



April 8, 2019

**By Courier**

Mr. David Willis  
Senior Director, Spectrum Planning and Engineering  
Innovation, Science and Economic Development Canada  
235 Queen Street  
Ottawa, ON K1A 0H5

**Re: Application for Terrestrial ATC Authority (2483.5 – 2500 MHz) of Globalstar Canada Satellite Co.**

By letter dated January 19, 2017, Globalstar Canada Satellite Co.<sup>1</sup>, a company incorporated under the laws of Nova Scotia and a Mobile Satellite Service Provider (“Globalstar Canada”), applied pursuant to RP-023 – *Spectrum and Licensing Policy to Permit Ancillary Terrestrial Mobile Services as Part of Mobile-Satellite Service Offerings*,<sup>2</sup> for authority to provide ancillary terrestrial mobile services over 16.5 MHz of its licensed Mobile Satellite Service (“MSS”) spectrum in the 2.4 GHz band (2483.5 – 2500 MHz). With this letter, Globalstar Canada updates its application and further urges Innovation, Science and Economic Development Canada (“ISED”) to take the regulatory steps necessary to grant the requested terrestrial authorization.

As explained previously, Globalstar Canada’s request for authority to provide terrestrial wireless broadband services over a portion of its licensed spectrum is consistent with the policy decisions and framework provided in RP-023, as well as the Spectrum Policy Framework for Canada.<sup>3</sup>

In the United States, the Federal Communications Commission (“FCC”) in December 2016 adopted a Report & Order that established rules permitting Globalstar, Inc. (“Globalstar”) to offer low-power ancillary terrestrial component (“ATC”) wireless broadband services over a portion of its 2.4 GHz spectrum licensed for Mobile Satellite Services, 2483.5 – 2495 MHz.<sup>4</sup> In August 2017, the FCC modified Globalstar’s Mobile Satellite Services licenses to permit it to

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<sup>1</sup> Globalstar Canada Satellite Co. is a wholly-owned subsidiary of Globalstar, Inc.

<sup>2</sup> *Spectrum and Licensing Policy to Permit Ancillary Terrestrial Mobile Services as Part of Mobile-Satellite Service Offerings*, RP-023, Issue 2 (Dec. 2014) (“RP-023”).

<sup>3</sup> *Spectrum Policy Framework for Canada*, DGTP-001-07 (June 2007). Globalstar submits its request is also consistent with the *Decision on a Policy, Technical and Licensing Framework for Mobile Satellite Service and Advanced Wireless Service (AWS-4) in the Bands 2000 – 2020 MHz and 2180 – 2200 MHz*, SLPB-008-14 (Dec. 2014).

<sup>4</sup> *Terrestrial Use of the 2473 – 2495 MHz Band for Low-Power Mobile Broadband Networks; Amendments to Rules for the Ancillary Terrestrial Component of Mobile Satellite Service Systems*, Report and Order, 31 FCC Rcd 13801 (2016) (FCC 16-181).

offer terrestrial broadband services over this spectrum.<sup>5</sup> Further, over the past two years, Globalstar has received multiple additional terrestrial authorizations from international jurisdictions and expects to receive additional authorizations throughout this year.

With the FCC's license modification and other countries' terrestrial authorizations in place, Globalstar has sought standardization of the spectrum through the Third Generation Partnership Project ("3GPP"). In December 2018, Globalstar announced 3GPP approval of a standard for terrestrial use of Globalstar's spectrum at 2483.5-2495 MHz, designating it as Band 53.

In addition to the above regulatory and standardization work, Globalstar has been engaged with multiple hardware and device manufacturers to develop a Band 53 network and equipment ecosystem in North America and globally. The demand for private LTE ("pLTE") networks to support next-generation Industrial Internet of Things ("IIoT") applications requires spectrum that is an alternative to low-band spectrum, unlicensed (or license-exempt) spectrum, and commercial cellular offerings. Band 53 will provide a potential solution for commercial applications that require dedicated mid-band LTE spectrum for critical communications across a host of different verticals including mining, utilities, agriculture, and smart cities.

Currently, the first Band 53 equipment is being submitted for FCC certification in the United States. Thus, less than two years after the FCC's authorization for terrestrial use of the spectrum, we are now certifying equipment there to meet the commercial needs of a host of industrial customers. Globalstar Canada, in cooperation with its technology partners, is now ready to certify the same initial Band 53 equipment for use in Canada.

Our request to ISED for a terrestrial authorization in Canada has been pending now for well over two years. The ATC authority requested by Globalstar Canada is a necessary step to harmonize the use of this spectrum throughout North America, a goal that is consistent with ISED's telecommunications policies and objectives. Globalstar Canada has undertaken a detailed review of Canada's prior decisions and rulings regarding the provision of ATC services by MSS providers, as well as its more general policy decisions regarding spectrum management. Globalstar Canada is confident that the instant ATC request is consistent with these prior policy decisions and rulings.

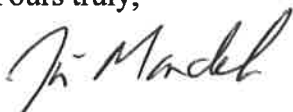
In the attached appendices, Globalstar Canada has submitted the information supporting an ATC mobile service application specified in RP-023 (Appendix A), as well as information supporting Globalstar Canada's continued commitment to providing mobile satellite services (Appendix B).

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<sup>5</sup> See Application for Modification of Globalstar Licensee LLC, IBFS File No. SAT-MOD-20170411-00061, Call Sign S2115 (filed Apr. 11, 2017; granted Aug. 8, 2017); and Application for Modification of GUSA Licensee LLC, IBFS File No. SES-MOD-20170412-00422, Call Sign E970381 (filed Apr. 11, 2017; granted Aug. 11, 2017).

Globalstar Canada would be happy to supply any additional information requested by ISED, or to answer any questions the Ministry may have.

Yours truly,



Jim Mandala

Vice President and General Manager  
Globalstar Canada Satellite Co.

cc. Martin Proulx, Director General, Engineering, Planning and Standards Branch

## APPENDIX A

### RP-023 Section (c)

#### Information in Support of ATC Application of Globalstar Canada Satellite Co.

- i. *The identification of the ATC (“ancillary terrestrial component”) applicant and its relation to the MSS (“Mobile Satellite Service”) operator;*

The ATC applicant and the MSS service provider are one and the same, Globalstar Canada Satellite Co. (“Globalstar Canada”). Globalstar Canada is a licensed MSS service provider in Canada and a wholly-owned subsidiary of the MSS operator, Globalstar, Inc. (“Globalstar”).

- ii. *A summary of the commercial, operational and technical arrangements made for the ATC to have access to the MSS spectrum in the relevant area(s), in particular as they relate to the obligation to ensure the integrity of MSS and protect MSS operations;*

Globalstar Canada’s low-power ATC mobile broadband systems will have access to and utilize its MSS spectrum at 2483.5 – 2500 MHz through the use of a Network Operating System (“NOS”). Specifically, Globalstar Canada’s low-power ATC operations will be conducted so that its access points are carefully controlled by a NOS that is analogous to those currently deployed by Commercial Mobile Radio Services operators to manage pico- and femto-cellular infrastructure. Globalstar Canada’s parent, Globalstar, will maintain a NOS center that will be available for contact and support 24 hours a day, seven days a week.

Globalstar Canada’s use of a NOS is consistent with the low-power ATC rules adopted by the Federal Communications Commission (“FCC”) in its December 23, 2016 Report & Order.<sup>1</sup> In its Report & Order, the FCC ruled that for its low-power ATC operations in the United States, Globalstar must utilize a NOS consisting of a network management system located at an operations center or centers. The FCC required that the NOS have a point of contact available 24 hours a day, seven days a week with the technical capability to address and resolve interference issues. The NOS must be capable of controlling the operation of all low-power transmitters, so that it can address any interference concerns by whatever means necessary, including but not limited to reducing power or terminating operations at a particular location or installation. The FCC adopted the above-described NOS requirements in a new Section 25.149(g)(2) of its Rules.<sup>2</sup>

Under the rules adopted by the FCC, Globalstar will be responsible for implementing measures to control the availability of its terrestrial network to user devices, and will be responsible for any other measures necessary to prevent unauthorized use of the approved ATC band.<sup>3</sup>

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<sup>1</sup> *Terrestrial Use of the 2473 – 2495 MHz Band for Low-Power Mobile Broadband Networks; Amendments to Rules for the Ancillary Terrestrial Component of Mobile Satellite Service Systems*, Report and Order, FCC 16-181, IB Docket No. 13-213 (rel. Dec. 23, 2016) (“Report & Order”).

<sup>2</sup> *Id.* ¶ 41; (to be codified at 47 C.F.R. § 25.149(g)(2)).

<sup>3</sup> Report & Order ¶ 42; (to be codified at 47 C.F.R. § 25.149(g)(3)).

Globalstar will comply with all such requirements, and Globalstar Canada proposes that Canada adopt identical requirements which will ensure the integrity and protection of Globalstar Canada's MSS operations, as well as services in adjacent bands.

Globalstar Canada anticipates that it will enter into commercial arrangements with different classes of customers (e.g., facilities-based providers, resellers, industrial end-users) in order to provide ATC services to end users. In all circumstances, however, Globalstar Canada, as the ATC licensee and MSS provider, will remain responsible to Innovation, Science and Economic Development Canada ("ISED") and to the MSS operator, Globalstar.

*iii. A demonstration on how the operation of the ATC mobile service will be an integral and infeasible component of the MSS offerings;*

ISED authorization to deploy a stand-alone ATC network is tied to the provision of MSS in Canada. Globalstar Canada welcomes this requirement. As discussed more fully in Appendix B, Globalstar Canada has already deployed robust and growing MSS across Canada. Accordingly, no build-out or similar performance requirement is necessary to ensure Globalstar Canada's provision of MSS in its licensed spectrum.

Importantly, Globalstar Canada's requested authorization will help meet the overwhelming demand for mobile broadband spectrum in Canada. Presently, the public is consuming around 6 exabytes of data per month across the globe, equal to 6 quintillion bytes. Under conservative predictions, this demand will scale to approximately 30 exabytes a month by the end of this decade.<sup>4</sup> These numbers are significant for policy makers, because there is simply no ability to meet this growing demand relying only on the existing broadband spectrum inventory. In addition to more spectrum, the wireless communications industry must also fundamentally change its network topology, engaging in the "densification" of its wireless networks and re-focusing on small cell architectures.

Globalstar Canada's 16.5 MHz of licensed MSS spectrum within the 2.4 GHz band is an ideal resource for the development of LTE small cell operations that can help meet consumer and industrial capacity demands now and well into the future. This spectrum enjoys the same propagation characteristics as the neighboring, heavily utilized Industrial Scientific Medical ("ISM") band – mid-band spectrum at 2.4 GHz provides both excellent propagation and throughput capacity. At the same time, Globalstar Canada's spectrum is free from the significant disadvantage of the public ISM band; rather than being saturated, Globalstar Canada's spectrum is quiet and clean. In addition, this spectrum band can be harmonized globally, due to the global International Telecommunication Union allocation to MSS in the international *Radio Regulations*. This factor confers a unique status on this spectral opportunity.

With its requested terrestrial authority, Globalstar Canada can provide a Time Division LTE based service that is many times more efficient (*i.e.*, greater throughput) than the existing standard Wi-Fi 802.11 based service, while exhibiting propagation characteristics that are

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<sup>4</sup> *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2015 – 2020*, Cisco, Document ID:1454457600805266 (Feb. 3, 2016).

superior to unlicensed services that parties will attempt to offer at 5 GHz. While there is no single solution to meeting the growing demands of consumers for more data-intensive wireless services, Canada should take an “all of the above” approach and continue to free up additional spectrum resources where possible, including providing additional regulatory flexibility for licensed spectrum holders. As it did in its 2 GHz Decision,<sup>5</sup> ISED should eliminate any dual-mode handset requirement for ATC operations in the Big LEO downlink band at 2483.5 – 2500 MHz. As was observed in that decision, an obligation for ATC licensees to provide dual-mode terminals greatly increases handset costs and impedes ATC operators’ ability to compete with other terrestrial mobile providers.<sup>6</sup> By aligning with U.S. policy allowing the deployment of terrestrial-only low-power ATC terminals in the 2.4 GHz band,<sup>7</sup> ISED will provide more options for consumers who do not require the satellite service.

iv. *The amount and specific frequencies or spectrum blocks proposed for use by the ATC system within the assigned spectrum of the MSS network and associated MSS coverage area;*

Although Globalstar Canada is licensed to operate in four separate bands of radio spectrum, its application for terrestrial authority involves only its licensed 16.5 MHz of spectrum within the 2.4 GHz band at 2483.5 – 2500 MHz.



v. *An indication on how the sharing of the spectrum for ATC will not constrain the growth of MSS offerings;*

Globalstar Canada has a substantial and growing MSS business in Canada. The growth of Globalstar Canada’s current and future MSS offerings in Canada will in no way be limited by a decision by ISED to remove existing regulatory barriers and enable the more intensive use of the 2483.5 – 2500 MHz band for Canadian consumers. To the contrary, allowing Globalstar Canada

<sup>5</sup> *Decision on a Policy, Technical and Licensing Framework for Mobile Satellite Service and Advanced Wireless Service (AWS-4) in the Bands 2000-2020 MHz and 2180-2200 MHz*, SLPB-008-14, ¶¶ 46-47, 52 (Dec. 2014) (“2 GHz Decision”). In its 2 GHz Decision, ISED noted that in its work to develop policy and licensing frameworks for spectrum utilization, it takes into account the need to provide spectrum access to services and technologies, such as mobile broadband. After detailed consideration, ISED concluded in the 2 GHz Decision that removing regulatory barriers currently imposed on ATC services in the 2 GHz band would promote use of the band for mobile broadband and foster competition. ISED therefore eliminated the requirement for dual-mode ATC handsets in the 2 GHz band. The same reasons that justified ISED’s decision at 2 GHz apply equally to Globalstar’s MSS allocation at 2483.5 – 2500 MHz.

<sup>6</sup> *Id.* ¶ 27.

<sup>7</sup> Report & Order ¶ 17.

to make greater and more flexible use of its spectrum assets will facilitate greater investment and more innovative terrestrial broadband service offerings in this band. Revenues from such terrestrial services will help support Globalstar Canada's continued provision of MSS.

*vi. A demonstration on how substantial mobile-satellite service offerings will be available before or at the time ATC service is to begin operation;*

Globalstar Canada already makes available substantial MSS offerings across the whole of Canada. Globalstar Canada has over 160,000 existing customers, who are supported by Globalstar Canada's substantial gateway facilities, employee base, and dealer network. Please see Appendix B for a description of the Globalstar mobile satellite system and Globalstar Canada's substantial network and service deployments in Canada.

*vii. An attestation to the obligations to cease operation if harmful interference were to be caused to other MSS networks or to other primary radio services operating in adjacent bands, until such time as the cause of harmful interference is resolved;*

Globalstar Canada believes that there is little or no risk that its low-power ATC services, subject to significant out-of-band emission ("OOBE") limits, will cause harmful interference to any other MSS networks or to other primary radio services operating in adjacent bands. Nonetheless, Globalstar Canada hereby attests to the obligation to cease any such ATC operations in the event of such harmful interference until such time as the cause of any such interference is resolved.

*viii. An attestation to the understanding that the use of MSS spectrum for ATC mobile service is conditional on the spectrum being made available for mobile-satellite service as required, and that the ATC mobile service cannot claim protection from other MSS networks in the band concerned or from primary services operating in adjacent bands in accordance with the international Radio Regulations;*

Globalstar Canada currently uses, and will continue to use, the entirety of its licensed 16.5 MHz of MSS spectrum in the 2.4 GHz band for MSS in Canada. Thus, Globalstar Canada attests to its understanding that the use of its licensed spectrum at 2483.5 – 2500 MHz for ATC mobile service is conditional on the spectrum being made available for MSS as required, and that Globalstar Canada's ATC mobile service cannot claim protection from other MSS networks in the 2.4 GHz Big LEO band or from primary services operating in adjacent bands in accordance with international *Radio Regulations*.

*ix. An attestation to the understanding that the use of MSS spectrum for ATC mobile service is conditional on the spectrum being made available for MSS as required, and that the ATC mobile service will cease operation, within a reasonable period, should the satellite service be discontinued;*

While Globalstar Canada has no intention of terminating MSS operations in Canada, Globalstar Canada attests to its understanding that the use of its MSS spectrum for ATC mobile service is conditional on the spectrum being made available for MSS as required, and that the ATC mobile

service will cease operation, within a reasonable period, should Globalstar Canada's satellite service be discontinued.

- x. *A description of the technical and operational measures to be taken to ensure that any potential interference to other MSS and primary services is mitigated to reasonable levels, including a demonstration on how priority access will be given to the AMS(R)S and other primary services operating in adjacent bands.*

Appropriate OOB limits and power restrictions, together with the implementation of the NOS described above,<sup>8</sup> will be more than sufficient to protect any adjacent services from potential interference.

First, Wi-Fi, Bluetooth, and other licensed-exempt services exist below 2483.5 MHz in the ISM band. In the United States, Globalstar and the unlicensed community agreed to a significant commercial OOB limit at 2483.5 MHz to ensure that Globalstar's planned low-power ATC services will not cause detrimental interference to unlicensed operations in the ISM band.<sup>9</sup> This OOB limit was adopted by the FCC in its recent Report & Order: "Emissions below 2483.5 MHz shall be attenuated by a factor of at least  $40 + 10 \log (P)$  dB at the channel edge at 2483.5 MHz,  $43 + 10 \log (P)$  dB at 5 MHz from the channel edge, and  $55 + 10 \log (P)$  dB at X MHz from the channel edge where X is the greater of 6 MHz or the actual emission bandwidth."<sup>10</sup> Globalstar Canada recommends that Canada adopt the same OOB limit for low-power ATC operations at the 2483.5 MHz band edge.

Above 2500 MHz in Canada exists the Broadband Radio Service where as in the United States BRS starts at 2496 MHz.

In the United States, Globalstar agreed to a significant commercial OOB limit at the 2495 MHz band edge to ensure that its planned low-power ATC services would not cause any detrimental interference to licensed Educational Broadband Service/Broadband Radio Service operations above 2496 MHz. This OOB limit was adopted by the FCC in its recent Report & Order: "Globalstar will be required to attenuate below the transmitter power (P) measured in watts the unwanted emissions above 2495 MHz by a factor of no less than  $43 + 10 \log (P)$  dB at the 2495

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<sup>8</sup> See *supra* at 1.

<sup>9</sup> See Letter from Stephen E. Coran, Counsel to WISPA, to Marlene H. Dortch, Secretary, FCC, IB Docket No. 13-213 (Nov. 21, 2016); Letter from Danielle J. Piñeres, NCTA – The Internet & Television Association, to Marlene H. Dortch, Secretary, FCC, IB Docket No. 13-213 (Dec. 7, 2016); Letter from Edgar Figueroa, Wi-Fi Alliance, to Marlene H. Dortch, Secretary, FCC, IB Docket No. 13-213 (Nov. 22, 2016); Letter from Edgar Figueroa, Wi-Fi Alliance, to Marlene H. Dortch, Secretary, FCC, IB Docket No. 13-213 (Dec. 5, 2016); Letter from Edgar Figueroa, Wi-Fi Alliance, to Marlene H. Dortch, Secretary, FCC, IB Docket No. 13-213 (Dec. 12, 2016); Letter from Michael Warnecke, Entertainment Software Association, to Marlene H. Dortch, Secretary, FCC, IB Docket No. 13-213 (Dec. 12, 2016).

<sup>10</sup> Report & Order ¶¶ 28-30.



MHz channel edge, and  $55 + 10 \log (P)$  dB at X megahertz from this channel edge where X is the greater of 6 megahertz or the actual emissions bandwidth.”<sup>11</sup>

Globalstar Canada recommends that Canada adopt this same OOB limit at 2500 MHz, recognizing that Globalstar Canada is licensed exclusively in Canada to operate up to 2500 MHz, rather than 2495 MHz as in the United States.

In addition to these significant OOB limits, Globalstar Canada will be subject to restrictions on the transmit power of its proposed low-power ATC services. Such power limits will help minimize the likelihood of harmful interference to adjacent-band services.

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<sup>11</sup> Report & Order ¶ 24.

**RP-023, Annex, Part A**  
**Technical and Operational Requirements to Support the MSS ATC Deployment of**  
**Globalstar Canada Satellite Co.**

*ATC Mode of Operation*

Globalstar Canada proposes to operate in the “downlink duplex mode” such that the ATC base stations transmit and receive in the satellite downlink band, which is necessary to support Time Division LTE based service. As stated above in (vii), Globalstar Canada’s low power ATC services – including its downlink duplex mode operations – will not interfere with other primary services operating in the adjacent bands.

The FCC in its Report & Order found it in the public interest to permit ATC authorization in a non-forward-band mode of operations of the end user equipment (downlink duplex mode) where equipment deployed meets the new requirements for low-power ATC systems.<sup>12</sup>

Accordingly, Globalstar Canada requests that its low power ATC systems be allowed to operate in a downlink duplex mode in its licensed spectrum at 2483.5 – 2500 MHz.

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<sup>12</sup> *Id.* ¶ 19.

## APPENDIX B

### *Globalstar is Fully Committed to Providing Industry-Leading MSS Across Canada*

Globalstar, Inc. (“Globalstar”) is a leading provider of global mobile satellite voice and data services. Having invested over US\$5 billion in its global non-geostationary (“NGSO”) Mobile Satellite Service (“MSS”) network during its history, Globalstar is fully committed to the continued development and future success of its satellite business. Globalstar was licensed in 1995 by the United States Federal Communications Commission (“FCC”) to launch and operate a satellite constellation in Big LEO band<sup>1</sup> and a number of these first-generation satellites continue to operate and provide services to Globalstar’s customers. From 2010 through 2013, Globalstar launched its state-of-the-art, second generation of MSS satellites, which are licensed for operation and registered with the International Telecommunication Union – Radio Communications Sector by the French Administration.<sup>2</sup> This second-generation constellation – which has a fifteen-year design life – supports highly reliable, crystal-clear CDMA-quality voice and data services to the billions of consumers, public safety personnel, and other potential customers within its footprint. Globalstar’s global MSS business continues to grow, and today it uses its constellation of satellites and twenty-three ground stations on six continents to provide affordable, high-quality MSS to more than 860,000 customers worldwide.

In conjunction with its MSS operations, Globalstar is authorized to operate in four different spectrum bands around the world. For service to end users, Globalstar carries out uplink transmissions (mobile Earth stations to satellites) in the Lower Big LEO band at 1610 – 1618.725 MHz, and downlink transmissions (satellites to mobile Earth stations) in the Upper Big LEO band at 2483.5 – 2500 MHz.<sup>3</sup> For the “feeder links” that connect its twenty-three gateway Earth stations to its satellite constellation, Globalstar conducts uplink transmissions from its gateway Earth stations to its satellites in the 5096 – 5250 MHz band, and downlink transmissions from its satellites to its gateways at 6875 – 7055 MHz.<sup>4</sup>

Canada has been, and continues to be, extremely important to Globalstar’s success, and Globalstar has made a significant investment there. Presently, Globalstar Canada Satellite Co. (“Globalstar Canada”) is Globalstar’s largest operation outside of the U.S., with personnel in

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<sup>1</sup> *Application of Loral/Qualcomm Partnership, L.P. for Authority to Construct, Launch, and Operate Globalstar, a Low Earth Orbit Satellite System to Provide Mobile Satellite Services in the 1610 – 1626.5 MHz/2483.5 – 2500 MHz Bands*, Order and Authorization, 10 FCC Rcd 2333 (IB 1995).

<sup>2</sup> See Press Release, Globalstar, Inc., *Mission Accomplished! Globalstar Announces Successful Fourth Launch of Six Second-Generation Satellites* (Feb. 6, 2013), <http://www.globalstar.com/en/index.php?cid=7010&pressId=764>.

<sup>3</sup> Iridium is authorized to share spectrum with Globalstar at 1617.775 – 1618.725 MHz.

<sup>4</sup> Globalstar’s feeder uplinks from its gateway earth stations carry the “return” traffic from parties communicating with Globalstar’s MSS users, and Globalstar’s satellites then translate, amplify, and downlink this return traffic to its MSS customers in the Upper Big LEO band at 2483.5 – 2500 MHz.

British Columbia, Alberta, Ontario and Quebec. Globalstar Canada's head office in Canada is located in Mississauga, Ontario, where it handles sales, marketing, service, finance and inventory management. Two of Globalstar's 23 gateways are located in Canada, one in Smiths Falls, Ontario and the other in High River, Alberta. Globalstar Canada has regional offices across Canada together with a robust nation-wide dealer network with over one thousand dealers and retail locations from coast-to-coast-to-coast serving Canadian customers. Globalstar Canada has over 160,000 satellite customers across numerous vertical markets, including Government, Lone Worker, Oil and Gas, Mining, Safety Services, Recreation, Transportation and Trucking.

Since initiating commercial MSS in 2000, Globalstar has been dedicated to providing mission-critical, emergency, and safety-of-life services to commercial, recreational, and government customers in remote, unserved, and underserved areas not reached by terrestrial deployments. Globalstar's MSS network also provides critical back-up capabilities for public safety personnel during disasters when terrestrial facilities can be rendered unavailable. Public safety entities involved in relief efforts around the world have relied on Globalstar's satellite services after earthquakes, hurricanes, and other disasters.

During forest fire season across Canada, Globalstar Canada's products and services are used to help fight fires through personnel and equipment tracking, helping to maximize the efficiency of resource management. In the U.S., Globalstar's MSS network played a vital role during and after the devastating Hurricanes Sandy and Katrina. Similarly, Globalstar's services were relied upon during the recent Middle Eastern refugee crisis. Globalstar and first responder communications specialist, Disaster Tech Lab, worked together to assist the victims of the European and Middle East refugee crisis by dispatching satellite communications solutions to the Greek island of Lesbos, which received thousands of fleeing Syrian and Iraqi refugees.<sup>5</sup>

Currently, Globalstar's products and services are supporting relief efforts in the aftermath of Typhoon Idai in Mozambique. The National Institute for Crisis Management (INGC), the United Nation's World Food Program (WFP), and Mozambique's Ministry of Health are all using Globalstar products and services to monitor the delivery of food, medicine and supplies, and to support first responders' attempts to locate people in need of assistance.

Globalstar has also focused on developing affordable, consumer-oriented devices and services with significant public safety benefits. In particular, Globalstar has developed an innovative, hand-held personal tracking and emergency messaging product category by combining a Global Positioning System ("GPS") receiver with a multi-featured MSS L-band transmitter. Globalstar's innovative, consumer-oriented "SPOT" family of MSS devices has played a critical role in providing emergency and safety-of-life services to individual consumers beyond terrestrial wireless reach.<sup>6</sup> From any location in Globalstar's global MSS footprint,

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<sup>5</sup> Caleb Henry, *Disaster Tech Lab Bringing Globalstar Satellite Support to Refugees in Greece*, *Satellite Today* (Oct. 28, 2015), <http://www.satellitetoday.com/telecom/2015/10/28/disaster-tech-lab-bringing-globalstar-satellite-support-to-refugees-in-greece/>.

<sup>6</sup> In early 2007, Globalstar's first-generation constellation suffered an unanticipated degradation of its S-band capability that temporarily precluded consistently reliable voice and two-way data services. It was in response to that development that Globalstar refocused its

SPOT devices can transmit a user's GPS coordinates and status updates to any e-mail, handheld device, or smartphone address in the world. As of December 31, 2018, the family of SPOT devices has been used to initiate 6351 emergency communications, often life-saving, on land and at sea.<sup>7</sup>

Canadian customers are directly benefitting from these services. To date, over 2,045 rescues have occurred in Canada as a result of Globalstar Canada's SPOT devices, representing no less than 31% of all SPOT rescues. There were 288 Canadian rescues in 2018 alone, including rescues in every Canadian province and territory except Prince Edward Island. Our SPOT customers in Canada include hikers, boaters, campers, hunters and fishermen, snowmobilers, and off-road motor enthusiasts. In addition, numerous businesses operating in areas beyond reliable terrestrial wireless coverage utilize our SPOT products and services to help ensure the safety of their lone workers and other staff. Globalstar is unaware of any other satellite-based product that has achieved the remarkable life-saving record of the SPOT family of devices.

In addition to individual consumers, Globalstar Canada's customers include entities in government, the military, emergency preparedness and Public Protection and Disaster Relief, transportation, heavy construction, oil and gas, mining, forestry, and commercial fishing. For these government and business customers, Globalstar's data solutions are ideal for asset and personal tracking, data monitoring, and supervisory control and data acquisition ("SCADA") applications. In particular, Globalstar's commercial simplex service enables subscribers to track cargo containers and rail cars and to monitor utility meters, as well as a host of other applications. In 2016, Globalstar introduced its latest product for the intelligent management of fixed and mobile assets, the "SmartOne C," a product for the intelligent management of fixed and mobile assets. This device utilizes motion sensors, comparative GPS positions, and other custom-configured sensors to gather and transmit asset status information.

Last year, Globalstar launched three new MSS products: SmartOne Solar, SPOT X, and Sat-Fi2. SmartOne Solar is the next generation of the industry-acclaimed SmartOne product line. As its name indicates, SmartOne Solar operates on solar-powered rechargeable batteries with a 10 year lifespan, drastically reducing maintenance time and cost for labor and parts. It lets users intelligently configure reporting times and intervals for custom information delivery through Globalstar's revamped and innovative "back office."

SPOT X is the first two-way SPOT texting device, breaking new ground for satellite products with respect to functionality, ease-of-use, and affordability. The first SPOT X rescue occurred in Canada and involved a customer climbing a remote mountain in Willmore Wilderness Park. The customer was able to utilize the SPOT X to its fullest capabilities when he

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energies on affordable consumer-based simplex products and services while continuing the design, manufacture and launch of a second-generation constellation of more capable satellites.

<sup>7</sup> SPOT was also utilized in the 2016 Marathon Des Sables in Morocco, where numerous athletes used SPOT Gen3 during one of the world's most extreme running races. See Press Release, *1,250 Athletes in the 2016 Marathon Des Sables to Use Globalstar's Spot Gen3*, Globalstar (Mar. 7, 2016), <http://www.globalstar.com/en/index.php?cid=7010&pressId=920>.

awoke in the middle of the night unable to breathe. After initiating the S.O.S. function, the customer was able to message back-and-forth with his Emergency Contact, Search and Rescue, and a medical professional. He was ultimately able to administer health aid to himself and hike to a hospital.<sup>8</sup> As of April 1, 2019, SPOTX has been used to initiate 23 emergency S.O.S. communications around the world.

Sat-Fi2 is the next generation of Globalstar’s “Sat-Fi” offering. Sat-Fi2 is a revolutionary voice and data technology that permits any Wi-Fi enabled device (*i.e.*, smartphones, tablets, laptops, etc.) to communicate over Globalstar’s second-generation MSS constellation. With Sat-Fi2, Globalstar subscribers can use their smartphones to email, text, talk, post to social, access the web, check the weather, and share photos and files, as well as initiate S.O.S. communications, over Globalstar’s MSS network when beyond cellular range or when terrestrial networks are temporarily unavailable due to natural or man-made disasters.

Globalstar’s 9600 Data Satellite Hotspot permits customers to use their Wi-Fi-enabled devices to send and receive e-mail outside of cellular coverage, whether at land or at sea. The 9600 Hotspot is capable of uploading tweets, photos, and low-resolution video.

Globalstar’s second-generation Big LEO MSS ground infrastructure is now operational in Canada, permitting an array of additional future MSS offerings over Globalstar’s global network. Operating in combination with its second-generation constellation, Globalstar will continue to provide the highest voice quality, fastest truly mobile data speeds, and most affordable service in the MSS industry.

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<sup>8</sup> See Rescue Alert, SPOT, *First SPOT X Initiated Rescue* (June 24, 2018) [https://www.findmespot.ca/en/spotemergency/index.php?article\\_id=10280083](https://www.findmespot.ca/en/spotemergency/index.php?article_id=10280083)