

McKinney Associates has provided **modeling, simulation & analysis (MS&A)** solutions for complex systems analyses since 1993. **Leon McKinney**, the founder and president of **McKinney Associates**, has more than 30 years of experience in analysis of extremely complex problems in aircraft, missiles, space launch vehicles, space platforms, reentry systems, and tactical/strategic systems, dating back to working at **McDonnell Douglas Space & Defense Systems** from 1982 to 1993, prior to founding **McKinney Associates**. **McKinney Associates'** broad range of experience is unique within the aerospace and defense industry and **McKinney Associates** has also retained an equally unique data archive of systems analyses.

McKinney Associates MS&A solutions will improve your project through optimization: minimizing project costs (land and physical plant acquisition costs, associated transactions costs, construction costs, operations & support costs, etc.) and risks, balanced against maximizing specific project performance goals. For example, for bridges those goals include annual traffic volume and truck loadings, ability to withstand ice, debris, wind, and seismic loadings, etc. Simply put, if your project can be described by a collection of mathematical values and equations, then McKinney Associates can develop a MS&A solution for your program!

What are McKinney Associates MS&A solutions? They are **mathematical models** of systems – perhaps a single system, say, a particular manufacturing process - or, more likely, more-complex **“system-of-systems” (SoS)**. A SoS model of a storm and flood control system could include:

- Rivers, streams, creeks – Hydraulics models w/ heights & volume flow-rates, nominal & for storm events (10 to 500-yr)
- Storms – Hydrology models
- Levee Networks – Length, height, and depth
- Detention basins – Number, size (volume capacity), altitude above mean sea-level
- Channels – Number, length, size (volume capacity), altitude above mean sea-level at each end
- Pumping stations – Number, capability (Cu. Ft. per minute), power requirements
- Flood gates – Number, size (volume capacity), altitude above mean sea-level
- Hydraulics models to characterize flow thru the system
- Acquisition costs of all acreage for all SoS components
- Construction costs for all SoS components
- Operations & support (O&S) costs for all SoS components

Each major component of a SoS model may contain hundreds of independent variables which can be considered as inputs, as well as hundreds of dependent variables that are the outputs for that component of the SoS model. Some outputs from one component of a SoS model may be inputs to one or more other components.

McKinney Associates conducts thorough reviews of projects with project staff, using industry-standard best practices for process models, to identify and understand the hundreds or perhaps even thousands of independent/input and dependent/output variables and the mathematical relationships between them that define the project. It is interesting to note that clients may be unaware of how complex their project is until after the review!

McKinney Associates then develops high-fidelity mathematical models that capture all of the SoS variables and their relationships. Alternatively, clients may prefer to use existing, “in-house” SoS models, which of course would streamline developing the MS&A solution.

Either way, with a SoS model in hand, **McKinney Associates** applies a variety of analysis methods – nonlinear programming, genetic algorithms, quadratic response surface models, neural-net models, etc. – to produce optimized “design point” models of projects as well as the capability to explore the “design space” of projects (modifying the SoS model’s variables and relationships for “what-if” scenarios). The power of **McKinney Associates MS&A solutions** is that clients can use them independent of **McKinney Associates** to determine the specifications of any number of new optimized design-points and conduct any number of trade studies.

In addition to our historical aerospace and defense experience **McKinney Associates** has experience in environmental & regulatory affairs and public works engineering. **McKinney Associates MS&A** analyses of storm water and flood control systems have resulted in savings of millions of dollars for local governments. One such analysis in 1999 – to determine the minimum size of a set of water detention basins that satisfied the key constraint of allowing no flooding - saved over \$35 million, 90% of the original estimated cost. A 2007 analysis for another client to optimize the addition of a new culvert/gate thru a Missouri River levee produced over \$250,000 in project savings, 10% of the total project cost. In both cases, **McKinney Associates** was retained to optimize only new additions to the systems, as most of the pieces of the systems had already been designed and put in place, but analysis showed that much larger project cost savings could have been obtained had the systems been optimally designed from the start.