KPP, CTP, COI, and MOE/MOS Exercise

Note: Some student groups will work on part 1 of the exercise, while other student groups work on part 2.
This lesson will cover the following topics:

1. Exercise – Part 1
2. Exercise – Part 2

DT&E activities will start when requirements are being developed to ensure that key technical requirements are measurable, testable, and achievable.

– DoDI 5000.02, Encl. 4 par 4a
Lesson Objectives

• Given a scenario, assess whether the capability requirements are well defined, can be measured and/or assessed during testing, and are relevant to the operational mission.

• Given a scenario, assess whether planned tests support the test objectives / system requirements; and whether data collected will support established effectiveness, suitability, and survivability metrics.

• Given a scenario, develop Critical Technical Parameters (CTPs), Measures of Effectiveness (MOEs), Measures of Suitability (MOSs), and data requirements to support assessment and evaluation of system performance requirements, Key Performance Parameters (KPPs), Key System Attributes (KSAs), and Critical Operational Issues (COIs).
Lesson Topics:

1) Exercise – Part 1
2) Exercise – Part 2

Note: Some student groups will work on part 1 of the exercise, while other student groups work on part 2.
KPP, CTP, COI & MOE/MOS
Exercise (Part 1)

- **Given:**
  - Acquisition documents (TES, Draft CDD) & key operational, technical, & programmatic reqts.

- **Objective:**
  - Develop Critical Technical Parameters (CTPs)

- **Overview (4 tasks)**
  Task 1. Identify and build a list of SPAW top-level functions.
  Task 2. Allocate capabilities (e.g. requirements from the CDD) for three of the SPAW functions ID’d.
  Task 3. From the acquisition documents, select (4) KPPs and develop (4) CTPs. (The CTPs must be related to the KPPs, and must be different than the KPPs.)
  Task 4. Present a briefing to the class.
Task 1. Identify Functions & Build a List of Top Level Functions

Figure 1. Sample List of Functions for UAV System.

<table>
<thead>
<tr>
<th>UAV System Functions (partial)</th>
<th>mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>communicate</td>
</tr>
<tr>
<td></td>
<td>sensing</td>
</tr>
<tr>
<td></td>
<td>survivability</td>
</tr>
<tr>
<td></td>
<td>maintenance</td>
</tr>
<tr>
<td></td>
<td>training</td>
</tr>
<tr>
<td></td>
<td>firepower</td>
</tr>
</tbody>
</table>

**FUNCTION:** What must the system do? (Normally expressed as a verb.)
## Task 2. Allocate Capabilities For Three Functions

### Example

Functions and Capabilities, UAV System

<table>
<thead>
<tr>
<th>Function</th>
<th>Capability</th>
</tr>
</thead>
</table>
| Mobility      | 1. Travel at not less than 100 miles per hour  
                 2. Conduct reconnaissance from an altitude of 5000 feet AGL  
                 3. Have a combat radius of 75 miles |
| Communicate   | 1. Transmit images of battlefield with resolution of 1 meter  
                 2. Receive flight control commands from the ground  
                 3. Travel to commanded geographical location |
| Firepower     | 1. Deliver 500-pound warhead with Circular Error Probable (CEP) of 10 meters or less  
                 2. Have weapon reliability of 0.95 or higher.  
                 3. Carry all air deliverable ammunition. |

**Capability:** How well; in what environment; under what conditions; interfacing with....
Task 3. Select KPPs

<table>
<thead>
<tr>
<th>Key Performance Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Combat Radius. The Unmanned Aerial Vehicle must be capable of operating with a Combat Radius of 75 nautical miles (T) 125 nautical miles (O).</td>
</tr>
</tbody>
</table>

This KPP is critical because there is a requirement to provide surveillance at a range that is beyond the engagement range of the major enemy threat.

* Second KPP.
  - Third KPP.
  - Fourth KPP.
**Task 3. Develop CTPs**

<table>
<thead>
<tr>
<th>Critical Technical Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Fuel Consumption. Fuel consumption will not exceed eight gallons per hour (T).</td>
</tr>
</tbody>
</table>

This CTP is critical because fuel consumption and fuel capacity directly impact the range, payload available, and operating cost of the system.

* Airspeed. The UAV will be capable of cruising at no less than 100 nautical miles per hour.

This CTP is critical to ensure that accurate surveillance at the maximum combat radius is available to ensure acceptable reaction time for friendly troops from the XXX enemy weapon system.

- Third CTP.
- Fourth CTP.

**Note:** each CTP must support one of the KPPs; and each CTP must be different than the KPPs.
DAG 9.5.3.4. Defining CTPs:

- T&E programs will have hundreds or thousands of technical parameters needing capture to support data analysis and evaluations; however, every technical parameter is not a CTP.
- CTPs measure critical system characteristics that, when achieved, enable the attainment of desired operational performance capabilities in the mission context.
- CTP do not simply restate the KPPs and/or KSAs. Each CTP must have a direct or significant indirect correlation to a KPP and/or KSA that measures a physical characteristic essential to evaluation of the KPP or KSA.
- Note: some services and programs do this differently
Mandatory KPPs

- Up to 6 Mandatory Key Performance Parameters (JCIDS Manual, Encl. B):
  1. Force Protection (FP-KPP)
  2. Survivability KPP
  3. Sustainment KPP / Availability KPP
  4. Net-Ready (NR-KPP)
  5. Training KPP
  6. Energy KPP

- For systems where the above KPP’s aren’t mandatory, they are selectively applied (sponsor determines applicability)

- One team will have exercise questions that pertain to the Mandatory KPPs, for the SPAW system
Exercise - Part 1 Timeline

Task 1. Identify and build a list of top level functions.

Task 2. Allocate capabilities for three functions.

Task 3. From the acquisition documents, select (4) KPPs and develop (4) CTPs; one CTP for each KPP selected.

  Note: each CTP must support one of the KPPS, and each CTP must be different than the KPPs.

Task 4. Present your results to the class in a briefing.

You will have 45 minutes to prepare your briefing.

Note: Some student groups will work on part 1 of the exercise, while other student groups work on part 2.
Lesson Topics:

1) Exercise – Part 1

2) Exercise – Part 2

Note: Some student groups will work on part 1 of the exercise, while other student groups work on part 2.
KPP, CTP, COI, and MOE/MOS Exercise (Part 2)

- **Given:**
  - COIs assigned by the instructor
- **Objective:**
  - Identify & develop MOE, MOS, MOP & Data Elements
- **Overview (5 tasks):**
  Task 1. Using the (2) COIs assigned by the instructor, identify (2) MOEs or (2) MOSs for each COI.
  Task 2. Develop (2) MOPs for each MOE or MOS.
  Task 3. Develop and Identify at least (2) Data Elements required to fully assess each MOP.
  Task 4. Highlight within the master Dendritic the KPP’s and CTP’s.
  Task 5. Present your results to the class in a briefing.
Task 1. Link COI’s with MOE / MOS

- Sample COI / MOE linkage for a Race Car (Effectiveness example shown)

**COI**

Can this car win the race?

**MOE**

- Speed
- Acceleration
- Maneuverability
- Fuel Consumption
Task 2. Develop MOP for MOE & MOS

- Sample MOE and MOP for selected COI
- Select One COI for Effectiveness, One for Suitability that best address Risks

<table>
<thead>
<tr>
<th>MOE</th>
<th>MOP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>Maximum (Hot Day)</td>
</tr>
<tr>
<td></td>
<td>Maximum (Cold Day)</td>
</tr>
<tr>
<td></td>
<td>Avg (Straight Away)</td>
</tr>
<tr>
<td></td>
<td>Average (Lap)</td>
</tr>
<tr>
<td></td>
<td>0 to 100MPH</td>
</tr>
<tr>
<td></td>
<td>100 to 200MPH</td>
</tr>
<tr>
<td></td>
<td>200 to max MPH</td>
</tr>
<tr>
<td>Acceleration</td>
<td>Steering (New Tires)</td>
</tr>
<tr>
<td>Maneuverability</td>
<td>Steering (Used Tires)</td>
</tr>
<tr>
<td>Fuel Consumption</td>
<td>Braking</td>
</tr>
<tr>
<td></td>
<td>Max Speed</td>
</tr>
<tr>
<td></td>
<td>Average</td>
</tr>
</tbody>
</table>

Can this car win the race?
Task 3. Identify MOP Data Elements

- Sample Race Car MOP Data Elements

- MOE (Maneuverability, Observability, Effectiveness)
  - Speed
  - Acceleration
  - Maneuverability
  - Fuel Consumption

- MOE (Maneuverability, Observability, Effectiveness)
  - Maximum (Hot Day)
  - Maximum (Cold Day)
  - Avg (Straight Away)
  - Average (Lap)
  - 0 to 100MPH
  - 100 to 200MPH
  - 200 to max MPH
  - Steering (New Tires)
  - Steering (Used Tires)
  - Braking
  - Max Speed
  - Average

- Data Elements
  - Break out force
  - Sensitivity
  - Steering wheel force per G in turn
  - Steering wheel mount position
Task 4. Highlight KPPs & CTPs

- MOE 1
- MOE 2
- MOE 3
- MOS 1
- MOS 2
- MOS 3

- COI 1
- COI 3

- MOP 3: DATA 3, 9, 27, etc...
- MOP 4: DATA 4, 6...
- MOP 9: DATA 8, 12...
- MOP 10: DATA 3, 6...

KPP
CTP
Examples – MOE, MOS, MOP, and Data Elements

• MOE – high level  
  Mobility

• MOP – lower level  
  Speed on improved roads

• Data elements – lowest level  
  Time, Distance Traveled, Road Surface, Weather, etc.

• MOS – high level  
  Reliability

• MOP – lower level  
  MTBF

• Data elements – lowest level  
  Total System Time (the “on” time), Total # Failures, Types of Failures, Environmental Conditions, etc.
Exercise - Part 2 Timeline

Task 1. Using the (2) COIs assigned by the instructor, identify (2) MOEs or (2) MOSs for each COI.

Task 2. Develop (2) MOPs for each MOE or MOS.

Task 3. Develop and Identify at least (2) Data Elements required to fully assess each MOP.

Task 4. Highlight within the master Dendritic the KPP’s and CTP’s.

Task 5. Present your results to the class in a briefing.

You will have 45 minutes to prepare your briefing.

Note: Some student groups will work on part 1 of the exercise, while other student groups work on part 2.
Critical Operational Issues

1. Can the SPAW deliver accurate fire on the battlefield? (E)
2. Can the SPAW be rapidly inserted into worldwide theatres of operation? (S)
3. Is the SPAW survivable on the battlefield? (E)
4. Is the SPAW availability sufficient to meet wartime and peacetime needs? (S)
5. Is the SPAW mobility adequate to support wartime and peacetime operations? (E)
6. Does the SPAW logistics footprint adequately support wartime and peacetime operations? (S)
Summary

- Given a scenario, assess whether the capability requirements are well defined, can be measured and/or assessed during testing, and are relevant to the operational mission. (ELO #5.1)
- Given a scenario, assess whether planned tests support the test objectives / system requirements; and whether data collected will support established effectiveness, suitability, and survivability metrics. (ELO #5.2)
- Given a scenario, develop Critical Technical Parameters (CTPs), Measures of Effectiveness (MOEs), Measures of Suitability (MOSs), and data requirements to support assessment and evaluation of system performance requirements, Key Performance Parameters (KPPs), Key System Attributes (KSAs), and Critical Operational Issues (COIs). (ELO #5.11)
Template - Students can use this for Part 2 of the Exercise, if they want