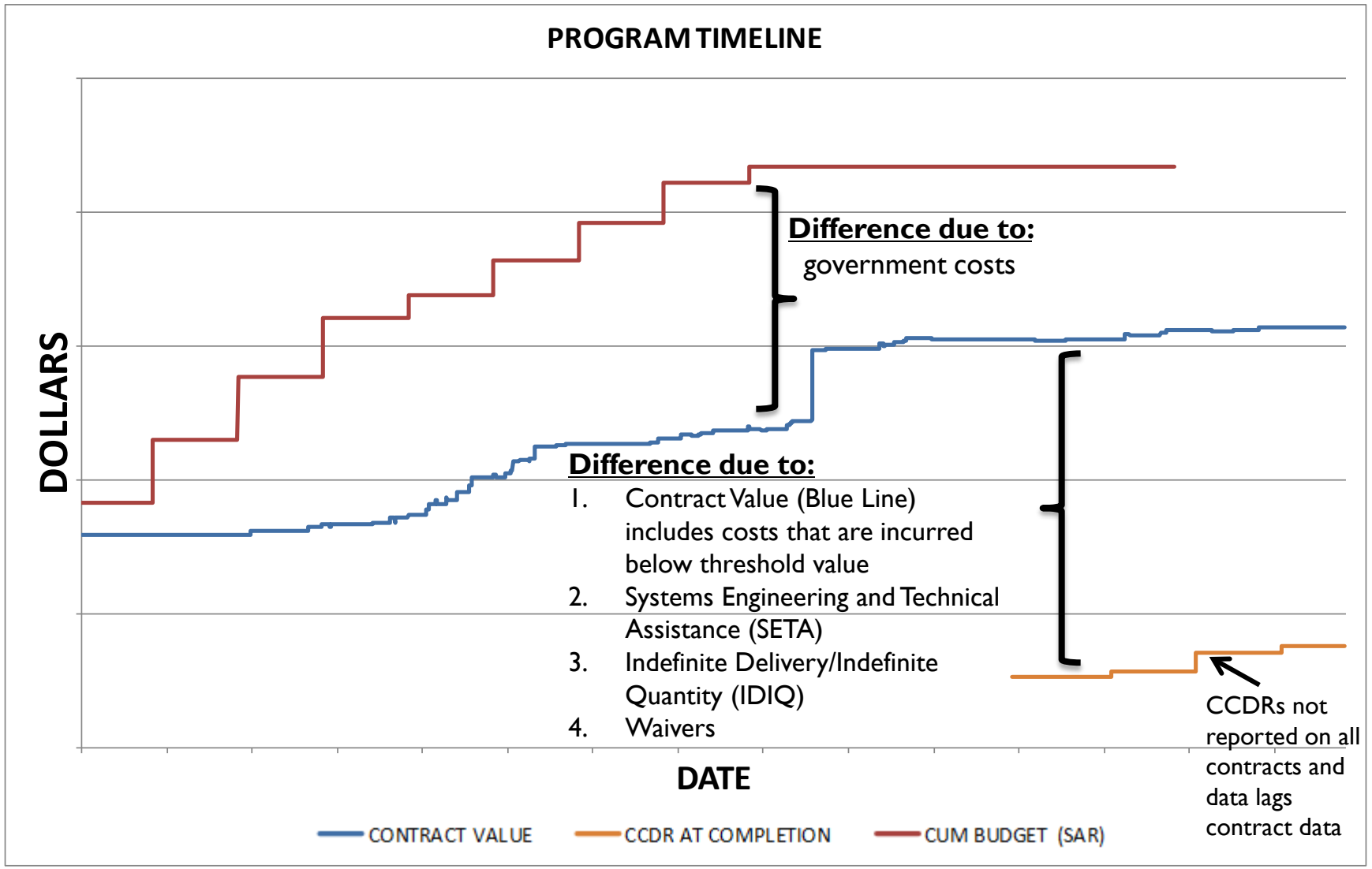
JUSTIFICATION OF ESTIMATES
MAY 2009

WEAPONS PROCUREMENT, NAVY

Example


PROGRAM TIMELINE
DOLLARS
DATE
CONTRACT VALUE
CCDR AT COMPLETION
CUM BUDGET (SAR)

Example Graph of Cumulative Cost/EAC



Contract Data – Potential Applications

1. Development of Cost Estimates
   - Cost growth metrics
   - Data Completeness
   - Data Fidelity
   - Cross checks
2. Program assessments / Root Cause Analyses
   - What occurred when and for how much
   - Traceability to CPR and/or CCDR if available (aids in data verification/validation & augmenting of data for below-threshold (non)-reporting)
3. Support special studies
   - e.g., Platform Integration, qualification testing, learning curves, award fees, etc.

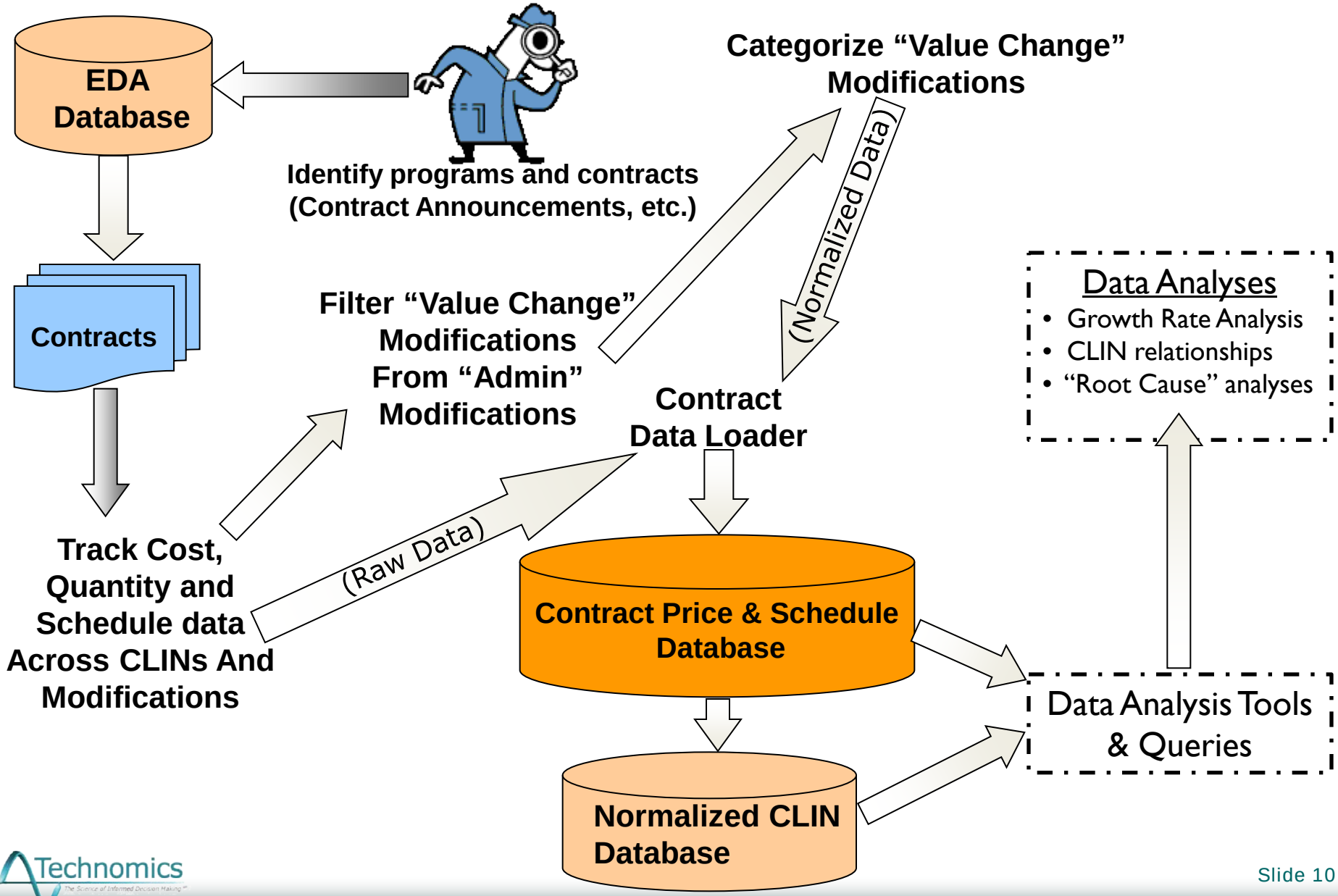
Contract Price & Schedule Database

A comprehensive repository of contract data

- Outlines **CONTRACTS** by program and phase
- Provides final Contract Line Item Number (CLIN) **PRICES** AND CLIN descriptions for each contract
- Provides modifications, modification **DESCRIPTIONS**, and price changes by CLIN for each modification
- Provides **QUANTITY** information by CLIN and quantity changes by modification
- Provides **SCHEDULE** period of performance information by CLIN, and period of performance changes by modification

Provides valuable insight into programs

Process


EDA Database
Identify programs and contracts (Contract Announcements, etc.)
Categorize "Value Change" Modifications
(Normalized Data)
Contracts
Filter "Value Change" Modifications From "Admin" Modifications
Contract Data Loader
Data Analyses
• Growth Rate Analysis
• CLIN relationships
• "Root Cause" analyses
Track Cost, Quantity and Schedule data Across CLINs And Modifications
(Raw Data)
Contract Price & Schedule Database
Data Analysis Tools & Queries
Normalized CLIN Database

Ground Rules/Assumptions/Terminology

- **Delivery Orders** are treated as separate contracts
- **Contract values** "updated with actuals" for completed contracts (criterion: >1 year without contract activity)
- Criteria for categorization of modifications:

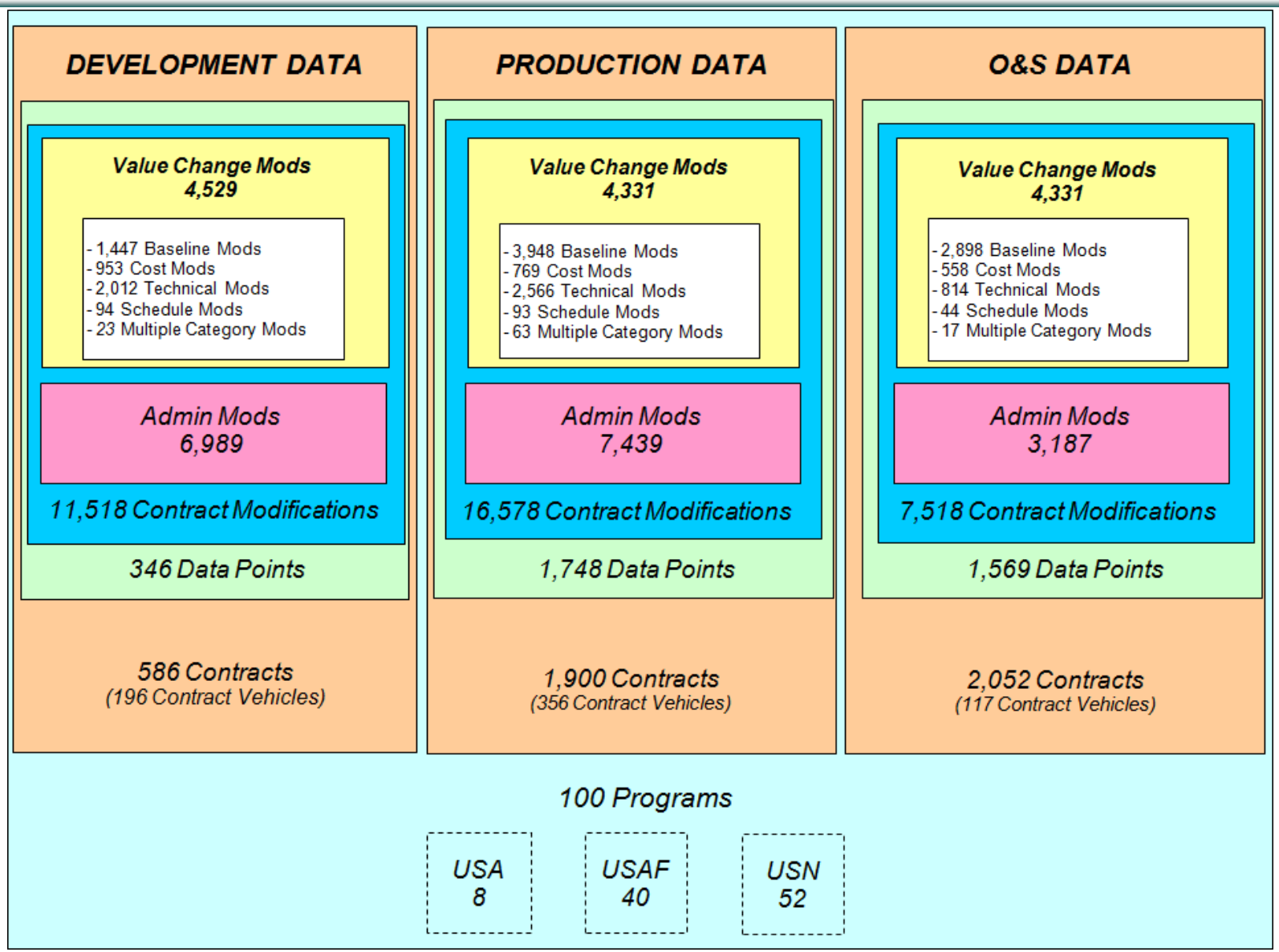
Modification Category	Criteria for Categorization
Initial Award	Always the Basic contract
Administrative	No change to the overall contract price; typically a revision. *Ex: Changes to SOW, Schedule, CLIN Descriptions, Funding information*
Baseline	Anticipated scope changes and exercising of anticipated options; FMS. *Ex: New lot buys, Definitizations of initial award, Congressionally-mandated changes*
Technical	Unanticipated changes through design or scope. *Ex: ECPs, Definitizations of technical scope; Exercising of unanticipated options*
Schedule	Value changes attributable to schedule compression/extension
Cost	Unanticipated changes without a change in scope or design. *Ex: Cost overruns/underruns, unanticipated rate changes (EPAs), de-obligation or obligation of funds, ceiling increases, unexplained price changes*
Unknown	Used when a value changed is inferred but the modification is missing

Data Validation Checks

- More than 100 slides, 2 training videos, and regular meetings among analyst team to ensure comprehensive and consistent data entry; documentation of business rules
- Access-based relational data structure, complying with 3rd normal form of relational database management system (RDBMS), ensures data integrity
- Random spot-checks/audits of high profile contracts
- Complete "A-Z" independent reviews conducted of key contracts (capturing 92% of development/production value and **all** contracts identified in Selected Acquisition Reports (SARs) for F/A-18E/F)

DATABASE

Database Composition



Database Update – Air Force

Commodity	Air Force Program(s) in Database*
Aircraft	**Galaxy (C-5), Globemaster III (C-17), Hercules (C-130), Raptor (F-22),** Fighting Falcon (F-16), Osprey (V-22), Sentry (E-3A), Spirit (B-2) Stratolifter (KC-135)
Decoys	MALD (ADM-160)
Electronics	ASIP, LAIRCM
Engine	F-119 Engine
Laser	Advanced Tactical Laser (ATL)
Missiles	ACM (AGM-129), AGM-130, ALCM/CALCM (AGM-86A-D), AMRAAM (AIM-120), CHAMP, DRADM, HAVE NAP (AGM-142), JASSM (AGM-158), Maverick (AGM-65)
Munitions	Bunker Buster (GBU-28), GBU-15, JDAM, Paveway II (GBU-12), Paveway III (GBU-24), SDB (GBU-39), SFW (CBU-97), WCMD
Non-Lethal	Active Denial System (ADS)
Space	AEHF
Targets/Drones	AST (QF-16), Firebee (BQM-34), FSAT (QF-4), Skeeter (BQM-167)
UAV	Global Hawk (RQ-4), Predator (MQ-1), Reaper (MQ-9)

*Primary data source from EDA: 1995 - 2010

****Bold** indicates program with significant amount of data in the contracts database

Database Update – Navy & Army

Commodity	Navy Program(s) in Database*
Aircraft	**Super Hornet (F/A-18E/F), Lightning II (F-35), Poseidon (P-8A), Seahawk (SH-60/HH-60H/MH-60)** Clipper (C-40), Goshawk (T-45), Growler (EA-18G), Harrier II (AV-8B), Hawkeye (E-2), Hornet (F/A-18A-D), Mercury (E-6), Sea Stallion (CH-53E),
Decoys	ITALD (ADM-141C)
Engine	F-135 Engine, F-136 Engine
Gun	CIWS
Missiles	AARGM (AGM-88E), AWS, ESSM (RIM-162), HARM (AGM-88), Harpoon (AGM-84)/Slammer, JSOW (AGM – 154A, A/C, C), RAM BLK 0,1,2 (RIM-116/A/B), RATTLRS, Sea Sparrow, Sidewinder (AIM-9), SLAM ER, SM-1,2,3,4,6, Sparrow (AIM-7), Standard Missile, Tomahawk Block III & IV (BGM-109), VLA Missile (RUR-5 ASROC)
Munitions	BTERM, ERGM (EX-171)
Targets/Drones	CHUKAR (BQM-74), COYOTE (GQM-163), Jayhawk (AQM-37), MSST (GQM-173)
UAV	BAMS (MQ-4C)

Commodity	Army Program(s) in Database*
Aircraft	**Blackhawk (UH-60L/UH-60M/HH-60M),** Cobra (AH-1)
Missiles	ATACMS (MGM-140), JAGM, JCM (AGM-169), PAC-3 (MIM-104F), Patriot (MIM-104A-D), SLAMRAAM

*Primary data source from EDA: 1995 – 2011

****Bold** indicates program with significant amount of data in the contracts database

Database Update

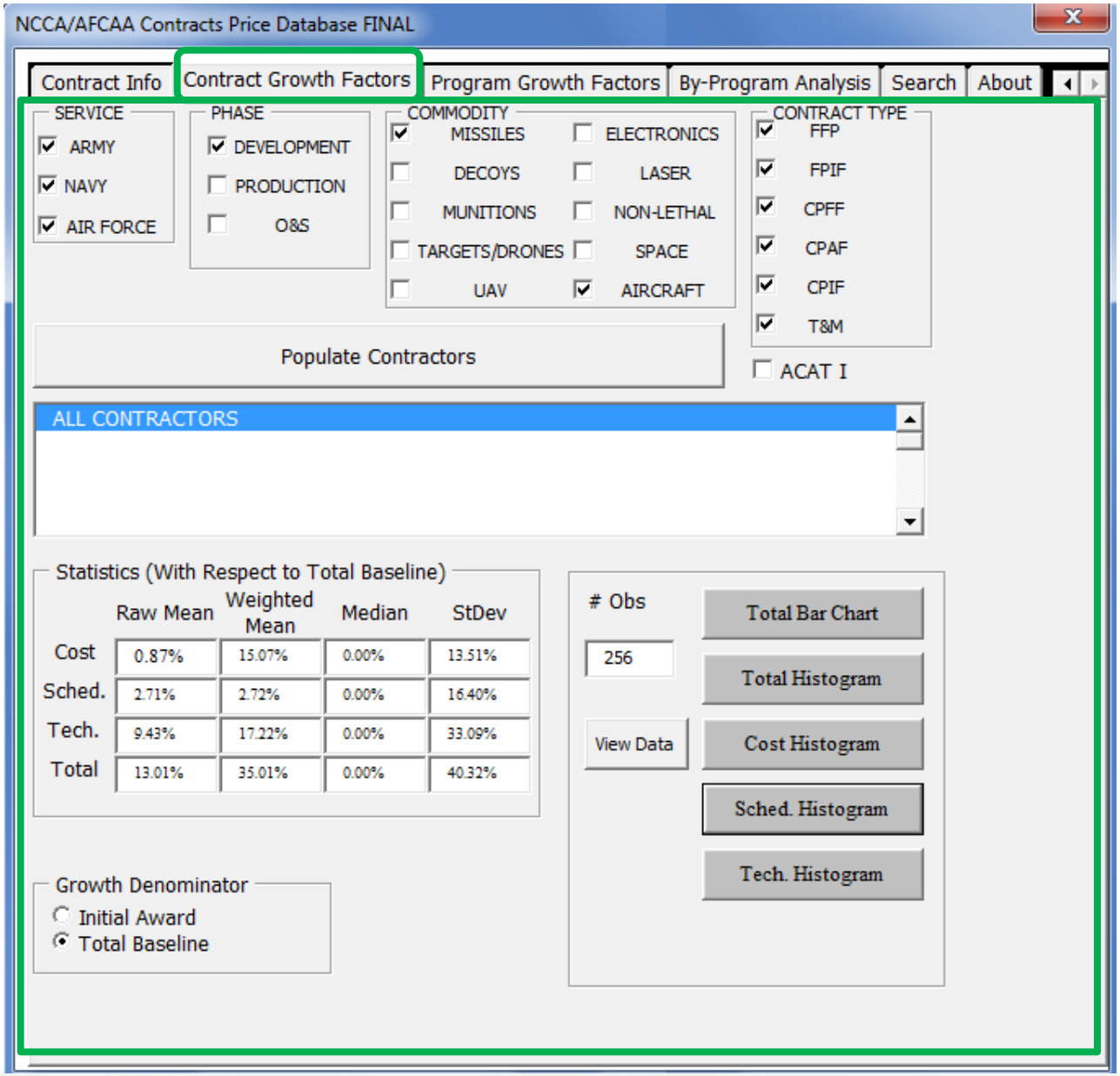
Commodity	Number of Programs Per Service in the Database*		
	Air Force	Navy	Army
Aircraft	9	13	2
Decoys	1	1	
Electronics	2		
Engine	1	2	
Laser	1		
Gun		1	
Missiles	9	28	6
Munitions	8	2	
Non-Lethal	1		
Space	1		
Targets/Drones	4	4	
UAV	3	1	

*Primary data source from EDA: 1995 – 2011

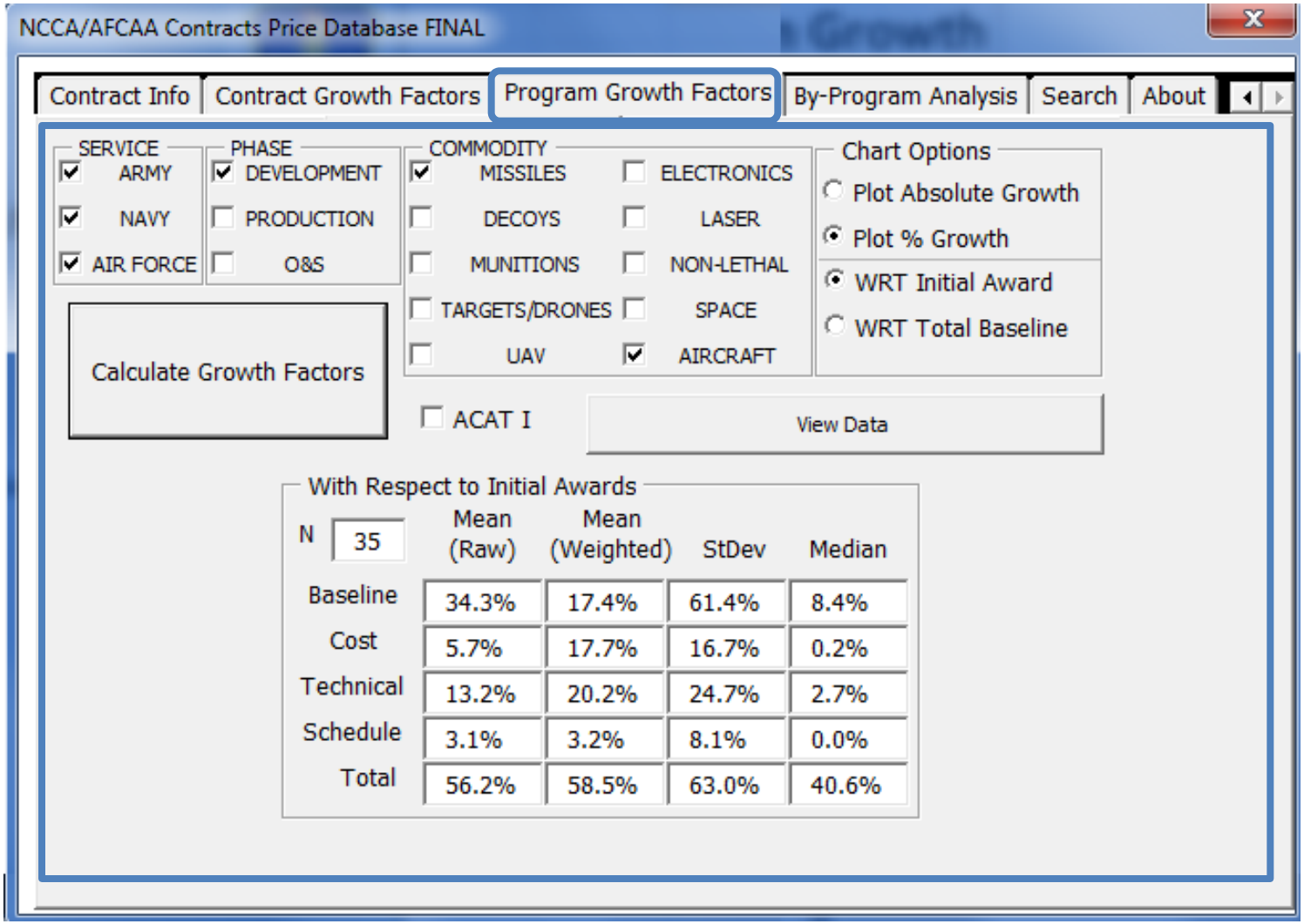
Interactive Database and Analysis Tools Overview

- Growth Factors & related statistics
  - By contract
  - By program
- Histograms and time series (cumulative value) charts
- Root cause information
- Allows user to filter data sets and perform exploratory data analysis

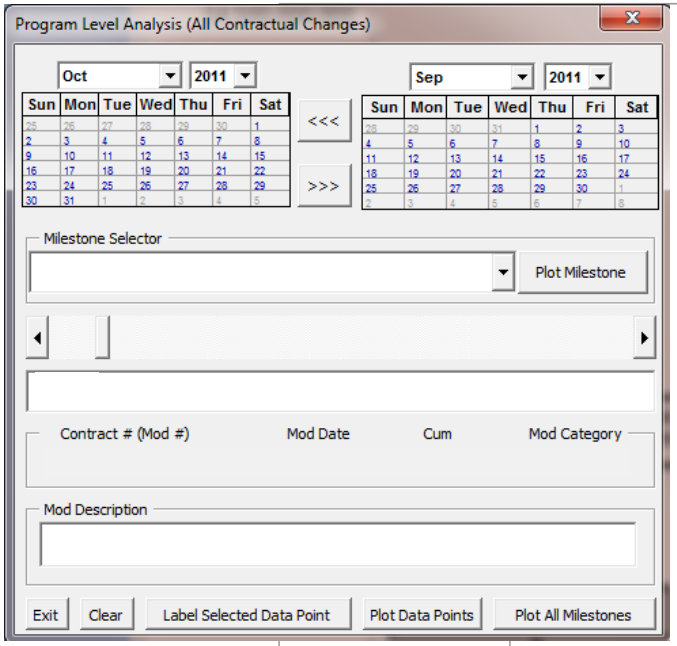
Database Functionality: Growth Factors

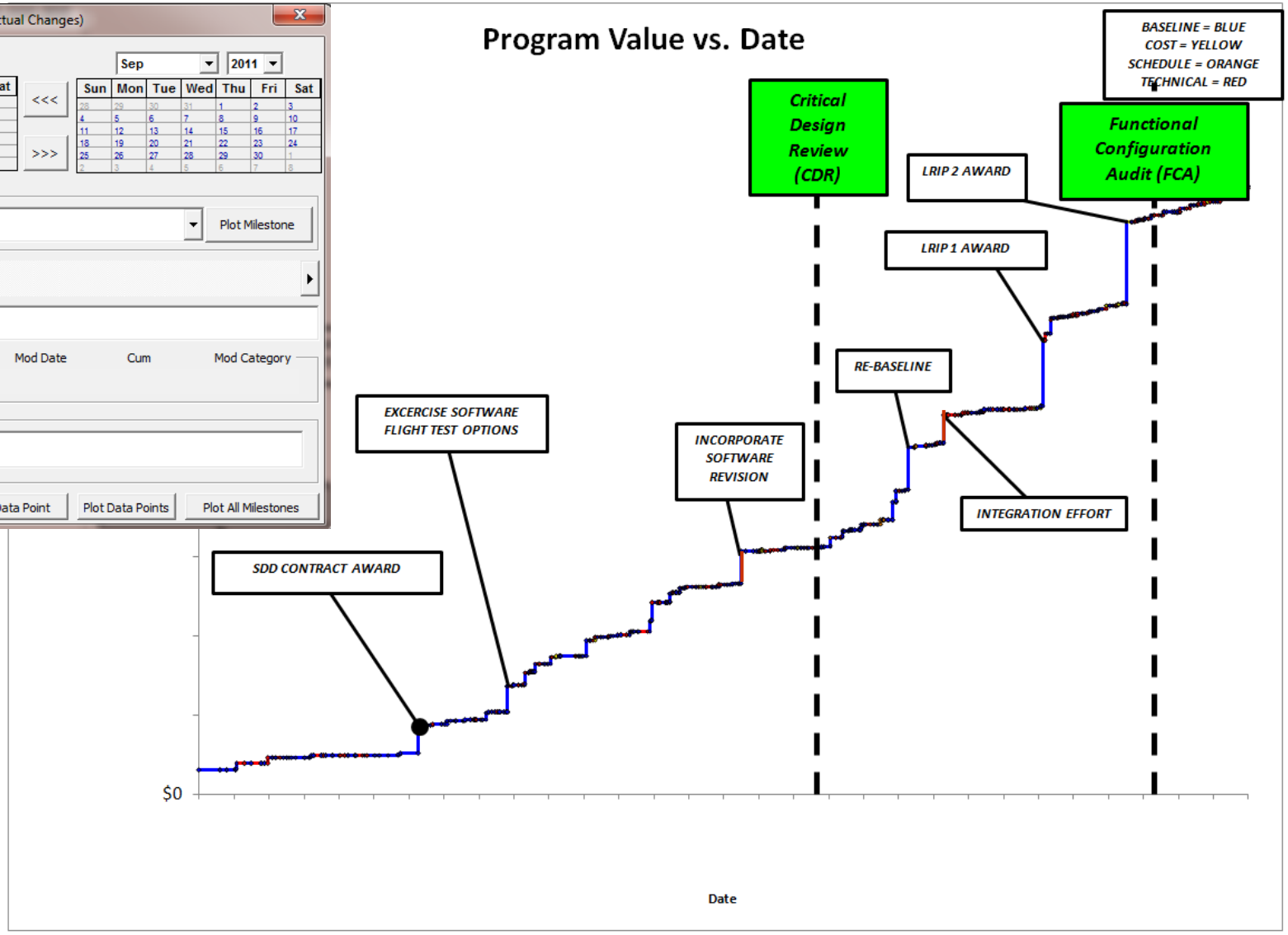


Database Functionality: Growth Factors



Database Functionality: Annotated Plots





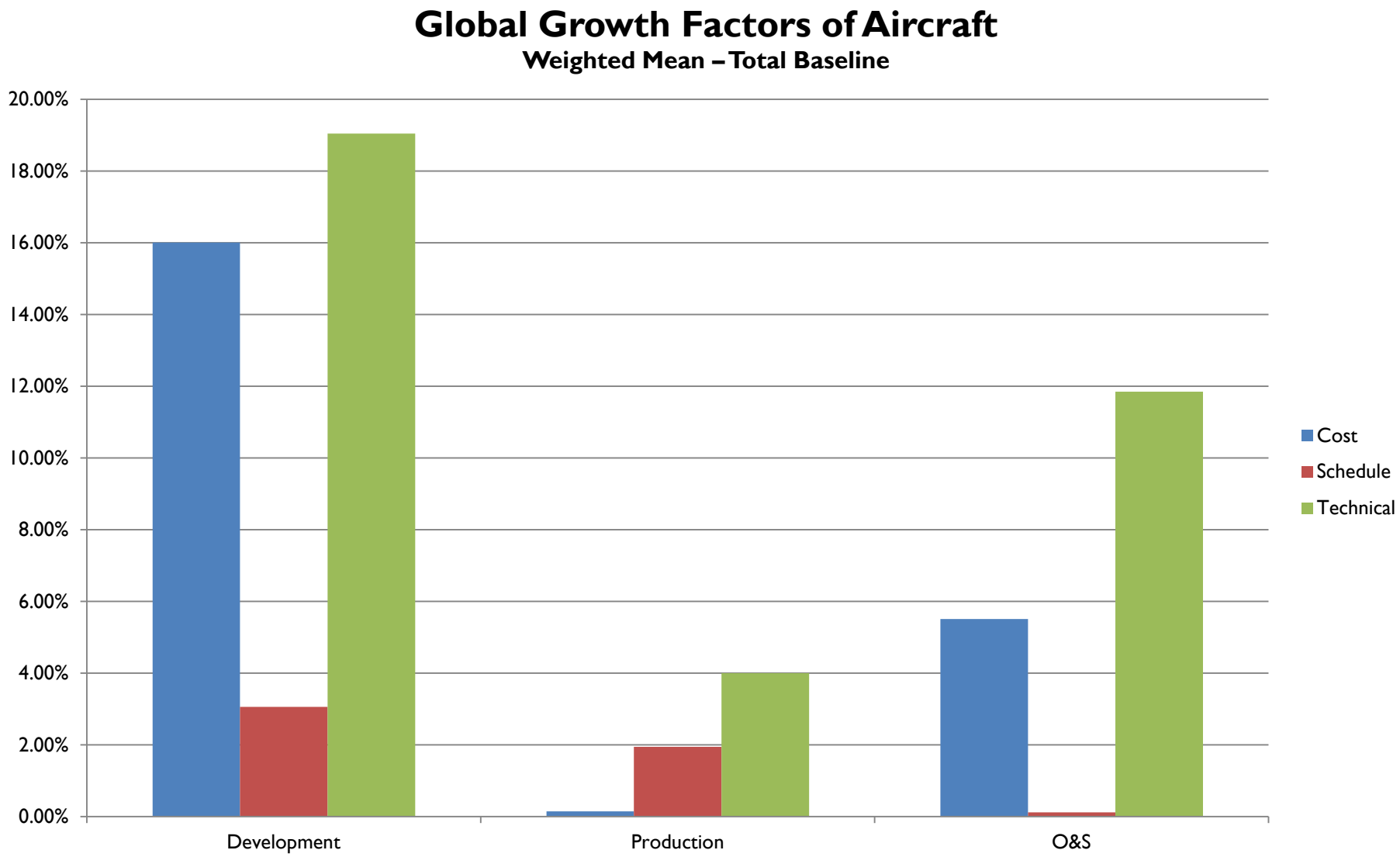
Key Database Functionality

- **Contract Info:** Refers to *individual* contracts
- **Contract Growth Factors**
  - Refers to *groups* of contracts (e.g. Air Force missiles)
  - Raw and weighted growth factors and associated statistics
  - Data filters (Service, Phase, Commodity, Contract Type, Contractor)
- **Program Growth Factors**
  - Refers to *all* contracts associated with a particular *program*
  - Raw growth factors
  - Data tables (CLINs, Modifications, Quantities, Period of Performance)
  - Charts (CLIN, Contract value over time)
  - Charts (growth category histograms, contract bar chart)
- **By-Program Analysis**
  - Accumulates all contract data across the selected program
  - Total growth statistics by category
  - Program growth chart (milestone and data point label capability)
- **Search:** Searchable data warehouse: search by keyword, program, contract, etc.

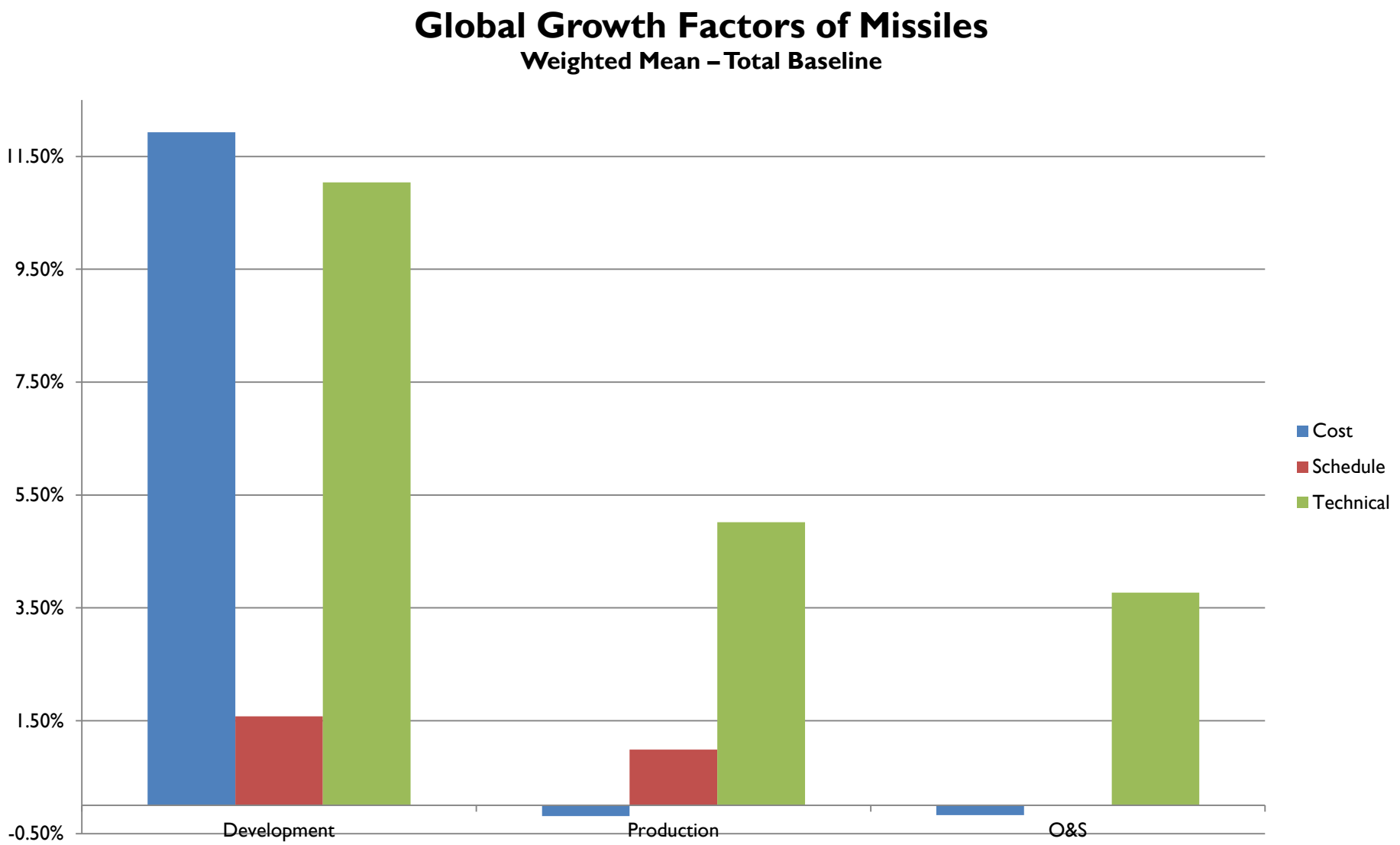
Calculating Growth Factors

- Averaging growth across multiple contracts can result in skewed results because each data point is weighted equally.
  - e.g., very high growth experienced on a very small contract is treated the same as moderate growth on a very large contract.
- To counter this effect, dollar weighted factors are also calculated.

Global Growth Factors



Global Growth Factors



CLIN LEVEL DATABASE

Objective

- Compile all CLINs across all contracts by ACAT I program
- Normalize CLINs
  - Map CLINs to a standard WBS structure
  - Develop logical/common groupings of CLINs
- Analyze the normalized data within a program and across programs to develop:
  - Growth factors
  - Estimating factors
  - Learning curves

Background

- CLIN analysis can result in more homogeneous datasets than analysis at the contract level.
  - Contract scope can often be a mix of mismatched, yet related efforts

	Contract A	Contract B
CLIN 1	AUR Missile Production	CATM Production
CLIN 2	Seeker Spares	AUR Missile Production
CLIN 3	Logistics Support	Platform Integration
CLIN 4	Missile Test Set Production	Control Section Repairs
CLIN 5	Platform Integration	Improved laser guidance study

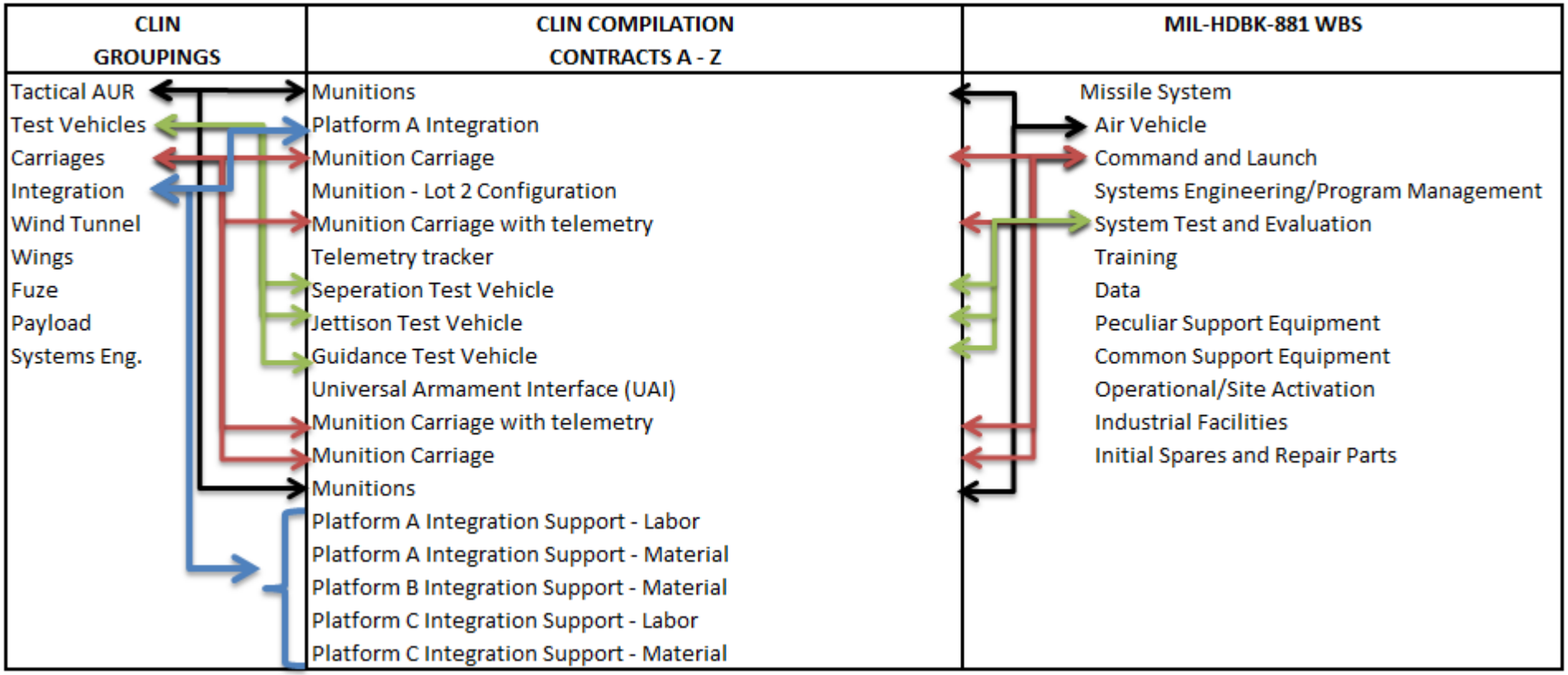
  - Mapping issues can arise when CLIN effort spans multiple WBS elements

Approach – Compile CLIN Data

- CLIN Database Fields
  - CLIN Number, CLIN Description
  - Program
  - Contract Number, Contract Description
  - Phase (Development, Production, O&S)
  - Production Lot (Lot 1, 2, 3, etc.)
  - CLIN Type (FFP, CPFF, T&M, etc.)
  - Primary CLIN Funding Appropriation (e.g. 3600, 3020, 3400, etc.)

Approach - Normalization

- CLINs are mapped to program-specific, logical groupings that are based on the commodity-specific MIL-HDBK-881 WBS (Missile System example shown)



CLIN Groupings

EXAMPLE: Missile Program

LEVEL 1	LEVEL 2	COUNT
PME	Air Vehicle (AUR)	32
	Command and Launch Software	14
	Control Unit	8
	GPS	9
	Guidance Unit	2
	Containers	2
	Safe Arming Fuze	2
	Telemetry	2
	Airframe	3
	Engine	4
	Fuze	2
	Payload	1
	Weapon Data Link	2
	Wing	3
	Instrumentation	15
System Dev.	EMD	4
	Risk Reduction	5
	P3I	1
	PDRR	3
ST&E	Simulator	6
	Test Support	19
	Test Vehicle	3
	Flight Test Missile	2
	Ground Testing	4
	Instrumented Test Vehicle	1
	Reliability Test Vehicles	3
	Separation Test Vehicle	3
	Simulation Vehicle	1

LEVEL 1	LEVEL 2	COUNT
Integration	Aircraft Integration Support	9
Mfg Eng	Production Support	3
	Production Verification	2
SE/PM	Proposal Preparation	12
	Systems Engineering	12
	Technical Support	7
	Support	3
	Ops Safety, Suitability & Effectiveness	6
	Program Management	1
	Reliability Program	11
	Weapon System Eval. Program	2
Training	Dummy Air Training Missile (DATM)	4
	Training	1
Data	Data	3
Spares	Obsolete Parts	3
Other	Fee	2
	Asset Management Program	1
	?	5
	Other - Contractor Costs	2

TOTAL CLINs: 245
TOTAL LEVEL 2 CATEGORIES: 47

CLIN Groupings (continued)

Summary of Common CLIN Mapping (Prime Mission Equipment)			
PROGRAM A		**PROGRAM B**	
Air Vehicle (AUR)	32	Air Vehicle (AUR)	96
Command and Launch Software	14	Command and Launch Software	19
Control Unit	8	Control Unit	1
GPS	9	GPS	1
Guidance Unit	2	Guidance Unit	12
Containers	2	Containers	2
Safe Arming Fuze	2	Safe Arming Fuze	2
Telemetry	2	Telemetry	3
Airframe	3	Processor	4
Engine	4	Rocket Motor	17
Fuze	2	Electronic Counter Measures	3
Payload	1	Booster	3
Weapon Data Link	2	Instrumentation Kit	95
Wing	3	Captive Equipment	2
Telemetry	15		
TOTAL CLINs	**101**	**TOTAL CLINs**	**260**

Common

Unique

MISSILES

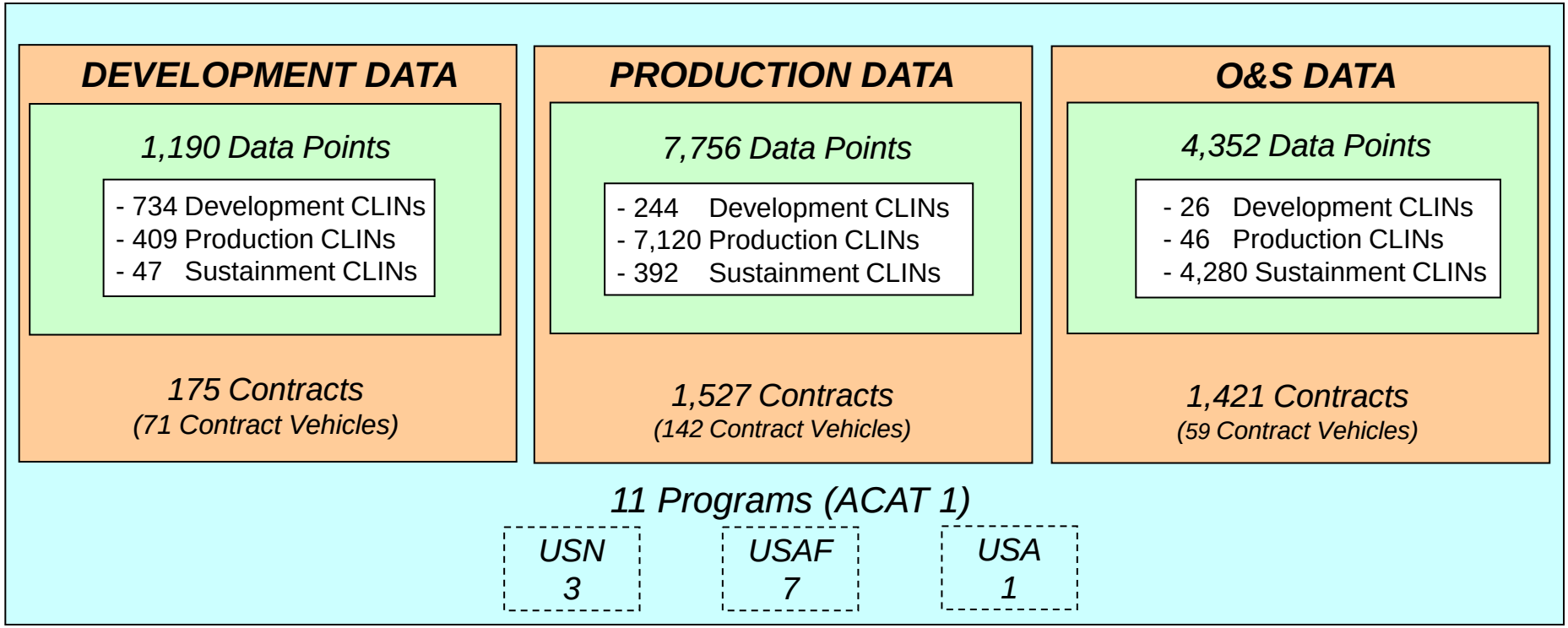
MUNITIONS

Summary of Common CLIN Mapping (Prime Mission Equipment)			
PROGRAM C		**PROGRAM D**	
Munitions (AUR)	18	Munition (AUR)	45
Payload	3	Payload	9
Command and Launch Software	4	Command and Launch Software	1
Fuze	1	Fuze	4
Telemetry	5	Altimeter	7
Wings	14	Bomblets	16
		Control Unit	1
		Release mechanism	1
		Propulsion	1
		Canister	3
		Cable	3
		Target Detecting Device	3
		Upper Housings	3
TOTAL CLINs	**45**	**TOTAL CLINs**	**97**

Common

Unique

CLIN Database Composition



Future Potential Efforts

- Add additional programs based on prioritized listings
- CLIN-level database expansion
  - Allows for assignment of programs at the CLIN level, rather than relying upon plurality of dollars
- Extraction of Section G funding data
  - Provides insight into time phasing
- Separate treatment of Foreign Military Sales (FMS)
- Dynamic definition of various criteria (e.g., "completed" contracts)
- Develop multivariate relationships for estimating contract growth
- Migration to .NET environment
  - Eliminates configuration control issues
  - Provides 'real-time' access to new data
  - Facilitates access to associated pdf file (mod or contract) via hyperlink
  - Facilitates user control/management (e.g., full vs. limited access privileges)