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SUMMARY REPORTS OF PROGRESS ON USBM/OMOL/CANMET RESEARCH PROJECTS, 1987-1988

by

John E. Udd, E.D. Dainty, and L. Geller

MINING RESEARCH LABORATORIES
DIVISION REPORT MRL 88-24(OP)

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- Meeting of USBM/CANMET Mining Research Directors, Minneapolis, Minnesota, May 5, 1988
- Meeting of the Chief Inspectors of Mines, Edmonton, Alberta, May 7, 1988

Updated on June 7, 1988

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ABSTRACT

Through a Memorandum of Understanding between CANMET, the Ministry of Labour of the Province of Ontario, and the United States Bureau of Mines, an exchange of data and technology is taking place in three areas of mining research. These are: (1) Diesel Emissions Control; (2) Wire Ropes and Hoisting Technology; (3) Rock Mechanics and Ground Control.

In this report a summary is presented of the progress that was made during the year 1987-1988.

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Keywords

CANMET, Diesel Emissions, Ground Control, Hoisting Technology, Joint Research, Memorandum of Understanding, Ontario Ministry of Labour, Rock Mechanics, Wire Ropes, United States Bureau of Mines

RAPPORTS SOMMAIRES SUR L'AVANCEMENT DES PROJETS DE RECHERCHE, 1987-1988 - USBM/OMOL/CANMET

par

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RÉSUMÉ

Selon un protocole d'entente entre CANMET, le ministre du travail de la provence de l'Ontario, et le United States Bureau of Mines, un échange de données et de technologie est en cours dans trois secteurs de la recherche minière. Ce sont: (1) contrôle des émissions diesel; (2) technologie du hissage et des câbles de treuil; (3) mécanique des roches et contrôle du terrain.

Un sommaire est présenté, dans ce rapport, l'avancement réalisé au cours de l'année 1987-1988.

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Mots-clés

CANMET, émissions diesel, contrôle du terrain, technologie de hissage, recherche conjointe, Ministère Ontarien de la main d'oeuvre, mécanique des roches, câbles de treuil, United States Bureau of Mines

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INTRODUCTION

by

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Through an "umbrella" Memorandum of Understanding between CANMET and the United States Bureau of Mines, dated April 2, 1981, the staff of CANMET/MRL are now participating in three cooperative research projects. This report contains summaries of the progress on these that has been made since the previous report was presented at the annual USBM/CANMET review meeting, held at Salt Lake City, Utah, on May 11, 1987.

The first cooperative project started under the M.O.U., on Diesel Emissions, began in December, 1981 and was concluded in June, 1987. The project also involved the Ministry of Labour of the Province of Ontario. The details of the progress which was made during 1987-1988 are included in a summary report which has been prepared by E.D. Dainty. CANMET's research in diesel emissions reduction technology are continuing and are now at an advanced stage of technology transfer and commercialization. It is to be noted that no joint meetings have been held since May, 1987 - just prior to the conclusion of the agreement.

The second project, also involving the province of Ontario's Ministry of Labour, on Wire Rope and Hoisting Technology, was commenced in September 1983 and extended to a termination date of September 30, 1988. It was subsequently extended, in April, 1988, to September 30, 1993. The details of the progress made during 1987-1988 are given in a summary report which has been prepared by Lorant Geller.

A third tripartite project involving the same partners, on Rock Mechanics and Ground Control, was started in April 1986. The M.O.U. was signed on April 1, 1986, for a five-year period and will end on March 31, 1990. A summary report of progress during the past year, by their author, is also included in this document.

AN UPDATE AS OF April 30, 1988
STATUS OF USBM/MOL/CANMET COOPERATIVE DIESEL PROGRAM

by

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OVERVIEW

The formal Memorandum of Understanding defining the cooperation among the three agencies expired during June of 1987. As a consequence, there has not been a meeting of the Cooperative Diesel Research Advisory Panel since May of 1987.

The success of this program signalled a reduction in CANMET/MRL/CEAL's equipment development efforts involving zero contracting-out funds. However, efforts are continuing to assure that the ceramic filtration systems become commercially available through the field demonstrations of the NRC/IRAP/PILP government/industry technology transfer program with Engine Control Systems of Aurora, Ontario, as described below.

While the equipment dvelopment phase is diminishing, the underground environment monitoring and air quality assessment aspects of the work have become more important in the eyes of the industry and the Regulatory Authorities. Evidence of this interest is the fact that there are four major mine investigations involving MRL personnel which are slated for completion by March 31, 1989. Evolution of a technology package to reduce mine ventilation costs by degrees of automation are anticipated.

Consideration of the recent, very important, American, European and Japanese studies on the health impact of diesel soot on animals, is presently being undertaken. This could have an important impact on the levels of ventilation required in Canadian underground dieselized mines as a result of suggesting lower thresholds for diesel soot than presently considered suitable.

TECHNICAL HIGHLIGHTS

Equipment Development Progress

1) Engine Control Systems of Aurora, Ontario, has pursued the NRC/IRAP/PILP Ceramic Filter Program with some success. The first phase of the program at the Brunswick Mine has been completed. The outcome has been that the equipment has been accepted for mine-wide application. The emphasis is now on monitoring installations of the ceramic equipment in 5 major Ontario mines involving Deutz, Caterpillar and 2-stroke engines in a number of different types of vehicles. The program ends in March of 1989.

   CANMET/MRL efforts to acquaint the industry with the effectiveness of this technology continue. Presentations of progress, and background thinking to date, have been made to the Val D'Or Quebec and the Ontario mining communities by means of seminars sponsored by CANMET in Val D'Or (February 1988), and the Ontario Mining Association (OMA) in Sudbury (March 1988), respectively. The subject matter of these presentations is contained in MRL Report 133 (OP) - "Improvement of diesel engine performance from the standpoint of gaseous and soot emissions reduction."

To keep the international mining community informed of the progress of this technology, an MRL paper 87-125 (OP,J) entitled "Status of Canadian in-mine diesel particulate filter trials" has been accepted for presentation and publication by the 4th International Mine Ventilation Congress in Australia during July 1988. A copy of this has already been shared in advance with the USBM Twin Cities Research Staff.

2) Steps have been taken to transfer CANMET/MRL's venturi scrubbing technology to Engine Control Systems of Aurora, Ontario. In support of this technology, an MRL paper 87-18 (OP,J), entitled "Tests of a venturi scrubber system", was written and presented to the international mining community at the Beijing International Conference of Safety in Mines Research Institutes in November of 1987. This technology is particularly applicable to coal mining conditions.

Environmental Assessment Progress

1) Because it is perceived that the industry needs better methods of measurement of Respirable Combustible Dust (RCD) - mainly soot, MRL/CEAL is studying instrumentation to replace the gravimetric method presently employed. A lab study comparing the gravimetric method to that of the USBM TEOM continuous analysis system was undertaken thanks to the cooperation of the USBM Bruceton group. Although the absolute values were not reconciled, the continuous operation of the instrumentation was gratifying, indicating that continuous soot analysis is indeed feasible. This is detailed in MRL internal report 87-3(TR) - "Laboratory confirmation of methods of RCD determination." CEAL is in the process of purchasing two continuous soot sensors for incorporation into the 1988 field tests. The cost of these units is relatively little. It is hoped however, that they will function effectively.

The CONSPEC Monitoring System and a number of sensors were assessed in the laboratory utilizing the ventilation dilution system associated with the CEAL engine/dynamometer bay, thus simulating an operating mine environment. The signal variations were examined to determine instrumental drift over time. In general, the system functioned satisfactorily and the results were outlined in MRL 87-86 (OP,J) - "Mine Environment Monitoring System and Sensor Performance Evaluation". This was presented to and published by the IIIrd International Mine Ventilation Congress resulting in considerable comment.

This was a prelude to installation of this system in a salt mine in Ontario during 1988 for monitoring CH4 concentrations to prevent explosions and to monitor diesel aspects of the operation in 1989.

3) An underground environment study involving the measurement of CO_2 as a surrogate for all other components in diesel exhaust in a multi-vehicle heading, was undertaken in collaboration with Brunswick Mining and Smelting, at Bathurst, New Brunswick, and Noranda Research. The results are very encouraging. A second confirmatory set of measurements is to be taken early in 1988. This is a key aspect of ventilation closed loop control technology. A paper is to be written on completion of the project in 1988.

4) During March of 1988, a long-standing project was completed with the collaboration of several American mining equipment manufacturers and a representative of MSHA. The Canadian Standards Association Diesel Technical Committee, chaired by MRL/CEAL, successfully completed its consultations leading to

the promulgation of CAN/CSA-M424.1-88. This national standard, governing the manufacturing of mining diesel equipment for Canadian jurisdictions, is entitled "Flameproof non-rail-bound diesel-powered equipment for use in gassy underground coal mines". Work will begin soon on the non-coal version.

In this standard, the ventilation provision is based upon the Air Quality Index (AQI). The AQI is the comprehensive toxicity criterion used by the Cooperative Diesel Research Advisory Panel as the measure of progress for the development of emissions reduction devices including the ceramic filter and the venturi scrubber.

Health-Impact Considerations

There have been 8 studies carried out in recent years of the health effects of exposure of animals to diesel exhaust. These were carried out in the USA, Switzerland, Germany and Japan. All are consistent in indicating that exposure to whole diesel exhaust produces a statistically significant incidence of lung tumours in animals (rats and mice). Three (3) of these 8 studies were carried out comparing whole exhaust exposure effects to those of filtered exhaust exposusure. for filtered exhaust:

3 studies out of 3 - rats didn't get lung tumours.

1 out of 3 - some mice did get lung tumours (mice are perhaps a "prone" species)

another of 3

- rats had a higher incidence of lymphoma of the spleen (blood cancer - leukemia) but no lung tumours.
- note that these tests were run on a 2.3 L Japanese truck engine running at highly atypical operating conditions (1000 rpm @ 80% load) - a very low speed relative to its max of 3500 (compare to Deutz max speed of 2300 rpm).
- note also that these rats have a high spontaneous incidence of lymphoma of the spleen.

Albert in the USA, deriving his data from both the above animal studies and comparative potency studies (cigarette smoke and coke oven gas), concluded that an exposure to a dose level of 1 mg soot/m3 would produce a 2% excess cancer rate in humans.

The studies suggest that there is a dose response relationship between tumour generation and exposure level. The relationship does not appear to be time dependent. This raises the following points:

- removing soot is a logical approach.
- why did some of the mice respond in the same way to filtered exhaust and unfiltered exhaust?
  - tumour-prone species?
- why did some rats suffer increased lymphoma when exposed to atypical filtered exhaust?
  - high spontaneous lymphoma rate?

Comparison of mutagenicity results to the generation of tumours in animals, indicates a general relationship between the two. Therefore, the low mutagenic activity of untreated heavy duty Deutz exhaust should result in lower incidence than that predicted by the animal studies which involved predominantly light duty exhaust exposure.

Further, the appended newspaper article describes a collaborative INCO/USW/McMaster University study which suggests that INCO miners have slightly higher than normal cancer risk. Although the study doesn't provide a cause, the above animal results suggest diesels as a possibility.

CONCLUSION

Apparently, the level of RCD = 2.0 mg/m3 is too high. To what level ought this consitituent be controlled?

The above discussion suggests the advantages of removing soot from diesel exhaust. This action would presumably have the effect of removing the increased risk described above. Soot removal would then make an expression like the AQI outmoded. Reversion to a comprehensive gaseous criterion on the TLVs for individual constituents would then be required.

In the very near future, in order to provide a realistic and suitable criterion for the establishment of ventilation in dieselized workings, a consultation including workers, manufacturers, operators, researchers and Regulatory Authorities, must needs be convened to arrive a consensus with respect to future action. This is particularly important with respect to the formulation of the national Canadian diesel standard for non-coal mines.

I.W. French and Associates will soon table a report in which is described their views of the above animal studies, a suitable soot threshold, and the impact on the AQI expression. This information will form part of CANMET's contribution to such discussions. This would be an excellent opportunity for a renewal of collaborative efforts involving the United States Bureau of Mines, CANMET and other particpants.

APPENDED NEWSPAPER ARTICLE

Cancer risk bit higher for miners, study finds

SUDBURY (CP) — Inco Ltd. miners have a higher-than-average rate of lung cancer, a 10-year study shows.

The study, sponsored the United Steelworkers of America union and Inco, involved men who worked for the company in Ontario from 1950 to 1984.

Results show that of the 32,022 men in the study with mining experience, 34 more died of lung cancer over a 35-year period than would be expected under the cancer rate for the general population, said Prof. Robin Roberts, leader of the study team at Hamilton's McMaster University.

While that rate is only slightly higher than the average, he said, "the excess is unlikely to be due to chance" because of the number of people in the study.

The study also found that 162 of Inco's Sudbury employees died on the job between 1950 and 1984, three times the Ontario average for work-related deaths.

Roberts said the cause of the extra cancer deaths isn't clear.

However, a similar finding for Ontario gold miners adds "credence to the possibility that this may be a general effect of hard-rock mining," he said.

The study results also show men with 25 or more years of mining experience hired before 1930 have the greatest risk of lung cancer, showing a 50-percent increase over provincial rates.

The higher risk for those miners is probably related to old methods of mining, said A.C. Magee, Inco director of human resources and administration for Ontario.

"We've changed the whole face of mining in the last 10 to 15 years and we intend to change it more," Magee said, citing improved underground ventilation as an example.

AN UPDATE AS OF MAY 1, 1988 ON THE COOPERATIVE RESEARCH PROJECT ON WIRE ROPE AND HOISTING TECHNOLOGY

by

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Canadian Explosive Atmospheres Laboratory
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BACKGROUND

The need to routinely examine mine-shaft wire-ropes non-destructively in-situ, has been recognized for several decades. In Canada this matter was pursued with particular zeal in Ontario, after a major disaster at an Ontario mine, in 1946. The Province, and the provincial mining association, jointly sponsored an R&D project; it resulted in the development of an EM instrument, whose use was henceforth mandated in Ontario, and in several other Canadian provinces.

This instrument proved to be very useful in establishing an acceptable basis for assessing whether or not a rop could continue in service. In fact, experience has identified several internal rope anomalies which, under normal inspection conditions, could only be detected by using this type of test instrument. Thus the use of the EM tester increased the safety of hoisting operations severalfold.

Nevertheless, a number of factors indicated that the time had come for a renewed effort to evaluate the relative merits, and shortcomings, of these types of instruments. These factors were recognized in several countries, including Canada and the United States.

A tripartite effort was initiated in September 1983 by CANMET, the Ontario Ministry of Labour, and the US Bureau of Mines. Its work, as described in general terms by the heading of this report section, includes, but is not limited to, NDT rope testing. The joint activities of this group, up to May 1, 1987, have been described in MRL divisional Summary Reports numbers MRL 85-69, MRL 86-63, and MRL 87-53. This report will bring this account up-to-date.

Joint Organizing Committee Meetings

These meetings have been held quite regularly, alternating between US and Canadian locations. To date, two were held in Pittsburgh (1984 and 1986), one in Spokane (1985), and one each in Toronto (1984), Sudbury (1985), and Elliot Lake (1987). All were well attended, and did full credit to the organizing skill and enthusiasm of their respective hosts. In fact, the Organizing Committee decided to make the valuable information exchanged at these meetings more widely available by inviting, for the first time, "observers" to the 1987 meeting at Elliot Lake. The latter were chosen from among provincial authorities and from mining companies, whose concerns were known to be particularly closely linked with matters to be discussed. The invitations were much appreciated.

Otherwise the 1987 meeting was organized on the well-established and well-liked precedents, with one day being spent in laboratory, underground, and hoist plants visits, and two in conference discussions. Details of this meeting follow hereunder.

Tasks and Responsibilities

Conference discussions centered upon the following major themes:

1) Effects of temperature on wire rope sockets: this subject was raised by the Ontario MOL, who (like others as well) had intermittent problems with very low rope strengths in case of zinc socketing of high tensile strength, or high carbon, wire ropes. The results of thermocouple equipped control tests were described, and discussed.

2) Optical extensometer: The US BOM have been investigating an optical extensometer instrument for some time. The Ontario MOL are also interested in the use of such an instrument, for accurately determining specimen elongation during destructive testing at their new Sudbury rope-testing laboratory. The Committee decided that a joint effort should be undertaken, to evaluate the possibilities of using such an extensometer under the circumstances of common interest.

3) Resin terminations: Resin terminations are of interest to both the US and Canadian members of the Joint Committee. Both reported successful use of these terminations, with full details being reported by both sides. The consensus of the Committee was that resin is a good socketing material for mine wire-rope use, and that this aspect of the joint work had now been completed.

4) Fatigue failure of a friction hoist tail rope: Results of a physical-metallurgy examination in the US of a rope failed at a Canadian mine were described and discussed. It was decided that a joint US BOM/Ontario MOL/CANMET/mining company paper on this subject would be presented at the 1988 International Hoisting Conference in Toronto (June 19-24).

5) International Hoisting Conference: Details of this conference were explained by the conference's technical chairman, who is also a member of the tripartite Joint Committee.

6) 1986 European visit: Details of the October/November, 1986, European visit by Canadian members of the Joint Committee were discussed. Their report was illustrated with overheads and rope samples, and included an account of the research, regulatory, academic, manufacturing, and hoisting facilities visited.

7) Use of Kevlar ropes: An account was given of the first operational use, on a temporary test basis, of aramid fiber "Kevlar" ropes, instead of wire-ropes, in mine shafts. The advantages and disadvantages inherent in the use of this material were discussed. A final decision on their use in mines is still outstanding.

8) Baseline tensile testing: The basics of destructively testing wire rope samples, in order to establish benchmark values, was discussed on hand of results obtained with the US BOM's new tensile testing machine in their Pittsburgh laboratory. The objectives of these tests were to determine: (a) the operating characteristics of the tensile testing machine, (b) the precision of the data being produced with it, and (c) the characteristics of the wire rope samples during the test procedures. The subject is of special interest, in view of the Ontario MOL's current plans to install a 1.2 million pound vertical rope testing machine at their new Sudbury laboratories. Details of this machine, and of the new laboratories, were also discussed.

9) Evaluation of rope lubricants: This subject was discussed on hand of results obtained during a six-mine study in the US, as well as by practical experience in several Canadian mines. Results were encouraging in both countries; rope life increases of 19 to 36 months were reported by the US team, and those of up to some 48% by the Canadians.

10) Comparative evaluation of EM rope testers: This subject was discussed at some length. Details were given of CANMET's current work at both contractual and intramural levels. The basic requirements of the proposed contract, and its current status were reported on. So were details of the in-house activities. The latter involve the gathering, and the in-depth analysis, of a large amount of test results obtained, primarily, in the rope-testing laboratory of the Ontario MOL during the course of its very extensive (covering more than two decades) program of "Special Tests". One of the important features of CANMET's work is that it provides valuable information about the safety aspect of the mine-shaft wire-ropes at the point of their retirement. CANMET's study provides this information by analyzing the remaining rope strengths at this stage, as determined by both destructive and non-destructive testing. The latter involves several Canadian EM instruments.

This investigative work is known to be of considerable interest not only in Canada (to both the regulatory authorities and industry), but also in Europe and the US. Details of the test results achieved in the laboratories of the US BOM, with a range of Canadian and US testers, were reported on and discussed at several of the joint Canada/US meetings.

11) Accident reports: Examination of details of how, and why, mine-shaft wire-ropes have failed in the recent past, have been of particular interest to members of the joint Canada/US Advisory Committee. Such an unfortunate incident occurred at an Ontario mine only weeks before the October, 1987, joint meeting. An in-depth explanation was provided by experts, representing several aspects of the matter, including rope-constructional and operational details, as well as regulatory questions.

12) ASTM work: Many members of the joint US/Canada Advisory Committee are also active participants at the meetings of the ASTM Committee E-7 on non-destructive testing. An update of the latter committee's work is, therefore, always part of the US/Canada joint meetings.

13) Publications: Information about recent publications by committee members in the field of common interest is a regular feature of the joint meetings. The possibility of joint publications is also of considerable interest. One such paper will be tabled at the June 1988 International Conference on Hoisting in Toronto.

SUMMARY

The group's cooperation is proceeding very satisfactorily with obvious benefits to all. This includes not only members of the Joint Advisory Committee, but also those who have been invited by this Committee, on a strictly ad hoc basis, as "observers". As a result the next joint meeting has been tentatively arranged, on the usual rotational basis, for October 1988, at the US Department of Labour's National Mine Health and Safety Academy in West Virginia. Moreover, it is intended to extend the joint agreement in question by another three years, past its present termination date of September, 1988.

AN UPDATE AS OF APRIL 30, 1988
STATUS OF USBM/OMOL/CANMET COOPERATIVE PROJECT ON ROCK MECHANICS AND GROUND CONTROL

by

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Mining Research Laboratories

The tripartite Memorandum of Understanding, for a cooperative project on Rock Mechanics and Ground Control, for a five-year period, was signed on April 1, 1986. A first meeting, between senior managers, to initiate the project and to define the topics which would be addressed, was held at the USBM Pittsburgh Research Centre on November 18, 1986.

At that time, it was decided that the most appropriate structure for the project would consist of a Management Advisory Panel, to provide overall direction, reviews, and guidance, and a number of Technical Committees which would be devoted to specific topics. Four areas of research were selected for immediate attention. These were: "Rockbursts and Outbursts"; "Support Systems"; "Coal Mine Design"; "Metal/Non-metal Mine Design".

It was agreed that each party would identify participants for the Technical Committees and that these persons would be asked to decide amongst themselves on the dates and locations for their meetings.

Subsequently, the Management Advisory Panel met at CANMET's Elliot Lake Laboratory on April 21, 1987 (with the two following days involving mine tours and visits to Denison Mines, at Elliot Lake, and to INCO, at Sudbury).

During the past two years the technical Committees have met on a number of occasions. The details of both past and planned meetings are as follows:

Rockbursts and Outbursts Technical Committee:

Sudbury, Ontario	March 12, 1987
Minneapolis, Minnesota	June 7, 1988

Support Systems Technical Committee:

Nepean, Ontario	June 3, 1987
Spokane, Washington	November 17, 1987
Sydney, Nova Scotia	June 22, 1988

Coal Mine Design Technical Committee:

Pittsburgh, Pennsylvania	June 24, 1987
Sydney, Nova Scotia	June, 1988

Metal, Non-Metal Mine Design Sub-Committee

Denver, Colorado	July 29-31, 1987
Sudbury, Ontario	October 19-23, 1987
Spokane, Washington) or Rapid City, South Dakota)	Spring, 1988

The present memberships of the Management Advisory Committee and the four Technical Committees are shown in the following Table.

USBM/OMOL/CANMET COOPERATIVE PROJECT ON ROCK MECHANICS AND GROUND CONTROL

Structure of Committees

Management Advisory Panel

D.R. Forshey	U.S.B.M.	(Washington)
D.D. Bolstad	U.S.B.M.	(Spokane)
E.E. Hollop	U.S.B.M.	(Denver)
J.N. Murphy	U.S.B.M.	(Pittsburgh)
L.V. Wade	U.S.B.M.	(Twin Cities)
D. Brown	CANMET/CRL	(Devon)
D.B. Stewart	CANMET/CRL	(Devon)
G. Larocque	CANMET/MRL	(Bells Corners)
J.E. Udd	CANMET/MRL	(Bells Corners)
V. Pakalnis	OMOL	(Toronto)
P. Kivisto	OMOL	(Sudbury)

Rockbursts and Outbursts Technical Committee

B. Brady	U.S.B.M.	(Denver)
T. Iannacchione	U.S.B.M.	(Pittsburgh)
M. Jenkins	U.S.B.M.	(Spokane)
D.G.F. Hedley	CANMET/MRL	(Elliot Lake)
T. Aston	CANMET/CRL	(Sydney)
D. Ames	OMOL	(Sudbury)

Support Systems Technical Committee

T. Barczak	U.S.B.M.	(Pittsburgh)
J. Goris	U.S.B.M.	(Spokane)
S. Tadolini	U.S.B.M.	(Denver)
A. Annor	CANMET/MRL	(Sudbury)
T. Aston	CANMET/CRL	(Sydney)
D. Ames	OMOL	(Sudbury)

Coal Mine Design Technical Committee

R. King	U.S.B.M.	(Pittsburgh)
N. Kripakov	U.S.B.M.	(Denver)
L. Powell	U.S.B.M.	(Twin Cities)
T. Aston	CANMET/CRL	(Sydney)
G. Haslett	CANMET/CRL	(Sydney)
T. Smelser	U.S.B.M.	(Spokane)

Metal, Non-Metal Mine Design Technical Committee

G. Johnson	U.S.B.M.	(Denver)
M. Poad	U.S.B.M.	(Spokane)
R. Thill	U.S.B.M.	(Twin Cities)
J. Pathak	CANMET/MRL	(Bells Corners)
S. Bharti	Falconbridge Ltd. (CANMET/OMOL joint nominee)	
P. Campbell	OMOL	(Sudbury)

By the end of June, this year, each of the Committees will have met on at least two occasions. Considering the numbers of meetings that have been held, and the participants who have been involved, a very considerable effort has been made to maximize the benefits to be derived from the cooperative projct. There is much interest and activity in rock mechanics and ground control on both sides of the U.S.A./Canadian border and the actions of the Committees reflect this.

Reflecting the enthusiasm of their members, each of the Committees started out with very ambitious agendas. In most cases it was recommended that meetings should be held semi-annually, and that these should be coordinated to be held in conjunction with major technical events. Further, it was also recommended that site visits should also be included in the plans.

After the initial formative meetings it has emerged that there is much potential overlapping of interests and activities between the Committees. Some of the groups have requested that the Management Advisory Committee be made aware of this and asked to provide direction concerning activities. Specifically:

- Instrumentation and ground support are areas of common interest for all of the Technical Committees. Reviews of the state-of-the-art on both are proposed action items for the Metal/Non-Metal Mine Design and the Support Systems Committees, respectively. There is concern that there could be an overlap and duplication of effort.

- the Coal Mine Design Committee, on finding that other groups are discussing support has recommended that it be restructured, if necessary, to reflect a common interest in subsidence.

for the not-too-distant future. As mentioned, the Metal/Non-Metal Mine Design Committee proposes to produce, by the end of 1988, a document that delineates the state-of-the-art technology of rock mechanics instrumentation that is available for underground mining. The other groups, no doubt, will also progress to this stage as the mandates are clarified and discussions mature.

Very substantial progress has been made in the last year.