

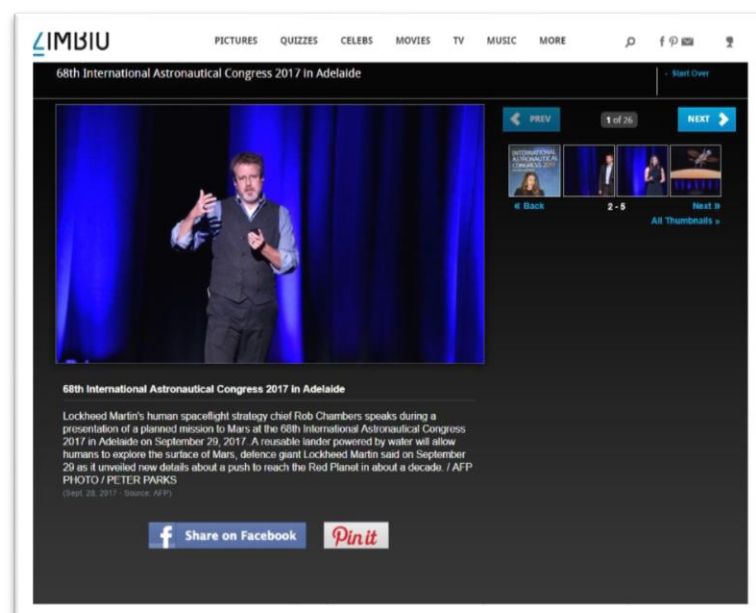


IAC 2017 Press Articles

Online



<http://www.abc.net.au/news/2017-09-25/sa-should-play-role-in-australias-new-space-agency-premier-says/8984194>





<http://www.zimbiu.com/pictures/KncmV0VSZ3V/68th+International+Astronautical+Congress>



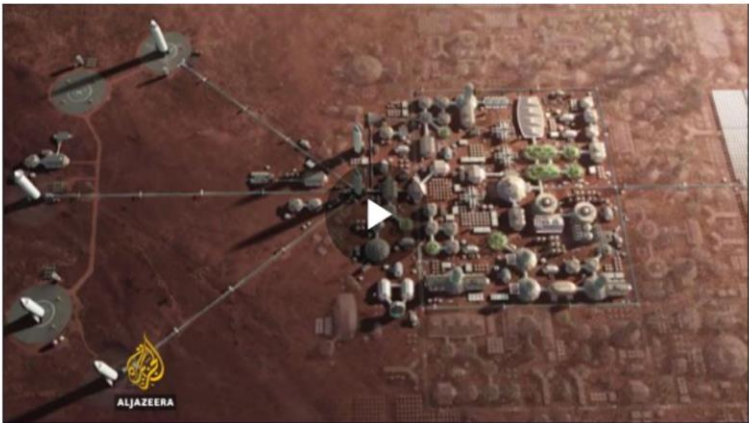
<https://presse.cnes.fr/en/french-space-adelaide-68th-iac-international-astronautical-congress>

NEWS / AUSTRALIA

Mars colonisation dominates International Astronautical Congress

by Yaara Bou Melhem  

29 Sept 2017



Aerospace giant Lockheed Martin wants to set up a base camp on Mars, while Space X founder Elon Musk intends to colonise the red planet much sooner than previously thought.

MORE ON ASIA PACIFIC

Suu Kyi visits Rakhine as Rohingya exodus continues

© AFP/GETTY IMAGES

<http://www.aljazeera.com/news/2017/09/mars-colonisation-dominates-international-astronautical-congress-170929130400871.html>

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Le Gall reflects on successful International Astronautical Congress

by Jeff Foust — October 27, 2017



Jean-Yves Le Gall, president of the International Astronautical Federation (IAF), speaking at the 68th International Astronautical Congress in Adelaide, Australia, in September. Credit: IAF

When the International Astronautical Federation (IAF) selected Adelaide, Australia, as the site of its 68th International Astronautical Congress (IAC), many feared the worst. They worried the location would depress attendance, particularly for the many attendees from Europe and North America who would need to spend the better part of a day to get there.

Those fears turned out to be unfounded. The IAC wrapped up a month ago with more than 4,500 attendees, a figure that the IAF's president, Jean-Yves Le Gall, called "very outstanding." The week-long event started with the announcement that Australia would, at long last, establish a national space agency, and ended with a keynote by SpaceX founder Elon Musk giving an update about his Mars mission architecture.

<http://spacenews.com/le-gall-reflects-on-successful-international-astronautical-congress/>

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The Space Journal room.eu.com

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THE 68TH INTERNATIONAL ASTRONAUTICAL CONGRESS 2017

SIAA, IAF

Adelaide, September 25, 2017

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As the world's largest space conference, every year the International Astronautical Congress (IAC) brings together leaders in space from across the globe – heads of major space agencies, astronauts, senior space engineers and policy makers.

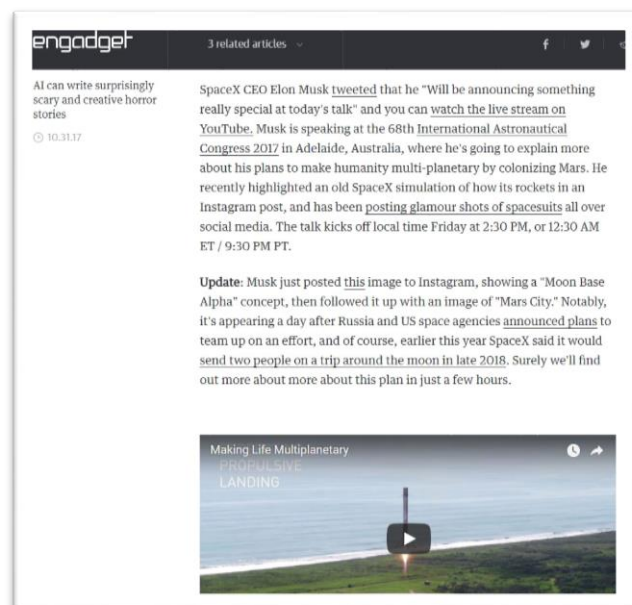
In 2017 we'll be marking some important anniversaries of human endeavour in space.

- The 60th anniversary of the launch of Sputnik 1
- The 50th anniversary of the signing of the Outer Space Treaty (OST). The OST seeks to ensure that outer space remains accessible and available for the benefit of all humankind
- The 50th anniversary of the launch of Australia's first satellite, WRESAT

<https://room.eu.com/events/view/14-iac>



<https://www.cnbc.com/2017/09/26/musk-shares-spacex-simulation-video-teases-unexpected-mars-updates.html>



<https://www.engadget.com/2017/09/28/elon-musk-spacex-mars-iac-stream/>

Insight - 68th International Astronautical Congress

Wednesday, October 4, 2017

By Victoria Samson, Washington Office Director

On Sept. 25-29, 2017, the 68th International Astronautical Congress (IAC) was held in Adelaide, Australia. This event with 4,500 delegates marked the annual gathering of the world's space experts. The Secure World Foundation (SWF) used this opportunity to get very involved in the discussions being held by moderating and speaking on panels, presenting papers, supporting young professionals, and participating in planning committees.

A plenary session for the next generation of space leaders discussed "Innovative Methods for Assured and Secure Access to Space Resources." Moderated by SWF Executive Director Michael Simpson, this session examined industry, academic, agency, national, and international efforts being taken to address the broad spectrum of human-made and environmental challenges which could interfere with assured and secure access to space assets. The panel allowed students and young professionals to speak about what legal and economic systems are needed to properly manage the space environment and ensure that it is safe for all to operate in and use for the long-term.

SWF Space Law Advisor Christopher Johnson was a panelist during the Global Networking Forum's session on "Space Mining - Law, Politics, Perspectives." This session examined the legal and policy challenges arising from plans to use the resources of celestial bodies. Building off of work SWF has done elsewhere, including the Hague Space Resources Governance Working Group, Mr. Johnson spoke about how the Outer Space Treaty falls short of clearly and explicitly precluding this sort of proposed use, and more generally on the role of international law in fostering emerging space activities.

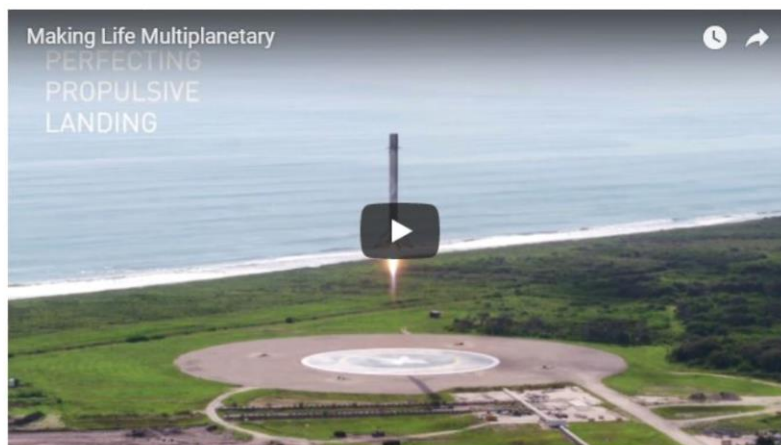
SWF staff presented a variety of papers in various technical sessions. Washington Office Director Victoria Samson and Director of Program Planning Brian Weeden co-authored a paper with SWF advisory committee member Rajeswari Pillai Rajagopalan on "Stability, sustainability, and crises: The role tabletop exercises in space crisis dynamics can play in ensuring the long-term sustainability of space." Mr. Johnson and Dr. Simpson co-authored "Lacunae and Silence in International Space Law - A Hypothetical Advisory Opinion from the International Court of Justice." SWF Project Manager Ian Christensen presented a paper on "Norms of Behavior for Small Satellite Operations - Basic Principles," which was co-authored with Dr. Weeden. SWF Project Manager Krystal Wilson presented a paper on "Broadening Benefit as a Pathway to the Widely Accepted Development of Extra-terrestrial Resources," which was co-authored with Dr. Simpson and Mr. Christensen.

<https://swfound.org/news/all-news/2017/10/insight-68th-international-astronautical-congress>

IN BRIEF

Earlier this week, Elon Musk teased news of "major improvements" and "unexpected applications" set to be delivered during his presentation at the International Astronautical Congress. Here's how to stream his address as it happens.

Tonight, Elon Musk will take to the stage at the International Astronautical Congress in Adelaide, Australia to address attendees. Once he does, people around the world will be able to see what he has to say via the livestream below.



<https://futurism.com/heres-how-to-watch-elon-musks-presentation-at-the-international-astronautical-congress-live/>

SKA at the 2017 International Astronautical Congress

9 October 2017

From 25-29 September 2017, South Australia welcomed 5000 delegates to the Adelaide Convention Centre for the 68th International Astronautical Congress. The Australian SKA Office, as part of the broader Australian Government booth, showcased the radio-astronomy project with an eye-catching backdrop and a SKA test antenna – identical to those currently installed at the Murchison Radio-astronomy Observatory.

Jerry Skinner, from the Australian SKA Office, gave his insights on using art for community engagement with radio-astronomy in a presentation that formed part of the technical program. The Office also organised a panel of distinguished Australian astronomers who discussed how our local astronomy is helping to understand the universe and improve life on Earth.

Shared Sky, the SKA Indigenous art exhibition, was opened at the South Australia Museum to coincide with the beginning of the Congress. This exhibition reveals perspectives on astronomy from both Australia and South Africa, and has returned to Australia for the first time since its inaugural showing in Perth in 2015.

The Congress concluded with an exciting presentation from engineer and inventor Elon Musk. The founder of SpaceX talked through his plan to not only develop a fully reusable rocket for transport to Mars, but also use the same rocket technology for transport on Earth!

See below for some great photos from the events in Adelaide. Shared Sky will be on display at the South Australia Museum until 26 January 2018.



<http://www.ska.gov.au/updates/Pages/2017-International-Astronautical-Congress.aspx>

The Advertiser

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SA NEWS

Elon Musk unveils lofty vision at International Astronautical Congress in Adelaide to pay his way to Mars

Tory Shepherd and Jamie Seidel, News Corp Australia Network
September 29, 2017 10:56am



- [Bill Nye: Why we have a need to explore space](#)
- [The moon has become even more important](#)
- [Musk to detail plans to colonise Mars in Adelaide](#)

A PLAN to have a Mars City of a million people has been outlined in Adelaide by billionaire entrepreneur Elon Musk as he also revealed his plans for a base on the moon.

He plans to use a rocket bigger than an A380 plane to send 100 people at a time — with two or three people per cabin — to Mars. Ultimately he hopes to create a sustainable population of about a million.

<http://www.adelaidenow.com.au/news/south-australia/elon-musk-to-detail-his-mission-to-mars-at-international-astronautical-congress-in-adelaide-on-friday/news-story/53708c3d16e4070a66aab3d0b8b7477a>

Australia Rockets to Success with IAC 2017

October 17, 2017




Australia rocketed firmly into the space industry with the hosting of the 68th International Astronautical Congress (IAC) in Adelaide in September 2017 – the largest conference to be held in Adelaide to date and the first to be held at the newly expanded Adelaide Convention Centre.

The Paris-based International Astronautical Federation (IAF) is the world's leading space advocacy body whose members include all key space agencies, companies, societies, associations and institutes across 66 countries.

The annual conference of the world's 'space family' is the largest gathering of the space industry in the world. Each year, the IAC changes country, theme and local organiser. The Adelaide Convention Bureau, in conjunction with the Space Industry Association of Australia, coordinated the event and is proud to have hosted the IAC 2017.

<http://boardroom.global/australia-rockets-to-success-with-iac-2017/>


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ENTREPRENEURS

9 years ago SpaceX nearly failed itself out of existence: 'It is a pretty emotional day,' says Elon Musk

Catherine Clifford | 2:05 PM ET Fri, 29 Sept 2017




SpaceX CEO Elon Musk at the International Astronautical Congress on September 29, 2017 in Adelaide, Australia.



Nine years ago, SpaceX almost went bankrupt.

Billionaire tech entrepreneur **Elon Musk** recalled the event as he unveiled his updated Mars-voyage plan at the **International Astronautical Congress (IAC)** conference in Adelaide, Australia, on Thursday. He opened up about when and how his now adored and very

PRIMETIME SHOWS:
THE JOB INTERVIEW



<https://www.cnbc.com/2017/09/29/elon-musk-9-years-ago-spacex-nearly-failed-itself-out-of-existence.html>

The National

UAE WORLD BUSINESS OPINION ARTS&CULTURE LIFESTYLE SPORT

HOME > UAE

Dubai wins bid to host the 2020 International Astronautical Congress

An estimated 5,000 scholars are expected to attend the largest annual gathering of space professionals in 2020

N Hameen Dajani
September 26, 2017
(Updated: September 26, 2017 05:52 PM)

155 shares



EDITOR'S PICKS

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Dubai will host the International Astronautical Congress in 2020. Photo courtesy Dubai Government Media Office.

Dubai has won the bid to host the 2020 International Astronautical Congress (IAC), which will take place days after the UAE Mars Mission launches its probe "Hope" to Mars.

<https://www.thenational.ae/uae/dubai-wins-bid-to-host-the-2020-international-astronautical-congress-1.662733>

International Astronautical Congress expands space frontiers in South Australia

SPACE INDUSTRY

When a convention begins with record numbers of delegates washing down 7,380 fresh Smoky Bay oysters with 1,248 bottles of fine South Australian wine and ends with Elon Musk outlining his Mars plans, the days in-between have much to live up to.




NASA imagery of the Earth at night.


The International Astronautical Congress (IAC) at the Adelaide Convention Centre last week delivered on all counts, both to the 4,470 visiting delegates and to South Australia.

<http://theleadsouthaustralia.com.au/industries/space-industry/international-astronautical-congress-expands-space-frontiers-in-south-australia/>


Planetary Radio • October 4, 2017

Australia Gets Serious About Space






Planetary Radio
Australia Gets Serious About Space



15:56

[Download MP3](#)

Special Guests



Brett Biddington

68th International Astronautical Congress CEO and past Chair, Space Industry Association of Australia

The Australian government announced that it would create a national space agency at the 68th annual International Astronautical Congress in Adelaide. We'll talk with IAC 2017 CEO Brett Biddington about what this means for his country. Last week's IAC was also where Elon Musk provided more details about his audacious plan to put hundreds of humans on Mars by the mid-2020s. Digital Editor Jason Davis has the scoop. A really easy space trivia contest question could win you space art and much more as you hear What's Up in the night sky.

<http://www.planetary.org/multimedia/planetary-radio/show/2017/1004-brett-biddington-australia.html>

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Travel news • Elon Musk wants to take...

Elon Musk wants to take you anywhere in the world in less than an hour

Imagine taking off from Los Angeles, and arriving in London 22 minutes later. Or spending 27 minutes en route from Tokyo to New York City. How about a quick 27 minute trip from Bangkok to Dubai.



At the 68th International Astronautical Congress in Adelaide last week, SpaceX CEO Elon Musk took the stage for the luncheon.

These trips sound like fantasy – or maybe science fiction – but maybe that's not surprising when you learn who is proposing that international travel this fast might be possible.

<https://www.lonelyplanet.com/news/2017/10/02/travel-world-less-than-one-hour/>

Airbus held New Space and Innovation competition at the International Astronautical Congress (IAC) 2017 in Adelaide, Australia

Posted on 2 October 2017 by EuropaWire PR Editors | This entry was posted in [Aviation & Aerospace](#), [Awards](#), [Netherlands](#), [Science](#), [Technology](#) and tagged [Airbus](#), [Arjuna](#), [Delta-V](#), [New Space and Innovation competition](#), [Sebastian Chaoui](#), [the International Astronautical Congress \(IAC\) 2017](#), [Valentin Merino](#). Bookmark the [permalink](#).



Chaoui with the French Ambassador to Australia, H.E. Christophe Penot (left) and Anthony Fraser, Managing Director Airbus Australia Pacific

Winning Australian start-up to visit Toulouse to meet European space experts

ADELAIDE, Australia, 02-Oct-2017 — [/EuropaWire/](#) — Airbus and other industry players yesterday held a New Space and Innovation competition at the International Astronautical Congress (IAC) 2017 in Adelaide. The initiative demonstrates the commitment of Airbus and its partners to support the development of Australia's space sector.

<https://news.europawire.eu/airbus-held-new-space-and-innovation-competition-at-the-international-astronautical-congress-iac-2017-in-adelaide-australia-6543214567890/eu-press-release/2017/10/02/>

SPACE NEWS

NEWS OPINION VIDEO LAUNCH BUSINESS MISSIONS POLICY & POLITICS

United Arab Emirates to establish human spaceflight program

by Jeff Foust — October 2, 2017



Salem Humaid Al Marri said that the UAE plans to select between four and six astronauts by next year to fly missions starting in the early 2020s. Credit: IAF


ADELAIDE, Australia — The United Arab Emirates (UAE) plans to establish its own astronaut corps in the next year, seeking to fly its citizens into space on other nations' vehicles starting in the early 2020s.

In a panel discussion at the 68th International Astronautical Congress (IAC) here Sept. 28, officials with the country's new space agency said that the country sought to develop a "sustainable" human spaceflight program with scientific applications, rather than simply the prestige of flying humans in space.

<http://spacenews.com/united-arab-emirates-to-establish-human-spaceflight-program/>

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IAG SPACE CONFERENCE

cc

Adelaide hosted a meeting of the world's top minds in the field of space - the International Astronautical Congress. During the week, some big announcements were made. We sent Rookie Reporter Ness along to give you a taste of the action.

<http://www.abc.net.au/btn/story/s4748481.htm>

NYSF 2016 ALUMNUS ...
DINGLEY! REPORTS FROM THE
INTERNATIONAL
ASTRONAUTICAL CONGRESS
(IAC)



The best thing I've seen Australia do since I attended the National Youth Science Forum (NYSF)

From Monday 25th to Friday 29th September, Adelaide saw cosmonauts from Russia, science educators from America, space entrepreneurs from New Zealand, and a geeky kid from Perth come together to experience the 2017 International Astronautical Congress (IAC). It was truly one of the most inspiring events I've been to and the best thing I've seen Australia do since I attended the National Youth Science Forum (NYSF).

<https://www.nysf.edu.au/nysf-alumnus-dingley-international-astronautical-congress-iac/>

AerospaceDaily

& DEFENSE REPORT

The Business Daily of the Global A&D Industry Since 1963

Russian ISS Module Launch Delayed Until Late 2018

Irene Klotz | Aerospace Daily & Defense Report

Sep 25, 2017

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COMMENTS 0



Heads of the U.S., Russian, European, Chinese and Japanese agencies and an interpreter speak to reporters at the opening day of the International Astronautical Congress: Irene Klotz/Aviation Week

ADELAIDE, Australia—Russia does not plan to launch its new science lab to the International Space Station (ISS) until late 2018, likely prolonging the country's scaled-down staffing of the orbital base, which frees an extra seat aboard Soyuz capsules for NASA or U.S. partners ahead of upcoming

commercial space ...

<http://aviationweek.com/space/russian-iss-module-launch-delayed-until-late-2018>

AVIATIONWEEK

& SPACE TECHNOLOGY

Step INSIDE what's next

China Willing To Consider Foreign Modules On Space Station

Other countries could add modules to China's planned orbital base

Bradley Perrett | Aviation Week & Space Technology

Sep 29, 2017

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COMMENTS 0

China is open to expansion of its planned space station in cooperation with foreign partners, says a senior official involved in the program. Discussions on use of the station by other countries are underway, says the official, Wei Chuanfeng of spacecraft builder Cast. Speaking at the International Astronautical Congress here, Wei did not say the negotiations specifically covered the possibility of enlarging the station; the idea has obviously not progressed as far as a definite plan. But ...

<http://aviationweek.com/space/china-willing-consider-foreign-modules-space-station>

AVIATIONWEEK
A SPACE TECHNOLOGY

Step INSIDE what's next

United Arab Emirates Sets Sights On Mars

Nascent United Arab Emirates space program aims to launch orbiter to red planet in 2020

Irene Klotz | Aviation Week & Space Technology Oct 25, 2017

☐ EMAIL

COMMENTS 3

Mohammed al-Ahbabi, director general of the three-year-old United Arab Emirates (UAE) Space Agency, had some advice for Australia after this year's International Astronautical Congress (IAC) host announced it would establish a national space agency. "It is important to focus on the future rather than going back to classic-era space programs," he said. "And have a niche . . . because competition is very hard in space." The UAE practices what it preaches. With ...

<http://aviationweek.com/space/united-arab-emirates-sets-sights-mars>

SPACENEWS

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Australia to establish national space agency

by Jeff Foust — September 24, 2017



Australia, one of the few major countries without a national space agency, has decided to establish an agency to support the country's space industry. Credit: NASA

ADELAIDE, Australia — The government of Australia announced Sept. 25 that it plans to formally establish a national space agency, a milestone sought for decades by the country's space industry and other space advocates.

Sen. Simon Birmingham, the Minister of Education for the government of Prime Minister Malcolm Turnbull, formally announced plans to establish the agency in a speech during the opening ceremonies of the 68th International Astronautical Congress (IAC) here.

<http://spacenews.com/australia-to-establish-national-space-agency/>

SpaceX has published Elon Musk's presentation about colonizing Mars – here's the full transcript and slides

Dave Mosher 25 Oct 2017, 14:30 Science 124,358



In late September, billionaire and SpaceX founder Elon Musk debuted a fresh plan for colonizing Mars with 1 million people.

The focus of Musk's new presentation, which updates a 2016 talk he gave at the International Astronautical Congress, was the "Big F---ing Rocket," or BFR.

Musk told a crowd at the 2017 IAC meeting in Adelaide, Australia, that he hopes to start building the 35-story space vehicle in early 2018, launch the first BFR to Mars in 2022, and use it to land



Elon Musk wants to colonize Mars with SpaceX. Anaele

Pelisson/Business Insider; Getty Images; Shutterstock; SpaceX

<http://www.businessinsider.fr/us/elon-musk-mars-iac-2017-transcript-slides-2017-10/>

21 OCTOBRE 2017 PAR VLAD

GhanaSat-1 Chef de projet honoré



M. Ben Bonsu (à gauche) reçoit un certificat de Mme Lyn D. Wigbels, agrégée supérieure et professeure adjointe au Centre de recherche sur les politiques aérospatiales de l'Université George Mason. Avec eux, Christophe Bonnal, expert senior de l'Agence spatiale française

La Fédération Internationale d'Astronautique (FIA) a décerné le Prix de la Meilleure Présentation Interactive 2017 à M. Benjamin Bonsu, le leader du projet GhanaSat-1 qui a lancé le premier satellite du Ghana dans l'espace le 7 juillet 2017.

Le prix a été décerné en reconnaissance de sa présentation sur GhanaSat-1 et des activités spatiales en cours au Ghana lors du 68e Congrès international d'astronautique qui s'est tenu à Adélaïde, en Australie, en septembre 2017.

<https://blog.anusstl.com/ghanasat-1-project-leader-honored/>



SpaceX chief Elon Musk gestures as he delivers a speech at the International Astronautical Congress in Adelaide, Australia, Friday, Sept. 29, 2017. Musk's elaborate plan for a mega-rocket to carry astronauts to Mars may have some ... more ▼

Two more cargo missions would follow in 2024 to provide more construction materials, along with two crewed flights. The window for launching to Mars occurs every two years.

For the approximately six-month, one-way trips to Mars, the SpaceX ships would have 40 cabins, ideally with two to three people per cabin for a grand total of about 100 passengers. Musk foresees this Mars city growing, and over time "making it really a nice place to be."

<https://phys.org/news/2017-09-spacex-rocket-moon-mars-ny-to-shanghai.html>

ESPI AT IAC 2017 IN ADELAIDE, AUSTRALIA

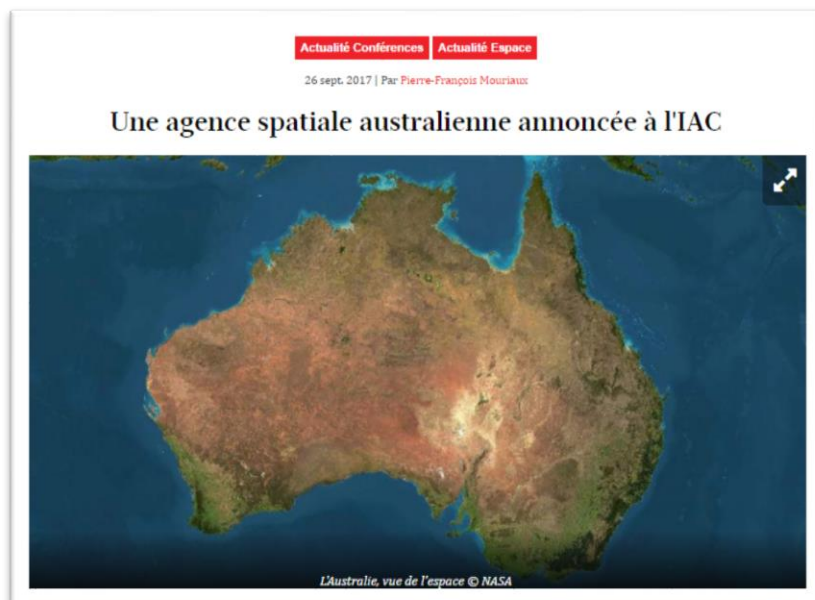
06 October 2017. During the 2017 *International Astronautical Congress*, held in Adelaide from 25 to 29 September 2017, Dr. Serge Plattard, chair the IAF Committee on Space Security, and former ESPI Resident Fellow Alessandra Vernile participated in various technical sessions where the outcomes of ESPI studies were presented. This year ESPI significantly contributed to IAC with a number of papers in various areas:

1. "Looking at the future governance of Galileo" co-authored by Dr. Serge Plattard and Amiel Sitruk, Institut d'Etudes Politiques de Paris.
2. "Space and SATCOM for 5G European Transport and Connected Mobility" co-authored by Dr. Stefano Ferretti, Jean-Jacques Tortora and Hermann Ludwig Moeller and Magali Vaissiere, European Space Agency.
3. "Space education for diplomatic circles" co-authored by Dr. Annette Froehlich and Patricia KHWAMBALA, Cape Peninsula University of Technology, South Africa.
4. "Interregional cooperation on the margin of UNCOPUOS: GRULAC-European space activities" co-authored by Dr. Annette Froehlich and Ms. Riddhi Maharaj, University of Cape Town, South Africa.
5. "The rise of the private actor" authored by Alessandra Vernile.
6. "Understanding India's New Space Potential: Implications and Prospects for Europe" co-authored by Marco Aliberti, David Nader and Alessandra Vernile.
7. "Exploring Governance Frameworks for an Earthquake Early-Warning Future Space-Based System, co-authored by Dr. Stefano Ferretti, Matteo Tugnoli and Alessandra Vernile.

<https://www.espi.or.at/News-Archive/espi-at-iac-2017-in-adelaide-australia>



<http://www.air-cosmos.com/un-super-lanceur-pour-mars-mais-pas-seulement-100951>



<http://www.air-cosmos.com/une-agence-spatiale-australienne-annoncee-a-l-iac-100721>

Ausztrál űrügynökség alakul

2017.09.27 10:15

Ürpolitika

A kormányzati szándékot szeptember 25-én, az Adelaide-ben ezen a héten zajló Nemzetközi Világűrkongresszus megnyitóján jelentették be.

A 68. Nemzetközi Világűrkongresszus (*International Astronautical Congress, IAC*) szeptember 25-én kezdődött és 29-éig tart a dél-ausztráliai városban. A kongresszus idején történő események sorában is kiemelkedő Ausztrália kormányának az a bejelentése, miszerint a kontinensnyi ország űrügynökséget hoz létre. A lépést más hosszú ideje várták, és most lelkesen üdvözölték az űrkutatás és űripár szereplői. Jelenleg még folyik az ausztrál űrkapacitások átfogó felmérése, de a koordinációs és szabályozó feladatokra szánt nemzeti űrügynökség megalapításának szándéka biztos. A pontos időpontról és a szervezet helyéről az ausztrál államigazgatásban egyelőre nem tudni.



Ausztrália egyáltalán nem kezdő az űrtevékenységben. Ez az az ország, ahol 1967-ben már saját műholdat indítottak és állítottak Föld körüli pályára, az űrtörténelemben a Szovjetunió, az Egyesült Államok és Franciaország után negyedikként. (Mivel a francia műhold algériai területről startolt, az ausztrálok szerint övük a harmadik hely, legalábbis ami a saját területéről indított saját építésű űreszköz felbocsátását illeti.) Ötven év elteltével viszont számos állam megelőzte az ausztrálokat, ami az önálló nemzeti űrügynökségük létrehozását illeti – példaként lehet említeni Kazahsztánt, Bolíviát vagy Perut is. Valójában Ausztrália a világ gazdaságilag legfejlettebb államai közül az egyetlen, amely még nem rendelkezik önálló űrügynökséggel.



A 45 kg-os ausztrál WRESAT (Weapons Research Establishment Satellite) ionoszférakutató kísérleti műhold... (Kép: Fairfax Media)

http://www.univis.hu/urpolitika/20170927_ausztrali-urugynokseg-alakul

Musk komolyan gondolja

2017.10.02 07:15

SpaceX, Emberes űrutasítás?

A SpaceX alapítója újabb részleteket árult el az űripari magáncég távlati terveiről az ausztráliai Adelaide-ben tartott Nemzetközi Világűrkongresszuson.

Robert Zubrin, az emberes Mars-utazás alighanem legaktívabb és legmeghatározóbb kortárs támogatója azt a következtetést vonta le Elon Musk 2017. szeptember 29-én tartott előadásából, hogy a SpaceX vezetője valóban komolyan gondolja azt, hogy a 2020-as években – nyilvánvalóan a NASA-val való szoros együttműködés keretében – embereket küld a Mars bolygó vörös felszínére. A YouTube-on élőben közvetített, közel háromnegyed órás előadásában Musk részletesen bemutatta a jelenleg BFR kódnéven futó projektet.



Elon Musk előadása a 68. Nemzetközi Világűrkongresszuson. (Forrás: SpaceX)

A BFR (*Big F... Rocket*, szépen fordítva Nagyon Nagy Rakéta) lényegében a korábban Falcon-XX és MCT kódnevekkel ellátott elképzelések legújabb verziója. Mindenekelőtt abban különbözik a tavalyi, mexikói Világűrkongresszuson elhangzott előadás alkalmával bemutatott MCT koncepciótól, hogy némileg szerényebb méretekkkel és sokkal alaposabban kidolgozott megvalósíthatósági és felhasználhatósági koncepcióval rendelkezik.

Hogyan tovább, ISS?

2017.10.24 07:15

Az Űrállomás és az USA, Az Űrállomás és Oroszország, Az Űrállomás és kontinensünk

Alig született meg minden partner

döntése az ISS 2024-ig történő fenntartásáról, máris szóba került a további folytatás kérdése. Megoszlanak a vélemények, sürgős-e a döntés.

A Nemzetközi Űrállomás (ISS) üzemeltetésében részt vevő szervezetek képviselői az Adelaide-ben megrendezett 68. Nemzetközi Világűrkonferencián (IAC) keretében szeptember 25-én tartott sajtótájékoztatójukon bejelentették, hogy megbeszéléseket folytattak az ISS 2024 utáni sorsáról. Robert Lightfoot, a NASA ügyvezető főigazgatója elmondta, hogy emellett a Deep Space Gateway (DSG, „kapu a távoli világűrhez”) néven előterjesztett tervükről is tárgyaltak, de úgy értékelték, hogy egyelőre semmi sem sürgeti, hogy a két kérdés bármelyikében máris döntéseket hozzanak.

Lightfoot azokra a tanulmányokra hivatkozott, amelyek szerint műszakilag lehetséges az ISS 2024 utáni üzemben tartása. Bejelentette, hogy az IAC idején további megbeszéléseket tartanak, viszont egyelőre nem szükséges határidőket szabni vagy döntési menetrendet felállítani. Utalt arra, hogy az Európai Űrügynökség (ESA) csak a tavaly decemberi Miniszteri Tanács után vállalt véglegesen kötelezettséget részvétele 2024-ig történő folytatására. Igor Komarov, az Orosz Űrügynökség, a Roszkoszmosz vezetője megerősítette, hogy 2024 után is szükség lesz arra, hogy alacsony Föld körüli pályán végezzenek súlytalansági kísérleteket, bár ebben nem feltétlenül szükséges a jelenlegi modellt követni, költséghatékonyabb megoldásokat is kereshetnének. Ugyanakkor Komarov elhatárolódott azon véleményektől, melyek szerint Oroszország 2024 után leválasztaná saját moduljait az ISS-ről, bár elismerte, hogy tanulmányozták ennek a technikai lehetőségét. Hangsúlyozta, hogy az ISS működtetését a jelenlegi partnerekkel kell folytatni.



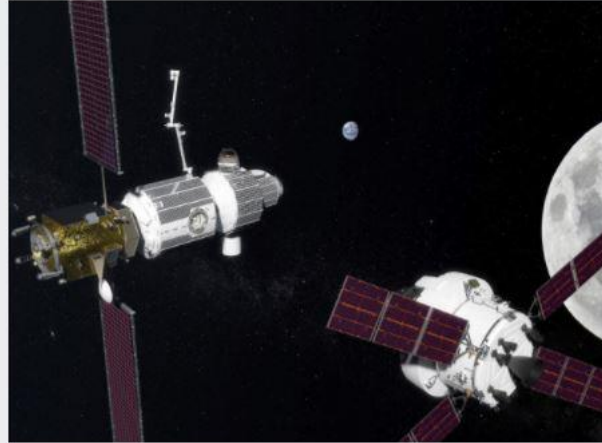
Kapu a távoli világűr felé

2017.10.27 07:15

Úrpolitika, Emberei Mars-utazás?

Körvonalazódik egy, a Hold körül megépítendő űrállomás terve, nemzetközi együttműködésben. A NASA reményei szerint ugródeszka lehet a Mars-utazáshoz.

A Roszkoszmosz Orosz Űrügynökség és a NASA képviselői szeptember végén az ausztráliai Adelaide-ben, a 68. Nemzetközi Világűrkongresszus (IAC) keretében megállapodást írtak alá a két szervezet együttműködéséről a távoli világűr felderítésében. Ez a Nemzetközi Űrállomáson folytatott együttműködésen túlmenően azt is tartalmazza, hogy összehangolják a Hold körüli pályán és a Hold felszínén végrehajtandó küldetések tudományos programját, valamint a Hold körüli térségben létrehozják a Deep Space Gateway (DSG, kapu a távoli világűrhez) nevű platformot.



A Deep Space Gateway a jelenlegi, 2017-es tervek szerint. (Kép: NASA / Wikipedia)

http://www.urvilag.hu/urpolitika/20171027_kapu_a_tavoli_vilagur_fele

宇宙好きのみんなの国際会議は"コミケ"のノリ

世界最大の宇宙会議IAC探訪記・その1



村瀬 裕人

バックナンバー

2017年10月26日(木)

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南オーストラリア産のシラーとメルローの赤ワイン。白はシャルドネ。

そして、ビール派には、地元産のペールエール。

巨大なホールのそこかしこで供されるアルコールと、肉、魚、ベジタリアンフードまでバラエティ豊富なメニューを、食べやすい一口サイズで皿に盛り、給仕するホールスタッフたち。

参加者の服装は、正装にはほど近いけれど、最低限、ジャケット着用くらいの身だしなみで、ざっくりと言って「格式ばらないビジネスの立食パーティ」といった雰囲気だ。

たぶん世界中のどこにいても、こんな集いはある。

ひとつだけ目につく大きな特徴は、ホールの展示だ。



ロケット・マーティンの展示。赤いボールは火星。

(冒頭のグラフで英文表示)

<http://business.nikkeibp.co.jp/atcl/report/16/102400174/102400004/>

「日本のJAXAはとても親切」とUAEの担当者

世界最大の宇宙会議IAC探訪記・その2



川崎 新吾

バックナンバー

2017年10月27日(金)



(前回はこちら→「宇宙好きのみんなの国際会議は”コミケ”のノリ」)



[画像のクリックで拡大表示]

9月25日から29日にかけて、オーストラリア・アデレードで開催された国際宇宙会議「IAC(International Astronautical Congress)」は、84カ国から4500人の参加者を集め、「世界最大の宇宙関連会議」の名の通りの盛況に終わった。

この「会議」には、学術的な場での発表「テクニカル・プログラム」(発表内容は論文化されるか、そうでなくても内容のアブストラクトは公開される)、話題性の高いテーマで企画される「グローバル・ネットワーク・フォーラム」(パネルディスカッションや講演形式のものが多く)といった「座って聞く」ものとは別に、企業や宇宙機関などが自らの活動をアピールする大ホールでの展示がある。

<http://business.nikkeibp.co.jp/atcl/report/16/102400174/102500005/>

日本のロケットベンチャー、国際会議に見参！

世界最大の宇宙会議IAC探訪記・その3



村瀬 裕人

バックナンバー

2017年10月30日(月)

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(前回はこちら→『日本のJAXAはとても親切』とUAEの担当者』)

9月26日の午後、国際宇宙会議IACのテクニカル・プログラムの一つとして、"Small Launchers: Concepts and Operations" (小型ロケット打ち上げ、コンセプトとオペレーション)と題されたセッションが開かれた。



[画像をクリックで拡大画像]

1セッションは2時間、6人の発表者がそれぞれ20分の持ち時間で語る。発表内容は、その後論文として出版されるが、少なくともアブストラクトはウェブ公開されるので、司会者は「では、次のペーパーは……」というふうに紹介することが多い。つまり、学術度が高いプログラムだ。複合的な要素からなるIACでも、展示会が華だとすれば、テクニカル・プログラムは幹といえる。

<http://business.nikkeibp.co.jp/atcl/report/16/102400174/102500006/>

イーロン登壇で大熱狂、「ええもん見たなあ！」

世界最大の宇宙会議IAC探訪記・その4



村瀬 裕人

バックナンバー

2017年10月31日(火)

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(前回はこちら→『日本のロケットベンチャー、国際会議に見参！』)



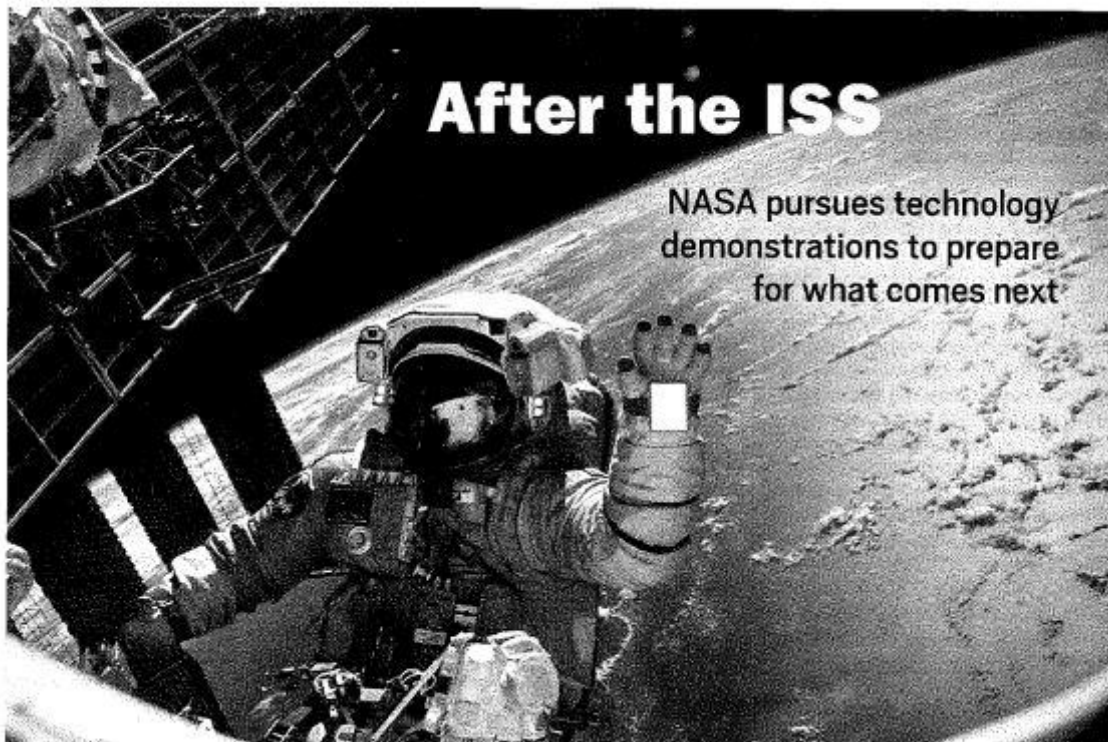
イーロン・マスク オンステージ！

[画像をクリックで拡大画像]

アデレードで開催されたIAC(International Astronautical Congress, 国際宇宙会議)2017にて、閉会前日の9月28日の夜7時すぎ、運営側からすべての参加者に対して一斉メールが送られた。

<http://business.nikkeibp.co.jp/atcl/report/16/102400174/102600007/>

SPACE



After the ISS

NASA pursues technology demonstrations to prepare for what comes next

Irene Klotz Adelaide, Australia

Ask NASA when it plans to end the International Space Station (ISS), and the answer comes back not as a date but as a list of technology demonstrations that need run time in low Earth orbit so engineers can build a safe and reliable crew transport to Mars.

The flight tests cover the gamut of life support, logistics, environmental monitoring and human health technologies aboard the station today—everything from how to extract water from concentrated urine brine, build small but effective resistance exercise machines, and develop fire extinguishers to replace carbon dioxide systems.

"If you try to put out a fire in the small Orion spacecraft with CO₂, you're going to asphyxiate the crew. The CO₂ level is going to be too high," Robyn Gatens, deputy director of the ISS Division at NASA headquarters, said during a presentation at the 68th International Astronautical Congress here.

The path forward in fire suppression—namely the development of nonhazardous water-mist systems—also provides a glimpse into NASA's post-ISS operations in low Earth or-

bit (LEO), when the agency buys what services it needs from commercial companies. After delivering cargo to the station, for example, Orbital ATK's Cygnus capsules serve as host vessels for NASA experiments that test fire detection, suppression and safety gear. During future missions, Cygnus resupply vehicles also may be repurposed for microgravity science experiments away from the station. Before atmospheric reentry and incineration, the capsules would redock at the station so the samples can be removed.

"That's a way to sneak into stations of the future without having to actually build a facility in space," says William Gerstenmaier, NASA associate administrator for Human Exploration and Operations. "The idea is to use [the ISS] to leverage all that, actually let companies see what they can do to generate revenue, see what markets can materialize."

"We're seeing early indications of that now," Gerstenmaier tells Aviation Week. "I don't know if it will be there by 2024... but that's some of the criteria that goes into how long we keep [ISS] operational."

NASA is due to report to Congress in December on its post-ISS plans. Gerstenmaier says he would like a

NASA and its partners are firming up plans for collaborative ventures beyond the International Space Station.

decision in 2018, or 2019 at the latest, about how long the ISS will fly. For now, "we're trying to stay a little bit out of the discussion of a date for when station ends, [focusing instead to] describe the transition criteria and what we need in the future."

The ISS may not end as all one piece, he adds. "We can look at deconstruction: taking some pieces off. Some things are still functional. They still have value.... We're being very creative in that arena."

The U.S., Russia, European Space Agency (ESA), Japan and Canada, which jointly own and operate the station, have agreed to fund the orbiting laboratory until 2024, although some of the long-duration life-support, environmental-monitoring and crew health systems being developed by NASA and the partners will need testing beyond that time frame.

Keeping the station in orbit beyond 2024 is one option. Flying on potential commercial outposts is another. "There is not going to be the replacement for the ISS: There will be many

replacements for the ISS," says David Parker, director of human spaceflight and robotic exploration at ESA.

"I am not a fan of extending the station to 2028," adds former NASA Administrator Charles Bolden. "The private sector loves it. Those who are doing investigations on-station love free transportation to low Earth orbit. They love free room and board. That is not a viable, sustainable LEO environment. That's a government environment," he avers.

"We need to have multiple platforms. Some are human-tended, some are human habitats," Bolden tells *Aviation Week*. "You want to be able to put modules at different places for whatever the type of research is that you want to do. They should be autonomous, be able to operate and sustain themselves for long periods of time. And that allows ISS to go away."

NASA is testing an experimental expandable habitat developed by Las Vegas-based Bigelow Aerospace, which intends to parlay the prototype

into free-flying and lunar-based stations staffed by its employees and occupied, on a timeshare and contract basis, by paying customers including government agencies, research organizations, companies and tourists.

Bigelow, Houston-based Axiom Aerospace and other companies also are eyeing an ISS docking port on the front end of Node 2 that NASA intends to make available for commercial use. "We have one that we can provide a significant amount of power and data to," Gerstenmaier says. "We're thinking about how we best utilize that ... what kind of competition we need, how we put that together ... to really leverage and expand commercial industries."

While nurturing the nascent low-Earth-orbit industry, NASA's primary focus is getting the equivalent of four racks' worth of equipment up and running on-station for testing, so engineers can determine which systems to include in the planned Deep Space Gateway—a small outpost slated to be put into an elliptical lunar orbit be-

ginning with the second flight of the Space Launch System (SLS) rocket in the 2023-24 time frame. The first piece of the gateway to launch would be the power propulsion element. "Within one or two flights [of the SLS] it will be complete," says station program director Samuel Schimemi.

The gateway, in turn, is intended as an assembly site and proving ground for a proposed Deep Space Transport, which NASA would like to have ready for a crewed, yearlong shakedown mission beginning in 2029. Completion of the demo run in 2030 could position NASA and partners to send astronauts into Mars orbit for the first time in 2033.

"That gateway is the stop along the way at the Moon, where we want to test things out," acting NASA Administrator Robert Lightfoot says. He notes it is a vantage point that "gives you a lot of options, and there is a lot of opportunity for international partners to participate in that arena." He says it has been the next logical step for a long time. ☐

Elon's Big Gamble

Iconoclastic SpaceX CEO wants to scrap Falcon rocket line to fund his Mars dream

Irene Klotz Adelaide, Australia

SpaceX founder and CEO Elon Musk says he has fixed a fatal flaw in the interplanetary space transportation system unveiled during last year's International Astronautical Congress (IAC)—namely, how to pay for it.

The 46-year-old tech entrepreneur now plans to phase out his company's successful Falcon rockets and Dragon capsules in favor of a reusable, two-stage, multipurpose super-heavy-lift launcher that not only can take on the

distance transportation," commented U.S. Transportation Secretary Elaine Chao, a member of the council.

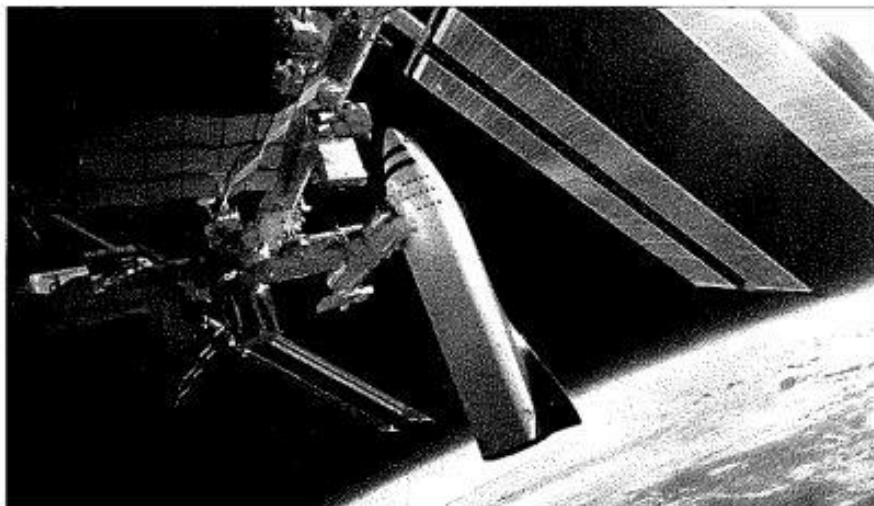
Ultimately, Musk intends for the BFR to render its current line of rockets and spaceships obsolete. "This was really quite a profound realization that if we can build a system that cannibalizes our own products... then all the resources—which are quite enormous—used for Falcon 9, Heavy and Dragon can be applied to one system," Musk said during a 45-min. presentation at this year's

"I know at first glance this may seem ridiculous," says Musk. "But it is not. The same is true of aircraft. If you bought, a small, single-engine turboprop aircraft, that would be \$15-2 million. To charter a [Boeing] 747 from California to Australia is half a million dollars, there and back. The single-engine turboprop cannot even get to Australia. So a fully reusable, giant aircraft like the 747 costs a third as much as an expendable tiny aircraft. In one case, you have to build an entire aircraft; in the other, you just have to refuel something."

"It is really crazy that we build these sophisticated rockets and then crash them every time we fly," he adds. "Often I'll be told, 'but you could get more payload if you made it expendable.' I said yes, you could also get more payload from an aircraft if you got rid of the landing gear and the flaps and just parachute out when you got to your destination. But that would be crazy, and you would sell zero aircraft."

Luxembourg-based SES, the first commercial satellite operator to fly on a Falcon 9, and the first customer for a

SpaceX's planned super-heavy-lift, multipurpose replacement for Falcon rocket and Dragon capsule at the International Space Station.



SPACEX CONCEPT

satellite delivery and station resupply flights that keep SpaceX financially viable but also fly crews and cargo to the Moon and Mars. The system, called the BFR (originally an acronym for big f***ing rocket, but recently renamed to the more politically palatable "Big Falcon Rocket") also could be used for suborbital, point-to-point travel between destinations on Earth.

Earth hops are "some of the first [BFR] tests that you will actually see," SpaceX President Gwynne Shotwell said during the Oct. 5 debut meeting of the reconstituted National Space Council, which is staffed by members of the Trump administration Cabinet and headed by Vice President Mike Pence.

"That sounds like something that would completely... revolutionize long-

IAC, which was held here Sept. 25-29.

"Some of our customers are conservative, and they want to see BFR fly several times before they're comfortable launching on it. So what we plan to do is to build ahead and have a stock of Falcon 9 and Dragon vehicles.... If they want to use the old rocket and old spacecraft, they can do that," he added.

Since debuting in June 2010, Falcon 9 rockets have launched more than 40 times. The Falcon Heavy, which extends the fleet's lift capacity to low Earth orbit (LEO) to 140,650 lb., from 50,265 lb. (22,800 kg), is due to fly for the first time before the end of the year. The BFR, in contrast, has a lift capacity to LEO of 330,000 lb., admittedly overkill for the communications satellites and other payloads needing rides into orbit today.

previously flown booster, said it would assess the BFR for future launch services, as it would any rocket. "SES's position is to constantly review the various launch systems available to it," says Martin Halliwell, SES chief technology officer. "The SpaceX Falcon 9 has proven itself in both expendable and flight-proven modes. The BFR is a completely new system with completely different levels of capability, so we will have to assess the fit once again for our requirements."

With 29,135 ft.³ (825 m³) of pressurized volume for cargo and a vehicle diameter of nearly 30 ft. (9 m), the BFR could be a game changer for satellite design, Musk notes. "You could send a mirror that has 10 times the surface area of the current Hubble [telescope] as a single unit—doesn't have to unfold or anything. You do whatever you like," he says.

The BFR, powered by 31 methane-fueled Raptor engines, is a scaled-down design of the 42-engine Interplanetary Transit System (ITS) Musk unveiled last year. "We were really

searching for... how [to] pay for this thing. We went through various ideas. ... These did not pan out. But now we think we have a way to do it, which is to have a smaller vehicle—still pretty big—but one that can do everything that's needed in the greater Earth-orbit activity."

For Mars transport, the BFR's cargo area would be configured into 40 cabins, each housing four to six people, with a central storage area, galley, solar storm shelter and entertainment area. Musk would like to fly two BFRs unmanned in 2022, followed by two more unmanned and two manned missions in 2024, when Earth and Mars are again favorably aligned. "The goal of these initial missions is to find the best source of water... and build the propellant plant," says Musk.

The BFR also could play a role in NASA's post-International Space Station plan to put a small base into orbit around the Moon to support lunar surface activities and serve as a testbed for technologies needed to send humans to Mars. For lunar sorties, the BFR would not need in situ propellant production.

A few hours before Musk's presentation, Lockheed Martin rolled out its design for a Moon and Mars lander, one that would stick with hydrogen for fuel, rather than methane. "The primary reason is just efficiency," although some engineering still needs to be done to figure out the best way to chill the hydrogen, says Rob Chambers director of Lockheed's human spaceflight strategy.

Another reason for using hydrogen is the ubiquity of water. "When you start looking at orbital missions at the beginning of exploration, water is everywhere, but methane is not and carbon dioxide is not," he says.

For now, Lockheed, like SpaceX, is self-funding its vehicle concept, with an eye toward competing for potential NASA commercial services contracts for deep-space cargo and supplies deliveries, a venture that also has caught the attention of Jeff Bezos's space company, Blue Origin.

"We—the human race—need all the best ideas brought forward," says Chambers. "Even the most radical ideas possible get us all out of our comfort zone and get us thinking." ☐

Check 6 Aviation Week editors discuss the blizzard of recent space developments: AviationWeek.com/podcast

Simple, Robust

Japan's LE-9 space launch engine has passed a first series of tests

Bradley Perrett Adelaide, Australia

Japan climbed a technological mountain in developing the main propulsion system for its H-II space launcher series in the 1980s and '90s, producing an engine of difficult configuration that was comparable with the best that had been achieved for NASA.

Then Japan climbed down from that mountain. Launching development of an engine for an H-II successor in 2014, the Japan Aerospace Exploration Agency (JAXA) decided that the remarkable efficiency of the old launcher's first-stage propulsion technology, also used by the space shuttle, was not worth its production cost. So JAXA and prime contractor Mitsubishi Heavy Industries (MHI) are now clambering up another technological peak, developing the largest engine so far of a configuration that offers simplicity and low cost but was previously regarded as suited only to small sizes.

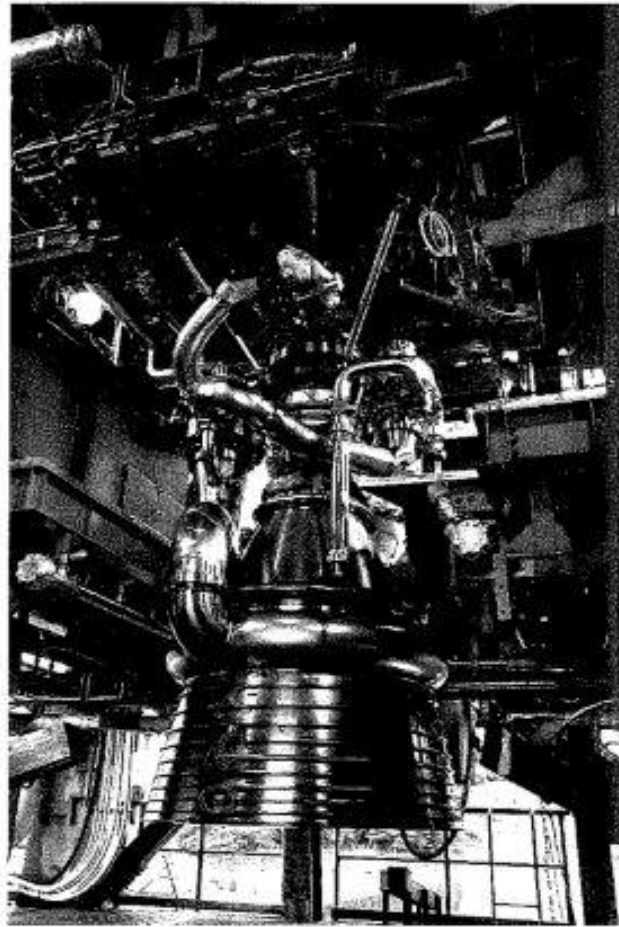
This engine, the LE-9, has performed successfully in a first series of hot-fire tests, JAXA and MHI reported to the International Astronautical Congress, held here on Sept. 25-29. It is intended to power the first stage of the forthcoming H3 launcher.

Two more series of tests for the hydrogen-burning LE-9 engine are planned: one for qualification and one for verifying modifications to cut

costs. The LE-9 and H3 launcher, successor to the current H-IIA and H-IIB, are due to fly in the fiscal year beginning in April 2020.

"The engine characteristics are mostly within predicted variations," says Akihide Kurosu, a senior engineer of the H3 project at JAXA, reporting on the first series of tests.

The LE-9 features the expander-bleed process for pumping propellant into its combustion chamber. Engines of that type use heat from the main combustion chamber to expand a little of their hydrogen fuel and use it not for burning but to drive the propellant turbopumps. This fraction of the fuel, also a coolant, is eventually bled—dumped overboard.



The LE-9 has undergone the first of three planned series of tests.

But the configuration is difficult to scale up, notably because transferring enough energy into the coolant hydrogen demands a long, almost pipelike combustion chamber with a large surface area. To get the most out of the extracted energy that can be drawn from that surface, the turbine needs to be highly efficient.

Conducted in April-July, the first series of tests was intended to assess the LE-9 in static and transient conditions, the latter covering startup, throttling and cutoff. Engineers also used the test series to initially verify a system of feedback, or closed-loop, control that should cut unit costs. Eleven firings were done at JAXA's Tanegashima facility, which also will be the launch site.

"There is no problem about combustion stability," program engineer Masaki Adachi of MHI told the International Astronautical Congress. Achieving combustion stability was the biggest concern before the tests, he says. The

second-biggest was achieving a satisfactory starting sequence, according to Kurosu. There was success there as well.

The LE-9 has been tested to above 225,000 lb. thrust. Designed output is 330,920 lb. JAXA and MHI plan that four versions of the H3 will variously mount two or three LE-9s in their core first stages and zero, two or four solid-propellant boosters derived from the first stage of the Epsilon space launcher.

The duration of firings of the LE-9 this year worked up to 78 sec. from the initial 2.6 sec. The engine was throttled down in three of those tests, including the final one, in which feedback control was demonstrated. The tested degree of throttling was from 90% thrust to 70%. Cutoff also was stable, with no continued burning, Adachi says.

A key objective of the H3 program is to deliver launch services at half the cost achieved with the H-IIA. The cost

of an H-IIA launch is undisclosed but is probably at least ¥10 billion (\$88 million). The LE-9 engine should cost only a little more than half as much as the LE-7A main engine of the H-IIA and H-IIB.

The LE-7A was the previous but overly expensive technical masterpiece of JAXA and MHI, featuring the unusually difficult combination of hydrogen fuel and the staged-combustion arrangement for driving propellant pumps. The result was a vacuum specific impulse—comparing thrust with the rate of fuel consumption—of 440 sec., comparable to the 452 sec. of the similarly configured space shuttle main engine. The LE-9's specific impulse should be 425 sec., still far higher than can be achieved with the most common space launcher fuel, kerosene.

Feedback control is intended to contribute to savings by eliminating a process of adjustment that would oth-

erwise have to be made on each unit during acceptance trials. It will do so by automatically meeting the specification for mixture ratios at various thrust settings, Kurosu says.

The first series of tests confirmed this function only by using sensors in the test facility, rather than with the onboard sensors that production engines will use. Each production unit, and two intended for qualification testing, will incorporate not just the usual pressure sensor in the combustion chamber for determining thrust; there also will be a sensor in the propellant lines that determines whether pressure is above, below or at the value that corresponds to the correct mixture. If the level is wrong, the engine automatically adjusts.

This should eliminate the usual lengthy acceptance process of testing each engine for mixture at various thrust levels, changing orifices as a physical adjustment, and repeating

the cycle, perhaps many times, until the unit meets the specification. Space launcher engines go through that process because of variations in manufacture.

The H3's second-stage engine is the LE-5, also used on the H-IIA and H-IIB but slightly improved. It is also an expander-bleed engine.

The technology is becoming something of a Japanese specialty, one that JAXA and MHI engineers see as highly suitable for reusable space launchers. Lacking the troublesome complication of upstream combustion to drive the turbopumps, an expander-bleed engine is inherently robust.

So an engine of this type will be used in a testbed reusable sounding rocket that is due to fly in the fiscal year beginning April 2018, with the aim of demonstrating vertical landings and 24-hr. turnarounds. These capabilities could later be applied to the first stage of a space launcher. The

testbed, RV-X, is 7 m (23 ft.) long and has a liftoff weight of 3 metric tons (6,600 lb.). Its single engine is designed to be used 100 times.

The tests will focus on fault-tolerance, vertical takeoff and landing and aerodynamic guidance and control, MHI researcher Kotaro Aoki told the conference, which was organized by the International Astronautical Federation.

An initial round of tests, including at least five flights, is intended to take the RV-X to an altitude of 100 m and show that it can fly again within 24 hr. using only simple ground facilities and make an emergency landing in case of fault. Higher altitudes will be attempted in a second series of tests. The evaluations should be completed in fiscal 2019.

A team of 10 to 20 people has been looking at conceptual design of a reusable launcher, say Akihiro Sato and Yusuke Suzuki, the heads of H3 development at MHI and JAXA, respectively. ☐

Damage Limitation

Long March 5's problems do not extend to other Chinese launchers

Bradley Perrett Beijing and Adelaide, Australia

Chinese space engineers have identified the fault that caused the failure of the second flight of their country's largest space launcher, Long March 5, a problem that appears to be pushing back the mission schedule by about a year.

The cause of the failure was simply a manufacturing defect in one of the two YF-77 hydrogen-burning engines of the core first stage, says a source close to the Chinese industry. The fault was quickly pinned down, says that source, who adds there was nothing wrong with the design and the problem should be easily addressed.

Although the cause of the failure has been found, several months of verification work will be needed, says another source familiar with the program. That suggests that Long March 5, which first flew in November 2016, cannot be used again this year.

Isolating the fault to the YF-77 is particularly important because it means the failure has no implications

for other Chinese space launchers; Long March 5 is the only launcher to use the YF-77. The national space program would be facing a far greater problem if one of eight YF-100 kerosene-burning engines in the rocket's boosters had caused the launch failure, and especially if some inherent shortcoming in the design of those powerplants were to blame. Both possibilities were conceivable when the state media tersely announced on the day of the flight that the mission had not succeeded (*AW&ST* July 10-23, p. 20).

The YF-100 is the main engine of two other Chinese rockets that have entered service in the past two years, Long March 6 and 7, both smaller than Long March 5. The beginning of full-scale development of another, Long March 8, is imminent; it will also use the YF-100 as its main engine. Under-scoring the blamelessness of the kerosene engine, another flight for Long March 6, its second, is scheduled for this year, says a third source.

Regardless of the serviceability of other launchers, Long March 5's unavailability is enough to cause considerable delays for the national space program, because no other rockets can undertake some of its missions. The next lunar mission, Chang'e 5, will be pushed back a year, for example. It will be flown at the end of 2018, Tian Yulong, secretary general of the China National Space Administration, said at the International Astronautical Congress, held in Adelaide, Australia, Sept. 25-29.

Chang'e 5, planned to bring a lunar sample back to Earth, was previously scheduled for the end of 2017. Because the spacecraft is larger than those that China has previously sent to the Moon, it requires a Long March 5.

Describing the Long March 5 failure as a major challenge to the space agency, Tian says the timing of the Chang'e 4 mission will also be adjusted. The reason is not clear. The spacecraft for that mission, smaller than Chang'e 5's and developed from the one used for the Chang'e 3 mission of 2013, will presumably be carried by a Long March 2F to the Moon. Long March 2F is a long-established launcher used by previous Chinese lunar probes, quite unrelated to the technology in Long March 5 and therefore never under suspicion following the July launch failure.

Launching Martian Hope

Nascent United Arab Emirates space program aims to launch orbiter to red planet in 2020

Irene Klotz Adelaide, Australia, and Cape Canaveral

Mohammed al-Ahbab, director general of the three-year-old United Arab Emirates (UAE) Space Agency, had some advice for Australia after this year's International Astronautical Congress (IAC) host announced it would establish a national space agency.

"It is important to focus on the future rather than going back to classic-era space programs," he said. "And

conference, is to have a sustainable presence.

"We are not looking at launching an astronaut for a week or launching a tourist flight," he said. "We are looking at a program that is based on science."

As a first step, the UAE is building a satellite to study the Martian climate and atmosphere. The orbiter, known as Hope, is scheduled to launch in the summer of 2020 aboard a Mitsubishi

ing to fly a microsatellite outfitted with a terahertz sensor to study molecules in Mars's atmosphere.

By the time Hope reaches Mars, the UAE expects its first group of astronauts to be well along with training for flight. A call for astronauts will be going out by the first quarter of 2018, and the agency anticipates selecting four to six astronauts by early 2019. The first would fly before the end of 2021, aboard other countries' rockets. By then at least two U.S. companies, SpaceX and Boeing, expect to be offering commercial low-Earth-orbit flights, along with Russia and China.

The UAE's first government-backed

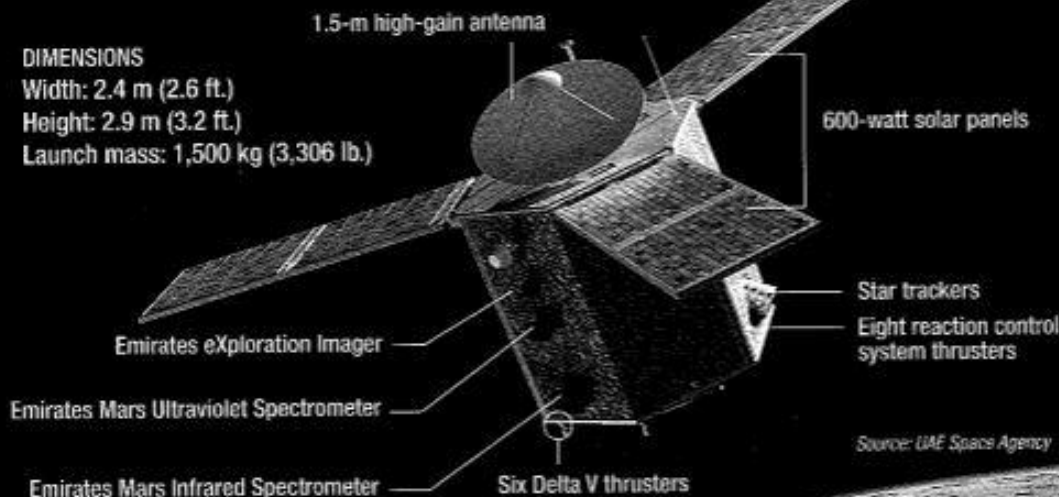
Emirates Mars Mission Hope Spacecraft

DIMENSIONS

Width: 2.4 m (2.6 ft.)

Height: 2.9 m (3.2 ft.)

Launch mass: 1,500 kg (3,306 lb.)



Source: UAE Space Agency

have a niche... because competition is very hard in space."

The UAE practices what it preaches. With the founding of its own space agency in 2014, the country unveiled plans for a Mars orbiter, scheduled to launch in 2020. In September, it took its first step toward a 100-year goal of being part of a Mars colony by putting aspiring young pilots, engineers and scientists on notice that the agency would begin staffing an astronaut corps next year.

The goal, Salem Humaid al-Marri, assistant director general of the Mohammed Bin Rashid Space Center in Dubai, said during an IAC panel discussion on Sept. 28 at the Adelaide

Heavy Industries H-IIA rocket and arrive at Mars in 2021.

The UAE has ample opportunities to build space partnerships. Hope is among a half-dozen or so spacecraft aiming to launch during the 20-day 2020 period when Earth and Mars are favorably aligned for interplanetary flight. NASA and the European Space Agency are both landing rovers to look for signs of past life. China plans to fly an orbiter, lander and rover to study the Martian environment, topography, atmosphere and internal structure. India intends to follow up its pioneering and ongoing Mars Orbiter Mission with a second orbiter and perhaps a lander and rover as well. Japan is look-

satellite, a remote-sensing spacecraft called DubaiSat-1, was launched in 2009; DubaiSat-2 followed in 2013. Both were built in partnership with South Korea's Satrec Initiative. A third satellite, KhalifaSat, scheduled for launch next year, is being built in-house.

The technological progress illustrates what the UAE says is among its prime motivators for investing in space: creating a new generation of pioneers and scientists who are able to lead the country toward a promising future.

"It is very important to invest in a space strategy and a space plan," says al-Ahbab. ☐