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George Johann Klein

Personal:

Name: George Johann Klein

Born: August 15th, 1904

Birth Place: Hamilton, Ontario Canada

Mother/Father: Josephine (Dinkel) Klein & George Stepler Klein

Married: Yes, October 4, 1940 to Florence Elizabeth Schrie

Children: George Fredrick Klein (1942) & Margaret Joyce Klein (1946)

Education:

B.A. Applied Science, University of Toronto in 1928

Honors:

Honorary Doctor of Laws Degree, Waterloo Lutheran University, 1969

Officer, Order of Canada, 1969

Honorary Doctorate from Carleton University, 1988

Introduction into Canada Science and Engineering Hall of Fame, 1995

Honors from the Royal Aeronautical Society and American Society of Mechanical Engineers

Career

1928 Machine Design Demonstrator, University of Toronto

1929- Junior Research Physicist, the Division of Physics, National Research Council

1961-69 Lecturer at Carleton University, Ottawa Canada

- 1969- Adjunct Professor at Carleton University, Ottawa Canada
- 1969- Senior Research Office, the Division of Physics, National Research Council
- 1972 Chief Consultant in Gear Design for the CANADARM Project, Nation Research Council

Box 1 Volume 1

Folder A

Green, J.J. *The Wind Tunnel Development of a Proposed External Form for Steam Locomotives*. Canadian Journal of Research. Vol. 8, P. 37-61. 1933.

Green, J.J. *Inspection of New Semi-Streamlined C.N.R. Locomotives of the 6400 Class*. Division of Mechanical Engineering, NRC. June 15th, 1936.

Knowles Middleton, W.E. *Mechanical Engineering at the National Research Council of Canada 1929-1951*. Wilfred Laurier University Press.

Annual Reports, number 16 and 18 of the National Research Council of Canada. 1932-1935.

Parkin, J.H. *Aeronautical Research in Canada 1917-1975*. Volume II. National Research Council of Canada.

National Museum of Science and Technology Worksheet, including image of the Northern Locomotive, 1936.

Hoerner, S.F. *Aerodynamic Drag*. P. 167-73.

Correspondence between Anthony von Hornstein and H.G. Tucker concerning wind tunnel testing carried out at the NRC on steam locomotives. January 1989.

Card from Helen Tucker to George Klein with the 1201 Steam locomotive on the front of the card and description on the reverse. January 26th, 1989.

Folder B

Black and white image of J.H. Parkin.

Two National Research Council Description brochures describing J.H. Parkin.

Various handwritten and photocopied descriptions of the work of J.H. Parker, specifically the wind tunnel, written by George Klein. August, 1982.

Letter to Frank from George Klein describing his draft of his J.H. Parkin memoir. August 4th, 1982.

Letter to A.G. Davenport from George Klein concerning the memorial of J.H. Parkin. September 23rd, 1982.

Additional References to J.H. Parkin in F.H. Ellis' "Canada's Flying Heritage". 1954/1961.

Whitham, K. *Carlyle Smith Beals 1899-1979*. Royal Society of Canada. Series IV Volume XVII. 1979.

Nuffield, E.W. *George Burwash Langford 1898-1977*. Royal Society of Canada. Series IV Volume XVII. 1979.

Letter to Judith Fyffe from G.T. Perry, concerning the celebration of the 50th anniversary of building M-2. July 11th, 1990.

Letter from K.F. Tupper, concerning the celebration of the 50th anniversary of building M-2. July 16th, 1990.

Letter to Dr. Earl Dudgeon concerning the celebration of the 50th anniversary of building M-2. July 11th, 1990.

Two programs concerning the 50th Anniversary of Building M-2 on Wednesday July 25th, 1990.

Two typed copies of the memoir of J.H. Parkin written by George Klein.

Folder C

Klein, G.J. *John Hamilton Parkin 1891-1981*. Royal Society of Canada. Series IV Volume XX. 1982. 3 Copies.

Hand written copy of the memoir of J.H. Parkin written by George Klein. August 3rd, 1982.

Folder D

Hand written account of a visit with Margaret Parkin on June 24th, 1982.

Two copies of a description of the life and accomplishments of J.H. Parkin. Revised in 1981.

List of Papers, Lectures and Addresses given by J.H. Parkin. June 1963.

Hiscocks, R.D. *Obituary of J.H. Parkin*. Canadian Aeronautic and Space Journal. Vol. 27, No. 4. December 1981.

University of Toronto Membership in The Hall of Distinction accorded to J.H. Parkin. June 1980.

Biographical Sketch of J.H. Parkin. January 1952.

Engineering Alumni Hall of Distinction to be Dedicated June 12th at Sandford Fleming Reopening. Engineering Alumni News, Page 4. November 1981.

Folder E

Glass Plate Negative, hoisting nozzle of a 9 foot wind tunnel.

Envelope containing two photographs of the wind tunnel.

Envelope containing 5 images of various working parts of the wind tunnel along with 5 negatives of various working parts of the wind tunnel.

Envelope containing 6 various images of the wind tunnel.

Klein, G.J., Tupper, K.F. & Green, J.J. *The Design of Corners in Fluid Channels*, Canadian Journal of Research. 1930. Two copies.

Klein, G.J. & Green, J.J. *Wind Tunnel Tests of Fairings for the Multi Camera Mount in a Cabin Monoplane*. National Research Laboratories, Report No. PAA-20. September 6th, 1934.

Parkin, J.H. *The Aeronautical Laboratories of the National Research Council of Canada*. The Engineering Institute of Canada. February 12th-14th, 1930.

Green, J.J., Klein, G.J. & Tupper, K.F. *Aeronautical Research in Canada*.

Folder F

Hand written draft of the description of Wind Tunnel Design.

Typed draft of the description of Wind Tunnel Design.

Ferrier, A. *Relation of Aeronautical Research to General Engineering*. The Engineering Institute of Canada. February 7th-8th, 1933.

McQueen, A.W.F. *Hydraulic Stability*. The Engineering Institute of Canada. February 7th-8th, 1933.

Holden, O. *Hydraulic Design- Chats Falls Development*. The Engineering Institute of Canada. February 7th 1933.

Trotter, H.L. *Construction Features of the Chats Falls Development*. The Engineering Institute of Canada. February 7th-8th, 1933.

Brandon, E.T.J. *The electrical Design of the Chats Falls Development*. The Engineering Institute of Canada. February 7th-8th, 1933.

Rundle, L.P. *Lighting the Welland Ship Canal*. The Engineering Institute of Canada. February 7th-8th, 1933.

Folder G

Collection of photographs,

- Klein, Parkin and colleges outside of the NRC
- Staff group photo
- Various photographs (9) of the wind tunnel, testing sites and employees working

Letter to Mr. Klein from Dennis Williams concerning a draft of the history of the Engineering Laboratory. August 14th, 1985.

Draft of the history of the Engineering Laboratory.

Willis, D. & Klein, G. *Engineering Laboratory Photographs 1941-1968*. Division of Mechanical Engineering, NRCC. 1985.

Folder H

Official Opening National Research Laboratories. Ottawa, Canada. August 10th, 1932.

National Research Council Official Letter Head.

Parkin, J.H. *Action in Emergencies Instructions*. October 6th, 1942. Two Copies.

Research and Development Work in the Division of Mechanical Engineering. National Research Council of Canada. 1977.

Mechanical and Aeronautical Engineering Booklet. National Research Council of Canada.

Programme, readings, vocals and refreshments. January 10th, 1933.

Canadian Journal of Research. National Research Council of Canada. Vol. 3 No. 3. September, 1930.

Folder I

Mechanical and Aeronautical Engineering Booklet. National Research Council of Canada.

Research and Development Work in the Division of Mechanical Engineering. National Research Council of Canada. 1976.

Research and Development Capabilities and Facilities in the Division of Mechanical Engineering. National Research Council of Canada. 1976.

The Engine Laboratory- Ten Years of Research. Research Council of Canada. Vol. 2 No. 3. September, 1975.

Research and Development Work in the Division of Mechanical Engineering. National Research Council of Canada. 1978.

Research and Development Work in the Division of Mechanical Engineering. National Research Council of Canada. 1979.

National Research Council Information Kit folder, includes various correspondence and notes from George Klein as well as various newsletters

Folder J

Letter to George Klein from G.R. Rutledge concerning the name change of Indal Technologies. 1985.

Letter to George Klein from C.F Wood concerning the 500-700 KW Wind Turbine. January 18th, 1982.

Ferguson, R.C. *Wind Turbine: Gear Geometry Analysis.* Engineering Worksheet. 1982.

Various hand written and hand drawn diagrams and calculations.

Folder K

Closed Book Final Examination. Course Name: Engineering 82.202, Instructor G.J. Klein. December 1973. Carleton University. Various drawings and calculation on reverse of booklet.

Letter to Mr. Klein from Malcolm A. Gullen concerning the Canadian Accreditation board visiting Team. October 5th, 1973. Calculations present on reverse of letter.

Folder L

Templin, R.J. *Aerodynamic Performance Theory for the NRC Vertical-Axis Wind Turbine.* National Aeronautical Establishment. Laboratory Technical Report, NRC. June 1974.

Klein, G.J. *The Design of High-Speed Windmills Suitable for Driving Electric Generators.* National Aeronautical Establishment. Laboratory Technical Report, NRC. August 1975. 3 Copies.

Klein, G.J. *Wind Tunnel Tests of Five Windmills.* Division of Mechanical Engineering, NRC. June 17th, 1937.

Letter to G. Klein from C.F. Wood concerning the design of a new gear drive. February 2nd, 1979.

Mahaffy, R. *Offering Wind-powered Machine for Cottage Use*. The Ottawa Journal. April 6th, 1974.
Newspaper Clipping.

Letter to George Klein from Dennis Bayne concerning the Vertical Axis Wind Turbine. March 26th, 1974.
Also includes 3 technical drawings of the wind turbine.

Folder M

Wind Power: A Bibliography. National Science Library, NRC. Aeronautical and Mechanical Engineering Branch. 1974.

South, P. & Rang, R.S. *A Preliminary Tests of a High Speed Vertical Axis Windmill Model*. National Aeronautical Establishment. Laboratory Technical Report, NRC. March 1971.

South, P. & Rang, R.S. *A Wind Tunnel Investigation of a 14 FT. Diameter Vertical Axis Windmill*. National Aeronautical Establishment. Laboratory Technical Report, NRC. September 1972.

Klein, G.J. *Wind Tunnel Tests of Five Windmills*. Division of Mechanical Engineering, NRC. June 17th, 1937.

Klein, G.J. *The Design of High-Speed Windmills Suitable for Driving Electric Generators*. Division of Mechanical Engineering, NRC. June 14th, 1937.

Correspondence between George Klein and C.F. Wood concerning the Helical Gear Drive. May 1st, 1981.

South, P. & Rang, R. *The Performance and Economics of the Vertical-Axis Wind Turbine Developed at the National Research Council, Ottawa, Canada*. American society of Agricultural Engineers. October 10th-12th, 1973.

Klein, G.J. *A Small Windmill-Generator Unit for Charging a 6-volt Storage Battery*.

Box 2 Volume 2

Folder A

Large schematic of the general assembly of 50 KM V.A.N.T Gear Box.

Proposed Hydraulic Schematic of 375 KM V.A.N.T.

Hand written notes by G. Klein concerning the 18 FT. Diameter Vertical Axis Windmill.

Letter to Mr. Klein from C.F. Wood concerning sketch of bearing arrangements. October 2nd, 1981.

Envelope addressed to G. Klein containing various sketches of Helical Gears.

Folder B

Large Schematic of a Gear box Assembly 75 HP Vertical Axis Windmill.

Two Air Canada Boarding Passes, an Automated Ticket and a guest receipt for The Bristol Place Hotel in Toronto, Ontario for 8.11\$.

Various correspondence between G. Klein and C.F. Woods. February 1979-March 1981.

Travel Expense Report for G. Klein. February 19th-20th, 1979.

Letter to G. Klein from B. Andrews concerning the layout of the general assembly for the gearbox. January 15th, 1981.

Helical Gearing for Wind Turbine D.A.F. Indal Ltd.

Folder C

Photograph of Unrotated Projectile, 1 & 2.

Photograph of a Rocket Test.

2 cardstock papers with 4 images of rocket tests, labeled Photo 1-4.

McNaughton, A.G.L. (Major-General). *A Trajectory Chart for the Graphical Solutions of the gunnery Problems of Crest Clearance and Air Burst Ranging*. Ottawa. January, 1937.

McNaughton, A.G.L. (Lt-General) & Field, R.H. *Auto Sights for Coast Defense Guns*. NRC, Ottawa. June, 1939. Revised 1940. Two Copies.

Folder D

Package containing schematics and photographs of Unrotated Projectile.

Photographs of Unrotated Projectile (33). December 21st, 1941.

Photographs of Unrotated Projectile, Petawawa (27). January 28th, 1942.

Folder E

Photograph Proximity Fuse Clock, American Type.

Photograph model of the NRC.

Photographs of snow mechanics (5). Canadian Army Photo.

Photographs Proximity Fuse Clock (14).

Folder F

Letter to G. Klein from T. Klotz concerning United States Patent 3,066,546. July 23rd, 1970.

Klein, G.L. *Report on Three Automatic Power Transmissions Suitable for Snowmobile Applications.*

Log, July 14th, 1970-September 28th, 1970. Carleton University Exam Booklet.

Folder G

Klein, G. *Vascular Everter.* January 28th, 1959.

Vascular Suturing Apparatus.

Klein, G. *A Surgical Instrument Designed to Facilitate Anasomosis of Blood Vessels.*

Clinical Symposia. CIBA: Vol. 8 No. 5. October-December 1956.

Vogelfanger, I.J. & Beattie, W.G. *A Concept of Automation in Vascular Surgery: A Preliminary Report on a Mechanical Instrument for Arterial Anastomosis.* Canadian Journal of Surgery. April, 1958. Two Copies.

Klein, G.J. *A Surgical Instrument Designed to Facilitate Anastomosis of Blood Vessels.* Division of Mechanical Engineering, NRC. July, 1958.

Flyer describing the 'Preci Circular Suturing Instrument Mark 2-5'.

Photographs of Surgical instrument in use (4), color photographs.

Photographs of Surgical instrument in use on a pig (29), black and white photographs.

Schematics for the surgical instrument.

Folder H

Suturing Apparatus Patent No. 620,096. Canadian Patent Office. May 16th, 1961.

Klein, G. *Vascular Everter.* January 28th, 1959.

Bird, J.E. *City surgeons Develop Revolutionary Stitcher.* The Canadian Press. May, 1958. Newspaper Clipping.

Folder I

Letter to G. Klein from G. Piasezki concerning U.S. Surgical v. Downs Surgical (Canada) Limited. December 12th, 1982.

Suturing Instrument. Canadian Patent. No.749,708. January 3rd, 1967.

Androsov, P.I. *New Method of Surgical Treatment of Blood Vessel Lesions.* Moscow. AMA Archives of Surgery.

Letter to G. Klein from G. Piasezki concerning the development of device Patent No. 620, 096. January 3rd, 1983.

Folder J

Various Sketches of *Suturing Apparatus.*

Androsov, P.I. *New Method of Surgical Treatment of Blood Vessel Lesions.* Moscow. AMA Archives of Surgery. Negative Photocopy.

Proceedings of the 159th Meeting of the Committees on Patents of Canadian Patents and Development Limited. November 8th, 1957.

Folder K

Klein, G.J. *An Application for Letters Patent of Invention Relating to Coilable Extensible Member.* January 19th, 1961.

Engineering Publication. Vol.3 No.3. March 10th, 1969.

Canadian Research and Development 2. March-April, 1969.

Canadian Geographical Journal. Royal Canadian Geographical Society. Vol. LXVI No. 1. January 1963.

Letter to G. Klein from D.J. Dalzell concerning Invention of STEM. July 16th, 1971.

Letter to J.R. Hughes from Smart and Biggar concerning Canadian Patent Application. January 23rd, 1961.

Letter to G.J. Klein from J.R. Hughes concerning first draft of patent application. December 28th, 1960.

Folder L

Photocopied Images of NRC Antenna in storage and extended.

Schematics of NRC Antenna in storage. 3 Copies.

Various drawings of the NRC Antenna (13).

Folder M

Letter to G. Klein from T.W. McGrath concerning the Canadarm. December 8th, 1981.

Allaway, H. *The Space shuttle at Work*. Scientific and Technical Information Branch, National Aeronautics and Space Administration. 1979.

Science Dimension. Issue 3. 1981.

National Aeronautical Establishment. National Research Council of Canada. 1980.

An Arm Space. National Research Council of Canada. 1980.

Perusse, D. *Canada in Orbit*. May 1983.

Spar News. Vol. III No. 2. September 1971.

Folder N

Various photographs of gear housing (15). May 22nd, 1952.

Various photographs of gears and gear housings (23). 1951-1953.

Various photographs of gears and gear housings (59). 1953.

Folder O

Klein, G.J. *Note on the G2 Planetary Gearing*. April 12th, 1976. P. 1-14.

Various SPAR documents. Handwritten notes.

Box 3 Volume 3

Folder A

Letter from Bob Ferguson to George Klein concerning Sigmund Rappaport Paper. January 29th, 1976.

Various blue prints and technical drawings (4) of the Shaft Details of the Bell Viking Trans. and gear design. 1973-1975.

Folder B

Meeting Notes: Shoulder joint Breadbard Test Program. February 11th, 1976.

Shoulder Joint Design Audit. February 24th, 1976.

SPAR Engineering Worksheet. February 24th.

Letter to G. Klein from R. Daniell concerning G2 shoulder joint design. February 19th, 1976.

Notes on Shoulder Joint Gear Design Review. February 16th, 1976.

Shoulder Joint Design Audit Agenda. February 24th, 1976.

Folder C

Meeting Minute Notes, SPAR Aerospace Products Ltd. October 1973-August 1974.

Folder D

Various blue prints and technical drawings (3) of the layout of R.M.S Shoulder Yaw Joint. 1975.

Folder E

Correspondence between G. Klein and SPAR Aerospace concerning equipment lists, gear manufacturing capacity and market forecast. 1973.

Repair and Overhaul. SPAR Aerospace Products Ltd.

Manufacturing and Support Services. SPAR Aerospace Products Ltd.

A Summary of the Capabilities of SPAR Aerospace Products Ltd. in Space Technology. April, 1972.

SRMS Motor Selection. December 4th, 1975.

Folder F

KMS Brush/Brushless Torque Motor Trade Off. Dilworth Secord Meagher and Associates Ltd. October 2nd, 1975.

Tillson, P. *Answers to SRMS Motor Review Action Item List.* November 21st, 1975.

Trudel, C. *SRMS Servo Loop- Dynamic Range.* December 3rd, 1975.

Folder G

Mechanical Items Repaired and Overhauled by SPAR Aerospace Products Ltd. SPAR Aerospace Products Ltd.

Equipment List. SPAR Aerospace Products Ltd. April. 1972.

Spacecraft Capabilities of SPAR Aerospace Ltd. SPAR Aerospace Products Ltd.

Aircraft Components Manufactured by SPAR. SPAR Aerospace Products Ltd.

A Summary of the Capabilities of SPAR Aerospace Products Ltd. in Space Technology. April, 1972.

Trade-Off Study Methods of Alleviating High Shoulder Pitch Joint Gear Train Loads During Launch- RMS Manipulator Arm. June, 1976.

Folder H

Heat Treat Development Programme Estimated Costs. May 1st, 1973.

Heat Treat Development Programme. April 2nd, 1973.

Klein, G. *SPAR-Metric Conversion- ISO Participation.* May 23rd, 1973.

Folder I

Various blue prints and technical drawings (3) of the layout of Shoulder Joint.

Final Exam, *Engineering 82.202.* G.J. Klein. Carleton University, December 1971. Various calculations on the reverse of the exam.

M.ENG. Thesis Examination. May 6th, 1974.

Folder J

Klein, G.J. *Bell Viking Transmission Gear Shaft Deflections.* December 19th, 1973.

Gear Data-Spiral Bevels. SPAR Aerospace Products Ltd. October 18th, 1972.

Spar/Bell Aerospace Sp.-Bv. Gear Bx. Gear Shaft Failure Preliminary Analysis. On the reverse of Carleton University Notice of Graduate Seminar. 1972.

Various notes and calculations concerning gear shafts.

Blue prints for Gear Box L.H. #4 (2) and Shaft Details for Viking Transmission. December 7th, 1973.

Manufacturing Work Orders. March 1973-April 1973.

A Quarterly Review. SPAR News. Vol. VII No. 3. December 1975.

Preliminary Manual Manipulator Development Facility (MDF) General Description. Engineering & Development Directorate Spacecraft Design Division. April 1976.

Folder K

Klein, G.J. *Gear Design Lectures*. SPAR Aerospace Products Ltd. 1970-1971. Two copies.

Hertzian stress and Gear Data. Includes 3 diagrams.

Breur, G. *Analytically Magnified Gear Tooth Profiles*. Curtiss-Wright Corp.

Root Fillet Radius of Gear Teeth Generated by a HOB or Rack-Type Cutter.

Gear Tooth Fillet Stress Concentration Factor. Two copies.

Folder L

Spalvins, T. *Bearing Endurance Tests in Vacuum for Sputtered Molybdenum Disulfide Films*. NASA Technical Memorandum. January 1975.

Godfrey, D. & Bisson, E.E. *Bonding Molybdenum Disulfide to Various Materials to Form a Solid Lubrication Film*. NACA. February 1952.

Royte, W.D. *7 Design Rules to Help Reduce Gear Noise*. GMC. November 1960.

Godet, M. *Lubrication Review: Gear Lubrication*. 1959-60.

Timms, C. *Recent Developments in Spur and Helical Gears*. National engineering Laboratory. 1959.

A Quarterly Review. SPAR News. Vol. VII No. 1. June 1975.

A discussion of the New Tufftriding Process. Metal Progress. July 1961.

Largest commercial Heat Treater Adds Tufftride in Newest Expansion. Canadian Machinery and Metalworking.

Folder M

Various correspondence between G. Klein and P.Ladd of SPAR Aerospace Products Ltd. October 1975-November 1975.

Breur, G. *Analytically Magnified Gear Tooth Profiles*. Curtis-Wright Corp.

RMS Mechanical Arm Subsystem Weights. December 11th, meeting with SPAR & NASA.

Shuttle Remote Manipulator System Weight Summary. November 19th, 1975.

Letter to Dr. G Liudirch from S.S. Sachdev concerning SRMS Bread Board shoulder joint. December 22nd, 1975,

Letter to Dr. S Sachdev from G.M Lindberg concerning SPAR Shoulder Joint Design. December 8th, 1975.

Avondoglio, L. *Vector Analysis of Epicyclic Gear Trains*. Product Engineering. August 1947.

Folder N

Meeting at Shar Design Audit on MAS/S. July 22nd, 1976. Hand written notes.

Assembly Procedure- G2 Planetary. Engineering Worksheet. March-April 1976.

Mamoun, M.M. *Load Variation, Frictional Energy Losses and Efficiency of Spur Gear systems- Part 1: For a contact Ratio of One*. American Society of Mechanical Engineers. October 6-9th, 1974. Two copies.

MAS/S Shoulder (E.M). SPAR Aerospace Products Ltd. April 14-15th, 1976.

Folder O

Letter to J. Graham from S.S. Sachdev concerning meeting with G. Klein on September 10th, 1975. September 16th, 1975.

Shuttle RMS Compound Epicyclic Breadboard Test Procedure. August 22nd, 1975.

Letter from R.C. Ferguson to P. Ladd concerning RMS Planetary Gear Cluster Manufacture. September 4th, 1976.

Braycote 3L-38RP. Bray Oil Company. Labeled "From September 10th meeting".

Carpenter Custom 455 U.S. Patent No. 3408178. Labeled "From September 10th meeting".

Viking Boom Assembly. Test Report. November 1971.

Section 1- Technical Information. P. 5-18. Labeled "From September 10th meeting".

Folder P

SRMS Shoulder Joint Preliminary Failure Modes and Effects Analysis. SPAR Aerospace Products Ltd.

Clamp, J. *Minutes of MAS/S Systems Design Audit Dr.149 July 22nd, 1976*. September 1976.

Hiller Helicopter Planetary Gearing. Photocopied notes.

Pump Gears. Photocopied notes.

Various handwritten, typed and photocopied notes and drawings concerning gear comparison. 1974.

Letter to G. Klein from R.C. Ferguson concerning draft copy of the circular-arc. June 20th, 1974.

SMRS Joint Drive Schemes Trade Off evaluation Matrix. October 17th-24th 1975.

Blue print of gear system.

Box 4 Volume 4

Folder A

Letter from S. Sachdev concerning the implications of back drive to forward drive on SRMS Joint Design. January 20th, 1976.

Charts (3) outlining various dynamic efficiency vs. Output torque.

Craig, S. *Test Report for Epicycle Gear Train Breadboard*. SPAR Aerospace Products Ltd. December 2nd, 1975.

Letter to J.D. Graham from G.M. Lindberg concerning SPAR shoulder joint design. December 16th, 1975.

SPAR Response to Item #2. December 16th, 1975.

Thomas, B.R. *SRMS Shoulder joint Preliminary Failure Modes and Effects Analysis*. SPAR Aerospace Products Ltd. September, 1975.

Hayes, R. *Shuttle RMS Monthly Report for August 1975*. SPAR Aerospace Products Ltd. September 17th, 1975.

Graham, J.D. *SRMS Brush/Brushless Motor Trade Off Minutes of Meeting*. December 5th, 1975.

Travel Expense Claim Form (unused) National Research Council Canada.

Letter to S. Sachdev from G.M. Lindberg concerning SPAR shoulder joint Design. December 8th, 1975.

N.A.E Teleoperator Research SPAR Shoulder joint Design. Various hand written notes and calculation in a Carleton University exam booklet.

Folder B

Kozak, M.N. *Shuttle RMS Conceptual Review Shoulder Joint Design Minutes of Meeting*. June 5th, 1975.

A Quarterly Review. SPAR News. Vol. VI No. 2. September 1974.

Annual Progress Report 1970. Institute for Aerospace Studies. University of Toronto, November 1970.

Folder C

Dudley, D.W. *Gear Handbook*. 1962.

Fatigue in Rolling Contact. Institute of Mechanical Engineers. March 28th, 1963.

Letter to R. Ferguson from G. Klein concerning the Fatigue in Rolling Contact Symposium.

Various handwritten notes concerning rolling element bearings.

James, R. *RMS Shoulder Joint Main Bearings*. SPAR Aerospace Products Ltd. April 20th, 1976.

Folder D

3 cardstock papers each with two photographs labeled 1-6. Images of ice and ice testing equipment.

Photographs (6) including negative strip showing a truck pulling a trailer stuck in the snow.

Photographs (3) showing truck making its way through the snow and ice.

Folder E

Northern Life Assurance Company of Canada Memo Book. Handwritten notes inside May 11th, 1941-May 19th, 1941.

Negatives (5) showing the smooth bore gun.

Photographs (9) showing various machinery and gears. August 3rd, 1940.

Burlew, J.S. *A Brief History of Tapered Bore Guns*. National Defense Research Committee. April 16th, 1942.

Images (2) of anti-tank gun Model 41.

Folder F

Photographs (15) of submergible car. March 20th, 1956.

Photographs (11) of submergible car. October 26th, 1956.

Folder G

Letter to G. Klein (son) from C.A. McLaurin concerning wheelchair information. November 1st, 1982.

Letter to from C.A. McLaurin from G. Klein (son) in response. November 10th, 1982.

Letter to G. Klein Senior from G. Klein Junior (son) about C.A. McLaurin's request. December 29th, 1982.

Letter to E.H. Dudgeon from C.A. McLaurin about Klein's wheelchair. July 13th, 1983.

Letter to G. Klein Senior from E.H. Dudgeon concerning his wheelchair. July 28th, 1983.

Letter to C.A. McLaurin from E.H. Dudgeon including a copy of G. Klein's report on his wheelchair. July 27th, 1983.

Letter to C.A. McLaurin from G. Klein Senior concerning his research on the wheelchair. January 20th, 1983.

The Legionary. National Magazine of the Canadian Legion. No. 7 Vol. XXX. December 1955.

Klein, G.J. *A Wheel Chair Electric Drive Designed for the use of Quadriplegics*. Division of Mechanical Engineering. December 29th, 1953.

Photographs (30) of the Quadriplegic wheel chair designed by G. Klein. 1954.

Photographs (21) of relay control for motor driven wheel chair. 1953.

Folder H

Photographs (8) of G. Klein and the motor driven wheel chair.

Newspaper Clipping of motor driven wheel chair. April 1968.

Newspaper Clipping of motor driven wheel chair. September 1953.

Newspaper Clipping of motor driven wheel chair. May 28th, 1969.

Advertisement for Cushman 730 electric Motor Vehicle.

Advertisement for the Aloutte motor vehicle.

Human Engineering: Wheelchairs. Product Engineering. February 1st, 1956.

Wheelchair Mobility. University of Virginia Rehabilitation Engineering Center. 1976-1981.

Letter to G. Klein from Hale & Associates concerning the Alloutte wheelchair. December 13th, 1976.

Folder I

Photographs (21) of various machinery and gear structures.

Huntington Hill Visit. Inco-Canadian Meeting. International Nickel Company. December 1st, 1950.

Folder J

Klein, G.J. *Materials in Machines I*.

Hanstock, R.F. *Damping Capacity, Strain Hardening and Fatigue*. Proceedings of the Physical Society. Vol LIX. August 17th, 1946.

Tabor, B.D. *A Simple Theory of Static and Dynamic Hardness*. Proceedings of the Royal Society. May 1947.

Stainless Steel and the Chemical Industry. 1966.

Folder K

Reflection on a Canadian First. AECL Review. Vol. 10 No.9. September 1975. Two Copies.

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