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Professional Technical Group on ELECTROMAGNETIC COMPATIBILITY

NEWSLETTER

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Grobowski to Head PTG-EMC:

Zigmund V. Grobowski, of Jansky & Bailey, Vice-Chairman of the Administrative Committee of PTG-EMC, has become Chairman on the resignation of Donald R. J. White, of White Electromagnetics, Inc., who had to resign because of the pressure of business matters. Mr. White will continue as a member of the Administrative Committee. The following is a message from our new Chairman:

"To: All Members of PTG-EMC

"January is an unusual time to undertake the Chairmanship of the PTG-EMC Administrative Committee. It forcibly brings home a realization that the Committee still has almost too many unfinished tasks in this fiscal year. It also points toward an increased reliance on individual members of the Administrative Committee, Chapter Chairmen and Standing Committee Chairmen to expend extra initiative and effort in correspondence and Committee meetings since these are the avenues whereby the many activities of PTG-EMC must be co-ordinated and governed.

"Details regarding our part in Technical Sessions at the March IEEE Convention in New York and the 1964 PTG-EMC Symposium in Los Angeles are being reviewed and tackled as this is written. An opportunity is also taken, hereby, to immediately invite written reports from Chapter and Standing Committee Chairmen with the idea that later addenda reports will follow for the March Administrative Meeting. This step is taken to stir and speed PTG-EMC Administrative progress.

"In conclusion, I believe that I may express on behalf of the entire Professional Technical Group on Electromagnetic Compatibility, a sincere appreciation to Don White for his recent leadership and service as Chairman during a period of continuing change and stress in Group affairs. Though vacating the Chairmanship, Don will continue his PTG-EMC contributions as a member of the Administrative Committee."

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6th National Symposium Changes Dates:

Due to a conflict between meetings of technical groups, the dates for the 6th National Symposium on Electromagnetic Compatibility have been changed to June 9th, 10th and 11th, 1964 to be held in Los Angeles. This change in dates has been made in response to requests from members who had to attend the Symposium.

CHAPTER ACTIVITIES

Chicago:

A meeting was held on October 16, 1963 at which time a paper was given by H. W. Kenny, Ace Engineering & Machine Co., Inc. Huntingdon Valley, Pa., titled "RFI Shielded Enclosures".

Los Angeles:

There were two meetings held: One on September 19, 1963 where Joseph E. Berger, Stoddard Aircraft Radio Co., Inc., Los Angeles, Calif. presented a discussion on "Instrumentation Requirements for System Compatibility Analysis"; the second one was held on January 23, 1964 and Ward S. Cayot, Secretary of the Aerospace Flight Test Radio Coordinating Council at Northrop Corporation, gave a paper on "Industrial Frequency Management".

Met. New York:

A meeting was held on October 10, 1963 and there was a "Panel Discussion on Spectrum Analysis and Spectrum Signature". The panel members were Joseph Boer, Lavoie Labs., Inc. Morganville, N. J.; David Fidelman, Electromagnetic Measurements Co., Farmingdale, N. Y.; Arnold Frisch, Pentrix Corp., Brooklyn, N. Y., and Ralph Sandstrom, Polarad Electronics Co., L. I.

Mohawk Valley:

On November 5, 1963 a meeting was held and O. Salati, Moore School of Engineering, Univ. of Penn., Philadelphia, Pa. gave a paper on "Interference Aspects of Satellite Communications."

Philadelphia:

A meeting was held on October 1, 1963 at which time a paper was given on "Problems of Measuring Interference Fields" by O. M. Salati, Moore School of Engineering, Univ. of Penna., Philadelphia, Pa.

San Francisco:

Two meetings have been held: One on April 11, 1963 at which time H. M. Sachs, IITRI, Chicago, Ill., gave a paper on "The Technical Program of the Electromagnetic Compatibility Analysis Center (ECAC)"; the second meeting was held on October 31, 1963 and papers were presented on "Electro-Compatibility Aspects of Microelectronics" by R. B. Schulz, Boeing Co., Seattle, Washington, and "Practical Problems in Microelectronics Applications" by H. L. Newman, Lockheed Missile and Space Co., Sunnyvale, Calif.

Seattle:

A meeting was held on September 18, 1963, and a paper was presented on "Electromagnetic Compatibility in Micro Electronics" by R. B. Schulz, Boeing, Seattle, Washington, and "Amateur Film: Radio Frequency Survey of Crete" by Stephen L. Dyrnes, Boeing Company, Aerospace Div., Seattle, Washington.

Simulation of Battlefield RFI:

Frequency, January/February 1964, carries a 3-page article under the above title by L. F. Babcock, Bell Aerosystems Co. Tucson, Arizona. The sub-title and first paragraph are:

"Here's an operational facility which provides an extremely realistic re-creation of a battle field electro-magnetic environment. Key to the system's usefulness is an automatic control technique for rapid accumulation of large amounts of data used in assessing the complex interference problem in today's Army communications."

"Near Gila Bend, Arizona, you'll find a unique approach to the ever-increasing problem of electro-magnetic interference with military communication channels. It is the Electromagnetic Environmental Test Facility - 2400 square miles of a varied desert terrain which serves to re-create the electromagnetic environment of a battlefield. During combat such an area would contain about 15,000 transmitting devices, posing a potential RFI problem which raises considerable doubt as to whether these devices would function normally in a combat situation. To simplify a test of these conditions, automatic control of a transmission was required, and only those transmitting devices which would radiate a significant signal into the test areas at a given instant were included. Boiling it down, the basic problem was to automatically operate hundreds of devices at remote locations in the Gila Bend desert."

It Looks Like Plastic Dog Tags in The Future:

An AP despatch with picture, December 26, 1963, states as follows:

"Bill Haynie, 12, of Newport Beach, Calif., holds his pet dog, Tex, whose channel-changing jingling dog tags play havoc with family's TV watching. Tags are in tune with channel changer in TV set and every time Tex scratches, TV flips from channel to channel."

Why Guess on Lead-Length Limitations?:

Electronic Design, December 20, 1963, contains an article by Robert M. Lee, Research Engineer, Computer Center, University of California, Berkeley, Calif., under the above title. The sub-title and first paragraph are:

"Maximum lead lengths in digital systems are generally determined by rough rules of thumb. By measuring circuit sensitivity and noise as a function of lead length, limitations can be pinpointed more accurately.

"Excessive lead lenghts between digital circuit modules can impair their performance, particularly at repetition rates above 100 Kc. To determine the lead length limitations by rigorous mathematical analysis would be extremely difficult, if not impossible, However, simple measurements can be used to establish practical values for the maximum allowable lead lengths."

Heaven Can Wait:

Under the above title the New York Times, February 9, 1964, carried the following news item:

"Sir Bernard Lovell, director of the huge Jodrell Bank radio telescope in the North of England, complained last week that a romantic couple who park their motor scooter nightly near the observatory have been blocking signals from a star 100 light years away and disrupting observations involving U.S. and Soviet Space projects."

Reliability Concepts Applied to Knitted Mesh RFI Gaskets:

A. H. Cohen, Vice President, Metex Electronics Corp., Clark N.J., has written a 3-page article under the above title in the December 1963 issue of Electromechanical Design. The first two paragraphs are as follows:

"The science of reliability engineering has been refined to a high state-of-the-art in the military electronic equipment. Criteria for proper equipment safeguards and design redundancy of critical components is an estalbished area of investigation on all equipment. With the rapid rise in the need for RFI shielding and gasketing over the past several years, these reliability factors have been, for the most part, ignored in gasket design. It is true that much gasketing was done in an after-the-fact manner in that the package was completed and shielding was added later. In these cases, the primary function of achieving RFI control overrode any concern about sophisticating the gasket design. The gasket design was usually fixed by the limits in existing sheet metal. As long as a satisfactory 'fix' was obtained, the gasketing problem was 'solved'.

"As the need for RFI control has become widely recognized, gasket design undertaken at the packaging stage has increased greatly. When the sheet metal design is still subject to change in its early stages, the concepts of reliability can be applied to the RFI gasketing. In the design and application of suitable RFI gaskets there are seven basic factors to be considered, each of which will be discussed in some detail."

Low-Noise C-W Klystron Oscillators Meet Doppler Radar Requirements:

A 2-page article has been written by J. J. Hamilton, Spencer Laboratory , Raytheon Co., Burlington, Mass., in the December 6, 1963 issue of Electronics under the above title. The first two paragraphs are as follows:

"Unique nature of moving-target information obtained by Doppler radar, has resulted in its widespread use in aerospace systems. Up to now, security restrictions have prevented the publication of much information relating to equipment use and performance of these radar systems and their components. It is now possible to share some of the interesting facets of this work, and some of the results.

"Microwave tubes for modern Doppler navigation systems must be virtually noise-free. The availability of noise-free tubes has led to improve Doppler systems."

Linear Scales Show Mixer Harmonics:

Electronics, January 10, 1964 has a 2-page article und the above title by Roger T. Stevens, Sanders Associates, Inc., Nashua, N. H. The sub-title and first paragraph are:

"Simplified method locates spurious signals generated by the first six harmonics of two mixed signals: one scale is for the sum, the other for the difference, of input frequencies.

"When two r-f signals are mixed to produce a sum or difference frequency output, the mixing is inherently a nonlinear process that produces harmonics of the two incoming signals, resulting in spurious outputs corresponding to these harmonics and the various combinations of their sums and difference. If the relation of the incoming signals and local oscillator frequencies is chosen unwisely, some of these spurious signals will be at the desired output frequency, so that they cannot be filtered out. In many cases, the resulting distortion of the r-f signals is intolerable."

Telecommunications Management: The Strategy of Organizational Location:

Irvin Stewart, formerly director of telecommunications management, Executive Office of the President, and now associated with West Virginia University, has written a 7-page article under the above heading in the September 1963 issue of Public Administration Review. The following are extracts from the article which are chosen by your editor as having the broadest interest to the members of PTG-EMC. They should not be quoted, from a technical standpoint, as they might be out of context and the original article should be referred to.

"The immediate occasion for telecommunications management arises from the nature of the radio spectrum. If two radio stations operate on the same frequency at the same time without proper geographical separation, the interference is such that neither can give satisfactory service. Even the most die-hard opponents of government regulation of business accept the necessity for government regulation of the radio spectrum although they may differ as to the proper extent of that regulation.

"The advent of the communications satellite adds a dramatic illustration of the necessity for international regulation of radio communication...."

"Since 1927 Congress has felt that the authority to assign radio frequencies for non-government purposes should be vested in an independent regulatory commission. Authority to assign frequencies to government stations was vested in the President by the Radio Act of 1927 and continued in him by the Communications Act. of 1934. As there is but one radio spectrum, the result has been a potential administrative nightmare with two agencies, independent of each other, having jurisdiction over a single subject matter. The rapid expansion

of demands upon the spectrum from both government and non-government applications has produced an increasingly disturbed situation in recent years."

"Certain aspects of FCC operations are in the public eye from time to time. That Commission and its predecessor Federal Radio Commission have experienced the common fate of any group charged with the administration of a commodity or service in short supply. When there are two or more contenders for a resource which by its nature can be allocated only to one, it is almost inevitable that the losers will claim that they have been dealt with unfairly. Inasmuch as the losers have access to their representatives in Congress, the Commission can normally expect Congressional criticism from the representatives of the losers. It can hope for, and perhaps at times obtain, support from those who are more inclined to see the merits of the successful contender.

"It is also natural for the losers to feel that if the FCC had at its disposal a larger share of the radio frequency spectrum, it might have met the requests of all of the applicants. This might sometimes, but not always, be true. In some parts of the spectrum there simply is not enough space for all the applicants; the limiting factor is imposed by nature, not by man. In other areas, however, the Commission might be able to meet a larger part of the demands upon it, if it were free in fact, as it is in legal theory, to assign to private applicants frequencies already in use by government stations."

"The increasing shortage of frequencies available for assignment has intensified interest in the proper management of the natural resource represented by the radio spectrum. President Truman became sufficiently concerned in 1950 that he appointed a Communications Policy Board to study the matter. The final report of that Board was published by the Government Printing Office in 1951 under the title Telecommunications - A Program for Progress. That report is recognized as substantially valid today. It provides a good starting point for those who may be seriously considering the problem of telecommunications management for the first time."

"Early in his administration, President Kennedy ran into the same type of problems in telecommunications management which had confronted his immediate predecessors. He met it by the issuance of Executive Order 10995 dated February 16, 1962, which created the Office of Director of Telecommunications Management (DTM), to be held by an Assistant Director of the Office of Emergency Planning (OEP). A major new element was the delegation by the President to the Director of OEP and the redelegation by the latter to the DTM of the President's authority under Section 305 and Section 606 (a), (c), and (d) of the Communications Act of 1934. The former covered the assignment of frequencies to government stations, the latter authority over communications in time of war or national emergency. The principal effect of this redelegation was to place in the DTM the President's authority to act whereas the 1951 recommendation of the Communications Policy Board had been limited to advice to the President."

"The function of telecommunications management must be performed against a background of a mixture of publicly-owned communications and privately-owned communications into which public policy toward privately-owned communications introduces complexities....."

"Out of this melange has come the best telecommunication service in the world and a system which handles a large portion of the world's telecommunications traffic. Out of it also have come some large sized problems of telecommunications management. Along the way there have been numerous occasions upon which Congressional debate has explored various issues but with little resultant impact upon Congressional policy determinations. Stakes are large, habits are fixed, crises are infrequent, and the forces seeking change have not been strong enough to bring it about in most cases."

"At the present time approximately 100,000 radio frequency assignments to government agencies are outstanding and the number is increasing at the rate of about 8,000 per year ..."

"The proposal of a single agency to exercise an overall jurisdiction over the frequency spectrum has difficulties of its own. Should this jurisdiction be placed in the FCC? Conceivably, a situation might arise in which the Commission would be called upon to decide in essence whether a certain part of the spectrum should be used for national defense (involving classified information) or for additional TV stations (requiring open hearings). Undoubtedly, the DOD would not be happy with any such solution; it is unlikely that the FCC would be any more so; and there is no evidence that Congress is eager to embrace it.

"At the other extreme, an agency operating as an arm of the President might receive such authority. No President has made such a request and it is difficult to imagine Congress being receptive to one, if made. There would still remain the difficulty of reconciling the requirements of national defense for secrecy with those of common carrier regulation or broadcasting for wide publicity.

"The difficulties inherent in other approaches probably account in large measure for the survival of the dual system for the control of the radio spectrum. It does not require the talents of a crystal gazer to foretell that with the continuance of the dual system there is likely to be a continuance of the dissatisfaction with the working of the system; but one may hope that with experience under Executive Order 10995 some of the occasions for dissatisfaction will disappear."

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Evaluating Shielded Cables:

In Electronic Design, December 6, 1963, is an article by the Engineering Staff, Tensolite Insulated Wire Co., Tarrytown, N. Y. The first two paragraphs are as follows:

"Capacitance parameters of shielded hook-up wires can be important in the design of high-frequency circuits. When shielded wire is used as rf coaxial cable, diameter and weight criteria are often more critical than electrical variations.

"The accompanying nomograph can simplify evaluation of the capacitance and dimensional characteristics of shielded single-conductor wires from 12 AWG to 36 AWG. The charts can reduce the computation work necessary to determine the capacitance of a known construction and will permit rapid selection of the best construction."

New Technics in R-F Room Construction:

Erik A. Lindgren, President, Erik A. Lindgren & Associates, Inc., Chicago 40, Ill., has written an article under the above title in the December 1963 issue of Electronic Industries. The sub-title states:

"What are the problems encountered when building an r-f shielded room? How are these problems overcome? What types of shielded rooms are available? What have tests conducted on these rooms shown? These and other pertinent questions are answered here."

Transistor Noise Figure and H. Parameters:

Electronic Products, November 1963, carries a 3-page article under the above title by Russel W. Jones, Melpar, Inc., Falls Church, Va. The sub-title and first paragraph are as follows:

"Two test properties peculiar to transistors but important to a system's efficiency are described here. They are the test procedures for obtaining the noise figure and hybrid h parameters.

"The prominence of transistors today is evident in almost every phase of electronics. Thus, it is important that these devices behave exactly as the manufacturer predicts. To accomplish this aim many tests are made on transistors to assure that close tolerances are met. Two such tests, noise figure and evaluation of small signal hybrid parameters, are discussed here."

The Response of an Automatic Phase Control System to FM Signals and Noise:

Under the above title, Donald L. Schilling, Department of Electrical Engineer, PIB, Brooklyn, N. Y., has written a 10-page article in the October, 1963, issue of the Proceedings of theIEEE. The summary is as follows:

"Summary - An Automatic Phase Control (APC) System is analyzed in order to determine its response to frequency modulated signals, and narrow-band Gaussian noise. Emphasis is placed on the system's response to signals having 'ramp'type FM.

"The response of the APC System to an FM signal is ob-

tained using a perturbation and a piecewise linear technique. The response of the system to noise is obtained using an iteration technique. The complete response to an FM signal and noise is then discussed using an iteration technique and extending the results previously obtained."

Can RFI Control Prevent Weapons Failures?:

Electronics, November 8, 1963, carried an article by Richard J. Sanford, Advanced Engineering Div., U.S. Naval Ordnance Lab., White Oak, Md., under the above title. The sub-title and first two paragraphs are as follows:

"Today's modern weapons often include electronic circuits. Where solid-state components are used, radio-frequency interference can impair or destroy reliable operation.

"Effects of electromagnetic radiation on weapons circuits has been considered only in the last few years, after it was discovered that the unrestricted use of a number of our operational weapons in the vicinity of operating transmitting antennas impaired both the reliability and the safety of the weapons.

"Failures resulted from the premature actuation of an electro-explosive device, or EED (squib). In this device, and electric current passing through a bridge wire heats it to a temperature that initiates a small explosive charge. This small charge then performs some useful task, such as opening or closing switch contacts, igniting a rocket motor, or detonating a warhead. Since the EED responds to the heating effect of an electric current, it is just as sensitive to stray radio frequency energy as it is to the direct current with which it is usually fired. For this reason, considerable effort is being expended to provide r-f protection for EED's and to design weapons using a minimum of r-f sensitive components."

How to Prepare Surfaces for Adhesive Bonding:

Under the above title is a 2-page article in the November 1963 issue of Materials in Design Engineering which was prepared by the Technical Committee of the Rubber and Plastic Adhesive and Sealant Manufacturers Council. The first paragraph states:

"It stands to reason that a metal surface has to be prepared properly in order to obtain a high strength adhesive bond. Proper surface preparation will remove oxides that can interfere with adhesive performance, as well as protect the metal against corrosion by the adhesive itself or by water and moisture."

IEEE Papers Available:

The following papers may be ordered from Headquarters, IEEE, by number, 60 cents for members and $1.00 for non-members:

CP63-999. "Pulses and Radio Influence Voltage of Direct-Voltage Corona" by B. Rakoshdas.

63-1020. "Traveling Waves on Power Transmission Lines With Special Emphasis on Radio Noise" by C. F. Wagner.

63-1022. "Analysis of Radio Noise From High-Voltage Lines, Part 1 - Meter Response to Corona Pulses" by Transmission & Distribution Committee.

Spectrum Signature Testing Information:

Electro-Magnetic Measurements Co., 50 Baiting Place Road, Farmingdale, L.I., N.Y., has brought out three bulletins on the above subject. Bulleton No. 1 is titled "Spectrum Signature Adapter" and it describes the Spectrum Signature Adapter to be used with a standard Noise and Field Intensity Meter to provide a spectral display of the received pass-band. Bulletin No. 2 is titled "Spectrum Measurements of Radio Interference" and is a reprint of a paper presented at the 4th National Symposium on Radio Frequency Interference. Bulletin No. 3 is titled "A Rapid-Display Technique for Radio Interference Measurements" and is the reprint of a paper presented at the 8th Tri-Service Conference on Electromagnetic Compatibility.

Body-Produced Electricity Generates for Eight Hours:

Electromechanical Design, November 1963, carries a news item, the first paragraph of which is as follows:

"General Electric Company scientists have successfully demonstrated that useable electrical power can be drawn directly from living animals according to John J. Konikoff, Manager of the Physical Biology Operation at G-E's Space Sciences Lab., King of Prussia, Pa."

Circuit Design Techniques for Radiation Environments:

Under the above title is an article in Electromechanic Design November 1963, the first paragraph of which is:

"The design of electronic circuits for operation within a radiation environment is presently undergoing a revival. Current trends include the environments of ambient space radiation and weapon detonation. The more intense, and frequently catastrophic, environment associated with nuclear propulsion is presently being bypassed to a certain extent until design techniques are perfected. Previous columns contain guide lines and references to various nuclear environments a and the selection of components for nuclear service. This column is concerned with the design techniques that will improve a circuit's performance for nuclear service and assumes that the best of materials and components for this environment will be utilized."

Future Trends in Tactical Communications:

Major General David P. Gibbs, Chief Signal Officer, has written the following article under the above title. It is reprinted from the October 1963 issue of SIGNAL, Official Journal of the Armed Forces Communications and Electronics Association. The sub-title is as follows:

"....the explosion in the use of electronics in warfare threatens an electronic 'paralysis' resulting from self-generated interference. Future tactical communications systems must, then, make efficient use of radio frequencies. The Army's Chief Signal Officer describes the frequency saturation problem and other areas of concern for the future of tactical communications."

I would like to discuss future trends in tactical communications. In so doing, I think it only appropriate that we take note of the current status of our communications effort. It is true that in spite of rapid advances and improvements in our communications capability, stated requirements have increased at an alarming rate, and in many cases, have far exceeded our capability to provide the means of exercising effective command and control.

The demands on communications, imposed by modern warfare concepts, weapons systems, and automation of many functions, have resulted in trends which, if continued, will eventually saturate the battlefield with electronic equipment to a point where we will be faced with a form of electronic paralysis resulting from self-generated interference.

In this connection, the explosion in the use of electronics in warfare has placed a premium on the frequency spectrum as well as on the time that it is available for use. In spite of this explosion, the dispersion and fluidity of a combat situation dictate that radio will be the primary means of communications.

The physical laws of radio propagation are not changed. The increasing reliance being placed on radio communications in tactical operations makes it necessary to find new techniques to exploit the frequency spectrum more fully.

This same explosion, however, has opened many avenues to the more efficient use of frequencies. There is no question but that future tactical communications systems must make especially efficient use of frequencies and the duration of their availability for use.

The results of our efforts to develop Single Side Band (SSB) radio equipment clearly illustrate one of the new avenues of approach that we have taken to satisfy this specific requirement.

These efforts to date have resulted in some opinions on our part. It appears that the SSB High Frequency (HF) radio equipment has a distinct place on the battlefield. We are not entirely convinced, however, that the Very High Frequency (VHF) SSB technique has a clearly defined role in the battle area. We are somewhat concerned that the pendulu

will swing too far in the application of SSB equipment to the point where it overshadows other promising techniques, and the higher power, longer tange SSB radios will contribute to the electronic paralysis that we are endeavoring to preclude.

It seems evident that in the near future, we must seek a reasonable and logical balance of FM and SSB radios to be employed on the battlefield. We must retain the inherent advantages of both techniques in their most desirable applications.

Areas of Concern

In addition to our efforts in seeking a cure for electromagnetic radiation saturation, there are several other areas of major concern. These include: simple and immediate access decreased reaction time, greater routing flexibility, decreased vulnerability to detection, improved electronic or cryptographic security, and stable directory information.

Future tactical communications systems must be completely integrated and responsive to all users.

The full capabilities of the field army communications system must be exploited by a continued evaluation of communications-electronics equipment to include provisions for a fully secure transmission capability, together with lighter and smaller equipments designed for air transportability, increased range, higher capacity and reliability, as well as for economical use of the frequency spectrum. During this period, the communications function must be decentralized resulting in the reduction of our present communications complexes. This decentralization will make our communications equipment more difficult to locate physically and probably more difficult to detect electronically.

Future Needs

We envision a system that will eventually replace most of our present communications means, initially in forward elements, followed by systems of greater capacity for use throughout the field army. We also visualize that the introduction of this system will be accompanied by improvements in the next decade in such items as HF point to point radios, lightweight high capacity microwave, radio relay and automatic switching.

In addition to improving our point to point communications capabilities, current trends also indicate the necessity for vast improvements in our ability to process and display considerable quantities of data. High speed general purpose computers will provide the means whereby this data will be funneled into operation centers to be processed and displayed as needed. Present versions are large and cumbersome and are not suitable from a mobility point of view in the forward area. After the next decade, a need will exist for a highly reliable, secure, high capacity, flexible and fully mobile communications system in the field army. The system should provide for handling voice, message traffic, facsimile, and high speed data transmission automatically on a subcriber to subscriber basis without contending with cumbersome communications switching complexes.

The life span of communication equipment configurations in our present and current developments may well be reaching obsolescence by the 1970 time frame. For the post 1970 time frame, there is a requirement for feasibility studies to uncover revolutionary techniques which will provide for an even more efficient and responsive communications system. These studies should include improved power resources and vastly improved antenna systems.

Money and Manpower

In all our efforts we must give serious consideration to the money and manpower conservation aspects. For every item put into the tactical inventory, we must take something out. The new items will have to do the job better for less. A consistent introduction of new items without disposing of superceded equipment or items that are not essential to the accomplishment of the mission cannot be tolerated. In addition to developing an almost prohibitive price tag,an unrestricted flow of communications equipment into the field army will serve to increase the ratio of combat support and rear echelon tactical personnel to the point where the number of soldiers available to shoot will be too few to influence a decisive action.

In conclusion I would like to point out that although I have highlighted the tactical field army requirements, comparable considerations must be given to improved strategic communications systems.

Mysterious Radio Commercial Intrudes in Countdown:

The Boston Globe, February 3, 1964, carried a story on the Ranger 6 of which the following is an excerpt:

"But even in the quiet moments of disappointment after the picture failure, there was incongruity. The same public address system that had minutes before brought the final minutes of Ranger to space agency headquarters, now yielded a feminine voice saying:

"'Spray on Avon cologne.....'

"No one - not telephone company experts overseeing the line, nor NASA spokesmen - could explain where the voice came from. J. P. L. people said it was not heard at their end of the line."

Pittsburgh Having RFI/EMC Trouble:

The following is an editorial which appeared in the February, 1964, issue of HiFi/Stereo Review:

"Does an agency of the U.S. Government, in the interests of national defense, have the right to prevent an audiophile from enjoying his hi-fi system? This is a question music listeners in the Pittsburgh area have been asking for about a year now. Since last February, a new high-power Air Force radar unit in the Pittsburgh suburb of Oakdale has been causing audible beeps in hi-fi sets, radios, television sets, electronic organs , public-address systems - in every type of electronic playback equipment. The radar antenna makes five revolutions per minutes, and thus the beep is heard every twelve seconds - three hundred beeps an hour, twenty-four hours a day. The radar unit, called the AN/FPS-24, is for the detection of enemy bombers and is part of a country-wide system of twenty-four such transmitters, most of which are being located in sparsely populated areas.

"Despite the fact that the interference has made many hi-fi sets Pittsburgh unusable, the Air Force disclaims any responsibility in the matter. Mimeographed instructions for coping with the problem note that 'the cost of any necessary modification to commercial equipment must be borne by the owner of that equipment.' This cost is estimated to be from ten to twenty dollars per system (hi-fi, radio or television). It appears, however,, that sometimes the interference cannot be eliminated at any price . George A. Hall, a Pittsburgh reader of ours, reports that an electronics engineer with special training in eliminating r. f. interference worked twenty-two hours on his set with no success. Other frustrated hi-fi listeners in the area have taken the extreme step of moving to sections of the city that are shielded from the radar by hills.

"One wonders why the radar equipment wasn't installed fifty miles farther from Pittsburgh in the first place, so it would have been out of range; if only twenty-four AN/FPS-24s will suffice to cover the entire nation, surely the operating range of the equipment would not have been significantly affected. If the Air Force chooses to locate the equipment near a population center, it should be responsible either for eliminating any resulting interference or for fairly compensating the individual for the loss of his music system and for the loss of an important part of his recreation. Let us hope the city government of Pittsburgh will be successful in pressing the Air Force to accept its rightful responsibilities. Also, let us hope that future installations of this kind will be located well away from centers of population."

Letter on RFI:

The following letter appeared in the August 30, 1963 issue of Electronics:

"The special report on r-f interference (p. 37, June 21) listed d-c power supplies as a source of rfi but did not dwell sufficiently on this aspect. While many engineers are concerned with the rfi generated by d-c power supplies (particularly high-current d-c power supplies using switching circuits including scr's and magamps), very little consideration is given to rfi generated by d-c series regulator-type power supplies.

"We have found, while developing a series of high-current (4 amp to 60 amp) d-c power modules per MIL-I-26600 and MIL-I-6181D, and using the d-c series regulator technique, that unless preventive steps are taken, considerable conducted rfi is generated. The major source is the input rectifier section, due to the high reversed currents that flow at the time the rectifier is turning off.

These highcurrent transients cause considerable rfi to be conducted back into the a-c line, from which point it may be conducted to other equipment powered from this a-c line.

"To remedy this situation, we provide a filter between the power transformer secondary and the rectifier bridge, which greatly attenuates the conducted rfi to the point where it falls well within the specification limits of MIL-I-26600 and MIL-I-6181D.

William O. McGrew
Valor Instruments, Inc.
Gardena, Calif.

Corona and Aircraft:

The January 1964 issue of the Proceedings of the IEEE carries two articles on corona and aircraft as follows:

"An Analysis of Corona-Generated Interference and Aircraft, R. L. Tanner, J. E. Nanevicz - Triboelectric charging, occurring when an aircraft is operated in precipitation, raises the aircraft potential until corona discharges occur from points of high dc field on the aircraft. These corona discharges generate noise which is coupled into receiving systems. The magnitude and spectral distribution of this radio interference, called precipitation static, depends upon three factors: 1) the strength and spectral characteristics of the source discharges; 2) the manner in which the disturbances produced by the discharges couple into the antennas; and 3) the magnitude of the discharge current and its distribution among the discharging extremities.

"The coupling between the antenna and the noise source is discussed using a reciprocity relationship. Because the geometry of an aircraft is complicated, and a purely theoretical approach to the determiniation of coupling factors is not possible, a technique developed for measuring absolute values of coupling factor as a function of frequency and position on the aircraft is described.

"The spectral character of the corona-noise source is studied, including a study of how the source spectrum is affected by altitude.

"To test the validity of the theory and the results of the laboratory work, calculations are made to predict the noise currents induced in the two test antennas employed in a flight-test program conducted on the Boeing 367-80 aircraft (prototype of the KC-135 and 707). The results of these predictions are compared with the noise spectra measured in flight."

"Some Techniques for the Elimination of Corona Discharge Noise in Aircraft Antennas, J. E. Nanevicz, R. L. Tanner - Theories of noise generation and coupling are applied to the problem of devising techniques for the elimination of precipitation stativ interference in aircraft. The logical consequences of the theory are employed in devising several versions of a decoupled discharger capable of providing precipitation static noise reduction of 60 dB. Optimum discharger locations are determined and successful flight tests of the dischargers are described. Various proposed discharger designs are considered in light of the coupling theory, and their performance when tested in the laboratory is discussed. Several antenna designs capable of providing precipitation static reduction on vehicles which do not permit discharger installation are proposed and tested in the laboratory. Electronic techniques for reducing precipitation static interference by operating on the signal at the receiver are considered.

"Although many of the proposed precipitation-static-elimination techniques are not entirely satisfactory, the decoupled dischargers and decoupled antennas work well enough so that precipitation static interference need not pose a problem under flight conditions normally encountered."

Electrical Interference, A New Book on EMC:

Electrical Interference is a new 262-page book by Rocco F. Ficcki, engineer in the Surface Communication Division of the Radio Corp. of America. It is published by the Hayden Book Co., Inc., 850 Third Ave., New York, N. Y., and the cost is $8.75. The chapter headings are as follows:

1) Introduction
2) Interference Reduction As A System Problem
3) Attacking the Fundamental Equipment Problem
4) Shielding
5) Filtering
6) Interference Reduction in Cables
7) Interference Control in Equipment
8) Grounding
9) Grounding of Structures and Buildings
10) Grounding of Equipment
11) Grounding of Power Systems

Appendix
1) Glossary
2) Formulas and Cable Characteristics
3) Bibliography

"This book gives the design and field engineer, program manager, and technician a broad view of the importance of interference in modern electronics systems. Its aim is to show the entire field as a unified discipline and to make it possible to solve the urgent and pressing problems that would be encountered from a large missile system to a small radio receiver.

"Interference control is introduced in the design of equipmer Theoretical and practical considerations of design are covered with tabular material summarizing the advantages of the various materials that can be used. Throughout this book, the author presents and develops the best practices necessary to contain interference."

New Filter Design Handbook:

White Electromagnetics, Inc., 670 Lofstrand Lane, Rochville, Md., has published a filter handbook which will permit technicians to design filters to meet their own requirements. Simple steps can be followed with this highly illustrated handbook to design nearly any lumped-element filter from 100 cps to 500 mc without complicated calculations. The dog work has already been done by computers and the design techniques and data are presented in easy-to-follow tables, charts, and graphs, The cost of the book is $11.75 postpaid.

The Design of Low-Noise Transistor Input Circuits - William A. Rheinfelder

Written for students as well as circuit design engineers, this book gives a multitude of time-saving graphs and design curves. Simple derivations of all important formulas are also presented to help the reader gain a deeper insight into the fundamentals of practical lownoise design. Important sections cover: Low-noise design where uniform spectral density of both signal and noise is involved; areas of non-uniform noise distribution; and the essentials of low-noise audio design. Some of the latest low-noise designs of leading manufacturers are given. #524, paper or cloth. 128 pages, illustrated. Hayden Book Co., Inc., New York.

NEW PRODUCTS

New Glass-Ceramics for Insulator Seals:

P. W. McMillan and B. P. Hogdson, Nelson Research Lab., English Electric Co., Ltd., have written a 2-page article unde: the above title. The sub-title and first paragraph are as follows:

"Combination of crystalline glass-ceramics and special processing techniques provides insulator-metal seals with excellent thermal, electrical and mechanical properties.

"New glass-ceramic materials and processes have been developed for providing leakproof seals for insulator-metal components. The new materials and processes eliminate many of the heat distortion and cost limitations of conventional glass and ceramic seals. They combine the convenient and economic sealing properties of conventional glasses, and at the same time they eliminate the lengthy processing involved in manufacturing brazed ceramic-to-metal seals."

Magnetically Shielded Rooms:

The Magnetic Shield Division of Perfection Mica Co., Chicago 22, Ill., has brought out a 40-page performance data compilation on shielding complete rooms using NETIC and CO-NETIC magnetic shielding allows. The results of the evaluation tests run by Space Technology Labs., Inc. Los Angeles 45, Canada, and Topical Report No. 31, Geological Survey of Canada, titled "A Magnetically Shielded Room", are included in the performance data compila

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P-D-Q Teckcell Panels:

Technical Wire Products, Inc. 129 Dermody Street, Cranford, New Jersey, has brought out a new line of RFI shielding and filtering panels known as P-D-Q Teckcell. They provide at least 95% open area so that air resistance is extremely low, and the installed panel provides a total shielding effectiveness of 70 to 100 db from 10 kc to 24 gc for the 1/8-inch cell size.

MEMBERSHIP:

For information on membership in PTG-EMC, please write to:

Richard M. Emberson, Secretary
Professional Technical Groups, IEEE
Box A, Lenox Hill Station
New York, New York 10021

EDITORIAL NOTE:

A great many things seem to be boiling behind the secenes in the RFI/EMC field from the White House becoming concerned over EMC to the Chicago-O'Hare International Airport putting in RFI zoning and the Soviets using some of our ham bands. Your Editor tries to check everything which goes into the Newsletter but sometimes they come too fast for complete checks. If there are any changes necessary in any news item, for further clarification, they will be mentioned in the next issue of the Newsletter. Your editor wishes to thank all those who are sending in such items and asks them to keep it up.

Rexford Daniels, Editor
PTG-EMC Newsletter
Monument Street
Concord, Massachusetts

Transient Signal Ranger 6 Suspect:

Electronic News, February 17, 1964, carried the following news item, in part, under the above title:

"A possible transient signal was the latest suspect in the inquiry to learn what went wrong with Ranger VI.

"Although there was no proof at press time, engineers at Jet Propulsion Laboratory here were investigating the possibility that an unscheduled 67-second turn-on of the cruise telemetry from the television package during launch could have caused arcing, damaging components in the TV system. A transient could have caused the turn-on.

"JPL engineers were trying to duplicate the situation on the ground with a proof test spacecraft.

"The turn-on came during the first few minutes of flight, about 32 miles out during the staging of the two outboard Atlas engines. The possibility existed that the high environmental stresses set up in the spacecraft by the staging could have generated a transient."
