ASTRO-CHAT

Newsletter of the Chatham Kent Astronomy Club

FEBRUARY 1986 Vol3 No (2)

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Deadline for March issue is Feb 14th.

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	7 & 8th.	Observing
	9th.	New Moon
	9th.	Comet Halley at perihelion (0.59 A.U)
	14 & 15th.	Observing
	21st.	Regular meeting, C.K.S.S. rm 213, 7-00 pm
	24th.	Council meeting, this one at Mikes
	24th.	Full Moon

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Just a few days ago I received two articles from our planetary specialist Rob Cattrysse. Due to the timely nature of them I am printing them in their entirety, making this the largest newsletter yet (13 pages). I can just imagine the response from John Christopher when I give him the bill for this one.

After a short winter break the Chatham Telescope Makers resumed their activities at the home of Bill Franssen. At the present time most ATM's are in the process of smoothing up their curves before going to the finer abrasives. I will attempt to keep you informed as to progress. If you would like to see the group in action Bill says to feel free and drop by. We are there most Thursday nights after 8, give myself or Bill a call just to make sure.

Our next regular meeting is Feb 21st, scheduled is the film Comet, and Bob is going to regale us with his astrophotography slides. If this isn't enough then Rob probably has a whole nights supply of videotapes, and more.

County man wants action on light pollution problem. This was the headline in the Feb.6 Chatham Daily News, featuring an article on club member Dan Kahraman and his battle for darker skies.

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THE CHATHAM — KENT ASTRONOMY CLUB
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PRESIDENT'S REPORT - FEBRUARY, 1986

January 16, 1986 - Regular meeting at CKSS

13 people attended and were treated to a very interesting talk by member Dan Kahraman, who spoke on the evils of light pollution and his efforts in getting the people responsible to do something about it. There was also some discussion on the recent Voyager discoveries at Uranus.

January 21

I lectured to the Windsor Centre of the RASC on our participation in the IHW, and another joint observing night was planned for March 22 at Eagle Point, specifically to catch a glimpse of Comet Halley while it's at it's brightest. It will be a long-shot at best since at 5:30 in the morning it will barely be 10° over the lake, so we will be very fortunate if we can spot it through the early twilight and fog rising from the lake.

January 23

I lectured to the Niagara Centre on the same subject and then everyone sat back and enjoyed some particularly good slides taken of Comet Halley in October/November by some of their members.

January 25

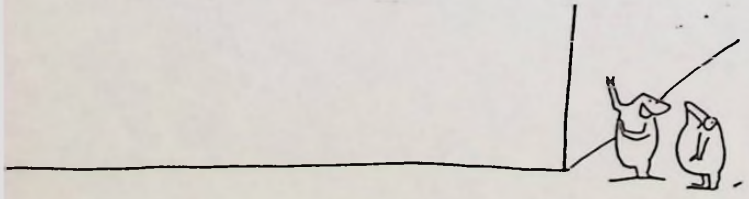
I was in attendance at the National Council meeting of the RASC and learned that membership and Observer's Handbook sales are way up, with a lot of help from our friend Halley, I'm sure. By the way, rates for the RASC are expected to rise quite substantially, the largest being in the life membership which is increasing from $300 to $500. I think these won't take effect immediately, so if you have ever thought about 'lifing it' now is the time to act.

Locally, we have recently received a large number of publications, care of the London Centre which were donated to them but which they have no use of. Thus our library is born. I am presently catloguing the RASC Journals which date from 1963 and a variety of issues of Sky & Telescope, Astronomy and the newsletter of the Hamilton Centre, 'ORBIT'.

The Library in town is still serious about hosting a seminar on Comet Halley, most probably in early March. Speakers would include Jaymie Matthews of UWO and possibly Peter Jedicke of London if we bother him enough about it.

John C. tells me our bank balance is presently in excess of $400.

Astronomy Day for 1986 is going to be held Saturday, April 19. Any ideas out there?



M. E. Flegel
354-9677

This kit contains everything an astronomer needs — telescope, camera, a galaxy

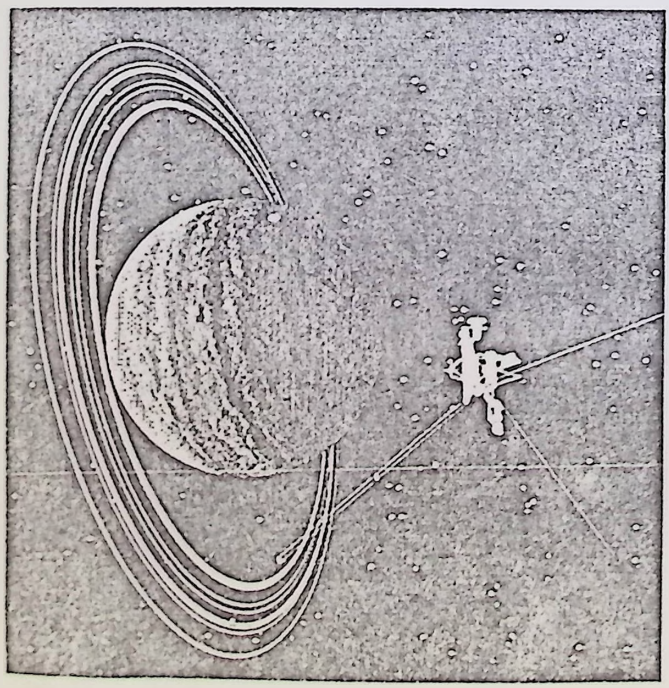
TRIUMPH AND TRAGEDY

Robert Cattrysse

1986 was to be NASA's biggest year in space but things started a little shakey. The Space Shuttle Columbia, after being postponed twice in December 1985, was delayed five times in January, making it a record seven times for the Shuttle. On try number eight Columbia returned to space on January 12, after being refurbished for the past two years. The seven-man crew successfully deployed an RCA satellite and operated over a dozen experiments, however problems did creep up. The lid covering of an astronomy instrument in the cargo bay refused to close, a medical device malfunctioned, two material processing units failed, and a light intensifier on a special camera to take close-up photos of Halley's Comet did not work. The mission was shortened by one day and when Columbia landed January 18 it was two days late. Bad weather in Florida delayed the return two days and on the third try there the weather forced a landing in California at Edwards Air Force Base. Spaceport ground operations manager Fritz Widick, in charge of the Shuttle's "turnaround" in California, said a preliminary inspection indicated the spaceship completed the 24th Shuttle mission in good shape. As all this happened Voyager 2 closed in on Uranus and then zipped by on January 24th. The tiny spacecraft gathered a wealth of information about the seventh planet from the sun. After five delays the Shuttle Challenger lifted-off on January 25 with the first civilian onboard. Another perfect launch but then 73 seconds into flight the Challenger exploded and was destroyed. All seven astronauts perished in the world's worst space disaster.

Voyager 2 at Uranus: Mission of Discovery

Hundreds of scientists gathered at the Jet Propulsion Laboratory (JPL) in Pasadena, California in January to witness another 1st in the space program. It was the tiny unmanned Voyager 2 spacecraft once again making the headlines. Voyager 2 made its closest approach to Uranus on Friday, January 24 at 12:58:51 p.m. EST, 69 seconds early, not bad considering NASA scientists made the calculations in 1981.



The spacecraft snaps each of its pictures every 15 seconds but sending them across the immense intervening distance of three billion kilometres is more time consuming and complex. Voyager must conserve energy so it transmits its pictures a little at a time using no more power than a lightbulb in a refigerator. Two hours, 44 minutes and 50 seconds after leaving Uranus they're received by giant radio antennas on Earth. There is one in Spain, one in the Mojave Desert of Southern California and one in Australia. By the time the

signals reached Earth, they still were far fainter than high-quality scientific research demands. So NASA established a microwave link between the agency's 61-metre deep space antenna in Australia and an identical antenna at Parks Radio Observatory 290 kilometres away. The link combined the two incoming signals and doubled receiver sensitivity. All of the five major Uranian moons are very dark in appearance, and scientists attributed the picture sharpness to remarkable engineering and navigational work on the ground that allowed Voyager's cameras to take 15-second-long exposures while travelling at more than 64 000 kilometres an hour. The spacecraft has returned images with no smear at all. Result of the changes: Voyager's data was as good from Uranus as it was from Saturn. The telescope then passes the information via communication satellite in Earth orbit to Southern California. There it's transmitted by a set of microwave relay towers to a computer at JPL. At JPL it is automatically decoded into pictures. Every Voyager picture, as seen close up, is made up of 800 lines and 800 dots along each line and scientists assign a number to each of those dots that says whether it's black or white or 254 shades of gray in between. At a distance the constituents dots are invisible and we see only their cumulative effect. The dots are then stored on a magnetic disc, something like a phonogragh record. And after further processing, coloured pictures.

Travelling ten times faster than a rifle bullet, Voyager threaded a path between the rings and the moons of Uranus and in six short hours collected more information on the planet than astronomers had amassed in the 205 years since it was discovered.

"I think no one could have anticipated even in an approximate way the exotic nature of what I'm going to show you this morning," said imaging team member Laurence Soderblom, deputy leader of the Voyager team analyzing some 6 000 photographs taken by Voyager 2. Voyager's data was stored on onboard tapes and sent to Earth throughout the weekend.

Computer colour enhanced photographs spotted orange bands around the planet's pole which astronomers interpreted as photochemical haze not too different from the smog around JPL. They also showed an orange methane haze around the planet's equator. Voyager also detected clouds in Uranus's atmosphere, which may flare a glaring blank in their list of Uranus's vital statistics: by tracking the clouds' rotations, they may finally learn how long it takes the planet to spin on its axis. A Uranian day now is believed to be around 16 to 17½ hours.

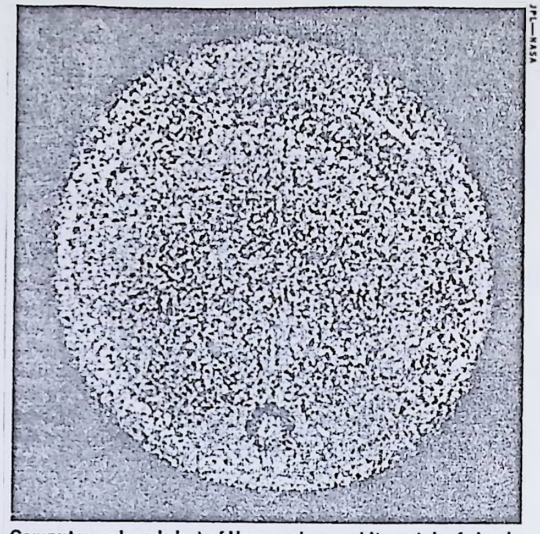
Other experiments have detected a strange phenomenon known as "electroglow" which makes Uranus almost as bright as the sun at ultraviolet wavelengths. This glow, seen on the daylit side of the planet, has also been observed on Jupiter and Saturn. It is caused by the collision of slowly moving electrons with hydrogen in the planet's upper atmosphere. It's like an aurora borealis.

On the day before the closest encounter, project scientist Edward Stone of the California Institute of Technology announced that the craft had finally detected radio noise from Uranus, which researchers interpret as evidence of a magnetic field around the planet. The noise resembled that made by electrons spiraling through a planet's magnetic field, and it was a welcome sound. The magnetic field of Uranus is inclined 55 degrees to the planet's axis of rotation. This is a far greater tilt than that of the magnetic fields known to surround any other planet. The magnetic field contains powerful

radiation belts, similar to Earth's Van Allen Belt. These belts extend out to the moons and interactions between charged particles and the surfaces of the moons may explain some of the newly found features.

A new ring was discovered inside Epsilon, the outermost ring. It is extremely faint and thin even by Uranian standards. Like the moons, the ring material is dark and difficult to photograph, unlike Saturn's broad, bright rings.

The planet is now known to have 10 complete rings and new evidence from an experiment where a star was carefully observed passing behind the rings has suggested that there may be many partial rings or arcs around the planet. Photograph of the rings with sunlight shining through them showed the rings are completely filled with dust particles. One astronomer said that there may be as many as 100 partial rings. After the rings were straightened out and filtered they were found to be all different colours, suggesting that each ring is composed of a different material.



Computer-colored shot of Uranus shows white patch of clouds

Tiny moons, dark rings, impact craters and more to come.

The most suprising discoveries came with the moons of the planet, the strangest being Miranda. "It's incredible," said Soderblom. "If you can imagine taking all of the bizarre geological forms in the solar system and putting them together on one object, you've got it in front of you." Miranda is covered with a jumble of craters, rolling hills, grooved linear troughs, deep valleys, and other strange forms. Part of it is covered with dark material of unknown origin. Both the flow-like shape of some features and the fact that craters and valley floors have been filled in indicate that some active geological processes have been operating even on this small moon. Miranda is just 500 kilometres in diameter. There is also a chevron-shaped mark on Miranda. Miranda is 129 400 kilometres from Uranus.

Tides have been suggested as one explanation. Tidal forces between Uranus and the moons might heat up the interiors of the moons and cause liquid material to rise to the surface. Pictures of Oberon, the largest moon with a diameter of 1630 kilometres and the outermost moon at a distance of 853 500 kilometres, revealed a mountain 5 kilometres high. It also has a small dark spot that looks suspiciously like a crater. A crater would support the idea that Uranus and its moons were the targets of speeding cosmic bullets long ago, one of which may have tipped over the planet. Uranus is tilted 98 degrees to the plane of the solar system. Also seen on Oberon were several impact craters surrounded by bright rays similar to those on Jupiter's moon Callisto. Umbriel, the darkest satellite has rough upland areas and a bright ring that appears near the moon's equator (top to bottom in photos because the system is tilted 98°). Umbriel is 1110 kilometres in diameter and its distance from Uranus is 266 300 kilometres. Titania, about 1 600 kilometres in diameter and 435 900 kilometres from Uranus, also showed light splotches across its brown-gray face, which hinted that the moon might have been "resurfaced" by new material welling up from the

core. Also seen were long valleys 50 to 100 kilometres wide and 500 kilometres long and many impact craters which scientists attribute to cosmic debris. Ariel shone with small bright spots, which might mean that the icy moon has a dark coating which, when punctured, throws white ice to the surface much as terrestrial volcanoes cough up lava. Ariel is 1330 kilometres in diameter and lies 191 000 kilometres from Uranus.

Geologists starting to put together the first pieces of the evolutionary puzzle note that Miranda is the closest of the five big moons to Uranus. The farther the big moons are from Uranus, the less severe surface deformation they seem to have undergone.

"What we're seeing--and maybe it will give you a glimmer of what we're beginning to think about--is that as we move closer to Uranus we see an increasing ferocity in the way these bodies have been tectonically shuffled in a cataclysmic fashion," said Soderblom.

University of Toronto professor Scott Tremaine, head of the Canadian Institute of Theoretical Astrophysics, working with an American and a French scientist, reasoned the rings wouldn't exist unless there were "shepard" moons in orbit around the planet and between the rings. They believed the influence of the separate gravities of those moons kept the rings in line--otherwise, they would dissipate, sending their particles toward the planet or into space. Voyager 2 discovered 10 new moons which range from about 20 kilometres to 50 kilometres in diameter. Some of these are shepard moons, including two found by Voyager on Monday, January 20, each measuring 20 to 29 kilometres in diameter. As Voyager data is looked over even more moons may be discovered. Some scientists believe there may be many more, possibly bringing Uranus to have a total of 30 satellites, the most of any planet.

Wind speeds in the planet's atmosphere have been measured at up to 100 metres per second. By comparison, winds in Earth's high-speed jetstream typically are 40 metres per second. Uranus's clouds are composed mostly of methane, but scientists announce that they have detected acetylene in the clouds as well. The atmosphere high above the dark pole (-360 degrees) is warmer than that in the sunlit pole (-370 degrees), the opposite from Earth.

The spacecraft continues to operate flawlessly at a distance of 3 billion kilometres from Earth as it heads for its August 24, 1989 close encounter with the planet Neptune. According to imaging team member Carl Sagan, "This is the first time we have seen a planet not known to the ancients." Uranus was discovered by Sir William Herschel in 1781. Dr. Sagan added that "had we lived 50 years ago we could never have learned what Uranus was like. Had we lived 50 years from now, we'd learn about it in the Second Grade. We are extraordinary lucky to be living at a time when the solar system is being explored for the first time."



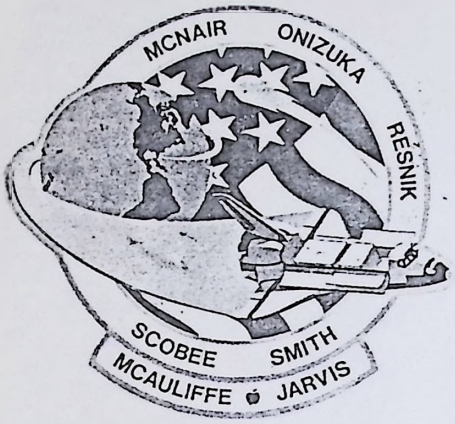
Titania



Oberon



Voyager view of Uranian rings



Disaster at Cape Canaveral

"We mourn seven heroes: Michael Smith, Dick Scobee, Judith Resnik, Ronald McNair, Ellison Onizuka, Gregory Jarvis, and Christa McAuliffe." Those were the words of President Ronald Reagan in an unexpected speech at a little past five in the afternoon on Tuesday, January 28. He was referring to seven heroic astronauts who perished onboard the Space Shuttle Challenger late Tuesday morning at the John F. Kennedy Space Center, Cape Canaveral, Florida.

It was the Space Shuttle Challenger's tenth flight and the twenty-fifth in the Space Shuttle program. The launch was originally set for Friday, January 24 but delays to Columbia set Challenger back one day and then another day. Saturday night bad weather was predicted for Sunday's lift-off time so NASA postponed the launch to Monday the 27th. When Sunday came the weather was perfect for a launch. On Monday a latch on the crew cabin's door was stuck and it took a while before it was taken off. After the ground crew sawed it off bad weather forced the launch to be cancelled. Tuesday morning the temperature was 24 F and icicles on the pad had to be knocked off before the countdown could proceed. The lift-off was delayed from 9:38 a.m. EST for two hours while the ice inspection team removed all the ice from Pad 39B. This was the first Shuttle launch from complex 39B. Then, all systems were go:

11:37:45, Hugh Harris, Launch Control (LC): T-15 seconds.

11:37:50, Voice: T-10 seconds. Go for main engine start.

11:37:50, LC: T-10...9...8...7...6. We have main engine start. 4...3...2...1...

11:38:00, LC: ...and lift-off. Lift-off of the 25th Space Shuttle Mission and it has cleared the tower.

500 observers at KSC including teacher in space Sharon Christa McAuliffe's parents and students in schools around the country felt joy and pride.

11:38:09, Voice: Houston now controlling.

11:38:12, Mission Control (MC): Roger roll Challenger.

11:38:17, MC: Good roll program confirmed. Challenger now heading downrange.

11:38:29, MC: Engines beginning throttling down now at 94%. Normal throttle for most of the flight 104%.

11:38:39, MC: Full throttle down to 65% shortly.

11:38:45, MC: Engines at 65%. 3 engines running normally. 3 good fuel cells. 3 good APUs.

11:38:53, MC: Velocity 2257 feet per second. Altitude 4.3 nautical miles. Downrange distance 3 nautical miles.

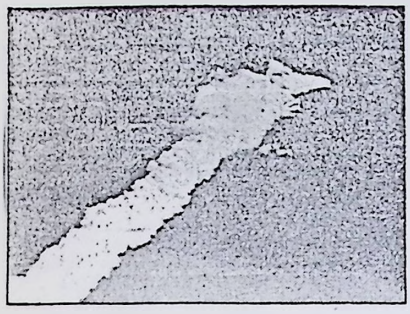
11:39:05, MC: Engines throttling up. 3 engines now at 104%.

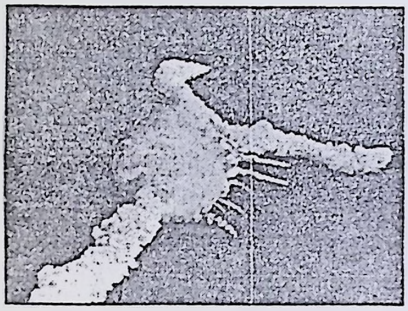
11:39:08, Capcom at MC: Challenger go at throttle up.

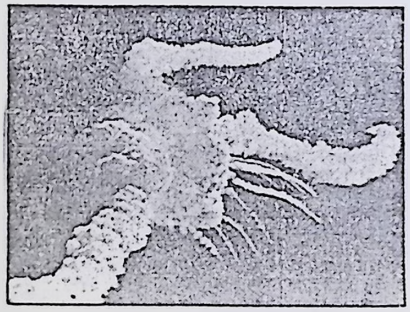
11:39:10, Challenger: Roger. We're go at throttle up.

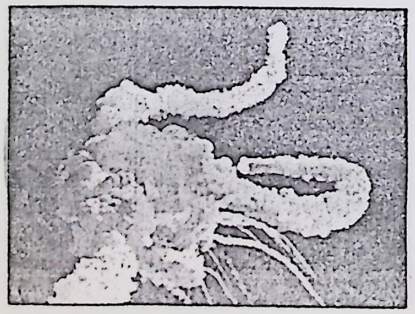
11:39:13: The Space Shuttle Challenger explodes in a ball of fire over the Atlantic Ocean. Some observers know what happened, others think nothing has gone wrong.

11:39:15, MC (reads off telemetry screen, unaware of the explo-









"We will never forget them; they prepared for their journey, waved goodbye and slipped the surly bonds of Earth to touch the face of God." ---Reagan, January 28.

sion): 1 minute, 15 seconds. Velocity 2900 feet per second. Altitude 9 nautical miles. Downrange distance 7 nautical miles.

11:39:50: Mission Control detonates and destroys the two solid rocket boosters (SRBs) in fear that they were heading for populated areas.

11:39:52, MC: Flight controllers here looking very carefully at the situation. Obviously a major malfunction.

11:40:04, MC: We have no downlink.

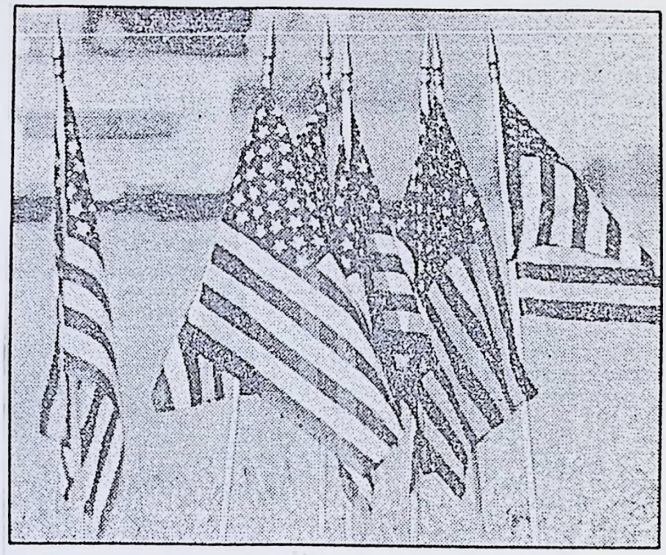
11:40:43, MC: We have a report from the flight dynamics officer that the vehicle has exploded. Flight director confirms that. We are now looking at...checking with the recovery forces to see what can be done at this point.

Challenger's crew was commander **Scobee**, born on May 19, 1939 making his second space voyage. He and his wife, June, have two children, 25 and 21; pilot **Smith**, born on April 30, 1945, was on his first flight. He and his wife, Jane, have three children, 17, 14 and 8; mission specialist **Resnik** was born April 5, 1949. Making her second voyage, she was the second American woman in space in 1984. She was single; mission specialist **McNair**, born October 21, 1950 was on his second flight. He was the second black in space in 1984. He and his wife, Cheryl, have two children, 3 and 1; mission specialist **Onizuka** was born June 24, 1946 and was on his second space mission. He and his wife, Lorna, have two children, 18 and 10; payload specialist **Jarvis**, born on August 24, 1944, was making his first trip into space He and his wife, Marcia, have no children; and teacher in space **McAuliffe** who was to become the first civilian in space. She was born on September 2, 1948 and she and her husband, Steven, have two children. McAuliffe taught American History in Maryland and was a social studies teacher at Concord High School in Concord, New Hampshire when chosen from over 10 000 applicants to be the first private citizen in space. Her selection was made in July, 1985, after President Reagan announced in August, 1984, that a teacher would be the first citizen in space. She was to teach two live lessons on space on Mission day 4 which would have been watched by students across the country.

The 25th Shuttle Mission was to launch the second 100-million dollar Tracking and Data Relay Satellite (TDRS). The first was deployed in April, 1983 by the **Challenger** on STS-6. Problems with its rocket stage, the Inertial Upper Stage (IUS), delayed a launch until 1985. Last March a problem developed with the satel-

lite so its launch had to be postponed. Finally, there was to be a second TDRS. With another TDRS NASA would always be in contact with the Space Shuttle while in orbit. An end to "Loss of Signal" would have come after the satellite had been checked out.

The United States could not afford the cost of an encounter mission to Halley's Comet. But the United States found other means--cheaper ways--to be involved in Halley'86. And ironically, one satellite--that would have deployed and then retrieved by Mission 25--would have been the first satellite to observe Halley. The carrier box is the Shuttle Pointed Autonomous Research Tool for Astronomy or SPARTAN in short. SPARTAN flew on the Shuttle last summer and was deployed to search for a black hole in the centre of the Milky Way Galaxy. Two days later it was retrieved and brought back to Earth where its data was removed and studied. SPARTAN is a simple system for space astronomy --a "cheap" system providing a reusable carrier box for about $3.5 million. The Canadian-built remote manipulator system (RMS) was to place the package in space so it could study Comet Halley. One day later **Challenger** would have retrieved SPARTAN with the use of the robot arm.



Associated Press

These seven small U.S. flags mysteriously appeared beside road at the Kennedy Space Centre in Florida.

Before the tragedy of **Challenger**, McNair said, "El (Onizuka) and I will be doing the SPARTAN preparation. Then the SPARTAN will be able to fire its jets to maneuver around to the Comet, a small dot in the universe, and make very precise measurements. ...Scientists are interested in knowing just what are the components of a comet, what are the constituent gases that make up the comet. From this we can get some idea about the origin of the universe. These studies can sometimes change the way you think about things."

SPARTAN carried two spectrographs which would have analyzed the Comet. "A spectra is recorded on a channel every 1.6 seconds, so that's two spectra every 1.6 seconds," said Dr. Ian Steward, of the University of Colorado and co-investigator for the mission, before the Shuttle disaster. "Most of the orbit will be spent observing the Comet in full sunlight. Once per orbit the Comet is available with the sun occulted (blocked) by the Earth for about 90 seconds. There will be about 30 active orbits."

Another Shuttle flight will not take place until NASA knows what happened to cause the **Challenger** to explode. There are many theories as to the cause of the explosion. They are:

Theory 1: A defect in one of the SRBs caused exhaust flames to spew from the side of the rocket, igniting the external fuel tank (ET). In slow motion film a flame on the aft of the ET moved its way up the tank and then exploded between the orbiter and the ET. On the night of Saturday, February 1 NASA released film of a different angle. It shows a plume of flame emerging from the right SRB above the normal exhaust flame. This plume, which may come from a seam,



The Challenger Seven: (L to R) Ellison S. Onizuka, S. Christa McAauliffe, Gregory Jarvis, and Judith A. Resnik. (Seated L to R) Michael J. Smith, Francis R. "Dick" Scobee, and Ronald E. McNair.

grew in size and in 15 seconds the entire Shuttle exploded after it had ignited the tank.
Theory 2: A seam in the main fuel tank ruptured, releasing hydrogen that caught fire and triggered the explosion.
Other theories:
Derrick damage: The possibility that the ET was damaged more seriously than believed when a derrick arm on the launch tower scraped a quarter inch of insulation from a small heater box on Saturday, January 25. The damage, called "a very minor scrape," was repaired and passed examination.
Bumping tanks: The possibility that either the external fuel tank or solid rocket boosters came loose and bumped the other. Gravity drag and a high pressure point may have caused the loosening.
Metal fragments: The possiblity that metal fragments splintered off the giant turbines, or pumps, that drive the liquid gases to the Shuttle's main engines.
Freezing weather: The possibiltiy that freezing weather at launch time damaged a line in the ET or weakened the plastic agent that bonds together the components of the solid fuel in the SRBs.
Icicle puncture: The possibility that icicles formed on the main fuel tank and were jarred loose during the flight, punturing a hole in the rocket motor or in the tank. NASA said they cleared all the ice from the pad and anyway, heat generated from the flight should have melted any icicles.

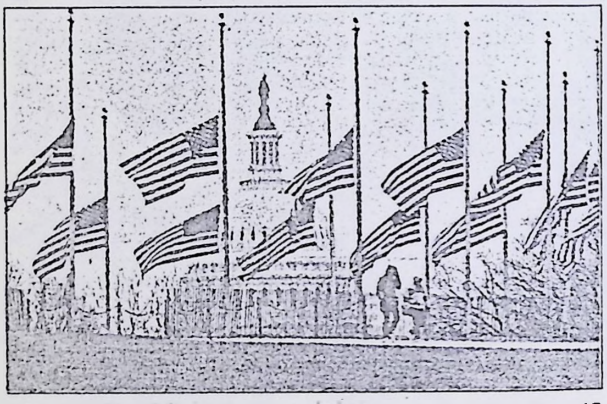
NASA believes they know the cause of the accident and can have it fixed in time to have a Shuttle ready to fly as early as June. A flight that had been scheduled by the Columbia for June 24 appears to be the earliest possible.

Search teams in the Atlantic have collected about 11 tons of wreckage since Monday, February 3. Included was the body flap, a piece of the right wing form the front and back, a part of the right cargo bay door near the centre, and a piece of Challenger's nose and cabin still intact. A control panel with wires sitll attached to it is believed to be part of the cockpit was also found. A foot bone with some tissue attached to it may be some of the remains of the

Challenger's crew. This washed up on the beach along with more debris from the $3 billion spaceship. Each day the search area is enlarged because of winds and currents which carry debris farther away from the original site.

As investigators combed the waters off Cape Canaveral memorials for the Challenger Seven were being held across the country. They were in Concord, New Hampshire, home of McAuliffe, in Hawaii, at the Cape and in many other places. The memorial service in Houston was on a grassy mall surrounded by the white stone and black glass buildings of the Johnson Space Center (JSC). About 10 000 gathered to mourn the Challenger Seven, including astronauts, engineers and grieving families. They listened to Reagan deliver a 10-minute eulogy for "seven brave Americans." He urged space exploration to continue despite the explosion of the Space Shuttle Challenger.

Capitol in mourning



By Scott Applewhite, AP

IN MEMORIAM: Flags at half-staff around the Washington Monument Wednesday are part of nationwide salute to seven astronauts killed in shuttle Challenger explosion.

"Sometimes, when we reach for the stars, we fall short," Reagan said. "But we must pick ourselves up again and press on despite the pain."

Many family members, sitting in a centre section near Reagan as he spoke, wept openly. Some senior NASA executives sitting nearby joined them in tears, as did some in a large contingent of astronauts. Marc Garneau, Canada's first astronaut, was also there.

Four T-38 jets roared in a tight formation overhead. One craft split away and climbed toward the sun. They flew in the missing man formation.

To remember the astronauts of the Challenger Representative Bill Nelson who flew on Mission 24 said that 7 of the newly discovered moons of Uranus should be named after the Challenger 7. The world offered condolences and Russia announced that map makers who are mapping Venus are going to name 8 craters on Venus after Resnik and McAuliffe.

Before the T-38 formation President Ronald Reagan said: "We come together today to mourn the loss of seven brave Americans, to share the grief that we all feel, and, perhaps in that sharing, to find the strength to bear our sorrow and the courage to look for the seeds of hope. On the day of the disaster our nation held a vigil



UPI Photo

Grief etched on their faces, from left to right, Rich Scobee and Kathie Krause, children of Francis Scobee; June Scobee, his wife; Nancy Reagan and President Reagan; Jane Smith, wife of Michael Smith, and two of their children, Scott and Allison, listen to a memorial service at the Space Center in Houston.

by our television sets. In one cruel moment our exhilaration turned to horror. We waited and watched and tried to make sense of what we had seen. Sometimes, when we reach for the stars, we fall short. But we must pick ourselves up again and press on, despite the pain. Our nation is indeed fortunate that we can still draw on immense reservoirs of courage, character, and fortitude but we're still blessed with heroes like those of the Space Shuttle **Challenger.** Man will continue his conquest of space, to reach out for new goals and ever greater achievements. That is the way we shall commemorate our seven **Challenger** heroes. **Dick, Mike, Judy, El, Ron, Greg,** and **Christa,** your families and your country mourn your passing. We bid you goodbye. We will never forget you."

High Flight

Oh, I have slipped the surly bonds of Earth
And danced the skies on laughter-silvered wings;
Sunward I've climbed and joined the tumbling mirth
Of sun-split clouds--and done a hundred things
You have not dreamed of--wheeled and soared and swung
High in the sunlit silence. Hov'ring there,
I've chased the shouting wind along and flung
My eager craft through footless halls of air.

Up, up the long delirious, burning blue
I've topped the wind-swept heights with easy grace,
Where never lark, or even eagle, flew;
And, while with silent, lifting mind I've trod
The high untrespassed sanctity of space,
Put out my hand and touched the face of God.

John Gillespie Magee
Pilot RCAF
1922-1941

