UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SHENZHEN TUOZHU TECHNOLOGY CO., LTD.,
Petitioner,

v.

STRATASYS, INC.,
Patent Owner.

Case IPR2025-00438
Patent 10,569,466

SECOND DECLARATION OF DR. MICHAEL HICKNER

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I, Dr. Michael Hickner, declare as follows:

I. INTRODUCTION AND SCOPE OF WORK

1. On February 4, 2025, I submitted a First Declaration in IPR2025-00438. *See* EX1003. I submit this Second Declaration for purposes of responding to Patent Owner's Response to Petition (POR) submitted on January 16, 2026 and the declaration testimony of Dr. Cormier (EX2013). In this Second Declaration, I provide additional analysis regarding the claims of U.S. Patent No. 10,569,466 (the '466 patent) and the relied-upon prior art references.

2. My analysis is based upon my education, training, and experience in the relevant field, including my professional experience and additional experience working with persons of ordinary skill in the art as of the earliest alleged priority date of the '466 patent. I am familiar with the technology described in the '466 patent, and I am also familiar with the knowledge of a person of ordinary skill in the art (POSITA) with respect to this technology as of the earliest alleged priority date of the '466 patent (Oct. 29, 2012).

3. I am being compensated for my work in connection with this IPR proceeding at my standard hourly rate. My compensation is not in any way contingent on the substance of my opinions or the outcome of these proceedings.

II. EXPERIENCE AND MATERIALS CONSIDERED

4. My analysis set forth in this Second Declaration is based on my education, training, and experience as summarized in my First Declaration and detailed in my CV (*see* EX1003), as well as my review of the '466 patent, its prosecution history, and the prior art references relied-upon in this IPR proceeding. I have also reviewed the Patent Owner's Preliminary Response to the Petition (POPR), the Patent Owner's Response to Petition (POR), each of the accompanying exhibits submitted with the POPR and POR, the Board's Decision Instituting IPR ("Institution Decision"), and the deposition transcript of Dr. Cormier (EX1045).

III. TECHNICAL DISCUSSION

5. The analysis provided in my First Declaration fully addresses why each and every feature of the Challenged Claims of the '466 patent is provided in the prior art. I understand that Patent Owner and Dr. Cormier have considered my analysis and offered their own proposals, some of which are inconsistent with my analysis. I will address some of those points below. The fact that I do not address all the opinions of Patent Owner and Dr. Cormier should not be interpreted as agreement with them.

6. I have noted that the POR does not address, much less rebut, much of the analysis I provided in my First Declaration. Indeed, rather than squarely confronting the substantial evidence of unpatentability offered in my First

Declaration, Patent Owner and Dr. Cormier sometimes mischaracterize my testimony, the disclosure of the '466 patent, and the cited prior art. As I previously explained with reference to the applied prior art, each of Grounds 1A-3H renders obvious the Challenged Claims. I need not repeat that analysis here. Rather, this declaration is intended to respond to particular arguments presented in the POR and the testimony of Dr. Cormier, including testimony from the declaration submitted with Patent Owner's briefing (EX2013) and testimony provided during deposition (EX1045).

IV. The Loughran-Dubois Combination Teaches Element 1[f] and Claim 5 (Grounds 1A-1B)

A. A POSITA Would Have Been Motivated to Combine Loughran and Dubois, and the Loughran-Dubois Combination Teaches Element 1[f]

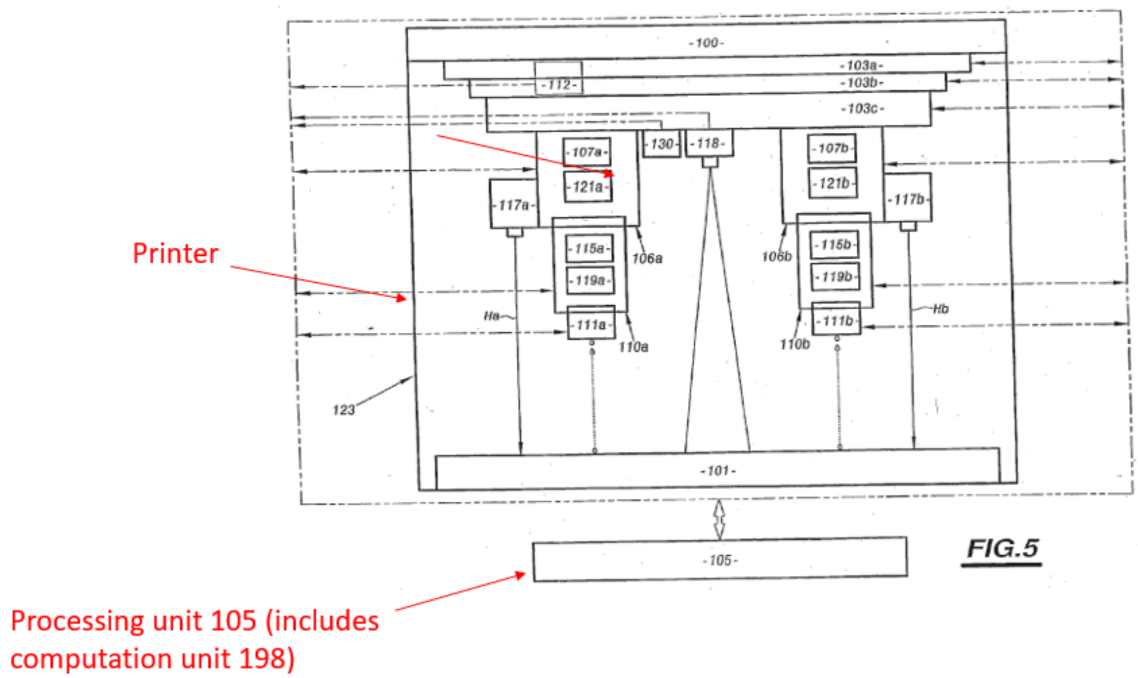
7. In my first declaration, I explained the combination of Loughran and Dubois, which does not require "redesigning Loughran" in the manner alleged by Patent Owner. Pet., 10-13, 23-28; EX1003, ¶¶45-48, 63-70; POR, 12-13. Loughran discloses SFF system 104 that performs "fabrication of physical objects" and "SFF system 102" remote from SFF system 104 that "ha[s] CAD software running thereon to generate SFF fabrication jobs" and "may be considered a client to" SFF system 104. EX1004, [0027], [0012], [0020], FIG. 1. Loughran is also clear that "material information server 108 sends [material] information back to the first SFF system 102" and "CAD software 610" executing on SFF system 102 "generates a

SFF fabrication job for fabrication from a specific material based on the information regarding that material which has been received." EX1004, [0028], [0042] (SFF system 102 "download[s] the information…from the material information server 108"), [0050]-[0051], [0055]. The SFF system then "sends the SFF fabrication job to the…SFF system 104." *Id.*, [0055].

8. The fact that client SFF system 102 generates the fabrication job based on the material information is true regardless of the fact that Loughran's SFF system 104 (the 3D printer) is also capable of "dynamically adjust[ing] its own parameters for fabricating physical objects" based on material information. EX1004, [0037]; EX1003, ¶¶63-64, 68-69. That is, Loughran describes a networked 3D printing system in which both the client device and 3D printer use material information to set operational parameters for fabrication jobs. *Id.*; EX1003, ¶¶61-62. Therefore, the proposed modification of Loughran based on Dubois does not involve "redesigning Loughran" to "shift[] parameter-setting into the client-generated job" as Patent Owner asserts. POR, 12-13. Rather, as I explained in my first declaration, it merely implements Dubois's suggestion to provide additional details on material-based operational parameters that would beneficially be determined during fabrication job generation to complement Loughran's express disclosure of "generat[ing] a SFF fabrication job for fabrication from a specific material based on the information

regarding that material." EX1003, ¶¶45-48, 63-70; EX1004, [0055]; EX1005, [0027], [0056]-[0059],[0109]-[0112]; Pet., 10-13.

9. Loughran's disclosure of generating print jobs at the remote client computer "based on the information regarding that material" is complemented by Dubois, which suggests the conventional option of determining material-specific operational parameters at a computer separate from the printer at the time of generating print jobs (prior to printing). EX1004, [0055]; EX1005, [0069]-[0073], [0081]-[0092], [0128], [0170]. For example, Dubois suggests associating the material-specific "printing parameters" with the print job "during the stage of cutting up the 3D representation of the component," which can be performed during a slicing stage by "computation unit 198" implemented as "***software on a personal computer***," not the printer. EX1005, [0081]-[0092] ("during or prior to the slicing stage"), [0148]-[0150] ("optimum values of ***printing parameters*** as a function of ***the nature of the materials***" determined by "computation unit 198"), [0170]. Patent Owner's expert agreed that "the computation unit 198… performs the slicing function" and the slicer software is executing "on a personal computer." EX1045, 73:15-76:13. Dubois's FIG. 5 shows processing unit 105 (which includes computation unit 198) as separate from and in communication with the printer.



EX1005, FIG. 5 (annotated), [0147]-[0150].

10. Dubois complements Loughran, which discloses that "client" SFF system 102 "may be or include a ***general-purpose computing device***, like a desktop, portable, or server computer running computer-aided drafting (CAD) software." EX1004, [0012]. Both references teach generation of print jobs based on material information at a computer communicating with, and separate from, the printer. The only difference is that Loughran's client computer 102 communicates with the printer over a network while Dubois client computer communicates with the printer over a local (wired) connection. The operational parameters are received at the printer from the client in the predictable combination. EX1003, ¶¶63-67; Pet., 23-26.

11. As I explained in my first declaration, a POSITA would have been motivated to implement Loughran's SFF system in a manner that employs Dubois's suggestion (e.g., sending the fabrication job from the CAD client using CAD information that includes printing parameters concerning the state or characteristics of the materials) to achieve several known benefits and thereby enabled Loughran's system to complete each fabrication job based on CAD information with the optimal set of material parameters. EX1003, ¶¶45-48; Pet., 10-13. The Loughran-Dubois combination teaches "receiving one or more operational parameters from the client" as recited in element 1[f]. EX1004, [0002], [0012], [0027], [0045], [0051]-[0052], [0055]; EX1005, [0016], [0056]-[0059], [0069]-[0072], [0128], [0170]; Pet., 23-26; EX1003, ¶¶63-67. Patent Owner does not dispute the numerous predictable benefits I articulated in my first declaration. EX1003, ¶¶45-48.

12. Patent Owner instead argues that sending printing parameters in the job is inconsistent and conflicts with Loughran's printer-side automatic and dynamic adjustment. POR, 12, 19-20. To support its argument, Patent Owner mischaracterizes my deposition testimony. POR, 19-20 (citing EX2015, 53:16–54:10). Patent Owner is wrong because there is no conflict. In the Loughran-Dubois combination, the printer would automatically and dynamically adjust its own parameters based on the information retrieved from the material information server and the printing parameters in the job received from the client. EX1003, ¶¶68-69.

As I explained during my deposition, "in Loughran, the adjustment is performed based on where the system starts from, which is specified in the job" and "Loughran can still do its job of dynamically adjusting." EX2015, 54:11-55:5, 76:8-77:3. Automatically and dynamically adjusting parameters based on both the information retrieved from the material information server and the printing parameters in the job received from the client would further Loughran's goal of ensuring "that physical objects can be properly fabricated from the material." EX1004, [0037]. As Dubois explains, "[c]omputer-aided design which does not allow for the properties of the device and the properties of the materials does not allow optimum definition of the patterns to be printed." EX1005, [0016]. Dubois therefore proposes controlling "the dynamic production process via… 'printing parameters'." EX1005, [0056].

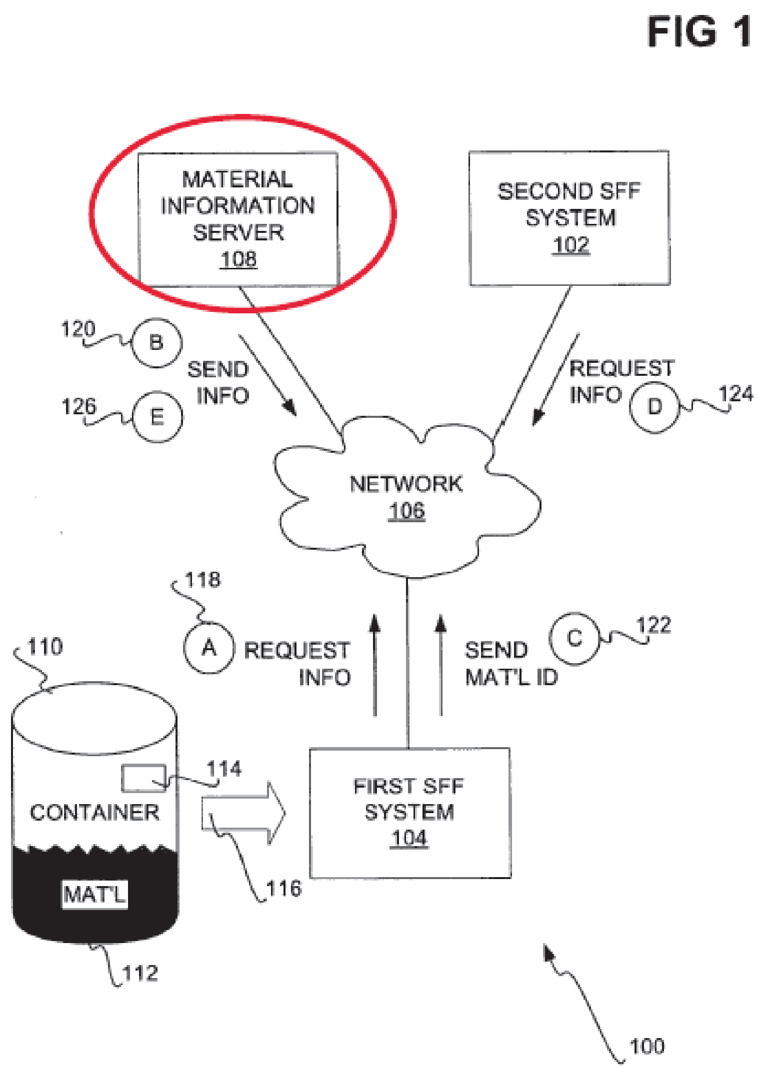
13. Further, Loughran's purported disclosures of printer-side automatic and dynamic adjustment does not teach away from receiving printing parameters in the job. As I explained in my first declaration, the Loughran-Dubois combination cites to the conventional teaching of the client sending the job that includes printing parameters concerning the state or characteristics of the materials and then the printer fabricating the object based on the job with the optimal set of parameters. EX1004, [0002], [0012], [0027], [0045], [0051]-[0052], [0055]; EX1005, [0016], [0056]-[0059], [0069]-[0072], [0128], [0170]; Pet., 23-28; EX1003, ¶¶63-70.

Nothing in the prior art criticizes this functionality, and thus there is no teaching away from the proposed combination.

14. Patent Owner alleges that Dubois does not support moving "parameter-setting to the CAD client when Dubois itself emphasizes printer-side computation dependent on printer/deposition-condition inputs." POR, 13-15, 21. But Patent Owner ignores Dubois's disclosure that the "computation units 198, 201, 202, 203… can thus be implemented by means of software on a personal computer." EX1005, [0170]. A personal computer is a distinct device from the printer itself. During deposition, Patent Owner's expert Dr. Cormier agreed that "the computation unit 198… performs the slicing function" and "the slicer software is executing on a personal computer." EX1045, 73:15-76:13. Therefore, Dubois discloses that the computation units that determine print layers, trajectories, and printing parameters as a function of input data and information (including the state of materials, printer characteristics, and deposition conditions) are implemented on a personal computer. Dubois is therefore complementary to Loughran's disclosure that the SFF system 102 "may be or include a general-purpose computing device, like a desktop, portable, or server computer running computer-aided drafting (CAD) software" and "may be considered a client to the second SFF system 104 in that the first SFF system 102 provides SFF jobs to the second SFF system 104, and the second SFF system 104 fabricates these jobs." EX1004, [0012]. Both references disclose fabrication of

print jobs based on material information at a computer separate from the printer. The only difference is that Loughran's SFF system 102 communicates with the printer over a network while Dubois's personal computer communicates with the printer over a (local) cable connection. As explained in my first declaration, a POSITA would have found it obvious to implement computation units such as disclosed in Dubois on Loughran's SFF system 102, thereby providing a CAD client that selects optimum parameters as a function of materials, printer characteristics, and deposition conditions and sends the parameters in the fabrication job. EX1003, ¶¶63-67; Pet., 23-26.

15. Regarding Patent Owner's assertion that "the client may not have the most current material database" (POR, 17), this argument ignores the fact that Loughran's client system "102" and printer-side system "104" receive material information from the ***same "material information server 108."*** EX1004, [0012], [0022]-[0023], [0038]-[0042].



EX1004, FIG. 1. In the Loughran-Dubois combination, Loughran's remote CAD client would be provided and possess the printer-characteristics and deposition-condition inputs that Dubois identifies as necessary to determine optimum values when generating a CAD file through Loughran's disclosed network communication paths, as discussed in my first declaration. EX1003, ¶¶60-62. For example, Loughran discloses:

> The first SFF system 102 receives a first list of material

> identifiers known to the second SFF system 104 over the network 106, as well as optionally other information (402). Receiving the first list may involve the first SFF system 102 receiving the list as part of an information extraction process performed by the first SFF system 102 relative to the second SFF system 104. For instance, the first SFF system 102 may query the second SFF system 104 for information regarding the second SFF system 104. In response, the second SFF system 104 may provide the first SFF system 102 with information about itself, including a list of material identifiers known to the second SFF system 104.

EX1004, [0041], [0028] (SSF system 104 sends "the material identifier for the material 112 to the [client] SFF system 102, as indicated by the letter C 122"), FIG. 1 (C 122), FIG. 4 (402). As Loughran discloses, the printer in the combination would provide the remote CAD client with "other information" and "information about itself," including the printer-characteristics and deposition-condition inputs that Dubois identifies as necessary to determine optimum values, "over the network" as part of the "information extraction process." EX1004, [0041]. As I explained in my deposition, "in Figure 1 of Loughran,… the second SFF system, first SFF system, those are all networked together. And so, information can be passed between those units of Loughran through the network, including the information that Dubois indicates in paragraph 148." EX2015, 68:16-69. In this way, the client would have the most current material database and the printer-specific constraints needed to set correct process parameters. Doing so would further Loughran's goal of ensuring that "the SFF fabrication jobs can be accurately generate[d] for ultimate fabrication of physical objects from the material" based on the material type. EX1004, [0027]. As I explained in my first declaration, a POSITA would have recognized that Dubois's suggestion would have predictably improved Loughran's system by enabling Loughran's system to complete each fabrication job based on CAD information with the optimal set of material parameters. EX1003, ¶45; Pet., 10. Such an improvement would have achieved the numerous benefits discussed in my first declaration. EX1003, ¶¶46-48; Pet., 10-13.

B. The Loughran-Dubois Combination Teaches Claim 5

16. As I described in my first declaration, Loughran teaches the printer is coupled to multiple supplies of different materials, each supply including a tag that stores a property of the material. EX1003, ¶¶51, 60, 62, 72 ("The build material is a first build material, and the support material is a second build material"); Pet., 15-16, 19-21, 28; EX1004, Abstract, [0016] ("a plastic build material and a wax-like support material is used"), [0020] ("material container 110 contains a tag 114 that includes a material identifier"), [0021], [0028], [0033], [0038], [0041], [0047]. Additionally, Dubois provides for "production of three-dimensional structures consisting of a plurality of different materials" and describes a printer that includes a "plurality of material storage tanks 106a, 106b, with one tank per material used

during the production of the multi-material component." EX1005, [0021], [0133]; EX1003, ¶¶76, 79; Pet., 28. Loughran teaches that the printer provides the tag data for multiple supplies to the client. EX1004, [0052] (client "receives from the second SFF system 104 a list of unique material identifiers of materials known to the second SFF system 104"); Pet., 21-23; EX1003, ¶¶60-62. Therefore, the Loughran-Dubois combination teaches the printer providing tag data for at least two supplies to the client. EX1003, ¶74.

17. As I explained in my first declaration, the Loughran-Dubios combination further teaches the printer receiving from the client a selection of one of the two tagged supplies for use in fabricating the object. EX1003, ¶¶75-79. As discussed in my first declaration, the Loughran-Dubios combination provides a CAD client that selects optimum parameters as a function of materials, printer characteristics, and deposition conditions and sends the parameters in the fabrication job. EX1003, ¶¶63-67; Pet., 23-26. The CAD client would also slice "the 3D representation of the component into print layers," which "involves slicing the 3D representation of the component to be produced into print layers which are to be printed in succession." EX1005, [0075]; Pet., 29-30; EX1003, ¶¶76-77. I explained that a "slice specifies a selection of build material for use in printing the layer of the multi-material component," citing Napadensky as corroboration of a POSITA's knowledge of this fact. EX1003, ¶¶77-79; EX1006, [0039]-[0040], [0193]-[0194];

EX2015, 26:1-6. In the Loughran-Dubois combination, the CAD client would provide the printer with the fabrication job that includes slices that each specifies a selection of one of two build materials for use in printing a layer of the object using the printer. EX1003, ¶79; Pet., 30; EX2015, 26:1-6.

18. Patent Owner does not dispute that slices specify a selection of build material. POR, 23-25. Instead, Patent Owner argues that "'slice-level material assignment' is not the claimed step of receiving from the client a selection of one of the two tagged supplies." POR, 23-25. I disagree. As I explained in my first declaration and reiterated above, the Loughran-Dubois combination teaches that the printer provides tag data for at least two supplies to the client and then receives from the client the fabrication job that includes slices that each specifies a selection of one of two build materials for use in printing a layer of the object using the printer. EX1003, ¶¶51, 60-67, 72, 75-79; Pet., 15-16, 19-23, 28-30.

19. Patent Owner further argues that "[n]othing in Dubois teaches that the printer receives from a client a selection between two tagged build-material supplies after the printer provides tag data for both supplies to the client." POR, 25. As I explained in my first declaration and reiterated above, the Loughran-Dubois combination teaches these features. EX1003, ¶¶51, 60-67, 72, 75-79; Pet., 15-16, 19-23, 28-30.

V. Devos Teaches a Support Structure Requirement as Required by Element 19[e] (Ground 2)

20. Devos is express: "The system can also use the data encoded in or on the memory mechanism 146 to determine certain operating parameters" including "powder settling coefficients (e.g., to determine whether powder supports need to be included, and if so, how much support)." EX1008, [0032]. Devos's disclosure regarding "supports need[ed]" is not "an explanatory aside" as Patent Owner insists. POR, 39. Rather, it is an express disclosure that "[t]he system" functions to "determine…how much support" is needed based on material information from the material supply tag. *Id.*; EX1003, ¶¶113-115. I understand that Patent Owner's expert acknowledges that "a POSITA would understand a 'support structure requirement' as an operational parameter would specify whether/where supports should be generated and printed and with what settings." EX2013, ¶133. Devos explicitly discloses determining "whether powder supports need to be included, and if so, how much support," thereby teaching an operational parameter that is a support structure requirement. EX1008, [0032]; Pet., 49; EX1003, ¶113.

21. Patent Owner argues that "a POSITA would understand that printing rigid support structures is not needed because the powder surrounding the part provides the necessary support," citing a publication disclosing that "[n]o support structures allow complex geometry to be created." POR, 40-41 (citing EX2014, p. 326). However, Devos is plainly directed to the 3D printing process and does not

mention any requirement for “thermal post-processing” that takes place after printing. EX1008, [0001]. Additionally, even if the support structure were only required due to this alleged “post-processing” such support structures would still need to be created during the printing process and therefore represent a support structure requirement operational parameter. The mere fact that a *different* publication (EX2014) contends “[n]o support structures allow complex geometry to be created” is far afield from Patent Owner’s theory that Devos would never need 3D printed support structures. *Id.* Rather, the evidence here plainly confirm the traditional understanding that in some powder bed processes, “overhanging surfaces… are not directly possible” and “support structures are necessary to guarantee adequate process continuation.” EX1043, 4; EX1044, 1 (“require a supporting of overhanging areas during the powder solidification”), 2 (“support structures for product manufacturing by means of metal- and powder-based additive processes are used… protecting these part sections from displacing during manufacturing.”). Devos makes clear that the powder settling coefficient (which is determined from information provided by the material supply’s memory chip) would dictate whether and how much powder supports need to be included and therefore constitutes a support structure operational parameter. EX1008, [0032]; EX1003, ¶¶113-115. As Dr. Cormier acknowledges a “powder settling coefficient is a characteristic of the powder that indicates how much a given powder will settle down, or compact, when it is spread out and/or when droplets of liquid binder are jetted onto it." EX2013, ¶139. If the powder settles or compacts during printing, then overhanging areas would be displaced during printing if support structures were not also printed. EX1044, 2.

VI. Menchik Teaches Elements 1[b], 1[e], 1[f], 19[e], and Claims 3-5 and 10 (Grounds 3A-3D)

A. Menchik Teaches a Client (Elements 1[b], 1[e], 1[f])

22. As I discussed in my first declaration and reiterate below, Menchik renders obvious all aspects of a client that Patent Owner alleges is required. POR, 46 ("distinct from the printer's controller," "sends a fabrication request," "a separate computing device that submits a job/request over a network"); EX2013, ¶150 ("user-operated role of initiating/managing/monitoring print jobs"). Menchik teaches a computing device that is separate/external from the printer and communicates with the printer over a wired or wireless network. Pet., 57-58; EX1003, ¶128. Menchik discloses that "a separate unit, such as a personal computer or workstation… may provide some control or data storage capability." EX1009, [0021]. Specifically, "[c]ontroller 105 may be located… outside of printing apparatus 100," "may be connectable to a… communications network," and "may communicate with printing system 100, for example, over a wire and/or using wireless communications." EX1009, [0024], [0053]. Controller 105 can be "a computing device such as a personal computer, a desktop computer, a mobile computer, a laptop computer, a

server computer, or workstation (and thus part or all of the functionality of controller 105 may be external to 3D printer system 100).” EX1009, [0026].

23. Menchik also teaches that the computing device is operated by users to generate and initiate print jobs and send print jobs to the printer. Pet., 58-59; EX1003, ¶¶129-130. Menchik discloses that “controller 105 may include a CAD system” and “may utilize Object Data (COD) representing an object or a model, such as CAD data in Stereo Lithography (STL) format.” EX1009, [0024]. A POSITA would have understood that a CAD system is installed on a user-operated computing device for generating CAD data for print jobs. Patent Owner’s expert confirmed this during his deposition. EX1045, 56:14-57:9 (CAD software “would typically be installed on a personal computer or a laptop computer”). Menchik further discloses that “printing file or other collection of print data may be prepared and/or provided and/or programmed, for example, by a computing platform connected to 3D printer system.” EX1009, [0025]. As I explained in my first declaration, the “computing platform” providing the printing file is an example of the controller 105 external to the printing apparatus 140. EX1003, ¶¶129-130; ID, 32. Patent Owner’s expert agreed during his deposition that a functionality of a client is submitting objects for 3D printing. EX1045, 39:19-22.

B. Menchik Teaches a Request (Element 1[b])

24. Patent Owner appears to argue that Menchik's print file is not a request because "a file can be created and transferred without initiating fabrication until a separate start/build command is issued to the printer." POR, 48. However, element 1[b], which recites "receiving a request from a client over a network to fabricate an object on the three-dimensional printer," does not require that the request must "initiate" fabrication. As I explained in my first declaration, Menchik's print file teaches a request to fabricate an object because it is provided to the printer by the computing platform client that communicates with the printer over a wired or wireless network, as discussed above, and it includes instructions for the printer to print the object. EX1009, [0024]-[0026]; EX1003, ¶130.

C. Menchik Teaches Element 1[e]

25. Patent Owner admits that "Menchik's cited disclosures describe transmitting information from a cartridge memory mechanism/chip to the controller." POR, 49. As I explained above, Menchik teaches that the controller is a client that communicates with the printer over a wired or wireless network, and therefore Menchik teaches providing the information from the memory chip (data from the tag) to the client over the network. EX1009, [0027], [0047]-[0048].

D. Menchik Teaches Element 1[f]

26. Menchik teaches a client-side selection of operational parameters and then a receipt of those selected parameters by the printer. Patent Owner does not

dispute that Menchik's controller computes parameters and provides a printing file that is used to determine "the order and configuration of deposition of building material." *See* POR, 50-54; EX1009, [0025]. Nothing in the two-word phrase "operational parameter" excludes these parameters of Menchik's printing file. EX1001, 15:17-24; ID, 34. As I explained above in §VI.A, the controller is a client that communicates with the printer over a wired or wireless network and provides the printing file over the network.

27. Also as discussed in my first declaration, Menchik teaches that controller provides the printer with the computed parameters and instructions in order to "control the supply of building material." EX1003, ¶¶135-137; Pet., 61-63; EX1009, [0027], [0006]-[0007], [0014], [0018], [0037]-[0038], [0044]-[0045], [0051]-[0052]. Because the controller is a client that communicates with the printer over a wired or wireless network, as I explained above in §VI.A, a POSITA would have found it obvious that the controller would provide the parameters and instructions to the printer over the network.

E. Menchik Teaches Element 19[e]

28. The Petition's and my analysis in my first declaration of element 1[f] establishes that Menchik teaches "determining an operational parameter… based upon at least one property of the build material in the data" read from the tag and the operational parameter includes "a support structure requirement" as required by

element 19[e]. Pet., 61-63; EX1003, ¶¶135-137. Menchik teaches "a tag that stores at least one property of the build material": "Menchik describes that each cartridge 250 (or 410) includes 'a memory device such as a memory chip 260' which stores 'information relating to the material stored within cartridge 250, for example, the type of building material in the cartridge bag 300, the material's color, manufacturing date, optimal operation parameters (e.g., recommended jetting temperature), optimum building parameters (e.g., for building or support).'" EX1009, [0035], [0043]; Pet., 59-60, 67-68; EX1003, ¶¶131, 146. Each of Menchik's examples of information stored on the memory chip is a property of the build material. *See* EX1001, 14:60-15:3, 21:28-38.

29. For the "operational parameter," the analysis in my first declaration relied on Menchik's disclosure that "[c]ontroller 105 may use the data received, for example, data from memory chip reader 225, data from load cell 230, and other data, to compute printing parameters, including, for example, guidelines for which cartridges to use, how many to use, if and when any replacements are necessary etc." EX1003, ¶135; Pet., 61; EX1009, [0037]. My analysis in my first declaration further relied on Menchik's disclosure of the controller processing the data "to compute material parameters for building material(s), material required to construct one or more objects, and supply parameters for materials in one or more cartridges." EX1003, ¶¶135, 146; EX1009, [0027]; Pet., 61-62. I further explained in my first

declaration that "Menchik's client controller 105 external to the printing apparatus 140 (per 1[b]) 'control[s] the supply of building material to printing apparatus 140' based on the data by sending operational parameters to the printing apparatus 140." EX1003, ¶135; Pet., 62. In Menchik, "the term 'building material'… may include model or 'modeling' material, support material, and/or any suitable combination of model material and/or support material, used in the building, forming, modeling, printing or other construction of three-dimensional (3D) objects or models." EX1009, [0017], [0028].

30. Patent Owner acknowledges that "Menchik's cited disclosures describe transmitting information from a cartridge memory mechanism/chip to the controller so the controller can compute or use parameters for printing and material supply" and "Menchik's cited workflow is that controller 105 uses data from sensors and cartridge memory chips to compute 'material parameters' and 'supply parameters,' including computing quantities/availability and determining whether/when/how much material to extract according to printer requirements for a particular object." POR, 49 (citing Pet., 60-62; EX1009, [0027], [0047]-[0048]), 50. Patent Owner's expert acknowledges that "a POSITA would understand a 'support structure requirement' as an operational parameter would specify whether/where supports should be generated and printed and with what settings." EX2013, ¶133. Because building material includes support material and Menchik determines

quantities/availability and whether/when/how much support material to extract using data including property of the build material from the memory chips, Menchik teaches computing an operational parameter that is a support structure requirement based on a property of the build material in the data read from the tag. EX1003, ¶¶135-137, 146.

31. My analysis in my first declaration of claim 10 provides another example that satisfies element 19[e]. EX1003, ¶146. As I explained in my first declaration and reiterated above, Menchik describes that each cartridge includes "a memory device such as a memory chip 260" which stores "information relating to the material stored within cartridge 250, for example,… optimum building parameters (e.g., for building or support)." EX1003, ¶¶131, 146; Pet., 59-60, 67-68; EX1009, [0035], [0043]. The optimum building parameters for support structures is a property of the build material stored in the memory chip and used to determine the parameters for support structures which is a support structure requirement. EX1003, ¶¶131, 146; Pet., 67-68.

32. Patent Owner's expert argues that "the operational parameters in claim 19 are all parameters specifically relating to fused filament fabrication (FFF) processes." EX2013, ¶169; POR, 56-57. However, claim 19 does not recite a FFF process. EX1001, 24:54-25:9. The '466 specification makes clear that "numerous additive fabrication techniques" fall within the scope of the term "three-dimensional

printer." EX1001, 2:4-14. Patent Owner's expert, during his deposition, admitted that other fabrication techniques use similar operational parameters as those listed in claim 19. *See infra*, §VI.G. Indeed, both fused deposition modeling (which is synonymous with FFF) and multi-jet modelling create support structures during the printing process. EX2014, 7-8. Dr. Cormier confirmed this during his deposition. EX1045, 47:9-48:4 (testifying that in FDM "sometimes support structures are needed"); 52:1-14 (testifying that in multi-jet modelling "sometimes requiring a support material").

F. Menchik Teaches Claims 3-5

33. As I explained in my first declaration, Menchik teaches first and second supplies of different build materials, each supply having a memory chip storing a property of the build material. EX1003, ¶¶127, 131; Pet., 56-57, 59-60. Patent Owner ignores Menchik's teaching of "an array 400 of cartridges 410, each of which may contain building material," "may have different forms, colors, composition," and "may be located within printing apparatus 140." EX1009, [0042], [0017], [0028]. "Each type and/or color or suitable combination etc. of building material may be contained separately within one or more cartridges." EX1009, [0042]. Menchik further discloses controlling "the supply of building materials of multiple colors or types." EX1009, [0018]. "Each cartridge 410 may be associated with a memory or storage device such as a memory chip 260 and reader or data transfer

device such as a memory chip reader 225." EX1009, [0043]. The memory chip stores "information relating to the material stored within cartridge 250, for example, the type of building material in the cartridge bag 300, the material's color, manufacturing date, optimal operation parameters (e.g., recommended jetting temperature), optimum building parameters (e.g., for building or support)." EX1009, [0035], [0043].

G. Menchik Teaches Claim 10

34. As I explained in my first declaration and reiterated above, Menchik describes that each cartridge includes "a memory device such as a memory chip 260" which stores "information relating to the material stored within cartridge 250, for example,… optimal operation parameters (e.g., recommended jetting temperature), optimum building parameters (e.g., for building or support)." EX1003, ¶¶131, 146; Pet., 59-60, 67-68; EX1009, [0035], [0043]. Both Menchik's "recommended jetting temperature" and the claim's "extruder temperature" are temperatures for dispensing material and are therefore analogous terms in different printing techniques. The optimum building parameters for support structures is a property of the build material stored in the memory chip and used to determine the parameters for support structures which is a support structure requirement. EX1003, ¶146; Pet., 67-68. Also as discussed above in §VI.D, Patent Owner does not dispute that Menchik's controller computes parameters and provides a printing file that is used to determine

"the order and configuration of deposition of building material." *See* POR, 50-54; EX1009, [0025]. Menchik also teaches that controller is a client that provides the printer with the parameters and instructions in order to "control the supply of building material." EX1003, ¶¶135-137; Pet., 61-63; EX1009, [0027], [0006]-[0007], [0014], [0018], [0037]-[0038], [0044]-[0045], [0051]-[0052].

35. Patent Owner's expert argues that "FFF is fundamentally different from inkjet printing." POR, 61-62. However, claim 10 does not recite a FFF process. EX1001, 24:54-25:9. The '466 specification makes clear that "numerous additive fabrication techniques" fall within the scope of the term "three-dimensional printer." EX1001, 2:4-14. Patent Owner's expert, during his deposition, admitted that other fabrication techniques use similar operational parameters as those listed in claims 10. EX1045, 13:21-15:4 (discussing binder jetting and inkjet printing processes having a jetting temperature for dispensing material and build platform temperature based on material used), 51:14-25 (same), 16:25-17:25 (discussing fused filament fabrication having an extruder temperature for extruding material and build platform temperature based on material used), 22:1-10 (discussing fused deposition modeling), 23:2-24:6 (discussed multi-jet and inkjet processes), 44:19-50:22 (discussing fused filament fabrication, fused deposition modeling, and inkjet are dispensing processes where the material is melted).

VII. A POSITA Would Have Been Motivated to Combine the Teachings of Jazayeri with References Related to 3D Printing to Render Obvious Element 1[b] (Grounds 1B/1D/1F/3B/3D/3F/3H)

A. Jazayeri is Analogous Art (Grounds 1B/1D/1F/3B/3D/3F/3H)

36. Jazayeri is analogous art because it falls within the same general field of endeavor of the ’466 patent of “a networked three-dimensional printing environment.” EX1001, 1:41-42, 4:57-13:64, FIG. 2; EX1010, [0001] (“relates to printing”), [0002] (“within a computing environment”), [0003] (“in the context of a network”), [0018] (“provides printing capabilities over a network”) FIG. 1. Patent Owner’s expert confirmed during his deposition that in the ’466 patent portions of “four pages or so… refer to networked printing.” EX1045, 40:22-25. Similar to the “networked three-dimensional printing environment” toward which the ’466 patent is directed, Jazayeri is directed toward the same field of endeavor of providing “printing capabilities over a network.” EX1001, 1:41-42; EX1010, [0018]. Both the ’466 patent and Jazayeri illustrate similar networked printing environments:

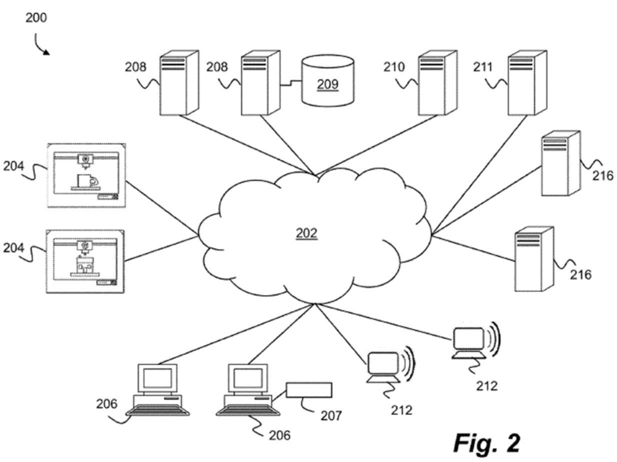
<table>
<tr><th>’466 patent</th><th>Jazayeri</th></tr>
<tr><td>

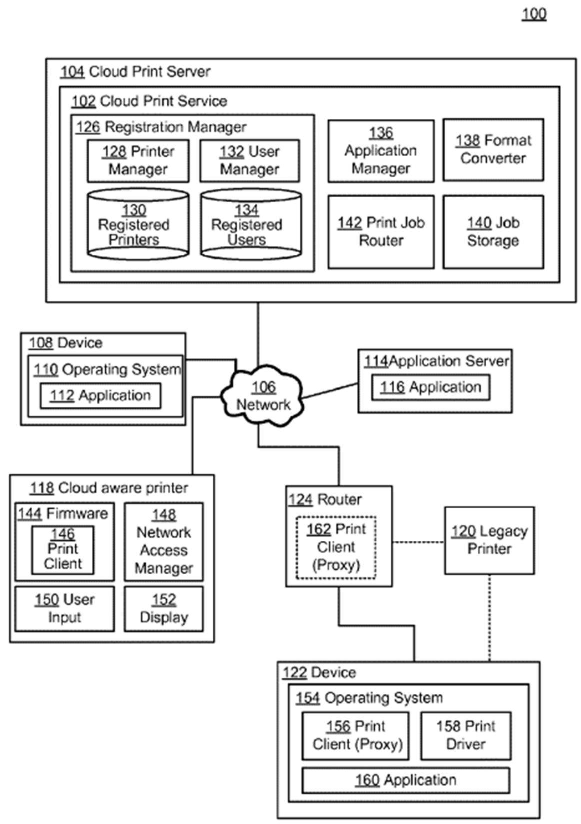
Fig. 2</td><td>

FIG.1</td></tr>
<tr><td>EX1001, FIG. 2</td><td>EX1010, FIG. 1</td></tr>
</table>

37. Jazayeri is also reasonably pertinent to the problems addressed by the ’466 patent of a system “interconnecting a plurality of participating devices in a communicating relationship” to provide “a networked three-dimensional printing environment.” EX1001, 4:57-65. Jazayeri describes a system that “provides an ability for virtually any application running on any device within the network… to communicate with the cloud print service… to thereby print to any printer which is also in (direct or indirect) communication with the cloud print service.” EX1010, [0028]. Here, although Jazayeri provides examples of a cloud print service with 2D

printers, Jazayeri explicitly states that a cloud print service can be provided "as a general service which is not specific to any particular type of printer." EX1010, [0076]. Therefore, Jazayeri is not limited to 2D printers and explicitly includes other types of printers. *Id.*

38. Element 1[b] does not preclude a server receiving a print request from a client. The '466 patent describes that "a print server 208 may maintain print queues for participating three-dimensional printers 204" that "include print data (e.g., the three-dimensional model or tool instructions to fabricate an object) for a number of print job" and the print server "allocate[s] print requests to various three-dimensional printers." EX1001, 8:27-28, 8:53-58, 17:2-12. Similarly, Jazayeri describes a print server receiving a print request over a network. EX1010, [0008]-[0010], [0036], [0066].

B. A POSITA Would Have Been Motivated to Combine Jazayeri with Loughran-Dubois, and the Loughran-Dubois-Jazayeri Combination Teaches Element 1[b] (Grounds 1B/1D/1F)

39. Patent Owner does not dispute that the Loughran-Dubois-Jazayeri combination teaches element 1[b]. POR, 34. Rather, Patent Owner argues that "Petitioner fails to establish the requisite motivation to combine." POR, 34-35, 31-33. Patent Owner argues that adding Jazayeri's teachings to Loughran "would not improve—and would potentially complicate—the material-parameter control that is central to Loughran." POR, 31. But Patent Owner never explains how Loughran's

material-parameter control would be affected by adding a print server to receive print requests and printer selections from a client. Neither the Petition nor my first declaration proposed modifying Loughran's material-parameter control, Loughran's SFF fabrication-job workflow, or Loughran-Dubois's parameter-control teachings. Pet., 33-36; EX1003, ¶¶93-100. In the Loughran-Dubois-Jazayeri combination, the selected printer would send the material information to the client, receive a fabrication job from the client, and complete the fabrication job based on CAD information with the optimal set of material parameters in the same manner as discussed in my first declaration and reiterated above in §IV.A. A POSITA would have recognized that Jazayeri's suggestion would have improved Loughran-Dubois's system by allowing multiple clients and multiple printers on a network and a client to select one of multiple printers for fabricating an object without requiring that a local printer driver be installed on the client device, as well as other improvements and benefits discussed in my first declaration. Pet., 33-36; EX1003, ¶¶93-100.

C. A POSITA Would Have Been Motivated to Combine Jazayeri with Menchik, and the Menchik-Jazayeri Combination Teaches Element 1[b] (Grounds 3B/3D/3F/3H)

40. Patent Owner repeats its arguments from Ground 1B. POR, 63-64. For similar reasons as discussed above in §VII.A-VII.B, a POSITA would have been motivated to combine Jazayeri with Menchik.

VIII. Menchik in view of Dahlin (in the Combinations of Grounds 1E/1F/3E/3F) Teaches Claim 17

41. As discussed in my first declaration and above in §VI.E, Menchik determines quantities/availability and whether/when/how much support material to extract (support structure requirement) using data including property of the build material from the memory chips. EX1009, [0017] ("the term 'building material'… may include… support material"), [0027] ("process data related to the status of building material in one or more supply sources to compute material parameters for building material(s), material required to construct one or more objects, and supply parameters for materials in one or more cartridges" indicating "potential yields during printing usage," "how much material… may be used," and "when to extract building material," and "how much building material to extract"), [0028], [0035], [0037], [0043]; POR, 49 (citing Pet., 60-62; EX1009, [0027], [0047]-[0048]), 50; Pet., 39-40; EX1003, ¶¶135-137, 146. Loughran confirms that it was known to determine various operational parameters based on material information obtained from a tag or memory chip. EX1004, [0021]-[0024].

42. Patent Owner's expert acknowledges that "a POSITA would understand a 'support structure requirement' as an operational parameter would specify whether/where supports should be generated and printed and with what settings." EX2013, ¶133. In each of the proposed combinations, the material type information is read from a tag affixed to the material supply. The amount of material

required (such as the amount of material ejected per layer) is "a function of the characteristics of the materials" used. EX1005, [0081]-[0090], [0069]-[0072] (describing that "physico-chemical characteristics of the materials used for production can also affect the size and shape of the droplets" which affects the amount of material needed for each layer). In Menchik, the amount of support material required (indicating how much material to extract) is an operational parameter that controls printer operation during fabrication because Menchik chooses whether and when to use a cartridge based on the amount required. EX1009, [0007] ("control the supply of the building material from two or more cartridges according to the supply parameters"), [0027] ("whether or not to use building material from at least one selected cartridge or other source" and "when to extract building material from one or more cartridges").

43. Menchik's and Dahlin's determination of whether the amount of support material is sufficient to complete the object is a diagnostic test. EX1003, ¶¶172-176. As explained in the '466 patent, a diagnostic test is used to determine "whether a desired fabrication can be performed with the supply." EX1001, 15:53-64. Determining whether there is enough supply to complete the object is a diagnostic test to determine "whether a desired fabrication can be performed with the supply." EX1003, ¶¶172-176.

IX. KISSlicer (in the Combination of Grounds 1C/1D/3G/3H) Teaches Claim 5

44. KISSlicer is a software executed by a computing device with an operating system such as Windows, Linux, or Mac and used for creation of a print file. EX1017, ¶2; EX1018, 1. KISSlicer "facilitates the conversion of 3D object models to specific path instructions for 3D printing by slicing STL files into 3D printer-ready G-code files." EX1017, ¶1. During his deposition, Patent Owner's expert agreed that one of the functions of KISSlicer is "slicing a 3D model into layers." EX1045, 81:17-23. In the combinations of Grounds 1C/1D/3G/3H, software such as that disclosed in KISSlicer would be executed by the client (Loughran-Dubois's client that generates fabrication jobs from CAD information (EX1004, [0027], [0051], [0055]; *see* §IV.B) or Menchik's client/controller that converts CAD data to instructions for the printer (EX1009, [0024]; *see* §VI.A)), and therefore the selection of one of two tagged build materials would be received from the client. EX1045, 73:23-74:17 (agreeing that in Dubois "the slicer software is executing on a personal computer"); 81:24-82:23 (testifying that both Dubois and KISSlicer "will generate the slice geometry"); EX1003, ¶¶101 ("allow the user of the client system to select"), 177 (same).

45. Patent Owner argues that references describing "two very different 3D printing processes… represents an infeasible combination." POR, 71-72. However, a POSITA would have understood that KISSlicer's teachings would apply to any 3D

printing process. As a POSITA would have understood, every 3D model "is reformatted into an stl file and sliced horizontally." EX2014, 2; EX1005, [0055] ("print layers… are obtained by slicing the 3D representation of the component into slices"), [0059], [0075]; EX1006, [0037] ("the digital representation of a three-dimensional object may be created by using suitable software such as CAD (Computer Aided Design) software,… which produces data which may be converted to a standard communication file format, e.g., STL (Standard Tessellation Language) format…. STL files are read by the system of the present embodiments and sliced into thin layers (also referred to as slices)."); EX1009, [0024] ("Controller 105 may utilize Computer Object Data (COD) representing an object or a model, such as CAD data in Stereo Lithography (STL) format…. Controller 105 may convert such data to instructions for the various units within 3D printer system 100 to print a 3D object."); EX1012, [0004] ("a CAD/CAM program that has been tessellated into the STL format and sliced into cross-sectional data files that are merged into a build file"). Indeed, Patent Owner's expert agreed that "3D printing in general usually require slicing a 3D model into multiple slices." EX1045, 73:6-19. KISSlicer "facilitates the conversion of 3D object models to specific path instructions for 3D printing by slicing STL files into 3D printer-ready G-code files." EX1017, ¶1. A POSITA would have found it obvious to apply KISSlicer's teachings to Loughran's client 102 that generates fabrication jobs from CAD information (EX1004, [0027],

[0051], [0055]; *see* §IV.B) and to Menchik's client/controller that converts CAD data to instructions for the printer (EX1009, [0024]; *see* §VI.A).

46. Patent Owner argues that KISSlicer does not describe that "the printer receives a client-provided selection between two tagged build materials in response to tag data provided 'over the network.'" POR, 72. First, the claims do not require that the printer receive the selection "in response to" tag data; claim 5 does not even mention tag data. EX1001, 23:53-67. Second, my first declaration relies on each combination as a whole to teach providing tag data to the client over the network and receiving a selection between two tagged build materials.

X. CONCLUSION

47. I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of the Title 18 of the United States Code.

Dated: April 10, 2026 By: [signature]

Dr. Michael A. Hickner