Martian counterrevolution or transition to a Type II civilization

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Abstract

This paper identifies the underlying causes of ongoing "Martian counterrevolution" – the replacement of SpaceX widely publicized plans and its head, Elon Musk, on creating a "city of a million people on Mars" to a "permanent human base on the Moon" on the Moon and/or the launch of "millions of data centers" (which have already begun to turn into "tens of thousands") into near-Earth orbits to develop artificial intelligence using Starship system. Essentially, the reason for this counterrevolution is the inability of SpaceX, having expended reasonable resources within a sensible timeframe, to create a version of Starship system that could satisfy the requirements necessary to implement all the programs announced by the company. This was caused by fact that SpaceX, in its struggle against the primary cause of all its current problems – Pogo auto-oscillations – chose a strategy of concealing the very existence of these phenomena, which for objective reasons have become an inherent attribute of such reusable rocket systems. Moreover, the company's desire to use only one highly beneficial corollary of the theory, not the integral Pogo theory itself (which was created in 2023), leads to multiple explosions of Starship stages during endless flight tests.

As a result, such a development strategy for Starship reusable rocket transportation system has a very high chance of ending in failure. In that case, all incredibly ambitious plans of SpaceX under the banner of Martian counterrevolution must be completed in the same way the "Martian revolution" ended in recent months – with an obvious and unconditional collapse.

Keywords: *Mars, Moon, orbital data center, AI, neural network, Starship, Pogo, accident*

I. Beginning: Martian revolution

By all accounts, SpaceX CEO E. Musk's sacred goal, at least since its founding in 2002, has been Mars. By 2016, after 14 years of working, the first-ever partially reusable launch vehicle, Falcon 9, was launched. It is currently the company's workhorse, having launched ~ 82.5 % of the world's payloads into low-Earth orbit by 2025 [1]. Thus, SpaceX demonstrated its ability to implement space programs that seemed impossible to other players in the launch services market. Since then, Starlink program has begun to unfold—the creation of a global system of ~ 30,000 low-orbit satellites to provide access to high-speed broadband satellite internet has begun. Now (with around 10,000 satellites) Starlink is generating significant profits for SpaceX, and would have been impossible without Falcon 9 [2].

And so, in September 2016, at 67th International Astronautical Congress, Elon Musk delivered a presentation titled "Making Humanity a Multi-Planetary Species" [3]. In it, he stated that a "fully autonomous and genetically diverse colony of at least 1 million people" should be established on Mars. This, in his view, would significantly increase the probability of human survival in the future. The means for this was to be reusable rocket Interplanetary Transport System (ITS), with a "payload capacity of up to 550 tons to low Earth orbit in an expendable configuration and 300 tons in a reusable one", with a liftoff mass of about 10,000 tons. It was assumed that it would run on methane and oxygen, which could also be produced on Mars, and its structure would be primarily made of carbon fiber. Essentially, this report proclaimed the Martian revolution. In the audacity and novelty of the ideas expressed at the time, it could be compared to the April Theses of 1917, proclaimed almost exactly 100 years prior by V. I. Lenin upon his return to Russia from exile – who, six months later, became the head of the Russian government and changed the entire course of the Russian revolution [4].

By 2017, the project had evolved into BFR (Big Falcon Rocket), with approximately half the liftoff mass. This version could be used for launching commercial payloads into low Earth orbit, thereby providing a means to fund this Mars project. A year later, in November 2018, Elon Musk announced that BFR had been renamed Starship [5], and the rocket system's design was once again fundamentally revised – stainless steel became the primary structural material. The payload capacity to low Earth orbit was also to be roughly halved – to 250 tons and 150 tons, respectively [6]. In January 2020, the intention to send one million colonists to Mars by 2050 was announced. To achieve this, there were plans to build a fleet of 1,000 Starship vehicles, launched 3 per day during the launch window, capable of sending about 100 megatons of cargo or up to 100,000 people per synodic period [7]. By that time, prototypes of these ships were already being built for hops, with the first manned Starship flight to Mars planned for 2026 – the current year [8].

It should be noted that launching ~ 1,000 ships at a rate of three per day would require about 11 months, whereas the launch window (given a 6 – 9 month transit time to Mars) doesn't exceed two months. Even if the transit time were reduced to three months through significantly higher energy expenditures (as Musk mentioned in his posts), and a corresponding increase in flight time due to the approach to Mars during the second intersection of its orbit (then finishing the campaign of launches will be later in the first case and starting earlier in the second), it is unlikely that the window could be expanded at least to up to six months. Thus, such Mars flight schedules simply contradict elementary calculations, yet this did not seem to trouble SpaceX in the slightest. Apparently, no one there had performed such calculations prior to making these high-profile announcements.

II. Key results of Starship transportation system and its elements flight tests at the completion of their first, six-year cycle

So, flight testing of Starship prototypes began approximately six years ago (a year prior, there were hops by a technological mockup called Starhopper, which we will not include in the testing cycle of the full-scale system and its elements). This is due to the fact that the development of Starship follows the Agile methodology, where the core principle is rapid prototyping. In this approach, a currently feasible and not yet fully refined iteration of final product is tested, data is collected (in rocketry, usually after its loss), and the design is upgraded based on the test results. This cycle of testing and modernization repeats until a final product is achieved that satisfies developer and/or customer, or until the project is terminated. Since flight tests of such large-scale systems in the Western world are usually conducted in public, an outside observer is able, to some extent, to "keep a finger on the pulse", independently analyzing the core processes while maintaining a fairly comprehensive understanding of the overall development progress – and, as impossible as it may seem, even influencing it.

a. "Hops" phase

Almost 6 years ago, in August 2020, first Starship prototype, SN5, performed its first successful 150-meter hop. It was equipped with a single Raptor rocket engine (instead of the standard six) and lacked a fairing or control surfaces – essentially being an assembly of tanks, a fuel system, and an engine along with a control system – and was finally able to reach launch readiness without explosions or structural failure. A month later, SN6 successfully repeated the same thing. Then, from December 2020 to May 2021, five triple-engine prototypes (SN8 through SN11, and SN15), featuring different fuel system configurations, performed flights to an altitude of approximately 12.5 km. These tests included active flip maneuvers and vertical landing attempts; of these, only the last one, the fifth (SN15), was completed successfully [9]. Based on the results of these flights, the design of Starship's fuel system was finalized.

b. Flights of Starship's first version

Finally, more than three years ago, on April 20, 2023, the first launch of full Starship system, the so-called V1 (or Block 1) version, was conducted. It consisted of Super Heavy B7 booster (first stage) and Ship S24 (second stage). These flights began utilizing more powerful and lightweight Raptor 2 engines, which (as their subsequent modification Raptor-3), based on their design and performance characteristics, can be considered the most advanced modern rocket engines.

In accordance with SpaceX practice, the launch was broadcast live in real-time, with certain flight data, including velocity, continuously displayed on-screen. After a successful liftoff – which, however, resulted in the partial destruction of the launch pad – the flight was plagued by multiple engine failures, explosions, a fire in the aft compartment (engine section), and, in the end, a loss of communication and control. By the end of the second minute of flight, the entire first stage was engulfed in flames. At that moment, the rocket began a pitch-up maneuver, which eventually turned into a full-scale somersault, followed by uncontrolled rotation, leading to its flight termination [10].

At the same time, the most interesting and apparently unprecedented feature of this flight in the history of rocket engineering was that Starship, throughout the entire controlled portion of its trajectory, experienced extremely sharp longitudinal acceleration oscillations with a period of about 12 seconds (acceleration was determined by differentiating the velocity shown on the screen). These were manifested as at least 10 pairs of narrow peaks, starting with a sharp drop in the system's acceleration to nearly zero, followed by an equally sharp spike. Upon close observation, these oscillations were visible to the naked eye when watching the flight video; however, when analyzing the system's acceleration graph, they are "glaringly obvious" – see the specific, EKG-like (electrocardiogram-like) line of the rocket's longitudinal acceleration in Fig. 1 [11]. This graph shows 10 clearly identifiable and periodically recurring double, multidirectional acceleration peaks (superspikes). And, at the final superspike, the trajectory fails, and Starship descends into erratic tumbles and rotations.

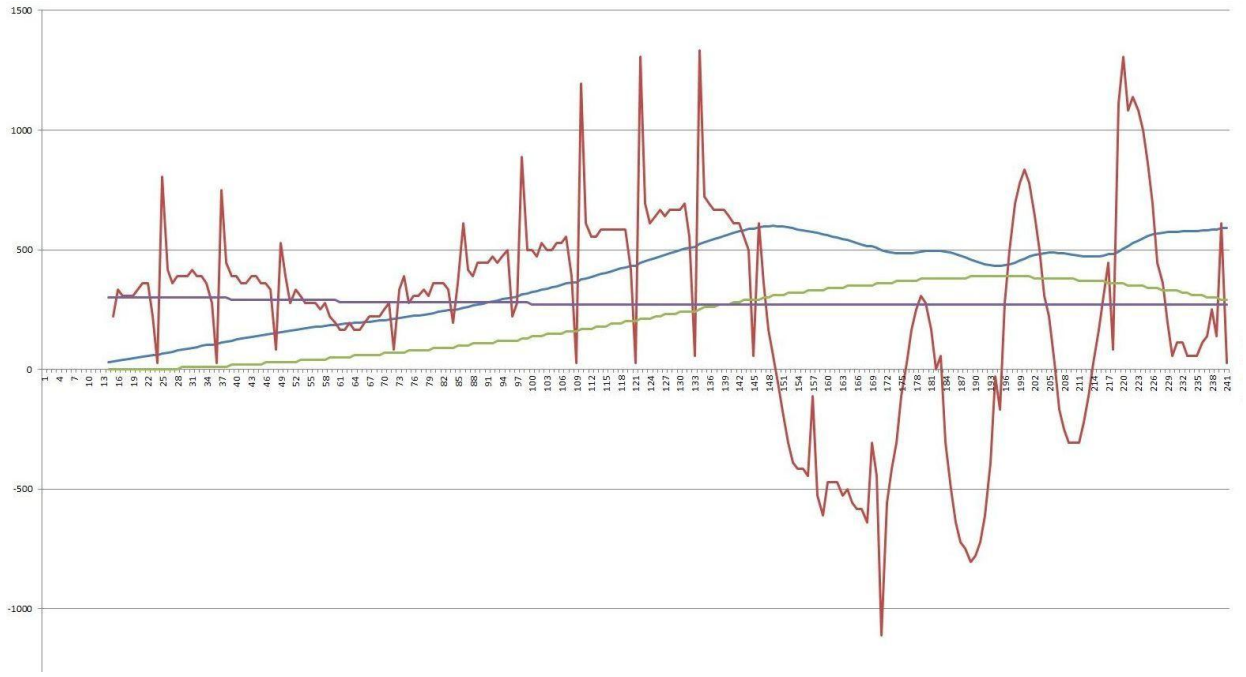

Fig. 1 – Acceleration (in cm/s^2, purple "EKG line"), speed (in m/s), altitude (in hundreds of meters), and the number of operating engines of Starship vs. flight time (in seconds) [11]

Despite the paradoxical unusualness of this flight, almost no one – except for the author of this paper and, of course, SpaceX itself – paid attention to this key feature. Those whose attention was eventually drawn to the phenomenon lightly attempted to attribute it to sensor failures or signal processing algorithm glitches. SpaceX, for its part, pretended that nothing unusual was happening. However, just a month and a half after the flight, Elon Musk announced a seemingly unmotivated, if not strange, decision to switch to hot staging. This involves igniting the second-stage engines before separation from the first stage, without fully shutting down the latter's engines. This decision was presented as a way to reduce gravity losses during acceleration and, consequently, increase the payload capacity of Starship. Setting such a goal immediately after a failed first launch at such an early phase of developing what are essentially still prototypes seemed entirely premature, even within the framework of Agile methodology – especially since hot staging could clearly pose a risk to a reusable complex like Starship. Nonetheless, as subsequent events showed, this decision was perfectly justified and timely.

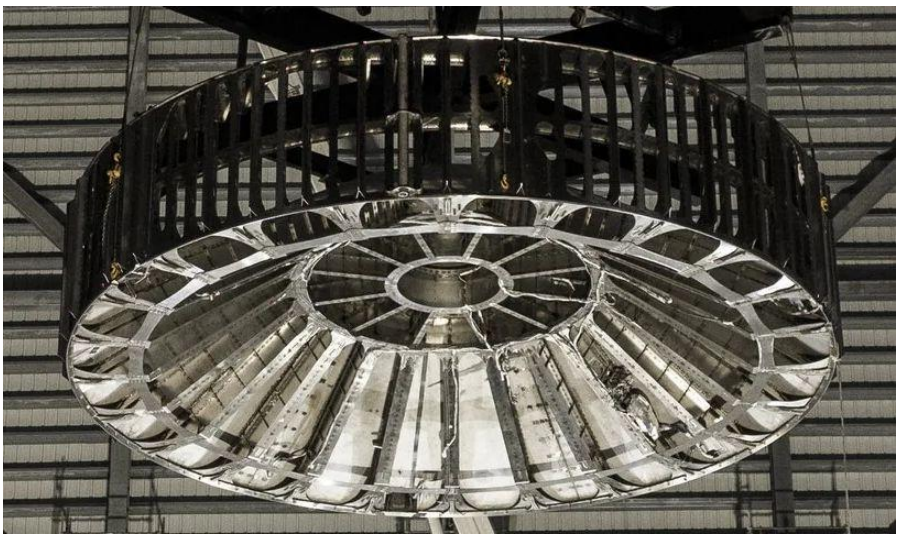

Fig. 2 – Forward Heat Shield Interstage (FHSI)

To implement this, a special stainless steel structure called the Forward Heat Shield Interstage (FHSI) was introduced between the stages (see Fig. 2 [12]). Following the installation of this intermediate shield, the second flight of Starship stack in November 2023 proceeded perfectly smoothly until stage separation, with no issues whatsoever. The phenomenon of the catastrophic superspikes from the first flight was effectively hidden behind a veil of oblivion.

But then everything turned out to be much worse. The first stage (booster) exploded during its active flight phase while maneuvering to flip the trajectory for a boostback (returning to the general vicinity of the launch site).

The second stage (ship) also spontaneously exploded during what seemed to be a completely restful phase of the trajectory – the final stage of ascent [13]. For the first two months following the flight, explanations for these explosions provided by various SpaceX representatives remained highly speculative and somewhat incoherent. For instance, the explanation for the second-stage explosion given by Elon Musk personally during a meeting with spaceport staff clearly contradicted the observed flight picture.

Nevertheless, in a press release regarding the results of the second flight – issued in late February 2024, just two weeks before the third flight – an extremely revealing phrase suddenly appeared concerning the implementation of a new electronic Thrust Vector Control (TVC) system for Starship's second-stage Raptor engines (the first stage had such a system from the start, at least to perform the boostback) [14]. The accelerations of the stages, and thus the thrust of their propulsion systems during moments that had previously been catastrophic, differed strikingly in the third flight compared to the second, and this time there were no explosions. Nonetheless, at the very end of the boostback, the first-stage propulsion system encountered issues with correct engine shutdown; and then, during an attempt to reignite them for a landing burn in the ocean, the first stage exploded again. The second stage successfully reached its designated ballistic trajectory, but due to the venting of excess gas during the passive phase of the flight, it lost its orientation, entered the atmosphere in a non-nominal attitude, and burned up [15].

However, SpaceX had clearly found the right path toward overcoming its current problems. This was demonstrated by Elon Musk's tone and the topics of his next presentation to the spaceport staff in April, as well as the fact that during the fourth flight in June 2024, almost everything went according to plan. The thrust of the first-stage engines during the boostback was slightly more reduced further (while increasing their burn duration). For the first time, the heat shield interstage was jettisoned between the boostback and the final engine burn; this reduced the stage's velocity before the burn began, allowing for lower engine thrust during the landing operation. All this finally enabled a soft splashdown of the booster in the ocean. The timely shutdown of some of the second-stage engines at the end of its ascent (similar to the third flight), along with the decision not to vent excess gas during the passive phase of the ship's trajectory, resulted in a designated atmospheric entry and, after the final burn, a soft splashdown of the ship in the ocean. Now, finally, it was possible to begin flight testing one of the most complex issues – the ship's thermal protection – and to completely forget about the mythical "filter clogs" in the fuel systems and "fires during the venting" of excess propellant components [16].

The fifth flight in October and the sixth flight in November 2024 built upon this success. In these missions, for the first time, the boostback was performed not with reduced thrust, but with a significant increase in engines thrust compared to the first catastrophic experience during the second flight. The heat shield interstage was regularly jettisoned, resulting in successful final burns for the booster. During the fifth flight, the booster returned to the launch site for the first time and was caught by manipulators of the launch tower – thus, for the first time in practice, a highly extraordinary and spectacular method of returning a rocket stage was realized. The second stages splashed down in the ocean in increasingly intact conditions; the refinement of the thermal protection system was in full swing [17].

However, despite all the visible successes of the 2024 tests, Elon Musk – much like the biblical King Belshazzar – must have been haunted by the ancient words: *"Mene, Mene, Tekel, Upharsin – You have been weighed in the balances and found..."*, yet, unlike Belshazzar, he was found not wanting too light, but on the contrary, far too heavy. Due to the excessive structural mass of Starship V1 system, its payload capacity turned out to be close to zero – a situation further exacerbated by the thrust manipulations developed during the last four flights of this version to prevent stage explosions. It was decided to overcome this substantial problem by increasing the liftoff mass and, consequently, engine thrust by transitioning to their new Raptor 3 version. But since these engines were not yet ready at the time, the company had to switch after the first six flights to an interim version of Starship using the existing Raptor 2 engines. This was dubbed V2, although it could hardly be accurately called anything more than, say, V1.2. In this iteration, only the liftoff mass of the second stage was increased, and changes were made to its fuel system to lift some of the trajectory-based thrust constraints.

c. Flights of Starship's second version

In the second version of Starship, design changes affected the second stage exclusively. For the most part, it differed only in being lengthened by 1.8 meters, with its fuel tanks significantly enlarged – partly by reducing the payload bay, since the payload capacity was expected to be very small anyway. Consequently, the propellant mass increased by 300 tons (a 25 % increase), which was intended to enable a payload of at least 20 tons in the form of 10 Starlink V3 dummy satellites [18].

Another significant change was the shifting of the forward flaperons (control surfaces) upward along the hull, further away from the lower surface and deeper into the aerodynamic shadow. This was done so that the bow shock wave wouldn't intersect them at hypersonic flight speeds. It is well known that such an intersection leads to boundary layer separation and a manifold increase in heat flux on the surface where the shock falling occurs. As an illustration, Fig. 3 shows the calculated heat flux values in the vicinity of the nose of Space Shuttle Orbiter (OK) at a Mach number of M = 5.6, both with and without the external tank (ВБ) and the resulting bow shock impingement. In the latter case, peak heat flux is approximately 5.5 times higher than in the former [19]. In fact, this has been well

known for about 50 years, and the original placement of the flaperons characterizes the level of hypersonic aerodynamics understanding at SpaceX. To understand that flaperons at such a location would inevitably burn off at hypersonic speeds – regardless of the thermal protection used – one didn't need to launch the Starship V1 version six times.

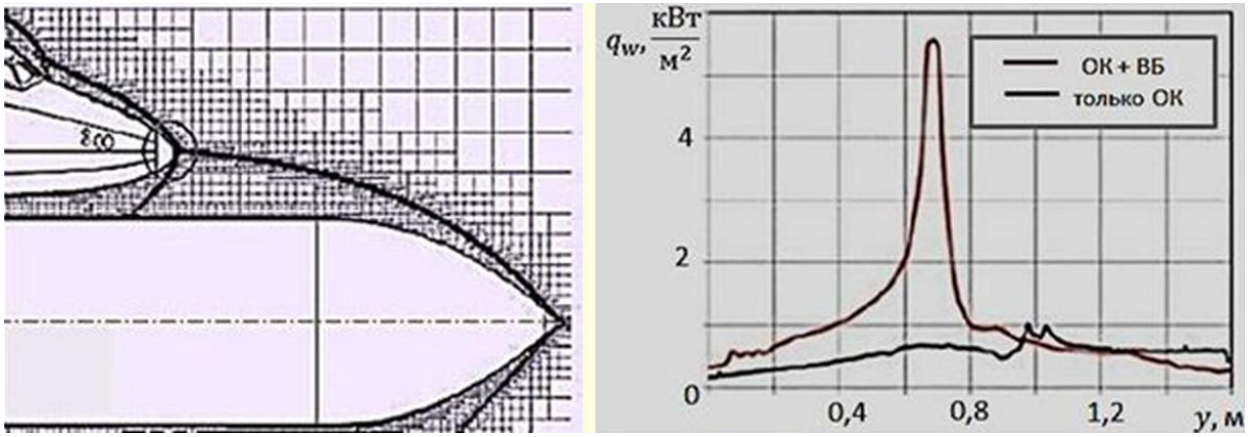

Fig. 3 – Heat flux distribution on the nose of Shuttle Orbiter (ОК) in the absence and presence (ОК + ВБ) of the external tank [19]

Another significant difference in the second version of Starship's second stage was the design of the liquid methane feed lines to the three outer engines with vacuum nozzles. Instead of a single central pipe passing through the liquid oxygen tank with three short branches, a "tripod" of three individual feed lines to the engines was implemented alongside the remaining central pipe (see Fig. 4, [18]).

Fig. 4 – Design variants of the methane feed lines for the second-stage engines with vacuum nozzles

This obviously more massive structure was introduced so that it wouldn't be necessary to shut down these engines at the end of the second stage's ascent to prevent an explosion – a measure that had been required for the V1 stage and which resulted in reduced payload capacity. Of course, had SpaceX possessed a better understanding of the processes occurring at that phase, the threat of an explosion could have been easily eliminated by significantly simpler and cheaper means. However, they proceeded as shown in Fig. 4, and as a result, two more V2 second stages were lost.

In January and March 2025, two launches of Starship V2 – the seventh and eighth – were conducted. Both ended in explosions of the second stages, quite unexpectedly for both SpaceX and the mass media that constantly monitored these tests. It is interesting to note that, unlike during the V1 launches, SpaceX and its chief engineer, Elon Musk, remained silent for at least three and a half weeks after the seventh flight regarding even the presumed causes of the latest fiasco or when the next test launch could be expected. The cause of the accident during that launch was simple: intense resonant transverse oscillations of the new, long, and unsupported methane feed lines, accompanied by fuel leaks and, subsequently, the destruction of one of them. In subsequent flights, these lines were

reinforced; however, longitudinal oscillations then unexpectedly emerged already in the oxygen feed lines to the outer engines, and once again the second stage exploded, though slightly later in the flight [18].

Therefore, in the next, ninth launch (the third flight of the V2 version) in May 2025, as in the successful flights of the V1 version, at the end of the second stage's boost, it was necessary to again shut down the more efficient engines with vacuum nozzles, and also manipulate the thrust of all engines. However, in the May flight, this wasn't done skillfully enough, and at the very end of the boost, the shutdown of the three central engines of the stage didn't occur accurately simultaneously due to the onset of longitudinal oscillations, which led to its spin, as a result of which the stage's orientation was again lost in the passive portion of the trajectory. This resulted in its uncontrolled re-entry into the atmosphere and destruction [20].

Subsequently, in June 2025, during cryogenic propellant loading prior to static fire tests, the S36 ship (the second stage) intended for the tenth flight scheduled for the coming days exploded. Therefore, the tenth flight didn't take place until August 2025 with a new ship, followed by the eleventh flight in October 2025. Both were similar in terms of flight profile and results achieved – finally, both ships performed successful soft splashdowns in the ocean.

Since V2 version booster was the same as V1 version, there were few problems with it during these flights. Twice, in the seventh and eighth flights, successful booster catches by the launch tower manipulators were performed, just as in the fifth flight. In the ninth and eleven flights, boosters B14 and B15 – that had already flown in the seventh and eighth flights – ware reused. Although boosters B14 was lost during the ninth flight, its return trajectory was intentionally made as complicated as possible to experimentally determine its operational limits [21].

Ultimately, through the five flights of Starship V2, it was clearly demonstrated that by transitioning to a modified design with increased fuel capacity, it was possible to deliver a certain payload of ~ 20 tons – an order of magnitude less than what was stated in the original plans – at least onto a suborbital ballistic trajectory. It also became clear that SpaceX methods intended to prevent in-flight stage explosions don't transfer directly from one version of Starship to the next. With this approach, the path of in-flight explosions must be traversed anew with each new version, and depending on the depth of the structural changes, the duration of this path can be unpredictable.

d. Flights of Starship's third version

And what can be observed now doesn't inspire optimism. The accident on November 21, 2025, during cryogenic testing of the latest V3 version of Starship booster B18, allowed a glimpse inside to see the new architecture of its fuel system (see Fig. 5, [22]).

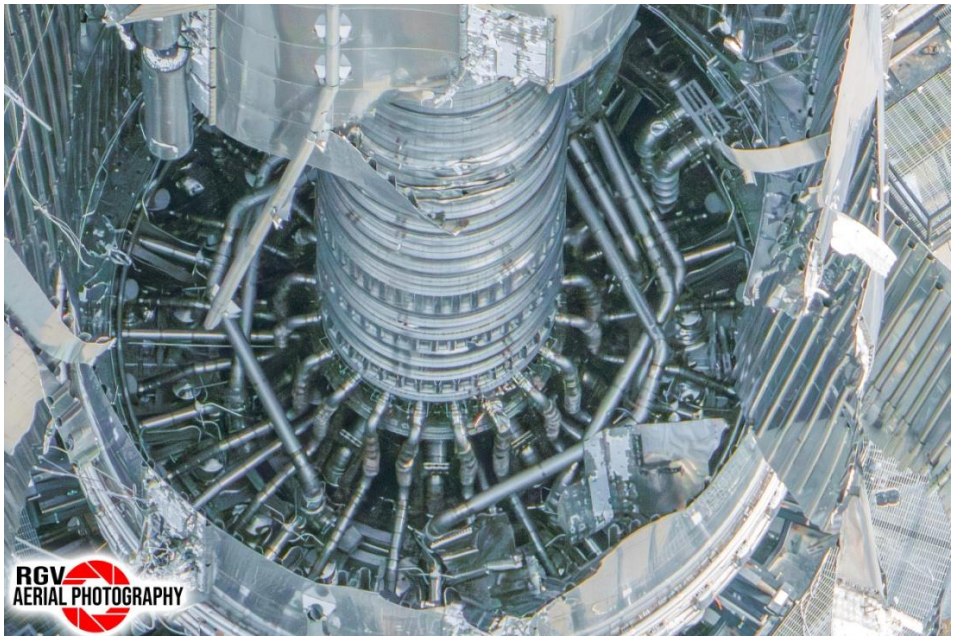

Fig. 5 – Visible portion of the pipes running from the side landing oxygen tank to engines of B18 V3 booster

At first glance, the inexplicable increase in the cross-section of the central methane feed line in V3 version was caused by issues with supply stability during the booster's rapid rotation around its transverse axis during the boostback. This led to the displacement of the oxygen header tank (used for landing operations, i.e., when the booster is caught by the launch tower) from the center to the sidewall of the main tank. As a result, the feed lines supplying oxygen to the engines during landing now have at least seven different lengths (see Fig. 5).

According to unofficial reports, after analyzing B18 booster debris, it was determined that its destruction was caused by stress concentration at the attachment points of the oxygen header tank to the central methane supply pipe, caused by its asymmetry. In subsequent booster versions (B19 and B20), this tank was significantly increased

in height and reduced in width to decrease this asymmetry, and strengthening the design of the fastenings led to an increase in the weight of the apparatus by approximately 2 tons.. But even without this "hindsight", it was immediately clear that, in light of the problems encountered with the two previous versions of Starship; these decisions immediately appeared, to put it mildly, completely short-sighted. One gets the impression that while the evolution of Raptor engine leads to an increasingly simple and elegant design, the evolution of the rocket system itself is moving is moving in the opposite direction.

The development of Starship V3 after the November accident lasted almost six months. Since its first launch was scheduled to take place from a new launch complex, work was underway to complete its construction and adjust the ground equipment. In March and April 2026, two ground static fire tests of the new B19 booster were conducted, first with 10 engines, and then with full complement of 33 engines. Both tests were terminated prematurely due to problems with the ground equipment [23], and in early May, one of the pressure generators in the launch pad's deluge system exploded while it was being turned on at full power [24].

The first launch of V3 version, the twelfth overall, took place on May 22, 2026, and was partially successful [23]. The second stage, despite some failures, more or less completed its flight program, and the condition of its thermal protection after deceleration in the atmosphere was apparently better than in all previous flights. However, the booster propulsion system shut down with the explosion of one of the engines during an attempt at a boostback, that is, a reversal of its trajectory in the opposite direction. Moreover, its operating mode after stage separation was radically different from that of previous launches – all 33 of its engines were supposed to fire, not the 13 that had always been used previously. The maneuver was disrupted, the first stage flew in its original direction, and, apparently, during an attempt to ignite its engines for a soft landing, it exploded, or simply disintegrated upon impact with the water at supersonic speed. The only reasonable explanation for the attempt to launch all 33 booster engines for the boostback instead of the usual 13 was the desire to avoid the excitation of self-oscillations of the Pogo type in the new version of V3 booster in this flight mode (see [24]).

Thus, all the problems that prevented the first two versions of Starship from completing epic saga of entering a circular near-Earth orbit in 11 launches, judging by the incidents of November 2023 and May 2024, remain in its third version.

III. Ten Years Later

a. Martian counterrevolution

As recently as January 2025, it seemed that Elon Musk’s crusade for the Holy Grail – Mars, the backup planet necessary for human survival – which had lasted nearly a quarter of a century by then, could neither be stopped nor even paused. It was at that time that he declared once again: "The Moon is a distraction", despite having signed contracts with NASA worth over $4 billion to fly to its surface using a lunar version of Starship. This coincided with the start of the second administration of President Trump, who stated in his inaugural address that Americans would "plant the stars and stripes on the planet Mars". At that moment, Musk was at the peak of his political influence. The budget proposal announced by the new administration essentially called for the termination of American lunar program, Artemis; sensing the shift in the political winds, NASA pivoted toward concepts supporting manned flights to Mars [25].

However, everything soon changed drastically once again. The U.S. Congress approved a $10 billion amendment to the budget reconciliation bill, which categorically rejected the cancellation of Orion spacecraft, SLS rocket, and Gateway lunar orbital station – the foundational elements of the national Artemis program. Soon after, just a few months after his inauguration, the President himself – in his inimitable, trickster-like manner – revised his stance on the Mars mission. Simultaneously, in June, Musk left the government administration. By autumn, Acting NASA Administrator Sean Duffy reopened the landing contract for Artemis III program to other bidders, quite reasonably fearing that Starship wouldn’t be ready in time [25]. All of this unfolded against a backdrop of somewhat unexpected but regular explosions – both in-flight and on the ground – of the second version of this rocket system, a version with a far from the most fortunate fate.

By that point, it became clear even to Elon Musk that the test flights – which by then had been ongoing for more than five years already – hadn’t yielded any coherent results, and a manned flight to Mars in the coming years was absolutely impossible. Furthermore, the lunar contracts with NASA (which were already overdue) had to be fulfilled in some way to avoid becoming a failure and turning him into a pariah for the American establishment. Consequently, in February 2026, Musk declared: "SpaceX has already shifted focus to building a self-developing city on the Moon", while the construction of a city on Mars would now become a goal "about 5 – 7 years from now" [25]. However, given how far original timelines of his plans – even when eventually were being met – diverged from reality, it is clear to an unbiased observer that even in a best-case scenario, any "Martian" activity is unlikely to resume for another 15 to 20 years. It will be a different "crusade", and not necessarily with the same "crusaders".

Fig. 6 – Visualizations of Blue Moon HLS lander and Starship HLS spacecraft (the second stage of the launch vehicle) on lunar surface

At the same time, simple considerations lead to even greater skepticism regarding the new project. The concept of Starship reusable rocket transportation system – where the second stage of the launch vehicle simultaneously serves as an interplanetary/lunar spacecraft performing a direct landing on the target planet's surface (see Fig. 6) – made sense only if propellant production for the return journey could be established on the target planet. It was supposed to be that way and such a thing is, in principle, possible on Mars. This is precisely why such a Martian revolution in the conceptual foundations of interplanetary flights was accepted so quickly and painlessly. Since 1962, when the "Kondratyuk route" was revealed to the global public, the prevailing view had been a strict separation between launch vehicles, transit modules, and lunar/planetary landers of space ships [26]. However, unlike Mars, the Moon lacks the sources to produce methane – the fuel for Starship spacecraft. Therefore, in its lunar configuration, Starship must be viewed as a necessity masquerading as a virtue, and as an attempt "to drill with a saw and saw with a drill". And so, in the framework of this Martian counterrevolution, SpaceX entire lunar program seems pretentious and, on the whole, rather artificial.

Furthermore, there is another aspect to which SpaceX tends to tries not attract much attention. As Starship is refined, its expected payload capacity continuously decreases a trend and SpaceX attempts to offset by increasing the system's liftoff mass from one version to the next – which, naturally, is primarily accompanied by an increase in propellant mass. All flights further from Earth must be sustained by repeated on-orbit refueling in low Earth orbit. Thus, a spiral in the number of required refueling missions is triggered: insufficient payload capacity leads to the development of a version with a higher liftoff mass (and greater propellant mass in the second stage), which in turn increases the number of orbital refuels. If the rate of increase in the second stage's propellant mass exceeds the growth rate of the payload, the number of refueling missions required for deep-space flights will grow indefinitely as the launch vehicle is modernized.

In late 2018, the planned values for the first version of Starship were as follows: 150 tons of payload and 1,200 tons of propellant for the second stage [6], which nominally would have required eight orbital refuels to completely fill its tanks. At the time, this seemed a perfectly acceptable solution given the system's full reusability. Such data appeared repeatedly in late 2018 and early 2019 on both SpaceX website and in Elon Musk's tweets, though finding traces of them today is becoming quite difficult.

Seven and a half years later, in late 2025, the following planned values for V3 version were reported: 100 tons of payload and 1,600 tons of propellant for the second stage (though even these are no longer on SpaceX website). This implies that at least 16 orbital refuels would be required to fully fill the ship's tanks. Moreover, there are no guarantees that the payload will not decrease further, causing the number of refueling missions (taking into account storage losses) to rise to 20 or even 25 – a prospect that looks entirely uninspiring. Yet, the first flights to the Moon – and perhaps not only the first – will have to utilize variants of this very version. It is unlikely that any "sane mind" would agree that a "self-developing city on the Moon" is feasible when it requires two dozen launches from Earth for propellant just for a single lunar landing. Consequently, in the grand scheme of things, such "lunar" Starship has far from bright prospects even if it is created by the planned deadline.

b. Transition to Type II civilization

It is obvious that these simple considerations are fully understood by Elon Musk himself. Perhaps this is precisely why, almost simultaneously with Lunar project bringing to the forefront – on December 7, 2025, just two weeks after booster of first V3 Starship was completely destroyed during ground testing – he proposed a new grand project: launching a constellation of millions of data centers into low Earth orbit for training and operating neural networks [27]. In this case, orbital refueling of second stages would not be required; therefore, in principle, the "insane spiral" of refueling missions cannot occur here, even if the liftoff mass of new rocket systems grows significantly. Thus, at first glance, this new project has no internal contradictions. This new project has no internal contradictions, that undermine it at a foundational level. That's why, it is worth examining it some more closely.

It should be noted that this occurred on a significant date for the United States – the anniversary of attack on Pearl Harbor and America's entry into World War II. While we will not analyze the external environment of Musk's proposed data center constellation in detail, but multiple statements suggest that the data available for training neural networks has already been practically exhausted or will be within the next 2 to 3 years [28]. Musk himself made a similar statement in January 2026 [29]. If so, it won't turn out to be that the current intensive growth of neural networks will either be unnecessary in the near future or only possible if they use content generated almost exclusively by themselves? In that case, neural networks will be learning from other neural networks, and the content they produce will become increasingly detached from reality. This carries the risk of unbridled growth of rampant hallucinations and models collapse, especially with the multiple repeated cycles of this process. Do we need this? Furthermore, formal economic analysis of AI development suggests a high probability that the growth of neural networks bears all the hallmarks of a speculative bubble that is bound to burst in the near future. Naturally, if that happens, the space-based data center constellation project will also collapse.

However, let us examine this project from a purely technical perspective. Despite his own January statement, which seemed to undermine the idea that neural networks require the infinite growth of data centers [29], Musk continued to develop this concept in February 2026. He proposed using Starship to launch 1 million tons of satellites per year within four years, at a power capacity of 100 kW per satellite. This, he claimed, provides an increase of 100 GW of AI computing power annually – without operational or maintenance costs, and with connections to Starlink via lasers. It is the fastest way to scale because readily available energy sources on Earth are already extremely difficult to find [30]. This implies a mass of roughly one ton per satellite. According to a letter sent to SpaceX employees on February 2, 2026, the plan would be realized by carrying 200 tons of payload per launch every single hour [30]. Indeed, there are approximately 8,766 hours in a non-leap year, and at least 5,000 launches will be required per year. Only then would "an exciting future where humanity is out exploring amongst the stars" open up [30]. It should be noted that maximum payload for V3 version of Starship currently under development is planned at 100 tons. Considering that the ground and flight testing in essence sole predecessor (the V1/V2 version, which wasn't fully reusable and had a payload of about 20 tons) took between three and six years, Starship V3 launches in the next few years would have to occur even more frequently than once an hour to fulfill this program.

As for the next level of project development – constructing satellite manufacturing plants on the Moon and using an electromagnetic railgun to accelerate data satellites without rockets, that "scales to > 100TW/year of AI and enables non-trivial progress towards becoming a Kardashev II civilization" [27] – let that be recounted by whoever might still remember it in two or three years, if any such people will be found then.

To evaluate the scale of the project, consider that as of November 2025, there were 5,427 data centers in the United States, making it the world's largest data center market by a significant margin [31]. Globally, more than 12,000 such centers are in operation, with the U.S. accounting for approximately 45 % of all facilities worldwide. This is two orders of magnitude less than the projected annual growth of the orbital data center constellation. Of course, the average number of chips and power of terrestrial centers are roughly two orders of magnitude greater than those of the orbital ones, which mean that the annual growth of orbital data centers in terms of power must be comparable to the current capacity of all terrestrial centers combined. Furthermore, 100 GW is close to the total capacity of all nuclear power plants in the U.S., which generate about 20 % of all electricity consumed there [32].

Let us briefly assess the characteristics of the proposed orbital data centers. A power capacity of 100 kW with a mass of 1 ton implies a specific power-to-mass ratio of 100 W/kg. The electrical system power of modern Starlink V2 Mini satellites with mass 800 kg, is 20 – 24 kW, which yields an unprecedented (for orbital objects) power-to-mass ratio of 25 – 30 W/kg. It is expected that the next version, Starlink V3 Full, which is to be launched by Starship, will have a mass of ~ 2,000 kg and a power of 50 – 60 kW, yielding approximately the same ratio [33]. It appears that existing architecture has hit a "ceiling" in terms of energy efficiency. Moreover, unlike Starlink satellites, orbital data centers will have to reject nearly all the electricity generated by their solar panels as waste heat using radiator emitters. With a thermal radiation power of 100 kW, a maximum permissible processor temperature of 355 K, a radiator surface temperature 20 – 30 K lower, and an area of 81 – 92 m² (accounting for the Earth's surface heat flux of 55 – 60 W/m² in a sun-synchronous orbit at an altitude of 800 – 600 km), the radiator-emitter alone would have a mass of at least 1,000 kg, consuming the satellite's entire "mass" budget.

Analysis conducted in collaboration with AI has shown that, in principle, it is possible to hope for an approach toward the required power-to-mass efficiency for data centers. However, this would necessitate the use of novel technologies: integrated design, functional element merging, thin-film flexible perovskite solar cells that convert 10 – 12 % of solar energy (which would require a solar array area of about 1,000 m²), graphene heat pipes for thermal transfer from processors, and – most critically – liquid droplet radiators. What is more, to ensure an acceptable level of coolant loss, these must feature magnetic confinement. Research on such radiators has been ongoing for at least 40 years (without magnetic confinement), yet nothing practically useful has been achieved to date. Thus, attempting to create orbital data centers with the characteristics specified by Musk ib February 2026 would require years, if not decades, of research and development – work entirely uncharacteristic of SpaceX – and even then, with no guarantee of success. Consequently, in his latest project, he attempted to solve the launch vehicle's problems assuming the use of a payload whose characteristics cannot be achieved within any reasonable timeframe in relation to the launch vehicle development program.

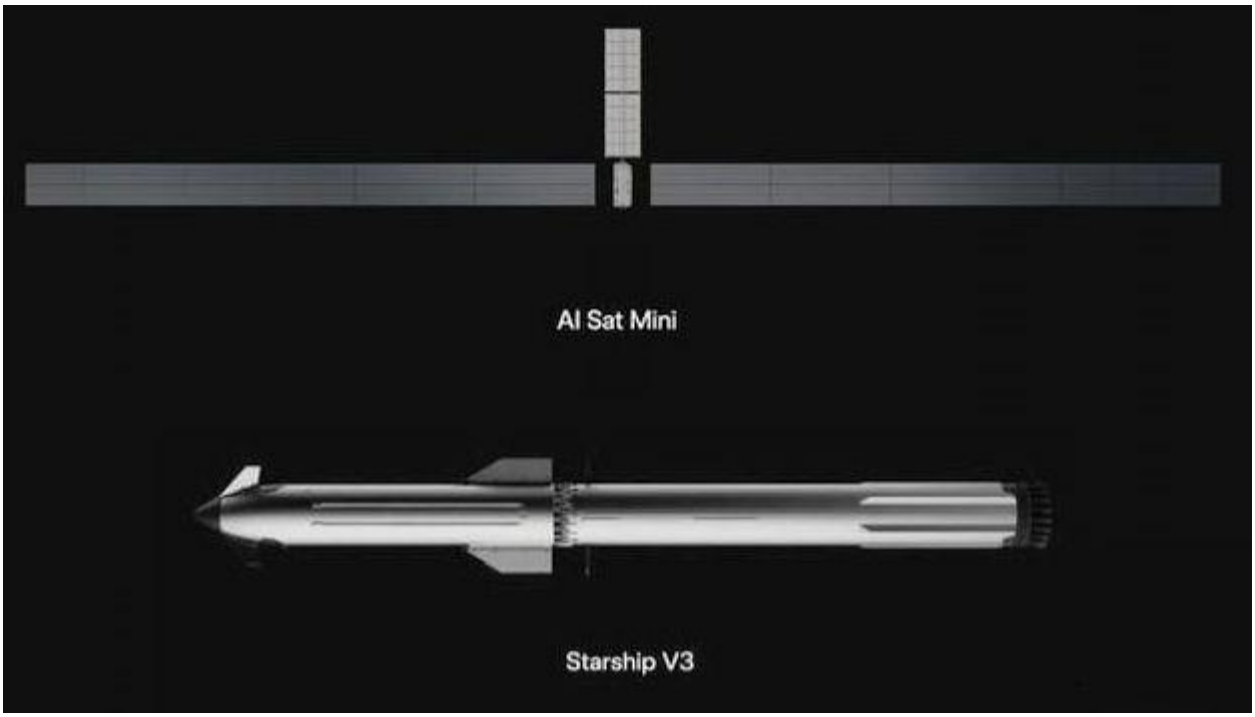

Fig. 7 – Size comparison between AI Sat Mini satellite deployed in orbit and Starship V3 launch vehicle

Indeed, following Musk's presentation of the "TERAFAB project" in late March 2026 [34], it became clear that the current proposal for ~ 100 kW satellites, designated AI Sat Mini, involves using thin-film solar arrays with an area of ~ 1,000 m² and a "wingspan" of ~ 85 meters, along with conventional radiator emitters with an area of ~ 90 m² (see Fig. 7). This practically coincides with our earlier estimates. The total capacity of the orbital data centers is now set not at 400 GW, but at ~ 1 TW, with a total mass of 10 megatons, meaning the mass of each individual unit remains unchanged. This is incompatible with conventional radiators, even those of extremely lightweight design, intended for no more than 5 years of operation without system redundancy and micrometeoroid protection. After analyzing such a design in conjunction with a neural network, it was determined that its mass couldn't be less than 500 kg. Furthermore, it would be extremely difficult to manufacture solar arrays with a semi-span of about 85 meters with a mass of no more than 150 kg – which was a non-negotiable requirement to stay within the total satellite mass of ~ 1,000 kg.

Therefore, the transition from a power-to-mass ratio of 25 – 30 W/kg, typical for Starlink satellites, to 100 W/kg for AI Sat Mini is currently nowhere in sight. Even if their mass turns out to be ~ 2000 kg, it would represent an unprecedented achievement for Tesla, SpaceX, and xAI. However, if their mass is twice as large, all estimates for the TERAFAB project become even more daunting. Most importantly, what is the purpose of all this? Is it really just so that orbital data centers can continuously train each other on a stream of self-generated hallucinations so mighty that the flow of information from the human world becomes negligible? All while consuming amounts of energy to produce this digital junk that are incomparable to what is currently available to humanity? And this, as claimed in presentation [34], is supposed to open the door to interplanetary travel?

Admittedly, one can discern another possible outcome of the symbiosis between Tesla, SpaceX, and xAI. If, as Elon Musk suggests, the primary data flow will connect orbital data centers with autonomous vehicles like Tesla EVs and billions (!) of Optimus robots and their analogues [34], then neural networks would be processing information from the physical world. In this case, a catastrophic collapse of neural networks due to their own hallucinations might be avoided. But doesn't this imply that such a "Type II civilization" neural structure would

begin to decide the fundamental questions of its own evolution, as well as the evolution of the surrounding world, without human involvement? What place would then remain for humanity in such a civilization? If such a project succeeds, wouldn't this neural structure, spanning all near-Earth space, become the physical embodiment of Vladimir Vernadsky's speculative concept of Noosphere (the highest stage of Earth's biosphere development)? Yet, unlike the original idea, it would be governed not by human intelligence, but by another mind. It appears that instead of granting a" backup planet", Elon Musk's Martian counterrevolution may now result in taking away from humanity the only planet it has. Although such plans seem to have been maturing for quite some time now in his head.

Back in 2014 – 2015, E. Musk compared artificial intelligence developers to fairy tale characters who draw a pentagram and hope to tame a demon with holy water, and that the risk of something "seriously dangerous" would arise within 5, maximum 10 years. At the same time, he first voiced the idea, which frightened many, that humans are just a "biological boot loader" for digital superintelligence, necessary only to launch it [35]. Then he broke off relations with Google co-founder Larry Page, claiming that he wanted to create a digital superintelligence as quickly as possible, essentially striving for the status of a "digital god" [36]. And then he became a co-founder of OpenAI, which soon took a leading position in the development of neural networks, and 10 years later E. Musk announced a program to deploy an orbital neural structure of unprecedented scale. But, approximately four months later, in the last days of April 2026, during a lawsuit against OpenAI in California, E. Musk again issued sharp warnings about the dangers of artificial intelligence [37]. What conclusion can be drawn from all these contradictory statements by E. Musk? Apparently, only one – he wants to become a "digital god" himself, and to prevent anyone else from becoming one.

It should be noted that a little earlier than his latest warnings about the dangers of neural networks, in mid-April 2026, and 4 months after announcing the data center constellation program, E. Musk cut it by more than 50 (!) times. Instead of 1 million AI Sat Mini satellites per year, according to the new plans, together with Starlink satellites, only 20,000 will be launched into orbit per year [38], and their mass will not be 1 ton, but 2 – exactly as we indicated a month before E. Musk's tweet. Then, in this scenario, the annual growth of the orbital neural constellation power will not exceed 2 GW (instead of 100 GW in the first scenario). And compared to the increase in the power of terrestrial data centers, this no longer looks like something that can replace them all (in China alone, it should increase by approximately 30 GW by 2030) [39]. In this case, an orbital data center constellation may prove to be a niche structure, perhaps only offering advantages in terms of minimal response latency to operational requests from autonomous vehicles, military personnel on the battlefield, and so on, due to the fact that the nearest space data centers will be located almost directly above the consumer, rather than in a cluster thousands of kilometers away on another continent. And precisely right after reassessing his capabilities to create a constellation of orbital data centers, Elon Musk again changed his rhetoric about artificial intelligence, once again emphasizing its threats to humanity.

Furthermore, ahead of its planned 2026 IPO (Initial Public Offering), SpaceX warned investors in a confidential filing with the US Securities and Exchange Commission (SEC) that not all of its current ambitious plans could be realized. This could be due to their reliance on Starship, then because of unproven technologies that will be used in the projects, and owing to the risks associated with Elon Musk ourselves [40]. However, as the IPO results showed, investors completely ignored the company's warnings and enthusiastically joined in inflating yet another stock market bubble, while E. Musk himself, instead of being the "head of Mars" and/or a "digital god", became simply a "trillionaire."

Let us also note that there is another aspect not considered by Elon Musk, which can be termed ecological: instead of ~ 5 – 10 kilotons of meteoric matter currently entering the Earth's atmosphere annually [41], we will inevitably receive ~ 2 megatons per year from the first version of TERAFAB project in the form of falling and disintegrating data centers. This estimate assumes an average constellation power of 1 TW; at 100 TW, the bombardment would reach 200 megatons per year. What will happen to the Earth's atmosphere and the planet itself after such an onslaught? Must humanity truly endure all this just to justify the existence of Starship system?

Therefore, the approach to solving current problems demonstrated by SpaceX, and first and foremost by its leader, E. Musk, can perhaps be called hallucinogenic. Issues of the current project that prove unsolvable upon deeper analysis (and when faced with reality itself) are gradually pushed outward into new, sister projects. This is done with the expectation that the unreachability of these new goals – and even their very necessity – will only be realized later, when it is already impossible to change the outcome. It appears that what might happen to neural networks during limitless, extensive development without a basis in reality has already been achieved by natural intelligence. The hallucinations purposefully created by SpaceX for outside observers since April 2023 (if not since September 2016) seem to have begun consuming the company itself over time. Or are we currently witnessing a reincarnation of the Pied Piper of Hamelin [42] on a planetary scale, with the entire world being no different from the children of that legendary German town?

IV. Where Martian counterrevolution must stumble: Collision of hallucinations with reality

Now, let us present the view on why everything described in Section III, fortunately, most likely lacks such global significance, due to the contradiction between the plans described therein and the realities from Section II, and, therefore, impossibility of their realization. The fact is that almost all the explosions or losses of orientation – which also lead to the destruction of the vehicle – during the flights of Starship stages or their full-stack assembly during suborbital launches, were caused by the same single reason. And in all 11 flights conducted so far, there have been 8 such incidents (there were two flights, if not three, in which were two incidents on each; see [17, 18, 20]). These were manifestations of the auto-oscillating process known since the days of Peenemünde, which in the early 1960s, when it first began to cause major trouble for American rocket engineers, received the name Pogo. It consists of the following: when frequencies of the rocket hull own longitudinal elastic vibrations and hydroacoustic oscillations in the fuel feed lines are close or multiples of each other, a positive feedback loop arises. As a result, in the best-case scenario, these oscillations become undamped, and in the worst-case scenario, they grow rapidly, leading to the structural failure and explosion of the object in which they originated. The process was named after a child's toy – Pogo stick, which was popular during the years when American rocket engineers first truly encountered this formidable phenomenon [43] (see Fig. 8).

Fig. 8 – Taylor twins hopping on Pogo sticks along a quiet London street

Soon, our predecessors learned to solve Pogo problems, but doing so required complex and lengthy experimental work every time they emerged, as a full-fledged theory of the process hadn't been established at that time. Pogo could be suppressed either by using special gas-liquid dampers on the propellant feed lines, by mixing helium into the propellants, or by damping the elastic oscillations of the hull using special spring-mounted masses oscillating in counter-phase to the hull's own vibrations [44, 45]. The complexity of such work is illustrated by the fact that suppressing Pogo on Titan II GLV rocket required 24 launches during 22 months from 1962 to 1964. By the end of the 20th century, the relevance of these issues had significantly waned due to natural causes described in [43], and these auto-oscillations apparently fell outside the focus of SpaceX engineers designing Starship. It seems that no design work related to the potential emergence of these processes was ever conducted. Yet, as it turned out, Starship – like any very large reusable rocket system – is a natural habitat for numerous variants of Pogo. Consequently, its developers are required to wage a long and grueling battle against them, especially if they lack the tools to predict the excitation modes of these auto-oscillatory processes. Incidentally, all this was already noted back in 2023, immediately following the first two Starship flights [46].

During its very first flight in April 2023, the struggle between Starship's advanced control system and Pogo effects manifestations led to those unusual secondary auto-oscillations with a period of about 12 seconds, resulting in the loss of the first rocket. SpaceX quickly identified the cause of this erratic behavior. By introducing a Forward Heat Shield Interstage (FHSI), as described in Section IIb, they altered the hull's own longitudinal frequency, thereby breaking the positive feedback loop – a necessary condition for Pogo to occur. However, for some reason, the company concealed this crucial feature of the rocket system; the word "Pogo" remains taboo to this day, despite at least 7 direct and 1 indirect manifestation of it during 11 suborbital flights. Consequently, it was then that SpaceX

laid the foundation for a system of omissions and cover-ups that, three years later, bring the company into shaky ground of "'terawatt power" hallucinations.

Having suppressed Pogo on the full stack, SpaceX immediately and unexpectedly encountered two new manifestations of the phenomenon on individual stages during the very next flight (see Section IIb). For about two months, Starship developers searched for random, disparate causes for these two episodes [15]. Even if they had grasped the true nature of these catastrophic events, the lengthy process of refining Pogo issues on ground test stands – which, naturally, they didn't possess – in no way fit the Agile methodology used to develop this rocket system. Consequently, at the turn of 2023 – 2024, the development program found itself in a deep crisis.

It was then that SpaceX appeared to incredibly lucky. In May-June 2023, the author of this paper, drawing on previous research into similar types of auto-oscillations, developed an integral theory of Pogo auto-oscillations in the shortest possible time. This theory made it possible to link the basic characteristics of the rocket's hull and its propulsion system to opportunity for exciting this process. Soon, after performing dozens of calculations for various cases involving previous Pogo manifestations, a consequence of immense practical importance was derived from this theory: "In the hydroacoustic systems under consideration, featuring high or very high pressure drops and constant geometry, their frequency is, with a high degree of precision, inversely proportional to the square root of the pressure drop across the pump". Elements of this theory, along with this corollary, were described in the paper [10], which was submitted to the well-known resource arXiv.org on October 5, 2023. Two weeks later, following unexplained delays in its publication, it was posted on the website http://www.synerjetics.ru/index.htm.

Finally, in November, shortly before the second Starship flight and after an unprecedentedly long delay, the archive decided not to publish the paper. The official reasons given were as follows: "Our moderators have determined that your submission is on a topic not covered by arXiv or that the intended audience for your work is not a community we currently serve". Then, three weeks later – already following the second Starship flight – on December 6, 2023, the author posted a brief summary of the rejected paper as his first post on the well-known aerospace forum NSF (NASASpaceflight), adding a few lines about the study's subject. This short post triggered such a heated debate on the NSF forum that it soon overshadowed all other topics regarding the second Starship flight. To continue the discussion, a separate thread was created by another forum member (not the author) on December 15. However, that very day, after only 13.5 hours and without any explanation, the thread was closed, and the author's access to the forum was revoked. Furthermore, it later emerged that the author had also been blocked from an indefinite number of administrative and information websites throughout Cameron County, Texas, where the economic influence of SpaceX is dominant.

It seems the only reasonable conclusion to be drawn from all this is that SpaceX became interested in and obtained paper [10], subsequently deciding to suppress, as much as possible, all public information regarding the Pogo issues encountered by Starship, the theoretical solutions to such problems, and the author of that work. At the same time, as detailed in paper [15], the company's CEOs soon realized that the corollary mentioned in paper [10] pointed them toward a new, previously unknown, and highly convenient method of suppressing Pogo by adjusting Starship engine operating modes. Already during its third flight on March 14, 2024, both modes that had resulted in two explosions in the previous launch were carried out quite successfully – though, as described in Section IIb of this work, the booster phase still experienced some minor issues.

Since then, a pattern has emerged: after each in-flight excitation of Pogo process – which usually culminated in an explosion – the subsequent launch would feature adjustments based on telemetry data regarding longitudinal elastic and hydroacoustic oscillation frequencies. The operating mode of the specific group of engines whose fuel system excited the oscillations (entering into positive feedback with the hull's elastic vibrations) would be altered. It's worth reminding that the frequency of hydroacoustic oscillations also depends on the length of the fuel lines, which varies for different groups of engines of a multi-engine power plant. As a rule, these adjustments involved either reducing engine thrust or simply shutting them down. Starting with the fifth flight, as experience grew, SpaceX also began employing thrust increases to quickly "slip through" dangerous regimes. Thus, by the end of the V1 version testing, all currently critical Pogo regimes of Starship had been identified, and it seemed that Pogo could finally be forgotten – all while continuing to conceal its very existence for the outside world.

However, as the events of 2025 have shown, reality has torn these illusions to shreds. Changes to the geometry and mass of the second stage alone in V2 version, along with the reconfiguration of the methane feed lines to the ship's outer engines because of Pogo (as detailed in Section IIc), led to a shift in the frequencies of both elastic and hydroacoustic oscillations. While SpaceX was undoubtedly able to calculate the elastic frequencies of the new design, they failed with the hydroacoustic ones, as they lack access to the relevant theory. Instead of moving forward, for most of 2025, SpaceX was once again engaged in the same process which went through from late 2023 to the autumn of 2024 – struggling through explosions and failures to experimentally determine the permissible operating regimes for the engines of new second-stage.

In essence, having simply wasted a year, SpaceX will now have to do this for a third time, with the added complication that both stages and engines have now been modified. And forced, but in no way justifiable, and probably fatal decision to create some kind of "octopus" – an asymmetrical oxygen landing tank with feed lines of

varying lengths – is likely to give rise to several more deadly dangerous variants of Pogo, which could even endanger the launch and landing complex itself [22]. Overall, one gets the impression that the leadership of SpaceX has completely lost any cohesive vision of Starship project, and with it, the possibility of creating a viable transportation system.

And that's a good thing. The longer Musk and SpaceX, in this state, will continue to mislead the world into their hallucinations of transitioning to a "Type II civilization" with the aid of Starship system, the less likely they are to deviate from path to combating pogo which requires a very large number of flight experiments and that the author of this paper has pushed them onto, that path which is practically incompatible with the Agile design methodology they employ. And the sooner reality, having blatantly and visibly intruded into their hallucinations, will destroy these magnificent but insane constructs.

Ultimately, the Martian counterrevolution will stumble upon the exact same obstacle as the Martian revolution: the mismatch between the stated goals and the means employed to achieve them.

Conclusions

1. During its first two decades of operation, leading up to 2023, SpaceX revolutionized markets of the launch services and high-speed broadband satellite internet. It also developed a first approximation to prototype of Starship transportation system for flights to Mars. It appeared that the exceptionally ambitious plans of the company's founder, Elon Musk, stood a chance of being realized, even if in a more realistic form than in dreams. In the future, this could indeed have led to what might truly be called the Martian revolution.

2. However, the subsequent three years of Starship testing resulted in no fewer than 8 explosions and losses of orientation (which also caused to the destruction of the system or its stages) across 11 test flights. Furthermore, the launches of the two developed and tested versions of the rocket system failed to demonstrate the capability of delivering any significant payload into low Earth orbit.

3. These incidents also prevented the second stage thermal protection system from achieving an acceptable level of functionality during 11 test flights, which is crucial for its reusability.

4. The maiden flight of the third version of the system, upon which so much hope had been pinned, demonstrated that during an attempt to perform a boostback, the booster's propulsion system shut down, resulting in the explosion of one of the engines. The booster continued on its way in the same direction, and apparently exploded while attempting to engage the engines for a soft landing, or simply disintegrated upon impact with the water at supersonic speed. This means that problems have once again emerged, the solution to which will require ever more test flights, leaving essentially no time or resources to address urgent next-level issues. These include orbital insertion, orbital maneuvering, and docking in low-Earth orbit, the transfer of cryogenic propellant between different versions of Starship second stage, and the storage of large masses of it in orbit.

5. The significant lag in both characteristics and development timelines for Martian transportation system in late 2025 and early 2026 led to the Martian counterrevolution – a total overhaul of the entire concept for operating Starship system. Instead of Mars missions, Elon Musk is now announcing lunar flights, extending to the creation of a "self-developing city" there (which apparently now seems impossible to him on Mars), and/or the launch of millions (or tens of thousands, as it turns out) of data centers into sun-synchronous Earth orbits over the next few years for evolution neural networks (Artificial Intelligence) with performance characteristics that are absolutely unattainable in the near future.

6. Furthermore, neither the rationale nor the actual objectives of these two new projects are being articulated. The question remains unasked: why should all this be undertaken with costs that will exceed, by orders of magnitude, everything known in the history of civilization?

7. The latest twelfth test flight of Starship (and the first flight of its new V3 version) showed that SpaceX chosen a strategy to combat the root cause of all its problems – Pogo auto-oscillations – namely, concealing the very existence of these processes, doesn't allow it, having spent any acceptable resources within a reasonable time, to create a version of this system that could in any way meet the requirements necessary for the implementation of all the announced programs.

8. Moreover, SpaceX failed to fully capitalize on a stroke of luck – development in 2023 of an integral Pogo theory capable of predicting the onset of these catastrophic auto-oscillations prior to actual flights. By covertly applying a published corollary of this theory to adjust Starship's engine operating modes after each accident, SpaceX demonstrated that it can suppress Pogo only after 3 – 4 crashes for each version of the system.

9. However, due to the iterative Agile approach to design, a version of Starship of an acceptable level (if one is possible at all) may emerge only after at least four or five iterations. Since Pogo-type auto-oscillations are objectively an inherent attribute of such reusable rocket systems, and because of the company's chosen strategy of treating the symptoms rather than the root causes of the problem, it is forced – with every new version of the system – to repeat the cycle of explosions and "fireworks" we are witnessing for the third time now, and which, it seems, even her devoted fans have become tired of.

10. Ultimately, such a development strategy for Starship reusable transport system has a very high chance of ending in failure, and then all of SpaceX incredibly ambitious plans under the banner of the Martian counterrevolution will, apparently fortunately for all mankind, end exactly as the Martian revolution has in recent months, that is, collapse. Or, at best, something like Big Falcon Rocket will be created to deliver payloads to low Earth orbit more cheaply (or more expensively but at a larger scale) than Falcon 9 rocket.

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