Fourth Meeting of the Brazil-Sweden High Level Group on Aeronautics

Agreed Minutes

The Fourth Meeting of the Brazil-Sweden High Level Group on Aeronautics (hereinafter referred to as HLG), established during the May 21, 2015 Meeting of the Joint Commission on Economic, Industrial and Technological Cooperation (hereinafter referred to as the "Commission"), was held on November 21, 2018 in Brasilia.

The Swedish delegation was headed by His Excellency Mr. Niklas Johansson, Acting Minister of the Ministry of Enterprise and Innovation. The Brazilian delegation was headed by Her Excellency Ms. Yana Dumaresq Sobral Alves, Executive Secretary of the Ministry of Industry, Foreign Trade and Services.

The compositions of the Brazilian and Swedish delegations are listed in Annexes I and II, respectively.

The two sides expressed their satisfaction with the current state of bilateral relations and agreed on the need to continue fostering dialogue and cooperation by promoting mutual high-level visits and meetings. They expressed the importance of this HLG to strengthen the bilateral relations.

Both sides underlined that they should capitalize from the intensification of the cooperation in aeronautics including the defense area to identify opportunities of partnerships in other areas, with the aim of raising our economic and trade relations to a higher level. Both sides recognized the importance of this cooperation as a model to other sectors that will be discussed in other groups and Committees.

The agenda for the meeting (found in Annex III) included presentations of the Air Domain Study report, the status of the ongoing cooperation and discussions on the possibilities of new projects and activities for this partnership. Several positive examples of successful cooperation activities were mentioned, for example the effects from the Endowed Professor Chair at ITA.

Finally both sides reviewed the updates on the Terms of Reference, Working Plan for the Brazil-Sweden Cooperation on Aeronautics and the Long-Term Strategic Plan adopted by the High Level Group. The Air Domain Study report document was also reviewed Consensus was reached on the documents in Annexes IV, V, VI and VII, respectively.

A joint session between the HLG and the Steering Group on Innovative High Technological Industrial Cooperation (SGI) took place to discuss ways to improve the bilateral cooperation.

Brasilia, 21 November 2018.

For the Brazilian Delegation

Yana Dumaresq Sobral Alves
Acting Minister
Ministry of Industry, Foreign Trade and Services

For the Swedish Delegation

Niklas Johansson
State Secretary
Ministry of Enterprise and Innovation

Brazilian Delegation

Yana Dumaresq Sobral Alves, Acting Minister of MDIC

Elton Santa Fé Zacarias, Executive-Secretary of MCTIC

Tenente Brigadeiro do Ar Carlos Augusto Amaral Oliveira, Secretary General of MD

Embaixador Nelson Antonio Tabajara de Oliveira, Undersecretary General of MRE

Igor Nogueira Calvet, Secretary of MDIC

Renato Coelho Baumann das Neves, Deputy Secretary of MP

Jackson Schneider, President of EMBRAER Defense and Security

Major Brigadeiro do Ar Sergio Roberto de Almeida, Chief of Undersection of EMAER

Major Brigadeiro do Ar Hudson Costa Potiguara, General Director of DCTA

Embaixador Benedicto Fonseca Filho, Head of the Department of MRE

Margarete Maria Gandini, Director of MDIC

Ana Cristina Rodrigues da Costa, Chief of Department of BNDES

Rafael Lucchesi Ramacciotti, General Director of SENAI

Leonardo Boselli da Motta, General Coordinator of MDIC

Rodrigo Augusto Barbosa, General Coordinator of MCTIC

Coronel Diógenes Lima Neto, Manager of MD

Coronel Engenheiro da Reserva Geraldo Antônio Diniz Branco, Manager of MD

Luiz Felipe Gondin Ramos, Chief of International Advice of MDIC

José Nelson Bessa Maia, Advisor of MP

Marcos Lamachia Carvalho, Chief of Division of MDIC

Emília Villani, Chief of Research Division of ITA

Frederico Lamego de Teixeira Soares, Executive Manager of SENAI

Secretária Camilla Neves Moreira, Assistant of MRE

Fernando Machado, Market Analyst of EMBRAER

Rodrigo Girdwood Acioli, Analyst of FINEP

Solange Maia Corrêa, ITA

Ana Caroline Suzuki Bellucci, MDIC

Daniella Mariano de Souza Rocha, MDIC

Juliana Pinheiro da Silva, MDIC

Ubajara Berocan Leite, MDIC

Swedish Delegation

Niklas Johansson, Ministry of Enterprise and Innovation

Carl Rosén, Ministry of Enterprise and Innovation

Liselott Andersson, Ministry of Enterprise and Innovation

Karin Höglund, Ministry for Foreign Affairs

Per-Arne Hjelmborn, Embassy of Sweden

Rear Admiral Andreas Olsson, Ministry of Defence

Colonel Olle Hultgren, FMV

Anders Blom, Innovair

Joakim Appelqvist, Vinnova

Micael Johansson, Saab

Jonas Hjelm, SAI

Romulo Enmark, Swedish Defence University

Catharina Zajcev, Ministry of Enterprise and Innovation

Johanna Carnö, Ministry of Enterprise and Innovation

Jacob Paulsen, Embassy of Sweden

Ana Carolina Bussacos, Embassy of Sweden

Robert Persson, Embassy of Sweden

Nils Hedberg, Embassy of Sweden

Rickard Nyström, Swedish Air force

Pamela Brown, Swedish Armed Forces

Andreas Rentner, Business Sweden

Alessandra Holmo, CISB

Lars Nyström, Saab

Mikael Franzén, Saab

Marianna Silva, Saab Brasil

Bo Torrestedt, Saab South America

Bengt Janer, Saab Aeronautics

Marcus Cato, Ministry of Defence

Andreas Danielsen, Ministry for Foreign Affairs

Mats Olofsson, Innovair

Björn Jonsson, Innovair

Magnus Ahlström, Saab

Ulf Anderini, SAI

Mats Johnsson, Ministry of Education

Fourth meeting of the Brazil-Sweden High Level Group on Aeronautics
Brasilia, November 21, 2018

Coffee served from 9.30, Ministry of Industry, Foreign Trade and Services
9.55 Photo session with HLG-members

10:00 I. OPENING
Brazil HLG Chair, Yana Dumaresq Sobral Alves, Acting Minister, Ministry of Industry, Foreign Trade and Services
Tenente Brigadeiro do Ar Carlos Augusto Amaral Oliveira, General Secretary, Ministry of Defense
Elton Santa Fé Zacarias, Executive Secretary, Ministry of Science, Technology, Innovation and Communications
Ambassador Benedicto da Fonseca Filho, Director for Scientific and Technological Affairs, Ministry of Foreign Affairs

Swedish HLG Chair, Niklas Johansson, State Secretary, Ministry of Enterprise and Innovation
Ambassador Per-Arne Hjelmborn, Swedish Ambassador to Brazil

10:50 II. OVERVIEW ONGOING AERONAUTICAL ACTIVITIES
Presentation of ongoing bilateral activities/projects by Brazil (MDIC) with support from Sweden (Innovair)

11.05 III. AIR DOMAIN STUDY
Presentation of study by Sweden (Innovair) with support from Brazil (FAB)

11.25 IV. WAY AHEAD/ACTION POINTS
Presentation by Brazil (MDIC) with support from Sweden (Ministry of Enterprise and Innovation)

11.35 V. CLOSING REMARKS
Swedish HLG Chair, Niklas Johansson, State Secretary, Ministry of Enterprise and Innovation
Brazil HLG Chair, Yana Dumaresq Sobral Alves, Acting Minister, Ministry of Industry, Foreign Trade and Services

11.45 VI. SIGNATURE
Approval of draft minutes

11.50 JOINT SESSION HLG AND SGI
Presentation about the development of the strategic partnership BR-SE; what we have achieved so far and where we are heading; lessons learned; how to incorporate them into a broader cooperation.

12.30 LUNCH HLG AND SGI

Long-Term Strategic Plan for the Brazilian-Swedish Cooperation in Aeronautics

Version 2.0

1. Background

   A High Level Group on Aeronautics (HLG) was established in 2015 as a result of the Gripen export to Brazil and commitments by SE Minister Mikael Damberg and BR President Dilma Rouseff. An Executive Committee (EC) was formed to support the HLG and in the Working Plan[1] decided by HLG in the October 2016 meeting, the EC was tasked to produce a Long-term Strategic Plan for the Brazilian-Swedish Cooperation in Aeronautics.

   The present document is intended to lay a long-term strategic plan for joint collaboration in aeronautics research and innovation. It is linked to other plans and documents for the cooperation, coordinated by the ministry level in the two countries.

2. Organization

   Roles related to the Aeronautics Cooperation and also to this Strategic Plan are stated by the HLG in the Terms of Reference (ToR)[2] for the HLG and EC.

   The High Level Group will take strategic decisions regarding new joint activities.

   The Executive Committee will act as an advisory group to the HLG, analyze suggested activities and, when needed, appoint and direct Working Group(s), in accordance with the Terms of Reference. Such decisions can be taken by the EC in their regular meetings and shall then be stated in agreed meeting minutes. The EC will also summarize the status of ongoing programmes and advise the HLG about suitable future activities.

   The EC may create and appoint non-permanent, *ad hoc* working groups to deal with specific issues, *ad referendum* of the HLG.

3. Purpose of collaboration and long-term goals

   The purpose is to build joint aeronautical activities that will be mutually beneficial in terms of cost sharing, establish technical networks in prioritized areas and transfer knowledge between the two countries, all in order to create improved innovation systems.

   This shall be performed in civil, military as well as dual-use applications. Long-term goals include a successive increase in Technology Readiness Level (TRL) for the joint activities, to save costs and to create competitive knowledge for future products and systems.

4. Process

   To produce the requested strategic documents, the Executive Committee has established an initial Bilateral Working Group with representation from both countries. The group members are assigned based on a Triple Helix concept, from government, academia and industry.

   During the initial year, Innovair has been tasked to lead the work on the Swedish side and the Brazilian Air Force (FAB) on the Brazilian side. Main POCs have been appointed on each side.

   The work has been carried out in meetings between the two national groups, by video conference or face-to-face, as well as by mail correspondence. The final document was

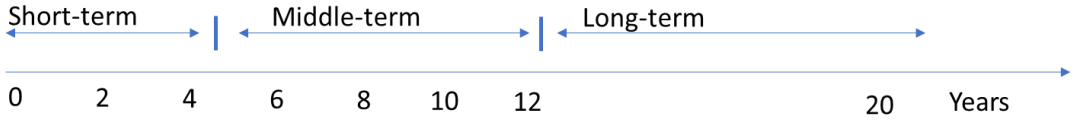
[1] Working Plan for the Brazil-Sweden cooperation on Aeronautics, agreed by HLG Oct 18th, 2016
[2] Terms of Reference for the Brazil-Sweden cooperation on Aeronautics, agreed by HLG Oct 18th, 2016

forwarded as a jointly developed product to the Executive Committee (EC) for approval, before being sent by EC to the HLG in accordance with the Working Plan from October 2016.

This long-term strategic plan will be revised yearly and updated if needed. Any suggested changes will be presented to EC well in time before the annual HLG meeting.

The suggested cooperation is structured in three separate time periods: short-term, middle-term and long-term, with the following distinctions concerning the time for delivery of results from an activity (a study report, research summary or technology demonstrator):

- Short-term: Up to four years
- Middle-term: Five to twelve years
- Long-term: More than twelve years



As part of this Strategic Plan, the working group has developed a joint roadmap for the period 2018-2020, with a view also about the period after that. The basic idea is a gradually expanding cooperation level, starting at low TRL, eventually (mid- to long-term goals) leading to joint demonstrators of technology as a base for future product concepts. See further text and figure in chapter 6.

5. Stakeholders

Academic collaboration has already successfully started in several technical disciplines. Low TRL research is carried out at high academic standard. Institutes typically carry out work at slightly higher TRL, frequently using critical infrastructures and providing critical mass for larger programmes. Industry is, apart from final manufacturing of products and systems, responsible for defining technical directions for relevant research but also to establish demonstrator programmes that can involve both academia and institutes, resulting in a real Triple Helix innovation system. SMEs (Small and Medium Enterprises) are frequently more adept at acting within their respective areas of expertise at higher TRL, as subcontractors or partners to large industries.

6. Programmes at different TRL

During 2015-2017, a number of pilot projects were established at low TRL using existing funding in both countries.

On the Swedish side, these projects have been part of the National Aeronautics Research Programme (NFFP), financed through Vinnova. This programme has recently been approved by government for a new period, lasting 2017-2022. In this new NFFP7, part of the funding has for the first time been dedicated to international cooperation, with Brazil as one of the partner nations. The NFFP programme is primarily aiming at research at TRL 1-4. For higher TRL, projects could be funded by special constellations on a case-by-case basis.

On the Brazilian side, the initiatives regarding technological development are oriented by the National Technological Strategy (with MCTIC as responsible ministry). Linked to that there is a

Working Plan with detailed areas of interest. Currently, a Brazilian Aerospace Technological Innovation Strategy is under development. In Brazil TRL 1-3 projects normally are funded by CNPq and FINEP, TRL 3-6 could be funded by EMBRAPII or FINEP and TRL 6-9 by BNDES.

Following the signature of agreements (MoU) for specific CFP (Calls for Proposals), FINEP and SENAI together with Vinnova launched two independent CFPs for bilateral innovation co-operation in different areas of the aeronautics sector. Seven projects were approved and have been started during 2017-2018. Another Vinnova MoU and CFP with FAPESP has been signed and new projects are expected to start in 2019.

Additional new programmes in both countries are needed, in balance with strategic needs as well as with funding opportunities. In the work preceding this strategic document, the interest from both countries concerning cooperation areas were investigated, based on the full map of technology areas. It is suggested to form the base for new programmes or projects to be jointly defined, to further stimulate co-creation in a Triple Helix type of collaboration between academia, institutes and large as well as small companies in both countries. Due to the present economic limitations, the initial ambition has to be restricted but it is seen as strategically important to support and evaluate good initiatives when they emerge. The reduced list, proposed by the Working Group, is stated in Appendix 1.

On the long-term scale (see above), such programmes should be extended to technology demonstrators for new products or systems. Such initiatives are normally more cost-driving and will require long-term allocation of strategic funding, involving government as well as industries.

Funding mechanisms should be further explored and decisions on funding will be taken by the funding entities. Such funding decisions should also address the need for national as well as bilateral coordination and project management. Funding entities must, within legal boundaries of each country, provide equivalent conditions of economic and financial contribution for companies of both countries, in order to assure a balanced and fair cooperation, according to the principle of reciprocity.

An example of a stepwise and conceptual approach, needing continuous coordination of funding mechanisms is shown below (figure 1), illustrating a gradually increasing TRL with time. This needs bilateral structuring of funding schemes and focusing of resources in each country. The figure is further explained in chapter 11 of this document.

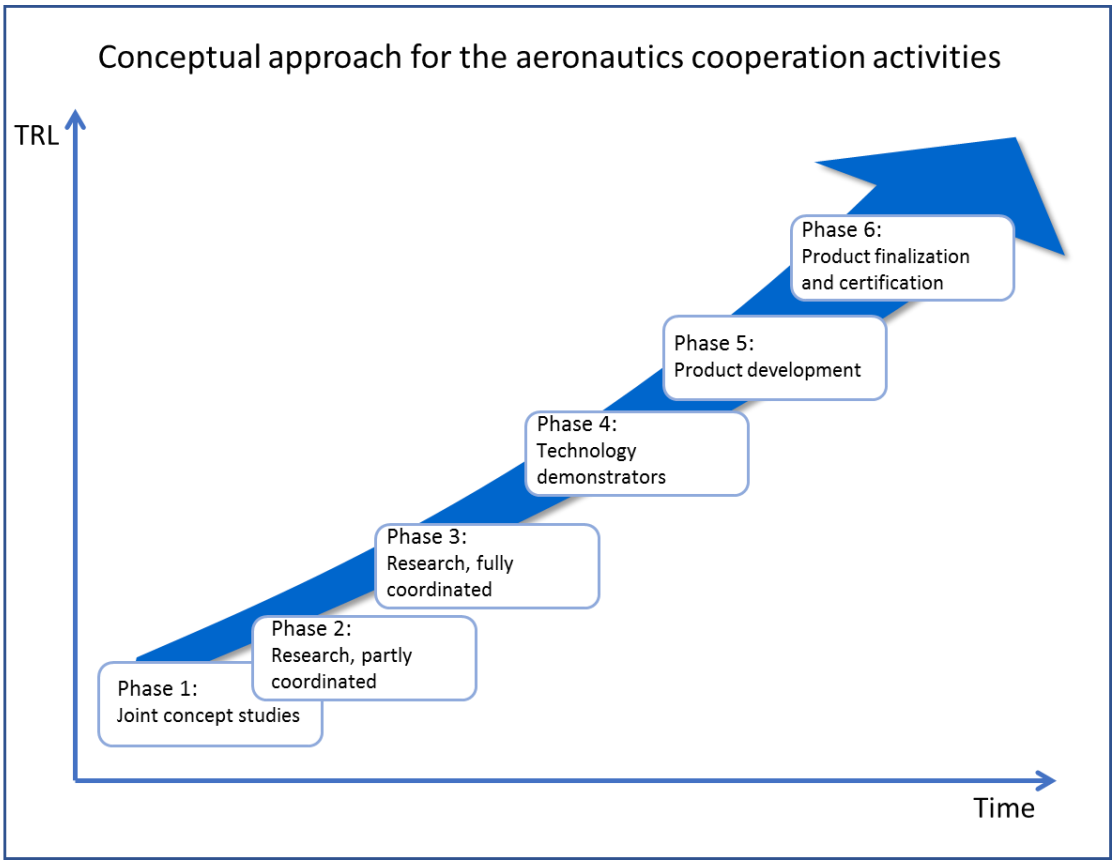


Figure 1. A conceptual approach for the aeronautics cooperation activities

7. Technical content – mapping between actors in both countries

A proposal for initial technical areas for joint activities is presented in appendix 1 (see also chapter 8). The matrix is reflecting the "Areas of interest for cooperation" stated in the Terms of Reference agreed during the HLG meeting in October 2016, which should be subject to revision and/or expansion when found relevant. The final list was reached as the result of a process where all the technology areas were surveyed in both countries. The remaining list is reflecting a combination of priorities, abilities and expected available resources in a joint perspective. The full list of expressed needs, concerns and priorities collected from all the involved actors is kept by the Working Group as a base for up-coming revision and further development.

The matrix has been developed with input from stakeholders in government, academia and industry in both countries and is reflecting the already started cooperation projects as well as interest to engage in new activities. It is however not showing any funding decisions or intentions at this stage and it is not indicating any funding level assumptions.

8. Joint activities – content for the first years

In order to reach an attractive level of cooperation without initial decisions on substantial funding, a list of joint activities is suggested by the Bilateral Working Group established by EC in 2017. Concept studies should be carried out in areas where both countries have declared an interest to gain further knowledge and understand the prerequisites for collaboration.

Joint activities so far identified as suitable for start in 2018-2019 are the following:

Future Air Domain Analysis (Civil and Military) concerning

- Needs and Requirements,
- System and Product Concepts,
- Exploration of Technology opportunities in relevant areas,
- ILS (Integrated Logistics Support).

The joint activities may also include:

- Aeronautics R&D Innovation Ecosystem,
- R&D Programs,
- Access to Commercial and Military Aircraft Technologies,
- Sharing of national strategies of technology and capability focus in the civil and military domains, to identify areas of common interest,
- Reviewing national R&T capabilities and major funded programmes, to identify complementary resources and matching opportunities,
- Starting conceptual studies, feasibility studies etc., paving the way for future cooperation decisions.
- Making an overall description of types of bilateral activities that could be identified as relevant, from the technology areas in an extended matrix (note that Appendix 1 only shows the initial selection of the areas), when possible expanded into several 5-year periods during decades ahead,
- Making a gross list for down-selection of suitable areas of cooperation for capability growth and product development.

The links to proposed technology areas for cooperation are shown in Appendix 1.

The list above and the initial technology matrix in appendix 1 must not be regarded as static, but rather as a dynamic base for further development when more experience has been gained from the cooperation activities.

Another recommendation is that the areas described here should not result in exclusion of research and calls related to other areas, if such opportunities and requests are found relevant and agreed between the parties.

A process for exchanging experiences and lessons learned from the cooperation activities should be considered, in order to further develop and smoothen the procedures leading to establishment of new calls and other project-related joint activities.

9. Mobility and visiting professors

To build long-term cooperation, transfer of personnel at all levels is imperative. Existing mobility programmes will be utilized to further establish guest researchers in both countries. The experience from having the first three visiting Swedish professors at ITA is very positive and it is recommended that Brazilian professors can be connected to Swedish universities in a similar manner. During the stay of these professors in Brazil, contacts have been nurtured and networks created, which in an efficient way has overcome the geographical distance between the two countries. The professors have also brought other senior personnel along and got involved in current pilot programmes in the host organization. This activity should be

expanded in both countries, prioritizing projects which are already started and in those areas described in Appendix 1.

10. Special considerations

The basic principle should be that jointly developed IPR can be shared between the parties. Guidelines for how to handle IPR should be developed between the two countries. The intention is to deal with IPR on a case-by-case basis between the stakeholders involved in the specific project arrangement.

Every cooperation consortium (involved industries, institutes and/or academia) must consider developing a plan for the inclusion of Non-Disclosure Agreements (NDA) and Project Agreements (PA) in accordance with the needs in each case.

11. Roadmap to fulfil the vision

Based on the already started research and development projects and the prerequisites for the first 2-3-year period concerning funding possibilities etc, the joint work with this strategic plan resulted in the following suggested roadmap.

A first phase with concept studies/analyses to further explore commonalities concerning needs, resources and strengths. The work is expected to be performed by man-power mainly funded through in-kind contributions from the engaged partners, with some additional participation from relevant research project groups. Such individuals will probably need some additional mobility funding to be able to participate.

A second phase (to link to already ongoing research activities), with partly coordinated research activities. They can be funded from national programs or coordinated new calls.

A third phase with specific and fully coordinated research activities, with joint funding when feasible. Such funding could come from various sources in the two countries as a result of continued work to establish new cooperation agreements between relevant partners in Brazil and Sweden.

A fourth phase where technology demonstrators are produced within joint projects. The funding needed is then considerably higher than in phases 1-3 and is expected to require new funding mechanisms with government-industry coordination.

A fifth phase with product development, carried out and funded by industry but based on the results from phases 1-4.

A sixth phase with final production and certification of new products, reaching TRL 9. This phase is entirely owned and handled by the involved industries.

The phases can overlap when suitable. Demonstrators and product development can of course partly be based also on previously developed IP, which then must be managed accordingly.

The idea behind the activities proposed in chapter 8 is to better understand the future air domain. These activities will gradually expand the knowledge and support the efforts of the stakeholders to position themselves in the future global Aeronautics landscape.

The view is shown in the following figures. To create the concept solutions (figure 2) short term activities are performed, leading to a better base for activities at higher TRL (figure 3) and

eventually to reach the solutions (figure 4) that can fulfil the vision stated in the ToR. The projects listed in figures 3-4 are examples from a longer gross list than used in Appendix 1.

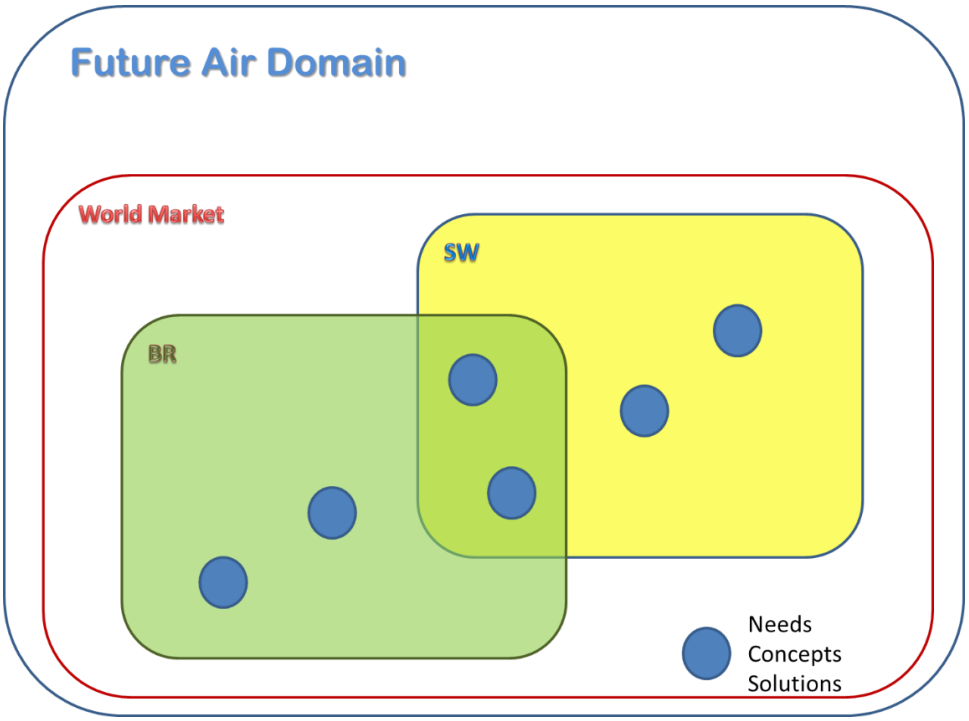


Figure 2. Studies of the Future Air Domain in order to identify Needs, Concepts and Solutions of common interest

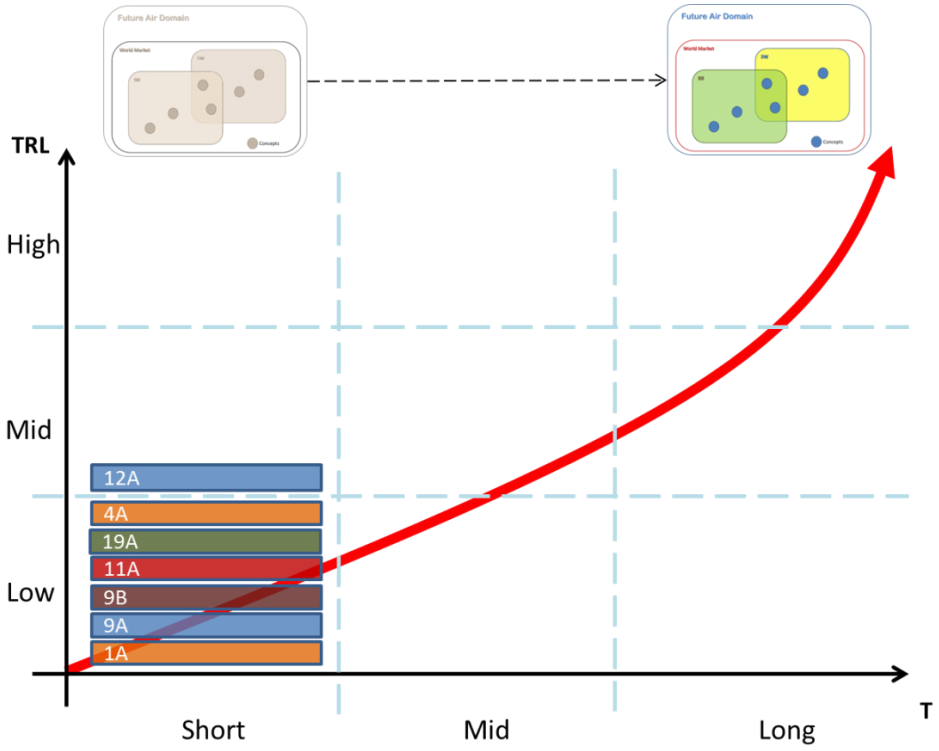


Figure 3. Short term activities creating a foundation for (selection of) higher TRL activities as well as clarifying the long-term goals

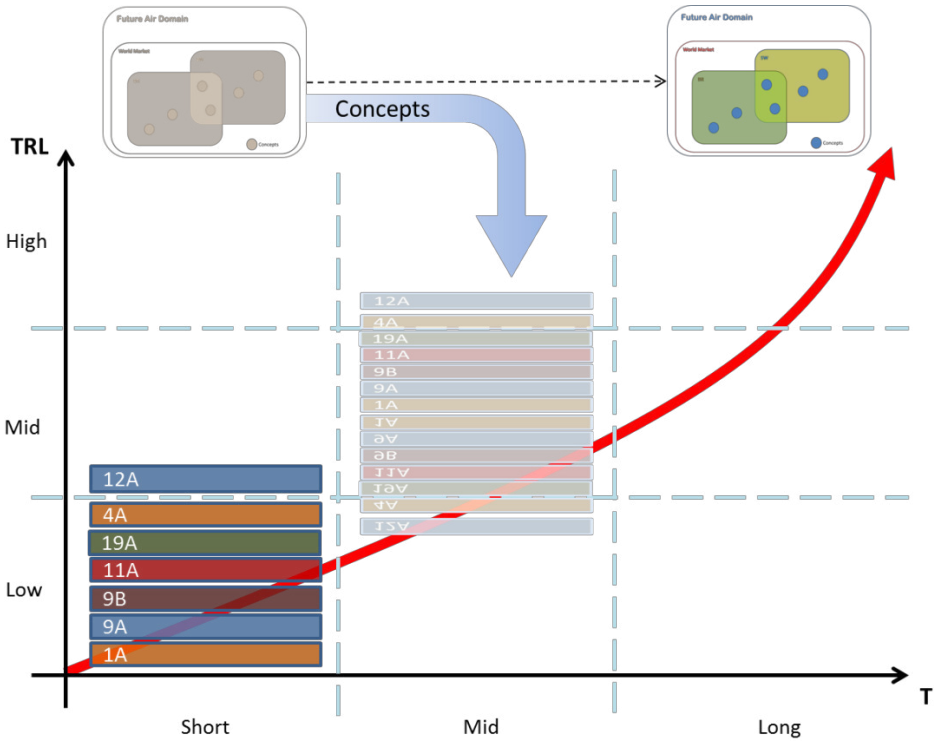


Figure 4. Selection of Medium – Long-term activities that can fulfil the vision

12. References

All relevant existing documents should be referenced and the content of this paper needs to correspond to such existing documents.

Matrix for Strategic Cooperation in Aeronautics

No	Technology Area	Time period ST = up to 4 years MT = 5-12 years LT = over 12 years	Preferred TRL L (1-3), M (4-6), H (7-9) Dual/Triple Use BR	 SE	BR-SE bilateral working group common view Cooperation subjects suitable for the initial period
1	Communications Networks	Short Term	Med	Med	Communication and network solutions for unmanned/autonomous applications.
2	Autonomous Systems	Short Term	Low	Low/Med	Collaboration between manned and/or unmanned platforms, including decision support and dynamic replanning. Connection to Human Factors and single pilot cockpit. Concepts of operation / levels of automation / on-board intelligence / autonomy / sense-and-avoid / airworthiness / certification.
3	Aeronautical Engineering	Short Term	Low	Low/Med	Methodologies for evaluation of unsteady aerodynamics in the transsonic regime and the use of such methodologies in aeroelastic analysis and dynamic loads prediction.
		Short Term	Low	Low/Med	Laminar Flow: active technologies for flow control; sensor and actuator network architectures; concepts for laminar wing design.
4	Propulsion	Short Term	Low	Low	Heat management, cooling and aero-acoustics. Bio fuel.
5	Materials	Short Term	Med	Low/Med	Caracterize nano-reinforced multifunctional materials for aeronautics applications.
6	Human Performance	Short Term	Low	Low	Including HMI, human factors - aviation safety, workload / stress / situational awareness / new generation cockpits / crew coordination.

WORKING PLAN

FOR THE

HIGH LEVEL GROUP ON AERONAUTICS

AND THE SUPPORTING

EXECUTIVE COMMITTEE

2019/2020

1 INTRODUCTION

This Working Plan sets the goals for the next two years: 2019 and 2020. It encompasses the actions that will be developed under the supervision of the HLG, focusing on the priorities listed in the Strategy.

Sweden and Brazil have cooperated for many years in areas of interest such as automotive industries, technological companies, promotion of security, prosperity and democratic governance, and have signed a number of agreements, treaties, and memorandum of understanding. It may also be added that Sweden and Brazil have long been strong partners in promoting joint action in science and technology from a "bottom-up" perspective, whereby dialogue between Brazilian and Swedish experts has always been a hallmark of the relationship.

Despite this, however, there had long been a desire expressed within both governments to leverage existing activity in order to strengthen bilateral ties in the interest of promoting enhanced commercial ties and economic well-being for both countries.

Long-term aeronautics research has long provided the basis for new concepts leading to industry innovation and societal benefits. The future holds new challenges for the aviation system, including continuing growth to meet emerging global demand, integration of unmanned aircraft systems and other innovative vehicle concepts to serve myriad needs, and proactive adaptability to changing conditions – all with minimum adverse impact on the environment. To address these challenges, Brazil and Sweden agreed to develop cooperation on the Aeronautical Sector.

2 VISION

The vision expressed in the Terms of Reference is:

An efficient bilateral ST&I cooperation that gives stakeholders in Brazil and Sweden access to key technologies and capabilities for future combat air systems and future commercial aircraft, combining industrial relevance, academic excellence and innovative ways of working.

The cooperation will build on, but will not replace, current national ST&I agendas and efforts in both countries. The long-term Strategy, approved in the 3rd Meeting, will help focusing the work and provide guidance for prioritization when necessary.

3 WORKING PLAN CONTENT

3.1 Objectives

The Aeronautical Sector has always been an area with a significant technology drive. Complexity and cost in highly technology-intensive areas like aero-systems is however increasing, making it hard for nations and organizations to stay at the top by themselves.

Cost sharing through collaboration is a way to reduce risk as well as financial burdens. It is then crucial to choose collaboration partners among those that have competences and objectives forming a match that will result in cost-efficient and competitive end results.

With such a goal, Brazil and Sweden are ideal partners in the Aeronautics area, based on the combination of strong competence centres, advanced industry actors and governmental support.

3.2 Areas of Interest

The aeronautics cooperation is organized in a structure covering a broad field of research and development areas, almost all with dual-use features and most of the areas offering possibilities for spin off to other sectors.

The following priorities have been agreed for the cooperation. Projects within the following areas will be prioritized by the institutions for both financing and implementing. Cooperation can involve e.g. academic activities in education and research, industrial R&T, demonstrators, concept studies on future products.

Figure 1. Aeronautical technology areas and clusters

This structure will be revised and modified (if and when needed) by the Executive Committee, as part of the joint activities. New clusters and technology areas may be added over time.

Triple-helix coordination and cooperation should primarily be performed at low Technology Readiness Level (TRL), thus simplifying dual-use and possibility for independent initiatives.

Cooperation at higher TRL could be performed either as demonstrator projects, involving actors from all parts of the Triple Helix arrangement, or as full-scale production projects, normally involving industry actors and based on strictly commercial contracts. In the latter case, it will happen outside the scope of the Executive Committee.

4 EVALUATION OF THE LAST PERIOD

In the 2nd Meeting of the HLG the following goals for 2016 and 2017 were established:

2016:

1. The Executive Committee will start the development of a roadmap document before the end of 2016, for the period 2018-2021.
   1.1. The Executive Committee was created and had its first meeting in December 2016. Since then, The EC has been meeting regularly and working to implement the approved agenda.
   1.2. The Executive Committee started the preparation of a roadmap within a long-term strategy for the period 2018-2021 in 2016.
2. A strategic dialogue is initiated, concerning how to best proceed with the roadmap.
   2.1. The EC initiated a dialogue focused on how to develop the roadmap.
3. 10 joint pre-study projects started.
4. Funding process established for mobility of researchers linked to these agreed projects.
   4.1. A Funding Process for researchers´ mobility has been stablished. The Call of Innovation Projects CISB 03/2016 approved five proposals to support the participation of five researchers in the Aerospace Technology 2016 congress and the 4th Brazilian Swedish Workshop in Aeronautics and Defence in Sweden, October 2016
5. One workshop on aeronautics organized, with active participation of researchers from both countries.
   5.1. A workshop on aeronautics with researchers from both countries was held in Sweden in October, 2016.

2017:

1. The Executive Committee will present a joint roadmap document before the 2017 HLG's meeting looking for the period of 2018-2021.
   1.1. The Executive Committee produced a joint roadmap presented for approval at the HLG´s meeting in October, 2017
2. The strategic dialogue included ideas of a long-term funding strategy and a Long-Term Strategic Plan for joint focus areas based on an analysis of strengths, needs and complementarities in the aeronautics sector of each country.
   2.1. The Long-Term Strategic Plan replaced the previously mentioned roadmap document and the planned MoU between the funding agencies replace the funding strategy.
3. 10 joint projects started.
   3.1. The joint call FINEP/Vinnova approved 4 projects:
   - Digital hydraulic actuator for flight control: innovative solution for high energy efficiency, reliability and safety – AKAER/UFSC and Saab/LiU;
   - Aerodynamic influence of the fuselage on the propeller helix and its performance – Embraer/ITA and GKN/Chalmers University;
   - Sensing, acquisition and identification of dynamic in-flight systems of non-conventional sub-scale aircraft prototypes – FT Sistemas/ITA and Saab/LiU;
   - Monitoring of structural integrity of aircraft and analysis of human factors in aeronautics from data analysis (big data) / Integrated management of vehicle health and analysis of human factors in aeronautics from data mass (big data) – Konatus Soluções Inteligentes/ITA and Saab/LiU.

3.2. The joint call SENAI/Vinnova approved 3 projects:

- Tools and methods for certification of AM fabricated parts for aerospace applications – Akaer/Alkimat/Saab/Cobolt;
- Airframe sealing automation using snake robot – Intelectron/Saab;
- Flexible automation for cost-effective aircraft manufacturing – FlexAM – Akaer/Prodtex/X-laser.

4. 10 new joint pre-study projects started.
5. One workshop on aeronautics organized, with active participation of researchers from both countries.

   5.1. The workshop on aeronautics happened in São José dos Campos, Brazil in May 2017, with intense participation of researchers from both countries. In addition to that, a series of panels and working groups with government and business representatives discussed partnership possibilities for the aeronautics industry.
6. One workshop focused in the partnership possibilities for civilian and military aeronautics solutions (industry and government).

   6.1. A second workshop on aeronautics happened as part of the Brazil-Sweden Innovation Week in Stockholm in October 25th, 2017.

In the 3nd Meeting of the HLG the following goals for 2018 were established:

1. Coordination of aeronautical research programmes resulting in new projects in accordance with the Long-Term Strategic Plan.

   1.1. Seven joint projects have started since the 3rd HLG meeting.
2. One workshop on aeronautics organized, with active participation of researchers from both countries.

   2.1. The workshop on aeronautics happened in Belo Horizonte, Brazil in September 2018, with intense participation of researchers from both countries. In addition to that, a series of panels and working groups with government and business representatives discussed partnership possibilities for the aeronautics industry.
3. Possibility to revise the Long-Term Strategic Plan.

   3.1. Only minor adjustments were found necessary in the document.
4. Investigate on how to take measures to launch concept studies or publications in one or two areas suggested: Future Air Domain – Needs and Requirements; Efficient Air Force Operations; Air Force ILS (Integrated Logistics Support); Commercial and Military Aircraft Technologies; Air Force Recruitment and Training.

   4.1. The study chosen by the HLG to be started in 2018 was concerning the Future Air Domain. The kick-off meeting took place in June in Sweden and further joint meetings were held in August and September in Brazil
5. Sign the Memorandum of Understanding between funding agencies.

   5.1. The MoU between CNPq, Finep, Confap (Brazilian parties) and Swedish Research Council, Vinnova, Formas (Swedish parties) was signed in May. It has a wider scope than only the aeronautics area.
6. To study how to seek guidance on IPR for companies and partners involved in projects.

   6.1. A clarification has been added in ToR regarding IPR.
7. To investigate opportunities to develop a Web Site of the Brazil – Sweden Cooperation, taking into account already existing Web Sites.

7.1. A common Web Site was developed during 2018: http://brasweaic.org/.

5 GOALS

For the next years, the proposal is continuing the support to projects, interactions and opportunities for the triple helix actors. The group should also focus on new activities to give more inputs to further discussions.

2019 – At the end of 2019, the goals are:

1. Coordination of aeronautical research programmes resulting in new projects in accordance with the Long-Term Strategic Plan.
2. To review the estimation of funding as well as scope and order of preference of the proposed projects in Air Domain Study (ADS), based on information presented by the ADS Working Group to the EC.
3. To continue the discussion about IPR-related issues.
4. To provide priority financing for the next stages of projects approved in the previous calls.
5. To attain financing for projects prioritized by the strategic plan.
6. To organize a workshop on aeronautics with active participation of researchers from both countries.
7. To launch concept studies or publications focusing on areas established by the strategic plan.
8. Possibility to revise Working Plan and/or ToR for 2020-2021.

2020 – At the end of 2020, the goals are:

1. Coordination of aeronautical research programmes resulting in new projects in accordance with the Long-Term Strategic Plan.
2. To review the estimation of funding as well as scope and order of preference of the proposed projects in Air Domain Study (ADS), based on information presented by the ADS Working Group to the EC.
3. To provide priority financing for the next stages of projects approved in the previous calls.
4. To attain financing for projects prioritized by the strategic plan.
5. To organize a workshop on aeronautics with active participation of researchers from both countries.
6. To launch concept studies or publications focusing on areas established by the strategic plan.
7. Possibility to revise Working Plan and/or ToR for 2021-2022.

6 FUNDING

The activities will be funded according with the rules of the funding agencies from each country. The representatives from each country will provide their administrative support to attend the Executive Committee meetings.

7 PROJECT PORTFOLIO AND APPLICATION PROCESS

All projects suggested for cooperation within the bilateral Brazilian-Swedish initiative should have a scope suitable to be positioned in the structure shown in figure 1.

Projects can be suggested to the Executive Committee by aeronautics stakeholders in both countries. The Executive Committee will monitor the overall distribution of projects over the cluster areas. The project portfolio is a base for funding proposals and discussions between industry stakeholders, forming a base for reports to the High Level Group.

The decision mechanism for jointly funded projects will be designed to allow evaluation of project proposals with respect to Strategic Fit, Industrial Relevance and Academic Excellence. It will be organized by the involved funding institutions in both countries. The decision body shall cover the scope of both civil and military applications, and evaluation of project proposals must be independent from the applicants. Procedures for reporting from the projects will be developed and suggested by the Executive Committee, to enable follow-up of the activities in both countries.

8 ADMINISTRATION AND REPORTING

The Executive Committee will meet on a regular basis, virtually or live, in the format and timelines stated by the HLG leads. When found relevant, the Executive Committee can include recommendations to the High Level Group.

8.1 Proposed Meetings for 2019/2020

2019:

1. High Level Group: October/November, in Sweden.
2. Executive Committee: February, May, September (early) and October/November (connected with HLG).

2020:

1. High Level Group: October, in Brazil.
2. Executive Committee: February, May, September and October (connected with HLG).

9 INFORMATION CONTROL

Disclosure of projects will be handled according the Non-Disclosure Agreement (NDA) between the parties engaged in the projects.

Any form of publicity regarding the projects must have the authorization of the projects agencies engaged.

TERMS OF REFERENCE

BETWEEN

THE GOVERNMENT OF THE REPUBLIC OF BRAZIL

AND THE

GOVERNMENT OF THE KINGDOM OF SWEDEN

RELATED TO A COOPERATION ON AERONAUTICS

1 INTRODUCTION

Swedish and Brazilian solid ties of friendship and successful cooperation since 1950 are consolidated by several agreements already in place.

In October 2015, Brazil and Sweden signed a new Strategic Partnership Action Plan[1] stating that "Brazil and Sweden reaffirm their satisfaction with the bilateral cooperation in defense matters, greatly strengthened by the industrial and technological partnership currently being established on the basis of the Gripen NG project. Both countries recognize the potential for expanding cooperation in this field, and express their commitment to identifying new initiatives of mutual interest."

This new Strategic Partnership Action Plan supports one major initiative agreed during the Brazilian-Swedish Joint Committee on Economic, Industrial and Technological Cooperation, held in Brasília on 21 May 2015, establishing a High-Level Group (HLG) on Aeronautics, in order to broaden and extend the strategic collaboration in the Aeronautical Sector between both countries.

It was identified that the HLG on Aeronautics should be placed under the Additional Protocol on Innovative High Technological Industrial Cooperation from 2009, and represents the mutual ambition to develop the bilateral cooperation on Aeronautics, not only regarding military projects, but, regarding civil and dual use projects as well.

The first meeting of the High Level Group on Aeronautics was held in 19 October 2015. The meeting Protocol[2] consolidate the directives posted in the Strategic Action Plan as result of the understandings of the Brazilian-Swedish Joint Committee on Economic, Industrial and Technological Cooperation.

During the first HLG meeting, the following directives were agreed:

- Establish a Working Group under the HLG on Aeronautics consisting of targeted persons from both countries.
- Develop a Working Plan regarding the 2016/2017 timeframe.
- Establish a second meeting of the HLG to be held in Brazil second term 2016.

[1] Brazil-Sweden Strategic Partnership New Action Plan, confirmed in Stockholm 19 Oct, 2015.

[2] Protocol, Swedish Ministry of Enterprise and Innovation, ref no N2015/08122/FÖF, dated 20 Oct, 2015. Protocol has the same meaning of "Minute" of the meeting.

2 PURPOSE

This document contains the Terms of Reference (ToR) for the bilateral Brazilian-Swedish HighLevel Group on Aeronautics and the working group hereinafter referred to as Executive Committee that will advise the HLG.

3 BACKGROUND DOCUMENTS

- Agreement between the Government of the Kingdom of Sweden and the Government of Federative Republic of Brazil on Economic, Industrial and Technological Cooperation (signed April 3rd, 1984).
- Memorandum of Understanding on Cooperation Regarding Defense Area (signed April 24th, 2001).
- Memorandum of Understanding on Political Consultation (signed October 6th, 2009).
- Additional Protocol on Innovative High Technological Industrial Cooperation (signed October 6th, 2009).
- Memorandum of Understanding on Partnership and Dialogue regarding Global Development (signed August 29th, 2012).
- Agreement on Defense Cooperation (signed April 2014, to be ratified by Brazilian Congress).
- Memorandum of Understanding on Cooperation in Military Aeronautics Area (signed September 3rd, 2014).

4 DEFINITIONS

For the purpose of this ToR:

- “information” means scientific, technological or technical data, or research and development results or methods stemming from cooperative activities including design procedures and techniques, product formulas, manufacturing methods, processes and treatments, the chemical composition of materials, computer programs, data compilations and employee know-how such as specialized skills and experience; and any other data as may be jointly decided in writing by the Parties;
- “intellectual property” shall have the meaning found in Article 1.2 of the Agreement on Trade-Related Aspects of Intellectual Property Rights, which is Annex 1C of the Marrakech Agreement Establishing the World Trade Organization (WTO) done at Marrakech on 15 April 1994 (TRIPS).

5 AIM FOR THE HIGH LEVEL GROUP ON AERONAUTICS

To promote Science, Technology and Innovation (ST&I) cooperation between Brazil-Sweden academia/industry/government, supporting initiatives to create joint programs, projects, studies and other activities in the Aeronautical Sector. The scope shall include activities with civil, military as well as dual-use focus.

6 VISION

The vision for this initiative is:

An efficient bilateral ST&I cooperation that gives stakeholders in Brazil and Sweden access to key technologies and capabilities for future military and civilian aeronautical systems, combining industrial relevance, academic excellence and innovative ways of working.

The cooperation will build on, but will not replace, current national Science, Technology and Innovation (ST&I) agendas and efforts in both countries. A long-term objective and roadmap will help focusing the work and provide guidance for prioritization when necessary.

Desirable elements in order to realize the vision are:

- Structure and scope
- Financing and governance forms
- Process to evaluate project proposals and develop a project portfolio
- Administration and reporting mechanisms
- Communication plan and process to exploit results in other industry sectors

A strategy based on phasing the initiatives, in order to reach the agreed vision, is desirable and will allow the required increase of confidence in the bilateral arrangements.

An initial phase will deal from low to medium Technological Readiness Level (TRL1-6), dual-use (civil + military aeronautics) and no military secret information could be exchanged.

A second phase will expand into more sensitive projects, civilian and military, and/or higher TRL (7-9). As always, some exception may be applied.

There are long-term partnerships between Brazil and Sweden, traditionally in commerce and industry sectors. The results of the initiative in the Aeronautical Sector may establish a framework model for research cooperation in other areas.

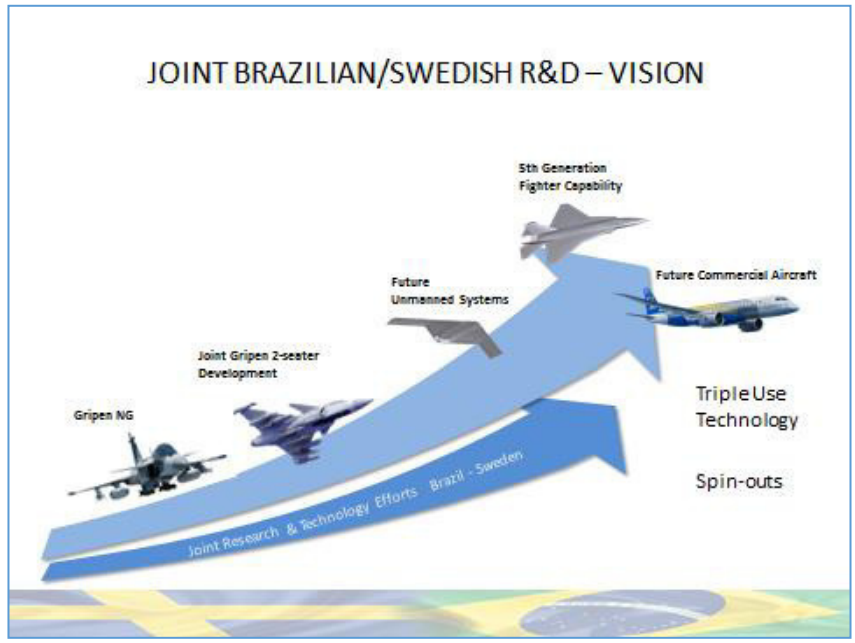


Figure 1. Illustrative Brazil-Sweden R&D Vision.

7 GOVERNANCE STRUCTURE

The Brazil-Sweden High Level Group (HLG) on Aeronautics, a political entity composed by representatives from both countries, will be assisted technically by the Executive Committee (EC). The HLG will receive the proposals selected by the EC, which may be submitted by facilitating institutions and other stakeholders.

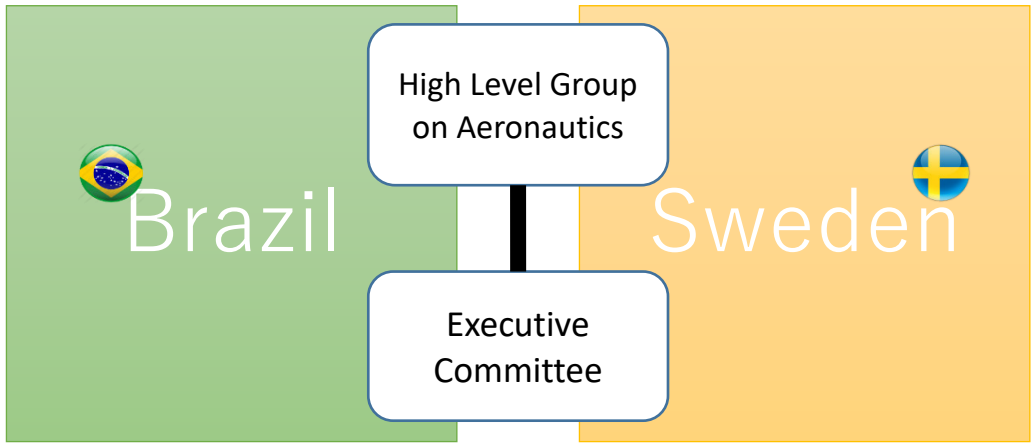


Figure 2. Illustrative Brazil-Sweden HLG governance.

The EC will act as advisor to the HLG, analyze the proposals received from the facilitating institutions and other stakeholders, prioritize the most viable and oversee the execution of programs, projects, studies and other activities in cooperation approved and implement High Level Group decisions.

The EC may also create and appoint non-permanent, *ad hoc* working groups to deal with specific issues, *ad referendum* of the HLG.

8 COMPOSITION

The HLG (political level) will have representatives from the Government, industrial and academic sectors of both countries as members. Representatives of agencies and institutions that are part of the HLG, but at the technical level, will compose the EC.

Brazil and Sweden will define, independently, their representation in the HLG and EC, not being mandatory symmetry between the countries. Thus, both countries may define their representation according to their own specific political, cultural and legal terms. In the image below, there is a draft view developed from a previous interaction between Brazil and Sweden representatives.

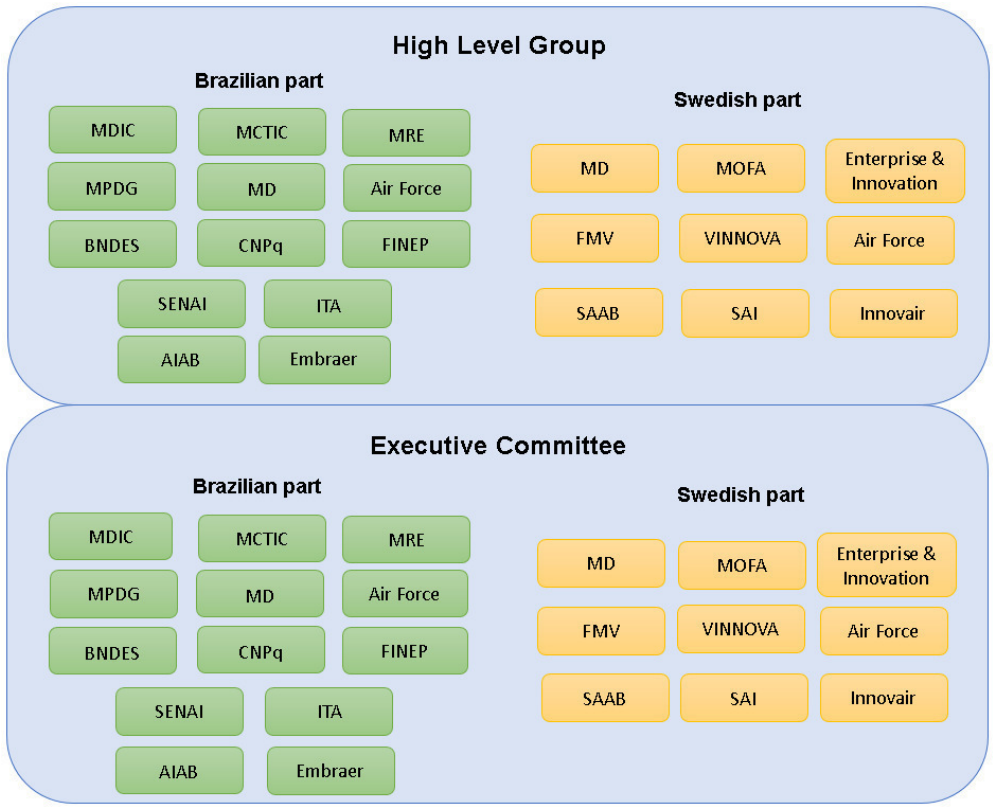


Figure 3. Illustrative Brazil-Sweden composition of the governance.

9 COMPETENCES

9.1 High Level Group on Aeronautics

The HLG will have the general objective to establish guidelines and strategies to the partnership development and the execution of programs, projects, studies and other cooperative activities, under the Brazil-Sweden cooperation, related to military and civilian aeronautical sector.

The HLG will have the following competences:

- Set guidelines and strategies for cooperation in the Aeronautical Sector;
- Facilitate and systematize the dialogue between universities, science and technology institutes, industry and public agencies involved;
- Identify opportunities and articulate initiatives;
- Articulate the support to the development of programs, studies and other cooperative activities; and
- Set goals to be achieved by the EC

9.2 Executive Committee

The Executive Committee is the technical and executive advisory branch of the HLG and its activities and actions will be approved by the HLG.

The EC will have the following competences:

- Act as a platform for collaborative discussions between its members;
- Promote innovative ideas of working and new cooperation ideas involving a dual or triple-use[3] project model;
- Identify potential programs, studies and other cooperative activities suitable for further development to complete proposals including funding;
- Analyze and prioritize the proposals of programs, project portfolios, studies and other cooperative activities received from facilitating institutions and other stakeholders;
- Monitor the implementation of the prioritized programs, project portfolios, studies and other activities and report their results;
- Propose new programs, project, studies and other cooperative activities for interested parties to develop into complete proposals including funding
- Propose the HLG meeting agenda and the required documentation, performed by the host country.

10 AREAS OF INTEREST

The cooperation in the Aeronautical Sector is organized to cover a broad field of research and development areas, almost all with dual-use features and most of the areas offering possibilities for spin-out to other sectors.

The following main areas of interest have been agreed for the cooperation, but other related areas might be developed. The projects can be relevant to more than one area of interest, inside the cluster. Cooperation can involve e.g. academic activities in education and research, innovative industrial technology, demonstrators, concept studies on future products and technological process.

[3] Triple-use: a project where dual-use (civil and military) aeronautics industry actors are teaming up with an actor from another industry sector, forming a triple-branch stakeholder group with common interests.

Figure 4. Aeronautical technology areas and clusters

The Executive Committee is responsible for updating and/or modifying according to the bilateral partnership strategy, adding new areas to the cluster over time.

The concept of Triple-Helix coordination and cooperation will be applied at low TRL, thus simplifying dual-use and possibility for independent initiatives.

Cooperation at higher TRL could be performed as either demonstrator projects, involving actors from all parts of the Triple-Helix arrangement, or as full-scale production projects, normally involving industry actors and based on strictly commercial contracts. In the latter case, it will happen outside the scope of the Executive Committee.

11 PROJECT PORTFOLIO AND APPLICATION PROCESS

All projects suggested for cooperation within the bilateral Brazilian-Swedish initiative should have a scope suitable to be positioned in the areas of interest shown in figure 4.

The Executive Committee will appoint, at each country's discretion, the agency that will monitor the distribution of the projects. It will be necessary to develop an information sharing structure to facilitate the exchange of data and control of the projects between both EC branches.

Every cooperation consortium (involved industries, institutes and/or academia) must consider developing a plan for the inclusion of Non-Disclosure Agreements (NDA) and Project Agreements (PA) in accordance with the needs in each case. The consortium is also responsible for careful consideration on Intellectual Property at all stages – background technology brought to the consortium, implementation and post project where results and outcomes need protecting. The intention is to deal with IPR on a case-by-case basis between the stakeholders involved in the specific project arrangement.

12 FINANCING

These Terms of Reference do not give rise to disbursement of new or additional budgetary resources. All future costs resulting from the cooperation under this document are to be borne by the Parties that incur them, unless otherwise mutually agreed.

The joint financing of programs, projects or activities shall be agreed under specific instruments to be signed between the funding institutions.

13 DECISION MECHANISMS

HLG is a political group, working under agreements signed between both countries. Preferably, a consensus decision should be the target for the HLG.

The Executive Committee is working in support of HLG.

Any request for decisions within the committee and/or directed to the HLG shall be preceded by information presented in advance regarding the proposal.

Members that are unable to participate during the meeting have the possibility to declare their position via e-mail.

14 MEETINGS

HLG will meet at least once a year.

Executive Committee will meet typically two to three times per year.

Exceptional meetings for HLG and EC can be requested by each country-leading agency.

15 EXPLOITATION AND COMMUNICATION

A Projects Communication Plan should follow the rules agreed by the parts engaged in the activity.

The Executive Committee will issue guidelines regarding the external communications for joint events.

For projects reaching higher TRL, the exploitation is primarily a responsibility for the participation industry actors.

Aeronautical Sector interaction with other industry/technology sectors may influence the communication but will not be part of the near-term scope.

16 DISAGREEMENTS AND REVISIONS

Any disagreement relating to the interpretation and implementation of this ToR shall be settled between Brazil and Sweden representatives, through consultation, and not subject to external jurisdiction.

This ToR can be revised at any time by mutual consent of all the Parties.

Air Domain Study – a central activity within the BR-SE bilateral cooperation in Aeronautics

Proposal to the High Level Group on Aeronautics

Task the Executive Committee to review and follow up the study in accordance with the intentions and scope stated in this document. In accordance with the Long-Term Strategic Plan for the Brazilian-Swedish Cooperation in Aeronautics, budget allocation in each country will be necessary as a base for funding decisions about research, technology development and demonstration activities from 2020 onwards (some activities from 2019).

The ADS output is to be reported to the Executive Committee according to decisions in that group and a status report with an updated proposal presented to the High Level Group on Aeronautics at their 2019 meeting.

In the following text, the suggested activities and timelines are described first, followed by background and working group process descriptions.

Suggested areas for further work in 2019-2020

From an initially long list of subjects potentially relevant for cooperation, the joint Air Domain Study Working Group has made a down-selection, considering the expected limited resources available in both countries in the next few years. The following activities and subjects have been identified as suitable for further studies and analyses to be planned and/or initiated in the 2019(-2020) timeframe:

1. Develop scenarios based on mutually relevant needs, initially with Unmanned Aerial Systems (UAS) with Intelligence, Surveillance, Reconnaissance (ISR) capability as a focus (this item is seen as the master to be carried out first, however planning and initial work on agreed capabilities or technologies could start in parallel).
2. Develop scenarios (and projects) related to the Human Factors area, to support the HUF LAB activities already decided between the two Air Forces. Level of Autonomy and Human-Machine Interfaces (HMI) for unmanned systems are also issues to be explored further.
3. Navigation issues with dependence on Global Navigation Satellite Systems (GPS etc.) versus inertia navigation and new onboard Geo-referencing systems (e.g. real-time image processing navigation control guidance and imagery).
4. Air Traffic Management
    a. Unmanned Traffic Management (UTM) and autonomous system studies, including safe operations of UAS with manned aviation and integration of UAS in the Air Traffic Management (ATM).
    b. ATM in remote areas, such as remote operations of Air Traffic Control (ATC), need for satellite communication etc.
5. Sensors and software concerning detection and tracking of “difficult targets” such as foliage and camouflage penetration and objects with very small radar-cross-section.

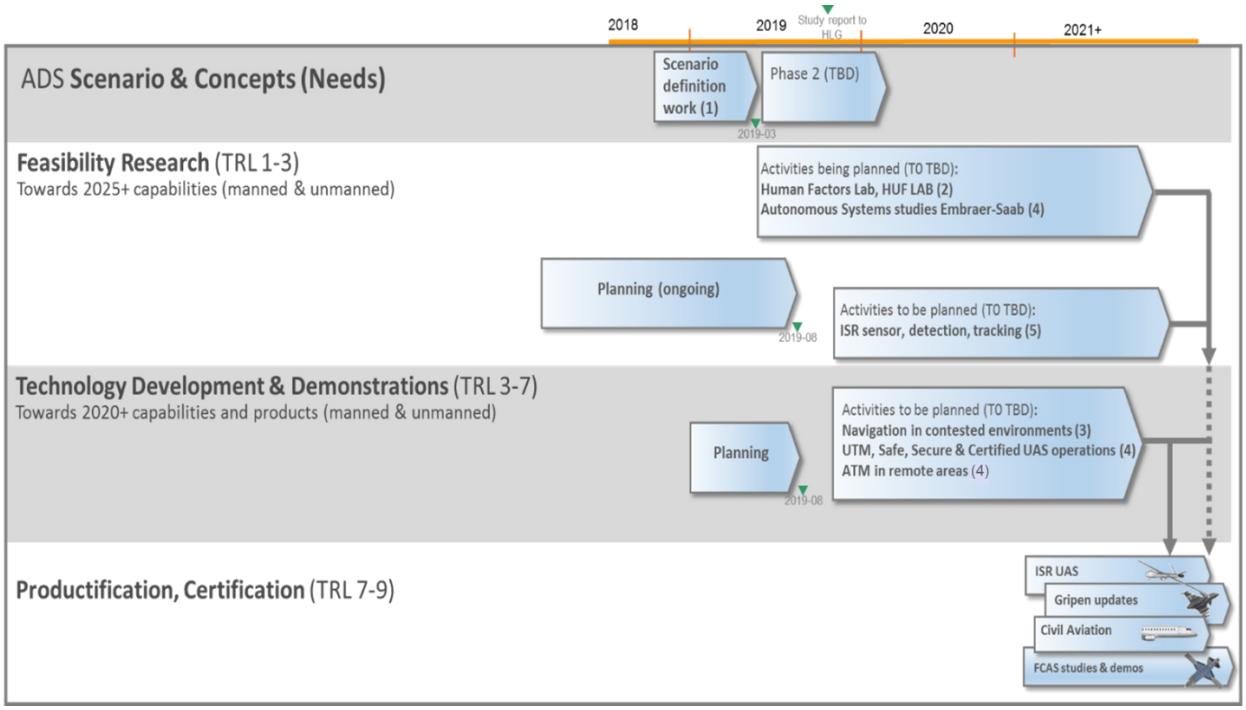


Figure 1. Suggested areas of work and Timeline (number in brackets refer to the list above)

Proposed timeline

Scenario definition work	Dec 2018 – Mar 2019
Identify Operational gaps	Until Mar 2019
Identify Technology gaps	Until Apr 2019
Scenario workshop (joint)	One week in the Apr-May timeframe, in Sweden
Planning phase of Technology areas (and potential projects)	Jan-Aug 2019
Study report to HLG	Aug-Oct 2019

Resources for Air Domain Study work[1]

In order to allow for the activities needed to fulfill the work suggested in this report, budget decisions by the various funding entities will be needed, in accordance with section 6 of the Long-Term Strategic Plan[2] (LTSP) for the Brazilian-Swedish Cooperation in Aeronautics. Each involved actor and institution should allocate reasonable resources for such activities. The required funding and man-power needs will be detailed in the planning phase for each project. The preliminary cost for study activities during 2019 is estimated to about 2 million SEK = 0.8 million Reals for each nation. For 2020 the preliminary cost estimate is up to 28 million SEK = 11.5 million Reals as a total for the involved actors in both nations. Specific technology demonstrators will require additional funding. The ADS WG will refine the

[1] Without funding the work will slow down or stop, but the ways to allocate resources – in the form of man-hours, travel expenses or direct technology development and research – may differ between the actors and years.

[2] Annex 2 to the Agreed minutes HLG 26 October 2017.

estimate of the funding level as well as the scope and order of preference of the proposed areas and present this to EC.

Background

The High Level Group on Aeronautics (HLG) agreed during their meeting 26 October 2017 to run the "Future Air Domain Analysis" proposed by the Executive Committee (EC) as a part of the Long Term Strategic Plan (LTSP) that was then adopted by HLG.

A bilateral Air Domain Study Working Group (ADS WG) was assigned by the EC in the two countries to outline the scope and content of the work. In April 2018, a course/seminar in Scenarios and Technology Forecasting was performed in Sao José dos Campos, to set the base for how to develop the Air Domain Study. The joint ADS WG is headed by Innovair on the Swedish side and by FAB/EMAER on the Brazilian side.

The ADS work was then initiated, followed by a meeting week in Sweden in June, where the following characteristics of the ADS were agreed:

- The ADS WG has a task to suggest, discuss and – based on stated needs and interests – propose a prioritized list of activities suitable to perform during the up-coming years.
- The ADS is to be seen as a Forum for further outlining of the needs, projects and studies discussed in paragraphs 6 and 7 of the LTSP.
- The ADS WG reports to the EC on a regular basis, for final prioritizing of activities and to prepare the relevant channels for resource allocation (funding and staffing) from the involved actors. The related documentation required for the yearly HLG meeting are a responsibility of EC, with support from the ADS WG.
- The ADS shall cover both military and civil needs and explain the borders and dual-use prerequisites. Industrial focus areas shall be identified and the process from agreed needs via research and study projects to product development shall be outlined. The industrial discussions will start with military product development and continue with opportunities in the Commercial (Civil) Aeronautical sector.

The Swedish ADS POC visited Brasilia in August to discuss the ADS work progress with EMAER and Embraer. As decided in the June meeting in Sweden, the ADS WG joined again for a meeting in Belo Horizonte in September, during the ICAS week. A final report with proposals from ADS WG was issued to EC in October, for them to consider as the base for a statement and proposal to the 4th HLG meeting, in November.

ADS framework

In the LTSP it was agreed to perform a Future Air Domain Analysis (Civil and Military) concerning

- Needs and Requirements.
- System and Product Concepts.
- Exploration of Technology opportunities in relevant areas.
- ILS (Integrated Logistics Support).

These areas form the base for the work in the Air Domain Study WG. An initial finding has been the need for scenarios in various areas, where needs can be compared and joint interests identified. When

suitable, such needs can be subject to further studies, research project calls or technology development activities, involving relevant actors and institutions.

Initial areas discussed in the meetings

Even before analyzing the possible scenarios, it was decided during the meeting week in June 2018 that the ADS WG should focus the efforts to one of the technological areas outlined in the LTSP but maintaining the ability to expand and initiate further studies when needed. The area that has since then been identified as an initial focus area is *UAS with ISR capability*, with suggestions according to the statements below:

- Merge together the identified national needs related to 24/7 access to ISR capabilities. The ADS WG has identified similar needs in both countries, involving i.e.:
    - border control over land, coastal regions and open sea (the Baltic Sea as well as the South Atlantic).
    - surveillance in support of environmental protection, disaster relief and Search and Rescue (SAR).
- A study combining the national needs and eventually possible solutions, involving a mix of manned and unmanned platforms, level of autonomy for UAS, new sensor and communication devices and the use of Artificial Intelligence (AI) has been identified as a first step. This could later on be followed by various projects derived from such a study.
- The work should include concept descriptions. This is an area where we can expect a high potential for a global market interest and spill-over to other sectors, so it should be seen as a true multi-use area.

During the meetings in June and September, areas of interest related to the main subject – UAS ISR – were discussed and the group identified a number of interesting subjects. A major concern has been to find out the needs in each organization and compare those, to find the most urgent and mutually relevant subjects. For each theme a study of threats and possibilities and the capability needs and how these can be solved should be analyzed. Both military and civil needs should be covered.