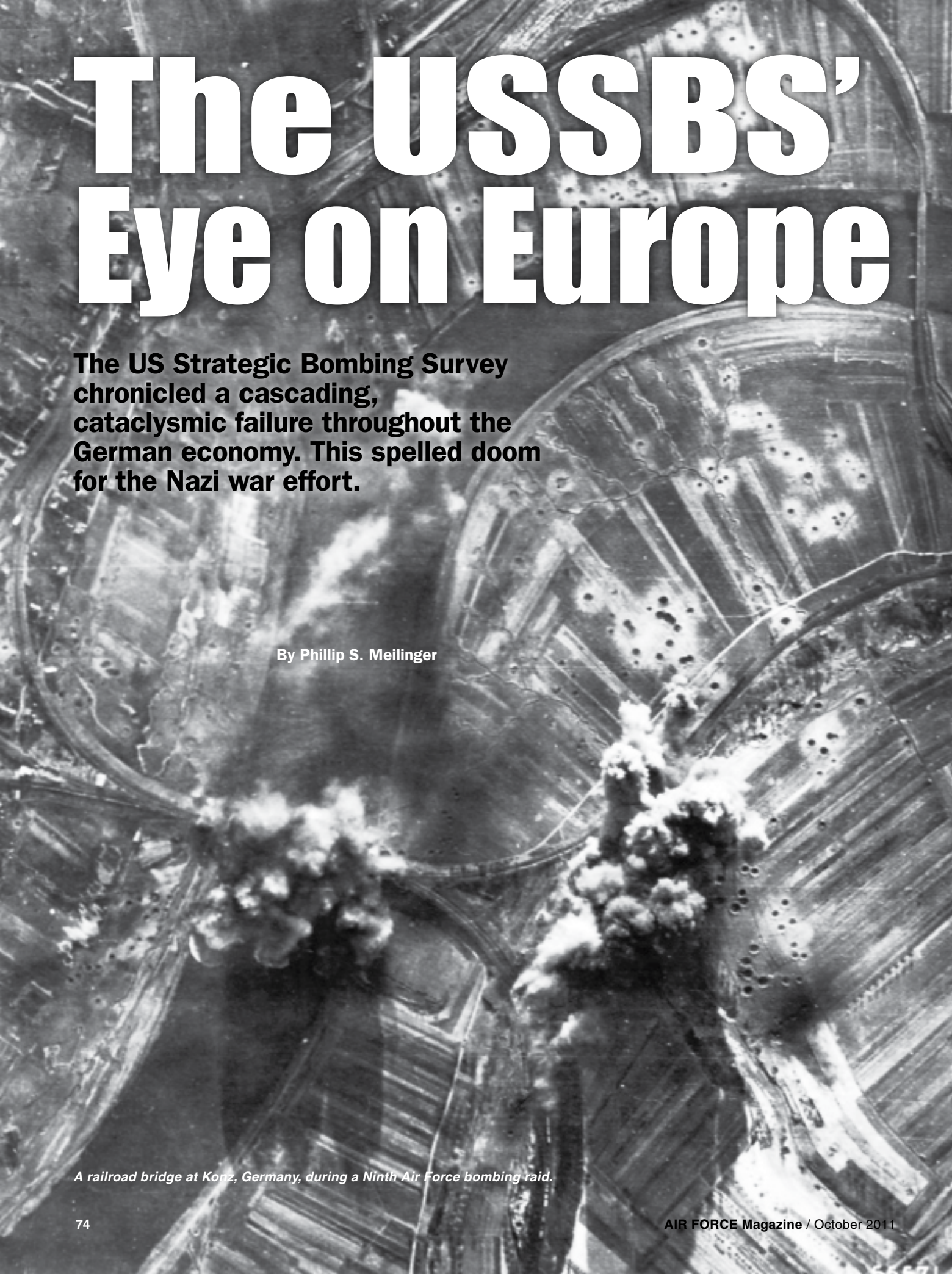
The USSBS' Eye on Europe

The US Strategic Bombing Survey chronicled a cascading, cataclysmic failure throughout the German economy. This spelled doom for the Nazi war effort.

By Phillip S. Meilinger



A railroad bridge at Konz, Germany, during a Ninth Air Force bombing raid.

The United States spent $183 billion on armaments during World War II. Of that amount, the Army Air Forces share was $45 billion. With that money, the AAF bought 230,175 aircraft, of which 34,625 were heavy bombers—15 percent of the total aircraft purchased. These bombers cost $9.2 billion—20.4 percent of AAF expenditures, and five percent of total US armament spending.

Did the United States get its money's worth?

Those in uniform, but also historians and military buffs, have debated that question for decades. Much of that debate sheds a great deal of heat but little light. There was, however, a massive effort conducted at the end of the war to answer the question of strategic airpower's effectiveness. That effort was the US Strategic Bombing Survey (USSBS, pronounced "us bus").

Many over the years have referred to the survey, but few seem to have read it.

The survey was the intellectual brainchild of Maj. Gen. Muir S. Fairchild. "Santy" had been an instructor at the Air Corps Tactical School in the late 1930s where he had refined and articulated the doctrine of high-altitude, daylight precision bombing of an enemy's industrial centers. The core of this belief was referred to as the "Industrial Web" theory postulating that economies were integrated entities, like a spider's web, and a disturbance in one sector of the web (the economy) would reverberate throughout all sections. During the war, Fairchild served in Washington, D.C., on the Air Staff and the Joint Staff, but he remained interested in the concept of strategic bombing and, more importantly, on what effect it was having on the German war effort.

As the war drew to a close in Europe, he believed a bombing survey was essential to answer questions regarding the effectiveness of airpower. He took the idea to Gen. Henry H. "Hap" Arnold, Commanding General of the AAF. At the same time, Gen. Carl A. "Tooey" Spaatz, the top American air commander in Europe, wrote Arnold with a similar idea. Arnold liked the idea, agreed with his subordinates, and approached Robert A. Lovett, the assistant secretary of war for air. Lovett took the idea to the President, and on Sept. 9, 1944, Roosevelt gave his approval to form a bombing survey team.

Lt. Gen. Carl Spaatz (foreground), commander of US Strategic Air Forces, and Gen. Henry Arnold, AAF Commanding General, visit a rough airstrip in France after D-Day.

The following month, Arnold offered the job as survey chief to Franklin D'Olier, president of the Prudential Insurance Co. D'Olier was caught by surprise and expressed his unsuitability for the job—he was not an aviator. Arnold countered that that was precisely why he was ideal: He wanted a nationally prominent man of affairs, with no axes to grind, pro or con.

Historian David MacIsaac writes that Arnold and Lovett told D'Olier the AAF needed an impartial report to be used "as a basis for planning the postwar composition and strategical principles of the Army Air Forces." The general stressed, "This is your job, and when you're finished, you report not to me, but directly to Secretary Stimson and the President."

D'Olier organized his team, which would eventually number nearly 1,600 officers, enlisted personnel, and civilians, into three broad groups dealing with military, economic, and civilian studies, with those in turn divided into 13 smaller divisions for categories such as physical damage, oil, munitions, transportation, and morale.

Civilian businessmen, lawyers, and bankers headed all of the groups and divisions although they usually had a military officer serving as deputy who acted as their executive officer to ensure things got done within the military system. The quality of the civilians chosen was exceptional and included Paul H. Nitze, John Kenneth Galbraith, Henry C. Alexander, and George W. Ball. The expertise of those selected was specific for the tasks they were given: For example, Robert P. Russell of the Standard Oil Co. was to be the director of the Oil Division, and Col. Frank A. McNamee Jr., deputy head of the Office of Civilian Defense, was named director of the Civilian Defense Division.

A Catastrophic Effect

Over the next year, USSBS teams roamed Europe, visiting hundreds of bombed sites, measuring, photographing, and collecting data, while also interviewing thousands of individuals, from top generals and diplomats—Hermann Goering, Karl Doenitz, and Albert Speer, for example—to workers and civilians.

So what were the bombing survey's findings?

The survey's writers concluded that "Allied airpower was decisive in the war in Western Europe." Airpower was

B-17s form up on a World War II bombing run. Eighth Air Force suffered astounding casualties—more than 26,000 of its airmen were killed.

not the only decisive factor: The massive Soviet Army on the Eastern Front was chewing up German divisions at an astonishing rate. The American, British, and Free French forces in the West were facing far fewer German troops, but the offensive beginning on D-Day caught Germany in the jaws of a vice it could not escape.

Also, not just strategic airpower but airpower in general was a decisive factor in victory. By D-Day, Ninth Air Force, a tactical air force tasked to support the 12th Army Group, was larger than the operational strength of the entire Luftwaffe.

Even so, USSBS argued that strategic bombing had a catastrophic effect on the German economy and transportation system, and this in turn had a fatal impact on German armed forces.

The survey completed 212 volumes covering the European war, and in these reports it presented scores of charts, graphs, and tables illustrating the impact of bombing. At its peak, the combined bomber offensive—which included the AAF and the Royal Air Force Bomber Command—employed 1.34 million personnel and more than 27,000 aircraft. The bombers flew 1.44 million sorties and dropped 2.7 million tons of bombs—54.2 percent by the AAF. (An additional 2.7 million fighter sorties were flown, most of those in support of the bombers.)

The bombing campaign was costly: The survey reported the British and the Americans suffered nearly 160,000 deaths among their airmen (almost exactly the same number by each), and 40,000 aircraft were destroyed (22,000 RAF and 18,000 AAF). The casualties for Eighth Air Force were staggering: 44,483 men. Indeed, Eighth Air Force suffered more deaths—26,000—than did the entire US Marine Corps during the war, as 24,511 marines died of all causes.

Significantly, 85.9 percent of all bombs dropped by the AAF on Germany fell after D-Day. In truth, the combined bomber offensive did not really begin until the spring of 1944—a date predicted by prewar planners. When the aircraft and crews were finally available in mid-1944 to conduct major bombing operations against Germany, the "Crescendo of Bombing" proved devastating to the German war effort.

The bombing survey's graphs regarding production in key industries are dramatic. Virtually every major commodity necessary to sustain the German war effort began a severe decline by the summer of 1944.

Regarding synthetic fuel, for example, peak production of 316,000 tons per month plummeted to 107,000 tons in June and 17,000 tons by September.

Aviation fuel dropped from 175,000 tons in April 1944 to 30,000 tons by July and 5,000 tons in September—a 97 percent drop in five months. The largest German oil refinery, Leuna, was bombed 22 times during the war, ultimately reducing its capacity by more than 90 percent. The effects of this fuel drought were felt throughout the Wehrmacht. Aircraft stopped flying and tanks stopped driving. In March 1945, for example, the Soviets overran 1,200 German tanks that had run out of gas. Because of the aviation fuel shortage, new Luftwaffe pilots entered combat with perhaps 110 flying hours compared to 360 for the AAF.

The bombing attacks on the German transportation industry were even more profound: "The attack on transportation was the decisive blow that completely disorganized the German economy," the survey stated.

Eliminating the Luftwaffe

The survey noted that 40 percent of all rail traffic was used to deliver coal—21,400 train carloads per day at the beginning of 1944. By the end of the year that number had fallen to 9,000 cars daily, a drop of 58 percent. Steel production necessarily followed, with production in the Ruhr plummeting 80 percent in six months. Similar drops

A watchman picks through debris at Rheinmetall-Borsig in Dusseldorf after the munitions plant was hit by Eighth Air Force. The plant made 88 mm gun barrels.

were experienced in the production of explosives, synthetic rubber, chemicals (nitrogen, chlorine, methanol, etc.), powder, and combat munitions.

The effect of the bombing campaign on the German labor force was also significant: 2.5 million workers were engaged in "debris clearance, reconstruction and dispersal projects, and other types of repair activity necessitated by bombing." One million more workers were assigned to produce civilian goods that had been destroyed in the bombing attacks, and another one million were devoted solely to the production of anti-aircraft guns—Germany had more than 55,000 anti-aircraft guns in 1943 and they consumed 20 percent of all ammunition produced. It is worth considering the result if those millions of workers had either been producing offensive armaments, or worse, if they had been in uniform, opposing Allied forces at Normandy.

Above: A B-17 from Fifteenth Air Force releases its bomb load. Left: Hit by flak, a B-17 goes down. Despite a quick aircraft inventory buildup before the US entered the war, the Air Force only had 374 heavy bombers in 1941. By the end of the war, nearly 35,000 heavy bombers were built.

By D-Day, defense against Allied air attack—which ultimately proved futile—absorbed one-third of the entire German war economy.

The survey also gave some overall conclusions: Air superiority was essential to the success of the bombing campaign, as had been predicted before the war. This air dominance was not attained until the spring of 1944—but it allowed the bombing campaign to achieve its dramatic success. By D-Day, the Luftwaffe was virtually eliminated as a factor, with only 80 aircraft operational to oppose the Allied landings on June 6.

The analysts also concluded it was better to focus on one target system and destroy it, rather than hit numerous systems simultaneously with a relatively small amount of tonnage on each. Each industry had built-in slack, and a small degree of bombing was simply absorbed, resulting in little decline in overall production.

As noted, the transportation network, which was the recipient of greater tonnage than any other target system—32.1 percent of all bombs dropped—was the key to the enemy economy because it moved the resources to the factories and the finished goods to the front. The disruption of the railroads brought everything to a crawl. Especially important was the movement of coal that powered the entire German economy.

Close behind the destruction of the transportation system was the demise of the oil refineries, a situation particularly fatal to the Wehrmacht's mobility on land and in the air (9.3 percent of the total tonnage dropped was on oil targets).

Area attacks were deemed less effective in reducing industrial production than were "precision" attacks. In fact, the survey concluded that the area attacks of the RAF had only a minor impact on German production. Surprisingly, the RAF's own bombing survey reached much the same conclusion. The analysts stated, however, that German morale fell precipitously as a result of bombing, causing "defeatism, fear, hopelessness, fatalism, and apathy."

Yet, the coercive practices of the Nazi regime that relied on slave labor and a 72-hour workweek kept the factories operating. The survey also noted the synergism existing between target sets: The bombers destroyed the steel mills and the munitions factories, but also the rail lines leading to and from those mills and factories, along with the marshaling yards serving the railroads. Taking down the oil refineries meant there was little fuel to power the airplanes and tanks that were produced. All of this contributed to German military collapse.

In other words, rather than specific bottleneck targets existing as predicted by prewar theorists, it took repeated, heavy attacks against several components of the industrial system in order to produce the collapse of the entire enemy infrastructure. The German economy, indeed any economy, is akin to a living organism that adapts and reacts to stimuli such as attacks against it. The Germans fought back and changed behaviors and produced

Berlin after the heavy bombing campaign at war's end. Block after block of the German capital was devastated.

work-arounds. The resiliency of the German economy was a disturbing surprise.

Even so, when the bombing campaign was able to launch powerful attacks in mid-1944, the result was dramatic: The USSBS reports depict a cascading, cataclysmic failure throughout the German economy, a failure that spelled doom for the enemy war effort.

Survey analysts claimed, however, that some targets were overlooked that should have been struck more heavily during the war. The primary "lost target" was the German electrical system. Even before the war, air planners had considered the power grid a bottleneck target—the Air War Plans Division-Plan 1 team had placed it at the top of their list—but once the air campaign began, air leaders decided its widely dispersed nature and the small size of individual power plants made it a low priority target. This system, with minor exceptions, was never made a primary target for strategic bombing, but USSBS analysts argued it should have been. A relatively small amount of bomb tonnage would have had catastrophic and cascading effects throughout the economy.

Bottom Line: Worth the Cost

Similarly, the survey argued that the ball bearing industry, hit hard in the fall of 1943 but at grievous cost, was indeed a choke point target system that should have been revisited.

Other potential key nodes susceptible to cascading effects were aircraft engine factories, fuselage assembly plants, propeller facilities, and tetraethyl lead plants. This last was interesting. Tetraethyl lead (TEL) is a chemical that when added to gasoline raises its octane rating. High-performance engines of the time were dependent on high-octane gas. If the TEL plants had been destroyed—and there were only a handful around the Reich—the results could have been disastrous for the Luftwaffe, which required high-octane fuel for its fighter aircraft. This was the type of keystone target prewar theorists had predicted, but its importance was not discovered until after the war.

Of interest, Speer, the German armaments minister during the war, later stated that the ball bearing industry was indeed a bottleneck target as American air planners had thought. Speer felt striking it harder would have had a major effect on the economy.

Strategic bombing on Germany, while concentrated in time to the last nine months of a six-year war, was devastating, and Allied air superiority proved critical. Speer later stated that May 1944 was the beginning of the end: "The war was over in the area of heavy industry and armaments."

Although USSBS was supposed to be apolitical, this hope was naive. The subject of strategic bombing was freighted with politics: interallied (US vs. UK), interservice (AAF vs. the Navy), and intraservice (bombers vs. fighters). No matter what the survey teams wrote, they would offend someone. Moreover, the survey did have inherent problems. Its focus on strategic bombing tended to slight the achievements of tactical airpower—although such a strategic focus was after all its specific task. The civilian specialists chosen were from management rather than labor, and this might have skewed the results regarding worker productivity and morale.

Significantly, the US entered the war with a pitifully small number of heavy bombers, bombers that could have been built six years earlier—the B-17 first flew in July 1935. In September 1939 when war broke out in Europe, the Air Corps had a total of 27 heavy bombers—26 B-17s and one experimental XB-15. Over the next two years, the air arm would enjoy a huge buildup—21,000 more aircraft were built—but of those, only 374 were heavy bombers.

The Army hierarchy simply refused to buy the heavy bombers that airmen proposed. The land warfare zealots who controlled the top echelons of the Army between the wars prevented the AAF from acquiring the tools necessary to properly carry out the strategic bombing mission until 1944.

The result: In mid-1943, the Allies together could muster barely 1,000 heavy bombers on a given day. One year later, that number had tripled. By the fall of 1944, the combined bomber forces numbered 5,250 aircraft. That is why the Crescendo of Bombing, which began in mid-1944, was so utterly devastating. Airmen wondered if those astounding results could have been achieved earlier and with less loss of life.

The bottom line: Most certainly the strategic bombing offensive against Germany was worth the cost. The campaign was expensive in both human and economic terms, but it measurably shortened the war and saved tens of thousands of American and Allied lives. ■

Phillip S. Meilinger is a retired Air Force pilot with 30 years of service and a Ph.D. in military history from the University of Michigan. He is the author of seven books and more than 80 articles on military affairs. His latest book is "Into the Sun: Novels of the US Air Force." *His most recent article for* Air Force *Magazine, "The Prescient Planners of AWPD-1," appeared in July.*