

# *Hitchhiker*

## Customer Accommodations & Requirements Specifications

740-SPEC-008

1999



(formerly HHG-730-1503-07)

APPROVED BY:

<hr/> <i>Signature of</i> <hr/> Joanne Baker Electrical Systems (Flight)	<hr/> 7/26/99 <hr/>
<hr/> <i>Signature of</i> <hr/> Barbara Milner Electrical Systems (Ground)	<hr/> 7/22/99 <hr/>
<hr/> <i>Signature of</i> <hr/> Gerard Daelemans Systems Engineering	<hr/> 7/29/99 <hr/>
<hr/> <i>Signature of</i> <hr/> Steve Wasserzug Mechanical Systems	<hr/> 7/22/99 <hr/>
<hr/> <i>Signature of</i> <hr/> Roger Counts Flight Assurance	<hr/> 7/22/99 <hr/>
<hr/> <i>Signature of</i> <hr/> James T. Harper Systems Safety	<hr/> 7/26/99 <hr/>
<hr/> <i>Signature of</i> <hr/> Theodore Michalek Thermal Systems	<hr/> 7/27/99 <hr/>
<hr/> <i>Signature of</i> <hr/> B. Thomas Dixon II Missions Operations	<hr/> 7/23/99 <hr/>
<hr/> <i>Signature of</i> <hr/> G.J. Daelmans ISO 9000 Compliance	<hr/> 7/26/99 <hr/>
<hr/> <i>Signature of</i> <hr/> Michael R. Wright I&T	<hr/> 7/26/99 <hr/>

---

*Signature of* 7/30/99  
Chris Dunker  
Office Chief  
Shuttle Small Payloads Project Office

REVISION *	DESCRIPTION	DATE	APPROVAL
B	COMPLETE REWRITE PER CCR #SSPP-918	7/30/99	C. Dunker ( <i>signature</i> )
C	RESISTANCE VALUE CORRECTION PER CCR# SSPP-919	10/18/99	J. Baker ( <i>signature</i> )

\* Original release of CARS: HHG-730-1503-07, 1991, (Yellow Cover)  
REV "A" of CARS: HHG-730-1503-07, 1994, (Pink Cover)

# SECTION 1

## Table of Contents

1.	INTRODUCTION.....	1-2
1.1	Purpose.....	1-2
1.2	Customer Payload Requirements (CPR) Document .....	1-2
1.3	HH Project Organization.....	1-2
1.4	Points of Contact .....	1-3
1.5	HH Payload Manifesting.....	1-3
1.6	Space Shuttle HH Accommodations.....	1-7
1.7	Transportation and Integration Costs .....	1-7
1.7.1	Integration Cost.....	1-9
1.8	Customer Survey.....	1-9
1.9	Internet Information .....	1-10

## List of Figures

Figure 1.1	NASA Form 1628.....	1-4
Figure 1.1A	NASA Form 1628.....	1-5
Figure 1.2	Customer Survey.....	1-11

## List of Tables

Table 1.1	Small Payload Accommodations (SPA) and Standard Mixed Cargo (SMC) Payload Classes .....	1-7
-----------	---	-----

## **1. INTRODUCTION**

The HH carriers can carry payloads side mounted in the Shuttle payload bay (Hitchhiker-S) or mounted on a cross-bay "bridge" structure (Hitchhiker-C). Both carriers have the same electrical systems and provide the same electrical interfaces and services for customer equipment. Either carrier can accommodate equipment mounted in a standard canister or on a standard vertical mounting plate. The cross-bay version also has horizontal top mounting plates.

In 1993, development was begun for a reduced version of HH (Hitchhiker-JR) intended for Shuttle secondary payload customers familiar with the Get Away Special (GAS) carrier interfaces who do not need HH ground control capability. Hitchhiker-JR (HH-J) is planned for an initial flight in 1995 and provides canister mounting and electrical interfaces similar to GAS but with some electrical power and improved monitoring capability.

### ***1.1 Purpose***

This document defines available standard interfaces and services provided by the HH carrier systems, the Shuttle Small Payloads Project (SSPP), the Shuttle Program, and NASA to a HH payload customer as well as requirements to be met by the customer in areas such as interfaces, environmental capability, Electro-Magnetic Interference (EMI) control, and safety.

### ***1.2 Customer Payload Requirements (CPR) Document***

The customer shall prepare a CPR document (appendix E) which specifies all interface requirements and parameters. The CPR contains thermal, mechanical, electrical, attitude control, alignment, test and checkout, contamination control, mission operations, and shipping and handling requirements. It also includes customer-prepared interface drawings and schematics. The document defines which of the available carrier services and interfaces the customer needs and is requesting. Requirements over and above those noted here need specific authorization by the HH Project Office. They shall be documented in the CPR document as deviations from standard interfaces and services.

Upon signature of the CPR, Appendix E to this document, the customer agrees to meet all the applicable customer requirements, (i.e. mechanical, electrical and thermal interfaces and deliverables, safety assessments and deliverables, etc.) as specified herein, for flight as a Hitchhiker payload.

### ***1.3 HH Project Organization***

The HH Program is managed by the Carrier System Division of the NASA Headquarters OSF and implemented by the GSFC HH Project Office which is part of the GSFC SSPP.

## **1.4 Points of Contact**

Key points of contact within the HH Program and Project Offices, as well as their telephone numbers follow.

### HH Program Office

NASA Headquarters, Code MO  
Washington, DC 20546  
Facsimile: (202) 358-2889  
Program Office:(202) 358-4413

### HH Project Office

Code 870  
Goddard Space Flight Center  
Greenbelt, MD 20771  
(301) 286-8799  
  
Facsimile: (301) 286-1694  
E-MAIL: SSPP@SSPP.GSFC.NASA.GOV  
Project Office: (301) 286-8799  
Customer Support Office: (301) 286-6760

### HH Reimbursable Payloads

NASA Headquarters, Code MO  
Washington, DC 20546  
Program Office:(202) 358-1849  
Facsimile: (202) 358-2803

## **1.5 HH Payload Manifesting**

In 1987, NASA redefined Space Shuttle payload categories as follows. Primary payloads weigh more than 8,000 pounds each; their requirements may determine Shuttle mission parameters such as orbit altitude and inclination. Secondary payloads are accommodated in space remaining after manifesting the primary payloads; weighing less than 8,000 pounds each, their requirements can not determine major mission parameters. Secondary payloads such as HH will be manifested under a system to be described later. Tertiary payloads are accommodated in space remaining after manifesting primary and secondary payloads; these currently consist of GAS payloads already in the GAS queue.

Potential HH customers should submit a Request for Flight Assignment, Form 1628 (Figures 1.1 and 1.1a) through the appropriate Headquarters discipline office and arrange to be included in the office priority list. Department of Defense (DOD) HH customers should contact the United States Air Force/Space Systems Division Code CLP.



National Aeronautics and Space Administration

# Request for Flight Assignment

Form Approved  
O.M.B. No. 2700-0040

Note - Please read and detach instructions before completing this request.

CONTROL NO. (MC Use)

TO	National Aeronautics and Space Administration Customer Services Code MC Washington, D.C. 20546	FROM	DEVELOPMENT COMPANY/AGENCY NAME AND ADDRESS
			PRINCIPAL CONTACT (Name and Phone, incl. Area Code)

## I-BASIC PAYLOAD AND FLIGHT DATA

1. PAYLOAD TITLE

2. PAYLOAD OBJECTIVES

3. CATEGORY

- a. U.S. COMMERCIAL                       b. DOD                       c. NASA                       d. FOREIGN COMMERCIAL  
 e. FOREIGN GOVERNMENT                       f. OTHER U.S. GOVT.                       g. JEA/OTHER

4. FLIGHT INFORMATION (Check at least one in items 1-4)

1.  a. SHARED                       b. DEDICATED  
 2.  a. CARGO BAY                       b. MIDDECK (Specify locker volume): \_\_\_\_\_  
 3.  a. ATTACHED                       b. DEPLOYABLE                       c. RETRIEVAL                       d. REVISIT/SERVICE  
 4.  a. KSC                       b. VLS

5. CARRIER

- a. PAM D                       b. PAM DII                       c. IUS  
 d. MPSS                       e. HITCHHIKER-G                       f. HITCHHIKER-M  
 g. SPACELAB (Specify: e.g., LM&P) \_\_\_\_\_                       h. OTHER (Specify) \_\_\_\_\_

## II-PAYLOAD REQUIREMENTS

6. PAYLOAD ORBIT REQUIREMENTS

- a. 160NM ALTITUDE/28.5 INCLINATION                       b. 160NM ALTITUDE/57 INCLINATION  
 c. OTHER: (1) NM ALTITUDE \_\_\_\_\_ ; (2) DEGREES INCLINATION \_\_\_\_\_                       d. ORBIT INSENSITIVE

7. PAYLOAD LAUNCH REQUESTED (Total launch(es) and date(s)) (Enter month and year only)

- a. NUMBER OF LAUNCHES \_\_\_\_\_  
 b. FIRST LAUNCH (Scheduled, stand-by, or short-term call-up) \_\_\_\_\_  
 c. SUBSEQUENT LAUNCH(ES) \_\_\_\_\_  
 \_\_\_\_\_  
 d. MINIMUM INTERVAL REQUIRED BETWEEN LAUNCHES \_\_\_\_\_

FIGURE 1.1 NASA FORM 1628

<b>II-PAYLOAD REQUIREMENTS (Continued)</b>					
8. UNIQUE PAYLOAD CONSTRAINTS (e.g., launch window, late servicing, early access, etc.)					
9. REMOTE MANIPULATOR SYSTEM REQUIRED <input type="checkbox"/> a. YES <input type="checkbox"/> b. NO			10. PAYLOAD MISSION DURATION REQUIRED <input type="checkbox"/> a. YES (Indicate hours/days) _____ <input type="checkbox"/> b. NO		
<b>III-PAYLOAD REQUIREMENTS CHARACTERISTICS</b> (The term payload refers to all customer provided equipment and associated carrier)					
11. LAUNCH	a. WEIGHT (LB/KG)	b. MAX. DIAMETER (IN/CM)	c. MAX. LENGTH (IN/CM)	d. CG (IN/CM)	
12. LANDING	a. WEIGHT (LB/KG)	b. MAX. DIAMETER (IN/CM)	c. MAX. LENGTH (IN/CM)	d. CG (IN/CM)	
<b>IV-QUESTIONNAIRE AND SERVICE REQUIREMENTS</b>					
DESCRIPTION				Y E S a.	N O b.
13. HAS EARNEST MONEY BEEN SUBMITTED?				<input type="checkbox"/>	<input type="checkbox"/>
14. DOES YOUR ORGANIZATION REQUIRE COPIES OF STANDARD STS DOCUMENTATION?				<input type="checkbox"/>	<input type="checkbox"/>
15. SERVICES (List any anticipated special services required)					
16. REMARKS					
17. TYPED NAME AND TITLE		18. SIGNATURE		19. DATE	

FIGURE 1.1A NASA FORM 1628

## **GUIDELINES FOR COMPLETION OF NASA FORM 1628 (Formerly STS Form 100)**

A completed NASA Form 1628 enables a payload developer to inform NASA of his or her intentions to use the National Space Transportation System (NSTS). Information contained in this form permits NASA to become familiar with general payload requirements and develop a preliminary STS cargo manifest which assigns the identified payload to a particular orbiter flight.

This form should be completed for a single payload entity rather than for individual experiments which would fly on a common carrier. Instructions listed below are intended to assist the payload developer in completing this form.

1. Payload Title - Enter the name you plan to use when referring to your payload.
  2. Payload Objectives - Identify the major objectives for this payload program. For example, "This payload will map the surface of Venus using radar from orbiting spacecraft. Instruments will include imaging radar and microwave radiometers."
  3. Category - Select the appropriate customer category by placing an "x" in the proper box.
  4. Flight Information - Select at least one category for each item listed. For example, a company requests a launch to deploy its satel-lite and a later launch to service it, in which the spaces designated as "Cargo Bay," "Deployable," and "Revisit/Service" would be checked.
  5. Carrier - Specify the type of carrier or upper stage required for the payload. Upper stage options are PAM-D, PAM-DII, IUS, TOS, SCOTS, IRIS, UNIQUE STAGE, HITCHHIKER-G, HITCHHIKER-M, SPACELAB (+ CONFIGURATION), MPES, PALLET, SPOC, SPAS, SPECIAL STRUCTURE, etc.
  6. Payload Orbit Requirements - Select the desired orbit for your payload. If item 6c. "Other" is selected, please identify both the degree altitude and inclination.
  7. Payload Launch Requested (Total launch(es) and date(s)).
    - a. Number of Launches - Enter the total number of flights required for this payload program.
    - b. First Launch - Enter the desired date for the first flight of this payload.
    - c. Subsequent Launch(es) - List the requested flight date for each additional launch.
    - d. Minimum Interval Required Between Launches - If you have requirements for a specific number of days, weeks, months, or years between your payload launches, identify the spacing timeframe.
  8. Unique Payload Constraints - List any unique requirements for your payload. Identify launch window constraints, experiment operating time, satellite checkout time, etc.
  9. Remote Manipulator System Required -Place an "x" in the appropriate box for use of Remote Manipulator System.
  10. Payload Mission Duration Required - If your payload requires a certain number of operating days in order to obtain the proper data, please indicate the number of hours and/or days required.

Payload Characteristics - The term payload refers to all customer-provided equipment and associated carriers. Using U.S. or S.I. (Metric) measurement units, enter launch and landing weight, diameter and length of the payload as well as the center of gravity, if known, in items 11 and 12.
  - Questionnaire and Service Requirements. Items 13 and 14 are self-explanatory. List in item 15 any anticipated optional services required. Optional services are tasks performed for a charge using the existing capabilities of NASA. Some examples of optional services which would be listed in this block are: extravehicular activity, non-standard altitude and inclination, payload retrieval packages, etc.
  16. Remarks - Enter any further comments that concern your payload program.
  - 17, 18 and 19 - This request is to be signed by an official within the company who can authenticate the information provided. NASA payloads require the signature of an Associate Administrator.
- NOTE - If you need any additional assistance in completing this request, mail your inquiries to the address shown on the face of the form, or call (202) 534-2347.

## 1.6 *Space Shuttle HH Accommodations*

HH payloads are accommodated on the Space Shuttle, which is operated by the NASA Headquarters Office of Space Flight. HH payloads are flown under the Space Shuttle Secondary Payload Program.

HH payloads can connect to one of the four Standard Mixed Cargo Harnesses (SMCH) in each Orbiter (normally used for cross-bay carriers) or to the Small Payload Accommodation (SPA) harness (normally used for side-mount carriers). The capabilities vary slightly as shown in Table 1.1.

TABLE 1.1 SMALL PAYLOAD ACCOMMODATIONS (SPA) AND STANDARD MIXED CARGO (SMC) PAYLOAD CLASSES

	<u>Small Payload</u>	<u>Standard Mixed</u>
Orbiter Electrical Harness	SPA	SMCH
Total Payload Power (28VDC)*	1.4kw	1.75kw
Nominal Total Energy (Kwh/day)*	6	12.5
Crew Control Panel	SPA Switch Panel	Standard Switch Panel
Payload Bay Locations	2-8, 12, 13	2-12

\* Includes Carrier Requirements of 75-125 W (1.8 - 3.0 Kwh/day)

HH carriers are designed to interface with either the SPA harness or the SMCH. Each Orbiter has a single SPA harness to service a payload in bay positions two or three. A SPA Switch Panel (SPASP) in Aft Flight Deck (AFD) position A6 provides for crew control of a SPA payload. Each Orbiter also has four SMCH cable sets which can be connected to payloads anywhere in the payload bay. Each SMC payload will be connected to one-half of a Standard Switch Panel (SSP). SPA power is obtained through a tap on one of the SMCH power lines and is restrained by the requirements of any SMC payload connected to that line.

HH-C payloads are equipped with electrical connectors on either end of the bridge for connection to either a SPA or SMCH harness.

## 1.7 *Transportation and Integration Costs*

HH is considered an extension of the basic Space Shuttle services. It is provided at no cost to NASA organizations (non-reimbursable organizations) for standard transportation and integration services. The standard HH integration service covers HH Project costs for a payload requiring no optional services or hardware. Additional integration costs are billed to the customer organization.

Reimbursable customers provide NASA with funds to cover transportation costs as well as standard and optional HH integration costs.

The OSF (Code MOC) has developed a preliminary policy for reimbursable HH payloads as follows:

The standard HH mounting "slot" accommodates any payload equipment which can be mounted in a canister or on a 25-inch mounting plate and attached to a HH side-mount or cross-bay carrier. The current charge factor per slot for customer payloads wishing to purchase space on a HH carrier on a shared basis is .0078. The FY1990 price for an entire shuttle payload is \$142M. The charge per HH slot is therefore .0078 x \$142M or \$1.108M. This charge covers shuttle transportation costs and standard GSFC integration services as defined in this document for a one-slot payload. Payloads requiring more than one slot are charged an integral multiple of the above fee. Fractional slot payloads are not allowed. The above example is for FY1990. Current year pricing is based on the current Shuttle flight price which may be obtained from NASA Headquarters, Code MO.

Customers requiring a dedicated HH carrier may be accommodated under the standard Shuttle Mixed Cargo Pricing Policy. GSFC integration charges for dedicated payloads are individually negotiated.

Customers desiring to use HH services as part of the customer's primary payload or on the customer's dedicated flight will pay GSFC integration charges to be individually negotiated. Contact NASA Headquarters, Code MO for current pricing policy.

In cases where GSFC and the customer identify optional GSFC activities required by the customer, these will be priced on a case-by-case basis and are funded by the customer organization.

Payloads sponsored by NASA discipline offices do not pay transportation costs. During the development of the Payload Integration Plan (PIP) with the Johnson Space Center (JSC) and the Kennedy Space Center (KSC), optional transportation services associated with a particular customer may be identified and estimated.

The current estimated weights (in lbs.) of various HH carrier equipment which could be used on a given mission are as follows:

Adapter Beam Assembly (ABA)	163.0
HH-S 50"x60" Plate (SPOC)	370.0
HH-S 25"x39" Plate	50.0
Avionics Unit (Beam Mount)	182.0
- Avionics	127.0
- Plate	50.0
- Bolts, etc.	5.0
Sealed 5 ft <sup>3</sup> Canister	153.8
HMDA Canister	234.5
HMDA w/ Window Canister	258.3
HH-C Carrier	2165.0
- HHBA	1434.6
- STP-1 MPE	323.4
- STP-1 Cables	144.9
- STP-1 Bolts	21.1
- Avionics Assy.	241.0

(Avionics 127.0)  
 (Plate & Misc. 114.0)

	SEALED	HMDA
Canister w/ Blankets	67.0	67.0
Bridge Brkts & Bolts	15.0	15.0
Ground Strap	0.2	0.2
Lower End Plate (LEP)	29.4	29.4
Lower IEC	7.0	7.0
Battery Vent	1.3	1.3
End Plate Bolts	4.0	4.0
Upper End Plate	24.0	---
Upper IEC	6.0	---
HMDA	---	75.5
HMDA Blankets & Sht. Mtl.	---	15.5
HMDA EMP	---	11.0
HMDA Cable from LEP	---	2.0
HMDA Relay Box	---	6.7
<b>Total</b>	<b>153.9</b>	<b>234.6</b>
HMDA Window		18.9
Window Retainer		4.9
<b>Total (HMDA w/ Window)</b>		<b>258.4</b>

### **1.7.1 Integration Cost**

The integration costs consist of the cost of a package of normal services defined in Section 3 of this document covering GSFC activities in support of all HH payloads. In addition to the normal services, optional GSFC integration services may be required. Anticipated GSFC optional services will be identified and estimated. Finally, JSC and KSC may impose optional service costs for special activities required by a particular payload. Any such anticipated charges will also be identified and estimated during GSFC evaluation of the customer's requirements.

If you need more information regarding integration costs, contact the HH Project Office.

### **1.8 Customer Survey**

As part of standard post-flight customer processing, the HH Project Office will distribute a Shuttle Small Payloads Project Customer Survey form (Figure 1.2), to be completed and returned at the customer's discretion.

## **1.9     *Internet Information***

The Project maintains an Internet web site for distribution of project related information including documentation, manifest data, photographs of carriers and payloads, information on symposia and workshops, and daily mission updates during flight operations. We will be happy to provide links to web pages of SSPP customers containing information of interest to the Shuttle payload community. The Internet address is: <http://sspp.gsfc.nasa.gov>.



## Shuttle Small Payloads Project Customer Survey



---

Mission:

Payload:

Date:

Name/Title (optional):

Organization/Company:

Phone:

---

**Please rate the following on a 1 - 10 scale (0 = n/a, 1 = poor, 10 = excellent, ? = not sure):**

1. Mission and pre-integration planning support from GSFC/SSPP:
  2. Integration & Test support provided by GSFC/SSPP personnel:
  3. Launch site support provided by KSC personnel:
  4. Mission ops support provided by GSFC/SSPP personnel:
  5. GSFC/SSPP response to special or new customer requests for support:
  6. Effectiveness of TIM's, design & safety reviews:
  7. Value added by having GSFC/SSPP personnel visit customer facility:
  8. GSFC/SSPP understanding and documentation of your requirements:
  9. GSFC/SSPP implementation of your requirements:
  10. Effectiveness of the training and security programs:
- 

**Please respond to the following questions (continue on other side if necessary):**

1. What have you enjoyed most about working with GSFC/SSPP?
2. What have you enjoyed least about working with GSFC/SSPP?
3. What processes or services provided by GSFC/SSPP have helped the most?
4. What could have been done more effectively or efficiently?
5. What did not add value to your operations, or caused "unnecessary" work?
6. What could have been done to improve your payload operations?
7. What additional comments do you have?

FIGURE 1.2 CUSTOMER SURVEY