SECTION I - Positional Restraints (Phase I)
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FOREWORD
Flight orientation.

Convenient access to hygiene compartment throughout entire callup location which is readily accessible to space couches.

Flight deck personnel.

Flight engineer provided with ability to maintain visual contact with flight deck personnel.

Social organization of space couches.

Reorganization of crew compartment components to improve emergency hatch.

Provisions for adequate escape aisle (passageway) from couches to in the mock-up for this configuration were as follows:

The design recommendations which were developed and incorporated and full compartment model.

Evaluated by fabricating a full scale, partial compartment mock-up.

X-axes docking crew compartment components were reviewed and evaluated.

Shuttle orbiter crew compartment X-axes docking
deck area with much more versatile hardware. We illustrated that to accomplish this goal would require a larger flight
mean of separate leisure and sleep facilities in that area.
area we were requested to look into with the objective being the establishment of the isolation of the flight deck from the crew compartments was another
convenience during launch, reentry and zero-G flight. A flexible coach positioning system for this compartment was suggested.
out the passenger compartment, and into space coach related activities.
important to consider less strenuous techniques of maneuverability throughout.
With the knowledge that future space flights may include the elderly, it was
during the various flight modes.

in developing concepts aimed at solving the problems of space coach access
in the passenger compartment study, Loo/Hey/Snith was primarily interested
Shuttle Orbiter Passenger Compartment and Flight Deck Flexibility

DESCRIPTIO

TASK

SECION
Private Quarters

B4 - Flight Deck Crew and Area Configuration

B3 - Space Couch and Track Detail of Modular

Compartments

B1 - Space Couch in Bracket-Supported Modular
may not be the best choice for a restaruant facility.

For a large hotel, it was necessary to achieve adequate
rest, but for a hotel where the space was limited, it was

The design of various restaruant systems was pursued after the

less space was utilized and component replacement

By placing the food/utensil collector and hand wash units on adjacent walls,

The relative merits of various restaruant concepts under identical conditions.

It is important to first base the restaruant design on the

To obtain useful data from a restaruant study, it is necessary to consider

Restaruant system for restaruant facility (Phase I)
In Hygiene Compartment
C4 - 95% Male - Launch and 0-6 Operations

C3 - Hygiene Facility Shoulder Restraint

C2 - Lowry/Seamer Hygiene Compartment Persecute

CI - Lowry/Seamer Hygiene Compartment Concept

for Shuttle orbiter
The primary screen is in place, all are located within arms length of the crewman and observable while in flight. Controls and emergency equipment are organized for quick retrieval. Immediate access items, such as personal gear, environment, and support planes to be designed to the maximum allowed. Space frame rather than being contained within it as in early concepts. The small passenger couch body support plane no top of the structural launch. It adjusts from flat for sleeping or upright for in-flight leisure and travel. The larger couches maneuver into the same orthostatics and contains more storage space. Limited to 77.5" x 27" x 44.6". It performs the same functions and couch helped establish the design direction for the smaller one which was experience and knowledge gained from the development of a large passenger.
concepts as explained in the final report.

2. The desired goal, reduction in food retrieval and pre-
   preparation area, led to a significant change in the
   system and layout. Two-dimensional sketches of the

MSC requested that Raymond Loewy/William Shelly, Inc., review

Order Food System and Caddy

DESCRIPTION

TASK

SECTION
When not in use, and collapsible units which would totally or partially fold out of sight, and ease of access. The clothing rests were organized for maximum space efficiency areas by order level to prevent holding of relatively clean items. Recommended that the garments should be segregated into isolated placed on the prevention of odors transfer between garments. We in the development of the over-the-counter clothing storage unit, emphasis was Temporary clothing rest.
Concepts presented included the use of non-irritating, easily cleaned belts.

Physical access and minimum body contact.

The system which was maximum simplicity.

As a result of the Phase I study, interest was developed in investigating

Reservoir System for Hygiene Facility (Phase II)
Recognizing the need to better utilize existing space due to unexpected requirements, a new layout was developed that efficiently utilizes available space.

The model illustrated that a negative habitability factor of the设计理念 could be avoided by adjusting the layout of the Z-axis docking area in the shuttle orbiter.

A 1:20 scale model of an MSF layout of the Z-axis docking area in the shuttle orbiter was constructed to analyze the impact of the skewed-Z axis on the orbiter.
Foot and wrist rests.

Parallel to a work bench utilizing various moveable or random access

The concepts developed were to allow the restrained individual to walk

Shoulder points selected, therefore, were the wrist and both feet.

natural bending and limit the reach of a restrained individual. The re-

and that any rigid restraining device above the waist would inhibit

It was decided that a three point restraint was necessary for stability

both areas are required to adequately produce a positive restraint.

Although individual illustrations centered on either the foot or waist area,

as necessary to complete a particular task.

It was necessary to allow him to have both hands free while maneuvering

particular task.

of the necessary for restraint, thus allowing him to concentrate fully on his

him to cover the largest work area possible without a conscious aware-

a limited amount of controlled movement was pursued in order to allow

The development of a flexible positive restraint which will allow a crewman

Flexible Positive Work Station Restraint (Phase I)

DESCRIPTION

TASK

SECTION
Adjustment
1- Foot Restraint with Foam Pad and Tension

12 - Horizontally Adjustable Restraint Arm Which

13 - Matching Protusion Devices on Sole of Shoe and

1- Flexible Restraint Arm Which Adjusts to Bullet
slope configuration of the crewman's shoe.

and reverse movement along a track. The foam covered bar conforms to

An adjustable toe bar located near the base of the unit allows forward

bench.

Length adjustment allows the crewman to adjust his distance from the

The track allows the arms to slide the length of the bench while the arm

in use, the arms fold out of a recess and couple into the crewman's belt.

sliding track with couplers located on adjustable fold away arms. When

from the bench. The frontal surface of the bench also incorporated a

free lateral movement with slack adjustment to enable movement away

belt system was located on the frontal surface of the bench which allowed

was constructed incorporating all of the selected concepts. A closed loop

To better evaluate the effectiveness of each system, a presentation model

selected location.

rotating belt and an adjustable toe bar restraint to restrain feet in a

including a waist belt which integrates with fold away arms, continuous

In phase I, lowery/Smith illustrated the practicality of several concepts

Postive Restraint (Phase II)

DESCRIPTION

TASK

SECTION
out of the way when not in use.

The couch is designed to provide all immediate needs of the crewman during leisure, sleeping, eating periods in zero-G and provide proper
neutral buoyancy testing.

In the original couch concept and was constructed for compatibility with
Shuttle Orbiter Passenger Couch - Full Scale Mock-up

DESCRIPTION

TASK

SECTION
The card, the model developed stresses simplicity of form and organization. By means of personalities to personalize the responses. To prevent crew interaction with inappropriate, and allow the emotional, feeling that all answers should be brief, but allow.

...
to MSC.

A light visual scale model of the selected concept was fabricated and pre-

sector mock-ups.

The design of the unit was developed with the aid of full scale human

build as a container becomes punctured.

their use priority, and are entirely enclosed to prevent dispersion of

for carrying cleaning agents and wipes have been allocated according to

may be carried as one or separately. The storage units within the caddy

The caddy and vacuum unit were designed as two interlocking units which

activities.

supply of wipes, disinfectants, etc. to support general housekeeping

vacuum unit and a portable, "caddy" section equipped with a limited

three basic parts: a master storage unit for central supply, a portable

The housekeeping equipment stored in the galley facility consists of

Housekeeping Equipment Storage
Threaded heighting is arranged in a matrix in the structure.

are attached to the shuttle structure by transporting threaded fasteners into
location based on the physical constrains of that location. The outer cases
option would be to provide the largest storage with possible for each storage
object of the master locker size
able in various sizes based on a set modular growth pattern (i.e., 24" X 24" X 24"

The system developed utilizes standard storage lockers which would be available.

The methods of rest charming are interchangeable.

try sizes are dependent on the size of the storage locker being used. However, the
the components on the trays are restricted using various techniques. The

unit to a location within the spacecraft.

single tray or several as a unit. If necessary, to transport that particular
these gives a swimming option in order to remove an entire locker, a
transportable (mounted horizontally, vertically, as a unit with individual.
inside the storage lockers is a system of trays (stlid into "C" shaped ex-

not designed as a single component.

design of each piece of equipment which are single mission related and
is that a flexible storage system will reduce requirements for custom
transporting a variety of experiments, equipment and mission supplies
therefore, the locker system must be developed which will lend itself to
mission storage requirements may vary from one mission to another.

DESCRIPTION

TASK

SECTION
contain, may be removed as desired.

The interior of the master storage locker is then divided up as required.

The end result of this system is that a totally flexible storage system from which individual trays in total groups and the items they hold are removable, the final result of this system allows one to subdivide the case horizontally as required. The middle horizontal tray allows one to subdivide the case vertically as well.

imported into any propositions desired relative to mission storage is enabled to be subdivided vertically at one-inch increments. Using the tray inserts which interlock with the extended inside walls by using that tray inserts which interlock with the extended inside walls.
Report.

Summarize each study which are more thoroughly covered in the final
Spacecenter Center, Houston, Texas. Selected Illustrations and copy
briefer all tasks completed during the 1972 contract period for manned
as required by NASA Contract #NASSA-9-12479, this report summatizes

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