

The ideological failure of the Space Agencies

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The [European](#) and [U.S.](#) space agencies have entered a state of vertical ideological crisis that will inevitably lead them to unprecedented strategic turns or to the obsolescence of the role of the agencies themselves, as we've known them until now.

Different for nature, composition and political strategies, these two agencies are united by a chronic incapability to warn in time the ongoing changes, even when they are epoch-making ones. I postpone to another article (and maybe I will ask for help to someone who knows better those realities) the analysis of the [recently renewed Japanese agency](#) which, as I've understood, appears more prepared to the new opening phase than the western ones. [China](#), [India](#) and [Brazil](#) need another chapter apart, too.

Before beginning this analysis, I have to say first something. Criticism and not required suggestions are cause of bother for the bureaucrats, persuaded that nobody can have a point of view, maybe better than theirs, or even just a different one, but nevertheless pertinent and worthy of attention. In the space community, there is also a significant trend affirming not to give any suggestion to the agencies. Helping the agencies in any way means in fact to delay their extinction. I clarify, therefore, that I spend my time for the ones that - be they part or not of the bureaucracy - are not that much obscured by bureaucratic thought to be able to consider different opinions.

Talking about the destiny of the agencies, I am rather inclined to think that they should spend public money better than they've done till now: since Yuri Gagarin's flight to nowadays they have spent a trillion of American dollars and they have not lowered one only cent the cost to orbit one kg of terrestrial material! See also, at this purpose, the analysis made by Dr. Patrick Collins ([SpaceFuture](#), NASDA consultant, teacher at the Tokio and Azabu Universities, in Japan). For conscientious officials this would be enough to begin a balance of what it must be considered - at all extents - a failure. But a bureaucrat considers himself well above any duty of service toward the sovereign citizens: he sees them as subjects and, as an absolute monarch, as long as the fiscal yeld doesn't stop, he doesn't see any reason to put his own role in discussion! Rather, he will also try everything to find "reasonable" and "sustainable" motivations, in order "to sustain" his own chair and his own desk. Other people will have to face the crisis and the market ups and downs: the bureaucrats will affirm, not without a certain haughtiness, to be super partes. Yes, their income doesn't depend on the market, and they are well able to consider themselves superior and also to judge us "venal", poor deadly ones. We who, in lack of orders, risk to close our firms and have to fight with the banks, the tax office and all the other powers of a system that's very tender with the owners of great capitals (or, at least, a great appetite), and severe with the owners of few or none capitals. Anyone can well understand as the anger against the unmoveable bureaucracies can grow up in the real society: they are deaf to any demand, they stonewall and/or engulf any idea not born inside their back-garden. Nevertheless, I think that, dismantling a tool, we can clear its encumbrance, but we also loose its utilities: once dismantled the agencies, we could

also realize that we don't have anything else to collect funds to support useful researches, and this could even be a major cause for missing the space economy train.

Besides this, we would disperse a patrimony of scientific and technological knowledge that have cost however quite a lot and, if we knew how to use it for real objectives, it would constitute a great wealth. It would be really better if unbureaucratized people alternated at the direction of the agencies, people able to do social analysis and to totally reset up the strategy.

Let's stay with the feet on "Earth" (and how could we do otherwise? ☺): if bureaucracies are "fireplaces that don't suffer for smoke", deaf to any criticism until they are not touched on the economic side, why are they in crisis? That's easy: because they are broadly touched on their economic side!

The reduction of the commercial space

NASA saw its budget curtailed by Bush administration, in favour of the military engagement, first in Afghanistan and then in Irak, exactly while it was trying (with some success) to rebuild a post-cold-war mediatic image, thanks to the automated exploration of Mars. In 2004 the same administration played, to the heads of the same space agency, the wake-up of the "[Moon Mars and beyond](#)" plan. In practice: "please stop playing with the toy cars, and put again astronautics at the center of your strategy". The Chinese enterprise was needed, in order to arrive to that. Sign - if we needed another demonstration - that the western political directions don't reason upon preventive analysis of what it happens on this planet, but only upon the received solicitations and the electoral surveys. Is it possible that everybody kept on amusing by an entertainment based strategy, until the Colonel Yang Liwei made his [flight in orbit](#), last autumn? Yet, it takes longer than two days to send a man in orbit. There was time enough to understand what the Chinese were preparing and to discuss on the western strategy as consequence but our bureaucrats have slept blessed, until their "mother" did not kick them out of bed. While they were still, metaphorically, rubbing their eyes - and foretasting a substantial breakfast (read=a substantial budget increase) -from the desert of Mojave an annoying mosquito was rising up: [SpaceShipOne](#). And so the multimillion agency's budgets are put in discussion even more, since SS1 repeated the enterprise of the NASA' X15 with just 30 million dollars! They can lift their eyebrows with sufficiency, on the costs of the Chinese enterprise, since the Chinese economy is not yet a fully market economy. But Scaled Composites is an American enterprise, and fully subject to all the laws of the market! Never as in this month of July 2004, those sirs must have felt the chairs tremble under the bottom and all the eyes on them, with sardonic expressions, say: "how much did you say that mission should cost?".

To NASA, at least, some well precise tasks were assigned and whoever will move to the White House (or will renew the contract for other four years) in next November, won't be able to take back. And the good American boys at least have this beautiful use: they are able to redirect and move very quickly.

ESA is really worse: it is completely lost in fog. The series of negative events seems to be endless: the telecommunications' debacle and the subsequent vertical fall of the launchers market; the general bending of the world economy after September 11th; the climate of continuous war that followed. And, recently, the European Union enlarged at 25 countries seems to be a factor of political uncertainty, more than a strong point. So the European Union risks to miss the great opportunity of a 300 million people market, in the paralysis and total lack of authority of the central government, elected by little more than 40% of the having right to vote. And however deprived of true decisional powers towards

the member states. The great emphasis given to the widening of the union in the 2007 agenda, strategic four years plan of ESA, written in autumn 2003, plays nowadays as another factor of uncertainty.

The process of concentration of the big European space industry, in action from at least 10 years, does not give any sign of coming to an end. The 2007 agenda clearly says that - as Highlander - one only of them will remain. One only, gigantic, monopolist with a very huge appetite, will englobe Astrium, EADS-LV, Alcatel, Matra-Marconi and, in Italy, Alenia and Telespazio (already acquired by Alcatel). The big space industry, orphan of the commercial telecommunications market, is fully financed, nowadays, by public money, through the agency. The agency, therefore, could do anything but seek for a new sure, abundant, source (as we can read in the already quoted document) "to maintain the European space industry".

A future in uniform?

And ESA found it. In the 2007 agenda, a 23 pages document, the word "defence" appears 33 times, while the expression "human spaceflight" appears only 6 times and it's always related to non European activities (United States, China, Russia). The strategic turn of the European space agency seems therefore traced with a certain precision: from the ideology of the so-called "sustainable development", that gave priority to Earth observation and telecommunications, they pass to the safety, in the military meaning of the term. The basic philosophy doesn't change, therefore: they're always looking at their feet, rather than lifting the look to the endless universe. Rather than aiming to acquire new vital spaces and resources, to help the free development of civilization, they prefer to keep on observing the existing environment. And they revert to the old obsession of power: the military control. Nothing new, therefore, under the sun. If the cake doesn't grow up, the quarrelsomeness of the competitors will surely increase. Thus, the job for heads and martinets, with or without uniform, will increase in parallel.

In the same time, the policy of opening toward the small and medium enterprise is fading out and the continuation of the same Aurora program is questioned as well as other programs directed to accept ideas and study/research initiatives. The Galileo project obviously towers, so big and pretentious that does not even succeed in starting, although the old dispute for the leadership between Germany and Italy seems to be resolved in favour of the Germans.

Written in October 2003, the agenda quotes China only as a partner of the Galileo project. Just 8 months before the SpaceShipOne's enterprise, the vertexes of ESA didn't warn the need to notice the [X-Prize](#), neither the job of many small firms, endowed with great ideas and great courage. They neither mentioned any reusable vehicle, though an ESA exponent, interviewed after the Chinese enterprise, examined the resume of the Hermes project (the European shuttle, canceled some 10 years ago) as a proposal.

Anyone can also see that, while for NASA the difficulty was (and is) "to undress the military uniform", ESA finds more difficulties to wear it. We read in a passage on the relationships among ESA and the European Union institutions: "The most important aspect of the evolution of ESA is its position, together with national agencies, in Europe. That position needs to be well-defined in the framework of European Union institutions, so that ESA acquires a legitimacy it still currently lacks in that context, having developed in parallel with their political construction. Such legitimacy is necessary so that ESA does not have to continue justifying time and again its role in the framework of the EU's sector policies, its role in the construction of a European defence policy, its role in relation to the Commissioner

responsible for space, etc. This continual need to justify its role leads to inefficiency and stress, which work to the detriment of Europe and its citizens." But poor, poor bureaucrats! They don't feel enough cuddled and reassured, although the fabulous salaries, the benefits, and, above all, the privilege of doing a job that so many people- true astronauts, in the heart and in the aims, which would be proud to serve in those duties - sincerely envy them!

Analysing the topic from the European Union point of view, the situation doesn't appear very different. If the approach is more "political", the substance doesn't change. In the "white paper" AEROSPACE 2003-33, bringing the date of November 11th 2003, the space expense is supposed to rise from the 2004 5.38 G€ to an amount between 6.6 and 8 G€ (in 2033). Though it reaches to explore a 30 year horizon, the document sticks not giving any weight to Astronautics, if not as a marginal activity, concerning the "loyal collaboration" with the United States! The document candidly admits besides that "the human space flight and the exploration of the space have emerged as special elements from the process of consultation", but this doesn't mean at all that they will trouble, inserting such elements in the agency's strategies!

As far as the 2033 objectives are concerned, the European space program includes the economic growth (but how to get it if they don't foresee any true line of industrial development?), the creation of jobs and the industrial competitiveness, nearby – of course – the mythical "sustainable development". This last topic is in phase of obsolescence, but still able to make damages. Here we find also the objective for a stronger safety and defence for everybody, close to the widening of the union crowned by success, the reduction of the poverty, and the aid to development.

The ones who expected a bigger market orientation, more attention to the opening of Space to the privates, more impulse to the astronautic technologies, for space tourism and the geo-lunar infrastructure – i.e. a true politics of development – are served once again. At least the European Space Agency didn't yet arrive to that point: on this side of the Atlantic, the spoiled bureaucrats are slower to wake up than their United States colleagues, perhaps also because nobody handles to wake them up.

The knot of the development costs

External observers, missing any familiarity with the design processes in the aerospace environment, are fully legitimated to be well confused. In the '90s they assisted to the proliferation of the so-called "low-cost missions", in the name of a new philosophy: many small missions, instead of few high-cost missions. I need here to make a necessary premise. The items that keep high the space missions budget, in comparison to terrestrial applications, are very schematically:

- the special hardware, cosmic radiations resistant, produced in rooms with high coefficient of cleaning, submitted to very rigorous vibration test and built with particular criterions of robustness,
- the documentation imposed by the quality standard methodologies,
- the tests imposed by the quality standard methodologies,
- the safety criterions and protection required for the human space flight,
- besides, naturally, the elevated cost of the whole bureaucratic *apparatus*.

In order to realize the downsizing policy, NASA decided to act above all on two variables: it adopted commercial hardware components and gave priority to automated missions. For ESA the jump was not

so high, considering that Astronautics was a priority neither before. It was, therefore, an exercise targeted to demolish the cost of the missions, without even demolishing the cost of one kg. to orbit. The solution was to sacrifice, once more, Astronautics in order to keep intact the government power on space. Perfectly abreast of the same philosophy that sacrificed the development of the RLVs, in order to maintain the industry of the spendable rockets. Anyhow people prefer to watch Mars in TV than to go personally there. Perfectly "sustainable", little pollutant, certainly surer, in comparison to the dangers of the real trip. But the "jolly good times" never last for a long time, unfortunately and luckily.

China announces it's program of lunar colonization and it completes a definite first step. That's how NASA remembers (again) to be not only a government agency, but also a military agency! For all this all's well from the point of view of bureaucrats and military hierarchies who see a new active role and probably growing budgets.

But the very disruptive element is represented by SpaceShipOne. This is difficult to explain in plain words to the public opinion: why the hell the NASA and ESA missions have to cost so much, if Scaled Composites has succeeded in reaching 100 kms height with less than 30 M\$? Let's make some "account in the pocket" and disclose the mystery only in part. We take back the previous scheme, comparing two methods of work almost entirely antithetical for missions with human crew.

Item	Agencies	Small firms, style SC
Hardware	Special hardware, subcontracted to big contractors	Self-developed, or subcontracted to other small enterprises, or commercial hardware when possible
Documentation	Elephantine, according to quality standard methodologies	Essential and to hoc, according to the needs of the project
Test	Meticulous, according to quality standard methodologies	Essential and to hoc, according to the needs of the project
Safety	Nominally very elevated, according to quality standard methodologies	Targeted and customized to the mission
Structure	Heavy bureaucratic structure	Reduced at minimum
Personal	Matrix style, with big functional redundance, low efficiency	Project team, few designers, very experienced, very motivated
Job organization	Normal syndical schedules	People work 12 hours a day, weekend inclusive, and count 8 hours a day
Financing	Public	Auto-financing, personal and direct investment of the designers themselves
Prevailing motivations	Salary, position of power	Ideological passion, investment

Obviously many comments can be made on the table above. As to the different setup, it can be reassumed in this only sentence: the difference is between the artisan and industrial (expecially public) method of working.

Who could expect that the craftsmanship would jump out and exactly on the most technological frontier? Well, ladies and gentlemen, expected or not, here it is! It made its flight June 21st 2004. Apart all the considerations, the technicians of Scaled Composites don't enslave anybody but themselves, because they are convinced on what they do and they freely invest their own hours and their own enthusiasm.

We can call what emerges from such comparison a bigger maturity of the artisans, above all for their ability not to be slaves of the quality methodologies, which certainly represent a remarkable incidence on the total cost of the project. I don't think that the Scaled Composites' designers - for the most part "wild old foxes" and "living legends" - are fasting of the quality methodological standards. But they know how much and whether and how to use it to reach the objective without being buried by papers. I am saying all this without knowing them and without having yet spoken with them, therefore I expect denials and corrections.

The quality standards, currently used by the agencies, were born in the public context (aerospace and defence). Having no budget problems, they grew up at excess, keeping on branching and specializing the rules, traditionally giving more importance to the formal aspects than to the substantial one. A priestly caste of quality experts was formed, able to criticize the formal appearance of the documents, but not their technical content. Therefore, the developed systems can respect all the normative rules but cannot be sure neither reliable. The loss of two shuttles on five and of a certain number of Martian probes is the proof. In the house of ESA, the failures of Arian 5 amount to 21% (4 on 19 launches), highly overcoming the ones of Arian 4, 2,6% (just 3 on 114 launches!), sign that methodologies alone are not enough or they became perhaps a more and more blocking boulder. Or, probably, thing even more dramatic: they give the illusion of safety, reducing the attention and the application of the human intelligence. Another ideological failure for the agencies, on which we all should reflect.

The current quality standards represent, likely, the extreme hit of tail of the industrial age: the attempt to serialize the intellectual job (as it was made in the Soviet union, by the notorious GOST). The illusion is that, writing a complete handbook for each design activity, it was possible to use little experienced workers, therefore perfectly interchangeable: the result is the extreme mortification of intelligence, the triumph of the bureaucratic thought!

It would be now finally time to reverse the rout: instead of keeping on proliferating standards, more and more diversified and detailed, increasing the rules jungle (and the consequent dismay of the ones who should apply them), let's start to think about their rationalization and reduction. A very minor number of rules, draft finally by the experience of designers, and not by "quality experts". Which moment is better than now, for a true re-examination, considering that the success of SpaceShipOne is (and will be) there to see, still mediatically warm?

An alternative agenda for agencies

Since I always thought that a critical article without proposals is less than half of the possible contribution, I come to some ideas for a different role and a possible new strategy, more suitable to the challenges that our civilization is facing.

A space program should integrate private investments and support from the community, according to some basic "user requirements", that I find logical to re-specify hereafter (please also see my paper for the IAF congress 2003 "[Project & Test Engineering Methodology](#)", presented at the 54th IAF Congress, Bremen 29/09 - 03/10 2003, on the quality of the space systems):

- R1. Space Systems shall allow Mankind to establish as soon as possible self-maintaining bases outside of its birth planet.
- R2. Space Systems shall be sure enough not to put in danger the human life in space, not more than it was in danger on the terrestrial surface.
- R3. Space Systems shall not cost so much to prevent, by facts, the development of a true Space Economy in short time.

The above basic requirements have a contingent character, but they will certainly keep their validity on a horizon of many centuries to come. We can add some other ones, children of the above three.

In order to clear away the field from a possible misunderstanding, I don't believe that the engagement on the safety and defence front is entirely to be discarded. However, it is necessary to discuss deeply its requirements, above all bringing the discussion out of the narrow circles of the political-military hierarchies. Such people has always reasoned in a militarist optics, while the matter of the defence must be faced in a humanist optic. The same reaganian "star shield", being a purely defensive system, it was not so wicked as its detractors painted it, being aimed more by the worry that the American imperial power could become unassailable, rather than by pacifist aims. The new space defensive systems should be targeted to the defence of human life as a supreme value, both the lives of "our" people and the ones of the "enemy". Another basic requirement is to avoid to put too much the nose in the private life of the sovereign citizens.

Therefore, an ethical discussion is of vital importance and priority, before embarking in the design of any new defensive system. Furthermore, I am absolutely against the theory that the defence may become the strategic priority of the European Space Agency. If the big industry has to reappraise itself for a period, it is not a problem of mines. The big industry is, after all, endowed with a power of self-preservation entirely comparable to, if not bigger than, the one of the statist bureaucracies: it passes naturally from the exaltation of the virtues of free market (in order to have free hands when the economy is growing) to the robbery of public money, when the phase is negative, blackmailing the community with the fable of the "jobs" to be maintained.

Shortly, the guidelines for a new European Space Agency, are the following ones.

The EUROPEAN SPACE AGENCY should begin a transition program that brings it to split in two structures, endowed with wide autonomy:

- a structure of advanced space search, carrying on researches both autonomously and subcontracting to contractors, also using methods more advanced than the EMITS database (by itself a not badly system, to make public the tenders) in order to favour the birth of search initiatives in the society, also by single people, endowed with good ideas and suitable preparation;
- a financial structure, to coordinate public and private investments, able to create investment funds

and stocks to support (i) the validation of the astronautic technologies (ii) the birth of the astronautic industry; such structure should in short time to become financially autonomous, operating as a financial agency on the stock-exchange market.

As to the priority thematic areas, I propose the following ones:

1. PHILOSOPHY AND METHODOLOGIES - objectives:

- to draw the philosophy of the space age, and to favor the development of a new metaphysics, a new vision of the open world, whose borders are widened at least to the solar system;
- re-examination of the quality standard methodologies;
- to set methods of involvement of the people in the society, for the resolution of complex problems;
- to finance the art of the space age.

2. VEHICLES AND INFRASTRUCTURES - objectives:

- reusable earth-orbit vehicles, for transportation of passengers and goods;
- suborbital flyers for passengers transportation;
- orbital and lunar structures and housing modules, space hotel;
- reuse and disposal of the space wastes;
- validation and development of the inflatable and chemically rigidizable technologies;
- lunar colonies.

3. BIO-ASTRONAUTICS - objectives:

- artificial gravity, to prevent the bony and muscular deterioration;
- protection from the cosmic radiations;
- production of water and oxygen in artificial environments, copying and accelerating the natural processes;
- artificial ecosystems in closed environments, using the International Space Station as research laboratory.

4. ENERGY AND INDUSTRIALIZATION OF THE GEO-LUNAR SPACE - objectives:

- solar power harvested in space, both for terrestrial and space clients;
- solar power produced on the moon, for lunar, earthling and space clients;
- industrial production of micro-gravity products;
- zero gravity hospitals;
- disposal and storage of dangerous wastes;
- dangerous industrial productions move in earth orbit.

5. ADVANCED STUDIES AND EXPERIMENTATIONS - objectives:

- astronomic observatories on the Moon and in the points of Lagrange;
- research laboratories on the Moon and in the points of Lagrange;
- wide range researches on the benefits and on the conveniences of the zero-gravity;
- researches for the terraforming of extraterrestrial celestial bodies.

Obviously I am not speaking to cancel all the existing stuff (telecommunications, earth observation, various experimentations). But it is time to acknowledge that such themes aren't anymore prior and that the above listed ones have to be first.

To those gentlemen who believe to be by law owners of any idea, only because they occupy a desk where institutionally the ideas should be born, it is required, first of all, an exercise of humility. There are people who, since years, carry on an independent philosophic, politic and economic search on the space topics. It is from such a search that they draw their ideas, and who could develop such ideas better than them? Many recent events are giving proofs that we are right. I am not suggesting to the bureaucrats to go home, leaving their place to others, but only to accept the concept that there are, out of agencies, a rich and prolific elaboration. They should look very much more for the collaboration of the ones who studies and undertakes for true passion.

Otherwise, they could fail again as, on the long distance, whoever places himself below the minimum necessary ethical level that his own age requires. The post-industrial societies can exit ahead from the current crisis and can be again the cultural vanguard for the whole civilization (as they undoubtedly were during the industrial age) only if they will be able to complete a decisive ethical step. And a simpler and more transparent method to recognize the paternity and the ownership of the ideas constitutes an essential precondition of such ethical step.

Another ideological failure would not be only yours, since it would revert on the whole civilization. Of your (and our) successes, instead, we all would be proud!