

# Response on Review

## What is technical success?

BY HERMIONE GIFFARD

I want to thank the editors for this opportunity to respond, for Lutz Budrass's review cannot go unchallenged. The core of the review is an attack on my scholarship suggesting I have not read the latest German historiography on the topic and thus get my story seriously wrong. Budrass suggests my work is part of a wider programme led by David Edgerton to discredit German engineering, and that in an unprofessional way I concealed this in my book. Yes, I share Edgerton's "analytical preferences" for studying technologies *in use* rather than the stories of invention alone.<sup>1</sup> I also agree based on the ample evidence that the British government was an enthusiastic supporter of British technology in World War II. Studying these things seriously isn't any sort of secret but a clear methodical program.

Budrass's thinking seems to be simplistically zero-sum as his review makes clear: criticizing Britain in World War II is implicitly praising Germany and praising Britain is being implicitly critical of Germany. I disagree, as my book makes clear. The two nations had different models connecting technology to use. None of Budrass's criticisms of my work, major or minor, stand up. Proper analysis of what he says in every case supports the story I tell rather than the criticism he wishes to make. I do not have sufficient space or time here to speak to each one. I will first deal with some of his criticisms, and then move on to the way he misrepresents my project, which is one I believe readers of this journal would be interested in. For my central objection is that he does not see that this book is a critical evaluation of theories of invention and a suggestion as to what a new such theory might look like, taking the international history of the jet engine in its early years as its case. Budrass sees only what he takes, wrongly, as I will show, to be an erroneous even offensive account of the German wartime turbojet programme. In his own words: "[t]he purpose of Giffard is to belittle the German turbojet project..." It is not. I am used to having my arguments misrepresented and misunderstood by some British jet enthusiasts; I am dismayed to find myself the butt of an attack of a similar sort by an academic colleague. I need to state unequivocally that nowhere in the book do I ever belittle the German project or the quality of the German turbojet's engineering.

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1 David Edgerton, *Shock of the Old. Technology and Global History Since 1900*, Oxford 2007.

Budrass bluntly suggests that I wrote in ignorance of the most recent German scholarship and his own work. In fact, I did read this work and found it eminently useful. Very little however was directly relevant to my chief concerns. I engaged with those German sources that were. Budrass' well-known study of the German aircraft industry, which he implies that I took no note of, is not directly quoted in the book but is listed in the book's bibliography although it does not deal with the production of jet engines. He similarly criticises me for supposedly dismissing relevant work by German scholars in an article I published. I do not dismiss it, but as I say there, I argue something different to those scholars, whose work is focussed on academic-style science.<sup>2</sup> Budrass seems unable to grasp that I could have different concerns from the literature he knows, as well as quite wrongly suggesting I am unaware of it.

One of the novelties of my book is that I make clear for the first time what it means that jet engines were produced by slave labour in the Harz mountains alongside V2 rockets. Budrass alludes to this, but only to imply that I am wrong. He states that "It is not possible to produce a device as sophisticated as ... a turbojet under death camp conditions." He cites a paper that he co-authored to prove this, but that study talks only about the use of prisoners by two companies which did not produce turbojet engines (Henschel and Volkswagen) and therefore proves no such thing. As he should know, scholars have shown that complex products were produced in concentration camps.<sup>3</sup> He seems to imply that jet production at Nordwerk by slave labour was not, could not be, the brutal affair I suggest. My argument – not understood, much less reported by Budrass, is that National Socialist Germany *designed* an aero-engine, the jet engine, to be produced under concentration camp conditions, which *did* go against everything that industry believed to be good engineering practice (including the gains offered by learning effects), and that it *produced* jet engines there in large numbers. That these engines did not live up to the engineering standards of production by a peace-time aero-engine firm is unsurprising.

Central to my book is the idea, again not reported by Budrass, that contrary to naïve first impressions the jet engine was a simpler, cheaper substitute for extremely complex and expensive piston engines. Further, it argues that we should question whether new inventions are adopted only because of "superior performance" not for other reasons, such as the ability to be produced under concentration camp conditions. In my account, Germany made many jet engines in part because they *could be* produced in concentration camps. Budrass ignores all this – and treats my carefully-weighted challenge to the story of the German jet as an uncritical, broad-sided attack on the quality of

2 Hermione Giffard, Engines of Desperation. Jet Engines, Production and New Weapons in the Third Reich, in: Journal of Contemporary History 48, 2013, pp. 821–844, here p. 824f.

3 Michael T. Allen, Flexible Production in Ravensbrück Concentration Camp, in: Past & Present 165, 1999, pp. 182–217.

German engineering. The jet engine is for him a major engineering achievement, which followed from the recognition that the piston engine had limits – the traditional story. He thinks my story is something like that of ‘Prussian militarists piecing together the shabby version of a sophisticated machine, outweighing the lack of technological expertise by sheer brutality.’ That is not my argument.

Perhaps I used the term “Ersatz” too freely to describe Germany’s turbojets, given the history that Budrass brings attention to, but it was meant in its most textbook way rather than in this historical way. The use of the term was not a comment on the nature of the materials used in the German turbojet engines, as Budrass implies, but on the fact that the engine itself was known to be inferior to existing piston engines in some crucial measures (my central argument). The Luftwaffe would have – like the Royal Air Force – continued to use high-powered, proven piston engines for its fighters if they were not so costly to make and improve. (Because the industry at war’s end did not make high-powered piston engines for fighters, I use the figures for bomber engines to give an estimate of labour and material costs.) The Luftwaffe was ultimately forced to embrace the turbojet by the dire circumstances Germany was in. Curiously, Budrass is content to accept this argument for the He 162 airframe – the “epitome of the moral corruption of the German aircraft and aero-engine industry” – but not for the jet engine.

I cannot evaluate claims such as: “the German turbojet was a remarkable technical achievement”. The reason is that such claims are not as straightforward as they seem. As I write in the book, we cannot proceed as if “turbojet” describes a single historical thing; each type of “turbojet” produced during the Second World War was unique, as I explore in deep detail in my book. International comparison shows just how much detail such simplifications sacrifice: did Britain and Germany’s aero-engine companies produce the same thing? Like Air Ministries, I use things like weight, power output, hours of use before overhaul and number of accidents to compare aero-engines – including *in use*. I do not compare the quality of engineering and all that implies, but specific engineering products at particular times, a very different thing.

Budrass mangles my argument about fuel. I do not argue (as others have) that turbojets were produced because they saved aviation gasoline. Instead, I argue that the German Air Ministry’s decision to make diesel fuel rather than aviation gasoline could only be made because they had already decided to introduce jet engines. The fact that some of Germany’s turbojets (like the BMW 003) were converted to diesel after being designed shows that it was deemed better or easier to convert these to diesel (and to make diesel) than convert other turbojets to aviation gasoline, which would also have powered piston engines.

Budrass resorts to making up arguments and attributing them to me and then claiming I provide no evidence for them, and indeed makes the grave

charge of falsifying evidence to support a false argument. He writes: “Giffard’s frequent claim that those hollow [turbine] blades, made of folded Tinidur sheet (59), highlighted the “shoddy construction work” (61) has no basis. She presents neither a single reliable piece of evidence for this, nor for her general claim that “performance, quality and safety” of the Jumo 004B were intentionally sacrificed for production needs (65). Sometimes she even makes up references: Her claim that those hollow blades “increased the frequency of fatal, catastrophic engines failures” (58) is referenced with pages 208 to 211 of Constant’s book. Here, on page 211, is indeed a description of the design of the Jumo 004, but there is not a word on engine failures, least of all on catastrophic ones.”

To clarify his confusing and confused text, he accuses me of making three claims, which he jumbles together: 1. That the BMW 003’s hollow turbine blades (the 004 originally didn’t have folded turbine blades) exemplify the produced engine’s “shoddy construction work”. 2. That hollow turbine blades “increased the frequency of fatal, catastrophic engines failures” supported by made-up evidence. 3. That the “performance, quality and safety” of another turbojet engine, the Jumo 004B, were intentionally sacrificed for production needs. Alas for Budrass’s confident assertions, I never made the first two claims and therefore obviously do not adduce evidence to support them. I do make argument 3, and support it with evidence. The supposedly made up reference in fact gives evidence for this claim, rather than being non-evidence for Budrass’s invented claim 2. My well-substantiated argument (referring on page 61 to the German Air Ministry’s own files) is that decisions influencing design were taken to put jets into the air quickly and in quantity, knowingly sacrificing reliability and performance and even safety, as the record of use shows. While Budrass recognises that in Germany ‘quality standards’ were sacrificed during the war, he cannot see that my argument is that the rapid adoption of the jet engine was itself a sacrifice of quality standards of aero-engines. This illustrates again the fundamental problem with his review, which is that he simply does not report what I actually argue despite the fact that my arguments are strong, clear and distinct. He is attacking a book of his own invention, with a much weaker and indeed confused thesis than the book which I wrote.

Budrass’s account is full of further minor misleading claims, which there is no space to correct. But I do need to challenge the implication that I am not even-handed between the British and German projects. What I show is that the British could afford many projects, many of which failed, but it had so many and was so focussed on development that by 1945 they had more and better jet engine designs ready for production than did the Germans. I do not take this as evidence of British engineering superiority for there is no reason to. Nor is it correct to say that “she distils a British model of success by which she assesses the history of the German project”; the two are treated

symmetrically and did not have the same goal. I, unlike Budrass, nowhere try to speak in supposedly objective terms of “success” – I deny that such an evaluation is meaningful.

I need to add that just as Budrass misunderstands my analysis of the German case he also fails to explain the nature of my book as a whole. It is revealing that he finds the “most innovative” part of the book the chapter on inventors and rejects the rest. In fact, that chapter only makes sense in the context of my rethinking of the nature of invention. I put the immediate question of production at the centre of the invention problem for something like the jet. I also challenge directly the established traditions of thinking about invention in the history of technology. All this passes Budrass by. He seems to be criticising me for not writing a new version of Edward Constant’s invention-centric book about the turbojet. He thus misses the key point that my book is a critique of such accounts of invention, not just Constant’s specific book, but the broader history of invention to which Constant made a key contribution. He claims that “Giffard doesn’t put up a theoretical framework of her own against Constant’s” which is simply not correct – a different theoretical framework is central to the whole book!

The chapter that Budrass praises also reflects on the nationalist impulses, which led in different ways to the writing of innovation-centric history of the jet as a revolutionary technology. As I am one of the first to have argued, techno-nationalism has coloured the early history of the jet engine, and clearly it still resonates powerfully as Budrass’s review illustrates so unfortunately. In this way and in criticising theories of invention, my book undermines the very preconceptions Budrass brings to his review.

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