



Volume V

Appendix G.2

Appendix R, Space Shuttle Program Contingency Action Plan

This Appendix contains NASA NSTS 07700, Volume VIII, Revision E, Appendix R; Space Shuttle Program Contingency Action Plan.

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APPENDIX R

SPACE SHUTTLE PROGRAM CONTINGENCY ACTION PLAN

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APPENDIX R

SPACE SHUTTLE PROGRAM CONTINGENCY ACTION PLAN

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to serve as an integrated plan to predetermine the program response in the event of a Space Shuttle contingency. This plan will be implemented in concert with the OSF SFO Contingency Action Plan, and field center contingency plans. It has been written to augment each of these by providing the anticipated, integrated timelines of the formalized program response.

1.2 SCOPE

The Manager, Launch Integration, KSC has overall responsibility for contingency planning during flight preparation, launch ascent, and post-landing operations. During ascent, this responsibility continues until the Shuttle is established in a stable orbit or until landing, should a stable orbit not be achieved. The Manager, Launch Integration will hold a Mishap Response Teleconference (MRT) approximately one hour and 30 minutes after the contingency where specific actions will be levied by the MMT. Normal program elements will execute those actions along with this plan. The Manager, Space Shuttle Program will determine when the MMT no longer has operational oversight for this plan. The Manager, Launch Integration, KSC will retain responsibility for contingency operations until a formal investigation board is established, and/or until the Orbiter is returned to KSC.

1.3 DEFINITION

For the purpose of this plan, a program contingency is defined as any SSP-related failure, accident, or incident (involving SSP-controlled flight or test hardware, support equipment, or facilities) that significantly delays or jeopardizes the SSP or a flight, prevents accomplishment of a major objective, or terminates a flight prematurely.

NPD 8621.1G, NASA Policy Directive on NASA Mishap Reporting and Investigating Policy, defines six mishaps/contingencies in which the AA-OSF may become involved. They include Type A, B, and C Mishaps, mission failures, incidents, and close calls, all of which are defined in Table 1. The AA-OSF or delegated agent is the final authority in determining if an actual or suspected mission failure, accident, or incident constitutes a SSP contingency. All probable contingency situations will be reported to the AA-OSF or delegated agent for a final decision.

1.4 APPLICABILITY

This plan applies to any contingency situation during Space Shuttle operations where a multi-center response may be required. It applies to all SSP organizations and those agencies that support the SSP during a contingency operation. Use of this plan assumes the AA-OSF has declared, or will declare, an SSP contingency.

1.5 REFERENCED DOCUMENTS

This plan is intended to be consistent with the documents listed in Attachment 10 of this appendix.

1.6 NOTIFICATION

Those witnessing a potentially significant Shuttle Program incident will notify the appropriate element/project manager who in turn will notify the Manager, Space Shuttle Program. The Manager, Space Shuttle Program will be responsible for notifying the Deputy AA for International Space Station and Space Shuttle.

1.7 CONTINGENCY READINESS

Space Shuttle Program and Project personnel will participate in contingency response exercises that demonstrate the program's effective response. These will consist of exercises prescribed by NASA Headquarters' Office of Safety and Mission Assurance and as outlined in the OSF SFO Contingency Action Plan.

TABLE R.1
CONTINGENCY CRITERIA SUMMARY

Classes of Unexpected Events	Damage to Property, Facilities, or Equipment and/or Personnel Injury/Death		Investigation/Analysis
Type A Mishap	Greater than \$1M	Death	AA-OSF appoints investigation board or Administrator chooses to appoint investigation board and board investigates mishap*
Type B Mishap	Equal to or greater than \$250K but less than \$1M	Permanent disability of 1 or more persons, or hospitalization of 3 or more persons.	AA-OSF or Deputy AA appoints investigation board and board investigates mishap*
Type C Mishap	Equal to or greater than \$25K but less than \$250K	Occupational injury or illness that results in a lost workday case.	Deputy AA appoints investigator or investigation team depending on significance of mishap*
Incident	Equal to or greater than \$1K but less than \$25K	Personal injury of less than Type C Mishap severity but more than first-aid severity.	Same as Type C mishap*
Mission Failure	A mishap of such severity that it prevents the achievement of primary NASA mission objectives as described in the Mission Operations Report or equivalent document.		An investigation board is required and Type A or B Mishap investigation procedures are followed*
Close Call**	No equipment/property damage equal to or greater than \$1K	No injury or significant interruption of productive work	Investigated in accordance with its potential*

*If event involves more than one Center or has significant public interest, the AA-OSF, or delegated agent, may order an investigation board or recommend to the Administrator that the Space Shuttle Mishap Interagency Investigation Board be activated.

**Event which possesses high severity potential for any of the previous types of mishaps.

2.0 RESPONSIBILITIES

2.1 MANAGER, SPACE SHUTTLE PROGRAM

In accordance with the OSF SFO Contingency Action Plan, the Manager, Space Shuttle Program is responsible for ensuring that:

- a. SSP contingency response actions are included in the OSF centers contingency plans.
- b. The program is ready to manage appropriate actions to minimize losses, and preserve evidence, should a contingency occur.
- c. The program is prepared to manage the contingency situation until a formal investigation board is established.

2.2 MANAGER, LAUNCH INTEGRATION, KSC

The Manager, Launch Integration, KSC is directly responsible for management of contingency activities after a suspected launch or EOM landing contingency has been reported. Immediately following a suspected contingency, the Manager, Launch Integration, KSC will implement this plan anticipating that the AA-OSF will declare the incident a program contingency.

The Manager, Launch Integration, KSC, will chair the MRT within one hour and 30 minutes after a contingency has been reported. The MMT will provide direct support to the Manager, Launch Integration, KSC.

The Manager, Launch Integration, KSC appoints the Chair of the Mishap Investigation Team (MIT), and activates the MIT, as necessary, with the approval of the AA-OSF.

2.3 MANAGER, SPACE SHUTTLE PROGRAM INTEGRATION

The Manager, Space Shuttle Program Integration is responsible for chairing the MMT during on-orbit activities. If a suspected mission contingency occurs, it is the responsibility of the Manager, Space Shuttle Program Integration, to coordinate and chair the MRT from JSC, and to inform the MMT.

Immediately following a suspected mission contingency, the Manager, Space Shuttle Program Integration, JSC will implement this plan anticipating that the AA-OSF will declare the incident a program contingency.

Responsibility for contingency operations will be transitioned back to the Manager, Launch Integration, KSC, after landing has occurred.

2.4 SPACE SHUTTLE PROGRAM ELEMENTS (MSFC PROJECTS/EVA/FCOD/PAYLOADS PROCESSING/SHUTTLE PROCESSING/SYSTEMS INTEGRATION/VEHICLE ENGINEERING)

In the event a failure, accident, or incident occurs involving SSP hardware or facilities, it is the responsibility of the respective element manager to take the following actions:

- a. Assure that all possible action is taken to prevent injury to personnel, and damage or loss of equipment;
- b. Notify, by the most expeditious means, the Manager, Space Shuttle Program; the respective Center Director; AA-OSF; and the Deputy AA-OSF;
- c. Assure that the scene is secured against action that could impair investigation;
- d. Protect records, logs, data books, film, etc.
- e. Initiate preliminary on-site assessment to determine scope of potential contingency;
- f. Initiate their respective center contingency action plans;
- g. Support investigations of SSP contingencies under its own direction or under the direction of the lead center, a Headquarters Mishap Investigation Board (MIB), or any board established by the NASA Administrator or the President of the United States; and
- h. Prevent sabotage and provide security.

2.5 MISSION OPERATIONS

When a potential contingency situation arises during mission operations, the Flight Director, as specified in JSC 12805, Flight Control Operations Handbook, will put contingency procedures into effect. All flight control and support personnel will be required to complete these procedures. Logs of each individual's equipment status prior to and at the time of the potential contingency will be completed. JSC Form 1441, Flight Director's Mission Log, will be used and completed as soon as possible after a mission contingency and prior to the release of the individual from the MCC or his/her support area. These logs will be collected by each area/specialty supervisor or lead flight controller, and forwarded to the Flight Director, who will provide the data to the MIB. A roster of all mission personnel will be provided in addition to the logs. At the time a contingency is suspected or declared, all personnel will immediately verify that their logs are up-to-date and will institute a "hands-off" policy with regard to switches, push-button indicators, knobs, recorders, etc., as is appropriate to continued flight safety. The MCC will remain active in support of the potential contingency until released by the AA-OSF

or the Manager, Space Shuttle Program. Upon release of the MCC, its functions in support of the contingency will be transferred to the Technical Action Center.

3.0 REQUIREMENTS

3.1 PERSONNEL NOTIFICATION

All Space Shuttle program elements shall provide predefined notification lists within their respective center contingency action plans to address any failure, accident, or incident involving program resources. These predefined notification lists will be executed within 60 minutes of the suspected incident. The notification shall include a description of the potential contingency; its cause, if known; associated information leading up to the potential contingency; any actions that have been initiated or are planned; and recommendations for a course of action.

The manning of action centers and communication networks also shall be predefined to ensure an organized and timely response. Attachment 2 describes the NASA Action Centers at NASA HQ, MSFC, KSC, JSC, and SSC.

3.1.1 Launch Notification Sequence

The Manager, Launch Integration, KSC will notify the members of the MMT who, in turn, will notify their respective organizations. The Flight Director shall notify the JSC MCC, and the LSO shall notify specific NASA and other government personnel.

3.1.2 Mission Notification Sequence

During SSP mission activities, officials will be notified through normal mission-monitoring activities. The SSP Manager will notify the Deputy AA for International Space Station and Space Shuttle or delegated agent of the potential contingency.

3.2 TEAM NOMINATIONS

The Manager, Launch Integration, KSC, or his designee shall be responsible for publishing a list of the qualified personnel two weeks prior to the FRR for each flight. This includes membership of the NASA MRT, MIT, RRT, and the Crew Recovery Team (CRT). MIT personnel will be on alert to depart for the contingency scene as soon as a contingency has been declared. A list of the positions to be filled for each team is included in Attachment 1.

The travel of all NASA personnel to an overseas landing site shall be approved by the AA-OSF, with responsibility delegated to the Manager, Launch Integration, KSC. All personnel deployments and manifests will be provided to the Office of External Rela-

tions at NASA HQs approximately two weeks prior to each mission to ensure timely visa requests.

3.2.1 Mishap Investigation Team

The MIT shall be responsible for immediately traveling to the contingency site to gather first-hand information, take witness statements, and preserve material, which could be valuable to the formal investigation board. The turnaround/ salvage teams shall not begin their operations until the Orbiter is released by the MIT. The MIT shall comply with NPD 8621.1G and the NASA Headquarters OSF SFO Contingency Action Plan. The MIT Chair is appointed by the Manager, Launch Integration, KSC and approved by the AA-OSF. Once deployed, all MIT members are considered on detail from their field centers and are responsible only to the Chair. If the Orbiter should land undamaged, a decision not to deploy the MIT may occur at the MRT. Reference Attachment 5 for the detailed MIT Operations Plan.

3.2.2 Rapid Response Team

KSC shall prepare a KSC Off-site Transportation Plan for TAL site deployment. The RRT will arrive at the contingency site within approximately 18 hours. These plans shall be modified realtime to reflect the actual condition of the Orbiter. The activation of the airlift shall begin when the LRD calls the DDMS Operations SOC to request airlift. The SOC shall then notify the Air Mobility Command (AMC) Tanker Airlift Control Center for actual aircraft deployment. KSC, in conjunction with the AMC Tanker Airlift Command Element (TALCE) (once in place), shall coordinate support for arriving aircraft at NASA and TAL facilities.

The RRT shall consist of personnel under the direction of the KSC GOM who will evaluate the condition of the Orbiter and determine any additional requirements to prepare the Orbiter for ferry. The RRT will modify existing contingency planning to accommodate the realities of the Orbiter configuration and landing site facilities. If Orbiter towing equipment is not available at the landing site, the RRT will transport towing equipment to the site, if possible. Most of the RRT shall be deployed from KSC. For a TAL, the aircraft will pick up personnel and equipment at the KSC SLF approximately six hours after the TAL declaration. Estimated deployment timelines are in Attachment 6 of this appendix.

- a. Augmented Landing Site Rapid Response - Three landing sites in the European and African continents shall have personnel trained to participate in an Orbiter recovery. Personnel from the sites at which the Orbiter did not land will be utilized at the actual landing site. The aircraft used for transportation will be the SAR or MEDEVAC aircraft (C-130) stationed at the TAL sites. The KSC GOM shall identify the personnel, and the request for transportation will be coordinated with the DDMS and the DOD/SOC at PAFB.

- b. Non-augmented Landing Site Rapid Response - Unscheduled Orbiter landings will likely occur at ALS where NASA and DOD personnel will be trained and equipped to take care of an Orbiter that has landed. However, the possibility remains that the landing of an Orbiter may occur at an airfield other than an ALS. If such a landing should occur, the capability may exist for equipment and personnel at the ALS to reach the Orbiter before any response aircraft from CONUS. The aircraft used will be the SAR or MEDEVAC aircraft stationed at Zaragoza Air Base (AB), Banjul, and/or Ben Guerir.

3.2.3 Crew Recovery Team

In the event of a non-CONUS landing, the JSC FCOD will send the KC-135 aircraft containing the CRT from JSC EFD to the location of the flight crew. The purpose of this aircraft is to return the flight crew to the U.S. Transportation of other JSC personnel on the KSC RRT will be provided to the KSC SLF. A DDMS provided aircraft will be used as a backup aircraft in the event that the NASA KC-135 is unavailable. The DOD, using available SAR/MEDEVAC aircraft, will provide evacuation for uninjured flight crew members to the nearest U.S. military base, if necessary. The estimated typical TAL timeline for the KC-135 deployment is in Attachment 6 of this appendix.

3.3 MISHAP RESPONSE TELECONFERENCE

A MRT will be established within one hour and 30 minutes after a suspected launch, on-orbit, or EOM landing contingency occurs.

- a. Launch MRT - The KSC Launch Integration Staff Office will be responsible for coordination and set-up of the teleconference in Room 1R29 of the Launch Control Center. The teleconference will be effected by MCI communications. The Chair shall be the Manager, Launch Integration, KSC. The teleconference shall cover a review of pertinent facts, statements of contingency actions, and a review of deployment schedules of response teams. Access to the MRT will be predefined, and approved by the Manager, Launch Integration, KSC prior to the prelaunch MMT review.
- b. Mission MRT - Upon notification of a suspected contingency, the Manager, Space Shuttle Program Integration will chair the MRT from JSC. The Space Shuttle Customer and Flight Integration Office, JSC will coordinate the teleconference.

A complete description of the MRT is included in this appendix in Attachment 3.

3.4 SEARCH AND RESCUE REQUIREMENTS

SAR capabilities will be provided through the DDMS on a per site basis. Given 24-hour advanced notice, Air MEDEVAC will be available at the primary CONUS EOM sites and the TAL sites. ELSs will have no prepositioned Shuttle support resources and the DOD SAR and MEDEVAC effort will be on a “best effort” basis.

3.4.1 Kennedy Space Center

KSC will have the following resources available for launch, RTLS, EOM, and near coastal bailout:

Required:

- a. DOD HH-60 helicopters on standby at the SLF
- b. One UH-1 NASA helicopter
- c. One DOD HC-130 positioned 175 nm downrange (excluding EOM support)
- d. One DOD HC-130 and KC-130 positioned at PAFB (excluding EOM support)

If available:

- a. One E-2C positioned at PAFB (excluding EOM support)
- b. One U.S. Navy ship with helicopter (excluding EOM support)
- c. One Coast Guard cutter with helicopter

Each DOD helicopter will carry one medical doctor and two pararescuemen and have the capability to transport two astronauts in litters. Each HC-130 will have two 3-man pararescue teams with motorized inflatable rafts.

3.4.2 Edwards Air Force Base

When given 24-hour advanced notice, EAFB will have DOD UH-60 or UH-1 MEDEVAC helicopters available for EOM landings. Each UH-60 helicopter will carry one medical doctor, three Emergency Medical Technicians (EMTs), and up to three flight crew members. Each UH-1 helicopter will carry one medical doctor, one EMT, and two flight crew members.

3.4.3 White Sands Space Harbor

WSSH will have UH-1 MEDEVAC helicopters available for EOM landings, given 24-hour notice. Each helicopter will carry one medical doctor, one EMT, and two flight crew members.

3.4.4 TAL Sites

TAL sites will have available the following SAR/MEDEVAC resources to support a landing:

- a. One DOD fixed-wing aircraft (C-130) at Banjul, The Gambia, for low inclination launches
- b. One DOD fixed-wing aircraft (C-130) at Ben Guerir, Morocco
- c. One DOD fixed-wing aircraft (C-130) at Zaragoza AB, Spain, for high inclination launches

The C-130 aircraft at Ben Guerir, Banjul, and Zaragoza will have two flight surgeons and nine pararescue specialists onboard. Each aircraft will be capable of transporting the entire flight crew. Fixed-wing assets along with equipment to support landing activities will be transported to Moron, Spain as needed.

3.5 EMERGENCY MEDICAL SERVICES

The Director, Space and Life Sciences Directorate, JSC has overall management responsibility for EMS operations. This will be implemented by the Medical Operations Branch through the FCR surgeon and through the respective site EMS coordinators. The on-scene physician is responsible for making realtime trauma treatment decisions until such times as the flight crew member is under the care of an Intermediate Medical Care Facility (IMCF) or Definitive Medical Care Facility (DMCF). Patient information will be relayed from the on-scene physician to the site EMS coordinator. EMS's are described more fully in Attachments 7 and 9 of this appendix.

3.6 COMMUNICATIONS

In the event of an unscheduled landing, all operational communications will remain in their landing support configuration until direction to do otherwise is obtained from the MMT or other appropriate site managers. Any other predefined communications in support of unscheduled landings will be activated after crew egress. It can be expected that the support role of some facilities will change to support this unscheduled event. For any unscheduled landings associated with the launch phase, the MMT will exercise its management role while still at the KSC LCC. Landings occurring after the MMT has arrived at JSC will be supported using the Action Center in the MCC. Landings at any non-CONUS bases with U.S. military presence will have telephone capability in place and active to either the tower or airport manager's facility. This phone line capability is provided by the DOD SOC. For landings at non-CONUS sites without U.S. military presence, the LSO in the MCC will utilize a hotline to the State Department. The State Department will contact the embassy in the country where the landing occurred. The

embassy will contact to the airport tower or airport manager's office. Within three days of a landing at a TAL site or non-CONUS ELS, DDMS will provide a 24-channel voice communications capability to handle non-secure communications with the DOD SOC and KSC.

3.6.1 MCC Communications

Handover of the Orbiter from the JSC FCT to the KSC turnaround team occurs at flight crew egress. At this time, the FCT and communication lines are nominally released. If a contingency landing should occur, continuing communications between the flight crew and the MCC Capsule Communicator (CAPCOM) and Flight Director will be required. This may occur via telephone or by leaving the flight communication channels active. It is to be expected that all communication channels will remain active until the MMT convenes. For an unscheduled landing, the voice control element and the LSO would remain on console in the MCC to provide support to those elements, which are involved in evaluating the situation.

3.6.2 TAL Sites

The primary TAL sites will have three International Maritime Satellite (INMARSAT) terminals available for use prior to launch. These circuits will provide primary communications to the MCC and LCC. The channels are:

- a. Landing Field Prime 1
- b. Weather Observer, which is time-shared between voice and data transmissions

The following circuit reallocations will occur after the landing:

- c. The Landing Field Prime 1 circuit will be left to its normal functions and additional JSC/DDMS coordination, as necessary.
- d. The Weather Observer circuit will be reconfigured to the Convoy Commander net, to be used for local UHF communications with units around the TAL site.
- e. The Weather Aircraft circuit will be used for initial MCC communications including medical status, flight crew debrief, flight crew family conversations, and recording the flight crew's statement. Should a bailout occur, this circuit would be used by DDMS to communicate with the SAR aircraft.

In addition, each flight crew member will have a PRC-112 UHF handheld radio in his flight suit, capable of transmitting and receiving on 282.8 MHz and 243.0 MHz. Attachment 8 describes the communications available at each TAL site.

3.6.3 Daily Status Teleconference

A daily status teleconference will be established from the landing site to KSC to report the progress of turnaround operations. The time will be established after the MRT.

Participants will vary according to the condition of the Orbiter and the recovery and turn-around progress.

3.7 AVAILABLE LANDING SITES

There are a variety of landing sites loaded into the Orbiter software available for flight crew selection during flight by item execution on the horizontal situation display. High and low inclination launches have different sites defined in the software. In addition, landing sites are defined as either (1) augmented, with Shuttle-specific landing aids and NASA personnel available or, (2) emergency, with 8,500 feet of available runway and a TACAN. The sites available are listed in NSTS 07700, Volume X - Book 3. Personnel at DOD ALS's and overseas ELS's have received rescue training. Attachment 6 of this appendix lists the types of landings that could occur and a nominal contingency response timeline for each site. Annex 1 to Appendix R will be published as a separate document for each mission to specify the configuration and operations for each landing site. This document will assist KSC and DDMS in planning and staffing for required support.

3.7.1 Return to Launch Site

The RTLS scenario will return the Orbiter to the SLF within 25 minutes. The RTLS may be declared between approximately T+2:30 and T+4:05 minutes. A convoy will be located at the SLF with purge, towing, fire, and rescue capabilities. Attachment 6, Table R6.1, of this appendix details an estimated RTLS timeline.

3.7.2 Transoceanic Abort Landing

A TAL may result in the Orbiter landing at the prime TAL sites of Ben Guerir, Morocco; Moron AB, Spain; Zaragoza AB, Spain; or Banjul, The Gambia. The TAL may be declared between approximately T+2:30 minutes and MECO. The primary TAL site will be manned by approximately 40 predeployed people to provide landing aids and weather operations. Fire and rescue capabilities will be present. The DOD MEDEVAC aircraft will evacuate the flight crew to Naval Station Rota, Spain if uninjured, or to appropriate medical facilities if injured. The flight crew will remain together unless medical circumstances dictate otherwise. The USA Transportation Office has developed airlift schedules for RRT personnel and equipment. All TAL sites are downgraded after launch day, with most of the personnel support released. If a TAL occurs, the NASA GOM will have a prepared press statement for release to the local media thanking the local government and explaining the nature of the landing.

Attachment 6, Table R6.3, of this appendix details a typical TAL timeline.

3.7.2.1 Support Requirements Available at Each TAL Site

Different TAL sites are governed by different international agreements and may have site-unique support personnel and facilities available. A synopsis of the support

provided is included in Attachment 8 of this appendix on those sites that have a high probability of a TAL occurring.

3.7.3 Abort Once Around

The AOA will result in a landing at either EAFB, California; WSSH, New Mexico; or KSC, Florida. It may be declared from MECO to approximately T+30 minutes. There will be personnel at each location to support convoy operations. This convoy does not allow the vehicle to remain powered up, but has adequate equipment for purge (excluding WSSH) as well as fire and rescue operations if needed. KSC ground operations personnel will be immediately dispatched for ground turnaround activities. The vehicle will remain on the runway until KSC personnel arrive if it is damaged; otherwise, the Orbiter will be secured and towed to the deservice area. Warm air purge (excluding WSSH) and around the clock surveillance will be provided until the turnaround team arrives. Attachment 6, Table R6.4, of this appendix describes a typical AOA timeline.

3.7.4 Emergency Landing Sites

3.7.4.1 Primary Landing Site (PLS)

Daily PLS's are identified for each mission. These are the sites that provide the best opportunity for an emergency deorbit to a NASA-supported facility (EAFB, WSSH, KSC). It is also possible to have a Rev 3 Deorbit if the Orbiter is not cleared to continue to orbit. These landings will have minimal convoy support including purge, (excluding WSSH), fire, and rescue. The Orbiter will not remain powered up. The flight crew will return to JSC on the STA as soon as possible.

3.7.4.2 Non-NASA Supported Facility

For an emergency landing at a CONUS site, KSC personnel will be airlifted and equipment will be loaded and shipped by rail or truck from EAFB and KSC. It is estimated to take at least 72 hours to begin equipment deployment. The flight crew will be picked up by the JSC STA, as soon as possible, and returned to JSC. The response timeline will be similar for the AOA up through the teleconference and press conference.

3.7.4.3 Emergency Landing at Non-CONUS Site

For an emergency landing situation where the Orbiter lacks sufficient time or energy to reach a PLS, the software loads onboard the Orbiter provide guidance to a variety of landing sites. These sites will not have personnel predeployed, and if they are non-DOD airfields, they may not have received any Shuttle-unique rescue training. Some non-U.S. sites may not have been notified by NASA that they are in the software loads.

The profiles of the facilities available at each local U.S. Embassy are available through the U.S. State Department. The Embassies have been sent an Airgram giving pertinent details of an Orbiter landing, and actual notification of an impending Orbiter landing will be accomplished by the State Department via a flash message and telephone call. In these instances, the flight crew will retain responsibility for the Orbiter until either (1) they are evacuated out or, (2) a U.S. citizen with a secret clearance arrives at the landing site. The flight crew will carry onboard letters of explanation to the local officials giving simple precautionary instructions and telephone contacts. In the timeline, a C-130 is shown arriving at the site at L+5H. This assumes a landing has occurred at a site that could be reached by the SAR or MEDEVAC C-130 from an ALS within two hours. This time could vary significantly depending on how close to the ELS a U.S. presence is and on the suitability of the airfield. The RRT will arrive in a minimum of 25 hours, assuming the Landing Operation Team is already deployed to DFRF. Aircraft support from the AMC will be best effort. A typical timeline is described in Attachment 6, Table R6.5, of this appendix.

3.8 BAILOUT

Preparations for flight crew bailout will be initiated by starting cabin depressurization to equalize cabin pressure with the altitude. A nominal bailout will begin at 20,000 feet taking approximately two minutes to egress all flight crew members. A bailout may be declared at any time when it is known that there is insufficient energy to reach a runway. The Commander may declare a bailout without MCC knowledge if there is a loss of communications. DOD SAR forces are prepositioned at KSC and TAL sites to locate and/or retrieve the flight crew as soon as possible. Initial DOD SAR forces are under the control of the DOD SOC at PAFB, FL. The progress of the SAR effort shall be reported to the DOD LSO. The LSO will report efforts to the Flight Director and appropriate officials. A typical timeline is described in Attachment 6, Table R6.6, of this appendix.

3.9 CREW CHECKLISTS

The flight crew will carry onboard the Orbiter a series of checklists to aid in post-landing operations after a contingency landing at a non-EOM site. These will be located in the Flight Data File Maps and Charts book. The Initial Flight Crew Response is included in this appendix as Attachment 7.

3.10 ORBITER TURNAROUND

After the RRT begins initial safing and towing of the Orbiter, approximately 400 more personnel will be deployed for turnaround operations. These operations will be controlled by the TAL Orbiter Recovery Plan, which describes the responsibilities for the

management and conduct of the preparation and return of an Orbiter from a TAL site. The detailed plan for TAL Orbiter Recovery is included in this document as Appendix S.

3.11 SALVAGE OPERATIONS

In the event that the Orbiter/payload cannot be returned to KSC via normal ground turn-around and ferry procedures, SFOC-GO-0014, KSC NSTS Salvage Plan, will be implemented. This plan establishes the structure of the Shuttle salvage organization, the assignment of responsibilities, and management procedures to be used in conducting Orbiter/payload salvage operations.

Salvage operations requirements under the direction of KSC Shuttle Processing are as follows:

- a. Develop, prepare, and implement the Space Transportation System (STS) Transportation and Salvage Plans.
- b. Provide the organization and staffing of KSC/contractor personnel for recovery and salvage operations.
- c. Coordinate with applicable government and commercial agencies for services, equipment, and personnel required to effect recovery and salvage operations.
- d. Identify support hardware and equipment required for recovery and salvage operations.
- e. Coordinate with and advise the Department of Defense (DOD) regarding the transportation of personnel and equipment and/or salvaged items of the Orbiter and its payload.

Salvage Operations will be conducted in support of and under the direction of the designated mishap investigation team or accident investigation board until the scene/hardware has been released from further investigation.

3.12 ACTING WORKING GROUPS

Activation - The MIB Chair will activate working groups appropriate to the contingency situation. The Manager, Space Shuttle Program, may also activate the working groups either prior to the appointment of a MIB Chair, or at the request of the AA-OSF or delegated agent or at the request of another Center Director. The appropriate center will provide personnel to support any working group established to evaluate the contingency including those specified in this plan.

As a basis for the selection of working groups for a specific contingency investigation, a description of various working groups is provided in the following paragraphs. Any or all

of the working groups may be activated. There is no limit to the number of specialized working groups that may be appointed.

The MIB Chair may rearrange the working group structures and define their roles as required. Maximum use should be made of government and contractor experts as consultants or advisors to the working groups and the MIB.

Responsibilities - Each activated working group is responsible to the MIB for performing the following functions within the scope of the group's assigned investigation activities:

- a. Take all possible action to prevent injury to personnel and damage or loss of equipment, property or data.
- b. Obtain and review contractor and NASA records pertaining to receipt, inspection, configuration control, assembly, reliability, quality control and checkout, as well as any other records pertinent to the investigation.
- c. Obtain and review contractor and NASA procedures associated with the activity taking place at the time the contingency occurred.
- d. Reconstruct the circumstances under which the contingency could have been initiated.
- e. Perform interviews and obtain witness statements as soon as practical after the occurrence of the contingency.
- f. Review all data, which may have a bearing on the contingency.
- g. Report progress to the MIB on a periodic basis (daily, weekly, etc.) as required by the Board Chair.
- h. Participate in MIB meetings when working groups of overlapping interest are reporting.
- i. Perform other services as directed by the Chair of the Board of Investigation.

3.12.1 Impoundment/Classified Data Working Group

The Impoundment/Classified Data Working Group will review all data, information and findings to determine if security classification guidance is applicable, and where applicable, will ensure proper classification handling is implemented. This group will also have the overall responsibility for ensuring proper data impoundment procedures are followed and impoundment records are maintained.

3.12.2 Systems Integration Working Group

The Systems Integration Working Group is responsible for the analysis of the integrated Space Shuttle Launch Vehicle data which includes the environment, aerodynamics, flight dynamics, and total vehicle loads.

3.12.3 Vehicle Engineering Working Group

The Vehicle Engineering Working Group is responsible for all of the Orbiter systems-associated instrumentation, prelaunch and post-launch data applying to those systems, and associated support not covered by the Facilities and Ground Support Working Group.

3.12.4 Propulsion and Power Working Group

The Propulsion and Power Working Group examines Orbiter propulsion and power subsystems such as reaction control subsystem, auxiliary power unit, orbital maneuvering subsystem, and hydraulics, pyrotechnics, fuel cells and power reactant storage and distribution subsystems. This group will also assess the integrated main propulsion system for conditions that may have contributed to the contingency.

3.12.5 Navigation, Control, and Aeronautics Working Group

The Navigation, Control, and Aeronautics Working Group will analyze and document the performance of the integrated avionics system, define requirements and compare these data to preflight predictions and post-flight history, and reconstruct flight dynamics, as required.

3.12.6 Avionics and Software Working Group

The Avionics and Software Working Group will analyze and document the performance of the integrated avionics system (includes all essential onboard electronics and software). Coordinate the retrieval and interpretation of data from recovered avionics units. The group will interface with the Navigation, Control, and Aeronautics Working Group as appropriate.

3.12.7 Structures and Mechanics Working Group

The Structures and Mechanics Working Group will analyze the Orbiter structural integrity, loads, structural dynamics, materials, thermal protection system, thermal control system and the purge, vent, and drain system. Orbiter mechanical systems, including interfaces between the Orbiter and External Tank, and their performance will also be reviewed.

3.12.8 Crew and Thermal Systems Working Group

The Crew and Thermal Systems Working Group will examine Shuttle environmental control and life support systems and EVA equipment.

3.12.9 Mission Operations Working Group

The Mission Operations Working Group is responsible for the MCC, network control center, network stations, and the associated data which may have a bearing on

the contingency. Responsibilities may include a review of the flight plan, MCC, NCC, and network configurations and procedures, flight control, communications with the launch site and flight vehicle, and commands (including spurious signals) to the SSV or attached payload. This working group is also responsible for reviewing the adequacy of all operating procedures and actions. Adequacy pertains to the adherence to and compliance with the procedures, the effectiveness of the procedures, and the flight controller training and certification processes.

3.12.10 Flight Crew Operations Working Group

The Flight Crew Operations Working Group is responsible for analyzing any flight crew procedures, training, or other factors involving crew participation which may have a bearing on the contingency.

3.12.11 Payloads/Cargo Working Group

The Payloads/Cargo Working Group is responsible for all payloads, including payload support equipment and consumables. This responsibility also includes examining pre-launch and post-launch data, payload integration, engineering, hardware safety, checkout and payload status at the time of the contingency.

3.12.12 Photographic and TV Analysis Working Group

The Photographic and TV Analysis Working Group is responsible for analyzing all available photographic and video data which may have a bearing on the contingency. This working group will also be responsible for processing, screening, and analyzing optical products. The working group will define and manage all imagery enhancement required and will perform the intercenter coordination required for all photographic investigation products.

3.12.13 Records and Witnesses Working Group

The Records and Witnesses Working Group is responsible for obtaining and reviewing contractor and NASA records pertinent to the contingency, including records on receipt, inspection, configuration control, assembly, reliability, quality control, checkout, and modification. Records may be impounded, if required. This group will accumulate and review statements of witnesses as soon as possible after the contingency.

3.12.14 Timeline Working Group

The Timeline Working Group will analyze all data (telemetry, photographic, etc.) concerning the contingency and will correlate the chronological timeline which will be used by other working groups in their analyses.

3.12.15 Public Affairs Working Group

The Public Affairs Working Group is responsible for the coordination and release of information in accordance with the NASA management instructions and the operational procedures outlined in the Center support plans. The PAO representative will develop and coordinate all public releases with the MIB Chair and will also effect coordination through normal PAO channels.

3.12.16 Fire, Explosives, and Radiological Working Group

The Fire, Explosives, and Radiological Working Group is responsible for locating, identifying, and plotting the position of any fire, explosive, or radiological hazard patterns and the associated debris. This working group is also responsible for reconstructing the circumstances under which such hazards could have been initiated.

3.12.17 Medical and Toxicological Working Group

The Medical and Toxicological Working Group will analyze all medical factors which may have a bearing on the contingency and assess any actual or potential health hazards or stress associated with the mission. In the formation of this working group, reference should be made to the Medical Contingency Action Working Group, defined in Paragraph 3.12.18, established immediately following the contingency.

3.12.18 Medical Contingency Action Working Group

The Medical Contingency Action Working Group responsibilities are to identify the relevant circumstances under which an injury or death occurred, considering those factors which may have led to the injury or death; review all relevant medical documents including autopsy reports; and formulate recommendations concerning corrective action as appropriate.

3.13 OTHER WORKING GROUPS

In addition to the working groups listed above, the lead center for the investigation will support the following working groups.

3.13.1 Facilities and Ground Support Working Group

The Facilities and Ground Support Working Group will evaluate launch and landing facilities, test support systems, and ground support equipment that includes servicing and deservicing equipment at the primary, backup, secondary and contingency landing sites and at ground test sites.

3.13.2 Launch, Landing, and Retrieval Operations Working Group

The Launch, Landing, and Retrieval Operations Working Group is responsible for reviewing all flight, ferry, launch, landing, and ground service operations associated with

the contingency. This includes landing operations and deservicing at secondary and contingency landing sites, and at ground test sites.

3.13.3 Search, Recovery, and Reconstruction Working Group

The Search, Recovery, and Reconstruction Working Group is responsible for performing the search for and recovery of critical vehicle flight components for determination of the exact cause of the contingency. Upon recovery of the hardware, the working group will take precautions to maximize the use of the recovered components for failure analysis. These steps will include photographic documentation, preservation and sampling.

3.14 CONSULTANTS

The following consultants should be assigned by the MIB Chair and approved by the Center Director:

- a. Counsel from the legal office will be available whenever witnesses are being questioned or when legal problems arise, or when legal advice is needed by the MIB.
- b. The PAO will provide advice and assistance regarding news releases or public information.
- c. A safety official; and
- d. Others as required.

3.15 SPECIALISTS

As many specialists as necessary will be appointed by the Chair of the MIB. Specialists will participate in the MIB meetings and be available, at the request of the Chair, to assist the working groups. These specialists can be selected from outside NASA; however, non-government employees or non-full-time government employees will not be voting members of the MIB.

4.0 INVESTIGATION GUIDELINES

4.1 GENERAL

The investigation is conducted to determine the cause of the contingency and to recommend steps to prevent recurrence of such a contingency. If the MIT is activated following the MRT, all evidence and data collected will be turned over to the formal MIB, once established. The MIB and each working group involved in the investigation will

document their findings, determinations, conclusions, recommendations, and the procedural methods used during the investigation. Various guidelines for conducting an investigation are provided in the following paragraphs.

4.2 SUPPORT FACILITIES

The centers will support any investigation that may be required. Necessary resources to conduct the investigation - administrative, facilities, secretarial support, communications, data access and security systems - will be made available to the MIB. To the extent possible, the respective center will utilize existing facilities, organizations, and procedures for data handling and analysis.

4.3 SECURITY

Security, as it pertains to this plan, applies not only to classification of data, but also to restricting access to accident-sensitive areas to approved personnel only. NASA security regulations do not apply to the DOD supporting facilities, except for those specified instances where joint DOD/NASA agreements are available. Security coordination with contractor security services will be provided.

4.4 ACCIDENT SITE PRESERVATION

Those resources committed to support the SSP at the time of the contingency will be preserved in their operational state and configuration until released by the AA-OSF or MIT Chair. Space vehicle and launch or impact-site debris will be moved only as authorized by the AA-OSF or MIT Chair, except when mandatory for rescue personnel, firefighting, or removal of explosives. The DOD forces and equipment that are available for location and removal of salvageable components are responsible to the DOD for command and control. The AA-OSF or MIT Chair is responsible for requesting the DOD to utilize salvage equipment or move debris in the vicinity of KSC or adjacent shallow water areas, if required. The term vicinity applies to the Florida mainland and shallow waters of the Atlantic Ocean for which 45th Space Wing (45SW) agreements exist. The DOD Manager for Space Shuttle Support may be required to provide salvage/retrieval on a world-wide basis. Arrangements will be made to store damaged hardware, equipment, debris, etc., in controlled facilities, if necessary. Duties listed for the AA-OSF or MIT Chair in this paragraph will be assumed by the MIB Chair when investigation responsibility has been turned over to that board. Exceptions to this policy will be justified when equipment or actions are necessary to ensure personnel safety.

4.5 NETWORK INSTRUMENTATION

The Flight Director will make timely recommendations to the Manager, Space Shuttle Program, regarding equipment and network instrumentation to be released from further

flight or test support. The Manager, Space Shuttle Program, should reach early agreement with the DOD Manager on the appropriate status of configuration control for any pertinent DOD equipment. GSFC will be kept informed through the Network Director of all decisions involving the network and recorded data requirements.

4.6 DATA HANDLING

4.6.1 General

Data designated in the implementing message, such as realtime recordings of telemetry, plotboard charts, trajectory data, tape recordings, weather reports, digital command system and tone command tapes, acquisition aid data, signal-strength records, photographs, etc., will be reduced into legible format as soon as possible and distributed as required to support the investigation. The MIB Chair may specify any special data requirements for use by the investigating authority. All other mission data may be processed in a normal manner on a noninterference basis with data in support of the investigation.

4.6.2 Records

The Director of Mission Operations, the Manager, Space Shuttle Program, the Manager, Launch Integration, and the Manager, Space Shuttle Vehicle Engineering, may impound applicable/appropriate records and protect NASA records pertinent to the contingency. These may include records of receipt, inspections, modifications, reliability and quality control, assembly and checkout, configuration control, and resolutions of significant technical problems. A custodian within each working group will be designated for these records and will retain the records for use by the MIB.

4.6.3 Security of Data

Data associated with the contingency will not be reclassified. To ensure all data are available to the MIB, the distribution of these data will be restricted and accorded special handling procedures as specified in this plan. Except for direct support of continued flight operations, and to the extent permitted by law, no information or data will be released to any person without a need-to-know, as designated by the Manager, Space Shuttle Program until such time as the MIB Chair is appointed. To the extent provided by law, access to the processed and reduced data associated with the investigation will be limited to personnel involved with the failure investigation until the data are released by the MIB Chair.

4.6.4 Public Release

Any public release of information relating to a contingency is the responsibility of the PAO. The Manager, Space Shuttle Program, in consultation with the AA-OSF or

designated agent, will provide guidance to the Manager, Launch Integration and the Director of Public Affairs, Flight Director, DOD Representative, and other appropriate personnel until a duly appointed MIB assumes investigative responsibilities.

4.7 REPORTS

The Mishap Investigation Board Report shall consist of five volumes which are entitled:

- a. Volume I: The Report
- b. Volume II: Appendices
- c. Volume III: Proposed Corrective Action Implementation Plan
- d. Volume IV: Lessons Learned Summary
- e. Volume V: Witness Statements/Recordings/Transcripts

The convening authority may also require the MIB to prepare intermediate reports. The MIB reports will be submitted to the convening authority and to other organizations as appropriate.

The working groups will report their progress periodically or at prearranged intervals as established by the MIB. Preliminary investigative reports will be reviewed at a time designated by the MIB Chair.

Time-lost reports will be filed for cases in which hospitalization for more than five days or death occurs.

The MIB will assemble lessons learned in the form of a summary of corrective actions.

4.7.1 Minority Reports

If a MIB member disagrees with the findings, conclusions, or recommendations of a majority of the MIB, a non-concurrence statement will be appended to the report and become a part of the report.

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