United States Cryptologic History

The First Americans

The 1941 US Codebreaking Mission to Bletchley Park

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Center for Cryptologic History

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Cover: (Top) Navy Department building, with Washington Monument in center distance, 1918 or 1919; (bottom) Bletchley Park mansion, headquarters of UK codebreaking, 1939

UNITED STATES CRYPTOLOGIC HISTORY

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The 1941 US Codebreaking Mission to Bletchley Park

David Sherman

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Foreword

Folk wisdom in most cultures has much to say about the importance of good beginnings and positive first impressions. The many sayings about this are true, and they apply not only to individuals but also to groups and even government organizations.

The truth about good beginnings and positive first impressions is strongly illustrated by the development of the secret relationship between the United Kingdom and the United States in communications intelligence (COMINT) in World War II. The bilateral cooperation grew in range and depth of coverage and has continued over time; it has lasted from World War II until the present day.

The strong links and enduring quality of this intelligence-gathering relationship between two nations were not automatic or inevitable. Their closeness and longevity—and voluntary nature—are unprecedented in history.

One major factor in the development of this amazing relationship was its good beginning. It started a little tentatively, but both nations quickly recognized the professionalism of the other and, most importantly, quickly learned to trust and rely on the other.

Dr. David Sherman has written a fascinating narrative of the first professional contacts between Britain and America in communications intelligence. He emphasizes the dire situation confronting the Allied nations in 1940 and 1941, and how they decided on intelligence cooperation as one way to meet it.

Most significantly, Dr. Sherman emphasizes the people involved in the first COMINT contacts. The actions and reactions of a few key people, the impressions they made on each other, became the vital factor in determining the new policies on intelligence in their respective nations. Ultimately, what grew from their initial interactions helped change the course of history—many times.

Dr. Sherman's book is important professional reading for historians and intelligence practitioners alike.

It is also a whopping good tale, well told.

David A. Hatch, NSA Historian

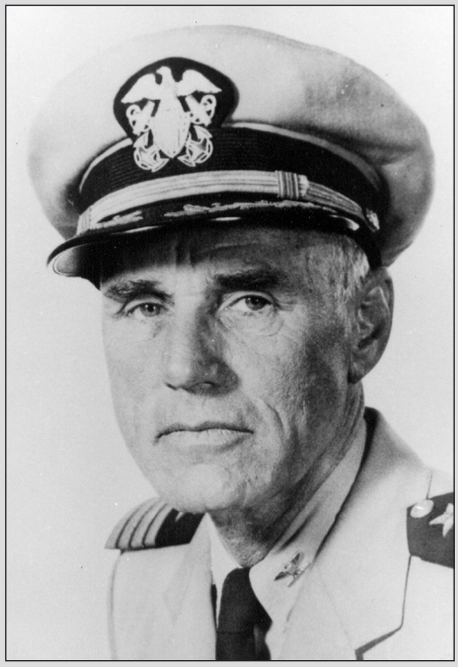
The First Americans
The 1941 US Codebreaking Mission to Bletchley Park

In late January 1941, ten months before Pearl Harbor and America's entry into World War II, a four-person US military delegation slipped onto the British battleship HMS *King George V*, which was anchored in the Chesapeake Bay off Annapolis, Maryland. Wearing civilian clothes, carrying diplomatic passports, and armed with the cover story of being Canadians, the four officers—the US Navy's Prescott Currier and Robert Weeks and their US Army companions Leo Rosen and Abraham Sinkov, the group's leader—were bound for a British installation so secret that for three decades after the war's end in 1945 it remained unknown to the general public in both Great Britain and the United States. This was Bletchley Park, the United Kingdom's wartime codebreaking establishment located on a former country estate an hour's train ride north of London.

The home of "the Ultra Secret," or the breaking of Germany's supposedly impenetrable Enigma encryption system protecting the Reich's most sensitive military communications, Bletchley Park had never before been visited by any foreigners, American or otherwise. Winston Churchill himself, while well aware of Bletchley Park's existence and the critical importance of its activities, did not set foot there until September 1941. The British government at first set significant limits on what the Americans could see or be told about Bletchley Park's codebreaking effort. In particular, discussions of the Enigma were ruled out of bounds. The Americans' disclosure of their successful cryptanalysis of the Japanese "Purple" code—used by Tokyo to protect its highest-level diplomatic communications—and their gift of a replica of it invented by the army's Signal Intelligence Service (SIS), a device which became known as the "Purple analog," persuaded London to reverse its previous position of excluding the Enigma from discussion and share with the Americans its success against the German cryptosystem, including its engineering of the "*bombe*" cryptanalytic machine.

During the final leg of their voyage across the Atlantic, the Americans would be strafed by the German *Luftwaffe* and, above the waves of the North Sea, see the tops of British merchant vessels sunk by German bombs. Some of the British naval officers they traveled with had lost family members during the Blitz. Having arrived in southern England, they would gain a first-hand look at wartime Britain which few Americans—most notably the radio journalist Edward R. Murrow—had experienced by the winter of 1941. While at Bletchley Park, they would hear the sounds of German bombing in the distance. Visiting London itself, they would see the devastation wrought by the Nazi aerial onslaught on

The American delegation to Bletchley Park: Navy officers Prescott Currier (top), and Robert Weeks . . .



its docks and underground stations and would spend an evening at a café which within the week suffered a direct hit by a German bomb and major loss of life.

After the delegation returned to the United States, some American military intelligence officers apparently questioned whether it had been a success. As for the British, it seems to have had little immediate impact on their activities for the remainder of 1941 and into early 1942, especially given that they remained locked in a life-or–death struggle with Hitler's Germany and—for the moment, at least—possessed cryptanalytic capabilities which had progressed far beyond those of the Americans. For the four American participants, however, there was no doubt about the value of what they had seen and learned at Bletchley Park. Their ranking officer, Sinkov, believed the experience at Bletchley Park would save American codebreakers two years of intense work on German and Italian cryptosystems.

The four Americans would not be the last to visit Bletchley Park. Two years later, in the summer of 1943, the first of what ultimately would come to over 200 Americans arrived as full members in what was now a codebreaking partnership between the two Allies, the United States and the United Kingdom, a partnership which would become a critical element in their ultimate victory over the Axis powers and, in the war's aftermath, endure as a key component of the West's containment strategy vis-à-vis the Soviet Union.

The Mission's Political and Military Context

In the spring of 1940, the armed forces of Hitler's Germany deployed the unprecedentedly mobile style of warfare which came to be known worldwide by its German name, Blitzkrieg, to overrun in rapid succession the Scandinavian nations, the Netherlands, Belgium, and—most significantly—France. The army which Great Britain had sent to the continent to aid its French ally had been surrounded at the coastal city of Dunkirk, from which it was evacuated

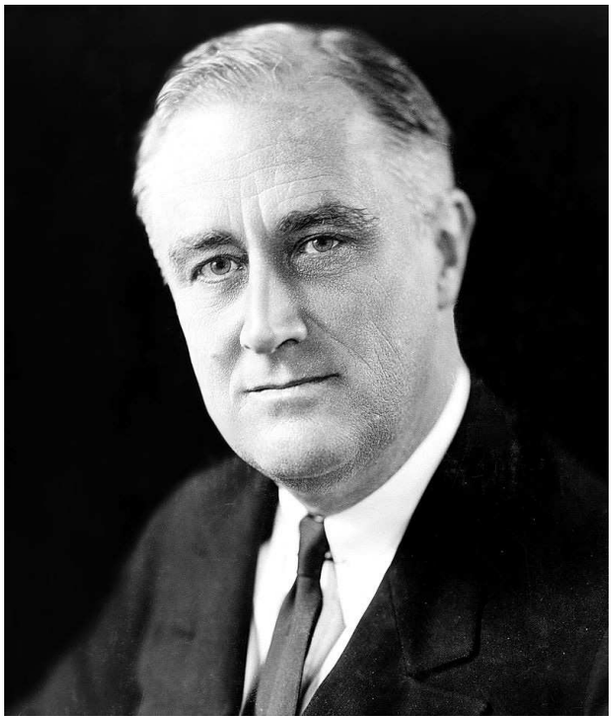
successfully but without most of its heavy equipment. With the undefeated German army, navy, and air force now occupying bases from the North Sea to the English Channel and France's Atlantic coast, it seemed only a matter of time—notwithstanding the appointment of the defiant Winston Churchill as prime minister—before London was forced to surrender or sue for peace, regardless of whether this resulted from a German invasion of southern England or the strangulation of Britain's overseas supply lines by Hitler's U-boats.[1]

The swift and successive German victories in the spring of 1940 also spurred American President Franklin D. Roosevelt to take a more assertive stance toward aiding Britain in the face of continuing isolationist opposition to becoming entangled in the European conflict. Speaking at the University of Virginia's commencement exercises on June 10, following Italy's invasion of an only lightly defended southern France which he denounced as a "stab in the back," Roosevelt vowed that "we will extend to the opponents of force the material resources of this nation and, at the same time, we will harness and speed up the use of these resources in order that we ourselves may have equipment and training equal to the task of any emergency and every defense."[2]

Five days earlier, and in response to a plea for assistance from Churchill, Roosevelt began shipping arms and ammunition to Britain that had been declared surplus by Army Chief of Staff George C. Marshall. The day before France signed its armistice with Germany, June 20, he reshuffled his cabinet, nominating interventionist Republicans Henry Stimson and Frank Knox to serve as the secretaries of war and the navy. That same day, the Selective Service Act, which proposed the first peacetime draft in American history, was introduced in the Senate. It was filed in the House the next day.[3]

However, despite Churchill's courageous "never surrender" rhetoric, there were those in Britain dur-

. . . and army officers Abraham Sinkov (top) and Leo Rosen (photos taken later)



Prime Minister Winston Churchill (l) and President Franklin Delano Roosevelt

ing the early summer of 1940 who harbored doubts as to whether their nation could endure against Berlin's seemingly unstoppable military juggernaut. Germany's rapid military successes also kindled such doubts among some American political and military leaders. The American ambassador in London, Joseph Kennedy, was particularly skeptical about the United Kingdom's ability to withstand the German onslaught.

Accordingly, in July, Roosevelt sent William Donovan—the future head of the wartime Office of Strategic Services, or OSS—to London to assess not just British resolve but, perhaps more significantly, its capability to continue the war against the Axis. As Roosevelt's personal envoy, Donovan was given access to Churchill and the British high command. He also met with Stewart Menzies, the chief of Britain's Secret Intelligence Service, MI-6, and the titular head of the codebreaking operation at Bletchley Park, which at the time was experiencing its first successes against the Enigma. While Menzies said nothing of Bletchley nor of its progress in breaking the German cryptosystem, a feat which ultimately would become the most important contribution of British cryptanalysts to the survival of Britain, he did tell Donovan that, in the words of Donovan's biographer Douglas Waller, "he was confident the *Luftwaffe*'s moves over British skies could be anticipated."[4]

Having returned to the United States in early August fully persuaded that Britain would survive, Donovan joined Roosevelt and Secretary Knox on a trip to New England for an inspection of the navy yards at Boston and Portsmouth, New Hampshire. After a series of conversations, first on the train north and then on the presidential yacht as it sailed between the two ports, Donovan felt that he had successfully convinced Roosevelt of London's ability and will to continue the war. In the view of one scholar who has studied Donovan's visit to Great Britain, "it was a key factor in his [Roosevelt's] decision in August

to transfer fifty overage destroyers to Britain," something Churchill had requested that Roosevelt do as early as the day after the latter's pivotal speech to the University of Virginia's graduating class. Having returned to Washington, Roosevelt pushed ahead with the destroyer deal. In early September, Roosevelt and Churchill agreed to an arrangement whereby the destroyers would be transferred to the Royal Navy in exchange for American basing rights on British territories in the Western Hemisphere.[5]

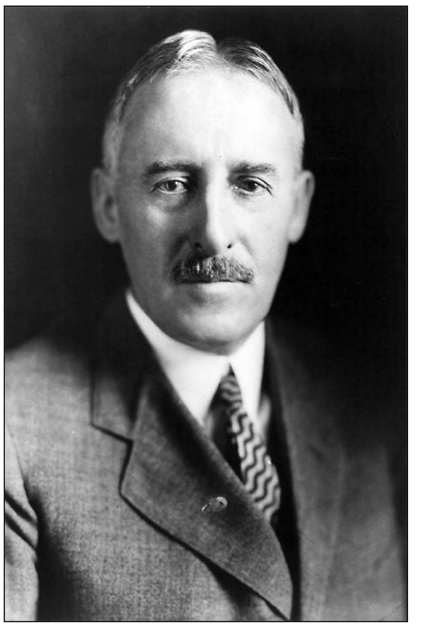
A Technical Exchange Takes Shape: The Tizard Mission

In the meantime, a separate series of events had moved Great Britain and the United States toward a joint discussion of their most advanced military technologies. Roosevelt's increasing tilt toward London may have established the necessary political context for the cryptanalytic exchange that began when the four American officers visited Bletchley Park in early 1941, but this shift in his administration's policy toward Britain by itself likely would have proven insufficient to trigger one. If there was a catalyst, it may well have been the budding secret technical dialogue between the two nations which began to emerge in the summer of 1940.

In the period leading up to the war and then for much of its first year, efforts by the two nations to start a conversation on secret defense systems invariably had come to nothing. Attempts by the British to gain access to the America's Norden bomb sight, which allowed aircraft to deliver munitions with great precision from high altitudes, were repeatedly rebuffed by the heads of the US Army and US Navy. London's offer to share its ASDIC antisubmarine warfare capability was similarly fruitless, especially after it learned that the naval technologies Washington might offer in return were either not as advanced as what the British already had or by US law could not be provided to a foreign military.

However, a week before Donovan departed for London, the British ambassador in Washington,

US Army Chief of Staff General George C. Marshall (photo taken near end of war)



US Secretary of War Henry Stimson

Philip Kerr, Lord Lothian, made a direct appeal to Roosevelt. "The British Government have informed [*sic*] me," he wrote, using language drafted by the Air Ministry and cleared by the Admiralty and the For-

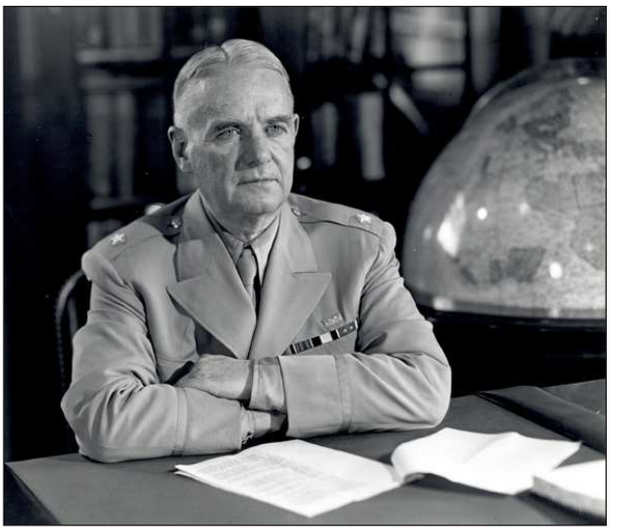
US Admiral Harold R. Stark (l) and Secretary of the Navy Frank Knox on a train in the UK, 1943

eign Office, "that they would greatly appreciate an immediate and general interchange of secret technical information with the United States, particularly in the ultra short wave radio field." London had no intent, he continued, of making this arrangement "a bargain of any description" but rather was ready to send a small group of British military officers and civilian scientists to the United States "to give you the full details of any equipment or devices in which you are interested without in any way pressing you beforehand to give specific undertakings on your side." Naturally, Lothian concluded, his government "would hope that you would reciprocate by discussing certain secret information of a technical nature which they are anxious to have urgently."[6]

Lothian's proposal was discussed at a cabinet meeting on July 11, where Secretary of War Stimson and Secretary of the Navy Knox supported the British initiative. Roosevelt then decided to accept it and press forward. There was, however, an important caveat. Lothian had concluded his memorandum to Roosevelt by indicating that "for our part, we are probably more anxious to be permitted to employ the full resources of the radio industry in this country [the United States] with a view to obtaining the greatest power possible for the emission of ultra short waves than anything else."

In June, however, Congress had passed the Walsh Amendment, named after the isolationist Massachusetts Senator David Walsh, forbidding the sale of US military equipment to another nation unless General Marshall and Chief of Naval Operations Admiral Harold Stark certified it as surplus materiel not essential to American national defense. Stimson thus insisted that any items which the British wanted to procure from US industry would have to be approved by Marshall and Stark as not interfering with US efforts to increase military preparedness.[7] Acting Secretary of State Sumner Welles included this proviso in a letter he sent to Lothian on July 29 confirming the administration's readiness to receive a "small secret British mission for technical and scientific discussions."[8]

Churchill, who by virtue of his membership on the Air Defense Research Committee during the 1930s was well aware of British progress on radar, initially had been skeptical upon becoming prime minister about sharing this technology with the United States. However, by June 1940, his military leaders had swung behind the idea. On June 30, Churchill authorized Air Minister Archibald Sinclair to proceed with the proposed technical mission on the condition that "the specific secrets and items are reported beforehand."[9] A month later, on July 25, having received advance word of Welles's letter giving the go-ahead for the mission, the British War Cabinet directed, in the words of one recent histori-



William Donovan, head of the wartime Office of Strategic Services

an of the discussions regarding a technical exchange, Steven Phelps, "all service branches to prepare lists of the technology to be handed over to the Americans." It also "made clear that disclosure must be full and open."[10]

Both London and Washington spent August preparing for the British mission. On August 1, the scientist Henry Tizard was appointed to head what would become a six-person group, which met for the first time on August 10. Tizard departed for the United States on August 14—the day after "Eagle Day," which marked the *Luftwaffe*'s launching of the assault which became known as the Battle of Britain—as the mission's advance man, arriving in Washington via Ottawa eight days later. On August 26, he met with Roosevelt at the White House. The next day, he met with Stimson, who may have arranged for an August 29 briefing by Tizard at the War Department. At this session, Tizard briefed the British "Chain Home" radar network, then proving its worth in alerting Britain's Fighter Command to German aircraft approaching from the English Channel or the North Sea, as well as a system known as Pipsqueak, an Identify Friend or Foe (IFF) capability under which a signal emit-

Stewart Menzies, chief of Britain's Secret Intelligence Service, MI-6

British ambassador in Washington, Philip Kerr, Lord Lothian

ted by British aircraft allowed ground controllers to separate radar detections of them from those of a German aircraft.[11]

Brigadier General Joseph Mauborgne, head of the US Army Signal Corps

William Friedman, chief cryptanalyst, army Signal Intelligence Service

The Genesis of a Signals Intelligence Exchange

One of those in attendance at Tizard's briefing was Brigadier General Joseph Mauborgne, head of the US Army Signal Corps, the organization which contained the codebreaking SIS. Mauborgne apparently was so taken by what he had heard from Tizard that he asked for a separate meeting, which Tizard would later say was intended to have been only "a few minutes talk" but due to Mauborgne's interest "went on until lunchtime."[12] Phelps describes the impact of the British scientist's presentation on Mauborgne in the following way: "Tizard's openness about IFF had so impressed General Mauborgne…that he invited Tizard to visit the Corps radar research center at Fort Monmouth, New Jersey. There Tizard was able to see for himself its SCR-268 gunlaying set."[13] A pulse radar system which was to be used to aim anti-aircraft artillery, the SCR-268 had just undergone field testing at Ogdensburg, New York, where its effectiveness at detecting aircraft proved superior to that of a network of observers which had been spread across the northern part of the state to provide visual reports. The SCR-268 also demonstrated an ability to provide the first-ever identification by a US system of an aircraft at a distance of 75 miles.[14]

Mauborgne may have been so taken with Tizard's briefing that he asked the chief of the army's SIS, Colonel Spencer Akin, and its founder and chief cryptanalyst, William Friedman, to develop a proposal for a cryptanalytic exchange with the United Kingdom. Alternatively, the Friedman proposal may have emerged from a directive by the army's acting assistant chief of staff for intelligence, Brigadier General Sherman Miles, who had been given the task of "coordinating the details of the interchange of information covered in the [Lothian's] Aide-memoire," and was seeking recommendations on technologies which could be shared with the British.[15] Yet another possibility is that the Akin-Friedman proposal could have been stimulated by word of talks on the parameters for the overall technical exchange then taking place in London between the American Military Observer Mission stationed there and British military leaders. At the August 31 session, army representative Brigadier General George Strong, had—apparently on his own initiative—raised with his

US Army Brigadier General George Strong

British counterparts the possibility of an exchange on the cryptanalysis of German, Italian, and Japanese systems. On September 5, after the Labor Day holiday weekend, Strong cabled Generals Marshall and Miles to ask two urgent questions: "Are you prepared to exchange full information on German, Italian and Japanese code and cryptographic information therewith? Are you prepared to agree to a continuous exchange of important intercept in connection with the above?"[16]

Regardless of how it came to be, Akin and Friedman's proposal appears to have been drafted for General Mauborgne at either the end of August or the beginning of September. A September 5 letter from Colonel Clyde Eastman to Mauborgne, who was then away from Washington at Fort Monmouth, seeking Mauborgne's comments on the Strong cable, included a copy of the Akin-Friedman proposal and indicated that it had been "prepared and submitted to you several days ago."[17] Akin and Friedman began by stating that any information whatsoever about devices the United States used to encrypt its own sensitive com-

US Army Brigadier General Sherman Miles

munications should be off the table. They then proceeded to recommend a full exchange of cryptanalytic information with the British, "on a basis of complete reciprocity, the same [the exchange] to be on specific exchange of specific items and not upon the basis of an exchange of information of a generalized character."[18] The two further recommended exchanging training materials, information about machines used for cryptanalysis, and actual intercept, noting in the latter instance that "It would be of especial interest to us to have traffic of a tactical nature from the German, Italian, and Japanese Armies." The only conditions suggested by the two men were (a) that as the United Kingdom currently was not at war with Japan, providing certain information about that nation might require the administration's approval to ensure its disclosure would not affect American defense interests and (b) that the proposed cryptanalytic exchange "only be undertaken in a joint conference between the Army and the Navy on the one hand and the British on the other." Akin and Friedman presumably suggested this latter provision in light of the fact that the two American services tended to conduct cryptanalytic activities in isolation from each other and rarely shared their methods or results.[19]

US Admiral Walter Anderson, Office of Naval Intelligence

The day Strong's telegram from London was received, Akin took it to Admiral Walter Anderson at the Office of Naval Intelligence. Anderson told Akin to inform General Miles "that the Navy's 'off-hand' answer to the whole project was an emphatic 'No' but that he would also send Miles a 'considered answer.' "[20] Akin and Friedman's proposal also noted a series of objections from Commander Laurance Safford, the head of the US Navy's cryptanalytic unit, OP-20-G. Not surprisingly, Safford agreed with the notion that discussions of the systems used by the United States to encrypt its sensitive communications should be out of bounds. However, he did not concur with the proposed "full exchange of cryptanalytic information." He also opposed any discussions of any machines the army and navy had developed to break foreign cryptosystems and questioned the "advisability" of exchanging training material. The only thing he did not oppose outright, according to notations on the Akin-Friedman draft, was the proposed exchange of intercept.[21]

General Mauborgne cabled the War Department from Fort Monmouth on September 7 to urge that it support the Strong proposal as a "matter of utmost importance to National Defense."[22] Four days later, Stimson formally added "cryptanalytic information" to the categories of materials which the War Department could share with the British, with the caveat that "no information which concerns our own codes, cyphers, and methods of cryptography will be divulged." Stimson also formally designated General Miles as the individual who would "coordinate details for the interchange of information with members of the British Technical Mission or other authorized representatives of the armed forces of the British Empire."[23]

The split between the army and the navy was unchanged as of early October, when Miles wrote to Stimson that, while the army remained strongly supportive of working with the British, "the Navy Department is opposed to any exchange of information on cryptanalysis of foreign codes and ciphers." "I understand," Miles continued, "that this opposition is based on a fear that any information we give on our methods of cryptanalysis may aid the British in breaking down our codes and ciphers."[24] Later that month, according to historian David Alvarez, Miles, Mauborgne, and Assistant Secretary of War John McCloy—whom Stimson had hand-picked to join him at the War Department after Roosevelt had nominated him in June—"met with Stimson to review the status of the Army's signals intelligence program and discuss cooperation with the British…. It took no time to convince him [Stimson] that the exchange project should go forward." As a result, Stimson apparently made an on-the-spot decision to force the issue and moved quickly to do so. The same day, he met with Secretary of the Navy Knox and secured his approval. Twenty-four hours later, having obtained Secretary of State Cordell Hull's blessing as well, Stimson approached Roosevelt, "who responded (through his military aide, General Edwin 'Pa' Watson) that he was happy to accept the judgment of his Secretaries of War and the Navy in this matter and approved the proposed exchange."[25]

Office of Alastair Denniston, chief of Bletchley Park operation

In London, the initiative taken by General Strong at the end of August to propose a cryptanalytic exchange appears to have been met more cautiously than it was in Washington, at least in US Army circles. There were several reasons for this wariness. First and foremost, America was not yet in the war and thus perhaps not worth the risk of Britain's disclosing its codebreaking successes, ones which for a beleaguered nation were increasingly seen as vital instruments for national survival. Moreover, the British cryptanalytic establishment saw the 1931 publication of Herbert Yardley's *The American Black Chamber*, which revealed the success of the United States in reading a number of foreign diplomatic cryptosystems, as an example of Washington's lax security practices. Finally, the Churchill government learned through the Tizard mission that, somewhat contrary to expectations, its defense research programs generally were significantly ahead of those of the United States. Thus, the question became more one of whether America's industrial might could make up for the deficiencies in British capacity to produce key military technologies in quantities sufficient to equip a modern army, navy, and air force. As a result, London would have had no reason to think that its cryptanalytic efforts were not similarly ahead of the Americans'. At this point in the war, moreover, London likely could not have perceived how the capacity of the United States to mass produce cryptanalytic machinery would turn out to be as important for the war effort as, say, airborne radar.

It is understandable, therefore, why as late as November 1940 the chief of the Bletchley Park operation, Alastair Denniston, was arguing that, in an implicit contrast to the capabilities Tizard had offered unilaterally to Washington, "As regards German and Italian [cryptosystems], any progress we have made is of such vital importance to us that we cannot agree at once to hand it over unreservedly." As for a possible visit to the United Kingdom by an American cryptanalyst, Denniston continued, "Should this expert make a favorable impression, we could consider opening out on the Italian material, and possibly discuss generally 'Y' [wireless intercept] work problems as regards Germany, upon which subject their assistance might be valuable."[26] However, the next month British and American representatives apparently reached agreement on the general parameters of a cryptanalytic exchange and signed a brief written statement documenting them.[27]

Continued Progress in Technological Cooperation

As the United States and Great Britain were taking their first steps toward a discussion of cryptanalysis, their larger exchange of advanced military know-how was accelerating and, as the fall of 1940

Alfred Loomis (r), Wall Street banker and founder of Tuxedo Park laboratory

unfolded, was seen by both sides as offering ever greater potential. While there is little direct evidence on how progress in this broader technical collaboration may have influenced planning for the American cryptanalytic delegation's visit to the United Kingdom, it seems entirely possible that it both solidified the support of senior leaders such as Stimson for a cryptanalytic exchange with the British and raised American expectations with regard to what the British codebreakers could offer. Moreover, the willingness of the British to share many of their most advanced technologies with the Americans may have incentivized the Americans to reciprocate by providing the machine which the SIS had developed to crack Purple.

On September 6, 1940, the remaining six members of the Tizard mission—a combination of leading scientists and military officers familiar with the operational use of the technologies the team would show to the Americans—arrived in Halifax, Nova Scotia, on the *Duchess of Richmond*, an ocean liner pressed into service as a troopship which also was carrying the crews who would man the first of the older destroyers being transferred by Roosevelt to the British in exchange for basing rights. Making their way first to Ottawa, the six then moved on to Washington, where they arrived on September 11.[28]

That evening was one of the most pivotal moments in the history of Anglo-American scientific cooperation during World War II. Each of the two future allies had made progress in radar technologies, with the British further along in terms of both the precision and range at which their systems could detect enemy aircraft. Given the urgency created by the outbreak of hostilities in Europe, the British also had succeeded in moving radar out of their research laboratories to create an operational network which stretched across the south and east of England and, as described by Tizard to American military leaders, aided greatly in the successful defense mounted by the Royal Air Force against the *Luftwaffe* during the Battle of Britain. That engagement, however, prompted a realization that, while ground-based systems could provide early warning of aircraft approaching the British coastline, they were limited in what they could do to vector RAF interceptors to their targets under combat conditions. For that, a device was needed which was small enough in size and weight to be mounted in an aircraft yet at the same time powerful enough to generate radio waves of sufficiently short length to avoid the problem created by longer ones, which was that the latter's "strong … echo from the ground obscured the weak echo from an aircraft beyond a certain range."[29]

However, the British had surmounted this challenge. Early in 1940, a group of scientists at the

University of Birmingham successfully tested a prototype of a device known as the cavity magnetron, which was both small and powerful enough to meet the requirements of an effective mobile air-based radar system. The Tizard mission brought one of the early versions of the magnetron to the United States. On that pivotal evening of September 11, it was demonstrated to a small group of American scientists and military officers who had been assembled at Washington's Wardman Park Hotel by Alfred Loomis. Loomis, a Wall Street banker whose fortune had escaped the ravages of the Great Depression, was a talented amateur scientist who ran a private laboratory at Tuxedo Park, an enclave for the wealthy located in the Ramapo Mountains north of New York City. Among the many projects Loomis worked on there, in the company of some of the most prominent American scientists of the time, were microwave systems.[30]

Loomis immediately grasped the revolutionary potential of the cavity magnetron. Accordingly, he invited the two members of the British delegation most familiar with the device, the physicists Edward Bowen and John Cockcroft, to visit Tuxedo Park. Once there, Bowen and Cockcroft provided a demonstration of the magnetron which awed and delighted the American scientists, no one less so than Loomis himself. As Bowen and Cockcroft had brought the blueprints for the device, Loomis quickly gathered representatives of America's leading electronic manufacturers and placed large orders for it. By the middle of October, he also had sealed an agreement with the Massachusetts Institute of Technology for the establishment of a new radar laboratory that would become known as the "Rad Lab" and serve as the key locus for Allied research and development projects in this field for the remainder of the war. The magnetron was not the only technology which members of the Tizard mission brought with them to the United States, but it was by far the most important and the most far reaching in terms of its impact on the tightening of

Frank Rowlett, US Army Signal Intelligence Service cryptanalyst

Anglo-American scientific ties and, ultimately, the Allies' conduct of the war.[31]

One individual Loomis was quick to share his excitement with was Secretary of War Stimson, who was his first cousin on his mother's side. Traveling to Washington a few days after the British had demonstrated the magnetron at Tuxedo Park, Loomis met with Stimson and General Marshall at the War Department and also had dinner with Stimson at the latter's home that evening, to which Stimson also had invited some of his key aides, including John McCloy. Of the meeting at the War Department, Stimson would write:

> Alfred Loomis came in in the afternoon, full of excitement over his interviews with the British and with the scientists, and he was full of the benefits that we were getting out of the frank disclosure by the British to us of their inventions and discoveries of methods they have made since the war. He said we were getting the chance to start now two years ahead of where we were….

Loomis, Stimson also would note, "said that our [the War Department's] frankness had enabled the British to put their hands on the table and had given us a rich mine of information and it has also brought the Navy around to a better state of frankness on their part."[32]

Around the same time, Stimson, Marshall, and McCloy were receiving briefings on a separate technological wonder, only this time it was an American one. In the weeks following the telegram from General Strong in London that recommended a cryptanalytic exchange between the United States and Great Britain, the SIS finally, after more than eighteen months of work, had succeeded in breaking Purple. The key breakthrough, according to William Friedman, had come on September 20 with the first two fully decrypted Japanese diplomatic cables produced on September 27.[33] Along with SIS cryptanalyst Frank Rowlett, who had played a key role in breaking the Japanese cryptosystem, Friedman and SIS chief Akin immediately briefed their success to General Mauborgne, the Signal Corps commander. Mauborgne quickly informed General Miles, the army G-2, while Friedman notified OP-20-G head Safford.[34]

Sometime thereafter, Akin asked Rowlett to prepare a demonstration for "an important official of the War Department," not indicating who that official was. According to Rowlett, "about a week later" Akin indicated that the visit would take place the following afternoon. Having waited for Akin and the mystery guest, Rowlett was stunned to see that it was General Marshall, who soon became fascinated with the replica of the Japanese Purple machine which the SIS had constructed in order to break it, and went so far as to ask Rowlett to remove its cover so that he could see its inner workings. Around two weeks later, Akin informed Rowlett that he should expect another visitor. This time it would be Secretary Stimson, who would be accompanied by McCloy and another senior aide, Harvey Bundy. Stimson focused on several decrypted Japanese cables that Rowlett had assembled for the visit, drawing the attention of McCloy and Bundy to one in which the Japanese Ambassador provided Tokyo with a summary of a recent meeting with Secretary of State Hull. Having read the entire cable aloud, Stimson was heard by Rowlett to remark that "our nation is indeed fortunate to have access to such important information, vital to the success of our diplomatic endeavors."[35]

The exact timing of the demonstrations of the Purple "analog" for first Marshall and then Stimson is unclear.[36] It seems most likely that Marshall's was early in October, with Stimson's probably coming during the second half of the month. It would be risky to tie them too closely, simply because of their timing, to the disclosures the British made in late September and early October regarding their technological breakthroughs, particularly the cavity magnetron. However, in its success in creating an analog of Japan's Purple cipher machine, the SIS in a sense also gave Stimson and Marshall an analog of a different sort for the magnetron, in that both were devices of potentially great importance to the security of the United States and the United Kingdom if the two nations could harness their military potential. Moreover, the SIS provided the two American military leaders with a singular capability which, at the time of General Strong's early September proposal, did not exist.

The State of American and British Cryptanalysis in Mid-1940

Viewed in hindsight from the perspective of the cryptanalytic partnership which the United States and Great Britain subsequently established, it seems fortunate that SIS broke Purple when it did. Specifically, what is striking about American codebreaking efforts during the second half of 1940, when Washington was considering a possible exchange with London, was their relative lack of success compared to the singular ones which would be attained once the United States entered the war. Seen in this

light, General Strong's late August proposal for a full exchange of cryptanalytic information came at a time when American fortunes in this area were at particularly low ebb. Even more interesting, Strong put the exchange on the table for the British to consider before the SIS had the first indications that Purple would be broken, much less constructed a replica of the Japanese machine or conducted the subsequent cryptanalytic work necessary to read Japan's diplomatic cables on a regular basis. In other words, had the SIS not delivered Purple, Sinkov and his colleagues most likely would have sailed for Britain with precious little to offer.

Moreover, as of the end of August 1940, the SIS had had little success against German and Italian military and diplomatic cryptosystems. Decades after the war, the officer who headed the German section of the SIS, Solomon Kullback, told an interviewer that while the SIS was aware of the commercial model of the Enigma prior to the visit by the four Americans to Bletchley Park, it had no idea that this version had been adopted by the German military nor that variants had been created for each service.[37] Sinkov would claim that the only German systems which the SIS had an effort against were diplomatic, particularly one which had been designated Floradora.[38] As for the Enigma, Sinkov would add that he did not know whether the SIS was confronting a small or a large amount of traffic and suspected that, at least when it came to the Enigma used by the *Wehrmacht*, the SIS did not in fact have any. Cryptologic historian David Kahn summed up the state of SIS efforts against the military systems of the other two Axis powers—Italy and Japan—at the end of 1941, which was unchanged from what it had been in January of that year when Sinkov and his colleagues departed from the United States, in the following way: "by the time of Pearl Harbor, no Japanese Army codes could be read, chiefly because of a paucity of material. Little effort had been expended against Italy; consequently, results were about nil."[39]

At the navy counterpart of the SIS, OP-20-G, the state of affairs seemingly was no better. Its situation could even be described as worse, given that OP-20-G could point to no current success analogous to that of the army's solution of Purple. Kahn concludes that it

> … was attacking the cryptosystems of the Japanese, Italian, and German navies, but had made hardly any progress with Italian and German and little more with Japanese, on which it concentrated. It was reading about 10 percent of Imperial Navy traffic, but most of this was in minor cryptosystems such as those used for weather reports; it read the main fleet code only sporadically and the flag officers code not at all.[40]

Although OP-20-G's predecessors had experienced some successes in the 1930s against the naval codes of Japan, its principal target, these were eclipsed in mid-1939 by Tokyo's introduction of a new cryptosystem, designated JN-25, to protect the operational or "Fleet" communications of the Imperial Japanese Navy. The deployment of the second variant of this code, JN-25B, at the start of 1941 erased those few inroads which OP-20-G had made into its initial version. David Alvarez, a leading scholar of American World War II cryptanalysis, has said with regard to the Sinkov mission that the navy's "codebreakers had recovered so few encipherment and code values that the codebook Currier and Weeks packed for the journey was 'almost empty.'"[41]

The situation at Bletchley Park in late August 1940 was markedly better, with the codebreakers there experiencing their initial breakthroughs on certain Axis cryptosystems. However, they were still months and, in certain cases, years away from the sustained success against all variants of the Enigma used by the German military that would become the hallmark of British cryptanalysis during World War II. Up to this point, Bletchley Park's core accomplishment was breaking the principal Enigma vari-

ant used by the *Luftwaffe* for its operational messages, which it designated Red (not to be confused with the Japanese diplomatic code similarly designated by the Americans), in late January 1940. Other German Enigma variants generally remained resistant to British cryptanalysis until the spring of 1941, when the first inroads were made into that used by the German navy, a salient achievement in the context of the onset of the Battle of the Atlantic in late 1940.[42] As for the *bombe* designed by Alan Turing to support Enigma cryptanalysis, the first machine was delivered to Bletchley Park in March 1940 but, in the words of one recent assessment, "did not prove particularly effective."[43]

It was only with the arrival of a redesigned second machine in August 1940, not long before General Strong made his proposal for a cryptanalytic exchange, that the *bombe* began to have a significant impact on British operations. As for Germany's Italian ally, most of its communications were encrypted using cryptosystems—including a less capable variant of the German Enigma—which Bletchley Park had been reading regularly since Rome's entry into the war in June 1940, with decrypts of those of the Italian navy proving particularly important to the British defense of the Mediterranean.[44] How much success British codebreakers had achieved with regard to Japan is not as clear. An effort against Japanese codes and ciphers had been in existence since at least the mid-1930s, with its considerable initial success followed by several years when all messages were unreadable. It seems, however, that the British may have had more success than their American counterparts with JN-25 after it was introduced in the late summer of 1939, although any such success—if in fact it was achieved—apparently was not disclosed to the two American naval officers, Weeks and Currier, who would visit Bletchley Park in February and March 1941.[45]

It also is not clear exactly what the two sides told each other prior to the American visit about their progress against German, Italian, and Japanese cryptosystems. Writing in the mid-1950s, Friedman would claim that the Americans and British gave each other more than a cursory sense of their progress, certainly enough to demonstrate to each that an asymmetry in their respective successes made an exchange of information potentially worthwhile.

> It was ascertained that the UK communications intelligence experts had not succeeded in solving the highest level Japanese diplomatic cryptosystems and the machine which was involved in enciphering and deciphering the messages in that system….Cryptanalysts in the U.S. Army Signals Intelligence Service, however, had accomplished this task and were reading the Japanese messages in that cryptosystem, which they had named, for brevity as well as for disguise, the "Purple" system….On the other hand, it has been ascertained that the UK cryptanalysts, although they had been unsuccessful with the "Purple" system, had been quite successful with German and Italian diplomatic systems, the study of which had only recently been undertaken by U.S. cryptanalysts. It therefore seemed that both the U.S. and the U.K. could profit by an exchange.[46]

While the accuracy of Friedman's account cannot be ruled out, there also are reasons for approaching it cautiously. First, it was written over ten years after the early 1941 American visit to Bletchley Park and thus may have been colored by knowledge of how the exchange progressed subsequently. Second, Friedman made at least one factual error, and that is with regard to the level of British progress on German diplomatic ciphers. In fact, Bletchley Park had made little headway against German cryptosystems in this area by the fall of 1940, in part due simply to the sophistication of these systems but also, perhaps more importantly, to the military necessity of focusing resources and attention on those of the Axis armed forces during a time of war, particularly after the fall of France

in the spring of 1940. Friedman, in describing the British as "quite successful" against the diplomatic systems used by the European Axis nations, may have been trying to conceal their achievements in breaking the Enigma—which would remain secret for another 20 years—since it seems odd that an individual who was typically very precise in his language would choose to obfuscate it through use of the term "diplomatic" when the more accurate "military" would seem to have sufficed.

What seems more probable, with all due respect to Friedman—especially as it seems highly unlikely that he would have participated directly in any discussions with the British in advance of the Sinkov mission—is that each of the two sides was somewhat circumspect with the other about its achievements prior to the departure of the Americans for Britain in late January 1941. There may have been some discussions of the state of their respective cryptanalytic efforts, although it is hard to believe that either would have gone into too much detail. The Americans may have hinted at their success against Purple, as suggested by Friedman's statement, in order to assure the British they were serious. However, it seems unlikely that they would have disclosed that they had built a replica of the Purple machine.

As for the British, they had reason to be cautious about what they said to the Americans, but not so much so that their reticence would have placed doubts in the latters' minds regarding Great Britain's ability to engage in a productive exchange. After all, Churchill had initially been opposed to any discussion of cryptanalysis whatsoever with the Americans when the possibility of the more general technical exchange had been first raised months earlier. Moreover, his government, while overjoyed with the mobilization of America's industrial might after the disclosure of the cavity magnetron, also experienced some disappointment when it saw that the military technologies America put on the table for Tizard's delegation were considerably less sophisticated than those offered by the British scientists. Finally, London had made a conscious decision not to disclose Bletchley Park's success against the Enigma, a choice which would have a dramatic impact on the Sinkov mission when it was reversed.

The American Team Is Chosen

None of the four men who formed the American team—the army's Abraham Sinkov and Leo Rosen and the navy's Robert Weeks and Prescott Currier—would be able to say later exactly when it was decided that a US delegation should actually visit Bletchley Park. Currier would claim that he had a sense that something was up as early as October, although this simply may have been an awareness of the discussions then taking place at higher levels regarding an exchange of cryptanalytic information between the United States and the United Kingdom, not knowledge that a trip to Bletchley Park was under consideration.[47] He would tell David Kahn that it really was only in late December, when he was recalled from home leave and instructed to report to Washington and at the same time moved out of the Naval Reserves and placed on active duty, that he really had his "first inkling that something might be afoot."[48]

Currier would say that he thought Friedman, who had coauthored the detailed proposal for a cryptanalytic exchange earlier in the year, was an early supporter of the trip. Currier also believed, noting that he did not have any proof, that Friedman wished to go alone.[49] Friedman's travel orders were issued on December 26.[50] In the end, however, he was unable to make the trip due to his hospitalization for what is generally thought to have been a nervous collapse.[51] It is unclear exactly when Friedman entered Washington's Walter Reed Hospital. His service record indicates that he was furloughed from active duty on December 23 (like Currier he had been moved out of the reserves to make the trip).[52] Sinkov would date Friedman's hospitalization somewhat earlier—"somewhere about the middle of December"—whereas David Kahn, citing

Purple analog

what he called Friedman's "official Army biography," would claim his hospitalization began on January 3.[53] Friedman's wife, Elizebeth, would say he became ill "shortly after the thing [Japan's Purple code] was broken," which suggests that whatever health crisis he experienced had its origins earlier in the fall given that the SIS rendered Purple readable in late September.[54] Regardless of exactly when Friedman entered Walter Reed, what is interesting is that Friedman's travel orders were "revoked" only on the eve of the trip, January 24, suggesting that the army may have held out hope until the last minute that he would recover in time to go to Britain.[55]

Moreover, a decision was taken by the War Department at some point to send a second officer. This would had to have been no later than January 17, when Sinkov's orders were issued.[56] If the army was in fact still keeping open the possibility of Friedman's recovery, this would imply that it saw Sinkov as Friedman's second, not his replacement as leader of the group. With the revocation of Friedman's orders, however, Sinkov succeeded him as the ranking officer among the four in the traveling party. The exact reasons why Sinkov was placed on the team are unclear, and none of the interviews he gave in later years contain any clues. Rowlett would have in some ways been the more logical choice. However, senior leadership may have felt that, with Friedman first slated to go and then out of the picture altogether, Rowlett could not be spared. Solomon Kullback, another SIS veteran, also could have been a reasonable replacement for Friedman given that he was the unit's specialist on German cryptosystems. However, Sinkov led its efforts against Italian and other systems and may have been deemed just as suitable as Kullback. Kullback also would claim that Colonel Akin had asked that he check with his wife to see whether she would object to his going to the United Kingdom. She did, and Akin purportedly opted to send Sinkov, then a bachelor, instead.[57]

Leo Rosen also was unmarried at the time. As for his later claim that he replaced Friedman, this was correct in the sense that the latter's removal from the team created an opening in the two-person army team but not in the delegation's leadership.[58] Rosen also was certain, according to Kahn's notes of a 1982 conversation with him, that his being named to replace Friedman reflected his experience with Purple and the fact that the Purple analog, which he had helped build, was included among the items the United States was sending to Britain. According to Kahn's notes, Rosen came along in the event that the device needed to be repaired while the group was at Bletchley Park.[59]

Currier would later say, on several occasions, that he did not know why he was selected. In a 1984 letter to Kahn he speculated that "it was because there was really no other choice, i.e., I was the only officer in OP-G-20 at that time who had any hands-on experience and who possessed a modicum of technical knowledge."[60] Weeks agreed that Currier "had considerably more time in OP-20-G

and had a good cryptanalytic capability," which Weeks admitted he did not possess. As for the reason he was chosen, Weeks noted that he "was in charge of no project and could be spared without detriment to OP-20-G," a rationale which Currier surmised as well. Of his army counterparts, Weeks later would say that both "struck me as being very capable, with Abraham Sinkov really outstanding."[61]

***King George V* battleship, which transported the American team and a Purple analog machine to Britain**

It was also during this period that final decisions appear to have been made about what the four Americans would take with them to the United Kingdom. However, more information is available on the 720 pounds of material the army packed in six shipping crates to accompany the party than on what the navy intended to deliver. According to a December 21 memorandum from General Mauborgne to Rear Admiral Leigh Noyes, the navy's director of communications, the first two crates contained the Purple analog which the SIS had built along with an instruction manual for using it. The next two contained an analog which the SIS had built to break Purple's predecessor, which it had designated Red and which was still used by Japanese diplomats to protect less important communications. Spare parts for this analog were also included. The fifth crate held documents related to an Italian diplomatic cryptosystem, while in the sixth were stored ones related to a German system, also diplomatic, designated GEE. Neither SIS nor Bletchley Park had broken the latter system at the time of the Sinkov mission; however, as noted above, the British had been highly successful in penetrating Rome's codes and ciphers. They also, unknown to the Americans, had broken the Japanese Red diplomatic code. A separate memorandum, dated January 21, 1941, and signed by Safford, simply notes that the navy's Weeks and Currier would be carrying their personal luggage along with three boxes weighing a total of 225 pounds. Safford did not specify the contents of the latter.[62]

The Voyage to Britain

The four men did not meet as a team prior to their departure for Annapolis to board the British battleship *King George V*.[63] Currier remembered receiving some very brief instructions prior to the trip.[64] Weeks would later state that, to the best of his recollection, the navy duo was told by Safford that the four men were to deliver the materials being shipped with them to the British and "lay the basis for initial contacts." He also recalled Safford indicating that he and Currier were to learn what they could with regard to "the naval enigma"—perhaps indicating only that Safford knew of the German system's existence as opposed to being aware that the British were attacking it—and the Royal Navy's high frequency direction finding efforts. Separately, Weeks indicated, Safford had instructed him to see what he could learn about the German "AOR" cipher,

The four US officers transferred to the HMS *Neptune* (above) with their cryptanalytic cargo.
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which had been detected in messages "transmitted in the U.S. on frequencies which could be copied in Europe."[65] Sinkov did not remember any meetings with senior leadership before the trip.[66] Based on an interview with Sinkov, the writer Thomas Parrish would note that "Sinkov and his fellow officers had been told nothing about the high level negotiations that had led to their trip, nor had they been given any detailed information about what they might expect to see and hear in England."[67]

Rosen later stated that at least some consideration had been given to having the delegation fly from the United States to the United Kingdom but that this idea was abandoned in light of the fact that the group would have been exposed to attack by the *Luftwaffe* during the final stage of their journey. Three of the men—Sinkov, Rosen, and Currier—only held reserve commissions and, as noted above, were placed on active duty. This was required so that their passage on the *King George V* would remain consistent with US law, which forbade civilians from traveling on a foreign military vessel during wartime. They were issued diplomatic passports. Sinkov said he was made an assistant military attaché. He and the others were supposed to pose as visiting Canadians, a cover story which Sinkov claimed fooled no one.[68]

None of the four Americans remembered seeing what had been packed in the crates until they had arrived in Britain, although clearly they all knew that the Purple analog was among the items being shipped. Currier and Weeks presumed that they had been packed by army or navy logistics specialists; Sinkov incorrectly assumed that the packing was supervised by Rosen, who separately said he was not present.[69] According to Weeks, on the morning of their departure he, Currier, and their army counterparts were driven in a military convoy from the War and Navy Department buildings in downtown Washington directly to Annapolis, without an armed escort. Upon their arrival, in what Weeks and Rosen recalled as being a heavy downpour, the men and their personal baggage along with the shipping crates were loaded onto a motor launch and taken out to the *King George V*, which was anchored in the Chesapeake Bay several miles off shore. They learned that Roosevelt had sailed out from Washington in the presidential yacht, *Potomac*, ostensibly to greet the new British ambassador, Lord Halifax, but more likely to get a glimpse of Britain's newest and largest warship.[70] In the end, Roosevelt decided not to go on board, perhaps due to a combination of rough seas and the fact that the wheelchair-bound president would have had to have been hoisted onto

the vessel by a crane in a special cage apparently built for this purpose. The four Americans, however, then had to endure an additional wait until Halifax himself disembarked. It was only at that point that they and their precious cargo were allowed on board.[71]

Currier and Weeks thought the captain and senior officers of the *King George V* had a general sense of the Americans' mission and were aware of their military status despite their civilian clothes and diplomatic passports. It was also clear that the British had prepared a dedicated storage area for the group's cargo and had extra security guarding it. Rosen also was aware of this area, describing it to Kahn as a "stronghold" in the bowels of the ship.[72]

On the morning of January 25, the *King George V* departed for home. Four days into the voyage, the battleship was joined just south of the Grand Banks by a large convoy from Bermuda carrying fuel and food supplies to Britain. Reducing its speed to 11 knots in order to match that of the slower moving merchantmen, the *King George V* performed escort duty for the next five days. Sinkov remembered this part of the journey as being particularly cold, as the ships now went north of the 60th parallel and also encountered several days of bad weather.[73] On February 3, the convoy was southeast of Iceland and was met by a group of destroyers which would escort the merchant ships south to the English Channel. The *King George V* could now separate from the rest of the vessels and accelerate toward the Royal Navy base at Scapa Flow, where it arrived in the early afternoon of February 6. The four Americans had been at sea for almost two weeks. Weeks recalled that their arrival coincided with a "terrible snowstorm," which Rosen remembered as being so severe that it had paralyzed all of Scotland.[74]

It was at Scapa Flow that the US group encountered its first difficulties. Debarking from the *King George V*, the four officers discovered that the shipping crates in which their cryptanalytic cargo had been packed would not fit through the hatches of the Short seaplanes which were waiting in the harbor to fly them south. As a result, the men and the crates were transferred to the HMS *Neptune*, a cruiser which recently had arrived from 16 months of sea duty in the Atlantic, the Mediterranean, and the Indian Ocean and was headed south to the Plymouth shipyard for repairs. After ensuring the crates were lashed to the *Neptune*'s deck, the four men went below to find their quarters.[75]

Currier would recall the *Neptune* as "pretty beat up," with Rosen observing that none of the plumbing on the ship was operational, suggesting that in additional to any combat damage the ship bore the scars of ordinary wear and tear from the long tour of sea duty it had just concluded.[76] It was to experience another attack on the way south to the Thames, the Americans' next destination. Around noon on the day after it departed Scapa Flow, the *Neptune* overtook a convoy also headed south and was briefly intermingled with it. By happenstance, a German reconnaissance plane spotted the ship at this exact moment. Currier realized it was likely that the German pilot would conclude that a convoy escorted by a cruiser would have more than routine significance, and in fact about 20 minutes later a flight of German aircraft appeared to attack the ship.[77] They first bombed the vessel, with two near misses causing the ship to lurch violently, and then made strafing runs. When Currier heard the bullets hitting topside—making a sound which he would later describe as like "a chain being dragged across the deck"—he was certain that the cryptanalytic materials in the crates on the deck, and especially the Purple analog, had been destroyed. However, coming up from below after the attack Currier and Rosen discovered that the Germans had used antipersonnel bullets which had exploded on contact with the crates' exteriors and thus did not penetrate to the items inside them. Instead of mangled gear, all the Americans found were wood splinters strewn across the deck.[78]

In later years, the four Americans' memories would diverge over the specifics of their arrival in

Colonel John Tiltman, head of British army operations at Bletchley Park. *© Crown Copyright*

southern England shortly after dark on February 8. Currier would recall being met on the dock at Sheerness, near the mouth of the Thames, by a Royal Navy officer along with two staff cars and a truck. The officer, he would later say, was Captain Humphrey Sandwith, then head of Naval Signals Division 9 (NSD 9) at the Admiralty, the British equivalent of OP-20-G. Rosen would claim, however, that it was Bletchley Park's deputy commander, Edward Travis, who met the American party. Weeks also thought that Travis had boarded the ship, accompanied by several other officers, but admitted to David Kahn 40 years after the fact that he could not be sure. Weeks would claim that, as opposed to Currier's assertion that the four men had left the *Neptune* at Sheerness and traveled by car to Bletchley Park, they and the shipping crates were loaded onto a motor launch and taken up the Thames to London, where they debarked. Sinkov agreed that the men came ashore in London, although he made no mention of being transferred from the *Neptune* to a smaller vessel. He also claimed that instead of Travis greeting them on board it was Colonel John Tiltman, head of the British army's operations at Bletchley Park, who met them and did so at the dock in London. All four would remember driving through London. Thus, as a route from Sheerness to Bletchley Park presumably would not have taken them through the city without a major diversion, it seems most likely that—regardless of who met the Americans—they would have come ashore in the capital itself after having come up the Thames.[79] On one occasion, Currier would recall that after entering their vehicles the group made a stop in London before proceeding on to Bletchley Park.[80] If true, this would support Sinkov's recollection that upon arrival in England, he and the others visited the American Military Observer Mission in order to present a sealed letter to General Strong, the army's representative. Sinkov himself had not seen the letter, which was from General Miles. However, he believed it informed Strong "that we were on a highly secret technical mission and that he was not to concern himself therewith." Strong read the letter without comment, according to Sinkov, and the group proceeded from London to Bletchley Park.[81]

The drama involved in the events of the final hours of February 8 meant that they would be imprinted on the four Americans' memories more indelibly, so that years later there would be few discrepancies in their recollections. Currier's was the most detailed. He remembered that, upon the convoy's arrival at Bletchley Park, the American team saw a "forbidding-

looking brick building with all the blackout curtains drawn": the Bletchley Park mansion.[82]

> We…arrived about…ten or eleven o'clock at night I guess, drove into the grounds of Bletchley Park and got out, everything all, of course, there were blackout curtains up everywhere, everything was absolutely black, went through a doorway with two blackout curtains, one ahead of the other, walked through into a rather brightly lit office, and there was John Tiltman…standing there in his regimentals with his hands behind his back, he and Travis and Denniston….And that was coming out of the dark into the light and seeing the three of them sort of standing there in a row…and so we all went around and shook hands.[83]

Earlier that day, Denniston had alerted his assistant, Barbara Abernethy, to the Americans' pending arrival. Years afterward, she would recall Denniston as saying that "There are going to be four Americans who are coming to see me at 12 o'clock tonight. I require you to come in with the sherry. You are not to tell anybody who they are or what they will be doing."[84] Currier would later say to David Kahn that the first meeting between the Americans and their British counterparts "was truly a memorable moment for me and I shan't soon forget it." Given the lateness of the hour, the session was a short one and after a brief exchange of pleasantries the four Americans returned to their cars and were driven to what would be their home during their stay at Bletchley Park.[85]

Settling into a Routine

Shenley Park, like the Bletchley Park mansion, was a local manor house. Located a few miles from Bletchley Park, Shenley Park was the estate of Lord John Cadman, then president of the Anglo-Persian Oil Company. At the time of the Americans' visit, Cadman was terminally ill in the hospital and in fact would pass away a few months later. Sinkov would recall being met by Lady Cadman, who after welcoming the group immediately departed for her husband's bedside. Acting as their host for the remainder of their stay would be the Cadmans' son, Basil, who while presumably not told of the purpose of the Americans' visit, apparently relished the opportunity to play a role in the British war effort and a vaguely secretive one at that.[86]

Lord John Cadman hosted the Americans at his manor house, Shenley Park

Sinkov later would describe the time he and his fellow Americans spent at the Cadman estate as an experience in "really elegant living."[87] The house had retained its housekeeping staff, consisting of the butler, the cook, and three maids. The wealth of its owners as well as the fact that it was a working farm with a reasonably steady supply of food would, the Americans later realized, spare them from much of the austerity of wartime Britain. (Weeks, however, would later say that during the trip he ate enough Brussels sprouts to last a lifetime.) Their stay also had

Bletchley Park Hut 1 (photo taken after war)

its humorous moments, with Cadman's butler Wyatt on one occasion showing unspoken but clear disapproval for the fact that Sinkov did not know how to use a butter knife. Nonetheless, Currier recalled that the team was well looked after by Wyatt and the rest of the Shenley Park staff. Wyatt also apparently would later warm to the Americans.[88]

The Americans' comments about their reception throughout their visit to Bletchley Park and other sites in the United Kingdom were universally positive. An official report filed by Sinkov and Rosen shortly after the group's return to the United States noted that "During this entire period, all the British officials we met with were most cooperative and open-handed. We were invited to ask questions about anything we saw, no doors were closed to us and copies were furnished of any material which we considered of possible interest to the United States."[89] Currier said much the same. "The feeling I got when I was there," he would write years later, "was only one of extreme friendship and willingness to provide us with anything we saw that we wanted. And they did. We could go absolutely anywhere and they were very good at answering questions and providing the documents they had."[90] Weeks agreed. "We were treated with great personal kindness," he would tell David Kahn, "and every effort was made to insure [*sic*] our well-being under war time conditions."[91]

Soon, the Americans were following a fairly standard routine. After breakfast at the manor, they would board two chauffeured staff cars, one for Sinkov and Rosen and the other for Weeks and Currier, and travel to Bletchley Park. Having been issued gate passes for the duration of their stay, they would pass through security and then be taken to an office which had been equipped for their use.[92] Lunch might be at a local pub, where occasionally they would be joined by Colonel Tiltman.[93] The group would return to Shenley Park for dinner. Sinkov recalled that, during their evenings at the manor, the four men generally avoided discussing what they had seen and learned that day.[94] One night, Sinkov and Currier found a phonograph and passed the time listening to Lord Cadman's apparently extensive record collection.[95]

What the Americans Learned at Bletchley Park

The four Americans left no chronology or log of their time at Bletchley Park.[96] Nevertheless, it is possible to reconstruct some of the time line of their stay from their surviving oral histories and correspondence. However, this approach yields no more than the periods at which they are most likely to have been away from the British codebreaking center visiting other sites. There is one exception, and this is the date when the decision was made in London to disclose Bletchley Park's success against the Enigma and the workings of the *bombe*, a decision which was reached in late February and implemented in early March. It therefore seems likely that most discussions not involving the Enigma—which, as stated earlier, the British initially had placed off the agenda—would have occurred before that time, with those related to it invariably coming after.

There also are discrepancies in the four Americans' recollections of their time at Bletchley Park and what was discussed there. One of the principal

Bletchley Park Hut 4 (photo taken after war)

reasons appears to be that they often operated separately, with differences in how they spent their time existing not only between the two army and the two navy officers but also, within the army duo, between Sinkov and Rosen. Currier described this situation in the following way:

> The British split us up. The Navy group and the Army group never traveled together. We each had our own car and our driver, so [the Navy] never went to the same place as they [Army] did—at least not at the same time. We weren't intentionally kept apart. We saw each other almost every night, but we often did our own thing and saw the things that we, as service representatives, were interested in.[97]

Speaking of the group's first days at Bletchley Park, Sinkov said that he spent his time "talking with the Italian group" while "Rosen concentrated on displaying to the British the Purple machine and its functioning." Of his discussions with Bletchley Park's Italian cryptanalysis section, Sinkov would say, "They were in possession of a codebook which had been surreptitiously obtained for the use of certain superenciphered code systems which proved very useful to us. It had been a system that we hadn't been able to make much progress on. We were able to provide them with considerable information about the decrypt of some diplomatic material which was being handled rather effectively at home."[98] More generally, Sinkov noted that "there were several periods where Rosen and I were operating independently." "During all this time," he continued, "the Navy officers were having conversations with Naval counterparts."[99] Rosen went so far as to assert that, in his recollection, he "would provide information; Sinkov would receive." As a result, Rosen claimed, he "did not really know what information was received and therefore did not really know what the group had brought back to the U.S."[100]

Sinkov and Rosen's post-trip report suggests that a large number of Axis cryptosystems other than the German Enigma were discussed during their stay at Bletchley Park. These included systems used by the German air force, army (including the *Wehrmacht*'s

lower-grade field ciphers, used to protect tactical communications), foreign service, security services (including the *Schutzstaffel* [SS] and the *Sicherheitsdienst* [SD]), and intelligence service (*Abwehr*); by the Italian army; and by the Japanese army and air force. The British also provided information on Axis commercial codes as well as the cryptosystems used by the diplomatic services of several Latin America countries. More generally, Sinkov and Rosen were impressed by the tenacity of Bletchley's efforts. "The point was stressed several times," they would write, "that one of the most significant factors in the success achieved is the continuity of effort along solution lines. Very few of the problems now being studied are altogether new. In most cases, a small group, already quite familiar with the general problems, was merely required to expand its field of effort." The two army officers concluded, "Given the same amount of material for study and as large a staff, we could in time be able to do fully as well."[101]

Weeks, the senior member of the navy twosome, recalled seeing the Hollerith machines located in Bletchley Park's Hut 7. Developed by the American Herman Hollerith and first purchased by the United States to conduct the 1890 census, these machines were capable of tabulating information stored on large numbers of punched cards. At Bletchley Park, they were used to compare letter sequences in high volumes of messages encrypted by the Enigma, sequences which when correlated could produce "cribs" (informed guesses about the plain text which corresponded to a series of enciphered letters, guesses which were suggested by their repeated or predictable use, indicating that they might correspond to a common term or phrase, or by their regular appearance at a certain point in a series of messages, often their beginnings or ends, possibly associating them with a word or phrase often used at the start or finish of such messages), which then could be used by Bletchley's cryptanalysts as entry points for breaking single messages or a series of ones.[102] As for Currier, a comment he made to an interviewer in 1980 suggests a trace of boredom may have set in after the initial excitement of the team's arrival at Bletchley:

> I spent a lot of time going out and talking to people and just talking code groups and, as I say, doing such menial things as tracing German submarine charts and getting all the lower level systems, the hours of operation of the systems with the E-Boats in the channel, and the naval items I could think of.[103]

If information about the communications of German patrol boats in the English Channel—a clear threat to British shipping but not one which was at all likely to be of interest to the United States until the first discussions of the difficulties involved in mounting a cross-Channel attack against the German-occupied French coast—was indicative of the type of material Sinkov and his colleagues would bring back to America after delivering one of the few precious Purple analogs then in existence, Washington and especially the navy's skeptics might well have deemed the mission a failure. Events, however, took a different course.

Breakthrough: The British Decision to Disclose Enigma

One of the British participants, John Tiltman, suggested that the Americans' delivery of the Purple analog was a surprise for which Bletchley Park's leaders were unprepared, as they had not been involved in the political decision in London to begin a cryptanalytic exchange and therefore felt restricted as to what could be shared with the Americans, especially given the November decision by the leaders of the British intelligence services to focus discussions on Japanese and—according to Tiltman—Russian systems.[104] "We were in the war," Tiltman would tell an interviewer in 1978, "you were not in the war and we weren't that ready. We hadn't really been fully consulted about what…the exchange meant and we weren't originally prepared to reciprocate by hand-

ing over our Enigma results. Also, we had certain kinds of agreements which I don't remember with the French as to what we should do with the Enigma work….So we were instructed that the Enigma was not to be handed over."[105]

However, sometime in the second half of February Tiltman—who by acting as the Americans' host perhaps had become closest to them—concluded that, once the Americans had delivered the Purple analog, Bletchley Park's continued refusal to disclose its success against the Enigma posed an increasing threat to any future cryptanalytic cooperation between the two nations. Accordingly, he attempted to persuade Denniston to reverse the decision not to allow discussion of the German cryptosystem. Denniston refused. However, he did allow Tiltman to go to London and raise the matter with Menzies. "I said to him [Menzies]," Tiltman recalled, " 'Unless you give way on this and show the American Party, allow them to see all our work on Enigma, I don't see how we are going to have any kind of successful collaboration. Apart from anything else, they can't help seeing something like a quarter of the office to which they've been barred.' "[106]

Menzies agreed. However, he imposed two conditions, the first of which he immediately communicated to Tiltman. "Alright," Tiltman remembered Menzies saying, "but if you disclose it to them they must sign a document which lists all the people to which they'll make the disclosure when they get back to Washington and any further spreading of information must also be reported back to us, otherwise we won't do it."[107] The second condition was worked out between Menzies and Churchill subsequently and then communicated to Denniston. On February 26, having consulted with the British chiefs of staff, Menzies informed the British prime minister "that, on balance, they favor revealing to our American colleagues the progress we have made in probing German Armed Forces cryptography. Before I give permission to open discussions, which will be confined to the mechanized devices which we utilize <u>and not showing its results</u>, the chiefs of staff desire me to obtain your consent." The next day, February 27, Churchill would write on Menzies's memorandum "As proposed. W.S.C."[108]

Denniston had secrecy oaths drawn up and presented to the Americans. Weeks signed his on March 3. In it, he agreed—possibly, as the senior navy officer present, on behalf of Currier as well—"to carry out all instructions for the preservation of secrecy of the work mentioned, informing only by word of mouth the head of our section, Commander L. F. Safford, USN." Weeks also agreed, presumably referring to that of the Enigma machine, that upon receiving "the wiring of interest to us... [we will] disclose that only when it is decided to work on the problem…and keep you informed of our actions." Finally, Weeks stated that he and Currier would "make arrangements for the forwarding of communications through our naval attaché…."[109] Sinkov indicated that all members of the group were sworn to secrecy.[110] However, Tiltman recalled the Americans as initially being reluctant to sign the document which Denniston had prepared, particularly because as junior officers they felt they lacked authority to enter into such an agreement without approval from their superiors. "Eventually," Tiltman would say, "after I had left them alone for about an hour and a half, I went in to see them and I said, 'You know, this is something you can't go away without, or the whole thing will break down….Sometimes we have to make decisions without authority.' " To which Sinkov responded, according to Tiltman, "I can see saying that to my General," and the four Americans signed.[111]

The Americans, the Enigma, and the *Bombe*

The British decision to disclose their success against the Enigma—a decision of such import that it required the approval of Churchill himself—dramatically altered the trajectory of the Sinkov mis-

UK *bombe* deck. The United States would build its own version of the *bombe* for work against the four-rotor Enigma based in part on the British experience using these machines.

sion and may well have saved it from being deemed a failure back in Washington. Although the United Kingdom and the United States likely would have still found themselves in a cryptanalytic partnership once the latter had entered the war, London's revelation of Bletchley Park's penetration of the Enigma provided American and British codebreakers additional months to become comfortable working together. Arguably, it saved both sides from having to overcome the ill will which likely would have been created if the exchange during the Sinkov mission had been judged to have been more or less one-way. Bletchley Park and its American partners would experience enough lingering suspicion of one another during 1942 and early 1943 as it was. Had the Sinkov mission failed, these doubts might have continued to late in the latter year or even into early 1944, at which point the invasion of Normandy—planning for which was in important ways shaped by intelligence derived by one side from the Enigma, Purple, or other sources and shared with the other—would have been drawing closer and closer.[112]

With their security oaths signed, the four Americans were able to visit areas of Bletchley Park which they had not seen before and discuss topics not previously covered. All except Sinkov remembered seeing the *bombe* in operation—Currier would say "we were there for at least an hour or two twice and watched the entire operation…had all of the techniques explained in great detail,"[113] including "precisely what happened, what was going on, how the menu was fed in, what happened when the red lights went on and when they discovered they had a match"[114]—although it seems unlikely that as the senior officer of the group Sinkov either would have been excluded from a look at this transformative piece of British technology or deliberately chosen to pass up the opportunity to view it. Currier, in fact, later would say that "Sinkov must have taken copious and useful notes [on the *bombe's* operation]

although I never saw them." In the end, however, Currier would acknowledge he understood very little of how the *bombe* actually worked. Weeks would admit much the same.[115]

Among the four American team members, it was Rosen who likely benefited most from seeing the *bombe* and talking with his British counterparts about its engineering. He was, after all, the individual at the SIS who, once its cryptanalysts had solved Purple's cryptosystem on paper, built the machine which would be able to break high volumes of messages quickly and repeatedly. Unlike Currier, he would say that simply watching the *bombe* work would have been a waste of time. Instead, he appears to have separated from Sinkov and his navy colleagues at this point and spent most of his time with Bletchley's engineers. As a result, he understood enough of the *bombe's* design that, he would claim, he did not need to take detailed notes back to the United States. In fact, he thought he could improve it through the introduction of electrical switches, something he had done when building the Purple analog, and proceeded to incorporate them into American variants of the *bombe* which he set to work on after returning to the United States.[116]

Moreover, Sinkov, Currier, and Weeks did not need to have Rosen's understanding of the *bombe* to be able to grasp the status of Bletchley Park's efforts against the Enigma when they were explained. "At the time," Weeks would say of the British attack on the naval Enigma, "they had more than one enigma machine, and the rotors, but one of the principal problems was that they could not recover on any regular basis the ciphered starting point for individual messages. As I recall, they had keys for only a few days." Sinkov would agree that the British had been forthcoming about the Enigma, albeit at a more abstract level. "We were given an introductory talk about the cryptanalysis of the Enigma system….It was essentially a preliminary discussion—we didn't get a great deal in the way of detail at that time so that when we came back all we were able to tell was the overall cryptanalytic technique for getting solutions, but their techniques required rapid analytic machinery to accomplish their purposes."[117]

All four Americans seem to have realized that, as Churchill and Menzies had intended, they were not receiving the intelligence products which Bletchley Park was producing based on its decrypts of messages enciphered by the Enigma. In later years, Weeks would say that this was his explicit understanding at the time. They also knew they would not be taking a *bombe* back to the United States, particularly as only a few had been produced at the time of their visit. As for the Enigma itself, there would be those back in Washington who upon their return reportedly would express disappointment or even dissatisfaction that the British had not offered one to the American delegation in exchange for the Purple analog. Here again, however, Sinkov and his colleagues understood why: Bletchley Park simply did not have a spare captured military Enigma to provide. Moreover, it is not clear how simply having a machine would have been of any real benefit to the Americans, if only for the reason that during this period, and due to obvious factors of distance, they were intercepting little if any Enigma traffic. Finally, the Americans did bring back a form of the Enigma, as Weeks returned with a sketch of its wiring which came to be known as the "Paper Enigma," and provided some real insight into the machine's operation.[118]

Travels Away from Bletchley Park

The Americans also made several trips away from Bletchley Park. The four went on some of them together, including one of what were at least two visits to London and a separate one to Oxford. Following the pattern of their days at Bletchley, the two-person army and navy teams also seem to have split up, with Weeks and Currier traveling elsewhere from time to time while Sinkov and Rosen apparently remained at the British codebreaking center. The most significant of the navy duo's travels seems

A bombed district of London, World War II

to have been a lengthy trip, apparently in late February or early March, to British direction-finding facilities in southern and eastern England.

London

The group's visits to London, of which again there were at least two, seem to have been largely administrative in nature. The four Americans also saw the damage which German bombers had caused during the Blitz of the previous fall and which they continued to wreak, albeit with less intensity, throughout the Americans' stay in Britain. Their first visit allowed Weeks and Currier to notify the American naval attaché of their presence. This, in the telling of both American officers, did not go smoothly. The attaché, Captain Alan Kirk, had been informed that Weeks and Currier were in the United Kingdom as "observers" but had not been advised where specifically the two were or what the purpose of their trip was.[119] "As a result," Currier would recall, "he was a bit put out, to put it mildly, and demanded that we tell him what we were up to. When we refused he treated us to a lecture about the obligations of junior officers to their seniors and when this failed to elicit the information he wanted he intimated we might be subject to court martial." Weeks and Currier still refused to budge, leaving Kirk to sort the matter out with Washington. While in London, Weeks and Currier also visited the Admiralty and NSD 9. There, they arranged their tour of the British direction-finding network, many of the sites of which were run by the Royal Navy,

and a trip to the Marconi Wireless Company's factory in Chelmsford. They also were guided through the navy's underground facilities for its communications and saw its center for taking the high-frequency direction-finding (HF-DF) bearings received from its field sites and correlating them with other information to provide a comprehensive picture of estimated U-boat positions.[120]

A second trip to London occurred during the first half of March. Its official purpose may have been to visit Menzies. Currier remembered hearing distant explosions—caused, presumably, by German bombing—while waiting to meet Menzies, after which they were ushered into a reception room and had a fireside chat with the British spy chief. The experience made Currier later reflect on the group's minimal preparation before leaving Washington:

> We were served tea and talked briefly about our mission. It was not clear at the time just what role the head of the British Secret Intelligence Service played in the Sigint business nor precisely why we were talking with him. I recall having the impression that he thought we knew a lot more than we did since he spent some time telling us about the difficulties of "running agents" and collecting intelligence from enemy territory. I wish now that I had been more thoroughly briefed before we left Washington.[121]

It also seems likely it was on this trip that the group had a series of experiences which, if hearing German bombing while waiting for Menzies was not enough of a reminder, brought home yet again the fact that the four Americans were in a nation at war.[122] The British, for example, had arranged for the officers to stay at the Savoy, a hotel east of Trafalgar Square. Upon arriving there, the four were advised "to be ready to go to the shelters in the event of an air raid that night." Currier remembered that all of the doors and ground floor windows around the hotel were protected by sandbags.[123] It may have been at this time that their Shenley Park host, Basil Cadman, arranged for them to have a tour of the London dockyards and East End, where Currier and the others received "a close up view of the destruction." Driving back to Central London and passing St. Paul's, the four also paused "for a quick look at an enormous hole in the ground made during the previous night's bombing when a large bomb had penetrated an underground station and blown its top off."[124]

The Americans had an even closer encounter during their early March trip with the devastation inflicted by the *Luftwaffe* on London when they spent an evening at the Café de Paris, a nightclub off Leicester Square. Accompanied by a Royal Navy officer (their typical escort on their nights out), they listened to a West Indian dance band led by Ken "Snakehips" Johnson and, Currier would recall, watched the actor David Niven and other officers of the British army's Rifle Brigade hold a tricycle race on the dance floor. The night at the Café de Paris became even more memorable when—the following evening, as Sinkov and Currier would remember it, or the next week, as Weeks and Rosen would recall—a German bomb penetrated the roof of the building which housed the nightclub and exploded in the basement where the dance floor was located. At least 34 were killed, including Johnson and members of his band.[125]

Other Locations Visited

Sinkov and Rosen, the army duo, seem to have confined their travels away from Bletchley Park to the trips to London, with the exception of visits to the English Channel and to Oxford. Their recollections of their time in the United Kingdom as contained in oral history interviews and correspondence do not contain any direct references to them traveling elsewhere (except, of course, in connection with their inbound and outbound voyages). Independently, however, Weeks and Currier made the extended inspection trip of the British direction-finding net-

Intercept facility in Scarborough (aerial view)

work which they had arranged at the Admiralty during their first visit to London. Moreover, a report on the mission filed by Sinkov and Rosen after its conclusion indicates that at a minimum they had been briefed on a broad range of facilities outside Bletchley Park which were critical to the British signals intelligence endeavor. Regardless of which members of the American parties visited which locations, they all received first-hand insights into the organization and use of signals intelligence for combat operations, insights which were unprecedented for American military personnel at the time.

HF-DF (known informally in British signals intelligence circles as "Huff-Duff") allowed for the precision location of a target—for example, a ship—through the correlation of lines of bearing taken at multiple points of the direction from which the target was observed communicating. This was true whether or not the target's communications were encrypted or could be read. HF-DF was particularly important to the American and Royal Navies as a source of intelligence on their Japanese and German adversaries, especially at a time when their cryptanalytic efforts were unable to penetrate Axis naval ciphers due to the effects of the JN-25B and naval Enigma systems. Moreover, the British HF-DF system was one about which OP-20-G chief Safford specifically asked Weeks and Currier to obtain information.

Transcripts of oral history interviews with Currier conducted decades later, as well as his correspondence with David Kahn, provide the most insight into the tour he and Weeks made of the British direction-finding network. This tour culminated in a two-day visit to a Royal Navy intercept facility in Scarborough, on northern England's North Sea coast.[126] An installation dating to World War I, Scarborough had a staff which included a sizeable contingent of personnel from the Women's Royal Navy Service (WRNS), the members of which were commonly referred to as "Wrens." Currier recalled visiting the site's operational areas and being briefed on their "intercept methods and equipment layout" as well as on how the facility's HF-DF equipment

worked. Neither Weeks nor Currier referred by name to the locations of any other sites in this network which they visited, although Weeks later indicated their trip covered "stations in the south, and along the east coast up to Scarborough." Weeks also claimed they were assigned a British army driver but otherwise traveled unescorted, although Currier noted that at Scarborough they were escorted by the director of NSD 9, Captain Sandwith.[127]

One other site which Weeks and Currier visited was at Dover, in southeast England next to the Channel. On this occasion they were accompanied by Sinkov and Rosen and had both Royal Navy and Royal Air Force escorts. An RAF installation, Dover was home to the Chain Home radar located closest to mainland Europe and hence played a key role in both the Battle of Britain and the subsequent Blitz. It also was the site of a command center for RAF Fighter Command and a signals intelligence facility with personnel from the "Y Service." This organization staffed facilities in the United Kingdom and around the world and was dedicated to intercepting Axis radio messages (wireless intercept, or WI, shortened for convenience to "Y") and forwarding them on to Bletchley Park. Currier recalled visiting the RAF command center, which was located in tunnels underneath Dover Castle and—he was told—built by French prisoners held there during the Napoleonic Wars. However, the most memorable part of the visit for him occurred above ground when he visited the radar site. While there, one of the operators on duty—like many of the others, a member of the Women's Auxiliary Air Force (WAAF), the RAF's equivalent of the WRNS—drew his attention to the blips on the radar screens and suggested that he and the other Americans go outside to see "the show."

> It was a brilliant day [Currier later recalled] and when we looked into the blue sky we saw the contrails of the bomber formation streaking across the heavens from the south and shortly thereafter the contrails of the fighters who had taken off from their bases nearby. It was indeed a show; the contrails merged and turned and looped around each other and after a brief encounter the bombers turned back toward France. No bombs were dropped that day.

Women's Auxilliary Air Force (WAAF) Chain Home radar operator

Currier also recalled visiting Flowerdown, a Royal Navy site in Hampshire near Winchester that focused on intercepting the communications of the German navy, but had no specific recollections of his time there.[128]

A detailed annex to the report filed by Sinkov and Rosen in April 1941 after their return to the United States contains substantial discussion of three other British intercept sites—Cheadle, Chicksands, and Harpenden, all RAF facilities—but it is unclear whether these were derived from on-site observations or from briefings the Americans received at Bletchley Park. Given the level of specificity contained in Sinkov and Rosen's descriptions—and the

facts that Chicksands and Harpenden could have been easily visited on day-trips from Bletchley, with Cheadle likely requiring an overnight stay due to its distance from the British codebreaking facility—it seems more likely that the Americans visited them in person as opposed to simply being briefed on them. If Sinkov and Rosen indeed made such visits, it appears probable that they would have done so at a time when Weeks and Currier also were away from Bletchley and perhaps during the navy pair's lengthy tour of Britain's HF-DF network.[129]

Of the three RAF facilities, Cheadle was the most significant, and it thus is not surprising that it was the one to which Sinkov and Rosen devoted the most attention in their report. Like many other stations on the British mainland, Cheadle's intercept operations at the time of the Sinkov mission were focused on the German Air Force. It was particularly important in two ways. First, when it was decided to centralize all British cryptanalytic activities and conduct them at Bletchley Park in the event of war, an exception was granted to Cheadle with respect to low-grade, non-Enigma encrypted German Air Force communications. Second, Cheadle had direct communications with Fighter Command. During the Battle of Britain and the Blitz, this gave Cheadle distinct advantages over Bletchley Park.

While German Air Force Enigma decrypts allowed Bletchley Park to reconstruct the *Luftwaffe*'s order of battle, it had difficulty providing indications of pending activities or shifts in strategy. Cheadle was able to fill this gap by combining its decryption of the low-grade cryptosystems with direction finding from a network which included stations at Waddington, Montrose, Sutton-Valence, and Land's End, all of which were connected to Cheadle by teleprinter lines both directly and through London. Through separate phone connections with Fighter Command and its subordinate entities, Cheadle also was able to pass on the resulting intelligence so that it could have an immediate impact on RAF operations. As Sinkov and Rosen put it in their report, "on various missions…information obtained from intercepts is of value only if action is taken with the utmost speed. Instances have occurred when planes have been in the air within 10 minutes of the interception of a code message." This was possible, the Americans explained to their superiors, because "material intercepted at Cheadle is decoded and translated at Cheadle whenever possible."[130]

Sinkov and Rosen also learned that Cheadle, in their words, "supervised the maintenance" of measures which the British had introduced to counter navigational aids which the *Luftwaffe* was using to guide its bombers to their targets. Under a system designated *Knickbein*, radio beams would be transmitted from several locations in continental Europe. German pilots would be instructed to follow a specific beam when approaching the United Kingdom. At the point at which this beam crossed with a second, the bomber crews would know that they had arrived at their intended targets and could release their ordnance. As the system increased in sophistication, as many as six beams were used to increase the precision of German targeting. The American team learned, however, that the British had developed a system for "meaconing" *Knickbein* by first intercepting the German beams and then retransmitting them. This was done, in the words of Sinkov and Rosen's after-action report, "in such a way as to warp the course [of the] beams and produce 'phantom' sources for the bearing beacons." "These tactics," Sinkov and Rosen continued, "have been successful in confusing the German pilots and have caused a number of planes to run out of fuel and make a forced landing in England."[131]

RAF Chicksands received somewhat less attention than Cheadle in Sinkov and Rosen's post-trip write-up, which describes it as "quite similar…except that the material covered is not German Air Force, but German Army and other services." Chicksands also differed from Cheadle in that it collected com-

The HMS *Revenge* bore the four Americans and crates of direction-finding equipment back from Scotland to Nova Scotia.

munications but did not decrypt or translate them, forwarding them to Bletchley Park instead. As a result, it was focused on "studies…of the frequencies and operation times of various German units." Its greatest challenge, according to the two Americans, was managing a limited number of receivers capable of intercepting relevant communications, some of which were focused on a specific frequency known to be of high interest while others scanned multiple ones to detect new signals of possible importance. As for RAF Harpenden, it had become what Sinkov and Rosen described as the "semi-permanent location" of the British Expeditionary Force's intercept and direction-finding activities after its evacuation from Dunkirk and had "the assigned mission…to intercept and D.F. any invading forces" but otherwise served "to augment the regular intercept stations" elsewhere in Britain.[132]

The four Americans made only one trip outside Bletchley Park which they seem to have deemed not particularly profitable. This was to Oxford and involved both the army and the navy duos. The purpose of this visit was to see the Oxford Press, which according to Weeks produced "all the…cryptographic material" needed to secure the Royal Navy's communications. The visit, according to Sinkov, was both brief and "quite sketchy.…It was just a general indication of the sort of things that they were working on, and that they were doing in their own communications."[133]

The Mission Returns to the United States

In mid-March, the four Americans began preparing to travel back to the United States. One of the last trips Weeks and Currier made was to the Marconi Wireless Company's factory in Chelmsford, located thirty miles northeast of London. "It had been arranged as part of the exchange agreement," Currier would recall, "that we were to be given one of the new Marconi-Adcock HF/DF sets and our visit to the factory was to view the equipment and accept it for the U.S. Navy." The set included not just the Marconi receivers but also the 20- to 30-foot masts and antennas needed to create the Adcock array. Whether the "exchange agreement" Currier references was one worked out between the

The USS *Overton* took the four Americans from Nova Scotia to Washington, DC.

British and Americans before the Sinkov delegation departed for the United Kingdom or, alternatively, it was negotiated by him and his fellow officers while at Bletchley Park is unclear.[134]

Regardless of how long the transfer of the Marconi direction-finding equipment had been planned, the four Americans left Bletchley Park on either March 18 or 19, traveling in three staff cars and accompanied by Tiltman. Their destination was Greenock, on the west coast of Scotland, where the crates were to board another British battleship, the HMS *Revenge*, one considerably older than the newly constructed *King George V* which had brought them to Britain. At Greenock, they experienced a difficulty eerily reminiscent of one they encountered upon their arrival at Scapa Flow, namely, their discovery that the shipping crates they had brought from the United States would not fit through the hatch of the seaplanes sent to fly them south to London. Specifically, when Weeks and Currier boarded the *Revenge* to see whether the crates carrying the Marconi equipment, which had been delivered separately, were safely stowed, they discovered the crates were missing. As a result, the two navy officers began a search of the port's warehouses and eventually found the crates tucked away in a corner of one of them, next to other materials which no one apparently knew what to do to with. Having secured a truck and then a lighter to carry the two tons of equipment back to the *Revenge*, they found its crew reluctant to allow it on board due to its size and weight. However, Weeks and Currier succeeded in persuading the battleship's captain to order it loaded.[135]

The *Revenge* departed Greenock late on March 24. The next day, along with a second battleship, the HMS *Nelson*, two cruisers, and over a dozen destroyers, it began escorting a convoy consisting of 20 troopships. Three days later, having followed a southwesterly course toward the Azores, the *Revenge* left the convoy and, with one of the merchantmen, headed for Halifax, Nova Scotia.

On board, the four Americans discovered they were in the presence of several distinguished traveling companions. One was General Wladyslaw Sikorski, then serving as the prime minister of the Polish government in exile. Another was Malcolm MacDonald, the newly appointed High Commissioner for Canada. Their presence, in Currier's words, would make "coming back…more fun than going over," as in the evenings there would be performances by a concert pianist who was accompanying Sikorski as well as discussions on international politics led by Sikorski and MacDonald.[136]

Arriving in Halifax on April 1, the Americans left the *Revenge* and boarded the USS *Overton*, which had been sent to meet the four officers and take them to Washington. Departing after dark the

same day, the *Overton* nearly collided at the harbor entrance with several Canadian trawlers returning from a day's fishing, as both it and they were sailing without lights due to wartime blackout conditions. Otherwise, the final leg of their journey was uneventful—except, apparently, for some rough seas—and they arrived back at the Washington Navy Yard at midday on April 5.[137]

An incident which occurred as the four Americans were disembarking from the *Overton* was the source of some later controversy. In Currier's telling,

> We were tired. We probably looked a bit bedraggled because we'd been up a lot of the night. We did have a lot of gear that we had to get ashore and as we came ashore, Don Seiler, who had a machine shop down in the Navy Yard—he was the one, by the way, who made the first analog of the RED machine [the Japanese diplomatic cryptosystem in use before the introduction of Purple and one also broken by both the SIS and Bletchley Park]—he just happened to be there. He saw us coming off and he made a remark to one of his friends, Here they come, they look like whipped dogs and they don't have anything. This got round and you can imagine what some writers made of this remark of his that later got out, got in print and the first thing you know that became gospel. We went over there, we gave them everything we had, we came back empty-handed with nothing. It took a long time before that view of our trip and the results of our negotiation ever got put to rest, but eventually it was.[138]

Irrespective of later controversies, however, the Sinkov mission was now at an end. As Currier would later say, "We delivered our material to our respective offices, made a very brief report and went home for a good night's rest."[139]

Assessment: Was the Sinkov Mission a Success?

It is not clear that the four Americans left Bletchley Park with any specific understandings that the exchange would continue. Nor, for that matter, is it clear that the British had an unambiguous vision for where the relationship would head next. Regardless, there appear to have been relatively few contacts between the British and American codebreaking centers until after the United States entered the war in December. However, one of the leading authorities on the history of the SIS, David Alvarez, has concluded that the SIS sought a more or less continuous engagement and was willing to back that up with its own materials.

> The War Department wasted little time in capitalizing on the new relationship. Sinkov and Rosen had hardly unpacked their bags before SIS was seeking from its new British contacts material on French diplomatic systems, especially those used between Vichy and the French territories in the Western Hemisphere. In return, SIS began sending to Bletchley Park cryptanalytic findings relating to German, Italian, and Japanese communications.[140]

As for the British, Alastair Denniston would travel to the United States that summer and visit both the SIS and OP-20-G. These sessions were productive but also apparently somewhat tense, and may have confirmed Denniston's view that—except for those of talented individuals such as William Friedman—the capabilities of American codebreakers lagged well behind their British counterparts.

After Pearl Harbor, it took several months before a solid working relationship was established, that relationship being more between Bletchley Park and the army's rechristened Signal Intelligence Service, now the Signal Security Agency, than with the American navy's cryptologists. Moreover, it required a crisis in relations during late 1942 and early 1943—when the US Army's perception that

it needed its own capability against the Enigma to support its forces which were now in combat against the Germans in North Africa ran up against ongoing British concerns about how purportedly lax American security practices would put the Ultra secret at risk—to prompt the now Allies to enter into a permanent agreement allowing the United States to station several hundred personnel at Bletchley Park for joint operations against Enigma communications in exchange for America adopting British security practices for the transmission and use of the resulting intelligence at the front.

As for the Americans, Sinkov and Rosen would write in their official report that the British "were enthusiastic about future cooperation along cryptographic lines and suggested definite plans for such cooperation including the possibility of a division of effort to avoid duplication." Bletchley Park also had one specific suggestion in this regard, and it related to the Far East. "The British have a cipher section in Singapore," the two would write, "which is getting fairly good results but is handicapped by lack of competent Japanese translators. They would be glad to turn over to us the results of these labors if we did no more than supply the translators."[141]

Speaking of the value of their visit more generally, Sinkov and Rosen also would note in their official report that "[t]he material which was furnished by the Army personnel will result in a saving of several years of labor on the part of a large staff."[142] In a 1979 oral history interview, Sinkov would place the trip's significance in a broader historical context. "Well," he would say, "if you leave out for a moment the Enigma then I think we were probably giving them cryptanalytically more than we were getting, because of Purple, which was a pretty good accomplishment. But when the Enigma information is added in I think that throws the balance in their [the British] direction, because the Enigma was quite an accomplishment and of extreme importance in the conduct of the war."[143] As for Rosen, he would tell David Kahn, "we gained a lot in the exchange…everything they had." He also would offer the following observation: "[The] purpose of the transfer was not only to get our info but also to ensure continuity in case Britain went under. They didn't go under so its value was less than it might have been. If [the] Brits had gone under, its value would have been incalculable."[144] As for information which the navy duo received and deemed particularly valuable, Weeks would cite that regarding British direction-finding capabilities and operations. "Quite apart from the Enigma problem," he would write, "the evolution of our HF/DF network and its coordination with that of the RN [Royal Navy] was most valuable."[145]

Another important conclusion which the Americans reached, one which William Donovan had come to the summer before, was that the British were in the war for keeps and were confident of their ultimate victory. Writing over forty years later about his experiences, Weeks would say that he came away from their visit with "the firm impression that everyone [of those he had met in Britain] was convinced of the justice of the British cause and of its inevitable successful conclusion. By the end of the trip I was convinced too." As for Sinkov and Rosen, they would remark in their official report that "the British morale, as we saw it, is improving daily. From having been on the point of collapse last September (this statement was made by more than one of their officers), they have now come to the point where they feel quite confident of victory. The change in spirit was naturally very much aided by the attitude of the United States."[146]

In later years, some members of the American team at times became more guarded in their assessments of the utility of their visit to Britain. Weeks would write to David Kahn in the mid-1980s that "It was quite evident that—at least on the naval side—there were untouched areas which were not brought up or discussed." Weeks specifically noted that discussions of the Japanese navy were "not… on the agenda," which he found interesting given

that "recent writers have stated that the British had probably made at least partial entry into the Japanese naval ciphers."[147] Almost 40 years after the trip, Sinkov also was more cautious than he and Rosen had been in their official report, telling Kahn that "we got some info from the Brits—not much; some info on the Italian problem; some info on Enigma; we knew that something was happening but it all didn't develop until very much later."[148]

In Washington, there were some skeptics about the Sinkov mission's success, most notably in the navy and particularly in OP-20-G. As Currier would explain to an interviewer in 1980:

> The fuss arose when, I think, the decision was made not to give us any hardware at all, and this caused pretty much of a fuss back here. I was not aware of it, because it did not bother me at all. I wouldn't have been involved in it anyway, and I didn't…I didn't really know that we were…that we might have been able to bring back some of the actual hardware. When we got back, the upper-level discussions that went on to review what we had gotten and whether or not we had gotten all we should have, apparently ended up in a decision that we would go back and say that we thought we had…our people thought we had been slightly short-changed and could we have an additional meeting and such about the Enigma and the Bombe…. [149]

The most vocal among them was that cryptanalytic unit's chief, Laurance Safford, who, prior to the mission's departure, had serious doubts about its wisdom. Safford later charged that the delivery of what he wrongly claimed were two Purple machines gave the British a fuller picture of Japanese intentions in the Pacific, and hence they were able to even more successfully manipulate the Roosevelt administration's policies. While not claiming a Roosevelt-led conspiracy to goad Japan into an attack on the United States and hence overcome what remained of isolationist sentiment against American involvement in the European war, Safford nevertheless argued that the allegedly unrequited gift of the Purple machine was just one more example of the level of incompetence General Marshall, Admiral Stark, and others would show in allowing intelligence about Japanese intentions derived from Purple decrypts to be withheld from local commanders in Hawaii, intelligence which Safford claimed they would have used to prevent the surprise attack on Pearl Harbor.[150]

> Rosen observed, "[The] purpose of the transfer was not only to get our info but also to ensure continuity in case Britain went under."

The claim about the transfer of allegedly two Purple machines also was made by former naval intelligence officer Ladislas Farago, apparently using information provided to him by Safford. Farago also exonerated the Roosevelt administration of the charge of a conspiracy regarding Pearl Harbor, arguing that failure to warn commanders there of a pending Japanese strike resulted not so much from the negligence of senior commanders in Washington as from haphazard intelligence assessment. Scholarly analyses of Farago's and Safford's arguments have shown them to have serious flaws and factual errors and indicate some of their claims, particularly Safford's, are utterly without foundation.[151]

It is appropriate to leave the last word to William Friedman, the individual originally slated to make the trip but who was withdrawn at the last minute for health reasons. The American with the longest experience in signals intelligence, having worked continuously in the field from World War I to the early years of the Cold War, he arguably had the broadest historical perspective on its evolution. He would travel to Bletchley Park himself in the spring of 1943 and marvel at its organizational effectiveness and unique culture, recognizing its successes as far superior to those which American cryptanalysts had attained at the time. He also formed close personal friendships with several of his British counterparts, particularly Alastair Denniston.

Looking back on the Sinkov mission from the 1950s, Friedman understood the critical importance of this initial encounter between the four American officers and their British counterparts, as it provided the foundation for the full partnership in codebreaking established by the United States and the United Kingdom less than two years later, a partnership which proved so important to the ultimate Allied victory. With the benefit of this hindsight, he offered the following verdict on the visit of Sinkov, Rosen, Weeks, and Currier to Bletchley in the winter months of 1941:

> In the exchange of the "Purple" machine and informational details concerning the Purple system for specific technical data on certain German and Italian cryptosystems…both the U.S. and the U.K. gained advantages of inestimable value….Moreover, this exchange paved the way to later complete U.S.-U.K. collaboration in cryptanalytic operations after the U.S. entry into World War II as one of the belligerents.
>
> The value of this collaboration can hardly be overestimated….

"On this point," Friedman concluded, "there has never been any doubt on either side."[152]

Notes

1. Churchill replaced Neville Chamberlain as British Prime Minister on May 10, 1940, the same day as German forces invaded the Netherlands, Belgium, and France. German armored units reached the English Channel ten days later, cutting most British forces in France off from the bulk of their ally's units and surrounding them in the ports of Dunkirk and Calais. The British evacuation of Dunkirk ended on June 4. Paris fell on June 14. The following week, France signed an armistice with Berlin which ceded much of the country to German occupation.
2. Franklin D. Roosevelt, "Address to the Graduation Exercises of the University of Virginia," Charlottesville, VA, June 10, 1940. Franklin D. Roosevelt Presidential Library and Museum. Master Speech File 1898-1945, Box 52. Accessed August 10, 2016, http://www.fdrlibrary.marist.edu/_resources/images/msf/msf01330.
3. The morning of May 15, Churchill learned from French Prime Minister Reynaud that the *Wehrmacht* had opened a fifty-mile gap in the French lines, with Reynaud repeatedly exclaiming "We are defeated. We have lost the battle." That afternoon, Churchill wrote his first letter to Roosevelt since assuming power. Telling Roosevelt that "as you are no doubt aware, the scene has darkened swiftly" and that "the voice and force of the United States may count for nothing if they are withheld too long," Churchill asked that America "help us with everything short of engaging armed forces" and tendered a request for a long list of military hardware and supplies. Winston S. Churchill, *The Second World War*, vol. 2, *Their Finest Hour* (Boston: Houghton Mifflin, 1949), 22, 38-39. Roosevelt did not respond to Churchill. However, he directed Marshall to scour army depots for surplus stocks. In early June, 500,000 World War I rifles as well as smaller numbers of machine guns and mortars plus ammunition were first sold to American steel companies and then resold to Britain, where they began arriving late that month. See Forrest C. Pogue, *George C. Marshall*, vol. 2, *Ordeal and Hope* (New York: The Viking Press, 1966), 50-51.

4. Douglas Waller, *Wild Bill Donovan: The Spymaster Who Created the OSS and Modern American Espionage* (New York: Free Press, 2011), 60. On Donovan's visit to London and specifically his meeting with Menzies, see Anthony Cave Brown, *"C": The Secret Life of Sir Stewart Menzies, Spymaster to Winston Churchill* (New York: MacMillan Publishing, 1989), 264-269.
5. On Donovan's return to the United States, his briefings to Roosevelt, and his mission's impact on the destroyers-for-bases deal, see Michael Fullilove, *Rendezvous with Destiny*, 90-102. For Churchill's June 11, 1940, letter to Roosevelt with his initial request for older American destroyers, see Churchill, *The Second World War*, vol. 2, *Their Finest Hour*, 116.
6. Aide-Memoire from the British Ambassador (Lothian) to President Roosevelt, July 8, 1940. *Foreign Relations of the United States, Diplomatic Papers 1940*, vol. 3, *The British Commonwealth, the Soviet Union, the Near East and Africa* (Washington, DC: US Government Printing Office, 1940), 78. For the drafting of Lothian memorandum to Roosevelt, see Stephen Phelps, *The Tizard Mission: The Secret Operation That Changed the Course of World War II* (Yardley, PA: Westholme Publishing, 2010), 126-130.
7. War Department, Memorandum for the Chief of Staff, "General Interchange of Secret Technical Information between the United States and British Governments," July 19, 1940; and Letter from Secretary of War Stimson to the Acting Secretary of State Sumner Welles, July 22, 1940. National Security Agency, UKUSA Agreement Release Collection (hereafter, NSA UKUSA Collection), accessed on August 10, 2016, https://www.nsa.gov/news-features/declassified-documents/ukusa/.
8. Letter from Welles to Lothian, July 29, 1940. *Foreign Relations of the United States, Diplomatic Papers 1940*, vol. 3, *The British Commonwealth, the Soviet Union, the Near East and Africa*, 79.
9. Phelps, *The Tizard Mission*, 127. For Churchill's account of his awareness of radar, see Churchill, *The Second World War*, vol. 2, *Their Finest Hour*, 338. See also Stephen Budiansky, *Blackett's War: The Men Who Defeated the Nazi U-Boats and Brought Science to the Art of Warfare* (New York: Alfred A. Knopf, 2013), 122-131.
10. Phelps, *The Tizard Mission*, 133.
11. Ibid., 146-162.
12. Ronald Clark, *Tizard* (Boston: Massachusetts Institute of Technology Press, 1965), 266. I am indebted to Stephen Budiansky for this reference.
13. Ibid., 162.
14. Jennet Conant, *Tuxedo Park: A Wall Street Tycoon and the Secret Palace of Science That Changed the Course of World War II* (New York: Simon and Schuster, 2002), 171-172. See also Phelps, *The Tizard Mission*, 162.
15. War Department Memorandum, "General Interchange of Secret Technical Information between the United States and British Governments," July 19, 1940. NSA UKUSA Collection.
16. Radiogram from army Attaché Raymond Lee, London, to Acting Assistant Chief of Staff for Intelligence Brigadier General Sherman Miles, September 5, 1940. NSA UKUSA Collection. For the August 31 meeting of Strong and his navy counterpart, Rear Admiral Robert Ghormley, with the British, see F. H. Hinsley et al., *British Intelligence in the Second World War: Its Influence on Strategy and Operations,* vol. 1 (London: Her Majesty's Stationery Office, 1979), 312. Most scholars who have studied Strong's proposal have concluded that it was made without prior consultation with or authorization by his superiors. David Alvarez, for example, argues, "The evidence suggests that the [American military observer] mission had no instructions to raise cryptanalytic questions and that General Strong seized the initiative in proposing cryptanalytic cooperation….General Strong's fellow observers, Admiral Robert Ghormley and Army Air Corps General Delos Emmons, were completely surprised….Strong's cable of 5 September and the reaction to it in Washington suggest that American authorities had not prepared a policy concerning cryptanalytic cooperation with London, an inexplicable lapse if Strong had been directed to propose such cooperation." David

Alvarez, *Secret Messages: Codebreaking and American Diplomacy, 1930-1945* (Lawrence: University Press of Kansas, 2000), 77-78.

17. Colonel Clyde L. Eastman to Major General Joseph Mauborgne, September 5, 1940. NSA UKUSA Collection.
18. Colonel Spencer Akin and William F. Friedman, "Proposed Exchange Basis with the British (Draft)," undated attachment to Eastman's Letter to Mauborgne, September 5, 1940. NSA UKUSA Collection.
19. Akin and Friedman, "Proposed Exchange Basis with the British [Draft]."
20. Eastman Letter to Mauborgne, September 5, 1940.
21. Akin and Friedman, "Proposed Exchange Basis with the British (Draft)." Regarding the differences between the army and the navy over the wisdom of the exchange, one of the two navy participants—Prescott Currier—would recall almost four decades later that "I did hear rumblings of… disagreements…that there was some…felt that we should not make the trip. I felt that the army pressed it, and I'm pretty certain that the navy felt that this was an inappropriate time for us to be doing this sort of thing. This sort of filtered down. I have no way of knowing where the opinions came from or how strongly they were held." Prescott Currier, Oral History Interview, NSA OH-38-80 (November 14, 1980), 48 (hereafter, Currier Oral History), accessed on August 10, 2016, https://www.nsa.gov/news-features/declassified-documents/oral-history-interviews/assets/files/NSA-OH-38-80-Currier.pdf. For his part, Currier would experience first-hand some British suspicions of American intentions on his voyage to the United Kingdom in late January and early February 1941. "In the course of the trip eastward," he would write, "I became friendly with the wireless officer who was a young man about my age and so he took me up into their communications center and took me through the area and into the radar room. That night at dinner the young…officer…got up. He had had more than his share of drinks before dinner and he called on the captain of the ship. He said, You've allowed these American spies to see British radar. I want you to do something about it. Well, they took him below and stuck him in his bunk. But that shows you how at that time the feeling—at least in the British navy—was that their radar was the only instrument that was keeping them from being beaten during the war and they damn well weren't going to release the details of it to anyone, including the Americans. I didn't get that feeling once I was in England…." Prescott Currier, "My 'Purple' Trip to England in 1941," *Cryptologia* XX, no. 3 (July 1996): 200.
22. Mauborgne to War Department, September 7, 1940. NSA UKUSA Collection.
23. War Department Memorandum, "Directive to G-2 Covering Interchange of Secret Technical Information with Representatives of the British Government." September 9, 1940. NSA UKUSA Collection.
24. Memorandum from Miles to Lieutenant Colonel E. A. Regnier, Aide to Secretary of War, "Codes and Ciphers," October 4, 1940. NSA UKUSA Collection.
25. Alvarez, *Secret Messages: Codebreaking and American Diplomacy, 1930-1945*, 82-83.
26. In the 1980s, army cryptanalyst Joseph Richard, who had joined the SIS in 1941, told author Bradley Smith that "Brig. Tiltman told me once that he had advocated giving complete info to the Americans but the Foreign Office opposed this." Undated note on conversation with Joseph Richard. Bradley F. Smith Miscellaneous Papers (hereafter Smith Papers), Hoover Archives, Stanford, CA.
27. The text of this agreement has yet to be found in the archives of either the United States or the United Kingdom. It was first alluded to by OP-20-G's Laurance Safford who, in a manuscript written at some point after the war and published in 1982, referred to what he characterized as "<u>the only known record of the deal</u>—a single page, signed by the senior representatives of the 3 British armed services and the 2 American services plus the Army Air Corps." "This written record," Safford continued, "provided for the full exchange of cryptographic systems, cryptanalyti-

cal techniques, direction finding, radio interception and other technical communication matters pertaining to the Diplomatic, Naval, Military and Air Services of the three (3) Axis powers, namely: Germany, Italy and Japan [emphasis Safford's]." Dundas P. Tucker, "Rhapsody in Purple: A New History of Pearl Harbor, Part 1," *Cryptologia* 6, no. 3 (July 1982): 215. Tucker was a wartime colleague of Safford's. The *Cryptologia* article contains his copy of the undated and previously unpublished manuscript by Safford as annotated by Tucker. One of the foremost historians of the World War II cryptologic relationship between the United States and the United Kingdom, Bradley Smith, while rightly noting errors or exaggerations elsewhere in Safford's account, nevertheless found it credible based on a May 1941 entry in Secretary Stimson's wartime diary stating that "way back last winter we arranged with the British to exchange secrets on this matter [cryptanalysis] and did so." In order to remind Secretary of State Hull of this arrangement, Smith writes, continuing to quote from Stimson's diary, Stimson "had in Sherman Miles [the G-2] and *got* [out] *the record of the arrangement* which was made, of course, with the consent of the President [emphasis Smith's]." Bradley F. Smith, *The Ultra-Magic Deals and the Most Secret Special Relationship* (Novato, CA: Presidio Press, 1993), 53. The soundness of Smith's argument, of course, hinges on reading Stimson's use of the term "record" as indicating the actual document containing Safford's purported one-page agreement, as opposed to meaning one or more documents containing information on the negotiations between the United States and the United Kingdom.

28. The journey of the Tizard mission on the *Duchess of Richmond* is described in Phelps, *The Tizard Mission*, 163-176; and Conant, *Tuxedo Park*, 185-186.
29. For the development of the cavity magnetron, see Phelps, *The Tizard Mission*, 96-109. On the problem created by ground returns for long-wave airborne radar, see Paul A. Redhead, "The Invention of the Cavity Magnetron and its Introduction into Canada and the U.S.," *Physics in Canada* 57, no. 6 (November/December 2001): 321. I am indebted to Stephen Budiansky for this reference.
30. Descriptions of the September 11 meeting of the Tizard mission with Loomis and others at the Wardman Park Hotel are available in Conant, *Tuxedo Park,* 189-190; and Phelps, *The Tizard Mission*, 177-178.
31. For Bowen and Cockcroft's visit to Tuxedo Park, see Conant, *Tuxedo Park*, 190-192; and Phelps, *The Tizard Mission*, 179-181.
32. The meetings between Loomis and Stimson are described in Conant, *Tuxedo Park*, 193-194. The quotations are from Stimson's diary. Paul Kennedy has argued that the cavity magnetron was one of a set of innovative technologies which, when combined in support of combat operations, proved decisive to the Allies prevailing in the Battle of the Atlantic, even more so than the contributions of Bletchley Park: "victory went to the side with the smartest and most powerful weaponry, not the one with better decrypts." Paul Kennedy, *Engineers of Victory: The Problem Solvers Who Turned the Tide in the Second World War* (New York: Random House, 2013), 83.
33. William F. Friedman, "Preliminary Historical Report on the Solution of the 'B' Machine." October 14, 1940. National Security Agency, William Friedman Collection of Official Papers (hereafter, "NSA Friedman Collection"), Document Reference ID A58137, accessed on August 10, 2016, https://www.nsa.gov/news-features/declassified-documents/friedman-documents/. By October 14, "solutions for over one-third of the 120 indicators [were] available," suggesting that roughly this percentage of Japanese diplomatic traffic encrypted in Purple was being read at that time.
34. Frank Rowlett, *The Story of Magic: Memoirs of an American Cryptologic Pioneer* (Laguna Hills, CA: Aegean Park Press, 1998), 160-163. Safford reportedly reacted to Friedman's news by asking him where the SIS had gotten its hands on an actual Japanese Purple machine. He was stunned to learn that what the SIS actually had

done was build a replica without having seen the original.

35. Rowlett, *The Story of Magic*, 170-173. In his memoir, Rowlett incorrectly identifies the Bundy who accompanied Stimson as William—whom Rowlett would later know as an SIS officer who served at Bletchley Park from August 1943 until the end of the war—rather than William's father Harvey, who was Stimson's special assistant.
36. Rowlett claims that the briefings to Marshall and Stimson coincided with a push for additional resources by the SIS. However, the only major expansion of the organization's personnel cadre during the period between the outbreak of World War II and the US entry into the conflict had come in late 1939, when General Marshall authorized a doubling of the organization's manpower and budget. See Army Security Agency, *History of the Signal Security Agency*, vol. 1, *Organization* (April 13, 1948), 48-74, accessed on August 10, 2016, https://www.nsa.gov/news-features/declassified-documents/cryptologic-histories/assets/files/history_of_the_signal_security_agency_vol_ISRH364.pdf.
37. Solomon Kullback Oral History Interview, NSA-OH-17-82 (August 26, 1982), 66-67 (hereafter, Kullback Oral History), accessed on August 10, 2016, https://www.nsa.gov/news-features/declassified-documents/oral-history-interviews/assets/files/nsa-oh-17-82-kullback.pdf.
38. Abraham Sinkov Oral History, NSA-OH-02/04-79 (May 1979), 11-12 (hereafter, Sinkov Oral History), accessed on August 10, 2016, https://nsagov.web.nsa.ic.gov/news-features/declassified-documents/oral-history-interviews/assets/files/nsa-OH-02-79-sinkov.pdf.
39. David Kahn, "The United States Views Germany and Japan in 1941," in *Knowing One's Enemies: Intelligence Assessment Before the Two World Wars*, Ernest R. May, ed. (Princeton, NJ: Princeton University Press, 1984), 484.
40. Kahn, "The United States Views Germany and Japan in 1941," in *Knowing One's Enemies*, 483.
41. Alvarez, *Secret Messages: Codebreaking and American Diplomacy, 1930-1945*, 85. For a summary of the navy's codebreaking efforts against Japan from the early 1930s through the introduction of the initial JN-25 system and its successor JN-25B, see John Prados, *Combined Fleet Decoded: The Secret History of American Intelligence and the Japanese Navy in World War II* (Annapolis, MD: Naval Institute Press, 1995), 73-83.
42. Describing the status of Bletchley's efforts against the German naval Enigma at the time of the Sinkov mission, David Kahn would write, "The British had few solutions to show, since up to the end of February Hut 8 [the building at Bletchley Park responsible for the *Kriegsmarine*] had broken only eleven days of naval Enigma traffic, and the *Krebs* material arrived only five or six days before the Americans were to leave for home." David Kahn, *Seizing the Enigma: The Race to Break the German U-Boat Codes, 1939-1943* (New York: Houghton Mifflin, 1991), 232. The *Krebs* was a German fishing trawler captured on March 4, 1941, and boarded by the Royal Navy, which found two naval Enigma rotors and codebooks containing Enigma keys for the previous month. See Kahn, *Seizing the Enigma*, 127-136; and Hugh Sebag-Montefiore, *Enigma: The Battle for the Code* (Hoboken, NJ: John Wiley and Sons, 2000), 117-122.
43. Joel Greenberg, *Gordon Welchman: Bletchley Park's Architect of Ultra Intelligence* (London: Frontline Books, 2014), 47.
44. Stephen Budiansky, *Battle of Wits: The Complete Story of Codebreaking in World War II* (New York: Simon and Schuster, 2000), 183.
45. Hinsley et al., *British Intelligence in the Second World War: Its Influence on Strategy and Operations*, vol. 1, 24 and 52-53.
46. William F. Friedman, "Certain Aspects of 'Magic' in the Cryptological Background of the Various Investigations into the Attack on Pearl Harbor," 35-36. NSA Friedman Collection, Document A489034.
47. Currier, Oral History, 48.
48. Letter from Prescott Currier to David Kahn, January 10, 1984, 2. David Kahn Collection. National Cryptologic Museum, Fort George G. Meade, Maryland (hereafter, Kahn Collection).

Rene Stein located these and other notes from interviews with the four Americans who travelled to Bletchley Park among Dr. Kahn's papers at the National Cryptologic Museum, where she serves as librarian. Frank Raven, a navy colleague of Currier's, would recall the latter running in and out of their office's 1940 Christmas party attempting to get the paperwork necessary for the trip signed by Safford. Frank Raven, Oral History Interview, NSA-OH-80-03 (January 24, 1980), 9, accessed on August 10, 2016, https://www.nsa.gov/news-features/declassified-documents/oral-history-interviews/assets/files/nsa-OH-1980-03-raven.pdf.

49. Currier Oral History, 49.
50. Brigadier General Sherman Miles, "Memorandum for Adjutant General," January 24, 1941. Reproduced in Ralph Erskine, "From the Archives: What the Sinkov Mission Brought to Bletchley Park," *Cryptologia* 27, no. 2 (April 2003): 111-118.
51. Kullback would claim that what frequently was described as Friedman's "nervous breakdown" would more properly be called simple exhaustion. "WFF [Friedman] was just drained of phys[ical] & mental energy. He [was] an emotional nervous guy to begin w[ith]." David Kahn, Notes of Interview with Solomon Kullback, October 27, 1979. Kahn Collection. Kahn would interpret Kullback's meaning to be that Friedman's "nervous breakdown was mainly exhaustion."
52. William Friedman, "Statement of Personal History" (DOD Form DD 398), undated. NSA Friedman Collection, Document A335508.
53. Sinkov Oral History, 24; David Kahn, *The Codebreakers: The Comprehensive History of Secret Communication from Ancient Times to the Internet*, revised edition (New York: Scribner, 1996), 9. Kahn puts the date of Friedman's discharge from the hospital as March 24, which supports Sinkov's claim that he was back at work when the delegation returned to the United States in April.
54. Elizebeth Friedman, Interview with Forrest C. Pogue. Marshall Research Library, Lexington, VA, May 16, 1973, 30.
55. "A Chronology of the Cooperation between the SSA and the London Offices of the GCCS," 2. National Archives and Records Administration, Records Group 457, Records of the National Security Agency and Its Predecessor Agencies, Historical Cryptographic Collection, Box 940/2738 (hereafter, NARA RG 457/HCC).
56. "A Chronology of the Cooperation between the SSA and the London Offices of the GCCS," 2.
57. Kullback Oral History, 67.
58. David Kahn's notes from telephone interview of Leo Rosen, February 13, 1979 (Kahn Collection).
59. Kahn's notes from telephone interview of Rosen, February 13, 1979 (Kahn Collection).
60. Letter from Currier to Kahn, January 10, 1984, 1 (Kahn Collection).
61. Letter from Robert Weeks to David Kahn, January 14, 1984, 3. Kahn Collection. There was one other difference between the army and navy duos, and that lay in their personal backgrounds. Sinkov and Rosen were both Jewish and from New York. Currier and Weeks were both from Massachusetts and, in Currier's word, "Gentiles." Currier would claim that this divide was remarked on by the British but that "it didn't really prevent things from happening." Years later, he would admit that while having the highest opinion of Sinkov because of their previous work together, he at first did not take a shine to Rosen. "I thought he was a brash young New York Jew and he didn't sit too well with me; didn't dislike him, but I didn't think at the time I would have wanted him for a close personal friend." Based on other comments by Currier, however, he would come to have high regard for Rosen's professional abilities during their stay at Bletchley Park. Currier, Oral History, 54.
62. Erskine, "From the Archives: What the Sinkov Mission Brought to Bletchley Park," 111-118. The Mauborgne memorandum was found by Erskine in the records of the US Navy at the National Archives. It decisively refutes a claim, first made by Safford after the war's end, that the Americans had given the British not one but two Purple analogs.
63. Currier would say, "We didn't actually get

together before we went. We never had…as I recall…we never had a meeting; the four of us never sat down and talked among ourselves as to what we were bringing, what we were going to do, or what our duties were, or would be when we got there…never." Currier Oral History, 51.

64. Currier Oral History, 52.
65. Letter from Weeks to Kahn, January 14, 1984, 1 (Kahn Collection). While he was at Bletchley Park, Weeks learned that the key for the German Atlantic Ocean Region (AOR) cipher was imbedded in the text of a popular novel, *All This and Heaven Too*, a 1938 novel by the American author Rachel Field. Learning that Weeks had been asked to investigate the AOR cipher, Kahn forwarded him a copy of an April 5, 1941, message from a station associated with the German intelligence service, the *Abwehr*, which had been encrypted using that system by a German agent in the United States and intercepted by a Federal Communications Commission monitor when sent to an *Abwehr* station in Germany. See David Kahn, *Hitler's Spies: German Military Intelligence in World War II* (New York: Macmillan and Company, 1978), 292-295.
66. Sinkov Oral History, 13.
67. Thomas Parrish, *The Ultra Americans: The U.S. Role in Breaking the Nazi Codes* (Briarcliff Manor, New York: Stein and Day, 1986), 62.
68. Kahn's notes from telephone interview with Rosen, February 13, 1979; Sinkov Oral History, 21.
69. On the packing of the crates and the delegation's awareness of what was in them, see letter from Currier to Kahn, January 10, 1984, 1; letter from Weeks to Kahn, January 14, 1984, 1; and Kahn's notes from telephone interviews with Sinkov, May 12, 1980, and with Rosen, February 13, 1979 (Kahn Collection).
70. Lothian had died suddenly in December 1940. Harry Hopkins, a Roosevelt aide and confidant who was in London at the president's behest at the time the *King George V* arrived in Annapolis, would tell him that "his decision to sail out…on his yacht the *Potomac* to welcome Lord Halifax, a radical departure from diplomatic convention, had been 'received very warmly' in the British capital, with full accounts carried on the front page of all newspapers and repeatedly described in broadcasts." Fullilove, *Rendezvous with Destiny*, 141.
71. For the group's transit from Washington to Annapolis and boarding of the *King George V*, see Currier Oral History, 55-57; letter from Currier to Kahn, January 10, 1984, 3; letter from Weeks to Kahn, January 14, 1984, 1; and Kahn's notes from telephone interview with Rosen, February 13, 1979 (Kahn Collection).
72. Letter from Currier to Kahn, January 10, 1984, 3; letter from Weeks to Kahn, January 14, 1984, 1; Kahn's notes from telephone interview with Rosen, February 13, 1979 (Kahn Collection).
73. Sinkov Oral History, 2. In contrast to the Brooklyn-born Sinkov, the navy's Weeks would describe the weather during the eastward transatlantic voyage as "good." Letter from Weeks to Kahn, January 14, 1984, 2 (Kahn Collection).
74. Letter from Weeks to Kahn, January 14, 1984, 2; Kahn's notes from telephone interview with Rosen, February 13, 1979 (Kahn Collection); and Currier, "My 'Purple' Trip to England in 1941," 95.
75. The delegation's arrival at Scapa Flow, difficulties transferring the crates to the Short flying boat, and transfer to the *Neptune* are described in Currier Oral History, 59; letter from Currier to Kahn, January 10, 1984 (Kahn Collection); and Currier, "My 'Purple' Trip to England in 1941," 195-196.
76. The *Neptune* was transferred from the south Atlantic to the Mediterranean in early 1940 and spent the late spring and early summer in a combination of convoy escort duty and combat with the Italian navy. Having dropped off the American party at Sheerness, the ship underwent a two-month refit and subsequently returned to the Mediterranean. There, the *Neptune* joined Force K, a squadron which was deployed to Malta in September 1941 and, benefiting from an increased RAF presence on that island which permitted a greater British freedom of operation in the central Mediterranean, was tasked with

interdicting Italian convoys carrying supplies to Axis units in North Africa. On one such mission in December 1941, Force K unwittingly entered an Italian minefield off Tripoli and the *Neptune*, having struck several mines, sank with the loss of all hands save one. See James Holland, *Fortress Malta: An Island Under Siege, 1940-1943* (New York: Miramax Books, 2003), 189-191 and 208-209; and Ralph Bennett, *Ultra and Mediterranean Strategy* (New York: William Morrow and Company, 1989), 91-94. Decrypts from Bletchley Park had enabled Force K to locate and sink several Italian convoys in November, temporarily disrupting supplies to General Erwin Rommel's Afrika Korps until a massive infusion of German airpower forced its withdrawal at the end of December, which also marked the beginning of the most difficult year for the besieged island. For Churchill's descriptions of his August 22, 1941, request to the Admiralty that a squadron be deployed to Malta to interdict Axis supply routes, Force K's November successes, and the sinking of the *Neptune*, see Winston S. Churchill, *The Second World War*, vol. 3, *The Grand Alliance* (Boston: Houghton Mifflin, 1950), 434-35, 507-508, and 512-513.

77. Weeks claimed that the *Neptune* was attacked by a lone aircraft, a German Heinkel bomber. Letter from Weeks to Kahn, January 14, 1984, 2. Rosen also thought that only a single plane was involved in the attack. Kahn's notes from telephone interview with Rosen, February 13, 1979 (Kahn Collection).
78. This account is drawn from several descriptions of the transit of the *Neptune* from Scapa Flow to Sheerness which Currier provided over the years. See Currier Oral History, 59-61 (where he identifies the *Neptune* incorrectly as the HMS *Newcastle*); letter from Currier to Kahn, January 10, 1984, 4-5 (Kahn Collection); and the transcript of a talk given by Currier and John Tiltman at NSA during either 1974 or 1975, accessed on August 10, 2016, https://www.nsa.gov/resources/everyone/digital-media-center/video-audio/historical-audio/voices-from-the-past/assets/files/currier-tiltman-transcript.pdf. See also Rosen's account in Kahn's notes or his February 13, 1979, telephone interview of Rosen. Rosen recalled sprinting ten to twenty yards faster than he ever had to the safety of the aft gun turret, thinking with regard to the German pilot—according to Kahn's notes—"He better be careful [or] he'll hurt somebody."
79. The conflicting accounts of the group's arrival at the Thames are in: letter from Currier to Kahn, January 10, 1984, 5; Kahn's notes from telephone interview with Rosen, February 13, 1979; Sinkov Oral History Interview, 3; letter from Weeks to Kahn, January 14, 1984, 2 (Kahn Collection).
80. Transcript of talk by Currier and Tiltman at NSA, 1974/75, accessed on August 10, 2016, https://www.nsa.gov/resources/everyone/digital-media-center/video-audio/historical-audio/voices-from-the-past/assets/files/currier-tiltman-transcript.pdf.
81. Letter from Abraham Sinkov to Bradley Smith, January 20, 1991. Smith Papers. In his 1979 Oral History, Sinkov claimed that he gave the letter to the American ambassador, not General Strong, adding that "we never again reported to the American authorities in England." Sinkov Oral History, 20.
82. Currier, "My 'Purple' Trip to England in 1941," 196.
83. Currier Oral History, 62.
84. Michael Smith, *The Secrets of Station X: How Bletchley Park Codebreakers Helped Win the War* (London: Biteback Publishing, 2011), Kindle Edition, Chapter 7/Action This Day. Smith interviewed Barbara Eachus née Abernethy on several occasions while researching this study of Bletchley Park. Abernethy continued by saying, "Denniston rang the bell and I struggled in and somehow managed to pour glasses of sherry for these poor Americans, who I kept looking at. I had never seen Americans before, except in films. I just plied them with sherry. I hadn't the faintest idea what they were doing there. I wasn't told. But it was very exciting and hushed voices. I couldn't hear anything of what was said but I was told not to tell anybody about it. I guess it wasn't general knowledge that the Americans had got any liaison with Bletchley. It was before Pearl

Harbor, you see, and presumably Roosevelt was not telling everybody there was going to be any liaison at that stage."

85. Letter from Currier to Kahn, January 10, 1984, 5 (Kahn Collection).
86. Currier Oral History, 63-64; Sinkov Oral History, 7.
87. Sinkov Oral History Interview, 6.
88. Sinkov Oral History, 8; Weeks letter to Kahn, January 14, 1984; Currier letter to Kahn, January 10, 1984 (Kahn Collection).
89. Abraham Sinkov and Leo Rosen, "Report of Technical Mission to England." Memorandum to Assistant Chief of Staff, G-2, April 11, 1941, 1. NARA RG 457/HCC.
90. Prescott Currier, "My 'Purple' Trip to England' in 1991," 198.
91. Letter from Weeks to Kahn, January 1, 1984, 3 (Kahn Collection).
92. Currier claimed that the army and navy duos were given separate offices. Letter from Currier to Kahn, January 14, 1984, 6 (Kahn Collection).
93. Letter from Weeks to Kahn, January 1, 1984, 3 (Kahn Collection).
94. Sinkov Oral History, 13. Currier would say, "I don't remember a great deal of actual note comparing; we didn't…we talked over what we had done in a general sort of way." Currier Oral History, 70.
95. Sinkov Oral History, 8. Forty years later, Sinkov and Currier would remember one of the records in Cadman's collection in particular. This was "La Mulata Rumbera," a popular song by Cuban jazz pianist Justiz Peruchin. Sinkov and Currier both knew Spanish and could translate the first half of the record with ease. Initially, however, its second half was completely unintelligible. "And one day," Sinkov would recall, "out of the blue, as we were playing this record over and over again, Currier said, 'I heard the word spinach.' So we concentrated a little and it turned out that the second half of the record was the singer singing in English so badly that we couldn't understand it." "Then it dawned us," Currier continued, "that the phrase 'Gwada chilai' was actually 'What does she like?', followed by the names of various vegetables. So much for elementary cryptanalysis." Sinkov Oral History, 8-9; Letter from Currier to Kahn, January 14, 1984, 9.
96. When beginning to provide details on his time a Bletchley Park, Currier would admit that, contrary to his recapitulation of the sequence of events before arriving there, "from this point on, I cannot be sure of the correct ordering events. The chronology of our activities has long since become so blurred with the passage of time that I can only be certain of the last day or two [at the British codebreaking center]." Letter from Currier to Kahn, January 10, 1984, 6 (Kahn Collection).
97. Currier, "My Purple Trip to England in 1941," 196.
98. Sinkov Oral History, 3-4.
99. Sinkov Oral History, 3 and 5-6.
100. Kahn's notes from telephone interview with Rosen, February 13, 1979 (Kahn Collection).
101. Sinkov and Rosen, "Report of Technical Mission to England" and "Report of Cryptographic Mission."
102. Letter from Weeks to Kahn, January 1, 1984, 2 (Kahn Collection). For a cogent explanation of cribs, see Greenberg, *Gordon Welchman*, 217-222.
103. Currier Oral History, 66. See also Currier, "My 'Purple' Trip to England in 1941," 198.
104. Bletchley Park had an effort against Russian systems at the time of the Sinkov mission, although at Churchill's direction it was abandoned after Germany invaded the Soviet Union in June 1941. Although Weeks would specifically deny that Russian systems were discussed (letter from Weeks to Kahn, January 14, 1984, 2), this may have been because no Russian naval cryptosystems were discussed. Sinkov and Rosen's trip report indicates that there was discussion of Russian army, air force, and policy systems during their time at Bletchley. Sinkov and Rosen, "Report of Cryptographic Mission." American cryptanalysts did not mount an attack on Russian systems until 1943.
105. Oral History Interview, John Tiltman, NSA OH-07-78 (December 1978), 5 (hereafter Tiltman Oral History), accessed on August 10, 2016, https://www.nsa.gov/news-features/declassified-

documents/oral-history-interviews/assets/files/nsa-OH-07-78-tiltman.pdf.

106. Tiltman Oral History, 6.
107. Ibid.
108. Menzies's memorandum to Churchill is quoted in David Safford, *Roosevelt and Churchill: Men of Secrets* (Woodstock, NY: The Overlook Press, 2000), 58. Emphasis original. See also Hugh Sebag-Montefiore, *Enigma: The Battle for the Code*, 219-220.
109. Ralph Erskine, "What Did the Sinkov Mission Receive from Bletchley Park?", *Cryptologia* 24, no. 2 (April 2000): 98.
110. Sinkov Oral History, 10-11.
111. Tiltman Oral History, 6-7. Tiltman would conclude that "the way it [the secrecy agreement] was worded and that sort of thing was such that it caused a lot of trouble later."
112. For the impact of Enigma decrypts of Allied planning for the invasion of Europe, see Ralph Bennett, *Ultra in the West: The Normandy Campaign of 1944-45* (New York: Charles Scribner's Sons, 1980), 37-59. For a discussion of the importance of Purple decrypts, see Carl Boyd, *Hitler's Japanese Confidant: General Oshima Hiroshi and Magic Intelligence, 1939-1945* (Lawrence: University of Kansas Press, 1993), 117-126.
113. Currier Oral History, 65.
114. Currier, "My 'Purple' Trip to England in 1941," 198. A "menu" was a crib or series of cribs translated into machine language and fed into the *bombe* for processing to determine its accuracy.
115. Letter from Currier to Kahn, January 10, 1984, 7; Letter from Weeks to Kahn, January 14, 1984, 3.
116. Kahn's notes from telephone interview with Rosen, February 13, 1979. In a 1984 oral history interview, Rosen would say, "We recognized the problem, we recognized what had to be done and we thought about it. The Germans were using certain type equipments [*sic*] and we decided that the U.S. machine would be better off using electromagnetic relays. The British were using analogues and we thought that the electronic magnetic relays…would be far superior." Leo Rosen Oral History Interview, NSA-OH-16-84 (August 26, 1984), 4, accessed on August 10, 2016, https://www.nsa.gov/news-features/declassified-documents/oral-history-interviews/assets/files/NSA-OH-16-84-Rosen.pdf. When told by an interviewer that Rosen had claimed "he spent quite a bit of time with Welshman [*sic*]," Sinkov would respond, "Yes. Welshman is a name that comes to mind." Sinkov Oral History, 5. Gordon Welchman was a pivotal figure at Bletchley Park throughout World War II. His invention of the "diagonal board" for the *bombe* was a key improvement on Alan Turing's original design, in that it greatly accelerated the speed at which the bombe could identify Enigma keys. See Greenberg, *Gordon Welchman*, 60-62 and 229-237.
117. Letter from Weeks to Kahn, February 1, 1984, 3; Sinkov Oral History, 4.
118. Weeks appended a sketch of the "Paper Enigma" to his January 14, 1984, letter to Kahn. He presumably drew the sketch from memory as opposed to the actual document he brought back from Bletchley Park. Weeks also would claim that "as for the matter of the enigma, I know very well that I brought it back, and that it worked. I refer of course to the "paper enigma." Letter from Weeks to Kahn, February 1, 1984.
119. Currier recalled that, in fact, the American Naval Attaché office in London had dispatched a junior officer named McDonald to meet them in Scapa Flow, and that it was McDonald who had arranged their aborted seaplane transport to southern England. Currier, Oral History, 59.
120. Letter from Currier to Kahn, January 10, 1984, 7; letter from Weeks to Kahn, January 14, 1984, 3.
121. Letter from Currier to Kahn, January 10, 1984, 7.
122. Weeks noted that the four officers had been issued steel helmets and gas masks, which they carried at all times. Letter from Weeks to Kahn, January 14, 1984, 3.
123. Letter from Currier to Kahn, January 10, 1984, 7.
124. Letter from Currier to Kahn, January 10, 1984, 9; Currier Oral History, 64. Numerous stations

of the London Underground sustained damage during the war. One of the most notable ones to be hit was Bank Station. On January 11, 1941, it was struck by a German bomb which killed 111 people, many of whom had sought refuge in the station's platforms. The bomb also left a large crater in the busy intersection above the station, across which a temporary bridge was constructed allowing vehicular traffic to pass. It is not clear whether the crater remained unfilled at the time of the Americans' early March visit, which would make it possible that this was the destruction to which Currier referred.

125. Sinkov Oral History, 7; Letter from Currier to Kahn, January 10, 1984, 8; Letter from Weeks to Kahn, January 14, 1984, 3; Kahn's notes from telephone interview with Rosen, February 13, 1979.

126. Weeks would recall the inspection tour of HF-DF sites as providing him and Currier with yet more experience with life in wartime Britain, writing "we found all the road signs removed (no hindrance to our driver McPherson, who had been a lorry driver), frequent road blocks, zig-zag barriers on straight roads, and potential landing fields with obstacles on them." They also, however, had the chance to experience life in the British countryside. "When staying at a provincial hotel the food would be calorically sufficient and we could approach being warm with a shilling-fed gas heater….[I] can remember being invited, in February, to dinner at a thatched cottage with no heating but a fireplace and the facilities in an outhouse." Letter from Weeks to Kahn, January 14, 1984, cover page. McPherson was, according to Currier, "a little Scotsman from Sterling whose broad Scots made it difficult at times to communicate with the English country folks; oddly enough I do not recall having any trouble myself." On one of their trips outside Bletchley, Currier recalled, "we were stopped at a road block….When the local constable saw two men in civilian clothes, obviously not British, riding in a War Dept. staff car he reacted quickly and asked if we would mind getting out and accompanying him to the police station. At this our diminutive Scots driver was furious and jumped out and confronted the policeman—'Ye can nae do this; they're Americans on a secret mission.' This had no discernable effect on our constable and it took us the better part of an hour before we could convince our captors that it was alright to let us proceed. All this involved a checking of documents and telephoning which obviously produced the necessary information that established our bona fides and secured our release and an apology from the police." Letter from Currier to Kahn, January 10, 1984, 6 and 19. See also Currier, "My 'Purple' Trip to England in 1941," 199.

127. Letter from Currier to Kahn, January 10, 1984, 8; Letter from Weeks to Kahn, January 14, 1984, 3. For the experiences of WRNS personnel at Scarborough during this period, see Sinclair McKay, *The Secret Listeners: The Men and Women Posted Across the World to Intercept the German Codes for Bletchley Park* (London: Aurum Press, 2012), 67-71.

128. Letter from Currier to Kahn, January 10, 1984, 8. See also Currier, "My 'Purple' Trip to England in 1941," 197.

129. Sinkov and Rosen did say in their trip report that "we were…shown several radio intercept stations, and the offices where the British systems are prepared." The latter being Oxford Press, where the two did go, it seems likely that this statement should be read as indicating they made actual visits to Cheadle, Chicksands, and Harpenden. Sinkov and Rosen, "Report of Technical Mission to England," 1.

130. Sinkov and Rosen, "Report of Cryptographic Mission," 5. For descriptions of Cheadle's operations and their importance to RAF activities during the Battle of Britain compared to those of Bletchley Park, see Hinsley et al., *British Intelligence in the Second World War: Its Influence on Strategy and Operations*, vol. 1, 176-182. See also Peter Gray Lucas, "Tactical Signals of the German Air Force," in *Codebreakers: The Inside Story of Bletchley Park*, F. H. Hinsley and Alan Stripp, eds. (Oxford: Oxford University Press, 1993), 246-253; and McKay, *The Secret Listeners*, 32-34.

131. Sinkov and Rosen, ""Report of Cryptographic Mission," 5-6. For a discussion of Knickbein

and its successor, the X-Gerat or X-Apparatus, see R.V. Jones, *The Wizard War: British Scientific Intelligence, 1939-1945* (New York: Coward, McCann and Geogeghan, 1978), 92-145; and Hinsley et al., *British Intelligence in the Second World War: Its Influence on Strategy and Operations*, vol. 1, 322-328. For a recent account of Knickbein and British attempts to counter it, see Frederick Taylor, *Coventry, November 14, 1940* (New York: Bloomsbury Press, 2015), 85-94.

132. Sinkov and Rosen, ""Report of Cryptographic Mission," 6-7. Two months after the Sinkov mission left Britain to return to the United States, direction finding—specifically by Chicksands and Scarborough—provided the location of the German battleship *Bismarck*, which the Royal Navy proceeded to engage and sink. See Hinsley et al., *British Intelligence in the Second World War: Its Influence on Strategy and Operations*, vol. 1, 339-346; and McKay, *The Secret Listeners*, 93-94.
133. Letter from Weeks to Kahn, January 14, 1984, 3; Sinkov Oral History, 16.
134. Letter from Weeks to Kahn, January 14, 1984, 3; letter from Currier to Kahn, January 10, 1984, 10; Currier, "My 'Purple' Trip to England in 1941," 199; and Currier-Tiltman 1974/5 NSA talk transcript. Currier placed the timing of the visit to the Marconi factory in Chelmsford at about two weeks before the group's departure from Bletchley Park, i.e., the first few days in March.
135. Letter from Weeks to Kahn, January 14, 1984, 4; letter from Currier to Kahn, January 10, 1984, 10; Currier, "My 'Purple' Trip to England in 1941," 199; and Currier-Tiltman 1974/5 NSA talk transcript.
136. The descriptions of life during the return transatlantic crossing on the *Revenge* are from Currier, "My 'Purple' Trip to England in 1941," 200; letter from Currier to Kahn, January 10, 1984, 10; and Currier-Tiltman 1974/5 NSA presentation transcript. The latter contains several apparent misstatements, including ones that the *Revenge* broke off from the convoy at one point to search for the German battlecruiser *Hipper* and that the convoy included converted passenger liners such as the *Queen Elizabeth*, both of which were most likely false.
137. For the group's voyage on the *Overton* from Halifax to the Washington, see Currier, "My 'Purple' Trip to England in 1941," 200-201; letter from Currier to Kahn, January 10, 1984, 11; and Currier-Tiltman 1974/5 NSA presentation transcript.
138. Currier, "My 'Purple' Trip to England in 1941," 201. Currier claimed he had read Seiler's alleged statement in Ladislas Farago's 1967 book *The Broken Seal*. This appears incorrect; however, Farago did write—misleadingly—of the Americans "coming home in reduced style on a battered destroyer rather than on the *Queen Mary*…." More generally, Farago would claim, "The exchange did not work out as well as the Americans had hoped." Ladislas Farago, *The Broken Seal: "Operation Magic" and the Secret Road to Pearl Harbor* (New York: Random House, 1968), 254.
139. Letter from Currier to Kahn, January 10, 1984, 11.
140. Alvarez, *Secret Messsages*, 89.
141. Sinkov and Rosen, "Report of Technical Mission to England," 1.
142. Ibid.
143. Sinkov Oral History, 9-10.
144. Kahn's notes from telephone interview with Rosen, February 13, 1979.
145. Letter from Weeks to Kahn, January 14, 1984, 4.
146. Letter from Weeks to Kahn, January 14, 1984, cover page; Sinkov and Rosen, "Report of Technical Mission to England," 3.
147. Letter from Weeks to Kahn, January 14, 1984, 4.
148. Kahn's notes from telephone interview with Sinkov, May 12, 1980.
149. Currier, Oral History, 71.
150. Tucker, "Rhapsody in Purple," 193-228.
151. Farago, *The Broken Seal*. For additional information about the investigations into the attack on Pearl Harbor, see Robert J. Hanyok and David P. Mowry, *West Wind Clear: Cryptology and the Winds Message Controversy—A Documentary History* (Ft. Meade, MD: Center for Cryptologic History, 2008).
152. Friedman, "Certain Aspects of 'Magic' in the Cryptological Background of the Various Investigations into the Attack on Pearl Harbor," 36-37.

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