

NORTHROP GRUMMAN

DEFINING THE FUTURE

NDIA

**THE 8th ANNUAL SCIENCE &
ENGINEERING TECHNOLOGY
CONFERENCE / DoD TECH EXPO**

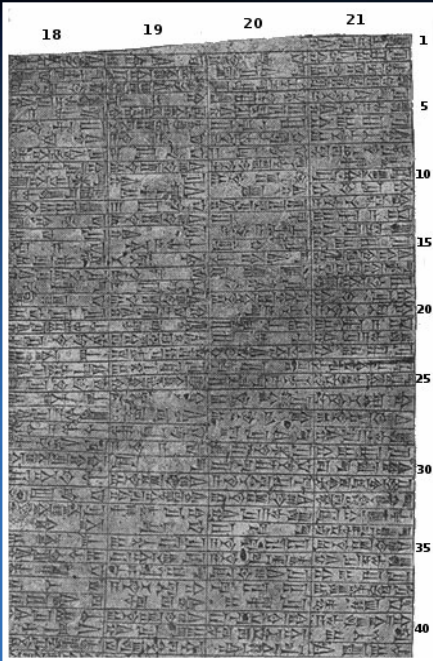
Air Force Space Systems for Transformation

Date April 14-17, 2007

Stuart Linsky

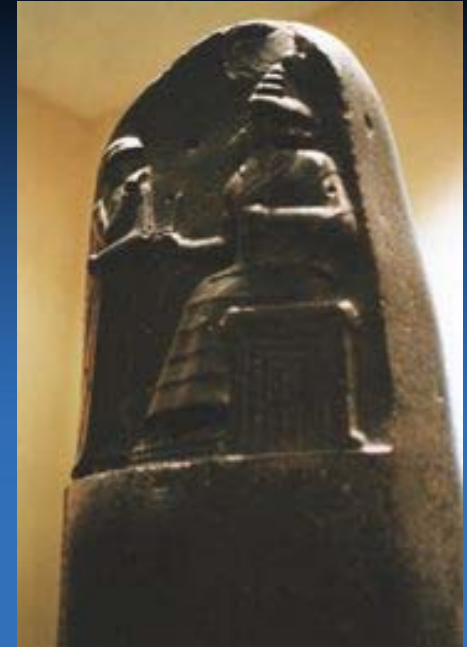
Vice President, Satellites Communications
Northrop Grumman Space Technology

Challenges in balancing performance and risk



Hammurabi's Code

- 282 laws
- 1760 BC



- 229.** *If a builder build a house for some one, and does not construct it properly, and the house which he built fall in and kill its owner, then that builder shall be put to death.*
- 230.** *If it kill the son of the owner the son of that builder shall be put to death.*

Causes of Engineering Disasters

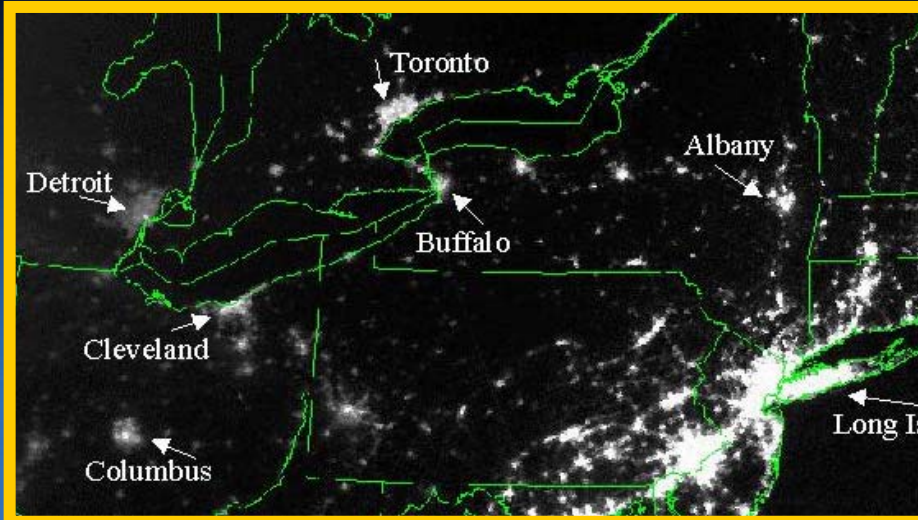
- **Insufficient knowledge** 36%
- **Underestimation of influence** 16%
- **Ignorance, carelessness, negligence** 14%
- **Forgetfulness, error** 13%
- **Relying upon others without sufficient control** 9%
- **Objectively unknown situation** 7%
- **Imprecise definition of responsibilities** 1%
- **Choice of bad quality** 1%
- **Other** 3%

* Study by Swiss federal Institute of technology in Zurich

- **Funding instability** ~ 36 %
- **Initial program parameters not reasonable** 24 %
- **Technology below best practice maturity standards** 18 %
- **Requirements instability** 13 %
- **Staffing problems** 8 %
- **Excessive oversight** 7 %
- **Inexperienced leadership** 7 %

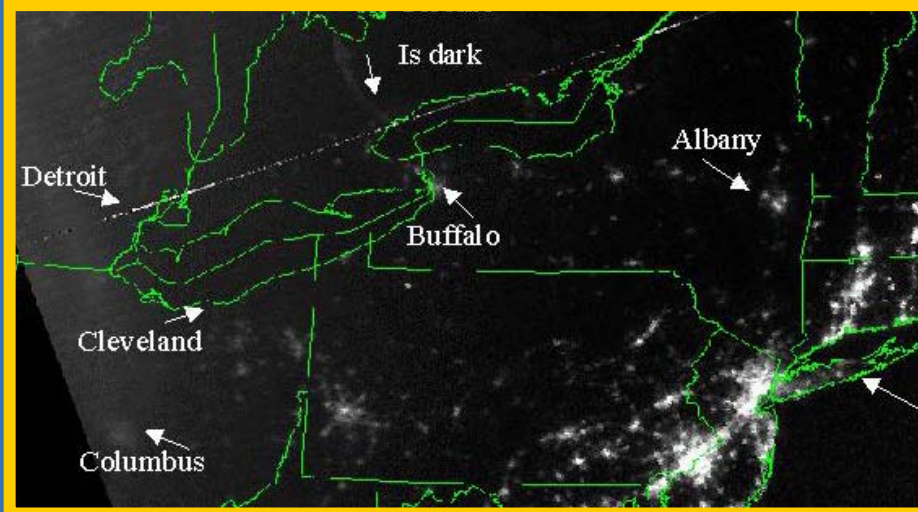
*GAO question DOD's major weapon program managers

Certain Failures are Unacceptable



Blackout by the Numbers

- 9sec - Time it took for the grid to collapse
- 6M - Area affected in acres
- 50M - Number of people affected
- 100 - Power plants shut down
- 22 - Nuclear power plants shut down
- 31C - Expected daytime high in Ontario



New York

- 60 - "Serious" Fires
- 800 - Elevator rescues
- 80,000 - Calls to 911
- 10,000 - Police on duty

Toronto

- 1,484 - Fire calls
- 110 - Elevator rescues
- 114 - Looting cases
- 38 - Blackout related arrests

Where Can You Not Afford to Fail?

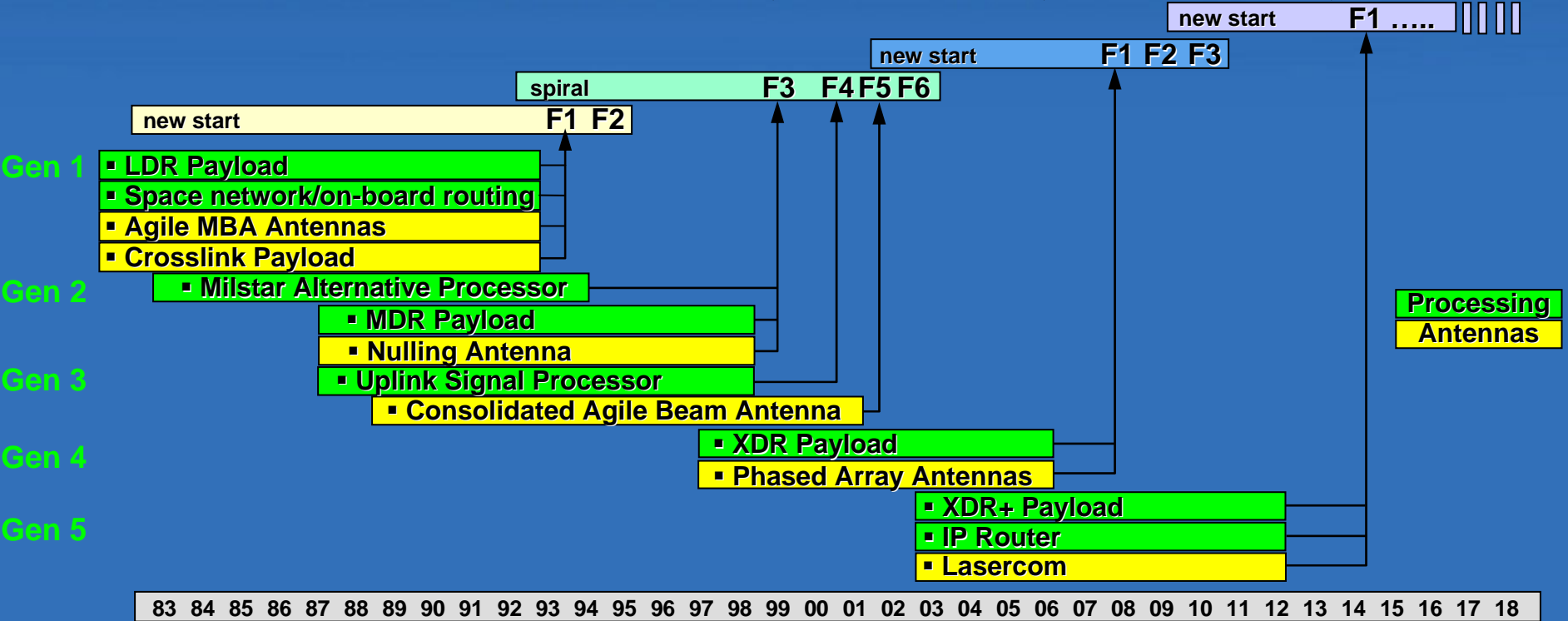
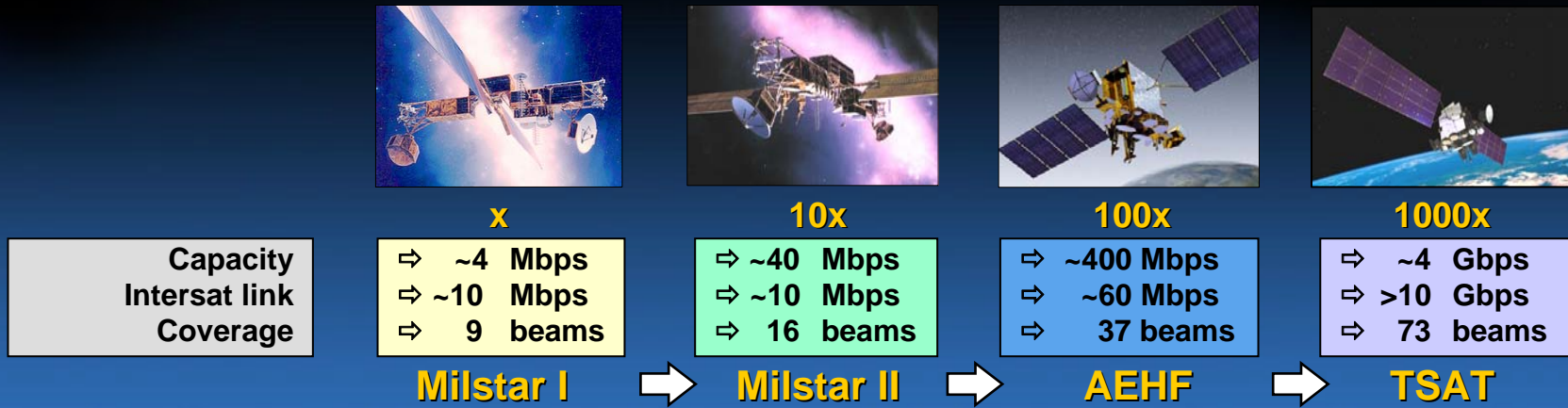
Managing risk in a portfolio of assets

		Severity of Consequences				
		1	2	3	4	5
Probability of Occurrence	1	Yellow	Red	Red	Red	Red
	2	Green ● <i>Rapid New Capability</i>	Yellow	Yellow	Red	Red
	3	Green	Yellow	Yellow	Red	Red
	4	Green	Green	Green	Yellow	Red
	5	Green	Green	Green	Green	Yellow ● <i>Protected Comm Satellites</i>

Challenges in balancing performance and risk

Development Risks	Balancing Approach
<ul style="list-style-type: none">● New missions<ul style="list-style-type: none">– No heritage infrastructure– No heritage acquisition community– No heritage domain knowledge	<ul style="list-style-type: none">● Maximum leverage of Government and industry 25 year heritage:<ul style="list-style-type: none">– Experience and domain knowledge– System engineering– Lessons learned and development processes– Requirements and configuration management– Facilities, hardware and software
<ul style="list-style-type: none">● New requirements<ul style="list-style-type: none">– No heritage development– No heritage system engineering– No heritage domain knowledge	
<ul style="list-style-type: none">● Large development steps<ul style="list-style-type: none">– Over long life span– Over significant quantity build	<ul style="list-style-type: none">● Block upgrades<ul style="list-style-type: none">– Technology insertion on-ramps– Milstar / AEHF proven insertion heritage– On-orbit upgrades
<ul style="list-style-type: none">● New technology and integration	<ul style="list-style-type: none">● RR&SD<ul style="list-style-type: none">– Technology maturity– Integration maturity

25 years of Protected Milsatcom Network Transformation

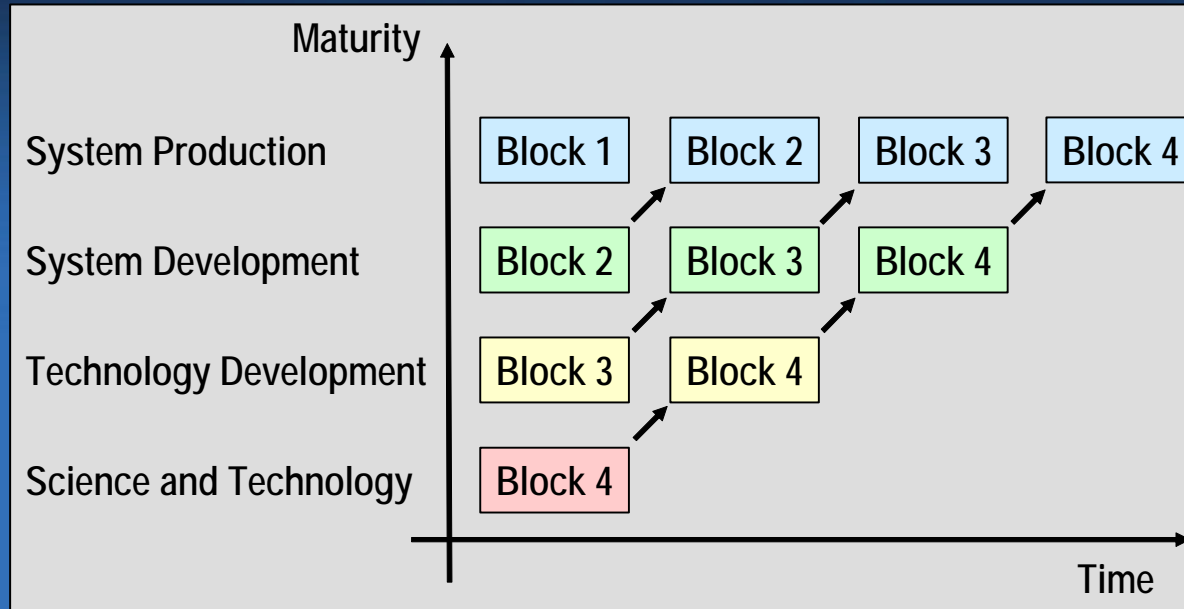


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Picking the Right Program

Block Development Enables Low Risk Transformation

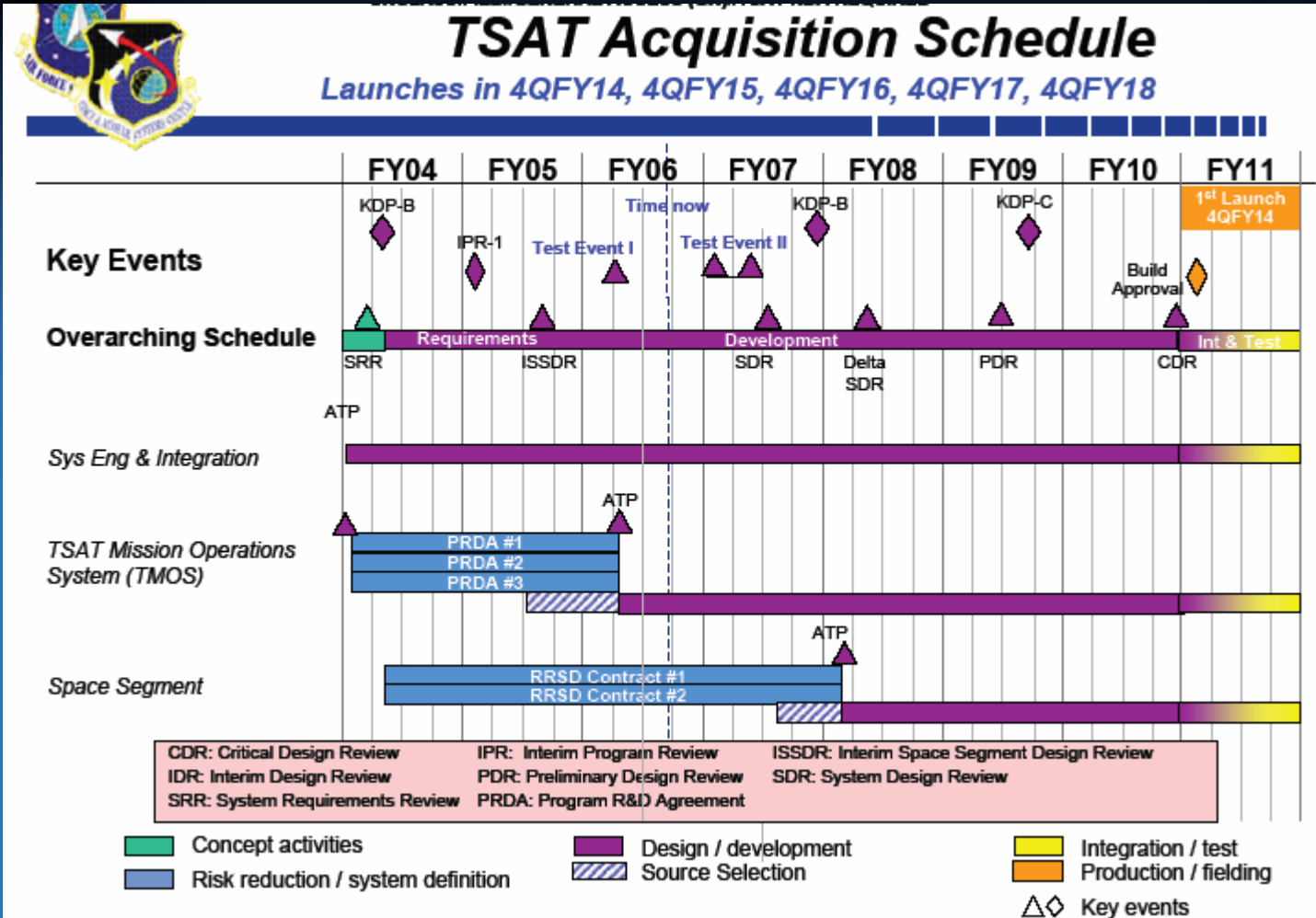
Low Risk System Production,
Take Risk in Technology Development



Block Options with Increasing Capability

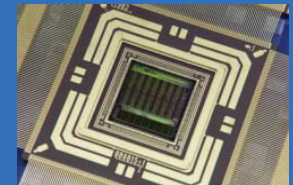
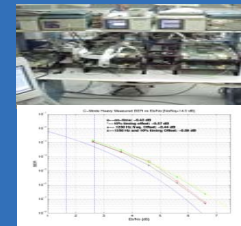
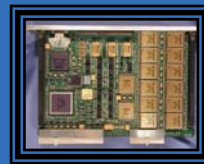
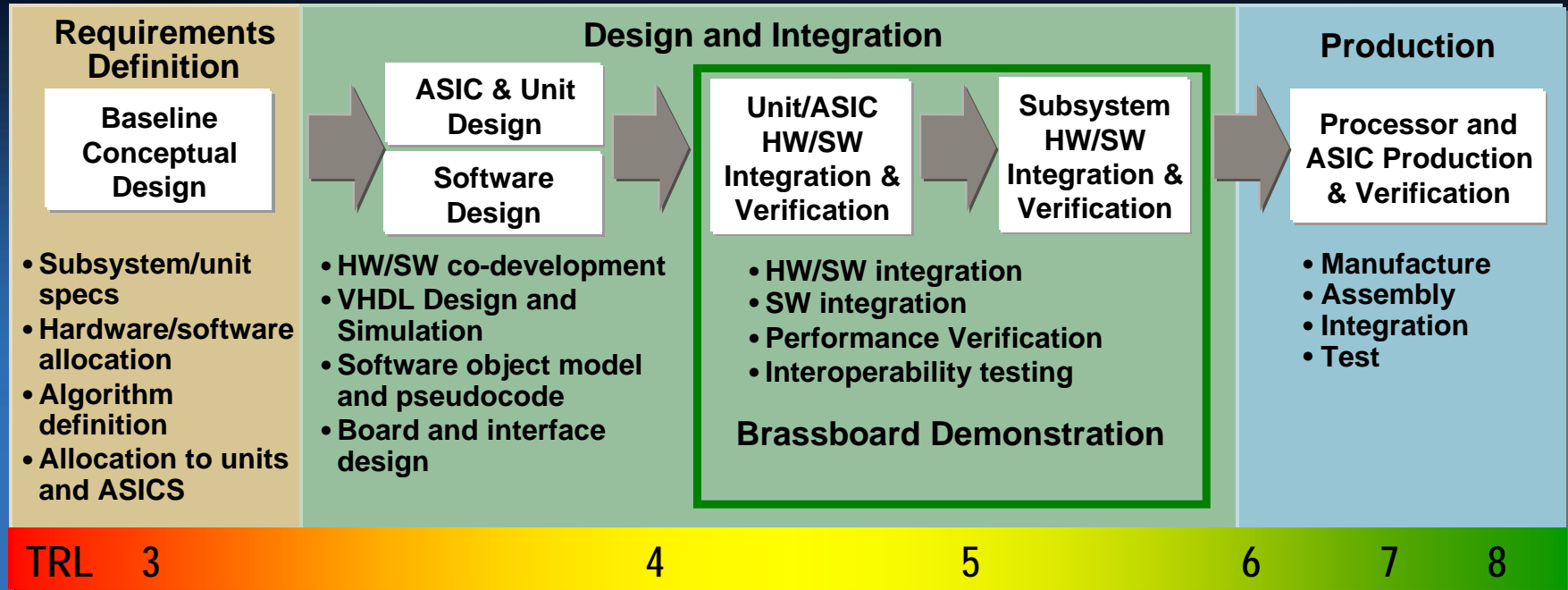
Picking the right Acquisition Approach

Risk Reduction & System Definition (RR&SD)



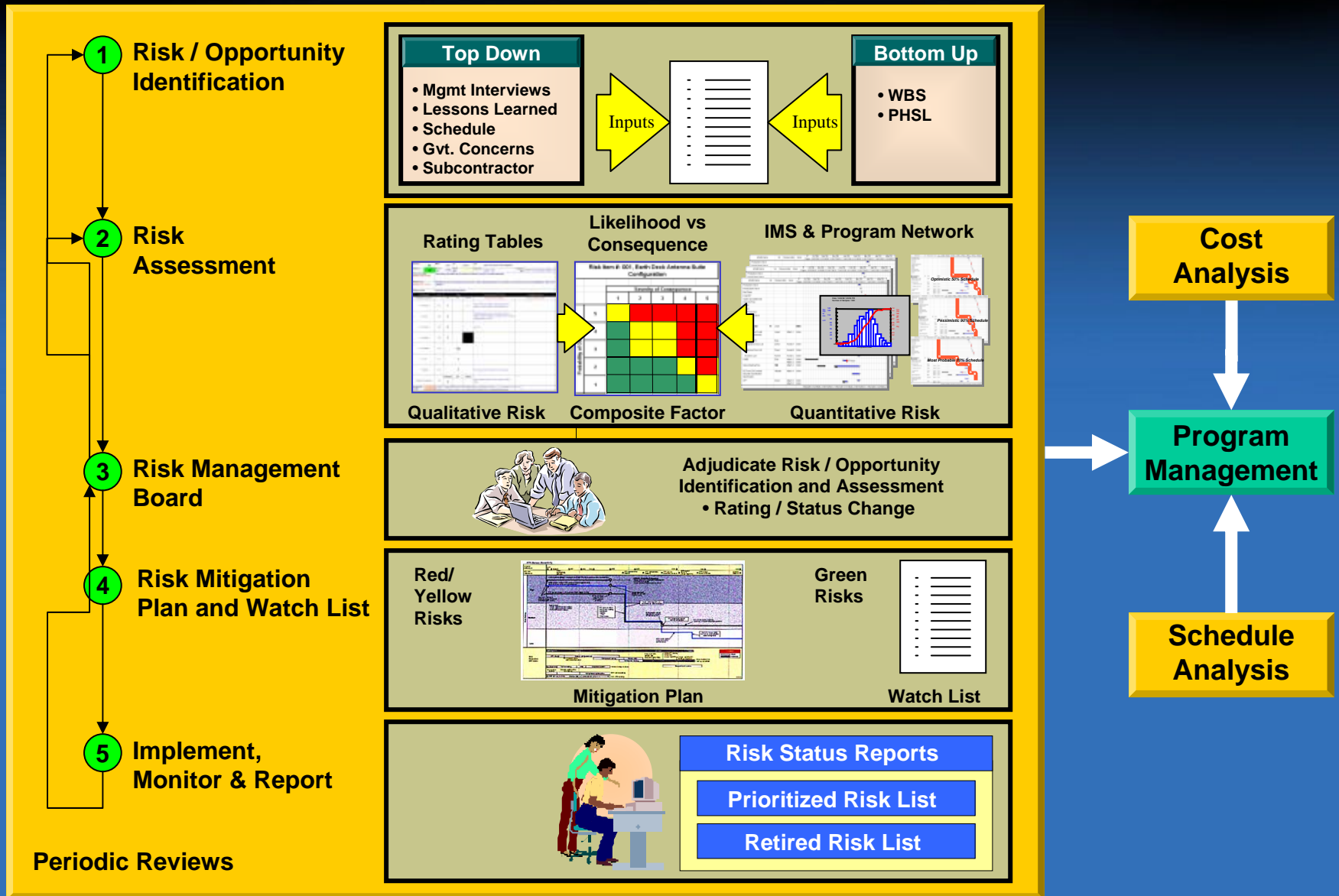
All TSAT technologies achieving TRL-6 or higher

Applying the Lessons Learned and Proven Processes



As complexity advances risk management needs to advanced

Applying Proven Risk Management within the Program



Understanding the Risk leverage as a function of time

Risk management through the life cycle

Risk Reduction Program Leverage

