



Don Eyles, left, receiving citation from Boston City Council President Gabriel F. Peimote.

DRAPER LAB SAVES MOON LANDING

Engineers at MIT's Charles S. Draper Laboratory were being credited this week with a major role in saving the Apollo 14 moon landing.

Three and a half hours before astronauts Alan Shepard and Edgar Mitchell (MIT Sc.D. '64) were to begin descent from lunar orbit, the abort switch on the main panel of their lunar module, Antares, began malfunctioning. The switch, possibly because of loose wires or dirt, was sending random signals to the on-board computer unit in the Draper-designed LM guidance system.

Had spurious signals been present when powered descent began, they would have triggered an automatic abort sequence in the guidance computer. The spacecraft would have been commanded to a new attitude and thrust back into a safe orbit—leaving insufficient fuel for another attempt to land.

Word spread quickly along the SCAMA (Scheduling, Conference and Monitoring Arrangement) network, a communications system that links contractor personnel in Houston with home laboratories and plants. Astronauts call them "the boys in the back room."

On duty for MIT in Houston was Russell Larson, Boxford, who headed the writing of Apollo 14 computer programs. He was quickly joined in Houston by Philip G. Felleman, Sudbury, who had overall charge of MIT's ground support for Apollo 14, Stephen Copps, Andover, and Romilley Gilbert, Titusville,

Florida, a member of the MIT office at the Kennedy Space Center. Also in on the problem in Houston were David G. Hoag, Medway, director of the Lab's Apollo group and Norman Sears, director of systems development for the group.

In the Lab's SCAMA room at 75 Cambridge Parkway, the chief communicator on duty was Robert E. Werner, Acton. With him were engineers Bruce McCoy, Brookline, David Moore, Saugus, Donald Eyles, Boston and Samuel Drake, Watertown. They were soon joined by Alan Klumpp, Wayland, Lawrence Berman, Cambridge and Peter Volante, Lexington. All had worked on the programs for the computer and all went to work figuring out how the unintentional abort could be avoided.

It was Eyles who devised the procedure eventually used and he was later singled out for special accolades, including TV and newspaper interviews and an appearance before the Boston City Council. A Draper Lab employee since he graduated from Boston University in mathematics in 1966, Eyles had designed programs and routines used in the computer for the landing portion of the mission and was on hand in the SCAMA room in support of Apollo 14's lunar descent.

His plan to avoid the pending abort was a four-step procedure that required the astronauts to enter certain keystroke sequences into their on-board computer so as, in effect, to re-configure the logic in the erasable memory and cause the computer to ignore the faulty sig-



Seated, left to right: Lawrence Berman, Peter Volante and Donald Eyles; standing, left to right: Samuel Drake and Bruce McCoy.

nals. The procedure, in addition, required the astronauts to do some manual throttle handling early in the descent, since the re-configuration to bypass the abort signal also disabled certain automatic throttling sequences.

The idea was quickly tried out twice on the Draper Lab's own lunar module simulator and passed on to Houston. Space agency engineers likewise tested the procedure by simulation, then passed the necessary computer entries up to the astronauts. Wire service reports said the astronauts entered the fix via their keyboard a bare ten minutes before descent was to begin. Once on the moon, Mitchell was reported to have told the ground "those guys at MIT saved the mission."

At its regular session Monday, even before the Apollo 14 splash-down in the Pacific Ocean Tuesday, the Boston City Council adopted a resolution commending Eyles and his colleagues at Draper Lab "for the contributions to and efforts in behalf of the manned space program of the United States."

In responding, Eyles told the council "I hope it's understood by everyone that I'm here as a representative of a team." He said what happened was not very different from what goes on in the Draper Laboratory all the time, except that

it seldom occurs under the time constraints encountered in the early morning hours of last Friday when the astronauts were preparing to land.

QUESTIONS AND ANSWERS

People like to ask questions and, for the most part, MIT is good at answering them. But there is some confusion about who to call. For example, many administrative offices receive calls asking for random information such as telephone and room numbers.

If you can't find what you're looking for in the Institute Directory, call Directory Assistance, Ext. 30. The switchboard keeps up-to-date lists of all MIT extensions, both by name and by room number.

The Information Office, Ext. 4795, is an excellent source for general questions pertaining to Institute matters: class schedules, how to locate students, etc. The Information ladies try to answer all questions, but if they can't, they usually know who can.

More exotic questions should go to the Reference Desk in the Humanities Library, Ext. 5683. Call there for any facts or figures you may need.

If you need information about the history of MIT, the Archives Library, Ext. 5688, is the place to

call. Archives can also help with questions about thesis requirements.

Finally, the Student Activities Office, Ext. 3766, is helpful if you want information about a particular student activity. It also makes arrangements for charter flights to Europe.

LOOKING AHEAD

More than 100 members of the community will gather this afternoon to begin working on the 1971 Institute Blood Drive. Faculty chairman is Professor Anthony French of physics and student chairmen are A. Warren Lippitt '72, representing the Technology Community Association and Bob Elkin '73, of Alpha Phi Omega.

This year's blood drive will be held in the Sala de Puerto Rico beginning March 9 and running through March 19. The Institute has so loyally supported the blood drive that for the past several years the Red Cross has annually given us an extra day to donate. MIT's drive is the largest single collection on the eastern seaboard and, because it comes at a time when blood reserves are low, has vital significance for the entire New England area.

Solicitors will begin distributing advance registration forms immediately, and the students have set the first computer run to schedule exact appointments for the last week in February. Those who sign up first, of course, have the widest choice of appointment times.



Mary Helen Thompson, left, has her costume adjusted by designer Linda Martin.

PLAY OPENS

The MIT Dramashop will present *The Merchant of Venice* beginning tonight (February 11) in the Little Theatre at Kresge, with further performances scheduled for February 12, 13, 19 and 20. Curtain time is 8:30 p.m.

This production sets the Shakespearean comedy in modern Venice but retains Elizabethan language. The staging is in contemporary Italian high style. Special music in the modern idiom has been written by Philip Bertoni, '73, using lyrics adapted from poems of Ben Jonson and John Donne.

The play is directed by Professor Joseph D. Everingham of humanities with sets designed by William D. Roberts, costumes by Linda Martin and light design by Edward Darna. Tickets are \$2.00 for reserved seats. Reservations may be made by calling Ext. 4720.

REMINDER

The Blue Cross-Blue Shield deductible for Extended Benefit claims is still \$50 per person per calendar year.

POTPOURRI OF ART

On Sunday (February 14) the Cambridge Arts Council will bring

"Hearts for Arts Sake" to Kresge Auditorium for a benefit performance. Many art forms will be represented in a two-part program during the afternoon and evening. The benefit is being held to offset a deficit resulting from last summer's Re-Creation '70, a neighborhood arts festival sponsored by the Council.

The Kresge lobby will be turned into a bazaar of arts and crafts during the afternoon portion of the program. Painters, photographers, candlemakers and weavers are among those whose work will be shown. Many items will be for sale with part of the proceeds to be donated to the benefit. Two exhibits will feature the Cambridge Art Center and *Kids* magazine which were recently reported in *Life*. Also, during the afternoon, there will be performances in the Kresge's Little Theatre of the Peoples Theater, a student group from Cambridge High and Latin School and the Orson Welles Film School.

The evening performance will take place in the main auditorium and will feature several different local musical groups. Those participating are the Cambridge Opera Workshop performing parts of *La Boheme*, St. Paul's Choir, organist John Dunn, the Jazz Spectrum, which regularly performs as part of the Young Audiences program and Gilbert Pimental playing Portuguese fado music.

The afternoon part of the program is from 2:30 on and is free, although donations will be accepted. The evening part of the program is scheduled from 7:30 to 9:30 — especially to accommodate families — and tickets are priced at 50 cents for children and \$1, \$5 and \$10 for adults. Tickets are available at TCA on the fourth floor of the Student Center or may be purchased at the door.

DSRV TEST

The Deep Submergence Rescue Vehicle (DSRV), for which the Draper Lab developed a precision control and navigation system, has passed a critical test. In a recent dive off San Diego, DSRV-1 achieved a depth of 3,500 feet. Skipper for the

test was Lt. Cmdr. D. Pat Raetzman, who was trained in its operation here. His report on the test: "Response to controls is immediate and the maneuverability is excellent." The DSRV vehicles are being developed by the Navy to rescue crews from stricken submarines.

MEDAL OF SCIENCE TO SLATER

Institute Professor Emeritus John C. Slater received the 1970 National Medal of Science on January 27 "for wide-ranging contributions to the basic theory of atoms, molecules and matter in the solid form." Professor Slater is now a member of the faculty at the University of Florida in Gainesville.

HERE AND THERE

Professor Norman Levinson, head of the Mathematics Department, recently received the 1971 Chauvenet Prize from the Mathematical Association of America. The prize is given from time to time in recognition of publication of a noteworthy paper.

Professor Emeritus Phillip M. Morse, now a senior lecturer in the Physics Department, assumed office as the vice president of the American Physical Society last week at the joint annual meeting of the APS and the American Association of Physics Teachers. Professor Steven Weinberg, also a member of the physics faculty, was elected to the APS Council at the same meeting.

Four members of the community are listed as contributing authors to the *Handbook of College and University Administration* recently published by McGraw-Hill. They are

Warren D. Wells, Registrar, Paul F. Barrett, Construction Manager of Physical Plant, Richard F. McKay, mechanical engineer in Physical Plant and Edward L. McCormack, Director of the Audit Division.

Dr. Harriet L. Hardy, Assistant Medical Director in charge of the Environmental Medical Service, has been appointed to a seven-man committee on Supersonic Transport Environmental Research by Secretary of Commerce Maurice H. Stans. The committee will study the potential effects of supersonic planes on weather, climate and radiation levels.

Dr. John C. Sheehan, Camille Dreyfus Professor of Chemistry, has been appointed to the 12-member National Advisory Research Resources Council of the National Institutes of Health. The Council reviews applications for NIH grants. Professor Sheehan's term ends September 30, 1973.

Sample copies of recent MIT publications—pamphlets, brochures, booklets, etc.—are posted in the Information Center in the lobby of Building 7. Notes show where copies may be obtained. Among the latest is a brochure on the master's degree programs at the Sloan School of Management.

FOR SALE, ETC.

Fuzzy kittens, beautiful mrkings, free to gd homes, 2 left. Janet x2657 or 354-6936.
Rcrd chngr, worn, \$5; AM-SW radio w/10" spkr, \$20. Steve 261-8017 evgs.
Wdn Skis, 6'6", cable bndgs, 56" alum poles, \$50; Reiker ski boots (2pr), M 8½, W 7½, \$20/pr. 868-8339.
Custom stereo, 1st class components, 10' of cabinets, \$1695. Chuck 899-7532.
Valentine miniature poodles, AKC papers, male & fem. x3485 or 395-7265.
Comb radio/phono TV; upr piano, both gd wrking order. Chuck x7360 or 774-2045 evgs.
Hipachi refrig, 3 cu ft, brnd new, was \$90, now \$65 or best. Sue x5757 or 491-7231 evgs.
Walnut stack tbls (3), \$10; hamper \$2. Laurie x6003.
Pr ladies xz 7½M Henke buckle ski boots, \$25 or best. Lynn x4875.
Pipe organ parts, old Estey, 9 ranks, some pipes brkn; med X-ray, 100kvp, 200 ma, 6' tilt tbl, wrking order in NY. Genovese x5820.
Polaroid camera, mod 150, complete w/flash & case, \$20. x535 Draper 11.
Red winter coat w/leopard collar & buttons, sz 9, alst new, best offer. Kay x6584.
Craig 3119 car tape & FM stereo and Pioneer TS 20 spkrs, \$150. George x5058.
Tires (2) 7.75, v low mileage, \$10 ea. x6444 or x6446.
Ital lthr sprng coat w/slvr fox collar, sz 7, \$20; french rabbit hat & coat, orig \$350, now \$125 or best; Motton lamb jacket, \$10. Carol x2093.
Arm chrs, wdn, w/cushions, gd cond, \$7 and \$11; formica tbl, 2½'x4', \$6. Rob x7817 or 742-2691 evgs.
Ski boots, Henke slalom, 9N, worn twice, \$75 new, now \$35. J. White x6849 or 868-0254.
"Fluid Mechanics" Landau & Lifshitz, Vol 6 of Theoretical Physics course, \$7, \$16.50 new. Alan x1917.
Apollo skis, 6'1", fbrglas, nrly new, adjus cable bndgs, \$25. Carl Wieman x3161 or x6813.
Highchr converts to youth chr \$6; infant seat \$3; jump chr \$5; car seat, xtra safety belt \$8. 491-2869.
Gldn Retriever, male, 5 mos old, AKC reg, \$50. Bob Kirby x7116.
Tires (2) 6.95x14, super prem/delta 140ww, 4 ply tubeless/dynacor rayon, used 4 mos. Leona x7193 Linc.
Akai M-9 (Roberts 770x) tape rcd, 40w of pwr, pro-type, wl inc 12 tapes, \$200. David 734-2168.
Russian/Eng & Eng/Russian dictionaries, nvr used, MIT Press, both for \$3. Chuck x2257
Basset pups, AKC, home raised. x289 Linc or 322-5414.
Norcold elec refrig, 2 cu ft capacity, wd grain, used v little, less than yr old, \$60. John Loud x7675.
Guitar amp, Realistic w/ Tremolo, 35w, perf cond, \$35. 332-7152 evgs.
Bell & Hwl 35mm fine proj, remote control, focus & slide advance, 12 magazines, \$50. I.J. Stiglitz x765 Linc.
Sony mod TC-250A stereo tape rcd, 4 track, solid state, v gd cond, \$60. 923-1985.

Port vacuum cleaner (elec broom), used only 1 yr, \$20. 923-0481 evgs.
Antiq ladder-back chrs (3); antiq ladder-back rocker (1), \$20 ea. 484-9591.
Rossignol Stratos skis 207cm, exc cond, Jacques x7174.
Lafayette spkrs 15/8/2 in, cross over & encl, exc cond, new \$210, sell \$85. Mike x6007.
'59 Mercedes 190SL, best offer. Clint 326-8038.
'61 Ford Falcon, std, new clutch, flywheel, gen & batt, gd cond, \$195. x4944.
'61 Classic 3 liter Rover, less than 40K, exc cond, \$750. Phil Waldran x7241 Linc.
'62 Plym Fury, auto, pwr st, new snws, R&H, new batt, gd eng & body, '70 sticker, \$150. Canitez x7798 or 776-3007 evgs.
'63 Olds Cutlass convert, fair cond, \$150. 879-2660.
'65 Chevy Impala, \$900. 868-7897 evgs.
'65 dead VW, nds engine work, \$100 or best. Norman Brenner x5810.
'66 Mustang, 6 cyl, auto, 47K, gd cond, \$695. x5022 or 479-8506 evgs.
'67 VW bus, recent rebt eng, gas htr, \$800; '66 BMW bike R-60, ceriana frnt forks, \$900. Margaret 491-8126.
'69 Mustang, convert, V-8, auto, pwr str, new tires, exc cond, best offer. x5719 Linc or 625-0671.
'69 VW sedan, exc cond, \$1300. x7102.

Belmont Ctr, unfurn fam house, sublet, 3BR \$300/mo. 484-3903.
Boston sublet, Marlborough St, studio, mod K, B, disp, carpeted, 4th fl. Marty x3846.
Camb, 3 apt house nr Harv Sq, estate settlemnt, low 40's x7104.
Watertown apt, 2 fam house nr Main St, 3BR, lrg LR, garage, \$225/mo. 924-1289.
St John, Virgin Isl, hilltp vacation home for rent, 2 BR, priv, empty beach, wk/mo/seas rental. 646-8618.

WANTED & MISC.

Wl rent color tv alignment equip. Bob x2593.
Wl do straight or tech typing. Mia Brown x4604.
Fem rmmate to share BR, all util, betw Harv & Cent Sq, \$60. Sarah 547-5706.
Dec 1969 edition of "Woman's Day" magazine. Guy x5597 Linc.
Fem rmmate to share Brookline apt, avail beg of Mar, own rm, nr T, \$80. Peggy x2405 or 731-9334 evgs.
Second hand garden equip: rakes, hose, hoe, shovels etc. Peggy x4801 or 449-3161 evgs.
Ice skates, M sz 9, W sz 5½. Gene Arnold x5040 or 547-1317.
Soprano saxophone. 734-7641 evgs or wkend.
Tires, 9.00x15, gd cond, reas. Frank Robinson x206 Draper.
Wl do typing, Eng, French or Russian, reas. x3966.
Young mother wl care for motherless hshold, days, exper & references. 484-1697.
Found: ladies watch in Sloan prking lot. x7867.