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Front cover designed by Raymond Loewy





Skylab in space

Raymond Loewy and Living in Space

Significance of Space Exploration and of its History

With the successful mission of the first re-useable Space Shuttle, code-named Columbia, from 12 to 14 April 1981, man's vision of living in space was given practical reality and assured of a future. The Shuttle marks a new era in space exploration and in the history of mankind.

The potential benefits arising from this momentous event are virtually limitless, but already it is envisaged (and the first 60 flights are already committed) that payloads of regular Shuttles will establish:

- journeys into orbit as routine as commercial airline flights with Shuttles operating under their own
 power without the necessity of lift-off boosters
- military communications, navigation, weather and surveillance satellites ("the nation that controls space will control the world")
- the construction of a giant 96-inch telescope operating high above the distorting effects of the atmosphere enabling astronomers for the first time to see any planets around nearby stars, to observe objects 100 times dimmer than those that can be seen through ground-based telescopes and perhaps also to detect light emanating from the very edge of the visible universe, which will contribute to our understanding of evolution and the origin of life
- the construction of space platforms and even of space colonies with space nations under their own governments, flags and laws
- the construction of the European spacelab
- a network of permanently located satellites able to destroy enemy atomic missles
- the return of raw materials from space and the extraction of unlimited energy from the Sun
- the solar polar mission
- a new industrial revolution: the development of virtual vacuum-free technosphere manufacturing plants free of gravity, thus making possible, for instance, the production of an estimated 400 alloys from metals that do not successfully mix under the pull of Earth's gravity which tends to separate the lighter metals from the heavier ones; the manufacture of perfect ball-bearings; stable foams; crystals of new semi-conductor materials; and super-pure vaccines and drugs produced in totally antiseptic conditions.

The success of the Columbia Shuttle will also refocus attention on all aspects of the development of the Shuttle and its forerunners as subjects for academic investigation and exhibition in museums and industrial centres.



Raymond Loewy in Skylab

The Raymond Loewy Files

The present collection - from the files of Raymond Lcewy, NASA's official Habitability Consultant from 1967 to 1973 - is a unique and fundamental record relating to the first steps in manned utilization of space and the birth of space exploration. It contains material that NASA itself does not have, such as the original drawings and sketches and the abandoned and experimental designs, or which, as a government agency, it is not at liberty to release. However, under American Government regulations all drawings, documents, blue-prints, statistical data, sketches and scale models remain the personal property of the consultant.

The importance of the collection and of Loewy's contribution are reflected in the success of Skylab and the Space Shuttle, for both of which Raymond Loewy was retained as Habitability Consultant. His designs will form the basis for all American manned spacecraft: "Manned space stations of the future will require few design changes for man to work comfortably in Zero-G operations, based on the 171-day occupancy of the Skylab workshop by nine astronauts" <u>Aviation Week & Space Technology</u>, 8 April 1974.

This documentary archive comprises some 3,500 items and includes:

- original conceptual drawings, designs, sketches and detailed sections together with finished art-work executed with airbrush or body-colour, on card, paper or tracing paper (c. 520) some initialled or signed by Loewy and a few consisting of reproductions reworked by hand; mechanical drafts; blue-prints; reflex negatives (a number on large sheets); coloured and black and white photographs (used by modern designers particularly in relation to mockups); negatives; VU-graphic overlapping transparencies; plates; plans; emblems; textual matter; reports; notes; photocopies; lithographs; press-type samples and data format cards contained in large folders.
- two space work-overalls and one jacket
- four scale models:
 - Apollo-Saturn V
 - crew's quarters ejected from the Shuttle Orbiter
 - a future space base
 - Skylab



- the official reports of the habitability consultant, in 47 illustrated volumes, mostly with spiral bindings, containing some 4,800 pages, sent by the Loewy team to NASA and consisting of 13 Final and Contract Summary reports (7 or them in two volumes), relating to Earth Orbital Space Stations (Skylab), the Shuttle, a Modular Space Station and a Wardroom Gallery Module together with general habitability studies covering all areas of human survival in space-sleeping, nourishment, hygiene, waste-management, the collection of samples, their dehydration, identification, dating and freezing for chemical analysis upon return to Earth after 90 or more days in orbit (27 being duplicates and a small number in photocopy)
- NASA's Habitability Design Support Technical Summary Statement for the design of the Shuttle dated 1972 as sent to Loewy by NASA's Deputy Chief of Manned Spacecraft Design
- commemorative photographs and letters signed by NASA officials and astronauts including Frank Borman, Buzz Aldrin and John Stafford.
- Raymond Loewy's own compilation consisting of originals and copies, relating to his part in the NASA Programmes, including magazine reports
- a space collage by Raymond Loewy, signed and dated
- index volume of NASA's terms and definitions

Skylab and the need for a Habitability Consultant

George Rodney, Director of Martin Marietta Aerospace and NASA's Contractor, explained the need for a Habitability Consultant in a letter to Raymond Loewy dated 12 February 1975: "Our space programs - Mercury, Gemini, Apollo and Skylab - have been the exclusive preserve of the scientist, the engineer and the medical doctor. It was only with Skylab that we first recognised that, if man were to survive for extended times in space, perhaps we engineers needed some added help." As it stood, all characteristics of existing space vehicles (primarily Saturn IVB) had been determined entirely by their function as a fuel cell and were heavily mission-orientated. Grids and internal structural members had been designed for the container's rigidity and suitability to cryogene liquid hydrogen fuel flowing through it. This produced a hostile metallic environment with distracting reflective light sources coming from the aluminium foil dome lining and filtered through the multi-layered grid flooring. To heighten the visual confusion and sense of a mechanical not a human environment, colour had been used to emphasise the different structural elements rather than acting as an organising medium.

CONTRACT SUMMARY REPORT





A1 - MSC Shuttle Orbiter Crew Compartment/X-Axis Docking

HABITABILITY STUDY

SHUTTLE ORBITER

JANUARY 1972/DECEMBER 1972

PREPARED FOR NASA BY RAYMOND LOEWY/WILLIAM SNAITH, INC. 110 EAST 59 STREET, NEW YORK, N.Y. 10022 Skylab, the first manned space station, in fact supported three separate crews for 171 days in space between 15 May 1973 and 8 February 1974. Clearly, as much attention had to be paid to "the physiological safety and comfort of the astronauts" as had been paid to getting them into space. In the pithy dictum of Dr. George Mueller, NASA's Deputy Administrator for Manned Space-Flights: "what comes out of the sliding rule is not necessarily compatible with human life."

Raymond Loewy: reasons selected as Habitability Consultant

Following an investigation of various organisations, Dr. J. L. McLaughlin, Chief of NASA's Division of Space Medicine, recommended Raymond Loewy and his team and confirmation of the appointment was made on 15 November 1967.

Loewy was a pioneer in industrial design and had had a distinguished career in both commercial and public projects (see curriculum vitae at the end of the catalogue).

In 1962 he had designed the exterior markings and interior appointments of the U.S. Presidential Air Force One and, "on the floor of the Oval Office", had explored with President Kennedy the idea of "re-designing America". Kennedy had arranged a meeting between Raymond Loewy and Jim Webb, then Administrator of NASA.

In the 1950s and 1960s Loewy had established the habitability standards of the U.S. Navy, Coast Guard and Department of Commerce Maritime Administration. He had also worked on the experimental submarine Tektite, emergency flying hospitals, helicopter ambulances and the interiors of the White House helicopters. He had also had comprehensive experience in solving human problems in such projects as the design of trains, passenger ships, aeroplanes, automobiles, buses, hotels, houses, hospitals, hydrofoils, interior components for the Inter-Allied Command Headquarters in Washington during the Second World War and even a prison.



Conceptual design for crew's quarters in Skylab ('wet' launch)

The Skylab Assignment

Raymond Loewy's task in 1967 was outlined by George Rodney, the Project Director of Martin Marietta Aerospace:

- "Consultant is to conceive and develop means to insure the psycho-physiological comfort and safety of the crew operating for prolonged periods in exotic conditions of Zero Gravity (Zero G), while exposed to micrometeorites and other risks inherent to frequent EVA's (Extra Vehicular Activities) in deep space"
- "Consultant to suggest ways and means to organise the interior of the workshop to allow the crew to operate efficiently in a confined semi-dark space, while exposed to claustrophobia and little-known forms of space sickness"
- "Desirability for the designer to keep in mind possibilities of psychic disturbances, even among men
 of outstanding physical and intellectual excellence, triggered by isolation and impossibility of rescue
 in case of serious operational failure and/or acute sickness"
- Establish a system to evaluate the fitness of individuals to become astronauts.

Special Problems and Unknown Factors

In 1967 the U.S. had little experience of manned space-flight and none of extended missions. There were four constants for the designer, each with unknown consequences for human physical and pyschological endurance:

- Zero Gravity, producing weightlessness
- Missions of long duration

- A surrounding hostile environment (including micrometeorites)
- A totally closed system with no visual access to Earth

Owing to the unique limitations of space, weight and materials, almost everything displayed or discussed was outside the range of accepted habitability standards and practices. For instance, in 1967, no one was certain how the crew would move about the station and the Apollo project was too undeveloped to provide data on how to translate from point to point in a Zero Gravity environment.

Ignorance of the potential problems resulted in the proliferation of development designs, many of them, such as for protective helmets, sleeping devices and exercising and guide rails, ultimately proving to be unnecessary. Such unused designs greatly add to the historical value of the collection.



Lack of knowledge also demanded some bizarre experiments, such as the following described by Loewy:

"Because of the impossibility of reproducing weightlessness on Earth nobody knew whether or not the device we had designed to collect fecal matter (for eventual analysis on re-entry) would create sufficient suction to be effective. An engineer from the team with which we collaborated had an idea in order to obtain visual confirmation of correct vacuum suction. View-ports were provided at strategic locations in the fecal collectors installed in a fast aircraft. Volunteers were paid \$50 to be fed pure prune juice and after a pre-established time interval the aircraft took off at a steep climb. At a given signal, it went into an outside loop creating for a few seconds a Zero Gravity condition of weightlessness. Any volunteer that produced the necessary bowel movement was given an extra \$50 bonus payment for its contribution to the project's development."

Raymond Loewy's General Recommendations for Skylab

After an initial briefing and indoctrination in Zero-Gravity living Raymond Loewy realised that the life of the crewmen "would take place while subjected to many unfamiliar, often forbidding influences and stresses, both physical and psychological. Besides discomfort, there might occur strange expressions of space-sickness compounded with EVA risk and, perhaps, deep emotional distress. However, I felt that even men of transcendental courage, and physical fitness, thoroughly trained through simulation devices and prepared for all sorts of contingencies, would react in predictable ways in regard to atavistic personal and social needs. Successful behaviour in prolonged O-G and in close proximity to other men in cramped quarters deserved subtle understanding and plenty of down-to-earth feelings on our part.

In addition, I felt that there was a value in surrounding them with a semblance of life-on-Earth familiarity at least in social areas. To induce relaxation and relieve strain were, I thought, necessary requirements.

I did not pretend, I freely admitted, that my opinions were necessarily based upon scientific premise; they were simply a case of what we called 'educated intuition', the result of decades of field experience."



Conceptual design for Food Management in the Shuttle

A plenary session was held at NASA's Headquarters in Washington under the chairmanship of Dr. George Mueller attended by scientists, psychologists, space medical doctors, engineers and astronauts. Loewy was invited to express his views. He made the following general recommendations, which have influenced all later concepts:

- A port-hole to maintain visual contact with Earth (debriefing remarks by crewmen as reported by NASA after Skylab's first mission included the statement that the most important off-duty activity was the window, and they wished they had more and larger windows)
- The need for sleeping areas giving total privacy for each crewman with the possibility of reading and listening to recorded music ("primary recreational activity during 70.5 million miles of manned space flight was listening to taped music..." recorded on wire to avoid fire risk. Aviation Week and Space Technology, 8 April 1974)
- The necessity of a wardroom providing some measure of communal living at meal times and during leisure periods
- The importance of adopting a vertical up-and-down monodirectional (Zero G) mode of living or stance (foot restraints were particularly important in achieving this)
- The development of systems to prevent the ascendency of one crew member over his fellows (the triangular eating surface was one outcome of this)

Practical Solutions by Raymond Loewy, primarily for Skylab

Raymond Loewy began his work under the enormous limitations imposed by the concept of a "wet" launch (based on the crewmen's moving all internal equipment from the Multiple Docking Adaptor to the Earth Orbital Space Station after the evacuation of residual fuel — Skylab was at first to be in a used fuel tank). With the change to a "dry" launch (whereby the laboratory would be fitted out before launch) the designer came into his own: among the many practical solutions produced by Loewy's team (working in conjunction with the technical consultants) were:



Conceptual design for Fecal Collector Unit Articulation in Skylab

- WASTE MANAGEMENT details of positioning, privacy and configuration taking into consideration the impossibility of using toilet paper because the fibres floating in Zero Gravity could cause pneumonia. The waste management system was one of the most significant technical and habitability advancements of Skylab over earlier missions. The system was highly sophisticated and enabled measured samples of urine and fecal matter to be retained in a freeze-dried state for analysis on return to Earth to detect possible chemical changes in body due to Zero Gravity.
- FOOD MANAGEMENT including designs for food preparation and utensils, with packaging (some collapsible) for convenience, attractiveness and control of errant food debris and surfaces that were flush and easy to clean to prevent the accumulation of matter ejected through space sickness.
- HEADGEAR the design of helmets to prevent injury through collision in Zero G (ultimately proved to be unnecessary).
- CREW QUARTERS the initial suggestion was that the living deck be divided into areas for exercise and experiment, dining, waste management, sleep and storage: Loewy provided designs for privacy and group relationships in three areas with toilets separate from basins.
- COLOUR SELECTION with emphasis on a congenial, warm spectrum.

- PERSONAL HYGIENE remembering that showers do not work in space.
- SLEEP STATIONS OR AREAS the first layout made this a communal space with bunks and storage pouches arranged in conventional bunkrooms. This took account only of the comatose state of sleeping; but sleeping also involves undressing, a period of reflection, awakening, rousing and dressing. Loewy insisted on privacy. The summary report stated: "Joe reads in his sleep compartment at night. At night Pete uses the headset so no one else has to listen to the music."
- RESTRAINTS so that while sitting and moving the crewmen could stabilize themselves by making toe-holds with the toe-cleats in their sandals into the honeycomb floors or ceilings.
- RECREATIONAL ACTIVITIES Robert L. Bond, Principal Investigator for Skylab Crew Activities and Maintenance Studies reported:



"... they all say the most important item is the window - and they wish they had more of them and bigger ones. They didn't start reading until the spacecraft altitude became such that they couldn't track the ground out (of) the wardroom window, or when the major daylight ground track took them primarily over water — they have used the balls a few times mainly out of curiosity. Paul is the champ holding two records - (1) a toss from the MDA that bounced off the lid of the Trash A/L and went into the CM without touching a thing (2) a toss around the same path the run around the lockers that continued to strike the lockers in sequence 111 times before running out of gas and going off line. No one has used any of the exercise gear. They prefer to ride the bike or lope around the lockers. They all use the binoculars to look at the ground (every day). They all enjoy the tapes and use the recorders in the wardroom, at the ATM, and in the bedrooms ... they all feel that the unique effects of Zero-G are just about enough to fill their off-duty time with interesting things to do. They also feel that Earth bound interests stay with them in orbit and whatever a guy's hobby or fun things to do on the ground might be is also what he would enjoy having for relaxation in flight - within design reason. Oh yeah - and the darts don't work!"

Assessment of Raymond Loewy's Achievement

Loewy's contribution has been the subject of laudatory articles in numerous magazines and reports, but perhaps most telling are the assessments in letters from members of the NASA team.

Dr. George Mueller, Deputy Administrator of NASA's Manned Spacecraft Division wrote to Loewy on 29 July 1974:

Dear Raymond:

Two significant events in the last decade will, I believe, shape the future course of human history. The first was landing on the Moon with its demonstration that humanity was no longer bound to the Earth. The second was the manned orbiting space station with its demonstration that man could live for indefinite periods of time in a weightless environment and that he could perform useful, yes, unique work in that environment.

Raymond, in my opinion, you and your organization played a crucial role in the latest of these momentous steps that man is taking to the stars. I do not believe that it would have been possible for the Skylab crews to have lived in relative comfort, excellent spirits, and outstanding efficiency



had it not been for your creative design, based on deep understanding of human needs, of the interior environment of Skylab and the human engineering of the equipment and furnishings which the astronauts used. That design and engineering applied, in turn, to our follow-on space stations has provided the foundation for man's next great step - an expedition to the planets. You should be proud, as all of us who know of your contribution are proud, of the key role you have

played in laying the foundation for man to live in space.

My most sincere congratulations for your work on the Skylab Program and my best wishes for your continued contributions to man's role in space.

Sincerely,

George Mueller,

Chairman and President.

William Schneider, Director of the Skylab Programme, wrote to Caldwell Johnson, Principal Investigator at the Johnson Space Centre, about his and Loewy's work:

"...Your contributions both to the basic concept for the workshop living provisions and to many of the detailed features that made it work well, were clearly instrumental in making Skylab the good place for living and working that the crews found it to be. And the systematic collection and organization of data from the missions will surely be of inestimable value in the design of the Shuttle, the Spacelab, and the experiment hardware they will carry into orbit..."



Conceptual design for the shuttle docking in space

George Rodney, NASA's Contractor and Chief of Martin Marietta Aerospace, wrote to Raymond Loewy on 12 February 1975:

Dear Raymond:

(

It was a pleasure to hear that the works of Raymond Loewy are going to be displayed at the Smithsonian Institute. That thought has caused me to reflect on the unique place you have had in our infant space program.

Our space programs - Mercury, Gemini, Apollo and Skylab - have been the exclusive preserve of the scientist, the engineer and the medical doctor. It was only in Skylab that we first recognised that, if man were to survive for extended times in space, perhaps we engineers needed some added help. We enlisted the aid of Loewy Snaith Inc.; and it was your influence, Raymond, that caused us to soften the lines, provide better crew accommodations, and consider the colors and light and the many other factors that helped make life reasonable for the astronauts. You, in short, among your many other firsts were the first to introduce the fine arts into space. Your imagination and personal enthusiasm left an imprint on both the hardware and all of us who had the good fortune to be associated with you.

Skylab has convincingly proved that we can live and work for indefinite periods in space and, therefore, manned space travel to other areas of the universe is practical. I for one am convinced that our civilization, if it continues to advance at all, will be setting forth on other planets within the next fifty years. So I say to you my dear friend that, as you reflect on the many achievements in your fabulous career, you can take special pride in your contribution to this next major step in man's evolution.

My best personal regards.

Sincerely yours, George A. Rodney,

In 1973 Raymond Loewy was invited to become Habitability Consultant for The Space Programme of the USSR. He declined.



Conceptual design for the Shuttle ("Earth Orbiter Shuttle/Recuperable/Early studies")



Enceptual design for advanced Shuttle Hort



Raymond Loewy

Raymond Loewy is generally recognised as one of the founders of the profession known as industrial design.

Under the headline "A brilliant designer streamlined the shape of things by joining form to function in bold new looks", he was hailed (in company with Edison, Bell, Ford and the Wright brothers) as one of the major influences on the American way of life in a special report in Life magazine (bicentennial issue, 1975) entitled "The 100 events that shaped America". He was also listed as "One of the Thousand Makers of the Twentieth Century" in the London Sunday Times (colour magazine), 1969.

Loewy's career was summarised thus in Life magazine: "Operating on the principles that 'form must follow function' and that 'weight is the enemy', Loewy, in 1929, began by remodelling an ugly duplicating machine into a handsome piece of office equipment. Subsequently Loewy's streamlined and elegantly simple designs shaped thousands of products - from locomotives, tractors and refrigerators to... vacuum cleaners. He created the revolutionary 'lean and hungry' postwar Studebaker. Later he designed the interior of the Skylab and the emblem of the U.S. Postal Service. His innovations in packaging, like the white wartime packet he created for the formerly green-packeted Lucky Strikes, started the trend toward clean designs in which bold letters seemed to jump out at customers' eyes. Through the influence of Loewy and his contemporaries, manufacturers now spend millions to make their products and the packages they come in physically attractive, and in testing to determine which designs the public likes best."

When creating him a Grand Officer of the Légion d'Honneur President Giscard d'Estaing wrote to Loewy:

"Vous n'avez cessé d'associer le nom de la France aux brillants succès qui font de vous l'une des personnalités les plus marquantes de notre temps et de servir la cause de l'amitié entre la France et l'Amérique."



Scale model of crew's quarters ejected from the Shuttle Orbiter

Among the many products and designs with which Raymond Loewy was involved may be mentioned:

- Coca Cola bottle and can
- U.S. Postal Service emblem
- · Lucky Strike packet
- Greyhound buses 1945-1950
- Studebaker cars
- · Presidential aircraft Air Force One
- Coldspot refrigerator
- Gestetner duplicating machine
- Kennedy memorial stamp.
- Concorde interior and cutlery
- · Shell and BP emblems, service stations and packages
- Heinz soup packaging
- Four Square Tobacco package
- · Avanti cars
- Wrigley's chewing gum package
- Pennsylvania Railroads, locomotives and passenger cars (GG1; K4S; S1; T1)
- Schick razors
- Total service stations
- Hupmobile cars

- · Lever Brothers packaging
- USSR design of a large range of mass-manufactured products
- Rosenthal crockery
- Sucaryl bottle
- · De Dietrich kitchen products
- Canada Dry soda bottle
- Black Label beer can
- · Bird's coffee package
- Vosene medicated shampoo
- U.S. Navy nuclear destroyer 1938
- Exxon Standard Oil of New Jersey's new trade mark
- Roots Brothers' Cars
- Hilton Hotels
- Austin 1948 model
- Fridgedair products
- Elna sewing machines
- Howard Hughes private aircraft 1951
- International Harvester trademark and tractors
- Aerodynamic ailerons





Conceptual design for donning a space suit for extra-vehicular activity (EVA)

Raymond Loewy was born in Paris in 1893. He became a naturalized American citizen in 1937 and married Viola Erickson in 1948.

His honours and positions include:

- Grand Officer of the Légion d'Honneur, 1980
- Croix de Guerre, 1914-1918, four citations
- Inter-Allied medal
- Liaison Officer with American Expeditionary Force 1914-1918
- · Founder, Fellow and former President of the American Society of Industrial Design
- · Fellow of the Royal Society of Arts, London
- Member of the American Academy of Achievement, Hall of Fame, Boston
- · Honorary Doctor of Fine Arts at the University of Cincinnati, Arts Center College, Los Angeles and the University of Linz, Austria
- Award of Honor, California Design Institute, Los Angeles, 1979
- Member of the Board of Education, New York City
- · Citizen of Honour of France, New York City, Chicago and Palm Springs
- Member of the Psycho-Physiological Institute, Washington
- · Honorary life member of the American Railroad Association, Washington
- · Counsel to the American Society for the study of human factors in aviation
- Lecturer at MIT, Harvard, UCLA, University of Paris and of Leningrad, USSR State Committee for Science and Technology, the All-Union Institute of Industrial Research, Moscow, and U.S. Academy of Engineering, Washington
- · Habitability Consultant to NASA's Saturn-Apollo Applications Programme, Skylab and Shuttle Orbiter projects
- Member of the U.S. Space Medicine Association

Exhibitions of his designs have been held at the Smithsonian Institute, Washington DC "The Designs of Raymond Loewy" in 1975; and at Centre Beaubourg, Paris, 1975.

Articles about him have appeared in <u>Time</u> (cover 1949); <u>Los Angeles Times</u> ("Loewy puts his stamp on the 20th century"); <u>Life</u> magazine "The Great Packager" (1949), as quoted above or in the main body of the catalogue and elsewhere.

He is author of The Locomotive, its aesthetics; Never Leave Well Alone (his autobiography); Raymond Loewy: Industrial Design and "Second-Best is not Enough" Reader's Digest 1963.

Last year the U.S. Foundation for the Arts made a television documentary about Loewy entitled "Looking Back to the Future".



Conceptual design for a crewman's quarters

Illustration on back cover: The Earth from Skylab

Catalogue Price £4.00

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