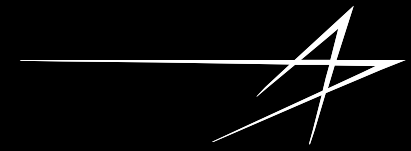# *Staying Within the Box*

- Manage your critical path

  - Managing the critical path is essential to controlling cost. Tip the odds in your favor by actively driving down risk early, rather than hoping risks heals themselves.

  - Schedule reserve is a resource to absorb difficult problem resolution. Don't allow your schedule reserve to be eroded by lack of preparation or minor problems.

    - Establish expectations early that the PM will allocate adequate resources to fix problems. This does not mean consumption of schedule margin for avoidable problems.

  - Recognize that capability above requirements is a form of management reserve. Avoid requirements creep that erodes excess capability.

    - Margin in your capability allows issues to close quickly so the team can concentrate on the next set of tasks

*Problems rarely get better with age, kill your problems quickly*

Staying Within the Box
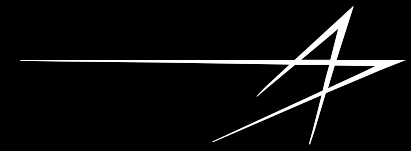
- Risk Management

  – Systems engineering and management across the whole program must be committed to identification and mitigation of risks. The consequences of ineffective risk management can drive cost and schedule in phase D when recovery is very difficult.

  – Make your entire leadership team (including subsystem leads) contributors to identifying and managing risk

  – Make your customer a partner in assessing risks (at least monthly) and build consensus with your customer when to expend resources for mitigation

Recognize the path to launch is fundamentally an exercise in risk management

Staying Within the Box
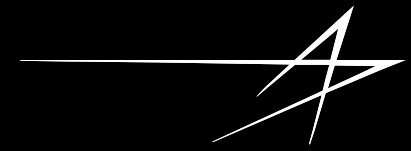
- Verification and Validation Planning

  – Early systems engineering focus on V&V is critical to establishing project-wide expectations, a fully coordinated verification matrix, and a timely starting of product verification, with orderly completion during final vehicle processing.

  – It's important for your systems engineering team to start the launch certification process before PDR.

    - Identify verification events, with requirement verifications allocated

    - Develop and load schedule allocations for a long list of off-nominal "stress test" cases (prioritize and prune later)

    - Identify a suite of mission scenario cases and assign owners

  – Apply vision to how you plan to integrate your launch certification process and manage that process throughout the life-cycle.

> *Avoid the trap of deferring V&V until it crosses critical path*

Staying Within the Box
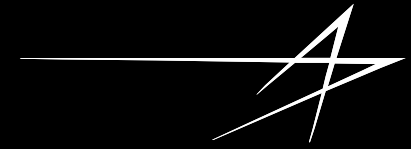
- Requirements Creep

  – Program leadership sets the tone for requirements creep and cost control. Clearly establish expectations early by stomping on product improvement changes that are masquerading as risk reduction changes.

  – Avoid falling into the trap of allowing well-meaning changes that improve the product.

  – Clear understanding of requirement decomposition and subsystem margins aids program leadership in assessing bonafide risk reductions that lessen technical, schedule or mission risk versus make-better changes that will consume budget and schedule.

(use for key points)

Staying Within the Box
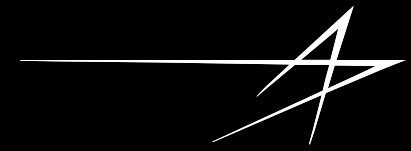
- Robust Power Margins

  - Ensure robust power margins early in development life cycle. Take steps early (pre PDR) to assure power margins are comfortably robust. Many things conspire to erode power margins that become expensive to optimize across multiple subsystems.

    - It's probably money well spent to "buy" more power margin during phase B

  - Large power, as well as other technical margins are very important to prevent expensive mitigations late in the program when late emerging issues, fault tolerance and fault recovery timelines need to be resolved.

  - Implementation details (especially software & fault management) will erode margins as your team figures out how to fly the mission.

    - Understanding of off-nominal system responses often emerge late relative to freezing your hardware configuration. Power margin allows flexibility in mission time-line designs, which is often the easiest solution path

Buying watts early in your life-cycle is cheap insurance

Staying Within the Box
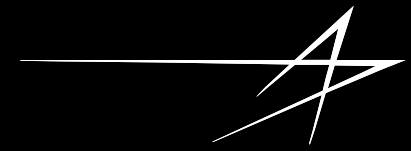
- Work-to-go Audits

  – Completing engineering tasks during I&T often results in frantic closure of launch certification requirements, with occasional unexpected waivers late in I&T or the launch campaign.

  – Work-to-go audits that start prior to system environment testing focus the team on remaining work, without generating typical review action items.

    - WTG #1 prior to system environments, WTG #2 at conclusion of system environments

  – Having each subsystem list all remaining work in their areas and the perceived amount of labor for complete each item allows contractor program management and the customer to gauge the risk associated with completing I&T and launch certification in an orderly manner.

Adjustments in labor roll-off plan can be made, facilitating a smooth and orderly launch certification campaign