Early Rocketry and Rocket Propellant Part 3

America - The American Rocket Society From Wonder Stories to Reaction Motors

At a time when Robert Goddard had achieved his first successful launch from his new test site in New Mexico enthusiasts in New York inaugurated a rocket study group with the title the American Interplanetary Society. Their goal from the outset was to develop the rocket as a means of getting into space.

They met in the apartment of G.E.Pendray and the link which connected them was that all contributed stories to the magazine 'Wonder Stories'.

This highly unlikely group amply qualified for the description dreamers and theorists.

Publicity

With this background it is not surprising that the Society's first activities were in the realm of publicity. They agreed that only rockets could propel a space ship but their effort was directed not to any practical work but to writing numerous papers which were read out at Society meetings and circulated in duplicated form in what was initially called the 'Bulletin', later 'Astronautics', and in its final form much later 'Jet Propulsion'.

The Bulletin did begin to attract attention from the European rocketeers and the Society was jubilant when the Frenchman Esnaut-Pelterie sent it an autographed copy of his book 'L'Astronautique', (see Touchpaper Autumn 2012). The December 1930 Bulletin contained a letter from the German Interplanetary Society assuring America that it had 'not gone to sleep'.

The Society's appetite for promotion was significantly whetted when Esnaut–Pelterie announced his intention to visit America. Without much hope of success the Society invited the rocket oracle to speak at a meeting to be arranged by the Society. To their surprise he accepted. The auditorium of the Museum of Natural History in New York was booked. This held 1500, but at its most optimistic the Society expected about half that. What transpired fully conveys the flavour of the early antics of this group of young idealists. When they arrived at the hall they were startled to find a crowd of about 2500 impatiently waiting to get in to see the film which had also been arranged. To their consternation this was followed almost immediately by a hand written note from the Frenchman that he had contracted a severe cold and was unable to attend. One can't help having the suspicion that he hadn't quite realised how amateurish the Americans were and when he did he felt it beneath his status to address their meeting. However they did have a copy of his speech and Pendray decided to press on and read it out, to not one but two 'performances'.

Somehow the audience got hold of the idea that Pendray was in fact the Frenchman and at the end of the speech there was a surge eagerly seeking his autograph. Pendray decided to continue the illusion and blithely signed with the Frenchman's name and so many went out into the night happy in the thought that the programmes they were clutching had been autographed by a famous person.

The first seeds of practicality

In 1931 Pendray and his wife decided to visit Europe. They were particularly impressed by the German Interplanetary Society (see forthcoming Early Rocketry Part 4) and their small liquid fuelled motor.

The scene was therefore set for a move however tentative into practical rocket building and as can happen the person to do it was there – Hugh Franklin Pierce. Although he had taken a desk job connected with the New York subway system, Pierce was an eminently practical man, having served as a mechanic in the US Navy in WW1, and constructed mechanical objects as a hobby. He was therefore strongly attracted to the Society and announced that he was willing to devote his entire resources to building a rocket, including finding a suitable workshop. Pendray appears to have had the ability to formulate a design.

By this time the Society had contacted Goddard for advice. It wasn't forthcoming. He had expended a considerable effort to get to New Mexico and it was perhaps rather naïve to expect him to hand over all the fruits of his labours.

Despite this by February 1932 Pierce had succeeded in producing the Society's first rocket.

To reflect this the Society was renamed the American Rocket Society.

American Rocket Society Rocket No.1

The motor was first tested at New York University and the resultant modifications took up to November 1932, when the intrepid experimenters assembled on a freezing cold day at a farm near Stockton, New Jersey, about 100 miles from New York.

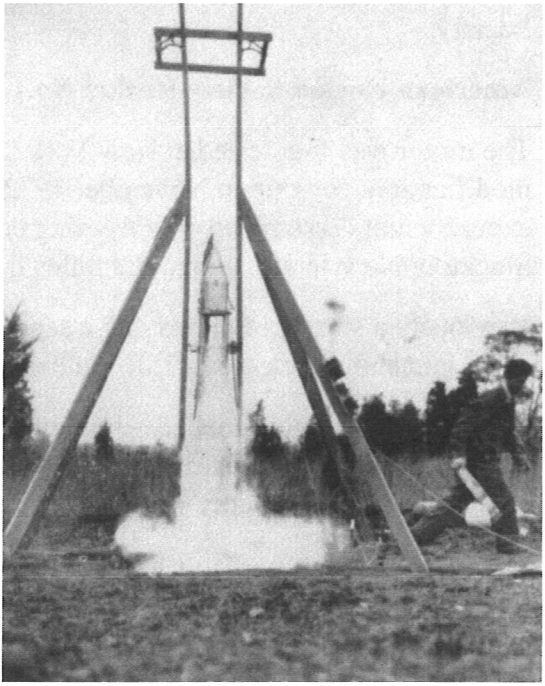
Previously a small group had dug a sand bagged observation trench and a launching rack – two 15ft. timber uprights.

The rocket was liquid fuelled – liquid oxygen (lox) and petrol with electrically actuated valves. A nice touch of domesticity was provided by Mrs. Pendray who had stitched the rocket's parachute.

The idea was first to establish the thrust with a tethered test. The test was successful. A thrust of 60 pounds was indicated – equivalent to an altitude of about 19,000 feet.

G.E.Pendray. Mrs. Pendray and Franklin Pierce at preparation of Rocket No.1 for static test

Rocket No.1 Static Test



The next test was to determine whether the rocket would actually take off and fly in a coherent course, i.e. straight up. At this point the trouble started. The rocket would not move freely in its timber guides. In the effort to free it it fell to the ground and was irretrievably damaged - so ended Rocket No.1.

However most of the components were undamaged and were taken back for reassembly within a strengthened casing.

ARS Rocket No.2

Designations had now been abbreviated to ARS. An important modification concerned valve operation. Electrical actuation had given some trouble so this was substituted by the simple expedient of opening the valve by pulling on a cord from the operating dugout.

On 14th. May 1933 the test party assembled in Marine Park on Staten Island in New York Harbour.

Twenty five feet from the launch rack was a dugout for three men – the fuel lighter, the valve man and an assistant. Actual observers were further back at 95 feet.

As before the fuel was petrol and the oxidant lox. The petrol was forced by nitrogen under pressure in the petrol tank.

First the fuel was ignited by the fuel man with a torch applied to the wick, who then 'retired' i.e. ran for cover.

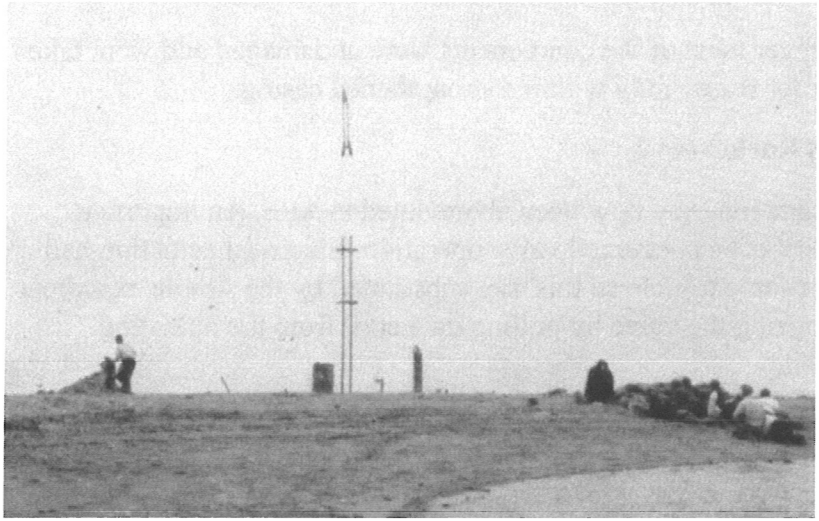
As soon as he was in the dugout the valve man pulled the cord. The motor blazed into life – for only eight seconds before expiring.

Undeterred the experimenters decided to make a second attempt.

Do not attempt this at home.

Again the wick was ignited and again the valve cord was pulled. But no flame, the handle had fallen off the valve. Before anyone could say anything Smith the valve man leaped out of the dugout,

ran to the rocket, containing an oxygen tank which might explode at any moment, replaced the handle and just before jumping back in pulled the valve cord.



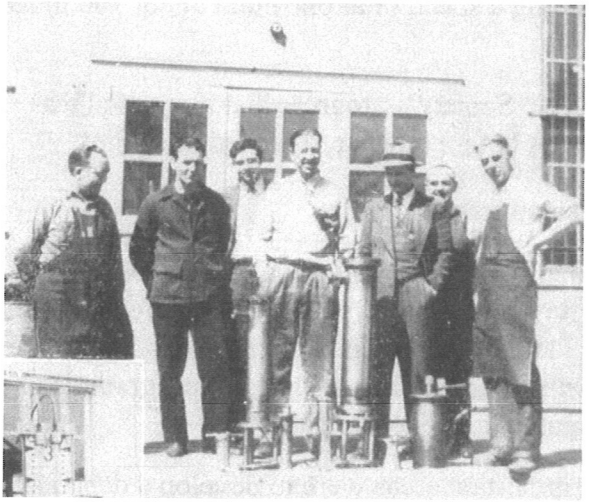
Rocket No.2 First liquid fuel rocket fired by the American Rocket Society
On left - Valve man Bernard Smith running for safety after very dangerous release of valve

This time the motor roared into life. But the rocket reached only 250 feet before the oxygen tank gave way and exploded and the rocket fell into the water, to be retrieved by two excited small boys who had witnessed the proceedings from a rowing boat despite being warned away.

However the Society had achieved flight. Its cash reserves now amounted to four dollars and twenty cents. But importantly it was beginning to attract vital trained engineers and technicians and a properly constituted technical committee was formed.

The dreams begin to turn into reality

One outstanding recruit was John Shesta, the son of a Russian who had originally come to America as a purchasing agent for the Czarist government. Shesta was later to become a bright star in the American rocket firmament. He had been fascinated by rockets since boyhood and had constructed his own powder fuelled examples (independently he had arrived at the conclusion that the powder should be wetted - first originated by Congreve).



Entire staff of Reaction Motors in 1943

3rd.,4th.,5th., from left James Wyld, John Shesta, Franklin Pierce

ARS Rocket No. 4

Shesta and a small team was charged with designing Rocket No.4. No.3 was allotted to a team led by Pendray and including Smith, the valve man who had risked his neck on Rocket 2.

Shesta's was ready first. Beautifully constructed and robust it was seven feet long and three inches in diameter. There was a single combustion chamber with four highly polished brass nozzles which would throw the blast clear of the tanks.

On 9th. September 1934 again at Marine Park the rocket was fired. At first it climbed several hundred feet vertically then two of the nozzles burned out. Its flight flattened but it continued on the remaining two nozzles, before dipping downwards into the bay, having been aloft for fifteen seconds.

It had risen almost four hundred feet and travelled four times that horizontally, reaching a speed of at one point about 700 miles per hour.

It is a measure of the Society's progress that this speed was achieved six months before Goddard reached this point.

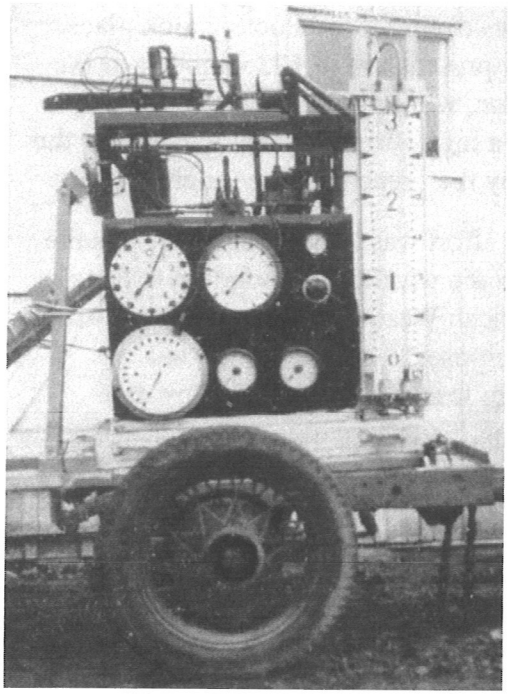
Ten years of development

It was apparent that the days of firing off rockets merely in the hope that they would stay aloft were over. What was now needed was a coherent research and development programme to identify all areas which needed further study within a coherent programme of scientific investigation and experiment.

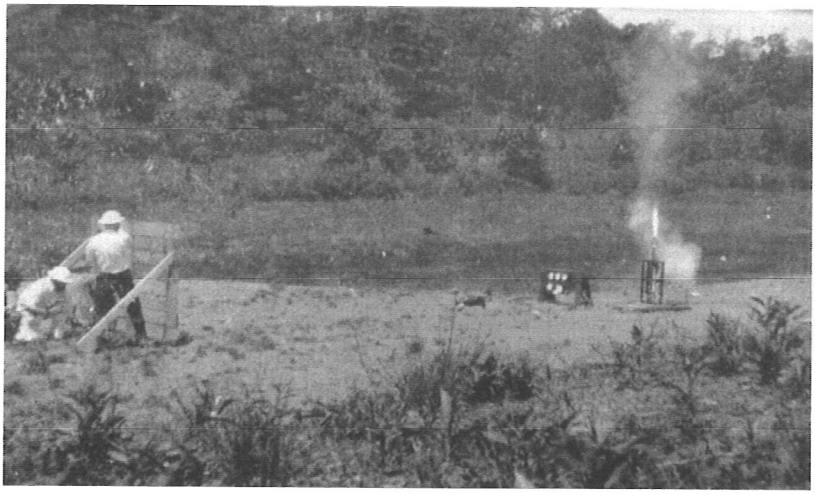
Two of the most important areas were to develop a dependable motor and to develop an efficient test stand which could withstand the conditions which would arise with more powerful motors and which would permit better study under increasingly demanding operating conditions.

John Shesta took on the test stand. In this he was assisted by another rising star in the firmament – James H. Wyld. This partnership was later to have important implications for the American rocket industry.

What resulted was a stand of great strength with a full complement of gauges for measurement of fuel combustion, combustion chamber pressure, temperature and motor thrust. All had a large face to enable sight at a distance. There was an extremely accurate timing clock and a second by second camera.



John Shesta's test stand



Test stand in use in 1935. John Shesta standing pulling valve cord

In the meantime a momentous event for the Society took place. Thoughts of space were ever present and in 1936 another of the Society's stars Alfred Africano, working from the Society's experimental data, designed a high altitude rocket which won the REP-Hirsch prize awarded by the French Astronomical Society.

However the Society's main effort was still directed towards the lower altitudes – i.e. study of the weather by sounding rockets as they were termed. The American Weather Bureau had been using upper air balloons for this purpose. They had significant disadvantages – liable to drift, loss of instruments, slow rise preventing quick observations. The alternative, aeroplanes, was unsatisfactory – expensive and limited by adverse weather, the very time when observation was most required. A rocket, if it could be made dependable, would not have any of these disadvantages.

To meet the challenge the Society formed a new Technical Committee with sub-committees to study the whole spectrum of rocketry science – the motor, the shape of the rocket, launch devices, the parachute, the instruments, controls and so on. By this time they had attracted an impressive array of enthusiasts, many with science or engineering qualifications, who were able to provide the necessary expertise for the committees.

James Wyld made the motor his speciality. At twenty six years old he ultimately produced a motor of outstanding quality. It reflected all the desirable characteristics of good engineering – simplicity of design, inherent lightness, practicality and economy of manufacture. Of paramount importance was the cooling system. The motor was cooled by incoming fuel. The idea was not new but Wyld refined it to a level not previously achieved. Again the design was simple but effective – the combustion chamber was one small tube fitted inside a larger tube with a space of one eigth inch between the two walls. The incoming fuel swirled through this space, absorbing much of the heat from the combustion chamber, before entering the combustion chamber inlet nozzle. The motor was thus cooled and at

the same time high efficiency was achieved by the pre-heated fuel. By this time – 1941 ethyl alcohol had replaced petrol as fuel with liquid oxygen continuing as oxidant.

Astronautics reported 'A reliable motor for astrological sounding rockets has at last been designed, built and tested'.

By this time war was intervening. The US Navy offered Wylde 5000 dollars for the motor design and a six month development contract for the production of a series of experimental motors ranging from 100 to 1000 pound thrust. The team consisted of Wylde, Shesta, Hugh Pierce who had laboured faithfully since the early days and a new man Lovell Lawrence reflecting the growing influence of electronics on controls.

Reaction Motors

A week after Pearl Harbour, using the Navy's 5000 dollars as capital, one of the world's first rocket production companies was formed – Reaction Motors, Incorporated

The Navy's particular interest was assisted take off and the liquid fuel RM motors performed perfectly in tests. Ultimately the medium adopted was the JATO dry fuelled unit, but the RM test results were of significant benefit in their development.

Reaction Motors went on to achieve impressive firsts. In 1946 it built a four motor unit with a thrust of 6000 pounds which powered the Bell Aircraft X-1 faster than the speed of sound. The same engine type drove a Douglas Skyrocket plane sixteen miles into the stratosphere with the pilot streaking through space at twice the speed of sound. RM powered the Navy's Viking when it ascended 150 miles.

But as often happened the pioneers were uncomfortable working in what had been become an administrative capacity in an expanding corporate entity increasingly dominated by production men. The first to leave was Franklin Pierce who sold his shares and disappeared

from the scene. The company reached the stage of requiring a fresh capital injection and was bought into by the Rockefeller interests. Reorganisation followed and Lawrence departed.

Wyld was seconded for a time to the Atomic Energy Commission at Oak Ridge where he was happy doing what he did best, solving new problems in a research atmosphere. Shesta had remained at Reaction Motors as Chief Engineer, but he finally decided the new set up was not for him and resigned.

Wyld returned from Oak Ridge, the last of the four. He had decided to resign when tragically he died, in 1953 aged forty one.

With James Wyld's death American rocketry lost one of its brightest stars.

One wonders whether amongst personal effects somewhere there is still a faded programme from a 1930's meeting bearing a signature which the owner fondly believes is of the rocket oracle Esnaut-Pelterie.

Les Tucker.