Congress of the United States
House of Representatives
Washington, D.C.

JOHN W. WYDLER
FOURTH DISTRICT, NEW YORK

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COMMITTEE ON
SCIENCE AND ASTRONAUTICS

March 23, 1965

Honorable James E. Webb
Administrator
National Aeronautics and Space Administration
Washington, D. C.

Dear Mr. Webb:

Much comment has been made about the pencils being used by our astronauts which supposedly cost $128.84 each. I would like to have a complete report on this program, particularly why 34 such pencils are required, together with the specifics which justify such costs.

Thank you for your cooperation.

Sincerely yours,

John W. Wydler
Member of Congress

JWW:bh

From AXC
Guidance Copy to ------
Action Copy to AC - follow up
Info Copy to AA - M -

Rec'd in NASA 3/24/65
Suspense Date 3/30/65
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
Houston 1, Texas

IN REPLY REFER TO: BD

MAR 25 1965

Mr. R. C. Raven
President
Elgin School Supply Co., Inc.
212 Mission Street
San Francisco 5, California

Dear Mr. Raven:

This Center appreciates your concern at the apparent cost of a writing device to be used by astronauts during spaceflight. The actual writing mechanism was obtained from a small pencil procured from a local office supply house at a cost of $1.75 each.

The cost of $4,382.50 ($128.88 per assembly) was for the fabrication and assembly of a take-up reel, baseplate, and the pencil housing. This assembly is fabricated of lightweight, high-strength materials of the type used in the spacecraft construction. This is to conserve weight and to assure the reliability of the device in flight.

The astronaut, as you may know, flies in a pressurized suit which restricts to a degree his mobility. The lack of mobility of the gloved hand requires that the pencil housing be large, knurled, and sufficiently strong to preclude possible breaking during use in flight. This is especially critical during periods of weightlessness when any loose materials may affect the operation of critical systems. This is also true of the balance of the assembly since it will be subjected to strains and stresses of launch, flight, and re-entry.

The principal costs of this device are for the initial machining and fabrication of the assembly and for the reliability testing. The price per assembly is related to the small quantity being procured. If quantities of the type usually being procured for office or general supply use were required, this unit price would be drastically reduced.

I hope that the above information may clarify this matter. Your sincere interest is appreciated.

Sincerely,

for Paul E. Purser
Robert R. Gilruth
Director

UNITED STATES GOVERNMENT

Memorandum

TO : AC/Special Assistant to the Director DATE: MAR 2 9 1965

FROM : BG/Chief, Procurement & Contracts Division

SUBJECT: Information memorandum - Astronaut retractable pencil

The following is a synopsis of the information that has been developed in connection with the design and procurement of the astronaut retractable pencil.

The astronauts have required the use of pencils in both training and actual space flights. During the Mercury shots, standard grease pencils were utilized and were determined to be unsatisfactory for numerous reasons, i.e., cumbersome gloves made handling difficult, no good method of preventing "floating", possibility of getting away and jamming critical gear, etc..

The initial official request for making the pencil part of the spacecraft was made July 27, 1964, during the regularly scheduled mockup review at MAC. Walter Schirra officially requested that provisions be made to include a stationary, spring-release, tethered pencil in the spacecraft. The Flight Crew Operations Division developed the pencil design after a number of detailed reviews and analyses were accomplished. An initial effort was made to utilize a common pencil used by waitresses and other clerical people which had a spring-loaded, retractable device. This pencil could be procured in the quantities required at a cost of $1.75. However, it was found in testing this device that the spring clip was a gravity device and would not work in a weightless environment, and that the pencil clip was subject to release during vibration and "g" loads. The final design of the pencil involved the use of the mechanism of a common pencil but with a machined base and holder, a stainless steel spring and a lock which would operate in a weightless environment. The materials and prototype design were subjected to necessary testing in accordance with the various quality and reliability requirements for spacecraft systems equipment. Some of the design considerations were as follows.

a. Configuration - The reason the pencil is designed as it is, i.e., reel, cord, and sturdiness, is through the following analysis. A pencil attached to the pilot may appear to be the simplest solution but one must consider that in space with zero gravity, it is highly possible for the pencil to float away and become lost. Also, if it did become lost and float into the ejection mechanism, it could jam the mechanism. Placing the pencil on the pilot's suit would present an interface problem.

That is, while it might be possible to use the pencil with one suit configuration, problems are encountered with a new suit such as a special suit for EVA. Therefore, a reel with a cord attached to the end of a pencil appears to be the safest way to prevent a possible danger area. A waitress pencil cemented onto a plastic sheet was first tried and then discarded because it would not work under zero gravity. It had a latching mechanism inside the reel that required one gravity to operate; also, it did not appear to have enough strength to pass the vibration characteristics encountered during lift-off and reentry. Therefore, the next lightest material, aluminum, was used. The pencil end is tipped up so that the pilot may remove it from the base with a gloved hand. The cabin restraints are such that the sharing of one pencil did not appear to be possible.

b. Location - The location of the pencil in this case also controlled to a certain extent the design of the pencil. Possible locations in the cabin appear to be on the side walls or above the mirror. The side walls have strips of velcro that are used during flight as stowage places for equipment such as cameras, film packs, and experimental gear. The position above the mirror did not agree with the pilot since it was in a line with his head.

c. Materials - The materials selected are easily obtainable metals and non-metals. All items have been tested. Two types of spring materials were tested. beryllium copper and stainless steel, type 302. Through cycle testing, the stainless steel was selected. The nylon cord was tested both for endurance and toxicity. All materials were checked for cracks and flaws using a penetrant method or through visual inspection under high magnification - 50x. The stainless steel spring was visually inspected for flaws.

d. Tolerances - The amount of clearance and tolerance was accomplished through large layouts and by building a prototype in the MSC shop. An effort was made to keep the tolerances reasonable so that it would not affect the price.

e. Prototype - The pencil prototype was requested on October 8, 1964, and received in November 1964. The pencil was used in GT-3 mockup reviews and as an evaluation item by all people concerned. Some minor redesign was accomplished; however, the basic design was approved by all concerned.

The delivery schedule to meet requirements for testing and installation required the initial units by March 1, 1965. (Delivery of first unit was accomplished March 4, 1965.) The total of 34 pencils is required to fulfill all of the anticipated needs known at this time, i.e., flight items,

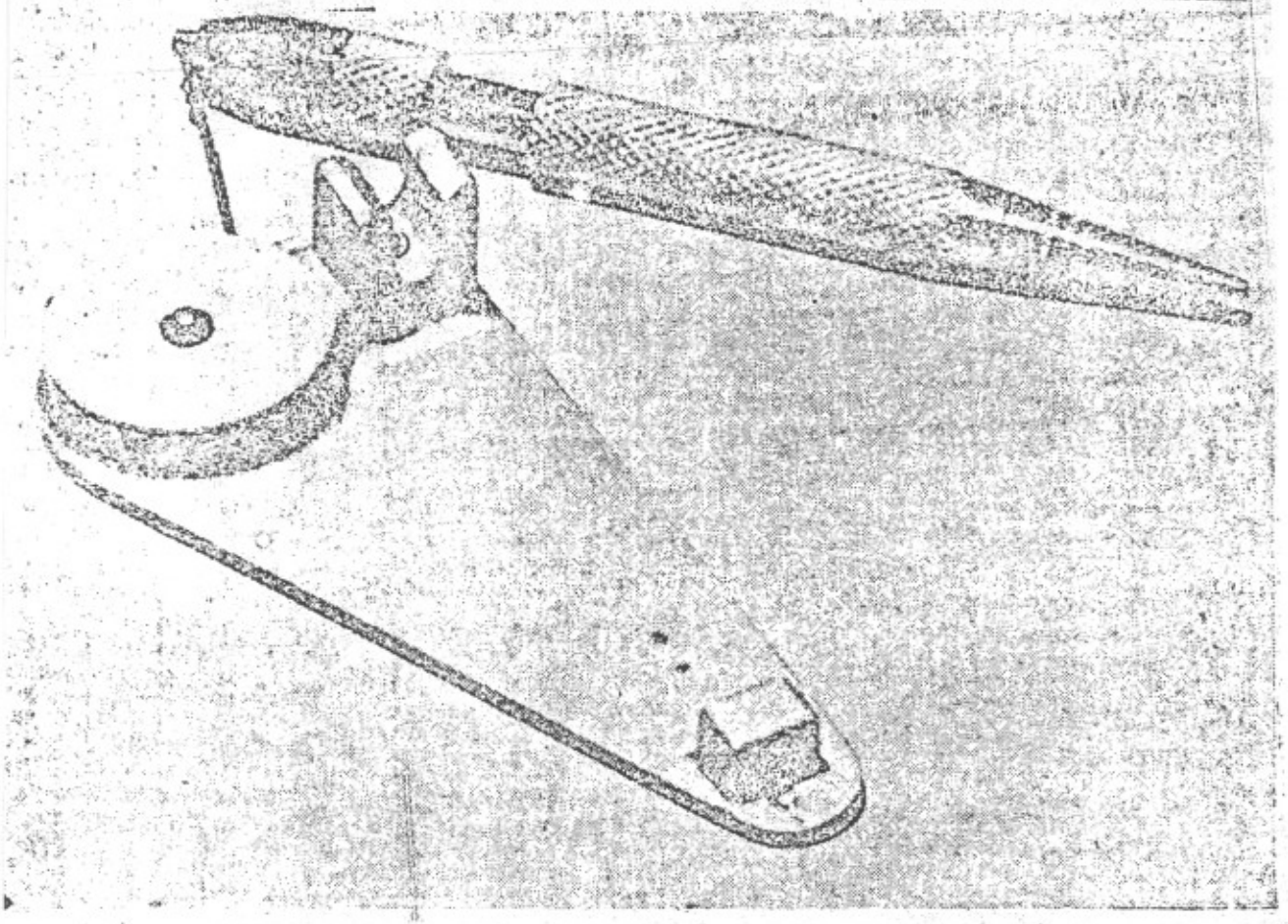
mock-ups and trainers. There is a left hand and a right hand pencil for each spacecraft with back-up assemblies for Spacecrafts GT4 through GT-6. Two sets of pencils for each spacecraft are required; one set to be installed on the spacecraft and one set as back-up. For Spacecrafts 7 through 12, one set of pencils for each spacecraft is required. The back-ups for Spacecrafts 4 through 6 will be used to back-up Spacecrafts 7 through 12. In addition to these requirements is the set which was installed for GT-3 and those required in the Gemini Mission Simulators Numbers 1 and 2, and the Gemini Crew Station Mockups at MSC and MAC.

The principal item of cost in fabricating this assembly was in the machining of the mounting bracket and holder. The item was located in available, suitable space in the spacecraft which required machining the case to fit the area and machining the pencil holder to assure that the astronaut could use the pencil when in a pressure suit. Once the initial machine set-up was made, the most economical method of production was to complete all of the required machine operations. The major cost of the assembly ($4,382.50) is in the configuration machining of the base and holder and the required testing. The price per pencil, $128.88, is a function of the small quantity being procured. Mass production methods and large quantity would reduce this unit cost considerably.

Dave W. Lang

BG:DWLang:am 3/29/65

ST. LOUIS POST-DISPATCH Saturday, March 6, 1965



A High Note

Two of these mechanical pencils costing $128.84 each are included in Gemini spacecraft to make note-taking easier for astronauts in space. The systems include a pencil, a nylon cord, a take-up reel and a baseplate. The expense of machine-milling and certified quality of raw materials and the finished product are cited in the $4382.50 cost of acquiring 34 of the pencils. UPI Telephoto