

Catalogue M, for box-files M1 – M6.

Scope: Letters, e-mails and notes received by S L H Clarke and S H Lavington (SHL) whilst researching the history of Elliott Brothers (London) Ltd. and the Borehamwood Laboratory. The senders are mainly ex-Elliott employees.

The first 34 entries in section M concern letters sent to Laurence Clarke in 1994/5, in response to Laurence's request for historical information and anecdotes. Laurence planned to write a book about the Borehamwood Laboratory but other events caused him to curtail the project. Laurence kindly passed his correspondence to SHL in 2000. The remaining entries are the results of enquiries originated by SHL from 1999 to 2011.

The items are arranged alphabetically by surname of correspondent (a) up to 1995, and then (b) again alphabetically by correspondent from 1999 onwards. In cases where there have been multiple letters/e-mails to/from one individual, usually a summary (or a selection of the more interesting of these) has been entered into the catalogue.

Cat. No.	Date	Correspondent	Comments on contents
M1	1994 and 1995	S L H (Laurence) Clarke	(a) Sample copies of two letters sent out by Laurence Clarke in 1994/5 to ex-colleagues of Elliott's Borehamwood Research Laboratory (EBRL). The purpose was to gather historical facts and anecdotes for a book. (b) Laurence's rough list of chapter-headings for his proposed book. (c) The remnants of addressing labels, etc., for Laurence's former EBRL colleagues.
M1	16/10/1995	Atkinson, P D (Peter).	(Contains pamphlet photos of magnetic amplifiers, etc.) First intake of 12 to Borehamwood (with Arthur Hemmingway (? and Alan Lott?) ; mag. amplifiers; hydraulic servos for TRIDAC. Then moved to Computing Division under R C Robins; nickel delay line (for SNARK probably) using a development of Ron Millership's experimental delay line; magnetic disk with mechanical design by Chris Phillips "who decided that a disk would enable him to control the head-to-surface spacing better than would the conventional drum" (precursor of one used in 153 and 401); Hugh Clausen retained by the Lab as a consultant mechanical engineer. "Lamorna was a large house in Radlett which was bought to accommodate a number of German engineers who were to be brought from Germany to work at the Lab on a contract (probably MRS5) for the Navy. This was just after the war. In the event the Germans, when they finally arrived, chose to live in London and Lamorna was made available for a number of staff to live in. There were six flats, only one of them was self-contained ... we were all very young and it was a lively and interesting community". Left in 1952 "following John Drew & Peter Briggs to BTM ... then to Tube Investments with John Coales, then to IBM Hursley with Bill Elliott, Harry Carpenter & Charles Owen".
M1	5/10/1995	Bennett, W E (Ben)	He was born in about 1921. Joined 'Circuit Group under C A Laws. Describes the original physical lay-out of the Borehamwood Labs. CDS with Maurice Needham, & then CRT storage 'after a few months (ie in about late spring 1947): "the work went quite well, and about two weeks before the first anniversary of the Lab (ie by say mid-Sept. '47) we were laying out the second stage of the

			<p>investigation intended to occupy the next three months. In preparation for the first anniversary JFC was reviewing the various projects. We demonstrated our stage one work, and showed him our plans for the next stage. His next words were roughly as follows: "Do you think we can have it working by next Wednesday?" – about nine days. Cobby Laws, Maurice and I worked right through the night and about 5 am we finally discovered a basic flaw in the circuit. Raster CRT storage demonstrated in October '47; staff had increased to about 250 by Oct. '48; by June '50 the MRS5 radar was being tested on site using aircraft fly-pasts & a helicopter. Some time between June '50 & the end of '53 (he left some time in '53) a contract was received from U S Naval Research Labs. to build another CDS demonstrator on Chesapeake Bay & a crew went over to install it; also, he moved to work on underwater detection (Portland) with Jack Pateman.</p>
M1	20/2/1995	Bristow, R (Ron).	<p>. He "was able to save the Lewisham collection of instruments and documents (the "Museum" collection) from being deported to USA, I am in retirement identifying and cataloguing them...". "When I began working on these papers I had hoped to find within them the justification for the claims that William Elliott made instruments for Faraday, Davy, the Duchess of Wellington, and so on. What I found made me suspicious of these claims ... ". Contains "some references to the loss of the submarine Affray and the search for her using the airborne magnetometer". Worked with Dennis Johnston on DC amplifiers. "Redcheeks, the inertial guidance system for a free-falling bomb launched from a Canberra. The project was cancelled before the production phase, but three prototypes were required by RAE before the very large Blue Steel IN contract was awarded to us. These were both state-of-the-art analogue systems, required to operate reliably in aircraft and missile environments".</p>
M1	9/11/1994	Bunt, John P	<p>"In May 1949 I was at Cambridge, reading Physics for Part II of the Natural Sciences Tripos, which I took that month. As I was thinking about jobs after finishing at Cambridge, a notice appeared saying that a coach would come up to Cambridge to take any students, who might wish to go, to see the Research laboratories of Elliott Brothers at Borehamwood. I had never heard of Elliotts, but thought it might be interesting, so I went. I met Harry Carpenter and Ed Hersom as well as John Coales, and was made to feel wanted. In due course I was offered a job at £475 pa – I think that was £25 more than I was offered anywhere else. The only other student to join Elliotts as a result of that coach trip was J C (Jack) Nutter, who later left Borehamwood to join the company's main works at Lewisham".... "To a new boy, whose knowledge of electronics was confined to amplifiers, oscillators, radio receivers and transmitters and suchlike devices, CDS was an enormous contraption completely beyond my comprehension....It seemed that the development work was largely done and we were part of a large construction team. I never found out much about CDS. It resided in the 'dark room' which was situated alongside the Circuits Lab. It was a popular meeting place for some of the laboratory assistants and secretaries during the lunch hour! Amongst other engineers in 'Circuits' were Jack Pateman, Reggie Moore, Norman Muchmore, who worked on power supplies, and Bob Conway". Initial salary £475 pa (£25 more than he had been offered anywhere else); John Coales' two vintage Sunbeams; transferred from CCTs to Elec. Eng. after a few months & worked on DC amps. for TRIDAC. Electrical Engineering was a large group run by a man called Gale. This was split into four sections: EE1 was run by A V Hemingway. EE2 was concerned with Electrical machines and was run by G L Ashdown... EE3 was run by D L (Dennis) Johnston and EE4 by Karl Selig. I was in EE3". then to Computing</p>

			under Harry Carpenter & put in charge of Jim Barrow to work on the 152. "The [152] computer was intended to analyse the results of radar trials which were recorded on 35mm film in digital coded form. If the whole system could be made to work for a minute or two without breakdown – film readers and computer together – useful results were obtained... No sooner had we achieved some satisfactory runs than a sentence of death was pronounced on the whole thing and that was the end of the 152".... "The calibre of staff in the workshops as very high, both fitters and electronic assembly men". ... "To a junior engineer, it seemed that the organisation at Borehamwood was, for a time, being run by a committee of the senior departmental chiefs, who would have long meetings 'upstairs' and who caused all sorts of rumours to be transmitted to us 'downstairs'. The usual rumour concerned lists of staff, who were thought to be more or less essential or dispensable. Lists 'A', 'B' and 'C' were supposed to have been drawn up. I never did discover the truth about these rumours and was never told which list my name appeared on". Stuart Ellis was a leading amateur actor with the 'Questors' theatre company in Ealing. ... A G Edmunds (Garnet, but universally known as 'Nimble').... "Apart from Sir Leon Bagrit, Charles Owen is the only colleague I had who has since merited an obituary in The Times". See also correspondence from John's sister Monica Bunt in section 8 of this catalogue.
M1	23/10/ 1995	Burgess, A M (Alan)	1952 – 57: Instrument ('Measurement) Division; magnetometer work; process control and telemetry. Then 57-58 in Aviation Division (autopilot). Then 58 – 59: Automation Research department under Ed Hersom "investigation into various problems for Process Control Division (Lewisham). 59 – 60: E-A Automation Systems Ltd., systems study for RTB Spencer Works.
M1	25/10/ 1994	Cameron, A Ross	Microwave components under Eric Whitehead; then ground/air trials of MRS5 (with a Lancaster), TRIDAC, and 'Mopsie' (a Q-band doppler radar?) at SERL Baldock, and trials with a Meteor. Info. on 'Radar at Sea' books, and on Harry Pout. Also, gives list of many names (some from an April '52 farewell card for JFC) & some addresses.
M1	10/11/ 1994	Carpenter, H G (Harry).	He writes: "I have never disguised the fact that I feel the organisational structure of the RLEB was badly flawed and ill-suited to the kind of development work we were trying to do (with, incidentally, an impossible time-scale)....Andrew St J feels much the same way, I know" but: "if you can't say something nice, don't say anything at all". More Harry Carpenter documents in section 8 of this catalogue.
M1	1945 to 1952. Then 1994 to 1998.	Coales, J F (John)	Many relevant documents, including: Three letters. Approx. 16 pages of early history (45 – 46) covering the foundation of Borehamwood. Notes, letters, memos, accounts, and business notes from the period 1947 – 1948, when financial and management problems beset Borehamwood. Copy of the transcript of a March 1994 interview with John Coales conducted by William Aspray (interview number 192). Photocopies of various John Coales papers stored in the Archives of the Institution of Electrical Engineers (IEE, now IET), Savoy Place, London (copied with permission in August 2003); these papers include the undated letter (circa Christmas 1996) from Laurence Clarke to John Coales, explaining that Laurence was having to abandon his plan to write a history of Borehamwood.
M1	14/11/ 1994; 9/10/ 1995	Cochrane, A (Alec)	Two letters. NB: Plan of Borehamwood attached; now scanned as file <i>BorehamwoodPlan1950.jpg</i> . Comments on early EBRL aims & objectives & management strategy. Trials of the MRS5 radar (overflying limited to 10,000 ft.; Lancaster unlikely; purpose of trials was to: "measure the accuracy of the angular tracking of a target approximating a medium bomber". Emphasis of MRS5 radar was on

			<p>innovative circuitry. "The lens offered a solution to the ever-present problem of the obstruction by the feed in mirror aerals and the plate lens offered light weight and a mechanical design problem which could be tackled within EBRL resources whereas a solid dielectric lens was not. The results were the 'egg-box' form of construction. All that was needed for adoption was for Tindale to confirm that he could design a mount for which Harry Gale could supply a servo system capable of holding the aircraft within the lock-on cone. So far as I know this phase comparitor simultaneous lobe was a world first and credited by Calpine (Admiralty O.R.) with being the most accurate angle measurer he had reviewed". Obviously the only real alternative to naval contract work was missiles and I nudged things in the direction of mm waves and also set up some kind of attempt to commercialise on our development of waveguide components and instruments. The Cassegrain aerial patent owes its birth to an incredibly boring MOS meeting on waveguides. "The origins of the happy but uneasy atmosphere that you detect for the early period [at Borehamwood] are to be found in the lack of realism in what seems to have been a primarily 'gentlemanly' agreement as to continued support of the lab venture which probably never had any possibility of survival on the official Admiralty side and could not survive the Swift Swallow of Elliotts. W A P Wykeham; Bendix. Documents enclosed include: (a) 10-page summary of the Borehamwood divisional organisation and current facilities (drawn up by Cochrane, and dated 14/5/52 and so probably just after the departure of JFC in April '52); (b) photocopies of photos of MRS5 aerial system; (c) other unidentified equipment photocopied photos; (d) group photocopied photos of visitors (to Borehamwood?); (e) plan of Borehamwood on 20th Nov. 1950 (visit of vice-Admiral Sir M M Denny); newspaper cuttings on TRIDAC (Oct. '54). Note: the originals of most of these photos are in John Coales' collection donated by his daughter Alison Steer.</p>
M2	4/2/1995	Cook, R (Roger).	<p>Programmer (of Nicholas, 402, 803, etc. etc.) Algol, high-speed PTR and card readers, statistics, election result prediction, oil field simulation, simulation of British Aluminium plant in Scotland, installation of a 402 at Leitz & flpt, 405 overall system architecture, NCR deal, ICI payroll, 405's 'five virtual processing units', R&D-to-product policy views, 802, 803, story of 803's reliability & 'lost key to cabinet', steel mill, computer-assisted type setting, Elliott Autocode, Tony Hoare, Algol compiler, multiprogramming, 902 & Chieftain tanks, 903, 4100, 4120, 4130, NCR activities, selling Elliott machines subsequent to English Electric take-over, graphics display, Harrods POS, still friends with Tony Hoare, etc.</p>
M2	9/2/1995; 16/5/1995	Essex, A (Alan).	<p>Born in approx. 1923/4. EBRL 'modelled on GEC Research Labs. (and on NPL); & GEC Labs' Chief Lab. Steward H Archer-Thompson was seconded from GEC to EBRL by Sir Clifford Patterson. As I recall it, EBRL was modelled on GEC RL. Both EBRL and GEC RL were modelled also on the National Physical Laboratory. Essex moved into Lamorna, Williams Way, Radlett (near JFC's house) in Dec. '52. The two Sunbeam cars. Chris Phillips, ex-Naval gunnery officer, Admiralty fire-control tables manufactured at Lewisham; Chris 'the acme of practical engineering & jury rigging'. Lamorna's coke boiler. Non-prompt payment of bills; vigorous stoking of the boiler; TRIDAC; potentiometers driven by hydraulic power; Askania-Weike (Berlin company); model of the Hoover washing machine. The Aviation Division under Bill Pearse initially had about 25 people. Elliott Flight Automation, Marconi Avionics, GEC Avionics, GEC-Marconi Avionics (at its peak employing some 12,000 people with a turn-over of £300 million pa". Master reference Gyro systems & Autopilots; Lightning & Blue Steel; head-up displays; vestige of an</p>

			aviation section at Lewisham; actuator for Lightning demo; Bill Pearce; Jack Pateman; Blue Steel inertial navigation system; joined Aviation Developments at Welwyn Garden City; back to Borehamwood (copy of letter from Pasley-Tyler). Telescope gas meter reading; precision rate integrating gyro; P-T's style of management; Doc Draper; MIT & technology transfer; TSR-2; Nortronics; rate-gyros & accelerometers; Rochester; guided missiles; GR-H4 gyros; P1155, Stingray air-drop torpedo; strapdown altitude reference system; Sky Flash; Sea Dart. (<i>Lots of good gyro-related quotes</i>).
M2	15/2/1995	Evans, D (David).	Optical encoding discs for three-axis radar; flying-spot scanner; photomultiplier.
M2	6/4/1995; 3/10/1995; 18/12/1995	Ford, R E (Bob).	Three letters. End of CDS; three-dimensional display; Guided Weapons Division when first formed under Roy Thomas; Badger head for GPV (joint Elliotts/Shorts GW); in 58, Head of Airborne Radio & Radar Division (split into three in 1963; left at end-68 or end-69 (anyway, just after GEC take-over) to join Negretti & Zambra Group – eventually became Chairman. “What I would describe as the hey-day of the company (1955 to 1965) when we were all inspired by Bagrit’s vision of ‘Automation’ and thriving under his divisional structure was a great time”. In 1951, EBRL suffering withdrawal symptoms following completion of CDS. <i>Good anecdotes of Borehamwood pranks and characters</i> . Three-dimensional display (projection TV & polaroid specs); the great purge of 52 or 53 in which ‘one third sacked & one third left’; the Circuits Division ceased to exist. Newly-formed Guided Weapons division under Roy Thomas; Badger radar guidance & control system for the Shorts GPV (General Purpose Vehicle); test shots at Aberporth & balloon escapes; Radar transponder for the Black Knight space research rocket. Success of the Bendix 21-series radio & radio Nav-Aid equip.; 200 or so managers into Bagrit’s office; Seabrook (canteen manager); cheese board; Cdr Mott, security & inside enormous safe; photographic collision in dark room; resistor testing; librarian, Bill (?) Sorrell.
M2	5/11/1994; 2/11/1995	Hemingway, A (Arthur).	Two letters. the 5-page hand-written enclosure and photo (now in section 7 of the Elliott catalogue) of TRIDAC model and of visit of US naval staff – as files <i>TridacHemmingway1.jpg</i> and <i>USvisitBorehamwoodHemmingway.jpg</i> In 1946 he was the ‘first’ employee (<i>but see Hersom, below</i>) at princely sum of £600 pa and oversaw the move out of Smiths. <i>Anecdotes</i> . Film town (set of Henry V; commissioned gun director; bought instruments from ex-WD shops; telescope & gas meter; rainwater flooding of basement; persuading the MD of Elliotts Brothers that he did not have security clearance; management by the Fog Box; shelves in local church covered with ‘secret’ drawings; guided missiles diving into Cardigan Bay; RAE tower & safety; skill of EBRL workshops in keeping JFC’s old cars running; national power strike; steel shortages & paying in pound notes; cash-flow and bill-payment problems; building 4" screen TVs; calculating engine build by mech. dept.; 3D display; TRIDAC; JFC’s enthusiasm & drive: “John’s success was never to consider ‘it can’t be done’ and it rubbed off on us”. .. never considered that ‘it can’t be done’. TRIDAC details & photo; photo during visit of US naval staff (with three people identified by name); list of miscellaneous projects implemented by the Control ‘Dept.’ at Borehamwood.
M2	6/11/1994; 1/12/1994	Hersom, S E (Ed)	Two letters. 150 staff when he arrived; letter of appointment from Geoffrey Lee, MD at Lewisham. Archer-T was said to be actually the first person on site; open-plan building; some old Smith employees (librarian; sister); MRS5; CDS; similar system called ATEWA (automatic tactical evaluator & weapons assigner) by Americans; spirit in the Labs. –fortnightly progress reports; TV & royal wedding;

			rabbit & custard; paper folding; telescope for gas meter; 1940 & visit to Pout to see LRS1; invention of binary disc for radar platform position encoding, & patents; 1949 & 'program' for a digital fire-control computer (the 152?); Social Club & squash. MRS5 trials in 1951: one-ton microwave lens for radar & dowels; original contract reduced to radar following and recording only (no prediction & no gun control); lay-out of experimental equipment for the trials; ; radar records read & analysed; film & teledelts; Miss Razzle on the company photo. Nicholas: theory group inherited the diff. analyser (Dome of Discovery). In Nov. 51 Ron Millarship, aided by Bill Watkins, demonstrated a 16-ft long nickel delay line storing a 3 microsec. pulse – (could therefore give storage for 16 words of 32 pulses). Dr Bowman (?) of Mellon Institute in USA said it was not possible (but he had used a rod of nickel with pulse-echoing problems rather than the Borehamwood wire); Bruce Bambrough & RAE contract for a guided bomb (must have been late 51 or very early 52(?)); Nicholas design & construction; Henry Orde, Iann Barron; general election in 1955 with Reuters. Floods & Nicholas & power supplies; consumption of coke was over 2 tons per day. E-A the first to automate a steel works (?). More correspondence from Hersom later on in this section.
M2	10/10/1995	Herzfeld, E (Edgar)	<i>(No interesting info. in the one short letter).</i>
M2	9/5/1995	Hill, N (Norman).	Letter and 6-page typed Notes dated 9 th May 1995, which have been scanned into file: <i>NormalHill1.pdf</i> Hill born in approx. 1914 (?). CDS & MRS5 as the two (only?) initial Admiralty contracts initially. Coales a great admirer of Sir Clifford Paterson (Director of GEC Research). Hill was one of about 10 founder-members at Borehamwood (incl. H Archer-Thomson from Wembley). "CDS ... was in the capable hands of Cobby Laws and Maurice Needham who showed probably for the first time how monoscope techniques could be used to identify images on a cathode-ray tube screen with distinguishing letters and figures". Alec Cochrane; Eric Whitehead; (Brunsvigas and Marchants). The Director was designed by Harry Gale and Arthur Hemingway, the mechanical structure being the responsibility of John Tindaler, Eric Lubbock and Rock-Carling. The aerial system was moved about its three axes by a series of hydraulic rams. It weighed about a ton and was supported on a tubular framework weighing in total about 4 tons". MRS5 broke new ground with lens aerials and real-time digital computing techniques. X band egg-box description. Ed Hersom produced a brilliant solution. ENIAC known about, & JFC encouraged staff to learn about it. Wilkes, Wilkinson, Hartree & Uttley visited ENIAC. Borehamwood wanted info., but could not reveal why. Visits to NPL (Turing) & Cambridge. Bill Elliott arrived in 1947 (?) Parallel operation of 152. Fly-by tests of the MRS5 system; other commercial projects of the Instruments Lab. (hygrometer, magnetometer). The Theory Group's Diff. Analyser. Resignation of JFC in April 52. Bill Wycomb took over; Sept. 52: order to 'prune' staff by 15% + 15%. The DF Calculator. NRDC & 401; 402. Calculations for the Low Angle Bomb Sight and Nicholas. Internal computing bureau. Pi to about 4000 decimal places. In 1953 P-T replaced Wycombe as chief administrator & Harry Pritchard, said to be the CEO in Oct. 54, but 'soon replaced by P-T); Hill became Sales Manager for computing machines. 405 machine. For Hill, crunch came in 1956 when Bagrit did a deal with NCR who became responsible for all sales of 405 ...Hill left for EMI.
M2	5/5/1995	Howard, R W (Ron)	Includes 10-page handwritten Notes, copy of draft lecture on Fly-by-Wire dated 1991, and his CV. Born 1929, Australia. First job was at Salisbury and Woomera, South Australia, working on the RTV1

			<p>guided missile. In 1951-2, seconded to Britain to work on guided missiles for the Admiralty Gunnery Establishment, Teddington, and at RAE Aberporth. Joined Borehamwood in Oct. 1954. CBE in 1991; returned to Australia in 1993. Electro-hydraulic autopilot systems & automatic landing systems. Harry Pritchard, replaced as CEO by P-T. Flight control for the Lightning. Interesting P-T anecdotes. In about 62, Howard transferred to Rochester. G-95/4 VTOL rig; European collaborations; GEC Avionics; USA; HUD; F-16; C5A Galaxy; Phantoms; Boeing 777; Jack Pateman; the 'dead hand of Stanmore'; Nimrod; the EBL Archives & Ron Bristow. 27-page text of a 1991 lecture on '35 years of fly-by-wire'. Howard's CV. PT was worth more than all the EE and GEC MDs added together. [PT retired when GEC took over in 1968]. He "inherited the Elliott Brothers (London) Ltd. 'shell' company at Rochester. I insisted that it should not be wound up; the brass plaque remained in the entrance hall and I think was still there when I left [in 1993?] Was I the last MD of Elliott Brothers (London) Ltd?" "Many have asked why the Jack Pateman team was so successful (up to Nimrod, on which we were screwed!) There are many ingredients. You will get differing views. My opinions". Jack Pateman, Bill Alexander, Peter Hearne. Peter Mariner was really a separate person. Fowke Mangeot [Finance], Wally Paterson and later David Richard. Stanhope Gate [the GEC Head Office] and Stanmore [the GEC-Marconi radar and defence site] interference. "Jack ran rings around Arnold [Weinstock]". From his paper (lecture) I deduce: fly-by-wire (the coming-together of autostabilisation and electrical signalling) first saw the light of day first for the Concorde and then for the Tornado. Bill Alexander joined Borehamwood in October 1954; also there were Dick Collinson, Alan Essex, Staff Ellis (an Australian) and Glyn Thomas and an aerodynamicist Eric Priestley. Hydraulic actuators, Siemens rate gyros and Elliott's magnetic amps.</p>
M2	No date	Laverick, Dr E (Betty)	<i>(Little interesting info. In this letter, but see chapter 11 of 'Moving Targets'.</i>
M2	9/11/1994	Laws, C A (Corry).	<i>(Little interesting info. In this letter).</i>
M2	15/10/1995	Middleton, D (Daphne).	Miscellaneous anecdotes (including: first printed circuit; De Barr's crystals; Hemingway's deer's head in office; gas meter telescope: folk dancing; music group & JFC & JFC's cello in office. "JFC was a master of the art of seeing people's potential and he would often switch them to another project, much to their dismay at first, with the greatest of success. He gave everyone confidence". JFC as a person who could see a person's potential. A 16-page made-up booklet containing about 263 Borehamwood staff signatures, presented to Daphne Middleton on her leaving the Labs on 17/9/52, in Sept. 52.
M2	6/2/1995	Moulton, M (Malcolm).	Joined Borehamwood in Nov. '61 in the Transport Aircraft Controls Division under Ron Howard. Blind landing for VC-10. Moved to Rochester in 63 'in the great exodus'. Booklet giving the history of Rochester Airport, which is now in section 5 of this catalogue. Some names.
M2	5/11/1995	Needham, M V (Maurice).	"I think the project to get something written about RLEB is a daunting one... I think the question of memory, as instanced in your letter, is a basic and real problem. Indeed, there is a great danger that history might well be invented somewhat. I know that when I sit down to think about and try to recall and order past events I find there are many black holes in the memory to cope with". Some Borehamwood projects in which Needham was involved, from (?) 46 to 54/5: CRT storage & data for the design of a working store for a computer ? 311; CDS – he acted as RLEB representative for evaluation at US NRL.; HM UDE sonar transducer; power supply for

			gyros; nucleonic instrumentation, leading to the formation of the Nuclear Division in 1954, which he managed.
M2	19/10/1995	Nicholls R B (Bob).	3-page typed Notes enclosed with letter. Moved to Borehamwood towards end '47 as an 'apprentice'. in the Instruments Division; later in Radar. Anecdote of JFC's 'people-skills', & of flooding (Pizzey's 300v battery). "Hawkes and Pizzey had moved over from Lewisham when the new Labs were opened". 'Aerials Lab', later called the Radio Division – (microwave). Construction of egg-box lenses – ('many constructed'). "Eric [Whitehouse] had designed various metal plate lenses that were formed using an egg-box construction. David [Turner] had designed a hand-operated machine for cutting slots into the contoured plates. "Measurements were made using low power klystrons to generate the microwaves ... 'All the [electrical & electronic] components were government free-issue. I was given the job of keeping the lab's stock of components up to date. – delivered within about a week of being ordered'. Eric Whitehead 'a brilliant theoretician'; electro-mech. computation by the Borehamwood Maths Dept. & 'one week' to produce one graph'. Development of high-accuracy microwave measuring instruments. Annual Physics Society Exhibition. Easy system for employees to buy scrap & consumables at low cost.
M2	1/2/1995; 24/5/1995	Pasley-Tyler, Commander H	Two letters. PT had a CBE. He was 84 in May 1995. He died 'a few days before 7 th December 1995' according to Jack Pateman. "I only have a somewhat tenuous hold on life and my memory is highly suspect". "I am rather surprised that JFC would seek to perpetuate the memory of a period which reflected little credit on him and led to his painful and embarrassing downfall. Better not tell him so but I think the whole period is better forgotten". But, note: in a second letter dated 24/5/95 after he and SLHC had met, P-T says: "I must insist that no documents are circulated which either quote me or refer to me in any shape or form. I have no wish to open up old wounds or create bad blood at this stage of our lives". (<i>But see audio interview transcript</i>).
M2	4/11/1994; 7/12/1995	Pateman, J E (Jack).	Two letters. Joined in 1948; became Managing Director from 1979 – 89. B&P Swift & Bagrit; EE & GEC take-overs, with dates (EE 67, GEC 68). Early days at Borehamwood. The new Divisions set up in 1952, including: Avionics, Guided Weapons, & Computing. Fairly detailed history of the Avionics Div. from '52 to '68; less-detailed history of the GW Division, '52 – '68. Aviation Div. & Barnes Wallis & the Swallow project. "The Aviation Division was formed in 1952 under Bill Pearce....Jindivic pilotless target aeroplane; a master reference gyro (MRG(B); an inertial navigation system. Air Marshall Sir Victor Goddard appointed to Elliotts as a defence consultant. The Aviation Division "rapidly acquired the contract for the auto pilot for the new English Electric supersonic fighter, the F23/49, later to become the P1 and ultimately the Lightning. Contracts for the Blackburn Buccaneer autopilot, the inertial navigation system for the AVRO Blue Steel air-to-ground-missile and the VC 10 auto pilot ... subsequently we won contracts for the BAC 1-11, the Concorde autopilot and the TSR 2 auto pilot". The Guided weapons Division, formed in 1952 under W R Thomas, was involved in TRIDAC and then with RAE...Homing heads".
M2	9/10/1995	Pearce, W H (Bill).	One of the first group of six people recruited by JFC at Borehamwood – (Mechanical Div.). First Head of the Aviation Division – (ie before Pateman took over). Sapphire bearings; mechanical aspects of MRS5: design of the nacelle, the elevating structure and the base unit, placement and supervision of fabrications in Scotland and elsewhere (the base unit was 15 ft diameter supporting several tons of structure)." Sine/cosine generators for missile simulators (probably TRIDAC): "Design of sin-

			cosine generators with swash plate drive – work carried out by two German engineers... Peenemunde with four others. The senior man, Weiler, held a position in the German hierarchy reporting directly to Goering and responsible for gyroscope design and supply across the Reich. Weiler (aged 65) was a very talented 'natural' engineer. The sin-cosine generator which was of such precision that we could not find a manufacturer in the UK. Trip to MIT with Arthur Hemmingway for discussions relating to missile design; stabilisation of the Lightning fighter; analogue simulator & Dutch Roll characteristics; V bombers. Early days at Borehamwood with Christmas parties for youngsters & 'much interchange with Universities – particularly Cambridge'. "John Coales' charismatic leadership".
M2	7/1/ 1995	Pout, H W (Harry).	Letter to Ross (and mentioning Sheila (?)). 'Considerable connections with MRS5; its write-up is in Vol. 2 of 'The Book' (on Naval radar). (SHL further note: Harry retired in 1980. In about 2000 he was about 92 years old.
M2	31/5/ 1995	St Johnston, A (Andrew).	(Note: Andrew's typed-up 'history' has been scanned into file: AndrewStJhist1.pdf) He joined Bill Elliott's Computing Division in 1949, to work under Harry Carpenter (who was at TRE during the war) on the 152. Original clock-rate = 1MHz, but reduced to 333 KHz by time St J. joined. Multiplier, PCBs; CRT ROM. 'A team under Robbie Robbins was developing CRT storage using a different technique from Manchester's, namely the Anticipation pulse method'. Cooling the PCBs (each containing four pentodes); the Positive Displacement Wind Engine; migration of silver across the glass PCB plates; radar glint: 'target wander over an aircraft's surface'. The 152 was 'taken no further ... because it was believed politically that missiles would replace guns'. The 153 ... Focus-defocus method of CRT storage for the 153; trouble with tubes, GEC tubes but GEC had re-designed the focussing system & Borehamwood could no longer modulate the beam with the focus electrode. The 153 subsequently fitted with nickel delay lines, & "it ran successfully for a number of years" with the pentode version of Charles Owens' circuits. The 401 overtook the 153 in timescale. Borehamwood divisional structure based on <i>techniques</i> rather than on applications or projects. Design team for the 401, & design decisions. Chris Strachey & Manchester simulation of the 401. Andrew suggested the concept of multiple accs to Strachey. Cocktail party with Bagrit, Ross & Herzfeld. "Why Coales & the Directors fell out I still don't know as I write (May 1995)". Bill Elliott trying to take the team away. P-T and the concept of Divisions based on Applications (not techniques). 401's 'endless intermittent faults' due to cathode poisoning. 'Other computing projects, of which the 153 was one'. TRIDAC: getting the project organised. Sales of small analogue computers. The 402 & French labelling of waveforms, etc. Switch for 'Engineer' or 'Programmer' view of the msd etc. The 403. Magnetic film The 405. Dr Ross 'took control of the project'. Anecdotes about Dr Ross. The NCR link-up. "By the late '50s, NCR-Elliott had made more installations of business computers than IBM". Transistors: head-start with the junction device. The 153 'at Scarborough' & John Bunt & Dina. John Bunt & junction transistor ccts, using cores. The 801 – ('the other numbers had been used elsewhere'). The 802. The 803.
M2	18/3/ 1995	Taylor, B R (Brian).	Joined Borehamwood same time as Laurence Clarke; left just after John Coales did.
M2	1/10/ 1995	Thompson, (John)	At Borehamwood as Naval Adviser from 1961 – 66. However, was familiar with Elliott Brothers from before the war, & did acceptance trials on Fire Control Tables (visiting Crayford ? for Vickers Armstrong? – is he mis-remembering Lewisham, or was there a link between Elliotts (Lewisham) and Vickers (Catford)?).
M2	3/4/	Warren, Sir	Started the Head-Up Display section of Avionics. Anecdote about a

	1995	Kenneth	digital waveform generator in 1964: "The best story I can tell you about [the Head-up Display Division] is that, on my return from Whitehall saying that I had been challenged with building a digital waveform generator, I told my Division – all five of them – that all they had to do was to do it in one year to get it to the SBAC Show in 1964. At the Show we had a breadboard under the table with two engineers crouched under as well to keep it going, because transistors 'went down' at about 70 degrees F and they had to have their tools ready, whilst on the top was an old TV set on which we put up symbols we could generate; a circle around a triangle enclosing a square with 'KRW 123' in the top right hand corner. The HMG man who had given me the challenge, Ron Fish, Assistant Director of Navigation, on examining the circle closely, said 'Good God, its digital' meaning he had espied the fact that we could not smooth the digital lines into a clean circular shape. He then said, 'What I meant you to do was to write up letters and numbers'. Hence the world's first digital waveform generator. American Naval contract in 1966 – ('fighting Dr Ross and the EBL Board').
M2	22/11/1994	Whitehead, Eric	"The times I spend at Borehamwood ... contained the most exciting professional experiences I have had at any time ...Also I think that the matter which makes interesting reading for those who were not personally engaged in an organisation are the power struggles between the dominant personalities of the day...".
M3	2006, etc.	Aylen, Jonathan	PREST, Manchester Business School. 803, iron and Steel industry. Corus Colors archive; Spencer, Llanwern
M3	Oct. 2002	Barrett, John	TRIDAC, RAE
M3	Aug. 2007	Bartolome, Tony	Borehamwood, GEC, AEW, Rochester, BAE, EASAMS, Marconi, Arnold Weinstock,
M3	2002, etc.	Bennett, Jim. (Also Chatt, Hughes, Jamison, Weymouth, Wilson, Wright	Miscellaneous but important correspondence about the Museum of the History of Science, Oxford, the Marconi Archives at Great Baddow, Chelmsford, the Elliott Archives at the Bodleian Library, and security on the Borehamwood site in 2002 & 2003. (Relevant also to Trevor Wright (Marconi Information Officer), Michael Hughes (Cataloguer at the Bodleian), David Wilson (Site Manager at Borehamwood), Louise Jamison (née Weymouth) who was the Marconi archivist at the end of the life of the GEC/Marconi company, and Colin Chatt Security Officer at Borehamwood). This folder includes an important list of all items (files, Visitors' Books, Reports, photographs, negatives and films (16mm & 35mm) removed by SHL, with permission, from Borehamwood on 2 nd June 2003.
M3	2001, etc.	Bental, L J (Laurie)	800 series, 900 series, 4100 series, Borehamwood organisation, GEC computers.
M3	2001, etc.	Bristow, H R (Ron)	Early history of Elliott Brothers (London) Ltd., Bagrit, Elphinstone, aviation division, Lewisham, Rochester, Jack Pateman, Ron Howard, Peter Hearne, Marconi Archives,
M3	2000, etc.	Burchall, Malcolm and Andrew Burchall	(Andrew Burchall is Malcolm's son). Power Supply specialist for the Elliott 803 and 503.
M3	1999, etc.	Burwood, R W (Richard)	ASWE, Elliott 803, ARCH, 503, 900 series, 4100 series, motorway traffic control, Vaughan Programming Services,
M3	June 1999	Burton, C P (Chris)	Computer Conservation Society. List of names & addresses of people associated with various early British computers
M3	2002, etc.	Bunt, J P (John) and latterly Monica	Company Annual Reports, 152, 153, 400 series, 900 series, mobile computing, FACE. The original Annual Reports now in section 5; more Monica Bunt correspondence & bio-data in section 8 of this catalogue.
M4	2007, etc.	Carmichael, Hamish	Computer conservation Society. ICL Archives. List of Elliott documents in the ICL Archives.
M4	1999	Carpenter, H J	(Frances Morley is Harry's god-daughter and closest 'relative'). 152,

	etc.	(Harry) and Frances Morley	153, 311, Oedipus, 401, Cambridge, Rothamsted, Pegasus, Bill Elliott, Chris Strachey, naval gunnery control, TRE, guided weapons, Longshot, John Coales, NRDC
M4	2003, etc.	Chinn, Peter	GPAC, analogue computing, aerospace, Rheinmetal desk calculator, Nicholas, TTY and 'Royal Navy', Bill Williams, 802, guided weapons, E-A Automation Systems, Frimley, Panellit 609, Richard Thomas & Baldwins, Llanwern, 803, Les Broad, Algol, 503
M4	1999, etc.	Clarke, S L H (Laurence)	Borehamood from earliest, Andrew St Johnston, Dina, 401, 402, 403, 405, 803, GEC, ARCH, process control, Hugh McGregor-Ross. Also, the original 16 th Sept. letter from SHL to Laurence that led to Laurence handing over, on 10 th July 2001, his collection of letters and Elliott memorabilia that he had accumulated in 1994/5 with the intention of writing a book about the history of Borehamwood.
M4	Jan. 2002	Cochrane, Mike	Marconi, Airspace Control Division, air defence, radar, Fire-Brigade, Simulator X, 803, 502, Rochester, EUCLID, ATC, 920A, GL161, Bloodhound
M4	2002, etc.	Cook, Roger	Dina, NCR, 803, nickel delay lines, Elliott paper tape reader, 402 to Paris, 405, 4100 series.
M4	July 2007	Cornish, Doug	Ninian Eadie, English Electric, NCR
M4	2000	Crawley, H J (John)	Pegasus, NRDC.
M4	March, 2004	Dyke, Roger	503
M4	July, 2007	Eadie, Ninian	GIRO and NDPS and Post Office, LACES, Telephone billing, Jeremy Bray, David Caminer, Elliott merger with ICL, LEO, Sir William Barlow,
M4	Nov. 2007	Edwards, D B G (Dai)	Graphical output on Mercury
M4	Jan., 2000	Excell, P S (Peter)	Elliott 803, Algol, Hatfield College
M4	2001, etc.	Froggatt, T J (Terry)	Borehamwood, Rochester, 900 series.
M4	2001	Gabriel, Andrew	Extracts from Andrew's website giving the history of GEC computers – especially the 4000 series.
M4	Sept. 2005	Gilbey, Steve	Forest Grammar School, near Reading. 405: Nellie, AERIAL
M4	March 2008	Goddard, Peter	WREDAC reliability; cost of an alternative (eg IBM 701); Jack Lonergan.
M5	2005, 2006, etc.	Hearne, Peter	Elliott-Automation Airborne Computing Division. Ron Howard, Jack Pateman (plus funeral eulogy, 1 st September 2004), Ron Bristow, ILAAS, ASW, GEC, Marconi, Tornado, Nimrod AEW,
M5	1999, etc.	Hersom, S E (Ed)	Nicholas, early days at Borehamwood, process control, ARCH, George Felton, Dina, predicting the results of General Eletions, Theory Group.
M5		Hills, A T	National Gas Turbine Research Establishment, Pyestock. Elliott 405 for controlling the testing of jet engines.
M5	May 2008	Hoare, C A R (Tony)	Algol, 803 Autocode; Oxford; mercury
M5	July 2001	Holdsworth, Ron	TRIDAC. Photocopies of a paper on TRIDAC and an extract from <i>Fire across the desert</i> ; these now in section 1 of the catalogue.
M5	Nov. 2006	Howard, R W (Ron)	Analogue airborne computing; autostabilisers; TSR2; ILAAS; Tornado; SCADC, RTV1, Jack Pateman, TRIDAC, RAE, GPAC, PACE
M5	2001, etc.	Hunter, Don	803, 903, 920A, 920M, FACE, Inertial Navigation, Admiralty Compass Observatory, FACT booklets
M5	March 2008	Hynes, R W (Roy)	TRIDAC; analogue computers; servos
M5	2003,	Kahan, Alex	Grandson of Sir Leon Bagritt.

	etc.		
M5	Aug. 2007	King, Paul	Jeff Hillmore, Gerry Mills, 402, Leitz, british Aluminium, 803, Moscow, Tony Hoare, Algol 60, Dijkstra, Roger Cook, 503, 4120.
M5	2006 - 2011	Kinnear, John and Gillian Kinnear	Elliott-Automation Radar Systems. Various organisational charts. See also files <i>EBRadarkin2.doc</i> , etc. Hand-out for the 1981 reunion at Borehamwood of the Elliott radar Division and associated avionics activities – (relevant to Peter Mariner).
M5	Feb 2005	Knight, Dennis	Maurice Wilkes, Eric Mutch, Rothamsted, NRDC, 401
M5	1999, etc.	Lane, G J	Sonobuoys, Verdun, TSR2, many FACTS booklets for 800, 900, 4100 series computers
M5	2005, etc.	Laverick, Elizabeth	Elliott-Automation Radar Systems. Transcript of interview with Elizabeth on 22 nd marh 1994 by William Aspray.
M5	2002, etc.	Lawrence, Peter	Elliott 802, 803, 502, 903, 905, 920, 4100 series, etc.
M5	Jan. 2008	Lonergan, J P (Jack)	AGWAC, LRWE, RAE, TRIDAC, Australia
M5	c. 2011	Lubbock, J G	Formerly at Borehamwood in about 1948 – 1953 (after engineering work on Spitfires and war service,etc.). Full-time artist from about 1963.
M5	2005	Ludlow, Andrew	Son of E G (Tom) Ludlow.
M5	2007, etc.	McGregor-Ross, Hugh	Versions of the history of Elliotts and Ferranti.
M6	Nov. 2003	Millis, B G	Joined NRDC in July 1956; involved with the Siemens project. Chris Strachey, Colin Merton, AEI
M6	2008, 2009	Mills, Gerry	Dina, Ross, Vaughan Andrew St Johnston, Programming Services, Eddie Nash, 405, Ed Hersom, Nicholas, 402, Norman Hill, Pat Shackleton, ICT, Bagrit, Mills Associates Ltd., Moscow, NCR, ICL, IBM
M6	Nov. 2008	Mounier-Kuhn, Pierre-E	402, Paris, Henry Orde, Leitz, Couffignal
M6	2007	Needham, Maurice	Early radar; Eastney Signal School; Witley; CRT store; process control; Moscow exhibition
M6	2009, 2010	Newey, Roger	GEC, Alpha, Beta, Gamma, CRL, Bill Williams, Neil Gammage, Mike Melliar-Smith, 4080, Colin Thurston, Coleur, Project R, GEC Series 63, Phoenix,
M6	2004, etc.	Ormerod, Ian	NCR company historian, Dayton, Jim Hinshelwood. See files <i>NCRElliott1.doc</i> , <i>ElliottNCR.doc</i> , <i>file: NCRAndersonExtract.doc</i> , <i>Etc.</i>
M6	July, 2006	Parker, Guy	David Pentecost, Eddie Nash, Pat Shackleton, football team, computer fraud
M6	2003, 2004	Pateman, J E (Jack)	Airborne computing. (Just before he died, Jack wrote an (incomplete) draft history of Elliott's aviation activity for me – (see file <i>Pateman2.doc</i>). Jack's colleagues Peter Hearne and Ron Bristow later judged this to be so incomplete that it was best to start again. Peter Hearne therefore wrote a more complete history, which appears as Chapter 12 in <i>Moving Targets</i>).
M6	2008, etc.	Pentecost, David	405, NCR, John Harwell and Language H, Gerry Mills, Pat Shackleton, Harry Lawrence,
M6	Feb. 2003	Ponsoby, J E B (John)	John was a radio-astronomer at Jodrell Bank. Cassegrain aerial and radar.
M6	July 2003	Purvis, Bill	Elliott 803; list of manuals
M6	Sept. 2007	Rayner, Paul	Verdan, GEC, Rochester, Stanmore, TSR2,
M6	2009, etc.	Ross, Gavin	Elliott 401, 402, Rothamsted; NRDC; also Chris Rawlings
M6	2002 -	Roth, Joseph	Process control; Spencer steel works; 803; ARCH; Samuel Fox; 405

	2008		valve failure analysis;Panellit
M6	March, 2010	Scammell, Geoff	GEC, GEC 4000, Telent, Project Trafalgar, Borehamwood, St Modwen,
M6	April, 2007	Sinclair, John	Eric Tommey, Perry Bar, Systems Reliability Ltd., 903, 905, 920,
M6	2001, etc.	Smith, Rod	Science Museum, South Kensington. Elliott's Borehamwood Research Lab.: classified research reports of the period approx. 1947 – 1955.
M6	1999, etc.	St. Johnston, Andrew and Dina (née Vaughan)	All Elliott computers from 1949 onwards (401, 402, 403, 405, 802, 803, 900 series, 4100 series, ARCH, etc.). Notes of a meeting with Andrew on 29 th October 2001. Test output (a rates demand invoice pro-forma) from the Norwich City 405 in 1957. Note: Aldrina (Dina) married Andrew St Johnston in the summer of 1958. All correspondence & personal documents with SHL relating to Dina are under St Johnston .
M6	2003, etc.	Steer, Alison	Née Coales: John Coales' daughter. Elliott documentation and where to deposit the whole collection after SHL has finished working on them.
M6	Aug. 2007	Tattersall, Philip	Gerald Everitt, Littlewoods, 405, Vaughan Programming services, Dina,
M6	Jan 2000	Thomson, W E	Pegasus, ERNIE, Elliott 803, Goonhilly, Telstar,
M6	1999, etc.	Vaughan, A N (Dina)	Aldrina (Dina) married Andrew St Johnston in the summer of 1958. All correspondence & personal documents with SHL relating to Dina are under St Johnston – (see above).
M6	Aug. 2007	Vince, Nick	NCR, NCR 315, banks, CRAM, Language H, Elliott 4100 series, Michael Irish, 405
M6	Feb. 2002	Vincent, Tony	Science Museum, South Kensington: archivist.
M6	Feb., 2010	Warman, David	NEAT, KOS, 4100 series, ICL Putney
M6	Jan., 2004	Whitby, Tony	503, 4100 series, commissioning engineer, EMI EMIDEC 1100, Cryptography, ICL
M6	July 2003	Williams, M	Elliott-Automation Head office staff, under Edgar Herzfeld. Company documents
M6	2003	Wright, Trevor	Marconi Archivist. See under Bennett, Jim
M6	2009	Wylie, Andrew	Old transistors. Mullard, OC72, Elliott 803