

# Mike McKay: Rocket Scientist

By Tom Mason, Director

At the end of April 2007 Digital Theatre Manager Julie Thompson and I visited the European Space Agency (ESA) facility at Darmstadt, Germany to meet with Mike McKay and other ESA personnel to discuss future joint projects.

Belfast born Michael McKay grew up under Divis and Black Mountain, so from an early age he has been accustomed to look up to the hills and the sky. When he was still at school, like most science mad teenagers, he wanted to be a “fighter jock”. He worked at weekends at Newtownards Flying Club, washing down aircraft, cleaning out the hanger and other odd jobs. In return he got to ride in the spare seat of many different aircraft. He got his gliding licence and enjoyed the freedom of unpowered flight. But his interest in space was triggered by the Apollo missions, watching satellites crossing the night skies, and following ‘Lost in Space’ and ‘Doctor Who’!

“successfully recovering the mission is part of a normal day’s work”

He trained as an aeronautical engineer at the Queen’s University of Belfast and then joined the European Space Agency in 1979, returning briefly to Queen’s to complete an MSc in Computer Science. He worked for three years at ESA’s European Space Research and Technology Centre (ESTEC) in the Netherlands before establishing himself in Germany at ESA’s Mission Control Centre in Darmstadt. From there, over the past twenty-five years, he has worked on a wide range of missions in the European space programme.

His experience as a rocket scientist varies, from probing the far flung corners of our Universe

with the EXOSAT observatory, to monitoring the fragile environment of our own blue-green planet with Europe’s ERS Earth Observation missions. More recently, as Flight Operations Director, he has been responsible for the operation of ESA’s Lunar and Mars Missions, SMART-1 and Mars Express, which continue to deliver outstanding scientific results. Later, he headed ESA’s Advanced Mission Concepts and Technologies Office, identifying and testing new technologies and mission operations concepts for the next generation of ESA spacecraft. He now runs ESA’s Exploration Missions Office, and is responsible for the operation of ESA’s future Space Exploration Programme, Aurora, covering robotic and eventually manned missions to the Moon and Mars.

Mike is one of hundreds of engineers and scientists who make the ESA missions work. He told us during our visit, and tour of the ESOC facility, that the most important element of success is the formation of the flight operations team. Every mission is meticulously planned. It is then simulated in the flight operations room with all of the team facing real time situations where the life or death of the spacecraft and its mission is tested to the point of failure. Faults and crises are simulated to train the mission teams, pushing them to the extremes, where they become used to handling up to six concurrent crises or glitches distributed throughout the space-based and ground systems.

Successfully recovering the mission is part of a normal day’s work. The outcome of this in depth training is that when it comes to the real thing, stresses and challenges of the launches and orbital insertions are totally familiar to all of the team, and some even express amazement during the real mission that all is going smoothly, as the simulations are, of necessity, filled with incidents and anomalies. The end result is that



**Local Hero** Mike McKay in the ESOC flight control room.

Mike knows his team can cope not only with the “normal” flight plan, but can confidently handle any situation as a single professional team.

Astronotes: Mike, you work for the European Space Agency. What precisely do you do?

MMcK: I get involved from the early design stages of a space mission, looking after all the operational aspects of the mission; from the design of the on-board computers and software, to the overall operations concepts dealing with how to fly the mission, to designing mission control and building up and training the mission teams. At Mission Control I am responsible for the design, and that it meets the needs of the mission, within the agreed cost and on schedule, making sure that at Mission Control we are go for launch. When it comes close to launch I become the Flight Operations Director, responsible for the mission operations and ensuring the mission is a success.

## “It is clear that exploration of our Solar System is for the benefit of Mankind ”

Astronotes: For our younger readers, do you wear a white coat to work, and do you have a crazy scientist haircut?

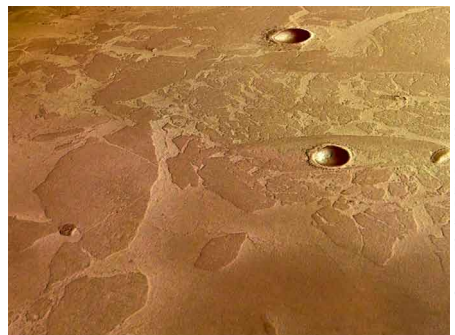
MMcK: Today’s rocket scientists don’t wear white coats, but occasionally they have been known to wear white waistcoats during launches. I strongly recommend the film Apollo 13. It does a great job at capturing the real atmosphere at Mission Control and what mission operations are all about. As for the weird haircut, only after I’ve

been to a bad barber or if I’m just having a plain bad hair day!

Astronotes: Why did you join ESA and did you ever envisage this as a career path?

MMcK: In the summer before I finished University I went to work in America, and spent two months working for a flight test company in the Mojave Desert. I was asked to design flight test equipment and experimental aircraft parts that I never thought I could do. It gave me the opportunity to take on exciting challenges that I wasn’t sure I could handle. It made me realise that we all have the potential to do things that, at first glance, we think impossible. If we can just push ourselves outside our comfort zone to take on that somewhat daunting challenge we can realise our true potential. So, on returning for my final year at University, I decided to really look upwards, beyond my dreams of aircraft, and focus on the stars and space. I guess that to work in space was always an unconscious dream, born from watching Neil Armstrong taking those first steps onto the Moon, but filed in the back of my mind, stamped IMPOSSIBLE. Being part of the space programme was not for normal people. My brief experience in the Mojave Desert told me it was time to rethink my definition of IMPOSSIBLE, and that building and flying spacecraft for the European Space Agency should not belong to IMPOSSIBLE if I had the courage and determination to try.

Astronotes: What is ESOC? Why is it at Darmstadt?



**Oceans of Mars?** This Mars Express image shows what may be a frozen sea covered in dust near the Red Planet’s Equator.

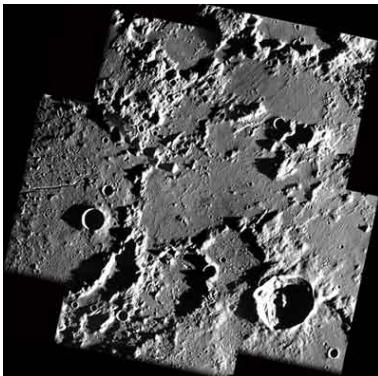
MMcK: ESOC stands for the European Space Operations Centre and it is the Mission Control for the European Space Agency's missions. Each of the major countries funding ESA wished to host an ESA establishment. ESA HQ is in Paris, ESTEC is near Amsterdam, ESRI, the Earth Observation data archiving and informatics centre, is outside Rome, and ESAC, the Science data archiving centre, is outside Madrid. ESOC is in Darmstadt because it is close to Frankfurt International Airport and has close ties with the Darmstadt Technical University.

Astronotes: What do you see as the next big project for manned space exploration?

MMcK: The completion and operation of the International Space Station is the big project which is already under way and one where

“...we all have the potential to do things we think impossible”

ESA is a major contributor. On the medium timescale, ESA and the Russian Space Agency, Roscosmos, are cooperating on developing a manned exploration vehicle called Clipper that will complement America's replacement for the Space Shuttle. In the medium term, manned missions returning to the Moon in the next 10 to 15 years will ensure a suitable testing ground for the new technologies and equipment needed for an International Manned Mars Exploration Mission which could take place after 2030. Just imagine, the astronauts that will fly this mission to Mars



**Mayer and Bond craters seen by SMART-1**  
Mike was involved with ESA's Moon mission.



Image Credit: ESA - AOIES Medialab

**Europe's Martian Invasion** The ExoMars lander will deliver the rover to a specific location using an inflatable braking device or parachute system.

are sitting in our schools today!

Astronotes: Are you in the robotic or the human exploration camp?

MMcK: So far I have been flying robotic missions, but I strongly believe in joint manned and robotic missions. Astronauts are more flexible and adaptable, being able to react more intelligently to what they find, and thereby increase the scientific return from a mission. Robots, on the other hand, are more suited to support tasks and hazardous operations. Therefore I see both as important for exploration, but with the support role that robots will play becoming more advanced and more important.

“Astronauts...increase the science return from a mission”

Astronotes: During our tour of the ESOC facility you mentioned the internationalising of the space exploration effort. Can you elaborate on this?  
MMcK: It is clear that exploration of our Solar System and our Universe is for the benefit of cooperation has been taking place, initially between the scientific teams. However, nowadays it is common practice for the space agencies to provide each other with services and support. This can range from exchanging expertise to providing ground station support or spacecraft. The ultimate example of this cooperation is the International Space Station.



Image Credit: ESA

**The ExoMars rover** will be ESA's field biologist on Mars. Its aim is to further characterise the biological environment on Mars in preparation for robotic missions and then human exploration.

Astronotes: Do you think we will find evidence of life on Mars, either fossil or extant? What about little green men elsewhere?

MMcK: It is clear that there was once a large quantity of water on Mars, covering almost the entire northern hemisphere. There is still water, but it exists as ice and permafrost below the surface. Mars has seasons like our Earth, and

still gets enough energy from the sun. We have found life forms on Earth, called extremophiles, which mankind, and not any one nation. International can survive in the most extreme conditions were we would never have expected to find life, so why not on Mars? If we are to answer the most fundamental question about our very existence, "Are we alone in the Universe?" Mars is an ideal place to start looking. That is why the European Space Agency is building ExoMars, the first exploration mission in the Aurora Programme. It will land a rover on Mars that will drill down to two metres below the surface, taking samples to be analysed by the rover in search of past or present signs of life.

As for little green men, I think we are more likely to find little green bacteria below the surface of Mars!

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By the time that you read this Mike will have been awarded an Honorary Doctorate from the Queen's University of Belfast, which is the University's way of acknowledging his massive contribution to space research. It is also recognition for one of Belfast's scientific exports, and of the fact that he readily gives his time to institutions like ours when we need a lively and informative talk. This is a well-deserved award, so from all at Armagh Planetarium, congratulations Dr McKay!