QUO VADIS?

Or, as this writer would say, WHEREINHECK are we GOING? ?
I have asked before; I must know, if this Newsletter is to be interesting (and hopefully, helpful) to readers and potential readers.
But never have I asked with such a sense of urgency. I must know, and know soon, where our interests lie.
You may or may not have noted my comments in the January Newsletter about OFT's (Operational Flight Trainers). But that was written last November.
Just the other day (4 March 1963, to be exact), I was “shook” when an acquaintance, who was advocating formation of an “International Simulation Council” (with no relation to our feeble effort) said “Simulation Councils Incorporated? They’re completely computer-oriented.”
Are we?
Is that bad?
Is it as though the American College of Physicians and Surgeons was concerned exclusively with the relative merits of competitive makes of scalpels?
Of course I exaggerate to make a point. But was my friend right?
If it seems to him that we are “completely computer-oriented,” it is certain that some others feel the same way. How many?
And, I ask again, is that bad?
Perhaps there should be a “Council” for computers. Even a council for Analog Computers!
Perhaps. But I for one do not think that Simulation Councils should be it. At least that was not the original intent. And in this I know whereof I speak—I called the meeting at which the original Simulation Council was born in November 1952. I was then—and still am—analog computer-oriented. But that is incidental (or should be). It was decided by all of us that at that first meeting that SIMULATION was our forte, not computers of whatever kind. We were to be concerned with simulation, and as better computers or other tools were developed we would use them.
Nevertheless computers have been the glamour girls of the past decade, so it was inevitable that these columns have been almost exclusively devoted to descriptions of various ways computers have been and can be used to simulate everything from biological systems to the national economy. And usually in these simulations the computer was the whole show; it simulated the entire system.
But now with man’s going into space we are creating systems which, though they make greater demands on computers than ever before, cannot be simulated by computers alone. Computers can do an excellent job of simulating the “hardware” but, at least for the present and foreseeable future, the man in manned spacecraft simulations must be a man. And that makes problems: Problems quite different from those with which this Newsletter has usually been concerned in the past.
So I decided to write another article in an attempt to find out what our readers think we should do. And I don’t just mean about this column. The Board of Directors of Simulation Councils Incorporated (SCI to you) is just as concerned, or perhaps more concerned, with serving the interests and needs of members—and readers—as ye Ed.
I had gotten just this far with the article when I received a copy of the following letter:

Maughan Mason,
Analog Simulation Office
Thiokol Chemical Corporation
Washatch Division
Brigham City, Utah

Dear Maughan:

I note the push toward identification of Simulation Councils, Inc., as a National organization of Simulation experts. Yet we identify with AFIPS by getting an “analog man” on their committees? We want to publish a
Multiple variable problems like the ones bothering our friend involve generating a great many independent trial solutions. The combination of GPS high-speed operation, with memory capability, logic-controlled iteration and time-sharing of computer units gives most reliable results. Operating on a compressed timescale of 3000 to 1, the GPS Computer System performs in one-tenth of a second a problem which in real time computation would require five minutes. A wide variety of problems, new to the analog computing art, can now be solved by the GPS Multiple Timescale Analog Computer with speeds and dynamic accuracy unmatched by any other analog computing system available today. Write for Technical Information.
magazine called "Simulation." Yet we still are councils of persons applying analog and hybrid computation.

Our scope is too narrow. Analog Computation has no "corner" on Simulation anymore than Operation Research has. There are huge simulation efforts that do not use any computer. I'm looking at a Physical Simulation Laboratory booklet that mentions in one sentence the availability of computers. We are swamped with digital computer people holding seminars in Simulation.

Take a good look at this word. Simulation is perhaps one of man's oldest analytical tools. The literature talks of Direct Simulation, Physical Simulation, Digital Simulation, Computer Simulation, Flight Simulation, Real-time Simulation, General Purpose Systems Simulation, Analog Simulation. When the SCI magazine says "Simulation" what will this mean? Will the OR man find articles on the technique of setting up a stochastic model of a real situation, and then performing sampling experiments upon the model? Will the Management Science man find articles on the science of employing computation models as description for the purposes of—management problems? Will the Laboratory type find information on the technique of substituting a synthetic environment for a real one, so that it is possible to work under laboratory conditions of control? Will there be articles on models of business systems, simulations of social and political systems, models of Air and Vehicular Traffic control problems or bomber flights against SAC to simulate an enemy attack? What will SCI mean when we say "simulation"?

Any attempt to claim the word as descriptive of some activity peculiar to some particular science is like trying to package a whale in one sardine can.

Our scope is too narrow! Build plans on the simple definition that simulation is the act of representing some aspect of the real world by numbers or symbols which may be easily manipulated to facilitate their study. Then SCI will have a potential that includes all scientific areas that use simulation as a technique of study.

Let's take off the blinders. To concentrate on simulation as done by analog or hybrid computation may be loyal to one's specialty, but it is short sighted, and is certainly missing the real need to present simulation as an analytical tool or technique of study that can be used by all.

M. E. McCoy, Jr.
Chief, Analog Computation
Martin Company
Orlando, Florida

Now getting that letter just as I was writing these lines might have been a coincidence. But it wasn't much of one. As suggested at the beginning of this article, there are probably many others who think that we are "completely computer-orientated," too narrow," and otherwise not doing the job we should do.

How about you?
I do not believe it possible to cov-
er adequately all of the facets of simulation which McCoy mentions. But if you let us know your interests we can certainly bias our coverage in the direction of the "most for the greatest." (The readers of the Newsletter being "the greatest," of course!)

In fact, in one simulator the pilots said a recording of air blowing across the hole in a spool of thread sounded more like the boosters at blastoff than a recording of the boosters at blastoff!

And smell is no problem unless something goes wrong with the chemical "life support" system!

Touch is important, but "realistic" models can be and are made of everything within the pilot's reach.

Taste is important from an aesthetic point of view, but they tell me they are getting the modern day "K ration" quite palatable. But now we are through with the easy ones.

No realistic visual presentation has yet been devised. In space all things within the pilot's view except his own spacecraft—and perhaps one with which he is docking—are at such a distance that the light rays from them reach his eyes travelling virtually parallel. This is a condition that is hard to fake. Arrangements of lenses and/or mirrors offer partial solutions, some of which are quite satisfactory for static conditions. But if the pilot moves his head, or looks out another window, or rotates his spacecraft, all but the most complex introduce so many artifacts that the illusion is lost. And the best of present-day systems—and even those on the drawing boards—leave much to be desired.

Kinesthetic senses combine with those of orientation to make it practically impossible to fool the pilot about accelerations, including gravity.

Centrifuges help us to simulate gravitational fields greater than 1 g. with some degree of satisfaction, but we are yet to find a way of creating a field of less than 1 g. on earth for a length of time that is useful in spacecraft simulation.

Need I go on?
I know of no field of engineering endeavor which cries out so loudly for "breakthroughs" in so many areas.

Interesting, isn't it?

The Eastern Simulation Council is forming an organization known as SARE (Simulation and Analog Reports), to distribute and archive programs, reports, etc. For details contact Arthur I. Rubin, Space Systems Div., Martin Co., Baltimore 3, Md., Mail No. 6009.
MEAN TIME BETWEEN FAILURE: 8 YEARS

Donner's customer wanted maximum reliability. Donner responded with this solid state dc operational amplifier using components selected in accordance with MIL-E-701B, preferred list. Mean time between failure: 70,000 hours at 25°C.

Forty-four of these ±20 v silicon amplifiers, packaged in specially built cans, are now being used in instrumentation of U.S. Navy high altitude balloon studies.

To satisfy the customer's requirements, Donner customized its standard Model 3801 amplifier. In addition to MIL Spec components, a special connector was placed on a standard size board, with a new board layout.

It was a custom job but the price of this special dc operational amplifier was only $75 above the standard unit.

Donner can do the same for you. Ask us for (a) a free copy of our new amplifier brochure, (b) an amplifier you can evaluate—sent promptly from stock.

*In accordance with Rome Air Development Center Reliability Handbook calculations.

Systron-Donner's MIL Spec silicon dc operational amplifier, Model 3801-S3. This solid state unit is 100 times more reliable than any comparable vacuum tube amplifier and only one-tenth the size (3" x 4½" x 2¼").
FIG. 1. TEST ENGINEERS at United Air Line's San Francisco maintenance depot pilot a simulated plane and check out autopilot behavior using an analog computer. The computer simulates all the signals an autopilot normally receives in flight.

At United Air Line's San Francisco maintenance base, an analog computer (Fig. 1) checks out complex electromechanical systems by simulating an airplane in flight, including autopilot. This permits a full operational check of an autopilot in less than 30 minutes, as opposed to six hours plus several test flights formerly required. The computer can sim-

FIG. 2. BLOCK DIAGRAM shows organization of acceleration and aerodynamic inputs for simulation of an aircraft in flight by an analog computer. Inputs and autopilot response are recorded on a six-channel Brush oscillograph.
ulate both weather and flying conditions, and be adapted quickly to different types of aircraft (DC-8, Boeing 720 and Caravelle).

By feeding the outputs from the computer into a six-channel Brush recording system (Fig. 2), a written record is obtained of control and dynamic responses under every conceivable kind of flying condition—including instrument flight, blind landings, turbulent air and the special problems of both low and high altitudes.

The computer consists of 23 operational amplifiers, twelve used as voltage summers, eleven as integrators. Used in programs involving various combinations of amplifiers at prescribed set-points, d-c voltages are generated which simulate specific angular accelerations, rates and displacements of the roll, pitch, and yaw in any possible aircraft maneuver.

The computer has two complete sets of potentiometers. Each set provides a full range of functional coefficients—one to represent cruising conditions, the other approach conditions. The computer can be switched from one set to the other, allowing new setups to be patched into one while the other is engaged in testing.

The computer simulates the following signals, which are the signals normally fed into the autopilot:

1. Three gyro inputs (simulating outputs from three auto-synchro pickups—one each for heading, roll and pitch).
2. Five accelerometers—one for roll acceleration and two each for yaw and pitch accelerations.
3. Magnetic compass and radio heading inputs.
4. Two radio displacement signals, as employed in ground control—one for glide slope, one for localizer signals.
5. Three stabilization signals—one each for roll, pitch and yaw.

These basic signals are delivered to the autopilot and provide the feedback from the aircraft's own motion, to which the autopilot must respond precisely and correctly.

No hardware is used; even aileron and elevator servos are simulated (external to computer).

The graphic record of flight events and autopilot response pinpoint system lags, overshoots or instabilities which may exist. The charts become part of the permanent maintenance record of the autopilot.

United's record of safety is among the best in the air transportation industry, a fact largely attributable to the care and thoroughness of its maintenance program.
Prohibitive cost no longer limits procurement of custom systems needed to solve specific simulation problems. For now Comcor of Denver delivers custom machines—bUILT to individual specification—at lower cost than ever before possible. Along with economy you get performance. Comcor state-of-the-art components and concepts have introduced degrees of speed, operator convenience, reliability and accuracy unchallenged by any other computer system.

CI-170 offers high-speed repetitive and iterative operation, and is compatible with most digital computers, eliminating the interface problems normally encountered in a Hybrid System. State-of-the-art components include solid state comparators, a 1000 point cross bar, and .02% oven mounted quarter square multipliers and sin-cos generators.

Custom Computers by Comcor

CI-171 Test Console affords functional diagnostic test capabilities for all analog components. Features include cross bar address system, temperature controlled oven, primary resistor and capacitor standards, AC and DC load device, and advanced cable well design. Configurations for all commercially available analog computer components can be incorporated in the CI-171.

CI-70 Precision Potentiometer Positioning System provides fully automatic tape or card set-up for coefficient potentiometers, diode function generators and UNE's. Programming time is reduced by a factor of 5. Potentiometers are set in less than 2 seconds each, with error no more than 10 millivolts. Other features are automatic scan, automatic check-out, and automatic error indication.

Tape Set Diode Function Generator System. Comcor Servo Set DFG's are available at a cost comparable to that of hand-set units. The new CI-225 Series Type DFG boasts specifications superior to any commercially available function generator.

Comcor Inc.

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CI-170 CIRCLE 104; CI-171 CIRCLE 105; CI-70 CIRCLE 106; CI-225 CIRCLE 107


**Central States Simulation Council**

The following information on the Central States Simulation Council activities was sent to us by R. W. Dagenais, their Secretary-Treasurer.

A meeting of the Central States Simulation Council was held on December 14, 1962, at Midwest Research Institute, Kansas City, Missouri. Papers presented:

1. "Network Approximations of Finite Integrators"  
   Charles C. Beh and Charles A. Haliwash, Kansas State University

   Martin Carter, MRI

3. "Analog Simulation of Sucker Rod Pumping Systems"  
   A. J. Bosser, MRI

4. "Simulation of Sample Data System on an Analog Computer"  
   D. M. Koshi, McDonnell Aircraft

---

**Letters**

Dear John and Suzette:

You may be interested in some of my activities at USC. As you know, I joined the faculty here last September as Assistant Professor of E. E., with a major responsibility for the teaching of courses in analog and hybrid computers and sampled-data control systems. Our course sequence in computers combines analog and digital techniques all the way from the first undergraduate course to the new Ph.D. level courses and seminars we will introduce next year.

We are in the process of acquiring a hybrid computer for the School of Engineering, to be installed in a new Systems Simulation Laboratory. The computers will consist of an IBM 1620, a Beckman 2132 (complete with iterative features) and IBM conversion equipment. The laboratory will be operated completely open-shop.

By next year we will have an active Ph.D. program for students interested in the area of hybrid computation. Our immediate interests lie in such areas as system optimization and identification, including the finding of mathematical models for biological systems. The acquisition of the computer has been made possible by a substantial gift from the Olin Foundation, which also donated $2.2 million to USC for the new engineering building now under construction.

George A. Bekey  
Electrical Engineering Department  
University of Southern California  
Los Angeles 7, California

---

**DIANG JING TII YUNN SUANN**  
**FANG DAH CHIH...**

Which means, of course...

**SOLID STATE OPERATIONAL AMPLIFIER**

Outside Dimensions 7½" x 2¾"

But that's not the whole story... It's **SHORT CIRCUIT PROTECTED**

and incorporates **FIELD EFFECT TRANSISTORS**

---

**THE SEL MODEL 9018 OPERATIONAL AMPLIFIER**

<table>
<thead>
<tr>
<th>OUTPUT</th>
<th>100 VOLTS @ 20 MA</th>
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<tbody>
<tr>
<td>INPUT IMPEDANCE</td>
<td>2 MEGOHMS @ D-C</td>
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<tr>
<td>INPUT CURRENT</td>
<td>0.1 NANOAMPERE</td>
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<tr>
<td>NOISE (WIDE BAND PP.)</td>
<td>6 MV</td>
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<tr>
<td>UNITY GAIN with</td>
<td>1 MEG FEEDBACK</td>
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<tr>
<td>BAND WIDTH</td>
<td>100 K.C.</td>
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DIMENSIONS: 7½" x 2¾" (Others Available)

This amplifier is available in several configurations which can be tailored to fit into your present connectors without the necessity of rewiring. Evaluation units are available. Write Dept. 01 for Bulletin 1028A and quantity prices.

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CIRCLE 108 ON READER-SERVICE CARD →
ANALOG TECHNIQUES

AN IMPROVED SQUARING CIRCUIT

By Vanig V. Abrahamian of Cornell Aeronautical Laboratory, Inc.

The following technique has been in use at the Cornell Aeronautical Laboratory for the past few years. This technique has been found to be superior to the circuits in the early literature in stability and is less noisy than most.

The basis of the idea is a standard mathematical device of adding something to both members of the equation and solving the new equation by the usual techniques. Let us assume we want the square root, \( y \), of \( x \): where \( y \) and \( x \) are voltage variables such that

\[
0 \leq x \leq 100, \quad 0 \leq y \leq 100
\]

The equation proposed for solution is:

\[
y = \left(100x\right)^{1/2} \quad \text{or equivalently} \quad y^2 = 100x
\]

At this time we apply our trick by subtracting 10,000 on both sides of this last equation:

\[
y^2 - 10,000 = 100x - 10,000
\]

factoring the left member

\[
(y + 100)(y - 100) = 100x - 10,000
\]

dividing by \((y + 100)\)

and finally

\[
y = \frac{x - 100}{y + 100} + \frac{100}{y + 100}
\]

This equation is mechanized in Figures 1 and 2 using servo and electronic multipliers respectively. It is immediately evident from the figures that all amplifiers are at normal unity gain and there is no explicit division by zero. The circuit in Figure 2 has been checked on a Beckman 1100 rack and will pass frequencies up to 25 cps before distortion becomes significant.

This is a good example of the reason for the existence of this column. Without doubt there are many people in the field who are using useful techniques such as this of which their colleagues are unaware. This column is our opportunity to profit by the experience and cleverness of others and to share with them the tricks and skills which we have developed ourselves.
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Typical unscheduled downtime LESS THAN 3%.

REAC 500 is the proud successor to a long line of REAC Analog Computers first produced more than 15 years ago. Most REAC installations are still in operation — many “round-the-clock” — with unscheduled down-time averaging less than 3%.

The same high quality built into our previous models has been maintained in the new REAC 500 series which are now in production. REAC is synonymous with RELIABILITY — safeguarded by our uncompromising standards for performance; construction, and ease of maintenance.

Your computer investment is guaranteed when you specify REAC 500. For complete information, write for Data File 904.

Qualified engineers who are seeking rewarding opportunities for their talents in this and related fields are invited to get in touch with us.

REEVES INSTRUMENT CORPORATION
A Subsidiary of Dynamics Corporation of America, Roosevelt Field, Garden City, New York
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SCIENTIFIC APPLICATIONS:
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Mathematicians
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Here's the largest
Concentration of
Complex Programming
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You Are Likely to Find in
One Organization Anywhere
A whole series of unusual pro-
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One of the most comprehensive
assemblages of computer equip-
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nation is at your disposal: GE-
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Pace Analog, Trice Analog, the
Bendix Flight Simulator.

Required are: Experience in ana-
lag circuitry, instrumentation
for analog computer display and
control. Experience in math-
ematical modeling, network
theory, heat transfer problems,
stochastic processes, variation
calculus, orbital trajectory anal-
ysis and control theory. BS or
MS in EE, ME, Physics or
Math.

Please write in full confidence
to Mr. Robert Johnson, Manager-
Analog Applications, Huntsville
Computer Operation, Room
D146 General Electric Co., P. O.
Box 988, Huntsville, Ala.

GENERAL ELECTRIC
An Equal Opportunity Employer

INFORMATION (Without Theory)
(about SCI-sponsored meetings)

Of the six meetings which we
thought would be of interest to read-
ers and which we therefore list under
Calendar, three reflect active participa-
tion by your Simulation Councils
Inc.

SCI has been one of the sponsors of
the San Diego Symposium for Bio-
medical Engineering for the last two
years because of the potential which
Simulation has in the fields of bi-
ology and medicine. This year Ed
DeLand has put together an excellent
session on "Computers and Computer
Techniques in Medicine" as follows:

1. "Comparison of Alternative Computer
Models for Thyroid Diagnosis"
  Clyde M. Williams, University of Florida,
  Gainesville, Florida, and John E. Overall,
  Kansas State University, Manhattan,
  Kansas

2. "Diagnosis from Tape: A Study of the
Ascutary Diagnosis of Mitral Regurgita-
tion"
  Mario Spanuolo, Angelo Taranta, Ray-
  mond Synder, David Gerberg, and John
  Hoffler, Irvington House for the Care of
  Children with Heart Disease, Irvington-
  on-Hudson, N. Y.

3. A "Perfusion Loss Computer for Use in
Cancer Treatment"
  Denys O. Akhurst and Frank W. Lewis,
  University of Arkansas, Fayetteville, Ark.

4. "Application of Signal Analysis Methods
to Arterial and Aortic Pressure Curves"
  Ernest J. Henley, Stevens Institute of
  Technology, Hoboken, N. J.

5. "Experiments with a Mathematical Model
of Drug Distribution for Cancer Chem-
otherapy Research"
  Bella Kottkin, The Rand Corporation,
  Santa Monica, Calif.

6. "A Study of Blood by Chemical Analysis
and a Digital Computer: A Comparative
Evaluation"
  Gilbert Bradham and J. Maloney,
  University of California Medical Center,
  Los Angeles, California, and E. C. DeLand
  and J. C. DeHaven, The Rand Corpora-
  tion, Santa Monica, Calif.

And your Ed has responded to an
invitation to organize and monitor a
panel discussion on "Manned
Spacecraft Simulation" at the Spring
Joint Computer Conference. His pro-
gram looks like this:

Panelists:
R. S. BUCHANAN, Major, USAF, Chief,
Research Pilot Division, Aerospace Re-
search Pilot Schedule Edwards AFB, Calif.
S. DEUTSCH, Chief, Systems Research and
Analysis, NASA, Washington, D. C.
W. R. LAIDLAW, Vice President—Advance
Systems Space and Information Division,
North American Aviation, Inc. Downey,
Calif.
W. B. LUTON, Supervisor, Manned Aero-
space Flight Simulator, Ling-Temco-
Vought, Inc., Dallas, Tex.
J. M. HUNT, Senior Vice President/Techni-
cal Director, Simulation and Control
Group, General Precision, Inc., Bingham-
ton, N. Y.
J. STROWD, Engineering Psychologist, Pa-
cific Missile Range, Point Mugu, Calif.
P. M. FITTS, Professor of Psychology, Uni-
versity of Michigan, Ann Arbor, Mich.
W. E. WOODSON, Engineering Psychologist,
General Dynamics/Astronautics, San Di-
ego, Calif.

Bob Howe has organized a session
for the same meeting which looks
like a "Who's Who of Simulation",
to wit:

SESSION IV: ANALOG AND
HYBRID SYSTEMS I

ROBERT M. HOWE (Chairman), Dept. of
Aeronautical and Astronautical Eng., Uni-
versity of Michigan, Ann Arbor, Mich.

Panelists:
L. WARSHAWSKY, Aero Systems Division,
Wright Patterson AFB, O.
R. FAYREAU, Electronic Associates, Inc.,
Princeton, N. J.
H. MEISSINGER, Space Technology Labora-
tories, Redondo Beach, Calif.

Then Milt Warsawsky, not content
with being a panelist, has his own
session, as follows:

SESSION VII: ANALOG AND
HYBRID SYSTEMS II

Chairman:
L. MILTON WARSHAWSKY, Aero Systems
Division, Wright Patterson AFB, O.

Panelists:
M. C. GILLILAND, Berkeley Div., Beckman
Instruments Inc., Richmond, Calif.
R. T. HARNETT, Aero Systems Division,
Wright Patterson AFB, O.
R. M. HOWE, Dept. of Aeronautical and
Astronautical Eng., University of Michi-
 gan, Ann Arbor, Mich.

SCI, the Midwestern Simulation
Council, and most importantly, indi-
vidual members of the Simulation
Councils, have also contributed to
the program of the Institute of Aero-
space Sciences National Specialists
Meeting to be held in Columbus,
Ohio in August.

Busy, aren't we?
Color My Face Red

Department

The correct affiliation of Maynard Sikes, who wrote "Commutation of Control Surface Commands in Rolling Missiles" covered in the January issue of the Newsletter is the Martin Company, Orlando Division of Marietta Corporation, Orlando, Florida.

This Division of the Martin-Marietta Corporation is in neither Martin nor Marietta, Georgia, as some dope (your Ed!?) apparently assumed.

Furthermore, Bob Harney (Chairman of the Midwestern Simulation Council) writes that his organization is not Wright Air Development Division, but Aeronautical Systems Division (Boy are we old-fashioned! — or maybe Martinized?)

Calendar

Third Annual San Diego Symposium for Biomedical Engineering
and
Sixth Region Conference, Institute of Electrical and Electronic Engineers
Ocean House, San Diego, California
22-24 April 1963 (Symposium for Biomedical Engineering)
24-26 April 1963 (IEEE Conference)

1963 Spring Joint Computer Conference
Cobo Hall, Detroit, Michigan
21-23 May 1963
A session will be held on "Man-Manned Spacecraft Simulation".
For information write Lewis Winner, 152 West 42nd Street, New York 36, N. Y.

WESCON
Cowan Palace, San Francisco, California
20-23 August 1963
For information write WESCON, 1435 La Cienega Boulevard, Los Angeles, Calif.

Institute of Aerospace Sciences
Deshler-Hilton Hotel, Columbus, Ohio
26-28 August 1963
Subject of the meeting is "Simulation for Aerospace Flight Test"
Sessions will be held on "The Interdisciplinary Approach to Simulation Studies";
"The Pilots' Role in Simulation"; "Fidelity Requirements in Simulation".

International Symposium on Analogue and Digital Techniques Applied to Aeronautics
Liget, Belgium
9-12 September 1963
For information write Organising Committee, care of Frederie Enns, Professor, University of Liget

1963 Fall Joint Computer Conference
Las Vegas Convention Center, Las Vegas, Nevada
For information write P. M. Davies, Aboec Inc., 1718 21st Street, Santa Monica, California. Papers and abstracts should be mailed to Mr. Davies by 3 June 1963.

Are you interested in computer control?

and we mean control, not just data collection

Most of the high-priced computer "control" systems in operation today are actually engaged in simple data collection. EAI PC-12 computers, however, can provide either on-site control or data processing of continuous processes and at a surprisingly low cost too. Many existing installations of these ruggedized, solid-state, compact, reliable, flexible and re-programmable computers are proving the PC-12 to be tops for on-site, year-in-year-out CONTROL of continuous processes or for the processing of performance data. We invite your inquiry today for details on any of these currently operating installations:

- Batch process feedback computation
- Variable end point oxygen steelmaking prediction
- On-line statistical analysis pilot plant data
- Operator guide heat balances
- Data reduction in frequency response testing
- Distillation column controls
- Nonlinear control computations
- Combination feed-forward/feedback control
- Waste disposal pH control
- Economic dispatching of utilities
- Reactor heat balance control
- Polymer molecular weight control
- Chromatograph computation
- Universal pilot plant control system

EAI
ELECTRONIC ASSOCIATES, INC. Long Branch, New Jersey

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CIRCLE 111 ON READER-SERVICE CARD

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