



CAD/CAM

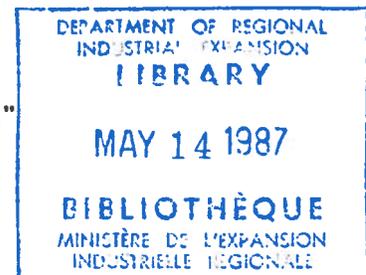
NEWSLETTER

March 1987

Information Compiled by the Canadian CAD/CAM Council
for the Advancement of Computer Integrated Manufacturing *

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1. Government Support for the CAD/CAM Council

The Canadian CAD/CAM Council held its 34th meeting in Winnipeg, March 27 at the Canadian Institute for Industrial Technology, an organization planned to occupy the NRC building originally intended as the NRC Institute for Manufacturing Technology.

The CAD/CAM Council has been advised by letter dated March 24th of changes in federal government support for the council through the Department of Regional Industrial Expansion. The letter is complimentary with respect to the major reports of the council, its "very effective" monthly newsletter, and the important link which the council has provided between industry and government. The letter, however, advises that support and services for the council will terminate on May 31, 1987.

The council believes there is a continued need for its work, particularly its long range and strategic planning role, and especially since the council is an existing body capable of providing advice to government and educational institutions as well as industry. The council will be seeking support for its continuation of this role from an organization in the private sector, and will also seek an extension of the May 31 termination date in order to facilitate an orderly transition.

Information on these and other events will be available in a special cross Canada CAD/CAM review session scheduled for Tuesday evening 7:00 - 10:00 p.m., June 16 as part of the Canadian Automation, CAD/CAM & Robotics Conference in Toronto, June 16-17.

2. TV Ontario Series "Coming to a Factory Near You"

TV Ontario has announced the schedule for airing of their four half-hour programs on CAD, CAM, Flexible Manufacturing Systems and CIM respectively.

The four part series will be aired weekly at 8:00 p.m. commencing at 8:00 p.m. Thursday, April 16 for four weeks to May 7 until completed. In order to reach the widest possible audience, each of the four parts is repeated at two other times during each week. These are Saturday afternoons, commencing at 3:00 p.m. Saturday, April 18 for four weeks to May 9 and mornings commencing at 7:00 a.m. Wednesday, April 22 for four weeks at the same time until completed May 13.

A textbook entitled "Coming to a Factory Near You: A Manager's Guide" has been prepared to accompany the series and is available for \$29.00 by credit card purchase by calling 1-800-268-6255.

To help viewers understand the benefits of these computer-based technologies, the program includes interviews with fifty different people at more than thirty leading companies and institutions in Eastern Canada.

The program is available for lease in addition to the air time schedule indicated above.

For course registration and the text available for \$29.00 contact:

TV Ontario Registration
Box 200, Station Q
Toronto, Ontario
M4T 2T1

Those interested in leasing of the program at times and places other than the above should contact TVO at (416) 484-2613.

3. Justification Procedures for CIM

The very nature of computer integrated manufacturing, and its benefits, demand justification procedures for management approval that are new and different from those normally employed in most companies.

Understanding and communicating the nature of these new procedures is of great importance. The CAD/CAM Council has a priority project in this area among those listed in the February CAD/CAM Newsletter.

As some of our CAD/CAM quotes by industry leaders have said recently:

- "Because we lack the tools to analyze overhead properly, the payoffs for CIM are invisible. We must learn how to make these invisible benefits visible and quantifiable."
- "Product quality is an intangible and how can you evaluate lost business or poor quality."
- "The payback from most robot installations is high, but the real results can be lost in the accounting system."
- "A CIM system is created by the interconnection or integration of the processes of manufacturing with other processes or systems. --- The CIM environment will also make cost accounting systems based on direct labour obsolete."
- "The first thing we look at on a proposed investment is the list of assumptions ----. At times you can ignore the ROA calculations; the assumptions make the decision for you."
- "The truth is, automation within or workcell may be much easier than automation to and from it."
- "There is a misunderstanding in industry, that if you have a CAD/CAM graphics system you have CIM and should be able to reap all the benefits. CIM is much more than that."
- "Next, I have to stress the idea that management has got to get behind this. The people on the factory floor are not giving to run out and put together a CIM strategy for you."
- "Computer Integrated Manufacturing is hard to implement, and even harder to define. One thing is sure though: you can't buy it."
- "CAD/CAM technology will yield its greatest economic and productivity gains when all or most of the [individual] application areas are married or joined together to form an integrated system. Hence there is a strong development trend in this direction."

We will continue to devote as much attention as possible to the topic of justification. Attention is drawn therefore, to:

- The special supplement of reference abstracts reprinted from the CAD/CAM Newsletter issues in 1986 and enclosed with the January 1987 issue. These were in several parts, including a group dealing with Management and Strategic Planning for CIM and a second group on CIM Benefits, Economic Return and Justification.
- Section 2 of the February Newsletter on the justification of AMT.

- Section 6 of this Newsletter - "Articles of Recent Interest".
- Section 7 of this Newsletter - "CAD/CAM Information Available".

4. Trade Balance in Manufactured End Products

There is no single barometer that measures the status of technology in the manufacturing sector. Nor can any signal or reading be attributed to technology alone. Computer integrated manufacturing is closely related to the production of manufactured end products in all industry sectors. One could expect therefore that the manufacturing sector trade balance for end products to be strongly influenced by, and to serve as an indicator of, the lags or leads in the adoption of advanced manufacturing technologies such as CIM.

Data for the Canadian manufacturing sector trade deficit for end products for the past three years are as follows:

<u>Year</u>	<u>Trade Deficit</u>
1984	15 billion
1985	18 billion
1986	21 billion (preliminary estimates)

5. Employment Forecasts for Engineers

Assuming that automation of the Canadian manufacturing industries is necessary, that this is recognized, and that it is to be accomplished, one would expect this to be reflected in the demand for technical personnel. Assuming that even a modest program were being launched, the supply of human resources would be a high priority. In fact, the need for human resources has already been identified in a number of reports dealing with CAD/CAM, Computer Integrated Manufacturing and Advanced Manufacturing Technologies (AMT) in general.

Figures from Employment and Immigration Canada on the forecasted demand for engineers, presented earlier this month in a leading national business paper, could be interpreted in a way that raise doubts and concerns on whether this modernization process has really been recognized and started in a major way.

Forecasts of job growth for engineers, which are listed below for some categories, show an average of only two percent annual growth for each year from 1985 to 1992, which is about the same growth rate as for the economy as a whole.

<u>Type of Engineer</u>	<u>Number</u>		<u>Percent increase over seven years</u>
	<u>1985</u>	<u>1992</u>	
Civil	29,200	33,300	14
Electrical	26,000	29,500	13.5
Industrial	15,900	17,800	11.9
Mechanical	18,100	20,300	12.1
Metallurgical	1,600	1,800	12.5

By comparison, but as an extreme, at the high end of companies in Japan with highly successful flexible manufacturing systems R. Jaikumar has reported in the Harvard Business Review that the composition of the workforce changed in these operations such that engineers outnumbered production workers three to one (see CAD/CAM Newsletter, January 1987).

6. CAD/CAM Articles of Recent Interest

- "Annotated Bibliography on Justification of Computer-Integrated Manufacturing System" - J.R. Canada, The Engineering Economist, Vol 31, No. 2, Winter 1986, pp. 137-150.

Since substantive information on the economic justification of computer integrated manufacturing is just beginning to appear and be available, this annotated bibliography of 113 references is of particular interest.

- Part 1 lists 24 books, most of which are general in nature.
 - Part 2 lists 13 symposia, mostly conference proceedings.
 - Part 3 lists 52 references, most of which are subjective overviews but attention is drawn to those from the Harvard Business Review.
 - Part 4 provides references and brief descriptions of 35 papers that describe quantitative techniques or present fairly specific information on the justification of CIM and robotic systems. Of these, several appear to stand out or are given special mention such as papers by R.E. Gustavson of the Charles Stark Draper Laboratory, R.J. Mayer of Rockwell International and a company report on Robotics and ICAM from the General Dynamics Corporation to the USAF Wright Aeronautical Laboratories.
- "Taking a Hard Look at Cost Management and CIM" - J.A. Schnur, CIM Review, Vol. 3, No. 1, Fall 1986, pp. 3-4.

This issue of the above publication contains several articles under the theme topic of CIM cost management. The consulting editor J.A. Schnur, who is also manager of CIM at Hughes Aircraft Co., leads off with an editorial overview. As stated, the benefits of CIM, such as reduced design and lead times are often known, but how can they be expressed quantitatively or in financial terms? Changes in financial practises are needed. Other articles in the issue deal with the specifics of this. A cooperative approach is recommended such as in CAM-I's Cost Management Project.

- "A Path to Successful Factory Automation" - H.J. Thamhain, K. Beicke, CIM Review, Vol. 3, No. 1, Fall 1986, pp. 5-11.

This article describes a step-by-step procedure for organizing and conducting a factory productivity improvement study based on experience in a department of the General Electric Co. Goals, objectives, sequential steps and checklists for project management are included.

- "Justifying CIM: A Quantitative Analysis Tool" - W. Herroelen, Z. Degraeve, M. Lambrecht, CIM Review, Vol. 3, No. 1, Fall 1986, pp. 33-43.

This paper, by three authors affiliated with the Katholieke Universiteit Leuven in Belgium, presents many detailed cost formula. A discounted cash flow (DCF) analysis is recommended, but in a manner which considers risk as well as the time value of money. The authors caution especially against assuming artificially high discount rates which can negatively bias the analysis of CIM investments, and which wrongly assume that better opportunities exist for the use of capital. A PC level software program called MANROB undertakes the net present value analysis and a complimentary sensitivity analysis.

Editor's Note: CIM Review is published quarterly by Auerbach Publishers, 210 South St., Boston, MA 02111, U.S.A. Subscription rate \$76 (U.S.) annually in the US and Canada. This publication may be of on-going interest and value to many Canadian organizations.

- Factory Automation: Greatly Needed But Slow in Coming. Why?" - K.E. Carey, Managing Automation, February 1987, pp. 17-19.

Despite widespread agreement on the need to automate, the author proposes that estimates for capital spending in the present decade are falling short of earlier projections. While government policies, industry managerial understanding or the demands of labour may all be factors, the real obstacle is considered to be the equipment suppliers themselves and an over-reliance on the sale of large scale turnkey systems. A solution is offered involving strategic and system planning by users, aided by machine suppliers providing consulting assistance as a new business service. The end result is estimated to be 90 percent of the benefit or a new plant at 20-30 percent of the cost.

- "1986 CADD Systems Survey" - R.G. Charlwood, Canadian Consulting Engineer, November/December 1986, pp. 25-27, 30-31, 34-39, 42-47, 50-51.

This useful review of commercially available systems is now in its sixth year of presentation by Canadian Consulting Engineer. The survey covers available systems in three categories; Personal computer based systems, Workstation based systems and central processing unit-based

systems. Addresses of Canadian based suppliers are given together with a brief description of each system configuration, its primary application area and basic system price in most cases. Data are included, where available, on the number of installations of each type in Canada. For example, Intergraph, a widely used system in the CPU based systems class reports a total of 735 workstations in 135 Canadian companies, while VersaCAD reports 250 installations to date of its PC level system.

7. CAD/CAM Information Available

- "Justifying Automation: A Survival Strategy for the Coming Decade"

Proceedings are available containing a portion of the papers presented at the above seminar held in Ann Arbour, October 28-29, 1986. Recognizing that traditional economic yardsticks fall short in measuring the competitive edge provided by automation, this special seminar was designed by the Financial Advisory Council of the Robotics Industries Association (RIA). The information is presented in order that financial planners, plant managers, team and project leaders can consider automation of their facilities. Price \$50 (U.S.).

Contact: Robotics Industries Association (RIA)
One SME Drive
P.O. Box 1366
Dearborn, MI 48121, U.S.A.
Telephone: (313) 994-6088

8. Errata, November-December CAD/CAM Newsletter

Several items were inadvertently omitted in the printing of the English language portion of the November-December 1987 CAD/CAM Newsletter.

For the convenience of readers, the missing information is presented below.

- "Study of the Factors Affecting the Low Level of Automation in the Canadian Small and Medium Companies. A Fabricated Metal and Machinery Industry Perspective", L.M. Bianchin

This book length report of over three hundred pages is the work of L. M. Bianchin in partial and successful completion of a doctorate degree program in business administration.

The author's underlying concern is the low level of automation technology in the Canadian manufacturing sector. For example, Canada is stated to be the only western country which has experienced a negative

productivity index over the last 5 years in the manufacturing sector. In his study, Dr. Bianchin seeks to constructively identify the reasons for this, both through analysis of his own survey data and through the work of others which is reviewed in his report. As stated, he is particularly "concerned about the lack of penetration of computer aided design and computer aided manufacturing techniques in Canadian manufacturing companies". The author's survey data updates the 1982 survey data of the CAD/CAM Technology Advancement Council and the Canadian Manufacturers's Association. Other work from Canadian sources referenced and discussed includes that of Craig and Noori, Zeman and Swaminathan, Mocek and Spiller, Auer, Wedley and Vergin, Peitchinis and Kyles.

The author's own survey is based on 175 replies from 2962 companies contacted in the 3400 - 3800 SIC codes. Comparing his 1985 results with previous 1982 data, the following increased penetration for CAD/CAM technologies in Canadian industry is indicated.

Table 1.2 Percent of companies using CAD/CAM technologies - 1982.

Source: (1) The Canadian CAD/CAM Advancement Council survey and (2) the author's survey.(*)

	<u>Company size</u>					
	Small		Medium		Large	
	<u>1981</u>	<u>1985*</u>	<u>1981</u>	<u>1985*</u>	<u>1981</u>	<u>1985*</u>
Computers for engineering design and analysis	6.7	11.6	10	8.9	23	31.3
Computer-aided drafting	0	19.5	3.2	21.9	17.8	32.6
NC machine tools	20	24	36	57	45	63.8
Industrial robots	0	6.3	1.3	8.8	5.7	25

While the improvement may appear encouraging or consoling, data from an Ontario government study is pointed out on the use of NC machine tools in other countries compared to Canada.

Table 5.1: NC as % of machine tool consumption (1983)

Japan	38.1%
U.S.	12.9%
U.K.	8.1%
Canada	4.4%

The author in his analysis has identified seven classes of possible factors which could explain the low level of automation technology in Canadian industry. The most positive factor favoring automation is the recognition that competitors, both domestic and foreign, are automating

their plants. Under free trade this is likely to accelerate. The most negative factors are associated with cost and a concern that automation as a "solution" does not match the companies' needs or expectations. Concern is expressed, throughout the report, that a lack of recognition of automation's benefits may be due to a lack of knowledge, shallow analysis or an over-reliance in some instances on pre-packaged turnkey CAD systems.

In the author's words "if Canada wants to reduce imports in manufactured products, and possibly to become a net exporter of goods and services, and to enter the twenty-first century with the right infrastructure --- Canadian companies have to embrace manufacturing automation technologies with a lot more zeal than the one displayed so far. In other words there could be no survival of the manufacturing sector without automation of the production process".

Copies of the report, particularly of chapter one and chapter five (summary and conclusions), are available on a limited basis from the author. Full copies on a loan or microfilm basis may be available by contacting CISTI or University Microfilms.

Contact: Dr. L.M. Bianchin
Digital Equipement du Canada Limitée
394 Isabey
SAINT LAURENT, P.Q. H4T 1V3

Editors Note: The following seven reports and books, all from different sources, each address this subject. They form a complimentary set and are highly recommended:

- 1 - "Management in Crisis: Implementing Computer Integrated Manufacturing in Canada". This is the 1986 report of the Canadian CAD/CAM Council as reviewed in the September 1986 CAD/CAM Newsletter and announced as available at that time.
- 2 - "Canadian Manufacturing at the Crossroads", as reviewed in the November/December 1986 CAD/CAM Newsletter.
- 3 - "Towards a New Era in U.S. Manufacturing", as reviewed in the November/December 1986 CAD/CAM Newsletter.
- 4 - "Restoring our Competitive Edge: Competing Through Manufacturing", R.H. Hayes, S.C. Wheelwright, J. Wiley & Sons, as reviewed in the CAD/CAM Newsletter, January 1986.
- 5 - "Robots in Manufacturing: Key to International Competitiveness", J. Baronson, Lomond Publication, Inc., as reviewed in the CAD/CAM Newsletter, March 1986.
- 6 - "Study of the Factors Affecting the Low Level of Automation in the Canadian Small and Medium Companies", L. Bianchin, as reviewed above.

7 - "Computer Integration of Engineering Design and Production": A National Opportunity", A NASA supported report to the National Research Council in the U.S.A., as reviewed in the CAD/CAM Newsletter, November 1985.

- "AUTOFACT 86 Conference Proceedings"

The November 1986 AUTOFACT Conference had the theme "Implementing CIM: A Strategic Challenge".

Copies of the 750 page proceedings containing over 50 key presentations can be obtained while supplies are still available. \$70 (U.S.) for SME members, \$75 (U.S.) for non-members plus \$2.00 (U.S.) postage and handling per book. Order code 1210-0325. Telephone and credit card orders accepted.

Contact: Publication Sales
Society of Manufacturing Engineers
One SME Drive, P.O. Box 930
Dearborn, MI 48121, U.S.A.
Telephone: (313) 271-1500 ext. 418/419

- "A Program Guide for CIM Implementation"

This 110 page publication prepared by the CASA/SME CIM Technical Council provides a guide to the successful implementation of CIM systems based on case studies and the experience of others. \$33 (U.S.) for SME members, \$38 (U.S.) for non-members plus \$2.00 (U.S.) per book for postage and handling. Order code 973-0325.

Contact: SME (as above)

- "Design Rules for a CIM System", Edited by R.W. Yeomans, A. Choudry, P.J.W. ten Hagen. 454 pages, hard cover, 1985.

This book represents the results of a complete study of CIM and a framework for company investigation prepared by the European Strategic Planning for Research in Information Technology (ESPRIT) program. \$50.75 (U.S.) for SME members, \$55.75 (U.S.) for non-members plus \$2.00 (U.S.) per book for postage and handling. Order code 1047-0325.

Contact: SME (as above)

- "Proceedings: Technology Canada Conference, May 21-22, 1986"

The Research Centre for Management of New Technology (REMAT) has proceedings available of the May 21-22, 1986 Technology Canada Conference "Managing New Technology: Today's Competitive Weapon", 569 pp., soft cover. Institutional rate \$50.00. Individual rate \$35.00.

Contact: Carole Litwiller
REMAT
Wilfrid Laurier University
Waterloo, Ontario
N2L 3C5
Telephone: (519) 884-1970 ext. 2662

9. CAD/CAM Conferences

(See also the January 1987 Newsletter for a list of major conferences.)

- "Fourth International State-of-the-Art Conference on Solid Modeling"
May 4-5, 1987, Marriott Copley Place, Boston, MA.

Contact: CAM-I Conference Manager
Telephone: (817) 860-1654

- "1987 SME International Tool and Manufacturing Engineering Conference and Exposition"

May 4-7, 1987, Cobo Hall, Detroit, MI.

Includes, conferences, twenty-four workshops and exposition.

Contact: Society of Manufacturing Engineers
Telephone: (313) 271-1080 (8:00 a.m. to 4:30 p.m. EST)

- "Profiting with Practical Automation"
"6th Annual CAD/CAM, Robotics and Automation Conference"
June 16-17, 1987, Skyline Hotel, Toronto.

This year's conference includes many presentations by senior management personnel as well as technical sessions, a "Cross Canada Forum" 7-10 p.m., June 16, with reporters on activities in all provinces as well as technical sessions and the exposition at the International Centre.

Contact: David Hogg
Ontario CAD/CAM Centre
Telephone: (519) 622-3100

or

Bill Durant
Ontario Robotics Centre
Telephone: (705) 876-1611

- "Third Canadian Universities Conference on CAD/CAM"
July 2-3, 1987, University of Ottawa, Ottawa, Ontario.

The conference is a multidisciplinary one, covering Chemical, Civil, Electrical, and Mechanical Engineering, as well as computer science interests. The purpose of the conference is to promote interaction between researchers in the field, as well as focus on the problems of education of CAD/CAM.

Topics of particular interest are:

- * CAD/CAM Hardware and Software
- * Computer Graphics
- * Computer Aided Engineering
- * Robotics
- * Flexible Manufacturing Systems
- * Computer Based Education in Engineering

Contact: Dr. A. Fahim
Mechanical Eng. Dept.
University of Ottawa
Ottawa, Ontario K1N 6N5
Telephone: (613) 564-5428

- "Third International Conferences on Advances in Production Management Systems" (APMS-87)
August 11-14, 1987, Winnipeg, Manitoba.

This conference, organized by Working Group 5.7 of the International Federation of Information processing (IFIP) will deal with topics such as the modelling, simulation and analysis of production systems, production planning and control, Economic Justification of FMS's, etc.

Contact: Dr. Andrew Kusiak
Dept. of Mechanical & Industrial Engineering
University of Manitoba
Winnipeg, Manitoba R3T 2N2
Telephone: (204) 474-9839
Telex: 07-587721

- "AUTOFACT '87 Conference"
November 9-12, 1987, Cobo Hall, Detroit, MI.

This major CAD/CAM Conference now attracts over 2,500 conference attendees, and over 25,000 exhibition attendees.

Contact: Computer & Automated Systems Association (CASA)
Society of Manufacturing Engineers
One SME Drive
P.O. Box 930
Dearborn, MI 48121, U.S.A.

- "IEEE International Conference on Computer-Aided Design" (ICCAD-87)
November 9-12, 1987, Santa Clara, CA.

This annual conference is oriented towards Electrical Engineering professionals, concentrating on CAD for Electronic Circuit Design. Submissions in response to the call for papers are required by May 5 in 12 copies with a one paragraph abstract and 1,500 word summary.

Contact: ICCAD-87 Secretary
Mentor Graphics Corp.
1940 Zanker Road
San Jose, CA 95112
Telephone: (408) 436-1500

- "COMPINT '87"

November 10-12, 1987, Palais des Congrès, Montréal.

Following its success of 1985, COMPINT '87, an IEEE computer aided technologies conference returns to Montreal with a wide range of CAD application topics in manufacturing, transportation, telecommunications, medicine, urban planning and others as part of MONTECH '87. Prospective authors may submit three copies of a 100 word abstract prior to May 1.

Contact: COMPINT '87 Chairman
Dr. L. Lèveillé
Laboratoire de Géomatique
Département d'Études urbaines, (T-4750)
Pavillon Les Atriums, 4e étage
Université du Québec à Montréal
870 est, boul. de Maisonneuve
Montréal, Québec, Canada
H3C 3P8
Téléphone: (514) 282-4121
Télex: 05131623

- "1988 IEEE International Conference on Robotics and Automation"

April 25-29, 1988, Franklin Plaza Hotel, Philadelphia, PA.

Call for papers for this 1988 conference has been issued. Deadline is September 15, 1987.

Contact: Robert B. Kelley
ECSE Dept.
Rensselaer Polytechnic Institute
Troy, NY 12180-3590

- "9th Engineering Application of Mechanics Symposium"

May 29-31, 1988, University of Western Ontario, London, Ontario.

Under the symposium theme of "Current & Emerging Technologies" topics such as CAD/CAM and Robotics, Applications in Manufacturing Systems plus AI and Expert Systems will be included in addition to others such as solid mechanics, fluid mechanics, multi-body system dynamics.

Contact: Prof. S.M. Dickinson or Prof. W.H. El Maraghy
Co-chairman
Faculty of Engineering Science
University of Western Ontario
London, Ontario
N6A 5B9
Telephone: (519) 661-3120 or 661-3121 (respectively)

10. CAD/CAM Quotes

"The industry is already automated, but the question is whether we are automated enough."

Managing Automation, February 1987 on "Semiconductor Consortium to Concentrate on Automation".

"Making automation work means a whole new level of process mastery. A large number of Japanese factories demonstrate its reality every day. They lead the war; we linger behind at our peril."

R. Jaikumar "Post Industrial Manufacturing", Harvard Business Review, November-December 1986, pp. 69-76.

"Increasingly, however, the experts are saying that the real savings from CAD are not found in direct labour costs, but in indirect labour costs from such factors as reduced errors, higher quality, more efficient flow of information, and integration with Computer Aided Manufacturing (CAM) systems."

C.A. Beatty "Tall Tales and Real Results: Implementing a New Technology for Productivity" Business Quarterly, University of Western Ontario, November 1986.

11. Twenty Selected Abstracts Provide a World View on CAD

Last, but not least, for a review of CAD/CAM developments around the world, please refer to the selection of twenty abstracts in the section attached.

By obtaining and using some of the references cited it is possible for industrial companies to save valuable management and engineering time in project planning and responding to the challenges of computer integrated manufacturing.

12. This newsletter may be reproduced in whole or in part. Reprinting in other Canadian publications is encouraged. Acknowledgement to the Canadian CAD/CAM Council would be appreciated.

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