National Aeronautics and
Space Administration
Office of the Administrator
Washington, DC 20546-0001

April 25, 2011

Vice Admiral Joseph W. Dyer, USN (Ret.)
Chairman
Aerospace Safety Advisory Panel
National Aeronautics and Space Administration
Washington, DC 20546

Dear ~~Admiral~~ Joe Dyer:

Enclosed is NASA's response to Recommendation 2010-02-01 from the 2010 Second Quarterly Meeting of the Aerospace Safety Advisory Panel (ASAP). Please do not hesitate to contact me if the ASAP would like further background on the information provided in the enclosure.

I look forward to receiving continued advice from the ASAP that results from your important fact-finding and quarterly meetings.

Sincerely,

Charles F. Bolden, Jr.
Administrator

Enclosure

THOUGHT WE HAVE BEEN WORKING THIS RESPONSE FOR TOO LONG, IT IS NOW TIME SP IN THAT I AM REQUESTING A THOROUGH REVIEW OF POTENTIAL SAFETY IMPACTS FROM BUDGET REDUCTIONS IN FY11 FULL-YEAR CR.

ASAP Tracking Number 2010-02-01
Budget Authority for Facility Maintenance, Infrastructure Development, and Safety Upgrades for NASA Aircraft

Finding
The ASAP has identified several areas of concern from a safety perspective, e.g., funding of the NASA Safety Center, funding levels required for maintenance or infrastructure improvements for safety, and funding for NASA aircraft that have safety implications. The ASAP is encouraged that NASA intends to mandate the recommended safety requirement for its aircraft, but is concerned that there is not yet any funding stream. Similarly, for infrastructure development, the concept is understood, but the detailed numbers are missing. While a beginning strategy has been developed, it is very optimistic, requiring huge amounts of infrastructure funding from Congress.

Recommendation
The Mission Support Directorate (MSD) should continue to identify safety-specific issues, not only in the three areas of maintenance, infrastructure improvement, and aircraft, but other areas that will have an impact on quantifying support and justification for further budget requirements. The ASAP requests that NASA finalize the budget numbers and give the Panel a clearer picture on the strategy and timeline to bring those capabilities to NASA aircraft. With respect to infrastructure development, the Panel requests that NASA provide detail in this area as well. The ASAP would like periodic updates on how NASA plans to fund and resolve these issues.

Rationale
Aging infrastructure has safety implications. As noted in the ASAP's 2009 Annual Report, the infrastructure used to launch complex vehicles into space must be reviewed and maintained to remain safe. The ASAP needs to follow this issue more closely to see if the infrastructure development plan is realistic or achievable.

NASA Response

1) What is the process for identifying safety issues with facilities?

Requirements for identifying and mitigating safety issues in NASA facilities can be found in NASA NPR 8715.1, NASA Occupational Safety and Health Programs. This regulation establishes the requirements for NASA`s compliance with occupational safety and health programs required by Section 19 of the Occupational Safety and Health Act, as well as Executive Order 12196, Occupational Safety and Health Programs for Federal Employees, and the implementing regulations found in 29 C.F.R. Part 1960. The requirements in the NPR are applicable to all NASA sites internationally and apply to all NASA employees, equipment, property, systems, and facilities.

NASA Centers and Component Facilities, including JPL, establish a formal schedule of inspections for all operations/facilities. All active areas and operations of each installation are inspected at least annually. More frequent inspections are conducted where there is an increased

risk of accident, injury, or illness due to the nature of the workplace. Any facility, structure, operation, vehicle, or equipment that is in an inactive status is inspected at least annually. Prior to reactivation, the facility, structure, vehicle, operation, or equipment receives a thorough inspection to identify potential hazards. In addition, unannounced inspections and unannounced followup inspections are conducted to ensure the identification and abatement of hazardous conditions. Finally, special inspections may be conducted at the request of safety and health committees, employees, or their representatives, or upon notice of an unsafe or unhealthy condition. Unsafe conditions may also be reported by employees.

In response to reports of suspected unsafe or unhealthy conditions, Centers' safety and/or health officials conduct inspections.

Based on the safety inspections of the facilities, the safety deficiencies that are identified must be corrected within 30 days, as required by OSHA. If the safety deficiencies cannot be corrected within 30 days, the NASA Center must develop an abatement plan along with a corrective action schedule to remediate the safety deficiencies. A frequent status update to the abatement plan by the NASA Center is required until the safety deficiencies have been corrected and closed. The identified safety deficiencies at the NASA Center may require facilities maintenance and/or repair tasks to correct the deficiencies or Construction of Facilities (CoF) Projects as part of the abatement plan.

a) What is the process for identifying safety critical functions?

NASA NPR 8715.3, NASA General Safety Program Requirements, identifies safety-critical functions and activities and provides policy on safety requirements, planning and management. The NPR identifies specific facilities systems, operations, and activities that relate to NASA facilities and work dependent on safe functioning of those facilities. Some specific safety-critical functions identified in NPR 8715.3 include pressure vessels and systems, lifting devices and equipment, facility systems safety, fire protection and detection systems, and explosives process safety. Other NASA policies provide policy on areas such as risk assessments, emergency planning, and specific program operations such as range safety, etc. These policies also impact facility requirements and operations.

b) How do we determine safety repair of critical facilities?

NASA NPR 8831, Facilities Maintenance and Operations Management, provides guidance on maintenance and repair of NASA facilities, systems, and related equipment. NPR 8831 provides policy on establishing a reliability-centered maintenance program for critical systems and setting safety-related repairs as the highest priority in scheduling repairs. NASA Centers use risk-assessment systems to evaluate repair projects and prioritize according to risk. NASA's safety and health Risk Assessment (RAC) process identifies and tracks mitigation of safety issues to ensure that facility safety issues are mitigated and/or closed out.

NASA prioritizes its CoF Program utilizing a RAC Matrix. This risk assessment uses definitions that are consistent with the NASA safety and health RAC system. In addition, projects that

mitigate a specific documented RAC are assigned additional priority points to ensure that safety issues are addressed and mitigated.

2) What is the amount of your unfunded maintenance and repair projects? This is more than bricks and mortar. It also includes laboratories. What is the facility part? What is the equipment part?

Through an annual assessment process, NASA has identified approximately $2.55B in backlog facility repairs. NASA does not track equipment repair requirements centrally but does track the equipment upgrade and repair requirements for a suite of facilities that NASA has identified as providing strategic capabilities. While not a comprehensive evaluation of the equipment upgrades and maintenance required within NASA's technical facilities, a request for minor maintenance and upgrade projects for six specific facilities located at five NASA Centers resulted in projects totaling $24.7M. The request was only for small projects at a very limited number of technical facilities (motion simulators, space environmental test facilities, and thermodynamic test facilities) and did not include all Centers or large technical structures such as wind tunnels and rocket test stands. The individual projects requested ranged from $5K to $1.8M.

a) Can we track this by risk assessment?

Abatement plans for specific identified safety issues are required under NASA's RAC process. These abatement plans include any repair projects that may be needed as part of the mitigation. NASA Centers monitor these abatement plans. Frequent status updates to the abatement plan by the NASA Center are required until the safety deficiencies have been corrected and closed.

b) What is the amount of the shortfall?

Typically, the funding requested to correct immediate facilities deficiencies exceeds four times the funding available in any year. Not all of these are safety-related deficiencies. NASA uses risk assessments at the Center to identify and prioritize projects that mitigate the highest risks first. Risk assessments are also used to prioritize NASA's major construction projects so that the greatest risks to mission are mitigated. This risk-assessment process allows NASA to focus resources on safety issues and critical mission risks.

c) How are you going to address the shortfall now and in subsequent years?

NASA has initiated a long-term strategy to renew most of its infrastructure over a 40-year period. NASA identified best funding-level projections for a sustainable renewal program that will minimize negative impacts to ongoing programs. NASA is currently evaluating the first five-year plan for this long-term strategy. This five-year plan makes significant progress in addressing the repair backlog for NASA's technical facilities. The plan identifies potential laboratory renewal and consolidation projects, replacement of critical infrastructure supporting rocket engine testing, and renewal of facilities supporting flight test data acquisition and communications, range safety, and instrument development facilities.

3) What is your process and approach to addressing the maintenance and repair backlog?

NASA prioritizes its CoF Program and its local repair projects using risk assessments. These risk assessments use definitions that are consistent with the NASA safety and health RAC system. In addition, major construction projects that mitigate a specific documented safety or health deficiency are assigned additional priority points to ensure that safety issues are addressed and mitigated. NASA uses this scoring system to identify the Agency's most critical needs in its maintenance and repair backlog.

a) i.e., the backlog of work to be done = $X; $Y is priority and $Z is safety critical?

Through an annual assessment process, NASA has identified approximately $2.55B in backlog facility repairs. NASA's projected CoF budget funding through 2015 is:

FY 11: $280.75M.
FY 12: $368M.
FY 13: $509M.
FY 14: $617.8M.
FY 15: $627.9M.

NASA does not track funding for specific safety-critical projects separately from the backlog. Instead, NASA uses the safety and health RAC system to document and track abatement plans, mitigation repair projects, and close out of safety and health-related deficiencies. In addition, NASA uses risk assessments to prioritize safety-mitigation projects.

b) What is the gap between available funds and $X?

The construction funding to correct the repair backlog is identified above. Centers identified specific maintenance-level requirements in FY 2009 totaling $592M. The actual maintenance and repair funding available was $283M. Centers use risk assessments to prioritize repairs to mitigate the highest risk items.

c) What is the trend (getting better or getting worse)?

NASA's repair backlog increases every year. The repair-backlog increase slowed slightly between FY09 and FY10 ($2.547B to $2.553B). This slowing of the increasing trend of the repair backlog was mainly due to replacement of several NASA facilities and demolition of obsolete facilities. Agency wide, the backlog was:

FY 06: $2.05B.
FY 07: $2.32B.
FY 08: $2.46B.
FY 09: $2.547B.
FY 10: $2.553B.

d) What is the unfunded maintenance and repair amount Agency wide and for each Center? Langley reported $200M in July.

Agency wide, the repair backlog was $2.55B in FY 10. In FY 2010 the backlog was:

ARC: $576M.
DFRC: $23M.
GRC: $300M.
GSFC: $146M.
JPL: $59M.
JSC: $198M.
KSC: $501M.
LaRC: $270M.
MSFC: $276M.
SSC: $202M.

4) How does NASA equip its aircraft with mandatory safety-related equipment? Putting it at Centers is not the way to go.

NASA has 66 active aircraft, and 47 of them (71%) have Traffic Collision Avoidance Systems (TCAS) and/or Enhanced Ground Proximity Warning Systems (EGPWS) or have funded plans to do so. These include the T-38 fleet currently being modified with TCAS and EGPWS, and funded plans for the two WB-57 aircraft based at the Johnson Space Center. Aircraft that do not have these systems include the two Shuttle Carrier Aircraft. With 18-24 months of remaining service and tightly controlled flights usually to military bases, they will not get TCAS. Cost is a potential challenge for our smaller aircraft, but there are cost-effective approaches to mitigate the risk with less costly systems. Excluding the Shuttle Carrier Aircraft and ER-2 Aircraft, the cost to install TCAS in the remaining 15 aircraft would be approximately $1.5M. NASA's Office of Strategic Infrastructure (OSI) does not have a budget for upgrade/modifications and does not believe that it should. Center or program budgets address aircraft modifications. All NASA aircraft, even those without TCAS or EGPWS, meet Federal Aviation Administration's requirements to fly internationally and within the United States' National Airspace System. OSI has requested $1.5M to install TCAS/Terrain Awareness Warning Systems (TAWS) on the remaining aircraft.

a) How do we move forward on this?

We will continue to advocate for budget to complete TCAS/TAWS installations.

b) What is the backlog, and what is the plan and time table to address this (TCAS/TAWS)?

All Centers that require TCAS/TAWS installation funding have identified costs and project plans to minimize the time required to complete installation, pending funding availability. We feel that this is the best approach to address this risk. The following chart shows installations of

TCAS/TAWS occurring in FY 11, if funding is available. The remaining installations would occur in FY 12.

Center	Aircraft	TCAS/TAWS Status	Prior Budget ($K)	FY11 Funding	FY12 Funding
DFRC	B-200	Installed		$ -	$ -
	DC-8	Installed		$ -	$ -
	ER-2	Not Installed. Waiver Requested.		$ -	$ -
	F-15	Status Vary. TAWS Waiver Requested for Research Missionized Acft.		$ 189.0	$ -
	F-18	Status Vary. TAWS Waiver Requested for Research Missionized Acft.		$ 72.0	$ -
	G-II/G-III	Installed		$ -	$ -
	SOFIA	Installed		$ -	$ -
	T-34	TCAS Underway. Need TAWS.		$ -	$ 15.00
Subtotal			*$ -*	*$ 261.0*	*$ 15.0*
GRC	DHC-6	Not Installed	$ -	$ 224.5	$ -
	Learjet 25	Not Installed	$ -	$ 155.5	$ -
	S-3B	Not Installed	$ -	$ 75.0	$ -
	T-34	Not Installed	$ -	$ 60.0	$ 100.0
Subtotal			*$ -*	*$ 515.0*	*$ 100.0*
JSC	G-III	Installed	$ 75.4	$ -	$ -
	WB-57	Not Installed	$ -	$ 124.0	$ -
	Super Guppy	Not Installed	$ -	$ 37.0	$ -
	SCA	Not Installed. Waiver Requested.	$ -	$ -	$ -
	STA	Installed	$ 661.6	$ -	$ -
	T-38	Underway	$ 928.0	$ -	$ -
Subtotal			*$ 1,665.0*	*$ 161.0*	*$ -*
KSC	Huey II	Not Installed	$ -	$ 51.7	$ -
Subtotal			*$ -*	*$ 51.7*	*$ -*
LaRC	B-200	Installed	$ -	$ -	$ -
	C-206	Not Installed	$ -	$ 37.0	$ -
	SR-22	Not Installed	$ -	$ 37.0	$ -
	UH-1H	Not Installed	$ -	$ 86.2	$ -
Subtotal			*$ -*	*$ 160.2*	*$ -*
WFF	B-200	Installed	$ -	$ -	$ -
	P-3	TCAS Installed. Need TAWS.	$ -	$ 90.0	$ -
Subtotal			*$ -*	*$ 90.0*	*$ -*
Total			*$ 1,665.0*	*$ 1,148.9*	*$ 115.0*

c) Can we build a case that every NASA aircraft needs TCAS/TAWS?

i) We need viable reasons why less than 100 percent of NASA aircraft don't have TCAS/TAWS.

Aircraft that support the Shuttle will not be getting TCAS/TAWS because they will no longer be used. At the Dryden Flight Research Center (DFRC), two aircraft (F-15 and F-18) will not have TAWS, but they will have TCAS. The ER-2 at DFRC will have neither TCAS nor TAWS because it is a specialized aircraft for which systems are not available.

ii) Is it reasonable/feasible to equip every NASA aircraft with TCAS/TAWS? If not, why not?

Aircraft that support the Shuttle and specialized research aircrafts, such as those at DFRC, are the only aircraft that are not slated to be equipped with TCAS/TAWS.

iii) What would it cost to equip every NASA aircraft with TCAS/TAWS?

The original budget estimate was $1.5M - $3M. The actual request is slightly over $1.2M.

iv) What is the available budget?

Currently, no funding has been budgeted for TCAS/TAWS. Funding has been requested through the budget over-guide process.