National Aeronautics and
Space Administration

**NSTS 08131**
**REVISION C**
**JUNE 17, 1998**

**Lyndon B. Johnson Space Center**
Houston, Texas 77058

**REPLACES**
**NSTS 08131**
**REVISION B**

## SPACE SHUTTLE

# CONTAMINATION CONTROL PLAN

# REVISION LOG

| REV LTR | CHANGE NO | DESCRIPTION | DATE |
|---|---|---|---|
| | | BASELINE ISSUE (Reference: PRCBD S01678) | 08/21/75 |
| A | 2 | REVISION A (Reference: Level II PRCBD S40129, dated 7/23/86) also includes Change 1. | 09/15/86 |
| B | 6 | REVISION B (Reference: Level II PRCBD S41472K-R1, dated 10/23/89) also includes PRCBD S41472K and Change Nos. 3 thru 5. | 10/27/89 |
| C | 7 | REVISION C (Reference: Space Shuttle PRCBD S061042, dated 5/12/98) also includes S041880B, SSP DOC-271 and SSP DOC-307. | 06/17/98 |

CHANGE SHEET

FOR

NSTS 08131 - Space Shuttle
Contamination Control Plan

REVISION C - CHANGE NO. 7

Program Requirements Control Board Directive Nos. S041880B, dated 12/31/96; S061042/(1-1), dated 5/12/98; SSP DOC-271 and SSP DOC-307.(1)

June 17, 1998

Robert H. Heselmeyer
Secretary, Program Requirements
Control Board

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CHANGE INSTRUCTIONS

1. This is Revision C to NSTS 08131 dated June 17, 1998, which replaces Revision B dated October 27, 1989. Please discard Revision B to NSTS 08131 and utilize this Revision C in its place.
2. This Revision C includes the contents of NSTS 08131, Revision B as amended by this Change 7.
3. Subsequent changes to NSTS 08131 will be processed against this Revision C.

_____ _____
Signature of person incorporating changes Date

NSTS 08131 - Space Shuttle
Contamination Control Plan

*Revision C (Reference PRCBD Nos. S041880B, dated 12/31/96; S061042, dated 5/12/98; SSP DOC-271 and SSP DOC-307)

## LIST OF EFFECTIVE PAGES

June 17, 1998

The current status of all pages in this document is as shown below:

| Page No. | Change No. | PRCBD No. | Date |
|---|---|---|---|
| i - vi | Rev. C | * | June 17, 1998 |
| 1-1 - 1-2 | Rev. C | * | June 17, 1998 |
| 2-1 - 2-2 | Rev. C | * | June 17, 1998 |
| 3-1 - 3-4 | Rev. C | * | June 17, 1998 |
| 4-1 - 4-2 | Rev. C | * | June 17, 1998 |

NSTS 08131

# SPACE SHUTTLE

# CONTAMINATION CONTROL PLAN

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## FOREWORD

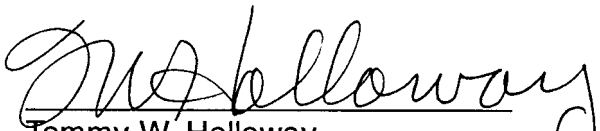
Efficient management of the Space Shuttle Program (SSP) dictates that effective control of program activities be established. Requirements, directives, procedures, interface agreements, and system capabilities shall be documented, baselined, and subsequently controlled by SSP management.

Program requirements controlled by the Manager, Space Shuttle Program, are documented in, attached to, or referenced from Volumes I through XVIII of NSTS 07700.

This plan identifies the overall tasks and responsible organizations required to ensure contamination control of the Space Shuttle System. The Space Shuttle Flight and Ground System Specification (NSTS 07700, Volume X) and Interface Control Documents, document and control the SSP requirement.

The SSP Contamination Control Program Plan does not control contamination requirements, but instead, provides management visibility into the manner in which the SSP is controlling contamination.

All elements of the SSP must adhere to these baselined requirements. When it is considered by the Space Shuttle Program element/project managers to be in the best interest of the SSP to change, waive or deviate from these requirements, an SSP Change Request (CR) shall be submitted to the Program Requirements Control Board (PRCB) Secretary. The CR must include a complete description of the change, waiver or deviation and the rationale to justify its consideration. All such requests will be processed in accordance with NSTS 07700, Volume IV - Book 1, and dispositioned by the Manager, Space Shuttle Program, on a Space Shuttle PRCB Directive (PRCBD).



Tommy W. Holloway
Manager, Space Shuttle Program

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# 1.0 INTRODUCTION

## 1.1 PURPOSE

This document defines the planned, organized approach to development and implementation of a coordinated program for control of contamination within the Space Shuttle System. This program implements contamination control requirements of NSTS 07700, Program Definition and Requirements: Volume V, Information Management Requirements; Volume X, Space Shuttle Flight and Ground System Specification; Volume XIV, Space Shuttle System Payload Accommodations; and the subtier contamination control requirements documents, SN-C-0005, Specification, Contamination Control Requirements; and SE-S-0073, Specification, Fluid Procurement and Use Control. The program defined herein shall be implemented to assure that contamination does not compromise safety, performance, and reliability of the Space Shuttle System and associated payloads.

## 1.2 SCOPE

The scope of the contamination control program defined by this document encompasses design, procurement, fabrication, assembly, test, storage, delivery, operation, and maintenance of the Space Shuttle System.

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## 2.0 APPLICABLE DOCUMENTS

The following documents of the date and issue shown form a part of this document to the extent specified herein. "(Current Issue)" is shown in place of a specific date and issue when the document is under Space Shuttle PRCB control. The current status of documents shown with "(Current Issue)" may be determined from NSTS 08102, Program Document Description and Status Report.

| | |
|---|---|
| NSTS 07700<br>Volumes I - XVIII<br>(Current Issue) | Program Definition and Requirements<br><br>Ref. Foreword |
| NSTS 07700,<br>Volume IV<br>(Current Issue) | Configuration Management Requirements<br><br>Ref. Foreword |
| NSTS 07700<br>Volume V<br>(Current Issue) | Information Management Requirements<br><br>Ref. Para. 1.1 |
| NSTS 07700<br>Volume X<br>(Current Issue) | Space Shuttle Flight and Ground System Specification<br><br>Ref. Foreword, Para. 1.1, 3.1 |
| NSTS 07700<br>Volume XIV | Space Shuttle System Payload Accommodations<br><br>Ref. Para. 1.1 |
| NSTS 08110<br>(Current Issue) | Space Shuttle Ground Support Equipment Integration Plan<br><br>Ref. Para. 3.2.2.2 |

| | |
|---|---|
| SE-S-0073<br>(Current Issue) | Specification, Fluid Procurement and Use Control<br><br>Ref. Para. 1.1, 3.2.2.2, 4.2 |
| SN-C-0005<br>(Current Issue) | Specification, Contamination Control Requirements<br><br>Ref. Para. 1.1, 4.2 |

## 3.0 REQUIREMENTS

### 3.1 GENERAL

Program Offices are responsible for assuring the development, documentation, and effective implementation of their respective Shuttle contamination control plans. The four element plans, the Space Shuttle Operational Contamination Control Plan, the Integration and Ground Turnaround Contamination Control Plan, the Main Propulsion Test Article Contamination Control Plan, and this document, comprise the contamination control program for the Space Shuttle System as required by Paragraph 3.6.12 of NSTS 07700, Volume X.

### 3.2 PLANS AND RESPONSIBILITIES

#### 3.2.1 Plans

The responsible organization for developing and executing contamination control plans are listed below:

| Contamination Control Plan | Responsible Organization |
|---|---|
| Element Plans | |
| SRB Contamination Control Plan | NASA/MSFC |
| ET Contamination Control Plan | NASA/MSFC |
| SSME Contamination Control Plan | NASA/MSFC |
| Orbiter Contamination Control Plan | NASA/JSC |
| Space Shuttle Flight Operational Contamination Control Plan For KSC | NASA/JSC |
| Integration and Ground Turnaround Contamination Control Plan For KSC | NASA/KSC |
| Main Propulsion Integrated Test Article Contamination Control Plan | NASA/MSFC |

#### 3.2.2 Responsibilities

##### 3.2.2.1 Space Shuttle Systems Integration Office

The Space Shuttle Systems Integration Office is the Office of Primary Responsibility to integrate and ensure implementation of the Program Contamination Control Requirements.

#### 3.2.2.2 Development Projects

It is the responsibility of each development project office (Orbiter, SSME, ET, and SRB) to comply with SE-S-0073 contamination requirement for each fluid interface with the respective element of the Space Shuttle Vehicle or submit a waiver request to justify noncompliance. Common Ground Support Equipment (GSE) providing fluids to the vehicle interface will provide filtration in compliance with SE-S-0073 and NSTS 08110, Space Shuttle Ground Support Equipment Integration Plan.

#### 3.2.2.3 Launch and Landing Project

The Launch and Landing Site (LLS) project is responsible for compliance with contamination requirements for systems and interfaces for which the LLS has design and operational integration responsibility.

### 3.3 ELEMENT PLANS

The element plans shall describe the overall organized approach for implementation of an effective contamination control program. The program described shall define the total planned contamination control activities from design concept through subcontracting, procurement, fabrication, assembly, test, and delivery of the contract items. Contamination controls and cleanliness levels shall be compatible with the most contamination sensitive fluids and design features involved. Controls for interface points for other elements, GSE, flight hardware, and payloads shall be included. The following items shall be emphasized:

a. The application of contamination control provisions during systems design.

b. Procurement and subcontracting contamination control.

c. Selection and training of personnel responsible for contamination control functions.

d. Cleanliness levels established for contamination sensitive surfaces.

e. Techniques for achieving, verifying, and preserving the required cleanliness levels.

f. Selection, application, and operation of controlled environment facilities.

g. Packaging, handling, shipment, and storage of items requiring contamination control.

h. Requirements for periodic updating of the Contamination Control Plans.

### 3.4 OPERATIONAL PLAN

The Space Shuttle Flight Operational Contamination Control Plan shall define the design rationale for Orbiter payload accommodations and the contamination controls to

be exerted during flight. It shall include significant tests and logic utilized in arriving at the design of the vehicle pertinent to contamination controls and shall cover the flight phase from lift off to approximately one half hour after touchdown. The content of the plan should include the following:

a. Orbiter Subsystems

    1. Functions

    2. Operations

    3. Effluents

    4. Leakages

b. Orbital Operations/Interactions

    1. Water Dumps

    2. RCS Plumes

    3. Fuel Cell Purges

c. Payload Bay Liner

d. Volatile Condensable Materials

e. On-Orbit Contamination Monitoring

f. Contamination Monitoring Studies

g. Post-Orbital Contamination Control

h. Tests (setup and results)

### 3.5 INTEGRATION AND GROUND TURNAROUND CONTAMINATION CONTROL PLAN

The Integration and Ground Turnaround Contamination Control Plan shall define the program to be implemented for effective contamination control during integration, turn-around, and contingency landing site operations. The document shall include all operations utilized to maintain or reestablish cleanliness levels of the Shuttle System. The content of the plan should include the following items:

a. Integration of the elements and payloads into the Space Shuttle System.

b. Environmentally controlled areas and their operation.

c. Maintenance of cleanliness during subsystem integration.

d. Cleanliness control of fluids.

e. Verification technique of subsystem and payloads interface cleanliness.

f. Contamination control during maintenance, repair, and replacement.

g. Contamination control accommodations at contingency landing sites.

h. Contamination control accommodations subsequent to landing and unloading of payloads.

### 3.6 MAIN PROPULSION INTEGRATED TEST ARTICLE CONTAMINATION CONTROL PLAN

The Main Propulsion Integrated Test Article Contamination Control Plan shall define the program to be implemented at Stennis Space Center (SSC) for effective contamination control during integration, testing and maintenance operations at this test site. The content of the plan should include the following items:

a. Implementation of elements contamination control requirements into the Main Propulsion Test Article (MPTA).

b. Environmentally controlled areas and their operation.

c. Maintenance of cleanliness during integration and testing.

d. Cleanliness control of fluids.

e. Verification technique(s) of MPTA cleanliness.

f. Contamination control during maintenance, repair, and replacement.

## 4.0 CONTAMINATION CONTROL INTEGRATION

### 4.1 GENERAL

Integration functions shall be conducted by the SSP to assure compatibility of contamination control between the various Space Shuttle project elements, fluid systems, and payloads. This effort will also assure uniformity of approach and technique thus providing maximum contamination control at minimum cost.

### 4.2 INTEGRATION REVIEWS

Contamination control integration shall include the following functions:

a. Review of Interface Control Documents (ICDs) for proper contamination control requirements.

b. Project level review of contamination control specifications and procedures for compliance with SE-S-0073 and SN-C-0005.

c. Review of the individual element contamination control plans, including revisions, specifications, and procedures during major project Preliminary Design Reviews (PDRs) and Critical Design Reviews (CDRs).

d. Review and comparison of major project element contamination control plans by the SSP. These reviews will be conducted by groups and organizations such as the SSP Particles and Gases Working Group; the Technical Manager Propulsion and Fluid Integration; and JSC Safety, Reliability, and Quality Assurance.

e. Compatibility review of all major project element Contamination Control Plans and ICDs during SSP design reviews.

f. Review of the Space Shuttle Operational Contamination Control Plan, and the Integration and Ground Turnaround Contamination Control Plan, by the following special contamination control working groups:

    1. JSC - Particles and Gases Working Group

    2. MSFC - Contamination Requirements Definitions Group (Payloads)

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