

Brazilian S&T

To the barracks or into the labs? Military programmes and Brazilian S&T policy

Renato Dagnino

Military R&D programmes are becoming increasingly important in Brazilian S&T. At the same time there is a deterioration of the S&T infrastructure. Civilian thought sees 'professionalisation' as one way to debilitate the military's power of veto in the political arena. This supports the military perception of their R&D programmes as a means of avoiding an identity — and perhaps legitimacy — crisis. It is debatable whether this trend is capable of providing the mix of interests and priorities required by the social and economic goals of Brazilian society. This article examines the underpinnings and objectives of military R&D programmes. It also evaluates their economic, technological and political potential implications for Brazilian society.

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CIVILIAN-MILITARY RELATIONS in Brazil are dominated by a confluence of two forces based on distinct motivations. Since the end of the military regime in 1985 civilian élites have been interested in reducing military influence in the political arena. The main current of civilian thought in Brazil sees 'professionalisation' as one way to limit the power of veto of the military, and thus subject them to civilian rule. The military appear convinced that their future is increasingly dependent on the adoption of a professional, strictly military, role that would give them greater legitimacy within society.

If the trend suggested by these forces is realised, it will be crucial to question the role assigned by the civilian élites to the 'mission-disoriented' Brazilian Armed Forces. The process that points to an identity, and perhaps legitimacy, crisis within the military is not recent. It is currently being exacerbated by two main factors: first, the 'funeral' of the 'internal enemy' caused by recent events in the socialist world, and second, the climate of co-operation that surrounds relations with Argentina, until now the main potential external enemy of the Brazilian military.

The military have been compelled to accept tasks not strictly concerned with their profession. Repressing the traffic in narcotics, as proposed by some interested parties, is viewed by the military as a minor function, incompatible with their traditional role and status. Furthermore, they are deferred from accepting this role because of the obvious potential for corruption it presents.

The fight against the "internationalisation of the Amazon by spurious foreign interests", claimed by

the military, cannot last, due to its artificiality. Other non-military tasks often cited, such as road construction, health care, literacy campaigns, and so on do not warrant serious consideration based on either civilian or military rationale. The main obstacle to these alternative paths towards legitimisation is that they cannot sustain and unify the military as a corporate body. The military appear convinced that in the long term, these paths will be detrimental to the institution.

This article argues that the confluence of the two forces towards 'professionalisation' increases the military involvement in the S&T field. Current military R&D programmes aim to build nuclear weapons, missiles and nuclear submarines. They are felt necessary in order to fulfil external defence scenarios (exclusively formulated, in Brazil, by the military). R&D programmes represent a new orientation for the military — they appear to be moving not so much to the barracks as into the R&D laboratories. Additionally, the military are gaining influence over Brazilian S&T policy and funding. This gives them increasing control in this key area. In the long run, it will substantially increase their political influence.

The current processes of 'de-regulation' and deterioration of the Brazilian S&T system brings, as a direct consequence, an increasing military influence in the field. The first allows increasing funds for their R&D programmes. The second enlarges the prestige of their activities. In effect, the military are succeeding in asserting themselves as central actors in the Brazilian S&T sphere.

Consequently, there is an urgent need to review the aims of these military programmes. It is necessary to evaluate their economic, technological and political implications for Brazilian society. This assessment requires two brief historical digressions that will help to understand the origins of the current situation. The first is about Brazilian military involvement in industrial and technological development in general. The second is more related to their specific function: their involvement in arms production.

Role in development

The Brazilian military have played a key role in the industrial and technological development of the country. This role needs to be understood as a consequence of their concern with long-term national development rather than as a corollary of its strictly military function of external (and internal) defence. The military self perception — as civilising and modernising agents — goes back to the beginning of the Republic at the end of the 19th century. Civilian élites were felt to lack nationalistic sentiments. The military saw their conception of the *República* as clearly distinct from the one held by civilians.

Military engagement in projects not directly related to its immediate or specific needs have been based on this perception. Historically, the military actively participated in the initial actions to install technology-intensive sectors, such as metallurgy, oil, energy, transportation, telecommunications and informatics. This participation has been linked to the technological capability of military cadres and based on a perception — unique among national élites — of the importance of scientific and technological development.

During military rule (installed in 1964), the military had the hegemonic power to formulate and implement public policies.¹ However, the S&T policy thereby formulated contradicted Brazil's economic and industrial policies. The aim of S&T policy was to establish a national structure capable of achieving, in the long term, technological autonomy. Economic and industrial policies were designed to achieve rapid economic growth, based on the flow of foreign capital and technology. Consequently, they tended to increase the country's technological dependency.

As a result, internally generated technologies never reached the productive sector and tended to remain useless. This was not sufficient to lead the military to abandon their nationalistic S&T policy. This posture fostered 'innovation policies' (encompassing industrial, commercial and technological aspects) in restricted sectors considered strategic by the military, the most important being the arms industry.

Arms industry: myths and reality²

After a period of fulfilling the internal demands of the Brazilian Armed Forces, the arms industry began (at the end of the 70s) to penetrate international market niches. The aim was to reduce dependence on the domestic market, and obtain economies of scale not permitted by the limited internal demand. At the same time, the financial resources generated in the politically unstable Middle East by oil exports considerably increased the demand for arms in the world market.

Two main elements explain the promotion of Brazilian arms exports. First, the convenience of exploring promising market niches of intermediate technological content. Second, Brazil's extreme dependency on imported oil — 80% of internal consumption at the time. Through long-term supply contracts based on oil-for-armaments counter-trade agreements, Brazil was able to ensure the oil supply under relatively favourable conditions.

In addition, the already difficult situation of Brazil's balance of trade had always been a powerful stimulus to export. Arms exports not only directly affected the increase in foreign exchange, but also helped to open up foreign markets to other Brazilian products from chickens to cars.

Three myths surround the Brazilian arms sector: that arms production has a positive economic impact; that weapons technology is significant for the arms sector and industry; and that arms sales have positive implications for foreign relations

In the second half of the 80s Middle Eastern demand for arms decreased as a result of the depressed oil price and a considerable excess stock of military equipment. The end of the Iran-Iraq war — Iraq being the main buyer of Brazilian arms — represented a *coup de grace* for the Brazilian arms industry. The turning point was 1988: exports in that year fell to 200 million dollars, equalling their 1982 value, prior to the beginning of sales derived from the conflict.

Three myths were sustained by the Brazilian military and entrepreneurs in the arms sector. These were massively disseminated by the press. In spite of being challenged they remain prevalent in the Brazilian decision-making circles. Their elimination is crucial to an appropriate assessment of the present civilian-military relations in Brazil.

The first myth was that arms production has a positive economic impact for the country. This was based on false information concerning export value. It was alleged by the military and entrepreneurs that arms exports reached billions of dollars. However, this was not the case. At their peak, in 1987, exports never surpassed 570 million dollars (averaging 1975-88, US\$186 million). This represented 2% of Brazilian total exports in that year.

The external balance of Brazilian arms production was as follows: every 100 dollars of production required 30 dollars of imported inputs and previous external sale orders of 40 dollars. The global balance of the trade is even worse: when the finished equipment purchased by the Armed Forces is included, the total required imports reaches 53 dollars.

The negligible contribution of arms production to industrial employment and production aggravates the poor performance in terms of external trade. Hence, the arms industry must be considered an enclave within Brazilian industry.

The second myth concerns the significance of the weapons technology developed both for the arms sector itself and for Brazilian industry. The interesting (but expensive) technological accumulation experienced by the sector has been unable to assure its subsistence. Its characteristics rule out its emulation in other sectors of Brazilian industry.

The main innovation of the sector was not a set of material technologies, but a technological ap-

proach. This was based on the search for autonomy (and not autarchy) as opposed to technological dependence. The atypical and long-standing concern with human resources and research established a unique capability to integrate endogenous knowledge and technologies of distinct origin and vintages. It avoided the purchase of 'black boxes' and thereby made possible the use of components with widely different characteristics.

This resulted in the production of locally designed intermediate-level technology platforms that incorporated sophisticated and well-selected critical components imported from various firms and countries. The 'innovation policy' devised by the military regime to manage the sector was only possible because of its strategic nature. *National* enterprises were created or selected, and supported with subsidies for technological development, production and commercialisation. Reliance on transnational corporations, unacceptable in this sector, but dominant in most technologically intensive Brazilian sectors, was avoided without sacrificing access to foreign technology and components.

Two paradoxical elements — the strategic nature of the arms sector, and the absence of external threat to Brazil — formed the basis of the 'innovation policy' adopted. Also paradoxical is the fact that the approach is particularly appropriate for guiding civilian technology (and industrial) development in peripheral countries. The approach adopted encompassed virtually all the recommendations now being formulated in the current literature on technological accumulation.³ There is no doubt that emulation of this approach in other (more economically and socially important) sectors would be beneficial. However, its spread has been hindered by the characteristics peculiar to periphery development and by Brazilian industrial policy.

Furthermore, the benefits of arms production to Brazil are far from clear. Even accepting the spin-off argument for advanced countries, it does not hold in the case of technologically dependent countries such as Brazil. The general rationale for importing technology into the industrial civilian sector is that it is cheaper, more reliable, more efficient and more prestigious than that which could be locally developed. This rationale is adopted by the transnational corporations' affiliates, that were responsible for the greater part of the technology brought into the country. Private and state-owned enterprises, despite the learning effort they have expended, also follow the same pattern.

Military technology internally generated, even if it could be used in civilian production, should have to satisfy an additional requirement. It would have to be capable of competing within a rather distinct civilian environment with the imported technology.

In addition, there is considerable evidence of the inefficiency of Brazilian military R&D. This can be demonstrated by assessing Brazilian and American military R&D expenditure and their respective economic impact. The comparison seems fair since the USA is often cited as an example of inefficiency in this area. The USA is also known to give excessive finance to its military R&D activities.

Official data indicates that National Defence and Security absorbed less than 1% of the Brazilian R&D public budget. The data concerning military R&D expenditure has been systematically distorted as have those related to arms export. Previous research by the author has shown that military R&D expenditure represents approximately 20% of the total public budget. This research also evaluated the economic significance of the Brazilian arms sector. Its production has been estimated as less than 0.2% of GNP (gross national product).

The ratio between these two indicators — military R&D expenditure as a proportion of the total R&D expenditure and arms production as a proportion of GNP — can be taken as a proxy for the relative economic efficiency of military R&D. Its value, which will be compared with the American data, is 100:1 in the case of Brazil.

In the USA the share of military R&D in total public expenditure on R&D can be taken as 40%. The share of arms production in GNP is 4%. Hence, the US ratio between the two indicators is 10:1. Contrary to expectations, the comparison of Brazilian and American ratios demonstrates: first, that Brazilian R&D activities are excessively militarised when compared to the size of the arms production sector and second, that the performance of Brazilian military R&D activities, evaluated by the share of the arms sector in GNP, is even worse than the American.

In summary, it is possible to argue that even if the products of the arms sector incorporated significant new technology, and the technology developed could be transferred to the civilian industry, the inefficiency of Brazilian military R&D would still seriously invalidate the current approach to technology development.

The third myth concerns the implications of arms sales for Brazilian foreign relations.⁴ These are alleged to be positive. In the context of the Cold War the arms trade was generalised. Despite minor blemishes on the Brazilian image and some threats of retaliation from the USA, preferred commercial relations based on the arms trade were maintained. Such a position was allegedly convenient for Brazil. This is because such arrangements gave Brazil political leverage through the mutual confidence derived from the arms trade.

In addition, it was felt that there would be potential economic advantages from such trade. Relations with Iraq provide an example of the success

of this strategy. Until the beginning of the Gulf War, Iraq was the main supplier of oil to Brazil (38% of imported oil) and the principal buyer of Brazilian armaments (nearly 70% of exports between 1982 and 1987). Today, although it is unclear how this situation will evolve, it is evident that trade prospects with Iraq and with the region in general are not good.

'Conversion' of military interests

The military appear unconcerned about the fate of the arms manufacturers now in trouble (the arms exports reached 20 million dollars in 1990, and have been negligible since then). One reason for this is that the problems experienced by firms in the arms sector are not unique. In general, Brazilian firms have undergone a process of bankruptcy and dismantling. This is partly due to the effect of the overall economic crisis, which has had important consequences for employment, denationalisation of the economy, capital flight, and so on.

In this context, it would be extremely difficult to convert the Brazilian arms industry. Even in a more favourable climate, conversion would be improbable, because the type of products that Brazilian arms manufacturers could make would have to compete with those already produced by the transnational corporations affiliates. In fact, the more technologically sophisticated industrial sectors (into which Brazilian firms could 'diversify') are already controlled by foreign capital.

On the other hand, the limited military budget has severely inhibited the acquisition of the weapons locally produced.

Consequently, military strategy seems to be changing. They are no longer concerned with the production of conventional weapons. They seem to be 'converting' by becoming increasingly oriented to R&D programmes dealing with more sophisticated military technology.⁵ A new area of influence and legitimisation is now being prepared and a new myth is being generated.

References to military R&D programmes are increasingly frequent in the Brazilian and foreign press. The Navy's nuclear programme is presented as a resounding success. The design of a

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nuclear-powered submarine has progressed, the nuclear fuel-cycle has already been achieved. It is also claimed that, in the near future, and at a very low cost, small-scale nuclear plants for electricity generation will be available. In contrast, the 'civilian' nuclear programme (established with Germany during military rule and now regarded as civilian) is considered a disaster.⁶

The Brazilian aerospace sector, called "the Brazilian exporting wonder" and "the vector of Brazilian high technology", has also been in the headlines. The satellite launch vehicle programme that can also be used to make ballistic missiles, was maintained in spite of being late in relation to the satellite development itself. Even the less prestigious Army is trying to convince the public of its technological capability in order to legitimate the increasing R&D resources it has been receiving.

Notwithstanding the fragility of the arguments currently being presented and the evasion to confront the existing myths, the image of efficiency in the S&T area, successfully cultivated by the military, remains. This could cause an increase in the already absurd share of the military in the total R&D budget. The press has repeatedly stated that additional resources will be allocated for nuclear programmes carried out by the three services. This would increase the military R&D share to 22%.

The image of efficiency of the military is also increasing in other areas. Military prestige has been raised by the ineffectiveness and corruption of the civilian government, a climate marked by political and social instability, economic distress, and so on.

S&T has been carefully managed by the Brazilian military for many years. It represents time, both the trench into which they are now retreating and the 'frontier of expansion' for their influence upon society as a whole.

Civilian élites project

Besides the attempt to debilitate the power of veto of the military in the political sphere, there is now an important new element of tension in Brazilian civilian-military relations. The civilian élites are increasingly determined to avoid anything which could jeopardise their project of "competitive insertion" in the world economy. This project is founded on the attraction of external capital and technology, and the exploitation of market niches abroad. It is seen by the government as the key to the door leading to the first world.

The civilian élites intend to develop the country (in which 50% of the population is starving and outside the market) through a "competitiveness magic". Through this 'magical' project the élites will acquire capital and technology from the developed countries and, as a result, Brazil will grow by exporting products to developed countries.⁷

Brazilian analysts considered this plan as at best, futile, at worst, destructive, potentially leading the country into the fourth world (nations with an extremely low *per capita* income and no natural resources). Yet this project is increasingly accepted by the élites and reinforced by the international community. The abandonment of the market reserve in the informatics sector, the adoption of international standards for regulating intellectual property rights and the progressive elimination of protectionism, are only a few examples of the determination of those involved.

The same objective has led the government to interfere in the military sphere. Declarations demonstrating its commitment to abandon arms production, trade, and military R&D programmes, have appeared in the world's press. A photo of the then Brazilian president with a shovel of lime, filling in the hole prepared to test a nuclear device, was widely publicised. Concessions in the military sphere in exchange for a more favourable attitude of the American government on questions of immediate economic impact, seem acceptable to the civilian élites. It is necessary to determine whether they have enough power to control military objectives.

There is evidence that the military R&D programmes are not being discontinued. These programmes, rather than arms production and trade, should be interpreted as the central activity to be controlled. The photo mentioned above, for instance, cannot deceive the informed public who know that it is possible to test a nuclear device through computer-aided simulation techniques. The organs responsible for such military programmes have been preserved in a climate marked by the 'deregulation' of the S&T system and the dismantling of research institutions and the universities. Maintenance and reinforcement of the programmes can only be interpreted as a concession to the military. Yet, privileges are being denied to the military though the reduction of public servants' wages.

Whether the civilian élites are interested in controlling military R&D programmes is also unclear. The military goal is to avoid an identity, and perhaps legitimacy, crisis. The civilian élites are concerned with 'professionalisation' of the Armed Forces to exorcise the interventionist spirit of the military. The confluence of these two forces tends to submit scientific and technological development to military interests.

The perception of the civilian élites seems misleading and naïve. It is perhaps due to lack of comprehension of what the principle of hierarchy in the Armed Forces really means that they presume the military can be treated as a block. It further assumes that if a particular role were to be claimed or accepted by them, other roles would be abandoned.

Historically the behaviour of the Brazilian

Armed Forces indicates that it is precisely this fixed hierarchy that permits the simultaneous adoption of quite distinct roles. It is important to remember that activities such as the support for civilian air traffic and torture of political prisoners were performed simultaneously, until a few years ago, without jeopardising the unity and the *esprit de corp*. Such heterogeneity of 'tasks' with totally different political implications could not co-exist under the same civilian roof. The confusion between hierarchy and monolithism seems to be the basis of the naïve and dangerous perception of the civilian élites.

New international order

The international context is characterised by the emergence of the United States as a hegemonic power. This has significantly reduced the room for negotiation available to third world countries. By the end of the 80s, after a 'lost decade' of economic stagnation and decreasing importance as suppliers of products dependent on cheap labour (made irrelevant by new technologies), the Latin American position in the international scene had already been debilitated. Events in Eastern Europe, particularly in the former Soviet Union, and the Middle East further reduced the bargaining power of Latin American countries. It increased their isolation with respect to the centres of world power.

Third world countries are now increasingly vulnerable in relation to the USA. As a result, actions to avoid the proliferation of arms production capability and to restrain the transfer of sensitive technologies may now be more effective. However, negative implications relate to the economic disadvantages inflicted on third world countries through the new international division of labour. These are aggravated by the increasing monopolisation of new technologies by transnational corporations. In addition, restrictions on transferring sensitive technology, given its potential non-military uses, may become detrimental to the development of these countries.

The development of the third world requires an increase in the flow of resources, investment and

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technology from the advanced countries. Neo-liberalism presents a serious obstacle to this. If third world countries demonstrate any intention to use technologies transferred from the USA for arms production, a disastrous restriction of technology inflow would probably occur.

It is hard to determine whether the USA is truly willing to control proliferation of arms production capability, or whether a potential military application of sophisticated technologies is being used as an excuse to avoid further menaces to its competitive position from third world countries. The end result is that missile guidance, nuclear and super-computer technologies would have their transfer restricted. In addition, their production could serve as an excuse for retaliation in other areas. However, this is not the only conclusion that could be derived from the evidence. As indicated below, the Brazilian military seem to think differently.

USA-Brazil relations

The main reasons for the preservation of military R&D programmes are their alleged relevance to national defence requirements and the spin-offs that could be promoted. It is necessary to verify the extent to which the military actually believe these arguments. There is evidence that fewer and fewer in the military sincerely agree with them.

Two other factors, probably more important, were relevant at the origin of these R&D programmes. The first, already mentioned, is that they are perfectly consistent with the military strategy of professionalisation and legitimisation. A second less evident reason is now addressed. Inherent in the military's logic is the idea that their R&D programmes, if successful, could increase the status of the country on the world scene. This view is based on 'old-fashioned strategic common sense': countries that have technological capability in the military field deserve privileged status.

Such perceptions are allowed by the ambiguous American posture in the non-proliferation field. The US government has indicated its determination to prevent new countries from obtaining nuclear and missile technology. In spite of the sanctions which have been exhibited, there has been no clear statement of the economic rewards available for countries refusing to acquire and use these technologies. On the contrary, countries that already have such technological and industrial capacities are receiving, even today, preferential treatment. Countries like Brazil, that are between these two categories have become particularly disoriented: they only see the size of the stick; no carrots have been offered.⁸

This situation tends to transform the Brazilian military (capitalising on the nationalistic feeling in opposition to the USA) into soldiers of a naïve and outmoded 'technological guerrilla'. In order to

evade regulations imposed by the Missile Treaty Control Regime, agreements with China have been made aiming to acquire missile guidance technology. It has been suggested that former socialist republics were also approached to transfer technology alleged as necessary to the development of the Brazilian aerospace programme.

The military have not hesitated in the past to exaggerate the size of Brazilian arms production and exports. They deceived public opinion by trying to demonstrate the necessity and contribution of the arms industry to the country. The same ambition for social legitimisation, on the one hand, and a genuine but mistaken aspiration to upgrade the country's status, on the other, seems to have led them to adopt exotic and outmoded geopolitical arguments. As in the past, they do not appear conscious of the potential grave consequences of their posture.

Final remarks

Due to the paralysing obsession of the civilian élites, there are only two currents of opinion which could counterbalance the current trend of military R&D in Brazil. Despite major historical differences in the content of their analyses and the character of their recommendations for Brazilian development, Brazilian progressive intellectuals (or, more properly, a fraction of them) and the American establishment seem to agree, albeit with different motivations, on one important issue —

that it is imperative to control Brazilian military R&D programmes.

Notes and references

1. The analysis of the arrangement established by the military within the state apparatus for the settlement of the Brazilian Arms Industry is extensively addressed in Patrice Franko Jones, *The Brazilian Defense Industry* (Westview Press, Boulder, Colorado, 1991).
2. An extensive treatment of this subject was presented by the author in Renato Dagnino, *A indústria de armamentos brasileira: uma tentativa de avaliação*, PhD dissertation, Instituto de Economia, UNICAMP, Campinas, Brazil, 1989.
3. A good synthesis of these recommendations can be found in the recent paper from Martin Bell and Keith Pavitt, "Technological accumulation and industrial growth: contrast between developed and developing countries", SPRU, February 1993.
4. The implications of arms export in Brazilian foreign policy have been comprehensively addressed in Scott Tollefson, *Brazilian arms transfers, ballistic missiles and foreign policy: the search for autonomy*, PhD dissertation, The Johns Hopkins University, Baltimore, 1991.
5. This point is raised by the author in Renato Dagnino, "The international political economy of the diffusion of military technology", in Center for International Cooperation and Security Studies, *The Global Diffusion of Military Technology* (University of Wisconsin, Madison, 1992) pages 44-51.
6. A detailed analysis of the nuclear submarine project was made by Domício Proença Jr and Paulo Franco, *Dossiê: Submarino Nuclear Brasileiro* (IBASE, Rio de Janeiro, 1989).
7. An assessment of the Brazilian project of "competitive insertions" and its impact on the industrial and technological fields is presented in Renato Dagnino, "O ajuste estrutural na América Latina e a política tecnológica", *Revista de Cultura Vozes*, 85(5), September-October, 1991, Rio de Janeiro, pages 548-564.
8. This subject is extensively discussed in Patrice Franko Jones and Renato Dagnino, "Membership in the first world geo-strategic club: possibilities for Brazil", *Defense Analysis*, 8(3), November 1992.