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THE
CANADIANS
WHO'LL HELP
PUT THE U.S. ON
THE MOON



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second skin**

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Canada's men on the

MOON SHOT

BY TOM ALDERMAN

Up there, 240,000 miles away, is the moon. And down here, in a suburb of Houston called Clear Lake City, there's an out-of-order cigarette machine. Anywhere else, the sign on the machine would read OUT OF ORDER. But this is the home of the Manned Spacecraft Centre of the National Aeronautics and Space Administration. So the sign reads INOPERATIVE. And nearby some wag has scribbled: Does this mean it doesn't work?

All of which gives you an idea of the mixed bag working here to put the first men on the moon by the middle of next month. Nearly 200,000 people work on the U.S. space program. The action takes place at Cape Kennedy,

when the 84-foot-long Apollo 11 spacecraft, with astronauts Edwin Aldrin, Michael Collins and Neil Armstrong aboard, takes off for the moon's Sea of Tranquility.

But the nerve centre is Clear Lake City, where the space flights are planned, developed and organized by about 10,000 people, the cream of North America's space experts. And — you can throw out your chest now — some of the most important are Canadians. It wouldn't be right to suggest Apollo 11 couldn't get off the launch pad without the dozen Canadians working there on the \$24-billion U.S. space project. But no one can deny that Canadians have made it all seem a whole lot easier.



The vehicle behind Owen Maynard is the LEM, the section of the spacecraft that will make the actual landing on the moon.

He designed their spacecraft

When Apollo 11 finally takes off under 7.5 million pounds of thrust, few people will be able to look up into the sky and know more about what is going on than Owen Maynard, a tubby 44-year-old from Sarnia, Ont. Maynard and his engineering team designed everything that makes the spacecraft go. And that makes for a lot of nuts and bolts. The LEM (Lunar Excursion Module), the spider-like vehicle that will actually land on the moon, alone has more than a million working parts. And the LEM is only one section of three that

make up the spacecraft. The others are the command module (the section containing the crew's living quarters) and the service module (the section in which much of the equipment is stashed).

"They've given me such important jobs," he says with just the beginning trace of a Texas twang, "that it's almost frightening. I feel like running up to them and yelling 'You must be out of your heads!'"

The problems of putting together the first craft to land on the moon are, naturally, highly complicated.

"Take a little thing like figuring out how big to make the command module," he explains. "We finally decided on a 154-inch diameter. But, brother, what arguments and soul-searching! Some wanted it one inch bigger so the crew'd be more comfortable. Some wanted it one inch smaller so we'd save weight and therefore fuel. Just one inch can cost millions." Understandably, Maynard puts in a 12-hour working day — even longer just before flight time.

Maynard quit school at 16, was a bomber pilot during the Second World

War, and went to university to study aeronautical engineering. He worked for Avro on the Arrow project until the 1959 collapse. Maynard still keeps a model of the plane near his desk alongside an autographed photo of the astronauts. "It was the world's greatest airplane," he says. "Even the people in the business down here will tell you that. But it simply cost too much to have the best."

Any bitterness Maynard may have felt is gone now. He lives well with his wife and four children in a six-bedroom ranch-style house on a two-

continued

acre lot. "Enough room," he explains, "for me to keep my horse tied up in back." And he likes Texas. Real friendly, go-out-and-do-it kind of people. "They don't just sit around and talk. They go right out and do what they have in mind."

Maynard is a Quaker, a religious man. "I don't think you'll find many people who work in space who don't believe in God," he says. "There's something about working with space that makes you think there must be some reason for the wonder of it all.

Nothing could be so logical, so beautifully organized, without some logical Being behind it."

He likens the space program to the time King Solomon built the temple. "It wasn't so much building a temple. Solomon used it as a symbol of devel-

oping technology. He used it as a symbol to encourage people themselves to develop. And there were no wars while he built it because it was also a peace symbol. I hope the space program will do the same thing for people everywhere."



The room in which Len Packham is standing can simulate acoustical conditions on the moon, different from those on earth.

He'll help them keep in touch with earth

Len Packham knows everything there is to know about how to talk to people way out there. A sombre 47-year-old from Saskatoon, who looks and sounds like movie actor George C. Scott, he heads the group that designed Apollo's telecommunications system.

From the second Apollo blasts off, it has to keep in touch with earth, the better to transmit vital information back and forth — such as moon pictures, and instructions on when to alter course, to slow down, to speed up, and to wake up. So it is that Packham is one day tinkering with pint-sized

tape recorders; the next, with radar or how to send a good TV picture from Apollo back to us watching the action in our homes; the next, with the size of an astronaut's head so as to outfit him with a proper set of earphones. "Now *that* is complicated," he says of this latter problem. "That Borman, he's got the biggest head you ever saw. It's a real headache to design a set to fit him properly."

Ask Packham to briefly explain any of his designs and he leaps joyously to his blackboard. And for the next two hours he flails away with his chalk, merrily chatting about scan

converters, dynamic ranges and booster noise interference.

"So you see," he says at last, "it's all really quite simple."

Packham was an RCAF aircraft mechanic during the Second World War and graduated in mechanical and electrical engineering from the University of Saskatchewan before going to work at Avro in Toronto. Though he became a U.S. citizen in 1965, he still likes to drive to Canada every summer with his wife and 21-year-old son to fish, visit with relatives and enjoy the change from the flat Texas landscape. In Texas, he likes to get

away from his desk for the odd game of golf. "You can play all year round down here," he boasts, "though it can get pretty sweaty in the summer when it's about 100 degrees for days unending."

Presumably the man who helped design the tiny TV camera that will transmit pictures to our living rooms 240,000 miles away has no trouble handling his own TV repairs?

"Are you kidding?" he says. "I send it out like everyone else. Who's got the time to mess with it yourself? And brother, do those TV repairmen ever charge!"



continued

He'll shield them from heat

Tall, gaunt, horn-rimmed, with a truncated vandyke and a penchant for five-syllable words, Calgary-born Bryan Erb looks and sounds somehow like what he is — one of the leading experts on how to keep spacecraft and astronauts from burning up in the atmosphere.

For six years, Erb, a 37-year-old civil and aeronautical engineer, has labored on the design of the heat shield, an inch-thick fibreglass and silicone resin coating smeared over the tip of the space capsule. After Apollo 11 leaves the moon, it'll hurtle homeward into the earth's atmosphere at 25,000 miles an hour. It's maybe 25,000 degrees F. at the re-entry point out there and the only thing that keeps everyone from getting char-broiled is Erb's marvelous heat-resistant shield.

Erb, in charge of a team of 150, spent two years alone calculating the amount of heat Apollo 11 would have to withstand. Then, painstakingly, juggling esoteric data such as angle of entry, rate of speed and physical and chemical properties, Erb conducted 7,000 tests before coming up with the perfect heat protection.

It's a two-layer, cream-colored circle of heat-absorbent impregnability, about eight feet in diameter, that arrives back on earth only slightly toast-



Apollo 6, behind Bryan Erb, returned to earth scorched but safe.

ed by the whole ordeal. And it costs only \$75 million.

The big problem in putting together a heat shield is people. "Working out the scientific problems is easy," says Erb, who likes to while away an idle hour doing mental calculus problems. "It's when some key person quits on you for another job that you go mad. Despite all our computer analysis and

documentation, much of the new important technology still drifts around in people's heads. It's taken me months to catch up after some of my people have left for private industry."

Like most of the Canadians in the space program, Erb worked on the Avro Arrow in Toronto. When the fighter plane project was junked in 1959, he went along with about two

dozen other engineers to work on NASA's fledgling project.

"I'd always wanted to be a space-man," says Erb, who as a 16-year-old in Edmonton, was already grinding his own astronomical lenses because the professional ones didn't suit his discriminating tastes. "And, failing that, I at least wanted to do something that no one else had been able to do before. I wanted my own little place in history."

Erb — like most engineers who've worked for NASA 10 years — earns between \$20,000 and \$25,000 annually. He lives with his wife and two children in a two-storey suburban home about a five-minute drive in his cream Volkswagen to his NASA office. Unlike most of his countrymen, he still hasn't become a U.S. citizen.

"Just laziness," he says. "I want to but just haven't had the time. We certainly don't miss those winters in Western Canada." Despite the easy tempo of Texas living, work absorbs most of his time. "You'll find we all work hard because we're all caught up in the excitement," Erb says. "The scientist has a natural explorative instinct to go against the probable. And technically there's nothing more exciting than tackling the thesis that man can fly off into space and live to tell about it."

He'll examine them when they return

The first earthling to say hello to the three astronauts when they return from the moon will be Dr. William Carpentier, a 33-year-old research physician from Cowichan, B.C. Dr. Carpentier, the boyish, crewcut son of a B.C. mill worker, has been giving home-coming spacemen their first medicals since he joined the space project four years ago.

During a flight, he's stationed on one of the recovery ships and as soon as the spacecraft splashes into the ocean, he's off for the area in a helicopter. A trained scuba diver, Carpentier has to be ready to dive into the ocean in case there's trouble.

"People always ask me the first thing they say when they crawl out of their capsules," says Carpentier. "Anyone who asks that doesn't know how noisy it is out there with the sea sloshing and the helicopter whirring. I don't hear a damned word."

Apollo 11 promises to be more



A trailer is part of Dr. William Carpentier's quarantine equipment.

complicated. Because scientists are concerned about alien germs being brought back from the moon's surface, the astronauts will be quarantined for two weeks — and Dr. Carpentier will be quarantined along with them. "We asked for volunteers," said a superior, "and he spoke up."

Even his wife and two children find it hard to see Carpentier nowadays. He's spending much of his time practising to see what it's like being cooped up day and night in the project's lunar receiving laboratory.

"It promises to be very, very dull," he told me by microphone from behind the lab's sealed glass partition. "I've no doubt we'll all be snapping at each other by the time we're ready to get out."

It's the most comfortable \$10,000,000 temporary home ever constructed, a vast one-storey edifice with lounge, dining room, kitchen, dormitory and numerous laboratory rooms.

The GRACE OF GOD- What Does It Mean?

Even among Christians, there is often misunderstanding of the nature and effects of this supernatural gift.

Saved from misfortune... or blessed in a worldly way... some pious and well-meaning people are wont to say: "It was only by the grace of God." This may reflect a worthy attitude of appreciation toward God, but it doesn't necessarily reflect the understanding of divine grace every Christian should have.

In general, grace has been defined as a supernatural gift infused in the soul, making it pleasing to God. No one can merit divine grace, or acquire it by his own unaided efforts. "... by grace you are saved ... that not of yourselves, for it is the gift of God" (Eph. 2:5-8).

There are, moreover, distinctions in the kind, quality and purposes of divine grace. The first distinction is between sanctifying grace, which the Church calls a permanent quality in the soul, and actual grace, described as a transient movement from God that comes and goes and acts on the soul rather than in it. Sanctifying grace makes the soul pleasing to God and remains there permanently unless expelled by serious sin.

Actual grace moves us to do good works.

There are other kinds, qualities and purposes of divine grace with which every Christian should be familiar. Lacking space to describe them here, we have published an interesting pocket-size pamphlet called "GRACE—Without It, You're Dead" ... and we will be happy to send you a copy free upon your request.

This new pamphlet covers such topics as "The Supernatural State" ... "Grace—What Is It?" ... "Actual Grace" ... "Other Kinds of Grace" ... "Ways to Obtain Grace" and "How Can We Merit God's Grace?" It explains what we must do to make ourselves worthy of God's freely given gift of grace... how the Sacraments and prayer open the channels through which the grace of salvation is poured into our souls.

Every Christian... in fact, everyone seeking the favor of God through grace... should read this interesting pamphlet.

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KNIGHTS OF COLUMBUS

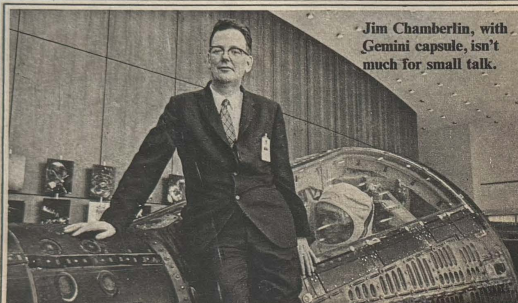
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Carpentier, the astronauts and a technician will arrive by plane from the splash-down in a sealed capsule. Then, untouched by human hands, they'll be wheeled into the quarantine area where 15 other cooks, scientists and general help will be sealed in with them. For the next two weeks, nothing will get out—not people, not food scraps, not human waste, not one

fragment of dust.

NASA is Carpentier's first employer. He graduated from UBC, got his pilot's licence and studied aviation medicine at Ohio State before going to Houston. "I suppose I could set up in a cushy private practice," said Carpentier from behind the partition, "but space exploration is something that turns me on."



Jim Chamberlin, with Gemini capsule, isn't much for small talk.

He'll troubleshoot if the need arises

He sits primly at his desk, precise, correct, blue-grey eyes peering out behind the bifocals. This is the complete space engineer and he communes only with space. I ask a question. He considers. "Yes!" he says crisply. I ask another question. He considers once more. "No!" he says more crisply. He's Jim Chamberlin and few know more about all aspects of the space program than he does.

"Jim's a strange guy," they'd warned me. "He doesn't talk much. Doesn't like wasting words. But he's one helluva genius of an engineer."

Chamberlin is a 54-year-old mechanical and aeronautical engineer from Kamloops, B.C., who still carries a slide rule in his pocket—the engineer's equivalent of someone who still writes with a quill pen. "I'm not sure I can always trust computers," he says in a rare outburst of loquaciousness. "They make mistakes occasionally."

He was the senior engineer scooped up by NASA in 1959 from Avro. In one month he was heading NASA's engineers. Then he was put in charge of Project Gemini, father of the Apollo Project, which was out to per-

fect the techniques of orbital rendezvous and solve the many problems of prolonged journeys in space.

With an office on the executive floor, Chamberlin is NASA's troubleshooter. When there's a hassle over what kind of earphones the astronauts should wear, Jim Chamberlin is there to mediate, pronounce and investigate. When a hunk of the craft falls into the sea when it's not supposed to, as it did on the last unmanned space flight, Jim Chamberlin arrives—slide rule at the ready—to find out why it happened. "The manufacturer's fault," he announced after six months of sifting evidence. "As I suspected. Didn't attach it properly."

Chamberlin became a U.S. citizen five years ago. He lives with his wife in Houston. A married daughter lives nearby and his son studies law at the University of Toronto.

"He's one of the best," they say of Chamberlin. "He'd be even bigger around here if he could only talk to people."

He stared out the window again. "So?" he said. "No more questions? Good. Good day."

He'll oversee their meals

Paul Rambaut admits he's not a very good chef. He's the nutritional biochemist on the team that plans the meals for the astronauts. This doesn't leave much chance for elegant cuisine. Because weight on a space flight is always a problem—every extra pound that goes to the moon needs an extra 185 pounds of fuel to carry it there—most of the food is of necessity dehydrated.

"Naturally," says Rambaut, "it's not the tastiest stuff around. And, naturally, the astronauts bitch about it all the time."

Of the two pounds of food and water each astronaut consumes daily, Rambaut likes to be sure each gets his 2,500 calories along with the usual assortment of fats, calcium, protein and carbohydrates. So it is that on Day 2 Meal 1, the astronauts will

feast on bacon squares, textured ham and applesauce, apricot cereal cubes, chocolate cubes and cocoa—no coffee, except by special request, because it's not nutritious. It all comes in neat little transparent plastic packages.

The chef de cuisine is hamstrung by more than the weight problem. With no gravity in the spacecraft, you can't do such a simple thing as pour yourself a glass of milk. It would spray all over the place. Instead you have to suck the stuff out of plastic tubes.

Actually, the Apollo 11 menu was planned two years before Rambaut, a six-foot-four graduate in biochemistry from McGill, arrived at NASA last year after one year at Procter and Gamble. The 29-year-old Rambaut is already plotting the meals astronauts will eat in 1971. By then he hopes

spacemen will be dining on fresh, more tasty natural foods.

For Rambaut, making a little food go a long way is the real excitement of the job. "Think what this means on an earth with more and more people with less and less food."

Rambaut was born in England but came to Canada in 1953 with his father, a commercial pilot. He got his own pilot's licence while going to school in Weyburn, Sask. After McGill he got his doctorate in public health, and went to NASA when he found he could combine his two interests of air travel and biochemistry. You'd imagine that an ace nutritionist eats perfect well-balanced meals.

"No, not quite," says Rambaut, who is separated from his wife. "When I get home, I just open up a TV dinner."



Paul Rambaut, with poly-bagged soft drinks, is used to complaints.

They'll try to decide what comes next

While others worry about next month's Apollo 11 flight, John Hodge and Dennis Fielder are already thinking about space flights two decades hence. Hodge and Fielder are the space program's resident brainstormers, part of a small group charged with working out what the U.S. will be doing in space over the next 20 or more years.

Not for them the quaint chatter about moon landings. Hodge and Fielder talk of visits to Mars; of space stations where men can live for years at a time; of airports on earth from

which spacecraft will take off for their extra-terrestrial flights and later return.

"It's damn expensive plucking spacecraft out of the ocean like we do now," says Fielder. "There's no reason—if we have enough space traffic—why we can't have them land on the ground at special airports."

Both Hodge and Fielder are, predictably, avid fans of science fiction authors like Isaac Asimov and Arthur Clarke. "But we don't get too many ideas from them," says Hodge, a salt-and-pepper-haired aerodynamicist of

40. "It's easy enough dreaming up those wild ideas and putting them on the printed page. The real imagination comes in working out the ideas realistically, then selling them to the people who plan the space program's budget in Washington."

Because there are so many variables, like the cost, the war in Vietnam and the mood of the politicians, Hodge, Fielder and their fellow soothsayers have worked out a variety of complicated plans. But if all goes well, they figure the U.S. will make the 34,000,000 mile trip to Mars between 1982 and 1986.

Both Hodge and Fielder were born in England, came to Canada to work for Avro, and left with the rest in 1959. Fielder, a droll and witty 38-year-old, looks like the definitive eccentric Englishman, from his wild, unruly mop of greying hair, down past his penetrating eyes and full beard and sombre dress—till the onlooker's eye is jolted by a pair of fancy Texas riding boots. He was divorced in 1962—"those first years down here working till all hours had a lot to do with it"—and now spends his off-hours building his own stereo and color TV sets and driving about town in his red

Cadillac convertible. Hodge lives with his family in a quiet suburb a few miles from his office.

"Like it? Sure I like it!" says Hodge. "We live well. All the conveniences. Sometimes I think we live almost too well. I mean, living in the perfect suburban community like I do, you're untouched by anything disagreeable. I wonder what it'll do to my kids' sense of values not to know about hunger, about violence, about how to do without."

"Ah well, I guess that's the worry of every suburban father."



John Hodge (left) in the mission control centre, and Dennis Fielder (right) with rocket model, are NASA's resident brainstormers.

