How Do I Get What I Need?

Work Zone ITS
and 23 CFR 940
What Do Motorists Want?

– “Road Construction! I really don’t want to detour or find another route”
  Translation: They are not going to make it easy for us as we plan our construction and lay out our work zone

– “Looks like they expect me to slow down and shift lanes!”
  Translation: We expect them to follow our instructions and drive more alertly through the work zone
Variability is Normal - And the Problem

- Morning/Afternoon Rush Hour
- Get out of town – it’s Friday
- Ball Games and Concerts
- Snow, Sleet, Heavy Rain
- Nighttime
- Young Drivers – Old Drivers
- Heavy Traffic
Work Zone ITS Technology

Traditional

Construction Project;
Data Collection
Traffic Control Plans
Install & Adjust
Maintain & Evaluate

Dynamic

1 Monitor Traffic
2 Evaluate Performance
3 Update Message
Better
- Benefits to Road Users & Agencies
- Ongoing performance measurement

Smarter
- Solves problems that are difficult to address with standard work zones
- Addresses different levels of demand

Faster
- Moves traffic through a work zone dynamically
Name Your System or Vendor Here:

___________________________________________________________________

NCHRP SYNTHESIS 20-05/Topic 45-06(new)  Active and Passive Methods for Slowing Traffic in Work Zone Technology and Procedure
Getting It Right is Important

New focus on technology means

• New opportunities for success
• New consequences of failures
• Greater interest from industry
• More visibility and scrutiny

• Federal regulations governing ITS projects
• Federal regulations governing procurements
What is Intelligent Transportation Systems?

• According to 23 CFR 940, “ITS means electronics, communications, or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system.”

• Smart Work Zone deployments meet this definition . . . .
What is ITS?
• All ITS projects must be developed using a Systems Engineering (SE) analysis
• The analysis shall be on a scale commensurate with the project scope
• SE analysis shall address (7) requirements
• The purpose is to ensure that agencies get what they (and their stakeholders) need
Seven Requirements of SE Analysis

1. Identify portions of the regional ITS architecture being implemented
2. Identification of participating agencies roles and responsibilities
3. Requirements definitions
4. Analysis of technology options to meet requirements
5. Procurement options
6. Identification of applicable ITS standards and testing procedures
7. Procedures and resources necessary for operations and management of the system
How Do We Deploy SWZ?

- “Consumer Reports”
  - Evaluate Available Technology
  - Consult with vendors / distributors
  - Deploy small scale system
  - Evaluate
  - Abandon or Expand

- Systems Engineering
  - Objectives
  - Needs / Constraints
  - Requirements
  - Design
  - Implement
  - Verification
  - Validation
  - Abandon or Expand

Focus on the process, not the technology!
Concept of Operations
- What are my current situation, needs, goals, and objectives?
- What can I do to optimize my current system without smart work zones?
- What scenarios will fit my current and future work zone situations?
- Envisioned concept for smart work zones.

Requirements
- What will I need to prepare for smart work zones?
- Which type of smart work zone is best for me?

Design
- Evaluate existing smart work zone systems.

Verification Plan
- How can I make sure the system will work as stated in the Requirements?

Validation Plan
- How can I determine that the system fulfills my needs?

Implement System
Basic Systems Engineering Deliverables

- Concept of Operations
- Requirements
- High Level Design
- Verification Plan
- Validation Plan
Systems Engineering V Diagram

Needs

Requirements

Design & Implementation

Testing
Work Zone ITS – What are the risks?

- Technology is new to most and still evolving.
- Most systems have very limited track record.
- Increased complexity, very dependent upon other stuff (communications, detection, staff).
- Often pitched as “one size fits all” silver bullet.
- What is the failure rate?

A Work Zone ITS system may not be the answer to your problem.
The Role of Systems Engineering

1. Understand the problem
2. Minimize the risk.

Where to start:

http://www.citeconsortium.org/Model/index.htm
Purpose of SE Model Documents

- Evaluate need for Work Zone ITS
- Help agencies identify verifiable, needs-driven requirements for evaluating design and implementation choices
- Model documents greatly reduce systems engineering effort by providing wording and documentation...
- ...but agencies still must identify their needs
Procurement Regulations

- Proprietary Materials (23 CFR 635.411)
  - Certification of no available competitive product
    - Uniquely fulfills the requirements imposed on the product
    - Achieves synchronization with existing systems
  - Public Interest Finding for proprietary purchase despite alternative available competitive products
    - Limited experimental application
  - Systems Engineering provides justification
What is Commercial-Off-the-Shelf?

FAR definition of COTS: a non-developmental item of supply that is both commercial and sold in substantial quantities in the commercial marketplace, and that can be procured or utilized under government contract in the same precise form as available to the general public.
Outcome of the Process

- Informed Technology Selection
- Agency Needs and Objectives
- Agencies Policies
- Operations and Maintenance Capability
- Resources
- Expansion
- Equipment Life Cycle
- Procurement Options
- Meet Federal Rule 940 and Rule 635 requirements for Federal Funding
Tailor the SE Process Based on Risk

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<tr>
<th>Risk Factor</th>
<th>Low Risk vs High Risk</th>
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<tr>
<td>Project Type</td>
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<td>Project Complexity</td>
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Systems Engineering Process
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