



CANADIAN GLOBAL AFFAIRS INSTITUTE
INSTITUT CANADIEN DES AFFAIRES MONDIALES

Ready for Launch: Preparing Canada for a Future in Space

by Montana Hunter & Katarina Koleva
October 16, 2018

CONFERENCE REPORT

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Opening Keynote Address – The Importance of Space to Canada: The Honourable Marc Garneau

- Space accounts for 10,000 well-paying jobs in Canada
 - Generates \$5.5B in revenue
 - Invests heavily in research and development
- It is estimated that the global space economy will triple in size
 - More countries are investing in space; the sector will become more and more competitive
- Canada is actively investing in space
 - Expedition 58/59 will launch with a Canadian astronaut soon
- RADAR Satellite Constellation Mission is set for February
 - The satellite will monitor trends in climate change and the impacts of humans on earth
- A space telescope (James Webb Space Telescope (JWST)) is on the horizon
 - It is currently being built
 - It is the most complex telescope in existence
 - Canada is contributing technology to it
 - Canada's involvement will provide dedicated time to Canadian scientists on the telescope
- Canada has been a space pioneer and I hope that Canada will continue to be a leader and an innovator in space

When Canada funded RADARSAT 2 it was a private-public partnership, could more of these follow?

- Yes, we are very interested in public-private partnerships. If the private sector approached the government, we would consider the project

Where should commercial industry focus?

- Canadians have been pioneers in space and there has been a good transfer of technology such as communications from other industries. Our industry is good at space, many remarkable achievements and a high success rate.

What should Canada's next big project be?

- Would love to see Canada participate in the lunar or deep space gateways. The clock is ticking, we need to be involved soon. Need to think about what comes up after RCM.



Panel I: Canada's Past, Present and Future in Space

**William MacDonald Evans, Dr. Lucy Stojak, Sylvain Laporte and Dr. Robert Thirsk
moderated by LGen (ret'd) D. Michael Day**

Where does Canada stands and the challenges the country faces? It is important to understand how did we get to today and where we'd like to go?

William MacDonald Evans (Space Advisory Board member)

- The Chapman Report (1967) became Canada's blueprint for space activities and set Canada to be a major player in the space. The report recommended that Canada uses space to meet the needs of the nation in a way to encourage international cooperation in the space industry
- In 1969, Telesat Canada was founded. The Telesat Act was an important step in providing telecommunications services
- In 1974, Canada's first national space policy was adopted. It reiterated the provisions of the Chapman report. A lot of programs were put in place beyond the government lab. The policy encouraged all government departments to look at ways and means how space could be use more effectively to benefit their mandates. Madame Jeanne Sauvé's commitment to space (then Minister of State for Science and Technology) was one of the main drivers
- In 1986 a long-term Space Plan I was adopted. It had a major impact on the development of Canadian space industry. In 1989, a National Space Agency was established
- In 1993-94 a long-term Space Plan II was adopted which is the last major funded space policy adopted by Canadian government. The reason again was a very strong dedicated minister: Hon. John Manley. Space was seen as essential for the protection of Canada's sovereignty and security. The policy focused on government's needs to use space. The Plan was fully funded by the 1994 Budget
- In 1999, the government established a base of \$300 million/year to space
- In 2010, the private sector was placed at the forefront, with a focus on progress, excellence in key capabilities to inspire Canadians and to encourage youth to pursue careers in the industry
- We got to today through vision and we have created first class capabilities, but we need to continue.

Dr. Lucy Stojak (Space Advisory Board chair)

- Minister Sauvé was very much a visionary leader, she was pushing the boundaries
- Since the mid-90s Canada does not have national space strategy (one of a few countries without such a strategy)
- The Space Advisory Board submitted a report in 2017 consistent with previous calls for direction and vision. Some of the key findings included:



- Canada can benefit from the space technology and infrastructure because of its geography
 - Space is taken for granted because it is invisible to the average Canadian, the public's knowledge is very limited
 - Space as national strategic asset – Canada needs medium scaled projects, important for the scientific community because of significant brain drain. If the best engineers are not challenged in their country, they will go elsewhere. Industry is facing these challenges
 - The new space environment includes over 60 countries active in space today. Canada has not kept pace in its investments. In contrast, UK and US are very active in emphasizing the development of their space commercial sectors which attracts foreign talent
- In terms of international cooperation and developing export markets, Canada is unable to respond in a timely manner to other countries' proposals. Why? Because of lack of investments
 - IPSOS Public Affairs survey confirms that Canada space achievements are well known, the challenges as well, but the Canadian public's awareness is very limited in terms of how space impacts health and connectivity. The story line as to why space is important, therefore, is very important.

Dr. Robert Thirsk (former Canadian astronaut)

- July 1969 – Neil Armstrong's mission was the event of the century. The question is how to get back to the dynamics of the 60s and 70s.
- 2023 – a planned mission to Mars, 2037 – plans about landing on Mars
- The missions to deep space are going to be challenging. Canada needs to make commitment and it will do it. 1972 was the last time Canada went to deep space. Canadas need appropriate technology and capabilities before it ventures off
- Health issues need to be considered, medical doctors are needed
- Canada does not have reliable systems at this moment, it needs 99% reliable systems
- There will be benefits: provision of health care to communities in Northern Canada, for example.

Sylvian Laporte (Canadian Space Agency)

- Commercialization of space is a very important topic everyone touched on and the CSA has been very proactive on that by providing practical initiatives such as business to business sessions (with Mexico, Australia, Airbus). During the sessions Canadian SMEs (the focus of the initiative) but also large companies can exchange knowledge



- The International Astronautical Congress in Bremen, Germany (1-5 Oct. 2018) was very different compared to the past in that it envisioned commercial activities going to the moon
- In Canada, there are a number of commercial initiatives looking at space. They know that to succeed, they need to bring in the know how of the Canadian industry, including the CSA
- From talking to real actions, message is needed
- How can Canada contribute to the Deep Space Gateway? It will be an open architecture and any commercial venture would be able to attach itself to it

What would be an ideal space policy – in terms of elements and principles?

William MacDonald Evans (Space Advisory Board member)

- The fundament should be that space technology can help a number of issues Canada faces as well as science, industry development and application. Those are the things that would create jobs and benefits.

Dr. Lucy Stojak (Space Advisory Board chair)

- Government needs to enable the pillars, the infrastructure that the industry wants to develop. In terms of regulations and law, there's national and international level. At international level, Canada has been a key player - there is Canadian technology in helping cleaning space debris, for example. At national level, Canada has very little space legislation and a lot of people are promoting the idea of having Canadian Space Act. The ability to go through licencing quickly is important, so revising the Remote Space Sensing Act would be a good step in the right direction. Additionally, the divide between defence and civilian use of space needs to be clear.

Sylvain Laporte (Canadian Space Agency)

- CSA strives for a whole-of-government approach; we create data and how to use the data is each department's decision. The CSA will always look at collaboration with defence, but it is not about the weaponization of space when it comes to CSA.

William MacDonald Evans (Space Advisory Board member)

- The military space budget continues to exceed the civilian space budget – where the military and the civilian programs overlap, it is in the industry, that's the common denominator.



Dr. Lucy Stojak (Space Advisory Board chair)

- The military, including in the UK and the US, are turning to the private sector – and this is new. Additionally, at least 60 countries are active in space which necessitates that space remains safe.

Fireside Chat: The New Space Age

Kenneth Hodgkins moderated by Bob McDonald

Kenneth Hodgkins (Office of Space and Advanced Technology, Department of State)

- The commercial evolution of space – the policy in the US is taking that into account and is adapting. What we need to do from an international law perspective? We have four new launching states (Canada, UK, New Zealand and Australia) – and we are discussing what does it mean to be a launching state, what is the implication for opening up a whole new level of capacity.
- Canada would be in the centre of the discussions with putting launch capabilities in Nova Scotia. We already have one venture in New Zealand. In order for the US to use these capacities, they need to make sure how to protect technology and to safeguard the equipment and commercial interactions. In the case with New Zealand, we have to make clear who would be responsible so that we can create a predictable and transparent environment for such joint ventures.
- The GPS system – increasing number of commercial ventures. I'd like to go back to military-civilian use of space – the line is now blurred. We worked to come up with a 'system of systems', in coordination with China, Russia, among others, so that the non-military use of space could be as transparent as possible. Russia, China, India, Japan, the EU – are all into that.

What about the private-government partnership? Are we going to see a partnership or a hand-off?

- I don't know whether it would be a hand-off. In the US, NASA defines the things they need, and then private money are invested. But what do we do beyond that? How do we capture the imagination of the general public so that they continue to support that? This administration recognizes that there is commercial component – my office is trying to make the case with the international community that will stimulate greater interest among young people and will benefit the global community. But without vision, why doing it?
- It is economically profitable to maintain the Space Station but also very expensive – obviously partners will have to cooperate
- The moon policy – the Obama administration wanted to develop new technology to demonstrate how humans could go beyond the moon. Now we are back to kind of the



Gateway project we are looking for – project which would allow you to station missions and go from there to the moon.

Where does Canada fit into that?

- Radar remote sensing is great capability and Canada had a vision, it was deeply involved with us. We need technology Canada can provide

Do you see “The America first” policy in the space?

- You really cannot do anything else without everybody else; you need international component. Plus, to create more opportunities for the US private sector we need other actors and the space traffic management policy also has an international component. We want to set the model of how we do these things because we have the capacity, but we'd like that would be a model that other countries would embrace.

What about the cleaning up of space debris? Who polices it?

- In the US we have domestic policy – in order to get a licence a commercial operator has to demonstrate what they'll do at the end of the life of that equipment. But what about the small things? The space traffic management policy is going to look at that as well

What about Russia and China?

- Russia is already part of the Space program and they are the only way we can get our astronauts out there. The ones up there have 200 days and that's complicated. We have a practical issue – NASA says Russia is the only way we can get our guys out there (for now). With China, the issue is on technology transfer, needs to be certified by the Congress. After the International space station comes down, the Chinese will be the only ones up there (with a station)

How come the US cannot get up to the moon 50 years after it landed there?

- A decision was made that that's too expensive, but we'll incentivise the private sector to do something. It comes with changes in administration, priorities, budgets.

Where's the vision?

- The President talked about space 4-5 times, including in his inaugural speech. There is vision in terms of the commercial part of space.



Panel II: Canadian Space Industry Leaders

**Dan Goldberg, Marina Mississian, Mike Greenley, David O'Connor moderated by
Charity Weeden**

What is the Canadian industry doing to position itself for success in the new space era?

Dan Goldberg (Telesat)

- Telesat focuses on communications software and use satellites for business requirements
- There is a massive disruption in industry
- 50% of Telesat revenue comes from providing direct to home connections; Other 50% is services to government
- Everyone is moving abroad, and everyone is moving to IP
- Companies like Netflix are scooping up the market
- People are looking for big, fast, cheap, high performing, broadband capability
- The current architecture of satellites is not well suited to what customers want
- This should lead to a new era of communications services
- They want to move satellites from 36000km above earth (1/2 second latency delay) down to lower orbit satellites to decrease delay.

Marina Mississian (Honeywell Aerospace)

- How did we get here? Demand – there is a constant need today for continuous connectivity
- Should be 50 billion connected devices by 2025.
- Business is looking for more affordable ways of getting to space.
- Innovation technology has changed so quickly with small and powerful devices
- Honeywell is looking at what technology they can use to fill the needs of the emerging market.
- It's all about speed and allowing them to move huge amounts of data.
- Partnering with SMEs and universities is important and as well as a science program

Mike Greenley (MDA)

- MDA is looking increasingly at business to business relationships
- Continuously looking for innovation opportunities in Canada related to business to business opportunities and for getting new tech into orbit
- Other area MDA are looking at is deep space (largely government led). MDA wants government to engage in these projects



David O'Connor (Magellan Aerospace)

- Business needs an anchor customer willing to buy a large amount of a product in order to make it truly viable.
- Government has failed Canada in how it handles space; Last long-term program was in the 90s.
- 2011 had the Emerson reports, got good advice, but wasn't really followed.
- They have a space advisory board, policy development, but a need a real project, with real schedules, and real plans.
- Magellan wants space development to look more like how commercial aviation looks like today.
- Many of the programs we call 'commercial' aren't entirely commercial. Many of them receive significant government funding.
- Main players such as SpaceX have received significant funding from government (to date).
- Canadian space ventures need this.

These markets are growing but they are global not just national, how are you positioning yourselves in the global market?

Dan Goldberg (Telesat)

- We're the fourth largest player in the global market; Generating almost \$1B topline and intend to pour that back into our business before someone also tries to steal it.
- We're a Canadian company and we care about investing in Canada
- We will solve the rural broadband problem in Canada.
- There are great Canadian supply chains that they can work with.
- While proudly Canadian, we compete on the global market. While we love working with Canadian suppliers, we need to ensure that we are competitive on the global market.

How is Maxar positioned to be a competitor globally?

Mike Greenley (MDA)

- We're engaged with 5-7 companies globally, people recognize our experience
- We will need to adopt from a government stance to an agile business stance
- Other nations are starting to get momentum behind them when it comes to space (we're about to hit 50 years next year, big space birthday party time!)



Reports indicate that the Canadian space industry should have revenue of \$8.5 billion in the future, while we sit at \$5 billion currently. Will the Canadian space industry meet those targets?

David O'Connor (Magellan Aerospace)

- We are optimistic outside of Canada

Mike Greenley (MDA)

- We need government flagship programs to meet those numbers. Gateway is a big one. Canada needs to step up.
- A pool developed in Canada for small-medium missions is important as well.
- The engine to drive these projects has fallen off the tracks. Need to re-engage.
- SMEs are the basis of our economy, need to support them.
- Are we on the trajectory? Not yet.

Marina Mississian (Honeywell Aerospace)

- Honeywell is always export driven; Turned \$20M in Canadian funding into \$20B in outside industry.
- Need support from the government in order to conduct major initiatives
- Worries that any new major government program will be at the cost of other programs in the space industry.
- Needs a sustainable industry partnership plan.
- Don't want to be in the same situation 5-10 years from now.

Dan Goldberg (Telesat)

- Growing rapidly for quite some time (with highs and lows); Last 4 years revenues have been decreasing
- Need to reinvent our business if Telesat is going to remain competitive
- However, we feel very 'bullish'. Massive market to target and have a plan for how to do it.
- Tech developments on the rise
- Phased array tech will be on spacecraft, BUT also on ships, homes cars. MDA are leaders in this area. Canada is well-positioned in these areas.
- For a multi-billion-dollar area, need more government investments.
- Last budget had \$100M for Low Earth Orbit investment (LEO). This is a first step but it's only a drop in the bucket for how expensive these programmes are.
- Industry, however, needs to invest themselves as well. They need to invest as least as much money as the government does



- Nothing encourages government more than industry saying we will spend at least as much money as you are
- This will benefit all Canadians, it's a great opportunity.

Tell us more about the 'Don't Let Go Canada' campaign.

Mike Greenley (MDA)

- Canada checked into how invested Canadians are in space, the answer is very invested, it drives innovation and drives youth into STEM
- 85% of Canadians, however, expressed concern over Canada's investments in space eroding
- 83% of Canadians support government funding space activities
- Serious lack of awareness regarding what Canadians have accomplished in space.
- This is a critical moment for Canadian involvement in space. We want people to speak to their elected government reps about how important space is to them.

What barriers are you facing regarding policy, regularly or legislative issues?

Dan Goldberg (Telesat)

- For the most part we get good support; most of our orbital locations come from ISED.
- Equally, the existing regulatory framework did not anticipate a modern advanced LEO infrastructure; Needs to be modernized and updated.
- Beyond that government tends to move slowly.
- When the Government of Canada actually has a requirement in space, they need to get on with the procurement process.

David O'Connor (Magellan Aerospace)

- Security is always an issue.
- Controlled goods program has made it difficult for SMEs to get contracts; Believe this is counter to what the program intended – government should modernize.

Where do you see the Canadian space program in 20 years?

David O'Connor (Magellan Aerospace)

- Going to be way faster at planning new programs. Good mix of private and public space programs.



Mike Greenley (MDA)

- In 20 years, hope that a new strategy will be developed, and that Canadian space centre is engaged internationally.

Dan Goldberg (Telesat)

- Optimistic. If we execute just right, we'll be stronger than we are today, but it's not going to happen on its own. Global competitors are receiving significant investments from government, Canada needs to follow suit if it wants industry to be competitive.

Fireside Chat: Canadian space exploration

Bob McDonald moderated by David Perry

Bob McDonald (CBC)

- Astronauts are a combination of engineers, construction workers and fighter pilots

Are people more interested in the human or the astronomical issues?

- Human. Robots don't get the same romance that humans do

Looking ahead, what do you see as the biggest challenge to making space relatable for people?

- Biggest challenge with science communication is keeping things real and fighting pseudo-science. The latter is getting a lot of air time which can be problematic.

Panel III: The SME Start-up Ecosystem

Ewan Reid, Dr. Nadeem Ghafoor, Froduald Kabanza, Stewart Bain moderated by Colin Robertson

Stewart Bain (NorthStar)

- Government has played a key role in allowing industry to define itself
- Industry is painfully aware that government funding is not 100% ensured for the future
- Commercial industry doesn't make it on its own, needs government support
- Northstar: global environment information programme; Want to empower humanity to save the planet



- ‘Northstar is the next big thing’, will monitor the chemistry of the earth every single day
- Wants to fill the ‘white spaces’ that aren’t being properly served.
- It’s our responsibility to do something meaningful for the planet.
- Government doesn’t owe us, we just need more hard work.

Froduald Kabanza (Menya Solutions)

- It’s interesting to reflect on the ways that space is changing. Across domains business is being transformed by a small number of changes;
 - Miniaturization
 - Small systems, assembled by larger systems in space is a major trend for space
 - People are no longer making much money on the things going into space. It’s more about them being put into space, so people are trying to make them as cheap as possible in order to monetize them.
- Looking at next-gen miniaturization systems.
 - Searching for a more serviceable architecture
 - Challenge is what you go for smaller systems with more requirements, new challenges arise.
 - Being robust and reliable are some of the key requirements for space
- Spending a lot of time working on deep space environments
 - when you target your development at deep space you are both planning for the current requirements and the next-gen requirements which places you in a key position for future development
 - Looking to empower the next generation of LEO and GEO tech
- Aiming to provide complete Canadian systems which will be the next generation of deep space tech.

Dr. Nadeem Ghafoor (Canadensys Aerospace)

- Teaching since 1993. Working with MDA.
- Developing future robot operations related to the deep space gateway.
- Developing robots that can function without human supervision
- Most of Canadensys Aerospace revenue comes from the defence sector
- AI applied to a whole array of applications.
- Greatest success so far is related to the Navy.

Ewan Reid (Mission Control Space Services Inc.)

- Own work is through automation and intelligence
 - Aim to increase safety, efficiency, and financial returns of missions
 - Also run an education/outreach branch for students
- Canada is an excellent place to start a company



- Numerous programs available for support and a great pipeline of talent
- Many good programs to collaborate with academia
- Everything is there to start and grow a company, the question, however, is that does that apply more to space than to other industries?
- No, Canada's unique history in space robotics (for example) provides us with unique credibility
- Only place they are lacking in is the sheer magnitude of support.

Dr. Nadeem Ghafoor (Canadensys Aerospace)

- There are fantastic mechanisms out there to support initial development and partner with the Government of Canada
- There is a gap. All sorts of funding to make them to tech readiness for flight. What they are missing to turn something from a terrestrial prototype to a space system something to help literally get it off the launch pad.
- Even partial funding would allow 100s of products to gain 'flight heritage' status which would allow them to compete in the international market.
 - These could be at 100K, 200K, 500K, 1M and 5M levels
 - If these opportunities existed than business would also invest heavily in these types of products

Ewan Reid (Mission Control Space Services Inc.)

- Yes, that's exactly what we need to move our industry forward. We're a space company that's never put anything into space. That's our proof of concept.

Froduald Kabanza (Menya Solutions)

- Menya Solutions started from wanting to use AI to support operators with tactical solutions
 - MDA eventually came looking at a partnership

From the point of view of Canada as an information consumer. What are the key things that need to happen for Canada to be a space faring nation?

Ewan Reid (Mission Control Space Services Inc.)

- Meeting with ISED where ISED said that they wanted a Canadian SpaceX. I'm sure everyone wants to be SpaceX, but they only got that opportunity because they got a big government contract. If government procures a piece of tech it's a major leg up on the international market.
 - It doesn't just have to be the government procuring a service. But it could also be information. If the Government of Canada puts out an open competition for



information with a prize for the result, it would spur an enormous amount of innovation

Dr. Nadeem Ghafoor (Canadensys Aerospace)

- We know Canada uses land and sea for its national interests, but people aren't really thinking about space as a national interest in the same way.
- They aren't waiting for the government to invest but if Government of Canada wants to contribute than there are specific areas, they can be helpful. Investments, programs that foster result driven activities and competitions

Stewart Bain (NorthStar)

- Already have programs like this. Biggest challenge is opening a channel in the first place. Lack of funds aren't the problem, lack of imagination is.

What is the largest problem you face in securing ITBs from companies such as Lockheed?

Stewart Bain (NorthStar)

- It's often about the challenge connecting dots between technical experts and business development teams. Large organizations like Lockheed Martin Canada can seem murky to the private sector.

Panel IV: Benefits from Space

Prashant Shukle, Ryan Anderson, Dr. Gordon Osinski, Sarah Pacey and Denis Bourque moderated by Charity Weeden

Describe who these benefits are for?

Dr. Gordon Osinski (Western University)

- We talk a lot about interdisciplinarity - scientists, engineers are beneficiaries pushing the boundaries of knowledge on earth; mining companies as well

Prashant Shukle (Natural Resources Canada)

- Space as important to geography – Canada is the second largest country by territory, we only have 33 million people, our GDP is considerably smaller – Canada should be smart, much more strategic and has to make tactical decisions in where we're investing.



- There are tremendous linkages between the space and the ground industries (geospatial data, GPS, Google maps, imagery; coastal erosion) and how you bring space down to earth and make it usable is very important. An observer of space could be a good job on earth.

Sarah Pacey (Space Strategy and Plans, RCAF)

- Director General Space (DG Space) moved in 2006 – we are part of RCAF, this is a joint capability.
- We launched a satellite in 2013 – part of the US space surveillance network (Sapphire). The Polar Communications as well is part of Canada’s defence policy. The adopted in June 2017 defence policy *Strong, Secure, Engaged* sets the tone of our strategic thinking about space and recognizes the importance that space industry plays. The focus on space environment outlines both the opportunities and risks.

Denis Bourque (ISED)

- The benefits of space? – smart phones, banking. We work closely with CSA to better explain how it creates jobs. We also have a new series of policy objectives like diversity, youth, science – we want to better understand what the benefits of space are.

Ryan Anderson (Satellite Canada Innovation Network)

- Satellites and earth observation, broadbands, navigation.
- “Data is the new oil” – but there’s a large gap between the data and those who may be beneficiaries at the end. Closing that gap is the fundamental paradigm shift how we can use space to solve problems on earth.

Prashant Shukle (Natural Resources Canada)

- We want to make Canada a geospatial destination for the rest of the world. We want to make sure that data is accessible. To do so, we need to know our market. We have to know what the induce of data is and what our clients’ requirements are.

Dr. Gordon Osinski (Western University)

- A lot of universities operate in silos, but we try to move forward, and it is exciting to bring together scientists and engineers, that’s what we are trying to do in academia (interdisciplinarity). The industry should communicate better though what kind of skills they need from universities.



Denis Bourque (ISED)

- As a nation, we are stronger because of our diversity and space provides good environment for creating better knowledge.

Sarah Pacey (Space Strategy and Plans, RCAF)

- We are already using commercial space capabilities and we recognize the commercial sector is evolving faster than the government – how do we develop new partnerships with the commercial sector is something we're actively working on now.

Panel V: International Space Cooperation

Micheline Tabache & Jason Wood moderated by Bill Mackey

Can you give us a rundown of the CSA objectives?

Jason Wood (Canadian Space Agency)

- International collaboration is a key success factor for the agency
- Not working on large legally binding documents but more soft initiatives

Micheline Tabache (European Space Agency)

- ESA is a very different animal from Canada
- If you think your government is slow and filled with red tape you should see the EU
- Even Brussels now understands the strategic value of space
- ESA would not be the same without Canada, they have been cooperating for many years
- No shame in cooperating with anyone
 - Since we don't represent a specific nation we can cooperate with many nations, (US, Russia, Japan, China).
- Can be a good intermediary

How does the ESA/CSA decide whether to lead a mission or be a participant?

Micheline Tabache (European Space Agency)

- ESA makes multi-year plans which ensures funding
 - Decisions take a lot of dialogue and discussion



Jason Wood (Canadian Space Agency)

- CSA is similar, focuses on discussion cooperation
 - Plans years in advance by consulting with stakeholders and academia, as well as cross-government

One of the largest challenges that Canada faces is timing. Are there any solutions to that problem?

Micheline Tabache (European Space Agency)

- Many of our members have their own national budgets and priorities which can be challenging. Since they have their own programmes and sovereignty member countries sometimes like to go off and work with organizations such as NASA.
- Challenging for us since there is only one pot of money. States tend to look to us when a project is too large for one country to handle alone.

Everyone has been looking to public private partnerships. Would the CSA consider partnerships with industry in order to support ESA mandates?

Jason Wood (Canadian Space Agency)

- Given how quickly space tech is moving, the number of viable options we have is enormous. We're constantly trying to find different and new ways to bring issues to the table.

The launch model from the US is clearly a model that can be used internationally. Does ESA have the same approach as a service provider?

Micheline Tabache (European Space Agency)

- Our role as governments/NGOs is to help them get there, not support them.
- As a politician would say, ok so you want to do it? Get the money for it and start it, then we'll talk.
- ESA is much more hands off when it comes to industry.
 - Europe has billionaires but not all of them want to contribute



**What sort of framework agreement would you like to have for space going forward?
Can you give us examples of lessons learned from the station program that ESA
would like to see followed forward to the gateway program?**

Micheline Tabache (European Space Agency)

- Europe only has 8.3% of the station. Given that investment they feel that they received a good return. Could never have had a European Space Station.
- Also need to integrate private sector but the framework does not really allow it. They do not want to be stuck paying these common costs forever.
- If gateway happens (not funded), ESA wants to gain flight opportunities for their astronauts.
 - Don't want to just pay our dues, also want to be actively involved.

Jason Wood (Canadian Space Agency)

- need for flexibility and adding in new partners. Going to be interesting going forward to maintain the elements of the partnership which exist now.
- Open Architecture concept for the station will be key.

To what degree should international regulatory efforts be impacted by space cooperation?

Jason Wood (Canadian Space Agency)

- Not isolated to the cases you provided. Concern is shared by all space agencies.

Micheline Tabache (European Space Agency)

- For better or worse our American friends will lead the way. Might be forced to be interoperable with the Americans.

► **Canadian Global Affairs Institute**

The Canadian Global Affairs Institute focuses on the entire range of Canada's international relations in all its forms including (in partnership with the University of Calgary's School of Public Policy), trade investment and international capacity building. Successor to the Canadian Defence and Foreign Affairs Institute (CDFAI, which was established in 2001), the Institute works to inform Canadians about the importance of having a respected and influential voice in those parts of the globe where Canada has significant interests due to trade and investment, origins of Canada's population, geographic security (and especially security of North America in conjunction with the United States), social development, or the peace and freedom of allied nations. The Institute aims to demonstrate to Canadians the importance of comprehensive foreign, defence and trade policies which both express our values and represent our interests.

The Institute was created to bridge the gap between what Canadians need to know about Canadian international activities and what they do know. Historically Canadians have tended to look abroad out of a search for markets because Canada depends heavily on foreign trade. In the modern post-Cold War world, however, global security and stability have become the bedrocks of global commerce and the free movement of people, goods and ideas across international boundaries. Canada has striven to open the world since the 1930s and was a driving factor behind the adoption of the main structures which underpin globalization such as the International Monetary Fund, the World Bank, the World Trade Organization and emerging free trade networks connecting dozens of international economies. The Canadian Global Affairs Institute recognizes Canada's contribution to a globalized world and aims to inform Canadians about Canada's role in that process and the connection between globalization and security.

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