MAGNIFICENT WOMEN:
Mary Sherman Morgan

Mary Sherman Morgan is an American rocket fuel scientist. She designed the rocket fuel Hydyne that enabled the launch of the Jupiter-C rocket, putting the US into space.

4 November 1921 – 4 August 2004

It IS Rocket Science!

The Russians made history by launching the first man made satellite, Sputnik, into space in 1957. The United States of America were desperate to win the next stage of the race. But while they had a rocket they struggled to find the rocket propellant that would get it off the ground and into space.

Rocket propellant is a mixture of fuel and oxidiser. To find the right combination that would produce the required power to lift a rocket meant analysing the properties of hundreds of chemicals. Mary Sherman Morgan produced a 10 point list of properties and requirements, including commercial availability, stability and vapour pressure. After months of researching and doing calculations, Mary came up with the right cocktail, Hydyne-LOX:

- Hydyne is 60% UDMH (Unsymmetrical Dimethylhydrazine) and 40% DETA (Di-ethylene-tri-amine)
- LOX is liquid oxygen
- The minimum specific impulse required to launch was 305 s – Hydyne gave 310 s (that is the force with respect to the amount of propellant used)

On 31 January 1958 Explorer 1 was launched on a Jupiter-C rocket, using Hydyne-LOX propellant.

Farm Girl to Rocket Girl

Mary Sherman was brought up on a rural farm in North Dakota. It wasn't until the authorities intervened that Mary was sent to school at the age of 8, having to combine her schoolwork with chores on the farm. She finally graduated from High School at 19 before running away at night to go to College. After only 2 years there and before graduating, she was offered a job at an Ordnance Works as a chemist, to aid the war effort. There she was responsible for manufacturing explosives.

After the war ended Mary went to work at North American Aviation, first as an analyst then as a Theoretical Performance Specialist. Her job involved determining the specific impulse values of new propellants using knowledge of thermochemistry, heat transfer and fluid flow dynamics. The ideal fuel is a trade off between performance and practical requirements, as fuels are often toxic and/or flammable.

> "Attitudes can't be changed by force or by confrontation. [Mary] slowly and subtly changed the attitudes of the men (and women) around her by simply, quietly, being herself."

"Rocket Girl" is the title of a book and play about Mary written by her son George D. Morgan.

Further information

Useful resources:

- en.wikipedia.org/wiki/Mary_Sherman_Morgan
- www.womenyoushouldknow.net/rocket-girl-son-restores-mothers-lost-legacy-americas-first-female-rocket-scientist/

Against The Odds

Despite having no college degree and being the only woman amongst 900 male engineers, Mary was put in charge of the top secret project to design the fuel to launch USA's rockets into space and so join the Space Race.