THE DIGITAL DIVIDE AND SPACE ACTIVITIES IN THE SOUTHERN HEMISPHERE(S): A General Overview of Africa and South America

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Abstract

Africa and South America share some commonalities, but are quite different in many respects. Both continents had several thriving indigenous cultures prior to their being colonized by mostly European settlers. The legacies left by the colonizers are quite different, but in the 21st century, there may be some convergence, particularly in respect to some space activities.

Communication and remote-sensing satellites, and internet access have played a key role in the last 20 years in bringing the benefits (and some of the ills) of industrialization and globalization to even the most remote areas in the southern hemispheres. International and national satellite systems, whether for communications or earth observation, have influenced their development. In turn, countries in the southern hemispheres have also had an impact in the development of space policies and regulations.

This paper will set forth what seem to be common issues, as well as issues on which there are differences between Africa and South America. It will also examine various attempts to unify the countries in these respective continents, the result of some of these efforts, and their impact on the development of space activities in Africa and South America

Will the digital divide prevail, or will it decrease with the availability and adoption of new technologies in the southern hemispheres? Will these help bridge or grow the gap between the "haves" and the "have-nots" on either side of the digital divide?

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Introduction

While hundreds of communication satellites are in the geostationary orbit (GSO) and in lower orbits together with many remote sensing /earth observation satellites, the "Digital Divide" persists. According to the International Telecommunication Union (ITU), despite recent efforts to close the gap, it remains significant in some regions of the world, notably Africa and parts of South America.[1]/ What is the Digital Divide? It is defined as "inequality of access to information technology: the difference in opportunities available to people who have access to modern information technology and those who do not."[2]/

In its on-going efforts to bridge the gap, the ITU has been hosting an annual Forum on the World Summit on the Information Society since 2003.[3]/ It also set up a special Broadband Commission for Digital Development that met for the first time in 2010, to try to close the Digital gap.[4]/ While these efforts are laudable, they face some challenges that are difficult to overcome, as the digital divide seems to be a north-south issue with many implications. Further, while some geographic barriers will always remain, other man-made (economic and legal) obstacles seem to be nearly as insurmountable. An overview of some of these follows.

Africa and South America share some commonalities, in terms of their geographical position (they are traversed by the Equator) and landforms, as well as their political heritage (as former colonies). Both continents had many thriving indigenous cultures prior to their colonization by the Europeans. Both have great variations in terrain, ranging from arid zones (the Sahara desert in Africa[5]/, the Atacama Desert in Chile[6]/); mountain ranges that extend the length of the continent (Great Rift in Africa,[7]/ the Andes in South America[8]/); to rain forests (Amazonía) and jungles in Sub-Saharan Africa. These geographic "accidents" have hindered development in both continents, and made communications between and among the countries difficult and costly. In the last century, thanks to aviation and to satellite communications, some of these geographic hurdles have been overcome, facilitating trade and communications within the continent(s) and the rest of the world.

These two continents are quite different in many respects: Africa's population is estimated to be over one billion people, living in more than 50 nations (the newest being South Sudan[9]/). In addition to French, English, Portuguese and Arabic, more than 1000 languages are spoken, making Africa the most multilingual continent in the world.[10]/ Most of the African countries obtained their independence in the 1960s.

South America is less varied than Africa: its population, estimated to be 371,090,000, lives in 12 countries and 3 major territories.[11]/ While Spanish and Portuguese are the two principal languages of the continent, some indigenous languages (e.g., Guaraní,[12]/ Quechua,[13]/ Aymara[14]/) are also widely spoken. The majority of the countries in South America won their independence from Spain or Portugal in the 19th century. The "ABC" islands (Aruba, Bonaire and Curaçao), are part of the Kingdom of the Netherlands,[15]/ and French Guyana is an overseas department of France since 1947. It is also the European Space Agency's Arianespace launch site.[16]/

Challenges to the Status Quo and the Desire to join the Satellite Club

In the 1970s, the less developed countries (LDCs) sought to redress what they perceived as imbalances and inequalities in economic opportunities and information flow. These inequalities are the gist of the arguments underlying the "New World Economic and Information Order."[17]/ The developed countries were seen as inundating the LDCs with their mass media (TV), while the developing nations had little opportunity to respond or communicate back, since they did not control the means of communication—the satellites.

In addition, perhaps as a means to correct the perceived communication

imbalance, several countries whose territory is traversed by the Equator[18]/ issued the Bogota Declaration in 1976.[19]/ They maintained that some segments of the geostationary orbit (GSO), where most communication satellites are located, were part of their national sovereign territory. They stated further that

> "[t]he geostationary orbit is a scarce natural resource, whose importance and value increase rapidly together with the development of space technology and with the growing need for communication…"[20]/

Furthermore, they questioned the legal status of the GSO, and contended that, since the Outer Space Treaty[21]/ does not define outer space, essentially, there is no way to prove that the GSO is included in outer space.[22]/

The Bogota Declaration sparked much controversy and many debates on a series of issues, which until now are unresolved. Among these are the lack of delimitation /definition of outer space; the saturation of the GSO by satellites belonging to developed countries; the lack of equitable access to space resources, such as the GSO and associated frequency bands, and space technology. (These space-related issues will be discussed at greater length, in another section of this paper).

The Bogota Declaration, in generating awareness among the developing countries as to the importance of geostationary communication satellites, and the use of the radio frequency spectrum (RFS),[23]/ gave impetus to regional and national satellite projects in both Africa and South America. It provided a context, or pretext, for groups of countries in those continents to study the necessity and feasibility of having a regional and/or national satellite system, more attuned to their needs. Some issues were of great importance to them: one of them was the question of national sovereignty over their communications, in part due to national security issues, but also in efforts to preserve their native cultures.[24]/

By the late 1970s, three international, intergovernmental satellite systems were in operation, providing services to their Signatories or member countries. These were INTELSAT,[25]/ INMARSAT,[26]/ and INTERSPUTNIK.[27]/ Two regional systems ((EUTELSAT[28]/ and ARABSAT[29]/), already in the planning stages, began operations in 1983 and 1985 respectively. EUTELSAT was to provide regional services primarily to and in the European continent[30]/, while ARABSAT provided services to the Arabic-speaking countries in northern Africa and the Middle East.[31] / Two other regional efforts are highlighted in the following section, beginning with Africa.

Africa: RASCOM

The idea of a pan-African satellite germinated in the late 1970s, and following a feasibility study undertaken in the 1980s, finally saw its realization in 1993, when the Regional African Satellite Communication Organization (RASCOM)[32]/ was officially established as an intergovernmental treaty-based organization, patterned largely on INTELSAT.[33]/ RASCOM aimed to provide satellite capacity on a commercial basis, for national and international public telecommunications services, as well as audio and television broadcasting in Africa.[34]/

In its early years, RASCOM operated by pooling and optimizing space resources leased mainly from INTELSAT.[35] The ultimate aim, to have a dedicated Africa-owned regional satellite system, was achieved in 2007, with the launch of RASCOM QAF1. Unfortunately, the satellite developed some anomalies, curtailing its services and life in orbit. RASCOM QAF 1R replaced it in 2010.[36]/

Today, in addition to accessing RASCOM's only satellite, most, if not all its member countries are able to receive broadcast and some internet / broadband services from several other satellites, as they are within the coverage area of global and regional systems, such as SES World Skies,[37]/ Intelsat,[38]/ Eutelsat[39]/ and

ARABSAT.[40]/ They are also within the footprint of national satellite systems, such as Nilesat,[41]/ Egyptsat,[42]/ Measat,[43]/ among others.

While more than 30 satellites can provide coverage to Africa,[44]/ the infrastructure (the terrestrial component) in most of the continent still needs much improvement, since telephone lines and internet access remain limited in number. Even though mobile communications have increased from 41% in 2005 to 75% (estimated) in 2010, there is still room for growth, according to the ITU.[45]/

Adequate communications remain beyond the reach of many people, particularly in rural areas, where deployment of the infrastructure for fixed wire lines, may not be cost effective to the service providers or their customers. (One of RASCOM's objectives was / is to provide universal service at affordable prices, and to facilitate the development of the infrastructure.) Further, most of the satellite capacity on the big systems like SES and Eutelsat seems to be used to provide broadcast and corporate network services. Thus, it would seem that many of the early arguments for having a regional satellite (e.g., to reach more people, protect indigenous cultures, interconnect more easily and inexpensively, etc.,) have been rendered moot with the advent of so many (mobile) service providers.[46]/

Satellite operators and service providers, however, face regulatory hurdles: governments still have a monopoly on fixed lines in most countries. Although there is competition in the cell-phone sector, most of it comes from international network operators in partnership with local investors and entrepreneurs.[47]/ Further, although many African countries have separate regulatory entities, many of these have little autonomy or decision-making power and small operating budgets, due to limited financing sources.[48]/ Satellite operators and service providers face similar regulatory challenges in some of the Latin American countries.

South America: Project Condor / Simón Bolívar

In the early 1970s, the countries that comprised the Andean Community or Andean Pact at the time (Bolivia, Chile, Colombia, Ecuador and Peru)[49]/ set up an organization, ASETA, to study the possibility of having a regional satellite system of their own.[50]/ They aimed at placing the regional bird in one of the orbital slots to which Colombia claimed sovereign rights.[51]/ Canadian, French, American and other consultants studied the project, and concluded that technically, it was viable. Its economic viability was less certain, but the consultants did not address its political viability. Most of the studies recommended further studies, particularly regarding some of the economic and legal / political aspects of the project.[52]/

This project underwent a series of name changes, ranging from "Satan" (for Satélite Andino) to "Condor", to finally Project "Simon Bolivar" in the late 1980s. (The name of the entity that would be in charge also underwent several name changes.) In the meantime, the five countries leased capacity from INTELSAT, each according to its need. This was not a very satisfactory arrangement, as they still did not own or control their own satellite, and the leased capacity was on different INTELSAT satellites, resulting in additional interconnection and service costs.

In 1994, ANDESAT, a new corporation was set up for the purpose of coordinating and implementing a satellite system among the five members of the Andean Pact.[53]/ In 1997, the Andean Pact became the Andean Community of Nations (CAN).[54]/ The telecom sector in most of the countries was further liberalized 1999,[55]/ and a new orbital position was sought for the Simón Bolivar satellite.[56]/

"Fast forward" to 2010: Rather than launch their own satellite, the CAN countries decided to accept an offer from SES World Skies to "develop [the] orbital slot at 67 Degrees West with the [ITU] … to provide television distribution, broadband connectivity and government services."[57]/

SES relocated two of its satellites in order to provide services to the CAN countries: in February 2010, it moved its NSS-5 satellite to the 340 Deg. East position, to provide coverage of Europe, Latin / South America, Africa, and Asia.[58]/ In September 2010, it moved its AMC-4 satellite to 67 Deg. West,[59]/ to provide corporate voice, data and broadband services in the CAN countries and beyond. In 2011, SES World Skies signed two deals, one with a Colombian company, Axesat,[60]/ for the provision of corporate voice, data and broadband services; the other agreement is with TIBA, an Argentinean company, for cable TV programming on the SES-6 satellite scheduled for launch in 2013.[61]/

While the SES satellites may provide the CAN countries with the capacity they need, it is unlikely that an autonomous regional satellite system will eventually emerge from their agreement. SES will continue to control the 3 satellites that will be used, rather than having a regional control center administered by one or all of the CAN countries. These are important issues, as one of the political premises for having a satellite for the Andean region was to have control over the spacecraft. In previous stages of the project, however, the countries were unable to agree as to the location of a control, monitoring and operations center; they each wanted to have their own.[62]/ Only time will determine the long-term success of the SES-CAN arrangement.

Are Regional Satellite Systems still needed or viable?

RASCOM took nearly 30 years to materialize; it launched its satellites in 2007 and 2010. Whether the CAN's Simón Bolivar will ever be deployed as an "independent" regional satellite system is questionable. Whether either regional satellite system is economically viable, in view of the increased capacity available is also open to question, as the satellite skies over both continents have changed exponentially.[63]/

At present, all the national and formerly regional systems face strong competition not only from Intelsat, but also from SES,[64]/ These two companies together have nearly 100 satellites in orbit providing services worldwide. Can national or regional satellite systems in Africa or South America, comprising one or two satellites, still survive? Possibly, but only if they form alliances with bigger systems, such as Intelsat, SES, Eutelsat and even ARABSAT.

Further, the system operators and service providers need to take into account the economic and regulatory changes brought about by their WTO commitments.[65]/ In addition, there is also a need for coherent policies, not only at the national level, but also amongst the different regional and international bodies that are involved in the development of information communications technology (ICT) in the various regions of the world.[66]/

The communication satellite world has changed over the last 20 years, particularly with the advent of new privately owned systems and the privatization of the intergovernmental systems.[67]/ In the 1970s-80s, INTELSAT and INTERSPUTNIK were the major providers of international capacity interconnecting with the public switched network (fixed lines), which in most African countries remains under government ownership and control. Currently, little mention is made of public telecommunication services, the basic "POTS" (plain old telephony service), with two exceptions: RASCOM[68]/ and Intelsat, which still provide them.[69]/

While in the early years of satellite communications, television broadcasting was limited in some countries due to content and copyright issues, today most satellite capacity seems to be dedicated to entertainment (TV broadcasting of sports and "telenovelas" or "soap operas")[70]/, rather than to more educational purposes or universal services. Whereas Internet and mobile communications were virtually unheard of until the 1990s, today corporate voice and data (broadband) and mobile services are increasing, expanding, and

revolutionizing the communications world, as well as relations at all levels.

One the one hand, even though more satellite capacity is available, the Broadband Commission for Digital Development's Sept. 2010 Report[71]/ stresses the importance of continued wireless communications at affordable prices. On the other hand, mobile telecom networks and internet services and networks are largely in the hands of private corporations, whose main aim is to gratify their shareholders. Thus, they will expand their services where profitable, not necessarily where most needed. Have all the new satellite systems redressed the imbalance of information flow and inequitable access to communications systems that existed 30 years ago?[72]/ Have these changes decreased the communications gap, or bridged the Digital Divide?[73]/ It would seem that the major changes in the way we communicate have been brought about by wireless technologies, which are still beyond the reach of many people.

Moving up from the Satellite Club to the Space Agency Club

Over the years, the "less developed countries" have evolved to "developing countries" and now are referred to as "emerging economies." Some of them have achieved their aspirations to join the "Satellite Club," to have satellites of their own, even if in some instances it has been with the launch of small, experimental satellites, such as Egyptsat[74], the South African "Sunsat"[75]/ and the Colombian "Libertad.[76]/ Other countries, like Algeria[77]/ and Nigeria[78]/, have launched remote sensing / earth observation satellites, and others have bi-national programs, like the Chinese-Brazilian CBERS program.[79]/ Will these national remote sensing initiatives assuage the emerging economies, which a few years ago were arguing that the information garnered from outer space should be more accessible to them, that the Remote Sensing Principles should be revisited?[80]

Due to the growing awareness of the benefits of satellite communications, of space activities and space technology (in which the Equatorial countries have wanted to partake since they issued the Bogota Declaration[81]) in the last decade, several countries have created national space agencies, even if they do not have the capacity to build or launch spacecraft. Some countries, like Argentina[82]/ and Brazil,[83]/ have fairly developed space agencies and research institutes[84]/ and have joint projects or programs with other space agencies, such as NASA, ESA, the French CNES, and the JAXA, the Japanese Space Agency, among others.[85]/ Brazil even has a launch center, at Alcantara.[86]/

Except for Paraguay, the South American countries have a space commission or agency,[87]/ but taking into account the scope of their projects, few of them have adequate budgets.[88]/ Some of them have high aspirations, e.g., the Ecuadorian EXA, a civil space agency, wants to send an astronaut to the Moon.[89]/ The Colombian Space Commission (CCE)), plans to set up a national space agency, with the aim of acquiring a remote sensing satellite, and expanding the national aeronautic industry.[90]/

In Africa, Algeria, Tunisia, Nigeria, Morocco, and Egypt have remote sensing centers, while the South African National Space Agency (SANSA) is the newest space agency.[91]/ While these African countries have all ratified at the 1967 Outer Space Treaty, and other space treaties, the same cannot be said of the South American nations. Bolivia and Colombia have signed but not ratified this treaty.[92]/ Given their plans to have their own spacecraft,[93]/ it is important for them to ratify this instrument, and the other space treaties, in particular the 1972 Liability Convention.[94]/ Ratification of the space treaties would provide them with some foundation for when they develop their national space policies, which are basic to any space agency that is going to be engaged in regional or international endeavors.[95]/

Most countries have some regulation regarding communication

satellites and the use of the radiofrequency spectrum (RFS), related to the International Telecommunication Union's Radio Regulations, but that is often the extent of their regulation of space activities. Fewer countries in the southern hemisphere(s) are familiar with the regulation of other space activities, such as the need to set up a national register, and submit information on the launch of their space object to the UN Secretary-General.[96]/ Even countries with well-developed space programs, such as Argentina, Brazil, or South Africa, do not have a comprehensive legal or policy framework encompassing their national space activities.[97]/ Rather, several agencies or ministries may be involved in setting policy or executing the project.[98]/

Conclusion

In reflecting on the (lack of coherent) regulation of the space sector's activities at the national level, it becomes evident that this sector's needs are similar to the requirements of the communications /ICT sector: namely, it is important, if not essential to have comprehensive policies and cooperation amongst the different agencies involved.[99]/

Even if we now live in a global communications world and global economy, inter-agency collaboration needs to begin at the national level. Further, regional cooperation and compatible policies and goals are needed. In addition to harmonized ICT policies, most countries need a legal / policy framework that includes space policies and law, as well as trained personnel to carry them out. International cooperation and good will are fundamental to the success of space-related projects, such as satellite communications and to communications /ICT projects, which rely heavily on the satellites in order to bridge the Digital Divide.[100]/

[1] ITU: The Digital Divide at a glance. (Data collected for the World Summit on the Information Society, Tunis 2005.) www.itu.int/wsis/tunis/newsroom/stats/. More recent data from the ITU state that internet penetration in Africa is 9.6/100 inhabitants, whereas in the Americas it is 55/100 persons. Broadband penetration in Africa is less than 1%, compared to more than 15% in the Americas. ITU:The World in 2010 (ICT) Facts and Figures. http://www.itu.int. Visited 29 August 2011.

[2] Encarta® World English Dictionary[North American Edition (2009).

[3] The most recent WSIS Forum was held 16- 20 May 2011 in Geneva, Switzerland. The results are available at http://groups.itu.int/wsis-forum2011/Agenda/OutcomeDocument.aspx.

[4] Broadband Commission for Digital Development. The Commission's first Report (Sept. 2010) is available at www.broadbandcommission.org/report1.pdf. [Cited as Broadband Commission Report.]

5 www.worldatlas.com/webimage/countrys/aflnd.htm..

6 www.worldatlas.com/webimage/countrys/saland.htm..

7 www.worldatlas.com/webimage/countrys/aflnd.htm.

7 www.worldatlas.com/webimage/countrys/saland.htm

8 www.worldatlas.com/webimage/countrys/saland.htm..

9 www.worldatlas.com/webimage/countrys/saland.htm..

10 Information obtained from http://en.wikipedia.org/wiki/Africa.

11 www.worldatlas.com/webimage/countrys/saland.htm..

[12] Guaraní, one of the official languages of Paraguay, is also spoken in Bolivia, Brazil and Argentina. www.omniglot.com.

[13] Quechua is an official language in Bolivia, Peru, and Ecuador, and also spoken in Colombia, Chile and Argentina. Quechua and Aymara remain essentially oral languages. http://en.wikipedia.org/wiki/Quechua_languages.

[14] About two million Aymara speakers are in Bolivia; several hundred thousand in Peru, and a few thousand in Chile and Argentina. www.omniglot.com.

[15] While the "ABC" islands (Aruba, Bonair, and Curaçao) are geographically part of South America, they are also considered part of the West Indies and the Leeward Antilles. http://en.wikipedia.org/wiki/Cura.

[16] www.infoplease.com/ipa/A0107544.html.

[17] See, for example, "Many Voices, One World:" Report by the International Commission for the Study of Communication Problems. Sean MacBride, President. Kogan Page, London/Unipub, New York/UNESCO, Paris (1980). This Report addressed differing political and social views prevalent in the 1970s and '80s. [Cited as MacBride Commission Report hereinafter.] For a good summary of these issues, see http://en.wikipedia.org/wiki/New_World_Information_and_Communication_Order.

[18] The Signatories of the Bogota Declaration are Brasil, Colombia, Congo, Ecuador, Indonesia, Kenya, Uganda and Zaire (now Dem. Rep. of Congo). For the full text online, see http://bogotadeclaration.wordpress.com/declaration-of-1976/

[19] N.M. Matte, Aerospace Law: Telecommunications Satellites. The Bogota Declaration of 1976. Appendix XV, p. 341. Butterworth & Co. (Canada) Ltd. 1982.

[20] Point 1 of the Bogotá Declaration, Matte, note 19, p. 341.

[21] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies. [UN] General Assembly resolution 2222 (XXI), annex)- adopted 19 December 1966, entered into force 10 October 1967. [Cited as the Outer Space Treaty or OST hereinafter].

[22] Point 4 of the Bogotá Declaration, "Treaty of 1967," Matte, note 19, p. 343.

[23] Some of these issues were the focus of the International Telecommunication Union's World Administrative Radio Conference on the Use of the Geostationary-Satellite Orbit and the Planning of the Space Services Utilizing It (WARC ORB), held in 1985-1988. It dealt with planning the use of the GEO, and assigning orbital slots and associated frequencies to each country, for a more equitable distribution and access to these limited natural resources. 1st Session (Geneva, August-Sept. 1985); the second Session was also held in Geneva in 1988. It was the only WARC convened in 2 sessions. An analysis of the results of WARC-ORB are beyond the scope of this paper. For more information, see the ITU's Complete List of Radiotelegraph & Radiocommunication Conferences*"*,www.itu.int.

[24] MacBride Commission Report, note 17.

[25] INTELSAT was an international, intergovernmental treaty organization(IGO). It began providing satellite services in the late 1960s, and its Agreement and Operating Agreement entered into force in 1974. Privatized in 2001, Intelsat, S.A. (small letters) comprises several corporations and provides global services through its fleet of 55+ satellites. www.intelsat.com.

[26] INMARSAT was founded in 1979, to provide mobile satellite services to the maritime sector. It was also the first of the intergovernmental organizations (IGOs) to be privatized in 2000. www.inmarsat.com/ INMARSAT's role in the southern hemisphere(s) is beyond the scope of this paper.

[27] INTERSPUTNIK, the Soviet Union's International Organization of Space Communications, was established in 1971. Due to political relations at the time, the USSR could not become a member of INTELSAT. At present, it has 25 member countries, including some that were not part of the USSR. www.intersputnik.com.

[28] EUTELSAT is the acronym for the European Telecommunications Satellite Organization. Originally set up in 1977 as an intergovernmental organization (IGO), it launched its first satellite in 1983. It became Eutelsat (small letters) when it was privatized in 2001. www.eutelsat.com/eutelsat/history.html.

[29] ARABSAT is the acronym for the Arab Satellite Communications Organization, created in 1976. The first generation satellite was launched in 1985; the most recent launch took place in 2010. ARABSAT provides very good coverage in the northern part of Africa, the Middle East, and the southern part of Europe. It remains an intergovernmental organization (IGO). www.arabsat.com/pages/history.aspx.

[30] EUTELSAT, note 28.

[31] ARABSAT, note 29.

[32] RASCOM is the acronym for the Regional African Satellite Communication Organization. http.www.rascom.org.

[33] This author was part of a team of legal experts who worked on the RASCOM draft treaty in 1991, at ITU's Headquarters, Geneva, Switzerland.

[34] As of March 2005, 45 African countries out of a total of 53 countries had signed the RASCOM

Convention, according to RASCOM's website. (www.rascom.org). Visited 28 August 2011.
[35]http://www.dfa.gov.za/foreign/Multilateral/africa/rascom.htmpartment of Communications (South Africa).
[36] http://space.skyrocket.de/doc_sdat/rascom-1.htm.
[37] SES World Skies Interactive Fleet map provides information on the coverage (footprints) of its 28 operational satellites and future launches. At least 7 of these cover most of Africa. http://www.ses-worldskies.com/worldskies/satellites/index.php?ca=Africa.
[38] Intelsat has 11 satellites providing coverage to Africa. The most recent satellite, New Dawn, is a joint venture with Convergence Partners of South Africa. Launched in April 2011, it soon developed antenna deployment problems, affecting its C-Band coverage, and its useful life in orbit. See http://www.intelsat.com/press/news-releases/2011/20110503-1.asp. (An interactive map of the Intelsat fleet is available at http://www.intelsat.com/network/satellite/.)
[39] Eutelsat's "W" series of satellites provide good coverage of most of Africa. For further details, see www.eutelsat.com/satellites/.
[40] ARABSAT, note 29.
[41] Nilesat, established in 1996, operates the Egyptian satellites, providing mostly TV services in the northern part of Africa and the Middle East. Nilesat 201, launched in 2010, provides high-speed internet broadband services, such as online health care, e-learning and e-commerce. http://nilesat.com.eg/Services/BroadbandServices.aspx.
[42] Egyptsat is a small remote sensing satellite, launched in 2007. This entity provides a variety of services. See http://www.egyptsat.com. Egyptsat and Eutelsat's Skylogic subsidiary signed an agreement allowing Egyptsat to use Eutelsat's Tooway™ satellite service to provide broadband services to users beyond reach of terrestrial or wireless networks across Egypt. Eutelsat press release, 29 August 2011. http://www.eutelsat.com/news/press-releases.html.
[43] Measat is a Malaysian satellite system, providing mostly TV services in Asia, but also providing core communication services for the African region. Founded in 1992, today MEASAT's satellites reach over 145 countries, representing 80% of the world's population, according to its webpage. http://measat.com/corp_profile_history.html.
[44] The satellite systems cited here operate in the Fixed-Satellite Service (FSS) bands. Other systems operating in the Mobile Satellite Service (MSS) bands, such as Thuraya, Inmarsat, Iridium, etc., are not considered in this paper.
[45] See ITU "The World in 2010", note 1. Another ITU document, "Key Global Indicators for the World Telecommunication Service Sector shows that fixed telephone lines have decreased worldwide, but mobile cellular subscriptions have nearly tripled. See "Key ICT Indicators for the ITU/BDT regions (totals and penetration rates)," www.itu.int/ITU-D/ict.
[46] According to one source, "[t]he high growth rate of mobile subscribers is [due to] the lack of an affordable, efficient fixed line infrastructure. Wireless is the solution of choice, making fixed line upgrade projects largely redundant. Mobile network operators .. provide voice communication and with the launch of third generation (3G) services in a number of mobile phone markets, play a considerable role in internet service provision." Computers and Communications in Africa- Overview (No author cited.) www.mbendi.com/indy/cotl/af/p0005.htm.
[47] Ibid. Also, see notes 38, 39, 42.
[48] The ITU's BDT has information on the countries with separate regulators, as well as on telecom laws and regulations. Most regulators are financed by spectrum or licensing fees perceived by the Government. www.itu.int/ITU-D/icteye/Reporting/ShowReportFrame.aspx.
[49] The Andean Community was established in 1969, upon signing the Cartagena Agreement, whose aim was to jointly improve their peoples' standard of living through integration and economic and social cooperation. In 1976, Chile withdrew from it. Venezuela joined it in 1973, but withdrew in 2006. Since 1989, it is known as the Andean Community of Nations (CAN), comprised of Bolivia, Colombia, Ecuador and Peru. Argentina, Brazil, Chile, Paraguay and Uruguay are Associate Member States. www.comunidadandina.org/ingles/quienes/brief.htm.
[50] ASETA is the acronym for the Asociación de Empresas de Telecomunicaciones de la Comunidad Andina, headquartered in Quito, Ecuador. At its creation, it was comprised of the five governmental entities authorized to provide public international telecommunication services. Today, membership is open to public and private telecom entities that provide fixed, mobile, local,

regional, and/or international services. www.aseta.org/empresas.html.

[51] See Bogota Declaration, note 19. The Declaration provoked numerous debates at the UN's Committee on the Peaceful Uses of Outer Space (COPUOS) Legal Subcommittee on the definition /delimitation of outer space, and the special status of the GSO, and at the ITU's 1985 World Administrative Conference on the Geostationary Orbit (WARC-ORB).

[52] Sylvia Ospina: Project Condor: An Analysis of the Feasibility of a Regional Satellite System for the Andean Pact Countries. This is the only study that addressed the legal/political issues associated with this regional satellite project. Unpublished LL.M. thesis, Inst. of Air and Space Law, McGill University, Montreal, Canada. (1988). http://digitool.library.mcgill.ca:8881/dtl_publish/8/64043.html.

[53] Leon T. Knauer and M. Veronica Pastor: Project Simon Bolivar: From Dream to Reality. The authors provide a good synopsis of the political issues related to obtaining an orbital position that could be used by the CAN countries. Latin America II (magazine), 1998. Available at www.connect-world.com/index.php/component/k2/item/2076.

[54] The Comunidad Andina de Naciones (CAN) now consists of Bolivia, Colombia, Ecuador and Perú. Venezuela withdrew in 2006. www.comunidadandina.org/ingles/.

[55] The 1997 World Trade Organization's Annex on Telecoms was one of the main factors in bringing about these changes in telecom services. WTO members made commitments to facilitate trade in telecoms services, including the establishment of new telecoms companies, foreign direct investment in existing companies and cross-border transmission of telecoms services, among others. In addition, WTO members have committed to implement regulatory reforms. www.wto.org/english/tratop_e/serv_e/telecom_e/telecom_e.htm. In 1999, the CAN's Andean Committee of Telecommunications Authorities (CAATEL) agreed to liberalize all telecommunications services, except for sound broadcasting and television, starting on January 1, 2002. www.comunidadandina.org/ingles/press/press/np25-2-2000.htm.

[56] The CAN issued several press releases related to corporate and name changes of the satellite project. http://www.comunidadandina.org/ingles/press. The issues surrounding the new orbital position for the CAN satellite are beyond the scope of this paper. (In 2008 Venezuela launched its Chinese-built national satellite, which is also called Simón Bolívar, but should not be confused with the CAN's.)

[57] SES World Skies press release, The Hague, NL, 8 February 2010. www.ses-worldskies.com/worldskies/news_and_events/press_releases/index.php

[58] Ibid.

[59] "Axesat Inks New Capacity Deal with SES WORLD SKIES to Provide Broadband Services in Latin America and the Caribbean." SES World Skies press release, Washington, DC, 15 March 2011. www.ses-worldskies.com/worldskies/news_and_events/press_releases/index.php.

[60] Ibid.

[61] "TIBA Extends Capacity Deal with SES WORLD SKIES to Meet Rising Content Demand in Latin America." SES World Skies press release, Washington, DC, 3 February 2011. www.ses-worldskies.com/worldskies/news_and_events/press_releases/index.php.

[62] S. Ospina, Project Condor, note 52.

[63] In the Americas, in addition to Intelsat, and SES, several other systems can provide TV and corporate voice and internet services: Hispasat, a Spanish satellite system, Satmex of Mexico, Brazilian satellite(s), Argentinean, and Venezuelan satellites have footprints covering South America.

[64] SES (Société Européenne de Satellites), was founded in Luxembourg in 1984. SES Astra and SES World Skies satellites are the world's leading television distribution platform, comprised of more than 40 satellites. However, only a few of them provide coverage to Africa or to South America. For each satellite's coverage, see www.ses.com/ses/footerPages/Pop-ups/SatelliteFleet.php.

[65] WTO Annex on Telecommunications, note 55.

[66] Broadband Commission for Digital Development, note 4.

[67] SES (note 64) is probably the largest provider that began operations as a private corporation. INMARSAT and INTELSAT were privatized in 2000-2001, pursuant to the "ORBIT Act", a USA law enacted in 2000. EUTELSAT also was privatized in 2000.-2001. See notes 25, 26, 28.

[68] RASCOM, note 30. According to its website, RASCOM "provides operators a unique opportunity for fulfilling their universal service obligation to provide an inexpensive universal service, particularly in rural areas." www.rascom.org.

[69] Intelsat (small letters) refers to one of the corporations that emerged upon INTELSAT's (capital letters) privatization, at which time Intelsat incurred several obligations. One of them is that it must provide international public telecommunications services to its "lifeline connectivity customers." According to Katkin, these are, for the most part, countries in Africa that meet certain requisites, among them, the country's GNP and its teledensity have to be below a certain level. Kenneth Katkin, "Communication Breakdown? The Future of Global Connectivity after the Privatization of INTELSAT." 38 Vand. J. Transnat'l L. (2005) 1323-1400.

[70] See "Latin America-The New Jewel in Satellite", Via Satellite magazine, August 2011, pp.18-21. The persons offering information on their companies' services spoke mostly of TV broadcasts, corporate networks for the petroleum and banking industries, though some mentioned the need for reliable communications to rural areas. (Several countries in both Africa and South America have government-sponsored programs to bring communications and internet services to rural areas. These programs could be the subject of another paper, and will not be addressed here.)

[71] Broadband Commission for Digital Development, note 4. www.broadbandcommission.org/report1.pdf.

[72] See MacBride Commission Report, note 17.

[73] See, ITU: The Digital Divide at a glance, note 1, and the Broadband Commission for Digital Development, note 4.

[74] See Egyptsat, note 42.

[75] Sunsat, launched by NASA in 1999, is South Africa's first micro-satellite, developed by local engineers at the University of Stellenbosch, Justine Limpitlaw, "Regulation of Space Activities in South Africa," Chapter 12 in "National Regulation of Space Activities", Ram Jakhu, Editor. Springer Science+Business Media B.V. (2010).

[76] "Libertad" is a Cubesat, designed and built by the Universidad Sergio Arboleda, Bogota, Colombia. It was launched in 2007, on the same Russian launch vehicle as Egyptsat.

[77] Algeria has launched 2 remote sensing satellites, ALSAT-1 in 2002, ALSAT-2 in 2006. www.asal-dz.org/lancement%20ALSAT1.php.

[78] Nigeria was the first African country to launch a Chinese-built communication satellite, NigComSat-1, in 2007, but it failed in orbit in 2008. www.nigeriannews.net/story/248590. Nigeria has launched 3 remote-sensing satellites: Nigeriasat-1 in 2003, as part of the world-wide Disaster Monitoring Constellation System; NigeriaSat-2 and NigeriaSat-X were launched in July 2011. Information obtained from EARTH OBSERVATION, www.spacedaily.com/reports.

[79] CBERS is the acronym for the China-Brazil Earth Resources Satellite Programme. CBERS-1, the first remote sensing satellite was launched in 1999; CBERS-2 was launched in 2003, and CBERS- 2B in 2007. CBERS-3 and-4 were to be launched in 2009-2011. Information from "CBERS Programme- Benefits for All," online article prepared by INPE and CRESDA. Due to their commitment to making the images available to as many countries as possible, the Chinese and Brazilians agreed to share satellite data not only with each other but also with countries in Africa, according to an announcement in "Satellite Today," 1st April 2010.

[80] The Principles Relating to Remote Sensing of the Earth from Outer Space, adopted 3 December 1986 ([resolution 37/92) were the subject of much debate at the COPUOS meetings prior to their adoption, and still are contentious issues, even while remote sensing satellites play an important role in disaster management activities and in the UN-SPIDER's program. See http://unoosa.org/oosa/en/sapidx.html, and "Space Technology and Disaster Management." http://unoosa.org/oosa/en/SAP/stdm/index.html.

[81] See notes 18-20, and accompanying text.

[82] CONAE is the acronym of the Argentinean National Commission on Space Activities, established in 1991, as a civil entity reporting directly to the President. Since 1996, CONAE is governed by the Ministry of Foreign Affairs. www.conae.gov.ar/eng/principal.html.

[83] Jose Monserrat Filho, "Regulation of Space Activities in Brazil", chapter 4, in "Regulation of "National Regulation of Space Activities", Ram Jakhu, Editor. Springer Science+Business Media B.V. (2010). The author provides excellent background on the Brazilian Space Agency (AEB), and Brazil's space program.

[84] INPE is the Portuguese acronym for the National Institute for Space Research. It has been

a major contributor to Brazil's space programs since the 1960s, albeit under different names. www.inpe.br/institucional/sobre_inpe/historia.php.

[85] Ibid.

[86] The Alcantara Launch Center (ALC), established in 1983, has been used to launch sounding rockets. In 2003 an explosion severely damaged the facilities, delaying Brazil's space program. http://www.cla.aer.mil.br/

[87] Wikipedia has a comprehensive list of space agencies, their capabilities, and budgets. It does not include the Bolivian Space Agency, set up in 2010, with a US $10M budget. http://en.wikipedia.org/wiki/List_of_space_agencies#List_of_space_agencies

[88] Ibid.

[89] Agencia Espacial Civil Ecuatoriana, EXA. www.exa.ec

[90] The Comisión Colombiana del Espacio (CCE) created in 2006, was comprised of 15 members; currently, it includes 44 entities. www.cce.gov.co/web/guest/miembros-cce. The Vice President of the Republic, who is in charge of the CCE, recently called for setting up a Colombian Space Agency, to acquire a remote sensing satellite and strengthen the local aeronautical industry. www.vicepresidencia.gov.co/Noticias/2011/Paginas/110810a.aspx.

[91] Ibid. SANSA was created in 2009. For more details on its history and programs, see http://www.sansa.org.za/home.aspx.

[92] Outer Space Treaty, note 21. See "Status of international agreements relating to activities in outer space (as at 1 January 2010)." ST/SPACE/11/Rev.2/Add.3, http://unoosa.org/oosa/en/SpaceLaw/spacelawupdate/index.html.

[93] In April 2010, Bolivia signed a deal with China, for a communication satellite. http://www.reuters.com/article/2010/04/01/bolivia-china-satellite-idUSN01119116201004 01.

[94] See "Status of international agreements, note 92.

[95] The Secure World Foundation's report, "Analyzing the Development Paths of Emerging Space Nations: Opportunities or Challenge for Space Sustainability?" offers a comparison of space policy development and interest (or lack thereof) in international cooperation in several countries, including Brazil, Venezuela and South Africa. While the study addresses the European Union's draft international Code of Conduct for Outer Space Activities, it does not mention the space treaties. Press release and full report may be obtained at http://swfound.org/media-center/2011-press-releases.

[96] These are some of the minimum requirements set forth in the Convention on Registration of Objects Launched into Outer Space (resolution 3235(XXIX), annex. Entered into force Sept. 1976.

[97] See Julián Hermida, "Regulation of Space Activities in Argentina" (Ch. 2) and José Monserrat Filho, "Regulation of Space Activities in Brazil" (Ch. 4) in "National Regulation of Space Activities," Ram Jakhu, Editor. Springer (2010), note 75.

[98] See Limpitlaw, note 75, and Monserrat Filho, note 96.

[99] See recommendations in the Broadband Commission Report, note 4.

[100] See ITU: The Digital Divide at a glance, note 1 and Broadband Commission Report, note 4.