

National Aeronautics and Space Administration
Headquarters
Washington, DC 20546-0001



October 14, 2010

Reply to Attn of:

Safety and Assurance Requirements Division

TO: Goddard Space Flight Center
Attn: 100/Director

FROM: Chief, Safety and Mission Assurance

SUBJECT: Endorsement of the Nuclear Compton Telescope Balloon Launch in Alice Springs, Northern Territory, Australia High Visibility Type B Mishap Report, Case Number S-2010-119-00007

I have reviewed the mishap investigation report of the Nuclear Compton Telescope (NCT) Balloon Launch in Alice Springs, Northern Territory, Australia High Visibility Type B Mishap and endorse the report. I concur that the report has been prepared as directed by the appointment letter and meets the requirements specified in NPR 8621.1B, NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping.

This Mishap Investigation Board (MIB) provided a complete detailed description of both the nominal balloon launch process and the launch process the day of the mishap, allowing the reader to discern the anomalies that contributed to the incident. The MIB also did an excellent job including documents and evidence in the report such as, but not limited to, a detailed list of evidence collected and evaluated, a comprehensive description of the tests and analysis conducted with supporting results, a comprehensive Event and Causal Factor tree with supporting discussion, a log (including thumbnail images) of all the photographs of the mishap, the Civil Aviation Safety Authority (CASA) permits, and the NCT Flight Folder documents. The report included a comprehensive human factors engineering (HFE) analysis which described each error type, factors that led to that error, and recommendations that would prevent the error from occurring. Additionally, the HFE analysis included a detailed analysis of the human force required to pull the lanyard to launch the balloon, as compared with the maximum reasonable human capability, thereby demonstrating the launch attempt was unsuccessful given the required force exceeded a human's abilities. This section and related references were well done and serve as a model for future investigations.

I concur with the findings and recommendations in the report with the following exceptions and comments.

The MIB report refers to "WFF Safety Leadership" and "GSFC Safety Leadership," without providing definitions of the scope of this expression. I read this to refer to the WFF or GSFC

Director, the Division Director with responsibility for the balloon program, and the safety organization, at a minimum.

Similarly, Intermediate Cause I1 is stated as, "WFF safety office did not perform rigorous hazard analysis," and the associated recommendation is that the WFF Safety Office should perform such an analysis in accordance with NPR 8715.5 section 3.2. The cited NPR requirement is that the vehicle program, in coordination with a Center range safety organization or the NASA Range Safety Manager, ensure that such an analysis is performed. It is important to recognize that the responsibility for safety is much broader than the safety organization alone.

The MIB report correctly documents many areas where the Balloon Program's crane operations were not in compliance with NASA standards for lifting devices. The mobile crane was used in an unorthodox manner as a dynamic launch vehicle, accelerating, decelerating, and turning with a load. Mobile cranes are not designed to move or perform sudden acceleration or deceleration under load because this may cause the load to shift and swing into the crane cab or cause the crane to tip over; both which have the potential to result in employee fatalities. Additionally, mobile cranes are not to be side loaded or used to drag a load sideways because this action can result in excessive overturning moments, causing them to flip over. NASA has experienced a number of incidents in the last two years where heavy lift equipment and cranes have flipped over, damaging equipment, injuring personnel, and potentially causing fatalities.

Other significant safety findings in the report include that the crane operator left the crane cab during the launch process (a violation of Occupational Safety and Health Administration (OSHA) requirements). Per OSHA, a crane cabin should be occupied at all times when a load is suspended (thus allowing immediate response in the event of an emergency). Although OSHA requirements do not apply to Australia, they do apply to similar operations in the United States and are in existence to protect the health and safety of the employees and the people around mobile crane operations.

Prior to use of the mobile crane for balloon launches, the mobile crane rented by the Columbia Scientific Balloon Facility (CSBF) was modified with a platform and railings in front of the crane cab. This allowed the flight crew to stand in front of the cab during the launch operation. The platform is open on both sides and is not a safe enclosed structure to be used while the crane is moving, accelerating, or making sharp turns. In addition to allowing potential falls from the platform, the design places the employees in the balloon/equipment fall zone as well as in danger of being hit by a swinging or falling load. Other modifications were made to the crane to add swivel wheels to the outriggers, allowing the outriggers to be deployed during movement. This unconventional design modification was made to allow the crane some stability because it was being used in an unconventional manner. However, no engineering design analysis seems to have been conducted to evaluate the placement, size, and design of the outriggers to demonstrate they provide the desired balance and protection for all payload weights and sizes.

Overall, all of these findings, and others related to the mobile crane indicate that the mobile crane was not being used in a safe manner at the time of the mishap. NASA should not use mobile cranes outside their design limits, in violation of OSHA requirements, or in violation of NASA safety requirements. Consequently, I add the following recommendation: The Balloon Program Office (BPO) should re-evaluate its balloon launch method and determine a safe method to release the balloon without violating NASA and OSHA lifting requirements. The analysis should ensure that the public and all employees are a safe distance from the load, and that there are adequate emergency stop capabilities if the load sways and poses risk to people or hardware.

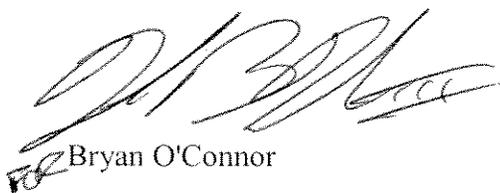
I do not concur on the MIB's Root Cause R5 "NASA Agency Range Safety Program failed to ensure corrective actions were accomplished from previous audits." The 2002 WFF Assessment was a NASA Range Safety Independent Assessment and not a formal audit. The purpose was to identify findings (non-compliances and observations) and to ensure closure of the findings via establishment of corrective action plans by the host organization. Ensuring that the corrective action plans are accomplished is the responsibility of the balloon program and the Center safety organization; i.e., not an Agency Range Safety Program function.

The Agency Range Safety Program did follow up on the findings from the 2002 WFF Assessment, and in particular finding #9 on the balloon program, to ensure corrective action plans were in place. The Agency Range Safety Program concurred with the WFF initial response in June 2002. The Agency Range Safety Program closed finding #9 in November 2002 based on procedure and process audits of the balloon contractor performed by the WFF safety and balloon program offices. During the next Range Safety Assessment of WFF in April 2005, the Agency Range Safety team verified that all 2002 findings were closed.

Modifications to the Agency Range Safety Program that are currently in affect address the MIB's Recommendations D-1 and D-2 regarding appropriate follow up on audit recommendations and placing range safety audits under NASA Safety Center responsibility. Per the updated policy in NPR 8715.5 Revision A, the Agency Range Safety Program now participates as an element of the NASA Headquarters Safety and Mission Assurance Audits, Reviews, and Assessments program defined by NPR 8705.6, which is managed by the NASA Safety Center. The Agency Range Safety Program also supports Inter-center Aircraft Operations Panel reviews as defined by NPR 7900.3, which are managed by the NASA Aviation Safety Office. Range safety related audit and review findings and corrective actions are now documented, followed up, and tracked using formally established Agency systems and processes.

I do not concur on the MIB's recommendation I8-1 "BPO should perform a cost, utility, and feasibility assessment for improving the terrain at Alice Springs Airport." This recommendation is based on the assumption that it is safe to use a mobile crane to launch balloons, which at this time has not been proven. Instead, I recommend that the BPO identify and use launch sites which are determined to be safe, allow an adequate range envelope to protect the public, and provide safe operation consistent to NASA's policies and procedures.

Please thank this MIB for their dedication, tireless service, and excellent work in completing this investigation and providing NASA with recommendations to improve public safety and ensure future safe and successful Balloon Program operations. In keeping with NASA policy, please attach this endorsement to the top of the mishap investigation report and publish/distribute it as a part of the report.



Bryan O'Connor

cc:

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Chief Health and Medical Officer/Dr. Williams
Office of Safety and Mission Assurance/Dr. Stamatelatos
Mr. Schumann

Science Mission Directorate/Mr. Gay
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