The Moon Watch: A History of the Omega Speedmaster Professional

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Few things in American history have generated more interest and pride in our country than our nation's space program. The wrist worn Omega Speedmaster Professional (S.P.) has played an interesting role in America's conquest of space.

Not only did this chronograph become famous for being the first watch worn on the moon, but the story of its selection by NASA to become the wrist timing device of the astronauts is a story of workmanship, repeated testing, and a study in American politics.

First manufactured in 1959 by the Omega Watch company in Bienne, Switzerland, the S.P. is a chronograph capable of measuring elapsed time in seconds, minutes, and hours. The black anodized multi-dial face with luminous markers is housed in a stainless steel water proof case. There are 150 separate parts and the chronograph is anti-magnetic and shock protected. There is a tachymeter outer scale used for calculating speeds or unit per hour production.

In the early days of the space program during Project Mercury, wrist timing devices were used for manned space flight as a backup to the on-board timing devices. There was no one watch that was "standard issue" during Project Mercury. It was the astronaut's choice to wear/not wear a wrist timing device, and to choose the make/model he thought best. Astronauts Shepard, Grissom, and Glenn wore no watch. Scott Carpenter wore a Breitling Navitimer.[1]

The Speedmaster Professional was first flight tested in space by Walter Schirra aboard Sigma 7, October 1962. The Omega ran flawlessly and was used as backup to the on-board clock. On-board timing devices in the Mercury capsule were internal to the spacecraft and wristwatches had not undergone rigorous testing, as the astronaut never left the protected environment of the spacecraft.

On the last Mercury Mission, Gordon Cooper wore both the Omega Chronograph and a Bulova Accutron Astronaut in order to compare the accuracy of the manually-wound Omega to the then new Electronic Bulova. The Omega was used to time the firing sequence of the retro rockets for re-entry.

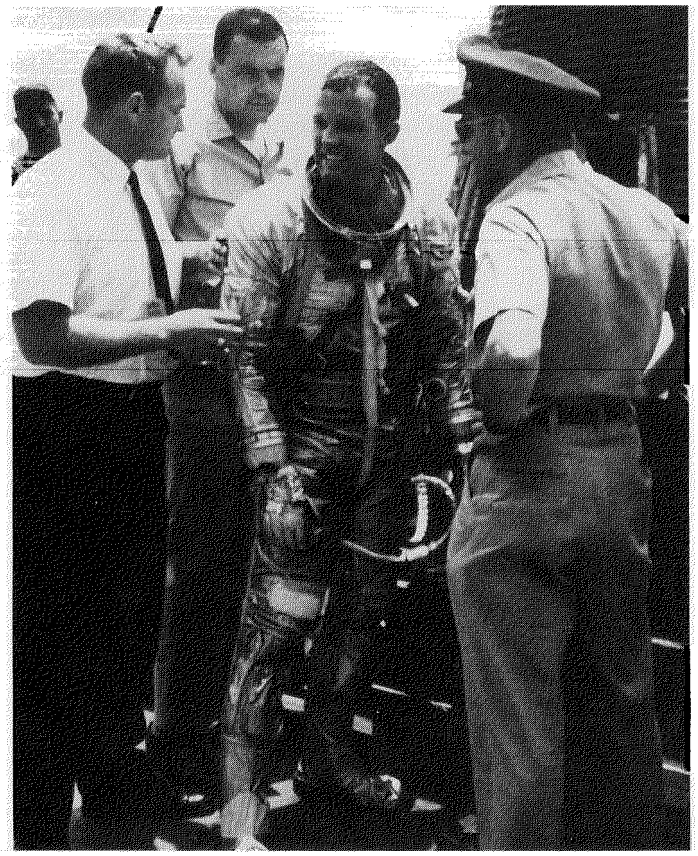
Astronaut Walter M. Schirra Jr., with Omega S.P. on his wrist, speaks to President Kennedy after his space flight in October, 1962.

However, with the Gemini and Apollo programs, astronauts would also need wrist timing devices to help them with EVA activities, such as space walks, photographic timing exposures, and timing fuel cell purges. Such a watch should be able to operate in the vacuum of space where there exists wide variances in temperature and pressure.

The primary requirement for the wrist timing device was to provide the capability to perform short interval timing and backup for the main spacecraft timing device. Initially, a manually wound watch was required, as the "self-winding" watch mechanisms depend upon the action of an inertial pendulum in a gravity environment for performing the winding function. Consequently, these devices would not function in the reduced gravity environment encountered in space flight.

In 1962 NASA began the search for a wristwatch that could be worn by the Gemini and Apollo astronauts. NASA purchased watches from several companies which were then subjected to a number of rigorous tests. The watches were placed in vacuum chambers with conditions closely matching the space environment. Temperatures varied from 200° above 0 to 0°. They were exposed to accelerations of 12g's—twice as much as could be expected in spaceflight, and a vibration table shook the watches violently. The watch was also to be water-proof, shock-proof, and anti-magnetic. The only watch that survived this testing was the Omega Speedmaster Professional. It is significant to note that this was a standard, production line model which was purchased over the counter, incognito at a Houston Jewelry Store.[2,13]

Astronaut L. Gordon Cooper after his 22-orbit mission in the Mercury spacecraft "Faith 7." The Omega is on his left wrist and the Accutron on his right.



In 1965, NASA chose the Omega Speedmaster Professional as the official chronograph for the space program. With the first Gemini flight (GT3) with astronauts Grissom and Young, the Speedmaster Professional became part of the standard equipment issued to astronauts. The watch was worn on the outside of the pressure suit with the use of a large black velcro band. It was worn during the first walk in space by an American, Edward White, in 1965. Two watches were worn by each Gemini astronaut as a matter of preference for timing different tasks.

Two years before the first lunar landing, a memo by Donald K. Slayton, then director of Flight Crew operations of NASA, indicated a need for "a wrist chronograph that would be qualified for use in an hostile environment existing on the lunar surface." He pointed out the difficulties in temperature protection and pressure suit garment interface needed by astronauts on the lunar surface. He once again suggested that in order to measure elapsed time, a chronograph would be best suited for these purposes.[1]

Due to its performance and reliability, the Speedmaster Professional was selected again as the official chronograph by NASA for project Apollo. Each astronaut wore one chronograph for space flight as a standard issue. Most, however, wore two during spaceflight. One watch was set on Mission Elapsed Time (MET) the other was set on Greenwich Mean Time (GMT) or Houston time. The watch became very popular with the astronauts and was often used in their everyday lives as well as their work in the space flight simulators.

However, the use of Swiss chronographs in the American space program met with political resistance by a number of American watch makers, specifically the Bulova Watch Company. In the early days of the space program, Bulova did not make a chronograph, but nonetheless, it exerted considerable pressure on NASA to use Bulova products. In the early 60's General Omar Bradley was President of the Bulova Watch Company. There were various meetings with NASA officials in order to promote the use of their products. In 1964, Senate hearings involved the domestic watch manufacturing industry and their use in space and defense projects. Senator Symington from Missouri, Margaret Chase Smith from Massachusetts, and Senator Stennis from Georgia were present at these meetings. The former assistant secretary of defense, Marx Leva was retained by Bulova as their legal counsel. James Webb, the administrator of NASA at that time, was aware of these meetings and helped shape NASA's response to them.[3]

As the official chronograph for all Apollo missions, the Speedmaster Professional was worn by Frank Borman

and crew on man's first journey to orbit the moon during Christmas of 1968. It was strapped to the outside of the space suit of Buzz Aldrin when he and Neil Armstrong made man's first lunar landing during the historic Apollo 11 mission in July 1969. The two hours and forty minutes that Armstrong and Aldrin were allotted on the surface of the moon, outside the lunar module, were timed by this chronograph.

There has been interesting discussion as to who in fact wore the first watch on the moon. Buzz Aldrin states that shortly after landing, there was a failure of the timer in the Lunar Module and he was unable to get it restarted. According to his best recollection, Neil Armstrong left his chronograph on board the Lunar Module as a backup. Thus, the first watch worn on the moon was worn by Buzz Aldrin.[15,16] This watch was later stolen from his personal belongings, and has never been recovered.

During Apollo 13 in April of 1970, an on-board explosion of an oxygen tank in the service module left no electrical power in the Command Module (CM) or Service Module (SM) except for emergency reentry power. This left the on-board computerized timing devices inoperative. The crew had to use the Lunar Module for survival and had to power down everything in the Lunar Module. The Lunar Module was designed to provide approximately two days of electrical power. The crew and NASA had to devise a way to make this last the five days it would take to return to earth. The only electrical equipment turned on in the Lunar Module for the most part of the trip around the moon and back to the earth was a radio receiver, not even a transmitter. This left the crew of Jim Lovell, Fred Haies, and Jack Swigert without the use of on-board computers and their associated timing devices. Commander James Lovell thus had to use his Speedmaster Professional for both the timing and interval of thrust for critical engine burns as they rounded the moon and set a course for home.[1,14] This contributed not only to saving the lives of the crew, but the vessel as well.

The last manned lunar landing Apollo 17 was scheduled for December 1972. As this date approached, the Bulova Watch Company became increasingly concerned that its products be used for this last manned lunar mission. Letters were sent to the Special Assistant to the President at the White House from Bulova indicating their displeasure with the use of Swiss chronographs in the American space program.

Thus it was decided by the Administrator of NASA, James Fletcher, that if a suitable Bulova chronograph could be found, it would be used on the last Apollo mission. The astronauts responded by stating that if forced to wear the Bulova time piece, they would also wear the Omega "as insurance." Bulova had insisted that chronographs chosen by NASA follow the policy of the "buy American" regulations established by the Senate. Both Omega and Bulova wished to comply with this, however, as of 1972, Bulova did not manufacture a U.S. made chronograph.[4,5,7,8]

In August of 1972, sixteen companies were notified by NASA that the Manned Spacecraft Center (MSC) planned to establish a Qualified Product List (QPL) for possible future procurement of astronaut watches.[6] This list included the Breitling Watch Corporation, Bulova Watch Company, the Elmore Watch Company, the Elgin National Watch Company, the Forbes Company, S. A. Girard-Perregaux Company, the Gruen Watch Company, the Hamilton Watch Company, Heuer Time and Electronic Corporation, the Lejour Watch Company, the Longines-Wittnauer Company, the Omega Watch Company, the American Rolex Company, Seiko Watch Company, and Zodiac Watch Company. Both Bulova and Omega were eager to comply with the "Buy American Act" which meant 51 percent of the products must be made or manufactured in the United States.

In order to comply with this act, Omega had the stainless steel cases for the Speedmaster Professional manufactured in Luddington, Michigan by the Star Watch Case Company. The crystals were shipped from Switzerland to the Star Watch Company where they were installed (the Star Watch Co. is no longer in business). The completed case and crystal were then shipped to the Hamilton Watch Company in Lancaster, Pennsylvania for inspection and testing. The case and crystals were then shipped

Walter Schirra and Tom Stafford after their Gemini 6 space flight, December 16, 1965.

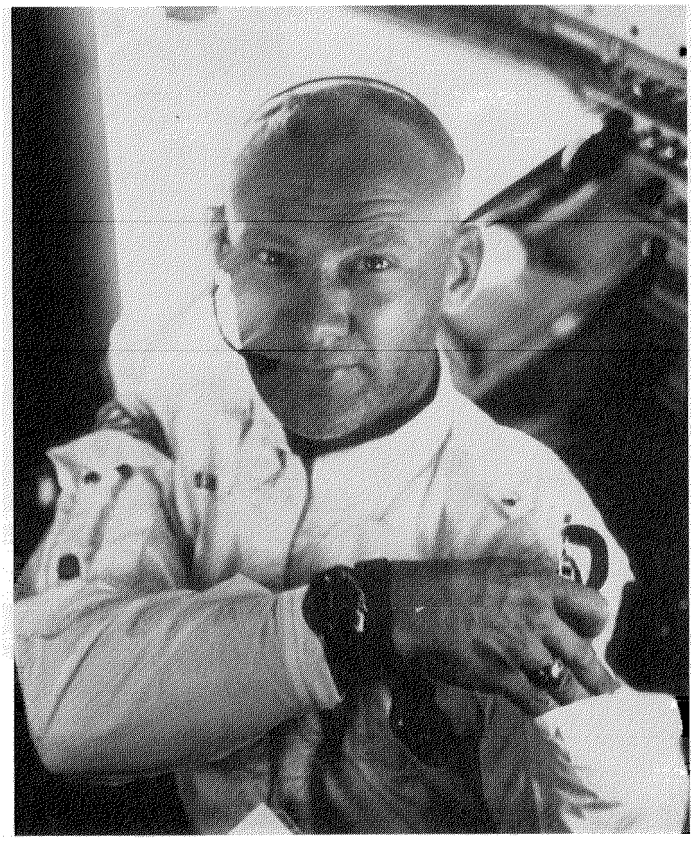
TABLE I

1. Vacuum Testing
   The chronograph shall be subjected to a vacuum of 1×10^{-6} torr or better for a total of 72 hours. During the first ten hours of testing the temperature of the items shall be increased to 160°F ± 10°F. The temperature shall then be returned to 78° ± 10°F for the remainder of the test.
2. Oxygen Atmosphere/Temperature Test
   The test items shall be placed in atmosphere of 95 ± 5% oxygen at a pressure of 5 ± 0.1 psia and a temperature of 155°F ± 5°F for 72 hours. Gas samples extracted from the chamber area shall be analyzed for organic and CO content per test number 6 of D-NA-0002.
3. Low Temperature
   The test items shall be lowered to 0°F ± 5°F. This temperature shall be maintained for 10 ± 0.5 hours. The test items shall be allowed to return to ambient before functional testing.
4. Acceleration
   The test items shall be subjected to 20 g's ± 2 g's in each direction of the three (3) perpendicular axes.
5. Random Vibration
   The test items shall be installed in a fixture and submitted to 7.8 g's RMS for 5 ± 0.10 minutes, as defined in Figure 2 in each of three (3) axes. The test fixture with the test items shall then be submitted to 3.2 g's RMS for 12 ± 0.10 minutes as defined in Figure 1, in each of the three (3) axes.
6. EMI Test
   The test items shall be subjected to all applicable requirements of MIL-STD-461A, if an electromechanical movement is employed.
7. Humidity Testing
   The test items shall be submitted to a humidity test per MIL-STD-810B, Method 507, Procedure I, except minimum temperature shall be 68°F and maximum temperature shall be 120°F.

to Switzerland, where the movements were installed and the entire watch was subjected to final inspection and environmental testing.[12]

The Bulova Watch Company submitted 16 chronographs for testing at this time. It was later learned that these watches were manufactured in Switzerland and that Bulova had purchased these chronographs through their subsidiary in Switzerland, Universal Geneva. The 16 chronographs were disassembled by Bulova in their research laboratory and a new crystal, a new machine case, specifically manufactured pin, a new crown and stem, a new face and dials and certain gaskets, washers and screws were replaced on each watch. The original movements and the back of each watch were retained.

Buzz Aldrin shown in the lunar module wearing the Omega S.P., the first watch worn on the moon.



When confronted with the fact that these watches were, in actuality, Swiss chronographs, Bulova stated that they had invested $23,000 of Research and Development funds in developing and tooling the process. Thus by utilizing these R&D costs, the watches were found to qualify under the "Buy American Act."[9]

The testing process was done in two stages. First, there were several general requirements needed to become "Flight Qualified." If a watch met these criteria it was then subjected to a series of specific and rigorous "space flight environmental tests" to determine final suitability for space flight. The general requirements were that the watch be a chronograph, anti-magnetic, water-proof, and shock-resistant. The case must be finished for non-reflective characteristics, and the crystal of the chronograph must be anti-reflective so that the dials could be easily read under light levels ranging from three-foot candles to direct unfiltered sunlight. And accuracy requirements both in the face up and face down positions should be plus or minus 6 seconds in a 24-hour period.

The watches were then subjected to the specific environmental test which included vacuum testing, oxygen atmosphere testing, low temperature, acceleration, random vibration test, electromagnetic induction tests, and a humidity test. The specific requirements are listed in Table 1.

These tests were completed by November 1972, and the Deputy Administrator of NASA, George Low, in his letter to the Assistant to the President at the White House, Jonathan C. Rose, stated the results of the spaceflight qualification test. To my knowledge, this information has never before been made public. "The Bulova chronograph stopped three times during the humidity test, and stopped again during the acceleration test. Based on our criteria, the Bulova chronograph therefore, has not qualified for use on the Apollo 17 mission. . . . We will continue to use the Omega watch in the Apollo program."[9]

The issue was finalized by a letter from Dale Myers, Associated Administrator for manned Space Flight, to Dr. George Low, the deputy director of NASA, on November 13, 1972. "The special Bulova chronographs purchased by MSC for possible application for Apollo 17 and Skylab, have failed their qualification tests both in humidity and acceleration." "I have instructed the Manned Spacecraft Center to take no further action with respect to chronograph testing of Bulova or other companies watches. I consider the Bulova watch issue closed."

Following the Lunar landing, the space program continued, and 1975 marked the first handshake in space between the American and Soviet crews during the Apollo and Soyuz mission. The American and Russian crews were both wearing the Speedmaster Professional.

The topic of astronaut timepieces was quiet for several years until 1976 when Bulova became interested in supplying time pieces for the Space Shuttle missions. Bulova had numerous public and private officials contact NASA in order to gain their objectives.

Senator Jacob Javits from New York contacted the Administrator of NASA, Robert Frosch, to lobby in Bulova's behalf.[10] Once again, NASA initiated a competitive solicitation. A new deadline was extended several times so that Bulova could participate.

In September 1978, astronaut chronograph watches wishing to be considered for the space shuttle program underwent yet another round of prescribed space flight environmental testing. This included vacuum, low temperature, pressure, vibration, acceleration, salt-fog, humidity, and shock testing. Responses to the NASA procurement requests were received from the Bulova Watch Company and the Omega Watch Company in Bienne, Switzerland. Bulova submitted a proposal offering one type of chronograph, sold to NASA for $1 each. Omega submitted three proposals for three separate models. The chronograph determined to be in compliance with the environmental requirements, achieving the highest technical score, and offered at the lowest price would be purchased. The technical evaluation team determined that, of the chronographs submitted by Bulova for space flight environmental testing, no single watch was exposed to all environmental tests. Also, one watch failed in salt-fog testing and all three watches exposed to vacuum testing failed to show adequate sealing. Accordingly, the Bulova chronographs were determined to be in non-compliance with the specified environmental requirements.

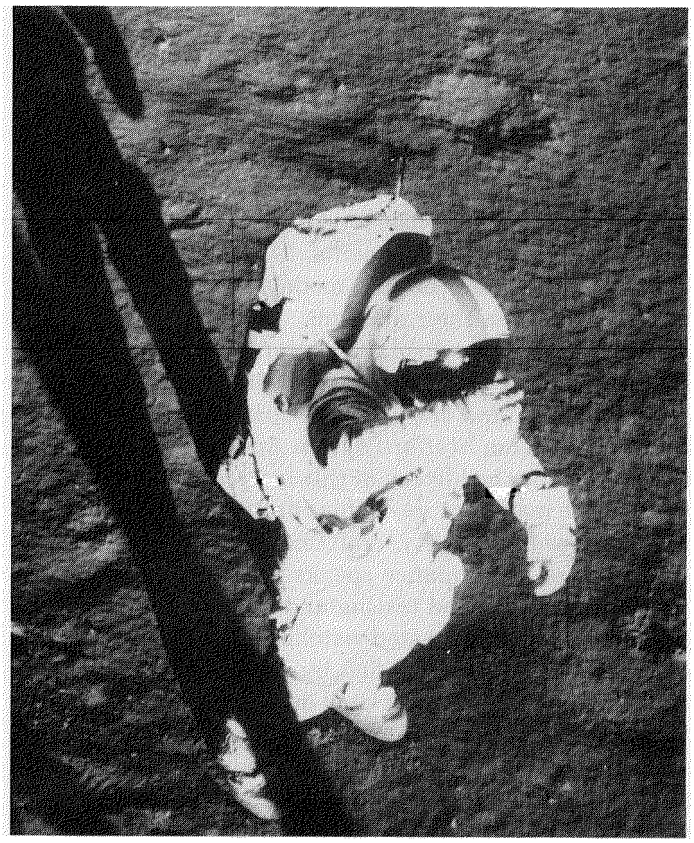
Once again, the Omega chronograph was superior to the other chronographs tested. The Speedmaster Professional met all environmental requirements, had the highest technical score, and was offered at the lowest price. Therefore, the Omega was accepted for procurement. It is significant to note that this was the identical model which had been submitted in 1962. The watch was offered to NASA at the cost of $.01 per watch.[11]

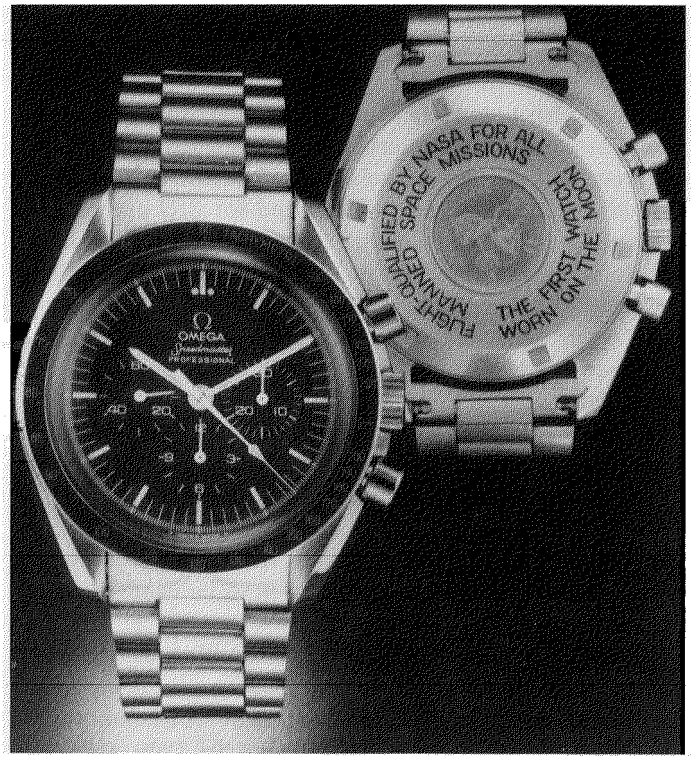
In April 1981, STS-1, the first shuttle mission, was launched with Commander John Young wearing the Speedmaster Professional.

Now that the shuttle flights have become operational, there are no longer requirements by NASA for specific watches to be worn during shuttle missions. With the exception of extravehicular activity, all astronauts are confined within the pressurized environment of the shuttle. Nonetheless, the S.P. continues to be used by many of the shuttle astronauts.

In 1989, Omega commemorated the 20th anniversary of the Apollo 11 moon landing by issuing a limited edition of the Speedmaster Professional. The commemorative watches were limited to 2,000 pieces. In 1989, with the Soviet Union's improved attitude toward the West, the Soviet Union selected Omega as the watch supplied to all cosmonauts.

Alan Shepard, commander of Apollo 14, wearing an Omega on the lunar surface.





The Omega Speedmaster Professional, Apollo 11 20th Anniversary Commemorative edition.

Through the years, this watch has become a collector's item to some and a momento to others. Astronaut Buzz Aldren mentions in his book *Return to Earth* that when donating several artifacts to the Smithsonian Institution, his Omega was one of the few things that was stolen from his personal effects.[13] General Stafford, who has flown four space missions, is now the chairman of the board of The Omega Watch Corporation of America. Frank Borman and other Apollo astronauts continue to wear their Speedmaster Professionals for daily use and as a momento of their space accomplishments. Many of the Apollo astronauts were given the gold model of the S.P. by Omega upon return from their missions.

The S.P.'s are on display in several museums, e.g., the Michigan Space Center, Jackson, Michigan (McDevitt's from Gemini), and the Air and Space Museum, Washington, DC (Tom Stafford's from Apollo 10).

This then is the history of this interesting and historic watch. The manufacture of this chronograph gives meaning to the words quality, craftsmanship, and teamwork. Its record of performance speaks for itself. It withstood vigorous and repeated testing and surely must be one of the most thoroughly tested watches in history. It was the only watch "Flight Qualified by NASA for all Manned Space Missions," and was used during Projects Mercury, Gemini, Apollo, Skylab, Apollo-Soyuz and the Space Shuttle. As the only piece of space equipment available for wear to the public, the Speedmaster Professional provides the opportunity to own a small piece of history.

But perhaps the greatest legacy of the Speedmaster Professional is that it has withstood the test of time. For even now, some 30 years after it was first introduced, it is still the only watch flight-qualified by NASA for extravehicular space activity.

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All photos courtesy of the National Aeronautics and Space Administration.

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