



**Space Telecommunications**  
**A key sector for Europe:**  
**achievements and perspectives**

## EXECUTIVE SUMMARY

The Telecommunications Satellites (SatCom) manufacturing sector is recognised by the EU Space Industrial Policy as “instrumental in sustaining Europe’s entire space industry” contributing to more than 50% of the revenues of the European Satellite industry (the total European Space industry gathers 35000 highly qualified jobs across Europe). Therefore, European actors, acting on a world-wide highly competitive commercial market, welcome the intentions of the European Union to address this sector whose sustainability is essential to the sustainability of the whole European space sector. Indeed:

- Since the adoption of the Treaty on the Functioning of the EU, the EU has acquired the legal competence to draw up a European space policy to “*promote scientific and technical progress, industrial competitiveness and the implementation of its policies*”
- The SatCom sector is very relevant for addressing several societal challenges and supporting policy objectives high on the EU agenda (typically the Digital Agenda for Europe and the Common Security and Defence Policy);
- The EU is empowered to act on Spectrum regulation, which is the backbone of the SatCom industry;
- The EU is acting across domains and sectors, thus able to foster a smart combination of Satellite and Terrestrial network technologies;
- The EU has the capacity to favour and install bi/multi-lateral agreements between the EU and non-EU countries that could support the EU industry on the export markets (as China currently does to generate captive markets in Africa and Middle East).

In 2013, the SatCom market will probably be on its average value but the evolution of the core broadcast market is uncertain while we observe a slow take-up on the next growth axis, namely broadband. Today, the positioning, and even the sustainability, of the European SatCom manufacturing industry and of the launcher industry are put at risk by non EU-players:

- The non-European manufacturing industry receives a very significant public support leading to competitive advantages (several hundred millions dollars can be embedded within a single satellite contract), or benefit from captive markets favoured by their governments (especially in China),
- Non-EU players apply aggressive commercial approaches which put even more pressure on the satellite prices (see dedicated chapter: Status and evolution of the Market)
- The European governmental market remains too small to generate a level of activities sufficient to develop novel technologies re-usable on the commercial scene, while public sales represent more than 50% of the US manufacturers business.

The European SatCom manufacturing sector has thus decided to create a dedicated Working Group within Eurospace, to convey to the EU decision-makers, information and recommendations aiming to define/promote the conditions for a level playing field with the non-European. In particular, the sector wishes to bring to the attention of the European decision makers the following recommendations:

- Increase the public support to R&D&I activities in order to enhance the satellites performance and attractiveness while minimising their prices to answer the overall ICT market trends thanks to innovation and to adapt to regulatory evolutions. This should be specifically addressed through H2020 (details are provided in the topic “The innovation challenges of the European SatCom Industry”):
  - H2020 ICT should continue to address user and network-centric activities fostering disruptive combinations of terrestrial and satellite network technologies to build future network infrastructures (including 5G).
  - H2020 Space should address research on enabling space communication technologies (including Terrestrial spin-in research) and techniques relevant to the EU societal challenges and EU policies.
- Set up an Industrial policy that addresses the technology dependence issue and implement an efficient mechanism to promote and share the results of the actions performed in this area.
- Set up an appropriate framework to enable the deployment of innovative SatCom infrastructures to serve the EU agenda (e.g Digital Agenda, Common Defence and Security Policy, data collection and distribution for Environmental monitoring etc.):
  - New financial scheme involving public support to facilitate for example IOV/IOD,
  - Market demand aggregation,
  - Pan-European harmonisation of the SatCom systems through standards and regulations,
  - Governmental markets
- Reserve and protect the necessary spectrum to serve the demand of the different SatCom market segments.
- Deploy actions to bring the European satellite industry on a level playing field with its non-EU competitors in particular in the field of:
  - **Competition:** define fair evaluation rules whose criteria encompass in particular a cost/benefit analysis, the assessment of the strategic character of the procured item and the identification of potential governmental support to non-EU competitors.
  - **Competitiveness:** support R&D&I at a level equivalent to that implemented in non EU countries to maintain European space industry competitiveness..

- **Bi/Multi-lateral agreements to support the export market:** for example, the EU could reflect on mechanisms generating captive market for its European industry, as China is currently doing with Africa through barter agreements (see Topic “Status and Evolution of the SatCom Market”).

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## COMMUNICATION SATELLITES MANUFACTURING : A STRATEGIC SECTOR AT RISK

**Space is a strategic sector with a high political dimension.** Indeed, a large part of satellite customers remain governmental institutions focused on both public service and development of domestic industrial capabilities. Privatization of the space customers is rather recent within the Space history, and mainly concerns Telecommunications (SatCom)<sup>1</sup>; however, this commercial market has been evolving rapidly: space telecommunications now account for more than 50% of the European Satellite manufacturing industry revenues (space and ground infrastructures) and the SatCom manufacturing sales are mostly commercial (currently about 85% of the European manufacturers sales). This commercial dynamic had a strong impact on satellite procurement as it opened the industrial market to a global competition. Competitiveness sustainability is thus essential for the sector. It is important to note that while the market accessible to European manufacturers is mostly commercial, the US players can rely on a governmental captive and well-funded market for more than half of their revenues.

The entire European Space industry is particularly exposed to the impacts of the SatCom market trends on the world-wide scene, at each level of the manufacturing chain.

**The European SatCom manufacturing industry is highly performing.** Of this worldwide commercial telecom market (GEO and Non GEO satellites), the European space industry has captured 43% of the order intakes (~12.6 B\$) over the last 3 years (2010 – 2012). However, this good positioning is now increasingly challenged. Typically, the share captured by Europe on the GEO market has been reducing from 32% in 2009 to 26% in 2012. Furthermore, the size of the market is limited (it has stabilised in the last years to about 20 opportunities per year for the European industry): thus, even a small market size variation has a significant impact on the sector. **Besides, the competitiveness of the European manufacturers is put at risk by non-EU players** benefiting from a high level of R&D support provided through large captive public programmes, and new commercial approaches. This market evolution, which profits to actors from the US, China, Russia and Japan, is further developed in the next chapter. Therefore, through this position paper, the SatCom European manufacturing industry wants to highlight the need for an increased European public support in order to maintain its competitiveness and ensure a stable workload for the corner stone of the space manufacturing sector: a 6 Billion euros strategic sector gathering more than 35000 high profile jobs across Europe. Ways to enable the European SatCom industry to remain in the race are multiple:

- In the short term: R&D support, public support on the export market, accounting of the national subsidies when evaluating non-European offers etc.
- In a longer term: shape a true European governmental market allowing European industry to securely plan its investments and technology development roadmaps.

**SatCom is now the first market of the European Space manufacturing industry; this is also true for the launcher sector.** Indeed, telecommunications operators are the main customers of European launch services. In the last 3 years, telecommunications satellites represented 87% of the Ariane launches; among those telecommunications satellites, only 9% are governmental. The SatCom

<sup>1</sup> SatCom operators, which used to be, besides some exceptions, intergovernmental organisations, became, after their privatisation at the end of the 90's, the first private entities to buy and own large satellites.

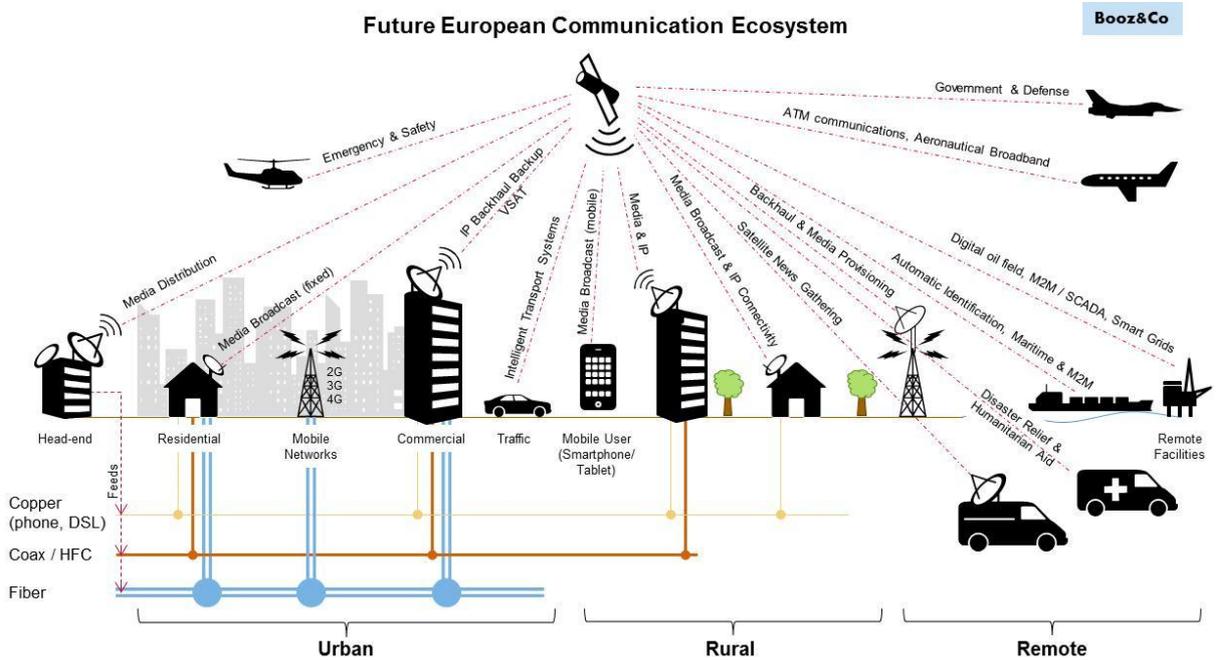
commercial market thus helps industry to keep its critical mass of activities and safeguard key enabling competencies for the whole Space sector. It largely contributes to the availability of the required technologies and skills necessary to meet the requirements of future public space system and space-enabled services.

**To tend towards a level playing field with its non-EU competitors, the industry needs a sustainable support from the European institutions, built around a long term vision.** Indeed, regulation policies and technology development, both public fields of action, are at the heart of the challenges faced by the industry. Adoption by the EU of SatCom solutions to answer EU societal challenges is also a lever that needs to be rapidly exploited. If the development of a domestic Space capability to answer public needs has always been at the heart of the European Space policy, **supporting the competitiveness of the European SatCom market is becoming a necessity to guarantee the sustainability of the European Space sector at large. Public support to the SatCom industry is an investment with a multiplier effect of public funding across the entire space sector.**

This reference document aims at giving an accurate overview of the situation of the SatCom sector in Europe focusing on the current and upcoming challenges of the European Space industry and on the potential public actions (R&D, regulations etc.) that would support the harsh efforts of this strategic sector to install sustainable perspectives.

COMMUNICATION SATELLITES IN A NUTSHELL

Satellite communications systems encompass a wide range of solutions providing communication services via satellite(s) as illustrated in the scheme below.



Space component of communication systems are located in the outer space following different types of orbit among which, Geostationary (GEO), Medium Earth Orbiting (MEO), High Elliptical Orbit (HEO) or Low Earth Orbiting (LEO). SatComs operates in Frequency bands allocated to Broadcasting, Fixed or Mobile Satellite services in low frequency bands (below 3 GHz, such as VHF, UHF, L and S band) or in higher frequency bands (above 3 GHz, such as C, X, Ku, Ka, Q and V bands).

SatCom systems can address a wide range of services broadcast, broadband and narrowband services to fixed, portable and mobile terminals over global or regional coverage. Some SatCom systems provide service coverage all over the earth including the north and south poles.

They are well recognised to provide a resilient and ubiquitous service and to be particularly cost effective for “one to many” (broadcast) and “many to one” (data collection) services which is ideal to complement other telecommunication technologies to meet the “everything, everywhere, all the time” Internet paradigm.

SatCom are expected to continue to address in particular the following three main telecom markets:

Market	SatCom role	Yearly revenue figures for the SatCom industry (space, ground and service)
Network media (production, contribution, distribution, consumption)	Broadcasting and multicasting: Cost effective real time or non real time multimedia content delivery to many terminals	Worldwide revenue of hundred B\$ retail sales with a current CAGR <sup>2</sup> of 5-10%. In Europe, 85 million TV homes receive their signals from satellites <sup>3</sup> .

<sup>2</sup> CAGR = Compound Annual Growth Rate

<sup>3</sup> <http://www.ses.com/4233325/news/2013/15061507>

Digital divide (access, backhaul)	Broadband access to fixed and mobile terminals in un-served and underserved areas: rural, sub-urban, maritime and aeronautic. It also includes backhaul of cellular/wireless local area networks	Worldwide revenue of few tens of B\$ retail sales with a CAGR of >20%
Safety/security: communication to support crisis management (public protection and disaster relief), critical infrastructure protection (monitoring/event detection), transport security (asset tracking), defence	Resiliency and global coverage with mobile broadband (Ku/Ka band) and narrowband (L/S band) satellite networks	Worldwide revenue of few B\$ retail sales with a CAGR of <5%

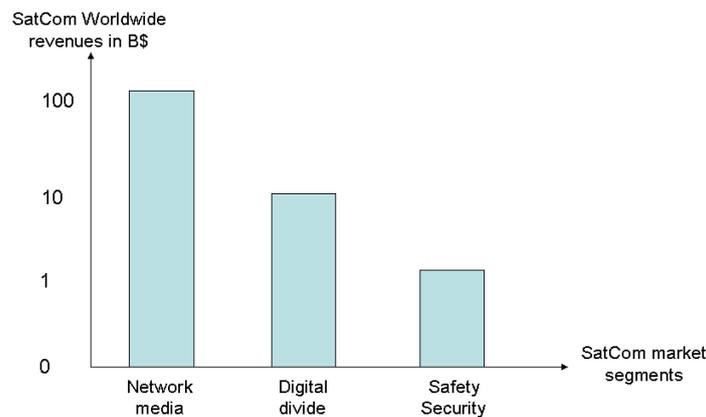


Figure 1: Order of magnitude of the worldwide revenues generated over the past 3 years by the 3 main SatCom market segments

SatCom is expected to maintain its role in these market segments thanks to efforts deployed to ensure its smooth integration with future network infrastructure. The added value of combining satellite with terrestrial networks is summarised in the below table<sup>4</sup>:

Main drivers for combining satellite with terrestrial networks	Possible satellite network roles
Service coverage extension	Address maritime, rural and low density populated areas Aeronautical/UAV communications
Broader range of service provisioning OR lower costs for customers and operators	Broadcast/multicast capabilities for off-loading video based traffic or other high bandwidth traffic, location based services in exurban areas
Increased service availability and/or resilience	Doubling of critical communication link, path diversity, fade mitigation. Moreover, the terrestrial segment signal and the satellite one can be combined together to achieve diversity

<sup>4</sup> ETSI Draft TR 103 124 V0.0.4 (2013-02), "Satellite Earth Stations and Systems (SES); Combined Satellite and Terrestrial Networks scenarios"

	gains (different combining schemes are possible).
Rapid and/or infrastructure independent service deployment	Backhaul solution (fixed or mobile), military communications, disaster recovery
Increase the Quality of Service (QoS) delivered to the operators and end-users alike	Complement terrestrial based internet access technology with satellite to deliver higher speed broadband service (especially in low density populated areas) by pooling both satellite and terrestrial network resources together so that the service may be enriched.

**Main drivers for combining satellite with terrestrial networks**

The future common 5G network infrastructure has to be designed to accommodate a growing video traffic which is expected to represent more than 90% of the total traffic and to serve an increased number of mobile and fixed devices also for the “Internet Of Things” market. The network architecture shall optimise spectrum, energy and cost efficiency while providing a large range of services including high speed broadband at high service availability. The future common network infrastructure will be based on transport, routing, storage and computing resources for maximum flexibility towards traffic and service provisioning requirements.

The dependence of the future society on the availability of the telecommunications network will be so dramatic that the first priority of the future networks shall be to ensure Connectivity EVERYWHERE and for ALL European citizens. Furthermore, in case of prolonged failure due to natural disasters or other man-made crisis situations, the effects of lack of connectivity will be nearly as dramatic as the disaster itself. For this reason, the 5G network architecture must include multiple layers, diversified and integrated technologies (wireless, wireline and satellite) to satisfy resiliency requirements, in order to be able to maintain continuous service provision.

In order to address a share of the future ICT market demand while facing the competition scene with mature and emerging “space” countries, the European SatCom manufacturing industry has to innovate along four main axis:

- **Performance improvement:** service, throughput and flexibility setting high design constraints on the space segment: e.g. high power and/or high throughput satellites to decrease the cost per Mbps, flexible payloads to maximise the useful service capability/cost or alternative space segment concepts including Low and Medium Earth Orbit systems;
- **Cost reduction:** CAPEX/OPEX of satellite networks during the development/deployment and operational phases;
- **Adaptation of satellite network design to the evolving regulatory context:** Spectrum scarcity, Frequency band sharing with other services, Green policy;
- **Integration of Satellite Communication systems** for overall improved spectrum, energy and cost efficiency as well as higher resiliency of current and future 5G network infrastructure: Increasing role of standards.

## STATUS AND EVOLUTION OF THE SATCOM MARKET

The last 5 years have seen major evolutions on the market, its context and the offer. **Firstly, it is important to note that we currently observe a decrease of the GEO SatCom market on the world scene.** The year 2012 has seen the lowest number of orders since 2004: 18 orders versus a peak towards 30 in 2009, the stabilised average being around 20. This trend seems to continue in 2013.

Novel aggressive commercial approaches enabled by national subsidies also participate to the evolution of the market, in particular

- satellite-packs procurement targeting lower purchasing prices,
- capacity purchasing commitment embedded in the satellite offer (when the manufacturer brings a customer in its offer ensuring a certain capacity purchase),
- bi-lateral agreements trading communication capacity against natural resources (see the China strategy developed later on).

**The LEO market relies on a different logic and is rather a renewal market with volume effect at each orders (dozens of smaller satellites).** New missions are opportunistic and no specific market trend conclusions can be drawn at this stage.

**Beside, while Broadcast remains the core market for communication satellites, its future is not secured.** In the US, on-demand video start to out-compete broadcast and the trend may extend further; also, the Federal Communication Commission challenges the spectrum allocated to broadcasters, arguing its use is not optimum. In Europe, we already observe attempts to deliver mixed broadcast and broadband services but predicting the market evolution is difficult.

**In the last 2 years, the next growth axis of the SatCom market has taken shape with the launch of high throughput satellites and payloads worldwide enabling efficient high speed internet-by-satellite.** While the European industry technical offer competes with the most advanced American ones, the low institutional support at demand level does not favour a rapid broadband market take-up in Europe and further concrete development in this field in the short term.

**On the technology evolution side, the first sale in 2012 of a fully electrical propulsion GEO satellite by Boeing, leading to a global decrease of the mission price, has left the European manufacturers momentarily aside.** In truth, the price attractiveness of this solution results from the use of a new generation of apparently economically attractive **medium-lift launcher** introduced by Space-X, namely Falcon-9. This all-electrical satellite being lighter than a traditional chemical propulsion one, it can indeed be launched by Falcon-9. However, it is important to note that:

- The price attractiveness of this new launcher is largely due to a significant governmental contribution (NASA) to the launch price, aiming to install F9 on the market. Its economic sustainability is not ensured: governmental support may not be indefinite... although long enough to bias the market.
- If the all-electric satellites are lighter, their price and mission capability (number of transponders) is comparable to the European chemical satellites (same price in € but conversion rate not favourable); the global mission price reduction is realised through a cheaper launcher price (furthermore offering dual-stack configuration).

Recovery actions addressing electric propulsion have started very rapidly with the support of the European Space Agency, and the European industry is now able to propose such solutions as well. Falcon-9 also proposes a dual-stack capability allowing sharing the launch costs, which motivates all satellites manufacturers to develop compatible solutions.

**As illustrated by the Falcon-9 example above, the competition scene of the SatCom market is twofold: it occurs at launcher and at satellite level.** The launcher landscape is developed in the next topic while we concentrate here on the market trends of the satellite manufacturing industry.

**Regarding the satellite manufacturing sector, the competition scene has seen worrying evolutions in the last years.** The non-EU players share one common characteristic: a very heavy national support, be it through very large governmental programme embedding lots of innovative R&D work, bilateral-agreement de facto securing their role and direct subsidies to the national launcher side allowing attractive prices for global mission offers (package deal: satellite and launch).

- **The American players are leading the commercial market**, and their presence is further increasing. They have indeed come-back on the commercial scene since public funding is also decreasing in the US. Boeing and Space System Loral are market leaders, further reinforced by major military satellite contracts (such as the WGS and the AEHF series) which sponsor a high level of leading edge R&D activities.
  - Indeed, the single WGS10 contract is worth 1.1 B\$ and encompass one satellite, its launch and the launch operations. The contract for the franco-italian SICRAL2 satcom military mission is only worth 400 M€ while it encompasses one satellite, the launch operations and the launch itself and also the mission ground segment and the satellite control center. Another example of the gap in funding scale is given by the SATCOMBw contract let to the European space industry by the German MoD: 950 M€ have covered for two satellites, their launch, a number of mobile tactical and fixed strategic ground stations, the control center and all the operations for 15 years.
  - It is thus obvious that the WGS10 contract includes a very significant amount of R&D activities (several hundred million dollars) which adds to the usual R&D budget available through NASA. Boeing announced early 2013 their intention to capitalise on governmental development (active arrays, processors) to address the commercial market. Actually, they do it for a while now: thanks to the R&D activities embedded in the huge WGS10 contract, Boeing was able to introduce in 2011 a new platform and new payloads on the commercial market. Also, this level of R&D allow the US manufacturers to enter our own European governmental market and defeat the local actors: a few years ago, Space System Loral built the US\$150 million SpainSat, for Hisdesat a Spanish service provider which provides dedicated communications for the Spanish Ministry of Defense.
  - US Government represents the main investor in space programs with a spending five times higher than the major European and Export (J-BRICK) Countries. The DoD's investment share represents more than the 50% of the total investment in space programs. Up to now, Lockheed Martin has been mostly active on this governmental market; the reduction of public funds in the US will most probably incite them to soon enter the commercial market, strengthening further the American competition.

Moreover, the merging of the American Space System Loral with the Canadian MDA, has created a technically stronger actor with an enlarged market access.

- **Players in Russia and Japan are increasingly a threat in the short and mid-term, but are definitely establishing a growing competence.** The actual **public-private character of the Russian industry** may not be clear to the outside world but it clearly benefits from a high level of subsidies which enabled it to position into the true competitive international market game five years ago. The **Japanese industry is private**, has a long established competence and is enhancing its SatCom platforms capacity coherently with the evolution to the Japanese launcher performance. After several years more focused on the governmental market, they recently came back on the commercial scene for a Turkish customer, and defeated both the US and the European players thanks to a very strong political support of their country directly addressing the Turkish government.
- **Emerging players are shaping up with China hosting the other very threatening competitors.** Even if not yet a very visible threat on the market accessible for the European industry, they will address the world market in the short term, supported by governmental subsidies allowing them to develop competitive competences. Their first steps in the commercial market was characterised by barter agreements with developing nations rich in natural resources (satellite development and launch in exchange of raw materials); more recently the involvement of the export-Import Bank of China has triggered the interest of a wider group of nations. The Chinese strategy generates a clear risk of opening new commercial markets but rendering them definitely captive.
- **Lastly, the Indian SatCom manufacturer is ISRO, the Space Agency itself, and it does not show much interest for the commercial market... yet.** It seems more inclined to answer national or bi-lateral needs.

To finalise the market landscape, one must mention the current discussion between the EU and the US regarding **commercial exchange**. The decisions that will be taken in this field can become dramatically penalising for the European satellite and launcher manufacturing sectors if they do not account for the non-EU powers subsidising strategies (especially the American government).

**As a consequence of those evolutions, the European positioning on the world-wide market has evolved: from 32% in 2009, its market share has decreased to 26% in 2012.** The rapidly moving market trends regarding demand and competition imposes to the manufacturing industry strict survival conditions: a high level of R&D activity and the development of innovative economic models pro-actively supported by the EU. This has never been truer than in 2013.

### LAUNCHERS AND LAUNCH SERVICES

**SatCom is the first market of the European Launchers manufacturing industry.** In the last 3 years, telecommunications satellites represented 87% of the Ariane 5 launches, among those telecommunications satellites only 9% are governmental. The telecommunications are core-business of European launch services; the European Launchers Industry is thus strongly exposed to SatCom market trends on the world-wide scene.

The decrease of telecommunication satellites commercial market observed in 2013 leads an aggressive competition among launchers companies (American, European and Russian) in need of a market guarantying a minimal launches rate. This minimal launches rate contributes to assure continuity of launch production, launch pad maintenance and of course a reliability product also as an access to Space. Today, four launchers are competitors: Ariane 5, Falcon 9, Proton, Sea Launch. The sale prices of these launchers reflect the real production cost but also the financial governmental contribution. The non-European companies indeed benefit from a significant governmental financial support which allow them to propose sale price lower than 25%-50% than their real cost.

In the USA, the internal market (mainly with governmental contracts for ISS) fills more than 50% of Falcon 9 manifest (against only 7% of Ariane 5 manifest); these contracts are signed to real launch service cost while prices are lower on the commercial scene. This is demonstrated by the figures of NASA audit report (reference IG-11-012-17 fev 2011) showing clearly that the real cost of a Falcon 9 launch is 163 M\$ while the sale price is between 60-80 M\$. Falcon 9 is economically competitive only because of significant NASA subsidies.

In addition, the internal governmental markets in USA, China, and Russia are captive while European market is opened to the competition.

In conclusion, the European Launcher industry suffers both from the decrease of the communication market and from the American governmental strategy. This in turn affects the Satellite manufacturing industry preventing attractive fully European package offer (satellite + launch).

## HOW SPACE TELECOMMUNICATIONS CAN ADDRESS EU POLICIES

For the decade to come, EU actions are driven by the EU 2020 agenda, in which communication satellites have a key role to play. Indeed, satellite communications can find a true enabling function in each of the flagship initiatives declining the three priorities of the EU 2020 Agenda:

- Firstly, European **industry competitiveness** and a **resource efficient Europe** shall pave the way towards **Sustainable Growth**.
  - The EC recognises today the top-class level of the space sector in its Communications “An Integrated Industrial Policy for the Globalisation Era Putting Competitiveness and Sustainability at Centre Stage”, “EU Space Industrial Policy: Releasing the Potential for Growth in the Space Sector” and “Toward a Space Strategy for the EU that benefits its Citizens”; the fact that satellite communications manufacturing industry is **instrumental in sustaining Europe’s entire space industry** is also acknowledged. This analysis is coherent with the elements provided in this paper which indeed describes the world-leading performance of the European SatCom industry within a highly competitive and aggressive market. However, the EU analysis does not pay enough attention to the threats towards this sector, which already have impacts today. Consequently, the SatCom sector is not supported at the same level than the other Space areas (see topic “Status and evolution of the SatCom Market” for details) although it should be an EU objective to help maintaining its competitiveness. The issue is not the absence of a European SatCom programme – although it would help!, but rather the lack of specific R&D&I activities in the Framework Programmes for Research and Technological Developments up to now. We count on H2020 to bring a dedicated SatCom line within the Space area, while considering SatCom based solutions as tools to address several of the specific societal challenges. This is vital for the future competitiveness of the whole space sector and for our industry and jobs.
  - Besides, telecommunications satellites can as well contribute to a more resource efficient Europe: for example M2M (Machine to Machine) technologies can be embedded within Space-based networks for a applications such as intelligent traffic management.
- **With its Smart Growth** priority, Europe wants to shape a society based on **knowledge** and **Innovation** thanks to the deployment of the **Digital Agenda for Europe**:
  - Satellite communications are of major relevance for the **Digital Agenda** as recognised in the Communication “Toward a Space Strategy for the EU that benefits its Citizens”. Today, still 4.3 % of the European population live in areas not eligible to a terrestrial or mobile internet subscription. The most recent satellite-based broadband offers perform evenly with terrestrial ADSL solutions. While they are the ideal solution to immediately serve the remaining white areas, they remain under-used by those regions needing it most because of a lack of awareness, combined to the difficulty to address this solution with the State Aids which would cover the

purchase cost of the Customer Premises Equipment (TV-like antenna)<sup>5</sup>: as well understood by the Australian and the US decision makers, satellite-based internet access will long remain the only viable solution to serve rural, isolated and land-locked areas. The EU could play a centralised and trans-boundary aggregator role in order to rapidly close the digital gap and reach the DAE 2013 objective; for example, the EU could locally “coach” the regions to ensure the promotion of all broadband solutions and to help them apply to the Structural Funds. However, if such action occurs too late, the European manufacturing sector will have lost ground with the most performing technologies and the European operators will call for non-European providers. Such European action would in particular enable true public e-services continuity across the regions, typically in the areas of **education** and health,

- The world-leading position of the EU **SatCom sector** demonstrates its **eagerness for Innovation**. To remain an actor on the world scene, the SatCom manufacturing sector needs first to be given the right R&D&I support through H2020. But it also needs to have Europe making use of Space Communications to support its own policies when relevant which is not the case today. Indeed, Broadcast is currently the core business of the SatCom sector and is likely to remain the main market segment for SatCom. Broadband is the next growth market axe and Security/Crisis management constitutes a market opportunity; they are increasing outside Europe but broadband take-up is slow in Europe and the European Common Security and Defence Policy does not yet trigger a market for new or specific SatCom infrastructures. Regarding Security matters, the EU has started to mention its willingness to own independent communication space-based means and the sector is thus welcoming an accompanying R&D&I roadmap in H2020.
- The third priority of Europe is **Inclusive growth** consisting in a **high-employment** economy delivering economic, **social and territorial cohesion**.
  - The SatCom manufacturing sector represent 50% of the Space industry turnover and thus is vital for the whole space sector and thus its **~35 000 skilled employees** throughout Europe. Moreover, these jobs are non relocatable and most of those industries cannot be bought by non-European powers because of their strategic character. Furthermore, the SatCom sector generates 87% of the launches operated in Europe, thus generating the core revenues of the European champion Arianespace. It is a rare case in those times of delocalization and the EU should ensure that this type of sector remains competitive.
  - Besides, using satellite-based Internet to immediately close the **Digital Divide** throughout Europe would participate to the **territorial cohesion** seeked by the EU. Typically, satellite broadband services are the immediate solution to enable public e-

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<sup>5</sup> Several non-technological roadblocks indeed prevent a smooth satellite broadband services market take-up, typically the generally held assumptions that satellite solutions are not eligible to State Aids or the administrative difficulty to use the EAFRD budget allocated to broadband networks.

services continuity throughout the territory at stake, thus enabling growth and jobs in those regions often needing it most.

**Along with the priorities expressed in the EU agenda 2020, Europe is also developing its Common Security and Defence policy.** Autonomy of decision-making and of action at a European level requires autonomy of operational infrastructures. Galileo and Copernicus were the first steps of the EU. They should be complemented by a resilient Space telecommunications architecture. Indeed, the capacity of SatCom to cover most of the world and to provide a back-up to communications link no longer available, or secure and resilient communication link between critical premises are very relevant. Such solutions are already used by EU stakeholders and, in order to have a holistic approach to a 'Space for CSDP' Policy, EDA's European satellite communications procurement cell pooling and sharing initiative, which brings great added value to EU capabilities, is a very welcome precursor to more ambitious mechanisms currently in discussion among the Member States. Also, space communications will enhance the response time of the GMES Emergency response Service thanks to the Data Relay Satellite (EDRS) system

Beside, the Communication "*Toward a Space Strategy for the EU*" mentions that to ensure services continuity and independence, "*the EU must begin discussions with the Member States to look into the possible options. In the framework of the CSDP, the EU could, for example, coordinate national facilities under conditions to be agreed with the owner Member States and identify additional needs in order to fulfil more effectively operational needs in the areas of crisis management and external action. To meet those needs, the EU could take part in the development of new infrastructure.*" The Communication "Towards a more competitive and efficient defence and security sector" released on July 24<sup>th</sup>, 2013, together with the accompanying preparation actions (conferences, workshop, press releases) unveil various options for the EU potential roles. Those options account for necessity to aggregate the needs from the Member states and end-user organisations (EEAS, FRONTEX, etc.) and to define/set-up the framework enabling, as a first step, the use of existing resources with the involvement of infrastructure owners/operators and in a second step, the definition of future pooling and sharing principles and systems allowing the EU to support its policies

The EU should also launch the accompanying R&D&I activities to ensure that industry will be able to timely answer the future needs of the Member States and the relevant EU bodies (EDA, EEAS, Frontex etc.). The sector is eager to participate to the elaboration of the associated R&D&I roadmap.

## THE INNOVATION CHALLENGES OF THE EUROPEAN SATCOM INDUSTRY

The preceding chapters have described the evolving context of the SatCom market:

- The sustainability of the core broadcast market is not ensured while we observe a slow take-up of the next growth axis, namely broadband,
- Novel aggressive commercial approaches appear which put even more pressure on the satellite prices,
- The non-European manufacturing industry receives a very significant public support leading to competitive advantages, or benefit from captive markets established by their governments,
- The European governmental market remains too low to generate assets on the commercial scene, while public sales it represents more than 50% of the US manufacturers business

**To remain in the race, the European manufacturing industry must thus pursue its innovation efforts, but also be supported by public R&D programmes in order to reach a level playing field with its competitors outside the EU .** While the European Space Agency, through its ARTES programme, is already funding a significant part of the necessary activities, the European manufacturing industry expects the European Horizon 2020 programme to complement the ESA works with the goal to primarily address the EU societal challenges, early research phases and spin-in applications. The SatCom sector considers necessary to secure a yearly budget (typically 10 to 20 M€) within H2020 to support the associated mid and long-term activity roadmap. **Also the European manufacturing industry expects H2020 to address the issue of technology non-dependence.** It is very important that the actions realised by industry in this area are promoted by the Commission so that the manufacturers can call for those industries having developed European attractive technologies.

### SatCom in Horizon 2020 Space

**The following section is an extract of the wider Eurospace proposal for H2020 under preparation by the Eurospace TPWG. This extract concerns only Space Telecommunications technologies.**

The Commission is currently shaping up the H2020 programme structure and envisages organising the H2020 Space activities around six topics, none specifically encompassing telecommunications. The SatCom manufacturing sector has thus addressed the EC with the request to consider the addition of a stand-alone SatCom research area in H2020 Space with the goal to primarily address the EU societal challenges and participate to the competitiveness of the sector for a strengthened position in the world-wide commercial competition scene. The detailed activity content shall of course be finalised in coordination with the European Space Agency in order to encourage synergies, focus on complementarity, support countries for which the ESA budget is not accessible (non ESA members and countries not having subscribe to ARTES) while avoiding any duplication with ESA work.

The detailed rationale and content of the activities proposed for EC funding are developed by the Eurospace H2020 task force. We only recall here the structuring components:

## 1. Societal challenges: Digital Agenda, Security, Clean Space

- a. Spin-in: spatialisation of terrestrial technologies: Photonics technology, Optical feeders building blocks, LTE coding technique, Optical fibre technology (1.55 um), smart antenna building blocks (ex: digital beam-forming)
- b. Enabling technologies and systems: Large Ka band antenna system (>5m dish) ,Tx/Rx active antenna technology bricks, Technologies to support flexible requirements of SatCom integrated in future networks (ex: 5G), Non dependence & critical technology development for telecom satellites (FP7 follow up: ex: GaN SSPA, FPGA), Technical enablers to increase the security of future Satellite networks (ex: anti jamming and interference geo-location), Disruptive technologies for high speed processors

## 2. End to end framework

- a. Ground segment: Automated mission management (optimization, reconfiguration), Scalable Service oriented architectures, Service enablers for integrated Satcom, EO and GNSS systems, Sustainable development (energy efficiency for ground segment)
- b. Technical and programmatic tools: Engineering tools (e.g. simulations), Innovating financing schemes for European SatCom infrastructures, Innovative industrial processes, Innovative governance model for hosted payload (coordination action), Standardisation of payload architectures (e.g. generic, hosted payload)

## SatCom in Horizon 2020 ICT

The SatCom community expects the European Commission to pursue its support to network and user-centric activities within the ICT area of the H2020 programme. The European SatCom industry sector believes mandatory to address the integration of satellite network solutions in Future networks (e.g. 5G Network infrastructure) to maximise the spectrum, energy and cost efficiency as well as resiliency and fulfil the Digital Agenda and the Common Security and Defence policy objectives. The various SatComs solutions (from networked media, Digital divide, safety/security market segments) are well suited to serve the 5G network through the following functionalities:

- Prevent network oversizing just for the peak service demand, thanks to traffic off loading techniques making use of satellite (broadcast/multicast) resources in Content Delivery Networks, Information Centric Networks especially to convey especially high definition and popular multimedia content
- Extension of the service coverage to “un-served” or “poorly served” areas as well as to passengers in trains, aircrafts, vessels with backhaul service to local 5G wireless/mobile network
- Sustainable throughput at high service availability in “under served” areas with access combining satellite with wireline and/or wireless technologies

- Wide area data collect service provisioning especially to monitor and control critical infrastructures (e.g. 5G network, Smart Grids, transport, etc.)
- Public safety communications provisioning via combination with wireless technologies.

In addition, the industry considers that the ICT area of the H2020 programme is fully appropriate to support non technical research activities:

- Regulatory (access to spectrum conditions) and standardisation (within sat com networks architecture and at SatCom network external boundaries) activities (to define a successful pan European deployment framework for future SatCom systems).
- Market demand aggregation investigations; Innovating financing schemes for European SatCom infrastructure.

## SATCOM AND THE EUROPEAN SPACE POLICY

The SatCom manufacturing sector is both highly concerned and highly relevant for the EU's space industrial policy adopted in February 2013<sup>6</sup>. Indeed, this policy is centred on five specific objectives:

### 1. Establish a coherent and stable regulatory framework

- Spectrum:
  - i. member states should implement international regulations (CEPT, ITU) to ease pan European harmonisation
  - ii. the spectrum primarily allocated to satellite communication services (BSS, FSS and MSS) should be protected;
  - iii. the spectrum allocated to satellite communication services (BSS, FSS and MSS) on a shared basis should be truly usable by satellite services while ensuring coexistence with other services. In some cases, satellites services could ultimately not be deployed because of interference risks.
- Licensing: the conditions across Europe should be harmonised in terms of technical requirements and global circulation of equipment. Fees should be limited to administrative costs recovery given the contribution of SatCom to policy objectives, Auctions should be avoided. A light and stable administrative process should be put in place.
- Competition rules for satellites manufacturer and launcher industry:
  - i. Cost/benefits analyses should be performed for major procurements evaluation, and be a decision criterion
  - ii. The strategic importance of the item procured within the industrial ecosystem should be a major evaluation criterion
  - iii. The selling price should be analysed against the exploitation costs: this will allow to identify unfair governmental support to the selling price
  - iv. The governmental market of non-EU competitors should be analysed during the evaluation: decision should account for the open or captive character of this market.

### 2. Further develop a competitive, solid, efficient and balanced industrial base in Europe and support SME participation

- As developed in the previous chapters, competitiveness is indeed the essential enabler for our commercial sector.

<sup>6</sup> 28.2.2013 - COM(2013) 108 final

- Besides, a large market size is a key to establish a solid industrial base. However the worldwide commercial Satcom market is not big compared to the level of competition (7 to 8 players for about 20 accessible contracts per year) and European players do not benefit from governmental anchor customers to secure a minimum size. One option for the EU to help strengthening the SatCom sector industrial base is to systematically procure related services and infrastructure respectively from European providers and manufacturers.
- Efficiency is ensured, among others, by the implementation of focused R&D&I activities; public budget should in particular be addressing the most strategic areas with the aim to sustain the existing industrial base.
- Lastly, SatCom applications generate a wide range of services which are implemented by SMEs (e.g local Internet Service providers, antenna dish installators).

### **3. Support the global competitiveness of the EU space industry by encouraging the sector to become more cost-efficient along the value chain**

- The main components of the Satcom sector value chain encompass Satellites operators, satellites and ground segment manufacturers, launch industry, and local service providers. Within this chain, the manufacturers are without doubt those submitted to the highest commercial pressure generating quite low margins and with no freedom to enhance the value-chain efficiency.
- For the specific Broadband market, cost-efficiency of the final services could be improved by easing the aggregation of the demand (at least at regional level) and harmonising this demand in Europe. The enabling tools for such actions lie in the hand of the EC and are analysed in details by the European thematic networks SABER<sup>7</sup> and BRESAT<sup>8</sup>. This would include an efficient way to mobilise funds controlled by the EU regions (e.g. structural funds).

### **4. Develop markets for space applications and services**

- The SatCom sector is the space sector generating most services and applications already.
  - i. In Europe, 85 million homes receive their TV signal from satellites, increasingly under High Definition and even ultra-High Definition format. Over the last four years, satellite has increased its reach in Europe by 17%. Terrestrial and cable reception both slightly decreased year-on-year. This demonstrates the effectiveness of satellite in multimedia transport, which will constitutes more than 80% of the internet traffic in 2020.
  - ii. Also, satellite broadband is the ideal tool to overcome the broadband divide especially in low density populated areas given the high deployment cost of

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<sup>7</sup> [www.project-saber.eu](http://www.project-saber.eu)

<sup>8</sup> [www.cip-bresat.eu](http://www.cip-bresat.eu)

terrestrial solutions; as developed in point 3, the EU regulations could help address this specific market more rapidly.

- iii. Support to Security and Crisis Management actions is another recognised field of applications for SatCom. Pooling and sharing initiatives from the EU are necessary to take those applications from a sparse market to a consolidated public one.
- Therefore the definition of future 5G network infrastructure (e.g. 5G), shall consider the integration of SatCom solutions which will help to maximise spectrum, energy and cost efficiency as well as resiliency.

### **5. Ensure technological non-dependence and an independent access to space.**

- Non-dependence is about critical technologies as well as about competences and know-how all along the value-chain of the Space sector, from operators to the service providers. Non dependence is also about the EU industry base legitimate existence and sustainability to serve European Public sector policies and societal challenges. For that purpose the European Union should urgently and equally support the Space sector by seeking:
  - i. Non-dependent access to space (launchers) to maintain a complete European independent space ecosystem
  - ii. Non-dependent access to infrastructures (satellites and ground segments)
  - iii. Non-dependent access to critical technologies (components).
- Amongst the short term actions necessary with regards to SatComs:
  - i. Public and private operators to be encouraged to procure their telecom space infrastructures from European economic/industrial actors when the infrastructure aim to address European public issues. Procuring only Satcom services is not sufficient to secure a sound industrial base (and jobs) in Europe.
  - ii. Satellites should increasingly count in the technology-mix solutions.
  - iii. Industry must come back at the forefront of the H2020 objectives and remain influential in the choices that the Commission and agencies intend to make on its behalf or for its own sake.