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UNIFIED UNIVERSAL LINEAR LUNAR TIME FOR SPACE NAVIGATION

Abstract.

On April 2, 2024, NASA received a task from the US Government to create a 25th lunar time zone, similar to the 24 existing time zones on Earth.

The author developed the unified reference universal LTC, the Lunar Coordinated Time Standard, and published it for the first time on his website on *July 10*, 2024. [6]

All failures with launches and landings on the Moon and Mars are connected, according to the author, with incorrect calculation of cyclograms of landing and navigation of interplanetary flights.

For example, in Russia and the USSR, out of 26 launches to Mars, 25 launches were unsuccessful. The United States had 14 unsuccessful launches out of the first 21 launches to Mars. Russia was unsuccessful with the Luna-25 flight, Japan's failures with all flights to the Moon. The list goes on.

This stupidity must be stopped. It is these failures that will be eliminated with the introduction of LTC.

It is necessary to create the collective international Center for navigation and calendar support of space activities [CNCS].

Time on the Moon is "linear", as One revolution of the Moon around its axis coincides with *One lunar day* and *One lunar month*.

The zonality ratio on the Moon is "1:1". On Earth, the Earth passes through *24 time zones* in *One* rotation around its axis, so the zonality ratio is "1:24".

On Earth, time is "circular". With a rigid connection between "Earth's Greenwich," based on the principle of UTC (Coordinated Atomic Earth Time), and "Moon's Greenwich," based on the principle of LTC (Coordinated Atomic Lunar Time), there is an exact synchronization of Earth's time and Moon's time with Einstein's relativistic corrections.

In this situation, LTC is the universal linear time in the Universe. It is the unified linear time of humanity's space civilization, convenient for use during regular space flights, both in near-Earth orbits and in space. This is the single "linear" time of the Universe.

It is proposed to use LTC as the unified universal linear time of the Universe, with automatic conversion to any specific circular time of any planet, space station, or spacecraft.

Keywords. Universal linear time of the Universe; lunar linear atomic coordinated time [LTC]; earth circular atomic coordinated time [UTC]; the collective international Center for navigation and calendar support of space activities [CNCS].

My materials were presented at two international scientific conferences:

A) in Kaluga at the Tsiolkovsky Memorial Readings (September 17-19, 2024) [2,7]; and B) in Moscow at the Korolev Memorial Readings (January 28-31, 2025) [1,3,4]. Two publications have been made: a) in the scientific British foreign journal ROOM [4]; and b) at the annual scientific conference at the S.I. Vavilov Institute of the History of Natural Sciences and Technology of the Russian Academy of Sciences [7].

I). The first report was made at the 59th scientific readings dedicated to the development of the scientific legacy and the evolution of the ideas of K.E. Tsiolkovsky. Kaluga. 17-19 September 2024.

With the autograph of Solovyov Vladimir Alekseevich – Chairman of the Organizing Committee, Academician of the Russian Academy of Sciences, General Designer for manned space systems and complexes, General Designer – Deputy General Director of NPO «Energia» S.P. Korolev, Soviet Cosmonaut, Twice Hero of the Soviet Union.

The section was led by Sergey Vladimirovich Krichevsky, Professor, Test Cosmonaut, (Chief Researcher at the S.I. Vavilov Institute for the History of Science and Technology of the Russian Academy of Sciences).

The article was published in the collection "K.E. Tsiolkovsky: Key Ideas and Modern Achievements in Space Exploration. Proceedings of the 59th Scientific Readings. Part 2, pp. 37-39. Kaluga, 2024". The report was made on September 18. 2024 (year). Section 6, Item 5.

S.L. Morozov. "Transition from Standard Terrestrial Time (1918) to Unified Space Reference Standard Time (2024); Impact on Humanity's Development and Prospects." [2,7]

II). The second report was made at the XLIX Academic Readings on Cosmonautics, dedicated to the memory of Academician S.P. Korolev and other outstanding Russian scientists who were pioneers in the exploration of outer space.

The report with the autograph by Sergei Konstantinovich Krikalev, Deputy Head of Roscosmos, a Soviet and Russian cosmonaut, and a two-time Hero of the Soviet Union and Russia. The readings were held on January 28-31, 2025. Section 1. Item 22.

The head of the section was: Aleksandrov Alexander Pavlovich, USSR cosmonaut, twice Hero of the Soviet Union, engineer of OKB-1 /NPO "Energia".

The report was made on January 30, 2025: S.L. Morozov "Linear Lunar Time of Civilization – the Basis of Astronautics in the Universe". (the S.I. Vavilov Institute for the History of Science and Technology of the Russian Academy of Sciences). [1;3;4].

III). The third publication was made in London [UK]: Sergei L. Morozov. A time zone for the Moon. ROOM, 2025, №36, pp. 82-86.[4]

IV). The fourth publication was made at the S.I. Vavilov Institute of the History of Natural Sciences and Technology of the Russian Academy of Sciences. Annual scientific conference. Moscow. 2024.

Morozov S.L. "Three problems of the Standard Time Act adopted in the United States on March 19, 1918. pp. 237-241."[7].

Conclusion.

The development of space technologies, industrialization in space, will become the locomotive of the entire economy of modern civilization.

The key factor in the industrialization of space is the creation of the unified lunar linear reference universal IT standard for space time [LTC]. The author of this article developed and published such a lunar analogue of Earth's Greenwich on *July 10*, 2024. [6]

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For example, in Russia and the USSR, out of 26 launches to Mars, 25 launches were unsuccessful. The United States had 14 unsuccessful launches out of the first 21 launches to Mars. Russia was unsuccessful with the Luna-25 flight, Japan's failures with all flights to the Moon. The list goes on.

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This directly concerns, in particular, the GLONASS system in Russia, the GPS system in the USA, and their counterparts in other countries.

Currently, in order to prevent accidents in space, it has become necessary to compile **the Unified Worldwide rocket Transport Schedule** for implementation (based on the proposed linear reference IT standard "lunar Greenwich Morozov", which has zero error relative to the duration of the tropical solar year of Kepler) for the development of

the Unified global transport link in all four environments at once (instead of three according to Newcomb, conducted in 1918 by US President Woodrow Wilson) with automatic recalculation and correction of LTC & UTC to any of the other 24 circular planetary time zones on Earth, taking into account the relativistic effects of Einstein:

1) on Earth,
2) in the atmosphere,
3) in the aquatic environment, and
4) **in outer space**. [2,7]

To this end, it is necessary to introduce an additional 25th space lunar time zone. On April 2, 2024, NASA received a task from the US Government to create a 25th lunar time zone, similar to the 24 existing time zones on Earth.[5]

However, given that NASA's next mission to the Moon is scheduled for 2025, the implementation of the LTC standard is unlikely to be completed on time.

WASHINGTON, April 2, 2024 (Reuters) - The White House on Tuesday instructed NASA to establish a unified time standard for the Moon and other celestial bodies, as the United States seeks to set international norms in space amid a growing lunar race between countries and private companies.

According to a memo seen by Reuters, the head of the White House Office of Science and Technology Policy (OSTP) has instructed the space agency to work with other U.S. government agencies to develop **the plan for establishing so-called Lunar Time Coordinated (LTC) by the end of 2026. [5]**

ROOM, 2025, №36, на стр. 82-86.
Sergei L. Morozov.
«A time zone for the Moon» [London, UK]

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The section was led by Sergey Vladimirovich Krichevsky, Professor, Test Cosmonaut, (Chief Researcher at the S.I. Vavilov Institute for the History of Science and Technology of the Russian Academy of Sciences).

It was published in the collection "K.E. Tsiolkovsky: Key Ideas and Modern Achievements in Cosmonautics. Proceedings of the 59th Scientific Readings. Part 2, pp. 37-39. Kaluga, 2024".

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WASHINGTON, April 2, 2024 (Reuters) - The White House on Tuesday directed NASA to establish a unified standard of time for the Moon and other celestial bodies, as the United States aims to set international norms in space amid a growing lunar race among nations and private companies.

The head of the White House Office of Science and Technology Policy (OSTP), according to a memo seen by Reuters, instructed the space agency to work with other parts of the U.S. government to devise a plan by **the end of 2026 for setting what it called a Coordinated Lunar Time (LTC).**

The differing gravitational force, and potentially other factors, on the Moon and on other celestial bodies change how time unfolds relative to how it is perceived on Earth.

Among other things, the LTC would provide a time-keeping benchmark for lunar spacecraft and satellites that require extreme precision for their missions.

"The same clock that we have on Earth would move at a different rate on the Moon," Kevin Coggins, NASA's space communications and navigation chief, said in an interview.

Under its Artemis program, NASA is aiming to send astronaut missions to the Moon in the coming years [2025] and establish a scientific lunar base that could help set the stage for future missions to Mars.

This project, which is expected to be completed by the end of 2026, aims to address the time differences that arise due to the varying rates of timekeeping on different celestial bodies.

According to research, the clock on the Moon is 58.7 microseconds behind every Earth Day compared to the clock on Earth.

This difference can significantly impact the accuracy and synchronization of important operations during lunar-related space missions.

LTC is designed to be used in spacecraft and vehicles involved in lunar missions to ensure precise synchronization of communication and data transfer.

However, given that NASA's next mission to the Moon is scheduled for 2025, the implementation of the LTC standard is unlikely to be completed on time.

Currently, it has not yet been determined how the standard will be implemented.

Dozens of companies, spacecraft and countries are involved in the effort. An OSTP official said that without the ***unified lunar time standard*** it would be challenging to ensure that data transfers between spacecraft are secure and that communications ***between Earth, lunar satellites, bases and astronauts*** are synchronized.

Discrepancies in time also could lead to errors in mapping and locating positions on or orbiting the Moon, the official said. 'How disruptive'

"Imagine if the world wasn't syncing their clocks to the same time - how disruptive that might be and how challenging everyday things become," the official said. On Earth, most clocks and time zones are based on Coordinated Universal Time, or UTC.

This internationally recognized standard relies on a vast global network of atomic clocks placed in different locations around the world.

They measure changes in the state of atoms and generate an average that ultimately makes up a precise time.

Deployment of atomic clocks on the lunar surface may be needed, according to the OSTP official.

The official also said that as commercial activities expand to the Moon, the **unified time standard** would be essential for coordinating operations, ensuring the reliability of transactions and managing the logistics of lunar commerce.

NASA in January said it has scheduled for September 2026 its first astronaut lunar landing since the end of the Apollo program in the 1970s, with a mission flying four astronauts around the Moon and back scheduled for September 2025.

While the United States is the only country to have put astronauts on the Moon, others have lunar ambitions. Countries have their eyes on potential mineral resources on the Moon, and lunar bases could help support future crewed missions to Mars and elsewhere.

China said last year it aims to put its first astronauts on the Moon by 2030.

Japan in January became the fifth country to put a spacecraft on the Moon.

India last year became the first country to land a spacecraft near the unexplored lunar south pole, and it has announced plans to send an astronaut to the Moon by 2040.

"U.S. leadership in defining a suitable standard - one that achieves the accuracy and resilience required for operating in the challenging lunar environment - will benefit all spacefaring nations," the OSTP memo stated.

Defining how to implement **Coordinated Lunar Time [LTC]** will require international agreements, the memo said, through "existing standards bodies" and among the 36 nations that have signed a pact called the Artemis Accords involving how countries act in space and on the Moon.

China and Russia, the two main U.S. rivals in space, have not signed the Artemis Accords.

The Artemis Accords is an international agreement signed by a number of countries under the Artemis program that governs the principles of cooperation and civilian activities for the exploration and use of the Moon, Mars, comets, and asteroids for peaceful purposes.

It is based on the 1967 Outer Space Treaty and includes principles such as non-weaponization, transparency, technological interoperability, and mutual assistance.

Coordinated Universal Time might influence how **Coordinated Lunar Time** is implemented, the OSTP official said. The U.N.'s International Telecommunication Union defines **Coordinated Universal Time as an international standard.** Reporting by Joey Roulette and Will Dunham, Editing by Rosalba O'Brien.

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