Supporting the missions of over 200 satellites

The CGI Space Story

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Launching anything into space takes a lot of clever people and a lot of hard work. It took just under half a million people working on the Apollo missions to send man to the moon. Less than 10% of these people were directly employed by the National Aeronautics and Space Administration (NASA); the rest were a vast army of suppliers, contractors and subcontractors, all working together towards a shared goal.

Now, we were born the same decade man first walked on the moon so we can't really claim a role in that mighty accomplishment. However we are very proud of the role we've had in the space industry's success ever since. Here, we'll take you on a whirlwind history lesson on advances in space and our role in them.

In the beginning:

Opinion is divided as to when the space industry actually began.

History generally dictates that it was in 1957 when the Soviet Union launched Sputnik into orbit.

But the space industry, perhaps through its love of a celebration, has been marking 50th anniversaries for several years now, whether that is through country milestones, or specific mission achievements.

It was the 1960s that was the golden decade for human spaceflight with the Apollo missions to the Moon. As well as the phenomenal advances being made on the planetary exploration front, similar advances were being made in applications with the launch of the world's first spy satellite, the world's first navigation satellite, and the world's first proper weather satellite all launching in 1960, behind the scenes. Several other 'world firsts' swiftly followed during the decade – the first telecoms satellite (Telstar 1962), the first geosynchronous satellite (Syncom 1963) and the first commercial communications satellite (Intelsat -1 – 1965).

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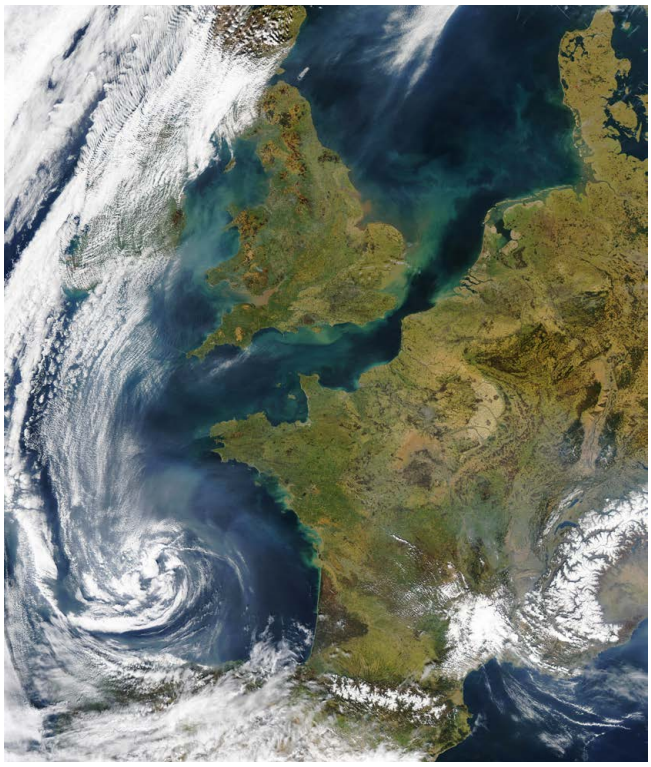
1970s:

A journey of a thousand miles begins with a first step

In the 1970s things really started to gather pace with yet more space “world firsts” being achieved, and various countries initiating their own space programmes.

This was the decade that saw CGI’s initiation into the space industry with its first contract being awarded, for satellite navigation, in 1970 with European Space Research Organization (ESRO), the precursor of European Space Agency (ESA), and another in 1974 for mission control. The relationship with ESA continues to this day, with our experts working alongside ESA and its contractors on spacecraft operations and ground control systems, and applying conventional information technologies (such as networking, cloud, or knowledge management) to the unique needs of space users.

Throughout the course of the decade, Europe was working towards launching its first weather satellite Meteosat and as part of this we were a major member of the various industrial consortia that developed the ground infrastructure.



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1980s:

The building blocks for growth

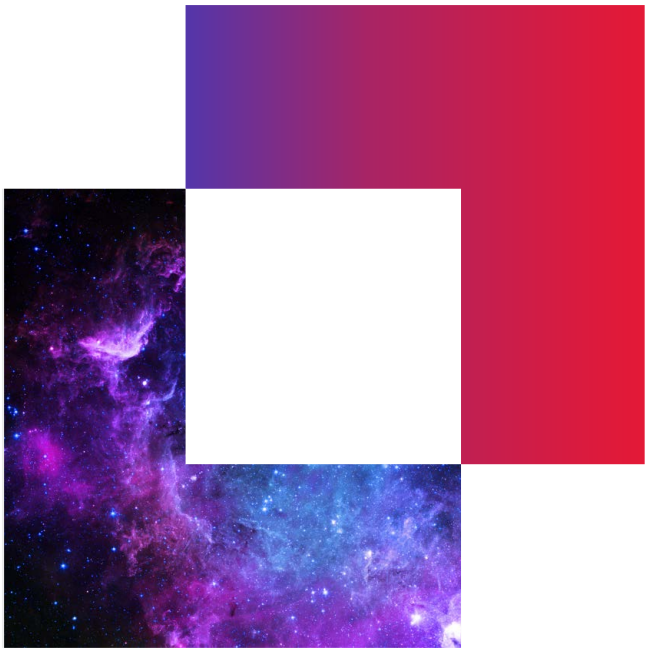
In the decade that Spain, Portugal and Greece joined the European Commission, the Berlin Wall came down, and computers looked a bit like this...

... the space industry kept up the momentum.

In 1986, Halley's Comet put in one of its 'once in a lifetime' appearances (its next is in 2061) to be met by several probes, among them ESA's Giotto. Giotto was ESA's first ever deep space mission and we supplied its ground-based mission control software and designed some of the onboard digital logic.

Interestingly, the 1980s also saw the first ever space mission dedicated to charting the positions of the stars. ESA's Hipparcos satellite successfully pinpointed over 100,000 stars. We performed several roles in the mission, both before and during its four year orbiting life – we built the mission simulator used to fine-tune the design of the satellite and we provided ground control systems and on-board software.

Perhaps the most significant development for CGI was our re-engineering of the mission control systems we had developed for ESA for the commercial market – initially for the Paris-based Eutelsat organisation. The control system we supplied began by managing two satellites and expanded painlessly to cope with almost 20 satellites a decade later.



Did you know?

Every Ariane rocket is monitored closely to check it is on-track. CGI supplied the computer system that alerts the Red Button operator that the "destroy" command must be sent and thereby avoid the danger of an off-course rocket falling on inhabited areas. So far it has only given the alert once!

1990s:

To boldly go...

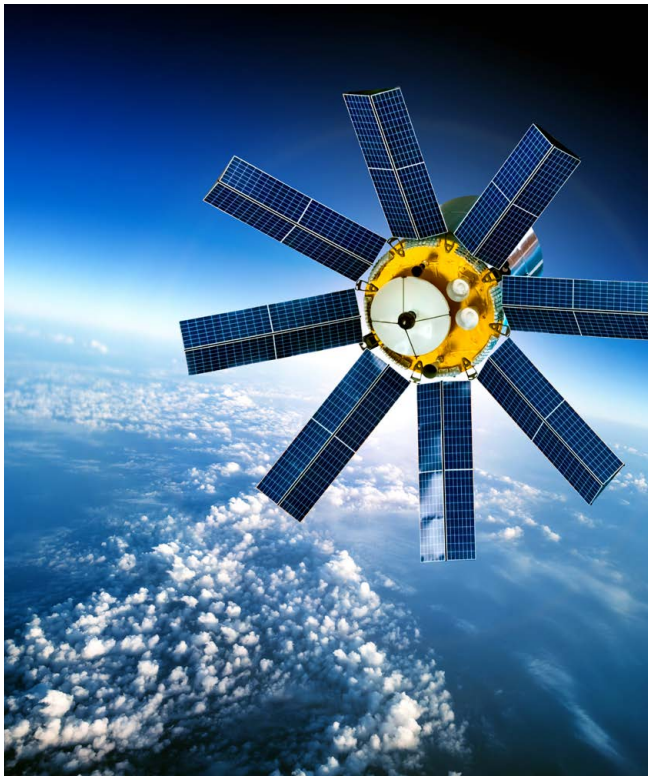
Having covered over three decades of history already, it may surprise you that Hubble has still not been launched and we still don't have the Global Positioning System (GPS) signal that is now in widespread use among military, civilian and aviation communities.

These two achievements happened in the 1990s. In the case of GPS however, it was still only accurate to about 40 metres for civilians until the turn of the century.

For CGI, two of the highlights of the 1990s were space science missions, for example, much of the decade was spent preparing for the 1997 launch of Cassini-Huygens. CGI designed all the software onboard the Huygens probe that would operate it when it reached its destination – Titan, one of Saturn's moons – seven years later in 2004. Continuing the science theme, the decade also saw the launch of XMM Newton – Europe's largest scientific satellite to date – with CGI supplying payload monitoring and mission control software.

The 1990s was also a great decade for earth observation with ESA launching the ERS1 and ERS2 remote sensing satellites, with some support from CGI of course! These two satellites were the most sophisticated Earth observation spacecraft Europe had ever developed, and they collected a wealth of vital data about Earth's oceans, land surface and polar caps. They were also used to help monitor natural disasters including flooding and earthquakes in remote parts of the world.

CGI also supplied key elements of the computer infrastructure that enabled European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) to take over from ESA as the operator of Europe's weather satellites – our systems process the images and extract information such as wind speeds in real-time. We then provided similar real-time image processing systems to Japan for that country's new generation of weather satellites.



2000s:

Helping make space more secure

In Europe, the start of the new millennia also marked the start of the Galileo programme.

After a politically stormy outset, the first two satellites – Giove-A and Giove-B – were launched in 2005 and 2008 respectively to provide in-orbit validation.

Our first contract in the Galileo programme came in 2002 when we partnered with Surrey Satellite to show how their small satellites could provide a viable navigation service. This led in due course to Surrey being selected to supply the first European navigation satellite, Giove-A, and the payloads for 22 of the 26 operational Galileo satellites. Work swiftly gathered momentum and in 2004 we were appointed prime contractor for design of the ground segment, covering the ground infrastructure that controls 30 satellites. We are now implementing major parts of the ground infrastructure including the real-time system to manage the satellites in space and major security facilities. Our security role is valued at over €100 million and includes delivery of systems to manage encryption keys and to support the political agencies that operate Galileo. We are also providing security consultancy to the European Commission (which owns Galileo) and to the main industrial contractors.

Of course Galileo wasn't the only satnav show in Europe during the Noughties. We also saw Europe's very first satnav programme, European Geostationary Navigation Overlay Service (EGNOS), go live. EGNOS acts as an overlay service to GPS making it fit for use in safety critical applications such as landing planes. Our role was, therefore, particularly crucial since we provided the system that validates the integrity of the GPS signal.

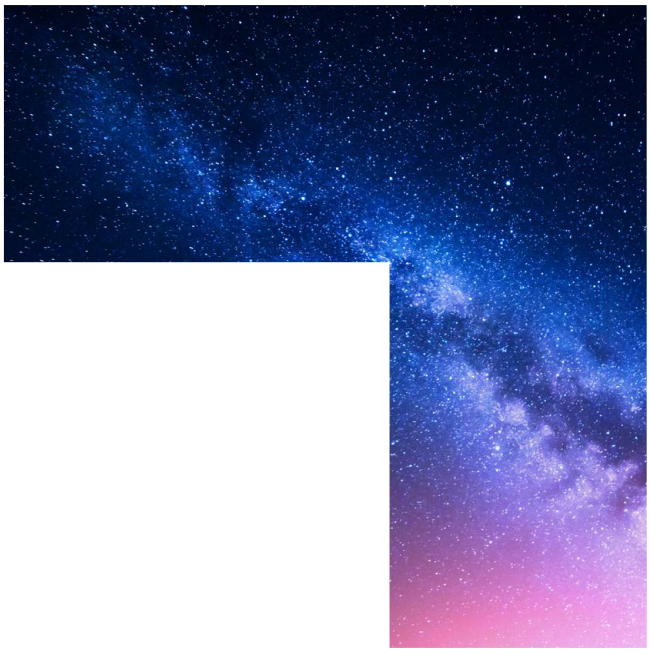
The turn of the century also marked a significant ramping up in our military space business, after we entered the Skynet Enterprise team in 2002, tasked with building the Skynet 5 programme for the UK Ministry of Defence. Our role was to develop and operate the management systems for the constellation, covering corporate management, network management and applications management – a €150 million role that saw us write over 2 million lines of code! Ten years and three satellite launches later, Skynet 5 is regularly held up as a best practice example of public private partnership.

Did you know?

Our client list is a "Who's Who" of the space industry, including European Space Agency (ESA), European Commission, EADS Astrium, EUMETSAT, Eutelsat, Inmarsat, SES and Thales Alenia Space.

Today:

Continuously adding value to space



Today, our space business is based in nine different countries and CGI operates from 40 countries across the world.

We can provide the right people, at the right place at the right time to deliver technology for space programmes efficiently and effectively.

Three programmes we are working on at present illustrate the value we are currently bringing to the space sector:

1

Meteosat Third Generation (MTG)

A new generation of Europe's weather satellites, called MTG, are being built right now, with the first due to be launched in about 2017. The information content of MTG data has grown enormously compared to the previous generation, requiring processing and storage facilities on the ground about 1000 times more powerful than before. We have been helping EUMETSAT to define the technologies and architecture of the required groundbased facilities costing €100 million or more, and we expect to be involved in developing and rolling out those facilities over the next few years. Cloud-based storage and real-time multi-processor configurations are among the technologies being considered. MTG will also require state of the art facilities to monitor and control the six MTG satellites, a natural follow-up to the system we have installed for Europe's 30 Galileo navigation satellites.

Today:

2

Climate and Environmental Monitoring from Space (CEMS)

Climate change takes the form of trends in temperature, sea height, ice cover, and other worldwide phenomena that are very difficult to measure in the presence of natural variation. For example, sea height is rising at 3 millimeters per year against a backdrop of daily tidal changes of several metres, while temperature has risen by less than 1°C in the past half-century against seasonal variations of 20 times that.

The CEMS facility is being installed (with CGI in a leading role) near Oxford in the UK and will be dedicated to ensuring that climate information is correct and credible. Data will be processed to stringent specifications, and configuration control of all processing of the data will be rigorously applied –making it easy to perform due diligence on the information. We expect the CEMS facility to attract major programmes of climate-related work over the coming years, involving climate groups across Europe and beyond. CGI in the UK and Norway is already helping the European Space Agency to identify the processing needed to provide sea level and sea ice information of the quality needed by climate scientists.

3

Galileo security

The core infrastructure of the Galileo satellites and the associated ground facilities will be in place within a few years. A whole new group of programmes will now begin that build on that infrastructure aimed at delivering positioning services to end user communities across Europe. One such group of programmes will involve a set of facilities in each European country required to authorise and manage the users of the Galileo controlled access service (the so-called Public Regulated Service, PRS).

We have been helping the European Commission to define what is required, and has also been assisting some of the countries to assess how PRS will be managed. PRS is expected to be preferred by users requiring extreme reliability and resilience, such as emergency services and transport. With almost €200 million worth of Galileo contracts logged to-date, involving our staff in eight countries, we expect to double that order value over the next ten years while assisting governments and user communities to maximise the benefit of Galileo.

When people within the industry describe the space industry, they often use the concept of a value chain.

At one end of the value chain we have the ‘upstream’. This essentially means the activities that develop space assets or hardware and get them operating in space.

At the other end, we have the ‘downstream’; which is the term used to describe what happens with all the data being generated by the upstream assets. So this might include GPS data being used in your mobile phone or car, satellites being used for military communications, broadcasting, monitoring the earth’s health and so on.

How we can help you...

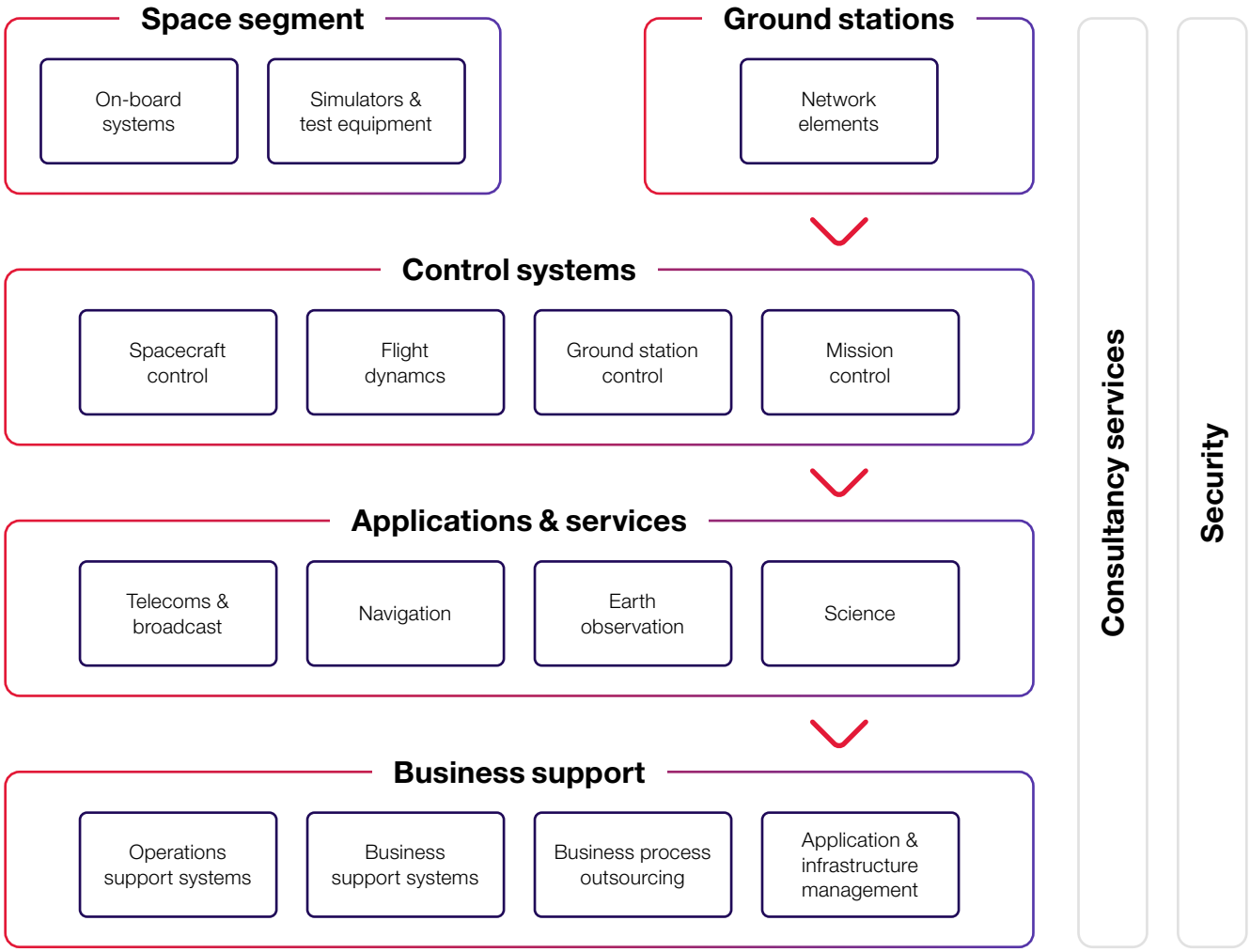
By gradually developing our portfolio and expertise over 40 years, we are now contributing to all parts of the space value chain.

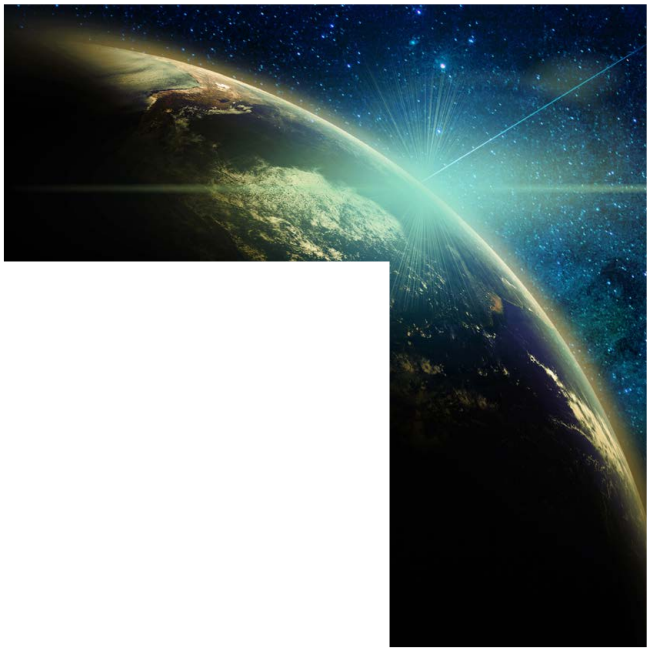
We add value to the space industry's supply chain in three key areas:

Firstly, in the upstream, we provide information technology solutions and services that ensure space assets perform perfectly the first time, in a hostile environment.

Secondly, we provide services that help space companies operate as efficiently and effectively as possible, for example having world class security or network infrastructures that may be needed due to the type of information that passes through.

Lastly, we make sure that the satellites themselves deliver the benefits they promised. Often this involves making sure the data can be trusted and is fit for business or safety-of-life use. However we also add value in other ways, such as using our strong knowledge of the downstream business sectors to deliver winning applications.





About CGI

Founded in 1976, CGI is among the largest IT and business consulting services firms in the world. We are insights-driven and outcomes-based to help accelerate returns on your investments. Across 21 industry sectors in 400 locations worldwide, our 76,000 professionals provide comprehensive, scalable and sustainable IT and business consulting services that are informed globally and delivered locally.

We are an IT Systems Integrator working to advise, build and operate bespoke, technically complex, mission-critical information systems. Bringing innovation to our clients using proven and emerging technologies, agile delivery processes and our expertise across space, defence, intelligence, aerospace and maritime, all underpinned by our end-to-end cyber capability.

For more information about CGI, visit cgi.com/uk/space, or email us at enquiry.UK@cgi.com

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