ASSOCIATED METALLURGISTS

P. O BOX 201 - NORMAN, OKLAHOMA 73070-0201

September 16, 2007

REPORT OF FINDINGS

PREPARED TO CONFORM TO THE REQUIREMENTS OF RULE 26 OF THE FEDERAL RULES OF CIVIL PROCEDURE

In the matter of:

MARK W. KOHN, JR., ET AL.

v.

BLACKPOWDER PRODUCTS, INC., ET AL.

Submitted to:

MATTHEW C. ALLEN
KOPP, McKICHAN, GEYER, SKEMP & STOMBAUGH
44 EAST MAIN STREET
P.O. BOX 253
PLATTVILLE, WI 53818-0253

Robert Jay Block, Ph.D., P.E.
Consulting Metallurgical Engineer

INTRODUCTION

Associated Metallurgists was retained by the law firm Kopp, McKichan, Geyer, Skemp & Stombaugh to determine the cause of failure of a burst .50 Caliber, BPI, Connecticut Valley Arms - Kodiak Magnum, Black-Powder Rifle. The rifle was reported to have failed causing injury to the shooter Mark W. Kohn. The principal investigator for Associated Metallurgists is Dr. Robert Jay Block, Ph.D., P.E., Consulting Metallurgical Engineer. All examinations, testing and review of documents were personally conducted by Dr. Block who is the sole author of this report. Dr. Block's curriculum vitae and a listing of the cases in which Dr. Block has testified over the last four years are attached. Associated Metallurgists charges $300.00 per hour for all work performed by Dr. Block including document review, laboratory examination, analysis and testimony either by deposition or at trial. Charges for time involved with travel are made at one-half rate. This report summarizes the results of the investigation thus far. Further discovery that may affect the findings contained herein or provide the basis for additional findings and opinions is continuing.

Methodology

The examination of the rifle, propellant, projectiles and review of documents followed the methods generally accepted and commonly used by experts in the field of failure analysis. The evidence was examined visually and microscopically and dimensional and hardness measurements were made. The examination was non-destructive and produced no changes in the evidence that would preclude any examination and tests by other individuals. Consideration was given to the principles of materials science and engineering design. The conclusions and opinions reached were made using a body of experience in the failure analysis of black-powder firearms as well as modern (cartridge-firing) pistols, revolvers, rifles and shotguns conducted by Associated Metallurgists and the principal investigator. The experience of the principal investigator ranges over an approximately forty-five year span of teaching engineering to undergraduates and graduate students at the University of Oklahoma and consulting to individuals, companies and attorneys representing both plaintiffs and defendants.

Review of Documents

The following documents provided by the Kopp – McKichan Law firm have been reviewed to date:

INTRODUCTION (Contd.)

1. The Complaint that forms the basis of the lawsuit (11/27/06),
2. The deposition testimony of Mark W. Kohn and exhibits (4/25/07),
3. Defendant Blackpowder Products Inc.'s Rule 26(a)(1) Initial Disclosures (5/4/07),
4. Defendant Blackpowder Products Inc's Responses to Plaintiffs' First Set of Interrogatories and Request for Production of Documents (6/25/07),
5. Rule 26(a) Initial Disclosures of Defendant Cabela's Retail, Inc. (5/3/07),
6. (Cabela's) Answers to Interrogatories (7/5/07),
7. (Cabela's) Response to Request for Production (7/5/07)),
8. Black Powder Handbook & Loading Manual, 2nd Ed., S. Fadala, Lyman Products Corporation (2001),
9. Formulas for Stress and Strain, 5th Ed., R. Roark & W. Young, McGraw Hill (1989).

Examination of the Evidence

The subject rifle and projectiles were presented for visual and microscopic examination, measurement and hardness testing at the laboratory of Associated Metallurgists on June 6, 2005. At that time photographs were made to document the condition of the evidence. Subsequently, a black plastic CVA powder flask containing propellant powder was received and photographs documenting the powder were made on December 22, 2005. The evidence rifle and shooting accessories (absent the powder flask and propellant) were again received on September 14, 2007 for reexamination in preparation of this report.

Description of the Accident

A description of the circumstances surrounding the accident is provided in the deposition testimony of Mark W. Kohn (cited above). The rifle together with a kit of shooting accessories were purchased new from

INTRODUCTION (Contd.)

Cabela's in Pairie Du Chien, Wisconsin on November 29, 2004. The rifle burst the first time it was fired on the day following purchase. It was reported that at the time of the failure, the rifle had been charged by the shooter, Mark Kohn, with a maximum of 130 grains of black powder taken from a flask provided by Mr. Kohn's Uncle. The propellant from that flask had been used on numerous prior occasions in other black powder rifles without incident. The Projectile was a .50 caliber, 240-grain lead, Cheap Shot Sabot bullet. The breech plug was primed with a No. 209, shotshell primer. Plaintiff makes no claim of defect in the primer, powder or projectile used at the time of the failure.

FINDINGS

Description of the Rifle

The subject rifle is an in-line type muzzleloader chambered for .50 caliber projectiles. The rear of the barrel is fitted with a screw-in breech plug that was made to accept No. 209 shotshell primers. The design of the rifle incorporates an external swinging hammer and trigger mechanism installed in a breech-block assembly. The entire breech-block assembly can be lowered to provide greater access to the breech plug for priming and cleaning the rifle. The rifle had been fitted with a telescopic sight by Cabela's at the time of purchase. The sight was mounted on two aluminum scope bases. The front portion of the telescopic sight remained attached to the front base, which was still screwed onto the undamaged forward portion of the barrel subsequent to the accident. The rear portion of the telescopic sight separated from its base and the base separated from the damaged rear section of the barrel.

Analysis of the Failure

Failure occurred at the rear of the barrel. Fracture surfaces extended from the front telescopic sight base to the breech end. The forward section of the barrel appeared to have escaped significant damage. The condition of the evidence is documented in "PHOTOGRAPHS OF THE BPI – CONNECTICUT VALLEY ARMS KODIAK MAGNUM .50 CAL. BLACK POWDER RIFLE AND PROPELLANT" (Associated Metallurgists – September 13, 2007) attached as an appendix to this report. The photographs were

made during the initial examination on June 6, 2005. The photographs together with the accompanying List of Figures are specifically incorporated as a part of this Report of Finding.

The left side of the barrel was imprinted with the following: **BPI – CONNECTICUT VALLEY ARMS, KODIAK MAGNUM, MADE IN SPAIN, Black Powder Only, .50 Cal. 1:28 TWIST, Read instructions before use, 61 – 13 – 185379.** The barrel was also imprinted with a variation of the Eibar (shield) Proof mark that is applied to all arms and three circles, the blackpowder proof marking for muzzleloaders produced in Spain. Proof testing of firearms produced in the United States, Spain and other European countries commonly involves firing with a load that produces an internal pressure within the barrel that is 135 to 150% above the maximum pressure the firearm is designed to support. The actual pressures required for proof testing of conventional (cartridge loaded) firearms is governed by SAAMI (Sporting Arms and Ammunition Manufacturers Institute) and is in the specified in the various ANSI/SAAMI standards covering rimfire and centerfire rifle, pistol and shotshell ammunition. SAAMI standards do not apply to black powder (muzzleloading) firearms.

Failure of the barrel produced at least four "banana-peel" fragments. However, only two portions of the damaged rear section of the barrel were recovered subsequent to the accident. The largest of the two comprised a section extending circumferentially from the left to the right side of the barrel, through the underside. This piece remained attached to the undamaged forward portion of the barrel and extended rearward to the breech face. The second smaller piece separated from the left side of the barrel across a common fracture surface with the larger piece. The other fracture surface contained on the separated piece, extended through the top surface of the barrel. The smaller, separated piece of the barrel, reached from the undamaged forward portion to the area where the rear sight base was mounted. The fracture surface (through the top of the barrel contained the forward one of the two threaded holes used to mount the rear telescopic sight base. The bore surfaces on both fragments and in the undamaged forward portion of the barrel were uniformly blued, virtually free of debris, rust and other damage due to attack of the metal. The almost pristine appearance of the bore is consistent with the representation that the rifle burst upon its first firing.

The fracture surfaces exhibited clearly defined chevron markings leading from a location approximately one and one-quarter inches from the forward face of the breech plug. The larger fragment exhibited a sharp bend in this same area of the barrel. The smaller fragment was broken by a transverse fracture across this same area of the barrel. Deformation, fracture and the texture of the broken surfaces indicate that failure of the barrel originated at a location approximately one and one-quarter inches from the front face of the breech plug.

Using the powder measure provided with the evidence it was found that a loading of 130 grains of black powder (or Pyrodex) occupies a length of two and three-quarter inches in the subject .50 caliber rifle barrel. It may thus be concluded that the origin of the failure was within the area that was occupied by the powder charge. It may further be concluded that bursting of the barrel was not the result of a "short loading," a projectile not seated on the powder charge. In those cases the unseated bullet acts as a barrel obstruction. Failures due to short loadings necessarily originate at the location of the unseated projectile.

Examination of the Propellant

The contents of the powder flask from which the accident load was prepared were examined microscopically and are documented in the photographs cited above. Comparisons were made among powder particles from the flask and reference materials obtained from a library of propellants retained by Associated Metallurgists. Two distinctly different types of power particles were contained in the flask. One of the types compared closely with a sample of Goex FFFg black-powder propellant. The other type of particles contained in the flask compared closely with a sample of Hodgdon Pyrodex FFg muzzleloading propellant. There were no particles of smokeless powder observed in the contents of the flask.

Strength of the Barrel

Hardness measurements were made on the external surface near the midsection of the undamaged forward portion of the barrel. Five measurements on the external surface of the barrel yielded an average hardness of Rockwell B 91.1 (HRB) with a standard deviation among the measurements of 0.43 HRB. According to ASTM A-370 Standard Test Methods and Definitions for Mechanical Testing of Steel products this level of hardness corresponds to an approximate tensile strength of 90,000 psi.

FINDINGS (Contd.)

The bore diameter across rifling grooves near the muzzle end of the barrel was 0.503 inches. The wall thickness of the barrel near the failure origin (measured through a bore groove in the separated barrel fragment) was 0.235 inches. Using these measurements and the strength of the metal, calculations were made using standard formulae in Roark (cited above) to determine the internal pressure required to cause the barrel to burst. The calculations indicate that in an area of uniform thickness near the failure origin, an internal pressure in excess of 50,000 pounds per square inch (psi) would be required to exceed the tensile strength of the barrel at the surface of the bore. This level of pressure is beyond the capability of any foreseeable 130-grain loading of black powder or Pyrodex behind a 240 grain, 50 caliber sabot projectile.

Examination of the separated fragment demonstrated that the fracture surface along the top of the barrel intersected the front screw hole for the rear base of the telescopic sight. The wall thickness through the bottom of the screw hole is 0.064 inches. Using this value for the wall thickness of the barrel and the same relationships employed in the previous calculations it was found that an internal pressure of less than 20,000 psi would be required to exceed the tensile strength of the metal at the surface of the bore. The Lyman Black-Powder handbook cited above lists the pressures for various loadings of black powder and Pyrodex behind a .50 caliber 240 grain sabot projectile in a 28 inch 1:24-inch twist barrel. The listed pressures for 120 grains of powder (the maximums listed) range from 16,700 psi to 29,900 psi. The levels of pressure is attainable with a 130 grain loading of black powder or Pyrodex behind a 240 grain, .50 caliber sabot projectile exceed the calculated strength of the barrel at the bottom of the threaded holes provided for mounting a telescopic sight.

CONCLUSIONS AND OPINIONS

The appearance of the evidence rifle is consistent with the description of the circumstances of the accident provided by Mark W. Kohn in his deposition testimony.

1. The subject rifle appeared to be in new condition.

2. The condition of the bore indicated that it had not been fired extensively prior to the accident.

3. The propellant contained no evidence of smokeless powder.

CONCLUSIONS AND OPINIONS (Contd.)

4. The projectile was seated on the powder charge at the time the rifle was fired.

Based upon my examination and tests of the evidence rifle barrel I have reached the following conclusions and formed the following opinions to a reasonable degree of engineering certainty:

1. The rifle barrel was fabricated from a free-machining grade of steel having an approximate tensile strength of 90,000 psi.

2. Failure of the rifle barrel originated at a location approximately one and one-quarter inches from the forward end of the breech plug.

3. Failure of the rifle barrel originated at or close to the location of the rearmost threaded hole provided for the rear base of the telescopic sight.

4. The thickness of the barrel wall at the location of the rearmost threaded hole provided for the telescopic sight was insufficient to withstand internal pressures within the barrel in excess of 20,000 psi.

5. A loading of 130 grains of black powder/Pyrodex is capable of developing pressures in excess of 20,000 psi when loaded with a 240 grain, .50 caliber projectile.

6. Threaded holes for the mounting of telescopic sight bases were introduced into the barrel at the time the rifle barrel was manufactured.

7. Failure of the subject rifle was caused by insufficient wall thickness at the threaded hole provided for mounting the telescopic sight base.

8. The subject BPI/CVA Kodiak black-powder rifle was defective and unreasonably dangerous because the wall thickness at the base of the threaded holes provided for mounting a telescopic sight base was insufficient to withstand the internal barrel pressures that develop when the rifle is fired with foreseeable loadings of black powder and/or black powder substitutes and appropriate projectiles.

Robert Jay Block, Ph.D., P.E.
Consulting Metallurgical Engineer

APPENDIX

ASSOCIATED METALLURGISTS

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September 13, 2007

PHOTOGRAPHS OF THE BPI – CONNECTICUT VALLEY ARMS KODIAK MAGNUM .50 CAL. BLACK-POWDER RIFLE AND PROPELLENT

Taken: June 6, 2005
And: December 22, 2005
At: Associated Metallurgists

In the matter of:

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LIST OF FIGURES

LIST OF FIGURES (Contd.)

LIST OF FIGURES (Contd.)

Figures 21 and 22. Overall and closer views showing two of the broken surfaces that were created when the barrel burst. In each of these photographs the fracture surface nearer the top is on the right side of the barrel, the fracture nearer the bottom is on the left side of the barrel.

Figures 23 through 28. Closer views showing contiguous areas (from front to rear) of the fracture surface on the left side of the barrel (seen nearer the top in Figs. 21 and 22). The surface exhibits clearly defined chevron markings leading from a location approximately one and one-quarter inches from the forward end of the breech plug. The focus of the chevron markings is shown in Fig. 26. Figure also 28 shows somewhat less obviously defined chevron markings in the area of the breech plug threads leading from the forward portion of the barrel.

Figure 29. Overall view showing the forward ends of the two fracture surfaces contained on the section of the barrel that did not separate during the failure.

Figures 30 through 35. Closer views showing contiguous areas (from front to rear) of the fracture surface on the right side of the barrel (seen nearer the top in Figs. 21 and 22). The surface exhibits clearly defined chevron markings leading from a location approximately one and one-quarter inches from the forward end of the breech plug. The focus of the chevron markings is shown in Fig. 33. A portion of the breech-plug threads appears at the right in Figures 34 and 35.

Figures 36 and 37. Overall views showing a fragment of the barrel that separated during the failure. The fragment, also shown in Fig. 3, was attached to the left side of the barrel as shown in Fig. 18. Figure 37 shows a portion of the common fracture surface across which the two pieces of the barrel had been joined prior to the failure. The rearmost edge of the fragment was located approximately one and one-quarter inches from the forward end of the breech plug.

LIST OF FIGURES (Contd.)

CURRICULUM VITAE

NAME:

Robert Jay Block

PRESENT POSITION:

Professor Emeritus of Metallurgical Engineering, University of Oklahoma. C.E.O., Associated Metallurgists, an Engineering Consulting Company.

EDUCATION:

S.B., Metallurgy, Massachusetts Institute of Technology, 1956
M.S., Metallurgical Engineering, Columbia University, 1958
Ph.D., Major - Metallurgical Engineering, University of Illinois, 1963
(Minors - Physics and Chemistry).

Thesis/Dissertation Titles

B.S. On Deformation Structures in Ag-Au Alloys
M.S. Resistivity Measurements on Eutectoid Be-Cu
Ph.D. Effects of Electrodeposited Coatings on the Plastic Deformation of Copper Single Crystals

REGISTERED PROFESSIONAL ENGINEER: Oklahoma Reg. No. 9458

PROFESSIONAL EXPERIENCE

Research Associate - Electrometallurgical Co., Niagara Falls, New York. (Carried out research program on cobalt based high temperature alloys. This work was directed by W. Boesch, 6/55-9/55.)

Summer Research Assistant - Massachusetts Institute of Technology, Cambridge, Massachusetts. (Carried out research program on deformation twinning in FCC alloys on a project directed by Dr. M.B. Bever, 6/56-9/56.)

Teaching Assistant - Columbia University, New York City. (Taught Physical Metallurgy Laboratory under the direction of Professor G.L. Kehl, Investigator; "Resistivity Measurements on Eutectoid Be-Cu", 9/56-6/58.)

Research Assistant - University of Illinois, Urbana Illinois. (Investigator; "The Effects of Electrodeposited Coatings on the Plastic Deformation of Copper Single Crystals" and "Rupture of Oxide Films on Aluminum During Plastic Deformation". This work was supported by the United States Office of Naval Research and United States Atomic Energy Commission and directed by Dr.M. Metzger and Dr. T.A. Read, 9/58-9/63.)

CURRICULUM VITAE (Contd.)

PROFESSIONAL EXPERIENCE (Contd.)

Assistant Professor of Metallurgical Engineering - University of Oklahoma, 9/63-6/67.

Associate Professor of Metallurgical Engineering - University of Oklahoma, 9/67-9/72.

Professor of Chemical Engineering and Materials Science - University of Oklahoma, 9/72-5/90

Professor Emeritus of Metallurgical Engineering - University of Oklahoma, 5/90-present.

CONSULTING ACITIVITIES:

Consulting to General Industry (Representative):

Black Sivalls and Bryson
Hermetic Switch Co.
Hydro Corporation
Freightliner Corp.
Macklanburg Duncan
Company Ford Motor Co.
Westinghouse Electric Co.
Kelsey Hayes
Transcon Lines
Research Instruments Inc.
PPG Industries
Maremont Corporation
American Trailers Inc.
York International
U. S. Air Force OCAMA
General Motors Assy. Divn.
ClimaCool, Corp.
Kyle Forge Co.
Rotex Bearing Co.
Insta-Pipe Corp.
Omeco, Inc.
Western Welding Co.
The City of El-Reno OK
Gas Conditioners Inc.
Magnetic Peripherials Inc.
White Motors Corp.
Alcoa Closures Division
Bank Building Corp.
Brown & Smith Hardbanding Co.
Hermetic Switch Co.
John Deere Co.
Chrysler Corp.
Star Manufacturing Company
Sundstrand Corp.
Avco Lycoming
Brown & Root
Vassar Industries
Poplarville Mfg. Co.
Honeywell Information Systems
U.S. Department of Transportation
International Environmental Systems
Mack Trucks
Four-J Co.
Stromberg Carlson
Rogers-Mustang
International Environmental Corp.
Holman Laboratories
Kalman & Associates
Catlin Aviation Co.
Triangle K Trailers
Alpha Metals Inc.
Winchester – Western

CURRICULUM VITAE (Contd.)

CONSULTING ACITIVITIES (Contd.):

Consulting to General Industry (Representative):

Union Carbide Corp.
Big Chief Roofing Co.
NCR Corp.
Skyhook Corp.
Western Electric Corp.
City Springs Works
Aspen Research Corp.
CMI Corp.
Uniflux - Heatran Co.
Flex-o-lators Inc.
Sentry Manufacturing Co.
Cook Valve Co.

Consulting to the Petroleum Industry (Representative):

Earlsboro Oil and Gas Co.
Exxon Petroleum Co.
Homko International
Continental Oil Co.
Parker Drilling Co.
Bodard & Hale Drilling Co.
Kellco Oil Co.
Marlin Oil Co.
Inexco Oil Co.
Tubular Finishing Works
Astro Drilling Co.
Brown & Root Corp.
Premier Resources Co.
Basin Drilling Corp.
Sarkeys Inc.
Cleary Petroleum Co.
Woods Petroleum Co.
AMF-Tuboscope
Chevron Oil Co.
Vierson & Cochrane Drilling Co.
Eureka Tool Co.
Petroleum Training & Technical Serv.
Amerex Oil Co.
TRG Drilling Co.
Barton Valve Co.
Otex Chemical Specialties Co.
Technadril-Fenix & Scisson

Consulting to the Firearms Industry:

Winchester Arms Co.
Winchester-Western Corp.
Firearms Importing and Exporting Co.
RG Industries
High Standard Corp.
Sterling Arms Co.
Armsport Arms Co.
Bauer Firearms Co.
Connecticut Valley Arms Co.
Ithaca Gun Co.
Tanfoglio-Guiseppe (Italy)
Smith & Wesson
American Arms Co.
(Bentinsoli Tarcisio & S.R.L.)
Beretta U.S.A.
Excam Corp.
U.S. Repeating Arms Corp.
Weatherby, Inc.
Taurus International
O.F. Mossberg & Sons
Buffalo Arms Corp.
Sears Roebuck & Co.

CURRICULUM VITAE (Contd.)

CONSULTING ACITIVITIES (Contd.):

Consulting to the Firearms Industry:

Aquirre y Aranzabal (Spain)	Davis Industries
Thompson/Center Arms Co.	Savage Arms
Browning Arms Co.	Stoeger Arms
Marlin Firearms Co.	Sako
Harrington & Richardson, Inc.	Investarms
Colt's Firearms	Ranson Italia spa

Consulting To the Insurance Industry (Representative)

Wackenhuth Adjustment Co.	Askew Associates
ESIS	Moore Group
Canadian Universal	Alstate Insurance Co.
California Union Insurance	MidContinent Insurance
The Kemper Group	Frontier Adjustment Co.
Foremost Insurance	The Travelers Insurance Co.
Sentry Insurance	Electric Mutual
US Insurance Group	Home Insurance Co.
Employers Casualty	Aviation Underwriters
Oklahoma Farmers Union	Alliance Insurance Co.
United States Fidelity and Guaranty Co.	
Sentry Insurance Co.	Jersey International Group
Insurance Co. of North America	Oklahoma Farm Bureau
United States Aviation Underwriters	
Employers Mutual of Wausau	Commercial Union Assurance Co.
The St. Paul Company	Aetna Life and Casualty
Farmers Insurance Group	Allstate Insurance
The Hartford Group	The Western Insurance Co.
Liberty Mutual Insurance Co.	Royal Globe Insurance
The Home Insurance Co.	CNA Insurance Co.
Silvey Companies	Lloyds of London
Foremost Insurance Co.	Crum & Forster Insurance Co.
New Hampshire Insurance Group	

Testified In Courts

California	Ohio	Colorado	Virginia
Florida	Oklahoma	Georgia	Arkansas
Idaho	South Dakota	Kansas	Louisiana
Kentucky	Texas	Missouri	Wisconsin
Wash. D.C.	Tennessee	Mississippi	Arizona
South Carolina			

CURRICULUM VITAE (Contd.)

CONSULTING ACITIVITIES (Contd.):

Patent

Method for Producing Iron and Steel From Iron Ore, with J.H. Christensen, U.S. Patent No. 3,951,644 (Assigned to Heatran Corporation)

GRADUATE DEGREES DIRECTED

Robert M. Johnson	Ph.D. Metallurgical Engineering	6/67
Wilson S. Lee	M.S. Chemical Engineering	9/67
Maj. Richard Feaster	M.S. Metallurgical Engineering	6/68
Cap. Norman Cochrane	M.S. Metallurgical Engineering	6/68
James H. Ford	M.S. Metallurgical Engineering	9/68
Parviz Mehdizadeh	Ph.D. Metallurgical Engineering	6/71
Fuad Akhtarkavari	M.S. Metallurgical Engineering	12/72
Woodward Sun	Ph.D. Metallurgical Engineering	1/73
Desmond O'Steen	M.S. Metallurgical Engineering	2/73
J.T. Amin	M.S. Metallurgical Engineering	6/74
John C. Tanzola	M.S. Metallurgical Engineering	6/75
Samuel McLaury	M.S. Metallurgical Engineering	6/75
Pankaj Mehta	M.S. Metallurgical Engineering	6/76
Kenneth E. Urtel	M.S. Metallurgical Engineering	1/77
Khoroso Kermany	M.S. Metallurgical Engineering	9/78
William Coleman	M.S. Metallurgical Engineering	1/79
Chen-Hsun Hsu	M.S. Metallurgical Engineering	9/79
Mohammud Elmarghani	M.S. Metallurgical Engineering	9/79
Everett W. Brothers	Ph.D. Metallurgical Engineering	1/80
Rita K. Edwards	M.S. Metallurgical Engineering	9/80
Joseph A. King	Ph.D. Metallurgical Engineering	6/85
Andreas Toliopoulos	M.S. Metallurgical Engineering	12/87
Yetunde Ponnle	M.S. Metallurgical Engineering	1/88

OTHER PROFESSIONAL ACTIVITIES:

Reviewer Of Papers And Proposals For:

National Science Foundation
U.S. Atomic Energy Commission
Transactions of Metallurgical Society AIME
Acta/Scripta Metallurgica
Oklahoma Academy of Sciences

RESEARCH AT THE UNIVERSITY OF OKLAHOMA:

Director-Research Contract U.S. Atomic Energy Commission. "The Effects of Surface Coatings on the Plastic Deformation of Metals," $223,527, 5/65-11/72.

Technical Reports To The U.S. Atomic Energy Commission

U.S.A.E.C. Report Nos.	ORO-3401-1	2/66
	ORO-3401-2	2/67
	ORO-3401-3	2/68
	ORO-3401-5	3/68
	ORO-3401-6	2/69
	ORO-3401-11	2/70
	ORO-3401-15	2/71
	ORO-3401-18	11/73

Reports on Special Topics and Completed Research Projects Have Been Published Except as Noted Below:

Report No. ORO-3401-10, "Residual Stress Measurements on Thin Electrodeposited Films," with R.V. Feaster, 2/69.

Report No. ORO-3401-16, "The Effects of Anodic Oxide Films on the Mechanical Properties of Aluminum Single Crystals," with P. Mehdizadeh, 2/71.

Report No. ORO-3401-17 "The Influence of Anodized Coatings on the Fatigue of 2024-T4 Aluminum," with F. Akhtarkavari, 11/73.

Other Externally Funded Research Projects

Director-Research Contract U.S. Department of Transportation, "Metallographic Analysis of Railroad Rails," $5,000, 6/75-5/76

Director-Research Contract Sentry Manufacturing Co. "Improved Manufacturing Methods for Thermistors," $1,500, 6/74-5/75.

Director-Research Contract Alpha Metals Inc. "Intermetallic Compound Formation in Antimonial Solders," $4,500, 7/78-6/79.

Co-director-Research Contract U.S. Air Logistics Command, Oklahoma City Air Materials Area, "Analysis of Failures in Aircraft Engine and Accessory Components," with R. D. Daniels, $100,000, 7/78-12/81.

Director-Research Contract U.S. Air Logistics Command, Oklahoma City Air Materials Area, "Analysis of Failures in Aircraft Engine and Accessory Components," $5,000, 7/85-7/86.

CURRICULUM VITAE (Contd.)

RESEARCH AT THE UNIVERSITY OF OKLAHOMA:

Other Externally Funded Research Projects

Director-Research Contract Technical Center, Kerr-McGee Corp., "Mechanical Testing of Adhesive Bonded Metal to Wood Samples," $5,000, 12/87-6/88.

PROFESSIONAL AFFILIATIONS:

American Society of Metals
American Institute of Metallurgical Engineers
Sigma Xi

RESEARCH INTERESTS:

Mechanical Properties of Materials,
Deformation Structures in Metals and Non-Metallic Materials,
Deformation Properties of Materials,
Characteristics of Metal Surfaces,
Analysis of Defects and Failures of Materials,
Analysis of Workplace Accidents,
Analysis of Safety, Guarding and Warnings on Machinery.

PUBLICATIONS:

"On Deformation Structures in Ag-Au Alloys," with J.B. Cohen and M.B. Bever, AIME, 212, p.300, 1958.

"Resistivity Measurements on Eutectoid Be-Cu," with G.L. Kehl, Trans. AIME, 215, p. 878, 1959.

"Rupture of Oxide Films on Aluminum During Plastic Deformation," with M. Metzger, Technical Report #6,ONR Project NR-036-024, 1962.

"The Relation Between Surface Damage and Film Strengthening Effects," with R.M. Johnson, Acta Met., 16, p. 831, 1968.

"The Existence of Preferential Surface Damage in Copper Single Crystals," with R.M. Johnson, Acta Met., 17, p.299, 1969.

"Reply to Comments on 'The Existence of Preferential Surface Damage in Copper Single Crystals,'" with R.M. Johnson, Scripta Met., 3, p. 511, 1969.

"The Effects of Electroplated Chromium on the Plastic Deformation of Copper Single Crystals," with M. Metzger, Phil. Mag., 19, p. 599, 1969.

CURRICULUM VITAE (Contd.)

PUBLICATIONS:

"The Mechanical Behavior of Anodic Coatings on Deformed Aluminum," with N.J. Cochrane, J. Electrochem. Soc., 117 p. 225, 1970.

"Buckling of Anodic Coatings," J. Electrochem. Soc., 117, p. 788, 1970.

"A Computer Technique for the Solution of Laue Back Reflection Patterns of Cubic Crystals Part I, with J.H. Christensen and W.H. Huang, Trans. Met. Soc. AIME, May 1971.

"A Computer Technique for the Solution of Cubic Laue Back Reflection Patterns Part II," with J.H. Christensen and W.H. Huange, Trans. Met. Soc. AIME, 2, 2295, 1971.

"The Influence of Anodic Coatings on Slip in Aluminum,"with P. Mehdizadeh, J. Electrochem. Soc., 119, 1091, 1972.

"A Copper Spearhead from Western Oklahoma," with R.E. Bell, The Plains Anthropologist, 17-55, 65, 1972.

"Discussions", Proceedings of the First International Conference on Corrosion Fatigue, Storrs, Connecticut, Gordon and Breach 162, 164, 208, 1972.

"Simulation of Blast Furnace Thermo-Economics," with J.H. Christensen, Proc. Summer Computer Simulation Conf. AIChE 1, 310, 1975.

"SEM Studies of Light and Dark Etch Pits in Copper," with E.W. Brothers, Scripta Met., 12, 667, 1978.

"Hydrogen Induced Dislocation Motion," with J.A. King, Scripta Met., 19, March, 1985.

PRESENTATIONS AT SCIENTIFIC AND TECHNICAL MEETINGS:

"The Effects of Anodic Coatings on Aluminum Single Crystals During Plastic Deformation," with M. Metzger, National Meeting AIME, Philadelphia, Pa., Fall, 1962.

"The Effects of Electrodeposited Coatings on the Plastic Deformation of Copper Single Crystals," with M. Metzger, National Meeting AIME, Spring 1964.

"The Effects of Electrodeposited Coatings on the Plastic Deformation of Copper Single Crystals," with M. Metzger, National Meeting AIME, Chicago, Illinois, Spring, 1964.

"The Behavior of Anodized Aluminum During Deformation," Oklahoma City Chapter NACE, Fall 1965.

CURRICULUM VITAE (Contd.)

PRESENTATIONS AT SCIENTIFIC AND TECHNICAL MEETINGS:

"The Effects of Surface Conditions Upon the Mechanical Behavior of Metal Crystals," Oklahoma University Society for Engineering Physics, October 1966.

"The Effects of Surface Conditions Upon the Mechanical Behavior of Metal Crystals," Oklahoma University Society of Engineering Physics, October 1966.

"The Effects of Electrodeposited Coatings on the Plastic Deformation of Copper Crystals," Department of Metallurgical Engineering, University of Kentucky, February 1967.

"The Effects of Electrodeposited Coatings on the Plastic Deformation of Copper Crystals," Department of Chemical Engineering and Mechanical Engineering, University of Maryland, February 1967.

"The Effects of Electrodeposited Coatings on the Plastic Deformation of Copper Crystals," Institute of Materials Science, University of Connecticut, October 1967.

"The Behavior of Anodic Coatings During Plastic Deformation of Aluminum Single Crystals," with P. Mehdizadeh, National Meeting AIME, Fall 1970.

"The Influence of Surface Conditions upon the Mechanical Properties of Metals," Department of Chemical Engineering and Materials Science, University of Oklahoma, April 1971.

"The Influence of Anodized Coatings on the Fatigue of 2024 T-4 Aluminum," with F. Akhtarkavari, Annual Meeting Electrochemical Society, Miami Beach, Florida, October 1972.

"The Effects of Antimony on Intermetallic Compound Formation in Solder Alloys applied to Substrates Containing Copper and Zinc" with W.R. Coleman and E.W. Brothers, Southwest Printed Circuits and Microelectronics Exposition, Dallas, Texas, March 1979.

"Gold Tin Intermetallic Compounds Formed in 60/40 Solder Connections" with E.W. Brothers, Southwest Printed Circuits and Microelectronics Exposition, Dallas, Texas, March 1979.

"Intermetallic Compound Formation in 60/40 Tin-Lead Based Solders Applied to Copper, Copper Alloys and Gold Plated Substrates," with E.W. Brothers, National Electronics Packaging Conference (Nepcon West) Anaheim, CA and Annual Meeting AIME, Las Vegas, NV, Feb. 1980.

CURRICULUM VITAE (Contd.)

PRESENTATIONS AT SCIENTIFIC AND TECHNICAL MEETINGS:

"The Metallurgy of Soft Solders," with E.W. Brothers and W.R. Coleman, Nepcon West, Anaheim, CA, Feb. 1980.

"The Effects of Antimony on Intermetallic Compound Formation in solder Alloys Applied to Substrates Containing Copper and Zinc," with W.R. Coleman and E.W. Brothers, Nepcon West, Anaheim, CA, and Annual Meeting AIME, Las Vegas, NV, February, 1980.

Chairman, "Condensation Soldering," session Nepcon West, Anaheim, CA, February, 1980.

"Corrosion Problems in Aircraft Components – Case Studies of Failure," with W. Coleman and R. Daniels, Tri-Service Conference on Corrosion U.S. Air Force Academy, November, 1980, Colorado Springs, Colorado.

Cochairman - Failure Analysis Session, International Conference and Exposition on Fatigue, Corrosion Cracking, Fracture Mechanics and Failure Analysis, ASM Technical Division Conference, Salt Lake City, Utah, December 1985.

"Failure of A Direct Fired Heat Exchanger", International Conference and Exposition on Fatigue, Corrosion Cracking, Fracture Mechanics and Failure Analysis, ASM Technical Division Conference, Salt Lake City, Utah, December 1985.

"Case Histories in Failure Analysis of Heat Exchangers", International Conference and Exposition on Fatigue, Corrosion Cracking, Fracture Mechanics and Failure Analysis, ASM Technical Division Conference, Salt Lake City, Utah, December 1985.

TEACHING EXPERIENCE:

Courses Taught at Columbia University:

1. Metallurgical Engineering Laboratory I
2. Metallurgical Engineering Laboratory II

Courses Taught At the University Of Oklahoma:

1. Engineering 3313 (112) Structure and Properties of Materials
2. Engineering 2131 (113) Materials Science Laboratory
3. Engineering (146) Engineering Laboratory I
4. Engineering (2722) Engineering Analysis

TEACHING EXPERIENCE:

Courses Taught At the University Of Oklahoma (Contd.):

5. Industrial Engineering (208) Manufacturing Processes
6. Metallurgical Engineering 3133 (210) Physical Metallurgy I
7. Metallurgical Engineering 3233 (211) Physical Metallurgy II
8. Metallurgical Engineering 3581 (298) Metallurgical Engineering Laboratory I
9. Metallurgical Engineering 3681 (299) Metallurgical Engineering Laboratory II
10. Metallurgical Engineering 4173 (317) High Temperature and Corrosion Resistance of Metals
11. Metallurgical Engineering 4450 (3573) Honors Seminar - The Analysis of Defects and Failures in Metals
12. Metallurgical Engineering 4333 (330) Mechanical Metallurgy
13. Metallurgical Engineering 4950 (399) Research for Bachelor's Thesis
14. Metallurgical Engineering 5613 (410) Theoretical Metallurgy I
15. Metallurgical Engineering 5713 (411) Theoretical Metallurgy II
16. Metallurgical Engineering 5490 (481) Seminar on Physical Metallurgy - The Theory of the Properties of Metals and Alloys
17. Metallurgical Engineering 5990 (490) Graduate Student - Faculty Seminar
18. Metallurgical Engineering 5000 (499) Research for the Master's Thesis
19. Metallurgical Engineering 6000 (599) Research for the Doctor's Dissertation
20. Metallurgical Engineering 4900 Fatigue Analysis (Concurrent with AMNE 6710)
21. Metallurgical Engineering 4950 Scanning Electron Microscopy
22. Seminar on Products Liability Law (Invited Lectures)

CURRICULUM VITAE (Contd.)

TEACHING EXPERIENCE:

Short Courses taught at the University of Oklahoma Center for Continuing Education:

1. Metallurgy for Engineers
2. Nondestructive Testing
3. Corrosion Fundamentals
4. Corrosion Control Short Course

Other Short Courses:

1. Corrosion and Corrosion Control, Petroleum Training & Technical Services (8/76)

2. Elements of Materials Science, Continental Oil Co. (11/77 - 1/78)

3. Failure Analysis - Corrosion and Fatigue, Western Electric Corp. (2/79 - 3/79), (9/80)

4. Corrosion Fundamentals - Otex Chemical Specialties Co. (3/81)

5. Corrosion of Aircraft Structures and Accessory components - U.S. Air Force OCAMA (7/88)

6. Aircraft Structural Fatigue - Federal Aviation Administration (6/91)

Miscellaneous:

Trial Clinic - Bronson, Bronson & McKinnon Santa Cruz, CA (3/96)

Professional Development

Principles of Failure Analysis, ASM International (9/05)

OSHA Standards, Electric Codes, Geographic Information Systems (9/05)
International Plumbing Code: A Guide for Use and Adoption, Geographic Information Systems (2/07)

RULE 26 LISTING OF TESTIMONY GIVEN BY ROBERT JAY BLOCK

According To The Requirements Of Rule 26 of The Federal Rules Of Civil Procedure

2002

February 8, 2002
Trial: Easterwood v. Mercy Memorial Health Center

February 28, 2002
Deposition: Peters v. Praxair Distributors

March 13, 2002
Deposition: Allied Steel Construction Co. v. Cherokee Hose and Supply Co.

March 19, 2002
Deposition: Stotts v. Heckler & Koch

April 23, 2002
Deposition: Davis v. Invacare

May 24, 2002
Deposition: Erdmann v. North American Arms

June 7, 2002
Deposition: Eliff v. Lowe's

June 25, 2002
Deposition: Walsh v. Michelin N.A.

August 1, 2002
Trial: Davis v. Invacare

August 14, 2002
Deposition: Hargrave v. Michelin North America

September 5, 2002
Deposition: Prince v. Michelin North America

September 9, 2002
Deposition: Cope v. Grove U.S.

October 7, 2002
Deposition: Williams v. Treadtech (Continental General Tire)

October 29, 2002
Deposition: Kane v. Medley, et al.

December 11, 2002
Deposition: Morning v. Rival

RULE 26 LISTING OF TESTIMONY GIVEN BY ROBERT JAY BLOCK

2003

January 3, 2003
Deposition: Bonewell v. Leapers

January 27, 2003
Deposition: Ingmire v. Covey, et al

February 3, 2003
Deposition: Stotts v. Heckler & Koch

March 20, 2003
Deposition: Salazar v. Lewis M. Carter Mfg.

March 27, 2003
Deposition: Samson Resources Co. v. Washita Valley Enterprises

March 31, 2003
Deposition: White v. Waco Fiberglass Inc.

April 7, 2003
Deposition: Griffith v. Lufkin Industries, Inc.

June 17, 2003
Deposition: Vidal, Torres, Baez v. Bridgestone/Firestone

July 2, 2003
Deposition: Burch v. Sumitomo Machinery Corporation

July 30, 2003
Deposition: Homsey v. Springsoft

August 7 & 8, 2003
Deposition: McDaniel v. Gayle Stuart Trucking

September 25, 2003
Deposition: Lorance v. Beam's et al.

September 30, 2003
Deposition: Teach (McClintock) v. Smith

October 3, 2003
Deposition: Garcia v. Bridgestone/Firestone

2003 (Contd.)

October 7, 2003
Deposition: Warford v. Yamaha Motor Corp.

November 25, 2003
Hearing: Stotts v. Heckler & Koch

December 2, 2003
Deposition: Ruiz v. Elwell Parker, Ltd

December 18, 2003
Trial: Samson Resources Co. v. Washita Valley Enterprises

December 31, 2003
Deposition: Coots v. Chuck Stacy Welding

RULE 26 LISTING OF TESTIMONY GIVEN BY ROBERT JAY BLOCK

2004

January 27, 2004
Deposition: C.A. McNamara & Assoc. v. Ross Oilfield Materials, et al.

January 29, 2004
Deposition: John Terry Turner v. Glock, Inc, et al.

February 10, 2004
Deposition: Graham (Red) Matthews v. Olin Corp, et al.

February 16, 2004
Deposition: Estate of Gary Wayne Johnson v. Autoquip Corp. et al

March 10, 2004
Trial: Graham (Red) Matthews v. Olin Corp, et al.

April 12, 2004
Deposition: Shannon Marie Duwe v. Toyota Motor Corporation

May 5, 2004
Deposition: Shondra R. Mitchell v. Brown Machine, LLC & Welex Inc.

May 12, 2004
Deposition: Carlos Arnulfo Jordan (deceased) v. Bridgestone/Firestone Inc.

May 25, 2004
Deposition: Charles A. French v. Bobby Ray Foster, et al

July 2, 2004
Deposition: Bryan Downey v. Daisy Manufacturing Co.

October 4, 2004
Deposition: Estile Roach v. Cust-O-Fab

RULE 26 LISTING OF TESTIMONY GIVEN BY ROBERT JAY BLOCK

2005

February 23, 2005
Deposition: Cannon v. Clement Industries

March 10, 2005
Deposition: Smith & Brown v. Ford Motor Co., et al.

March 15, 2005
Deposition: Jaime v. Michelin, N.A.

June 15, 2005
Deposition: Miller v. Bobcat

June 30, 2005
Deposition: Tisdale v. Hilti and Ramset

August 25 & September 7
Trial: Smith/Brown v. Ford

August 26, 2005
Trial: Cannon v. Clement Industries

September 22, 2005
Hearing: Jaime v. Michelin, NA

October 14, 2005
Deposition: Dixie Steel v. Grove Worldwide

November 16, 2005
Deposition: Twogood v. Don Tankersley Trucking & Ryder Truck Rental, et al.

December 13 & 19, 2005
Deposition: Davis v. Aladdin Industries

RULE 26 LISTING OF TESTIMONY GIVEN BY ROBERT JAY BLOCK

2006

January 30, 2006
Deposition: Parret v. UNICCO & Bridgestone/Firestone

February 4, 2006
Deposition: Powell v. Harper Trucks

May 15, 2006
Deposition: Snow v. Nautilus

September 21, 2006
Deposition: Burleson v. Burleson (Bush Hog)

RULE 26 LISTING OF TESTIMONY GIVEN BY ROBERT JAY BLOCK

2007

May 4, 2007
Deposition: Wilson v. Thompson/Center Arms

May 23, 2007
Deposition: Anthony Factor v. Bynum & Co., et al.

July 11, 2007
Deposition: Matthew Sibley v. Daisy Manufacturing Co.

July 19, 2007
Deposition: Clifton Bizelli v. AmerenUE, et al

July 27, 2007
Deposition: Hilton Inn v. ClimaCool