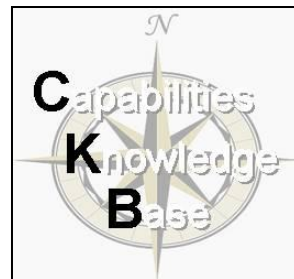




Utilizing The Capabilities Knowledge Base for Cost Benefit Analysis and Analysis of Alternatives



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Objective and Agenda

❖ Objective:

- To provide an introduction to Capability-Based Cost Analysis and The Capabilities Knowledge Base (CKB)

❖ Agenda:

Topic	Slide(s)
❖ <u>Capability-Based Cost Analysis</u> <ul style="list-style-type: none">➤ Definition➤ Applications	3 – 5
❖ <u>The Capabilities Knowledge Base</u> <ul style="list-style-type: none">➤ Overview➤ Content➤ Obtaining Access	6 – 19

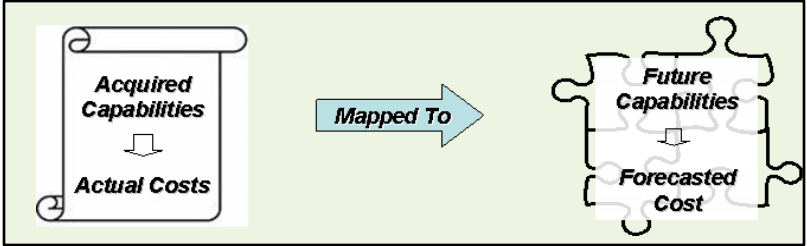


Capability-Based Cost Analysis



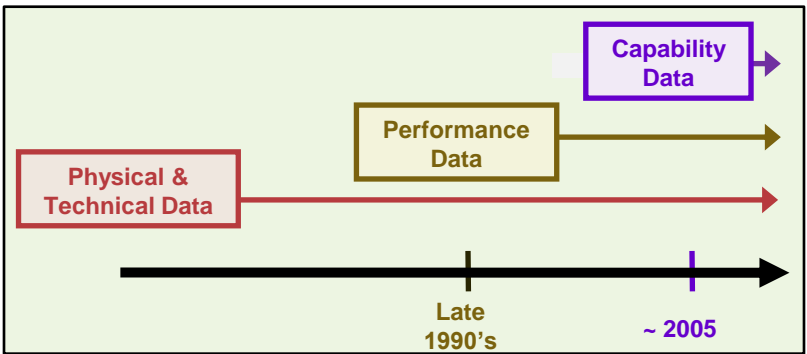
What is Capability-Based Cost Analysis?

- ❖ Using the capabilities of current systems and their associated costs to provide cost estimates for capability-gap-filling solutions



- ❖ Boolean logic is used to identify whether a system possesses a specified capability (i.e. '1') or does not (i.e. '0')

- ❖ Relatively new concept:





The Need for Capability-Based Cost Analysis

Capability-based cost analysis was first conceived of to address the problem of information scarcity early in a system's life cycle (i.e. lack of a system maturity, a developed CARD). It is a technique for producing an estimate using capability data only.

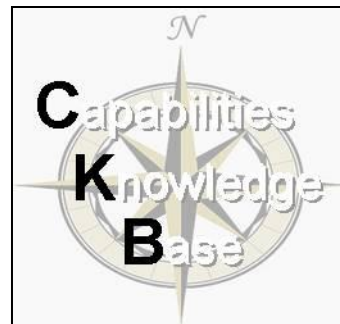
Capability-Based Cost Analysis Specifically Addresses:

- ❖ **Analysis needs early in the acquisition life cycle:**
 - Information-poor environments (such as Milestone-A)
 - Enabling the costing of “concepts” or “paper systems”
 - Using capability data (usually most readily available for early analysis)
 - Need for high-level cost analysis to support early investment decisions across portfolios

- ❖ **Analysis needs later in the acquisition life cycle:**
 - Identification of analogous systems, etc.



The Capabilities Knowledge Base



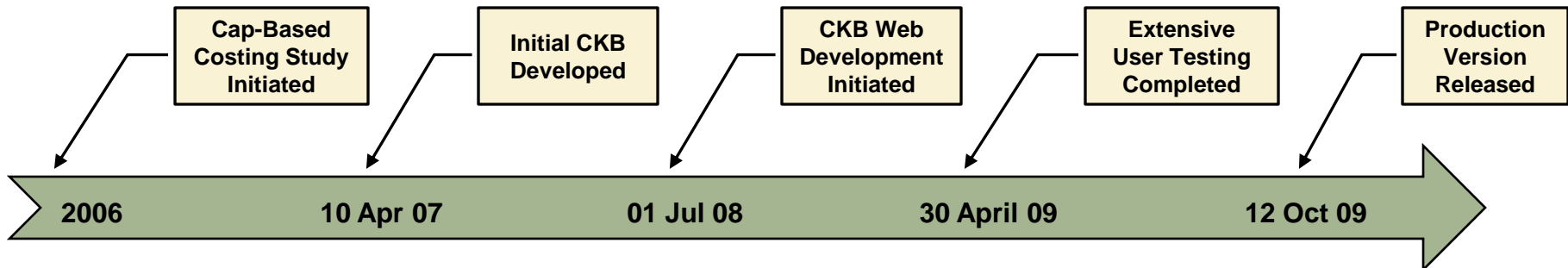


CKB Overview (1)

- ❖ The result of an on-going study conducted by the Early Cost Team within ODASA-CE
- ❖ Designed and developed to facilitate the use of capability-based cost estimating
- ❖ Contains the cross-service program capability, cost, and performance data required to produce cost forecasts within stricter timelines

Specification	CKB
ACAT Levels Included	I, II, III
Services Included	Army, Air Force, Navy, DoD
Programs Included	440
Historical Cost & Schedule Data	1969 – Present

❖ CKB Development / Release Timeline:





CKB Overview (2)

- ❖ Current user base consists of 108 DoD employees
- ❖ Fully functional Help Desk established / Several tutorials created
- ❖ Additional data collection in-process

Selection Criteria

Search [] Reset []

— All —

Program Name
-All-

Program Type
Aircraft

Program Sub-Type
-All-

Service
-All-

Acquisition Category
-All-

Acquisition Type
-All-

— Costs —

Data Source
-All-

Technical Attributes

Programs

Rows: 100 Go []

1 - 30 of 30

PNO	Program Name	Long Name	Service	Program Type	Program Sub-Type	Acquisition Type	Ad
101	H-1 UPGRADES (4BW/4BN)	H-1 Upgrades (4BW/4BN)	Navy	Aircraft	Rotary-Wing	MDAP	ID
156	BLACK HAWK (UH-60A/L)	Black Hawk Utility Helicopter (UH-60L)	Army	Aircraft	Rotary-Wing	MDAP	-
179	ARH	Armed Reconnaissance Helicopter (ARH)	Army	Aircraft	Rotary-Wing	MDAP	ID
182	LUH	Light Utility Helicopter (LUH); UH-72A Lakota	Army	Aircraft	Rotary-Wing	MDAP	IC
183	JCA	Joint Cargo Aircraft (JCA)	Army	Aircraft	Fixed-Wing	MDAP	ID
191	MH-60R	MH-60R Multi-Mission Helicopter	Navy	Aircraft	Rotary-Wing	MDAP	IC
198	F-35 (JSF)	F-35 Lightning II (Joint Strike Fighter)	DoD	Aircraft	Fixed-Wing	MDAP	ID
200	C-17A	C-17A Globemaster III	Air Force	Aircraft	Fixed-Wing	MDAP	IC



CKB Overview (3): Applications

❖ Supports Pre-Milestone-A Analysis and Beyond:

❖ Pre-Milestone-A Costing:

- Analysis of Alternatives (AoA)
 - CKB contains the following cost data: RDT&E; Procurement; MILCON; O&M; and O&S
 - Example: Joint Effects Targeting System (JETS) Milestone-A AoA

❖ Milestone-A and Beyond Costing:

- CKB serves as a repository of historical cost and schedule data
- Identification of analogous systems in the existing systems inventory
 - Supports both analogy and CER estimating methodologies, respectively

❖ Capability Portfolio Analyses:

- Example: Gap analysis across rotary wing aircraft fleet or ship inventory
- Example: Army capability analysis of the Heavy Brigade Combat Team (BCT) versus the Future Combat Systems BCT

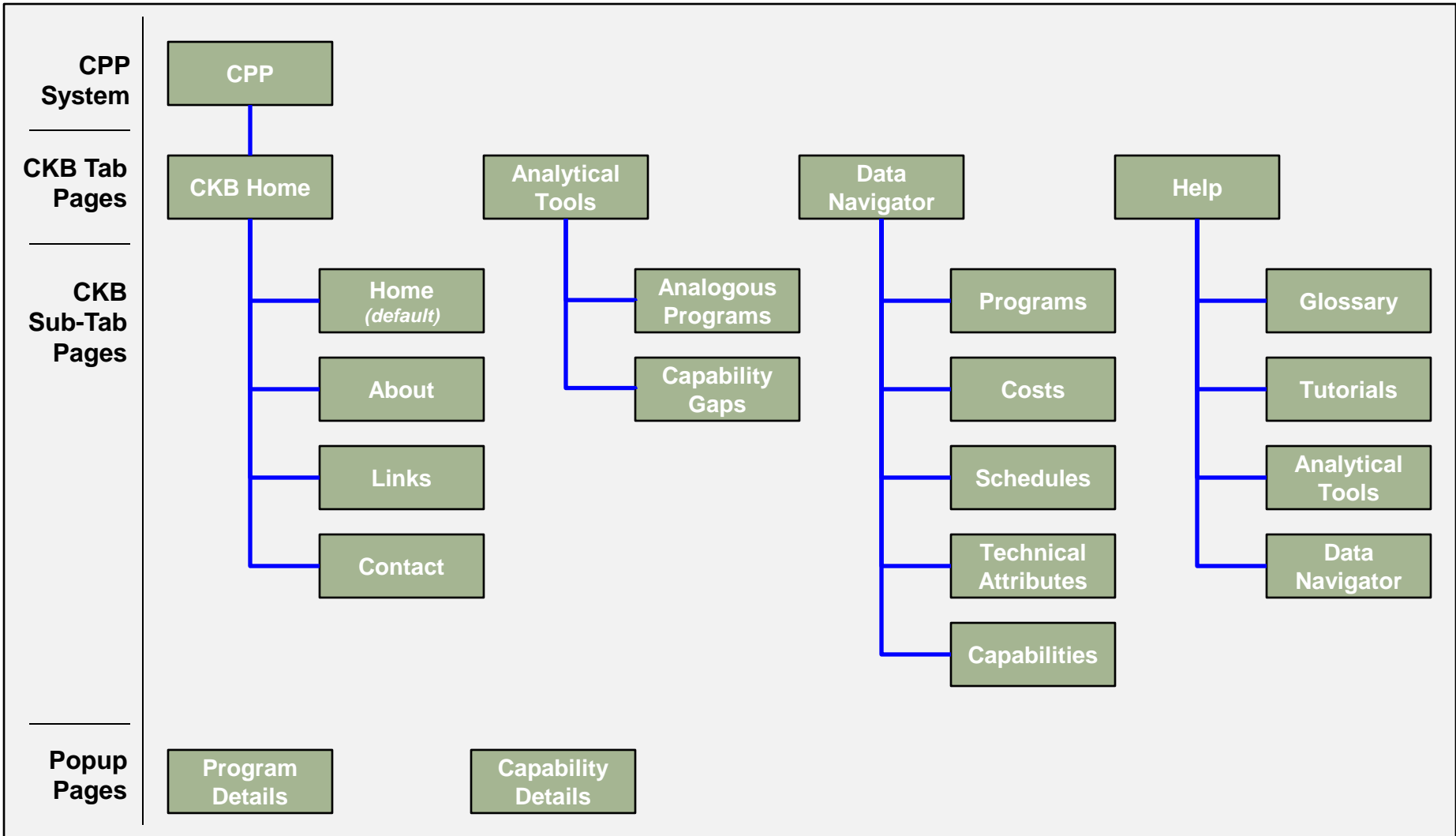
❖ Additional Studies:

- Examples: Analysis of cost growth and overall cost trends

Note: User scenarios are available to further introduce the user to the CKB and its potential uses. Please see the CKB Help – Tutorials page.

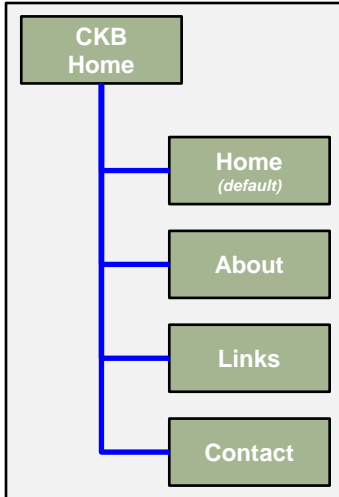


CKB Page Flow





CKB Home Page

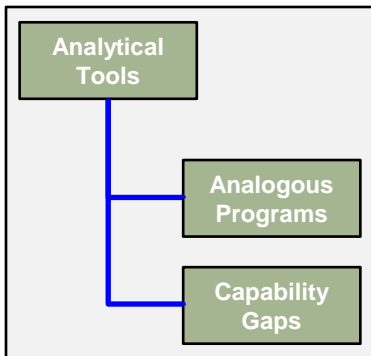


- ❖ The CKB Home Tab is the default starting location for all CKB users upon successful log-in
- ❖ There are currently four sub-tabs available within the Home Tab:

Sub-tab	Home	About	Links	Contact
Description	<ul style="list-style-type: none"> - The default starting page for all CKB users upon successful log-in - Provides a brief overview of the history and content of the CKB 	<ul style="list-style-type: none"> - Provides a detailed overview of the content and features of the CKB 	<ul style="list-style-type: none"> - Provides the user with links to 10 relevant Army and DoD web sites - These links provide further insight into key aspects of the CKB 	<ul style="list-style-type: none"> - Provides the user with three options through which to receive administrative and / or technical support: <ul style="list-style-type: none"> • Through the CKB Help Library • Through emailing the CKB Help Desk • Through mailing The Early Cost Team
Status	Currently Available	Currently Available	Currently Available	Currently Available



CKB Analytical Tools (1)



- ❖ The Analytical Tools Tab greatly aids the user when performing a capability-based analysis
- ❖ There are currently two tools (sub-tabs) available: Analogous Programs and Capability Gaps

Analytical Tool	Analogous Programs	Capability Gaps
Description	Measure the distance from a new capability set to existing already acquired capability sets; uses these distances to identify analogies	Easily identify capability gaps across portfolios; evaluate how a new capability set will mitigate those gaps
Status	Currently Available	Currently Available



CKB Analytical Tools (2)

Analogous Programs

Utilizes Jaccard Indexing. Measures the distance from a new capability set to existing already acquired capability sets; use these distances to identify analogies and estimate costs

Capability Gap Calculator

Easily identify capability gaps across portfolios; evaluate how a new capability set will mitigate those gaps

Potential Future Tools

Automated Data Export to Parametric Tools for Cost Estimating Relationship (CER) Development
Cost Risk Analysis Aids
Others



CKB Analytical Tools (3): Analogous Programs



Welcome, CHADD.SIBERT@HQDA.ARMY.MIL

Home Analytical Tools Data Navigator Help

Analogous Programs Capability Gaps

Selection Criteria

Process Reset

Step 1: Define Criteria

Program Name: [-All-]

Program Type: Surface

Program Sub-Type: [-All-]

Service: [-All-]

Acquisition Category: [-All-]

Acquisition Type: [-All-]

Step 2: Select Capabilities

Level-1 Only All Levels

C3I

Area Command And Control

Local Area

Net-Centric

Theater Battle Management

Wide Area

Control

Manned

Unmanned

Deploy

Air

Ground

Self

Water

Explode Penetrate

Large Effect

Local Effect

Mass Effect

Small Effect

Manage Data

Distribute

Process

Secure

Analogous Programs Summary Counts

Rows 10 Go

1 - 8 of 8

PNO	Program Name	Jaccard Threshold	Total Caps Selected	Total Caps Met	Level-1 Caps Selected	Level-1 Caps
353	Joint MRAP	68.42	13	13	6	6
515	EPV	56.52	13	13	6	6
746	FMTV	50.00	13	10	6	5
557	CRUSADER	41.67	13	10	6	6
299	STRYKER	40.74	13	11	6	6
575	ABRAMS UPGRADE	11.54	13	3	6	1
601	BRADLEY UPGRADE	11.54	13	3	6	1
367	HIMARS	10.53	13	2	6	2

1 - 8 of 8

Similar Capabilities (Level-1)

Graphical Display of Results

Unique Capabilities (Level-1)

Graphical Display of Results

- ❖ **Methodology:**
 - Utilizes the Jaccard indexing and weighting method
- ❖ **User Inputs:**
 - Programmatic Criteria
 - Capability Set
- ❖ **Output:**
 - Jaccard Threshold value
 - Stacked bar charts displaying similar and unique capabilities
- ❖ **Benefits:**
 - Identification of analogous programs for statistical analysis, etc



CKB Analytical Tools (4): Capability Gap Calculator



Welcome, CHADD.SIBERT@HQDA.ARMY.MIL Home Analytical Tools Data Navigator Help

Analogous Programs Capability Gaps

Selection Criteria

Process Reset

Step 1: Define Criteria

Program Name: [-All-]

Program Type: Aircraft

Program Sub-Type: Rotary-Wing

Service: [-All-]

Acquisition Category: [-All-]

Acquisition Type: [-All-]

Step 2: Select Capabilities

Level-1 Only All Levels

C3I
 Control
 Deploy
 Explode Penetrate
 Manage Data
 Maneuver Environment
 Protect
 Sense
 Shoot
 Support
 Sustain
 Train
 Transport

Capability Gap Summary Counts

1 - 13 of 13

Capability Level	Capability Name	Selected	Programs with Capability	% of Selected Programs	% of Total Prog
1	(Level-1) C3I	No	0	0	0
1	(Level-1) Control	Yes	13	100.00	6.74
1	(Level-1) Deploy	No	13	100.00	6.74
1	(Level-1) Explode Penetrate	No	0	0	0
1	(Level-1) Manage Data	No	1	7.69	0.52
1	(Level-1) Maneuver Environment	Yes	13	100.00	6.74
1	(Level-1) Protect	No	1	7.69	0.52
1	(Level-1) Sense	No	3	23.08	1.55
1	(Level-1) Shoot	No	5	38.46	2.59
1	(Level-1) Support	No	10	76.92	5.18
1	(Level-1) Sustain	No	2	15.38	1.04
1	(Level-1) Train	Yes	0	0	0
1	(Level-1) Transport	Yes	6	46.15	3.11

1 - 13 of 13

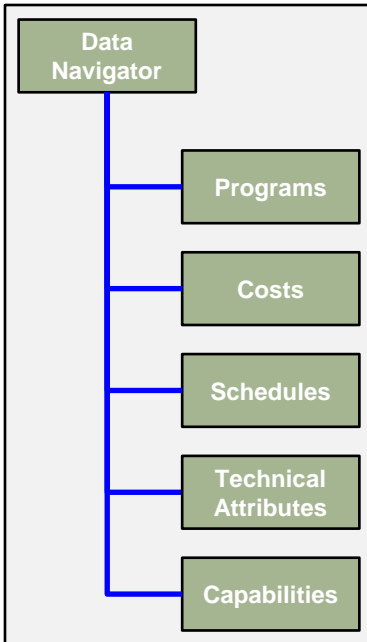
Capability Gap Summary Graph

Capability Gap Analysis

- ❖ **Methodology:**
 - Comparison of the capabilities of the current program inventory to those specified
- ❖ **User Inputs:**
 - Programmatic Criteria
 - Capability Set
- ❖ **Output:**
 - Columns indicate if capabilities are currently possessed and / or if they would be mitigate
- ❖ **Benefits:**
 - Easily identifies capability gaps across portfolios
 - Evaluates how a new capability set will mitigate those gaps



CKB Data Navigator (1)



- ❖ The Data Navigator Tab allows the user to access data for over 400 existing Department of Defense (DoD) military programs
- ❖ The source documents for all data are also made available
- ❖ The historical as well as the most current cost / budgetary data is available for each program
- ❖ There are currently five data types (sub-tabs) available:

Data Type	Programs	Costs	Schedules	Technical Attributes	Capabilities
Sample Data Fields	Program Name	RDT&E	Milestone B Dates	Crew Size	ODASA-CE Capability Architecture
	Acquisition Category (ACAT)	Procurement	Milestone C Dates	Horsepower	Joint Capability Areas (JCA)
	Lead Organization	MILCON	Initial Operational Capability Dates	Maximum Speed	Functional Capability Areas (FCA)
	MILHDBK881A System Type	O&M		Range	
	Service	O&S		Rate of Climb	
	Unit Costs (APUC & PAUC)		



CKB Data Navigator (2): System Capability Architecture (SCA)



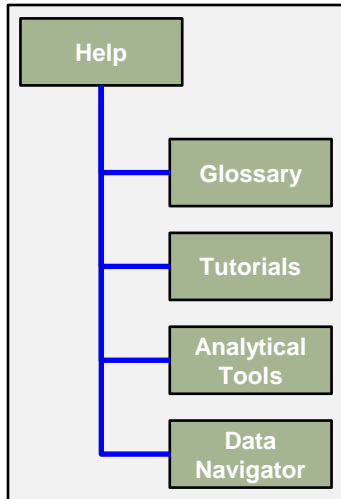
❖ A robust, balanced capability analysis architecture has been developed

- The System Capabilities Architecture (SCA) must be specific, distinguishable, well-defined, and analysis-ready to enable parametric and Boolean logic analysis
- Qty 74 capability descriptors available per program
- Capability architecture mapped to recognized DoD capability structures:
 - JCA = Joint Capability Areas
 - FCB = Functional Capabilities Boards

Capability	Definition	Includes	Excludes	Example(s)
1.0 Maneuver – Environment	An entity that maneuvers via the ground, water, or air as part of its critical mission. Maneuver is defined as a controlled change in the movement or direction of a moving vehicle or vessel, as in the flight path of an aircraft.	All ground vehicles, aircraft, ships, submarines, unmanned vehicles, missiles, torpedoes, and maneuverable spacecraft	Non-maneuverable spacecraft; ground stations; projectiles; MAIS programs	Vehicles; ships; submarines; aircraft
1.1 Ground	An entity that maneuvers on the surface of the earth as part of its critical mission.	Manned and unmanned ground vehicles; amphibious vehicles	Aircraft; ships; submarines; ground stations; projectiles; missiles; torpedoes; spacecraft; MAIS programs	Joint Light Tactical Vehicle (JLTV)
1.2 Maritime	An entity that maneuvers on the surface of the water as part of its critical mission.	Ships; amphibious vehicles	Ground vehicles; aircraft; submarines; ground stations; projectiles; missiles; torpedoes; spacecraft; MAIS programs	DDG 51
1.3 Submerged	An entity that maneuvers below the surface of the water as part of its critical mission.	Manned and unmanned submarines; torpedoes	Ground vehicles; aircraft; ships; amphibious vehicles; ground stations; projectiles; missiles; spacecraft; MAIS programs	SSN-774



CKB Help



❖ The CKB Help Tab is currently comprised of four sub-tabs:

Help	Glossary	Tutorials	Analytical Tools	Data Navigator
Description	Provides definitions for a lengthy list of terms referenced within the CKB	Provides step-by-step training guides for efficiently using the CKB	Provides specific instruction for how to effectively utilize the Analytical Tools	Provides definitions for terms that are referenced within the Data Navigator
Status	Currently Available	Currently Available	Currently Available	Currently Available

❖ Context-sensitive help is also available throughout the CKB



Accessing the CKB

❖ Detailed access request instructions available on ASA(FM&C) website

- <http://asafm.army.mil> – ASA(FM&C) website
- <http://asafm.army.mil/offices/CE/Ckb.aspx?OfficeCode=1400> – Direct link to CKB information page located on ASA(FM&C) website



CKB New User
Instructions

❖ The CKB is housed within ODASA-CE's Cost and Performance Portal (CPP) on AKO

- <https://cpp.army.mil>

❖ Fully functional Help Desk established and available to assist

- CKBHelpDesk@conus.army.mil
- The Early Cost Team
Office of the Deputy Assistant Secretary of the Army for Cost and Economics
1421 Jefferson Davis Hwy, Suite 9001
Arlington, VA 22202

❖ Detailed log-on instructions are provided to every user upon obtaining access



Questions or Comments?

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