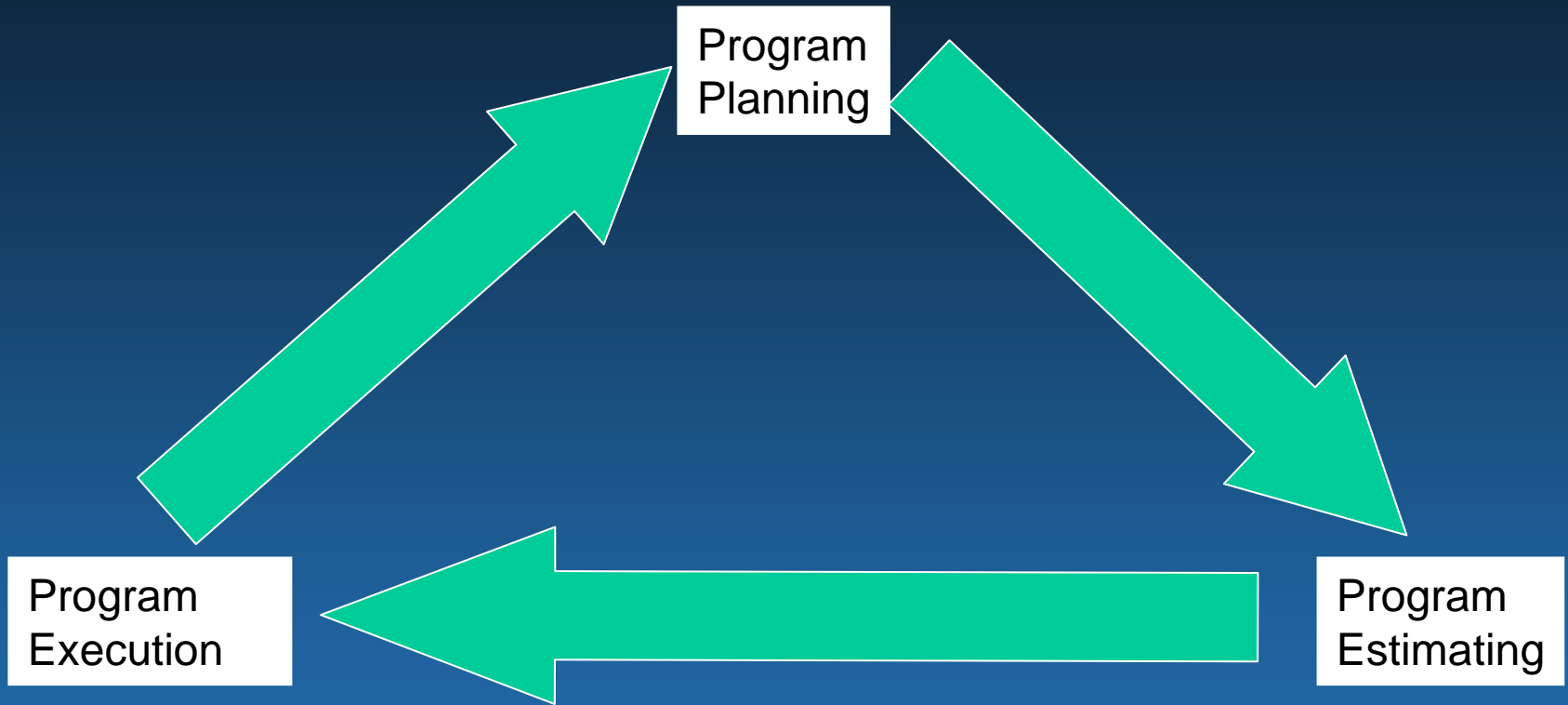


The Lockheed Martin Aeronautics Transformed Estimating System

***Cleo Liles
June 4, 2009***

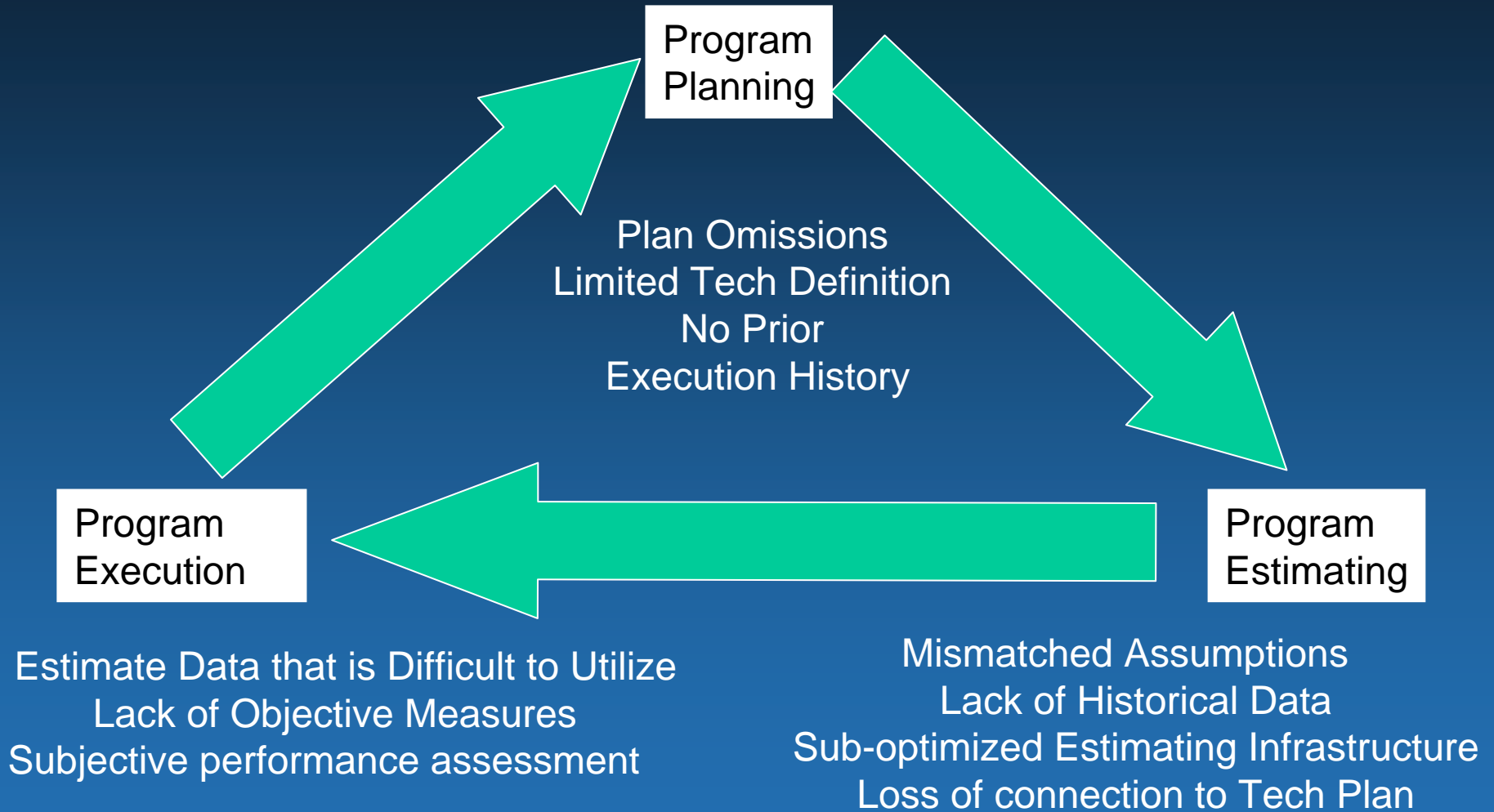


Typical Contract or Program Life Cycle





Contractor Risks Inherent in the Current Life Cycle of a Contract or Program



Current Industry Program Planning Practices

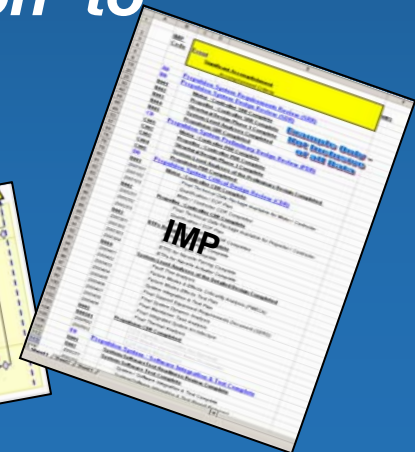


Characteristics

- *Frequently plans are generated based on “memory” of past efforts*
- *Limited definition of work products, their content and level of maturity*

Results

- *Plans omit key elements for successful accomplishment and sufficient information to form the basis accurate estimates and execution plans/schedules*



Current Industry Program Execution (EVMS)

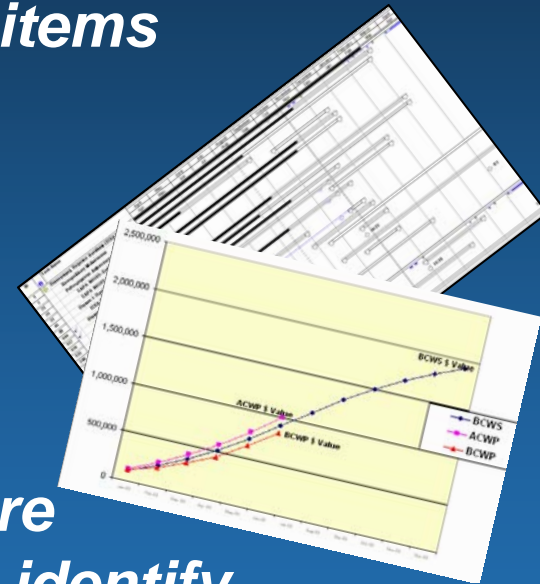


Characteristics

- *Execution planning is frequently unrelated to estimate data*
- *Work packages have more level-of-effort than desired and have limited association with measurable items*
- *Metrics measurement difficult*
- *Work package contain judgments rather than objective fact based assessments*

Results

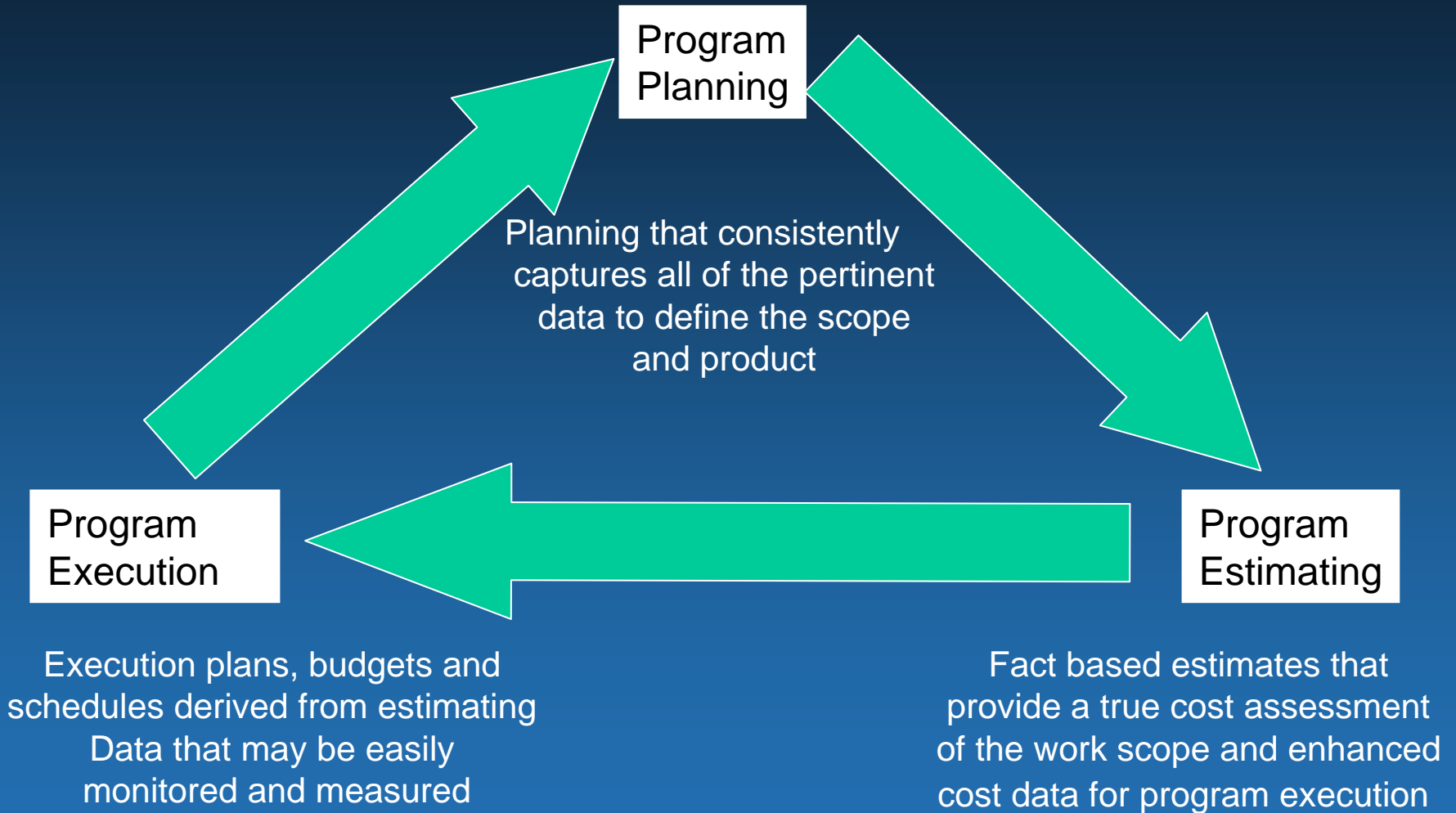
- *Progress against plan is difficult to measure*
- *Causes of variances to plan are difficult to identify*
- *Limited cost & schedule driver visibility*



Performance Measurement



A Vision for Improving The Planning, Proposing and Execution of Programs





Three Initiatives Contribute To the Achievement of the Vision

The Set of Initiatives That Enable the Vision

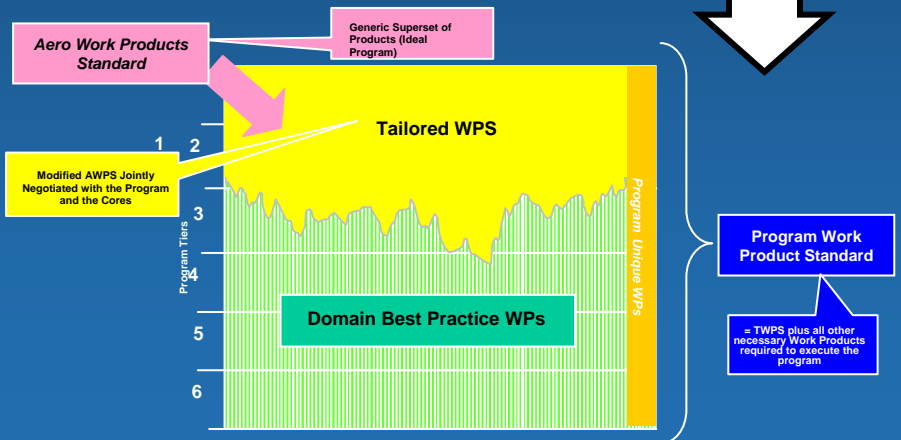
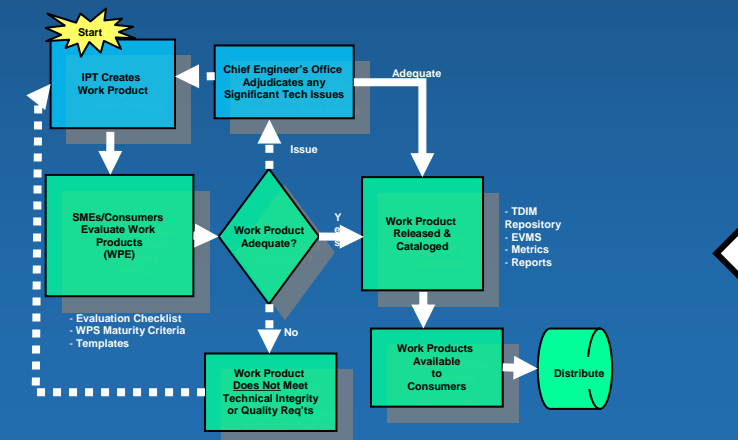
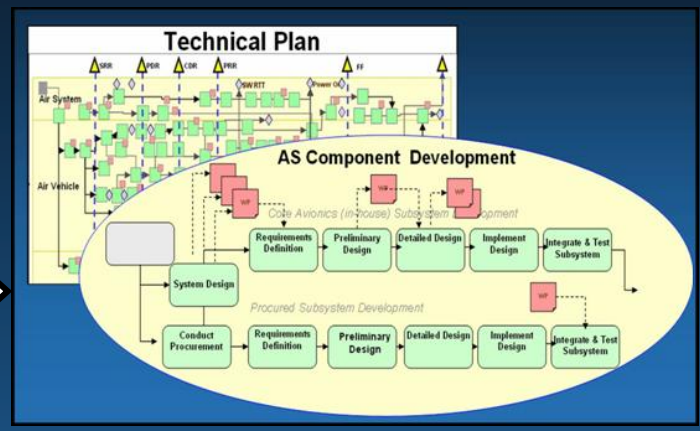
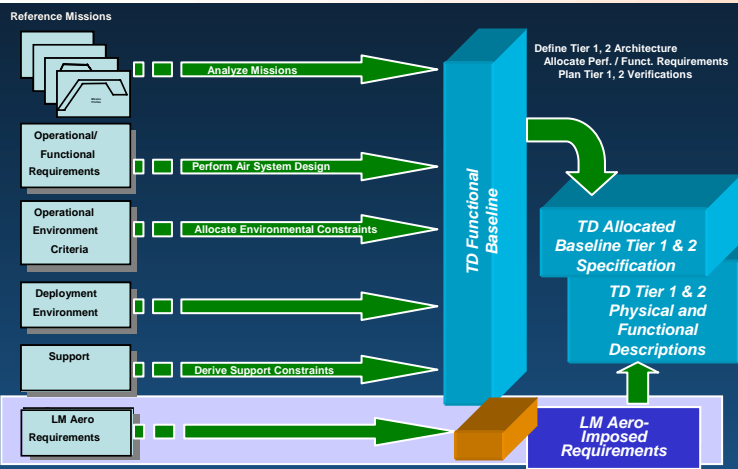


- ***The Enterprise Standard Planning Process (eSPP) Initiative***
- ***The Estimating Transformation Initiative (ETI)***
- ***EVMS system and process improvements (EVMS Changes)***



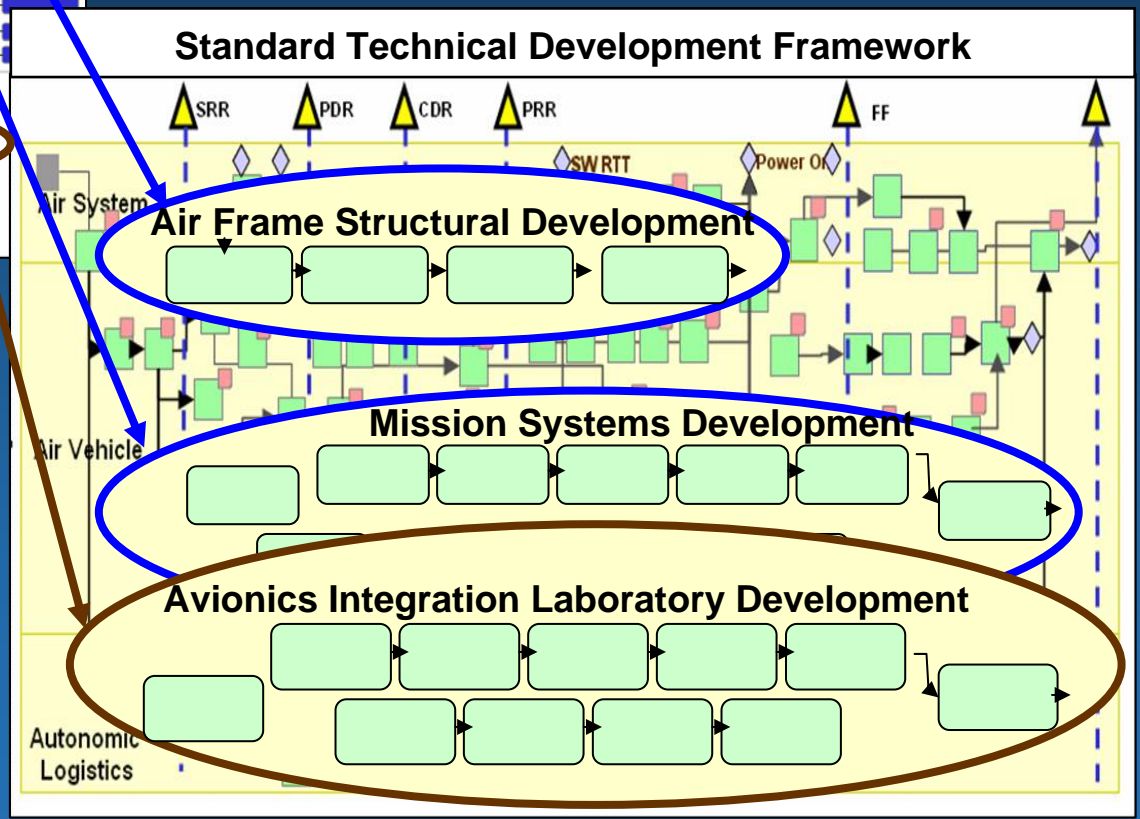
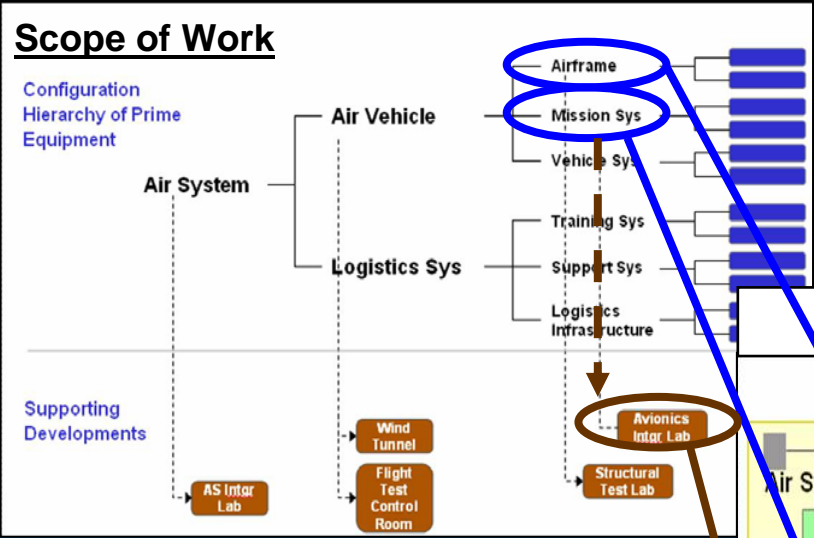
- ***A standard planning process***
- ***Product Development Framework***
- ***Standard Work Flow***
- ***Standard Work Breakdown Structure***
- ***Standard set of Work Products***
- ***Maturity definitions to ensure work product handoffs are adequate for the receiving work flow task***

Enterprise Standard Planning Package (eSPP)





Technical Planning Reflects System Design Scope





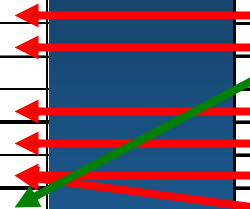
Work Product Standard & Standard WBS

Airframe Standard Work Products
Structural Layouts
Design Drawings
Structural Test components
Structural Parts
Static Test Article
Full Scale Static Test
Fatigue Test Article
Full Scale Fatigue Test
Flight Test Articles
Stress Analysis



Standard WBS	
0000	Air System
1000	Airvehicle
1100	Airframe
1110	Airframe Design Integration
1111	Configuration Definiton
1112	Specialty Engineering
1120	Airframe Structure
1121	Fuselage Structure
1122	Wing Structure
1123	Empennage Structure
1130	Airframe Test
1200	Airvehicle Systems
1300	Mission Systems
1400	Armament
1500	Flight Test
2000	Logistics Systems
2100	Support Equipment
2200	Training
2300	Technical Publications
2400	Spares
2500	Maintenance
2600	ILS Informtation Systems

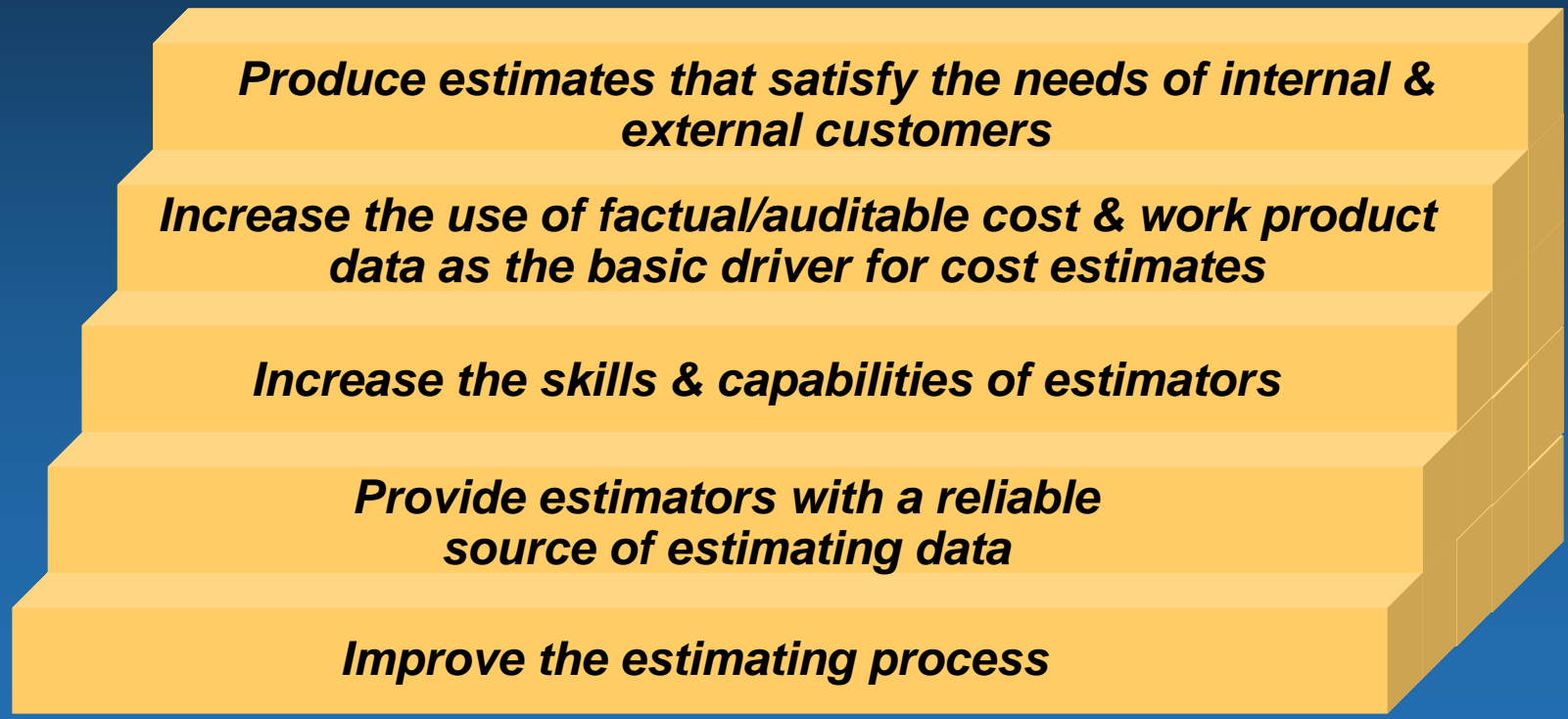
Program WBS	
0000	Air System
1000	Airvehicle
1100	Airframe
1100	Airframe intergartion
1111	Structural Analysis
1112	Specialty Engineering
1113	Structural Development Test
1120	Fuselage Structure
1130	Wing Structure
1140	Vertical Stabilizer
1150	Horizontal Stabililizer
1200	Airvehicle Systems
1300	Mission Systems
1400	Armament
1500	Flight Test
2000	Logistics Systems
2100	Support Equipment
2200	Training
2300	Technical Publications
2400	Spares
2500	Maintenance
2600	ILS Informtation Systems





Transformed Estimating Initiative (ETI)

- Objectives



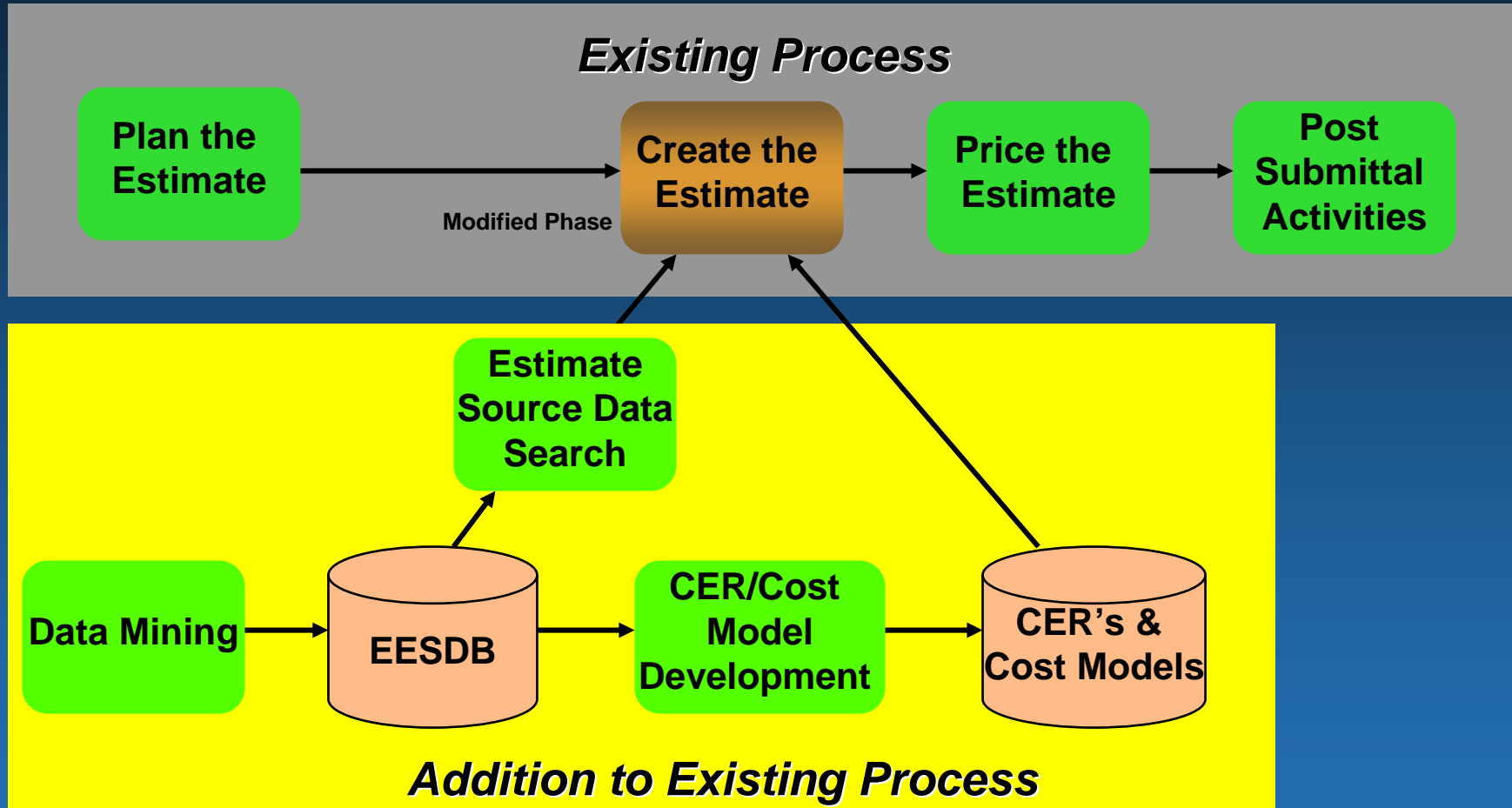


Elements of (ETI)

- ***Estimating System Support Data Base (EESDB)***
- ***Historical cost & work product data mapped to a Standard WBS***
- ***Cost data history identified to work products & program milestones***
- ***Repository of previously developed Cost Estimating Relationships (CER's) and Cost Estimating Models (CEM's)***
- ***Improved & expanded estimator training***
- ***Work Product Driven estimates***

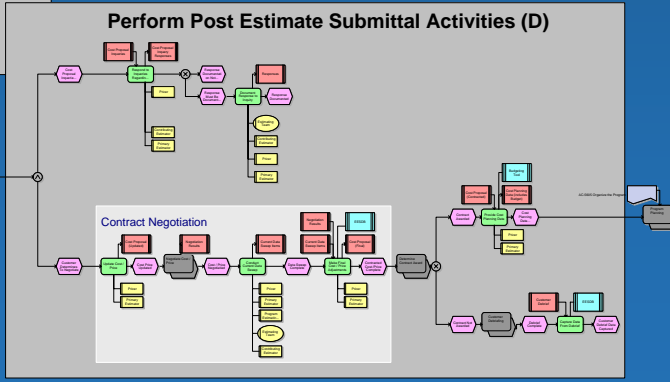
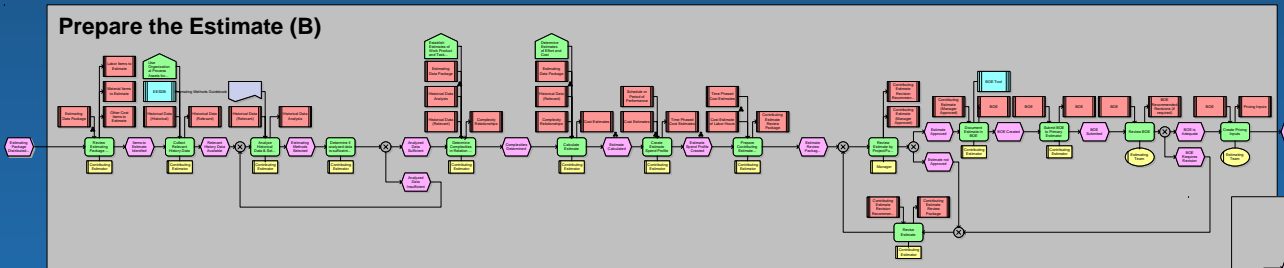
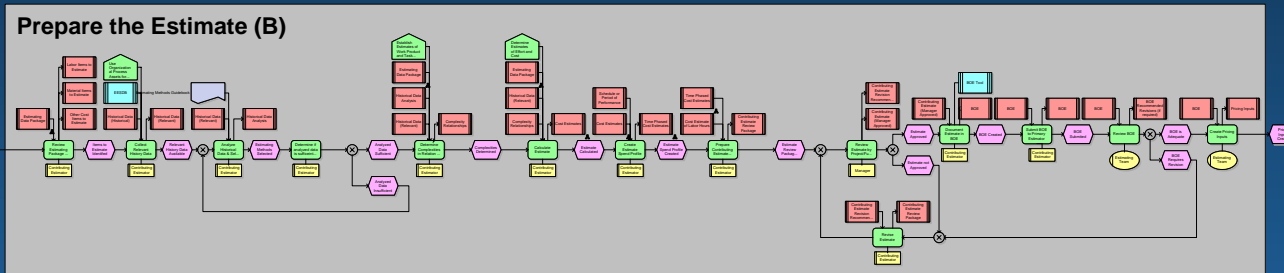
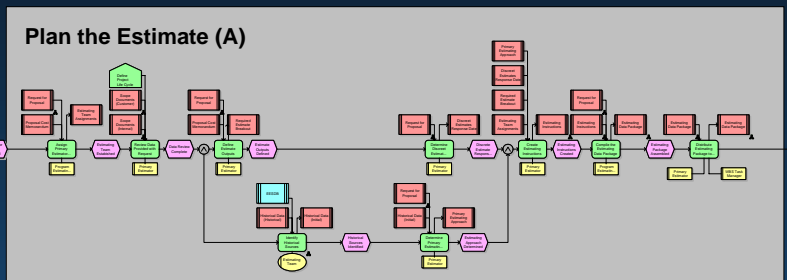


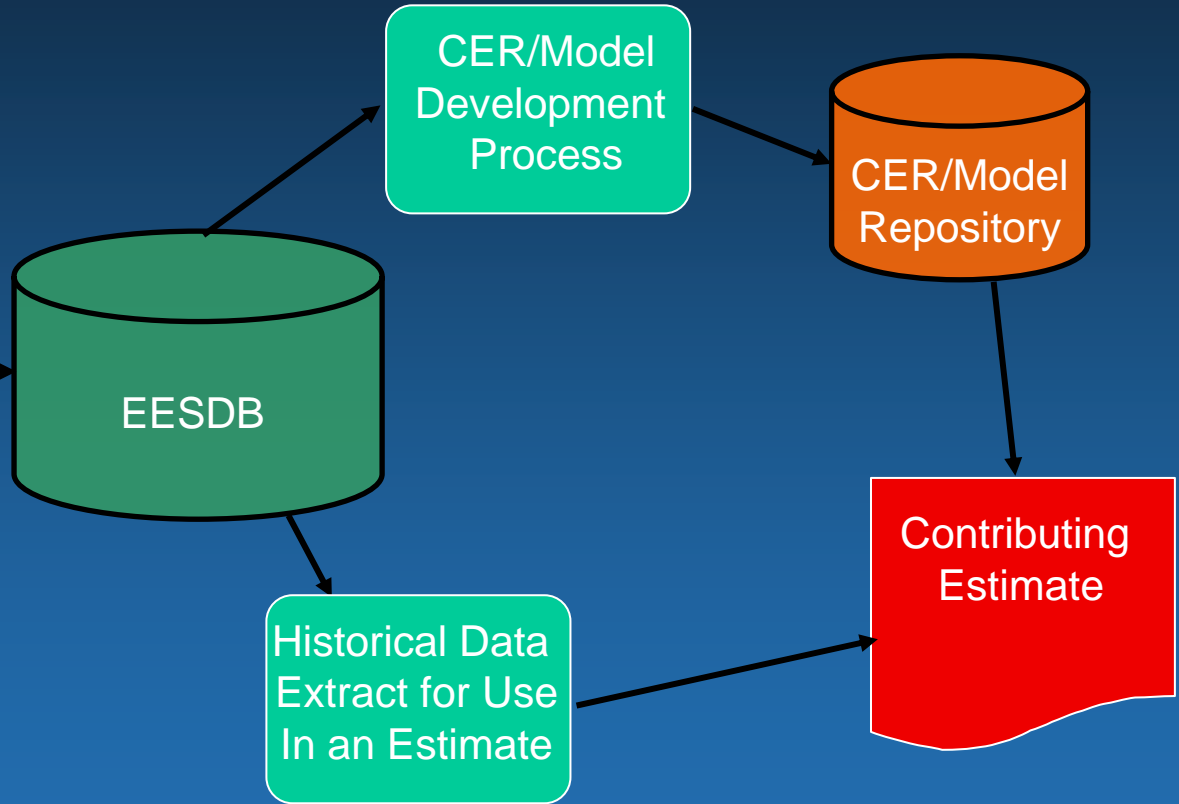
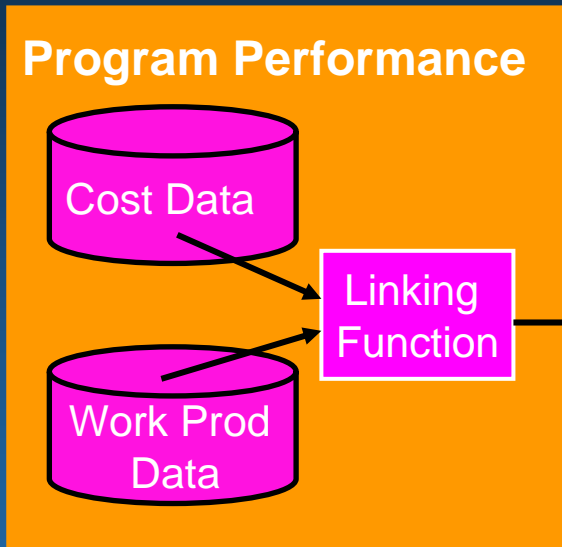
Estimating Transformation Initiative (ETI)





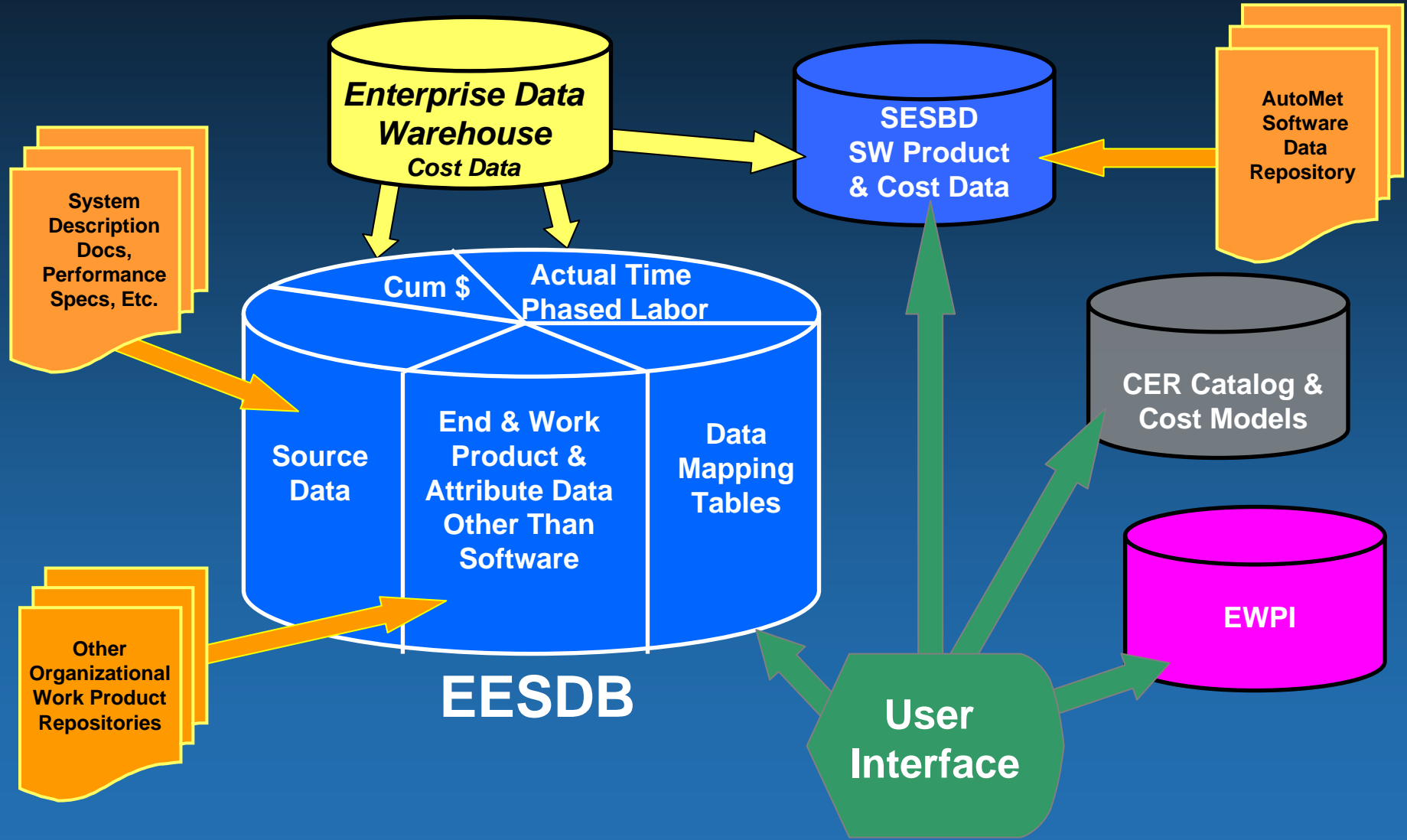
ETI Improvements - Improved processes





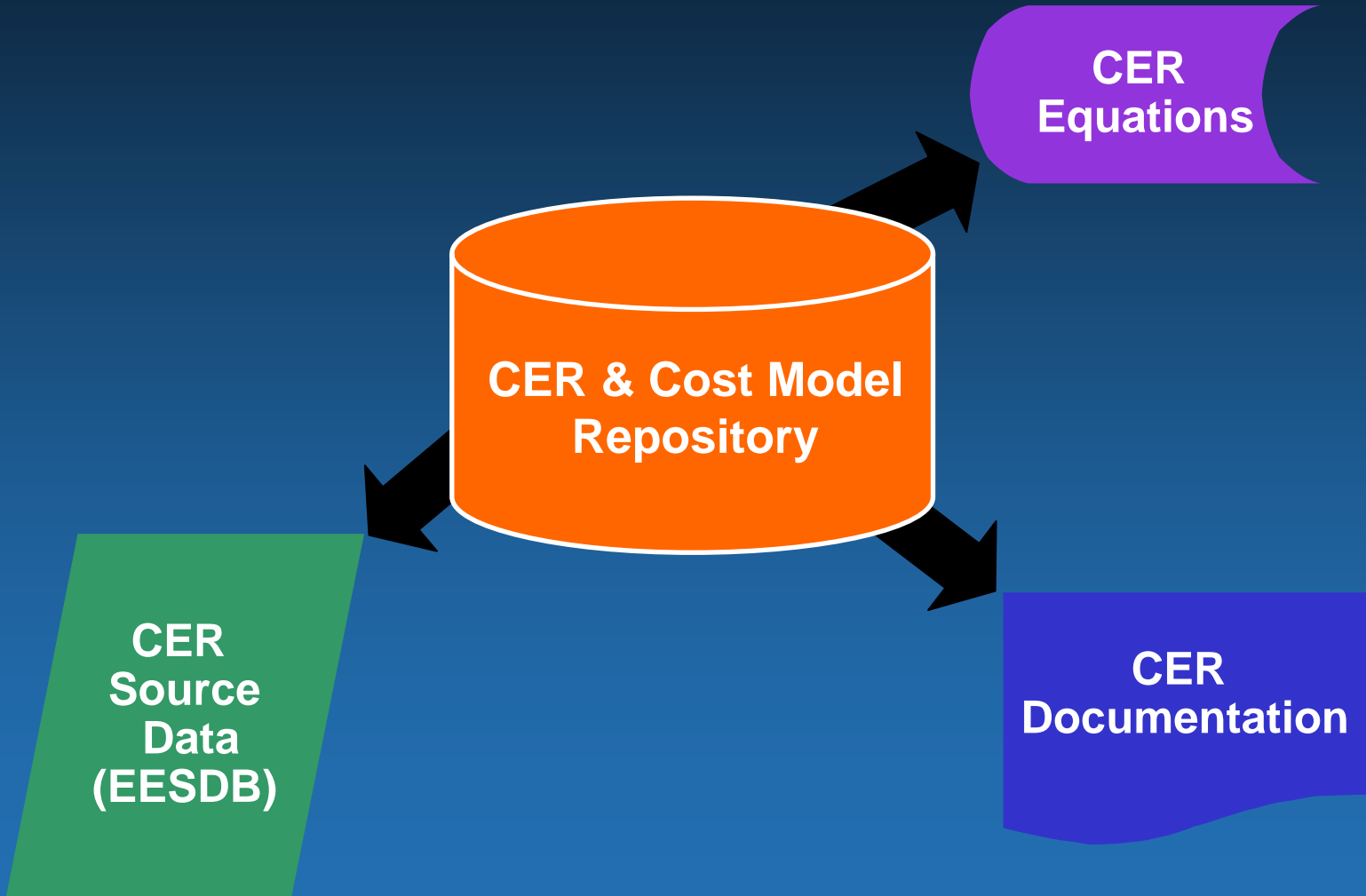
ETI Improvements

- EESDB



ETI Improvements

- CER/Cost Model Repository



ETI Improvements

- Estimating Skill Set training



- **Training tailored to the estimator's role**
 - **Estimating organization pricer**
 - **Estimating organization estimator**
 - **Data miner**
 - **Contributing estimator**

		Introduction	Intermediate	Advanced
Affordability Analysis Processes & Tools	Affordability Analysis	X	X	X
Air Vehicles & Aeronautical Concepts	Aeronautical Concepts	X	X	X
Data Mining & Analysis	Data Mining & Analysis	X	X	X
Proposal / Program Scheduling for Estimators	Proposal / Program Scheduling	X	X	X
Regression Analysis & Curve-Fitting Functions	Statistical Analysis	X	X	X
BOE Development	BOE Quality	X		
Pricing & Cost Volume Development	Pricing	X		
Rates/Factors Development	Rates & Factors	X		
Cost Proposal Review & Approval	Review & Approval	X		
Parametric Estimating and Modeling	Cost Modeling	X	X	X
Engineering Estimating	Engineering Estimating	X	X	X
Cost Estimating	Estimating Fundamentals	X		
Material Estimating	Material Estimating	X	X	X
Manufacturing Estimating	Operations Estimating	X	X	X
Global Sustainment / O&S Estimating	Sustainment Estimating	X	X	X



EVMS system and process improvements (EVMS Changes)

- ***Reduction in the percentage of level of effort***
- ***Work Packages***
- ***Improved training of EVMS employees and CAM's***
- ***Transition to work product driven work packages***





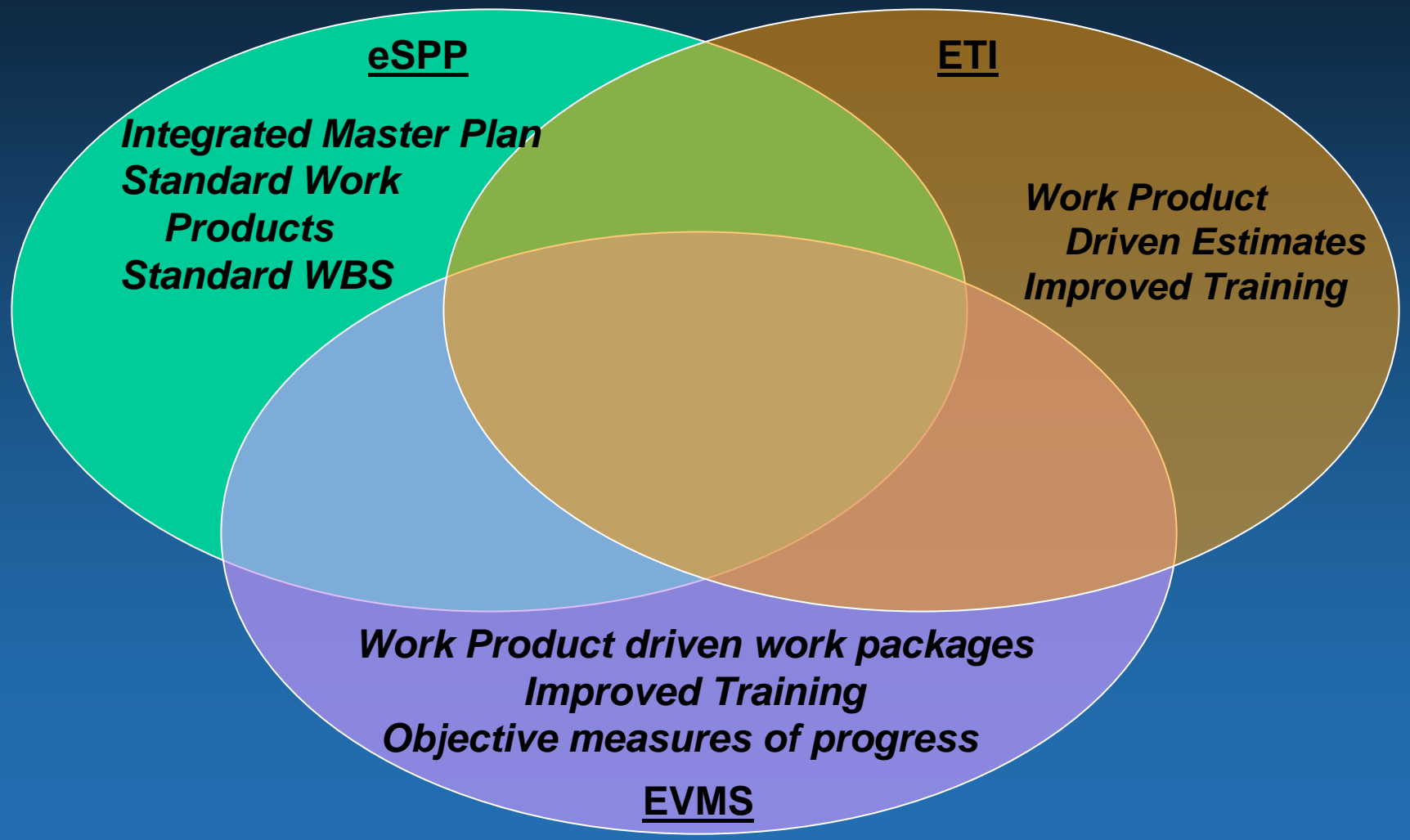
Elements of the eSPP Utilized by ETI & EVMS

- **Standard Work Products**
 - **Estimating – Effort sizing parameters in cost equations**
 - **EVMS – Objective accomplishment metrics**
- **Standard WBS**
 - **Estimating – Link between historical data and planning information**
- **Integrated Master Plan**
 - **Estimating – Start dates and durations for activities estimated**
 - **EVMS – Milestone dates for work package scheduling**





Interdependency of the Three Initiatives





Impacts of the Aeronautics Transformed Estimating System

ETI Impacts



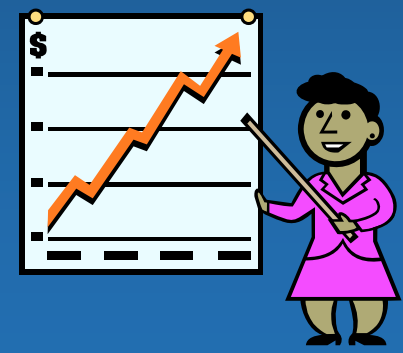
- ***Improved Estimate Quality***
- ***Solid Basis for Execution Planning***
- ***Enhanced Employee Skills & Careers***
- ***Culture Changes***



ETI Impacts

- Improved Estimate Quality

- ***Reduction in pure “judgment” estimates***
- ***Use of factual data as the base for estimate development***
- ***Reduction in estimating errors***
 - ***Higher level of training for all estimators***
 - ***Use of Factual data***

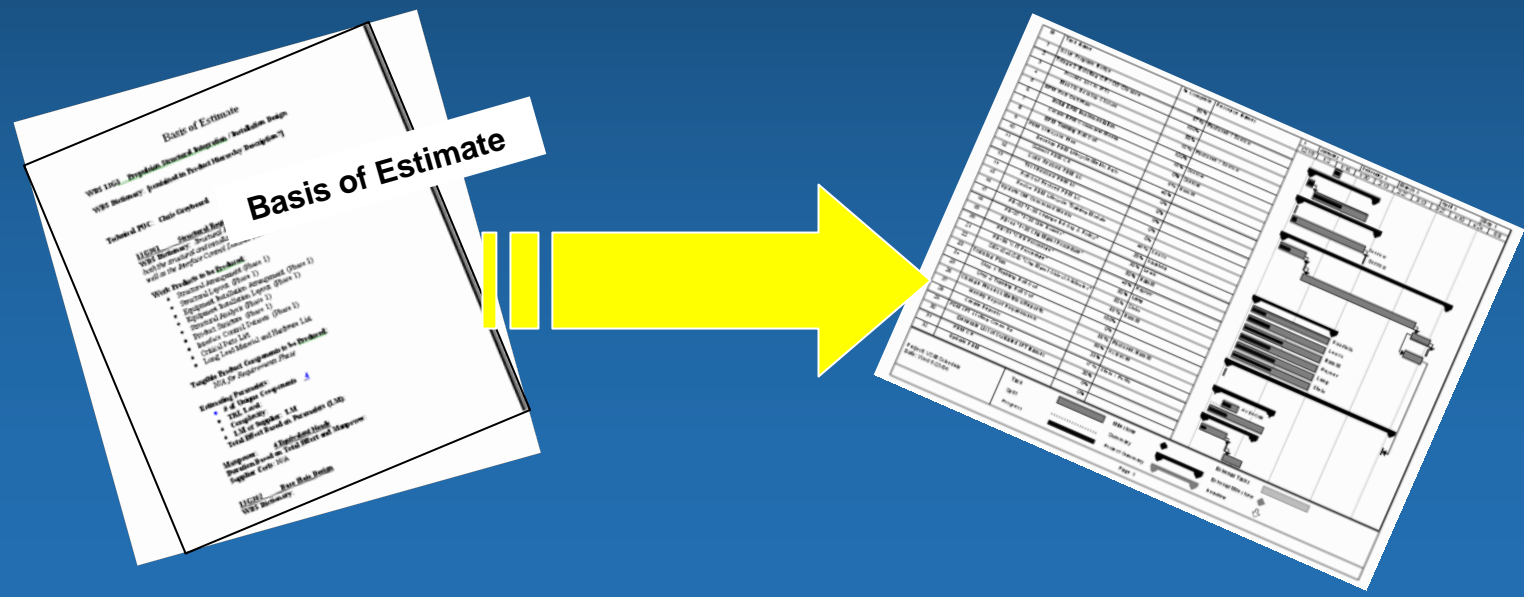




ETI Impacts

-Solid Basis for Execution Planning

- **Estimating data contained in BOE's provide the basic work package information needed to establish the value, schedule and metrics for performance measurement.**





ETI Impacts

-Enhanced Employee Skills & Careers

- ***Estimating Employees***
 - ***Development of higher skill levels***
 - ***Greater understanding of the product and the cost/product linkages***
 - ***Increase Employee responsibility and opportunity***
- ***EVMS Employees***
 - ***Development of higher skill levels***
 - ***Greater understanding of the***
 - ***Increase employee responsibility and opportunity***





ETI impacts

-Employee Skills & Careers (Cont.)

- ***Technical Employees***

- ***Improved estimating skills and access to source data***
- ***Added focus on technical planning and product definition the efforts***



ETI impacts

-Culture Changes

- ***Reliance on historical facts as base for estimating***
- ***Expectation of an “adequate” technical definition***
- ***Changes in Employee roles***
- ***Changes in program organization responsibilities for data retention***
- ***Management expectations for estimate and program performance reviews***

