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From women operators to technical assistants: women in the BBC's wartime engineering division

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ABSTRACT

Men have long dominated the engineering professions, with women's lower participation rates often explained as a disinclination—downplaying how organisational structures actively exclude women. The Second World War provides ample opportunity to explore women's large-scale entry into engineering fields, as wartime labour shortages expanded women's opportunities in technical fields. Like many wartime organisations, the British Broadcasting Corporation (BBC) recruited women to fill technical roles previously barred to women. From 1941, women were trained and deployed to control rooms, studios and transmitters, and were paid and promoted on equal terms as with men—dismantling, at least temporarily, the division's gendered structure. Ultimately, over 900 women trained as technical assistants during the war, but just seventeen remained in the Engineering Division into the 1970s. Using BBC archival documents and oral history interviews, this article investigates how the BBC integrated women into technical roles, the challenges that their introduction posed to ingrained gendered structures and hierarchies, and why the numbers of 'survivors' was so low. In doing so, it argues that women's eventual exclusion from BBC Engineering in the post-war era was not a wholesale reversion to pre-war norms, but a choice grounded in BBC engineering's management structure and sense of prestige.

KEYWORDS

Broadcasting; gendered labour; engineering; Second World War

Introduction

Within the first year of the Second World War, the British Broadcasting Corporation, like many other organisations, suddenly faced severe labour shortages. At the time, the BBC was divided into three divisions—Administration, Engineering, and Programming. While all divisions were affected, the shortages were particularly acute in male-dominated engineering. In the *BBC Year Book 1943*, the Controller of Engineering, Sir Noel Ashbridge, outlined how his division was both helping to win the war and coping with the loss of much-needed staff. Ashbridge explained that a third of BBC engineers had left for military service and, in response, the BBC had developed a training programme for the inexperienced recruits needed to replace them. Some of these new

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recruits were women—a novelty for the BBC. While he praised the new female technicians for their ability to become proficient in their work, these compliments were couched in qualifying, gendered language. In his hierarchy of replacement personnel, women were listed last behind juvenile males and men medically unfit for service. In Ashbridge's estimation, only women with the 'right temperament', who excelled in 'operational' roles where a 'light touch' was needed, could be expected to grasp what he termed 'a highly intricate business'.[1]

While Ashbridge's expectations of women's performance were circumscribed by gender, the training programme and promotional possibilities offered by the BBC were exceptional in the field of engineering. BBC women technicians received comprehensive training in mixed classrooms and were deployed in almost all areas of the Operations and Maintenance Department. Many women in comparable industrial engineering posts received limited training and few promotional prospects.[2]

Women's incursion into non-traditional industries and roles during the Second World War is often dismissed as ultimately unsuccessful due to the prevailing conservative attitudes of the 1950s. Previous research has stressed continuities between the interwar years and the post-war years, and gains viewed as limited and fleeting.[3] However, the war years can be considered a moment of conflict where, as Joan Scott suggested, gender distinctions were contested.[4] Rather than viewing wartime experiences as exceptional, reversion to gender segregated occupational categories could also be a conservative backlash against liberalisation of women's roles that occurred during the war. While some immediate pushback occurred at the BBC, management and staff initially demonstrated an openness to continue to recruit and utilise women in technical posts. How the BBC Engineering Division arrived at this crossroad will be explored by examining the BBC's Engineering Training School, the pay and promotion opportunities offered to women, and Engineering's deployment of women across the Operations and Maintenance Department during the war. Using BBC archival documents and oral history interviews, the following relates both how the Engineering Division integrated over 900 women into technical roles, and why, by the 1950s, management chose largely to exclude women from technical roles.

This exploration of BBC women engineers sits within the historiography of women workers in the Second World War and also intersects with other research areas including feminist histories of technology and the institutional history of the BBC. A substantial body of work on women's labour issues in wartime Britain exists, but few studies concentrate on women in non-industrial technical posts like those at BBC. James Hinton, Maggie Andrews, and Patricia and Robert Malcolmson focus on women's voluntary labour.[5] Harold Smith and Ian Gazeley address issues of equal pay.[6] Women's foray into non-traditional industries has sustained lasting debate over its long-term social impact. The leading academic on the industrial workplace, Penny Summerfield, posits that training and advancement opportunities in male-dominated sectors were limited during the war, preventing women from obtaining high-paying skilled jobs. Additionally, patriarchal structures prevented any long-term changes taking hold in masculinised industries. She argues that women were only ever viewed as temporary replacements with little room for advancement.[7] Sue Bruley's study of aircraft production, which had more favourable policies towards female staff and weaker trade unions, finds that men still had greater opportunities for advancement.[8]

Helen Glew's and Mark Crowley's research on the British General Post Office (GPO), a workplace similar to that of the BBC, show that women fared better non-industrial settings, but entrenched gendered policies limited these gains. According to Glew, the marriage bar and unequal pay grades kept all but a few women from advancing.[9] Crowley notes that limited gains were made through the loosening of restrictions against night work and the introduction of part-time positions.[10] Christopher Smith and Mar Hicks outline the Government Code and Cypher School's (GC&CS) use of women in rudimentary computing. Smith concludes that young women on minimal wages were siloed into mechanical processing jobs with little opportunity in to participate in more complex code-breaking activities.[11] Mar Hicks views the government's experience at Bletchley as formational in its post-war drive to reduce labour costs; young, unmarried women filled jobs designated as low-pay, low-skill, machine tending, and formed the backbone of gendered technical labour in the Civil Service throughout the 1950s.[12] The GPO and the GC&CS experience demonstrates how the British Civil Service clung to gendered job segregation that disadvantaged women workers.

Scholarship on the institutional barriers present during the Second World War form part of a larger narrative on the gendered hierarchies that limit women's participation in technological fields. Sociologists like Joan Acker scrutinise how gender inequalities are embedded within organisational structures; ideal workers are preconceived in terms that favour dominant groups and genders.[13] Feminist historians Anne Phillips and Barbara Taylor push the discussion of gendered labour further and postulate that '[s]kill definitions are saturated with sexual bias'; jobs are devalued not because they require fewer skills, but due to the gender make-up of the workforce.[14] Building on Taylor and Green, Cynthia Cockburn probes the connection between strength and technological innovation. Through the lens of the printing industry, she notes that technology requiring less physical strength threatened the masculine dominance in the field, intertwining strength and superior skills with masculinity.[15] Carolyn Malone and Kuntala Lahiri-Dutt both consider the role of government protective legislation in coding women as constitutionally weaker, and labelling certain workplaces as dangerous places for women both morally and physically. 'Dangerous' industries like engineering became masculinised occupations under the guise of protecting women's weaker natures and protecting fertility.[16] Feminist media studies drill down into these inequalities particularly in 'below-the-line' categories of media work such as editing, Foley artists and costume design. While much of this research focusses on film and television, there are useful parallels with the wartime BBC, providing examples of how feminine-coded qualities like dexterity are subordinated to masculine-coded traits such as strength.[17]

While the BBC feeds into the national story of the Second World War, historians focus mainly on programming and personalities.[18] The organisational side of the broadcaster is often neglected, and, as a result, the institutional structure remains obscure. Asa Briggs' official histories of the BBC offer glimpses of the innerworkings of the organisation. His third volume charts the major figures and events that occurred during the war. Women's contributions are not ignored but his works reveal little about gender divisions within the BBC.[19] Kate Murphy provides a corrective to this absence. Murphy charts the development of the BBC as an institution, and the progressive nature of the organisation in the interwar years. From the cleaning staff through to several women who rose to become influential departmental Directors at the BBC, Murphy shows that the BBC offered

women exceptional opportunities, but also created familiar gendered divisions.[20] However, the scope of her work does not substantially extend into the war years. Emma Sandon's publication on women in early post-war BBC television is a rare exploration of mid-century female technicians, but this excellent work sits outside the context of the wartime BBC.[21] This article builds on Murphy's and Sandon's research exploring how women fared during a dynamic period at the BBC. Finally, histories of the BBC Engineering Division remain the domain of former staff, the most comprehensive of which is Edward Pawley's *BBC Engineering*.[22] While women are a side note in his expansive tome, his praise of women technicians in the BBC Engineering Division's story is noteworthy.[23]

Gendering a new industry—the BBC in the interwar years

When the Second World War began in 1939, the BBC had been in operation for seventeen years. However, some within the organisation felt that this environment—once filled with eclectic and creative mavericks—had become staid and institutionalised.[24] For women employees, the BBC proved to be a progressive environment. Women were not just typists and switchboard operators, but also held positions of authority; Hilda Matheson was Director of Talks from 1927 to 1932, Mary Sommerville was Director of School Broadcasting from 1931 to 1947, and Isa Benzie was Foreign Director from 1933 to 1938.[25] Women also held responsible positions across the organisation as secretaries, producers, librarians and broadcasters.[26] However, other areas of the BBC remained steadfastly male. The BBC might have initially attracted mavericks, but its infrastructure came directly from contemporary office environments characterised by a masculine managerial class, often with a background in engineering, supported by a cadre of women from the middling social ranks.[27] The British Broadcasting Company, the precursor to the BBC, was conceived of as a top-down organisation. The first four staff members—General Manager, Director of Programmes, Chief Engineer, and Secretary—were a typical office complement.

The first Director-General, John Reith—an engineer and ex-military man—surrounded himself with those of a similar background. Many of the BBC's original engineering staff had worked together in the military or later at the experimental Marconi radio stations 2MT and 2LO, including the wartime managerial team of Noel Ashbridge, Harold Bishop, and Rowland T.B. Wynn.[28] The emphasis was on research and development, and academic qualifications were highly valued.[29] Recruits were expected to be qualified and trained with the potential to rise. In practice, only a few individuals, largely but not exclusively university-educated, could rise above the level of Senior Maintenance Engineer.[30] Until the 1960s the upper managerial team in the Engineering Division consisted of men hired by the BBC in the 1920s. This line of continuity suggests both that drastic changes, such as the introduction of women technicians into an almost wholly masculine environment, would not be accepted lightly, and that opportunities to rise in the ranks were limited and closely controlled.

In common with other engineering-related industries, the BBC Engineering Division was primarily male.[31] Women filled only small numbers of secretarial and other clerical roles. As a result, the pre-war Engineering Division, which constituted a third of the BBC workforce, had highly restricted roles for women.[32] On transmitters, which were often located in remote areas, women were excluded from even cleaning and clerical

positions.[33] These staffing decisions appeared anchored in gendered assumptions regarding women's frailty, both morally and physically. The appropriateness of deploying women to isolated locations alongside male staff served as a sticking point during the war when deciding whether women could serve on transmitters.[34] Women were expected to work in pairs at smaller transmitters to avoid the any possibility of being alone with a man. Noel Ashbridge forbade women from attempting to fix faults and indicated that women needed to follow explicit instructions if equipment failed.[35] Lavatory provision became a proxy issue, and one Superintendent Engineer declared: 'some of these stations are scarcely suitable for men'.[36] Long-standing protective legislation, beginning with the 1842 Mines Act, excluded women from 'dangerous' jobs and prohibited them from working night shifts.[37] While originally couched in moral terms, legislation later excluded women from 'dangerous' occupations on health and safety grounds.[38] References to unsuitable conditions and hazardous work practices would have been familiar justifications for excluding women.

War labour shortages and recruitment woes spark changes

Initially anticipating a reduction in broadcasting services, the BBC instead expanded programming provision both within the United Kingdom and across the globe. As a result, more transmission facilities were required, and the need for engineering staff mushroomed.[39] In 1939, BBC engineers numbered 1700 out of roughly 4200 staff. Some of the increased programme streams were initiated at the behest of the government, but this did not translate into enhanced access to labour or a blanket exemption for BBC staff.[40] The engineering management team had to enter into protracted negotiations to retain as many broadcast engineers as possible, and ultimately had to relinquish male engineering staff between the ages of nineteen and twenty-three.[41] Meeting persistent resistance from Noel Ashbridge, Peter Florence, the Engineering Establishment Officer (EEO) in charge of recruitment, advocated hiring women technicians from at least September of 1940; he finally received permission to do so in March 1941 when any hope of a blanket exemption for male engineers had failed.[42]

This decision was momentous for the Engineering Division as women had never been considered for technical roles. The move was also prescient as government regulations began to restrict the BBC's ability to freely recruit women. Women between the ages of twenty and thirty became subject to either conscription or a labour draft under the National Service (No 2) Act in December 1941 and the Employment of Women (Control of Engagement) Order in January 1942.[43] Ultimately the BBC would hire and train over 900 women for engineering posts during the course of the war, while the Engineering Division as a whole swelled from 1700 to just under 4000 staff members.[44]

The new female recruits were initially designated Women Operators and began working mainly in operational roles in the Operations and Maintenance Department which included Transmitters, Technical Recording and Programme Engineering. Their duties included monitoring and adjusting signals, patching transmissions, and cleaning valves. Many of the duties were similar to telephone switchboard operations, and 'PBX operatory girls' were considered suitable candidates (Figure 1).[45] As was typical for the time period, the BBC's own switchboard personnel, from operators to supervisors, were all women.[46] A smaller number of women worked in the Technical Recording

Figure 1. Women technical assistants, BBC Control Room, 26 November 1943, #1303739, BBC Picture Library.

Section recording programmes on various media, and those in Programme Engineering worked in studios cueing records, opening microphones, and creating sound effects.

The women received an equivalent salary to the junior members of the engineering staff. While the BBC publicly stressed that women were in operational roles only, this was not a circumscription of their duties as the jobs were similar to entry-level jobs for men.[47] Women were also appointed as senior operators, at least over other women.[48] While the women's contracts were unestablished, essentially temporary, this was true for all BBC wartime appointments, regardless of gender, and did not signify that the jobs were only for the duration of the war.[49] Peter Florence repeatedly noted in correspondence that whether or not women would remain in engineering posts after the war was an open question. In a May 1941 letter to the Ministry of Information, Florence indicated: 'Continued employment after the war will obviously depend upon the post-war organisation of broadcasting and a decision to retain women staff in the Engineering Division under peace time conditions'.[50] When the newly established BBC Staff (Wartime) Association asked for reassurance that 'Women Operators are primarily regarded as additional temporary staff', Florence replied that: 'Whether or not Women Operators will be employed after the war I obviously cannot say'.[51]

In 1941 when the first women technicians were hired, the BBC still operated a gender-segregated Women's Establishment that supervised women in lower-level weekly-paid roles.[52] The Engineering Division ensured that the Women's Establishment would hold no authority over Women Operators, and that all women would report through the normal Engineering Division chain of command.[53] Gender-segregated workplace

organisations were common in both industrial settings and non-industrial settings. For example, the Civil Service maintained separate offices and, more importantly, separate, less-generous pay grades for women.[54]

These unequal policies rested on twin assumptions. The first, as proposed by Phillips and Taylor, was that women deserved lower pay under all circumstances, even when performing identical or nearly identical work to men.[55] The second assumption, as Cockburn suggested, was that allowing women to perform jobs normally coded male by default would lower the skill level.[56] Engineering's desire to control the deployment of women inadvertently broke down some gendered aspects of a highly gendered division. By keeping women technicians in the BBC Engineering Division firmly outside of a gender-segregated structure, the work in BBC engineering became both intentionally and unintentionally ungendered. Women were incorporated intentionally into the male-only structure to maintain control of the Division, but unintentionally the engineering management team disrupted the segregated male environment. This disruption was further cemented when the title Women Operators was replaced with the designation Technical Assistant (TA) in 1942.

Before moving on to discuss training, pay and promotion, and deployment within the Division, it is worth noting that there are some aspects of the BBC use of TAs that conformed to the broad outlines of other wartime industries. For example, Morrison Aircraft women were classified with juvenile men.[57] This was also the case at the BBC. However, at the BBC, juvenile males below the age of seventeen were first hired in subordinate roles as Youths-in-Training, and this effort only began in earnest in 1943 after women's recruitment began to falter due to labour shortages.[58] The new trainees consisted mainly of young men and women under thirty-five.

Overall, BBC Engineering was loath to hire anyone over thirty-five, including men, as they felt older individuals were slow to learn and physically weak.[59] This was not an uncommon sentiment at the time. Staff at the GC&CS over forty years of age were deemed of little use, and side-lined.[60] While the BBC did eventually hire boys as young as fifteen, the initial age range was between seventeen and nineteen. Women Technical Assistants were older than the young men—between the ages of twenty-one and thirty-five.[61] While not the norm, the BBC did hire a few women as young as 16 years of age for TA posts.[62] There were some eventual issues with promotion which will be outlined below, but the age difference between the young men and women were not as pronounced as that at Morrison Aircraft.[63]

Another aspect that arose at the BBC as well as in more industrial settings was the issue of 'dilution'. In factory settings, dilution played a role in limiting women's opportunities. The term 'dilution' encompassed a range of workplace adjustments, including simply hiring women for 'men's' jobs or breaking down of a more-skilled position into component tasks.[64] In union-dominated workplaces, contract provisions addressed union fears that the use of women in job categories designated as male would negatively impact payrates because women were routinely paid a lower rate.[65] Two factors impacted on the BBC's conception of dilution. First, the BBC was not unionised before the war, and staff associations along similar lines of the Civil Service Whitley Councils were only established in 1941. These associations—one for general staff and for engineering—were more advisory than typical trade unions.[66] The second factor was the BBC's understanding of dilution. In BBC parlance, dilution was the substitution of experienced staff

with those with limited training and experience in the field of engineering; this designation explicitly included both women and men.[67]

Lack of experience did not mean lack of knowledge, as recruits were expected to have a good level of education with backgrounds in mathematics, physics, or chemistry. Educational barriers to both young girls and women did make recruitment trickier. In the 1930s, women were often barred from engineering courses at colleges and universities, and young girls were discouraged from studying intellectually difficult subjects to avoid compromising their reproductive potential.[68] While this limited the pool of women available to the BBC, women without subject knowledge were also hired. The BBC Engineering Training School played an important role in alleviating what the BBC saw as dilution of experience.

Managing dilution—The BBC Engineering Training School

The decision to hire women technicians coincided with the establishment of an Engineering Training School, which was the realisation of a long-standing goal.[69] Before the war, the training school was intended to provide refresher courses and advanced training in television and recording technology for BBC employees, and was never meant to impart basic training to incoming staff.[70] New engineering hires were expected—as they were in secretarial and administrative positions—to have gained knowledge and experience outside of the Corporation.[71] Even if it was not configured as originally planned, the war provided a way for the Engineering Division to realise this thwarted desire.

Women were enrolled in the course from its first session in May 1941, with women in this first cohort in operational roles by August.[72] The initial training syllabus included a two-week A Course of classroom instruction coupled with practical sessions, followed by a four- to six-week practical B Course in recording processes, control room operations, or on transmitters. The A Course topics included an introduction to the Corporation, an explanation of the wartime broadcasting system, the BBC broadcasting chain, outside broadcasts, an introduction to studio equipment, the control room, recording, transmitters, short-wave broadcasting, and special considerations during wartime broadcasting. In mid-1942 the A Course lengthened to four weeks in line with a BBC-produced training manual.[73] The new training schedule created bottlenecks that eventually led to both male and female staff being placed in supernumerary positions before completing formal classroom training.[74] The intention was to secure candidates in a tight labour market, rather than to limit training, and was a strategy deployed throughout the BBC during the war.[75]

Advancement from the training school required attendees to pass both a written and an oral exam. While references to test scores exist, the files contain no consistent gender desegregated score rates. An October 1942 report is likely indicative. Eleven women out of thirty-four, and no men, scored less than 50% on the written test. Eight men scored between 57% and 60%, and another twenty-three above 60%. At the time, a passing mark was 33%. Four women scored over 80% on both the written and the oral tests.[76] Although some women received lower marks on the written test, the overall statistics suggest that women's scores were comparable to the men's scores. Given that there was a certain amount of disbelief by the Engineering management team that women

would be able to learn theory, the lack of critical comment on women's scores in general, and the fact that some women achieved very high marks, is telling. A November 1944 report indicated that 2396 students had passed through the Engineering Training School, and there were only fifty-seven failures, leaving a success rate of 99.58%.[77] Again there was no indication of the gender split of these fifty-seven, but a July 1943 reckoning indicated that up to that point twenty-one women had either failed the exams or had not been confirmed, suggesting that women were just as likely as men to successfully complete the training programme.[78]

In February 1942, there was a temporary suspension of recruitment for Technical Assistant posts directly following the enactment of the National Service (Number2) Act and the Employment of Women (Control of Engagement Order) which restricted the recruitment of women between the ages of twenty and thirty.[79] EEO Peter Florence immediately became embroiled in negotiations with the Ministry of Labour and National Service to retain the 400 BBC women technicians already hired who fell within the age range for female conscription.[80] Despite this pause and the new restrictions, the BBC was still recruiting and training a fair number of women, but had almost no access to women under thirty-one years of age.[81]

There were also indications that some managers in the Engineering Department were trying to alter women's participation in the training programme. In December 1942, Senior Superintendent Engineer Rowland Wynn requested that the training classes be segregated by gender, although the request was not acted upon for logistical reasons.[82] While there was no movement towards segregating classes, the number of places offered to women on the course was reduced to roughly a third of the places on the course.[83] This was the only point a quota was mentioned in the files, and the limits might reflect the fact that a considerably smaller pool of women was available nationally.

By 1943 an extraordinary number of women between the ages of twenty and thirty-one were in the workforce in the United Kingdom, with 80% of married women and 90% of unmarried women in this age range in employment.[84] Recruitment would have been virtually impossible. From March 1943, engagement of women tailed off, coinciding with the reduction of places on the A Course.[85] This dip proved temporary. By December 1943 changes in male conscription ages forced the BBC back into negotiations with the Ministry of Labour, and BBC Engineering agreed to release male TAs at the age of eighteen. In exchange, the BBC was permitted to hire just over 100 women from a technical register of young women with mathematics or scientific qualifications in the highly-coveted age range of nineteen to twenty-five—a younger, conscription-age cohort who had been previously off-limits to the BBC.[86]

Equal pay and opportunities for advancement

After the initial training period, women technicians moved into weekly-paid roles and were eligible for promotion to monthly-paid roles as Maintenance Engineers or Programme Engineers. Before the job classification were merged in 1942, Women Operators received an equivalent wage to their male counterparts, Junior Maintenance Engineers (JMEs) and Junior Programme Engineers (JPEs). JMEs and JPEs had been a promotional track for male entrants prior to 1941, and the tasks performed by JMEs, JPEs, and Women Operators were the same. Despite management expectations that women

would be performing operational tasks only and that their theoretical understanding of engineering would be limited, a lower-paid women's grade was not created.[87]

While the emphasis on the operational function might suggest that women's roles would be restricted, their male counterparts also only performed operational tasks.[88] In August 1942, Women Operators and JMEs were merged into a generic designation of Technical Assistant which was theoretically ungendered. Internally the Engineering Division continued to make distinctions between women and men by attaching an F or an M suffix to the TA abbreviation.[89] One of the justifications for merging Women Operators with the JMEs was a desire to normalise a wage rate for the position, which does imply that preserving the job classification could have been a factor, a common part of dilution agreements in other industries.[90]

As noted above in other sectors outside of the BBC, management and unions often fought over the issue of whether a job could be labelled as a 'woman's role' and therefore downgraded to a lesser wage. Disputes about women working night shifts at the GPO festered because the GPO maintained separate pay grades for women, and any hint that women could successfully perform a 'male' job risked jobs being reclassified as 'female' and ultimately suppressing wages for men.[91] In the case of TAs, BBC management was fully behind the equalisation of the role and wage scale. There was initially some grumbling among younger staff about hiring women and a few supervisory engineers expressed dissatisfaction at what they saw as women receiving a higher wage than younger men.[92] As female recruits were hired at the age of twenty-one or higher, they were sometimes paid more than their younger male counterparts. While these concerns were noted, they were dismissed by Peter Florence who believed, '… in general there should be no grievance whatsoever unless you feel that your pride is being hurt possibly because some of the [women] are proving to be very successful operational engineers'.[93]

Shortly after the creation of the Technical Assistant job category in 1942, an interim promotional track was established for all TAs. After fifteen months of BBC service, TAs were eligible to rise from TA Class II to TA Class I.[94] This promotion was not automatic and relied on supervisory assessment of a TA's progress on the job, leaving some room for gender-based selectivity. One local supervisor threatened to not elevate any female staff until one of his younger male TAs, who was not yet eligible for promotion, was made a TA Class I. He stated that the young man in question was: 'more fitted for promotion to T.A. class 1 than certain W.T.A.s whom I am compelled to consider for promotion. In this respect, I think that the Corporation is unduly penalising bright boys who join as Youths'.[95]

This incident highlights one difference between younger male recruits and female TAs. Youths-in-Training could begin BBC service at the age of fifteen, with the expectation that they would achieve the rank of TA before they turned eighteen years of age, leaving them nearly three years to either to qualify or, equally, to fail.[96] Youths-in-Training did not attend the Engineering Training School, but they were eligible for a place on the A Course after six months of satisfactory service, allowing them to achieve the rank of TA Class II by sixteen years of age, providing they passed the A-Course exams.[97] Conversely, Youths-in-Training were also vulnerable to rapid dismissal. When trainers complained about the maths skills of some of the Youths-in-Training, the instruction was to terminate their service.[98] While Youths-in-Training might have more opportunity to learn on the job before attending the A and B Courses, management had

no qualms about dismissing them. In contrast, women with perhaps similar qualifications went straight into training with greater job security.

Throughout their tenure, women had the opportunity to advance to the level of Maintenance Engineer, although Engineering managers remained doubtful that women had the qualifications necessary for promotion. This scepticism was not just based on the dubious assertion that women lacked the capacity for scientific understanding. As noted above, women were at an educational disadvantage. Even if women did have the right qualifications, they could still face doubts about their abilities. Wartime TA Rita Barnsley reported that one of her colleagues, Eva Hinds, was constantly pressured to demonstrate her skills even though she came to the BBC as an experienced engineer. Barnsley colourfully recounted one incident:

> She was, I think, the only woman ME and she had an engineering degree. I think the EiC loathed her and made it as difficult as possible for her …
> He would give her orders to build something on night shift, she was stripped for action, heavy duty bra, rather baggy bloomers (she liked freedom of movement), fag hanging from her mouth, eyes narrowed. Working with her soldering iron, I haven't the faintest idea what she was doing. I did the readings, maintained the logs and made cups of tea.
> Next morning the Prince of Darkness arrived, seized pliers and wrenched at the work hoping it would fall apart. No such luck, dearie. He shambled off to his den.[99]

The step above TA Class I in the promotional ladder was Maintenance Engineer which was a monthly-paid grade. The leap from weekly-paid staff to monthly-paid was a pivotal transition at the BBC as it signalled a move into a professional class and brought with it the opportunity to be promoted into supervisory and managerial roles.[100] This limited two-step process from a weekly-paid Technical Assistant to a monthly-paid Maintenance Engineer suggests that promotion in the Operations and Maintenance Department was challenging. Table 1 demonstrates that once staff reached the level of Maintenance Engineer, they would have to be extremely patient or seek employment elsewhere if they wanted to advance past this level. Discontent over limitations on pay and promotion were not overtly apparent during the war years but became an issue in the late 1940s and early 1950s.[101] Emma Sandon, in her study of women technicians at BBC Television, noted that in the early 1950s the Engineering Division used institutional barriers to force women out of more desirable roles such as camera operators. These barriers included widening basic job responsibilities to include duties requiring heavy lifting considered too strenuous for women, instituting test-based promotions, and re-grading the positions.[102]

While the BBC provided initial training for female staff, it was unwilling to support women seeking a fuller grounding in engineering theory. In 1942, women employed at the Droitwich transmitter requested funding to pursue further outside training, indicating some women were eager to gain more knowledge. In peacetime, this expenditure had been allowed. However, the women's requests were denied citing women's impermanence in the engineering workforce. Instead, the Engineers-in-Charge were encouraged to help female staff expand their knowledge on-the-job.[103] Thus, women in the Engineering Division were trapped in a circular position typical in the engineering field.[104] Criticised for their lack of deeper theoretical knowledge, their attempts to gain further knowledge were circumscribed.

Table 1. Staffing levels in the operations and maintenance department in 1938.[a]

	London Control Room	Outside Broadcasting	Television	Technical Recording Section	Education Engineers	Other*	Regional Studios	Transmitters	Total
Engineer in Charge	1	1	1	1	0	2	8	14	28
Assistant Engineer in Charge	1	0	1	1	0	0	6	9	18
Senior Control Room Engineer	2	0	0	0	0	0	0	0	2
Senior Maintenance Engineer	13	6	10	6	1	4	22	16	78
Maintenance Engineer	73	13	56	36	12	15	80	155	440
Assistant Maintenance Engineer	4	1	2	0	0	4	5	5	21
Junior Maintenance Engineer	2	4	49	0	0	22	10	30	117
Engineering Assistant	0	0	0	0	0	0	7	0	7

*Other includes floating staff, Aberdeen Staff, Air Ministry Staff and Plymouth staff.
[a]BBC Staff List 1938, 61-106.

Despite some limiting factors, the BBC represented to outside organisations and the government that women were employed on equal terms with men. When the Canadian Broadcasting Corporation requested information regarding the BBC's women technicians, a glowing assessment of the Corporation's policies was provided, emphasising that the training and placement scheme had produced high-functioning staff eager to expand their knowledge. While noting that women were eligible for promotion to supervisory roles, this possibility was deemed to be some years in the future.[105] In a BBC report prepared for the 1946 Royal Commission on Equal Pay, the equal status and pay of female and male TAs was provided as an example of the BBC's progressive approach towards female staff members. One area that the report noted could be improved was that of promotion. The report indicated that in 1944, 4% of male TAs moved into the monthly grades, whereas only 1% of female TAs made the leap.[106] While in principle the BBC was affording women equal opportunities through training, pay and promotion, limits to further education meant that only exceptional women like Eva Hinds had clear pathways to promotion.

Hazardous conditions and the deployment of women in BBC Engineering

While the Engineering Division had crafted training and employment policies that appeared to afford women equal terms as men, gendered considerations hindered deployment of women. Some sections of the Operations and Maintenance Department were deemed more appropriate for female staff than others. While the Division preferred women who had studied physics or mathematics, in practice they hired women without scientific backgrounds.[107] The Recording Section and the Programme Engineering Section, in particular, did not require strong theoretical underpinning in engineering principles, and Engineering Division managers were confident that women would quickly become proficient.

The Recording Department was the first area in the Engineering Division to utilise women. Women were considered excellent candidates for Recording due to their 'delicate touch', especially in conjunction with disc recording.[108] However, the description of the tasks performed by recordists does not indicate that the job was delicate, as it was a dirty job that involved heavy lifting and pressured timetables. One wartime Recording TA, Mary Lawson, described her initial days at the Maida Vale recording studio in a makeshift, gloomy basement as cold and hectic.[109] Conditions were so messy that the recording instructor, Mr Godfrey, recommended that women be issued overalls or be allowed to work in trousers.[110]

Women's suitability as Programme Engineers was related to Programme Engineering's place within the Engineering Division, and echo women's continued prevalence in below-the-line creative technical posts. Programme Engineers worked in studios, controlling microphones and sound levels, and providing sound effects. In the pre-war era, many male Programme Engineers had backgrounds in drama and music, and the BBC sought women with similar qualifications.[111] Knowledge of musical scores helped in adjusting sound levels and dramatic training was employed in creating sound effects.[112] Programme Engineers had only been incorporated into the Engineering Division in May 1939, and while Engineering felt the function belonged in the division, it was

an uneasy fit.[113] Programme Engineers were considered skilled, but the skill was creative rather than physical, and did not require engineering qualifications.[114]

Technical Recording and Programming Engineering were two areas that BBC management felt that women would excel.[115] BBC files also suggest that women quickly assumed an air of responsibility and confidence in their abilities to perform in these areas. In Recording, women recognised that the skills involved qualified them for more remunerative posts in the Programming Division.[116] Women also jostled to fill the more lucrative Programme Engineering roles. Within months of becoming trained and deployed, women were vying for promotion to these roles.[117] Whether or not the trust the Corporation had in placing women in these roles fed into their confidence on the job is difficult to ascertain. However, it was in these roles that women maintained a secure position after the war.

Engineering managers exhibited more ambivalence towards posting women technicians at transmitting stations. However, operational pressures meant that in practice these reservations were quickly overcome.[118] Patching programmes, monitoring audio levels, and cleaning the equipment and valves were all seen to be within the competence of women, while some tasks carried out at transmitters were deemed too dangerous for women, including repairs to the masts, as it involved working at heights (Figure 2). In

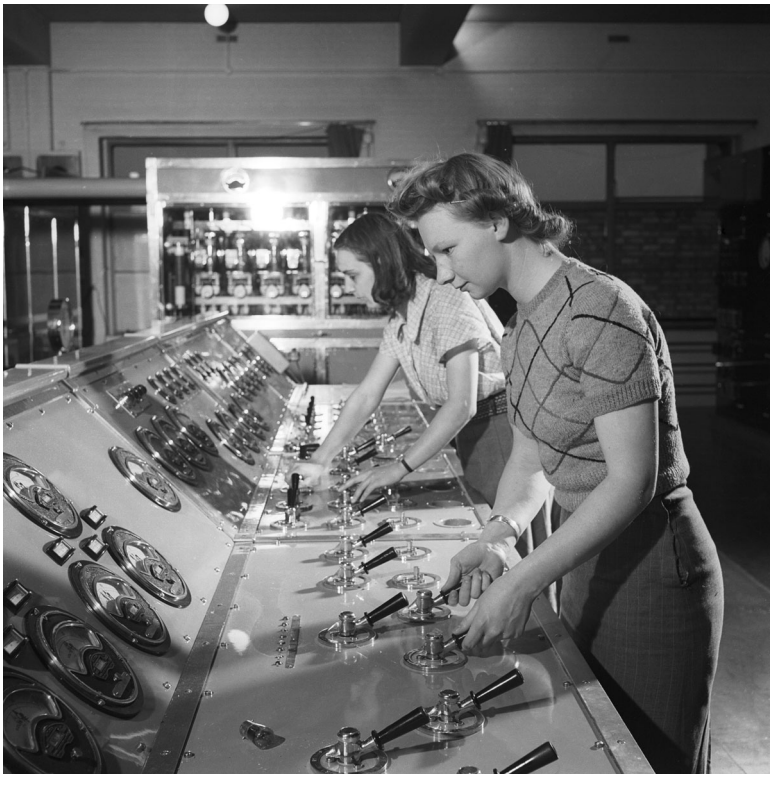

Figure 2. Women technical assistants running up a high-power transmitter, 1 December 1941, #644127, BBC Picture Library.

addition to these physical tasks, the diagnosing of mechanical faults was also considered beyond women's capacity.[119]

The H-Group transmitter positions in particular demonstrate how gendered unease with women technicians in certain roles impacted the women's job performance and promotions prospects. H-Group transmitters were established as part of the security arrangements for wartime operations. These small transmitters were often located in remote places, but in-town locations were also common. They were usually staffed with two to three personnel per shift—two to three duty technicians and a senior maintenance engineer who was not present at all times.[120] They were part of the diffusion of the radio transmission system designed to ensure that radio signals could not be used as targets in bombing raids. The secondary purpose was to act as local radio stations in the event of an invasion.[121] When women were first recruited as technicians, Peter Florence was keen to have women work at H-Group transmitters. He recognised that while the work was important, it would be undemanding and easy to master.[122] However, these were the last transmitters to which female TAs were deployed.

Women were assigned to work on shifts at H-Group transmitters from December 1941 and began working on female-only shifts from March 1942. However, women were not allowed to make basic repairs when a breakdown occurred, and had to await the arrival of a Maintenance Engineer.[123] Rowland Wynn instituted this rule at the behest of Noel Ashbridge for a trial period of three to six months to prevent women from acting 'irresponsibly' and accidentally 'killing themselves' in their zeal.[124] Florence thought this rule was overly harsh but agreed that he appreciated Wynn's sentiment.[125] However, a few days later Florence was protesting how the directive was being communicated. Florence felt a memo sent to the Engineers-in-Charge at transmitters advocated an overly restrictive application of Wynn's regulations and demonstrated a lack of 'confidence in the assessment of the value of the [women]', particularly as rules regarding technical competence were not extended to newly-hired men.[126] For his part, Wynn relented and recommended the ban be lifted two months later, which was supported by the then Assistant Controller, Harold Bishop.[127]

Despite the Control Board agreeing to lift the ban on women in May 1942, it was still in place in September of that year. The ban was instead extended pending the outcome of an outside engineering review of a fatal accident of a male engineer. Although specifics in the BBC files are unclear, the accident probably had taken place well before women were posted to H-Group transmitters, and had no bearing on the original institution of the ban. Reference to the accident was only invoked when the initial ban period was extended.[128] The restrictions were eventually lifted in May 1943 when the final report on the accident was issued.[129]

It is difficult to know if this lack of trust in women's abilities to make repairs to H-Group transmitters impacted their confidence, but Peter Florence worried that the restrictions would have a negative psychological effect.[130] In some instances, women displayed a rebellious attitude towards this mistrust. BBC files indicate that women, contrary to orders, would sometimes fix the faults, particularly if there were long delays in the arrival of Maintenance Engineers.[131] Serving at H-Group transmitters did negatively impact promotion potential. Wynn admitted that the limited nature of the job responsibilities made it difficult for women to demonstrate operational efficiency when being considered for promotion to TA Class I.[132] When deploying women within the

Operations and Maintenance Department, managers appeared to be more trusting in areas that were judged to be within women's competence—tasks that involved judgement and operational prowess, but not theoretical engineering knowledge or physical strength. At transmitters, even though women proved their abilities in control room duties, they were restricted in both gaining a better understanding of engineering theory and prevented from proving themselves especially in areas of equipment repair and maintenance.

Within two years of the end of the war, women were transferred from transmitters to studio centres, control rooms, and recording units.[133] This relatively swift reversion to pre-war norms at transmitters inverts the deployment decisions during the war. Transmitters were a male domain and the Engineering Division was quick to reassert this dominance. While some of these manoeuvres resembled mass dismissal of wartime female staff, women technicians were not slated for redundancy and continued to be recruited to technical positions in Recording and Programme Engineering. However, active recruitment of new female staff into Technical Assistant roles in control rooms ceased. In parallel, the Youth-in-Training entrance track was also suspended in September 1945 and was never revived.[134]

Many of the women who remained in control rooms were eventually squeezed out of the domestic services through the implementation of promotion exams and regrading. Some did eventually achieve promotion, while others transferred to the Overseas Service as these control room positions were not regraded.[135] Despite relying on 'natural wastage' seventeen women remained working in control room positions in 1971.[136] Programme Engineering was the one area where women held on to wartime gains. However, Programme Engineering did not remain in the Engineering Division as this section was transferred to the new Programme Operations Division in the 1950s.

Conclusion

The bigger picture suggests that BBC Engineering ultimately maintained gendered job classifications in the 1950s through to the 1970s, but in the late 1940s this continuity was not pre-determined. Initially reluctant to see women as permanent members of the technical staff, some managerial staff in the Engineering Division had admitted that employment patterns might be altered by the war.[137] Even though women were quickly removed from transmitting stations, they were posted to equivalent technical positions within the organisation. When television restarted in 1946, wartime women technicians became vision mixers, gramophone operators, and camera operators, and the future looked bright.[138] In 1948, the General Secretary of the Staff Association agreed in the wake of suggested staff reductions in engineering that singling women out for dismissal would be unfair.[139] Weary admissions in support of women technicians appeared in the Staff Newsletter. One commenter noted that women had proven their worth, despite a continued lack of theoretical engineering knowledge, ending with the question: 'cannot the Corporation give more hope of a settled career to a section of its Staff without whom it would, at one time, have been unable to carry on?'.[140] The letter also revealed a latent suspicion that BBC standards for many positions were too high.

Women's success in technical positions can be attributed in part to the relatively even-handed way that they were trained and integrated into non-gendered promotional

ladders. While management may have remained sceptical about women's potential, union-sanctioned dilution agreements that existed in other industries and workplaces to circumscribe women's opportunities and limit post-war careers were not put in place at the BBC during the war. Even where restrictions were enacted, such as at the H-Group transmitters, these were quickly recognised as disproportionate and eventually lifted.

There were deeper problems in the Engineering Division that became manifest after the war both with the promotional track for all engineers and with a perceived diminution in status for broadcast engineering in general. Many of the engineering jobs were operational in nature, and while the BBC insisted on top-quality educational qualifications and experience, few of the technical personnel needed these qualifications. In the mid-1940s, the BBC was still confident in its public role, having proved its worth during the war. After 1948, this positive outlook began to crumble with television provision straining BBC budgets, and the later introduction of competition from commercial television.

Edward Pawley's discussion of the post-war era highlighted the struggle the BBC faced attracting university-educated engineering talent after the war. The loss of prestige was palpable. More exciting fields were open to graduates than work in broadcast engineering, and special programmes were needed to draw in research engineers.[141] Women's presence and success in jobs across the Engineering Division perhaps exposed an underlying insecurity and a threat to the division's masculinity. After a four-year stint as Deputy Director-General, Noel Ashbridge resumed control of engineering in 1948, and the division started to fall back on familiar gendered reasons of physicality and potential harm to women's reproductive capacity to push women out of technical roles. Women perhaps also became symbolic of a loss of status and their exclusion became a point of catharsis for the Engineering Division.

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