Case

[¶50,133], Little Sandy Coal Company, Inc., Petitioner-Appellant v. Commissioner of Internal Revenue, Respondent-Appellee.

Little Sandy Coal Company, Inc., Petitioner-Appellant v. Commissioner of Internal Revenue, Respondent-Appellee.

U.S. Court of Appeals, Seventh Circuit; 21-3145, March 7, 2023.

Affirming the Tax Court, Dec. 61,818(M), 121 TCM 1113, T.C. Memo. 2021-15.

[Code Secs. 38 and 41]

Tax credit: Employee activities: Employee wages.–

A parent company (P1) (taxpayer) was denied a tax credit under Code Sec. 41. P1 failed to provide a principled way to determine the portion of employee activities that constituted elements of a process of experimentation. It was based on alleged qualified research expenses incurred for the design and construction of 11 first-in-class vessels. These vessels had never built before. Further, the taxpayer also claimed production employee wages. The taxpayer failed to show that the production activities accounted for by these wages were elements of a process of experimentation even less, research activities. The taxpayer failed to bear its burden for the court to calculate the "substantially all" fraction on a cost or other consistently applied reasonable basis. ¶4362.33

Before: Rovner, Hamilton, and Brennan, Circuit Judges.

BRENNAN, Circuit Judge: This case requires us to interpret the research tax credit under Section 41 of the Internal Revenue Code. To claim the credit, a taxpayer must demonstrate, among other things, that at least 80 percent of its research activities for a business component constituted elements of a process of experimentation.

Taxpayer Little Sandy Coal Company, Inc., the parent of a shipbuilding company, claimed expenses for 11 vessels under the tax credit. But the Commissioner of Internal Revenue disallowed the credit and assessed a tax deficiency. Taxpayer unsuccessfully challenged that decision in tax court.

We disagree with some aspects of the tax court's reasoning, but ultimately, Taxpayer claimed more tax credit than it could prove. Taxpayer did not offer a principled way to determine what portion of the employee activities for each vessel constituted elements of a process of experimentation, much less research activities. Instead, Taxpayer relied on arbitrary estimates and the newness of the vessels. So, we affirm.

I. Background

Taxpayer Little Sandy Coal Company, Inc. is the parent of a shipbuilding company, Corn Island Shipyard, Inc. (CIS), in southern Indiana. In the tax year ending in June 2014, Taxpayer claimed a tax credit under Section 41 of the Internal Revenue Code based on alleged qualified research expenses incurred for the design and construction of 11 first-in-class vessels—that is, vessels it had never built before. Taxpayer claimed employee wages, contract research expenses, and supply costs for the tax credit. After reviewing Taxpayer's tax return, the Commissioner of Internal Revenue disallowed the tax credit and assessed a tax deficiency as well as an accuracy-related penalty.

Taxpayer then petitioned for redetermination by the United States Tax Court, which conducted a five-day bench trial. For purposes of trial, the parties agreed to treat two of the eleven CIS vessels as representative of the others. The two vessels were a tanker barge, known as Project 720 or the Apex 720 Tanker (Tanker), and a dry dock, known as Project 730 or the Detyens Dry Dock (Dry Dock).

Vessel Development. At trial, the parties offered much testimony on the “iterative process” of designing and constructing vessels. CIS engineer, Brian Varner, and the Commissioner's expert, Kenneth Smith, each referred to the process as a “design spiral.” They explained that vessel components were interdependent, so the design of some elements could not be determined until the designs of others were established. Changes in vessel weight and other metrics could trigger new calculations and designs for other parts, causing the development

process to loop back to the drawing board. While engineers "tr[ied] to eliminate problems up front," the final design of some components could not be determined until construction. Varner explained that many of these design issues got "ironed out" as they built the ship, but they still had to feel "pretty comfortable with a design before … cutting steel." "Any repairs or modifications [could] become very costly very quickly."

Tanker. CIS based the design of the Apex Tanker on a previous tanker it had built, the Penn 80. But several elements were different. For example, CIS used three-dimensional modeling to redesign the stern notch, which attaches the Tanker to a pusher tug. The Tanker also featured a towing bridle that was redesigned to minimize interference with other vessel components. Designing these components often required engineering. CIS's lead engineer and naval architect, Bud Johnson, performed an engineering calculation—called a "wind sail" calculation—to determine the appropriate size of the vessel's anchor. Others performed engineering calculations to test the strength of the ship's longitudinal elements and to design the tanker's vapor barrier system, a special coating to prevent corrosion.

Some changes in the Apex Tanker's design, also determined through an iterative process, gave it greater cargo capacity than the Penn 80. After constructing the Tanker, CIS performed a deadweight survey to measure its water displacement, which indicates its cargo capacity. This displacement is a common contractual specification for vessels, and a sufficient variance can result in noncompliance with agreed-to terms. After analyzing CIS production employees' time records, one of its engineering technicians, Brian Meunier, estimated that 87% of the time those employees spent constructing the Tanker involved functions "tied directly to items" different from those of the Penn 80.

Dry Dock. A dry dock is a vessel that can partially submerge in water to raise a ship above water for repairs. CIS had never built a dry dock before it made the Detyens Dry Dock. As with the Tanker, CIS used engineering calculations and modeling to design the Dry Dock and to resolve problems. CIS drafted several versions of design drawings and performed calculations to test these designs.

One component, the outboard side plate, went through five design revisions. The safety deck also went through several versions, one of which involved raising the deck 18 inches to accommodate changes in the weight of the vessel. After building the Dry Dock, CIS conducted a partial raise-and-lower test to find out whether the Dry Dock properly submerged and rose. The client, Detyens, conducted a full raise-and-lower test after taking delivery.

Expenses Claimed. For the Tanker, Taxpayer claimed the research tax credit on $2,505,491 of production wages and $3,892,142 of supply costs. [1] And for the Dry Dock, Taxpayer claimed $146,109 of production wages and $1,943,265 of supply costs.

Taxpayer also claimed $609,276 in nonproduction "estimated wage expenses" for the 11 vessels. These expenses were not broken out by vessel, but some of the wages were attributable to specific employees: $173,996 to Bud Johnson, CIS's lead engineer and naval architect; $126,734 to CIS's management, Don Foertsch, David Foertsch, and Alan Fleischmann; and $56,895 to draftsmen, Dennis Gass, Kyle Harpenau, and Robert Kellems. Taxpayer calculated these nonproduction wages by applying to each employee's total wages an allocation percentage equal to the estimated portion of the employee's time spent on qualified research. Some trial witnesses testified that these estimates were reasonable. For example, Meunier testified that 60% is a "reasonable" allocation for the time Johnson spent on the design and development of the 11 vessels. David Foertsch similarly attested that the percentage estimations of time various employees spent on these vessels were "fair."

After trial, the tax court found that Taxpayer was not entitled to claim the research credit for any of the 11 vessels. The tax court upheld the tax deficiency and the accuracy-related penalty. Taxpayer timely appealed to this court under I.R.C. §7482(a)(1).

II. Statutory & Regulatory Framework

Before we consider the parties' arguments, we review the research tax credit and how it works. This includes examining what are qualified research expenses (including what qualifies as research); the Section 174 test,

which allows research and experimental expenditures that taxpayers would otherwise capitalize to be deducted from taxable income; and the process of experimentation test and its components.

A. Research Tax Credit

Section 41 of the Internal Revenue Code provides a tax credit for 20% of "qualified research expenses" that exceed a prescribed base amount. I.R.C. §41(a)(1). The statute is complex and has several nested definitions. We discuss only the relevant provisions.

Qualified Research Expenses. Qualified research expenses include "in-house research expenses" and "contract research expenses." §41(b)(1). "[I]n-house research expenses" include "wages paid or incurred to an employee for qualified services" and "any amount paid or incurred for supplies used in the conduct of qualified research." §41(b)(2)(A)(i)–(ii). "Qualified services" in turn "means services consisting of— (i) engaging in qualified research, or (ii) engaging in the direct supervision or direct support of research activities which constitute qualified research." §41(b)(2)(B). Qualified research expenses are broad. They include, among other things, the cost of supplies used for qualified research as well as wages for direct supervision and support of qualified research. §41(b)(2). Whether such supply costs and wages are qualified research expenses depends on whether the taxpayer has performed "qualified research" as defined in Section 41(d).

Qualified Research. To constitute qualified research, the research activities must satisfy four tests in Section 41(d)(1): (1) the Section 174 test, (2) the technological information test, (3) the business component test, and (4) the process of experimentation (or "substantially all") test. §41(d)(1); *Union Carbide Corp. & Subs. v. Comm'r* [CCH Dec. 57,753(M)], 97 T.C.M. (CCH) 1207, T.C. Memo. 2009-50, at *77 (2009), *aff'd* [2012-2 USTC ¶50,553], 697 F.3d 104 (2d Cir. 2012). First, under the Section 174 test, the expenditures for the research must be deductible "research or experimental expenditures" under I.R.C. §174. §41(d)(1)(A). Second, the technological information test requires the research to be "undertaken for the purpose of discovering information … which is technological in nature." §41(d)(1)(B)(i). Third, under the business component test, the application of the research must be "intended to be useful in the development of a new or improved business component of the taxpayer." §41(d)(1)(B)(ii). Fourth, substantially all of the research activities must constitute elements of a process of experimentation for the purpose of "(i) a new or improved function, (ii) performance, or (iii) reliability or quality." §41(d)(1)(C), (3)(A).

These four tests are initially applied at the "business component" level. §41(d)(2)(A); Treas. Reg. §1.41–4(b)(2). "'[B]usiness component' means any product, process, computer software, technique, formula, or invention which is to be—(i) held for sale, lease, or license, or (ii) used by the taxpayer in a trade or business of the taxpayer." §41(d)(2)(B). If a business component fails any of the qualified research tests, we follow the "shrinking-back rule" and apply the tests at the "most significant subset" of the business component. §1.41-4(b)(2). Failing that, the shrinking-back rule is applied to smaller subcomponents until "either a subset of elements of the product that satisfies the requirements is reached, or the most basic element of the product is reached and such element fails to satisfy the test." *Id*. Only the fourth "process of experimentation" test and indirectly the first test under Section 174 are in dispute here, so we elaborate on them, the latter first.

B. Section 174 Test

Section 174 allows research and experimental expenditures that taxpayers would otherwise capitalize to be deducted from taxable income. I.R.C. §174(a)(1); *Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *78. "The term *research or experimental expenditures*, as used in section 174, means expenditures incurred in connection with the taxpayer's trade or business which represent research and development costs in the experimental or laboratory sense." Treas. Reg. §1.174-2(a)(1). "Expenditures represent research and development costs in the experimental or laboratory sense if they are for activities intended to discover information that would eliminate uncertainty concerning the development or improvement of a product." *Id*. And "[u]ncertainty exists if the information available to the taxpayer does not establish the capability or method for developing or improving the product or the appropriate design of the product." *Id*. "Whether an uncertainty exists is an objective test that depends on the information available to the taxpayer." *Union Carbide* [CCH Dec.

57,753(M)], T.C. Memo. 2009-50, at *78 (citing *Mayrath v. Comm'r* [CCH Dec. 26,624], 41 T.C. 582, 590–91 (1964), *aff'd* [66-1 USTC ¶9250], 357 F.2d 209 (5th Cir. 1966)).

"Because the taxpayer need only be uncertain as to 'the capability *or* method … *or* the appropriate design' of the improvement, an uncertainty may exist even if the taxpayer knows that it is technically possible to achieve a goal but is uncertain of the method or appropriate design to use to reach that goal." *Id*. at *78 (quoting §1.174-2(a)(1) (emphasis added)). "Whether expenditures qualify as research or experimental expenditures depends on the nature of the activity to which the expenditures relate, not the nature of the product or improvement being developed or the level of technological advancement the product or improvement represents." §1.174-2(a)(1). In all cases, expenses deductible under Section 174 exclude "costs paid or incurred in the production of a product after the elimination of uncertainty." §1.174-2(a)(2).

Uncertainty. It is critical to correctly frame "uncertainty" in Section 1.174-2 because, as explained later, this same concept undergirds the process of experimentation test. Generic uncertainty is inherent in constructing or manufacturing a product. That involves questions like: Will this tire fit? What kind of screws are needed to attach this panel? Or will this weld hold up this truss? But "uncertainty" in Section 174 means something more. "[D]eductions under section 174 are limited to 'expenditures of an investigative nature expended in developing the *concept* of a model or product,' as opposed to the construction or manufacture of the product itself." *Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *79 (citation omitted) (quoting *Mayrath*, 41 T.C. at 590). Expenses incurred merely to determine whether a product is built to satisfy a client's desired specifications—without any indication that the expenses were incurred to improve or develop the concept of the product—do not qualify.

That is why the regulations exclude expenses for "ordinary testing or inspection of materials or products for quality control (quality control testing)." §1.174-2(a)(6)(i). Quality control testing refers to "testing or inspection to determine whether particular units of materials or products conform to specified parameters." §1.174-2(a)(7). Still, "quality control testing does not include testing to determine if the design of the product is appropriate." *Id*. But the "design"—if expenditures for it are to be deducted under Section 174—cannot just be any design or modification to meet customer specifications. The design must be intended to remove the correct type of uncertainty: that related to the "development or improvement" of the product. §1.174-2(a)(1).

We read "development" as used in Section 1.174-2(a)(1) to refer to more than mere construction (as in the common parlance of "real estate development"). The plain meaning of "development" is the "action or process of bringing something to a … more advanced condition"— embracing the idea of "improvement"—but it can also mean general "change" or "progression by successive stages." *Development*, Oxford English Dictionary (3d ed. 2016), https://www.oed.com/view/Entry/51434?redirectedFrom=development#eid; *see also Develop*, Webster's Third New International Dictionary (1993) ("cause to increase or improve"). The former definition fits better in context. "Development," as used beside "improvement," implies an advancement in technology or product concept. *See* §1.174-2(a)(1); Antonin Scalia & Brian A. Garner, Reading Law 195 (2012) ("Associated words bear on one another's meaning (*noscitur a sociis*)."). Granted, whether expenses are deductible under Section 174 depends on activities covered by the expenditures, and not on the level of technological advancement. *See* §1.174-2(a)(1). But while the degree of technological advancement may not matter, the goal of the research activity must still be development or improvement.

"The presence of uncertainty concerning the development or improvement of certain components of a product does not necessarily indicate the presence of uncertainty concerning the development or improvement of other components of the product or the product as a whole." §1.174-2(a)(5). So even if research expenditures furthered the advancement of some parts of a product, other expenses to build other parts of that product may not be deductible under Section 174. Generic manufacturing or construction uncertainty for the other parts will not suffice. Put a different way, a manufacturer may not simply "add a few new bells and whistles" on a pre-existing product and claim uncertainty as to the whole. If summed up in one word, expenses deductible under Section 174 must be "investigative." *Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *79 (quoting *Mayrath*, 41 T.C. at 590).

C. Process of Experimentation Test

The fourth test to constitute qualified research, the process of experimentation test, has two components: (1) substantially all the research activities must constitute elements of a process of experimentation, and (2) for a qualified purpose under Section 41(d)(3)(A). §41(d)(1)(C). The Commissioner does not dispute the tax court's finding that CIS designed the Tanker and Dry Dock for proper purposes such as: "a new or improved function," "performance," or "reliability or quality." §41(d)(3)(A). Only the "substantially all" fractional determination is in dispute.

Substantially All. By regulation, "[t]he substantially all requirement of section 41(d)(1)(C) … is satisfied only if 80 percent or more of a taxpayer's research activities, measured on a cost or other consistently applied reasonable basis … constitute elements of a process of experimentation." Treas. Reg. §1.41-4(a)(6). Accordingly, the "substantially all" fraction is:

$$\frac{\text{Research activities that constitute elements of a process of experimentation}}{\text{Research activities}}$$

See id.; §41(d)(1)(C). The regulations explain what is meant by the generic denominator "research activities." The penultimate sentence of Section 1.41-4(a)(6) reads:

> Accordingly, if 80 percent (or more) of a taxpayer's research activities with respect to a business component constitute elements of a process of experimentation for a purpose described in section 41(d)(3), the substantially all requirement is satisfied even if the remaining 20 percent (or less) of a taxpayer's research activities with respect to the business component do not constitute elements of a process of experimentation for a purpose described in section 41(d)(3), *so long as these remaining research activities satisfy the requirements of section 41(d)(1)(A) and are not otherwise excluded under section 41(d)(4)*.

§1.41-4(a)(6) (emphasis added).

This italicized portion clarifies that any non-"process of experimentation" research activities must "satisfy the requirements of section 41(d)(1)(A)" and not be "otherwise excluded under section 41(d)(4)." *Id.*; *see also Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *80; *Suder v. Comm'r* [CCH Dec. 60,038(M)], 108 T.C.M. (CCH) 354, T.C. Memo. 2014-201, at *17 (2014). An example in the regulation reaffirms this requirement. §1.41-4(a)(8), Ex. 4 (repeating italicized language above). Because Section 41(d)(1)(A) cross-references Section 174, the proper "substantially all" fraction becomes:

$$\frac{\text{Research activities that constitute elements of a process of experimentation}}{\text{Research activities not excluded under Section 41(d)(4) and whose expenses are deductible under Section 174}}$$

See §1.41-4(a)(6).

Denominator. The "research activities" in the denominator must not be excluded under Section 41(d)(4) and expenditures for such activities must also be deductible under Section 174. Section 41(d)(4) excludes certain research activities from "qualified research" including: research conducted after the commercial production of a business component, §41(d)(4)(A); research to adapt an existing business component to a particular customer's specifications, §41(d)(4)(B); and research to duplicate an existing business component, §41(d)(4)(C). We need not discuss the other exceptions. §41(d)(4)(D)–(H).

Numerator—Elements of a Process of Experimentation. More importantly, the numerator—a subset of the denominator—also requires that the research activities "constitute *elements* of a process of experimentation." §41(d)(1)(C) (emphasis added). Thus, the numerator is broad enough to encompass research activities that are not per se experimentation or testing. And "a process of experimentation is a process designed to evaluate one or more alternatives to achieve a result where the capability or the method of achieving that result, or the appropriate design of that result, is uncertain as of the beginning of the taxpayer's research activities." §1.41–4(a)(5)(i). "A process of experimentation … involves the identification of uncertainty concerning the development or improvement of a business component …." *Id*. "The 'uncertainty' element of this test is essentially the same uncertainty as is required by the section 174 test, and the test may be satisfied even if the taxpayer is certain of either the capability or method of achieving the desired goal if the appropriate design of the desired result is uncertain at the outset." *Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *80 (footnote omitted)

(citing §§1.174-2(a)(1), 1.41–4(a)(5)(i)); *see also Siemer Milling Co. v. Comm'r* [CCH Dec. 61,447(M)], 117 T.C.M. (CCH) 1196, T.C. Memo. 2019-37, at *8 (2019). As hinted earlier, our prior conclusions on "uncertainty" for the Section 174 test also apply for the process of experimentation test.

This raises the question: Is there daylight between the Section 174 and process of experimentation tests? The answer is "yes." While both tests are aimed at removing the same type of uncertainty concerning the development or improvement of a business component, the process of experimentation "test also imposes a more structured method of discovering information than section 174 requires and may not include all actions a taxpayer takes to resolve uncertainty." *Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *80 (citing *Norwest Corp. & Subs. v. Comm'r* [CCH Dec. 52,758], 110 T.C. 454, 496 (1998) and *Eustace v. Comm'r* [2003-1 USTC ¶50,133], 312 F.3d 905, 907 (7th Cir. 2002)). "A process of experimentation must fundamentally rely on the principles of the physical or biological sciences, engineering, or computer science." §1.41–4(a)(5)(i). It "involves the identification of uncertainty concerning the development or improvement of a business component, the identification of one or more alternatives intended to eliminate that uncertainty, and the identification and the conduct of a process of evaluating the alternatives (through, for example, modeling, simulation, or a systematic trial and error methodology)." *Id*.

This process requires the use of the scientific method to resolve the uncertainty. *Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *81. By scientific method, we mean "[a]n analytical technique by which a hypothesis is formulated and then systematically tested through observation and experimentation." *Id*. (citing *Scientific method*, Black's Law Dictionary (8th ed. 2004)). "To satisfy the process of experimentation test, the taxpayer should develop a hypothesis as to how a new alternative might be used to develop a business component, test that hypothesis in a scientific manner, analyze the results of the test, and then either refine the hypothesis or discard it and develop a new hypothesis and repeat the previous steps." *Id*. at *81.

A process of experimentation "must involve a methodical plan involving a series of trials to test a hypothesis, analyze the data, refine the hypothesis, and retest the hypothesis so that it constitutes experimentation in the scientific sense." *Id*. at *81; *Siemer Milling*, T.C. Memo 2019–37, at *8. "Testing and refining a hypothesis may involve determining the strengths and weakness of the alternative tested, whether and how the process could be further refined and improved, and whether other alternatives might be better suited for achieving the taxpayer's goal." *Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *81 And while only one alternative need be identified and evaluated, a process of experimentation "generally should be capable of evaluating more than one alternative." *Id.*; §1.41–4(a)(5)(i).

III. Discussion

With this factual background and statutory and regulatory overview, we move to analysis of the case.

"Tax credits are a matter of legislative grace, are only allowed as clearly provided for by statute, and are narrowly construed." *United States v. McFerrin* [2009-1 USTC ¶50,430], 570 F.3d 672, 675 (5th Cir. 2009) (citing *Stinson Est. v. United States* [2000-1 USTC ¶60,377], 214 F.3d 846, 848 (7th Cir. 2000)); *see also VHC, Inc. v. Comm'r*, 968 F.3d 839, 841 (7th Cir. 2020). "In this case, as with all claimed tax credits, the taxpayer bears the burden of showing entitlement to the credit." *United Stationers, Inc. v. United States* [99-1 USTC ¶50,136], 163 F.3d 440, 443 (7th Cir. 1998). "A taxpayer claiming a credit under section 41 must retain records in sufficiently usable form and detail to substantiate that the expenditures claimed are eligible for the credit." §1.41-4(d); *see also* I.R.C. §6001; Treas. Reg. §1.6001–1(a), (e). To the extent that the taxpayer's entitlement to the research tax credit turns on a legal interpretation, we review the tax court's legal determinations de novo. *Carter v. Comm'r* [2014-1 USTC ¶50,230], 746 F.3d 318, 321 (7th Cir. 2014) (citation omitted). But as to findings of fact supporting that determination, including findings of evidentiary sufficiency, we review for clear error. *Wegbreit v. Comm'r*, 21 F.4th 959, 963 (7th Cir. 2021).

If a taxpayer can establish that qualified research occurred, we may estimate the qualified research expenses subject to the tax credit. *See McFerrin*, 570 F.3d at 679 (citing *Cohan v. Comm'r* [2 USTC ¶489], 39 F.2d 540, 544 (2d Cir. 1930)). But this estimate relates to Section 41(b), which is a separate—albeit related—in-quiry from Section 41(d). Only after a taxpayer establishes that qualified research has occurred under Section 41(d) may

we estimate, if needed, the amount of qualified research expenses under Section 41(b). *Shami v. Comm'r* [2014-1 USTC ¶50,154], 741 F.3d 560, 568 (5th Cir. 2014) ("[T]he *Cohan* rule is not implicated unless the taxpayer proves that he is entitled to some amount of tax benefit."). Because Taxpayer failed to satisfy the process of experimentation test in Section 41(d), we conclude that no qualified research expenses are creditable under Section 41(b).

To reach this conclusion, we explain where we agree with the tax court, we review the pilot model production expenses, and then we review Taxpayer's failure of proof.

A. Where We Agree with the Tax Court

The tax court is correct in several of its conclusions.

"Substantially All" Fraction. The tax court properly construed the "substantially all" fraction for Section 41(d)(1)(C). As we did earlier, the tax court backed into the definition of the denominator, "research activities," by using the parameters that the regulations imposed on non-"process of experimentation" research activities. *See generally* §1.41-4(a)(6) & (a)(8), Ex. 4. Recall that the correct fraction is research activities that constitute elements of a process of experimentation divided by research activities not excluded under Section 41(d)(4) and whose expenses are deductible under Section 174.

Novelty Approach. The tax court also rightly rejected Taxpayer's novelty argument, namely, that because the majority of the Tanker and Dry Dock was new, substantially all of the activities in designing the vessels constituted elements of a process of experimentation. As it did before the tax court, Taxpayer repeatedly emphasizes that the eleven vessels in question were first-in-class and that Taxpayer had never built a dry dock before. But the tax court correctly recognized that " Section 1.41-4(a)(6) … requires that the substantially all test be applied in reference to activities—not physical elements of the business components being developed or improved." So novelty of the business component cannot be the basis for measuring the proportion of research activities that constituted elements of a process of experimentation. *See* §1.41-4(a)(6) ("substantially all of the activities must constitute elements of a process of experimentation").

This "feels new enough" approach was used in *Trinity Indus., Inc. v. United States* [2014-2 USTC ¶50,346], 691 F. Supp. 2d 688 (N.D. Tex. 2010), *aff'd*, 757 F.3d 400 (5th Cir. 2014). That case also involved a shipbuilder who built several vessels, and the district court found the expenses incurred for two of six vessels to be qualified research expenses. *Id*. at 690, 694–97. For example, the district court found that research expenses incurred for "a very innovative special operations deployment craft … designed to be very fast, undetectable, and able to fit on a C–5 cargo plane for rapid deployment" were qualified research expenses based on the vessel's novelty. *Id*. at 694. But like the stealth ship in question, the court evaded the mandate in Sections 41(d)(1)(C) and 1.41-4(a)(6) to determine whether the percentage of research activities exceed 80%. Rather, it used novelty as a shortcut. True, the regulation says courts may make this determination "on a cost or other consistently applied reasonable basis." §1.41-4(a)(6). But the novelty of a business component is not one such "other consistently applied reasonable basis." *Id*. The *Trinity Industries* court said it did "not intend to enumerate everything about the [ship] that was new and required research expenditures." 691 F. Supp. 2d at 694. It was loath to follow the government's suggestion that "the [c]ourt should scour the records and determine which [expense] line items are for matters not properly considered [qualified research expenses]." *Id*. at 697. Instead, the district court used the heuristic of newness to bypass statutory and regulatory directives. Like the tax court, we reject the novelty approach used in *Trinity Industries*.

Component-level Analysis. Taxpayer asserts that the tax court erred by applying the process of experimentation test at a subcomponent level as opposed to the claimed business component level. But this gets it backward: The tax court explicitly applied the "substantially all" test at the business component—that is, vessel—level. In fact, the tax court said that it could not apply the shrinking-back rule contained in Section 1.41-4(b)(2) to see if the "substantially all" test is met for a subcomponent of either vessel. This was because Taxpayer had chosen an "all or nothing" strategy in claiming the development of entire vessels—as opposed to smaller compo-nents—as qualified research. So the court could not perform the Section 174 and process of experimentation tests

underneath the vessel level, even though it observed that some of Taxpayer's activities with respect to certain subcomponents could involve a process of experimentation.

We recognize also that the Tanker's stern notch and towing bridle, as well as the Dry Dock's outboard side plate, among other elements, went through several design iterations. The research activities to develop these parts may very well constitute elements of a process of experimentation. But, as we revisit later, Taxpayer's documentation lacks the necessary detail to prove that. It is Taxpayer's burden to show entitlement to the research tax credit and to retain records to substantiate eligibility for the credit. *United Stationers*, 163 F.3d at 443; §1.41-4(d); *see also* §6001; §1.6001–1(a), (e). Other taxpayers seeking to avail themselves of the research tax credit would be well-advised to document research activities for subcomponents if they cannot demonstrate a process of experimentation at the business component level.

B. Pilot Model Production Expenses

While we agree with the tax court's ultimate conclusions, we disagree in part with its treatment of pilot model production expenses. As in the tax court, Taxpayer contends that the Tanker and Dry Dock are “pilot models,” as defined by Section 1.174-2(a)(4). It argues therefore that production wages for making such models categorically qualify as research activities that constitute elements of a process of experimentation. The tax court did not determine that either vessel was a pilot model. Rather, for purposes of the “substantially all” analysis, the court alternatively assumed that the vessels were and were not pilot models. We follow this same approach. But first, we consider the interplay between pilot model production expenses and the components of the “substantially all” fraction.

1. Deductible Under Section 174

Assuming that the two vessels were pilot models, the tax court properly included pilot model production expenses into the denominator. “Pilot model” is a defined term for purposes of research expense deductibility under Section 174. It means “any representation or model of a product that is produced to evaluate and resolve uncertainty concerning the product during the development or improvement of the product.” §1.174-2(a)(4). So the creator's intent matters. And “pilot model” is included in the definition of “product.” §1.174-2(a)(3). Recall that “research or experimental expenditures” deductible under Section 174 include those expended for “activities intended to discover information that would eliminate uncertainty concerning the development or improvement of a product.” §1.174-2(a)(1). Because pilot models by definition are “produced to evaluate and resolve uncertainty concerning the product during the development or improvement of the product,” pilot model production expenses incurred prior to the elimination of uncertainty are deductible under Section 174. §1.174-2(a)(2), (4). It follows that pilot model production expenses are included in the denominator of the “substantially all” fraction. *Cf*. §1.41–4(a)(6) (“so long as these remaining research activities satisfy the requirements of section 41(d)(1)(A)”—that is, Section 174).

This conclusion is buttressed by the examples provided in Section 1.174-2(a)(11). These examples also demonstrate that the way pilot model production expenses factor into the research and development process depends on the industry in question. Two of the examples illustrate the difference between pilot models for custom-made versus mass-produced products: In Example 3, a custom manufacturer, U, contracts to produce a custom machine based on a client's specifications. §1.174-2(a)(11), Ex. 3. U incurs a total of $31,000 on the project, $10,000 of which is for “materials and labor to produce a model that is used to evaluate and resolve the uncertainty concerning the appropriate design.” *Id*. $1,000 is for “using the model to test whether certain features can be integrated into the design of the machine.” *Id*. “After uncertainty is eliminated, U incurs $20,000 to produce the machine for sale to the customer based on the appropriate design.” *Id*. Of the $31,000, only “the $10,000 incurred to produce the model and the $1,000 incurred on design testing activities qualifies as research or experimental expenditures under section 174.” *Id*. Example 3 states that expenses incurred in producing a model to resolve uncertainty concerning the appropriate design of a custom-made product are deductible under Section 174. So the same expenses would also be included in the “substantially all” denominator. This example is analogous to the tailor-made shipbuilding industry in this case. But unlike in our circumstances, in the example the divide between pre-uncertainty and post-uncertainty expenses is well-defined.

In Example 5, a mass-production manufacturer, V, "incurs $5,000 to produce a number of models of the product that are to be used in testing the appropriate design before the product is mass-produced for sale." §1.174-2(a)(11), Ex. 5. "Multiple models are necessary to test the design in a variety of different environments (exposure to extreme heat, exposure to extreme cold, submersion, and vibration)." *Id*. All $5,000 are deductible under Section 174. *Id*. Example 5 is the "crash test" scenario in which a manufacturer produces multiple pilot models and subjects them to a variety of tests in order to refine the product for mass production. This example also involves a definite separation between the "pilot" or developmental phase and the post-uncertainty production phase of a manufacturing project. The same is true for Examples 4 and 6, which involve the redesign of a product part and the development of a new part, respectively. *See* §1.174-2(a)(11), Exs. 4, 6. In our case, the line at which uncertainty ends for each vessel is hazy, and that is problematic as a matter of proof for both the denominator and numerator of the "substantially all" fraction.

In Examples 7 and 8, the research is performed to develop a new line of product rather than to fulfill existing contractual obligations. §1.174-2(a)(11), Exs. 7 (vertical take-off aircraft), 8 (new type of compressor blade for an aircraft engine). So all experimental expenses in producing and testing the models are deductible expenses under Section 174. *Id*. Here, Taxpayer's alleged research activities were performed, first and foremost, to fulfill a contractual obligation. Now, that does not mean that a taxpayer cannot have a dual intent of contractual fulfillment and innovation. Taxpayer could have produced the Tanker and Dry Dock "to evaluate and resolve uncertainty concerning the product[s] during the development or improvement of the product[s]." §1.174-2(a)(4). That is, they could be pilot models. Ultimately, we need not resolve that question because, whether or not the vessels are pilot models, Taxpayer failed to demonstrate that the production and nonproduction wages for each vessel account for elements of a process of experimentation—the numerator in the "substantially all" fraction.

2. Elements of a Process of Experimentation

At this point, our analysis diverges from that of the tax court. In entertaining the possibility that the vessels were pilot models, the tax court also categorically excluded model production wages from the numerator of the "substantially all" fraction. That is, it found that pilot model production activities could not be an element of a process of experimentation. In so concluding, the tax court erroneously imported a distinction from Section 41(b)(2)(B) into the numerator of the fraction in Section 41(d)(1)(C). The court first observed the distinction that Section 41(b)(2)(B) draws between "direct support of research activities which constitute qualified research," §41(b)(2)(B)(ii), and "qualified research," §41(b)(2)(B)(i). Pilot model production, the court then reasoned, directly supported research activities but did "not have a close enough nexus to the testing to be considered qualified research in its own right." Accordingly, the tax court concluded that activities in "direct support of research activities which constitute qualified research," §41(b)(2)(B)(ii), including any pilot model production activities, are categorically not qualified research or elements of a process of experimentation.

Other courts have drawn similar distinctions. *E.g., Shami*, 741 F.3d at 570 ("In short, the supervisor of the direct supervisor of employees who conduct qualified research is not himself engaged in qualified research."). The regulation expounding upon Section 41(b)—the scope of qualified research expenses—states, "direct support of research includes the services … of a machinist for machining a part of an experimental model used in qualified research." §1.41-2(c)(3)(ii). And Section 41(b)(2)(B)(ii) distinguishes direct support and supervision of qualified research from qualified research itself. So, it would make sense that pilot model production expenses have no part in the "qualified research" defined by Section 41(d). *See generally* Antonin Scalia & Brian A. Garner, Reading Law 167 (2012) (explaining the whole-text canon). While that reading may be sensible, it is incorrect for reasons we will explain.

Within the "substantially all" fraction in Section 41(d)(1)(C), we see the text justifying two options as to how we can treat activities that would qualify as "direct support" and "direct supervision" under Section 41(b)(2)(B)(ii). Either direct support and supervision activities should be considered in both the numerator and denominator of the fraction as Taxpayer proposes, or they should not be considered at all as the amicus curiae, the National Association of Manufacturers, suggests. [2] The tax court took a third approach and suggested direct support and supervision activities—more specifically, pilot model production activities—could be included in the denominator,

but the court categorically excluded them from the numerator. [3] We conclude that the first approach, advocated by Taxpayer, is correct.

If we were to rule for the second option—to carry over the Section 41(b) distinction between qualified research and direct support/supervision into Section 41(d)—then production activities that support qualified research would not belong in the "substantially all" fraction. For the reasons stated earlier, this approach is internally inconsistent. But applying the Section 41(b) distinction in Section 41(d) comes with more problems of its own. For one, neither the terms nor the concept of "direct support" or "direct supervision" appears in Section 41(d).

More broadly, Section 41(b) and Section 41(d) address different subjects: Section 41(b) identifies the contours of qualified research *expenses* subject to the research tax credit under Section 41. It includes amounts spent on supplies for and wages in direct support or supervision of qualified research. §41(b)(2)(A)(ii), (B)(ii). By contrast, Section 41(d) deals with qualified research *activities*. *See* §41(d)(1)(C) ("research … substantially all of the activities of which constitute elements of a process of experimentation"). The "substantially all" fraction in Section 41(d)(1)(C) excludes supply costs for research, but the denominator includes research activities not excluded under Section 41(d)(4) and whose expenses are deductible under Section 174. §1.41-4(a)(6). So Section 41(d) is narrower in some respects, but broader in others, than Section 41(b). Qualified research expenses and qualified research are different—albeit related—concepts, and they have separate regulations explaining each. *See* §§1.41-2, 1.41-4. As explained next, importing a distinction from Section 41(b) into Section 41(d) presents conflicts with existing regulations expounding upon Section 41(d).

Nothing in the regulation explaining Section 41(d)—Sec-tion 1.41-4—explicitly addresses pilot models. Recall, though, that "pilot model" means "any representation or model of a product that is produced to evaluate and resolve uncertainty concerning the product during the development or improvement of the product." §1.174-2(a)(4). And the "uncertainty" element of the process of experimentation test is the same as that of the Section 174 test. *Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *80 (footnote omitted) (citing §§1.174-2(a)(1), 1.41-4(a)(5)(i)). If a pilot model, by definition, is produced to resolve the correct type of uncertainty, it would be odd that pilot model production activities should not constitute research activities deductible under Section 174. So the second approach is at odds with the definition of "pilot model." Further, if the pilot model was used to evaluate alternatives as part of a "methodical plan involving a series of trials to test a hypothesis," the model production activities would also constitute elements of a process of experimentation. *Siemer Milling*, T.C. Memo 2019–37, at *8. This casts doubt on the tax court's third approach.

A deeper dive into Section 1.41-4 is helpful. Several examples within Section 1.41-4(a)(8) explain what constitutes elements of a process of experimentation. One of the examples includes "design[ing]," "model[ing]," and "simulat[ing]"—not just "test[ing]"—alternative designs as part of the process of experimentation to eliminate uncertainties. §1.41–4(a)(8), Ex. 4. This suggests that the production of prototypes or pilot models can be an element of the process of experimentation. Example 3 concerns a food products manufacturer, X, who makes a large-shred version of a product. §1.41–4(a)(8), Ex. 3. X, seeking to produce a fine-shred version of the product, machined several thinner blades as alternative designs to produce a fine-shred version of the food product. *Id*. X then systematically tested out these various blades. *Id*. Notably, the example does not distinguish the blade production activities from the testing activities in concluding that substantially all these activities constituted elements of a process of experimentation. *Id*. This example, too, tends to show that pilot model production expenses can be included in the "substantially all" numerator.

Given the regulation's apparent inclusion of some pilot model production activities in the numerator, we hold that those activities can be research activities (denominator) that constitute elements of a process of experimentation (numerator). Our holding does not mean that any direct support or supervision activities may be considered in the "substantially all" fraction. Recall that an activity must be a *research* activity, whose expenses are deductible under Section 174, to make it into the fraction at all. *See* §§41(d)(1)(A), (C), 1.41-4(a)(6).

One more note about Example 3. The production of the fine-shred blades was an element of a process of experimentation because the blades were used in a "systematic trial and error process of analyzing various blade designs and materials to determine whether the new shredding blade must be constructed of a different material." §1.41–4(a)(8), Ex. 3. And as discussed above, a process of experimentation "must involve a

methodical plan involving a series of trials to test a hypothesis, analyze the data, refine the hypothesis, and retest the hypothesis so that it constitutes experimentation in the scientific sense." *Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *81; *Siemer Milling*, 2019 WL 1598588, at *8. Just making a prototype model is not enough to pass the process of experimentation test. The model must be used to evaluate one or more alternatives using the scientific method. *See* §1.41-4(a)(5)(i); *Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *81. "To satisfy the process of experimentation test, the taxpayer should develop a hypothesis as to how a new alternative might be used to develop a business component, test that hypothesis in a scientific manner, analyze the results of the test, and then either refine the hypothesis or discard it and develop a new hypothesis and repeat the previous steps." *Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *81. This is where Taxpayer failed as a matter of proof.

C. Taxpayer's Failure of Proof

The tax court did not decide whether the two vessels were pilot models. Instead, it performed the "substantially all" analysis under alternative assumptions that the vessels were and were not pilot models. We follow the tax court's lead. Under either assumption, Taxpayer fails the "substantially all" test.

1. Assuming the Vessels are Not Pilot Models

Assuming the vessels are not pilot models, Taxpayer loses because it failed to show what, if any, portion of the activities accounted for by the nonproduction wages constitutes elements of a process of experimentation. If none of the vessels are pilot models, then none of the production wages would be included in the "substantially all" fraction. This is because general production activities unconnected to "the elimination of uncertainty concerning the development or improvement of the product are not eligible under section 174." §1.174-2(a)(2). So under our assumption, the fraction hinges entirely upon the nonproduction expenses: nonproduction wages that are for elements of a process of experimentation divided by nonproduction wages. As we mentioned earlier, the $609,276 in nonproduction wages are not broken down by vessel. So we are unable to perform the "substantially all" analysis at the business component level that Section 41(d)(2)(A) requires—that is, at the vessel level. But the lack of categorization is just the start. Taxpayer faces a more fundamental problem in that many of its nonproduction wages may account for non-research activities.

Taxpayer asks us to take on faith that the percentage allocations of each nonproduction employee's wages were only for research activities that involved a process of experimentation. But Section 41(d) requires us to walk by sight, not by faith. Taxpayer has the burden to document that the activities accounted for by the nonproduction wages were elements of a process of experimentation. *United Stationers*, 163 F.3d at 443; §1.41-4(d); *see also* §6001; §1.6001–1(a), (e). The regulations do not require records in any particular form, except that they must be "in sufficiently usable form and detail to substantiate that the expenditures claimed are eligible for the credit." §1.41-4(d). And the "substantially all" test allows for the fraction to be measured "on a cost or other consistently applied reasonable basis." §1.41-4(a)(6). So flexibility is built into the test. But shortcut estimates of experimentation-related activities will not suffice. Something more, such as documentation of time spent on such activities, is necessary. In any case, the tax court found as a matter of fact that much of the $609,276 in nonproduction wages accounted for non-research activities.

The tax court found that CIS's lead engineer and naval architect, Bud Johnson, spent much of his time involved in customer relations and management activities. And indeed, trial testimony supports that Johnson managed payrolls, took care of personnel issues, interfaced with clients, put together bids, and handled supply chain concerns. The father-and-son management team, Don and David Foertsch, were stipulated co-owners of Taxpayer, and the evidence did not demonstrate that they conducted much, if any, research activities apart from their management activities. Don Foertsch was copied on project-related emails, but none of the emails showed how his involvement was an element of a process of experimentation. He would meet with Johnson and David to review bids and ship designs. Taxpayer also alleged that Don assisted with fabrication and production issues, but nothing documents how he did so. It seems Don played a supervisory role over research activities. David Foertsch's testimony regarding his efforts to "troubleshoot" the Tanker's towing bridle indicated that he may have engaged in some research activities that constituted elements of a process of experimentation. He also testified

about his involvement in designing the stern notch. But, in the end, the record gave the tax court no means of determining the extent of time David spent on experimentation-related research activities.

Another member of management, Alan Fleischmann, was CIS's purchasing agent and responsible for assessing and obtaining materials for shipbuilding projects. Meunier said Fleischmann worked with material vendors to procure ship parts that Johnson requested. Taxpayer's briefing similarly described Fleischmann's activities but also alleged he assessed material alternatives for functionality. Based on the record, the tax court found that at least some, if not a considerable portion, of Fleischmann's activities did not involve a process of experimentation. Finally, the tax court found that the draftsmen—Dennis Gass, Kyle Harpenau, and Robert Kellems—were not involved in a process of experimentation by "[s]imply drawing a design provided by an engineer." Indeed, Meunier attested that drafting work boils down to inputting specifications into a modeling program to create drawings. David Foertsch, too, testified that draftsmen simply took an engineer's calculations and produced the drawings. Without evidence of how the models they produced were used as part of a scientific method in evaluating alternative designs, the tax court had no basis to find that the nonproduction employees' activities were research activities that constitute elements of a process of experimentation. We find no clear error in these factual determinations.

Like the tax court, we conclude that the record does not allow us to determine the percentage of nonproduction employee activities that constituted elements of a process of experimentation—even less, research activities. Even if we assumed that all $609,276 in nonproduction wages were deductible under Section 174 and so includible in the denominator, Taxpayer has failed to demonstrate what, if any part, of that number belongs in the numerator.

2. Assuming the Vessels Are Pilot Models

Assuming the vessels are pilot models, Taxpayer still does not prevail because it failed to show how such pilot models—that is, the entire vessels—were used in a process of experimentation. If the vessels are pilot models, the production expenses for them are included in the denominator. [4] *See supra* Section III.B.1. Then the "substantially all" fraction would be as follows: production and nonproduction wages that are elements of a process of experimentation divided by production and nonproduction wages. Remember that Taxpayer claimed the research tax credit on $2,505,491 and $146,109 of production wages for the Tanker and Dry Dock, respectively. Again, the fact that the $609,276 in nonproduction wages are not broken out by vessel presents a problem. We cannot discern a way to factor these wages into the "substantially all" fraction without a breakdown by vessel.

The tax court addressed the issue by simply assuming that all the nonproduction wages were for the Tanker. The court also assumed that all $609,276 in nonproduction wages were for elements of a process of experimentation and categorically excluded pilot model production expenses from the numerator. Using this approach, the tax court found that, at best, the relevant fraction would be 19.6% ($609,276 ÷ ($609,276 + $2,505,491))—insufficient to satisfy the "substantially all" test. For the Dry Dock, the tax court also excluded pilot model production expenses from the numerator. But, instead of assuming that all $609,276 in nonproduction wages were for elements of a process of experimentation, the court calculated the percentage of nonproduction wages that would need to be for the Dry Dock alone and included in the numerator in order to satisfy the "substantially all" test: 96% ($584,436 ÷ $609,276 and $584,436 = 0.8 ($584,436 + $146,109)). Because Taxpayer had not provided sufficient information to show its nonproduction employees' activities constituted elements of a process of experimentation, the tax court concluded that the Dry Dock also did not pass the "substantially all" test.

We cut a different path. Above, we concluded that the record does not allow us to determine the percentage of nonproduction wages that account for elements of a process of experimentation. We also concluded that much of the nonproduction wages account for non-research activities. Given these conclusions, we do not strain ourselves with the sequential assumptions made by the tax court. Because we are unsure what nonproduction expenses account for research activities, we simply exclude them from our "substantially all" analysis. This is to

Taxpayer's benefit because, under our previous conclusions, including the nonproduction expenses would only increase the denominator without any gains in the numerator.

So, whether Section 41(d)(1)(C) is satisfied comes down to whether substantially all of the pilot model production expenses are elements of a process of experimentation. Remember, the process of experimentation test is distinguished from the Section 174 test in that the former "imposes a more structured method of discovering information." *Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *80 (citing *Norwest*, 110 T.C. at 496 and *Eustace*, 312 F.3d at 907). A process of experimentation "involves the identification of uncertainty concerning the development or improvement of a business component, the identification of one or more alternatives intended to eliminate that uncertainty, and the identification and the conduct of a process of evaluating the alternatives." §1.41–4(a)(5)(i). The tax court found that Taxpayer had provided insufficient evidence to include the alleged pilot model production expenses for the Tanker and Dry Dock in the numerators of the respective fractions. We agree.

Tanker. The tax court began by rejecting Taxpayer's argument that the deadweight survey, conducted after the Tanker was built, established that the entire tanker was involved in a process of experimentation. But it also viewed with skepticism the Commissioner's argument that the survey was merely a quality control test that was not a process of experimentation or deductible research under Section 174. *See generally* §§1.174-2(a)(6)(i), 1.41-4(c)(5)(v). We do not share the tax court's hesitation on this point. The deadweight survey determines a vessel's water displacement, which indicates its cargo capacity. Water displacement is a common contractual specification for vessels, and a sufficient variance can result in noncompliance with agreed-to terms. So the deadweight survey is closer to a quality control test that determines whether a customer's specifications have been met, §1.174-2(a)(7), rather than a "methodical plan involving a series of trials to test a hypothesis, analyze the data, refine the hypothesis, and retest the hypothesis." *Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *81; *Siemer Milling*, 2019 WL 1598588, at *8. No hypothesis was postulated, and no alternatives were evaluated. The test primarily addressed one question: Does the vessel conform to the customer's cargo requirements?

We do not doubt that Taxpayer encountered many uncertainties in building the Tanker. Plenty of trial testimony demonstrated that changes in one of several interdependent vessel components could trigger the redesign of other parts. But we suspect that much of this design spiral addressed generic manufacturing uncertainty, rather than "investigative" uncertainty "in developing the *concept* of a model or product." *Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *79 (quoting *Mayrath*, 41 T.C. at 590). The tax court found that Taxpayer had not established that post-fabrication testing was required to determine the design of every component of the Tanker that differed from its predecessor, the Penn 80. We agree and add that Taxpayer has not shown what expenses claimed for the whole Tanker were elements of a process of experimentation to remove uncertainty related to the "development or improvement" of the product. §§1.41-4(a)(5)(i), 1.174-2(a)(1). Sure, expenses incurred to iteratively design the Tanker's stern notch and towing bridle (among other parts) may have involved a process of experimentation. But Taxpayer failed to give us the means to apply the shrinking-back rule to apply the "substantially all" test to any subcomponent of the Tanker. *See generally* §1.41–4(b)(2). By choosing an "all or nothing" strategy, Taxpayer swung for the fences and missed. Assuming the Tanker is a pilot model, Taxpayer still failed to satisfy the "substantially all" test with respect to the Tanker.

Dry Dock. The tax court found that CIS's partial raise-and-lower test for the Dry Dock did not establish that the design of every element of the vessel remained uncertain, and thus constituted a process of experimentation. This raise-and-lower test, too, is less experimentation than it is a quality control test that establishes whether a customer's specifications have been met. §1.174-2(a)(7). It merely ascertains whether a dry dock submerges and rises as designed and according to a customer's desired parameters. In fact, the client, Detyens—not CIS—conducted a full raise-and-lower test after taking delivery of the vessel at its shipyard. This supports the understanding that the raise-and-lower test confirmed the vessel's functioning as designed. Its primary function was not to test any hypothesis or evaluate alternatives CIS had in mind.

We recognize that the Dry Dock is the first one that CIS built. But we reiterate that the novelty of a business component is not a proper heuristic for the "substantially all" test. The test is applied in reference to research activities—not the business component being developed or improved. §1.41-4(a)(6). We also acknowledge

the many uncertainties Taxpayer encountered while building the Dry Dock. Surely, Taxpayer engaged in some research activities to address these uncertainties. But Taxpayer failed to document what, if any, of these activities involved a "methodical plan involving a series of trials to test a hypothesis, analyze the data, refine the hypothesis, and retest the hypothesis." *Union Carbide* [CCH Dec. 57,753(M)], T.C. Memo. 2009-50, at *81; *Siemer Milling*, 2019 WL 1598588, at *8. Taxpayer simply said the Dry Dock is first-in-class and did not document whether hypotheses and alternatives were tested and refined in a scientific manner. True, the Dry Dock's outboard side plate and safety deck, among other parts, went through several design iterations, the research activities for which could constitute elements of process of experimentation. But again, we are unable to apply the shrinking-back rule on such subcomponents for lack of documentation. *See generally* §1.41–4(b)(2). Assuming the Dry Dock is a pilot model, Taxpayer also failed to satisfy the "substantially all" test with respect to the Dry Dock.

IV. Conclusion

For both vessels, Taxpayer failed to provide a principled way to determine the portion of employee activities that constituted elements of a process of experimentation. Instead, Taxpayer offered arbitrary allocations for nonproduction employee wages that estimate the portion of the employee's time spent on qualified research. These allocations were not broken out by vessel and did not adequately document that nonproduction employees performed research activities which constitute elements of a process of experimentation. Taxpayer also claimed production employee wages, but similarly failed to show that the production activities accounted for by these wages were elements of a process of experimentation—even less, research activities. The pilot model argument does not help because, even assuming the vessels were pilot models, Taxpayer did not show why the alleged model production expenses belonged in the "substantially all" numerator. Taxpayer therefore failed to bear its burden to provide enough evidence for this court to calculate the "substantially all" fraction "on a cost or other consistently applied reasonable basis." §1.41-4(a)(6).

The lesson for taxpayers seeking to avail themselves of the research tax credit is to adequately document that substantially all of such activities were research activities that constitute elements of a process of experimentation. Generalized descriptions of uncertainty, assertions of novelty, and arbitrary estimates of time performing experimentation are not enough.

Affirmed.

Footnotes

1 Taxpayer also claimed $17,504 in contract research expenses that are not at issue here. CIS paid Hayes Testing Labs to test some welds made in the Tanker's construction. The tax court found that this activity was excluded from the credit as the amounts CIS paid to Hayes were neither research nor experimental expenditures. Taxpayer did not address these expenses in its opening brief, so it waived argument on whether they are creditable. *Accident Fund Ins. Co. of Am. v. Custom Mech. Constr., Inc.*, 49 F.4th 1100, 1108 (7th Cir. 2022).

2 We thank the National Association of Manufacturers for its well-reasoned and helpful amicus brief.

3 Consider the practical import of the tax court's categorical exclusion of pilot model production expenses from the numerator. Under the tax court's reasoning, the more costly the production expenses for developing a pilot model, the less likely that a taxpayer can fulfill the "substantially all" test. Obviously, pilot model production expenses can vary widely depending on what is being modeled. For example, producing models of a plastic fork is much cheaper than making models of a fully functional automobile. If we include such model production expenses in the "substantially all" denominator but categorically exclude them from the numerator, as the tax court suggests, the satisfaction of the test would depend on how small the pilot model production expenses are relative to the nonproduction research expenses. It escapes reason why the "substantially all" test should depend on how expensive it is to produce the pilot model.

4 Even if we reached a different conclusion as to whether pilot model production activities can constitute research activities and elements of a process of experimentation, *supra* Section III.B, the result would not change for Taxpayer. If the pilot model production expenses were not a factor in the "substantially all" fraction, then our analysis would be the same as that performed under the assumption that the vessels were not pilot models.