Chart of Petitioner's Reliance on Positioning at Apex of Heart

Citation	Quotation from Petition or Supporting Declaration
Paper 1 ("Pet.") at 57	Mr. Crosby explains (*infra* §X.B.13) that a POSITA would have been motivated with a reasonable expectation of success to modify the HeartMate III "inflow subassembly" to serve as the "inflow cannula…placed into the apex of the left ventricle" as taught by Wampler-169, resulting in an "*axially aligned…inflow axis*." Ex.1007, 402; Ex.1008, [0076], Fig. 5; Ex.1003, ¶425.
Pet. at 86–87	Instead of borrowing parts from predecessor systems, a POSITA would have adhered to the express teachings of Wampler-169, which focused on "[g]ood anatomic compatibility" so that the device "fit[s] well between the apex of the heart and the adjacent diaphragm," eliminating the need for a peritoneal pocket dissection associated with increased rates of infection. Ex.1008, [0076]. Ex.1003, ¶¶651–654.
Pet. at 87	A POSITA would also have had a reasonable expectation of success that the Bourque-2001/Wampler-169 combination would "fit[] well between the apex of the heart and the adjacent diaphragm" due to the pump's "development as a compact" device and the existence of several similar LVADs that fit well at that position. Ex.1007, 405; Ex.1003, ¶¶652–655 (analyzing LVADs that fit at the apex of the heart, including Wampler-169, Akamatsu-1999, and HVAD).

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Pet. at 87–88	At the time of the claimed invention, it was within the general knowledge of a POSITA that there were a finite number (i.e., two) options for LVAD implantation: the device would be implanted at a preperitioneal pocket, or at the cardiac apex. Ex.1003, ¶656. To implant the device at the cardiac apex, a POSITA would have used the Bourque-2001/Wampler-169 combination, because that technique was common for implanting at that position. Ex.1006, Fig. 1; Ex.1008, [0075]-[0076]; Ex.1015. A POSITA would thus have had a reasonable expectation of success in view of several similar LVADs that fit well at that position. Ex.1006, Fig. 1; Ex.1008, [0075]-[0076]; Ex.1015. Ex.1003, ¶656.
Ex. 1003 ("Crosby") at 48 (heading)	The smaller third-generation devices could be placed at the cardiac apex within the pericardial space.
Crosby at 48-49 (¶ 61)	The smaller size of third-generation devices enabled these devices to be placed at the cardiac apex within the pericardial space instead of dissecting a preperitoneal pocket, which was associated with infection in the earlier generation devices.
Crosby at 49 (¶ 62)	For example, Wampler-169 reported that "[g]ood anatomic compatibility is possible since the pump casing is compact and disc-shaped, fitting well between the apex of the heart and the adjacent diaphragm[.]" Ex.1008, [0076], Fig. 5. When placed at the cardiac apex, an inlet tube and is placed into the apex of the left ventricle. Ex.1008, [0075]-[0076].
Crosby at 49-50 (¶ 63)	As another similar example, the HVAD reported that its "small size" allowed for an "optimized fit" because "[t]he pump ha[d] a short integrated inflow cannula and an axial height less than one inch," thus, "[t]he size of the device coupled with the perpendicular relationship of outflow to the inflow allow[ed] for intrapericardial pump placement and fast implantation." Ex.1015 (LaRose).

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Crosby at 50 (¶ 63)	As yet another example, one of "[t]he advantages of the [Akamatsu-1999] rotary blood pump [is] its compactness" that allows it to be implanted in patients at the cardiac apex "even those of small body size." Ex.1006 at 3.
Crosby at 51 (¶ 64)	However, the Bourque-2001 HeartMate III was already planned for "enhancements [to] continue the progression of this LVAD's development as a compact" device, which would enable its placement at the cardiac apex as discussed below. Ex.1007, at 405.
Crosby at 214-215 (¶ 423)	To the extent that Bourque-2001 does not expressly disclose an "*axially aligned…inflow tube*," it would have been obvious to a POSITA as of February 27, 2007 to modify the inflow subassembly of the HeartMate III described in Bourque- 2001 in view of Wampler-169 to axially align the LV cannula with the impeller of the rotor . . . . "[G]ood anatomic compatibility is possible since the pump casing is compact and disc-shaped, fitting well between the apex of the heart and the adjacent diaphragm." Ex.1008, [0076]. Consequently, "[t]he inlet tube 16 serves as the inflow cannula and is placed into the apex of the left ventricle 64," thereby eliminating the need for any elbow or additional inflow assembly, as shown below. Figure 5 (annotated) of Wampler-169 illustrates a representation of a human heart 63, showing the inlet tube 13 (green) of the pump 11 (blue) implanted within the left ventricle 64 (red) of the heart.

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Crosby at 299 (¶ 643)	[With regard to the combination of Bourque-2001 with Wampler-169,] "[g]ood anatomic compatibility is possible since the pump casing is compact and disc-shaped, fitting well between the apex of the heart and the adjacent diaphragm." Ex.1008, [0076]. Consequently, "[t]he inlet tube 16 serves as the inflow cannula and is placed into the apex of the left ventricle 64," thereby eliminating the need for any elbow or additional inflow assembly, as shown below. Figure 5 (annotated) of Wampler-169 illustrates a representation of a human heart 63, showing the inlet tube 13 (green) of the pump 11 (blue) implanted within the left ventricle 64 (red) of the heart.
Crosby at 302 (¶ 648)	It would have also been obvious to combine Bourque-2001 with the *axially aligned inflow tube* technique of Wampler-169 because a **POSITA would have been motivated** to do so based on the teachings of Wampler-169. For example, Wampler-169 teaches that a "centrifugal design" allows a considerable amount of flexibility during implantation" because "the axial inflow and radial outflow of the pump" means that "a 90-degree redirection of the blood is effected without the necessity of a flow-restrictive elbow fitting." Ex.1008 at [0076]. A POSITA would have recognized that, with the Wampler-169 configuration, "[g]ood anatomic compatibility is possible" so that the device "fit[s] well between the apex of the heart and the adjacent diaphragm." Ex.1008, [0076].
Crosby at 307 (¶ 651)	Thus, a POSITA would have been motivated use the Bourque/Wampler combination, recognizing that such a configuration would enable the device to "fit[] well between the apex of the heart and the adjacent diaphragm" and eliminate the need for a dissection of and placement at the preperitoneal pocket position. Ex.1008, [0076]. Indeed, Wampler-169 is focused on "[a]natomical placement of the pump" and "[g]ood anatomic compatibility" so that the pump "fit[s] well between the apex of the heart and the adjacent diaphragm." Ex. 1008 at [0075]-[0076].

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Crosby at 309 (¶ 655)	Further, a POSITA would have had a **reasonable expectation** of success that the Bourque/Wampler combination would "fit[] well between the apex of the heart and the adjacent diaphragm." Ex.1008 at [0075]. The Bourque-2001 HeartMate III was already planned for "enhancements [to] continue the progression of this LVAD's development as a compact" device (i.e., enhancements to make the device smaller), which would help its placement at the cardiac apex. Ex.1007 at 405.
Crosby at 309-310 (¶ 655)	A POSITA also would have had a reasonable expectation of success because numerous other similar devices had already shown that an LVAD could fit well at that position. For example, in addition to Wampler-169, the Akamatsu-1999 device described above similarly uses an inflow tube that is inserted into the left ventricle and fits at the cardiac apex so that the device sits within the pericardial space. Ex.1006 at Fig. 1.
Crosby at 310 (¶ 655)	Further, the HVAD, another third-generation type device, reported that its "small size" allowed for an "optimized fit" because "[t]he pump ha[d] a short integrated inflow cannula and an axial height less than one inch, thus, [t]he size of the device coupled with the perpendicular relationship of outflow to the inflow allow[ed] for intrapericardial pump placement and fast implantation." Ex.1015.
Crosby at 310 (¶ 655)	The fact that all these devices with similar designs fit well in the position at the apex of the heart would have given a POSITA a reasonable expectation of success that the Bourque/Wampler combination would also fit well.

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Crosby at 310 (¶ 656)	At the time of the claimed invention, it was within the general knowledge of a POSITA that the implantation of LVADs presented a finite number (i.e, two) options" the device could be implanted at a preperitoneal pocket or at the cardiac apex. To implant the device at the cardiac apex, a POSITA would have used the Bourque/Wampler combination, because that was the well-known technique for implanting at that position. See Ex.1006 at Fig. 1; Ex.1008 at [0075]-[0076]; Ex.1015.
Crosby at 492 (¶ 1129)	Further, a POSITA would have had a reasonable expectation of success that the Schima/Akamatsu-1999 combination could deliver a pump to the left ventricle of a heart to improve blood flow to the aorta, because this design was well known and commonly used in the prior art. For example, Wampler-169 also employed a similar configuration as Akamatsu-1999 and reported that "[g]ood anatomic compatibility is possible since the [Wampler] pump casing is compact and disc-shaped, fitting well between the apex of the heart and the adjacent diaphragm," so that when placed at the cardiac apex, an inlet tube and is placed into the apex of the left ventricle and an outlet to the aorta. Ex.1008, at [0075] - [0076]; Fig 5.