

STRATEGIC BOMBING IN
WORLD WAR II

AIR POWER had a mighty vindication in World War II. But it was Mitchell's conception of it—"anything that flies"—rather than Douhet's that was vindicated. It was in tactical employment that success was most spectacular and that the air forces won the unqualified respect and admiration of the older services. By contrast, the purely strategic successes, however far-reaching in particular instances, were never completely convincing to uncommitted observers. Against Germany they came too late to have a clearly decisive effect; against Japan they were imposed on an enemy already prostrated by other forms of war. If airmen were like laboratory animals running a maze, they would seek to repeat successes and to recoil from frustrations. They would now be all in favor of tactical as against strategic uses of air power. But being instead very human, and knowing also the power of nuclear weapons, they have remained intensely loyal to their original strategic ideas.

The conditions of any future war in which nuclear weapons are used will be critically different from those of World War II in almost every significant respect. Nevertheless, because the experience of World War II is often appealed to as having "proved" this or that about air power, there is value in summarizing that experience briefly and objectively. It is, for all practical purposes, the only experience we have with strategic bombing. Small wonder that it has influenced importantly the ideas we still carry around on the subject,

especially with respect to the amount of destruction necessary to win a war by strategic bombing.

The Allied strategic bombing campaigns against Germany and Japan in World War II are, despite their complexity and magnitude, among the most brilliantly illuminated military campaigns of all time. The United States Strategic Bombing Survey (U.S.S.B.S.) carried out its survey of Allied bombing in Europe on the heels of the advancing Allied armies, in the hope of applying the resulting lessons to the strategic bombing of Japan. However, the victory over Japan followed soon thereafter, and the Survey organization proceeded at once to make a comparable study of the campaign against Japan.

The resulting work comprises 208 separate published items for the European war and 108 items for the Pacific war. The Survey staff was in most fields marked by very high competence and talent, and the manner in which the members were selected provided about as good a guarantee against bias as could be found. There were also some complementary studies carried on by other organizations or individuals, some of which benefited from being under less pressure of time than was imposed on the authors of the Survey.¹ Thus,

¹ The British work most nearly comparable to the U.S.S.B.S. is that by the British Bombing Survey Unit (called during the war the RAF Bombing Analysis Unit). However, the publications of that organization—most of them classified—have had only the most limited distribution within the United States. The basic volume in the series is entitled *The Strategic Air War Against Germany, 1939-45*. In America, there have been some distinctive publications (also originally classified) by an agency of the Air Force called the AAF Evaluation Board, which was rather more concerned with tactical targets and operations, such as those incident to the Normandy landing, than with strategic air operations. The British Bombing Survey Unit tended to straddle both strategic and tactical operations. It was, unlike the other surveys mentioned, very largely directed by persons who had made heavy commitments to operational decisions. With respect

the relevant facts of any importance are available. All one has to do is read the appropriate publications carefully with an open mind.

The Attack on the German War Economy

With respect to the German campaign, study of the survey findings leads to three major conclusions: (1) our strategic bombing brought the German war economy to the point of collapse; (2) that result came very late in the war, too late to develop its full potential effects on the ground and naval campaigns, which were already proceeding to a decisive conclusion; and (3) given only the air power actually in Allied hands, but assuming better understanding of the capabilities of strategic bombing and especially a wiser choice of targets, the positive results achieved by bombing could have come much sooner than they did. Had they come sooner by six months, their beneficial influence for shortening the war and saving Allied lives would have been unequivocal.

Let us examine the first conclusion. The oft-repeated argument, based on U.S.S.B.S. statistics, that German war production in almost all categories increased drastically between the middle of 1942 and the middle of 1944, is beside the point, because the scale of bombing which brought about the final significant results had barely begun by mid-1944. The weight

to targets within France, one must mention also the work of the French Operational Research Group.

The general, semi-official histories which might be studied in conjunction with the above-cited reports are, for the United States, W. F. Craven and J. L. Cate, *The Army Air Forces in World War II*, 7 vols., University of Chicago Press, Chicago, 1948-1955; and for the British, Denis Richards and Hilary St. George Saunders, *Royal Air Force, 1939-1945*, 3 vols., H. M. Stationery Office, London, 1953-1954. See also Burton H. Klein, *Germany's Economic Preparations For War*, Harvard University Press, Cambridge, 1959.

of Allied attack, which in 1942 averaged under 6,000 tons monthly, rose in 1944 to an average of 131,000 tons monthly—a more than twenty fold increase. The greatest rate of increase occurred just prior to the Normandy invasion, which itself absorbed in tactical operations for many months the major part of our strategic-bombing capabilities. Along with this increase in tonnage of bombs dropped came a great improvement in operational techniques, especially in the use of radio direction devices. And beginning only in February 1944, large numbers of P-51 long-range fighters became available for escorting bomber sorties practically anywhere within Germany.

Also, until mid-1942 the German war economy contained a large amount of slack. Contrary to general opinion, that economy was far from fully mobilized for war either in the kind of commodities produced or in the rate of production. The labor force was essentially on a single-shift basis and included relatively few women. The great increases in German war production over the next two years, despite our bombing, resulted mostly from the taking up of this slack. Even so, judged by the standard of British industrial mobilization, the German economy never attained anything like its full war potential.²

In any case, from our point of view it would not matter whether or not production as a whole diminished if the Germans had been denied even one truly indispensable war commodity, such as liquid fuel. In the final stages of the war, that is just what happened. Allied bombers knocked out the German industries producing liquid fuels and chemicals.

² See U.S.S.B.S., *The Effects of Strategic Bombing on the German War Economy* (Item #3 for European War), especially pp. 6-11. See also Klein, *op.cit.*

In an overlapping campaign they also effectively knocked out the German transportation services, upon which everything else depended.

German oil-production facilities were recommended as a top-priority target on March 5, 1944, and officially designated as such in a directive of June 8, two days after the Normandy landing. There had meanwhile been two days of attacks on the industry during May, but the full-scale attack started at the end of June and continued until March 1945. There were 555 separate attacks on 135 different targets, including every synthetic-fuel plant and major refinery known to be in operation.

The beginning of the onslaught started a precipitous drop in German oil production. From an average of 662,000 tons per month, it went down to 422,000 tons in June, 260,000 tons in December, and 80,000 tons—or 12 per cent of the pre-attack level—in March 1945. As for aviation and motor gasoline, the results were even better. Practically all German aviation gasoline was made by the hydrogenation process in synthetic-oil plants, and those plants were the first to be hit. Aviation gasoline production declined from 170,000 tons per month to 52,000 tons only one month after the oil bombing offensive began, and it had been eliminated completely by the following March.

The effect on Luftwaffe operations was tremendous. German gasoline stocks had been tight to begin with, and production losses meant immediate curtailment of consumption. Flight training was steadily shortened, and toward the end of the war pilots were sent into action who had had only forty to forty-five hours in the air. Their inexperience made them easy marks for our highly-trained air crews. Germany's large reserve of military aircraft was grounded with empty

tanks. Only fighter missions against our bombers were permitted, and even those became few and ineffective.

Effects on ground combat were somewhat slower. Use of gasoline was restricted first in motor transport, but in the last stages of the war huge numbers of German tanks were unable to reach the fighting areas, or were abandoned on the battlefields, for lack of fuel. Before the end, wood or coal-burning gas generators, such as had been only moderately successful on buses and trucks, had been put on some fifty tanks.

Chemicals were never singled out as a target, but since most of the chemical industry was closely integrated with synthetic-oil production, attacks on the latter served to damage the former as well. When two plants (Leuna and Ludwigshafen) were shut down as a result of air attacks, Germany lost 63 per cent of its synthetic-nitrogen production and 40 per cent of its synthetic-rubber production. Damage to five additional oil plants brought the loss in synthetic nitrogen to 91 per cent. Nitrogen is essential for all explosives and powder propellants. As early as August 1944, Albert Speer was reporting to Hitler that the attacks on chemicals were threatening Germany's ability to carry on the war. Before V-E Day the Germans were filling their artillery shells with as much as 70 per cent inert rock salt.³

German transportation, including the extensive canal network as well as the railways, became a strategic target system in March 1944, although heavy attacks did not start until September 1944. By the end of October, carloadings were declining rapidly and showing immediate effects in

³ U.S.S.B.S., *Ordnance Industry Report* (Item #101 for European War), p. 29; also *Oil Division Final Report* (Item #109 for European War), pp. 40-47. Incidentally, the latter item is one of the most illuminating reports in the entire series.

over-all production. By late November and early December all munitions production had been severely affected by the failure to move critical materials.

Even as early as August 1944, the Germans could no longer supply coal to the steel plants of Lorraine and Luxembourg. By February 1945, the Ruhr was just about completely isolated. Such coal as was loaded was often confiscated by the railroads for locomotive fuel; even so, by March, locomotives were standing idle for lack of coal in districts where some traffic could otherwise have moved. On March 15, when almost the whole of the Allied army was still west of the Rhine, Speer reported to Hitler: "The German economy is heading for an inevitable collapse within four to eight weeks." At that time over-all carloadings were 15 per cent of normal and moving toward zero.⁴

It was the collapse of transportation which caused the Strategic Bombing Survey to state in one of its most often-quoted passages: "Even if the final military victories that carried the Allied armies across the Rhine and the Oder had not taken place, armaments production would have come to a virtual standstill by May; the German armies, completely bereft of ammunition and of motive power, would almost certainly have had to cease fighting by June or July."⁵ But these results of the bombing of Germany came late.

On the credit side, the fact that our ground forces during the last year of the war had little enemy air opposition to contend with, while our own planes were making things very rough for the German armies, owed much to our strategic bombing, especially to our bombing of enemy air fields (al-

⁴ U.S.S.B.S., *The Effects of Strategic Bombing on German Transportation* (Item #200 for European War).

⁵ U.S.S.B.S., *Effects on German War Economy*, p. 14.

ways considered good unloading spots for planes coming home with unused bombs) and to the air battles that attended our bombing forays. Moreover, the shortage of materials, especially oil, which our bombing was imposing on the Germans, did in fact hasten the final collapse of their armies. More important, the Germans in the last year of the war were devoting at least a third of their total war resources to air defense, resources which would otherwise have been available to their armies. We must remember also that some of our attacks, like that on the German V-weapon program, had important defensive results.

Nevertheless, the fact remains that the ultimate destruction of the German armies was practically assured from the time of the successful Allied break-out west of St. Lo late in July 1944, at which time the tangible battlefield results of our strategic bombing, apart from its important contribution to suppressing enemy air activities, added up to very little. By the time those results were making themselves felt seriously, the Battle of the Bulge was a thing of the past and the Allied armies were well into Germany.

If prior to mid-1943 we had put into our strategic air force some of the resources used in building up a great army and invasion armada, as some argued we should have done, we would no doubt have got our strategic bombing results faster. However, that is not the same as saying that the war would have ended sooner. The fact is that we did put into strategic bombing a colossal effort. We were also committed to an invasion of France, and there were at the time few grounds for calling that a bad commitment. At the time we made the relevant decisions, our government feared, probably wrongly, that if we limited ourselves to an air and naval effort the

Russians would make a separate peace. If, as is more likely, the Russians had gone on fighting, and if our bombing had guaranteed the success of Soviet ground forces, it would have been their armies and not ours that would have "liberated" western Europe, and that might very well have been there now.

The strategic bombing of Germany during World War II was almost totally a new experiment, in which much had to be learned the hard way. We steadily tried to reach out after greater capabilities, especially in carrying capacity, depth of penetration, and accuracy of bombing; and we sought, partly and inescapably through trial and error, to find good target systems. In both respects we can now see many critical and perhaps unnecessary errors which delayed our success.

The U.S.A.A.F. paid dearly for the prewar conviction, inherited from Douhet, that fighter escort was unnecessary for bombers like the B-17, unhappily called the "Flying Fortress." The disastrous second Schweinfurt raid of October 10, 1943, in which the attacking squadrons lost 30 per cent of their aircraft, indicated that deep daylight penetrations into Germany had to await the availability of large numbers of long-range fighters. Starting in early 1944, the P-51s played a major part in destroying the German Air Force. Similarly, the British paid heavily for their early conviction that night bombing could be precise enough for specific industrial targets. When that was disproved, they adopted in 1942 Chief of Bomber Command Sir Arthur Harris' compensating conviction that area bombing was the most promising method of aerial attack anyway, since the search for specific target systems was only a futile search for "panacea targets." Sir Arthur, incidentally, had not lost that conviction even when

he wrote his memoirs after the war's end; nor had some of the senior officers who had served under him.⁶

The basic strategy for the Combined Bomber Offensive was laid down in the Casablanca Conference of January 1943, where the relevant directive stated the primary objective of the strategic air offensive: "the progressive destruction and dislocation of the German military, industrial, and economic system, and the undermining of the morale of the German people to a point where their capacity for armed resistance is fatally weakened." The directive went on to name five primary target systems in the following order: (1) submarine construction yards, (2) the aircraft industry, (3) transportation, (4) the oil industry, (5) generalized targets in the enemy war industry. In the absence of specific instructions to the contrary, air force commanders retained the authority to alter the order of priority for individual raids according to their own judgment.

On June 10, 1943, a new and much more pointed directive from the Combined Chiefs of Staff set down the "Pointblank" target system, and created the so-called "Jockey" Committee as an advisory body on targets; this Committee carried out its function until it merged with the Combined Strategic Targets Committee in September 1944. Under "Pointblank," German fighter plane production and existing strength were made unequivocally top-priority targets for the American bomber forces. The governing considerations were: (a) air dominance had to be established in the face of increasing German fighter strength, which threatened the con-

⁶ See Marshal of the R.A.F. Sir Arthur Harris, *Bomber Offensive*, Collins, London, 1947, especially pp. 75, 220-234. Sir Arthur's Senior Air Staff Officer (or Chief of Staff), now Air Marshal Sir Robert Saundby, has espoused the same views in his numerous articles in British professional journals.

tinuance of the bomber offensive; (b) destruction of the German Air Force would provide the best short-term strategic-bombing contribution to the planned invasion of the Continent; and (c) the immediately preceding months, with their brilliant victories at sea, had brought the submarine menace under control and had shown, moreover, that the destruction of submarine yards and bases along with the other desired target systems was simply beyond the capabilities of existing bomber forces. The June 1943 directive thus recognized the need for adjusting to limited capabilities by ordering concentration on a single specifically-designated target system. All other systems were made secondary, and individual force commanders were given minimum discretion with regard to choice among systems to be attacked.

In principle, the selection of the German Air Force as a target system, and especially of its fighter contingent, was right. It placed first things first according to common sense as well as to the well-known Douhet dictum that command of the air must be won before it can be exploited. However, the offensive against the German aircraft industry, which reached its greatest intensity in the period February-April 1944, was a failure. Attacks upon airframe plants simply induced the Germans to disperse their facilities, which proved relatively easy to do since the tools mainly used were fairly mobile. The temporary loss of production resulting from such movement of equipment was about all that could be chalked up to the credit of the attacks.

The fact remains that front-line German fighter air strength increased sharply during the Allied offensive against it. No doubt the increase was less than it would have been but for our bombing. The Aircraft Division of the U.S.S.B.S. estimated that some 18,000 aircraft of all types were denied

the German Air Force in the period between July 1943 and December 1944.⁷ That figure, based on the disparity between planned and actual production, is ventured against an alleged total production for the same period of 53,000 aircraft—a quite improbable figure. The economists who prepared the over-all economic-effects report of U.S.S.B.S. were more cautious, offering the opinion that “it is possible that production would have been 15-20 per cent higher in the absence of bombing.”⁸

In short, the attack on airframe production paid dividends—any diminution of enemy strength is a dividend—but they were not in the category of “decisive.” They did not bear out what had been promised for a concentrated offensive by air forces of the size we were operating in early 1944. Moreover, we do not know how effectively the German Air Force could have used those “lost” aircraft, in view of shortages in fuel and pilots. The moment we started our attacks upon oil production in May 1944, the Germans began to find themselves with more planes than they could fly. Their aircraft production began to lag only in the fall of 1944, after the aircraft industry had ceased to be a primary target for the Combined Bomber Offensive. And, as we have noted, the major losses of German aircraft, together with trained pilots, occurred as a result of air battles which our bombing forays forced upon them and of our attacks on enemy airfields.

Possibly it was our method of attacking the aircraft target manufacturing rather than the choice of the system itself that was wrong. Hermann Göring and Albert Speer argued after their capture that aircraft-engine production would

have made a better target system than airframes, because the engines were made in a much smaller number of factories. But others pointed out that engine-manufacturing plants were of much lower physical vulnerability than airframe factories, especially to the light bombs (maximum 500 lbs.) we were then using.⁹

The marked and immediate success achieved against the oil-producing industry seemed to indicate that the enemy air force was far more vulnerable through denial of liquid fuel than through direct attack upon it. The great fuel-producing plants could not be dispersed, their essential producing facilities were quite vulnerable to blast and incendiary damage, and they were difficult to conceal. Yet only about 1 per cent of the half-million tons of bombs dropped on Germany before May 1944 had been aimed at the oil industry. This omission resulted from the belief that the major fuel-producing plants lay beyond our range capabilities, from our consistent overestimation of the reserves of fuel which the Germans had in storage, and from our anxiety to get quick results. The total weight of bombs ultimately aimed at oil-production facilities and storage depots was about 240,000 tons, or about half the total tonnage that had been dropped on Germany proper prior to May 1944.

Our failure to make a direct and comprehensive attack on the German chemical industry, including the synthetic-rubber plants, was also a serious error. The fact that that industry collapsed as a wholly unexpected result of our attack on oil reveals how vulnerable it was. Had we elevated it to the status of a target system in itself, we could have demolished it much earlier in the war than we did and with only a small percentage of the bombs ultimately aimed at oil. The German

⁹ U.S.S.B.S., *Aircraft Division Report*, pp. 53f.

⁷ U.S.S.B.S., *Aircraft Division Industry Report* (Item #4 for European War), p. 6.

⁸ U.S.S.B.S., *Effects on German War Economy*, p. 12.

General Heinrici told our U.S.S.B.S. interrogators that if Allied effort had been concentrated on ammonia plants, Germany could have been knocked out of the war a full year earlier.¹⁰ That may not be so, but it is an interesting opinion.

The Failure of City Bombing in Germany

The bombing of cities turned out to be a great waste of effort. To be sure, cities were easier to find and hit than were particular industrial plants, and the kind of weather encountered over Germany often left no choice. Also we must remember the special limitations imposed on the R.A.F. by the fact that it was built and equipped as a night-bombing force:

Prior to the development of long-range fighters and the discovery and improvement of non-visual bombing aids and techniques, the RAF could not undertake daylight bombing without prohibitive losses, nor could it achieve sufficient accuracy in night bombing to attack other than very large targets. Even with the earlier forms of radar, an attack on a target smaller than a city area of at least 100,000 population was not economical.

For example, using "GEE," the first radar navigational aid (which became available in March 1942), Bomber Command of the RAF, in attacks on towns in the Ruhr, could drop approximately 50 per cent of its bombs within five miles of the aiming point and 10 per cent within two miles. This meant that only 5 to 10 per cent of the tonnage dispatched could be dropped on a town the size of Essen and only two to three per cent on the Krupp works within Essen. Thus, economy required that attacks be aimed at the city center, ensuring that the maximum tonnage of bombs would fall somewhere on the target.¹¹

¹⁰ U.S.S.B.S., *Powder, Explosives . . .* (Item #111 for European War: Oil Division; Ministerial Report No. 1), p. 4; see also *Oil Division Final Report*, pp. 40-73.

¹¹ U.S.S.B.S., *Area Studies Division Report* (Item #31 for European

Bombing accuracy was greatly improved later on, especially during the summer of 1944. Nevertheless, the limitations described above could be accepted, and a campaign carried out despite them, only if the attacker expected substantial results from area bombing. Air Marshal Sir Arthur Harris of Bomber Command did expect such results, because, despite his utter disdain for what we now call "psychological warfare," he shared Douhet's faith in the critical vulnerability of civilian morale. We shall consider the effects of bombing on civilian morale in a separate section, though it should already be obvious that whatever morale decline took place was of limited effect upon the over-all strategic situation. There was immense destruction and damage wrought on the buildings in German cities, and it is really surprising that the war industries gathered in those cities should have suffered so little impairment or loss of production.

The tonnages expended on city bombing were enormous. Prior to our oil offensive, 53 per cent of the bombs dropped on Germany were aimed at area targets, and only 13 per cent at specific industries. Even during the oil offensive, over 27 per cent of the million-and-a-half tons dropped were aimed at cities and only 22 per cent at specific industries, the latter including the 16 per cent assigned to oil targets.

What were the results? The Report of the Area Studies Division of the U.S.S.B.S. opens with the following paragraph:

The major cities of Germany present a spectacle of destruction so appalling as to suggest a complete breakdown of all aspects of

War), pp. 3f. This kind of inaccuracy, incidentally, is one reason why electric power stations, which Speer and others considered an extraordinarily choice target system, were not in fact targeted. The vulnerable portions of electric power stations generally take up a very small area.

urban activity. On the first impression it would appear that the area attacks which laid waste these cities must have substantially eliminated the industrial capacity of Germany. Yet this was not the case. The attacks did not so reduce German war production as to have a decisive effect on the outcome of the war.

The reasons for this indecisive effect were several, and we can only mention a few. One was the fact that in most German cities the industrial areas were on the perimeter, and area attacks on previously unbombed cities were always aimed at the centers. Even with the considerable improvement in nonvisual bombing aids between 1943 and 1944, it was practically impossible to concentrate bombing attacks upon the industrial portions of built-up areas. Where industrial plants were hit, the nonessential as well as the essential were affected. The halting of the former only helped to speed the flow of labor and other resources to the latter. Such essential services as electricity, gas, and water were disrupted by heavy attacks, but in most cases they were readily restored. The cutting of the Ruhr gas lines in 1944 shut down important plants in Düsseldorf, Essen, Krefeld, and Berlin and contributed to the collapse of German steel production, but that was an exceptional occurrence. It must be remembered too that the same bombing which inevitably reduced some of the supply of essential utilities also reduced some of the demand.

Another important fact about city bombing is that the damage was done primarily to buildings rather than to the machines or machine-tools which some of those buildings housed. Not more than an estimated 6 to 7 per cent of all machine tools in Germany were damaged or destroyed by air attack, and not all of those had to be replaced. "In 1944, the year of the heaviest bombing, it is estimated that it was necessary to devote only 10 to 12 per cent of machine tool

production to the repair of machine tools damaged as a result of air attack."¹² If the buildings which housed machines important to war production were too severely damaged, the machines often could be moved to other locations. Otherwise the structures were roughly patched up and the workers prevailed upon to continue.

We should not assume that the damage done to over-all production was trivial. An area raid could drive production in a city down by as much as 55 per cent in the month immediately following the attack. But recovery was rapid; most cities were back to 80 per cent of normal within three months, and had recovered completely within six to eleven months. Naturally the recovery was most rapid in the most essential industries. No doubt the "cushion" in consumer goods was being eroded away. No doubt, too, indirect effects, as expressed in absenteeism of workers, were growing steadily more serious.

Certainly the terrible shock given to the entire German state by the series of extremely heavy attacks directed at Hamburg at the end of July and the beginning of August 1943 suggests what might have happened if attacks of comparable intensity could have been directed also against a substantial number of other German cities at about the same time and in rapid succession. *There is clearly no basis at all for assuming that conclusions about German urban bombing in World War II would apply to war in the atomic age.* A different result, as we shall see, obtained even in the same war in the case of Japan. But the fact remains that "the over-all index of German munitions production increased steadily from 100 in January 1942 to 322 in July 1944,"¹³ a period that included a tremendous amount of general city bombing.

¹² U.S.S.B.S., *Area Studies Division Report*, p. 22.

¹³ *Ibid.*, p. 19.

The bombing of German cities cost the Germans much in production and more in the diversion of military resources to defense; but we must nevertheless state that no critical shortages in war commodities of any kind are traceable to it. To cause inconvenience and unhappiness to the enemy is a reasonable military aim in war, but in view of the promises made by Douhet and his followers, and in view also of the great military resources invested in it, the urban-area bombing of World War II must be set down unequivocally as a failure.

Trial and Error in Bombing Tactics

For World War II types of bombs it was necessary not only to pick the right target systems but also to find the right facilities within those systems and the right target centers within those facilities. In our attack upon railroad transportation, for example, a large proportion of the bombing was directed against freight-car marshalling yards, and usually we aimed at the center of the yards in order to hit the greatest amount of trackage. As a result, such bombing usually left some fairly intact stump yards near the entrance to the original yards, which the Germans could use for high-priority traffic while proceeding with repairs. The entrance, or throat, of the yard would have been a far better target center, but was rarely so designated. Moreover, the Germans not only had a large surplus capacity in yards, but some of the important traffic, including troop movements, tended to use complete trains which did not require the use of marshalling yards at all. By far the most effective way of interdicting railroad transportation, at least with the H.E. (high explosive) bombs of World War II, proved to be by way of line cuts at bridges, underpasses, viaducts, tunnels, and the like.¹⁴

¹⁴ At least this is the conclusion of the Transportation Division of

Even in the successful offensive against the oil industry there was a generally poor selection of "ground-zeros"¹⁵ within the plants selected for attack. Although accuracy in general was far below the "pickle-barrel" precision advertised before the war, vulnerable areas when chosen consistently as the bull's-eye were invariably destroyed. In only a small minority of the cases, however, were the most critical and vulnerable sections of the plant so chosen.

Also, the bombs used were usually too light for the job. The U.S.A.A.F.'s attacks were "based on the observation that it is easier to hit an elephant with a shotgun than with a rifle." The average weight per unit of the bombs we dropped on oil and chemical targets was 388 pounds, but it was the heavy bombs of two to four thousand pounds each, used toward the very end of the war, which were alone able to do really permanent damage to heavy industrial installations. The British, incidentally, were considerably more advanced than we in this respect, the average weight of the bombs dropped by the R.A.F. during our oil offensive being something like 660 pounds. A considerable improvement in effec-

U.S.S.B.S. The British Bombing Survey Unit credited much greater effectiveness to the bombing of marshalling yards, but, as we have noted, the Survey was directed by persons who had been deeply involved in the operational decisions.

¹⁵ This awkward term is forced upon me by shifts in terminology since World War II. What for bombing would correspond to the "bull's-eye" in pistol or rifle target shooting used to be called the "aiming point," which is the sense in which the latter term is used through most of the U.S.S.B.S. However, with the development of bombing sights that permitted offset bombing, the "aiming point" might well be miles from the center of the target (making it rather like the offset "aiming point" used in archery target shooting). The atomic bomb has encouraged the habit of using the term "ground zero" to indicate the point on the surface immediately under the center of burst, and "designated ground zero," often abbreviated D.G.Z., is therefore comparable to "bull's-eye." In short, it is the point aimed at, not the "aiming point"!

tiveness could also have been obtained through cutting down the proportion of bombs in both forces which failed to explode.

One does not have to think in terms of perfect planning, perfect intelligence, or perfect anything else to admit that better planning and testing before the war and more flexibility of doctrine would have brought vastly better results than were achieved. The bombs aimed at what proved to be the right targets, the destruction of which caused the collapse of the German economy, comprised only a minute percentage of the total tonnage dropped on Germany and German-occupied territory.

In this brief résumé of the strategic bombing of Germany, we have *not* been concerned with whether the campaign was worth its cost. If we were trying to appraise the total payoff of the campaign, we should have to sum up the direct and also all the indirect results which we can find, including the great effort which the Germans put into active military and non-military defenses against our bombing. We should especially have to take into full account the fact that, from Dunkirk to the time of the invasion of Italy, there was no way other than bombing by which the British and ourselves could strike at Germany in Europe. The question whether strategic bombing on the scale applied represented the *optimum* use of the resources expended in it is essentially unanswerable; but there is a strong prima-facie case for its having been a good use of those resources.

The questions to which we have addressed ourselves are, first, whether the campaign produced *decisive* results, and, secondly, whether such results could have been achieved earlier with a better use of the resources actually available. The answer to the first question is a qualified "yes," and to

the second a clear affirmative. But that such a campaign could have been decisive even in the absence of ground operations—with all the freeing of resources for the air battle that such a situation would have implied *for both sides*—must be regarded as neither proved nor provable. Assertions to the contrary, on either side of the argument, can be only declarations of faith.

The Strategic Bombing of Japan

Any appraisal of results of the strategic bombing of Japan must start from consideration of the military conditions prevailing at the time the campaign really got under way, which was quite late in the war. The raids that began in the fall of 1943 by B-29's based in China, and supplied entirely by air transport over the "hump" from India, were on much too small a scale to have strategic significance. The U.S.S.B.S. report suggests that with their limited sortie rate, those forces would have been more effectively used in the campaign against Japanese shipping. The inauguration of the strategic air offensive against Japan is reasonably dated not earlier than November 1944. Toward the end of that month bomber attacks were initiated from recently won Saipan, and later from Tinian and Guam.

However, the intensive air attack on the Japanese that marked the latter stages of the war began only in March 1945, at which time some radically new tactics worked out in General Curtis LeMay's headquarters were introduced. These tactics involved "maximum effort" low-level attacks at night, with great compression of force in space and time. The intensity of attacks increased gradually, until an attack occurred on the southwest portion of Tokyo on May 23, 1945 in which 520 bombers dropped 3,646 tons of incendiary bombs

on an area of about eleven square miles. For two hours during that attack the bombs were dropping at an average rate of 1,000 pounds per second.¹⁶

The plight of the Japanese Empire at the time this campaign began is summarized by a single sentence from the U.S.S.B.S. report: "By March 1945, prior to heavy direct air attack on the Japanese home islands, the Japanese air forces had been reduced to Kamikaze forces, her fleet had been sunk or immobilized, her merchant marine decimated, large portions of her ground forces isolated, and the strangulation of her economy well begun."¹⁷

At that time, moreover, the Japanese had already lost the Philippines and Iwo Jima, and were suffering the investment of Okinawa. They were sending no further supplies to their ground forces outside the home islands, and they were concentrating solely on defense against invasion. How long they would have continued to endure even in the absence of a concentrated strategic-bombing campaign is questionable, because the blockade resulting from destruction of the Japanese merchant marine had, among other things, brought the national diet to below subsistence levels. The situation was thoroughly understood by many Japanese military leaders. Some of the senior naval officers had been secretly working since the previous September, that is, since before the Battle for Leyte Gulf, to take the country out of the war.¹⁸

So long as the American goal was unconditional surrender,

¹⁶ I am indebted for this information, and for much more that I have not been able to include, to my colleague Dr. Alexander W. Boldyreff.

¹⁷ U.S.S.B.S., *Summary Report (Pacific War)*, p. 9.

¹⁸ U.S.S.B.S., *Japan's Struggle to End the War*, p. 4. See also Robert J. C. Butow, *Japan's Decision to Surrender*, Stanford University Press, Stanford, 1954, which effectively supersedes the U.S.S.B.S. document and which provides an excellent and fascinating narrative of relevant events.

and especially so long as we were eager to achieve it as quickly as possible, there seemed at the time to be no question that some kind of direct assault on the Japanese home islands was necessary. A full-scale invasion was accordingly being projected for the following November. It is unequivocally to the credit of the strategic-bombing offensive that it secured all the objectives of the planned invasion before the latter could be mounted. It did so at immeasurably less cost in American lives, and no doubt also in Japanese lives, than might otherwise have been the case. Nothing can diminish or gainsay the value and importance of this accomplishment, which had no parallel in Europe. By the same token, it is both unreasonable and ungracious to the other services—as well as to the tactical air forces which conducted four years of marvelously successful and effective operations over land and water—to equate that accomplishment with the winning of the war.

The strategic air offensive against Japan was remarkably different from that against Germany in character as well as result. It was much more concentrated in time, and had the benefit of the more advanced technology then available. Japan was more urbanized than Germany, its cities were more vulnerable to fire, and its active defenses at the time of the campaign were of a low order of effectiveness, being almost confined to anti-aircraft guns.¹⁹ Thus, more was accomplished with fewer bombs. Only 160,800 tons of bombs were dropped on the home islands of Japan, compared with 1,360,000 tons dropped within the borders of Germany. Sixty-six Japanese cities received 104,000 tons of bombs (mostly incendiaries) as compared with 542,554 tons dropped on

¹⁹ Of which, however, there were some 500 heavy guns (88 mm. or larger) in the Tokyo area alone.

sixty-one German cities. Also, a disproportionately large part of the Japanese tonnage was dropped on a very few large cities. Of the sixty-six Japanese cities attacked, only six were struck before the last three months of the war.²⁰ Yet some 40 per cent of the built-up areas of those sixty-six cities was destroyed.

In Japan, unlike Germany, the urban-area bombing seems to have contributed more to achieving the desired results than did the precision bombing of specific industries. This was due not alone to the fact that there was less opportunity for recuperation among Japanese cities than there had been in Germany, but more importantly to the fact that in Japan economic objectives counted for less than psychological ones. The precision bombing was, as in Germany, much more effective per bomb in reducing Japanese war production, and immeasurably more discriminating about the kind of production reduced, than was the urban-area bombing. But Japan had already lost the battle of production; her economy had already proved grossly inadequate to the political and strategic ambitions of her leaders; her losses in a merchant fleet that had been inadequate from the start had already caused, through denial of raw materials, a sharp contraction in production. Greater contractions would have followed inevitably, even without bombing.²¹ It must be added that her overwhelming military defeats, by practically wiping out her navy and isolating most of her army, had greatly re-

²⁰ U.S.S.B.S., *Effects of Air Attack on Japanese Urban Economy, Summary Report*, pp. ivf.

²¹ The U.S.S.B.S. estimated that by August 1945, "even without direct air attack on her cities and industries, the over-all level of Japanese war production would have declined below the peak levels of 1944 by 40 to 50 per cent solely as a result of the interdiction of overseas imports." (*Summary Report [Pacific War]*, p. 15.)

duced the demands which the military forces were making upon the economy.

Japan was already defeated. It was necessary only to make her government develop a clear consensus on that fact, and then openly concede it. The U.S.A.A.F. may not have correctly appreciated the situation, but it acted as if it had. What was wanted was not a discriminating pruning out of this or that kind of military production, but simply the maximum of direct military pressure upon the population and the government. The awful terror of the great fire raids on the cities, culminating in the two atomic attacks, copiously provided that pressure.

The Attack on German Morale

It is difficult to tell just what proportion of the bombs dropped on Germany in World War II was deliberately aimed at German morale, but it was unquestionably very large. A good deal of the area bombing of cities was so directed, especially by the R.A.F. Although Sir Arthur Harris in his *Bomber Offensive* speaks sarcastically of "psychological" objectives as among the "panaceas" thrust upon him by uncomprehending but meddling civilians, it is abundantly clear from the whole text of his memoirs that the "German will to resist" was precisely what he was most interested in attacking. Douhet too, as we have seen, had considered it the most important target after the enemy air force.

The huge share of Allied bombs spent in the attack on German morale failed to achieve any important end results. Bombing did indeed seriously depress the morale of German civilians. The oft-expressed view that the bombing of cities stiffens the will of the populace to resist finds no support in experience. But in Germany the depressed morale had no

critical effects—at least until the very last months of the war, when all was lost anyway—on either the political structure or the capability of the German war economy to support the troops in the field.

The reason that this was so is to be found largely in a distinction, which the German Internal Security Service consistently emphasized throughout the latter part of the war, between *Stimmung* (attitude or feeling) and *Haltung* (behavior). It was one of the important discoveries of the war that the influence of the former upon the latter was much less immediate and direct than had been generally supposed. Some degree of influence there was bound to be, but from the Allied point of view it was disappointingly small.

The attack upon *Stimmung* or attitude was remarkably successful, but this success did not have much meaning for the things that counted. Depressed morale, *plus* the problem of coping with the physical deprivations resulting from bombing, significantly increased absenteeism of industrial workers beyond the normal. It also significantly lowered the productivity of those who reported for work. In combination, these effects—and notice that morale was depressed by defeats in the ground battles as well as by air raids—resulted in a loss of output of at least 25 per cent during the last year of the war. That looked serious enough to those responsible for keeping the war machine going. But as for stopping or vitally impairing the functioning of that machine, the effects were spread too broadly across all industries, were at best marginal, and therefore counted as nothing compared to the knocking out of a single essential industry such as oil production or transportation.

From at least the beginning of 1944 the average German had become disillusioned with the Nazi leadership, increas-

ingly frightened by the war's toll and its potential threat to himself and his family, and persuaded with growing certainty that all would end in defeat. Yet he stuck to his job and his machine for as long as it was physically possible to do so, and in so doing kept a disastrous war going to its ultimate ruinous conclusion. Why did he do so? The answer is to be found in need combined with habit, in coercion, and in propaganda—in descending order of importance—all adding up to the plain circumstance that the German worker had no real alternative open to him.

The effect of habit is in part reflected in the fact that unauthorized absenteeism was much more marked among women than among men, especially in those occupations in which female labor was strictly a wartime phenomenon. The man kept to his job largely because that was what he had always done, in calm and in crisis, and because he and his family needed his wages in order to eat.

The coercion of the government extended to all sorts of restrictions about changing or leaving one's job without permission, and applied with special vengeance to overt expression of feeling—let alone action—against the regime. More telling was the fact that over the years the regime had succeeded in eradicating practically all organized political opposition, so that no means existed for giving direction to and translating into action the feelings of disaffection which undoubtedly developed. There could be no *peace party* in Germany (outside the army, where the dissident group was liquidated after the abortive *putsch* of July 1944) simply because there could be no *party* outside the control of the Nazi leadership.

This absence of organized opposition is the feature of totalitarian countries that must give pause to those who would

count heavily on defeating them by psychological means. In that connection, a critical difference between wartime Germany on the one hand and Italy and Japan on the other was that the latter two countries, though quasi-totalitarian, had in their monarchial systems a latent means of crystallizing an effective and legal opposition to the war party. Those countries surrendered before hostile troops had effectively invaded their main territories, while Germany did not surrender until Hitler was dead and the eastern and western fronts had merged in the center of the Reich.

Although habit and coercion worked exclusively for the benefit of the German government, propaganda was the one means by which the Allied governments could hope to compete with the Nazis in giving guidance to the German workman and soldier. The Allied bombing helped induce Germans to listen to enemy radio broadcasts, partly because its success gave the lie to so many Nazi claims, and also because German stations had to go off the air to avoid serving as beacons. The invading aircraft themselves dropped millions of leaflets. Allied propaganda during the last year or more of the war concentrated on the hopelessness of the German military position, something which the huge formations of British and American bombers ranging freely over Germany effectively drove home. That was all right so far as it went, but it left a hiatus into which Goebbels and Company promptly moved.

The great propaganda achievement of Goebbels, in which he was aided and abetted by Allied word and actions, was to exploit sheer desperation as a means of keeping the Germans fighting. There was no "will to win" because, especially after the collapse of the hopes based on "secret weapons," there could be no expectation of winning. What

took the place of a will to win was an apathy about politics combined with a driving fear of what defeat would bring. One of the grimmer aphorisms then current in Germany was "*Geniess den Krieg; der Friede wird schrecklich sein*" (Enjoy the war; the peace will be terrible). The number of Allied casualties in the last year of the war testifies to the effectiveness of this combination of negative incentives.

One lesson the bombing attack on morale brought home was that a people accustomed to responding to authority—and all peoples are, in modestly varying degrees—will continue to respond even under very great physical stress. As physical conditions approach chaos, the population becomes more dependent upon authority, because of greater need for guidance and succor combined with the absence of alternative. Besides, the person of independent mind who forms his own opinions on the evidence of his senses and the fruits of his logic is an ideal form of human being which, like other ideal forms, rarely exists in nature. Even most intellectuals—always a small minority in a population—tend in their thinking merely to follow more refined fads. Moreover, it takes a very profound revolution of the mind and spirit to accept those cues for behavior provided by the acknowledged enemy as against those offered by one's own leaders.

Granting that it is behavior rather than morale that most interests both attacker and defender, there are nevertheless a few features about the response of German morale to Allied bombs which are especially interesting in view of the new weapons that have appeared since World War II.

One surprising finding of the U.S.S.B.S. was that the most heavily-bombed cities did not necessarily show lower morale than those less severely hit. As between unbombed towns and lightly-bombed ones, morale was much lower in the lat-

ter. It suffered a further but less sharp decline as the status of bombing progressed from "light" to "medium." But as the weight of bombs progressed from "medium" to "heavy," the morale of the target population appeared, if anything, to recover somewhat.²² Much, of course, depends on how one measures morale, and the returns used in the survey were undoubtedly too gross to confirm a real upturn in morale. But what is firmly established is the absence, after a relatively modest weight of bombing, of any significant correlation between additional bombs dropped and further depression in morale.

Why is this so? One reason, no doubt, is the simple fact that the person preoccupied with dodging enemy missiles does not find much time to think about other matters which might otherwise disturb him. He is unlikely to be brooding on the historic sins and errors of a government to which he can scarcely conceive an alternative. He is politically apathetic, and his apathy may look a good deal better to those whose job it is to control him than did the discouraged restlessness that perhaps preceded it. Besides, if he has been bombed out of house and home, he is grateful for small offerings, and he may acquire a more favorable attitude toward

²² The following classification for degrees of bombing was adopted by the Morale Division of U.S.S.B.S.: Group I (heavily bombed), cities receiving 19,100 tons to 47,200 tons (average: 30,000 tons); Group II (medium bombed), cities receiving 1,700 to 13,100 tons (average: 6,100 tons); Group III (lightly bombed), cities receiving 300 to 800 tons (average: 500 tons). Since these figures and categories ignore the size of the city concerned, they cannot give a good index of the *intensity* of bombing for any one city. However, a recheck of the results described in the text above according to the *percentage of destruction* for each city confirms the general conclusions reached. See *The Effects of Strategic Bombing on German Morale*, vol. 1, Morale Division, U.S.S.B.S. (Item #64b for European War), pp. 24, 27.

the regime merely from being given coffee at the refugee station.

On the other hand, we learned also that depression in morale, while not necessarily proportional to weight of bombs dropped, does vary with degree of personal involvement, such as the death or severe injury of members of one's family, or the destruction of all one's worldly goods, or forced evacuation. Despite the large amount of physical destruction in German cities, the statistics of personal involvement were quite different from what one would expect—certainly different from what one would have to expect with nuclear weapons. Only one-third of all Germans lived in cities that were subjected to bombing. One-half of 1 per cent of all Germans were killed by bombing, and 1 per cent were injured; that is, only 5 per cent of that minority of Germans *actually subjected to bombing* were killed or injured. One-fifth of all civilians were at one time or another deprived of water, gas, or electricity. And one out of fifteen civilians was evacuated.

These figures are impressive when converted to absolute numbers of people, and it is also true that virtually no German escaped some measure of hardship or suffering as a result of the bombings. But the great majority of Germans escaped the more serious kinds of heartbreak or horror. Under atomic weapons, even ignoring the effects of fallout, the proportion of persons exposed to risk in the cities would be much greater, the incidence of casualties and of lost homes would be multiplied, and the disorganizing effects upon the surrounding countrysides would be immeasurably more immediate and direct. Certainly the amount of warning permitted by missiles and by attacking cells of planes moving at or above the speed of sound would be much less.

It is true that the effects of reduced morale upon German production look very different if one concentrates on the last two months of the war rather than on the entire two years of heavy bombing. In the end, the overwhelming conviction that there simply was no use in going on did indeed control events. The efforts to restore damaged facilities finally collapsed for complete want of incentive. With nuclear bombs such a state of affairs would occur within days or hours of the onset of the attack.

The Attack on Japanese Morale

The physical and social context of the bombing attack on Japanese morale was sufficiently different from that of Germany to provide distinctive instruction; yet it serves also to emphasize the striking similarity of the results. The bombing of urban areas in Japan was both more concentrated in time and more intense than in Germany, and it resulted in a higher incidence of both physical destruction and casualties. Also, the campaign reached its awesome and dreadful culmination in two atomic explosions.

As in Germany, only more so, the effect of the bombing on Japanese morale was to produce, by whatever kind of measurement one adopts, an immediate and precipitous decline. In Japan as in Germany, low morale was reflected in loss of the people's confidence in their leaders and in one another, as well as in their becoming, as the U.S.S.B.S. puts it, "more and more obsessed with finding individual solutions to their own severe and urgent personal problems." In Japan there was no more tendency than there was in Germany for the low morale to find expression in any organized popular movement to revolt, or in manifest pressure upon the government to surrender. On the contrary, the

Emperor's announcement of the surrender was apparently greeted by a majority of the population with stunned disbelief and dismay. Only a relatively small minority of the whole population later admitted to their American interrogators a feeling of relief at hearing that the war was over. Even among those who had personally experienced ten or more air raids, barely 52 per cent were ready to cite cessation of such raids as a sufficient reason for satisfaction at the ending of the war.²³

That is not to say that the low state of public morale played no part in bringing about the surrender. In the peculiar oligarchical system by which wartime Japan was ruled, the peace faction which gradually emerged and moved toward ascendancy had to proceed most cautiously—even conspiratorially—with respect to the die-hard faction. The leaders of the peace-seeking party, ostensibly led by the Premier, Admiral Kantaro Suzuki,²⁴ had to assure themselves that the people knew enough of the general state of affairs to accept a surrender decision and to refrain from supporting a possible *coup d'état* by the army die-hards. The latter faction also had to be persuaded that the mood and condition of the people made absurd any talk of a last-ditch defense in which civilians would fight off the invaders with bamboo spears. Even so, the maneuvers of the peace group were delicate in the extreme, and required finally the personal intervention of the Emperor.

The part played by the two atomic bombs cannot be un-

²³ See *The Effects of Strategic Bombing on Japanese Morale*, U.S.S.B.S. (Item #14 for Pacific War), pp. 150f.

²⁴ The real leader of the movement was Shigenori Togo, whom Admiral Suzuki had selected as Foreign Minister, knowing that he had been opposed to the war from the beginning; but Togo on one or two critical occasions had to stiffen Suzuki's determination to end the war. See Butow, *op.cit.*, chs. III and VII.

equivocally determined by what was said or not said in cabinet meetings and comparable conferences. It would be hard to believe that they failed to have a positive and powerful effect on the surrender deliberations, but very little seems to have been said about them in those deliberations. So far as the populace was concerned, few people outside the target areas had any real comprehension of what the bombs meant, and those within the areas seem to have been psychologically affected in no significantly different way from the people of other cities who had experienced severe HE or incendiary attacks.²⁵

The cabinet had already initiated peace proposals to the Soviet government before the atomic bombs were dropped, and there is no reason to suppose that acceptance of the Potsdam Declaration would have been long delayed in the absence of such bombing. In the meeting of August 9-10 (after the second bomb had exploded) the cabinet was still deadlocked on the minimum terms under which Japan could agree to quit the hopeless fight, and it was this deadlock that the Emperor personally resolved. No doubt the atomic bombs affected him; but they could hardly have affected him decisively, because he had impressed upon the new Premier as early as the preceding April the need for finding the quickest possible means of ending the war.²⁶

²⁵ *Ibid.*, p. 94. See also Part 1 of *Air War and Emotional Stress*, by Irving L. Janis, McGraw-Hill, New York, 1951. A remarkable document in this connection is Dr. Michihiko Hachiya's *Hiroshima Diary: The Journal of a Japanese Physician, August 6-September 30, 1945*, University of North Carolina Press, Chapel Hill, 1955.

²⁶ See Butow, *op.cit.*, pp. 63f. My RAND colleague, Dr. Paul Kecskemeti, argues cogently in his *Strategic Surrender: The Politics of Victory and Defeat* (Stanford University Press, 1958) a position very close to the one that I have presented here, based on a completely independent examination of the same evidence. He tends, however, to allow even less

In summary, we can say that, insofar as the low morale of the Japanese people influenced the governmental decision to surrender, it did so in a quite passive way. The leaders who spearheaded the peace movement had been convinced for more than a year before the end that Japan had lost. The terrible destruction and death rained down on Japan in the summer of 1945 naturally compelled a mood of urgency on the part of the peace-seekers, and made speedier and easier the acceptance by the erstwhile die-hards of almost-unconditional surrender. No reasonable observer can deny that the aerial bombardment hastened the end of the war and sufficed to make invasion unnecessary. But what must be denied, for the sake of clarity in strategic thinking, is that this process operated to any important degree through the direct pressure of public feeling.²⁷

All this must of course be related to the singular political and social structure of wartime Japan. But under any form of government, an orderly surrender usually requires the initiative of political leaders who are already in authority or close enough to it to acquire it without waiting upon popular revolution.²⁸ Popular revolutions do not thrive under

weight than I do to the influence of the two atomic bombs in ending the war (*Strategic Surrender*, pp. 199-206).

²⁷ The authors of the above-cited U.S.S.B.S. morale report go so far as to insist, in their ch. XI, that the Japanese leaders ended the war when they did to conserve not lives but rather their own special privileges under the existing class structure of Japan. The authors, however, produce no evidence in support of that view, for the insistence upon the retention of the Imperial institution cannot be so regarded. No doubt the Japanese leaders, conservatives all, were interested in preserving as much as they could of the social and political structure of Japan, but we have no reason to assume they were callous in the face of the miseries being inflicted on the populace.

²⁸ A much qualified exception is the Bolshevik Revolution of 1917, followed by a Russian withdrawal from the war under peace terms (at

conditions of wholesale destruction from the air. The kind of extreme destruction that can be envisaged with nuclear weapons is rather more likely to dissolve all government than to cause the replacement of an incorrigible regime by an amenable one.

The Japanese experience suggests also that to compel huge evacuations is more profitable as well as more humane than to produce corpses. During the American air campaign, some eight and one-half million Japanese left their homes to become refugees. This figure must be considered not only in relation to the whole national population but even more to the populations of those larger industrial cities which mainly fed the exodus. Although evacuations also took place in Germany, the flight of urban dwellers from Japanese cities was more concentrated in time and hence more disorganized, and it included very much larger proportions of workers previously engaged in war industries. These panicked humans not only spread throughout Japan the full account of the horrors occurring in the cities, but they also created for the government burdens with which it showed itself unable to cope.

This rout of citizens would no doubt have resulted in any case from the fury of our attack, but it was given strong additional impetus by an American practice introduced in the last months of the war. That was the explicit warning of impending bombing attack, which was done chiefly by dropping leaflets (scarcely 2 per cent of Japanese civilians ever heard enemy radio broadcasts) listing cities to be destroyed "in the next few days." Each list was designed to be

Brest Litovsk) that were comparable to surrender. On conditions of surrender in general see the aforementioned study by Paul Kecskemeti.

short enough to impress the reader with its specificity, four or five cities usually being named in each series, yet long enough to avoid giving any marked assistance to the Japanese air defenses. The attendant commentary took care to stress that other cities besides those named might also be hit.

Unfortunately, the U.S.S.B.S. interrogators failed to question people seriously on what they had *done* as a result of hearing or reading about such warnings. They asked instead how many had seen the warnings or heard of them, and how many of those who did had believed them. But the evidence indicates (1) that the warnings were received by most of the targeted populations, (2) that they were generally believed, and (3) that they were acted upon through flight. Relatively few people left their homes until the cities in which they lived had received some bombing, but after such bombing the warnings had a most receptive audience. Many were unquestionably stimulated to move who would otherwise have tarried.

The military situation peculiar to the closing months of World War II in the Pacific was as favorable as it could be to the use of warnings, which literally cost us nothing in planes or air crews. Nevertheless, the warning technique could undoubtedly be applied even in the future under a wide variety of military circumstances. Whether it would be employed, however, in that massive interchange of blows which is the usual mental image of the onset of World War III is another matter

Relevance for the Future

The World War II experience with strategic bombing was the first of its kind in the history of warfare, and also, we

can be reasonably certain, the last. No campaign on a comparable scale is likely ever again to be carried on between great belligerents with HE or other chemical bombs, not only because of the availability of nuclear weapons but—in the unlikely event that nuclear weapons could be outlawed and stay outlawed in an otherwise total war—also because technological developments have made long-range sorties with bombers or missiles far too costly to be acceptable as means of delivering bombs of such very limited capability.

We have offered the above chapter out of the conviction that relevant experience is always valuable, the more so as it is scarce, but insofar as our interest is not purely historical, we have to acknowledge that in this instance the relevance is qualified. There are, however, hints about the future to be found in it, perhaps the most obvious and also the most important being the reminder that men's predictions about the outcome of a wholly new kind of campaign are likely to prove highly fallible.²⁹

²⁹ For a systematic effort to apply the lessons of various disaster studies, including the strategic bombing of World War II, to future war, see Fred C. Iklé, *The Social Impact of Bomb Destruction*, University of Oklahoma Press, Norman, 1958.