Aviation Safety

A Journey of Knowledge, Commitment and Leadership

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Aviation Policy & Requirements

• Two directives define the essential standards and organizational structure for aviation activity
  • Safety requirements set here fall outside the Agency’s safety organization
  • Agency Safety requirements are largely framed around large space-based programs

• Monetary provisioning is fractured being driven by diverse programmatic needs from space access/exploration, earth science and aeronautics.
  • Generates a resulting need to offset institutional costs with reimbursable work.
  • Works counter to an institutional asset view of the fleet. Sum of all programmatic funds does not meet the institutional needs to sustain a fleet of operators/maintainers and aircraft
  • In-house competition aggravates the problem.

• Culturally the community largely sees each of 7 flight operations as
  • “unique” both in how they conduct operations and perform/document maintenance.
  • Unwilling to accept the possibility that they are more deficient than the standard requires (essential flexibility)
  • Headquarters' Aircraft Management Division viewed as an impediment to Centers
Organizational Structure

- Headquarters Aircraft Management Division, small office that
  - Is assigned under the Institutional Support Associate Administrator
  - Ensures compliance with public law from everything from airframe airworthiness certification to lawful use of a “public” aircraft.
  - Leads interagency executive team consisting of the Directors of Flight Ops that self inspects and collaborates on policy and standards for the community.
  - Leads team of NASA program executives with Flight Directors to manage future aircraft utilization of the agency.
    - Recent managerial concept met to overcome the community’s perceived unwillingness to make difficult calls to reduce redundant capacity
Watershed Event - 2001

• Learjet Model 24 Landing Accident – Loss of asset/ No injuries
• Three Personnel on board (Pilot, Copilot and Observer)
• Aircraft entered a lateral PIO during flare that resulted in a hard landing
• Analysis by board with lead outside the Center indicated
  • Lack of adherence to currency and qualification standards
  • Aircraft inexperience on the part of the PIC and copilot
  • Failure of the PIC to detect a deteriorating situation and recover the aircraft
  • Inappropriate Management Oversight
    • Failure of Management to establish procedures
    • Failure to adhere to standards
• Events are Opportunities (some are thrust upon us and others need seizing)
Corrective Actions

• Required documentation of training
• Outlined specific training events ground, simulator EP, written exam checkout flights and checkride and solo flights
• Established when flight with IP required
• Requal required after 1 year of non-currency
• Instituted supervisor responsibility ensure appropriate daily crew composition based upon risk factors.
• Prohibited aircrew from performing duties for which a documented program is not completed except via waiver
• Define qualifications and ensure adherence to OPM hiring standards
Personnel Actions

- Replaced several of the managers with the Flight Ops Chain of Command
- Replaced the Chief of S&MA with a pilot
- Created an independent Aviation Safety Management position within Safety & Mission Assurance Directorate (outside the flight operations)
  - Aviation Safety Officer still assigned within flight ops
  - Given direct access to Center Director
- Reassigned Aviation Safety Officer
First two years

• First day a close call occurs
  • Opportunity or challenge?

• Establish policy and procedures for an active program
  • Challenge- Assign responsibility while retaining cooperative approach

• Trained as a pilot

• Reinvigorate Investigation program
  • Less catastrophic events were ignored
    • Data collection hap-hazard
  • Success (no major mishap) meant good enough
  • Shift perception of where the gold lies
Aviation Safety Program Structure

• Three Key Elements
  • Leadership
  • Planning
  • Risk Managements

• Stakeholders forum – Aviation Safety Council
  • serves the Director of Flight Ops
  • Reviews metrics
  • Recommends actions
  • Develops 1 year tactical plan
  • Assess impact of interim events
  • Conduct and procure training
Aviation Safety Council

• Heavily Maintenance in membership
  • Practitioners with little time for bureaucracy (aircrew similar)
  • Included Chief of Maintenance

• Flight Operations forum chartered to bring solutions
  • Largely perceived as an organizational extension of the Safety Organization
  • Expanded membership to include a project management representative
  • Rotated lead with other members of Aviation Safety Management Team

• Working to make forum effective
  • Ownership is essential
  • Need mechanisms to move toward short-term solutions quickly
  • Ultimately enables cultural changes for the the long haul
Intervening years - significant events/forces

- Loss of Helios (UAV)
- Loss of the X-31
- Kingair Stall from excessive icing (all contractor crew)
- Shift from Aeronautics to Earth Science/reimbursable work
  - Multiple projects competing for resources (manpower and time)
- Addition of SOFIA program (747 and 750 flight hours a year all at night)
- Implementation of common IT based maintenance management system
  - ER-2 Regulator failure is catalyst event
  - Shift from a multiple informal processes to a uniform process with experts from all disciplines
Significant Changes

• Incorporation of a fatigue risk management tool
  • Manage high demands of multiple projects for extended operations at home and abroad
    • Flight Doc created matrix/directive based upon Canadian tool
    • Targets both aircrew and maintenance personnel
    • Acknowledges common Human Factors Fatigue aspects (duty day, night operations, continuous successive days of operation, crew rest, time zones shifts, etc.)
  • Conflicts with the efficiencies gained by use of overtime
  • Matrix becomes a toll to evaluate the risk
    • May lead to an acceptance of an elevated risk by management
  • Enables aircrew and maintenance to counter pressures from projects
Significant Thrusts

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  • Matrix becomes a tool to evaluate the risk
    • May lead to an acceptance of an elevated risk by management or specific hazard
  • Enables aircrew and maintenance to counter pressures from projects
Significant Thrusts

• Development and management of hazard portfolio
  • Recognizes the continuous need to manage risks as operational and factors change (addition of new aircraft, significant project expansion, etc...)
  • Provides for management acceptance of risk
  • Records history of implemented and proposed mitigations
  • Records history of precursors and events that signal hazard manifestation

• Progress slow and buy-in is essential

• One more activity that requires considerable effort to see the benefit
  • Time is the limiting resource
Aviation Mishap/Close Call Trends

Data does not include Hearing Shift Incident

112% Increase in Close calls
Aviation Mishap (Type C & D)

Goal - Zero

Target -- 25% Reduction from 2 year Average

* Includes injury data (excludes hearing loss)

^ Type D threshold increased from $12K to $20K in FY14 and on
Goal - Zero
Criteria: Reported within 24 hours

Target -- 20% Reduction from 2 year Average

* Late reporting criteria was changed from 48 to 24 hours from incident occurrence

(7) Total Reportable
Aviation Ground Mishaps

Goal - Zero

Target -- 25% Reduction from 2 year Average

FY14/15 Average – 5.5

FY16 Target - 4

Includes injury data

^ Change in mishap Categorization criteria
Aviation Mishap Rate

- Mishaps per 1000 Flight Hours
- Mishaps per 100 sorties
- Mishaps per 10,000 Work Request Hours

Trend lines

FY16 Target – 0.45
FY16 Target – 0.15

10% Reduction from previous year

- Flight Hour rate uses flight mishaps only
- Sortie and Work Request Hour Rates use ground mishaps only
Incident* Finding Breakout

% of Total # of Root and Contributing Factors

- Organizational Factors
- Material Deficiency
- Process Deficiency
- Training/Skill Deficiency

* Includes Mishaps and Close Calls

Last years target areas
This years targeted areas
Incident* Finding Breakout

% of Total # of Root Cause and Contributing Factors

* Includes Mishaps and Close Calls
Finding Answers

• Most data is reactive
  • Mainly Close calls and mishaps
  • Fleet limitations/diversity, culture and sample size are challenges
  • FOQA solutions not easy or culturally acceptable

• Aircraft fleet is aging and always a decade or two behind the state of
  the art in terms of avionics
  • Upgrades can be singular, costly or not possible

• Proactive activity – looking for precursors
  • Hazard Institutionalization - common hazards that touch more than one
    platform.
    • Analyzes changes to the process/organization from common threat viewpoints
The current Horizon and Vision

• Looking to institutionalize a recognition of Human Factors affecting aircraft maintenance safety.
  • Using a Threat & Error identification and mitigation approach to risk management
    • Proactive, real time and reactive

• Culturally looking to instill a vision for excellence in aircraft maintenance with process view based upon continual improvement

• Challenges
  • Fixing the process while executing a significant workload
  • Fiscal enabling will require cuts in ongoing “necessities”
Flight Test Safety

• Most mishaps in this domain are not test related
  • Inherent focus on changes from nominal ops threats & errors
  • Structured airworthiness process
  • Cockpit review committee
  • Exposure is limited
  • Loss here more closely related to organizational reputation

• Process is championed by an SES

• Expansion of unmanned platforms brings challenges to process
  • Aircrew safety shifts the loss equation to largely mission
  • Platforms are typically spawned under limited budget increased risk approach
Flight Test Safety Challenges

• Use of Commercial aircraft test services comes at somewhat hidden costs
  • Public use responsibility requires airworthiness responsibility remains with gov’t
  • Reaching deep enough across proprietary boundaries is a challenge

• Use of unmanned systems as a pathway to research progress
  • Systems on a large scale are manpower intensive for planning and execution
  • Smaller systems chosen to accept greater mission risk – tends to work against the requirement to understand the root cause to failure.