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NASA Safety And Mission Assurance

Safety
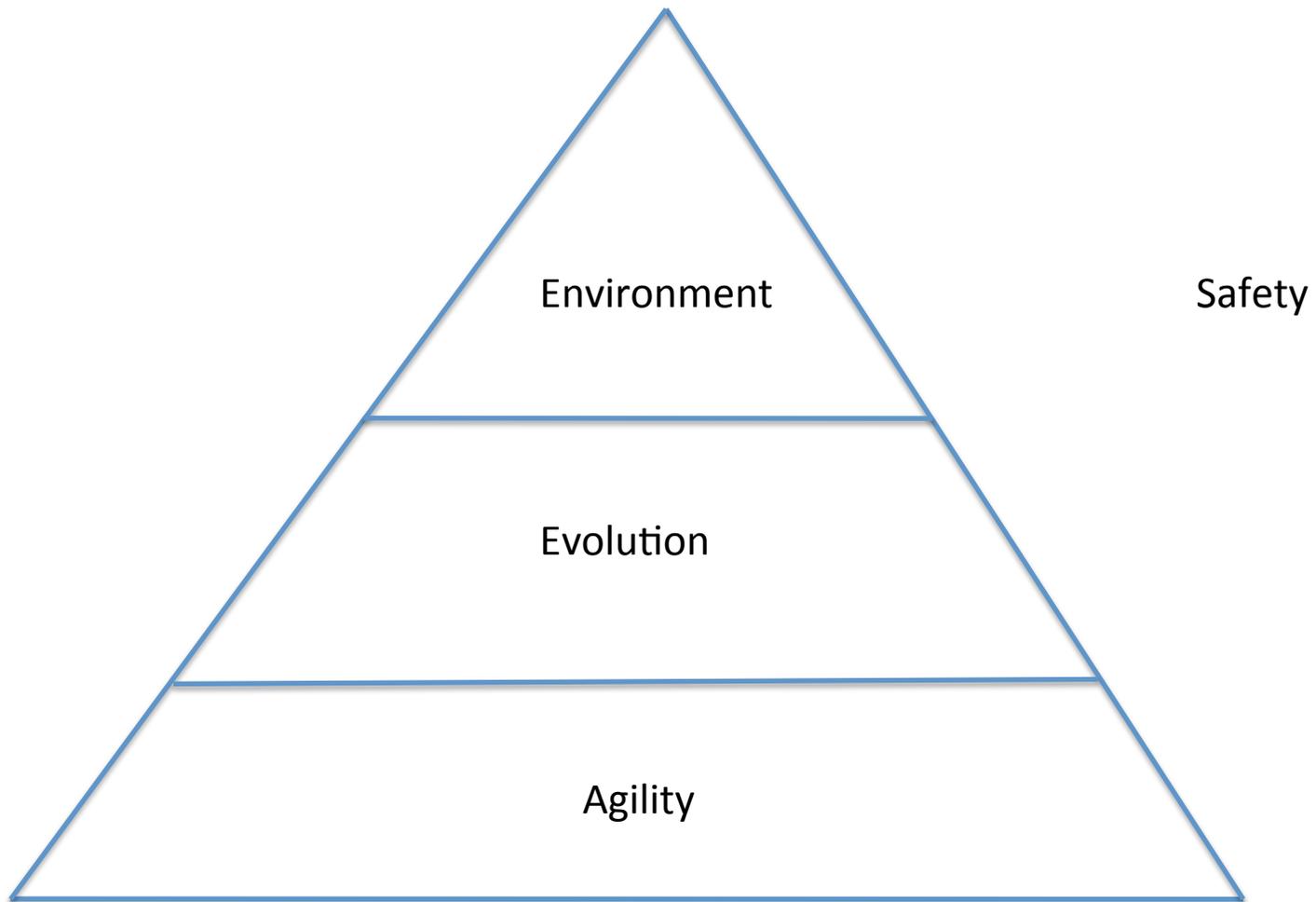
Environment

Natural Environment
Knowledge Environment
Social Environment
Business Environment
Political Environment

Attributes of Today's Environment

Fixed or Reduced Funding
Increasing Cost Drivers
High Expectations
=
Do More Without More

Evolution

Internal Adaptation
Co-Adaptation

Attributes of Today's Evolution

Flexibility
Learning

Agility

The Ability to Change Efficiently

Attributes of Today's Agility

Speed
Balance
Coordination
Strength
Endurance

Safety….

To Infuse Important Safety and Mission Assurance
   Practices and Approaches into this Environment

We need to be part of meeting the challenge

Doing More Without More

Constant Motion = Sustainability

Begin With Where We Are Today, What We Know About The Future, Incorporate A Few Assumptions, And Start Now, If You Wait For Tomorrow It Won't Come

Clear Vision Articulated By Minimal Set of Functional Requirements of What the System Will Do and What It Won't Do

Leverage In-House, Leverage Partners, Leverage Products, Leverage Platforms

Not Too Much Time, Not Too Much Money, Not Too Many People

Utilize Technology Across Elements

The Right Level Of Process At The Right Time

Unlock Productivity Of Individuals by Keeping Them Enabled, Motivated, and Accountable – Good People Would Rather Make a Difference Then Watch The Clock

Show Near-Term, Tangible Progress

Beware "Org Box Theory" Keep Serial Decisions To A Minimum

"Open Source" To Get Ideas From Other Sectors

Create A "Decision Framework"

Confident Quick Decisions During Early Stages of Design

Continually Build Upon Previous Results and Assets

Condition The Team To Innovate Not Invent

Seek Simple "Elegant" Solutions

Keep "Sanity Metrics" To Make Sure Projects Don't Get Out Of Balance; e.g., Ratio Of People Supervising Work To Doing The Work, Ratio Of Time Spent Discussing Work Rather Then Doing Work

Iterative Design-Build-Test of Flight-Like System Prototypes of Increasing Fidelity (3 iterations of 80% correct decisions = 99% Results)

Reward Entrepreneur Approaches

Remove Admin Road Blocks

Leverage Great Minds and External Resources

Start With Low Cost Integrated Analogs / Human in Loop Conduct Flight "Piggy Back" Demo When You Can

Up Front Situational Awareness Of Cost Accountability, "Cost is Captain," This is What I Want and This is What I Can Afford, Let's Make it Happen

Know Cost Every Day – "Flash Forward" "Rough Estimates" = Timely Info = Proactive Decision = Cost Avoidance

Demo Early Fly Often Create the "Virtuous Cycle"

Use Analytical Models and Bench Test to Get 95% of Integrated Design

Demo Flight the Design to Anchor the Model, to Get the Last 5%

Develop A Cost Aware Culture

Improvement in in Cost, Schedule, and Performance

Build In Continuous Competition

Anticipate Realistic Funding

"Lean" Management and "Plump" Delegation

Simple Concise Reporting (By Exception Not Rule)

Buy the 10 lb Thruster Don't Build the 9.333 lbf

Buy Services When You Can, Have Short Term Milestones

Incentive Fee With "Skin In The Game"

Clear Authority, Decide, Trust, And Move On

Manage RQs at Working Level

Monitor and Track Decision Making Velocity (Time = $$$$) (Annual Budget/365 = Daily Cost of Delayed Decision)

Let Incentive Drive Efficiency

Better is the Enemy of Good

Minor Inefficiencies Can Result in Tremendous Saving

Create Efficient Interactions

Have Clearly Defined Objectives

Short, Concise, SOW

Synthesize To A Few Key "Shalls"

Break Up Into "Bite Size" Pieces, "One Miracle Per Mission"

Resolve Issues Early (Post Award Sit Down)

Tailor Early

Do NOT Use Schedule as a Default-Reserve, Challenge Content If You Have To

Have A Small Knowledgeable Team Interface With Providers

Move The Fence, Create An "Island" For The Provider To Operate

Have "Clean" Requirements

Use High Value Insight

Streamline Reviews (Make Them Concurrent)

Replace Paper Deliverables with Electronic Access to Data/ "Simple" IT Solutions

Ask Providers to Identify Unnecessary/ "Dumb" Requirements

"What" Not "How" and No "Exquisite" Requirements

Eliminate Non-Decisional "Boards"

Co-Locate Approval for CM and MRB If Required

Have a Sense of Urgency Motivate a "Hunger" Mentality

Commercial Specs & Open Source When You Can

Move Quickly

Tighten Controls on Requirements Change/Creep Identify CR Cost and Schedule Impact Up Front

1) Be organized – have controlled interfaces

2) Be responsive – decision velocity is important

3) Be flexible – "yes if"

4) Be efficient – don't reformat if you don't have to

5) Be innovative – use today's technology to improve efficiency

6) --- but be vigilant, capable, and credible

One Size Does Not Fit All

1) There is a diversity of mission objectives and risk profiles (cargo, crew, science spacecraft, science launch providers, technology demonstrations)

2) There is a diversity of NASA acquisition approaches
   - Space act agreement (funded, non-funded, reimbursable)
   - Contract (fixed price, cost plus)

3) There is a diversity of providers
   - Dispersed geographic locations
   - Different company cultures
   - Unique business approaches
   - Different levels within the supply chain (prime to sub)

4) There is a diversity in technical solutions
   - Range of "design maturity"
   - Range of "flight heritage" and "flight experience"
   - Range of in-house integration vs. out-source buy
   - Range of international and/or partnered content

…. All moving fast (milestones measured in months not years)

Where NASA S&MA Stands Today

1) NASA's new program offices have been established and are staffed by experienced safety and mission assurance representatives

2) Related safety and mission assurance standards and expectations have been established, have been traced to Agency risk-based requirements, and are consistent across program elements

3) NASA programs and our safety and mission assurance community have demonstrated flexibility, inventiveness, and efficiency in interfacing with contractors/providers
   - Clear responsibilities established up front
   - More efficient/effective day-to-day interfaces
   - "Yes If" attitude in establishing requirements baseline and *compliance*
   - Examples: progress to date on commercial cargo (COTS/CRS), commercial crew (CCP), new insight/oversight for MPCV test flight, and new approach to SLS requirements
   - Evolving policy -- updates to 8735.2B for commercial and COTS items

4) Safety and mission assurance is busy ……

Resource Suitability

1) Like other parts of the Agency, and other organizations, resource availability and a changing mission profile is a challenge for safety and mission assurance. We are faced with tough choices in funding priorities and skill deployment.

2) Having the right resources will ensure a viable, credible, capable, and available organization suited for this new environment – the risk of resource or a skill mismatch range from slow or inadequate support to "nobody there," leading to program cost increase or worse.

3) This is a work in progress.

Increased Use of Commercial Contracts and Other Transactional Authority

1) These acquisition methods can accommodate creativity in design approaches, encourage co-investment, and allow competition in development.

2) Identification of technical weakness and determination of "meets or exceeds" requires that a strategic insight effort be accomplished in a timely manner.

3) NASA will use risk-based insight/oversight in combination with FAR contracting to address critical efforts such as certification of crewed flight systems and high-value spacecraft projects.