

CONCLUSIONS

This chapter presents a summary of findings on system engineering processes, the use of systems engineering by practitioners, the availability of existing methodologies, and the need for additional guidance. Recommendations are offered to resolve current deficiencies and to prepare a user-friendly document for practitioners.

Systems Engineering Processes—Workers in the general field of systems engineering generally consider systems engineering to start with the problem definition process and extend to design, implementation, operations, and support functions. Although some of the general systems engineering methodologies are useful for traffic signal systems, the methodologies and processes that are focused for application to other fields are generally not transferable to traffic signal systems engineering.

Key processes have been identified in the following traffic signal systems engineering areas:

- Goals and problem definition,
- Identification of constraints,
- Planning structure for identification of requirements,
- Traffic signal systems design engineering
 - Need for traffic signals,
 - Signal timing,
 - Requirements for signal coordination,
 - Selection of type of traffic signal systems control,
 - Communication systems,
 - Intersection field equipment,
 - Local intersection control strategies,
 - Preemption,
 - Transit priority,
 - Alternatives evaluation,
 - System procurement,
 - Operations and logistics,
 - Project evaluation.

Use of Systems Engineering Processes by Practitioners—Systems engineering is often viewed by practitioners as including not only the technical and project-oriented issues discussed in systems engineering literature, but also the administrative practices and policies characteristic of their agency. The extent to which systems engineering processes are used varies widely depending on the specific engineering topic involved. As determined from survey responses, agencies are generally satisfied with the processes and practices that they employ.

Availability of Existing Methodologies for Traffic Signal Systems Engineering—Methodologies currently exist in the literature for many areas that comprise traffic signal systems engineering. This synthesis has identified and summarized these existing methodologies. The following areas require additional methodologies, the updating of existing methodologies, or the upgrading of existing documentation:

- Structured inventory of traffic signal systems engineering requirements.
- Development of methodology for selection of the capability level of the traffic control system.
- Improved documentation for developing a database for conventional traffic response signal systems.
- Improved documentation for the placement of system detectors.
- Updated documentation for the selection of type of communications systems.
- Improved documentation for operational use of fully actuated and semi-actuated control strategies.
- Guidance for engineering transit signal priority functions.
- Improved documentation for development and maintenance of signal systems.

Need for Additional Guidance—As identified by survey respondents the areas that most often require additional guidance include

- Central traffic control systems, including equipment at the traffic management center and field master controllers that may be required by these systems.
- Communications to the field.
- Traffic signal systems deployment and maintenance.

The following is suggested

- That a project be implemented to resolve the current shortcomings in existing traffic signal systems processes and their documentation as outlined at the conclusion of chapter five.
- That a high-visibility document be prepared to identify the most appropriate existing methodologies and incorporate the resolution of the shortcomings cited in chapter five. That the document provide the methodologies to practitioners in a user-friendly manner or direct them to appropriate references and emphasize

- Selection of central traffic control systems and communications to the field.
- Central traffic control systems, including required equipment at the traffic management center and field master controllers.
- Processes for the development of traffic-respon-

- sive databases for systems using First Generation Urban Traffic Control System and closed-loop control strategies.
- Processes for deployment and maintenance of these systems.

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